

**City of Balch Springs
Hickory Creek Flood Protection Planning Study
Final Report**



Prepared for:

**Texas Water
Development Board**

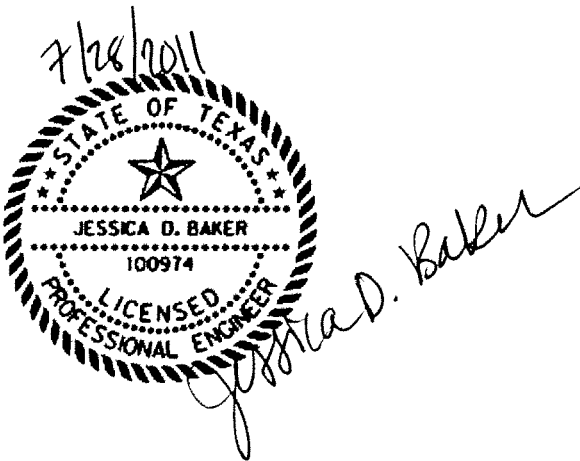
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AVO: 27171

July 29, 2011

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List of Acronyms

ASPRS	American Society of Photogrammetry and Remote Sensing
B/C	Benefit Cost
cfs	Cubic Feet per Second
CDBG	Community Development Black Grant
CN	Curve Number
D/S	Downstream
DCAD	Dallas Central Appraisal District
DEM	Digital Elevation Model
DFIRM	Digital Flood Insurance Rate Map
FDA	Flood Damage Reduction Analysis
FEMA	Federal Emergency Management Agency
FIPS	Federal Information Processing Standard
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
ft	Feet
GIS	Geographic Information System
HEC	Hydrologic Engineering Center
HMGP	Hazard Mitigation Grant Program
HMS	Hydrologic Modeling System
IP	Individual Permit
LiDAR	Light Detection and Ranging
mi	Miles
NAD83	North American Datum 1983
NAVD88	North American Vertical Datum of 1988
NCTCOG	North Central Texas Council of Governments
NRCS	Natural Resources Conservation Service
NSSDA	National Standards for Spatial Data Accuracy
NWP	Nationwide Permit
RAS	River Analysis System
RMSE	Root Mean Square Error
SCS	Soil Conservation Service
sq. mi	Square Miles
SSURGO	Soil Survey Geographic database
t_c	Time of Concentration
TCEQ	Texas Commission on Environmental Quality
TNRIS	Texas Natural Resources Information System
TR	Technical Release
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
U/S	Upstream
USACE	United States Army Corps of Engineers
USFW	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
WSEL	Water Surface Elevation



1. Executive Summary

Hickory Creek, located in Dallas County, Texas has been the source of frequent flooding over the years for the City of Balch Springs, Texas. The purpose of the City of Balch Springs, Hickory Creek Flood Protection Planning Study is to create new hydrologic and hydraulic models and perform a flood damage reduction alternative analysis to aid local officials in planning efforts.

New detailed hydrologic and hydraulic modeling was performed on Hickory Creek, Hickory Creek Tributary 4, Stream 4C6, Stream 4C6 Tributary 1, and 4C6 Tributary 2 through the City of Balch Springs. This analysis was combined with the 2005 City of Dallas Hickory Creek Floodplain Update Study to create a basin wide study of Hickory Creek and its tributaries. Detailed Light Detection and Ranging (LiDAR) elevation data, provided by the Texas Natural Resources Information System (TNRIS), and cross section and bridge/culvert surveys were used to enhance the accuracy of the models. The analysis resulted in updated and more accurate flows and water surface elevations (WSELs) for the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-year storm events. The resulting hydraulic data was then used to determine the annual flood damages and analyze various flood reduction alternatives through the City of Balch Springs.

Seven Balch Springs flood reduction alternatives were identified during the flood damage reduction analysis (FDA). Several structural options were considered to help reduce flooding in the two identified damage centers within the City of Balch Springs. It was concluded from the analysis that detention options are costly and the benefits in flood damage reduction are predicted to be much lower than the cost of the project. Channel widening alternatives were analyzed as a phased approach in addition to detention, but the amount of flood reduction was small compared to the cost. The recommended alternative produced the highest benefit cost (B/C) ratio and consists of the acquisition of several structures along Hickory Creek that have repeated losses in flood events. The damage reduction (benefits) provided by each alternative over the existing conditions was compared to the project costs with a B/C ratio.

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2. Introduction and Background

2.1. Community and Watershed Description

The City of Balch Springs, Texas (the City) is a rapidly developing community that is concerned about the increasing threat of flooding and associated damages due to increased urbanization in the Hickory Creek watershed. Hickory Creek and its tributaries are the major drainage waterways that flow through the City. These creeks were formed by centuries of flood water erosion and their floodplains include an abundance of scenic and environmental resources. Balch Springs' future population growth and associated development will require careful planning and management in order to minimize flood damages and to ensure the maximum possible preservation of the Hickory Creek drainage corridor.

The City of Balch Springs is located in the eastern portion of Dallas County approximately 12 miles southeast of downtown Dallas. It is bordered by the City of Mesquite to the north and east; Dallas County unincorporated area to the east; and the City of Dallas to the south and west as shown in Figure 1: Location Map located in Appendix A. The City of Balch Springs has an estimated 2011 population of 23,720 (Reference 1). Balch Springs is primarily a residential community with some commercial and industrial development.

The Hickory Creek watershed is located in a region of temperate mean climatological conditions, experiencing occasional extremes of temperature and rainfall of relatively short duration. Temperatures range from an average daily minimum of 35 degrees Fahrenheit in January to an average daily maximum of 95 degrees Fahrenheit in July. Average annual rainfall is 35.06 inches (Reference 2).

The Hickory Creek watershed is relatively narrow within the city. Elevations range from a high of about 540 feet (ft) in the upper reaches to a low of about 432 feet at the confluence with Stream 4C6. The existing conditions range from flat non-defined channels to deep, well defined channels. Most of the stream crossings are concrete bridges and culverts. Excessive brush, trees, and other vegetation growing along and within stream banks in floodway areas restrict flows through the channel. Several stream crossings also restrict natural flow and cause water to backup and overflow.

2.2. Purpose of Report

The purpose of this report, "City of Balch Springs, Hickory Creek Flood Protection Planning Study," is to provide a comprehensive, updated floodplain management master plan for the Hickory Creek watershed through the City of Balch Springs. This study addresses existing flooding problems within the City of Balch Springs and provides planning alternatives and design concepts to help alleviate potential flood damages. The information presented in this report will provide the City with the necessary updated drainage information to coordinate future development and to help minimize existing potential flood damages along Balch Springs' major stream corridors.

This report provides a summary of the procedures used to analyze the existing flood problems and presents results and recommendations that were derived from the analyses. Additional information (e.g. field survey notes, photographs, and work maps) and digital files used in the production of this report are located in the Appendices.

2.3. Principal Flooding Problems

The City of Balch Springs has a history of flooding problems within the Hickory Creek drainage basin. The large increase in population since the 1970s has led to urbanization of the Hickory Creek watershed and reclamation within the floodplain resulting in increased flood flows and flood elevations. Many of the City's flood damages or related problems are caused by inadequate capacity of the existing channels and bridges. Existing development, subject to overbank flooding, is primarily residential, but also includes some commercial property especially along the main stem of Hickory Creek. The primary location of reported flooding incidents occurs in an area of the City known as the "Cherry Bottoms." This area is at the confluence of Hickory Creek and Stream 4C6 and is bound by Interstate 635 (I-635) and Interstate 20 (I-20).

There are approximately 345 residential structures and 47 commercial structures located within the limits of the Hickory Creek current effective 100-year floodplain. Based on 2008 Dallas County Parcel Data, the estimated value of these structures exceeds \$42,000,000. The existing hydrology, hydraulics, and mapping of this watershed is based on a 1979, Federal Emergency Management Agency (FEMA) study that was incorporated into the effective 2001 Dallas County Flood Insurance Study (FIS) (Reference 3). This FIS Study is considered to be out of date and unusable for current planning and floodplain management purposes. Historically, severe damage to existing properties and loss of life has occurred as a result of heavy rainfall events. The United States Army Corps of Engineers (USACE) produced a document titled "Flood Plain Information Hickory Creek, Balch Springs and Kleberg, Texas" in 1972 (Reference 4). This report cited major flooding on Hickory Creek in 1928, 1942, 1949, 1957, 1962, 1964, 1966, and 1971. Additional newspaper records have indicated that significant flooding also occurred in 1900, 1911, 1967, 1973, 1976, 1977, 1991, 1994, 2004, 2007, 2008, and 2010. The flood of October 1994 reportedly caused over \$600,000 in damage and was responsible for the death of an 11-year-old boy.

2.4. Community Involvement

The project commenced with the first of three public meetings in the City of Balch Springs on February 9, 2010. At the meeting, the project scope was discussed with the residents. A breakout session followed where maps were provided and residents voiced their flooding issues. The second public meeting was held on February 17, 2011. The meeting focused on presenting the results of the hydrologic and hydraulic modeling and the resulting flood hazard mapping. The third and final public meeting was held June 21, 2011. During the meeting every phase of the project was reviewed and the results of the flood damage assessment and alternative development were discussed in detail. An interact map and hard copy maps were available for residents afterwards.

In addition to the public meetings, a meeting was held on October 5, 2010 with staff from the Texas Water Development Board (TWDB), City of Balch Springs, USACE, and Halff Associates, Inc. This meeting focused on how the current study could possibly be incorporated into future studies and projects within the City of Balch Springs.

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3. Study Procedure

3.1. Hickory Creek

This detailed study was focused on the Hickory Creek watershed starting at the downstream (D/S) limits of the City of Balch Springs. This area encompasses approximately 4,396 acres (6.87 square miles (sq. mi.)). Hickory Creek and its tributaries collect stormwater runoff from the majority of Balch Springs as well as portions of the City of Mesquite and Dallas. The Hickory Creek basin has one (1) major tributary, Stream 4C6, and three (3) minor tributaries, Stream 4C6 Tributary 1, Stream 4C6 Tributary 2, and Hickory Creek Tributary 4. As part of this study, the new detailed hydrology and hydraulics models created will replace the upstream (U/S) portion of the models developed as part of the 2005 Hickory Creek Study performed by Halff Associates for the City of Dallas (Reference 5). The end result is a watershed based model spanning from the confluence of Hickory Creek and Stream 4C3 to the upstream limits of Hickory Creek within the City of Mesquite. Table 1, Study Streams, is a summary of the source and description of each study stream. Figure 2, Study Streams, is a graphical representation of this information.

Table 1: Study Streams

Stream Name	Study	Downstream Limit	Upstream Limit	Length (miles)
Hickory Creek	2005 City of Dallas Study	Confluence with Stream 4C3	Confluence with Stream 4C6	7.62
Hickory Creek	New Detailed	Confluence with Stream 4C6	Bruton Road	4.19
Hickory Creek Tributary 4	New Detailed	Confluence with Hickory Creek	~300 ft D/S of Elam Road	0.71
Stream 4C6	New Detailed	Confluence with Hickory Creek	Timothy Lane	2.88
Stream 4C6 Tributary 1	New Detailed	Confluence with Stream 4C6	~930 ft U/S of Seagoville Road	0.74
Stream 4C6 Tributary 2	New Detailed	Confluence with Stream 4C6	Horseshoe Trail	1.10
Total Length:				17.24

3.2. Survey

3.2.1. Site Reconnaissance

Initial limited site reconnaissance of the specific study area was performed in December 2008. Pictures were taken of the creek and the general stream conditions were determined. A second field reconnaissance was performed in January 2010 where the entire stream was walked and a structure inventory was completed. Photographs of the

channels and structures were taken to aid in hydraulic modeling and to assign Manning’s channel “n” values. During a significant storm event in September 2010, structures known to be inundated by lower storm events were visited and pictures were taken.

3.2.2. Survey

The survey task included identifying and establishing survey control, conducting channel and structure surveys, and obtaining the physical dimensions of hydraulic and flood control structures. Survey was conducted by Garcia Land Data, Inc. from February 2010 through April 2010. Twenty seven (27) structure surveys and ten (10) channel surveys (not including channel surveys near structures) were taken. For each surveyed structure, the channel upstream of the structure was surveyed and the cross section downstream of the structure was modeled with the upstream channel survey data adjusted according to a survey shot of the flowline downstream of the structure. The survey data includes control points, text files with the survey point data, photographs, and sketches. The field sketches show all survey points taken at each location. This data is Included in the "Hickory Creek Physical Features Report" located in Appendix B.

In addition to the survey collected for this study, survey was performed on Hickory Tree Road, Seagoville Road / Kleberg Road, and the I-20 aerial crossings upstream of Hickory Tree Road and Seagoville Road as part of a 2007 City of Balch Springs project performed by Half Associates.

The location and name of all survey data incorporated into this study can be found in Table 2, Surveyed Structures, and Table 3, Surveyed Cross Sections. Figure 3 displays the location of the surveyed structures and cross sections.

The field survey was performed using vertical survey datum North American Vertical Datum of 1988 (NAVD88). The survey data included in Appendix B is in State Plane Coordinates, Texas North Central Federal Information Processing Standard (FIPS) 4202 (GRID – feet), North American Datum 1983 (NAD 83).

Table 2: Surveyed Structures

Structure	Location	Structure	Location
Hickory Creek		Hickory Creek Tributary 4	
STR_02	Bruton Road	STR_18	Hickory Tree Road
STR_03	Lake June Road	Stream 4C6 Tributary 1	
STR_04	Stein Avenue	STR_19	Rylie Crest Drive
STR_05	Elam Road	STR_20	I-20
STR_06	Eleanor Drive	STR_21	Seagoville Road
AC_01*	Pipe Crossing	STR_22	Woodsboro Drive

Table 2: Surveyed Structures (cont.)

Structure	Location	Structure	Location
Hickory Creek		Stream 4C6	
BR_01*	Hickory Tree Road	STR_23	Rylie Crest Drive
STR_07	I-635 Southbound	STR_24	I-20
STR_08	I-635 Northbound	STR_25	Seagoville Road
STR_09	I-635 Access Road	STR_26	Pioneer Road
AC_02*	Seagoville Road	STR_27	Spring Oak Drive
STR_11	Kleberg Road	Stream 4C6 Tributary 2	
STR_12	I-20 / I-635 Interchange	STR_32	I-20 Ramp
STR_13	I-20 Westbound	STR_35	I-20
STR_14	I-20 Eastbound		
STR_15	I-20 / I-635 Interchange		
STR_16	Rylie Crest Drive		
STR_17	Arrowdell Road		

* AC_01, AC_02, and BR_01 survey collected as part of a 2007 City of Balch Springs study performed by Half Associates, Inc.

Table 3: Surveyed Cross Sections

Cross Section	Approximate Location
Hickory Creek	
XS_01	~715 ft D/S of Bruton Road
XS_02	~1314 ft U/S of Lake June Road
XS_03	~520 ft U/S of Stein Avenue
XS_04	~3110 ft U/S of Elam Road
XS_06	~480 ft U/S of Eleanor Drive
XS_09	~500 ft D/S of Arrowdell Road
Stream 4C6	
XS_11	~580 ft D/S of Confluence with Stream 4C6 Tributary 1
XS_13	Confluence with Stream 4C6 Tributary 2
XS_14	~1520 ft U/S of Seagoville Road
Stream 4C6 Tributary 2	
XS_18	~470 ft D/S of Horseshoe Trail

3.2.3. Topographic Data

The topographic data utilized for this study was the TNRIS 2010 LiDAR Terrain Data Acquisition for Dallas County, Texas. The LiDAR was flown in January 2010. This data was available as LiDAR point clouds in American Society of Photogrammetry and Remote Sensing (ASPRS) common LiDAR Data Exchange Format (LAS 1.2). The LiDAR data was processed in ESRI's ArcGIS software to create a terrain and Digital Elevation Model (DEM) data set for the project area. This data was acquired and processed to meet 1 meter Root Mean Square Error (RMSE) horizontal accuracy and 0.07 meters vertical accuracy at 95 percent confidence level in open terrain using National Standards for Spatial Data Accuracy (NSSDA) and FEMA methodology. The data was acquired in Universal Transverse Mercator (UTM), NAD83 (Meters) with heights in NAVD88, meters. The data therefore did not require any datum conversion. It was projected to NAD83 State Plane Feet to conform to the coordinate system used for the base map.

3.2.4. Data Collection

Past studies of the Hickory Creek watershed were researched. The following is a summary of reports and data collected for the watershed.

Hydrology:

- HEC-1 model – Original Effective FEMA Hydrology (1979)
- HEC-HMS model – City of Dallas Hickory Creek Floodplain Update Study (2005)

Hydraulics:

- Original Effective FEMA Hydraulics Model (1979)
- HEC-RAS model – City of Dallas Hickory Creek Floodplain Update Study (2005)
- HEC-RAS model – City of Balch Springs Floodplain Reclamation Study (2007)
- HEC-RAS model – Developed by Half Associates for I-20 ramp addition (2009)

Reports:

- USACE Project Study Plan for Hickory Creek: Section 205 Small Flood Control Projects (1998)
- Sherwood Forest and Southwest Mesquite Drainage Study (2008). Prepared for the City of Mesquite by Nathan D. Maier Consulting Engineers (NDMCE)
- Balch Springs Comprehensive Plan (1999)
- USACE Floodplain Information Report (1952)
- Flood Plain Information Hickory Creek Balch Springs and Kleberg, Texas (1972)
- City of Balch Springs FEMA FIS Report (1989)
- Dallas County FEMA FIS Report (2001)
- Half Floodplain Reclamation Feasibility Study (2008). Report completed in conjunction with an I-20 proposed improvement study.

- Texas Department of Transportation (TxDOT) construction plans: Plans of Proposed State Highway Improvement, Federal Aid Project I-20-5(96) 479, I-20, Dallas County, From: North of US-175, To: West of Shepherd Road, dated January 1982

3.3. Hydrologic Analysis

A detailed hydrologic analysis was performed on Hickory Creek watershed within the City of Balch Springs which includes Hickory Creek, Hickory Creek Tributary 4, Stream 4C6, Stream 4C6 Tributary 1, and Stream 4C6 Tributary 2. The USACE Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS, Version 3.4) was utilized for the hydrologic modeling (Reference 6). The Balch Springs detailed hydrology model prepared as part of this study was combined with the Hickory Creek hydrology model from the "2005 City of Dallas Hickory Creek Floodplain Update Study." Rainfall events selected for this study include the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-year frequency floods.

3.3.1. Drainage Areas

The Hickory Creek watershed boundary through Balch Springs and Mesquite was delineated using visual inspection of the 2010 TNRIS topographic data. The total area of the Hickory Creek watershed upstream of the Balch Springs city limits is 6.87 square miles. The watershed was delineated into 45 sub-basins as shown in Figure 4. The sub-basin boundaries were adjusted based on the storm sewer locations obtained from the City of Mesquite as well as on-the-ground identification.

Nine (9) sub-basins were incorporated from the 2005 City of Dallas study of Hickory Creek and Stream 4C3 to create a comprehensive Hickory Creek watershed model through the Cities of Dallas, Balch Springs, and Mesquite.

3.3.2. Precipitation

The standard 24-hour (hr) duration frequency storm event was used to establish rainfall parameters for watersheds larger than 500 acres (0.78 sq. mi.). Point rainfall depths were obtained from the "United States Geological Survey (USGS) Water Resources Investigation Report Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas 98-4044" (Reference 7). The rainfall data is summarized below in Table 4, Rainfall Data.

Table 4: Rainfall Data (inches (in))

Flood Event		Storm Duration							
Year	%	5 Min	15 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
2	50%	0.50	0.98	1.68	2.06	2.33	2.65	3.05	3.51
5	20%	0.58	1.29	2.19	2.68	3.03	3.55	4.11	4.97
10	10%	0.64	1.50	2.52	3.10	3.51	4.19	4.88	6.04
25	4%	0.73	1.80	2.97	3.67	4.17	5.10	5.98	7.49
50	2%	0.81	2.04	3.35	4.13	4.72	5.88	6.93	8.66
100	1%	0.88	2.31	3.78	4.62	5.31	6.76	8.00	9.90
250	0.4%	0.95	2.70	4.40	5.34	6.20	8.09	9.64	11.66
500	0.2%	1.10	3.03	4.93	5.94	6.95	9.26	11.09	13.47

3.3.3. Rainfall-Runoff Losses

All rainfall-runoff losses were computed using the Soil Conservation Service (SCS) Curve Number (CN) loss method, developed by the Natural Resources Conservation Service (NRCS), formerly SCS. This method is used to predict the direct runoff or infiltration of an area based on the area's land use, hydrologic soil group, and hydrologic condition.

The existing land use was based on the 2005 North Central Texas Council of Governments (NCTCOG) Land Use Inventory and was adjusted to reflect the conditions shown on the 2009 Landiscor aerial photos of the watershed (Reference 8). The fully developed (ultimate) conditions land use was based on zoning files obtained from the City of Balch Springs, Dallas, and Mesquite. Figures 5 and 6 show the Existing conditions and the Ultimate conditions land use, respectively.

The hydrologic soil types in this study were obtained from the NRCS, Soil Survey Geographic database (SSURGO) for Dallas County (Reference 9). Soil properties influence the relationship between rainfall and runoff so the soils are grouped into four hydrologic soil groups: A, B, C, and D based on runoff potential. Table 5, Watershed Soil Classification, is a summary of the watershed soil types associated with hydrologic soil groups. Figure 7, Soils Map, shows the hydrologic soil types through the watershed.

Table 5: Watershed Soil Classification

SSURGO Database Classification	Hydrologic Soil Type Percentage				
	A	B	C	D	OTHER
Arents, loamy, hilly	100%	--	--	--	--
Austin-Urban land complex	--	--	50%	--	50%

Table 5: Watershed Soil Classification (cont.)

SSURGO Database Classification	Hydrologic Soil Type Percentage				
	A	B	C	D	OTHER
Axtell fine sandy loam	--	--	--	100%	--
Axtell-Urban land complex	--	--	--	70%	30%
Bastil fine sandy loam	--	100%	--	--	--
Burleson clay	--	--	--	100%	--
Crockett fine sandy loam	--	--	--	100%	--
Ferris-Heiden complex	--	--	--	90%	10%
Ferris-Urban land complex	--	--	--	65%	35%
Gowen loam	--	100%	--	--	--
Heiden clay	--	--	--	100%	--
Houston Black clay	--	--	--	100%	--
Houston Black-Urban land complex	--	--	--	55%	45%
Mabank fine sandy loam	--	--	--	100%	--
Rader-Mabank complex	--	--	65%	20%	15%
Rader-Urban land complex	--	--	65%	--	35%
Silawa fine sandy loam	--	100%	--	--	--
Water	--	--	--	--	100%
Wilson clay loam	--	--	--	100%	0%
Wilson-Urban land complex	--	--	--	60%	40%

The composite CNs selected for this analysis were based on the CN tables provided in the NRCS June 1986 TR-55 Report, “Urban Hydrology for Small Watersheds” (Reference 10). Weighted CNs were calculated for each sub-basin based on the incremental CNs calculated for each soil type and land use within the sub-basin. All initial abstractions were computed using the storage equation default formula within the SCS loss method procedure, which was automated within the HEC-HMS software. Table 6, Land Use and Curve Numbers, shows the CN associated with the various land use and soil types.

Table 6: Land Use and Curve Numbers

Description	Land Use Code	Impervious (%) Condition	Curve Number			
			A	B	C	D
Agriculture	AG	Small grain	60	72	80	84
Brushy Fair	BF	50 to 75% ground cover	35	56	70	77

Table 6: Land Use and Curve Numbers (cont.)

Description	Land Use Code	Impervious (%) Condition	Curve Number			
			A	B	C	D
Brushy Poor	BP	<50% ground cover	48	67	77	83
Light Commercial	LC	50% impervious	69	80	86	89
Commercial	C	85% impervious	89	92	94	95
Developing Urban	DU	Pervious only, no vegetation	77	86	91	94
Industrial	IN	72%	81	88	91	93
Institutional	IS	72%	81	88	91	93
Multi-Family	MF	72%	81	88	91	93
Maintained open area	OG	good condition, grass cover > 75%	39	61	74	80
Unmaintained open area	OF	fair condition, grass cover 50-75%	49	69	79	84
Single Family 1 Acre	SF-1	20%	51	68	79	84
Single Family 1/2 Acre	SF-0.5	25%	54	70	80	85
Single Family 1/4 Acre	SF-0.25	38%	61	75	83	87
Single Family 2 Acre	SF-2	12%	46	65	77	82
Transportation Highway	TR	completely paved	98	98	98	98
Transportation Road	RD	paved; open ditches including ROW	83	89	92	93
Water	W	100 % impervious	100	100	100	100
Wooded	WF	Condition fair	36	60	73	79
Wooded	WP	Condition poor	45	66	77	83
Brushy Good	BG	> 75% ground cover	30	48	65	73

3.3.4. Unit Hydrograph Method

The SCS Dimensionless Unit Hydrograph method was used and SCS lag times were computed for each sub-basin to generate runoff hydrographs. Existing time of concentration (t_c) was computed based on TR-55 methodology. Travel times for channel flow were based on velocities from the hydraulic model.

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

$$t_c = t_{sheet} + t_{shallow\ concentrated} + t_{pipe} + t_{channel}$$

Lag times were computed using the following equation:

$$T_p = 0.6 * t_c$$

Table C.1 located in Appendix C contains lag time calculations for all sub-basins within the new detailed study watershed. Table 7, Summary of Hydrologic Parameters, summarizes the sub-basin area, SCS lag time, and SCS CN for both existing and ultimate conditions for each sub-basin.

Table 7: Hydrologic Variable Summary

Sub-basin Name	Stream Name	Study	Area (sq. mi.)	Existing CN	Ultimate CN	Lag Time (min)
H_0060	Hickory	2005 City of Dallas	0.86	78	84	43.0
H_0070	Hickory	2005 City of Dallas	1.01	78	80	52.0
H_0080	Hickory	2005 City of Dallas	0.34	85	86	25.0
H_0090	Hickory	2005 City of Dallas	1.00	78	82	47.0
HC_B04	Hickory	New Detailed	0.07	88	89	20.8
HC_B05	Hickory	New Detailed	0.12	87	88	19.5
HC_B06	Hickory	New Detailed	0.32	88	90	38.9
HC_B07	Hickory	New Detailed	0.54	86	89	36.0
HC_B08	Hickory	New Detailed	0.43	86	90	21.5
HC_B09	Hickory	New Detailed	0.58	82	89	30.8
HC_B10	Hickory	New Detailed	0.27	80	86	30.0
HC_B11	Hickory	New Detailed	0.18	82	87	20.1
HC_B12	Hickory	New Detailed	0.20	86	89	20.5
HC_B13	Hickory	New Detailed	0.10	83	90	17.8
HC_B14	Hickory	New Detailed	0.07	86	86	19.7
HC_B15	Hickory	New Detailed	0.10	77	88	15.6
MES_B01	Hickory	New Detailed	0.16	88	89	18.3
MES_B02	Hickory	New Detailed	0.28	87	87	13.9
MES_B03	Hickory	New Detailed	0.04	84	87	13.5
MES_B04	Hickory	New Detailed	0.23	83	86	30.3
MES_B05	Hickory	New Detailed	0.07	84	84	21.9
MES_B06	Hickory	New Detailed	0.09	85	85	21.8
HCT4_B01	Hickory T4	New Detailed	0.20	86	91	26.5
HCT4_B02	Hickory T4	New Detailed	0.48	86	89	27.5
4C3_010	Stream 4C3	2005 City of Dallas	0.82	80	82	41.0
4C3_020	Stream 4C3	2005 City of Dallas	0.32	85	86	37.0

Table 7: Hydrologic Variable Summary (cont.)

Sub-basin Name	Stream Name	Study	Area (sq. mi.)	Existing CN	Ultimate CN	Lag Time (min)
4C3_030	Stream 4C3	2005 City of Dallas	0.25	84	85	41.0
4C3_040	Stream 4C3	2005 City of Dallas	0.53	82	83	29.0
4C3_050	Stream 4C3	2005 City of Dallas	0.56	80	82	40.0
4C6_B01	Stream 4C6	New Detailed	0.06	86	87	17.8
4C6_B02	Stream 4C6	New Detailed	0.14	85	87	20.0
4C6_B03	Stream 4C6	New Detailed	0.15	86	89	24.9
4C6_B04	Stream 4C6	New Detailed	0.14	88	88	20.1
4C6_B05	Stream 4C6	New Detailed	0.14	84	86	20.2
4C6_B06	Stream 4C6	New Detailed	0.11	76	79	25.9
4C6_B07	Stream 4C6	New Detailed	0.04	80	83	19.7
4C6_B08	Stream 4C6	New Detailed	0.09	83	86	6.4
4C6_B09	Stream 4C6	New Detailed	0.08	79	81	18.5
4C6_B10	Stream 4C6	New Detailed	0.02	77	80	18.0
4C6_B11	Stream 4C6	New Detailed	0.04	78	80	17.7
4C6T1_B01	Stream 4C6 T1	New Detailed	0.34	82	85	25.0
4C6T1_B02	Stream 4C6 T1	New Detailed	0.06	76	86	20.0
4C6T1_B03	Stream 4C6 T1	New Detailed	0.09	76	80	19.6
4C6T1_B04	Stream 4C6 T1	New Detailed	0.04	77	77	21.2
4C6T2_B00	Stream 4C6 T2	New Detailed	0.09	86	87	13.2
4C6T2_B01	Stream 4C6 T2	New Detailed	0.08	87	88	22.7
4C6T2_B02	Stream 4C6 T2	New Detailed	0.04	84	87	23.5
4C6T2_B03	Stream 4C6 T2	New Detailed	0.30	83	86	22.8
4C6T2_B04	Stream 4C6 T2	New Detailed	0.20	82	87	26.7
4C6T3_B01	Stream 4C6 T2	New Detailed	0.12	86	87	16.3

3.3.5. Flood Routing

Routing of flood flows through channels and reservoirs is necessary in order to model the amount of valley storage in the stream reaches. This valley storage reduces peak flows at the downstream end of a reach. The Modified Puls routing method was utilized for this study. This method is based on the conservation of mass and the concept that storage is a function of outflow to route flows through a designated stream reach. To

establish storage-outflow relationships, volumes through each reach were determined using a range of steady-flow water surface profiles in Hydrologic Engineering Center River Analysis System (HEC-RAS) hydraulic model created as part of this study. These relationships were imported into HEC-HMS and used to calculate discharges at the downstream end of each designated reach based on the inflow and storage in each reach. Storage-outflow relationships were determined for existing channel and floodplain conditions. The Kinematic Wave and Muskingum-Cunge Routing methods were also explored as applicable routing methods. The Muskingum-Cunge and the Kinematic Wave methods assume a circular, triangular, trapezoidal, rectangular, or a typical eight-point cross section. The valley storage in the streams could not be accurately modeled using any of these methods. Therefore, the Modified Puls method was selected based on the accuracy on which it approximated the storage through a given reach. This method is the preferred method in similar watersheds where detailed hydraulic modeling is available.

3.3.6. Detention

Eight existing detention ponds were identified as part of the Hickory Creek watershed, as shown in Figure 8: Existing Detention Ponds. Five of the ponds are located at the upstream end of Hickory Creek within the City of Mesquite. The hydrologic modeling of the ponds was based on the 2008 Sherwood Forest and Southwest Mesquite Drainage Study HEC-1 model (Reference 11). Since the original study was done in HEC-1, the pond outfall structures were modeled using Elevation-Storage-Discharge curves that were developed outside of HEC-1. In this study, because of added functionality in HEC-HMS, the HEC-HMS model was adjusted to more accurately reflect the ponds Elevation-Storage-Discharge relationship by simulating the physical properties of each outfall structure as a culvert and/or weir.

Two additional detention ponds outfall into Stream 4C6 Tributary 2 directly upstream of I-20. Elevation-area tables were developed for each pond based on 2010 LiDAR and the outlet structures were input based on field measurements.

The final detention pond is an inline pond located on Stream 4C6 upstream of Spring Oak Drive. It was not included as a reservoir in the hydrology model because the elongated shape of the pond and the presence of a foot bridge crossing. Instead, the pond was modeled with cross sections in the hydraulics model and was included as part of the Modified Puls routing for the reach.

Figure 9, HEC-HMS Model Configuration shows the HEC-HMS model components overlaid on the drainage areas.

3.4. Hydraulic Analysis

A hydraulic analysis was performed utilizing the USACE HEC-RAS software, version 4.1.0 (Reference 12). The purpose of the analysis was to develop flood profiles for the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-year storm events for existing and ultimate conditions. The hydraulic model developed for the 2005 City of Dallas Hickory Creek

study ended at the City of Dallas/City of Balch Springs city limits. Therefore, a new detailed hydraulic model was developed within Balch Springs which included Hickory Creek, Hickory Creek Tributary 4, Stream 4C6, Stream 4C6 Tributary 1, and Stream 4C6 Tributary 2. The two models were combined to form a comprehensive hydraulic model through the Cities of Dallas, Balch Springs, and Mesquite.

The Balch Springs Hickory Creek model analysis begins approximately 430 feet downstream of the City of Dallas limits and ends upstream of Bruton Road at the City of Balch Springs/City of Mesquite limits.

3.4.1. Stream Centerlines and Cross Sections

Study stream centerlines from the 2010 Revised Preliminary Dallas County Digital Flood Insurance Rate Map (DFIRM) Database (Reference 13) were adjusted to reflect survey data and 2010 LiDAR. Hydraulic cross-sections used for the study streams' HEC-RAS models were placed at close intervals above and below bridges and culverts, where applicable, in order to compute the significant effective flow and backwater effects of these structures. HEC-GeoRAS software was used to process the geographic hydraulic variables for the centerlines and cross sections. Elevation data was extracted from the terrain model created from 2010 TNRIS LiDAR for each cross section and imported into HEC-RAS. Cross section profiles were supplemented with field survey where available.

Several cross sections from the upstream limit of the 2005 City of Dallas Hickory Creek HEC-RAS model were copied into the new detailed Balch Springs HEC-RAS model in order to accurately combine the two separate models into a single comprehensive hydraulic model. The station-elevation data for these cross sections were adjusted to reflect the ground surface data updated from the 2010 terrain. No other changes were made to the geometry imported from the 2005 Hickory Creek HEC-RAS model through the City of Dallas.

3.4.2. Modeling Variables

Channel roughness factors (Manning's "n") were assigned based on field inspection and aerial photographs. Table 8, Manning's Roughness Coefficients by Type, is a summary of n-values used in this study.

Appropriate expansion and contraction coefficients of 0.3 and 0.5 were applied upstream and downstream of structures to account for natural and structural variation in channel cross section shape.

Ineffective flow areas were entered in the overbanks of the channel upstream and downstream of structures to account for overbank loss of conveyance due to the structures. Ineffective flow limits were also used in situations where there was storage without conveyance in the cross section overbanks.

Table 8: Manning’s Roughness Coefficients by Type

Description	Channel n-Values	Overbank n-Values
Concrete channels	0.013	--
Concrete pilot with maintained grass banks	0.025	--
Maintained grass	0.035	--
Weeds and brush, irregular channel (overflow)	0.055	--
Medium tree canopy	0.065	--
Heavy tree canopy	0.075	--
Grass	--	0.045
Gravel, construction	--	0.055
Scattered trees, flow obstructions	--	0.060
Light to medium trees with some open space	--	0.070
Medium tree cover	--	0.080
Medium residential with large streets in flow direction	--	0.090
Heavy tree cover with some open space	--	0.090
Industrial, commercial with some open space (no fencing)	--	0.090
Heavy tree cover, residential with some open space	--	0.100
Dense residential (small, fenced lots)	--	0.120

3.5. Results of Hydrologic and Hydraulic Analyses

3.5.1. Peak Discharges

Peak flood discharges calculated for this study include the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-year flood frequencies for both existing land use conditions and projected ultimate land use conditions. Ultimate land use conditions were analyzed with channel flood routing data based on existing channels and bridges. Peak discharges were computed at the downstream end of each sub-basin. Tables 9 and 10 display peak discharges in cubic feet per second (cfs) for existing and ultimate conditions, respectively.

3.5.2. Water Surface Elevations

Peak WSELs were calculated for the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-year flood frequencies for both existing land use conditions and projected ultimate land use conditions. Flood profiles and HEC-RAS output tables (Existing and Ultimate conditions) are included in Appendix E.

The 100- and 500-year existing conditions WSELs were mapped on the 2010 TNRRIS LiDAR and are shown along with the cross sections on Figure 10, Floodplain Workmaps. A Hickory Creek floodway model was created and the floodway extents are also shown in the Floodplain Workmaps.

3.5.3. Existing vs. Ultimate Conditions

Peak flood discharges for both the existing and ultimate conditions were compared for the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-year flood frequencies. Table 11, Existing Conditions vs. Ultimate Conditions Peak Discharges, shows the difference in flows for the 100- and 500-year events. Appendix E contains the tabular comparison of WSEL between the existing and ultimate conditions and also the profile comparison for the 100-year event.

The average change in flows between existing and ultimate conditions was approximately 3%. As a result, there were only small differences when the 100-year ultimate conditions floodplain was compared to the existing conditions floodplain. The existing conditions floodplain shapefile has been included as part of the digital data. In order to assure that any recommended alternatives could sustain future growth within the City, the flood damage assessment and alternative development phases of the study were based on the ultimate development conditions discharges and water surface elevations.

Table 9: Existing Conditions Peak Flood Discharges

Location	DA (sq. mi.)	XS Station	Peak Discharges (cfs)							
			2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	250-YR	500-YR
Hickory Creek										
Bruton Road	1.06	62,350	300	500	650	950	1,400	1,850	2,450	2,900
~1580 ft D/S of Bruton Road	1.38	60,697	500	850	1,050	1,400	1,900	2,400	3,100	3,700
~1760 ft U/S of Lake June Road	1.92	58,360	700	1,200	1,550	2,000	2,500	3,150	4,050	4,850
Lake June Road	1.92	56,665	700	1,150	1,450	1,900	2,350	2,900	3,800	4,600
Stein Road	2.34	55,262	750	1,250	1,600	2,050	2,500	3,050	3,950	4,750
Elam Road	2.92	50,295	800	1,350	1,700	2,200	2,650	3,200	4,050	4,900
Eleanor Drive	3.87	47,037	1,200	2,050	2,550	3,200	3,650	4,200	5,150	6,000
I-635	4.05	45,137	1,250	2,050	2,550	3,150	3,700	4,250	5,150	5,950
Seagoville Road	4.25	44,506	1,050	1,700	2,450	3,150	3,700	4,300	5,200	5,950
I-20	4.36	43,442	1,050	1,700	2,450	3,200	3,750	4,350	5,250	6,000
Rylie Crest Drive	4.43	42,350	1,050	1,700	2,450	3,200	3,750	4,350	5,250	6,000
~65 ft D/S of Confluence with Stream 4C6	6.87	40,168	1,750	2,750	3,900	5,100	5,850	6,750	8,500	10,450
US HWY 175	7.73	33,366	1,500	2,550	3,400	4,550	5,400	6,400	7,900	9,150
Private Drive	8.07	28,641	1,450	2,500	3,350	4,500	5,400	6,400	7,950	9,200
~190 ft D/S of Private Drive	9.08	28,330	1,500	2,650	3,550	4,800	5,800	6,950	8,750	10,250
~980 ft U/S of Confluence with Stream 4C3	10.08	20,583	1,400	2,550	3,450	4,650	5,750	6,900	8,800	10,450
Hickory Creek Tributary 4										
Elam Road	0.20	3,766	150	275	350	450	500	600	700	800
~900 ft U/S of Hickory Tree Road	0.68	1,418	450	825	1,025	1,250	1,450	1,650	1,950	2,200

Table 9: Existing Conditions Peak Flood Discharges (cont.)

Location	DA (sq. mi.)	XS Station	Peak Discharges (cfs)							
			2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	250-YR	500-YR
Stream 4C6										
Timothy Lane	0.06	15,204	50	100	125	150	175	200	250	275
Green Valley Drive	0.20	13,471	150	275	325	450	500	550	650	750
~200 ft U/S of Spring Oak Drive	0.34	11,124	150	250	325	400	450	550	650	700
Pioneer Road	0.48	10,477	275	450	600	750	850	1,000	1,150	1,350
~1520 ft U/S of Seagoville Road	0.62	8,542	325	550	750	950	1,100	1,300	1,550	1,750
Confluence of Stream 4C6 Tributary 2	1.55	6,239	800	1,550	2,050	2,700	3,250	3,850	4,650	5,250
Interstate 20	1.59	5,525	800	1,500	2,000	2,650	3,200	3,800	4,600	5,150
Rylie Crest Drive	1.68	3,968	800	1,500	2,000	2,650	3,200	3,800	4,600	5,200
Verdant Lane	1.76	2,728	800	1,500	2,050	2,700	3,250	3,850	4,700	5,300
~480 ft D/S of Verdant Lane	2.31	2,063	800	1,300	1,550	2,200	3,200	4,250	5,600	6,500
Stream 4C6 Tributary 1										
~930 ft U/S of Seagoville Road	0.34	3,883	225	450	550	700	850	1,000	1,200	1,350
Seagoville Road	0.40	3,124	250	450	600	800	950	1,100	1,300	1,500
I-20	0.49	1,999	275	500	700	900	1,050	1,200	1,400	1,600
Stream 4C6 Tributary 2										
Horseshoe Trail	0.09	5,752	100	175	225	300	350	400	450	500
~1020 ft D/S of Horseshoe Trail	0.17	4,770	175	275	350	450	525	600	725	800
I-20	0.32	3,617	200	325	450	650	850	1,050	1,300	1,450
I-20	0.62	1,719	425	750	950	1,300	1,600	1,950	2,350	2,600

Table 9: Existing Conditions Peak Flood Discharges (cont.)

Location	DA (sq. mi.)	XS Station	Peak Discharges (cfs)							
			2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	250-YR	500-YR
~50 ft D/S of I-20	0.81	609	525	950	1,250	1,700	2,050	2,450	2,950	3,300

Table 10: Ultimate Conditions Peak Flood Discharges

Location	DA (sq. mi.)	XS Station	Peak Discharges (cfs)							
			2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	250-YR	500-YR
Hickory Creek										
Bruton Road	1.06	62350	300	550	700	1,000	1,400	1,850	2,450	2,900
~1580 ft D/S of Bruton Road	1.38	60697	500	850	1,050	1,400	1,950	2,450	3,150	3,750
~1760 ft U/S of Lake June Road	1.92	58360	800	1,250	1,600	2,050	2,550	3,200	4,100	4,950
Lake June Road	1.92	56665	750	1,200	1,500	1,950	2,400	2,950	3,850	4,650
Stein Road	2.34	55262	850	1,350	1,650	2,100	2,600	3,150	4,000	4,850
Elam Road	2.92	50295	950	1,450	1,800	2,300	2,750	3,250	4,150	5,000
Eleanor Drive	3.87	47037	1,500	2,300	2,850	3,450	3,850	4,450	5,400	6,200
I-635	4.05	45137	1,550	2,300	2,800	3,400	3,900	4,450	5,350	6,150
Seagoville Road	4.25	44506	1,200	2,000	2,750	3,400	3,950	4,500	5,400	6,150
I-20	4.36	43442	1,200	2,000	2,750	3,450	4,000	4,550	5,450	6,200
Rylie Crest Drive	4.43	42350	1,200	2,000	2,750	3,450	4,000	4,600	5,450	6,200
~65 ft D/S of Confluence with Stream 4C6	6.87	40168	1,950	3,150	4,300	5,450	6,150	7,150	9,000	10,950
US HWY 175	7.73	33366	1,700	2,850	3,750	4,900	5,750	6,750	8,250	9,500
Private Drive	8.07	28641	1,650	2,850	3,700	4,850	5,750	6,750	8,250	9,550
~190 ft D/S of Private Drive	9.08	28330	1,750	2,950	3,900	5,200	6,200	7,350	9,150	10,650

Table 10: Ultimate Conditions Peak Flood Discharges (cont.)

Location	DA (sq. mi.)	XS Station	Peak Discharges (cfs)							
			2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	250-YR	500-YR
~980 ft U/S of Confluence with Stream 4C3	10.08	20,583	1600	2850	3750	5050	6150	7350	9200	10900
Hickory Creek Tributary 4										
Elam Road	0.20	3,766	200	300	375	450	550	600	700	800
~900 ft U/S of Hickory Tree Road	0.68	1,418	550	875	1075	1350	1500	1700	2000	2250
Stream 4C6										
Timothy Lane	0.06	15,204	50	100	125	150	175	200	250	275
Green Valley Drive	0.20	13,471	175	275	350	450	500	600	700	750
~200 ft U/S of Spring Oak Drive	0.34	11,124	150	275	350	450	500	550	650	750
Pioneer Road	0.48	10,477	275	500	600	750	850	1,000	1,200	1,350
~1520 ft U/S of Seagoville Road	0.62	8,542	350	600	750	1,000	1,150	1,300	1,550	1,800
Confluence of Stream 4C6 Tributary 2	1.55	6,239	950	1,650	2,150	2,850	3,400	3,950	4,750	5,300
I-20	1.59	5,525	900	1,600	2,150	2,800	3,300	3,900	4,700	5,200
Rylie Crest Drive	1.68	3,968	900	1,650	2,150	2,800	3,350	3,900	4,700	5,250
Verdant Lane	1.76	2,728	900	1,650	2,150	2,850	3,350	4,000	4,800	5,350
~480 ft D/S of Verdant Lane	2.31	2,063	850	1,350	1,650	2,400	3,500	4,500	5,750	6,600
Stream 4C6 Tributary 1										
~930 ft U/S of Seagoville Road	0.34	3,883	275	450	600	750	900	1,000	1,200	1,400
Seagoville Road	0.40	3,124	300	500	650	850	1,000	1,150	1,350	1,550
I-20	0.49	1,999	325	600	750	950	1,100	1,250	1,450	1,650

Table 10: Ultimate Conditions Peak Flood Discharges (cont.)

Location	DA (sq. mi.)	XS Station	Peak Discharges (cfs)									
			2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	250-YR	500-YR		
Stream 4C6 Tributary 2												
Horseshoe Trail	0.09	5,752	100	200	225	300	350	400	475	550		
~1020 ft D/S of Horseshoe Trail	0.17	4,770	175	300	375	475	525	625	725	800		
I-20	0.32	3,617	200	350	450	700	900	1,050	1,300	1,500		
I-20	0.62	1,719	450	800	1,050	1,350	1,650	1,950	2,350	2,650		
~50 ft D/S of I-20	0.81	609	600	1,050	1,350	1,800	2,150	2,550	3,000	3,350		

Table 11: Existing vs. Ultimate Conditions Peak Flood Discharges

Stream	DA (sq. mi.)	Reach	Cross Section	HMS Model Description	Existing 100-YR	Ultimate 100-YR	Delta 100	% Change	Existing 500-YR	Ultimate 500-YR	Delta 500	% Change
Hickory	1.06	3	62,350	HC_J03	1,850	1,850	0	0.0%	2,900	2,900	0	0.0%
Hickory	1.38	3	60,697	HC_J04	2,400	2,450	50	2.1%	3,700	3,750	50	1.4%
Hickory	1.92	3	58,360	HC_J05	3,150	3,200	50	1.6%	4,850	4,950	100	2.1%
Hickory	1.92	3	56,665	HC_J06	2,900	2,950	50	1.7%	4,600	4,650	50	1.1%
Hickory	2.34	3	55,262	HC_J07	3,050	3,150	100	3.3%	4,750	4,850	100	2.1%
Hickory	2.92	3	50,295	HC_J08	3,200	3,250	50	1.6%	4,900	5,000	100	2.0%
Hickory	3.87	2	47,037	HC_J09	4,200	4,450	250	6.0%	6,000	6,200	200	3.3%
Hickory	4.05	2	45,137	HC_J10	4,250	4,450	200	4.7%	5,950	6,150	200	3.4%
Hickory	4.25	2	44,506	HC_J11	4,300	4,500	200	4.7%	5,950	6,150	200	3.4%
Hickory	4.36	2	43,442	HC_J12	4,350	4,550	200	4.6%	6,000	6,200	200	3.3%
Hickory	4.43	2	42,350	HC_J13	4,350	4,600	250	5.7%	6,000	6,200	200	3.3%

Table 11: Existing vs. Ultimate Conditions Peak Flood Discharges (cont.)

Stream	DA (sq. mi.)	Reach	Cross Section	HMS Model Description	Existing 100-YR	Ultimate 100-YR	Delta 100	% Change	Existing 500-YR	Ultimate 500-YR	Delta 500	% Change
Hickory	6.87	1	40,168	Outfall	6,750	7,150	400	5.9%	1,0450	10,950	500	4.8%
Hickory	7.73	1	33,366	JH_0060	6,400	6,750	350	5.5%	9,150	9,500	350	3.8%
Hickory	8.07	1	28,641	JAH_0080	6,400	6,750	350	5.5%	9,200	9,550	350	3.8%
Hickory	9.08	1	28,330	CH_0080	6,950	7,350	400	5.8%	10,250	10,650	400	3.9%
Hickory	10.08	1	20,583	JAH_0090	6,900	7,350	450	6.5%	10,450	10,900	450	4.3%
HCT4	0.20	1	35,86	HCT4_J01	600	600	0	0.0%	800	800	0	0.0%
HCT4	0.68	1	14,12	HCT4_J02	1,650	1,700	50	3.0%	2,200	2,250	50	2.3%
Stream 4C6	0.06	3	14,545	4C6_J01	200	200	0	0.0%	275	275	0	0.0%
Stream 4C6	0.20	3	12,837	4C6_J02	550	600	50	9.1%	750	750	0	0.0%
Stream 4C6	0.34	3	10,494	4C6_J03	550	550	0	0.0%	700	750	50	7.1%
Stream 4C6	0.48	3	9,859	4C6_J04	1,000	1,000	0	0.0%	1,350	1,350	0	0.0%
Stream 4C6	0.62	3	7,921	4C6_J05	1,300	1,300	0	0.0%	1,750	1,800	50	2.9%
Stream 4C6	1.55	2	5,838	4C6_J06	3,850	3,950	100	2.6%	5,250	5,300	50	1.0%
Stream 4C6	1.59	2	5,119	4C6_J07	3,800	3,900	100	2.6%	5,150	5,200	50	1.0%
Stream 4C6	1.68	2	3,622	4C6_J08	3,800	3,900	100	2.6%	5,200	5,250	50	1.0%
Stream 4C6	1.76	2	2,417	4C6_J09	3,850	4,000	150	3.9%	5,350	5,400	50	0.9%
Stream 4C6	2.31	1	1,801	4C6_J10	4,300	4,500	200	4.7%	6,500	6,600	100	1.5%
S4C6T1	0.34	1	3,469	4C6T1_J01	1,000	1,000	0	0.0%	1,350	1,400	50	3.7%
S4C6T1	0.40	1	2,727	4C6T1_J02	1,100	1,150	50	4.5%	1,500	1,550	50	3.3%
S4C6T1	0.49	1	1,605	4C6T1_J03	1,200	1,250	50	4.2%	1,600	1,650	50	3.1%
S4C6T2	0.09	1	5,732	4C6T2_J00	400	400	0	0.0%	500	550	50	10.0%

Table 11: Existing vs. Ultimate Conditions Peak Flood Discharges (cont.)

Stream	DA (sq. mi.)	Reach	Cross Section	HMS Model Description	Existing 100-YR	Ultimate 100-YR	Delta 100	% Change	Existing 500-YR	Ultimate 500-YR	Delta 500	% Change
S4C6T2	0.17	1	4,770	4C6T2_J01	600	625	25	4.2%	800	800	0	0.0%
S4C6T2	0.32	1	3,612	4C6T2_J02	1,050	1,050	0	0.0%	1,450	1,500	50	3.4%
S4C6T2	0.62	1	1,709	4C6T2_J03	1,950	1,950	0	0.0%	2,600	2,650	50	1.9%
S4C6T2	0.81	1	599	4C6T2_J04	2,450	2,550	100	4.1%	3,300	3,350	50	1.5%

3.5.4. Comparison to Effective Discharges

The 2010 Dallas County Revised Preliminary FIS Report (Reference 14) includes flows derived from the 2005 Hickory Creek study (Reference 15). These flows were based on ultimate land use conditions. Before the 2005 study was complete, the 2001 Effective FIS Report had flows derived from the original study performed for Hickory Creek. Table 12, Peak Flow Comparison to Previous Studies, is a comparison of the 10-, 50-, 100- and 500-year peak flood discharges from the 2001 Dallas County FIS Report, 2005 City of Dallas Hickory Creek study, and this 2011 study. Figure 11, Effective Floodplain Comparison, has the new study 100-year floodplain overlaid on the Effective 2001 Dallas County FIRM panels which show the effective floodplains through the watershed.

Table 12 shows the reduction in flows from the 2005 study to this current study which result in a reduction in the floodplain. The main reason for this reduction is the added detail and existing detention. In addition to the more detailed sub-basins, seven detention ponds were added to the hydrology model. The five (5) detention ponds located in Mesquite at the most upstream end of the Hickory Creek watershed and the two (2) detention ponds off of Stream 4C6 Tributary 2 were included.

3.6. Flood Damage

3.6.1. Purpose

The main purpose for an economic analysis is to identify and quantify the extent of flood problems and, on a comparable basis, evaluate solutions to reduce flood losses. USACE HEC-FDA software was utilized in the economic analyses. A base flood damage assessment was developed to represent the expected annual damages if no alternatives are implemented. Estimates of flood damages and benefits presented in this report reflect 2008 dollars using ultimate development conditions.

3.6.2. Inventory of Structures

The economic analysis study area included all properties within the 500-year floodplain limits for Hickory Creek and its tributaries within the City of Balch Springs. Dallas Central Appraisal District (DCAD) parcel data (2008) was used to identify parcels that were partially or fully inundated by the 500-year floodplain limits (Reference 15). Aerial photographs overlaid with the parcels were observed in ArcMap to locate all structures to be included in the economic analysis. USACE provided a database of 374 structures within Balch Springs with detailed information, including foundation heights, collected as part of a 1998 USACE Section 205 study (Reference 16). As a result of the reduction in WSELs through the watershed, many of the structures in the USACE database are no longer considered at a high risk for flooding, so only a subset of these structures was used in the structure inventory for this study. The finished floor elevations were determined by taking the value of the lowest adjacent grade elevation, as determined by using aerial imagery and the 2010 TNRIS LiDAR data, and adding it to the foundation heights from the USACE database where available.

Table 12: Flow Comparison to Previous Studies

	10-YR (cfs)			50-YR (cfs)			100-YR (cfs)			500-YR (cfs)		
	2001 FEMA FIS	2005 Dallas Hickory Creek Study	2011 Hickory Creek Study (Ult)	2001 FEMA FIS	2005 Dallas Hickory Creek Study	2011 Hickory Creek Study (Ult)	2001 FEMA FIS	2005 Dallas Hickory Creek Study	2011 Hickory Creek Study (Ult)	2001 FEMA FIS	2005 Dallas Hickory Creek Study	2011 Hickory Creek Study (Ult)
HICKORY CREEK												
Above Confluence of 4C3	7,700	6,600	3,750	10,800	10,100	6,150	12,200	11,700	7,350	15,700	16,600	10,900
Below Edd Road	--	6,500	3,900	--	9,900	6,200	--	11,600	7,350	--	16,600	10,650
Above Edd Road	--	6,300	3,700	--	9,400	5,750	--	11,000	6,750	--	15,500	9,550
At Highway 175	--	6,200	3,750	--	9,400	5,750	--	11,000	6,750	--	15,400	9,500
Below Confluence of 4C6	9,000	6,100	4,300	12,400	9,300	6,150	13,900	10,800	7,150	17,500	14,700	10,950

Where foundation heights were not available from the USACE database, the average value of the foundation heights from the USACE database was used: 0.97 feet.

The inventory of structures was divided into commercial and residential damage categories based on the parcel data, as shown in Table 13, Major Damage Categories.

Table 13: Major Damage Categories

Damage Category	Description
Residential	Single and Small Multi-Family Dwellings
Commercial	Retail and wholesale businesses

Damage curves from the USACE database were used for the flood damage analysis since they covered the types of structures found in the study area and were considered as best available data. For commercial structures, the most appropriate of the 87 commercial damage curves from the USACE study was selected according to the type of structure. For residential structures, only one (1) damage curve was used, since all residential structures studied were houses, as opposed to mobile homes or large multi-family residences.

Damage reaches were determined by forming logical groupings of structures fully or partially inundated by the 500-year floodplain limits. Along Hickory Creek, fourteen damage reaches were defined. Along Stream 4C6, ten damage reaches were defined. Between the other tributaries in the study, five additional damage reaches were defined. Within HEC-FDA, damage reach extents were defined in relation to the corresponding stream stationing. The damage reaches' locations are listed and described in Table 14, Description of Damage Reaches. Figure 13, FDA Damage Reaches and Affected Properties, shows all structures identified and the corresponding FDA damage reach.

Table 14: Description of Damage Reaches

Stream Name	Damage Reach Name	Beginning Station (Feet)	Ending Station (Feet)	Index Location Station	# of Structures	Description*
Hickory Creek	H1	39,740	42,090	40,599	16	Most D/S end of Hickory Creek inside Balch Springs (left bank)
Hickory Creek	H2	40,440	40,890	40,709	3	Most D/S end of Hickory Creek inside Balch Springs (right bank)
Hickory Creek	H3	44,440	44,640	44,586	4	Between I-635 and Seagoville Road
Hickory Creek	H4	45,290	47,140	45,414	7	Along Hickory Tree Road after it parts with I-635 until Hickory Creek Tributary 4
Hickory Creek	H5	45,340	45,540	45,414	2	Along Hickory Tree Road at Spence Lane
Hickory Creek	H6	48,490	49,640	49,467	4	Between Small Drive and Molly Mac Lane, between Hickory Tree Road and South Peachtree Road
Hickory Creek	H7	50,590	51,940	51,778	9	Between Old Elam Road and Hickory Gardens
Hickory Creek	H8	50,790	51,990	51,778	16	Between Old Elam Road and Oak Tree Road
Hickory Creek	H9	52,940	53,540	53,295	8	Along Nevada Drive and Red Bud Lane
Hickory Creek	H10	53,540	55,140	54,378	25	Between Augusta Drive and Stein Ave, along South Peachtree Road
Hickory Creek	H11	54,940	56,440	55,647	66	Between Manon Drive and Lake June Road
Hickory Creek	H12	56,540	57,890	56,858	49	North of Lake June Road along Sheilah Drive, Lora Lane and Oak Ridge Drive
Hickory Creek	H13	57,990	59,540	58,665	24	Between Eloise Drive and Asher Lane
Hickory Creek	H14	60,090	60,940	60,606	9	Along S Blossom Circle and Slater Drive

*Note: Not every structure inside the area in the Description is included in the Structure Inventory. Structures identified as not-at-risk according to current information were not included.

Table 14: Description of Damage Reaches (cont.)

Stream Name	Damage Reach Name	Beginning Station (Feet)	Ending Station (Feet)	Index Location Station	# of Structures	Description*
Hickory Trib 4	HT4_1	180	500	300	1	Along Hickory Tree Road
Hickory Trib 4	HT4_2	3,450	3,550	3,500	1	U/S end of Hickory Tributary 4 along Badger Drive
Stream 4C6	4C6_1	850	3,200	1,801	13	Along Forest Glen Court, Woodsboro Drive and Thorndale Road
Stream 4C6	4C6_2	3,350	3,900	3,622	2	Along Rylie Crest Road
Stream 4C6	4C6_3	5,100	5,300	5,119	3	Along Tulip Court and Chickadee Drive
Stream 4C6	4C6_4	6,250	6,700	6,383	2	Along Seagoville Road
Stream 4C6	4C6_5	8,750	10,500	9,212	18	Along Pioneer Road and Spring Oaks Drive
Stream 4C6	4C6_6	9,500	10,400	10,312	4	Along Spring Oaks Drive and Cochise Drive
Stream 4C6	4C6_7	11,200	11,650	11,447	5	Along Rustic Trail
Stream 4C6	4C6_8	12,200	12,400	12,225	3	Along Sapling Drive
Stream 4C6	4C6_9	12,800	13,150	12,837	8	Along Green Valley Drive
Stream 4C6	4C6_10	14,400	14,500	14,450	1	Along Timothy Lane
Stream 4C6 Trib 1	4C6T1_1	2,400	2,900	2,513	6	Along Seagoville Road
Stream 4C6 Trib 2	4C6T2_1	350	600	599	3	Along Triangle Drive
Stream 4C6 Trib 2	4C6T2_2	1,700	2,000	1,709	3	Along Seagoville Road south of I-635

*Note: Not every structure inside the Description area is included in the Structure Inventory. Structures identified as not affected by the new floodplain extents according were not included.

Once the current market values of the structures were identified from DCAD parcel data, the value of investment (structures and contents) was estimated for each structure. The value of the existing residential contents was estimated to be 50% of the value of the structure. The value of the existing commercial contents was estimated to be 25% of the value of the structure. The number of structures and type of structure are shown along with their estimated structure and content values in Table 15, Estimated Value by Damage Reach.

Table 15: Estimated Value by Damage Reach

Damage Reach	Damage Category	Number of Structures	Total Estimated Structure Value	Total Estimated Content Value	Total Value Per Reach
H1	Residential	17	\$1,792,970	\$896,485	\$2,689,455
H2	Residential	3	\$147,390	\$73,695	\$221,085
H3	Residential	4	\$144,160	\$72,080	\$216,240
H4	Commercial	4	\$2,540,290	\$635,073	\$3,859,678
	Residential	5	\$456,210	\$228,105	
H6	Residential	4	\$242,970	\$121,485	\$364,455
H7	Residential	9	\$631,660	\$315,830	\$947,490
H8	Residential	16	\$813,300	\$406,650	\$1,219,950
H9	Residential	8	\$418,240	\$209,120	\$627,360
H10	Residential	25	\$1,020,380	\$510,190	\$1,530,570
H11	Commercial	2	\$114,590	\$28,648	\$4,984,338
	Residential	64	\$3,227,400	\$1,613,700	
H12	Commercial	12	\$1,971,960	\$492,990	\$5,458,470
	Residential	37	\$1,995,680	\$997,840	
H13	Residential	24	\$1,566,940	\$783,470	\$2,350,410
H14	Commercial	6	\$1,093,680	\$273,420	\$1,933,125
	Residential	3	\$377,350	\$188,675	
HT4_1	Residential	1	\$44,360	\$22,180	\$66,540
HT4_2	Residential	1	\$61,580	\$30,790	\$92,370
4C6_1	Residential	12	\$1,281,850	\$640,925	\$1,922,775
4C6_2	Commercial	1	\$20,600	\$5,150	\$253,645
	Residential	1	\$151,930	\$75,965	

Table 15: Estimated Value by Damage Reach (cont.)

Damage Reach	Damage Category	Number of Structures	Total Estimated Structure Value	Total Estimated Content Value	Total Value Per Reach
4C6_3	Residential	3	\$247,210	\$123,605	\$370,815
4C6_4	Residential	2	\$165,380	\$82,690	\$248,070
4C6_5	Commercial	2	\$2,742,070	\$685,518	\$4,858,408
	Residential	16	\$953,880	\$476,940	
4C6_6	Commercial	1	\$9,240	\$2,310	\$216,825
	Residential	3	\$136,850	\$68,425	
4C6_7	Residential	5	\$310,810	\$155,405	\$466,215
4C6_8	Residential	3	\$146,160	\$73,080	\$219,240
4C6_9	Residential	8	\$497,490	\$248,745	\$746,235
4C6_10	Commercial	1	\$9,870	\$2,468	\$12,338
4C6T1_1	Commercial	2	\$413,270	\$103,318	\$718,218
	Residential	4	\$134,420	\$67,210	
4C6T2_1	Commercial	1	\$1,719,340	\$429,835	\$2,260,520
	Residential	2	\$74,230	\$37,115	
4C6T2_2	Commercial	1	\$289,150	\$72,288	\$411,898
	Residential	2	\$33,640	\$16,820	
Grand Total		315	\$27,998,500	\$11,268,235	\$39,266,735

3.6.3. Evaluation of Flood Damages

The water surface profile elevations for 2-, 5-, 10-, 25-, 50-, 100-, and 500-year flood events based on existing (2011) channel and bridge conditions with ultimate developed watersheds, were used to evaluate flood damages. Fifty-four (54) structures have estimated finished floor elevations below the 100-year floodplain.

Table 16, Affected Structures per Flood Event Year, shows the number of structures affected by each flood event, and the value of the structures that were affected.

Once the expected damages per event were determined, FDA generated the expected annual damages. This value is a weighted average of the expected damages per flood event multiplied by the probability of the flood event occurring; taking into account uncertainty in discharges, damages curves, and stage-damage relationships. The expected annual damage for all the structures in the study area is **\$116,300**. This value

is the expected annual damage if no alternative is implemented and will be used as the base of comparison when determining the effectiveness of a given alternative.

In addition to the structures, a majority of the roadways that cross the study streams are inundated during even small events. Figure 12, Inundated Roadways, illustrates the maximum depth that all, or a portion of, the structures can be inundated in a given storm event.

Table 16: Affected Structures per Flood Event Year

Flood Event Year	Affected Structures	Value of Affected Structures	Value of Affected Content	Total Estimated Damage
2-Year	1	\$51,470	\$25,735	\$11,502
5-Year	12	\$656,430	\$323,065	\$155,242
10-Year	22	\$1,192,470	\$583,278	\$329,633
25-Year	32	\$1,914,180	\$899,805	\$562,837
50-Year	41	\$2,359,290	\$1,120,210	\$776,323
100-Year	54	\$3,169,600	\$1,463,670	\$1,089,713
250-Year	73	\$4,809,730	\$2,107,025	\$1,648,202
500-Year	85	\$5,795,930	\$2,486,188	\$2,098,857

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4. Flood Mitigation Alternatives

4.1. Alternative Objectives

Alternatives were developed considering the following objectives:

- Reduce or prevent damages to structures and their contents from overland flow along Hickory Creek and its tributaries within the City of Balch Springs.
- Reduce the flood risk to human health and safety associated with inundation, high velocities, and/or overtopping of roads and bridges.
- Reduce flood damages to public facilities, such as roads, bridges, utilities, schools, and churches, within Balch Springs.
- Reduce the public and private costs associated with flood fighting and recovery.
- Reduce business and commercial losses resulting from a loss of production and/or economic activity due to flooding.
- Improve the overall health, safety, and quality of life of the citizens of Balch Springs.

In the development of flood damage alternatives, the following limitations were identified:

- Alternatives were focused on alleviating flood damages for the citizens residing within the City of Balch Springs political limits. Benefits of these alternatives may translate into the City of Dallas but these effects were not examined.
- The formulation of alternatives that reduce flood damages and costs in one area should not result in measurable increases in the extent and magnitude of flooding in another area.
- The formulations of alternatives should avoid adverse impacts to structures.
- Total annual benefits must equal or exceed total annual costs for a plan to be recommended.

4.2. Alternative Concepts

In general, five concepts were considered for this project:

- Storm Water Detention Pond Facilities
- Channel Modifications
- Culvert/Bridge Structure Upgrade
- Property Buyouts / Acquisition
- “Do Nothing” Alternative

Storm Water Detention Pond Facilities were explored for the City of Balch Springs owned properties that were identified as part of this project and other areas which are not owned by the city. The other areas include: areas where the natural terrain maximizes storm water flow catchment, empty vacant land to minimize construction

costs and areas where minimizing downstream impacts are of great significance. The City of Balch Springs owned properties adjacent to Hickory Creek were analyzed and found to be insufficient for flood control due to limitations such as location, contributing drainage area, size, and available obtainable volume; therefore these properties were excluded from the recommended alternatives. The City of Balch Springs properties on Stream 4C6 and 4C6 Tributary 2 were found to be adequate for flood control and are discussed in more detail below. The main hydraulic function of a detention basin is twofold. The first is reducing the peak flow and releasing it slowly. The second is attenuating the peaks. Usually the most significant results are obtained by offsetting the timing of peak discharges to impact the timing of peak flows downstream. Therefore flow timing was another factor taken into consideration when analyzing the detention facilities.

Channel Modifications were explored in areas where the growth of the brush was obstructing the conveyance of the stream. The concept of modifying the channel considers removing the brush within the lower channel banks of the streams. This provides a "smoother" channel which increases the conveyance within the channel and reduces the water surface. Channelization was explored in areas where the existing terrain allowed for enough grade and horizontal space to modify the channel. The concept of channelization considers a new channel to convey flow. The limits of channelization were restricted to areas where additional open space is available and these areas are predominately within the natural hydraulic channel banks.

Culvert/Bridge Structure Upgrades were taken into account in those areas where there was a viable, hydraulically practical, and economical solution, especially for those structures owned by the City or within City right-of-way. Upgrading structures within Texas Department of Transportation (TXDOT) right-of-way was found to be impractical since in most instances, upgrading a structure alone would not correct the problem. In addition, the difference in criteria between agencies made upgrading TxDOT structures impractical and not cost effective.

Property Buyouts / Acquisition in flood prone areas are necessary for those streams where other alternatives explored yield a very low benefit cost ratio. If the City of Balch Springs would like to pursue Property Buyouts as a solution once the land is purchased and the structure removed, this area should be utilized as green space.

“Do Nothing” concept is an alternative where economical, political or other factors play a role. In areas where the benefit/cost ratio is low, surrounding structures are minimal, and flooded area covers empty or undeveloped land, the “do nothing” (no-action) concept could be a suggested option.

4.3. Alternative Hydrology and Hydraulics

A hydrologic and hydraulic model was created for each alternative based on the ultimate land use conditions models developed as part of this study. The alternative storage discharge relationships from the HEC-RAS models were exported and inserted into the alternative hydrologic (HEC-HMS) models to create the alternative hydrology.

This was done to ensure that there were no adverse impacts downstream due to the reduction of storage and the change in timing that can be caused by the addition of structural alternatives. For each alternative, the peak flows were used in the alternative HEC-RAS model to generate a revised water surface profile to be used in FDA.

4.4. Damage Center Alternatives

In general, all of the previous described concepts were explored for the City of Balch Springs. During the analysis, two damage centers were identified as the focus of the alternatives. These two damage centers encompass 84% of the all structures inundated by the 100-year floodplain in the Hickory Creek watershed. The damage centers are shown in Figure 13, FDA Damage Reaches and Affected Properties.

Damage Center I (DCI) is located in the vicinity of Hickory Creek and Lake June Road. This area has significant flooding in the neighborhood west of Hickory Creek as a result of development reducing channel conveyance. There is significant overland flow through the neighborhood which eventually overtopped Lake June Road. This area has 39 structures inundated by the 100-year event worth approximately \$2,187,740. Table 17 summarizes DCI expected damages.

Table 17: DCI Affected Property Summary

Storm Event	Total Number of Structures Affected	Total Value of Affected Structures	Total Value of Affected Contents
2-year	1	\$51,470	\$25,735
5-year	9	\$477,940	\$238,970
10-year	15	\$713,410	\$348,898
25-year	20	\$1,112,420	\$504,075
50-year	27	\$1,436,770	\$666,250
100-year	39	\$2,187,740	\$980,040
250-year	49	\$3,100,420	\$1,304,500
500-year	60	\$3,797,470	\$1,611,375

4.4.1. Alternative I (DCIALTI)

Damage Center I Alternative I consists of a detention pond on Hickory Creek located approximately 1,000 feet downstream of West Bruton Road. The proposed 187 acre-foot detention facility would be located on a property of approximately 32 acres. The detention pond would be constructed of 4:1 side slopes and would have approximately 300 feet of pilot channel guiding the runoff to the outfall structure. The average depth of the proposed detention pond is approximately 10 feet. The east and west portions of the pond would consist of a berm with 4:1 side slopes and a 15 foot top width. The outfall structure would be two 6 foot by 6 foot box culverts. The proposed pond was

designed for a 100-year ultimate development storm event. This alternative has no adverse impacts either upstream or downstream of the City of Balch Springs. The proposed improvements are shown in Figure 14, Alternative Sites Explored.

4.4.2. Alternative II (DCIALTII)

Damage Center I Alternative II was designed as a second phase to be completed once DCIALTI was constructed. In addition to the detention pond, channelization along Hickory Creek was added from the outfall of the pond to approximately 2,500 feet upstream of Elam Road. Channelization consists of mainly grass lined channels, with the exception of the channel directly upstream and downstream of Lake June Road which consists of an existing concrete lined channel. The proposed improvements are shown in Figure 14.

4.4.3. Alternative III (DCIALTIII)

Damage Center I Alternative III was developed independently of the phased structural solutions of DCIALTI and DCIALTII. This non-structural alternative involves a buyout of structures identified as having high annual damages relative to the value of the structure(s). The proposed buyout structures are shown in Figure 15.

Damage Center II (DCII) is the “Cherry Bottoms” area located at the confluence of Hickory Creek and Stream 4C6 and bound by I-635 and I-20. There are approximately 8 structures worth \$602,550 inundated by the 100-year storm event. Table 18 summarizes DCII expected damages.

Table 18: DCII Affected Property Summary

Storm Event	Total Number of Structures Affected	Total Value of Affected Structures	Total Value of Affected Contents
2-year	0	\$0	\$0
5-year	3	\$178,490	\$84,095
10-year	6	\$393,230	\$191,465
25-year	7	\$490,390	\$240,045
50-year	8	\$602,550	\$296,125
100-year	8	\$602,550	\$296,125
250-year	11	\$838,490	\$414,095
500-year	11	\$838,490	\$414,095

In the preliminary hydrology and hydraulic analysis of the damage centers, it was found that effects from the alternatives considered for DCI had little to no effect on DCII. Therefore, the two damage centers were analyzed independently of each other.

4.4.4. Alternative I (DCIIALTI)

Damage Center II Alternative I consists of three detention ponds in the Stream 4C6 system. The proposed improvements are described below and are shown in Figure 14:

- A 50 acre-foot detention pond was considered on a 12 acre property located at Spring Oak Drive and Stream 4C6. The detention pond was proposed to be constructed with 4:1 side slopes and approximately 1,280 feet of pilot channel. The average depth of the detention pond is 8 feet. The detention pond would be connected to the existing walking bridge and the two existing 48 inch Reinforced Concrete Pipes (RCPs) would be replaced with three 60 inch RCPs to serve as the outfall structure. The east side of the detention pond would be composed of a berm with 4:1 side slopes and a 15 foot top width. This pond was designed for a 100-year ultimate development storm event and would reach an elevation of 478 feet in the pond and discharge approximately 500 cfs.
- A 44 acre-foot detention pond on an 8.4 acre property located at Horseshoe Trail and Stream 4C6 Tributary 2. The detention pond would be constructed of 4:1 side slopes and have approximately 824 feet of pilot channel. The average depth of the detention pond is 14 feet. The outfall consists of a 36 inch RCP. The south side of the detention pond shall be composed of a berm with 4:1 side slopes and a 15 foot top width. This pond was designed for a 100-year ultimate development storm event and would reach an elevation of 483 feet in the pond and discharge 90 cfs.
- A 207 acre-foot detention pond on a vacant area of approximately 16.5 acres located at I-20 and Stream 4C6 Tributary 2. The detention pond would be constructed of 4:1 side slopes and have approximately 1,400 feet of pilot channel. The average depth of the detention pond is 14 feet. The outfall consists of plugging four of the six existing 10 foot by 9 foot box culverts. The southwest side of the detention pond shall be composed of a berm with 4:1 side slopes and a 15 foot top width. This pond was designed for a 100-year ultimate development storm event and would reach an elevation of 456 feet in the pond and discharge approximately 1,800 cfs.

4.4.5. Alternative II (DCIIALTII)

Damage Center II Alternative II was designed as a second phase to be completed after construction of DCIIALTI. In addition to the 3 detention ponds in DCIIALTI, the following improvements are proposed:

- A 180 acre-foot detention pond on a vacant area of approximately 28 acres located upstream of the crossing of Hickory Creek Road and Hickory Creek. The detention pond would be constructed of 4:1 side slopes and have approximately 2,000 feet of pilot channel. The average depth of the detention pond is 26 feet. The outflow structure consists of three 10 foot by 10 foot box culverts. This pond was designed for a 100-year ultimate conditions storm event and would reach an elevation of 451 feet in the pond and discharge 3,550 cfs.

4.4.6. Alternative III (DCIIALTIII)

Damage Center II Alternative III was developed independently of the phased structural solutions of DCIIALTI and DCIIALTII. This alternative includes a buyout of structures identified as having high annual damages relative to the value of the structure(s). The proposed structure(s) are shown in Figure 15.

4.5. Construction Costs

Probable construction costs were determined for each alternative including costs associated with the design and construction of the alternative. Unit cost rates were obtained from TxDOT unit cost rate tables. Alternative probable construction costs include the following:

- Construction cost
- Mobilization (8 percent)
- Stormwater Pollution Control (5 percent)
- Contingencies (30 percent)

Right-of-way acquisition costs were determined for each alternative based on the parcels impacted by the alternative. Property appraised values were obtained from DCAD. Due to the conceptual level of the study, all excavation computations are based on TNRIS LiDAR data. No survey information was obtained for the alternatives section of this study. Appendix F contains itemized probable construction cost tables for all proposed alternatives.

4.6. Permitting

Possible permitting requirements were identified for the structural alternatives.

USACE, acting under Section 404 of the Clean Water Act, regulates the discharge of dredge or fill material into waters of the United States. Waters of the United States include any part of the surface water tributary system down to the smallest of streams, any lake, pond, or other water body on those streams, and adjacent wetlands. Activities requiring a permit from the USACE under Section 404 of the Clean Water Act may be permitted by Nationwide Permit (NWP) or Individual Permit (IP). Stream features associated with the proposed project are likely considered waters of the United States under current guidance and are subject to USACE jurisdiction.

The USACE utilizes NWPs to authorize the discharge of dredged and fill material into waters of the United States when the discharge is expected to result in less than minimal adverse impacts to the aquatic environment. It is likely that on-channel detention alternatives would exceed the NWP program criteria; therefore authorization under an IP would be required. Individual permits are issued for activities that have more than minimal adverse impacts to waters of the United States. The evaluation of the IP

application involves a more thorough review of the potential environmental and socioeconomic effects of the proposed activity.

While the USACE is responsible for the final decision, various natural resource agencies have an important role in the regulatory program. Assistance to the USACE on the permit process is provided by the Environmental Protection Agency (EPA), United States Fish and Wildlife Service (USFW), and state agencies. A detailed delineation of waters of the United States, historical resources review, threatened and/or endangered species evaluation, and public comment period are also a components of the IP process.

Unavoidable impacts such as the loss of streams, wetlands, or other open waters would be compensated through a mitigation plan. USACE currently prefers the utilization of a mitigation bank to offset project impacts. Credits would need to be purchased from a local mitigation bank with available stream credits.

Section 401 of the Clean Water Act requires that an applicant for a federal permit provide a State certification that any discharges from the facility would comply with the Act, including water quality standard requirements. The Texas Commission on Environmental Quality (TCEQ), the state delegated agency for compliance of Section 401 of the Clean Water Act, has a two tiered process to determine potential impacts to waters of the state. Tier I certification is applicable to projects with direct impacts less than three acres or 1,500 linear feet of streams. Tier II certification authorizes impacts greater than the Tier I threshold. Since channel alternatives could impact greater than 1,500 linear feet of streams, Tier II certification would apply. Tier II certification involves a complete description of impacts to waters of the United States, discussion of water quality impacts, and a detailed alternatives analysis. The Section 401 permitting process is done in conjunction with the Section 404 permitting process.

4.7. Benefit Cost Analysis

A B/C analysis was conducted to determine which alternative provides the best benefit considering probable construction cost and the value of properties all or partially removed from the high risk flood areas. HEC-FDA model runs were created for each alternative from water surface profiles generated by the alternative HEC-RAS model. Average annual benefits were computed by subtracting the alternative (improved) channel conditions average annual damages from the existing channel conditions average annual damages. A B/C ratio was determined by dividing the average annual benefits by the alternative probable construction annualized costs. The B/C ratio was used to determine the economic strength of a project. Alternatives with B/C ratios greater than 1.0 have annual benefits that outweigh the reduction in annual damage and represent a feasible alternative.

The primary benefit, to be derived from a proposed plan of improvement, is a reduction in flood damages. Social, environmental, and other intangible benefits are not quantified in monetary terms and were not considered in this B/C analysis.

The average annual costs and benefits were calculated for a 50-year period of analysis. Benefit and cost accruals were made comparable by conversion to an equivalent annual basis using an interest rate of 5.50 percent (Assumed Average Current Federal Discount Rate).

4.8. Results

4.8.1. Damage Center I

A B/C Analysis was performed for three different alternatives in DCI. Table 19 is a summary of the cost and the overall B/C ratio of each DCI alternative considered.

Table 19: DCI Alternative Analysis

Alternative	Total Cost	Annual Cost	Reduction in Annual Damages	B/C
DCIALTI	\$5,110,000	\$302,000	\$47,000	0.16
DCIALTII	\$10,630,000	\$627,000	\$55,000	0.09
DCIALTIII	\$731,000	\$43,000	\$48,000	1.12

- **DCIALTI** – Detention pond downstream of Bruton Road – The pond significantly reduced the peak flow in the downstream channel therefore reducing the WSEL through Lake June Road. This causes a reduction in damages to the properties on Lora Lane, Sheliah Drive, and Dinah Drive. The results translate to a reduction in the WSEL as far downstream as Eleanor Road. The addition of a pond could also provide other benefits by allowing the City to use the areas for recreational purposes. However, the high cost associated with constructing the detention pond is greater than the monetary benefits resulting from its implementation.
- **DCIALTII** – DCIALTI plus channelization – In addition to the reduction in flows from the detention pond, the channelization improved conveyance through this section of Hickory Creek. The implementation of both structural components reduced the WSEL enough through Lake June Road to confine all flow in the existing channel, therefore eliminating all damages in DCI. While this alternative would significantly reduce annual damages through the watershed, the B/C ratio is well below 1.0, making this project economically unfeasible.
- **DCIALTIII** – Buyout – The buyout alternative is the least costly and provides the greatest B/C ratio. However, the buyout option does not provide any relief from flooding beyond the targeted structures.

4.8.2. Damage Center II

A B/C Analysis was performed for three different alternatives in DCII. Table 20 is a summary of the cost and the overall B/C ratio of each DCII alternative considered.

Table 20: DCII Alternative Analysis

Alternative	Total Cost	Annual Cost	Reduction in Annual Damages	B/C
DCIIALTI	\$6,840,000	\$404,000	\$22,000	0.05
DCIIALTII	\$16,300,000	\$962,000	\$28,000	0.03
DCIIALTIII	\$176,000	\$10,000	\$10,000	1.00

- **DCIIALTI** – Three detention ponds in Stream 4C6 sub-watershed – In this alternative, two (2) of the three (3) proposed detention ponds are located on currently owned City property. Those ponds combined with an additional pond at the confluence of Stream 4C6 and Stream 4C6 Tributary 2, provide a significant reduction in flows downstream of I-20 through the "Cherry Bottoms" area. However, the annualized probable cost to construct the three ponds renders this alternative economically unfeasible.
- **DCIIALTII** – DCIIALTI plus detention pond on Hickory Creek – The addition of the fourth detention pond nearly eliminates all damages through the Cherry Bottoms area. This addition to the already unfeasible DCIIALTI yields an even lower B/C ratio.
- **DCIIALTIII** – Buyout – The buyout alternative is the least costly and provides the greatest B/C ratio. However, the buyout option does not provide any relief from flooding beyond the targeted structures.

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5. Recommendations

5.1. Damage Center I

Based on the Alternative Analysis, any structural alternative would not provide enough reduction in annual damages to warrant the expense of such large projects. Therefore, the DCIALTIII - Buyout option is recommended for Damager Center I. As shown in Figure 15, Buyout Alternatives, the five (5) identified properties that had the greatest B/C ratio are just a part of the overall vision of the area. The map also shows a current park and the six (6) properties in the neighborhood that the City has already acquired through buyouts. Ten other properties have been identified for possible buyout. These properties had a B/C ratio less than 1.0 but the acquisition would allow for the city to extend the current park south to Lake June Road. This would significantly reduce flooding in the area and provide benefits to the residents.

5.2. Damage Center II

Based on the Alternative Analysis, any structural alternative would not provide enough reduction in annual damages to warrant the expense of such large projects. Therefore, the DCIHALTIII - Buyout option is recommended for Damager Center II. Figure 15 shows the recommended property.

5.3. Funding

The City of Balch Springs plans to research a number of funding sources to assist in the implementation of the recommended alternative for flood protection. Funding sources that will be researched and then applied for include:

- FEMA § Hazard Mitigation Grant Program (HMGP)
- FEMA § Flood Mitigation Assistance (FMA)
- Dallas County § Community Development Block Grant (CDBG)

The City also plans to continue coordination with NCTCOG and USACE for possible inclusion in the Upper Trinity River Feasibility Study.

As identified in the TWDB's comments to the Draft report, mitigation alternatives identified by this study are eligible for funding under the TWDB's financial assistance programs. Application requirements and eligibility criteria is identified by TWDB rules specifies in Section 363 of the Texas Administrative Code. This report would be appropriate for use in support of an application to the TWDB for financing the propped improvements. The City of Balch Springs will further pursue this funding opportunity as well.

5.4. Preventative Alternatives

In addition to the buyout alternative, the following non-structural alternatives are strongly recommended in order to reduce increases in annual flood damages.

5.4.1. Land Use Zoning and Subdivision Regulations

One means of preventing flood damage is to keep industrial, commercial, and residential structures from being built within the floodplain. Floodplain zoning restricts floodplain utilization to uses that can sustain floods without endangering life or valuable property. Regulatory ordinances are intended to secure the maximum benefits and productivity of flood-prone land by allowing floodplains to convey the design flood; promoting the public's health, safety, and general welfare; and minimizing potential flood losses.

Non-structural measures such as land use zoning and subdivision regulations allow a community to regulate development within the floodplain. As participants in the National Flood Insurance Program, the City of Balch Springs has adopted regulations that equal or exceed the minimum FEMA requirements of regulating the existing 100-year floodplain.

5.4.2. Construction Regulations

Construction regulations constitute an important means of preventing flood damage in a developing watershed. Some cities have building codes that contain general flood protection provisions whereby the building inspector tries to route all building-permit applications in flood-prone areas through the City Engineer. The City Engineer should then carefully review each application to determine if the proposed building may be flooded and ensure that all buildings adjacent to a flood-hazard area are built with a ground elevation that is at least one (1) foot above, and a finished floor elevation that is at least two (2) feet above the fully urbanized 100-year flood elevation. The City should require that all finished floor elevations be specified on the final plat of each new subdivision to help ensure all new structures are built above 100-year floodplain elevations.

To limit erosion and downstream sediment, construction projects should be phased to limit the land area that is bare at any one time, and vegetation should be left undisturbed wherever possible. Other practices, such as proper placement of hay bales and silt fences should also be required. Graded areas should be replanted as soon as possible, and mulches should be used during periods that are not suitable for replanting.

5.4.3. Informing the Public

Studies have indicated that most flood-related deaths in Texas occur at undersized bridges that are either overtopped or washed out by floodwaters. Using the hydrologic and hydraulic methods discussed in this report, the frequency of flooding and the depth of water overtopping each roadway was calculated. Computed 100-year flood depths at

existing roadway crossings in the Hickory Creek study area are illustrated on Figure 12 and in the flood profiles that supplement this report.

An alternative to improving dangerous bridges and culverts is to install flood warning signs, barricades, or other systems to inform and alert motorists of hazardous crossings. The City should consider the need for a flood warning sign at all crossings that are overtopped by water during the 100-year and more frequent floods.

Flood warning systems can be passive or active. A passive system would be a warning sign, such as "BEWARE OF HIGH WATER", which would notify people using the bridge that flooding may occur. A gage with easy-to-read depth markings, measured in feet, should show motorists the height of water over the roadway. Guardrails can be installed to prevent vehicles from being washed off a dangerous road crossing, and can be used to identify the edge of the road surface where it may be obscured by floodwater.

Passive warning systems are feasible on lightly traveled residential streets where the motorists are familiar with the area, and are used at crossings with minor flooding. Installation of a passive warning system would be relatively inexpensive. Features include warning signs, staff gages, and guardrails.

Active warning systems use a sensing device which monitors the water level in the channel and alerts motorists before the water is actually flowing over the roadway. The active system could be an automatic unfolding warning sign with flashing lights and sirens, or a relayed signal that would alert city workers to barricade the crossings. An active system could also be used to alert local residents of rising floodwaters and to evacuate prior to the flood. Active warning systems are necessary on heavily traveled thoroughfares or at crossings which are extremely hazardous.

The National Weather Service uses radar to locate severe and turbulent weather. The Weather Service declares a flash-flood watch when potentially severe storms are likely. A flash-flood warning is issued when a severe storm has developed and flooding is imminent. The warning is sent to weather wire services, counties and municipalities in the area, and to local Civil Defense authorities. Flood-prediction and early-warning systems usually give populated areas time to prepare flood defenses, evacuate flood-hazard areas, and close dangerous stream crossings.

A Balch Springs flood warning system could be used to alert city officials to barricade flood prone streets in the Hickory Creek watershed that become treacherous when overtopped. This system would not reduce or prevent property inundation or flood damages; however, it would increase public safety.

Many developed areas are flood prone, even if floods have not occurred within the memory of local residents. Flood hazard maps delineating flood prone areas, such as those included with this report, have been prepared by the FEMA and by USACE. Dissemination of such flood hazard information helps landowners to understand the need for compliance with floodplain zoning regulations. It also gives residents in

dangerous flood prone areas evidence of the need to consider relocating their families and businesses.

This report, by accurately updating and delineating the flood prone areas, identifies dangerous flood prone stream crossings, informs residents of local flood hazards, and will assist the city and the public evaluate proposed plans to minimize existing and future flood problems.

5.4.4. Watershed Management

The reduction of runoff in a watershed lowers peak discharges and flood stages. Soil conservation and the maintenance of vegetative ground cover retain water on the soil's surface, allowing infiltration into the soil. Urban development increases the percentage of impervious surfaces in an area, which generally increases the runoff potential. The preservation of trees, the maintenance of lawns, and the discharge of roof drains into vegetated areas increase the infiltration of storm water into soils in developed areas.

Bare soils are easily eroded, resulting in transportation of sediment through water courses. The flood carrying capacity of creeks and the storage capacity of flood control reservoirs are greatly reduced by deposits of this sediment. To limit erosion, vegetation should be left undisturbed wherever possible.

5.4.5. Debris Removal

The accumulation of trees, brush, sediment, and other debris at bridges, culverts, or other obstructions can have dangerous consequences. Obstructions to flow could cause higher flood stage elevations upstream of the crossing. In addition, masses of debris can break loose as flood flows increase, producing a destructive wall of water and debris that surges downstream. The force of water on the upstream side of a bridge plugged by debris may exceed the structural capacity of the bridge, causing it to fail. Prevention of debris obstructions can reduce flood damage and potential hazards.

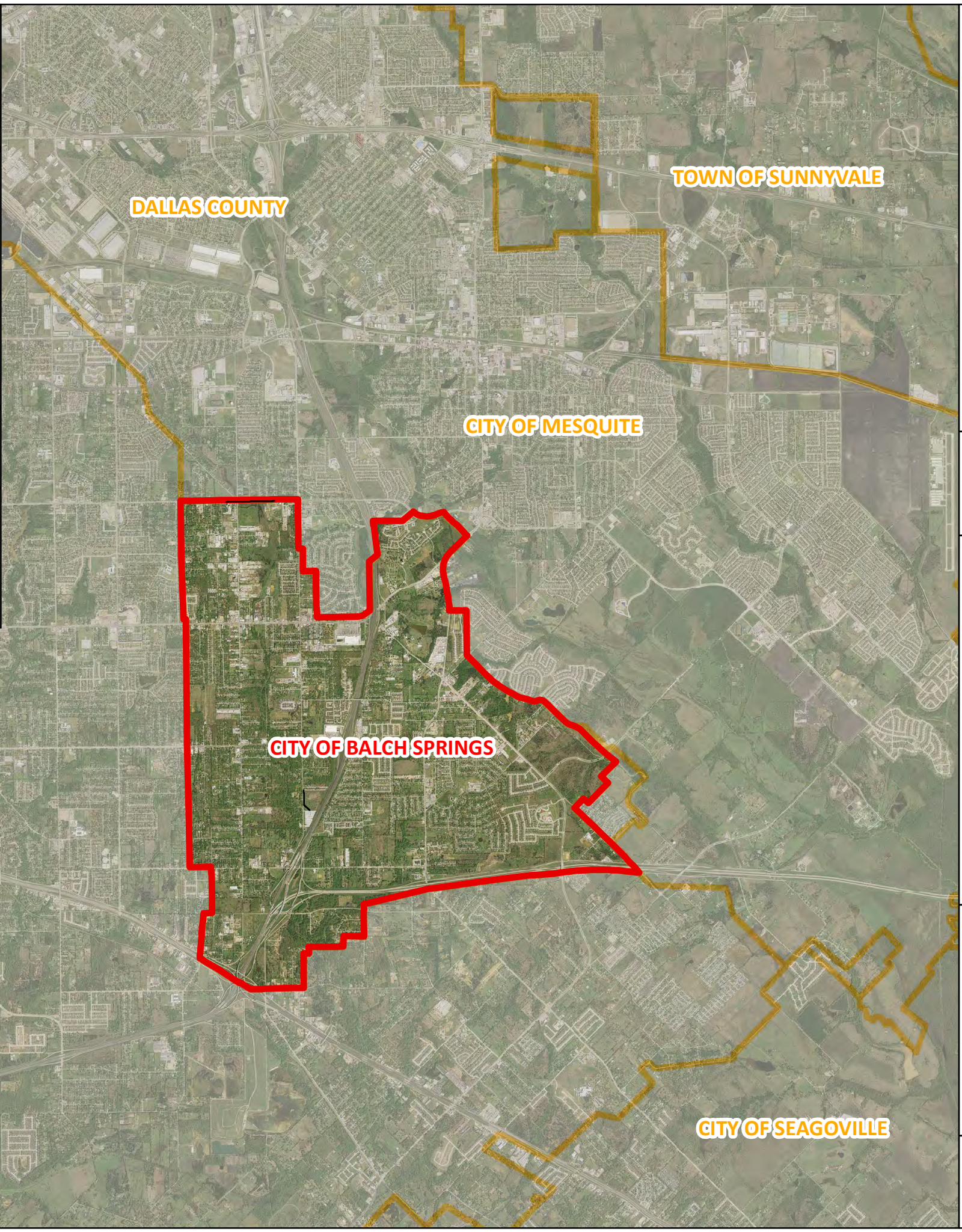
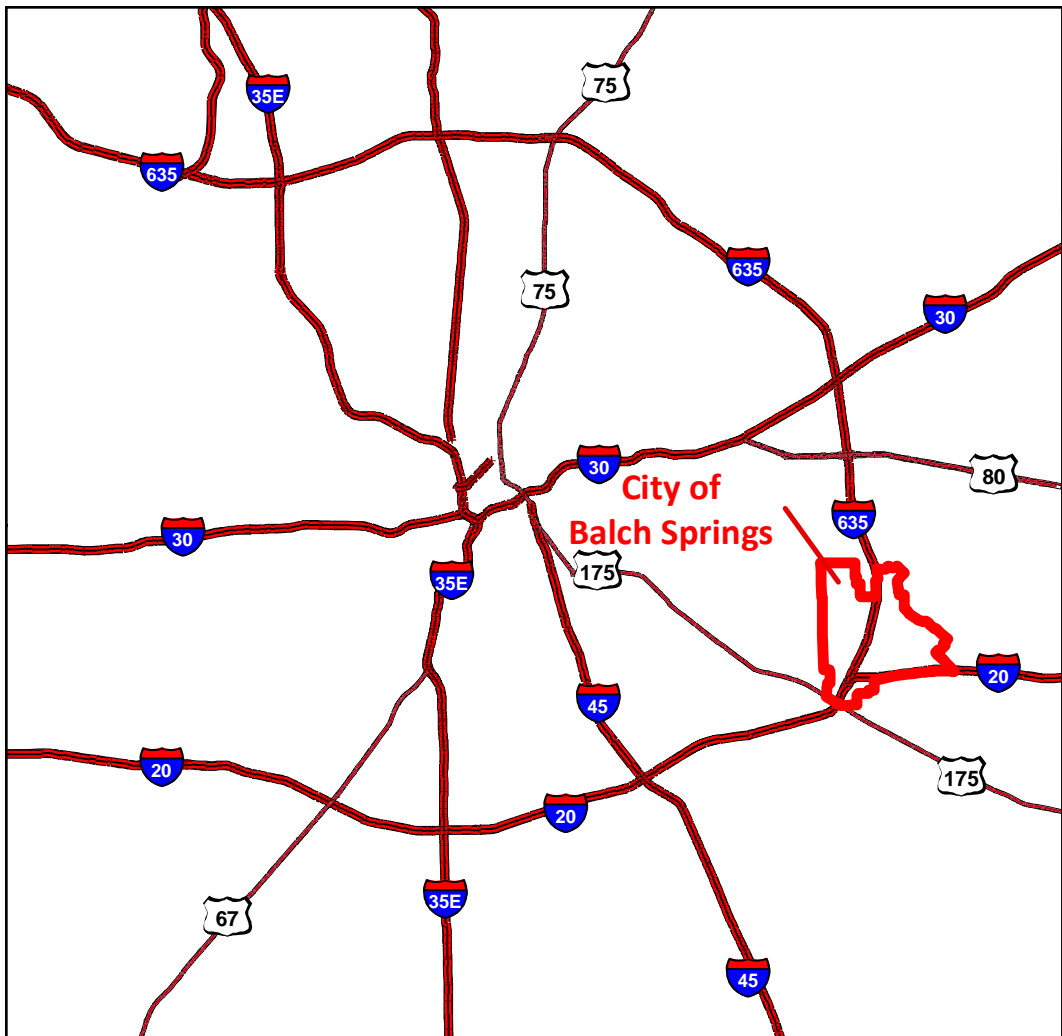
The City should designate a maintenance division responsible for creek debris removal. This department could inspect bridges quarterly, or upon request, and remove debris from bridge openings. It is not always economically practical for the city to take responsibility for debris removal on private property especially in Balch Springs where a significant portion of the floodplain land is privately owned. The removal of debris is an essential flood reduction technique.

Creeks should be inspected periodically to identify, cut, and remove dead trees or trees whose root systems have been undermined by erosion. An inspection program of this type should be aimed at the prevention of stream obstructions before they occur. Erosion-prevention measures should be instituted in areas where significant trees would be in danger of being uprooted by floodwaters. The inspection program should also identify areas in which siltation and debris could significantly decrease the flood-carrying capacity of the stream channel or the waterway under a bridge.

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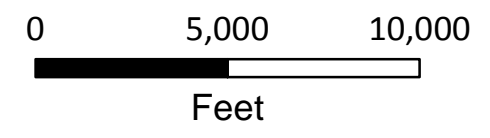
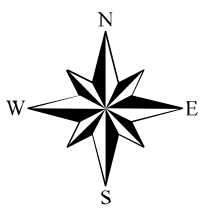


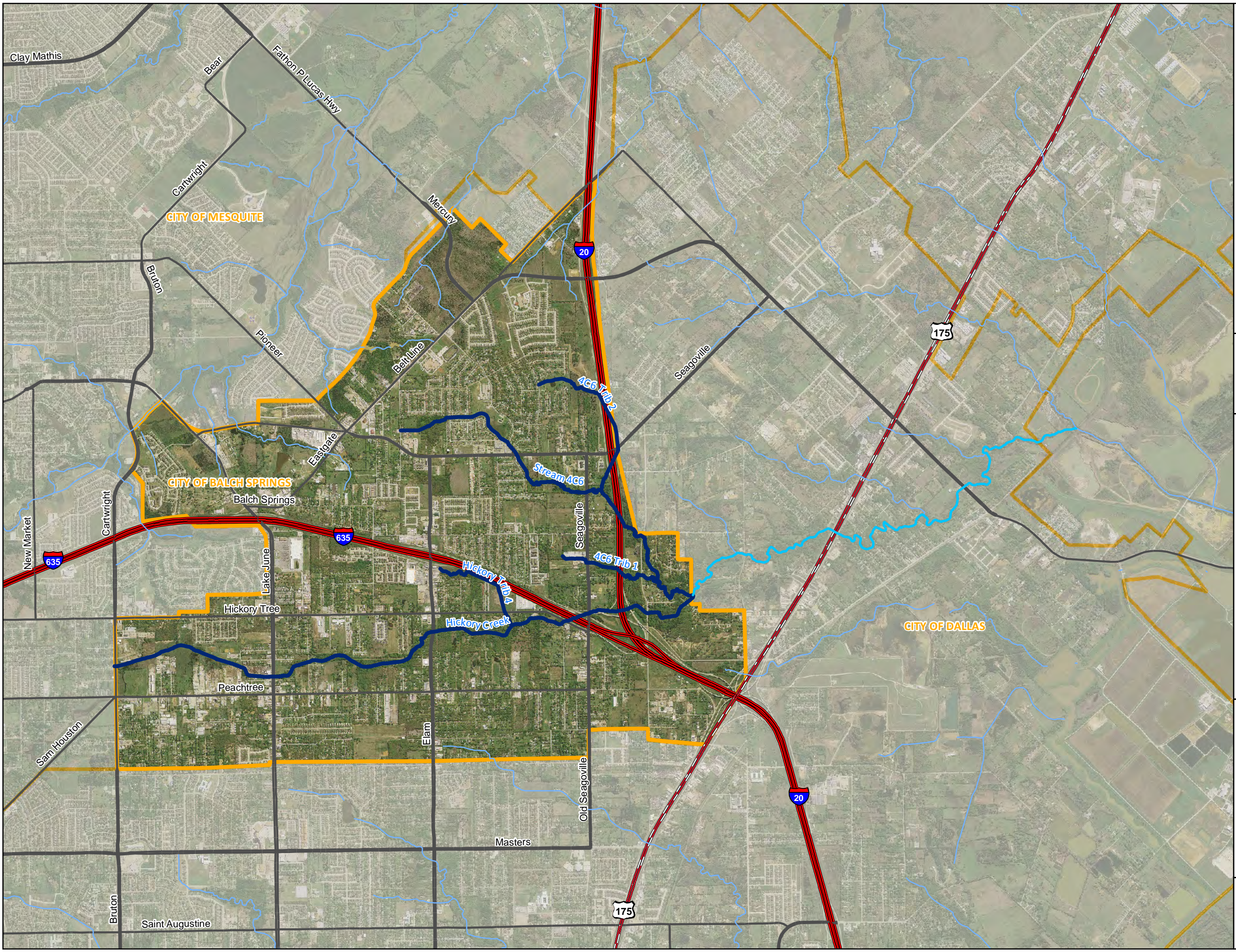
City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 1
Location Map

Legend

- City of Balch Springs
- Other Political Areas



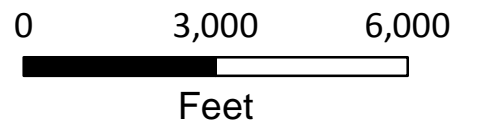
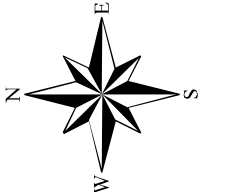


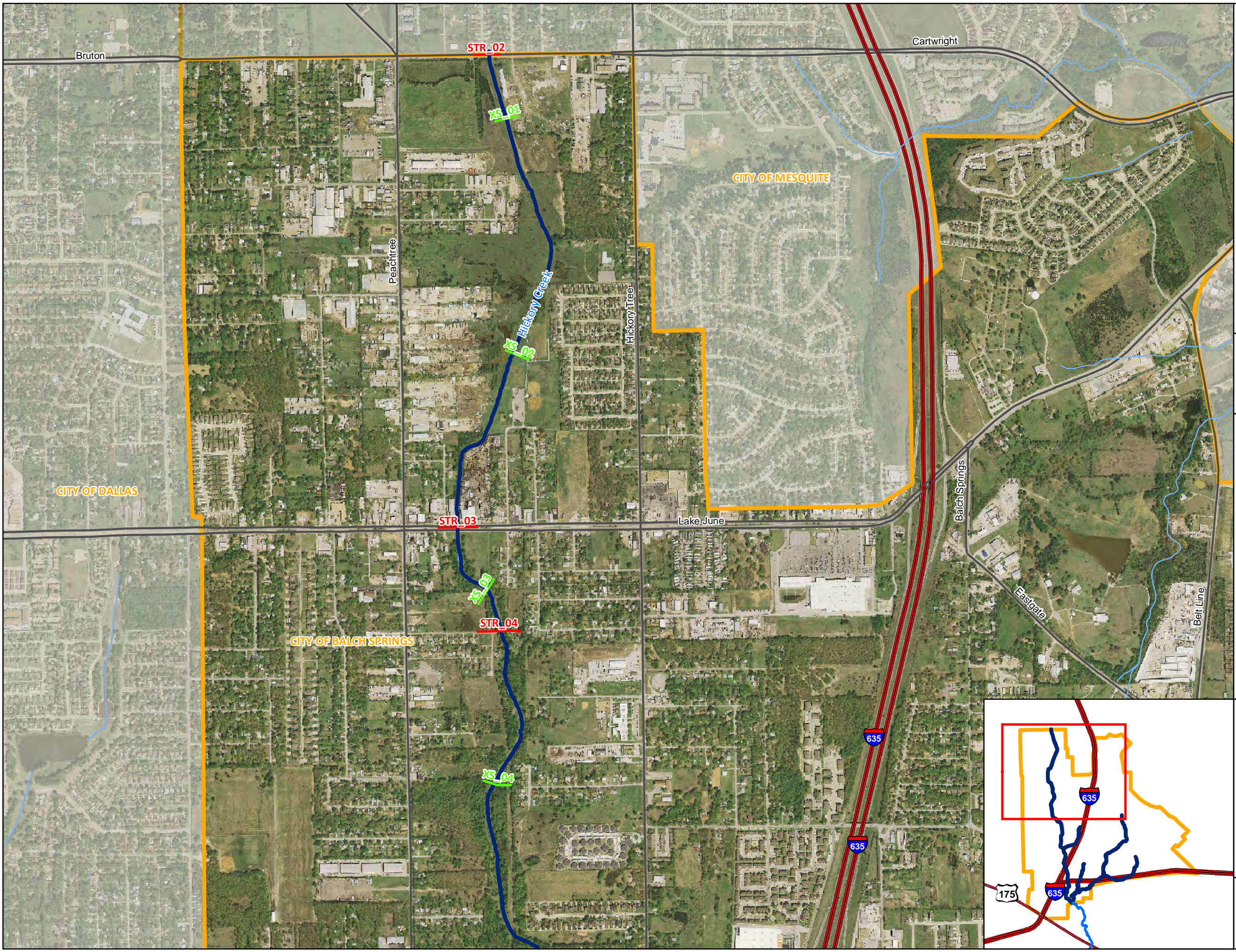
City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 2
Study Streams

Legend

- █ New Detailed Study
- █ 2005 City of Dallas
Hickory Creek Study
- █ Other Dallas County Streams
- City of Balch Springs



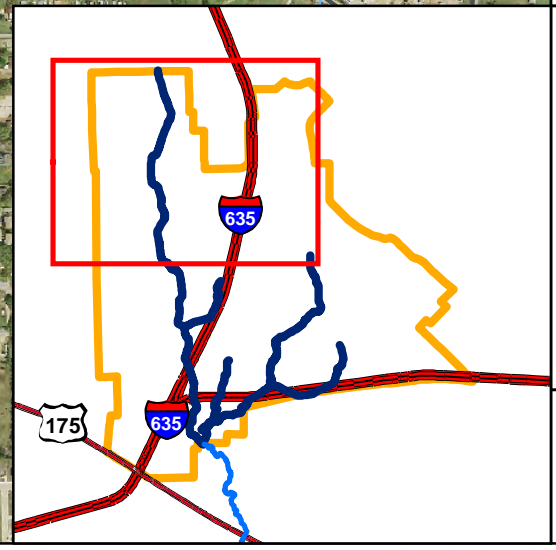
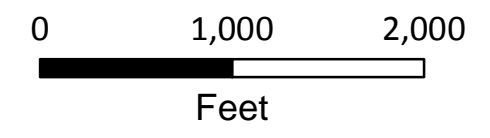
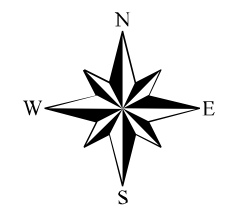


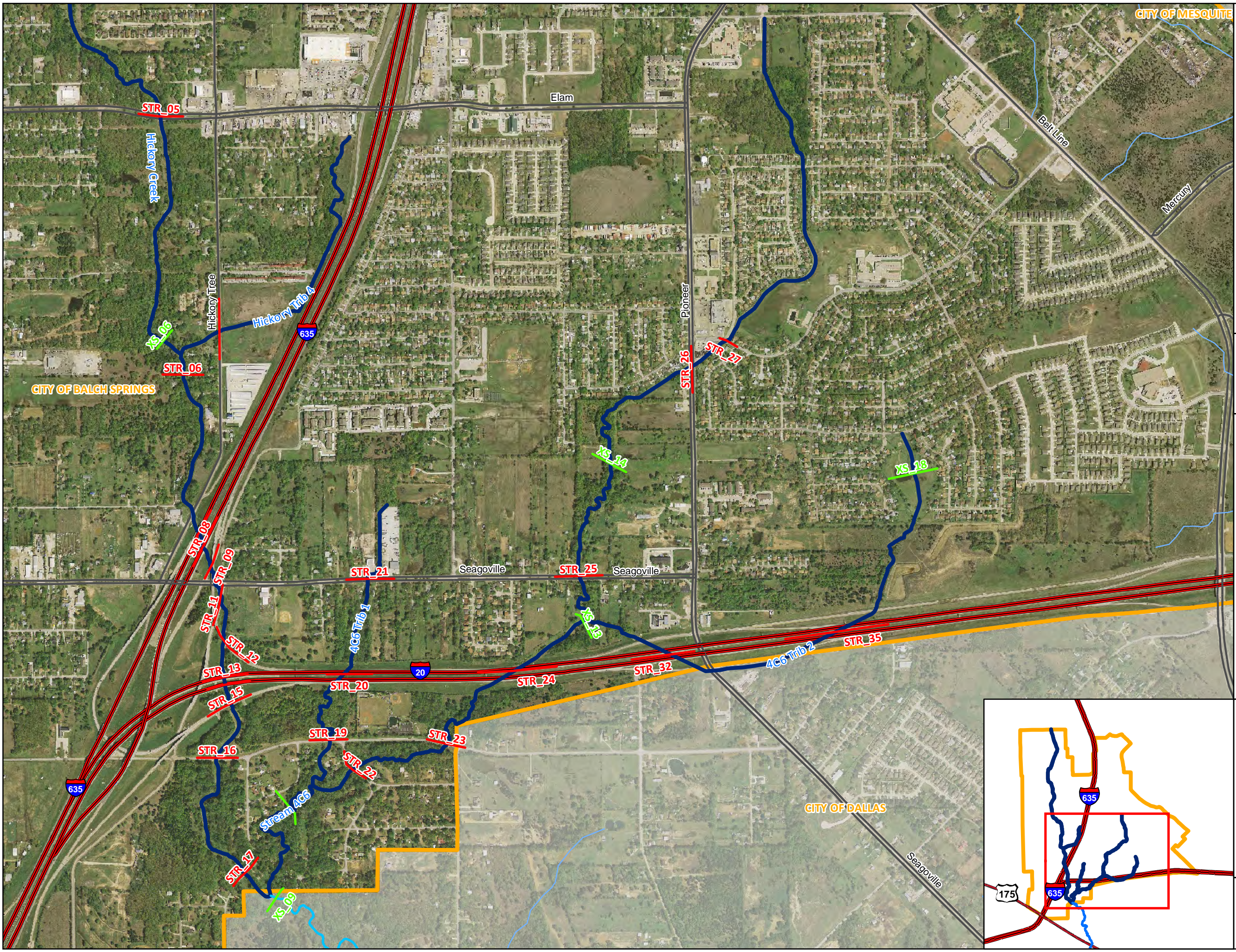
City of Balch Springs
 Hickory Creek Flood Protection
 Planning Study

Figure 3
Study Survey Summary
Map 1

Legend

- Survey Structures
- Survey Cross Sections
- New Detailed Study
- 2005 City of Dallas
Hickory Creek Study
- Other Dallas County Streams
- City of Balch Springs





CITY OF MESQUITE

CITY OF BALCH SPRINGS

CITY OF DALLAS

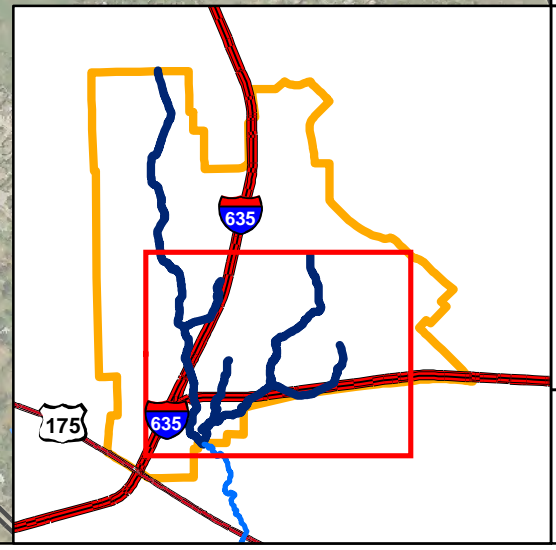
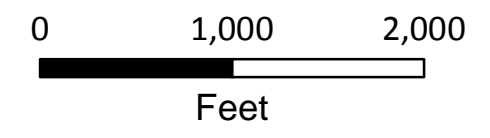
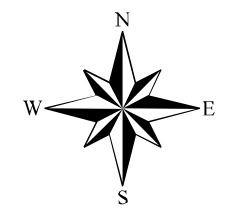


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 3
Study Survey Summary
Map 2

Legend

- Survey Structures
- Survey Cross Sections
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Other Dallas County Streams
- City of Balch Springs





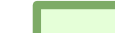



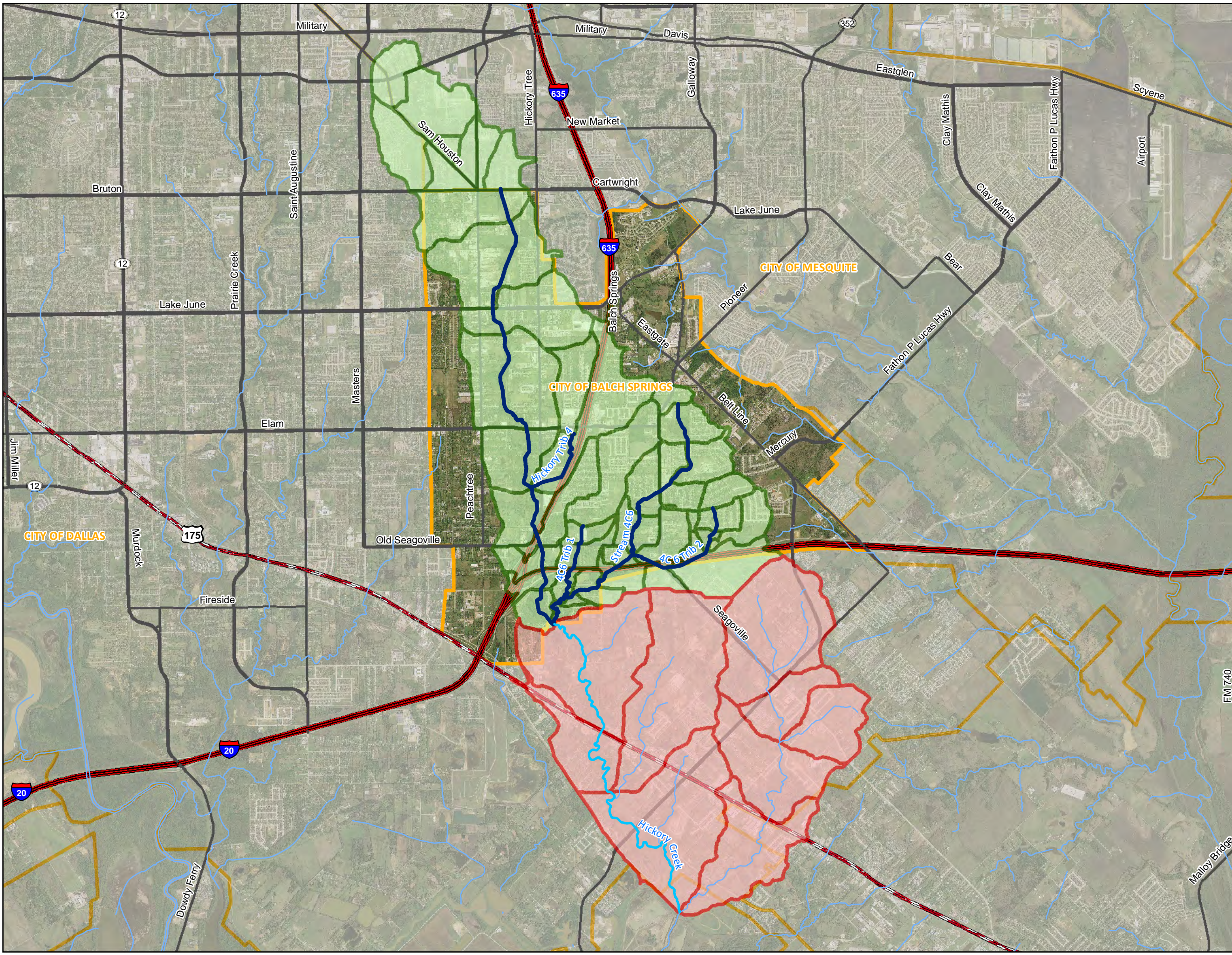
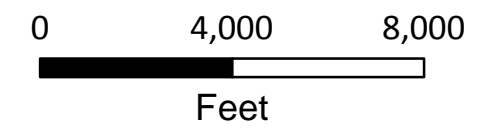
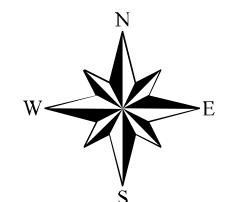


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 4
Drainage Areas
Overall Map

Legend

-  New Detailed Study
-  2005 City of Dallas
Hickory Creek Study
-  Other Dallas County Streams
-  New Detailed Hickory Creek
Drainage Basins
-  Halff 2005 Hickory Creek
Drainage Basins
-  City of Balch Springs









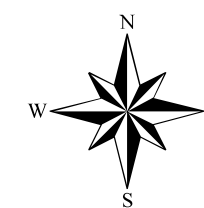


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 4
Drainage Areas
Map 1

Legend

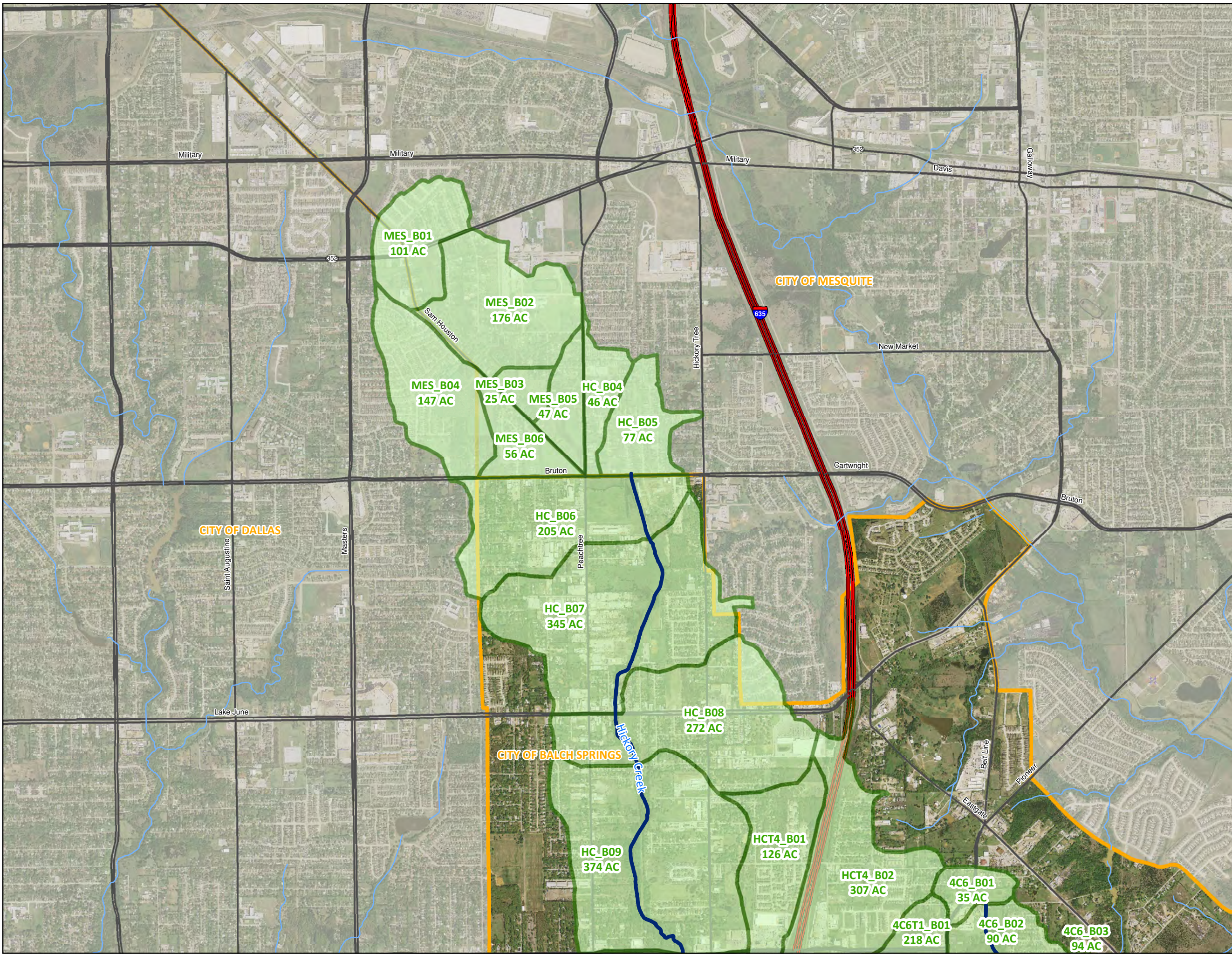
-  New Detailed Study
-  2005 City of Dallas
Hickory Creek Study
-  Other Dallas County Streams
-  New Detailed Hickory Creek
Drainage Basins
-  Halff 2005 Hickory Creek
Drainage Basins
-  City of Balch Springs



0 2,000 4,000



Feet



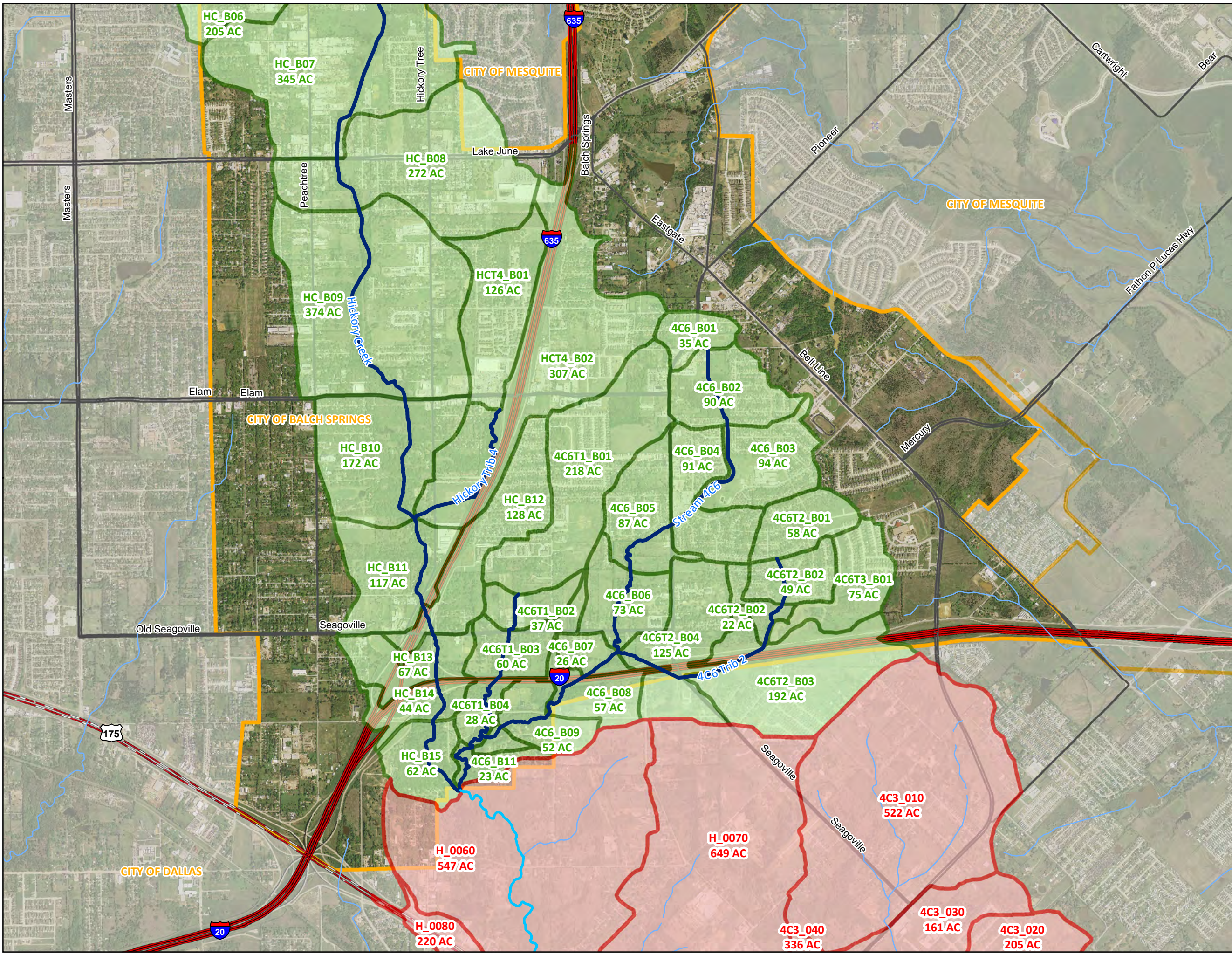
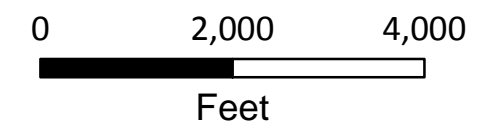
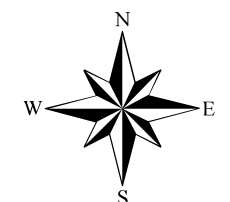


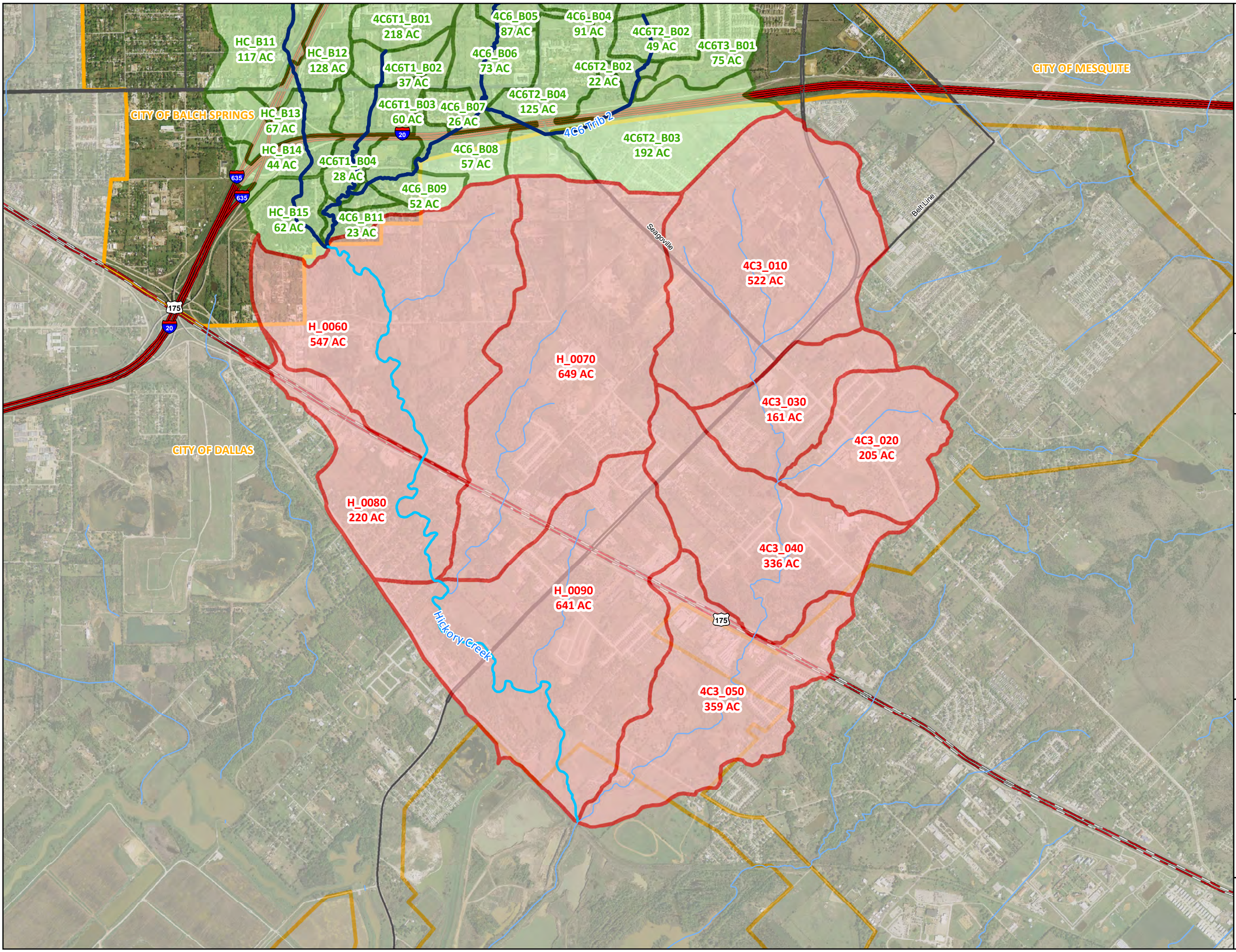
City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 4
Drainage Areas
Map 2

Legend

- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Other Dallas County Streams
- New Detailed Hickory Creek Drainage Basins
- Half 2005 Hickory Creek Drainage Basins
- City of Balch Springs









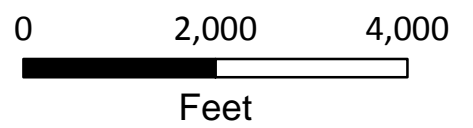
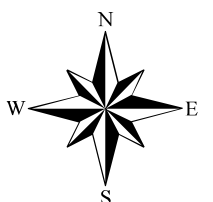


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 4
Drainage Areas
Map 3

Legend

-  New Detailed Study
-  2005 City of Dallas Hickory Creek Study
-  Other Dallas County Streams
-  New Detailed Hickory Creek Drainage Basins
-  Halff 2005 Hickory Creek Drainage Basins
-  City of Balch Springs



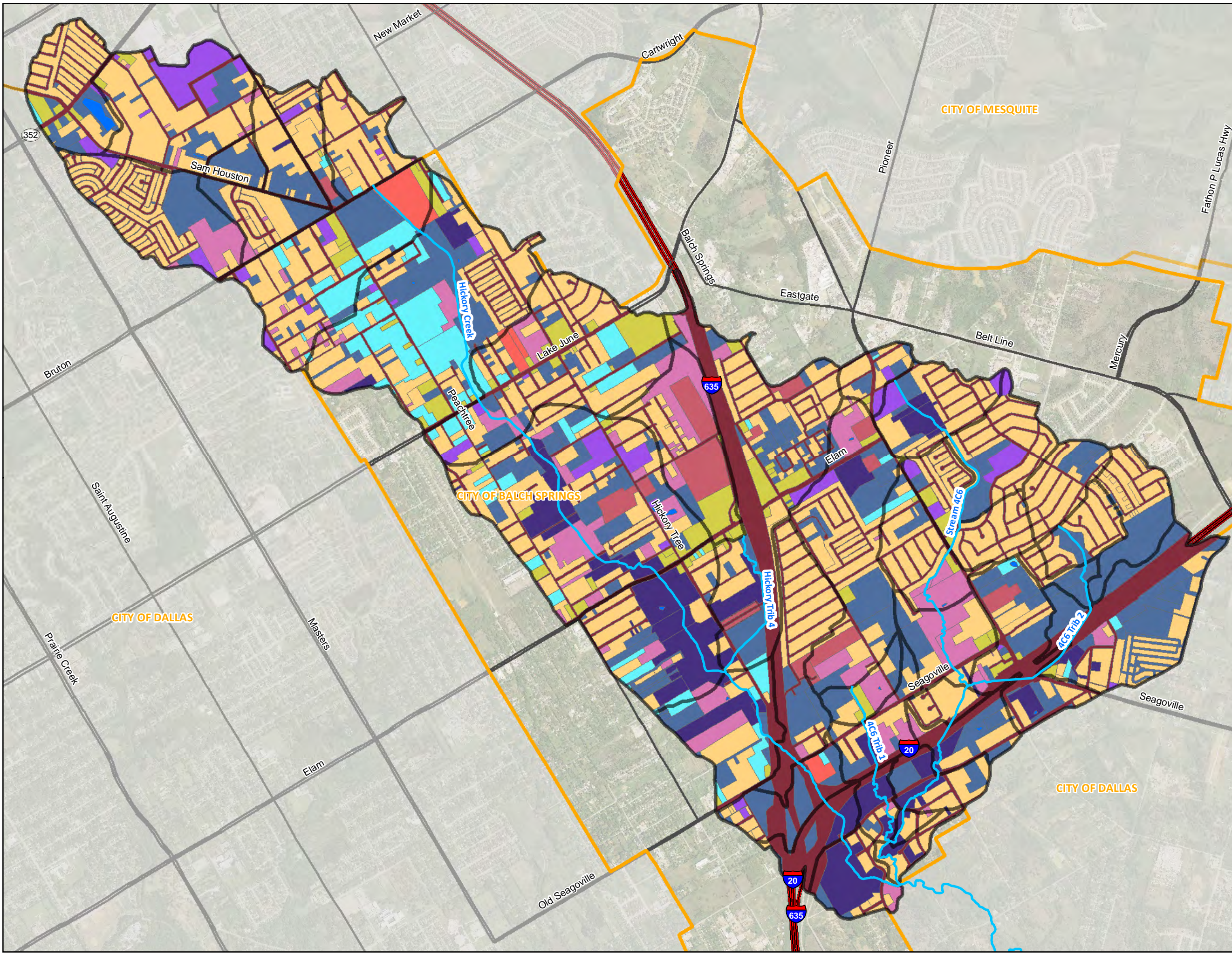
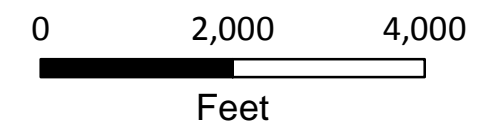
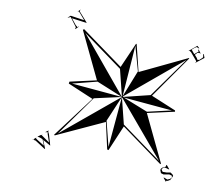


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 5
Existing Land Use

Legend

- | | |
|------------------|---------------|
| Drainage Basins | Multi-Family |
| Study Streams | Open Area |
| Brushy | Road |
| Commercial | Single Family |
| Developing Urban | Water |
| Industrial | Wooded |
| Institutional | |



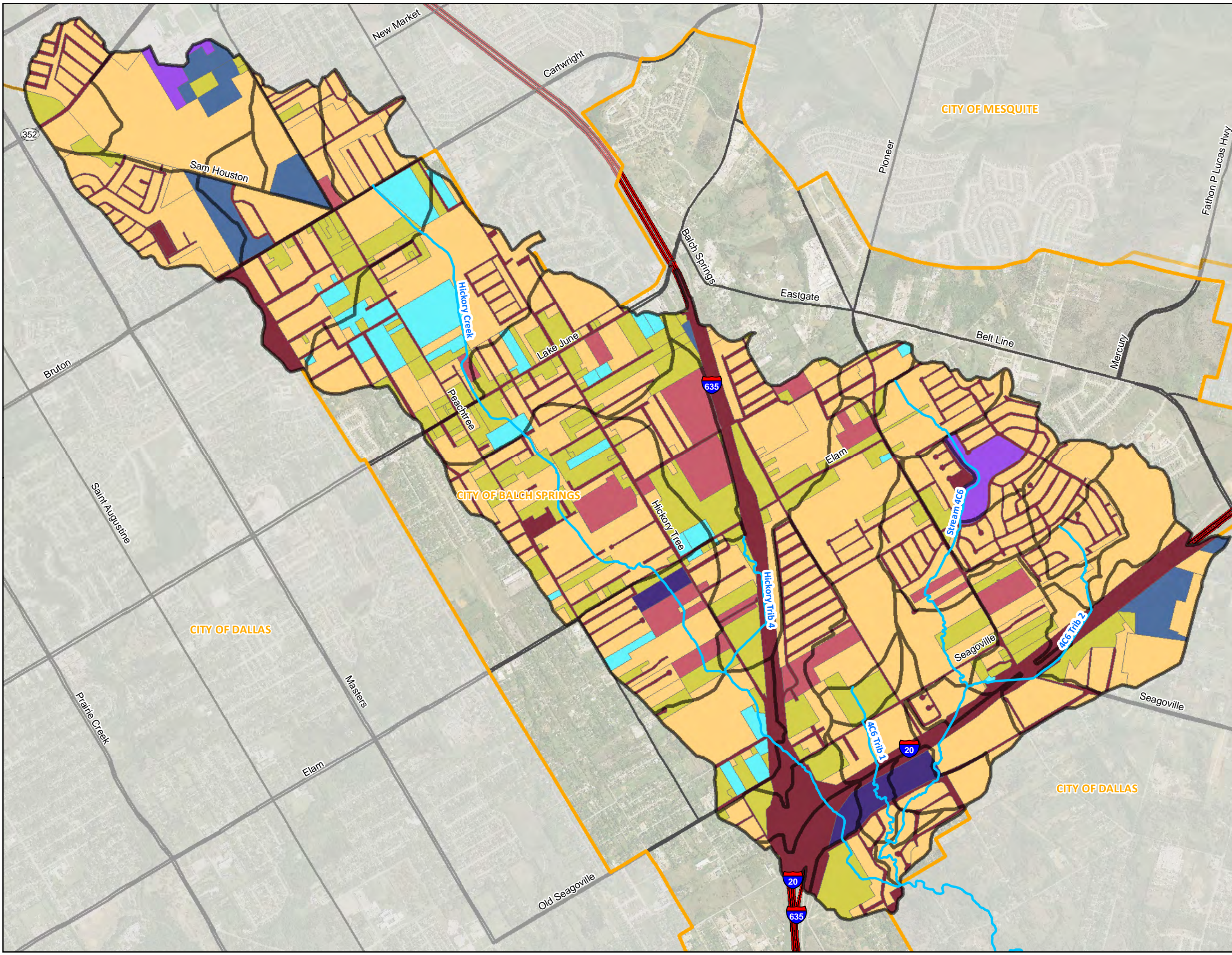
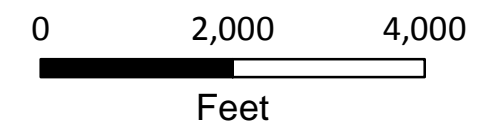
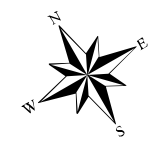


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 6
Ultimate Land Use

Legend

- | | |
|------------------|---------------|
| Drainage Basins | Institutional |
| Study Streams | Multi-Family |
| Brushy | Open Area |
| Commercial | Road |
| Developing Urban | Single Family |
| Industrial | Water |
| | Wooded |



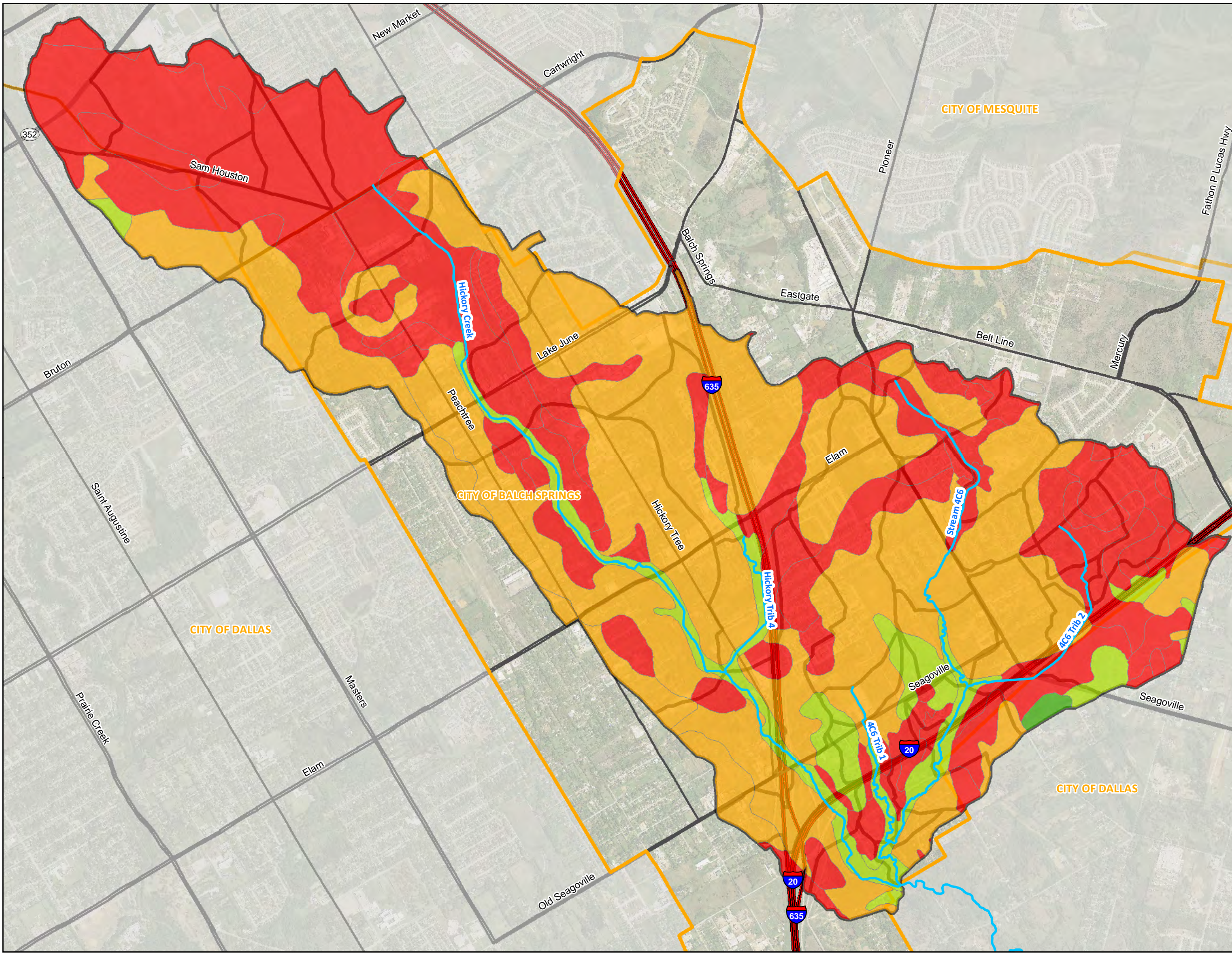
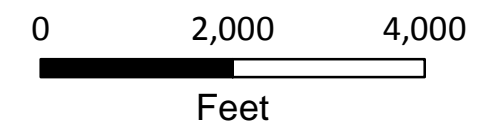
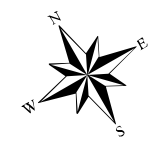


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 7
Soils Map

Legend

- Study Streams
- Hydrologic Soil Group
 - A
 - B
 - C
 - D
- Drainage Basins







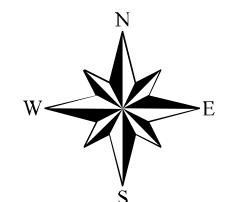


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

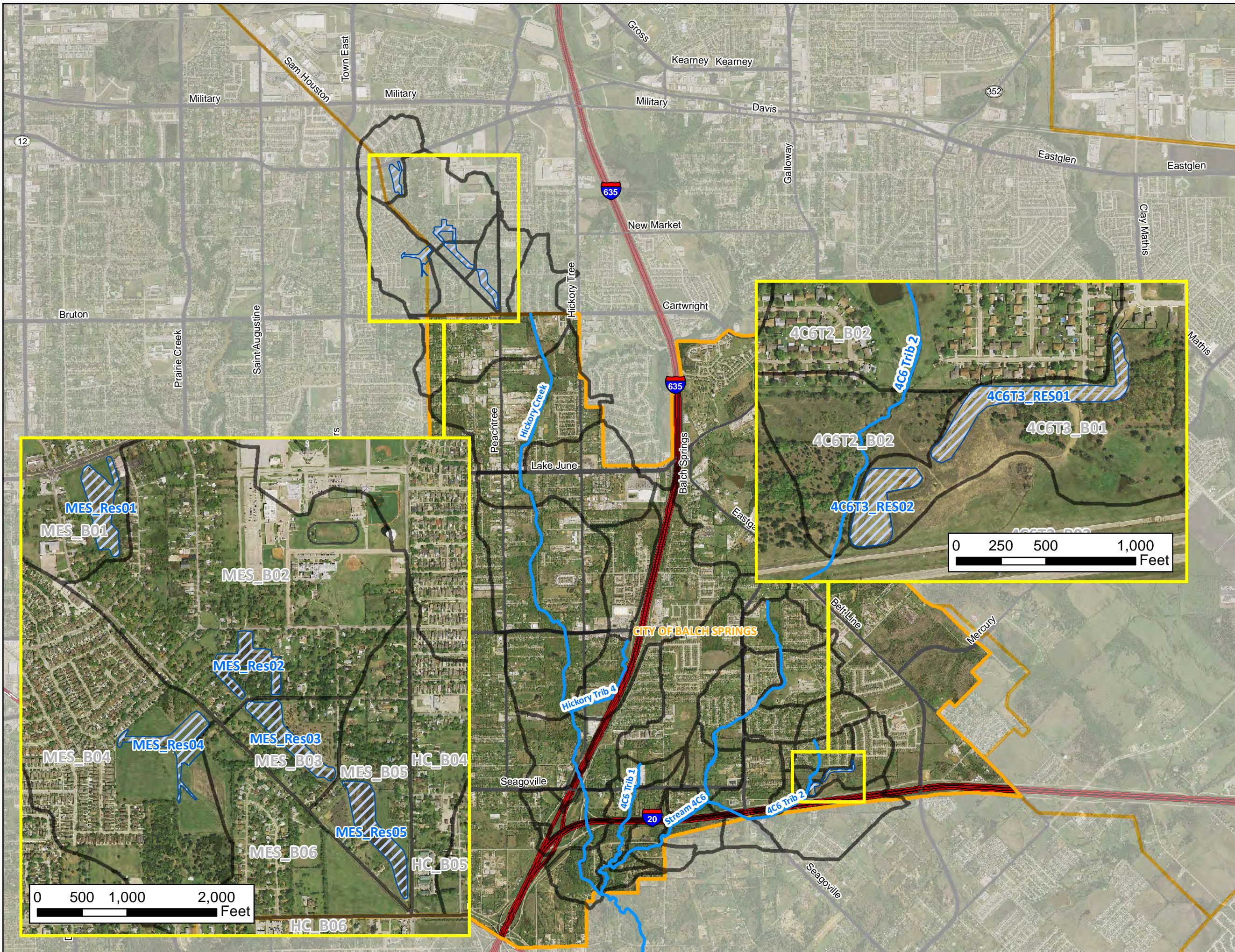
Figure 8
Existing Detention Ponds

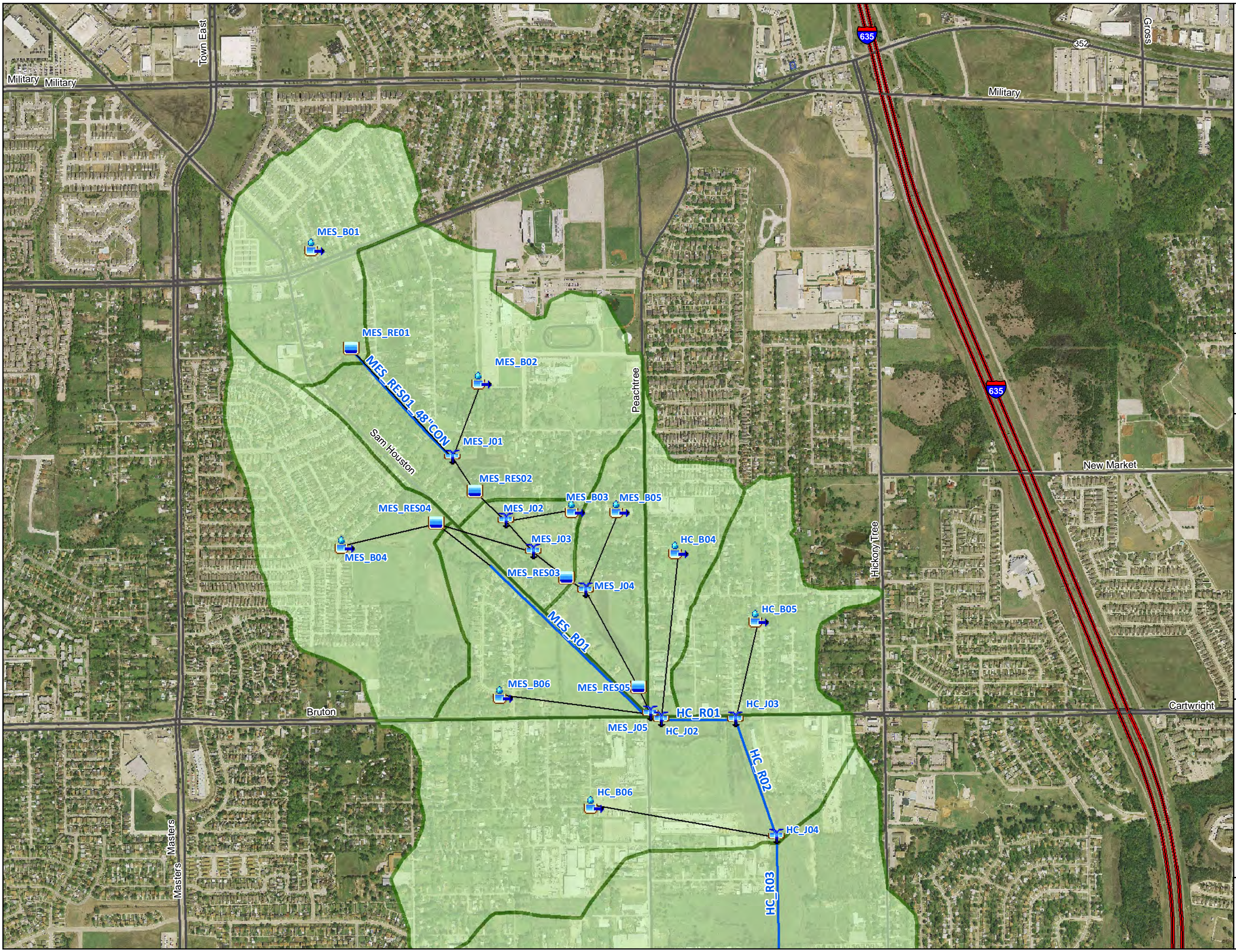
Legend

-  Study Streams
-  Existing Detention Ponds
-  New Detailed Hickory Creek Drainage Basins
-  City of Balch Springs



0 3,000 6,000
Feet



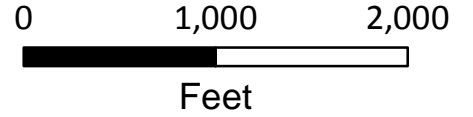
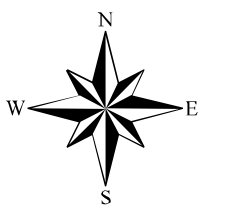


City of Balch Springs
 Hickory Creek Flood Protection
 Planning Study

Figure 9
HEC-HMS Model Configuration
Map 1

Legend

- HMS Basin Type**
- Junction
 - Subbasin
 - Reservoir
- HMS Reach Type**
- Connection
 - Diversions
 - Reach
- Drainage Basins**
- New Detailed Hickory Creek Drainage Basins
 - Half 2005 Hickory Creek Drainage Basins



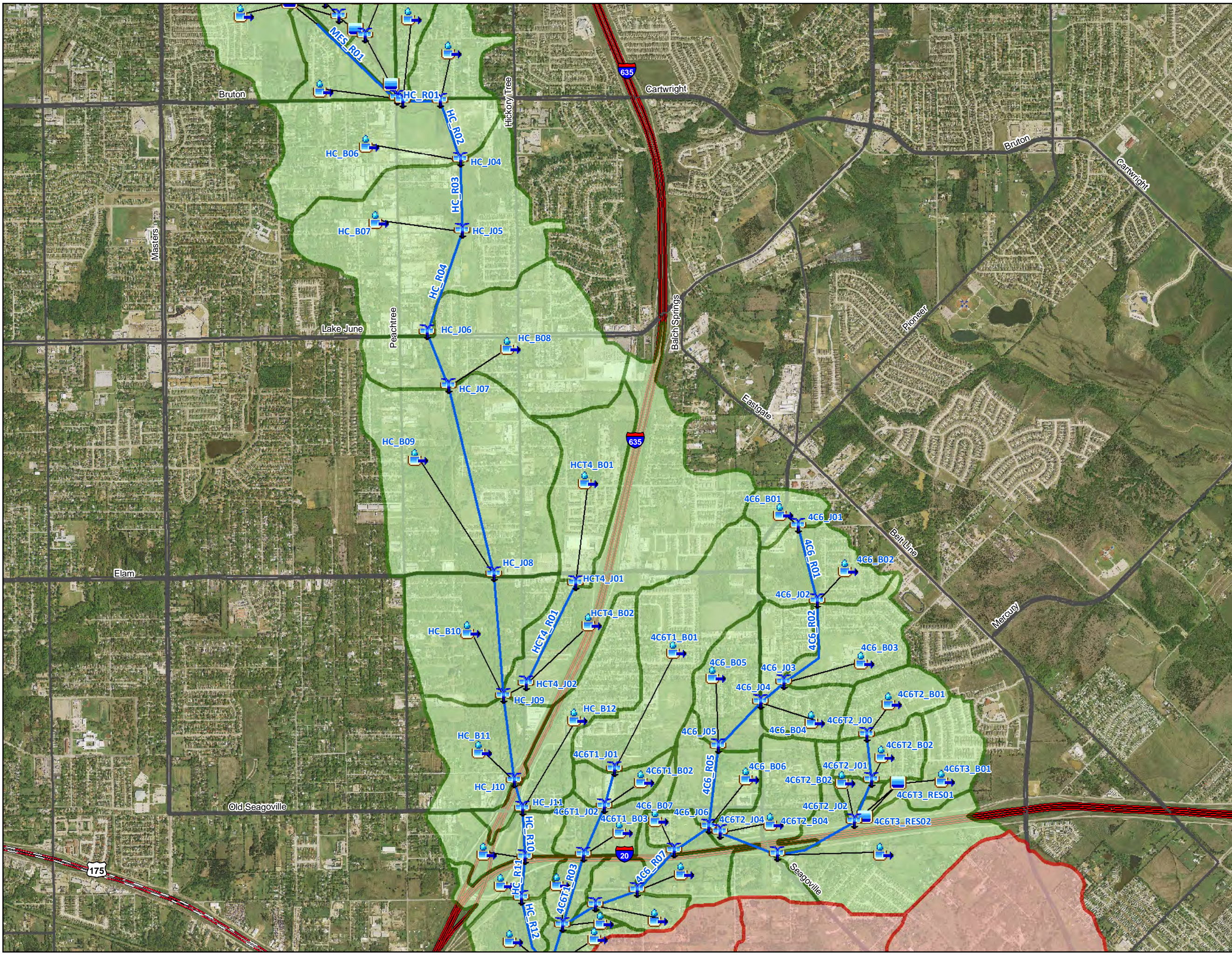
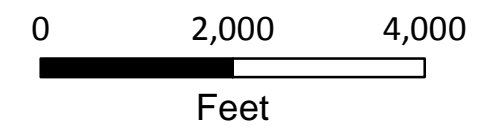
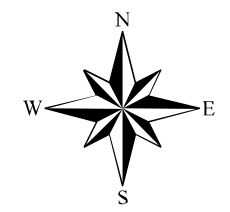


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 9
HEC-HMS Model Configuration
Map 2

Legend

- HMS Basin Type**
- Junction
 - Subbasin
 - Reservoir
- HMS Reach Type**
- Connection
 - Diversion
 - Reach
- New Detailed Hickory Creek Drainage Basins**
-
- Half 2005 Hickory Creek Drainage Basins**
-



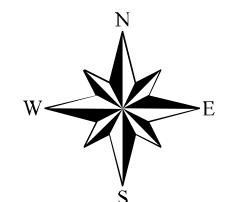


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 9
HEC-HMS Model Configuration
Map 3

Legend

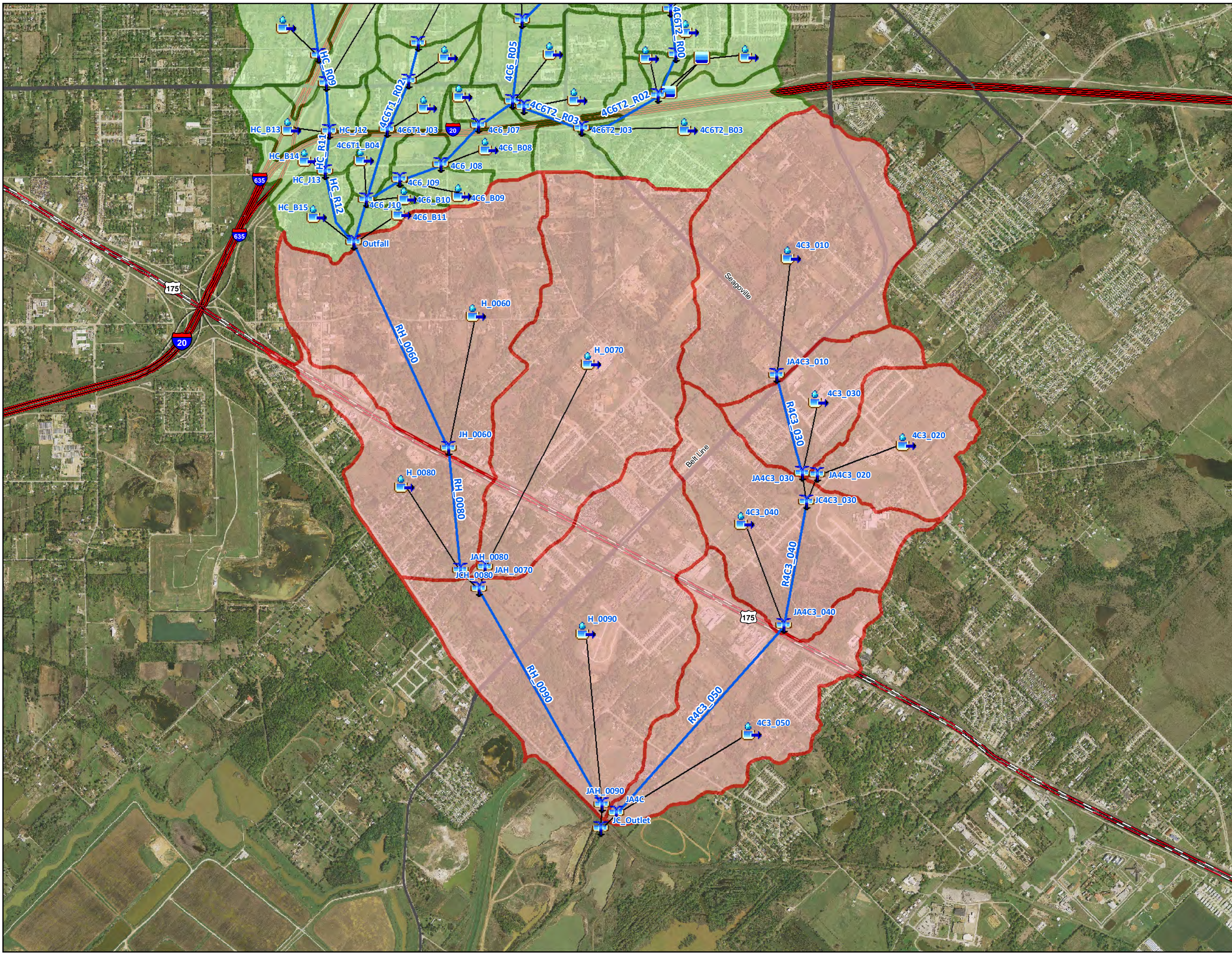
- HMS Basin Type**
- Junction
 - Subbasin
 - Reservoir
- HMS Reach Type**
- Connection
 - Diversion
 - Reach
- Drainage Basins**
- New Detailed Hickory Creek Drainage Basins
 - Half 2005 Hickory Creek Drainage Basins

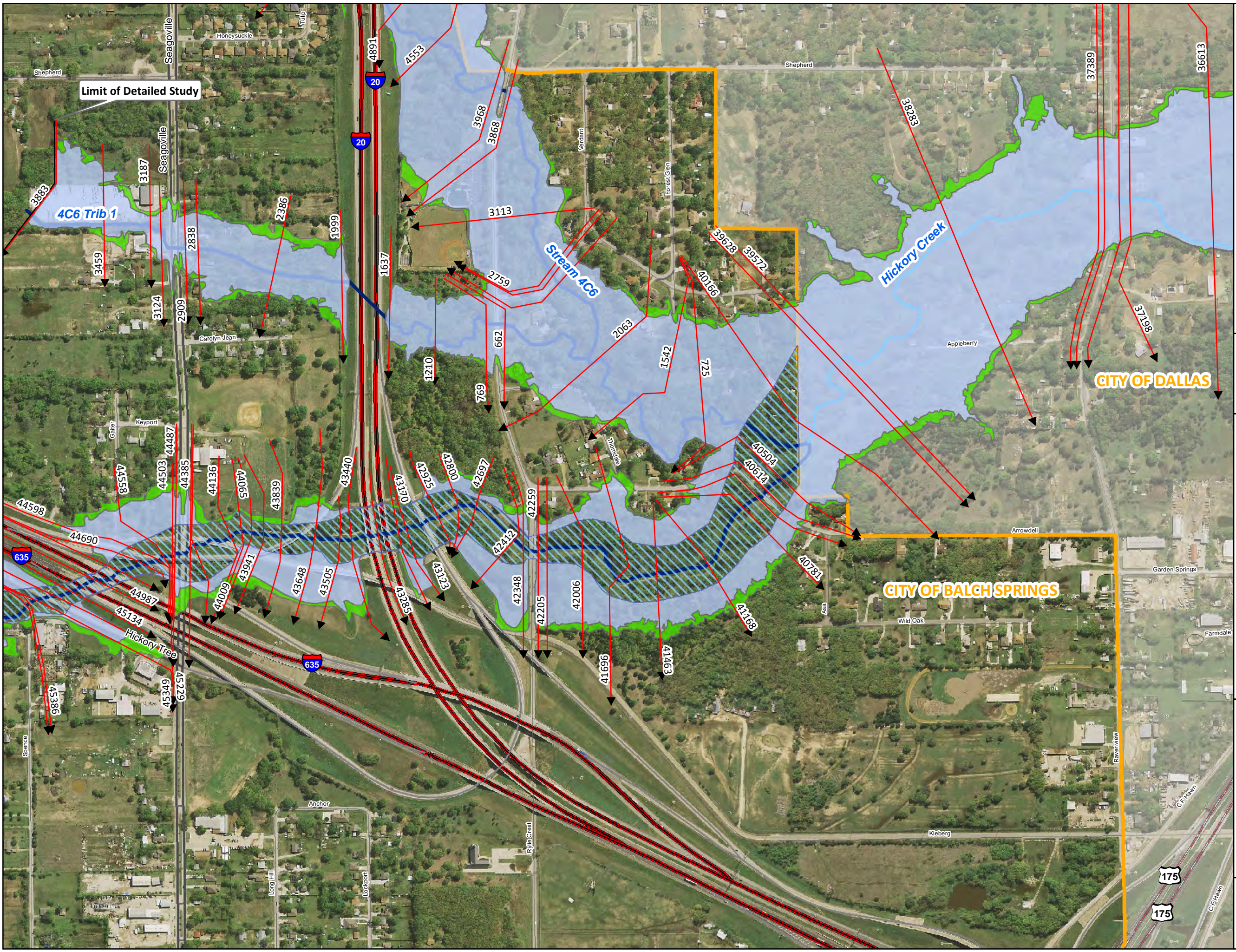


0 2,000 4,000



Feet



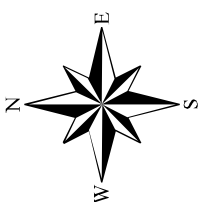


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 10
Floodplain WorkMaps
Panel 01

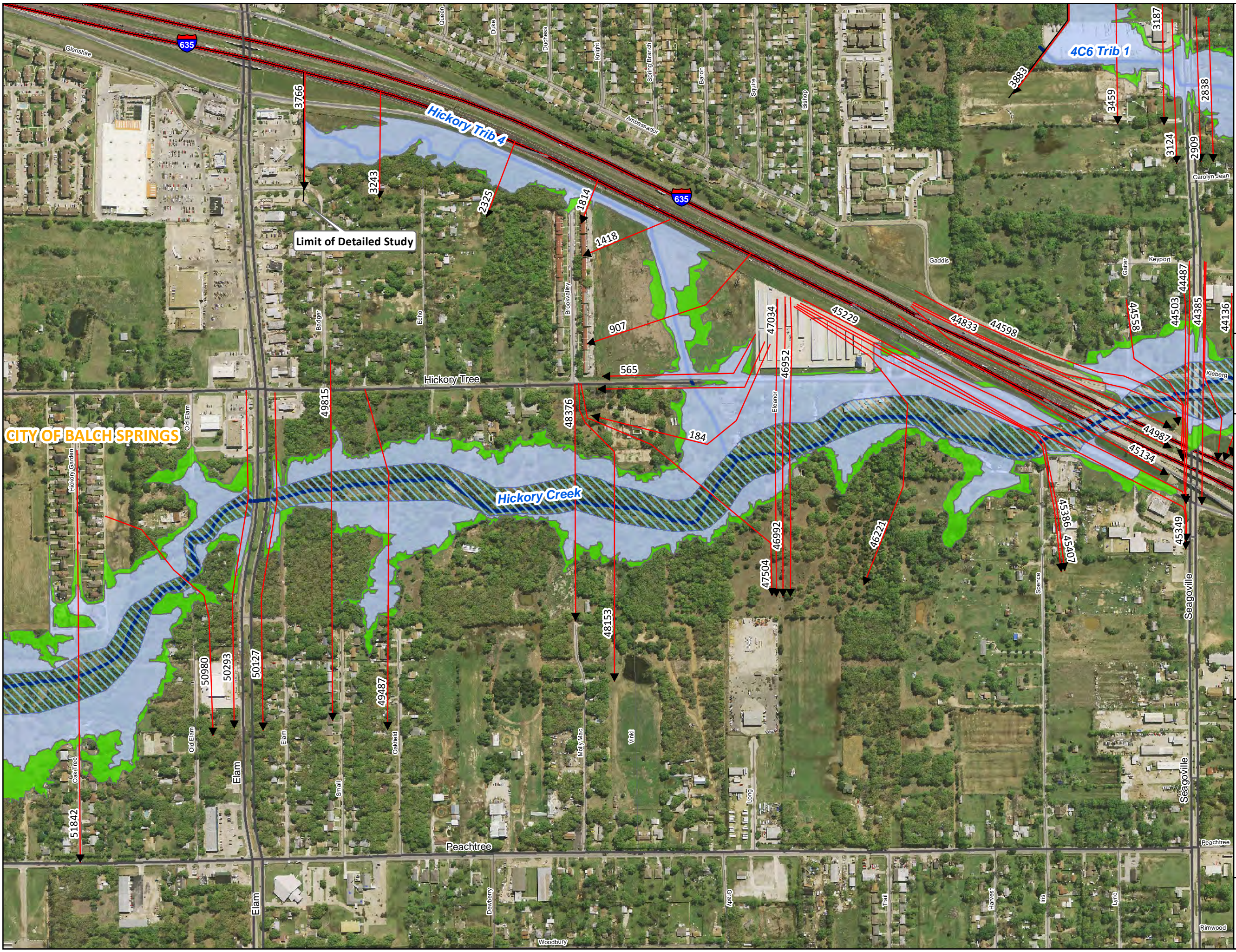
Legend

- Cross Sections
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries



Feet



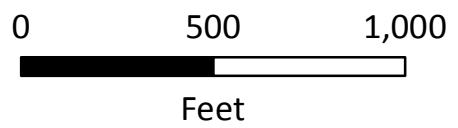
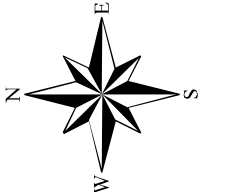


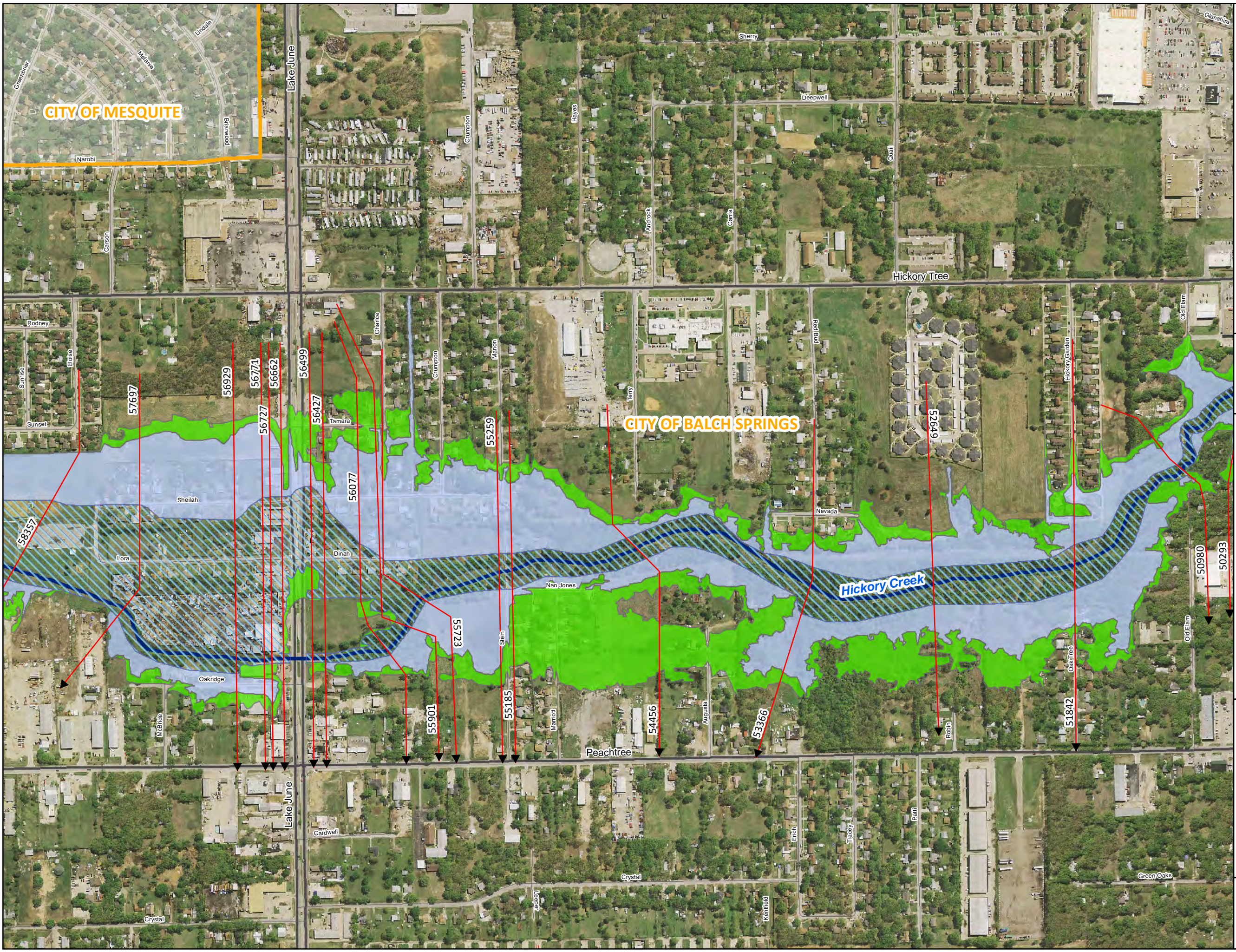
City of Balch Springs
 Hickory Creek Flood Protection
 Planning Study

Figure 10
Floodplain WorkMaps
Panel 02

Legend

- Cross Sections
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries



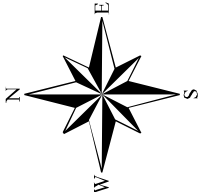


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 10
Floodplain WorkMaps
Panel 03

Legend

-  Cross Sections
-  New Detailed Study
-  2005 City of Dallas
Hickory Creek Study
-  Hickory Creek Floodway
-  Existing Conditions
100yr Floodplain
-  Existing Conditions
500yr Floodplain
-  City of Balch Springs
-  Dallas County Political Boundaries

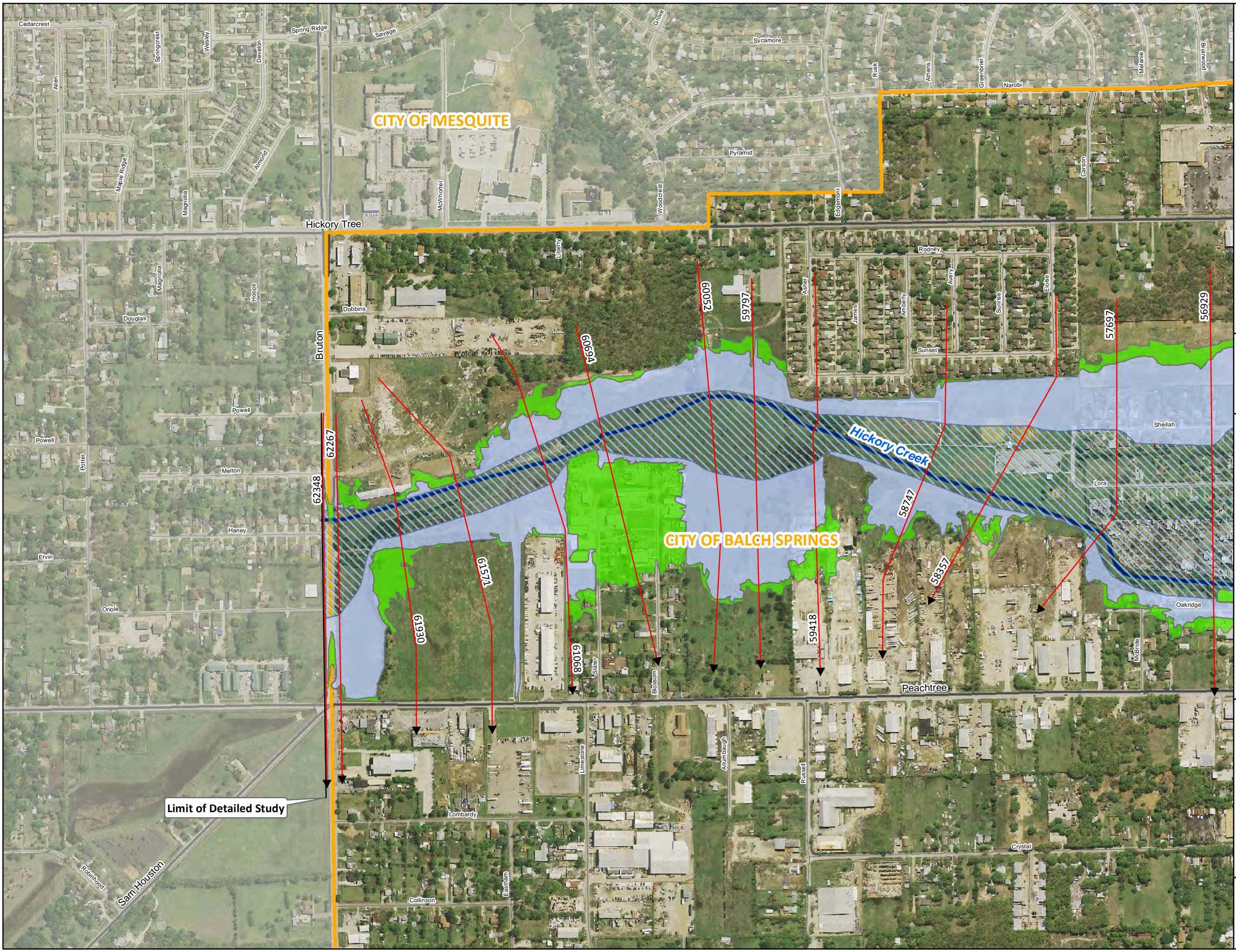


0 500 1,000



Feet



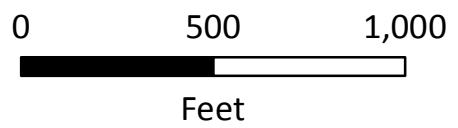
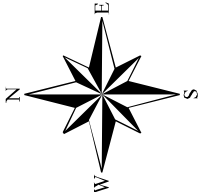


City of Balch Springs
 Hickory Creek Flood Protection
 Planning Study

Figure 10
Floodplain WorkMaps
Panel 04

Legend

- Cross Sections
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries







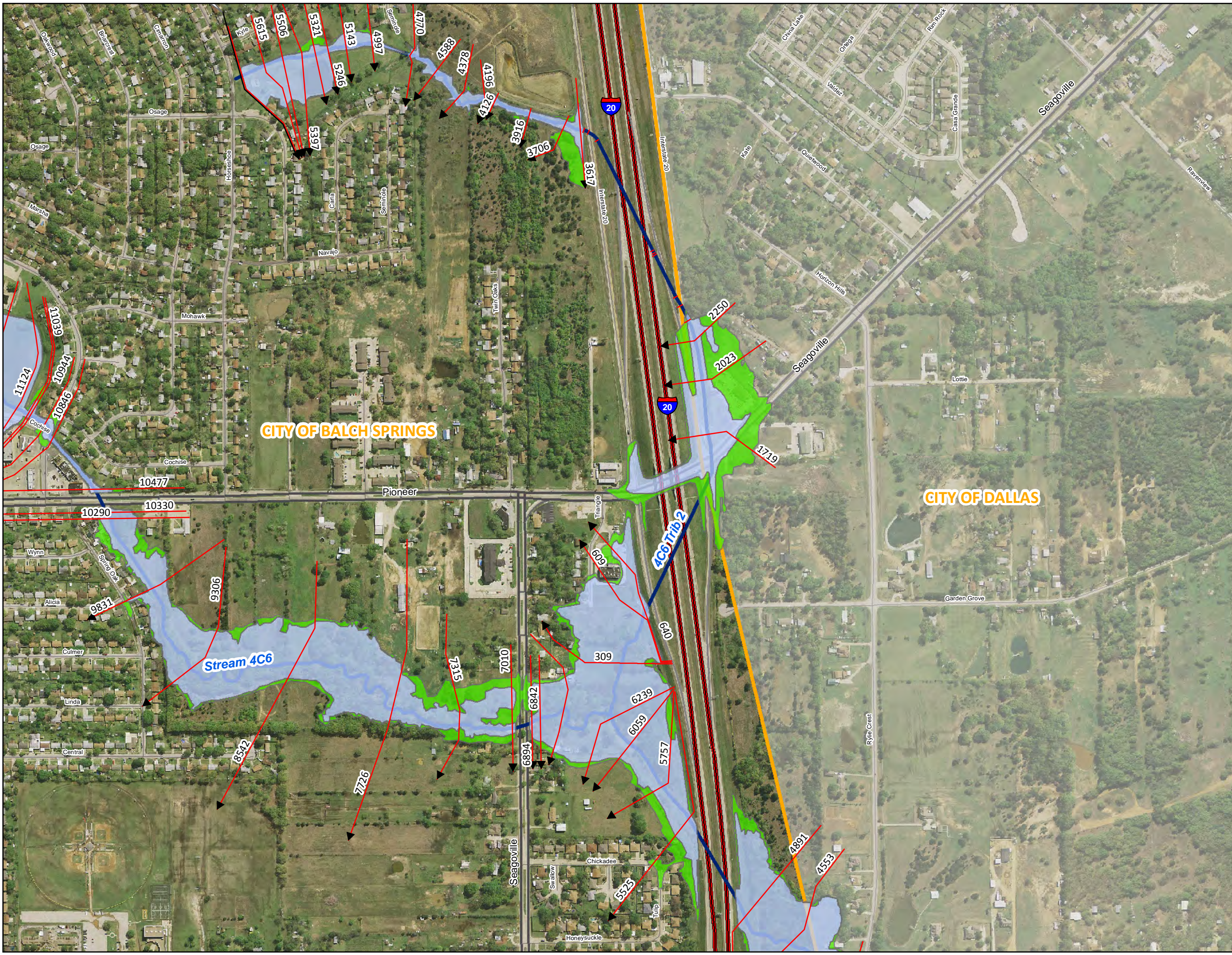
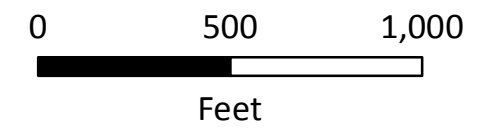
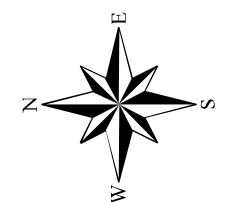


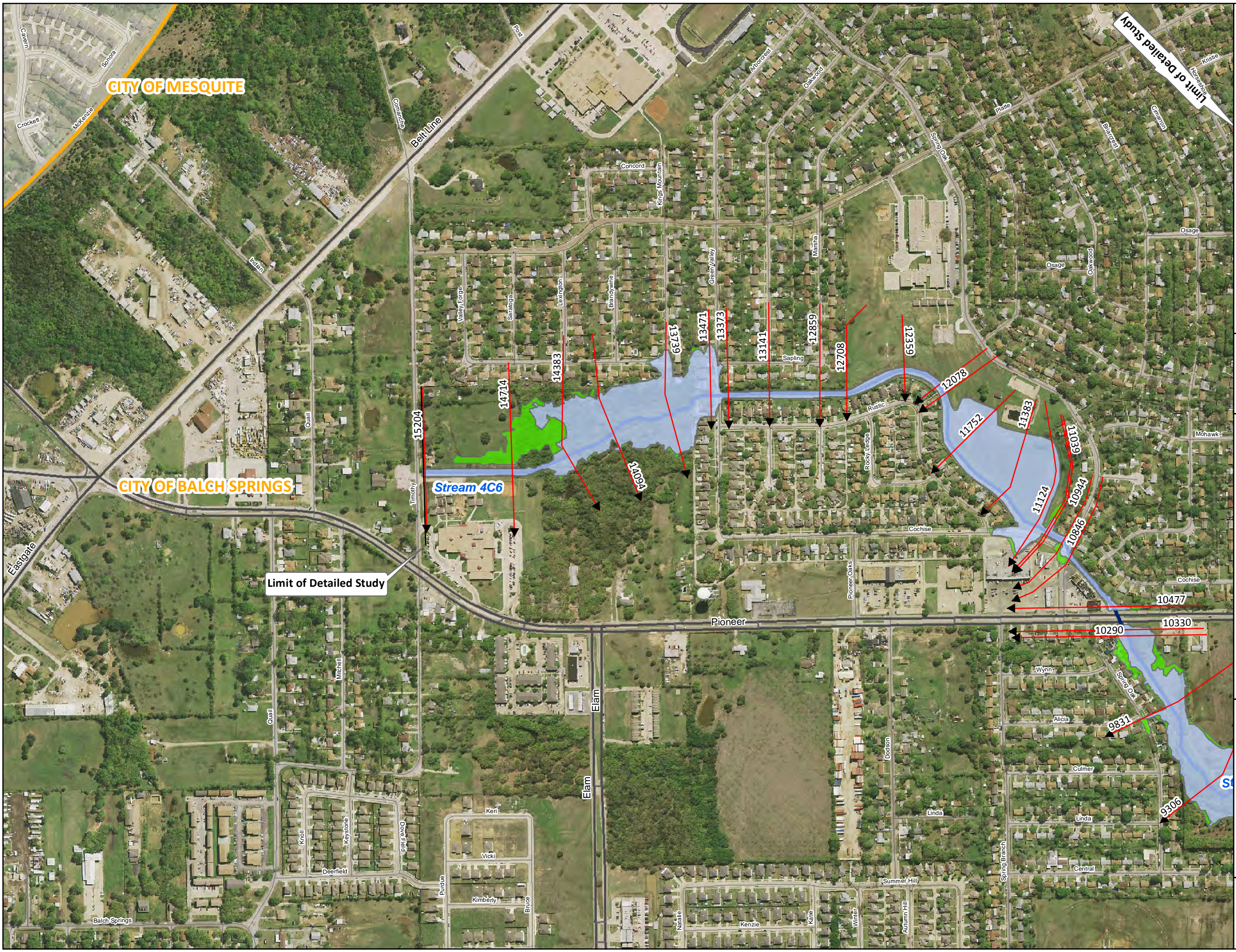
City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 10
Floodplain WorkMaps
Panel 05

Legend

-  Cross Sections
-  New Detailed Study
-  2005 City of Dallas
Hickory Creek Study
-  Hickory Creek Floodway
-  Existing Conditions
100yr Floodplain
-  Existing Conditions
500yr Floodplain
-  City of Balch Springs
-  Dallas County Political Boundaries



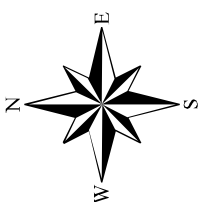


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 10
Floodplain WorkMaps
Panel 06

Legend

-  Cross Sections
-  New Detailed Study
-  2005 City of Dallas Hickory Creek Study
-  Hickory Creek Floodway
-  Existing Conditions 100yr Floodplain
-  Existing Conditions 500yr Floodplain
-  City of Balch Springs
-  Dallas County Political Boundaries



0 500 1,000



Feet



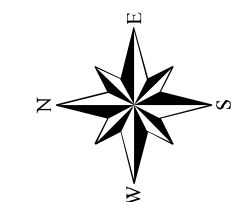


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

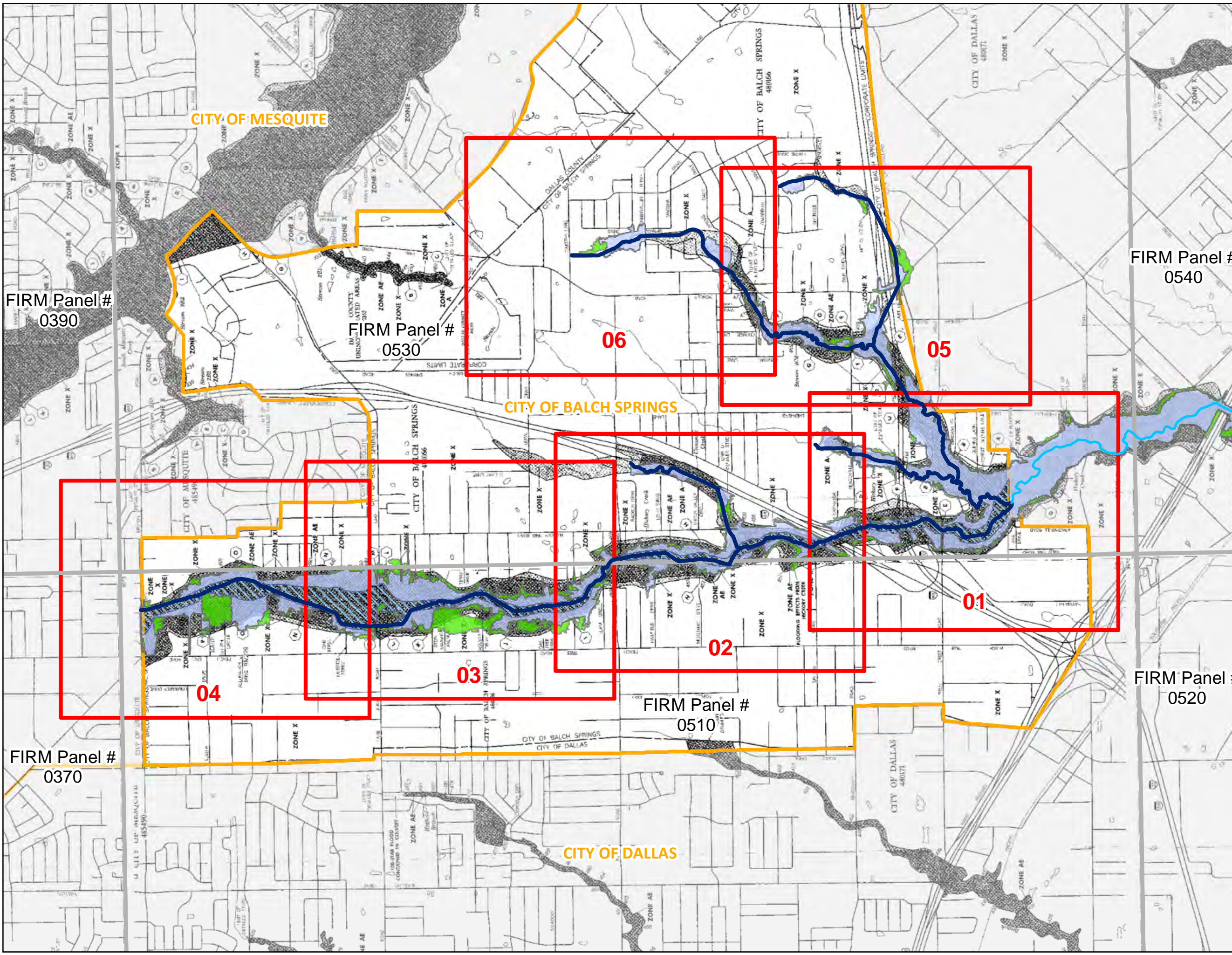
Figure 11
Effective Floodplain Comparison
Index Panel

Legend

- Panel Index
- 2001 Effective FIRM Panels
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries



0 2,000 4,000
Feet



FIRM Panel #
0390

FIRM Panel #
0530

FIRM Panel #
0540

06

05

CITY OF BALCH SPRINGS

01

02

FIRM Panel #
0510

04

03

FIRM Panel #
0520

FIRM Panel #
0370

CITY OF DALLAS

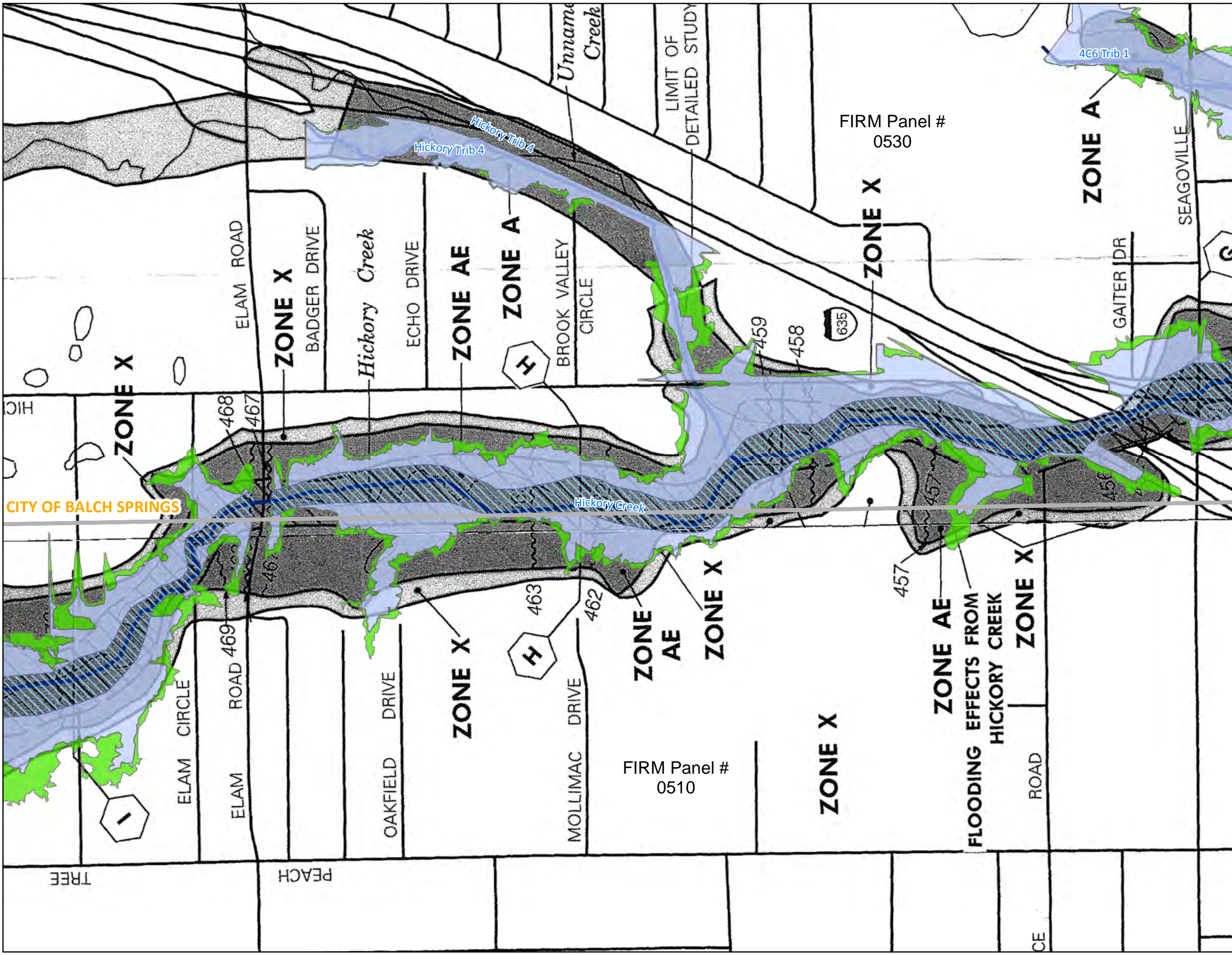
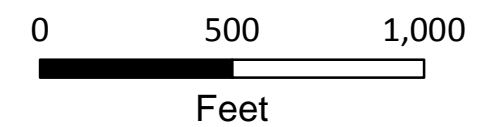
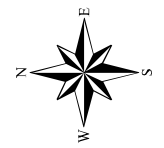


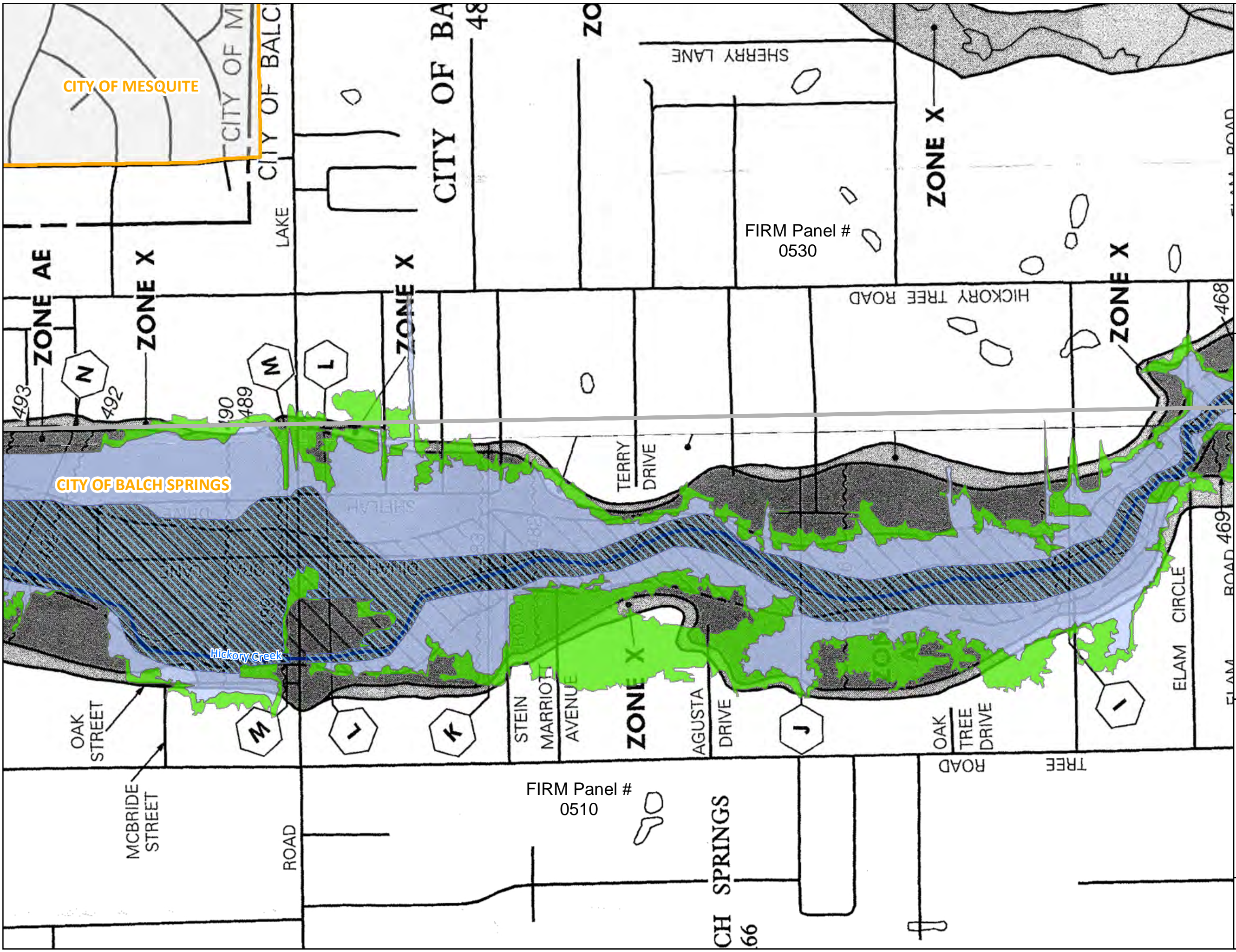
City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 11
Effective Floodplain Comparison
Panel 02

Legend

- 2001 Effective FIRM Panels
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries



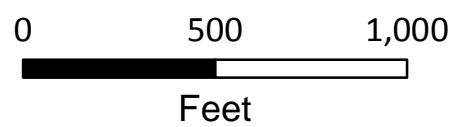
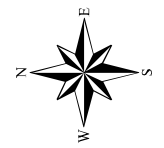


City of Balch Springs
 Hickory Creek Flood Protection
 Planning Study

Figure 11
Effective Floodplain Comparison
Panel 03

Legend

- 2001 Effective FIRM Panels
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries



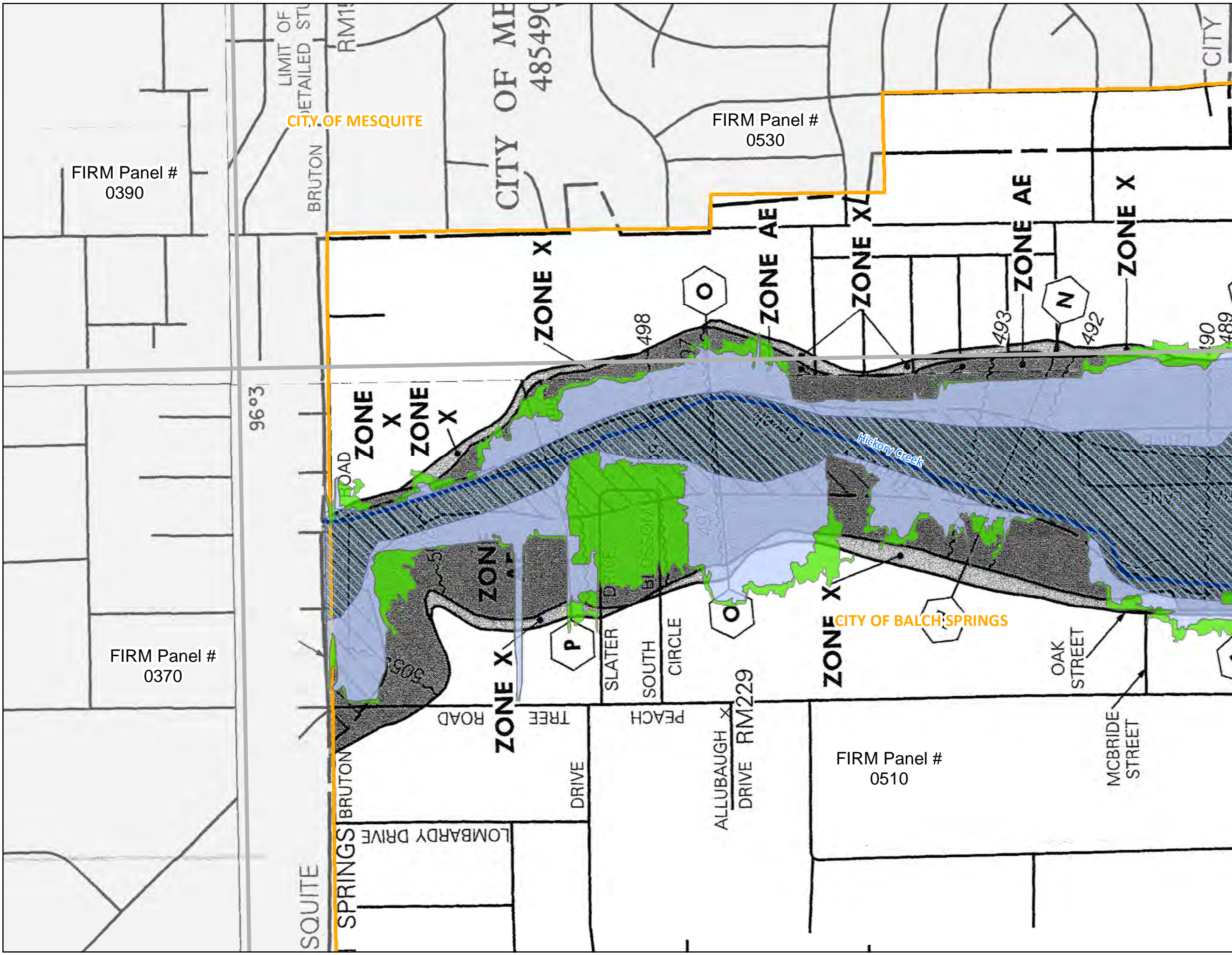
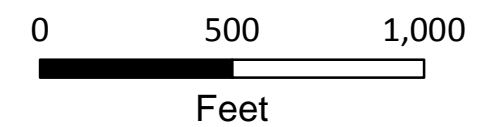
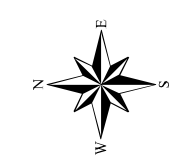


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 11
Effective Floodplain Comparison
Panel 04

Legend

- 2001 Effective FIRM Panels
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries



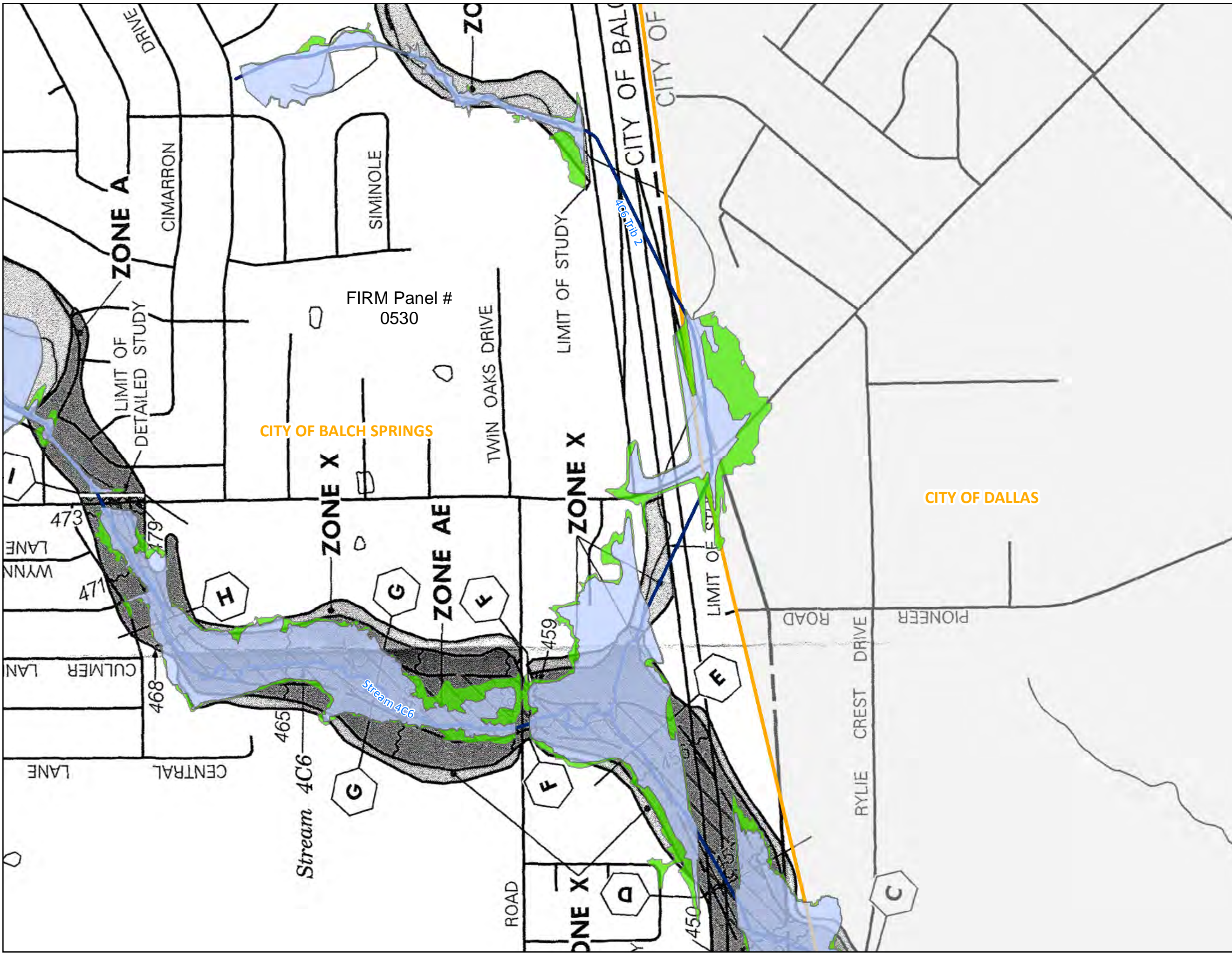
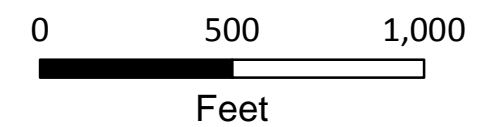
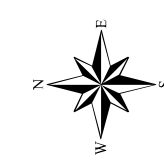


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 11
Effective Floodplain Comparison
Panel 05

Legend

- 2001 Effective FIRM Panels
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries



CITY OF MESQUITE

DALLAS COUNTY
CITY OF BALCH SPRINGS

CITY OF BALCH SPRINGS

UNINCORPORATED AREAS
480165

CORPO

TIMOTHY LANE

FIRM Panel #
0530

ROAD

PIONEER

LANE

WYNN

LANE

CULMER

LANE

ENTRAL

473

471

479

468

Stream 4C6

GREENVALLEY DRIVE

MARSHA DRIVE

ZONE X

SPRING OAKS DRIVE

ZONE A

CIMARRON DRIVE

LIMIT OF
DETAILED STUDY

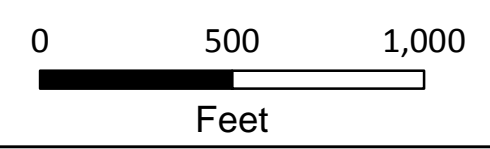


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 11
Effective Floodplain Comparison
Panel 06

Legend

- 2001 Effective FIRM Panels
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Hickory Creek Floodway
- Existing Conditions 100yr Floodplain
- Existing Conditions 500yr Floodplain
- City of Balch Springs
- Dallas County Political Boundaries





City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 12
Inundated Roadways

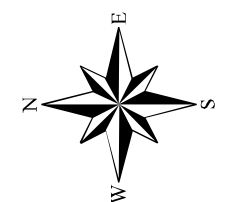
Legend

Structures Potentially Affected

- 500-year is contained

Event That Overtops Structure

- 2-year
- 5-year
- 10-year
- 25-year
- 50-year
- 100-year
- 250-year
- 500-year
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Balch Springs City Limits

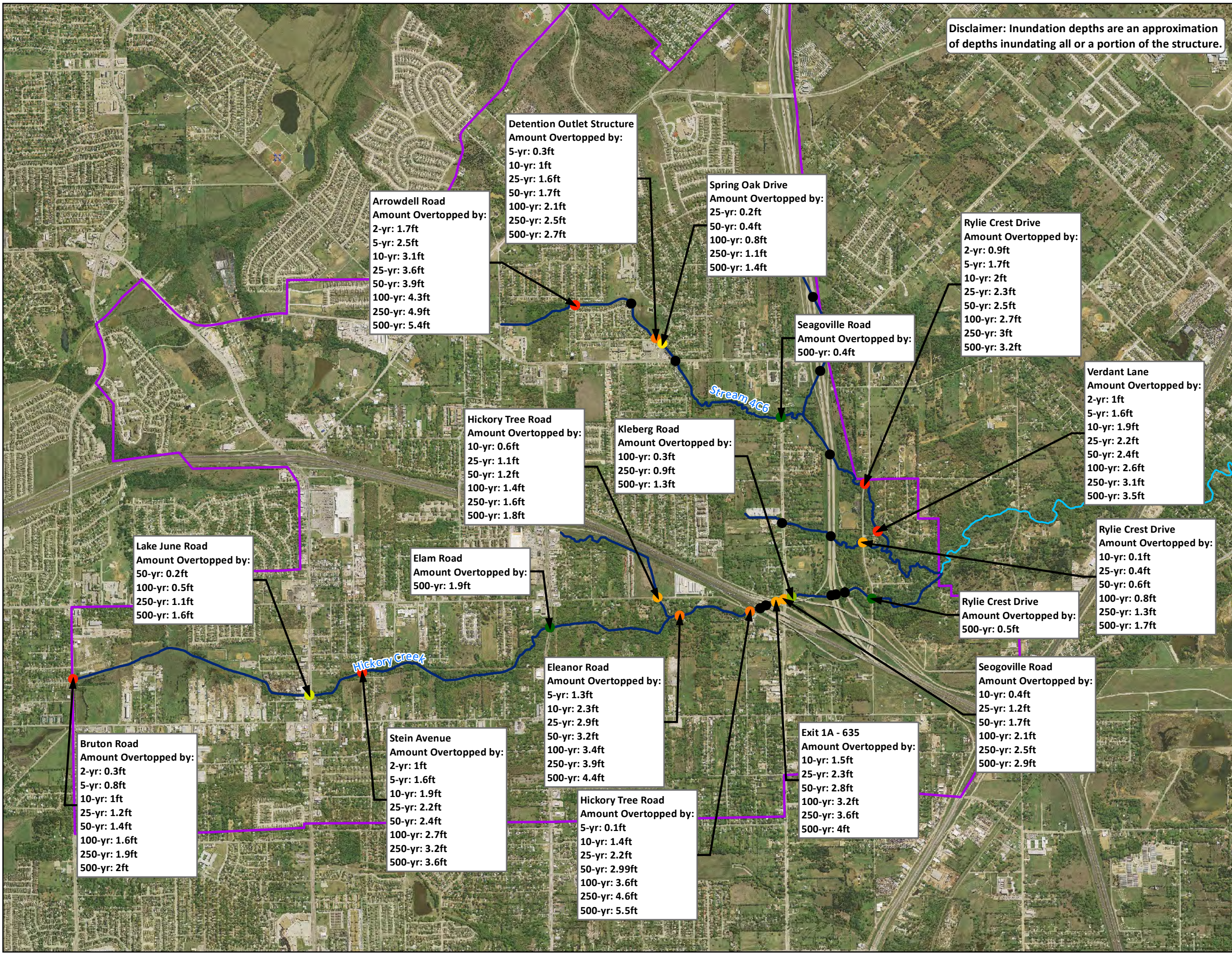


0 2,000 4,000

Feet



Disclaimer: Inundation depths are an approximation of depths inundating all or a portion of the structure.



Arrowdell Road
Amount Overtopped by:
2-yr: 1.7ft
5-yr: 2.5ft
10-yr: 3.1ft
25-yr: 3.6ft
50-yr: 3.9ft
100-yr: 4.3ft
250-yr: 4.9ft
500-yr: 5.4ft

Detention Outlet Structure
Amount Overtopped by:
5-yr: 0.3ft
10-yr: 1ft
25-yr: 1.6ft
50-yr: 1.7ft
100-yr: 2.1ft
250-yr: 2.5ft
500-yr: 2.7ft

Spring Oak Drive
Amount Overtopped by:
25-yr: 0.2ft
50-yr: 0.4ft
100-yr: 0.8ft
250-yr: 1.1ft
500-yr: 1.4ft

Rylie Crest Drive
Amount Overtopped by:
2-yr: 0.9ft
5-yr: 1.7ft
10-yr: 2ft
25-yr: 2.3ft
50-yr: 2.5ft
100-yr: 2.7ft
250-yr: 3ft
500-yr: 3.2ft

Seagoville Road
Amount Overtopped by:
500-yr: 0.4ft

Verdant Lane
Amount Overtopped by:
2-yr: 1ft
5-yr: 1.6ft
10-yr: 1.9ft
25-yr: 2.2ft
50-yr: 2.4ft
100-yr: 2.6ft
250-yr: 3.1ft
500-yr: 3.5ft

Hickory Tree Road
Amount Overtopped by:
10-yr: 0.6ft
25-yr: 1.1ft
50-yr: 1.2ft
100-yr: 1.4ft
250-yr: 1.6ft
500-yr: 1.8ft

Kleberg Road
Amount Overtopped by:
100-yr: 0.3ft
250-yr: 0.9ft
500-yr: 1.3ft

Rylie Crest Drive
Amount Overtopped by:
10-yr: 0.1ft
25-yr: 0.4ft
50-yr: 0.6ft
100-yr: 0.8ft
250-yr: 1.3ft
500-yr: 1.7ft

Lake June Road
Amount Overtopped by:
50-yr: 0.2ft
100-yr: 0.5ft
250-yr: 1.1ft
500-yr: 1.6ft

Elam Road
Amount Overtopped by:
500-yr: 1.9ft

Rylie Crest Drive
Amount Overtopped by:
500-yr: 0.5ft

Seagoville Road
Amount Overtopped by:
10-yr: 0.4ft
25-yr: 1.2ft
50-yr: 1.7ft
100-yr: 2.1ft
250-yr: 2.5ft
500-yr: 2.9ft

Bruton Road
Amount Overtopped by:
2-yr: 0.3ft
5-yr: 0.8ft
10-yr: 1ft
25-yr: 1.2ft
50-yr: 1.4ft
100-yr: 1.6ft
250-yr: 1.9ft
500-yr: 2ft

Stein Avenue
Amount Overtopped by:
2-yr: 1ft
5-yr: 1.6ft
10-yr: 1.9ft
25-yr: 2.2ft
50-yr: 2.4ft
100-yr: 2.7ft
250-yr: 3.2ft
500-yr: 3.6ft

Eleanor Road
Amount Overtopped by:
5-yr: 1.3ft
10-yr: 2.3ft
25-yr: 2.9ft
50-yr: 3.2ft
100-yr: 3.4ft
250-yr: 3.9ft
500-yr: 4.4ft

Exit 1A - 635
Amount Overtopped by:
10-yr: 1.5ft
25-yr: 2.3ft
50-yr: 2.8ft
100-yr: 3.2ft
250-yr: 3.6ft
500-yr: 4ft

Hickory Tree Road
Amount Overtopped by:
5-yr: 0.1ft
10-yr: 1.4ft
25-yr: 2.2ft
50-yr: 2.99ft
100-yr: 3.6ft
250-yr: 4.6ft
500-yr: 5.5ft



City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 13
FDA Damage Reaches
and Affected Properties

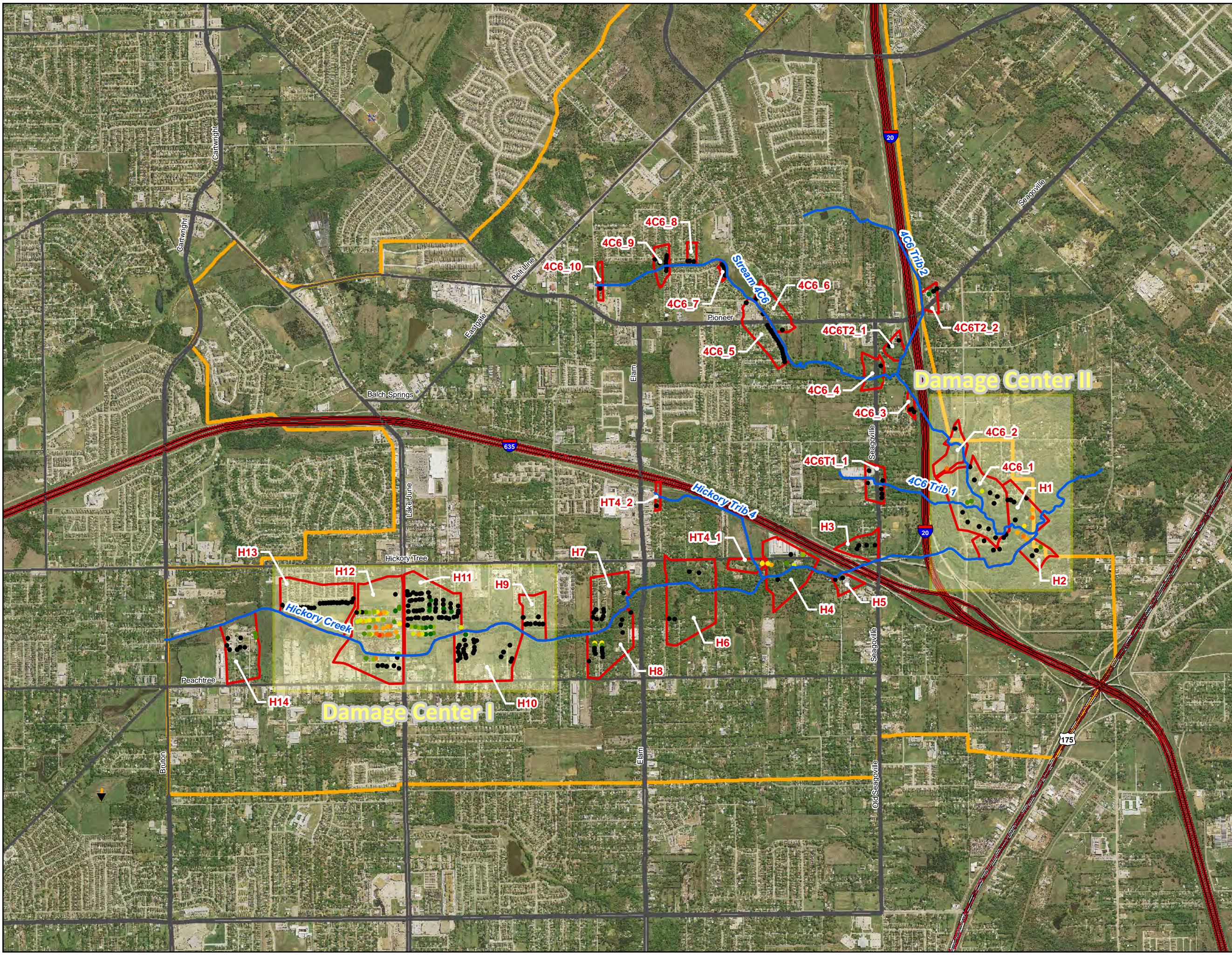
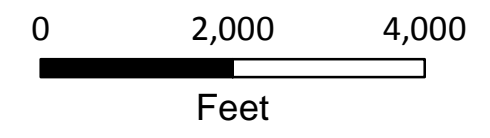
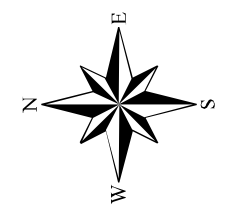
Legend

Structures Examined

Storm Event That Affects Structure

- Not Likely to be Affected
- 2-year
- 5-year
- 10-year
- 25-year
- 50-year
- 100-year
- 250-year
- 500-year

FDA Damage Reaches



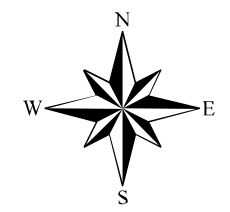


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

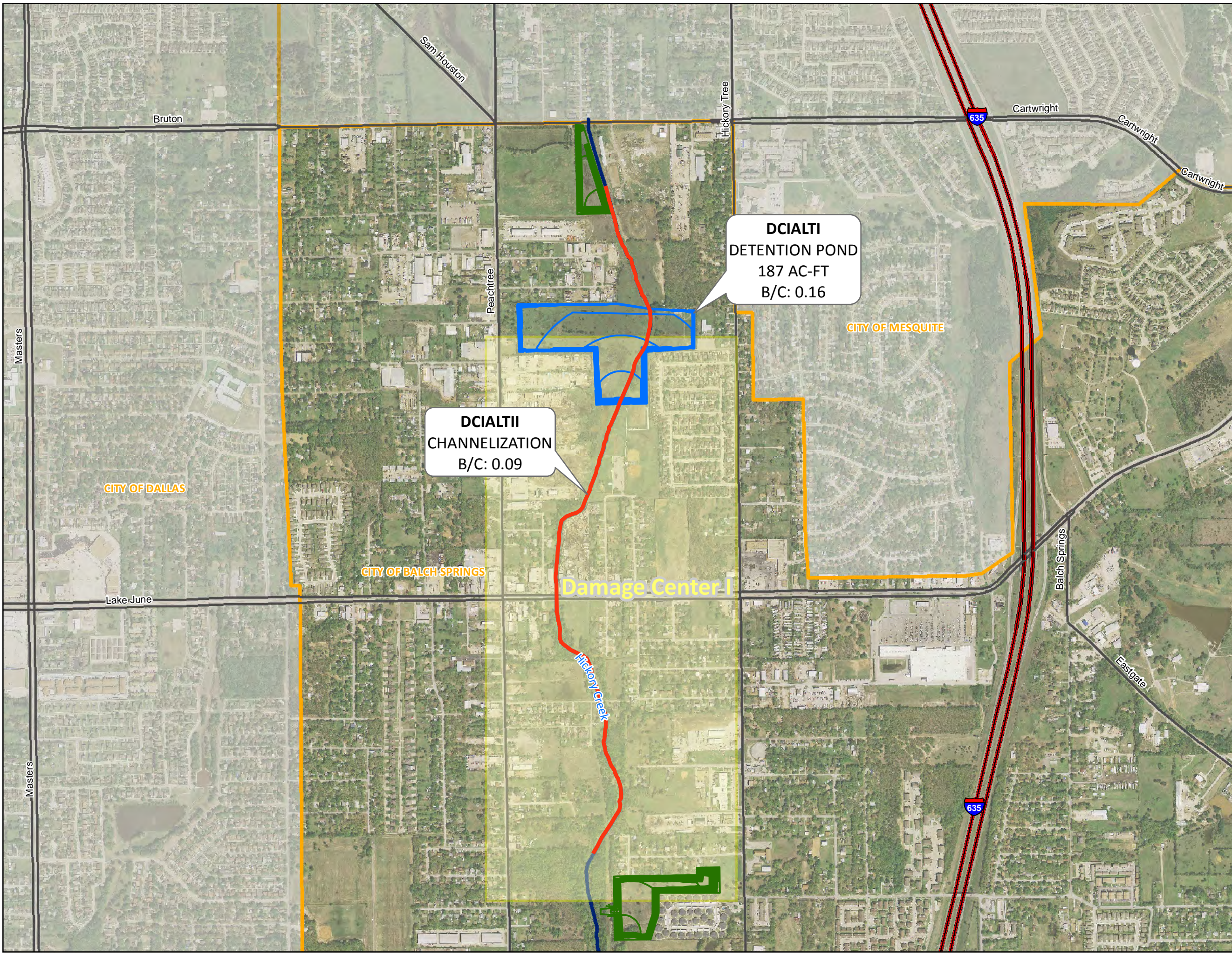
Figure 14
Alternative Sites Explored
Damage Center I

Legend

- FDA Damage Centers
- New Detailed Study
- 2005 City of Dallas Hickory Creek Study
- Alternatives - DCIALTI
- Alternatives - DCIALTII
- Alternatives - City Owned Property
- City of Balch Springs



0 1,000 2,000
Feet










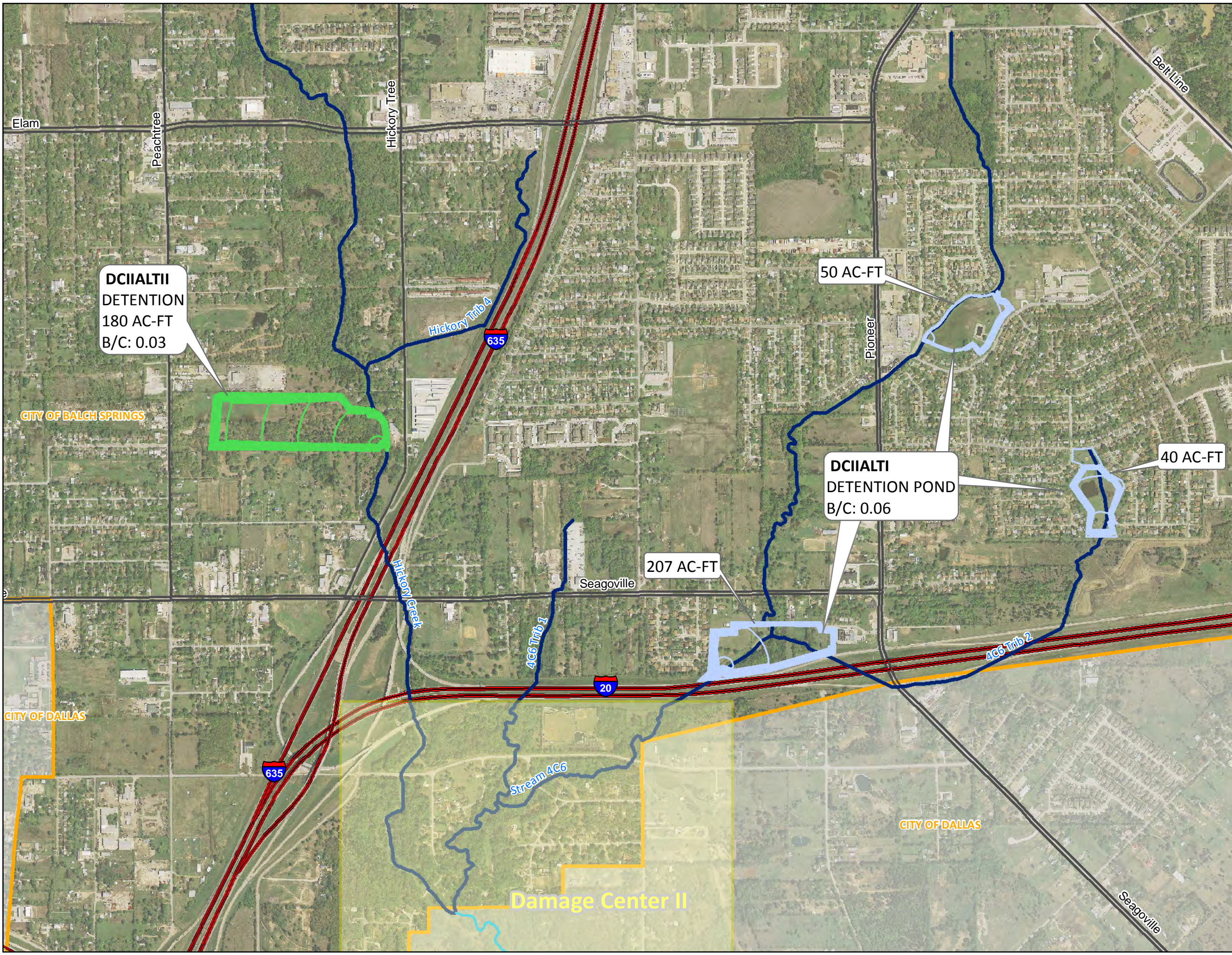
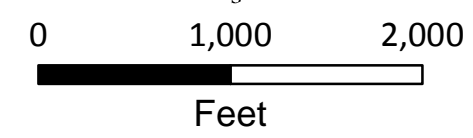
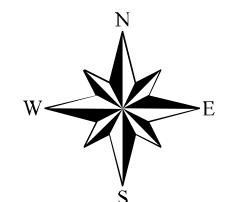


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 14
Alternative Sites Explored
Damage Center II

Legend

-  FDA Damage Centers
-  New Detailed Study
-  2005 City of Dallas
Hickory Creek Study
-  Alternatives - DCIIALTI
-  Alternatives - DCIIALTII
-  Alternatives - Other Sites
-  City of Balch Springs




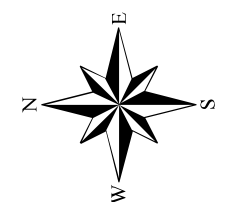


City of Balch Springs
Hickory Creek Flood Protection
Planning Study

Figure 15
Buyout Alternatives
Damage Center I

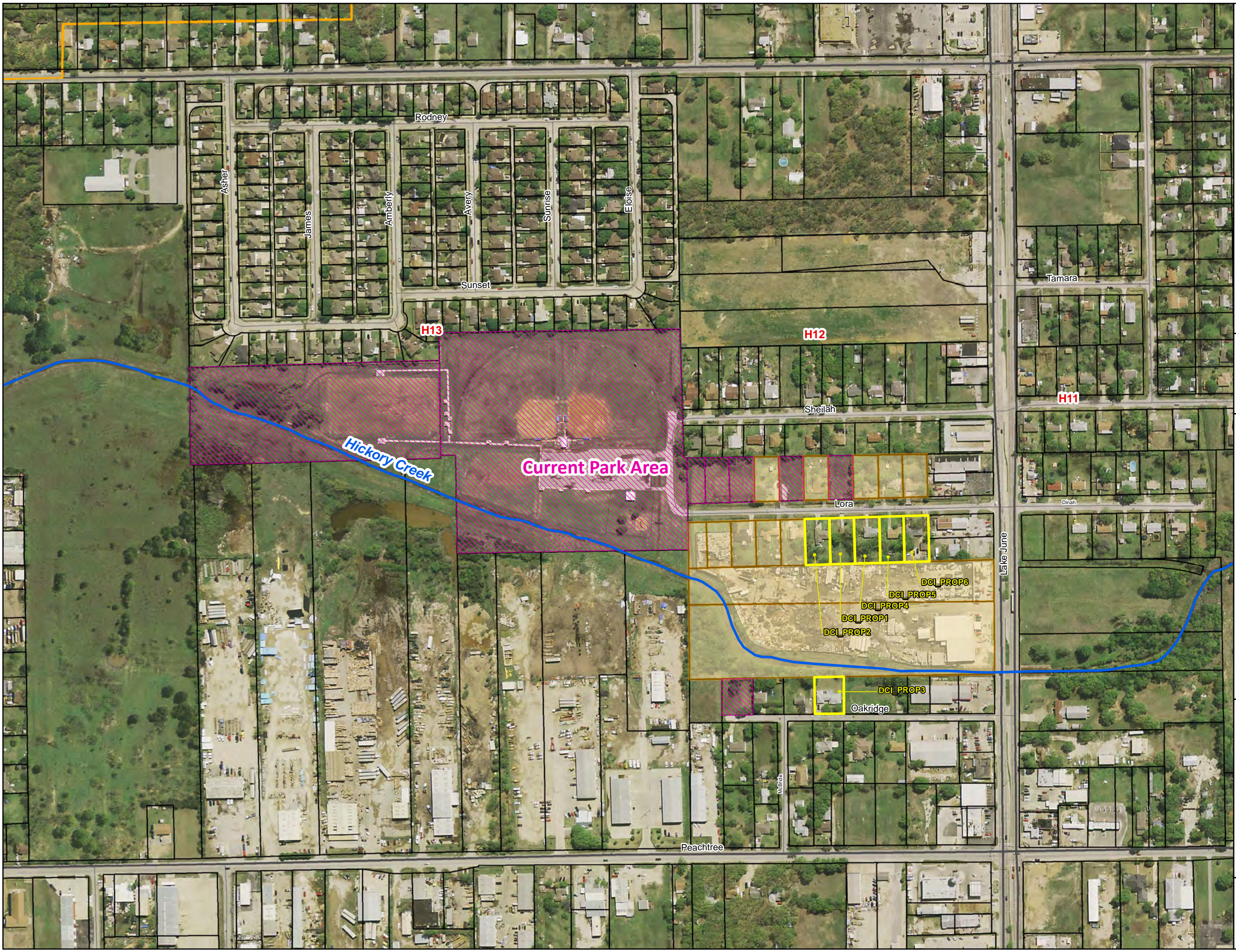
Legend

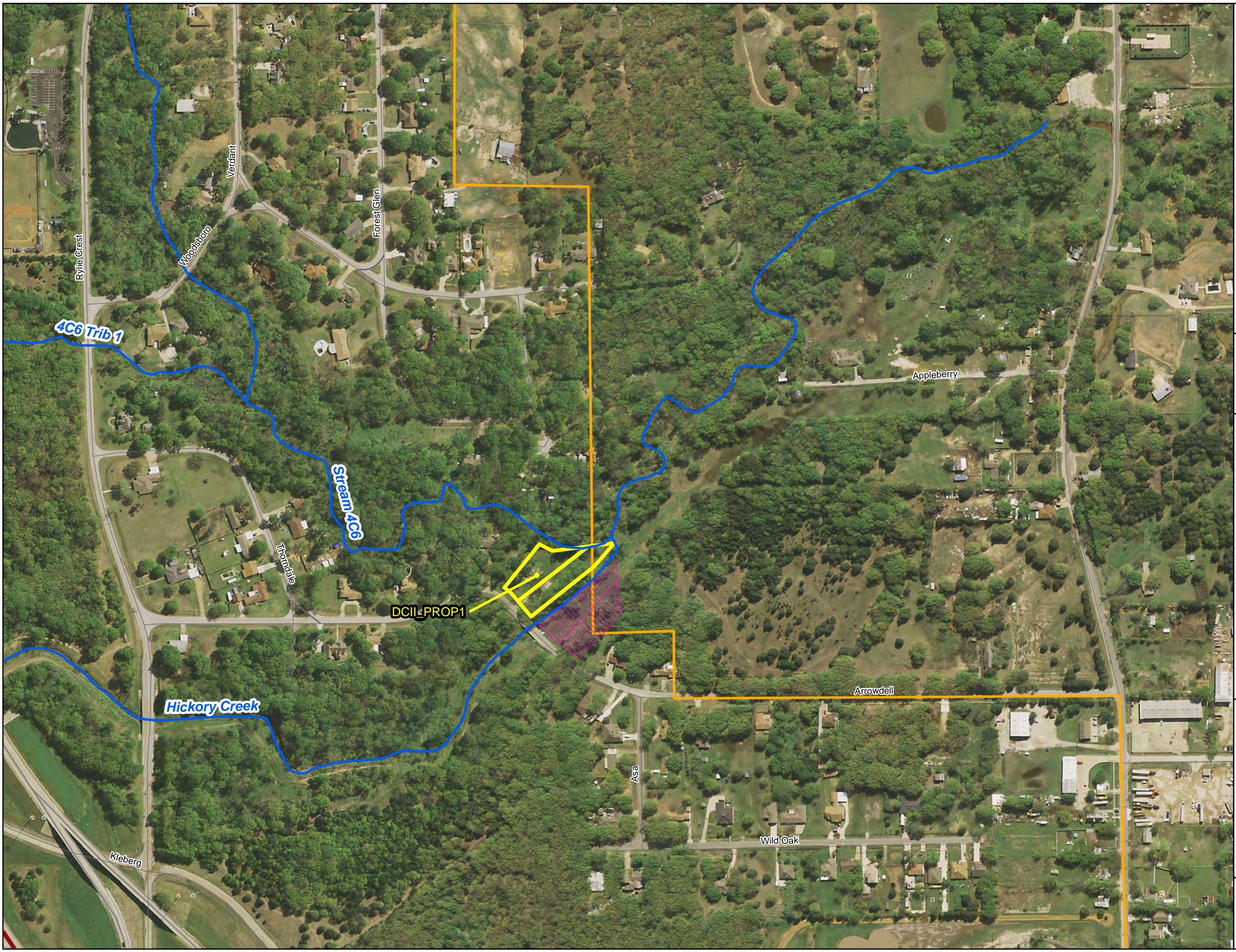
-  FDA Damage Reaches
-  Possible Future Buyout For Park Extension
-  Potential Buyout Parcels
-  City Owned Parcels
-  Other Parcels
-  Stream Centerlines
-  Balch Springs City Limits



0 300 600

Feet








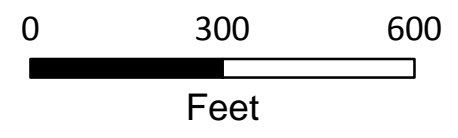
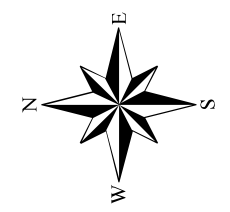


City of Balch Springs
 Hickory Creek Flood Protection
 Planning Study

Figure 15
Buyout Alternatives
Damage Center II

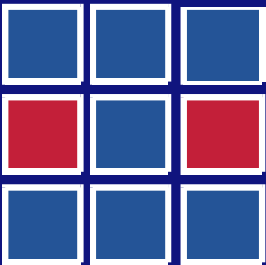
Legend

-  FDA Damage Reaches
-  City Owned Parcels
-  Area_Parcels
-  Stream Centerlines
-  Balch Springs City Limits





HALFF



Hickory Creek Physical Features Report



City of Balch Springs, Texas

Prepared for

**City of Balch Springs Hickory Creek Flood Protection
Planning Study**

March, 2011

AVO 27171



1201 North Bowser Road
Richardson, TX 75081

Surveyed Structures

Structure	Location	Structure	Location
Hickory Creek		Hickory Creek Tributary 4	
STR_02	Bruton Road	STR_18	Hickory Tree Road
STR_03	Lake June Road	Stream 4C6 Tributary 1	
STR_04	Stein Avenue	STR_19	Ryliecrest Drive
STR_05	Elam Road	STR_20	I-20
STR_06	Eleanor Drive	STR_21	Seagoville Road
AC_01*	Pipe Crossing	Stream 4C6	
BR_01*	Hickory Tree Road	STR_22	Woodsboro Drive
STR_07	I-635 Southbound	STR_23	Ryliecrest Drive
STR_08	I-635 Northbound	STR_24	I-20
STR_09	I-635 Access Road	STR_25	Seagoville Road
AC_02*	Seagoville Road	STR_26	Pioneer Road
STR_11	Kleberg Road	STR_27	Spring Oak Drive
STR_12	I-20 / I-635 Interchange	Stream 4C6 Tributary 2	
STR_13	I-20 Westbound	STR_32	I-20 Ramp
STR_14	I-20 Eastbound	STR_35	I-20
STR_15	I-20 / I-635 Interchange		
STR_16	Ryliecrest Drive		
STR_17	Arrowdell Road		

* AC_01, AC_02, and BR_01 survey collected as part of a 2007 study performed by Halff Associates, Inc.

Surveyed Cross Sections

Cross Section	Approximate Location
Hickory Creek	
XS_01	~715 ft Downstream of Bruton Road
XS_02	~1314 ft Upstream of Lake June Road
XS_03	~520 ft Upstream of Stein Avenue
XS_04	~3110 ft Upstream of Elam Road
XS_06	~480 ft Upstream of Eleanor Drive
XS_09	~500 ft Downstream of Arrowdell Road
Stream 4C6	
XS_11	~580 ft Downstream of Confluence with Stream 4C6 Tributary 1
XS_13	Confluence with Stream 4C6 Tributary 2
XS_14	~1520 ft Upstream of Seagoville Road
Stream 4C6 Tributary 2	
XS_18	~470 ft Downstream of Horseshoe Trail

Appendix B
Hickory Creek
Structure 02: Bruton

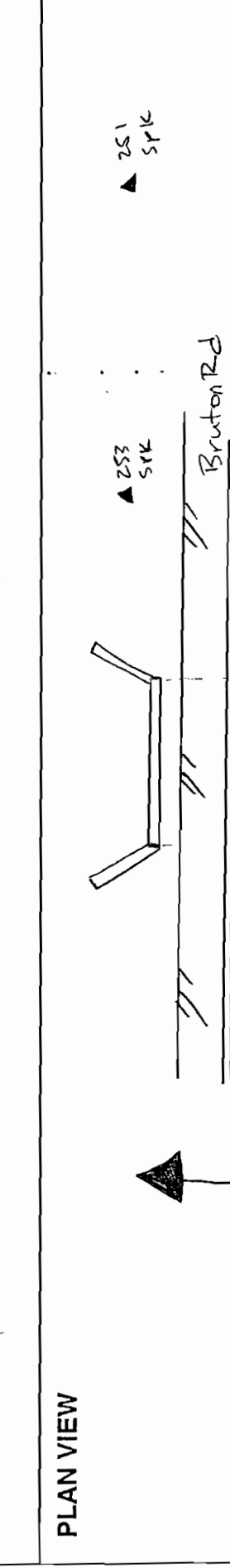
Stream Name Hickory Creek Location Bruton Rd @ Haney Date 3-8-10
 Instrument B. Dierks Rodman A. Garcia Benchmark: ID _____ Elev _____ Survey File 5380 Grid
 Type: XS () BR () CULV () DAM () Structure Name STR_02

Bridge: Rail _____ Deck _____ Width _____ Piers(s) @ Skew _____
 Culvert: #Bls 1 Type Box Length 40.00 Size: H 4.25 X W 8.25 Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser X Skew _____

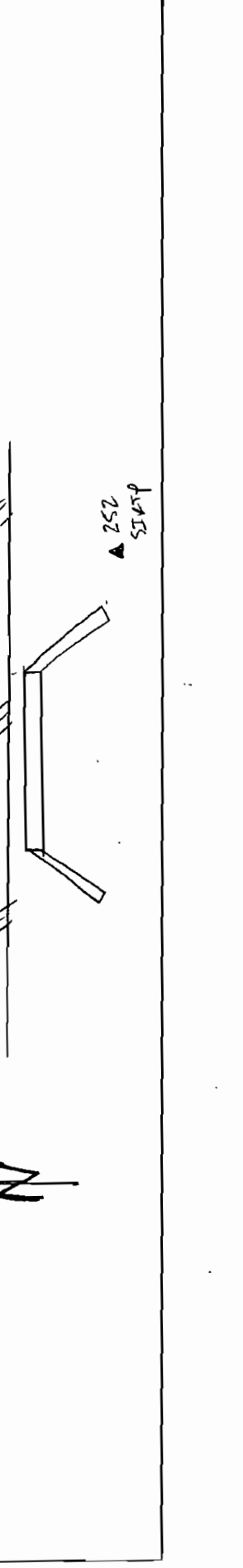
Photo IDs: _____ Looking E°
 Looking U/S 14 Looking D/S 15 Looking S°
 U/S Face 13 D/S Face 16 Looking N°

Additional Comments: No water flowing thru box
 ERM Description: SPK # 253 on E/W Bound Shoulder of Bruton Rd +/- 40' E. of Box Cul.

PROFILE VIEW



PLAN VIEW



STR 02 – Bruton Road



STR 02 looking upstream



STR 02 looking downstream



STR 02 upstream face



STR 02 downstream face

STR_02.txt

STR_02

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522,6960456.012092,2544121.403525,503.316876,ALPT1
523,6960454.729573,2544101.946503,503.586694,GR
524,6960453.862735,2544074.980469,503.463546,GR
525,6960454.226317,2544061.527044,502.707176,CB
526,6960456.208856,2544057.689022,500.364572,GR
527,6960457.121876,2544050.767653,499.348945,GR
528,6960456.410486,2544046.914702,499.116740,TE
529,6960456.203019,2544045.517053,499.057403,H2O
530,6960456.390575,2544044.267217,499.018155,H2O
531,6960456.283608,2544043.662203,499.020431,H2O
532,6960456.631731,2544042.811244,499.153410,TE
533,6960457.033770,2544038.345299,499.964483,GR
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535,6960453.347837,2544030.179010,502.738144,CB
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537,6960452.393720,2543994.635830,503.208688,GR
538,6960451.904481,2543954.594247,502.640080,ALPT2
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542,6960407.441600,2544047.912779,498.052831,DIB1_4_8
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545,6960427.918966,2544084.104680,504.511366,TR
546,6960427.122545,2544047.768506,504.375055,TR
547,6960426.412142,2543991.104285,503.936301,TR
548,6960426.298967,2543957.281974,503.795584,TR
549,6960425.718621,2543921.841785,503.562914,TR
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Appendix B
Hickory Creek
Structure 03: Lake June

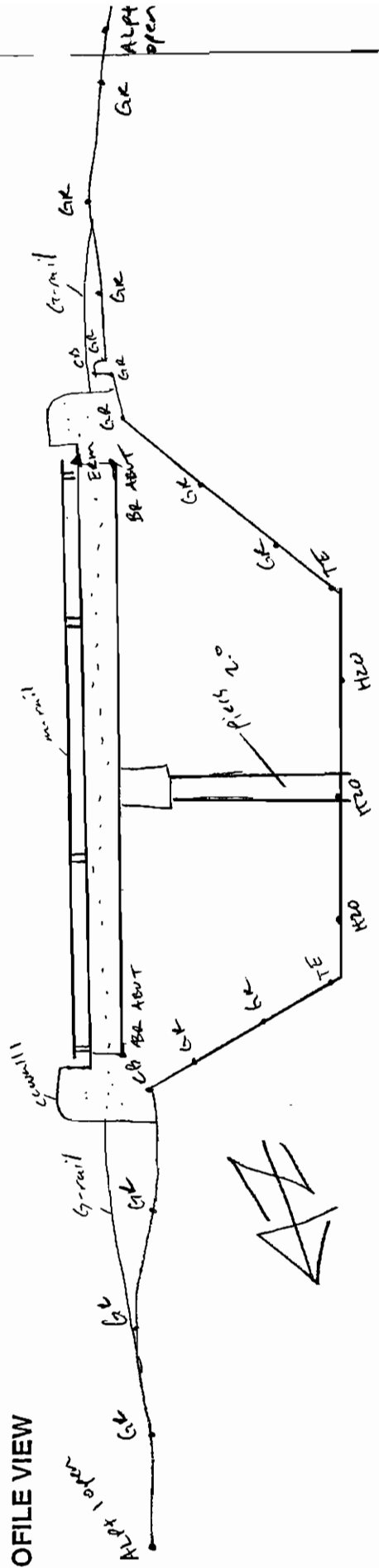
Stream Name Hickory Creek Location Lake June //S// Date 3-9-10
 Instrument B. Dierkes Rodman A. Garcia Benchmark: ID _____ Elev _____
 Type: XS () BR (✓) CULV () DAM () Structure Name STR-03

Bridge: Rail MH, 54 Deck 49.57 Width 92.45 Piers(s) 5 @ 2.00 dia Skew _____
 Culvert: #Bls _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

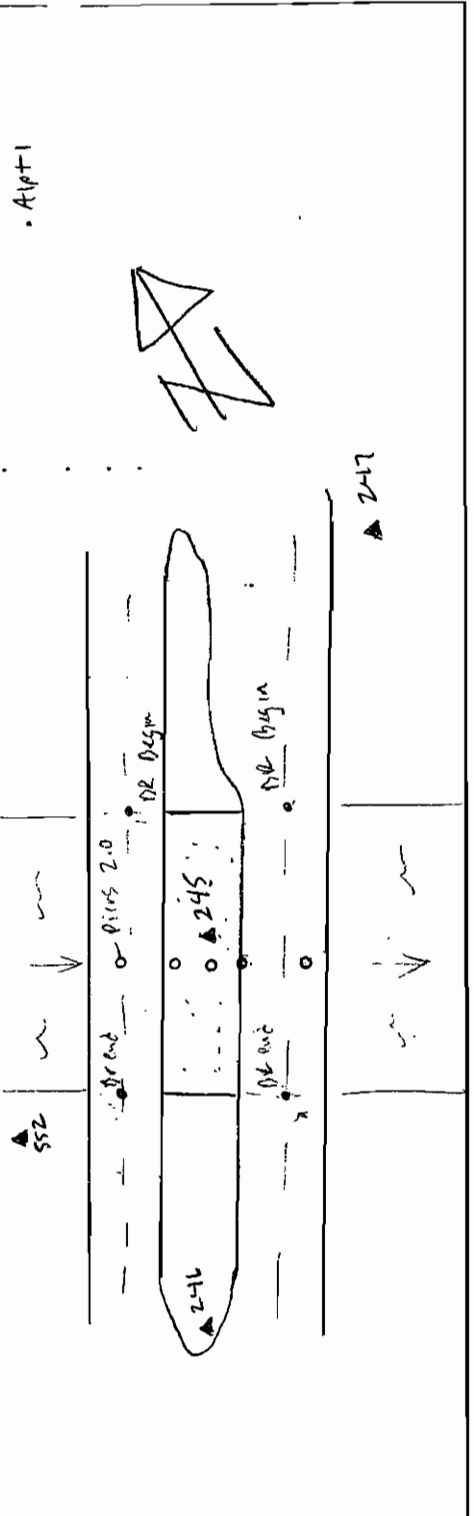
Photo IDs: #21 Looking W^o SE corner Damage
 Looking U/S: #17 W^o Looking D/S: #20 E
 U/S Face #18 E^o D/S Face #19 W^o

Additional Comments: Flowing Smooth
 ERM Description: SX on top of HDWL @ the SW corner of bridge Under M-rail

PROFILE VIEW



PLAN VIEW • A1p+2



STR 03 Lake June



STR 03 looking upstream



STR 03 looking downstream



STR 03 upstream face



STR 03 downstream face

STR_03.txt

STR_03

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553,6955201.333225,2543917.618974,487.210565,ALPT1_OPEN
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556,6955191.080062,2543758.014321,487.901384,GR
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562,6955171.428900,2543725.499658,493.728741,CCWALL1
563,6955171.345425,2543722.205487,493.779493,CCWALL1
564,6955171.323089,2543722.053083,492.152489,CCWALL1
565,6955170.932962,2543721.911540,493.704049,MRAIL1
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568,6955171.010381,2543669.678337,492.461204,CCWALL
569,6955170.708509,2543670.642983,492.310336,SX_ERM
570,6955171.036326,2543667.940580,492.350760,CCWALL1
571,6955171.038785,2543664.692663,493.602398,CCWALL1
572,6955171.259674,2543663.898204,488.777109,CCWALL1
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590,6955120.939169,2543580.813098,491.215064,CHKIN_FS_246
591,6955127.637051,2543509.677852,490.813694,TR
592,6955077.651123,2543613.924777,490.513788,GRAIL1
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STR_03.txt

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618,6955184.907778,2543710.388338,480.732728,TE
619,6955184.743876,2543714.236609,483.116948,GR
620,6955163.580179,2543695.235366,480.388922,P1_2.0
621,6955139.582307,2543695.537006,480.217134,P2_2.0
622,6955125.791588,2543695.533014,480.126557,P3_2.0
623,6955106.389756,2543695.680927,480.054906,P4_2.0
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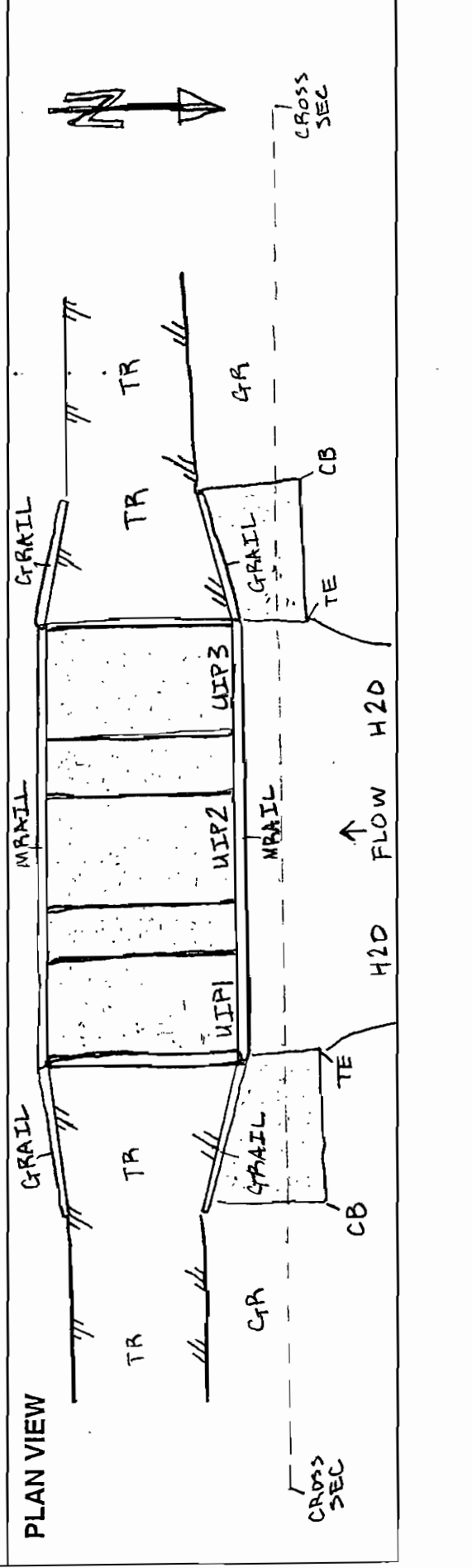
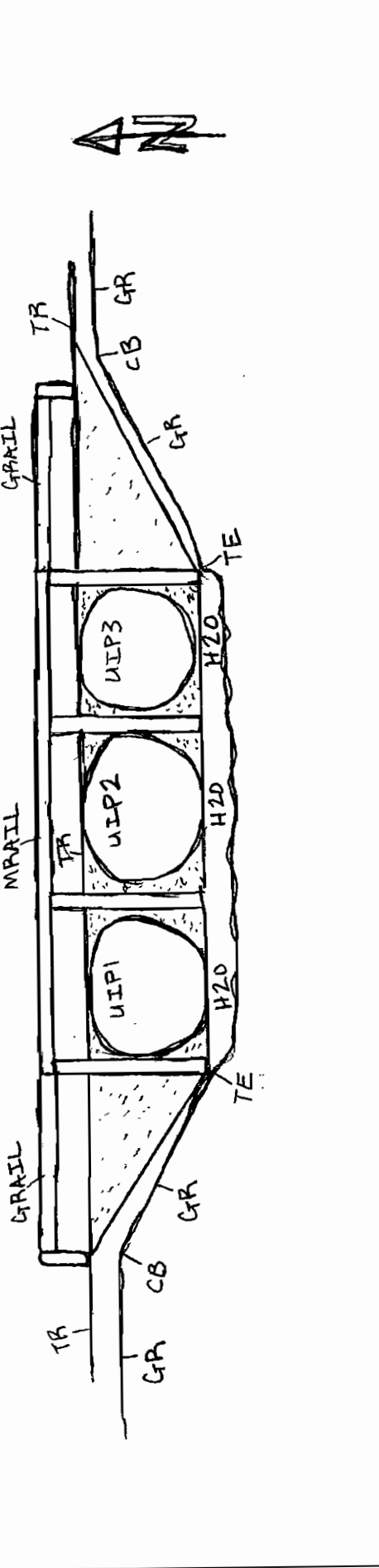
Appendix B
Hickory Creek
Structure 04: Stein

Stream Name Hickory Creek Location Stein Rd & Nona Jones Date 3-9-10
 Instrument B. Dierks Rodman A. Garcia Benchmark: ID _____ Elev _____ Survey File S380 Grid
 Type: XS () BR () CULV () DAM () Structure Name STR-04

Bridge: Rail _____ Deck _____ Width _____ Piers(s) @ Skew _____
 Culvert: #Bls _____ Type RCR 3x60' Length 15.80 Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser X Skew _____

Photo IDs: #26 Looking W° across DECK
 Looking U/S: #23 N° Looking D/S: #22 S°
 U/S Face: #24 S° D/S Face: #25 N°

Additional Comments: Seem to be flowing fine all three pipes
 ERM Description: Δ241 set x on Upstream Cor of Culvert



STR 04 Steins



STR 04 looking upstream



STR 04 looking downstream



STR 04 upstream face



STR 04 downstream face



STR 04 top

STR_04.txt

STR_04

100241,6953970.996248,2544173.687215,479.382745,XS_STR_04
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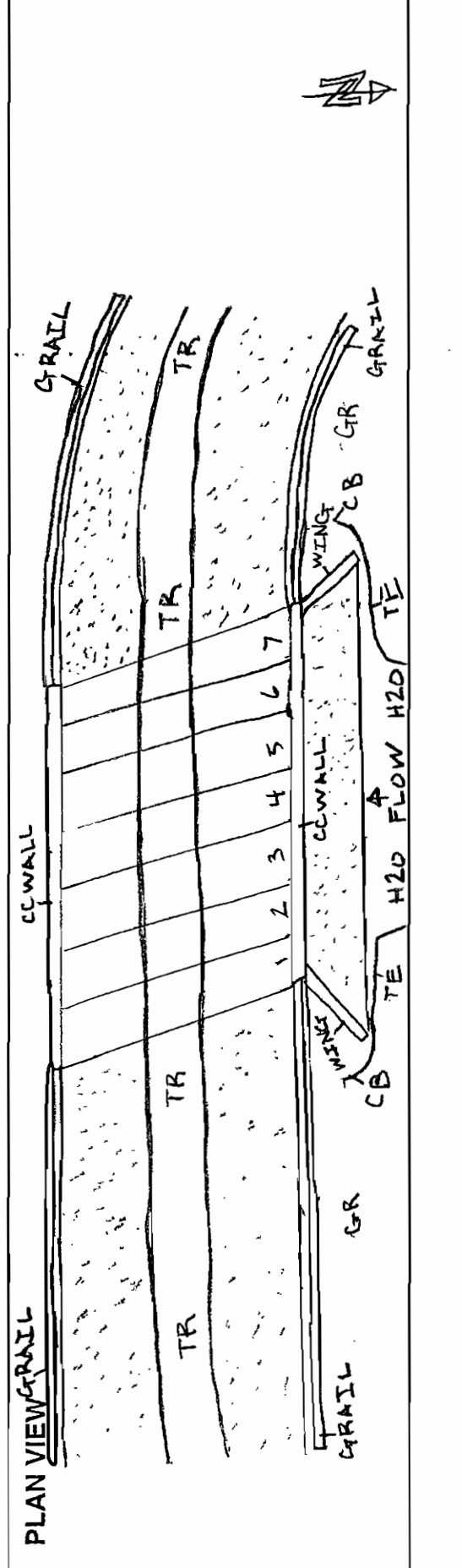
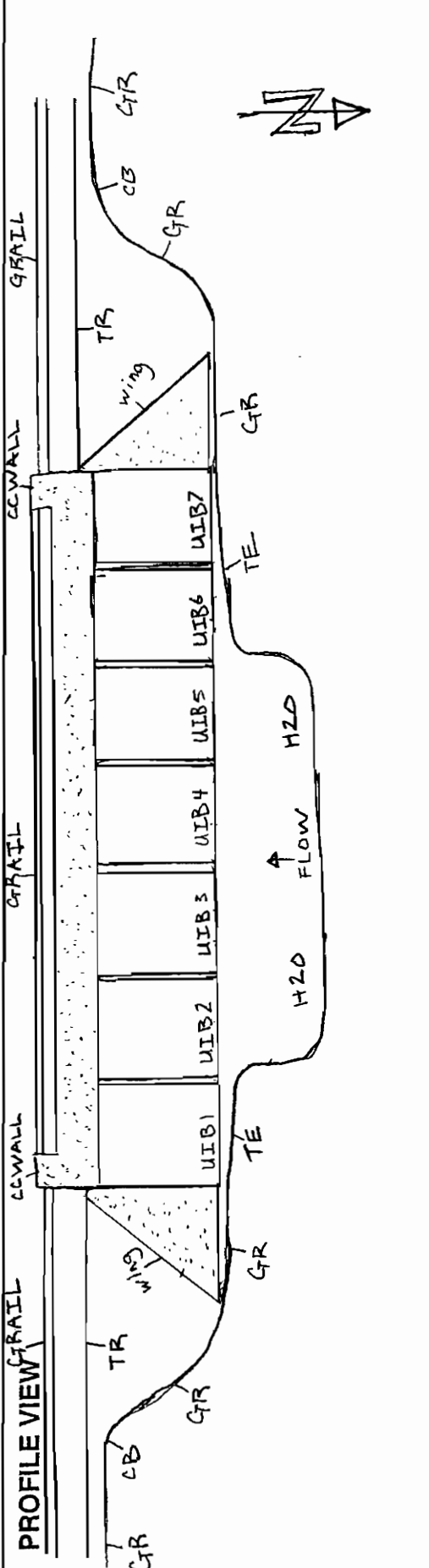
Appendix B
Hickory Creek
Structure 05: Elam

Stream Name ELAM RD Location ELAM RD +- 400' W° of Hickory Tree Date 03/10/10
 Instrument B Dick's Rodman A Garcia Benchmark: ID 5380 Grid Elev
 Type: XS () BR () DAM () Structure Name STR-05

Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bls Type Box Length Size: H x W 10' Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew

Photo IDs: #19 E° #20 W°
 Looking U/S: #10 N° Looking D/S: #17 S°
 U/S Face #15 S° D/S Face #18 N°

Additional Comments:
 ERM Description:



STR 05 Elam



STR 05 looking upstream



STR 05 looking downstream



STR 05 upstream face



STR 05 downstream face



STR 05 looking east



STR 05 looking west

STR_05.TXT

STR_05

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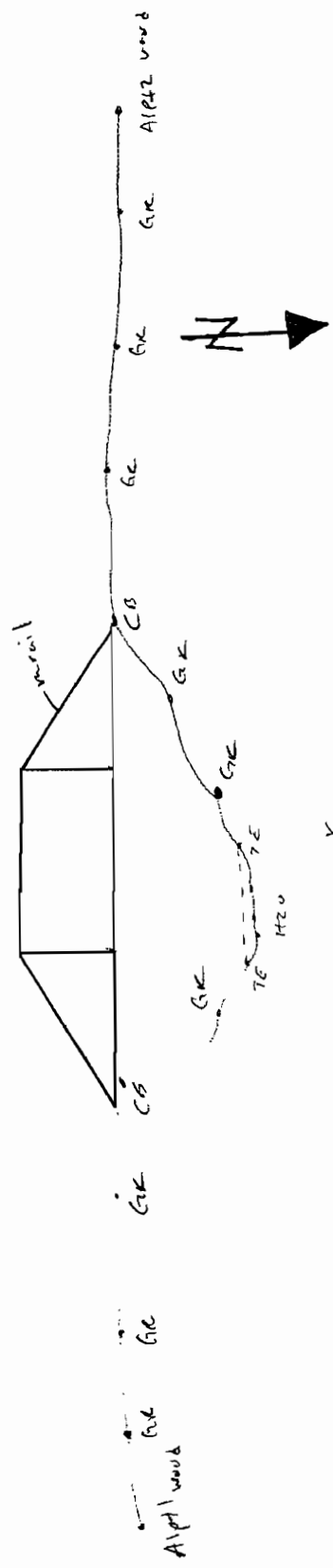
Appendix B
Hickory Creek
Structure 06: Eleanor

Stream Name Hickory Creek Location Eleanor f- 300' W of Hickory tree Date 3-15-10
 Instrument B. Diecks Rodman A Garcia Benchmark: ID A224 Elev 5380 Survey File 5380 G.I.E.D
 Type: XS () BR () CULV () DAM () Structure Name STR_06

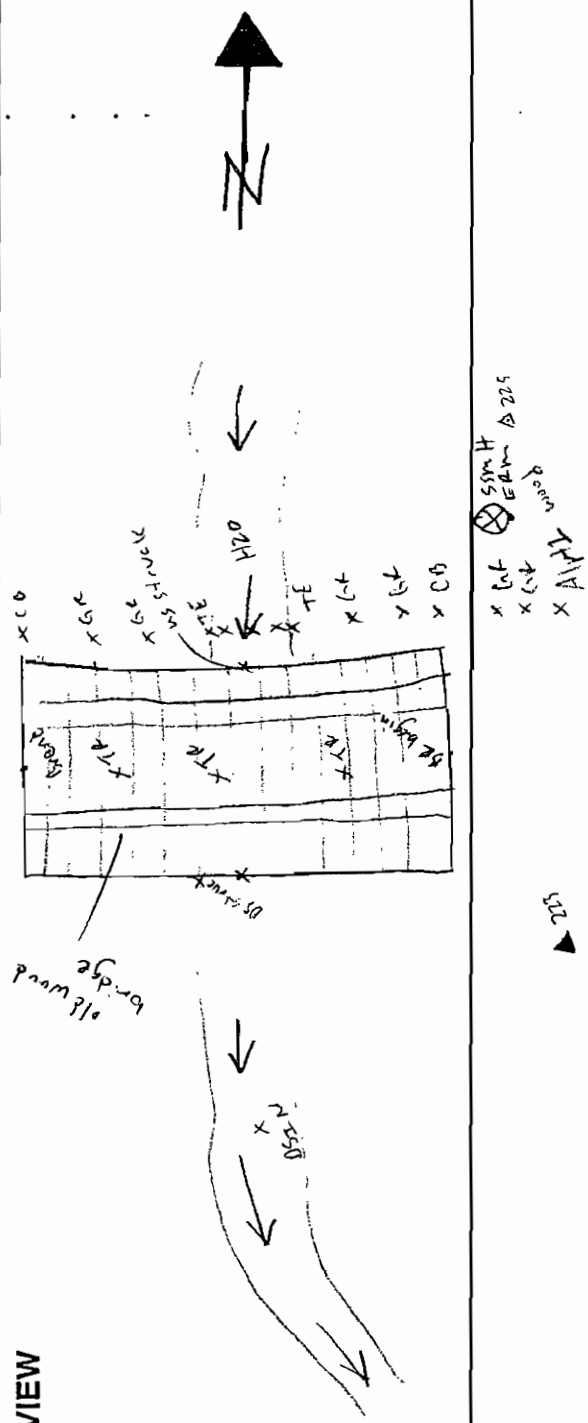
Bridge: Rail MH Deck WOOD Width 14.90 Piers(s) X @ Skew X
 Culvert: #Bls Type Length Size: H XW Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew
 Photo IDs: Looking U/S: Looking D/S
 U/S Face D/S Face

Additional Comments: old school WOOD BRIDGE NEEDS TO BE REDONE
 ERM Description: X-CUT A224 on the E. Limb of a SSMH on the N'side of Eleanor

PROFILE VIEW



PLAN VIEW



X cut SSMH
 X cut SSMH
 X cut SSMH

STR 06 Eleanor



STR 06 looking upstream



STR 06 looking downstream



STR 06 upstream face



STR 06 downstream face



STR 06 top



STR 06 bottom

STR_06.TXT

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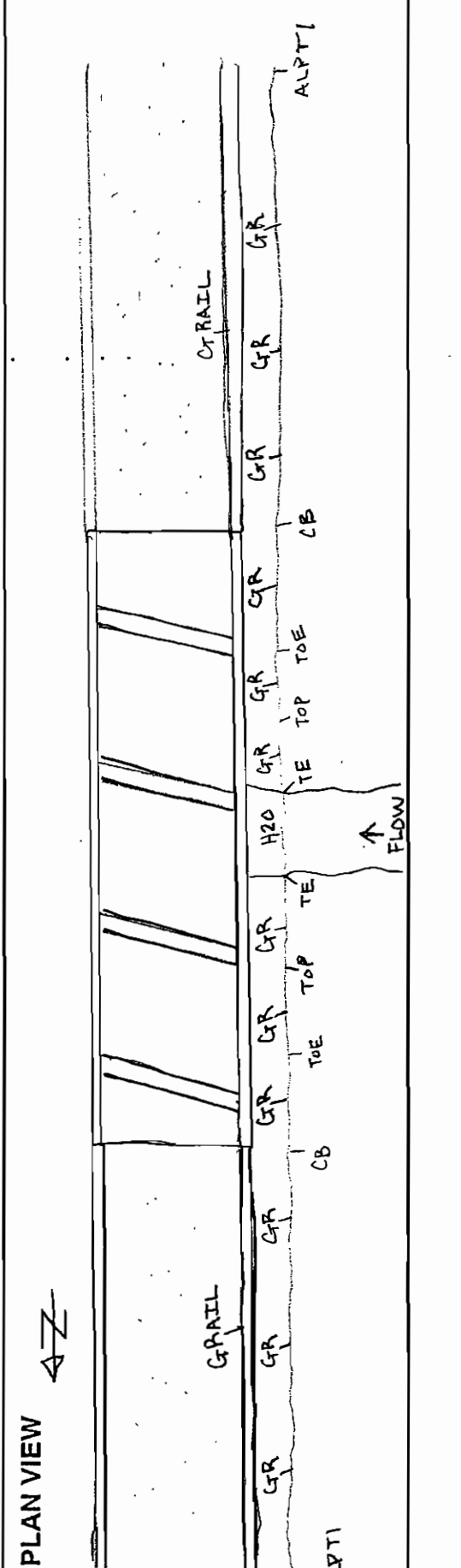
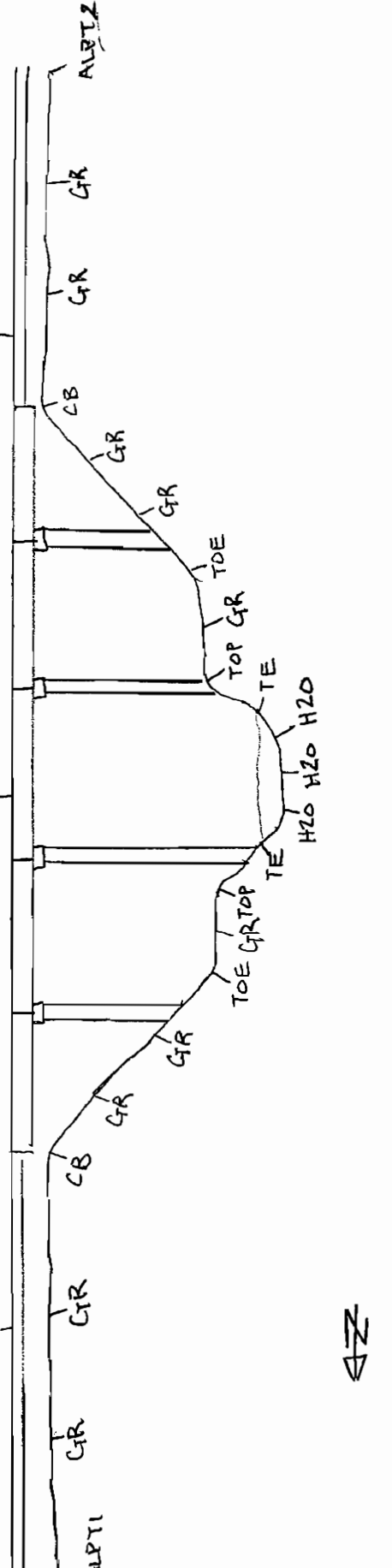
Appendix B
Hickory Creek
Structure 07: I-635

Stream Name Hickory Creek Location S band 6350 Season: 11 Rd Date 3-15-10
 Instrument B. Dierks Rodman A. Garcia Benchmark: ID Δ 218 Elev 5380 Grid 5380
 Type: XS () BR (X) CULV () DAM () Structure Name 572-07

Bridge: Rail M/H Deck conc Width 24-24" Piers(s) 4-30" @ Skew
 Culvert: #Bls 1 Type X W Size: H X W X Skew Skew
 Dam: Top Width 2 Side Slope: U/S X D/S X Riser X Skew Skew

Photo IDs:
 Looking U/S: 1 Looking D/S: 3
 U/S Face 2 D/S Face 4

Additional Comments: flowing smooth
 ERM Description: Δ 218 cut on the NW cor of bridge on top. E of Conc Flum



STR_07.txt

STR_07

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STR_07.txt

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934,6945169.563069,2545648.664146,444.470245,P28_30"

STR 07 IH 635 southbound



STR 07 looking upstream



STR 07 looking downstream



STR 07 upstream face



STR 07 downstream face

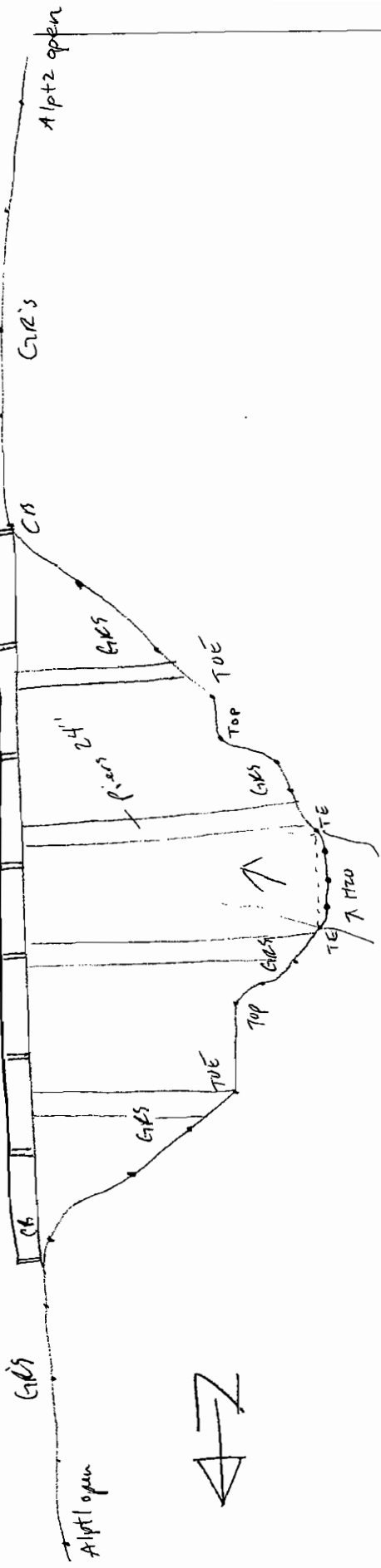
Appendix B
Hickory Creek
Structure 08: I-635

Stream Name Hickory Creek Location IH 635 N bound + 200' N. Season 11 rd Date 3-15-10
 Instrument B. Dierks / Rodman A. Garcia Benchmark ID 216 Elev Survey File 5380Grid
 Type: XS () BR () CULV () DAM () Structure Name 572_08

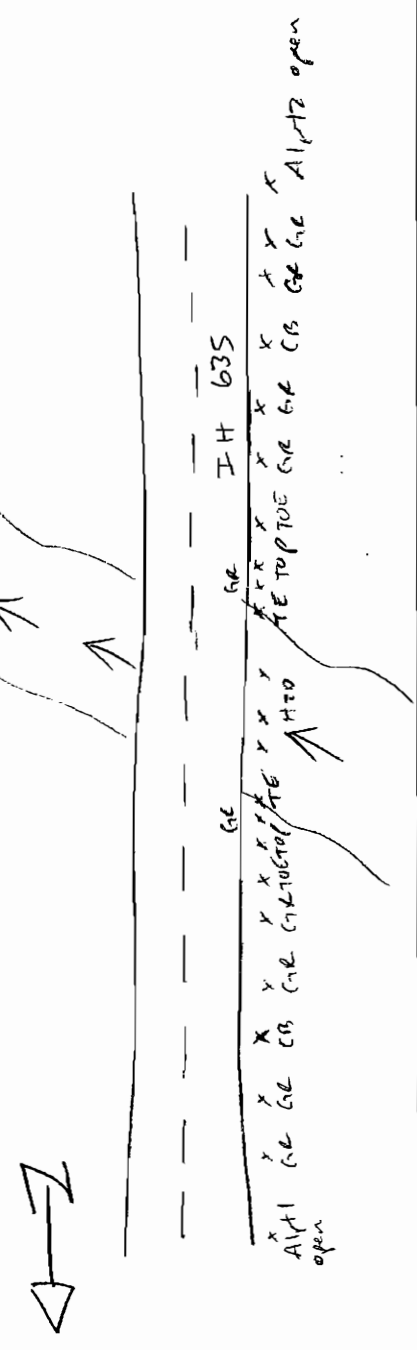
Bridge: Rail MH1 Deck Conc Width Piers(s) 24" @ 24" Skew Photo IDs:
 Culvert: #Bls Type Length Size: H X W Skew Looking U/S: 6 Looking D/S: 7
 Dam: Top Width Side Slope: U/S D/S Riser X Skew U/S Face 5 D/S Face 8

Additional Comments: Flowin Smooth
 ERM Description: 216 x-cut on the NE cor of N. bound 635 on top of bridge

PROFILE VIEW



PLAN VIEW



STR 08 IH 635 northbound



STR 08 looking upstream



STR 08 looking downstream



STR 08 upstream face



STR 08 downstream face

STR_08.txt

STR_08

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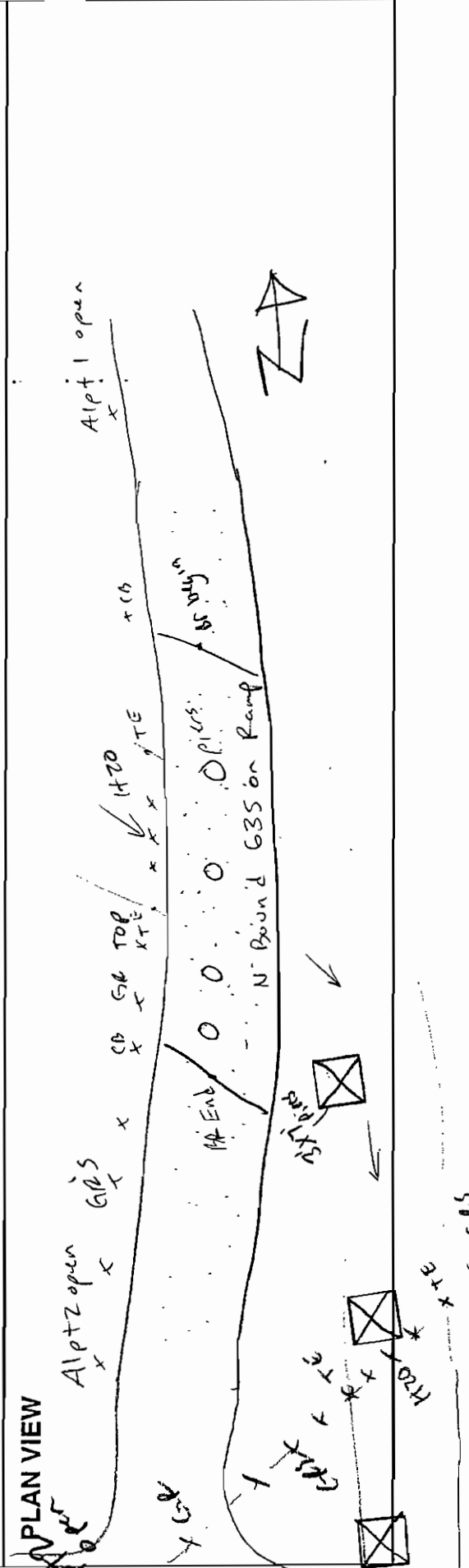
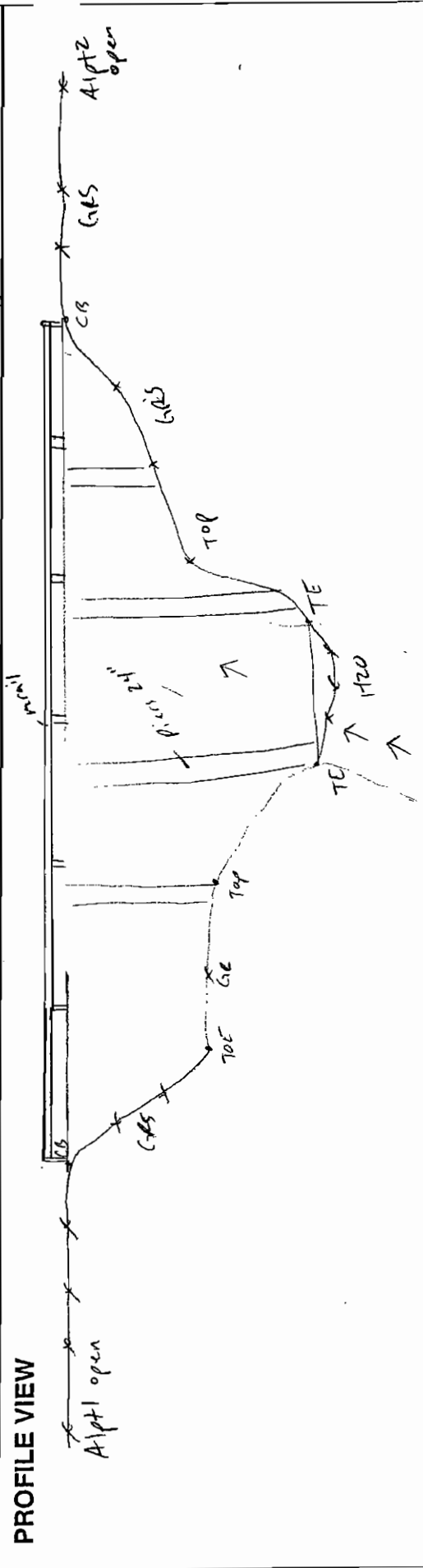
Appendix B
Hickory Creek
Structure 09: Access Road

Stream Name Hickory Creek Location N' bound ITH 635 on Ramp + 150' N' Section 11 Rd Date 3-16-10
 Instrument A. Garcia Rodman B. Dicks Benchmark: ID 1062 ELEV 5380 GATP Survey File 5380 GATP
 Type: XS (→) BR () DAM () Structure Name STR-09

Bridge: Rail Wtl Deck CONC Width 33.6 Piers(s) 9 @ 24" Skew ✓
 Culvert: #Bls _____ Type _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

Photo IDs:
 Looking U/S: 10 Looking D/S: 11
 U/S Face 9 D/S Face 12

Additional Comments:
 ERM Description: 1062 the NW cor. of on Ramp ITH 635 + 1.24 E of face of rail



Section 11 Rd

Structure 09 – IH 635 north bound service road



STR 09 – upstream



STR 09 – downstream



STR 09 – upstream face



STR 09 – downstream face

STR_09.txt

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996,6944845.748297,2545812.415079,447.791688,GRAIL1
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Appendix B
Hickory Creek
Structure 11: Kleberg

Structure 11 – Kleberg Road south of Seagoville



STR 11 – upstream



STR 11 – downstream



STR 11 – upstream face



STR11 – downstream face

STR_11.txt

STR_11

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1157,6944375.737525,2545862.771214,442.402074,GR
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1159,6944428.448176,2545861.464027,441.877254,TOP1
1160,6944455.149640,2545849.252086,441.677440,TOP1
1161,6944468.124393,2545833.921857,442.041891,TOP1
1162,6944468.799125,2545815.629597,441.805011,TOP1
1163,6944475.984944,2545797.692530,446.045636,
1164,6944476.318637,2545815.190332,438.585697,
1165,6944477.375614,2545834.957850,437.799083,
1166,6944459.211768,2545861.810390,436.081531,TOE1
1167,6944439.420744,2545869.974289,435.724964,
1168,6944419.096162,2545868.379844,439.202507,GR
1169,6944424.390695,2545870.578043,437.325417,GR
1170,6944433.168747,2545871.805352,436.159720,TE
1171,6944437.186414,2545872.876383,435.390073,H2O
1172,6944441.726683,2545875.583626,435.697905,H2O
1173,6944447.582128,2545877.470004,435.561673,H2O
1174,6944450.459165,2545878.925688,436.210666,TE
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1177,6944426.629515,2545879.698989,435.915717,P2_24"
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1182,6944297.015299,2545890.236240,435.916911,P7_24"
1183,6944223.703063,2545933.563692,433.801355,DS_IN
1184,6944312.650265,2545883.935542,435.951297,P8_24"
1185,6944328.965225,2545879.149768,435.377265,P9_24"
1186,6944345.560155,2545873.090044,435.092351,P10_24"
1187,6944361.342066,2545867.761934,437.642053,P11_24"
1188,6944280.499243,2545887.735761,434.994515,TE
1189,6944281.097096,2545888.899209,434.480222,H2O
1190,6944282.598181,2545889.797475,434.653055,H2O
1191,6944284.273334,2545890.458804,434.644222,H2O
1192,6944285.127891,2545890.963228,435.079550,TE
1193,6944413.109527,2545871.847867,446.024184,LC
1194,6944451.541506,2545871.872894,447.574571,

Appendix B
Hickory Creek
Structure 12: I-20 I-635 Interchange

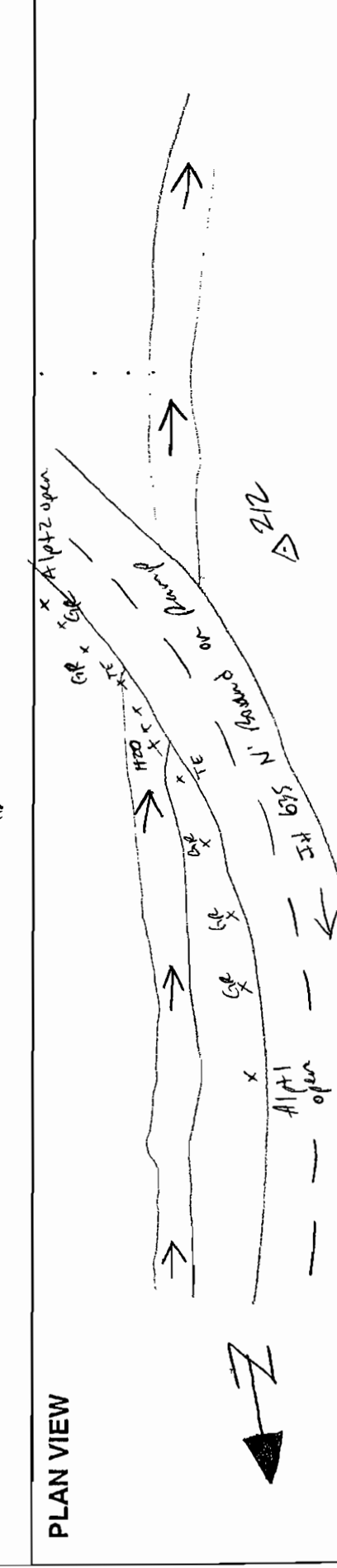
Stream Name Hickory Creek Location I 4635 N on ramp at IH20W Date 3:19:10
 Instrument A. Garcia Rodman B. Dicks Benchmark: ID A 1398 Elev _____ Survey File 5380GRID
 Type: XS () BR (✓) CULV () DAM () Structure Name STR-12

Bridge: Rail conc Deck conc Width _____ Piers(s) 6 @ 3x6.5 Skew _____
 Culvert: #Bls _____ Type _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

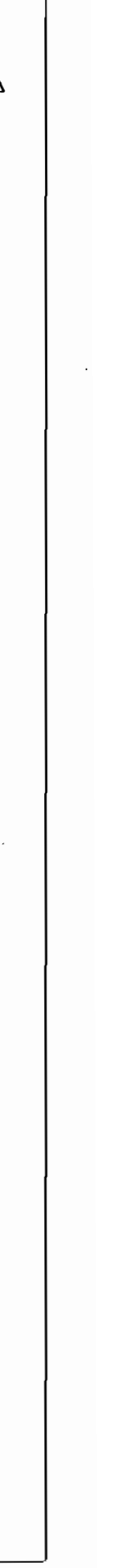
Photo IDs:
 Looking U/S: 2 Looking D/S: 3
 U/S Face: 5 D/S Face: 4

Additional Comments:
 ERM Description: Δ 1398 x-cut on the NE cor of bridge on top of conc wall + 2.5' N of rail

PROFILE VIEW



PLAN VIEW



Δ 212
 Δ 214

Structure 12 – west bound IH 20 to north bound IH 635



STR12 – upstream



STR12 – downstream



STR12 – upstream face



STR12 – downstream face

STR_12.txt

STR_12

100212,6943806.883338,2545851.373485,442.898875,STR_STR_12
100211,6943482.033533,2545784.180359,453.589564,STR_12
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100211,6943482.033533,2545784.180359,453.589564,BS
1372,6943482.008238,2545784.163417,453.553271,CHKIN_FS_211
1373,6943646.658314,2546129.882245,458.081588,CCWALL1
1374,6943672.705959,2546090.852711,459.066194,CCWALL1
1375,6943701.495000,2546053.010454,460.197057,CCWALL1
1376,6943740.410173,2546009.050282,461.872077,CCWALL1
1377,6943782.069536,2545968.783179,463.518553,CCWALL1
1378,6943826.565373,2545932.118512,465.192750,CCWALL1
1379,6943873.060331,2545899.574362,466.860595,CCWALL1
1380,6943856.748780,2545910.452267,466.218493,DS_STRUCT
1381,6943921.531426,2545871.006830,468.581895,CCWALL1
1382,6943972.208955,2545845.993586,470.195912,CCWALL1
1383,6944024.394480,2545825.191171,471.773042,CCWALL1
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1385,6944083.819805,2545832.823763,471.377135,CCWALL1
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1387,6943980.647302,2545869.739457,468.265520,CCWALL1
1388,6943933.255102,2545893.070439,466.721666,CCWALL1
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1390,6943889.439513,2545918.878606,465.187186,US_STRUCT
1391,6943841.240076,2545952.640241,463.370378,CCWALL1
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1393,6943757.441236,2546027.438222,459.967056,CCWALL1
1394,6943721.484108,2546068.157945,458.311112,CCWALL1
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1396,6943667.679903,2546143.701241,456.285792,CCWALL1/
1397,6943679.075522,2546129.710670,450.850949,BRABUT
1398,6943669.816231,2546142.802558,458.823822,ERM
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1400,6943650.091191,2546190.230194,454.173270,GR
1401,6943661.549669,2546169.657803,454.662719,GR
1402,6943670.623946,2546146.351593,455.625180,CB
1403,6943694.278275,2546112.760917,447.556768,GR
1404,6943732.743528,2546064.245826,443.884384,GR
1405,6943784.447536,2546013.489451,441.215299,GR
1406,6943831.311015,2545975.075397,439.716780,GR
1407,6943859.002507,2545951.180486,441.170871,GR
1408,6943881.046358,2545936.337431,437.441826,GR
1409,6943900.311700,2545926.724769,438.009514,GR
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1412,6943921.632497,2545916.286353,433.224848,H2O
1413,6943923.294310,2545913.659947,433.250999,H2O
1414,6943924.727521,2545911.304724,433.404245,TE
1415,6943929.616019,2545898.963015,440.727697,GR
1416,6943969.846754,2545881.498395,439.499686,GR
1417,6944014.992909,2545862.697145,441.799424,GR
1418,6944055.912602,2545850.322245,444.423599,GR
1419,6944099.172573,2545837.847678,449.044667,CB
1420,6944115.736273,2545832.112088,449.887472,GR
1421,6944170.477167,2545823.459862,449.102098,GR
1422,6944201.934803,2545817.692525,447.360074,ALPT2_OPEN
100212,6943806.883338,2545851.373485,442.898875,OCC
100211,6943482.033533,2545784.180359,453.589564,BS
1423,6943481.965255,2545784.176112,453.537362,CHKIN_BS_211
1424,6943733.786340,2545901.228432,432.504642,DS_IN
1425,6944049.696235,2545830.283455,447.086956,P1_3X6.5
1426,6943984.869502,2545851.561390,443.300498,P2_3X6.5
1427,6943903.297027,2545892.448421,436.356399,P3_3X6.5

STR_12.txt

1428,6943829.277289,2545942.925222,438.218631,P4_3X6.5
1429,6943760.767170,2546002.354073,440.084739,P5_3X6.5
1430,6943711.050600,2546060.458978,444.302576,P6_3X6.5
1431,6943782.777299,2546001.345011,455.776978,LC

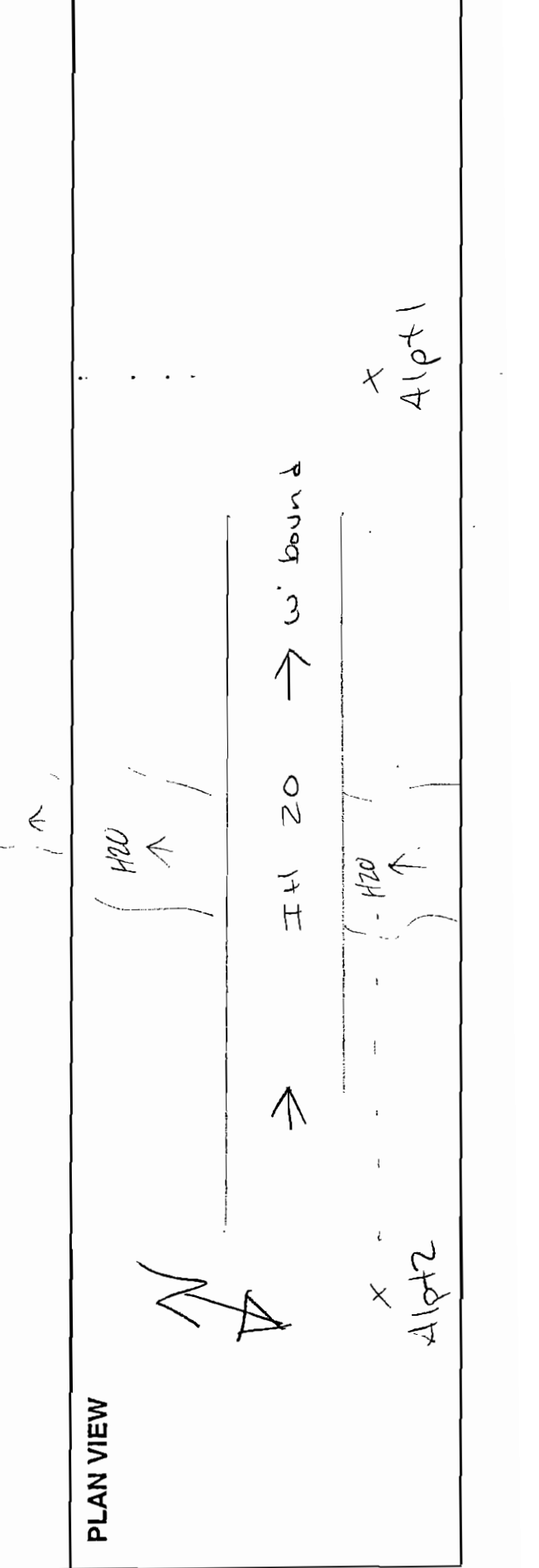
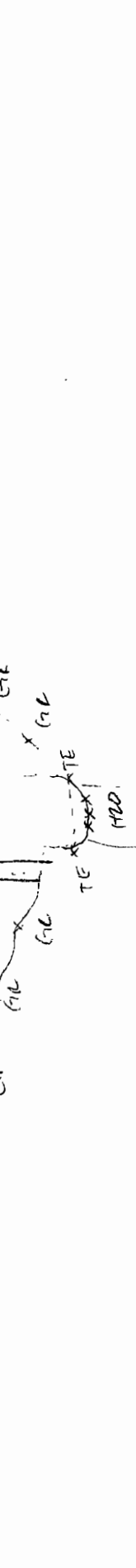
Appendix B
Hickory Creek
Structure 13: I-20

Stream Name Hickory Creek Location IT 20 W bound Date 3-17-10
 Instrument A Garcia Rodman B. Dick's Benchmark: ID 1229 Elev _____ Survey File 5380 Grid
 Type: XS () BR (✓) CULV () DAM () Structure Name SR 13

Bridge: Rail conc Deck _____ Width _____ Piers(s) 9 @ 24" Skew _____
 Culvert: #BIs _____ Type _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

Photo IDs: _____
 Looking U/S: 13 Looking D/S 15
 U/S Face 14 D/S Face 16

Additional Comments: Seams to be Flowing Smooth No Deck shots
 ERM Description: 1229 x-cut on top of conc wall on the NE cor of bridge along W bound. IH 20



Structure 13 – west bound IH 20



STR13 – upstream



STR13 – downstream



STR13 – upstream face



STR13 – downstream face

STR_13.txt

STR_13

100212,6943806.883338,2545851.373485,442.898875,STR_STR_13
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100211,6943482.033533,2545784.180359,453.589564,BS
1195,6943481.972330,2545784.169362,453.544305,CHKIN_BS_211
1196,6943440.579377,2545677.005733,456.301847,ALPT2_OPEN
1197,6943447.936380,2545702.733036,456.224307,GR
1198,6943460.680010,2545754.240734,456.133459,GR
1199,6943466.294203,2545795.200921,456.162372,CB
1200,6943472.058513,2545823.597031,443.159183,GR
1201,6943483.858803,2545871.112813,440.135584,GR
1202,6943485.402744,2545888.658100,437.086295,GR
1203,6943487.537115,2545905.953014,437.069058,GR
1204,6943486.695794,2545911.789532,433.513118,GR
1205,6943486.937838,2545913.489383,433.318846,TE
1206,6943487.341029,2545916.052948,432.279421,H2O
1207,6943484.197001,2545920.555077,432.389491,H2O
1208,6943486.018664,2545924.342069,432.699404,H2O
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1211,6943494.743450,2545962.804191,439.636749,GR
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1213,6943468.586321,2545953.224330,437.134825,P2_24"
1214,6943447.504701,2545956.919921,437.050879,P3_24"
1215,6943434.988922,2545886.947435,439.080829,P4_24"
1216,6943454.957580,2545882.819791,438.636876,P5_24"
1217,6943475.841734,2545878.615524,438.477469,P6_24"
1218,6943328.027783,2545916.698311,437.712258,TRAV_SN
1219,6943806.951212,2545851.387545,442.943145,CHKIN_BS_212
1220,6943503.545115,2545993.268461,440.857899,GR
1221,6943500.995381,2546022.721941,441.047722,P7_24"
1222,6943480.157038,2546026.738630,441.301449,P8_24"
1223,6943459.081884,2546029.359760,441.109364,P9_24"
1224,6943514.438411,2546066.940082,442.275803,GR
1225,6943520.467695,2546103.722049,457.650532,CB
1226,6943527.470882,2546132.788356,457.732056,GR
1227,6943530.370546,2546160.543801,457.682103,GR
1228,6943531.897698,2546187.772214,457.783177,ALPT1_OPEN
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Appendix B
Hickory Creek
Structure 14: I-20

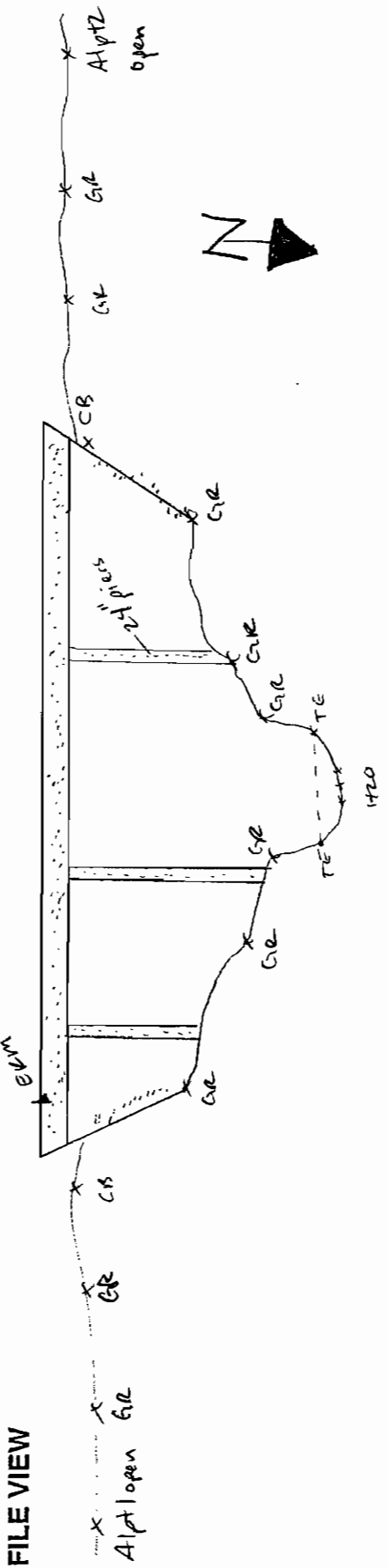
Stream Name Hickory Creek Location IH 20 E. bound Date 3-18-10
 Instrument A Garcia Rodman B. Dierks Benchmark: ID 1230 Elev 5300 Survey File 5300GRJD
 Type: XS () BR () CULV () DAM () Structure Name TR-14

Bridge: Rail conc Deck _____ Width _____ Piers(s) 9 @ 24" Skew _____
 Culvert: #Bis _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

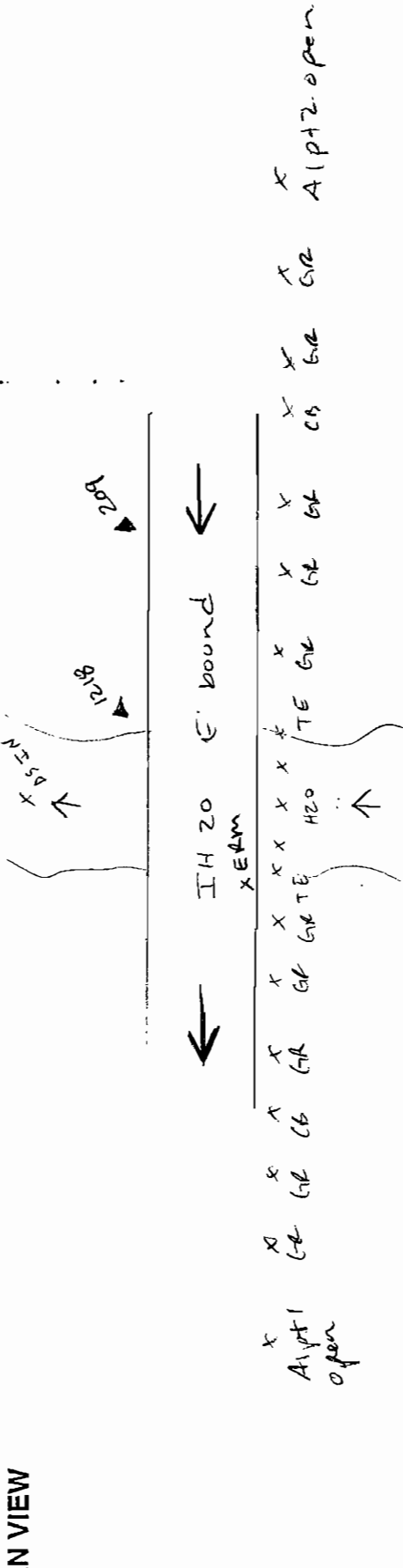
Photo IDs:
 Looking U/S: 26 Looking D/S: 27
 U/S Face: 25 D/S Face: 28

Additional Comments: Flowing Smooth No Deck Shuts
 ERM Description: 1230 ERM on top of conc wall @ the NE cor of bridge

PROFILE VIEW



PLAN VIEW



202

Structure 14 – east bound IH 20



STR14 – upstream



STR14 – downstream



STR14 – upstream face



STR14 – downstream face

STR_14.txt

STR_14

100211,6943482.033533,2545784.180359,453.589564,STR_STR_14
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1231,6943444.638971,2546196.444169,456.741954,ALPT1_OPEN
1232,6943442.691601,2546169.593514,456.558243,GR
1233,6943438.831289,2546140.398485,456.478920,GR
1234,6943432.596861,2546113.111100,456.437524,CB
1235,6943372.115798,2545808.517648,454.906440,CB
1236,6943369.478699,2545780.543636,454.594557,GR
1237,6943362.703053,2545756.541012,454.543441,GR
1238,6943355.552837,2545731.337721,454.493424,ALPT2_OPEN
1239,6943378.043707,2545805.939039,454.709769,CHKIN_FS_210
1001218,6943328.027783,2545916.698311,437.712258,OCC
100212,6943806.883338,2545851.373485,442.898875,BS
1240,6943806.865536,2545851.375927,442.828875,CHKIN_BS_212
1241,6943387.420047,2545832.301537,442.943295,GR
1242,6943393.030098,2545889.425484,440.167653,GR
1243,6943399.529261,2545906.291895,436.487650,GR
1244,6943401.332116,2545912.364369,437.077089,GR
1245,6943405.480176,2545919.015937,432.205189,TE
1246,6943406.010978,2545920.701181,431.576353,H20
1247,6943406.354860,2545923.003136,431.555297,H20
1248,6943407.377589,2545925.241502,431.820473,H20
1249,6943406.779067,2545926.906234,432.117699,TE
1250,6943407.324497,2545930.221201,434.005767,GR
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1252,6943406.856142,2545937.584248,436.160434,GR
1253,6943413.378894,2545972.501633,438.657338,GR
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1261,6943399.551180,2545960.403540,436.244571,P6_24"
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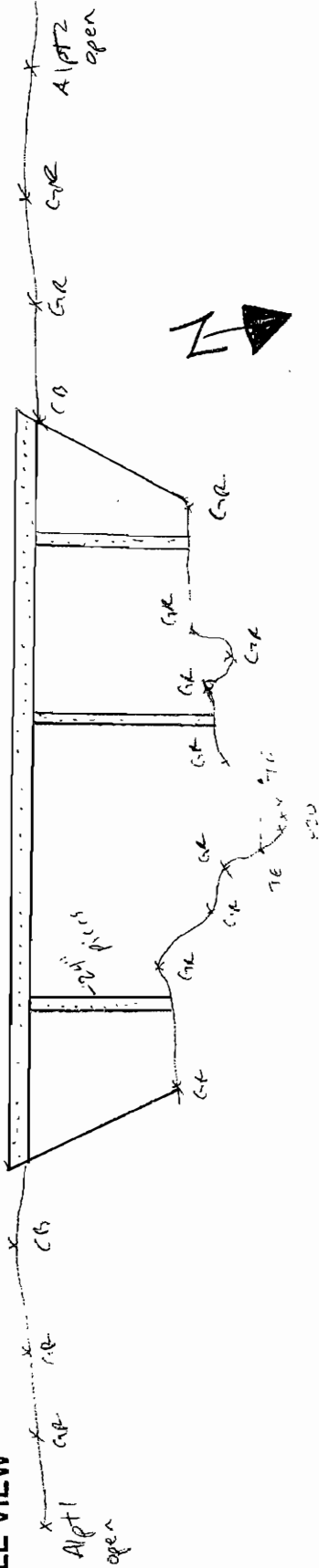
Appendix B
Hickory Creek
Structure 15: I-20 I-635 Interchange

Stream Name Hickory Creek Location IH 20 on Ramp Date 3-18-10
 Instrument A. Garcia Rodman B. Dierks Benchmark: ID A1289 Elev 5320 Grid Survey File
 Type: XS () BR () CULV () DAM () Structure Name 57A-15

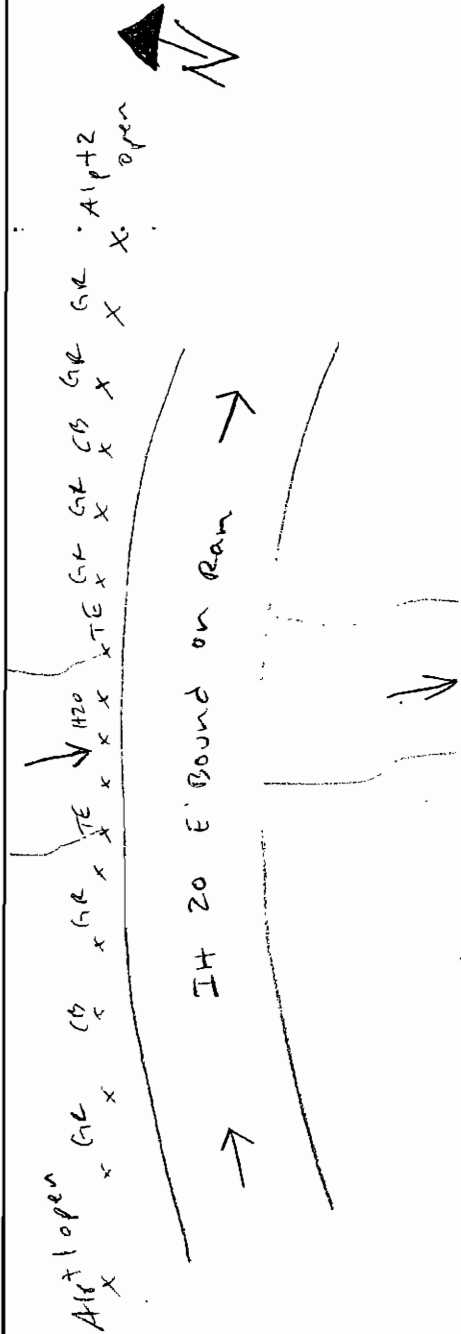
Bridge: Rail conc Deck Width Piers(s) 6 @ 24" Skew
 Culvert: #Bls Type Length Size: H XW Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew
 Photo IDs: Looking U/S 29 Looking D/S 30
 U/S Face 31 D/S Face 32

Additional Comments: Flowing Smooth No Deck shots
 ERM Description: Δ 1289 x-cut on top of Conc Wall @ the NE cor. of bridge

PROFILE VIEW



PLAN VIEW



Structure 15 – south bound IH 635 to east bound IH 20



STR15 – upstream



STR15 – downstream



STR15 – upstream face



STR15 – downstream face

STR_15.txt

STR_15
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100109,6942594.169200,2545431.027900,443.970000,BS
1267,6942594.152189,2545431.012466,443.914628,CHKIN_BS_109
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1270,6943077.551420,2545771.468143,465.222331,GR
1271,6943090.661799,2545795.966829,464.925982,CB
1272,6943116.335043,2545837.763688,442.826846,GR
1273,6943137.272941,2545878.554940,443.323677,GR
1274,6943151.857889,2545898.386250,442.574087,GR
1275,6943153.914082,2545909.005823,437.932550,GR
1276,6943156.947805,2545912.443400,437.804217,GR
1277,6943172.151891,2545934.739969,440.735326,GR
1278,6943184.843752,2545969.155913,434.722774,GR
1279,6943187.321421,2545976.946858,436.464460,GR
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1283,6943189.272585,2545991.412263,431.249092,H2O
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1285,6943197.086669,2545997.695935,436.627141,GR
1286,6943216.234773,2546036.005622,438.466424,GR
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1289,6943249.801678,2546126.399849,463.610590,ERM
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1300,6943093.146546,2545789.983959,464.364811,CHKIN_FS_207

Appendix B
Hickory Creek
Structure 16: Rylie Crest

STR 16 – Rylie Crest and Arrowdale



STR 16 up stream



STR 16 down stream



STR 16 upstream face



STR 16 downstream face

STR_16.txt

STR_16

100205,6942536.582148,2545853.382824,443.427300,STR_STR_16
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100109,6942594.169200,2545431.027900,443.970000,BS
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1302,6942576.233392,2545615.389721,442.793809,ALPT2_OPEN
1303,6942576.600177,2545671.489477,442.868764,GR
1304,6942576.483981,2545703.850591,443.224882,GRAIL1
1305,6942575.078308,2545725.021679,443.247622,GRAIL1
1306,6942576.555338,2545725.306866,443.091718,GR
1307,6942576.150794,2545786.131313,443.133836,CB
1308,6942574.316915,2545775.976339,443.281633,GRAIL1
1309,6942574.718210,2545828.548932,443.340841,GRAIL1
1310,6942574.796838,2545881.869897,443.341847,GRAIL1
1311,6942575.247053,2545857.995509,443.351680,US_STRUCT
1312,6942576.178445,2545920.763310,443.161100,CB
1313,6942574.488889,2545927.001192,443.327454,GRAIL1
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1316,6942576.364038,2546012.953652,443.669922,GR
1317,6942574.866716,2546012.799692,444.017905,GRAIL1
1318,6942577.717542,2546049.831751,444.072696,GRAIL1/
1319,6942575.994206,2546072.904282,444.896476,ALPT1_OPEN
1320,6942556.541438,2546072.490835,445.694156,TR
1321,6942554.207528,2546018.355815,444.642072,TR
1322,6942554.079831,2545962.442944,443.794015,TR
1323,6942553.949285,2545905.611010,443.659194,TR
1324,6942554.052327,2545840.110532,443.657507,TR
1325,6942553.994405,2545781.357689,443.633825,TR
1326,6942553.913990,2545722.364273,443.702517,TR
1327,6942554.415931,2545667.570623,443.776123,TR
1328,6942555.072697,2545618.697364,443.682382,TR
1329,6942530.868171,2545656.536210,441.541206,GRAIL1
1330,6942533.333582,2545693.853737,443.140318,GRAIL1
1331,6942533.362213,2545740.436152,443.368522,GRAIL1
1332,6942533.471464,2545779.961490,443.312613,GRAIL1
1333,6942533.111784,2545828.676720,443.358811,GRAIL1
1334,6942532.692039,2545860.839886,443.349186,DS_STRUCT
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1337,6942532.633452,2545962.626258,443.387291,GRAIL1
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1339,6942532.595156,2545913.914000,441.341376,BRABUT
1340,6942553.921984,2545914.011973,443.653681,BR_BEGIN
1341,6942575.400780,2545914.097653,441.329525,BRABUT
1342,6942575.334811,2545792.801417,441.398437,BRABUT
1343,6942554.104850,2545792.801113,443.670500,BR_END
1344,6942532.456759,2545792.738273,441.270677,BRABUT
1345,6942384.152880,2545853.276915,430.170893,DS_IN
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1347,6942575.057217,2545915.184524,443.373416,ERM
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1350,6942578.504710,2545827.642539,436.717958,GR
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1353,6942576.407170,2545840.781397,430.812481,H2O
1354,6942576.934258,2545847.169104,430.827784,H2O
1355,6942577.161140,2545850.880566,431.185175,TE
1356,6942577.142189,2545860.753084,432.463467,GR

STR_16.txt

1357,6942578.114759,2545874.838870,432.861857,GR
1358,6942579.117720,2545893.271791,431.947326,GR
1359,6942578.192002,2545902.616858,434.267695,GR
1360,6942578.178502,2545903.307036,435.922693,GR
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1362,6942554.038986,2545883.964148,431.957974,P2_24"
1363,6942538.692977,2545883.691856,431.600021,P3_24"
1364,6942538.338292,2545853.290553,432.485011,P4_24"
1365,6942553.942720,2545853.277635,431.634970,P5_24"
1366,6942568.326291,2545852.491154,431.363037,P6_24"
1367,6942538.611440,2545823.083312,430.678286,P7_24"
1368,6942554.389574,2545823.088956,430.661801,P8_24"
1369,6942569.815396,2545823.106380,434.335137,P9_24"
1370,6942575.298476,2545821.583916,441.370882,LC
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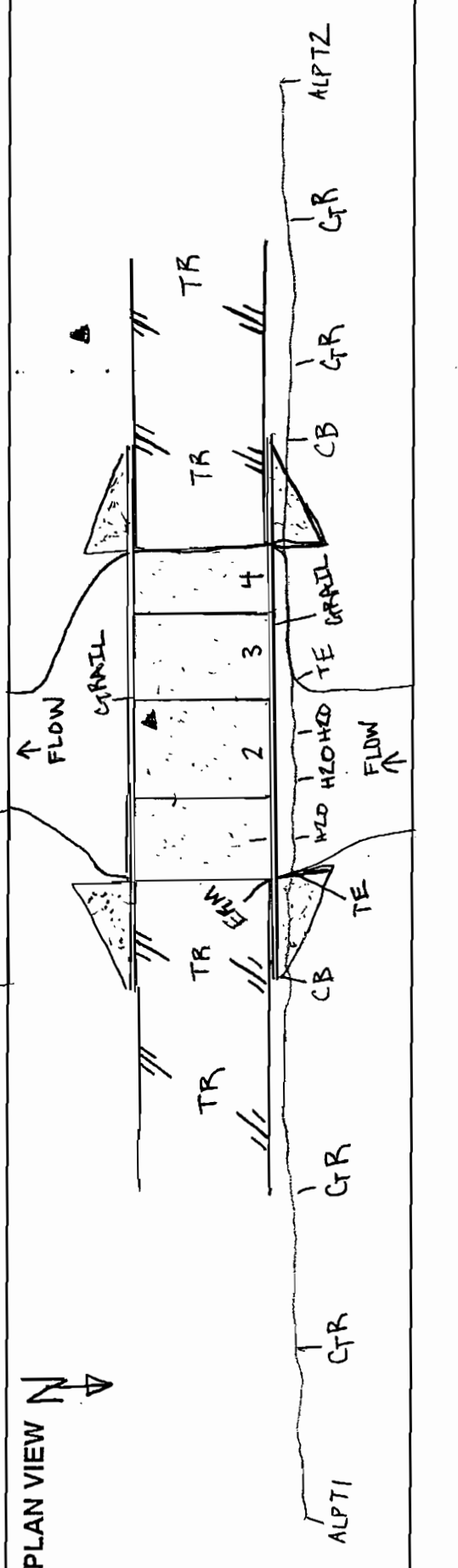
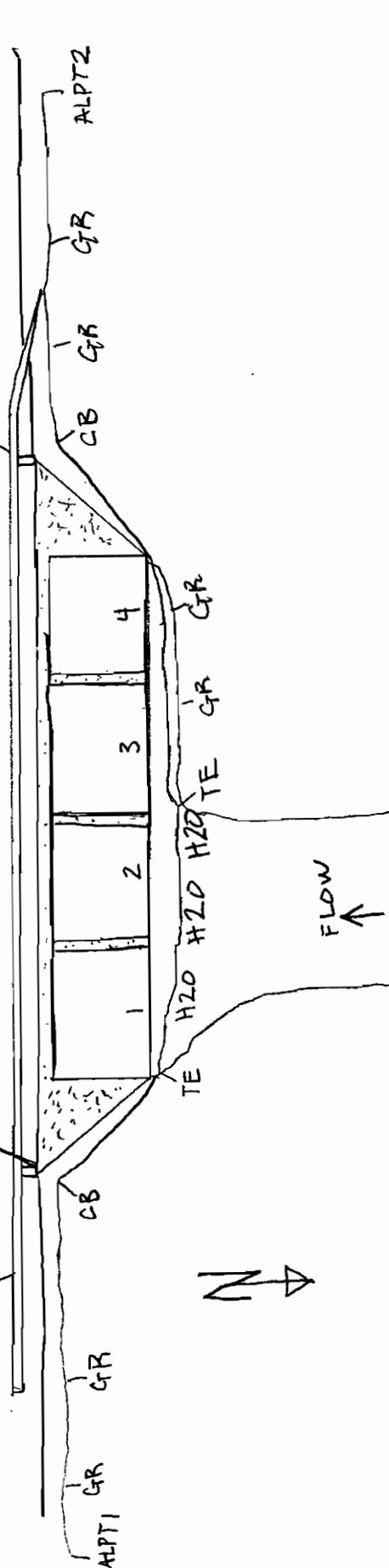
Appendix B
Hickory Creek
Structure 17: Arrowdell

Stream Name Hickory Creek Location Arrowdale Date 03/22/10
 Instrument A. Fair Rodman B. Dicks Benchmark: ID 1459 Elev Survey File 5340 GRID
 Type: XS () BR () CULV (X) DAM () Structure Name STR-17

Bridge: Rail _____ Deck _____ Width _____ Piers(s) @ _____ Skew _____
 Culvert: #Bls _____ Type Box Length 29.44 Size: H 9 X W 10 Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

Photo IDs:
 Looking U/S: 6 Looking D/S: 7
 U/S Face: 9 D/S Face: 8

Additional Comments: Flowing Smooth
 ERM Description: 1459 x-cut on the NE of bridge, 20 N g.rail



Structure 17 – Arrowdale



STR17 – upstream



STR17 – downstream



STR 17 – upstream face



STR 17 – downstream face

STR_17.txt

STR_17

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100204,6941269.444809,2546144.475033,438.161364,STR_17
100202,6941196.575726,2546109.700997,436.982065,OCC
100204,6941269.444809,2546144.475033,438.161364,BS
1432,6941269.433967,2546144.469884,438.193894,CHKIN_BS_204
1433,6941435.788810,2546316.254689,436.349567,ALPT1_WOOD
1434,6941401.591027,2546279.178597,435.434163,GR
1435,6941379.592818,2546247.306845,434.465250,GRAIL1
1436,6941365.441391,2546237.927133,435.026830,GR
1437,6941352.580626,2546225.015510,435.148036,GRAIL1
1438,6941330.094289,2546201.793848,436.138386,GR
1439,6941329.193330,2546202.636409,436.495214,GRAIL1
1440,6941301.593168,2546172.421223,437.828049,CB
1441,6941300.969747,2546173.036278,438.047179,GRAIL1
1442,6941272.555313,2546142.999182,438.106048,GRAIL1
1443,6941272.971816,2546142.516709,438.104440,US_STRUCT
1444,6941242.817772,2546111.017085,438.018812,GRAIL1
1445,6941243.778902,2546110.344759,437.708897,CB
1446,6941222.023653,2546090.448252,437.420240,GRAIL1
1447,6941204.866467,2546071.668905,435.484799,GRAIL1/
1448,6941205.935274,2546070.164470,435.168404,GR
1449,6941173.107515,2546038.067244,435.647690,GR
1450,6941133.803959,2546007.259235,437.331058,ALPT2_WOOD
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1453,6941194.554151,2546085.040886,437.647599,TR
1454,6941232.978529,2546121.430514,438.230847,TR
1455,6941262.427410,2546152.916291,438.382530,TR
1456,6941291.050176,2546181.261580,438.227002,TR
1457,6941319.730403,2546213.183427,437.372742,TR
1458,6941361.463034,2546264.613966,435.899147,TR
1459,6941299.317457,2546170.842666,438.144991,ERM
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1477,6941296.867636,2546166.150368,434.386094,GR
1478,6941282.502199,2546152.824570,427.506651,UIB1_9X10
1479,6941275.262558,2546145.150440,427.501679,UIB2_9X10
1480,6941267.984661,2546137.572042,427.518738,UIB3_9X10
1481,6941261.575595,2546130.635847,427.492112,UIB4_9X10
1482,6941239.813871,2546150.111020,427.549121,DIB4_9X10
1483,6941247.644699,2546158.560861,427.539411,DIB3_9X10
1484,6941254.591204,2546165.891849,427.525579,DIB2_9X10
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Appendix B
Hickory Creek Tributary 4
Structure 18: Hickory Tree Road

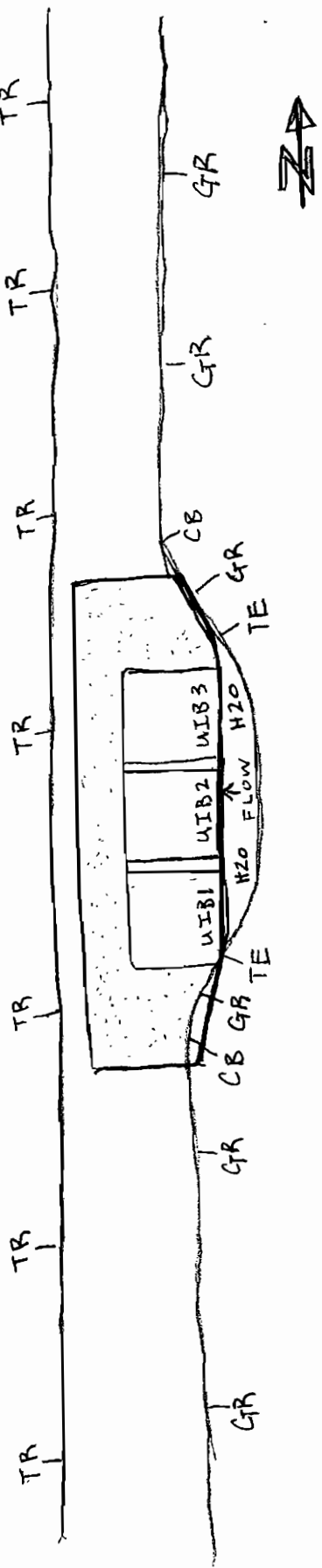
Stream Name Hickory Creek Location Hickory Tree + 400' N. of Elevator Date 03/10/10
 Instrument A. GARCIA Rödman B. DIEBKS Benchmark: ID Δ 81t Elev 5380
 Type: XS () BR () DAM (X) CULV () Structure Name STR18

Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #BIs Type Box Length 22.10 Size: H 5' X W 8' Skew ✓
 Dam: Top Width Side Slope: U/S D/S Riser X Skew

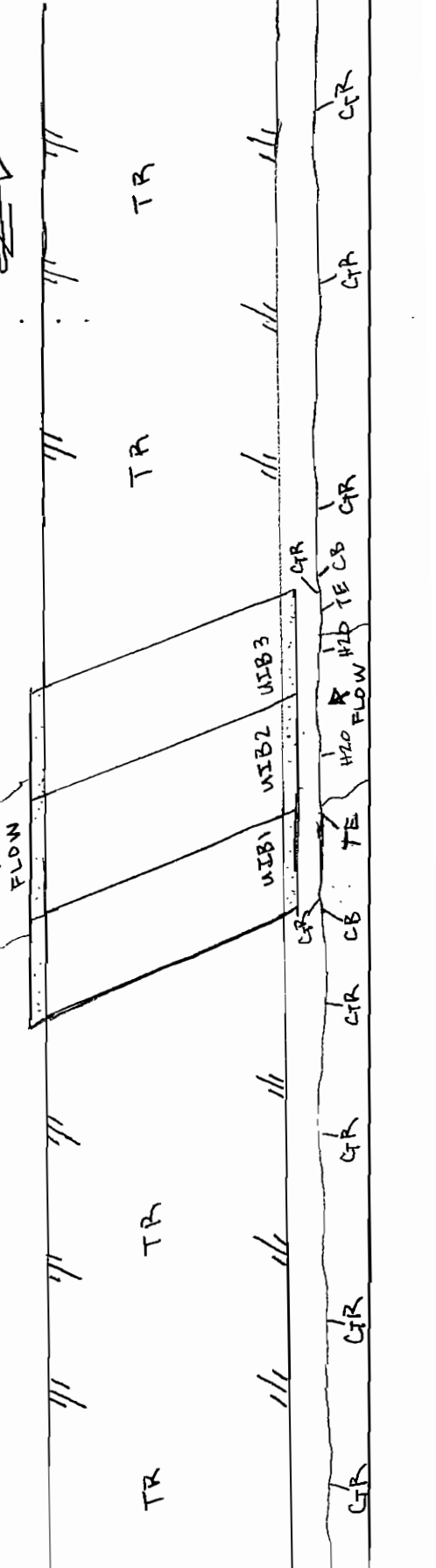
Photo IDs:
 Looking U/S E° 30 Looking D/S W° 32
 U/S Face W° 31 D/S Face E° 33

Additional Comments: U1B1 Not Flowing due to mud
 ERM Description: Xcut N° E° corner of Headwall

PROFILE VIEW



PLAN VIEW



STR 18 – Hickory Tree



STR 18 upstream



STR 18 downstream



STR 18 upstream face



STR 18 downstream face

STR_18.TXT

STR_18

100229,6947284.544374,2545880.106003,459.006200,STR_STR_18
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787,6947235.433395,2545866.001283,459.319524,TR
788,6947177.995177,2545867.032211,459.051943,TR
789,6947122.191975,2545868.133101,458.717758,TR
790,6947123.558948,2545904.404662,458.046131,ALPT1_OPEN
791,6947148.628914,2545903.686152,457.973768,GR
792,6947176.004713,2545903.595218,455.721992,GR
793,6947227.046661,2545901.618169,455.118643,GR
794,6947279.459451,2545900.594372,455.273628,GR
795,6947317.605305,2545903.925936,457.150741,CB
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797,6947337.138224,2545903.060404,453.182245,GR
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803,6947367.767111,2545901.951048,453.301945,GR
804,6947373.550688,2545901.632383,454.299174,GR
805,6947378.017367,2545902.386379,455.868338,CB
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813,6947420.719069,2545862.889011,460.514526,TR
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817,6947322.008539,2545893.321585,458.345808,HDWL1
818,6947321.891723,2545892.923937,458.285552,HDWL1+
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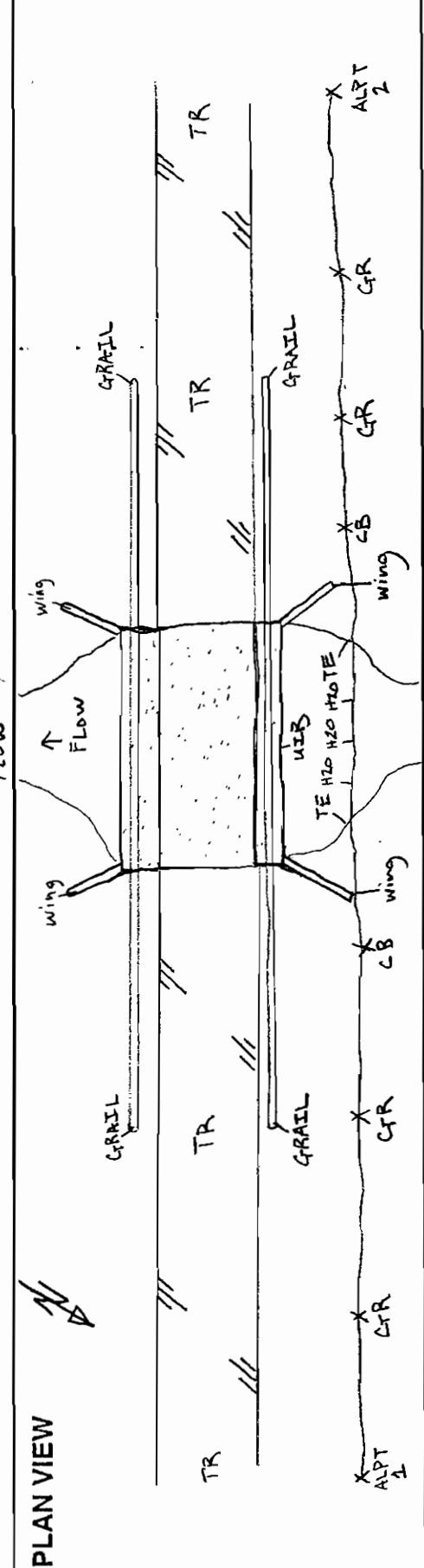
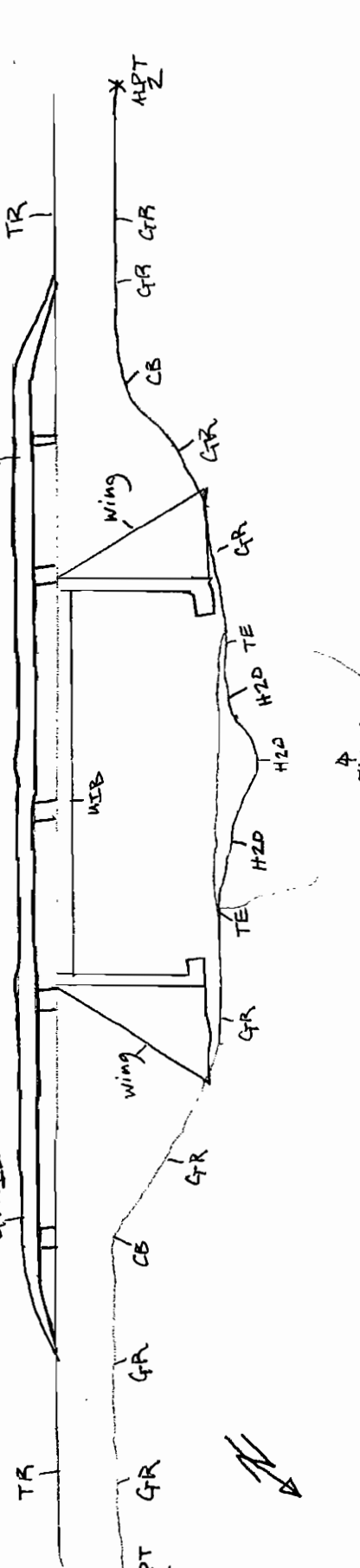
Appendix B
Stream 4C6 Tributary 1
Structure 19: Rylie Crest

Stream Name Trib 1 Location Rylicrest & Woodskwe Date 3-30-10
 Instrument A Garmin Rodman B. Dierks Benchmark: ID A 1628 Elev Survey File 53850 GRIP
 Type: XS () BR () DAM () CULV () Structure Name STR-19

Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bis 1 Type concrete box Length Size: H 5 X W 7.8 Skew no
 Dam: Top Width Side Slope: U/S D/S Riser X Skew

Photo IDs:
 Looking U/S: 22 Looking D/S: 23
 U/S Face: 25 D/S Face: 24

Additional Comments: ERM Description: A 1628 X-cut on NW. cor of Structure on top of bedrock



STR 19 – Rylie Crest and Woodsboro



STR 19 upstream



STR 19 downstream



STR 19 upstream face



STR 19 downstream face

STR_19.txt

STR_19

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1583,6942473.343107,2547318.077384,440.697140,CHKIN_BS_1493
1584,6942778.348165,2546866.878906,443.457934,ALPT2_WOOD
1585,6942781.441477,2546918.779993,442.528424,GR
1586,6942783.708993,2546969.708092,442.164780,GR
1587,6942784.675208,2547023.668385,441.221366,GR
1588,6942786.336668,2547073.742524,441.333405,CB
1589,6942786.705515,2547082.602253,440.126185,GR
1590,6942787.134577,2547090.449738,437.622100,GR
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1593,6942785.206899,2547099.672938,434.545882,H2O
1594,6942783.563509,2547104.238633,435.444860,H2O
1595,6942782.919250,2547109.290728,436.382860,TE
1596,6942787.094970,2547111.409660,437.911870,GR
1597,6942790.097093,2547118.157814,438.946296,GR
1598,6942790.941951,2547125.508318,440.708488,CB
1599,6942786.534364,2547180.574737,440.471409,GR
1600,6942785.333951,2547239.815322,440.601227,GR
1601,6942788.650227,2547297.329859,440.336952,ALPT1_WOOD
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1603,6942758.391175,2547246.600152,443.320507,TR
1604,6942756.605803,2547193.059272,442.796678,TR
1605,6942755.270600,2547132.087504,442.447126,TR
1606,6942754.829609,2547114.891409,442.703601,BR_BEGIN
1607,6942754.467441,2547095.254466,442.737040,BR_END
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1618,6942734.051866,2547115.233640,442.684081,GRAIL1
1619,6942733.503476,2547139.766199,441.282564,GRAIL1
1620,6942730.470678,2547184.477875,441.408969,GRAIL1/
1621,6942617.190465,2547042.441196,436.206555,
1622,6942779.358969,2547190.758271,440.594090,GRAIL1
1623,6942777.764157,2547152.050606,440.068969,GRAIL1
1624,6942776.341423,2547114.458549,442.641047,GRAIL1
1625,6942776.011943,2547094.914367,442.684084,GRAIL1
1626,6942775.874699,2547070.455757,442.290300,GRAIL1
1627,6942777.335914,2547026.115833,441.914961,GRAIL1/
1628,6942777.525487,2547113.297460,443.099099,ERM
1629,6942777.577377,2547104.549788,436.144277,
1630,6942732.481702,2547105.121650,436.225511,DIB_5X17.8

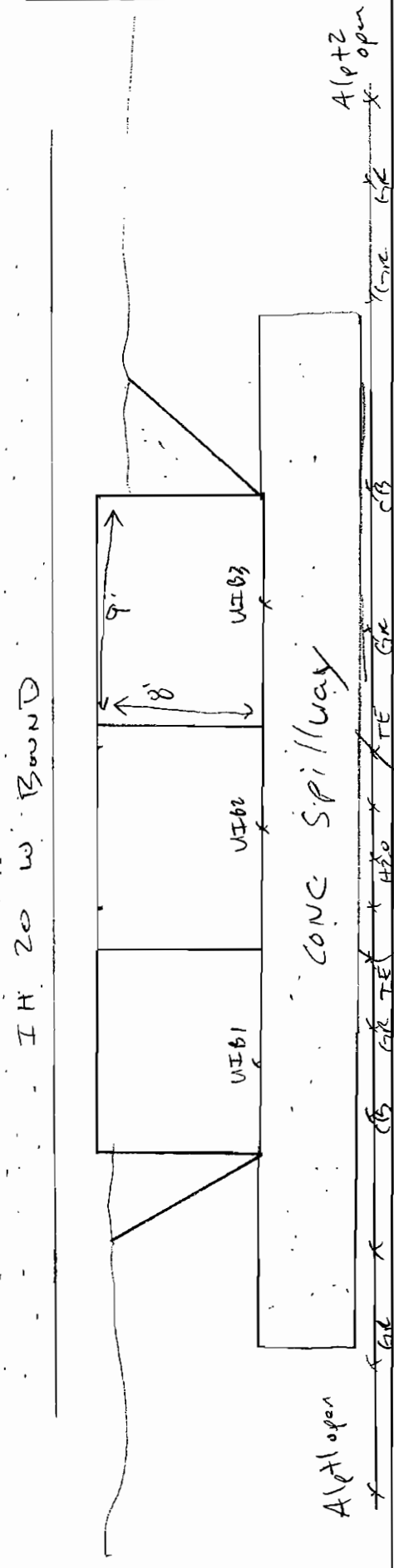
Appendix B
Stream 4C6 Tributary 1
Structure 20: I-20

Stream Name 406 Trib 1 Location IH 20 E + W Bound Date 4-5-10
 Instrument B. Dierks Rodman A. Garcia Benchmark ID 1717 Elev 5380 G.R.I.D
 Type: XS () BR () DAM () CULV Structure Name STK-20

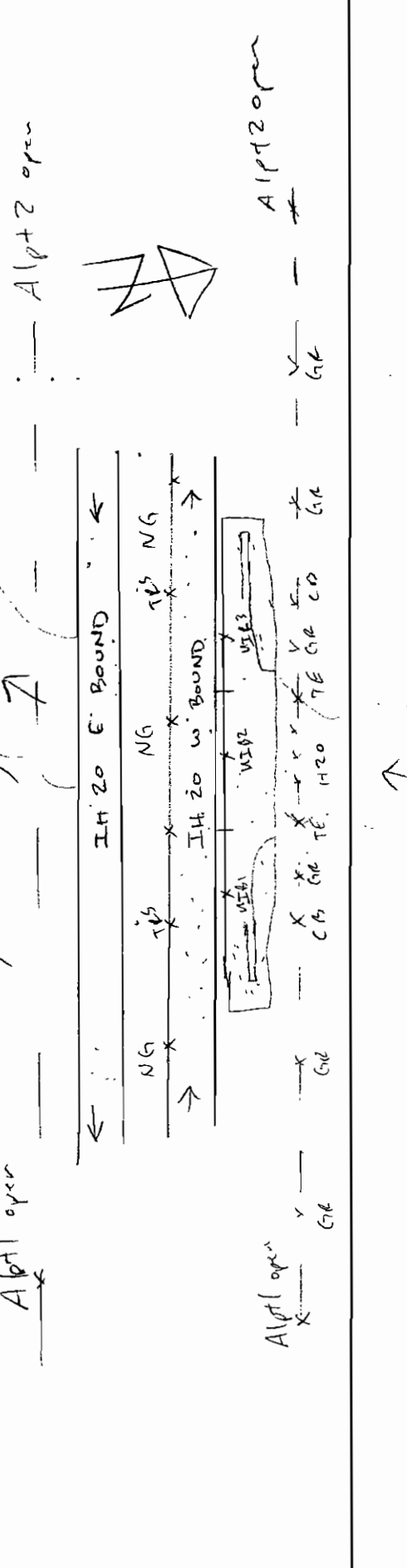
Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Blis 3 Type box Length 296.4 // Size: H 8.0 X W 9.0 Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew
 Photo IDs: Looking U/S: 2 Looking D/S: 3
 U/S Face 4 D/S Face 4

Additional Comments:
 ERM Description: 1717 ERM - X-cut on NE cor of Structure

PROFILE VIEW



PLAN VIEW



STR 20 IH 20



STR 20 upstream



STR 20 downstream



STR 20 downstream face



STR 20 downstream face

STR_20.txt

STR_20

1001691,6943559.792348,2547398.604064,369.710256,STR_STR_20
1001694,6942594.159,2545431.037,443.408828,STR_20
1001691,6943559.792348,2547398.604064,369.710256,OCC
1001694,6942594.159,2545431.037,443.408828,FS
1695,6943604.548,2547561.415,362.782932,ALPT1_OPEN
1696,6943605.66,2547506.974,361.678691,GR
1697,6943606.142,2547450.851,360.285954,GR
1698,6943605.089,2547400.808,359.619155,GR
1699,6943604.163,2547372.871,358.546464,GR
1700,6943607.25,2547347.892,357.099804,CB
1701,6943607.429,2547346.873,356.640217,GR
1702,6943607.768,2547346.487,355.459536,TE
1703,6943607.992,2547344.967,354.173181,H2O
1704,6943605.676,2547341.329,353.661396,H2O
1705,6943606.857,2547337.426,353.579347,H2O
1706,6943606.54,2547335.448,355.475895,TE
1707,6943606.828,2547334.024,356.786254,GR
1708,6943606.548,2547331.11,358.07065,CB
1709,6943605.042,2547290.956,358.538243,GR
1710,6943600.549,2547252.102,359.410259,GR
1711,6943596.42,2547199.165,360.08292,GR
1712,6943597.181,2547144.483,360.004316,ALPT2_OPEN
1713,6943581.662,2547357.47,354.595309,UIB1_8X9
1714,6943581.541,2547344.423,354.611832,UIB2_8X9
1715,6943581.445,2547330.368,354.618076,UIB3_8X9
1716,6943581.334,2547344.79,365.204789,US_STRUCT
1717,6943581.606,2547391.416,365.172849,ERM
1718,6943498.316,2547572.455,373.250717,TR
1719,6943497.695,2547513.353,372.825422,TR
1720,6943497.092,2547449.147,372.35259,TR
1721,6943496.229,2547378.122,371.823243,TR
1722,6943495.459,2547310.878,371.207394,TR
1723,6943494.755,2547248.521,370.641395,TR
1724,6943493.987,2547190.963,370.097589,TR
1725,6943493.375,2547133.634,369.585843,TR
1726,6943492.833,2547076.231,369.072038,TR
1727,6943369.179,2547124.044,353.751579,DIB3_8X9
1728,6943369.252,2547137.71,353.781562,DIB2_8X9
1729,6943369.487,2547151.802,353.784069,DIB1_8X9
1730,6943669.83,2546142.787,457.706343,CHKIN_FS_1398
1731,6943559.783,2547398.609,454.682619,CHKIN_FS_1691
1732,6943381.805,2547199.447,452.27484,CHKIN_FS_1692
1733,6943363.725,2547367.838,366.799284,ALPT1_OPEN
1734,6943365.34,2547310.772,366.196621,GR
1735,6943366.439,2547247.45,365.415491,GR
1736,6943366.384,2547187.775,363.133902,CB
1737,6943363.465,2547154.079,356.109827,GR
1738,6943363.306,2547143.752,356.876105,GR
1739,6943364.651,2547131.122,356.256255,GR
1740,6943364.84,2547130.381,354.486199,TE
1741,6943365.202,2547129.362,354.33119,H2O
1742,6943365.501,2547127.603,354.27638,H2O
1743,6943365.343,2547125.482,354.176173,H2O
1744,6943365.488,2547123.171,354.372598,TE
1745,6943365.886,2547122.09,356.536818,GR
1746,6943365.136,2547101.695,359.418425,GR
1747,6943365.373,2547081.993,362.525779,CB
1748,6943366.035,2547036.043,363.226232,GR
1749,6943365.594,2546983.245,363.813084,GR
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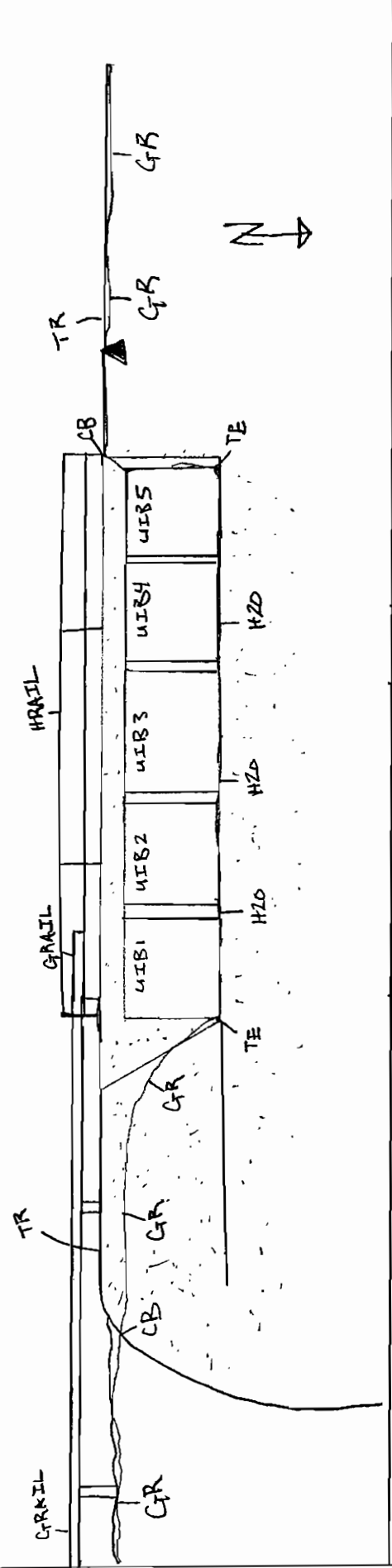
Appendix B
Stream 4C6 Tributary 1
Structure 21: Seagoville Road

Stream Name Trib 1 4C6 Location old Seagoville Rd Date 4/6-10
 Instrument A. Geacik Rodman B. Diecks Benchmark: ID 5380 GRID
 Type: XS () BR () CULV DAM () Structure Name STR-2

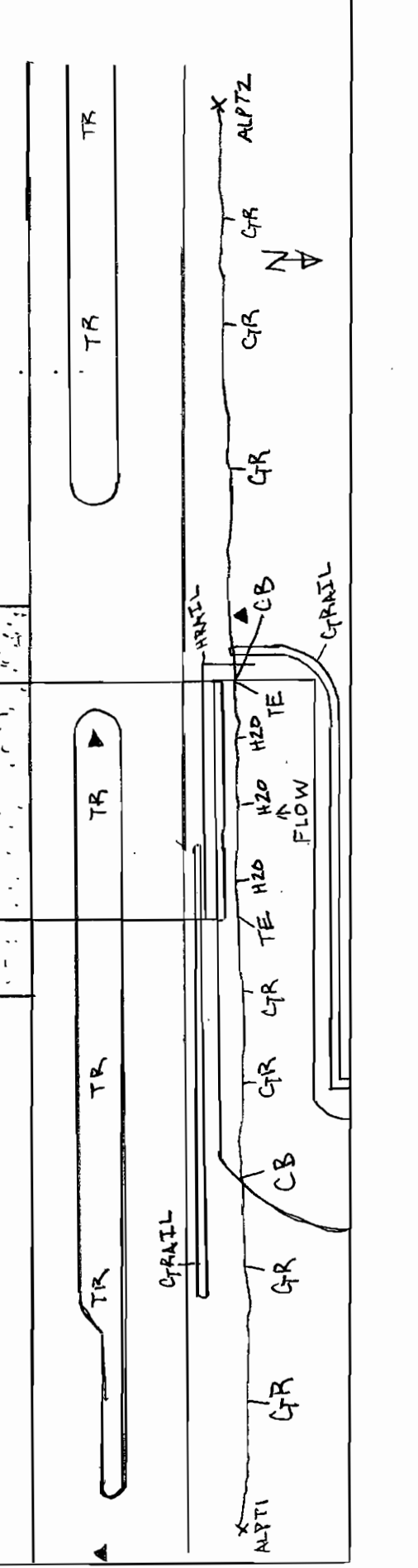
Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bls 5 Type BOX Length Size: H 5 X W 6 Skew
 Dam: Top Width Side Slope: U/S D/S X Riser X Skew
 Photo IDs:
 Looking U/S: 10 Looking D/S 11
 U/S Face 9 D/S Face 12

Additional Comments: ERM Description: 1042 GRM x-cut NE. C&K Structure

PROFILE VIEW



PLAN VIEW



STR 21 Old Seagoville Road



STR 21 upstream



STR 21 downstream



STR 21 upstream face



STR 21 downstream face

STR_21.txt

STR_21

1001687,6944599.162980,2547506.696654,366.859291,STR_STR_21
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1001687,6944599.162980,2547506.696654,366.859291,OCC
1001689,6944562.671511,2547821.660331,368.322841,BS
1814,6944562.664622,2547821.706430,453.390800,CHKIN_BS_1689
1815,6944600.346187,2547764.501291,452.278294,ALPT1_WOOD
1816,6944600.622115,2547705.268930,452.149119,GR
1817,6944597.542985,2547678.258989,451.970556,GRAIL1
1818,6944600.144930,2547646.437962,451.786920,GR
1819,6944600.437257,2547630.358772,451.476293,CB
1820,6944596.810582,2547615.384531,451.444648,GRAIL1
1821,6944599.983041,2547558.812526,449.937433,GR
1822,6944597.420462,2547558.967102,452.279339,
1823,6944596.026419,2547551.033762,451.616519,GRAIL1/
1824,6944597.031230,2547513.633000,452.271464,
1825,6944596.725342,2547511.943324,451.711814,GRAIL1
1826,6944608.544471,2547511.648629,451.852962,GRAIL1
1827,6944607.915912,2547513.497865,452.390321,
1828,6944620.505428,2547525.014778,451.553963,
1829,6944560.046167,2547540.186375,452.215799,CHKIN_FS_1688
1830,6944628.713824,2547619.055031,450.144240,GRAIL1
1831,6944643.308174,2547621.071250,450.024245,GRAIL1/
1832,6944599.391755,2547548.184822,445.607412,TE
1833,6944599.886302,2547537.758106,445.538441,H2O
1834,6944599.321948,2547527.313594,445.522088,H2O
1835,6944600.021421,2547519.263242,445.495577,H2O
1836,6944599.758953,2547514.328638,445.589098,TE
1837,6944597.427324,2547517.492290,445.502067,
1838,6944597.480428,2547523.253321,445.526474,
1839,6944597.693667,2547530.418436,445.497665,
1840,6944597.832553,2547537.529916,445.470510,
1841,6944597.967141,2547544.064364,445.488818,
1842,6944597.781383,2547559.082894,452.286157,ERM
1843,6944597.526326,2547530.644723,452.273785,US_STRUCT
1844,6944599.295655,2547513.936745,452.278408,CB
1845,6944597.075234,2547462.258444,452.878840,GR
1846,6944597.159598,2547406.978195,453.556344,GR
1847,6944596.034573,2547350.034508,453.955468,GR
1848,6944589.075034,2547294.191934,453.640642,ALPT2_OPEN
1849,6944548.756099,2547296.397272,453.352403,TR
1850,6944552.178247,2547353.707525,453.125601,TR
1851,6944555.174063,2547408.290858,453.065100,TR
1852,6944557.465458,2547462.985276,452.060846,TR
1853,6944559.345269,2547526.700238,452.057882,TR
1854,6944560.360180,2547590.680431,452.352526,TR
1855,6944560.422593,2547649.510377,452.201322,TR
1856,6944566.960518,2547705.596307,452.433914,TR
1857,6944566.143913,2547765.110620,452.217587,TR
1858,6944521.251633,2547560.598314,452.364465,
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1860,6944520.279189,2547539.262289,445.227286,DIB2_5X6
1861,6944520.200516,2547532.342695,445.066585,
1862,6944520.035022,2547525.771670,445.029657,
1863,6944519.907987,2547519.102294,445.064325,
1864,6944520.340217,2547531.686989,452.349353,DS_STRUCT
1865,6944519.994333,2547504.488878,452.348882,
1866,6944560.003112,2547540.212794,452.292479,CHKIN_FS_1688
1867,6944426.367485,2547527.147731,444.917275,DS_IN

Appendix B
Stream 4C6
Structure 22: Woodsboro

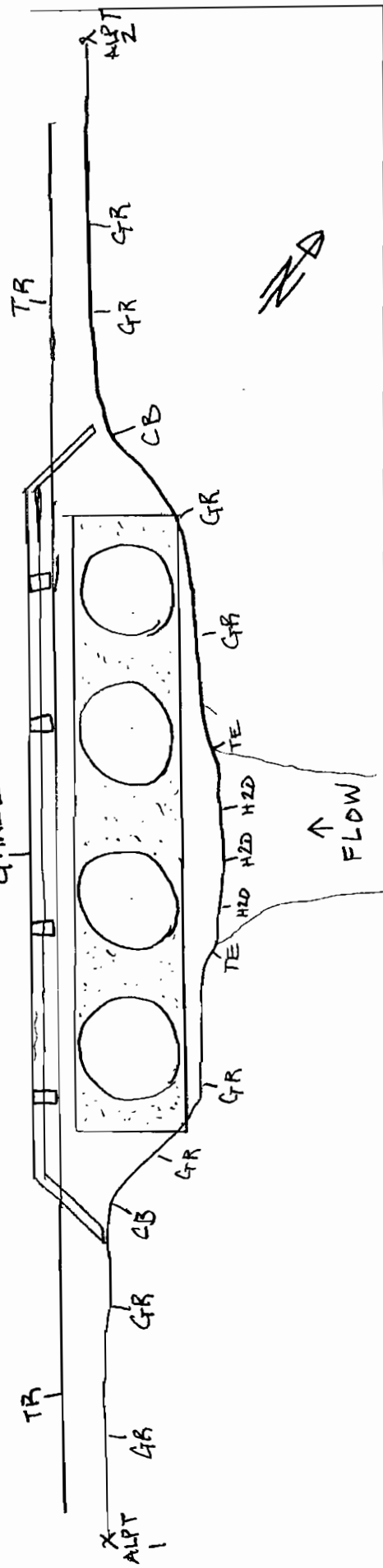
Stream Name 4C6 TRIB 2 Location Woodsboro Date 03/30/10
 Instrument B. Dicks Rodman A. Garcia Benchmark: ID 1493 Elev Survey File 5380 Grid
 Type: XS () BR () CULV (X) DAM () Structure Name STR 22

Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bls Type Pipe Length 38.0 Size: H⁵⁶CMF X W Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew

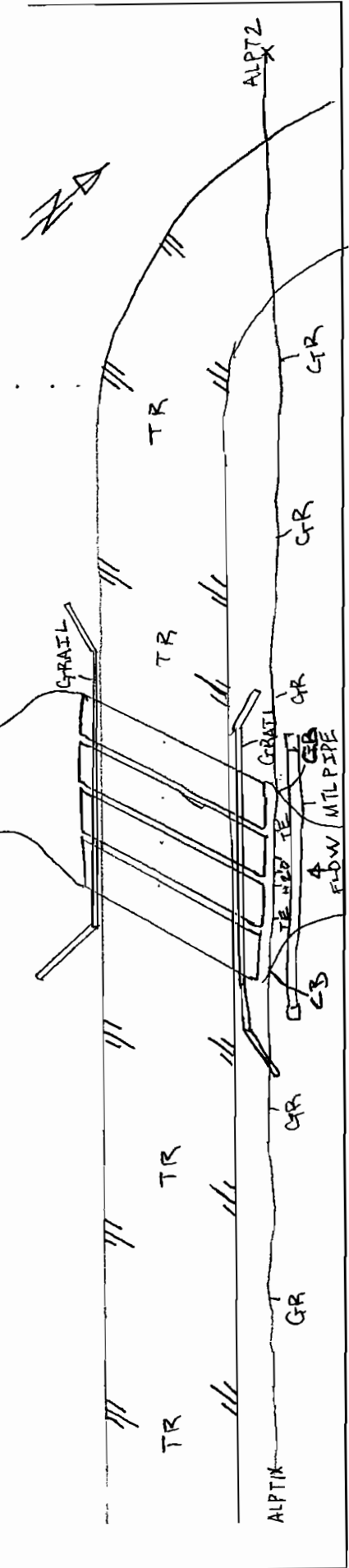
Photo IDs:
 Looking U/S: 18 Looking D/S: 19
 U/S Face: 2-1 D/S Face: 2-0

Additional Comments:
 ERM Description: Set PK N. side EA of woodsboro +/- 30' w/o of STR 22

PROFILE VIEW



PLAN VIEW



STR 22 – Woodsboro



STR 22 upstream



STR 22 downstream



STR 22 upstream face



STR 22 downstream face

STR_22.txt

STR_22

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1540,6942260.705925,2547567.273703,447.256922,CHKIN_BS_1494
1541,6942340.230154,2547519.340003,441.123931,ALPT1_WOOD
1542,6942373.112615,2547468.665469,439.593181,GR
1543,6942412.145296,2547414.762555,439.108530,GR
1544,6942425.804743,2547396.115726,439.134088,CB
1545,6942428.598876,2547388.580373,437.136402,GR
1546,6942430.360122,2547383.642185,434.605929,TE
1547,6942432.049158,2547382.677045,434.140458,H20
1548,6942432.801347,2547381.413851,434.188855,H20
1549,6942433.635704,2547379.865557,434.259373,H20
1550,6942434.524511,2547379.137219,434.542191,TE
1551,6942438.798648,2547372.833383,434.675726,GR
1552,6942429.790935,2547388.616625,437.067657,
1553,6942443.448803,2547368.802775,437.029097,
1554,6942445.478327,2547363.459186,437.475413,GR
1555,6942452.119163,2547355.766330,439.215054,CB
1556,6942416.388214,2547396.968638,440.262790,GRAIL1
1557,6942418.278090,2547384.794330,440.118752,GRAIL1
1558,6942436.709076,2547359.515921,439.856509,GRAIL1
1559,6942444.110371,2547357.122191,438.529350,GRAIL1/
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1561,6942428.827932,2547374.946556,434.005204,UIP2_56"
1562,6942432.674461,2547369.606343,433.959499,
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1565,6942534.806893,2547269.569849,441.808589,GR
1566,6942569.271205,2547245.993571,440.311144,GR
1567,6942619.113122,2547213.038466,440.685469,ALPT2_WOOD
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1569,6942564.022884,2547271.233358,441.936446,TR
1570,6942492.139075,2547290.839150,441.275491,TR
1571,6942421.295822,2547359.076274,440.907633,TR
1572,6942375.209167,2547424.757852,441.275083,TR
1573,6942326.768668,2547501.141541,443.097349,TR
1574,6942400.028480,2547360.487262,440.140204,GRAIL1
1575,6942407.650626,2547359.007403,440.568980,GRAIL1
1576,6942426.066218,2547332.879112,439.737361,GRAIL1
1577,6942430.335002,2547320.300081,439.559687,GRAIL1/
1578,6942416.873108,2547334.883373,433.534567,DIP4_56"
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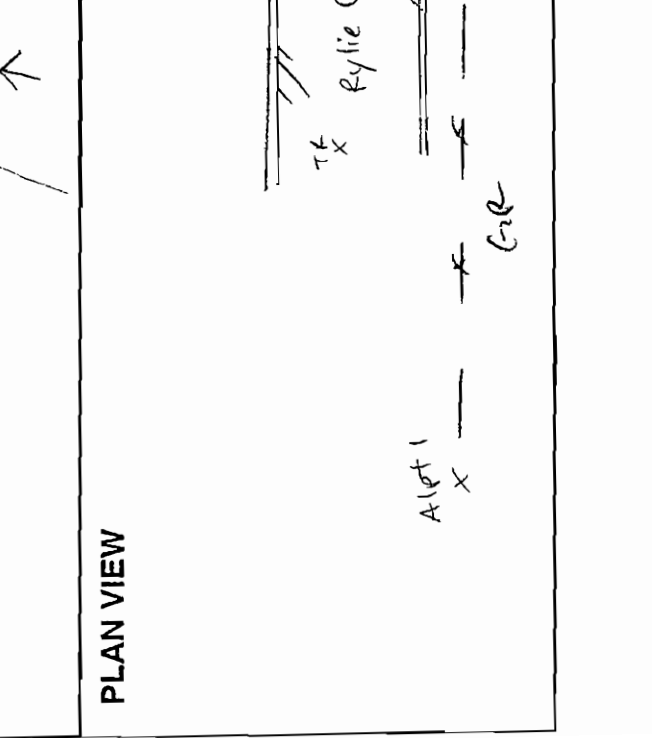
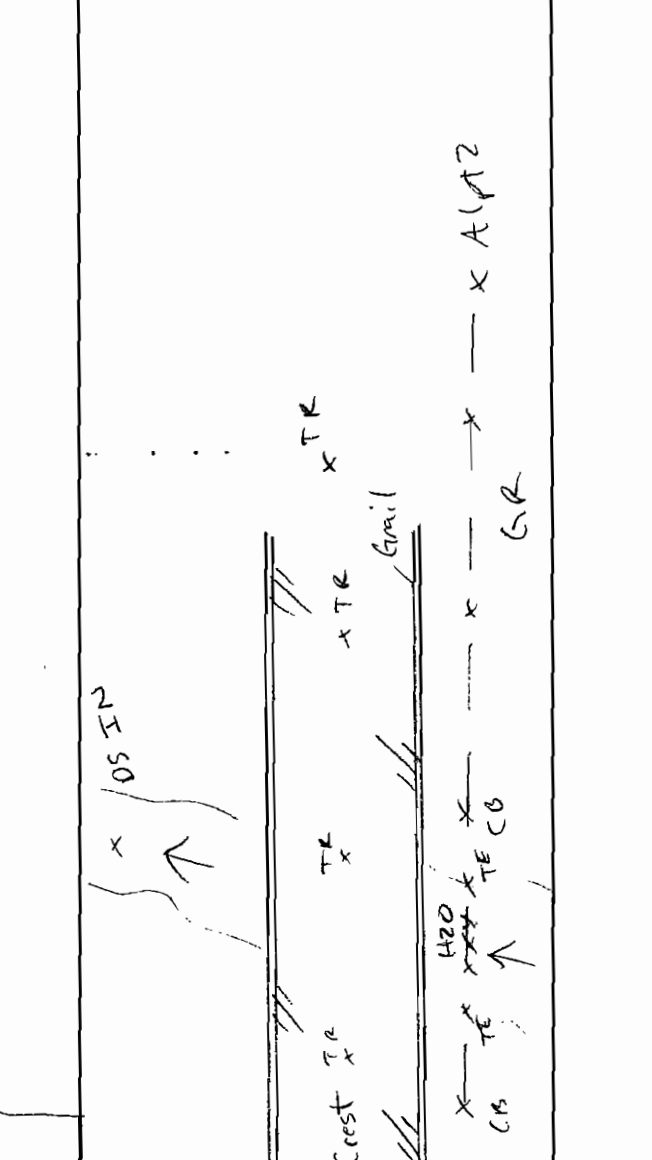
Appendix B
Stream 4C6
Structure 23: Rylie Crest

Stream Name Trib 2 Location Rylye Crest & Shepard Date 3-30-10
 Instrument A. Garcia Rodman B. Dierks Benchmark: ID A1650 Elev 5380 Survey File GRID
 Type: XS () BR () CULV () DAM () Structure Name STR-23

Bridge: Rail 3 Deck 3 Width 10 Piers(s) 3 @ 10 Skew 10
 Culvert: #Bls 3 Type 3 Length 10 Size: H 9 X W 10 Skew 10
 Dam: Top Width 3 Side Slope: U/S 26 D/S 27 Riser X Skew 29

Photo IDs:
 Looking U/S: 27 Looking D/S: 28
 U/S Face: 26 D/S Face: 29

Additional Comments:
 ERM Description: A1650



STR 23 Rylie Crest and Shepherd



STR 23 upstream



STR 23 downstream



STR 23 upstream face



STR 23 downstream face

STR_23.txt

STR_23

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1634,6942755.589373,2548303.912077,446.687666,GRAIL1
1635,6942771.482445,2548312.800760,444.717290,GR
1636,6942748.294080,2548327.614816,447.508589,GRAIL1
1637,6942765.267989,2548370.332478,445.922791,GR
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1639,6942762.393402,2548387.254019,446.203021,CB
1640,6942752.483937,2548405.421231,444.960176,GR
1641,6942746.837792,2548417.616464,443.287386,GR
1642,6942739.260410,2548428.258182,439.140803,TE
1643,6942738.512155,2548429.935830,438.624070,H2O
1644,6942737.507106,2548436.309697,438.627808,H2O
1645,6942736.691656,2548438.413605,438.421705,H2O
1646,6942734.846339,2548439.485623,439.136948,TE
1647,6942735.357852,2548446.198390,441.337466,GR
1648,6942734.015476,2548456.448215,442.991178,GR
1649,6942733.142458,2548464.833361,445.287265,CB
1650,6942717.808191,2548454.258737,449.303436,ERM
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1652,6942714.623749,2548466.317082,449.450440,GRAIL1
1653,6942704.057565,2548516.074603,449.300906,GRAIL1
1654,6942720.414925,2548520.350347,446.457651,GR
1655,6942692.851120,2548571.254378,450.225305,GRAIL1
1656,6942707.135705,2548575.366305,448.388885,GR
1657,6942683.407217,2548620.199516,450.532876,GRAIL1
1658,6942680.467087,2548645.092741,450.636628,GRAIL1/
1659,6942694.241393,2548628.468681,449.093914,ALPT1_WOOD
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1662,6942690.488961,2548514.074299,449.754865,TR
1663,6942701.419941,2548462.531820,449.654250,TR
1664,6942726.693914,2548418.572402,449.388638,US_STRUCT
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1667,6942725.341969,2548360.845588,449.086807,TR
1668,6942738.460111,2548305.685693,447.924570,TR
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1673,6942709.313736,2548366.441062,448.856032,GRAIL1
1674,6942700.432948,2548404.039613,449.209101,GRAIL1
1675,6942690.492619,2548446.778822,449.211026,GRAIL1
1676,6942684.844244,2548471.013449,449.323002,GRAIL1
1677,6942677.354766,2548494.950507,449.410154,GRAIL1/
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1679,6942726.988125,2548417.911536,438.673315,UIB2_9X10
1680,6942729.625664,2548407.183196,438.606451,UIB3_9X10
1681,6942702.277155,2548392.978243,438.425970,DIB3_9X10
1682,6942699.757005,2548403.515015,438.528445,DIB2_9X10
1683,6942697.150601,2548414.602578,438.576125,DIB1_9X10
1684,6942647.808435,2548366.805707,438.329519,
1685,6942606.197572,2549414.322155,476.490658,CHKIN_FS_1497

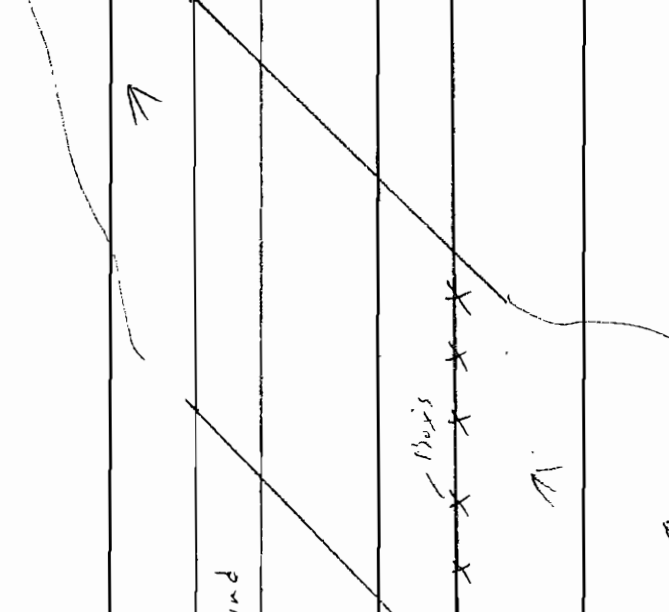
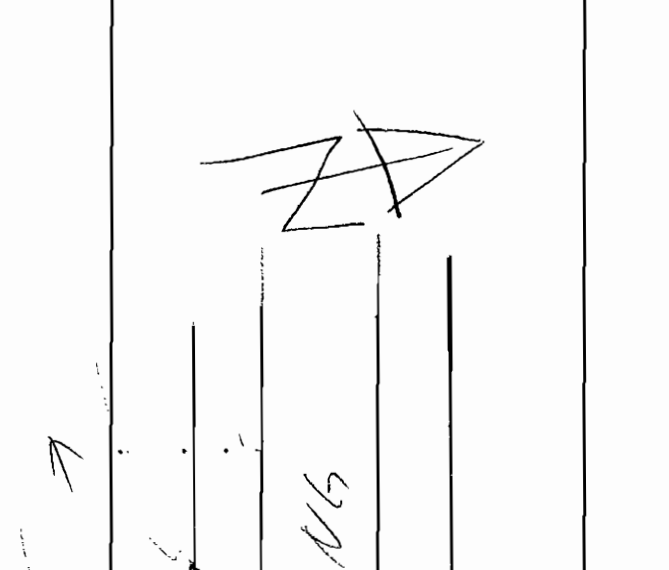
Appendix B
Stream 4C6
Structure 24: I-20

Stream Name 406 Trib 2 Location IH 20 Date 4-6-10
 Instrument A. Garcia Rodman B. Daniels Benchmark: ID Δ 1810 Elev 5380 Survey File GRIP
 Type: XS () BR () DAM () CULV Structure Name STR-24

Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bls 6 Type box Length Size: H 9 X W 10 Skew ✓
 Dam: Top Width Side Slope: U/S D/S X Riser X Skew

Photo IDs:
 Looking U/S: 6 Looking D/S 8
 U/S Face 5 D/S Face 7

Additional Comments: only flowing thru box 1 & 2
 ERM Description: Δ 1810 x-cut NE cor of structure



STR 24 – IH 20



STR 24 upstream



STR 24 downstream



STR 24 upstream face



STR 24 downstream face

STR_24_REV.txt

STR_24

1001499,6943587.271415,2549112.555617,456.756978,STR_STR_24
1001752,6943277.512657,2548736.378250,441.462535,STR_24
1001499,6943587.271415,2549112.555617,456.756978,OCC
1001752,6943277.512657,2548736.378250,441.462535,FS
1752,6943277.512657,2548736.378250,441.462535,DS_IN
1753,6943396.634048,2548963.132906,443.459290,DIB1_9X10
1754,6943394.863512,2548939.978258,443.491184,DIB2_9X10
1755,6943392.955840,2548915.860479,443.553510,DIB3_9X10
1756,6943391.253100,2548892.444419,443.474264,DIB4_9X10
1757,6943389.271820,2548868.059866,443.329384,DIB5_9X10
1758,6943387.520617,2548848.248762,443.238977,DIB6_9X10
1759,6943391.476741,2548891.995506,454.400937,DS_STRUCT
1760,6943419.035939,2549021.797377,459.632394,GRAIL1
1761,6943420.719960,2548997.161151,459.969048,GRAIL1
1762,6943418.850205,2548939.124512,460.101636,GRAIL1
1763,6943416.374881,2548883.625436,460.083199,GRAIL1
1764,6943414.053862,2548812.941026,460.597144,GRAIL1
1765,6943412.414962,2548741.007388,460.871857,GRAIL1
1766,6943411.030254,2548652.392411,461.243452,GRAIL1
1767,6943409.256631,2548571.279192,461.274245,GRAIL1/
1768,6943511.299546,2548768.674266,459.727479,TR
1769,6943514.064123,2548857.289838,459.472420,TR
1770,6943518.024079,2548953.989254,459.130106,TR
1771,6943523.338214,2549057.107624,459.242473,TR
1772,6943529.571399,2549154.889359,459.971044,TR
1773,6943537.305157,2549256.531277,460.629266,TR
1774,6943545.313082,2549348.370103,460.722251,TR
1775,6943554.783067,2549444.626224,461.234165,TR
1776,6943565.787513,2549544.394460,461.875704,TR
1777,6943577.607212,2549641.386817,462.404453,TR
1778,6943630.839942,2549577.102685,460.385446,GRAIL1
1779,6943618.861144,2549496.267282,460.137211,GRAIL1
1780,6943608.412176,2549413.747555,459.811247,GRAIL1
1781,6943598.943008,2549329.001694,459.338618,GRAIL1
1782,6943589.571279,2549241.844411,459.243680,GRAIL1
1783,6943581.796632,2549152.681439,458.342478,GRAIL1
1784,6943582.174027,2549127.779170,457.833530,GRAIL1/
1785,6943600.079807,2549152.902648,453.302563,CB
1786,6943599.564484,2549121.043469,454.704650,GR
1787,6943601.242690,2549067.203798,453.479447,GR
1788,6943599.741386,2549003.727824,453.012163,GR
1789,6943596.213026,2548945.382487,453.104209,ALPT2_OPEN
1001498,6943652.549558,2549647.119800,458.920209,OCC
1001499,6943587.271415,2549112.555617,456.756978,BS
1790,6943587.262183,2549112.480018,456.805197,CHKIN_bs_1499
1791,6943603.117777,2549175.737232,449.396434,GR
1792,6943603.922345,2549193.116748,446.225998,GR
1793,6943606.817664,2549229.646521,446.238424,GR
1794,6943609.412903,2549267.563271,445.735375,GR
1795,6943610.464413,2549284.817347,444.979896,TE
1796,6943610.849697,2549296.196932,444.487364,H2O
1797,6943613.174443,2549311.427999,443.851927,H2O
1798,6943613.292070,2549320.454529,444.323731,H2O
1799,6943613.671068,2549325.869710,445.247170,TE
1800,6943614.189546,2549331.437075,449.673362,GR
1801,6943616.088094,2549357.059974,452.792649,GR
1802,6943617.833661,2549389.658662,457.131485,CB
1803,6943609.934567,2549310.114225,444.499302,UIB1_9X10
1804,6943607.629550,2549284.111301,444.815036,UIB2_9X10
1805,6943605.773918,2549260.914407,444.819972,UIB3_9X10
1806,6943604.206383,2549240.088403,444.672442,UIB4_9X10
1807,6943602.256790,2549215.292136,444.477012,

STR_24_REV.txt

1808,6943600.737340,2549193.130484,444.384540,
1809,6943604.689003,2549244.668341,455.604770,US_STRUCT
1810,6943613.450757,2549362.940449,455.537441,ERM
1811,6943624.155801,2549448.580104,457.788088,GR
1812,6943633.052020,2549508.630581,458.041898,GR
1813,6943644.043792,2549574.667809,458.352023,ALPT1_OPEN

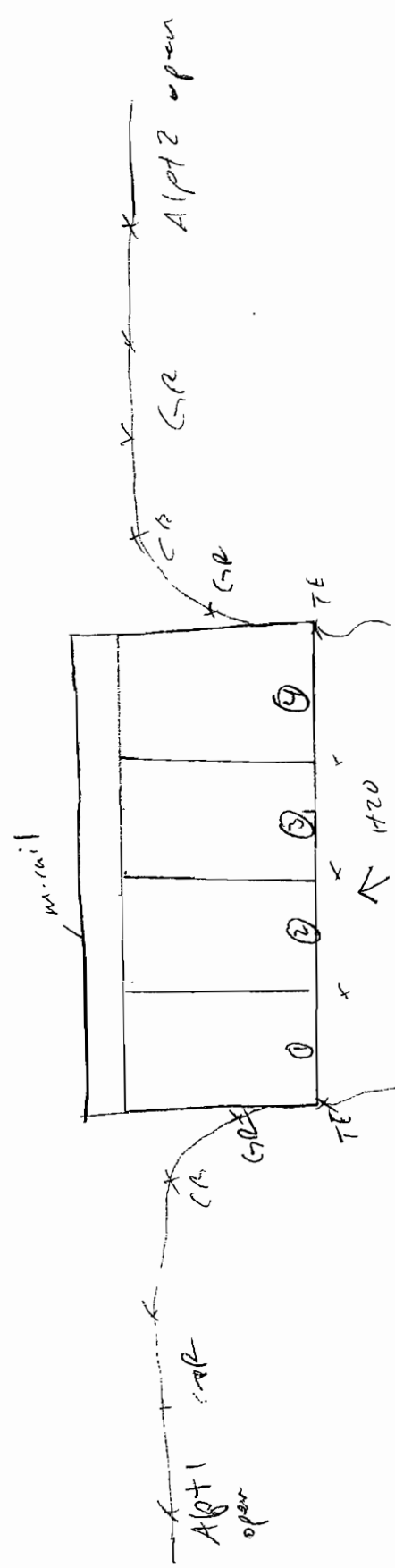
Appendix B
Stream 4C6
Structure 25: Seagoville Road

Stream Name 4C6 Trib 1 Location Old Seagoville Rd Date 4-6-10
 Instrument Asi Georgia Rodman B.O. cks Benchmark: ID 1877 Elev 5380 G.R.I.D
 Type: XS () BR () CULV () DAM () Structure Name SK-25

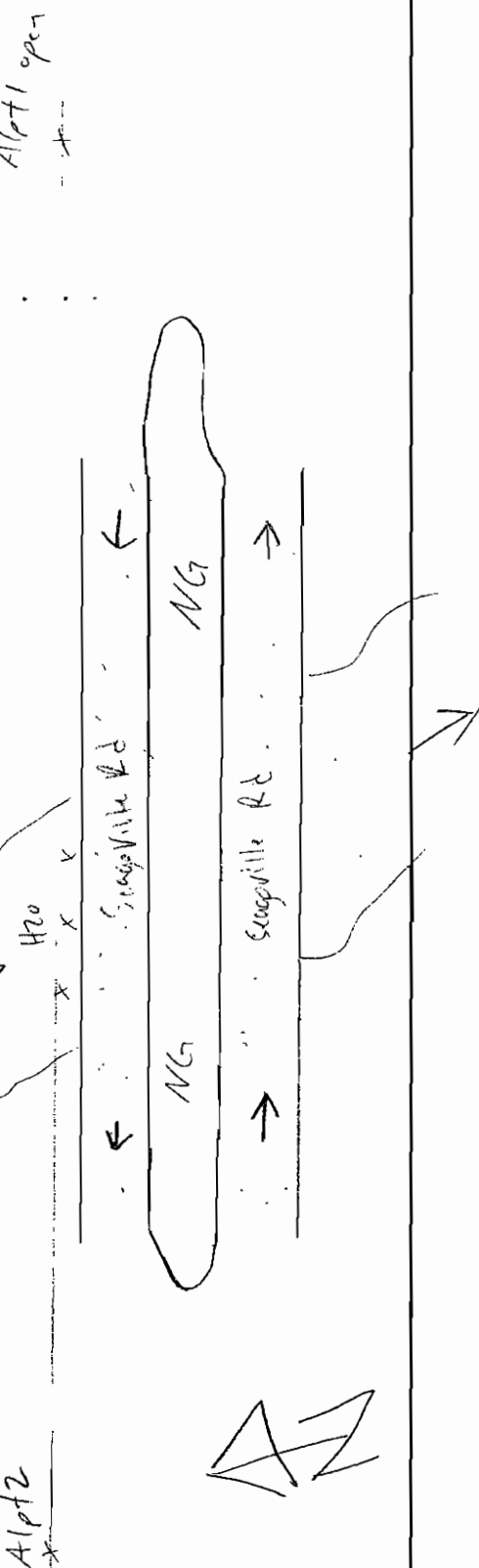
Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bis 4 Type Length 18.64 Size: H 7 X W 9 Skew ✓
 Dam: Top Width Side Slope: U/S D/S Riser X Skew
 Photo IDs: Looking U/S: 15 Looking D/S: 13
 U/S Face: 16 D/S Face: 14

Additional Comments: 1877 - cut on top of NE cor of Structure.

PROFILE VIEW



PLAN VIEW



STR 25 – Old Seagoville



STR 25 looking upstream



STR 25 looking downstream



STR 25 upstream face



STR 25 downstream face

str25.txt

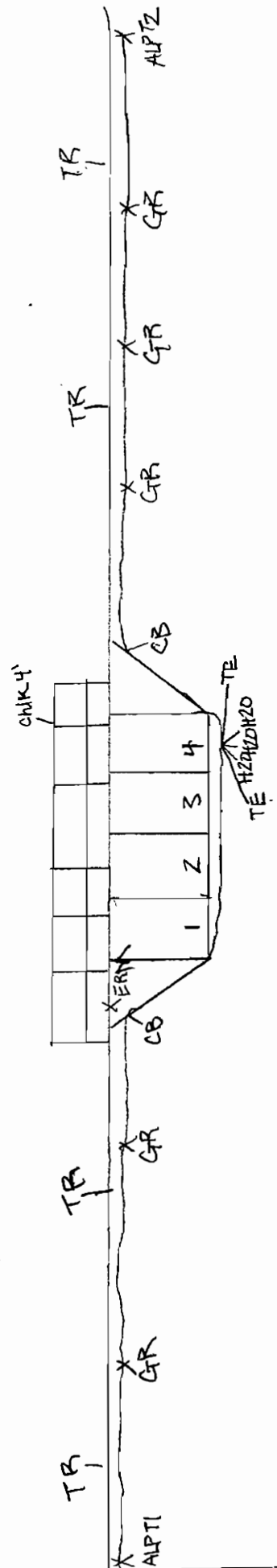
STR_25
1001690,6944582.810705,2549716.755957,463.369678,STR_STR_25
1001868,6944609.214722,2548879.658833,460.206357,STR_25
1001690,6944582.810705,2549716.755957,463.369678,OCC
1001868,6944609.214722,2548879.658833,460.206357,BS
1870,6944609.217398,2548879.573986,460.237629,CHKIN_BS_1868
1871,6944626.030816,2550135.582527,459.545923,ALPT1_OPEN
1872,6944622.076377,2550156.284111,459.773628,TRAV_SN
1873,6944588.120786,2550135.247137,460.020610,TR
1874,6944625.360335,2550076.374296,459.060425,GR
1875,6944624.546345,2550021.608566,459.372671,GR
1876,6944624.179384,2549962.289955,460.023143,GR
1877,6944621.579387,2549931.529666,460.604172,ERM
1878,6944622.693337,2549931.989515,459.806578,CB
1879,6944621.663280,2549931.387222,460.586841,
1880,6944622.011823,2549915.068694,453.066944,TE
1881,6944623.072922,2549922.226867,455.533839,GR
1882,6944621.713801,2549910.327849,451.896728,
1883,6944621.641468,2549900.729019,451.898569,
1884,6944621.584021,2549891.450354,451.920186,
1885,6944621.522116,2549881.472119,451.912261,
1886,6944622.139727,2549907.515743,451.675683,H2O
1887,6944622.173538,2549895.692926,451.675336,H2O
1888,6944622.127812,2549882.186466,451.677010,H2O
1889,6944621.123414,2549859.790643,460.697674,
1890,6944621.745591,2549875.876126,452.263278,TE
1891,6944622.905676,2549868.789606,455.381153,GR
1892,6944622.969123,2549859.382294,459.619861,CB
1893,6944585.057721,2549897.717466,460.920106,TR
1894,6944545.674338,2549902.175237,451.905364,
1895,6944545.830630,2549880.727455,460.668484,
1896,6944545.796575,2549912.071924,451.874407,
1897,6944545.883153,2549921.780084,451.862659,
1898,6944546.013841,2549931.769619,451.896085,
1899,6944546.608288,2549952.332036,460.615635,
1900,6944545.833279,2549916.566043,460.579662,DS_STRUCT
1901,6944483.451228,2549953.392780,448.851917,DS_IN
1902,6944621.582639,2549895.428594,460.617104,US_STRUCT
1903,6944623.357934,2549807.142742,460.759672,GR
1904,6944622.744385,2549747.935282,462.309523,GR
1905,6944622.375757,2549691.788493,464.312128,GR
1906,6944621.803789,2549632.071851,465.939582,ALPT2_OPEN
1907,6944547.442555,2549417.024164,462.082789,CHKIN_FS_1869
1908,6944580.497582,2549628.874117,464.820878,TR

Appendix B
Stream 4C6
Structure 26: Pioneer

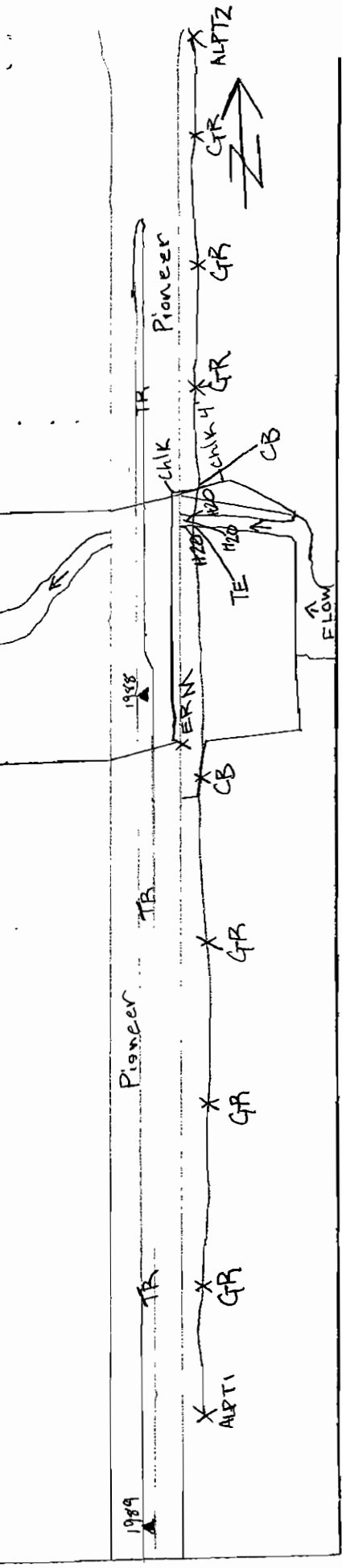
Stream Name 466 Trib 1 Location Pioneer @ Spring Oak Date 4-13-10
 Instrument Rodman Benchmark: ID 5380 GRIID
 Type: XS () BR () DAM () CULV () Structure Name STR-26
 Bridge: Rail Deck Width 0 Piers(s) @ Skew
 Culvert: #Bls 4 Type BOX Length Size: H 5 X W 9 Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew
 Looking U/S 7 Looking D/S 9
 U/S Face 8 D/S Face 10

Photo IDs:
 Additional Comments: 1993 x-cut top of HDWL on the SE corner of Structure
 ERM Description: 1993 x-cut top of HDWL on the SE corner of Structure

PROFILE VIEW



PLAN VIEW



STR 26 – Pioneer



STR 26 looking upstream



STR 26 looking downstream



STR 26 upstream face



STR 26 downstream face

str26.txt

STR_26
1001988,6946911.209399,2551159.515250,476.213211,STR_STR_26
1001989,6946865.824668,2551170.524842,476.746456,STR_26
1001988,6946911.209399,2551159.515250,476.213211,OCC
1001989,6946865.824668,2551170.524842,476.746456,BS
1992,6946648.635894,2551171.677956,478.046567,CHKIN_BS_1990
1993,6946925.669676,2551200.210190,475.987844,ERM
1994,6946720.949050,2551207.850538,477.027079,ALPT1_OPEN
1995,6946720.498978,2551170.811761,477.856823,TR
1996,6946782.764773,2551206.974280,475.531669,GR
1997,6946848.527371,2551204.379499,474.604676,GR
1998,6946904.800303,2551202.670832,473.855186,GR
1999,6946925.383398,2551201.696289,474.004851,CB
2000,6946935.316134,2551202.370362,471.830724,GR
2001,6946940.640816,2551202.081492,469.392322,GR
2002,6946953.354131,2551201.832540,469.430229,GR
2003,6946968.133879,2551201.894128,469.469082,GR
2004,6946982.529237,2551202.152533,469.443050,TE
2005,6946983.330316,2551201.765573,469.465183,H2O
2006,6946983.929705,2551201.452123,469.465350,TE
2007,6946977.874169,2551199.548352,469.360373,
2008,6946966.489268,2551199.794178,469.435329,
2009,6946955.834628,2551199.981067,469.425251,
2010,6946944.563023,2551200.218853,469.381961,
2011,6946996.324155,2551198.792925,475.976705,
2012,6946996.345465,2551200.689152,474.845032,CB
2013,6946996.981137,2551199.429995,474.990963,
2014,6947003.943468,2551208.074135,475.207194,
2015,6947004.032382,2551236.408550,474.612173,
2016,6946960.862909,2551199.759916,476.026287,US_STRUCT
2017,6946927.471908,2551199.773343,475.993484,
2018,6946941.351260,2551157.083828,476.314899,TR
2019,6946914.920121,2551122.666551,475.575342,DS_STRUCT
2020,6946898.392185,2551122.807582,468.878985,
2021,6946909.507420,2551122.632973,468.925184,
2022,6946920.209036,2551122.416273,468.957471,
2023,6946931.452684,2551122.187060,468.983775,
2024,6946888.282696,2551060.403037,466.450012,DS_IN
2025,6946880.207602,2551123.743182,475.540602,
2026,6946950.185363,2551122.236242,475.612629,
2027,6947054.889593,2551200.421341,476.176822,GR
2028,6947114.530420,2551199.342197,476.462340,GR
2029,6947169.192232,2551197.268914,477.936192,ALPT2_OPEN
2030,6947170.544785,2551156.674159,477.882972,TR
2031,6947187.169810,2551447.084226,476.336597,TRAV_SN

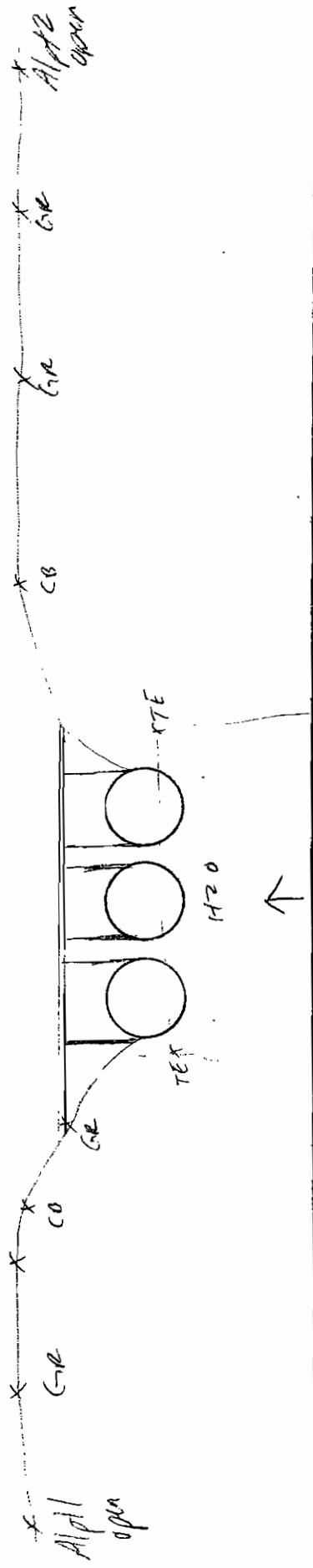
Appendix B
Stream 4C6
Structure 27: Spring Oak

Stream Name 466 Trib 1 Location Pioneer & Spring Ck Date 4-13-10
 Instrument Agariva Rodman B. Dicks Benchmark: ID 2038 Elev SEE GPTD
 Type: XS () BR () CULV () DAM () Structure Name STR-27 Survey File SEE GPTD

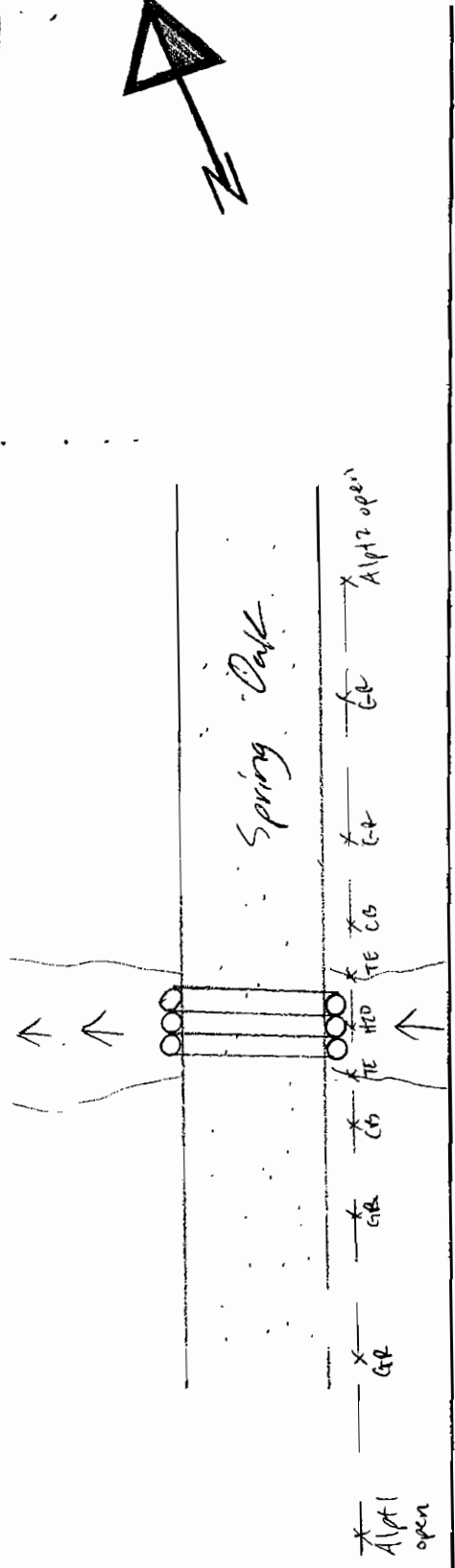
Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bls 3 Type pipe Length Size: H 56" X W Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew
 Photo IDs: Looking U/S: 13 Looking D/S: 11
 U/S Face 4 D/S Face 12

Additional Comments:
 ERM Description: 2038 x-cut top of HDWL NE ckr of Structure

PROFILE VIEW



PLAN VIEW



STR 27 – Pioneer



STR 27 looking upstream



STR 27 looking downstream



STR 27 upstream face



STR 27 downstream face

str27.txt

STR_27
1002031,6947187.169810,2551447.084226,476.336597,STR_STR_27
1001988,6946911.209399,2551159.515250,476.213211,STR_27
1002031,6947187.169810,2551447.084226,476.336597,OCC
1001988,6946911.209399,2551159.515250,476.213211,BS
2033,6946911.219847,2551159.526137,476.242563,CHKIN_BS_1988
2034,6947153.347330,2551665.120829,477.070013,ALPT1_OPEN
2035,6947184.143341,2551639.300143,476.841615,GR
2036,6947220.761473,2551604.293641,475.766698,GR
2037,6947229.567528,2551598.441028,475.704344,CB
2038,6947234.096548,2551591.610963,475.205669,ERM
2039,6947236.410058,2551594.161084,471.014994,TE
2040,6947238.198175,2551593.415319,470.525244,H2O
2041,6947237.791405,2551592.004745,470.488805,UIP1_56"
2042,6947243.160208,2551589.937354,470.577870,H2O
2043,6947242.676043,2551588.417620,470.498272,UIP2_56"
2044,6947248.115525,2551586.148432,470.536722,H2O
2045,6947247.312920,2551584.053282,470.493698,
2046,6947242.696070,2551588.257362,474.830740,US_STRUCT
2047,6947251.367243,2551583.221765,470.995681,TE
2048,6947256.328621,2551578.766435,475.861734,CB
2049,6947288.485524,2551557.008759,477.218027,GR
2050,6947329.923891,2551529.663424,478.489576,GR
2051,6947372.507727,2551496.281854,479.529650,GR
2052,6947415.775385,2551443.623152,479.785626,ALPT2_OPEN
2053,6947207.935983,2551516.628919,470.028591,DIP1_56"
2054,6947213.138989,2551512.994337,470.130271,DIP2_56"
2055,6947217.722340,2551508.735733,469.950288,DIP3_56"
2056,6947213.134255,2551513.231367,474.287703,DS_STRUCT
2057,6947223.485725,2551560.832097,476.165948,TR
2058,6947189.292724,2551630.936889,476.698638,TR
2059,6947251.809175,2551487.158166,476.085236,TR
2060,6947162.278422,2551446.975567,470.487762,DS_IN
2061,6946955.507721,2551200.009194,469.435053,CHKIN_FS_2009

Appendix B
Stream 4C6 Tributary 2
Structure 32: I-20 Ramp



STR 32 looking downstream



STR 32 downstream face

str32.txt

STR_32
1001909,6942975.096000,2552021.022000,477.380000,STR_STR_32
1001929,6943915.697966,2550628.399441,459.566468,STR_32
1001909,6942975.096000,2552021.022000,477.380000,OCC
1001929,6943915.697966,2550628.399441,459.566468,FS
1929,6943915.697966,2550628.399441,459.566468,ALPT1_OPEN
1930,6943909.456583,2550605.057806,457.559919,CB
1931,6943905.858873,2550593.494446,454.207996,GR
1932,6943899.760245,2550581.883851,452.701142,TE
1933,6943897.542027,2550574.569884,452.126389,H2O
1934,6943891.420303,2550558.998364,453.189149,GR
1935,6943890.386965,2550563.128937,452.383708,H2O
1936,6943885.059493,2550543.779420,452.179600,H2O
1937,6943882.099510,2550536.434867,452.562738,TE
1938,6943875.335410,2550517.639896,460.221596,CB
1939,6943869.616516,2550501.649833,462.340367,ALPT2_OPEN
1940,6943907.218795,2550615.634128,461.105739,ERM
1941,6943890.392548,2550567.471874,460.982362,DS_STRUCT
1942,6943898.051060,2550588.898804,452.190856,UIB4_7X10
1943,6943893.131521,2550575.136615,452.150793,UIB3_7X10
1944,6943888.390285,2550561.454126,452.118049,UIB2_7X10
1945,6943883.434937,2550547.350978,452.156158,UIB1_7X10

5300GRID

Stream Name: 406 trib 2
Culvert: 3 boxes 7x10
Structure Name: STR-33
ERM: Δ 1946 x-cut on NE core of Structure top of HDWL,

Location: IH20 & Seagoville Rd

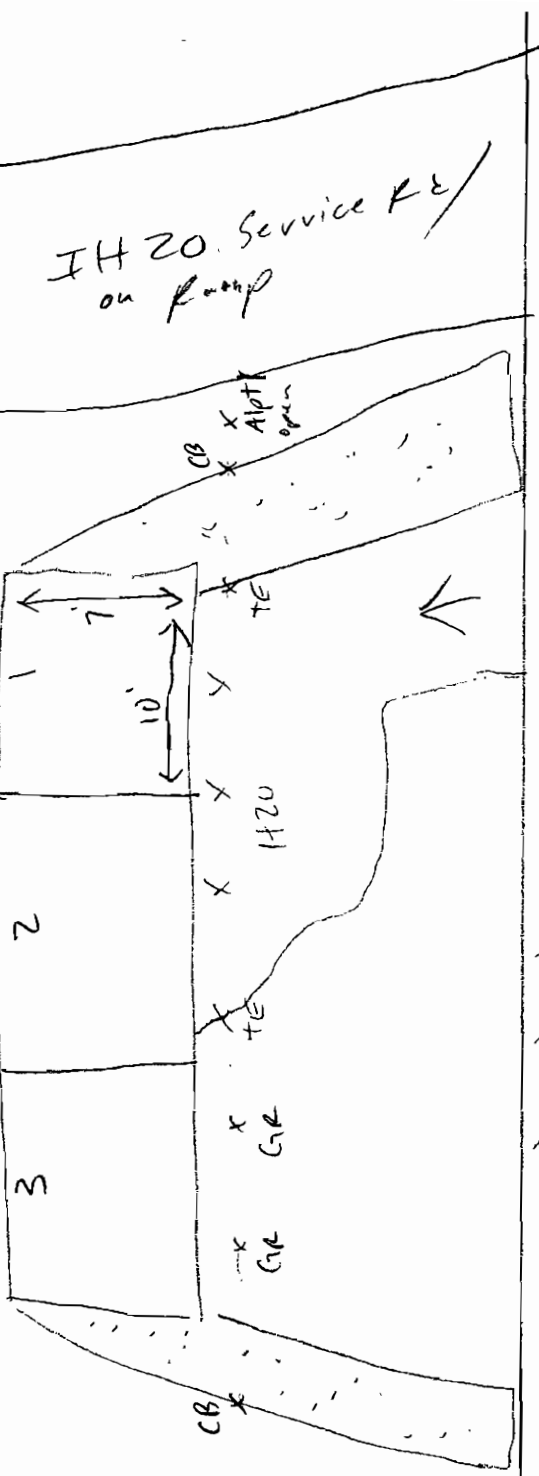
Date: 4-9-10
A. Garcia
B. Dierks
FCI

Photo ID:

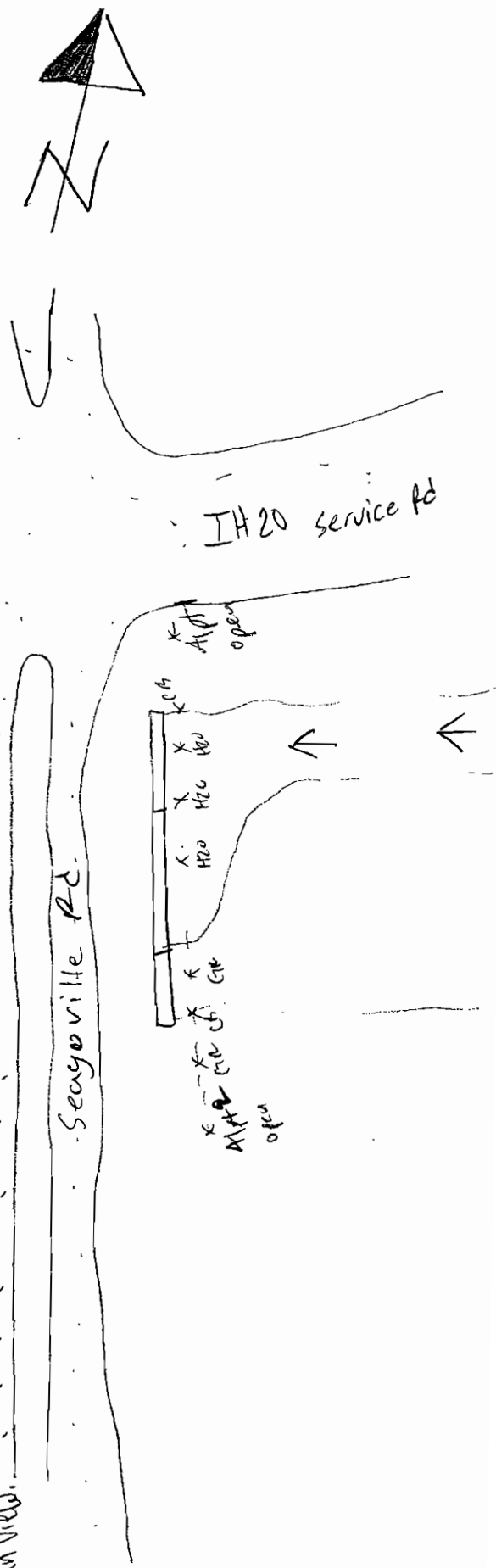
Lookin US. 19

Lookin USface 20

Profile View:



Plan View:



STR 33



STR 33 looking upstream



STR 33 upstream face

str33.txt

STR_33
1001909,6942975.096000,2552021.022000,477.380000,STR_STR_33
1001909,6942975.096000,2552021.022000,477.380000,STR_33
1001909,6942975.096000,2552021.022000,477.380000,OCC
1914,6943507.784937,2551485.762258,463.117334,ALPT2_OPEN
1915,6943513.563850,2551485.258298,462.640573,CB
1916,6943521.045117,2551484.633561,454.947878,GR
1917,6943538.771431,2551482.588602,454.235247,TE
1918,6943542.510085,2551482.980712,453.224381,H2O
1919,6943544.954731,2551483.238371,452.764903,H2O
1920,6943548.336776,2551482.541253,453.622781,H2O
1921,6943550.632593,2551482.246215,454.060483,TE
1922,6943556.626039,2551480.815330,455.570023,GR
1923,6943564.116740,2551480.432981,462.684514,CB
1924,6943576.051895,2551478.437075,462.786558,ALPT1_OPEN
1925,6943527.023626,2551480.886345,454.110757,DIB1_7X10
1926,6943537.954753,2551479.843346,454.188878,DIB2_7X10
1927,6943548.225298,2551478.848871,454.128826,DIB3_7X10
1928,6943539.289656,2551479.737190,462.990584,US_STRUCT
1946,6943562.092393,2551477.242407,462.940675,ERM

Appendix B
Stream 4C6 Tributary 2
Structure 35: I-20

Date 4-9-10
 A. Garcia
 B. Dierks
 FCI

SB80GRFD
 Location: IH20 Service Rd W. bound

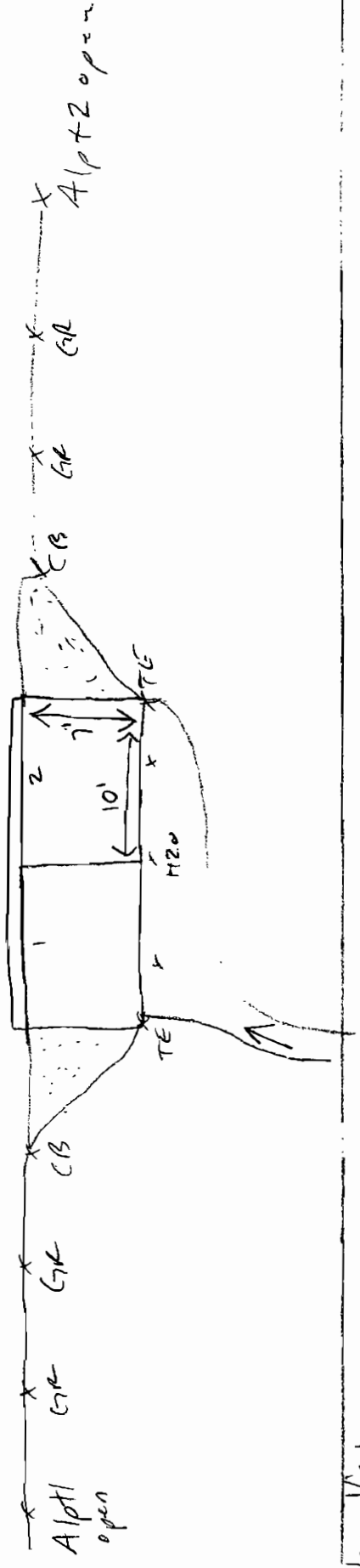
Stream Name: 406 trib 2
 Culvert: 2 boxes, 7x10
 Structure Name: STR-35

Photo ID:
 Looking US face 21
 Looking US 22

ERM: 1983 x-cut on top of HDWL, NE. cor. of structure

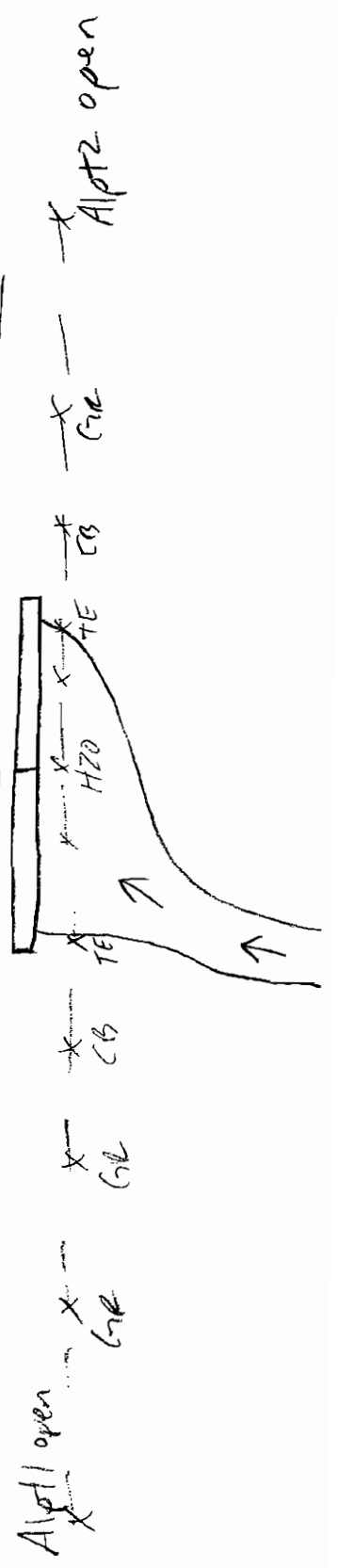
Profile View

Service Rd IH20



Plan View

IH20 Service Rd





STR 35 looking upstream



STR 35 upstream face

str35.txt

STR_35
1001909,6942975.096000,2552021.022000,477.380000,STR_STR_35
1001909,6942975.096000,2552021.022000,477.380000,STR_35
1001909,6942975.096000,2552021.022000,477.380000,OCC
1958,6944218.129565,2553003.265858,474.551522,ALPT2_OPEN
1959,6944225.491507,2553060.577703,474.643918,GR
1960,6944233.379298,2553116.637573,474.412278,GR
1961,6944241.382427,2553173.879484,473.418675,GR
1962,6944243.886882,2553195.263767,474.130308,CB
1963,6944245.312249,2553204.379024,471.821135,GR
1964,6944246.416797,2553212.821413,468.710874,GR
1965,6944246.556149,2553218.073316,466.731488,TE
1966,6944247.636467,2553223.479881,464.432083,H2O
1967,6944248.693604,2553228.883838,464.118367,H2O
1968,6944249.405885,2553232.130613,465.299763,H2O
1969,6944249.362169,2553234.139222,466.547914,TE
1970,6944246.490052,2553233.347842,466.281387,UIB1_7X10
1971,6944244.826937,2553221.737450,466.436367,UIB2_7X10
1972,6944250.377089,2553242.909046,468.155847,GR
1973,6944251.465767,2553254.466412,471.829449,GR
1974,6944251.321323,2553260.415130,473.945168,CB
1975,6944252.987951,2553278.163291,475.401527,GR
1976,6944260.343850,2553331.977163,473.917748,GR
1977,6944269.293299,2553388.041134,474.832325,GR
1978,6944275.072902,2553448.044547,476.448808,ALPT1_OPEN
1979,6944260.364870,2553434.195437,477.724715,GRAIL1
1980,6944248.410716,2553346.657000,477.178979,GRAIL1
1981,6944240.300594,2553349.172314,477.568999,TR
1982,6944237.672791,2553265.461774,476.889491,GRAIL1
1983,6944248.842345,2553257.952012,475.438392,ERM
1984,6944225.116143,2553234.978197,477.174323,TR
1985,6944231.083353,2553215.942643,476.838771,GRAIL1
1986,6944227.615601,2553161.124026,476.420788,GRAIL1/
1987,6944198.448460,2553033.906565,477.750369,TR

Appendix B
Hickory Creek
Cross Section 01

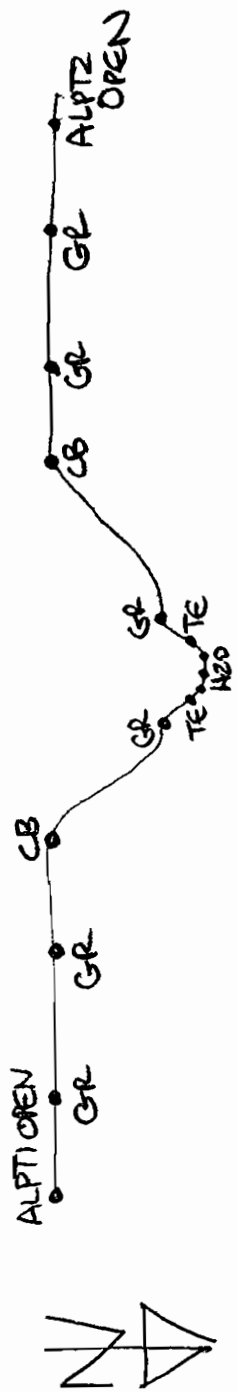
Stream Name Hickory Creek Location Dallas, TX Date 3-4-10
 Instrument BG Rodman TM Benchmark: ID Z55 Elev Survey File 5380 GRID - X501
 Type: XS () BR () DAM () Structure Name X501

Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bis Type Length Size: H X W Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew

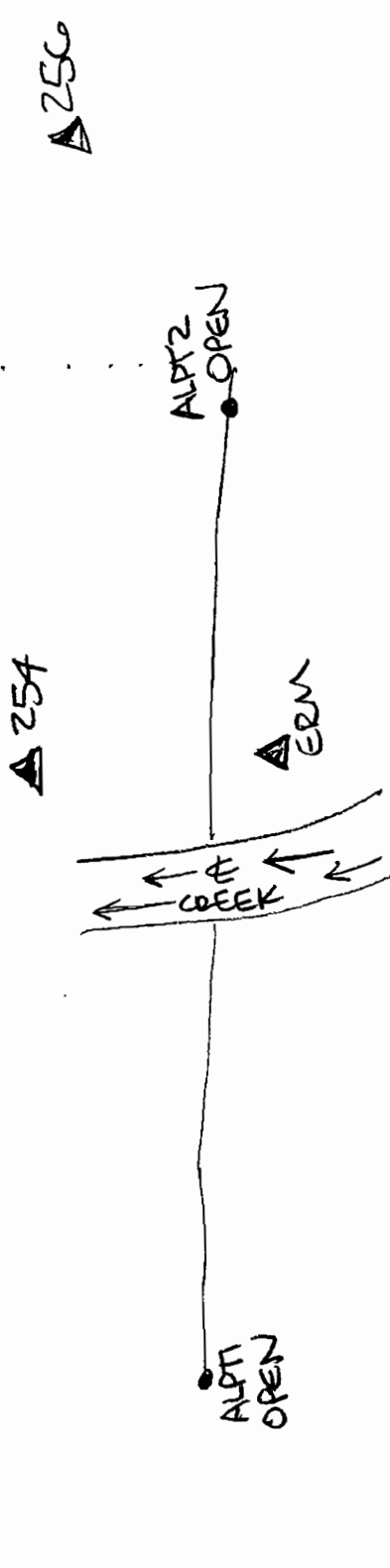
Photo IDs:
 Looking U/S 100-0439 Looking D/S 100-0439
 U/S Face D/S Face

Additional Comments:
 ERM Description: S1/2 orange cap TRAV. + 10' W. of W. side creek, under power lines, + 735' S. of BRUTON ST.

PROFILE VIEW



PLAN VIEW





XS-01 looking upstream



XS-01 looking downstream

XS_01.txt

XS_01

100255,6959719.470263,2544205.630560,500.081286,XS_XS_01
100256,6959495.203347,2544022.706423,497.661639,XS_01
100255,6959719.470263,2544205.630560,500.081286,OCC
100256,6959495.203347,2544022.706423,497.661639,BS
100400,6959495.155846,2544022.667678,497.611969,CHKIN_BS_256
401,6959742.623391,2544337.005947,500.708859,ALPT1_OPEN
402,6959739.152158,2544317.309487,500.608859,GR
403,6959733.945307,2544287.764797,500.508859,GR
404,6959728.738457,2544258.220107,500.408341,CB
405,6959721.587506,2544241.053478,495.844977,GR
406,6959721.749364,2544240.123914,494.772020,TE
407,6959721.696916,2544239.327646,494.193604,H2O
408,6959721.531962,2544237.896357,494.015873,H2O
409,6959721.750350,2544235.943174,494.142094,H2O
410,6959721.690882,2544234.870179,494.815298,TE
411,6959721.692275,2544233.145971,496.239032,GR
412,6959711.210092,2544213.625048,500.093053,CB
413,6959702.385415,2544185.935244,499.813926,GR
414,6959691.429072,2544153.694189,498.997696,GR
415,6959686.316573,2544140.652275,499.073335,ALPT2_OPEN
100416,6959607.321164,2544236.720480,499.572860,CHKIN_FS_254

Appendix B
Hickory Creek
Cross Section 02

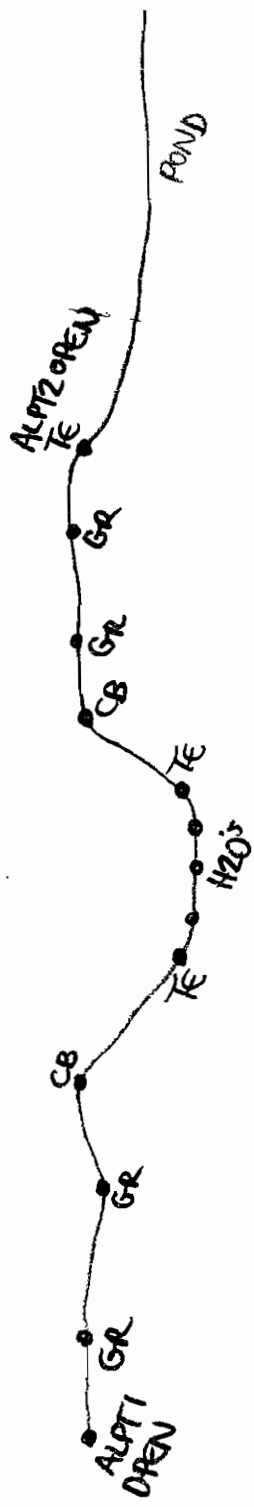
Stream Name Hickory Creek Location DALLAS TX Date 3-4-10
 Instrument B.G. Rodman T.M Benchmark: ID 249 Survey File 5380 GRID
 Type: XS () BR () CULV () DAM () Structure Name X502

Bridge: Rail _____ Deck _____ Width _____ Piers(s) _____ @ _____ Skew _____
 Culvert: #Bls _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

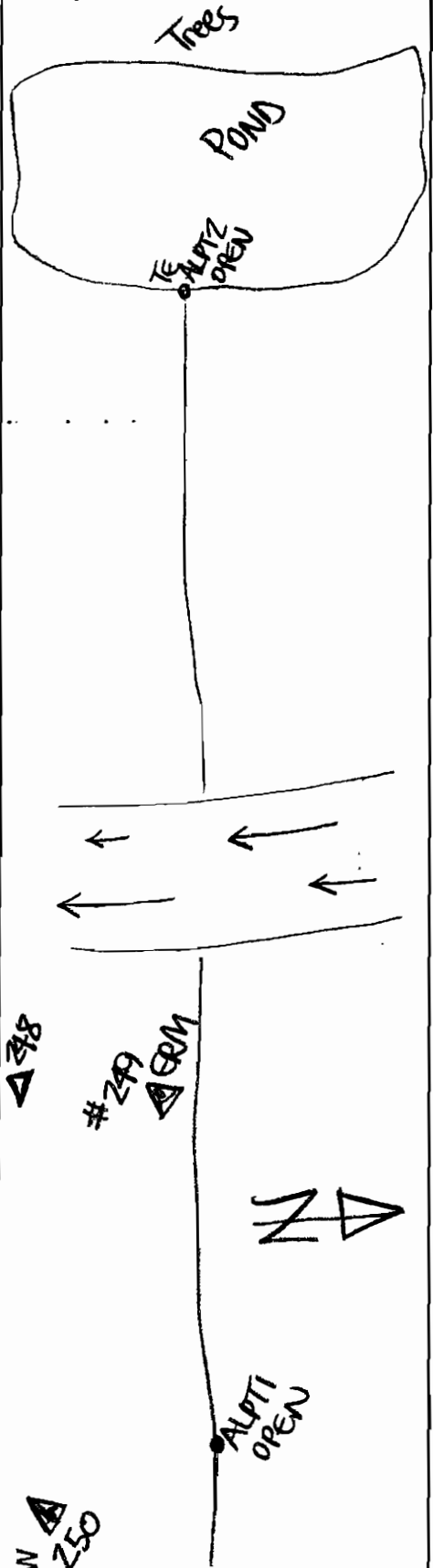
Photo IDs: Extra: 100-0442 W of creek
 Looking U/S 100-0440 Looking D/S 100-0441
 U/S Face _____ D/S Face _____

Additional Comments: There is a pond on W side of Creek
 ERM Description: SIF cap orange trav., E side creek @ CB, +100' N of cor black chlk. fnc., +60' E of obj. pps.

PROFILE VIEW



PLAN VIEW





XS-02 looking upstream



XS-02 looking downstream



XS-03 looking west

XS_02.txt

XS_02

100249,6957063.516913,2544343.447768,490.945091,XS_XS_02
100248,6956693.441501,2544328.374431,489.796912,XS_02
100249,6957063.516913,2544343.447768,490.945091,OCC
100248,6956693.441501,2544328.374431,489.796912,BS
100250,6956962.644996,2544468.617857,490.032811,FS
100417,6956693.406050,2544328.372987,489.690288,CHKIN_BS_248
100418,6956962.611848,2544468.667632,489.877958,CHKIN_FS_250
419,6957053.483155,2544445.253318,490.791608,ALPT1_OPEN
420,6957059.461896,2544409.282527,491.034382,GR
421,6957066.087837,2544365.151926,490.158322,GR
422,6957070.086232,2544342.816970,490.664956,CB
423,6957075.973341,2544323.809186,487.806700,TE
424,6957076.829411,2544321.134693,485.464793,H2O
425,6957084.150022,2544305.300722,487.819427,TE
426,6957082.071191,2544309.463721,485.924224,H2O
427,6957079.048700,2544314.797277,483.823276,H2O
428,6957092.340774,2544281.748556,491.232634,CB
429,6957096.733589,2544271.466481,492.000689,GR
430,6957103.719027,2544257.130956,491.400676,GR
431,6957105.003604,2544254.693505,489.913972,TE
432,6957105.004037,2544254.693701,489.914447,ALPT2_OPEN

Appendix B
Hickory Creek
Cross Section 03

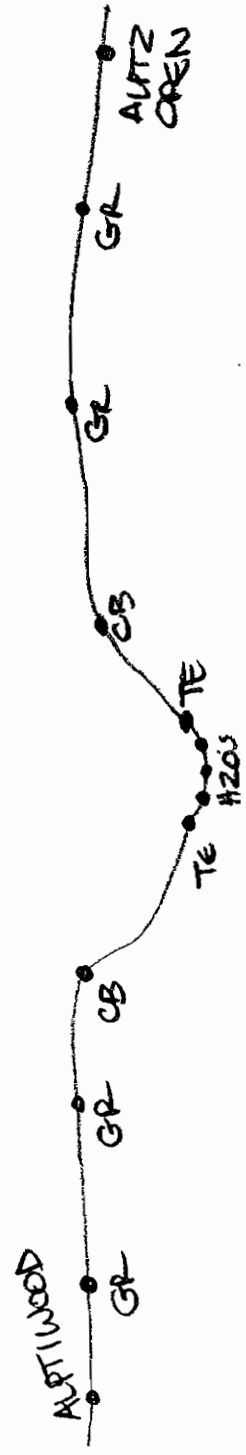
Stream Name Hickory Creek Location Dallas, TX Date 3-4-10
 Instrument BG Rodman IM Benchmark: ID 243 Elev _____ Survey File 5380GR1D
 Type: XS () BR () CULV () DAM () Structure Name X503

Bridge: Rail _____ Deck _____ Width _____ Piers(s) _____ @ _____ Skew _____
 Culvert: #Bls _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

Photo IDs:
 Looking U/S 100-443 Looking D/S 100-444
 U/S Face _____ D/S Face _____

Additional Comments: _____
 ERM Description: _____

PROFILE VIEW



PLAN VIEW





XS-03 looking upstream



XS-03 looking downstream

XS_03.txt

XS_03

100243,6954463.451376,2543959.269363,479.920794,XS_XS_03
100242,6953964.005009,2543758.786680,481.509388,XS_03
100243,6954463.451376,2543959.269363,479.920794,OCC
100242,6953964.005009,2543758.786680,481.509388,BS
100433,6953963.990682,2543758.780929,481.506365,CHKIN_BS_242
434,6954522.724408,2544032.930629,481.603666,GR
435,6954558.687186,2544039.698939,481.238144,ALPT1_WOOD
436,6954495.581104,2544024.795300,480.416212,GR
437,6954468.971190,2544015.880261,479.811927,CB
438,6954457.413069,2544011.190934,473.834829,TE
439,6954455.983300,2544010.267909,473.830795,H2O
440,6954454.137386,2544008.820780,473.710626,H2O
441,6954453.487630,2544007.565637,473.280641,H2O
442,6954452.332418,2544006.961577,473.897670,TE
443,6954448.148287,2544004.982906,477.426397,CB
444,6954433.638652,2543997.821181,479.911331,GR
445,6954394.212953,2543989.566212,480.772223,GR
446,6954343.148743,2543996.046609,480.673001,ALPT2_OPEN
100447,6954276.800209,2543975.165604,481.100505,CHKIN_FS_244

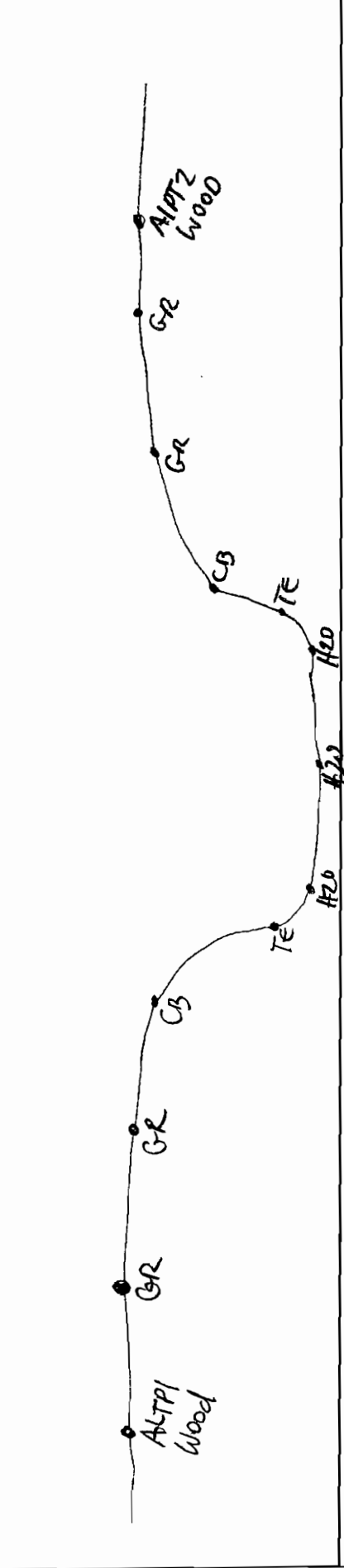
Appendix B
Hickory Creek
Cross Section 04

Stream Name Hickory Creek Location Dallas, TX Date 3-5-10
 Instrument B.F. Rodman I.M. Benchmark: ID 449 Survey File 53806-R/D
 Type: XS () BR () CULV () DAM () Structure Name X504
 Bridge: Rail _____ Deck _____ Width _____ Piers(s) _____ @ _____ Skew _____
 Culvert: #Bls _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

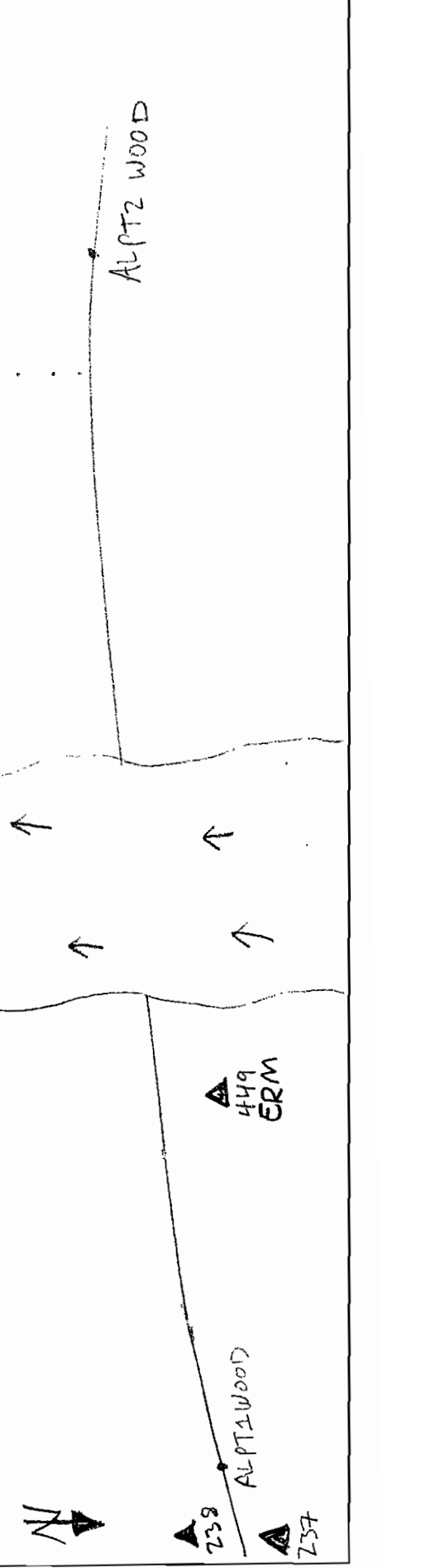
Photo IDs:
 Looking U/S 100-0447 Looking D/S 100-0446
 U/S Face _____ D/S Face _____

Additional Comments:
 ERM Description: S/R cap orange TRAV. @ creek @ CB, +- 142' W of #237, +- 150' W of MH

PROFILE VIEW



PLAN VIEW





XS-04 looking upstream



XS-04 looking downstream

XS_04.txt

XS_04

100449,6952257.233206,2544128.429812,472.353259,XS_XS_04
100237,6952281.643558,2544268.643536,474.421788,XS_04
100449,6952257.233206,2544128.429812,472.353259,OCC
100237,6952281.643558,2544268.643536,474.421788,BS
100450,6952252.247843,2544271.373672,473.547155,CHKIN_FS_238
100451,6952281.640644,2544268.626798,474.439333,CHKIN_BS_237
452,6952256.248780,2544091.721011,468.615959,CB
453,6952255.885978,2544094.846621,465.746488,TE
454,6952256.232132,2544096.322806,464.696491,H2O
455,6952256.434082,2544102.799876,464.493545,H2O
456,6952261.440442,2544078.136785,471.555075,GR
457,6952266.559759,2544039.089016,470.162124,GR
458,6952279.849852,2543996.008318,471.152872,ALPT2_WOOD
459,6952276.007381,2544239.615887,472.554377,ALPT1_WOOD
460,6952269.208615,2544203.478749,472.126580,GR
461,6952263.849545,2544166.356976,472.688960,GR
462,6952259.998581,2544119.235642,470.188878,CB
463,6952261.497706,2544116.661364,465.722624,TE
464,6952262.182873,2544113.866400,464.456946,H2O

Appendix B
Hickory Creek
Cross Section 06

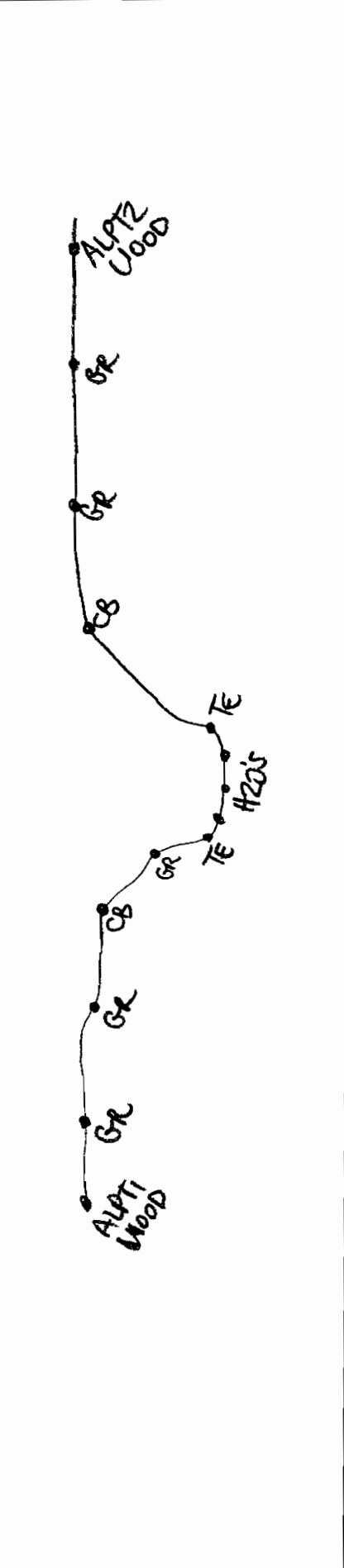
Stream Name Hickory Creek Location Dallas TX Date 3-5-10
 Instrument B.G. Rodman J.M. Benchmark: ID 466 Elev _____ Survey File 58806RID
 Type: XS (✓) BR () CULV () DAM () Structure Name X506

Bridge: Rail _____ Deck _____ Width _____ Piers(s) _____ @ _____ Skew _____
 Culvert: #Bls _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

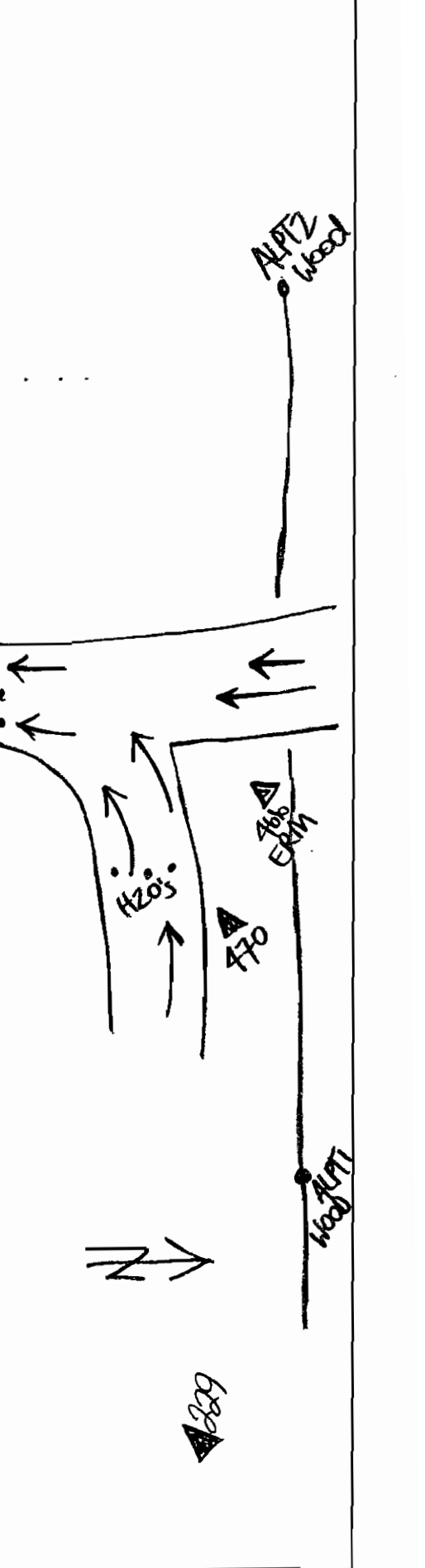
Photo IDs: _____
 Looking U/S: 100-0449 Looking D/S: 00-0448
 U/S Face _____ D/S Face _____

Additional Comments: Shot extra H2O shots @ incoming tributary and after on hickory
 ERM Description: SIR cap orange TRAV., + -10° E° of CB, + -50° NW of 6CHLK fnc. COR.

PROFILE VIEW



PLAN VIEW





XS-06 looking upstream



XS-06 looking downstream

XS_06.txt

XS_06

100466,6947262.441677,2545297.874221,454.647226,XS_XS_06
100475,6947284.544827,2545880.117931,458.975120,XS_06
100229,6947284.544374,2545880.106003,459.006200,SNTP
100227,6946390.781286,2545896.493279,454.757970,SNTP
100465,6946390.723945,2545896.489995,454.751786,CHKIN_BS_227
100466,6947262.441677,2545297.874221,454.647226,SIRCTP
100467,6947149.051022,2545474.835683,448.201929,H2O
100468,6947147.339379,2545476.488399,448.252072,H2O
100469,6947145.011539,2545478.089017,448.407088,H2O
100470,6947220.387712,2545351.286870,453.871663,SPKTP
100471,6947284.541904,2545880.085643,458.970245,CHKIN_BS_229
100472,6947056.513677,2545442.049457,443.111764,H2O
100473,6947054.879644,2545436.028687,441.829134,H2O
100474,6947051.667635,2545429.630879,440.602066,H2O
100466,6947262.441677,2545297.874221,454.647226,OCC
100475,6947284.544827,2545880.117931,458.975120,BS
476,6947215.965292,2545227.671942,452.803829,CB
477,6947191.018901,2545214.975452,453.025033,GR
478,6947172.028634,2545194.041389,455.031997,GR
479,6947160.935161,2545181.188301,455.681290,ALPT2_WOOD
480,6947223.805427,2545235.519479,444.118666,TE
481,6947225.432382,2545236.579980,443.249365,H2O
482,6947228.655164,2545241.676409,443.177406,H2O
483,6947237.524277,2545245.765503,444.267465,TE
484,6947236.674700,2545244.045825,443.255251,H2O
485,6947239.182315,2545246.761017,448.576848,GR
486,6947249.590773,2545255.588319,453.835612,CB
487,6947255.454199,2545262.863328,454.100893,GR
488,6947284.212515,2545291.699959,454.973926,GR
489,6947315.581119,2545331.622668,455.445620,ALPT1_WOOD
100490,6947220.382733,2545351.299468,453.859441,CHKIN_FS_470

Appendix B
Hickory Creek
Cross Section 09

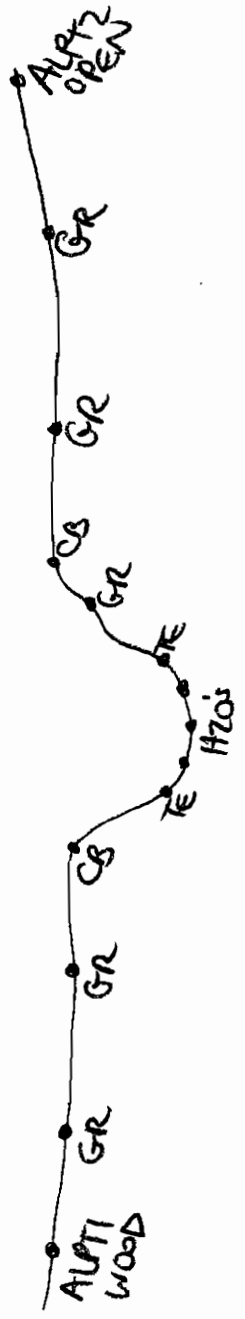
Stream Name Hickory Creek Location Dallas, TX Date 3-5-10
 Instrument B.G. Rodman T.M. Benchmark: ID 203 ELEV _____ Survey File 5380 GRID
 Type: XS (✓) BR () CULV () DAM () Structure Name X509

Bridge: Rail _____ Deck _____ Width _____ Piers(s) _____ @ _____ Skew _____
 Culvert: #Bls _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

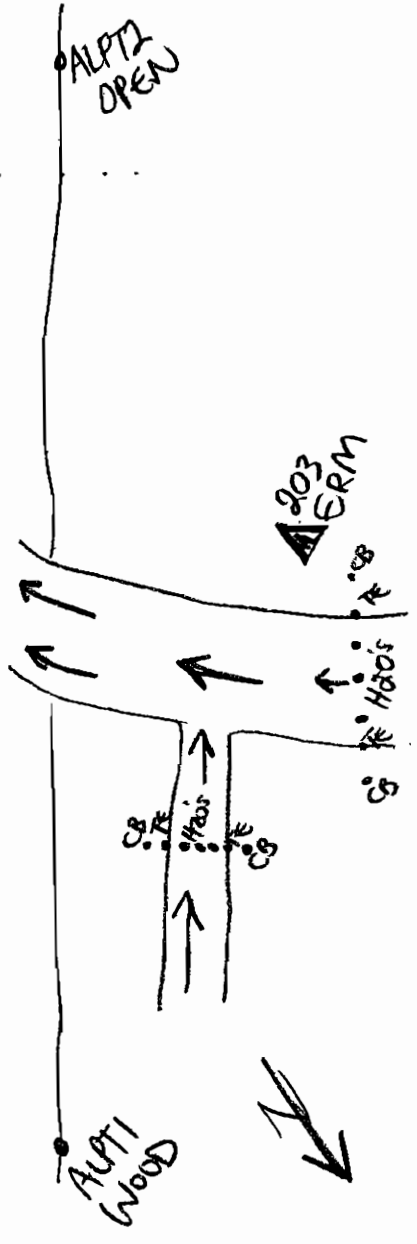
Photo IDs: Hickory-Tributary 100-0452
 Looking U/S 100-0450 Looking D/S 100-0451
 U/S Face _____ D/S Face _____

Additional Comments: Shot 100/BANK @ both sides tributary - Hickory int.
 ERM Description: S/R Cap Orange TRW. S/W Side of Creek On CB, T-40' W of Tributary - Hickory meeting

PROFILE VIEW



PLAN VIEW





XS-09 looking upstream



XS-09 looking downstream

XS_09.txt

XS_09

100203,6940970.365798,2546413.494143,432.826682,XS_XS_09
100202,6941196.575726,2546109.700997,436.982065,XS_09
100203,6940970.365798,2546413.494143,432.826682,OCC
100202,6941196.575726,2546109.700997,436.982065,BS
100491,6941196.585442,2546109.687950,437.025430,CHKIN_BS_202
100492,6940982.614687,2546385.263897,433.889644,CB
100493,6940994.108487,2546391.238175,428.781210,TE
100494,6940996.428808,2546391.130302,428.269975,H2O
100495,6940999.398564,2546390.728972,427.859127,H2O
100496,6941004.692943,2546389.946896,428.263395,H2O
100497,6941006.552609,2546390.662298,428.768007,TE
100498,6941011.563024,2546389.062283,432.704896,CB
100499,6941051.667074,2546421.810314,430.861489,CB
100500,6941051.794445,2546427.526935,426.095311,TE
100501,6941052.332532,2546427.977968,425.249931,H2O
100502,6941052.808973,2546429.560689,425.406168,H2O
100503,6941053.196880,2546431.224857,425.524337,H2O
100504,6941054.302885,2546431.564625,426.099624,TE
100505,6941049.260755,2546439.132202,432.438324,CB
506,6941077.745265,2546572.786276,435.636899,ALPT1_WOOD
507,6941034.349042,2546538.376574,432.761840,GR
508,6941009.260331,2546529.760792,433.032215,GR
509,6940991.238208,2546527.117674,431.358569,CB
510,6940983.542900,2546524.925751,425.817661,TE
511,6940980.997424,2546526.258819,424.499863,H2O
512,6940977.142290,2546526.424258,423.959199,H2O
513,6940974.908714,2546522.775736,424.326558,H2O
514,6940973.445900,2546522.896081,425.850140,TE
515,6940963.550872,2546528.011508,429.645468,GR
516,6940961.645120,2546526.798199,433.673027,CB
517,6940931.653883,2546527.453435,434.330770,GR
518,6940878.932645,2546520.969580,435.202236,GR
519,6940808.619333,2546508.761267,435.750236,ALPT2_OPEN
100520,6941269.427884,2546144.488655,438.243860,CHKIN_FS_204

Appendix B
Stream 4C6
Cross Section 11

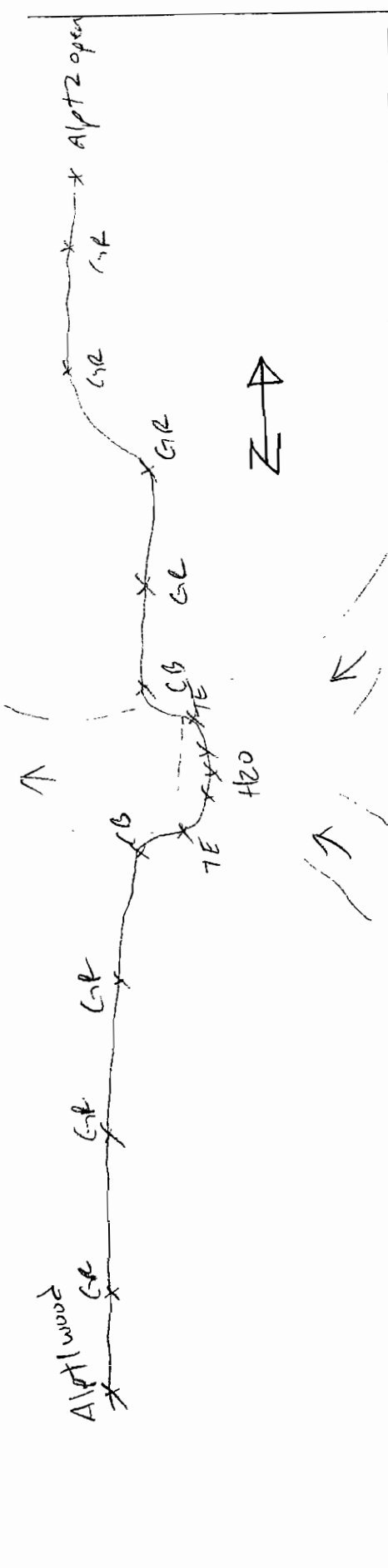
Stream Name 4C6 + Trib 1 Location S of Thorndale Date 3-23-10
 Instrument B. Dicks Rodman A. Garcia Benchmark: ID Δ 1490 Elev 5360 Survey File 5360 GRID
 Type: XS (→) BR () CULV () DAM () Structure Name XS-11

Bridge: Rail _____ Deck _____ Width _____ Piers(s) _____ @ _____ Skew _____
 Culvert: #Bls _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

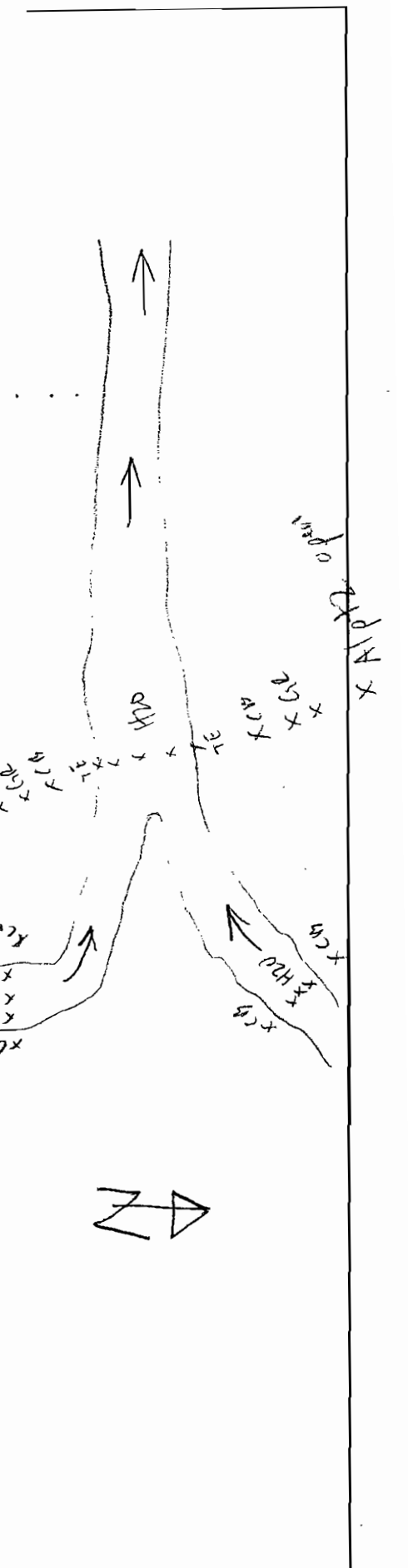
Photo IDs:
 Looking U/S 11 @ Split Looking D/S 10
 U/S Face 12 look u/s D/S Face 13 look in U/S

Additional Comments: _____
 ERM Description: _____

PROFILE VIEW



PLAN VIEW



XS 11 – south of Thorndale



XS 11 upstream



XS 11 downstream



XS 11 upstream at split



XS 11 upstream tributary

XS_11.txt

XS_11

1001490,6941978.959135,2546677.998330,350.941542,XS_XS_11
1001491,6942174.675553,2546501.642979,358.495765,XS_11
1001490,6941978.959135,2546677.998330,350.941542,OCC
1001491,6942174.675553,2546501.642979,358.495765,BS
1501,6942174.717953,2546501.599614,443.494255,CHKIN_BS_1491
1502,6942209.427982,2546594.661371,441.236258,CHKIN_FS_1492
1503,6942137.288723,2546546.257894,442.180642,ALPT2_OPEN
1504,6942104.307335,2546568.684891,441.182952,GR
1505,6942062.443001,2546596.313437,440.384091,GR
1506,6942042.384513,2546614.785683,437.218315,GR
1507,6942000.992189,2546654.709320,436.554226,GR
1508,6941968.691307,2546691.034379,435.153674,CB
1509,6941967.280544,2546692.189198,434.775024,GR
1510,6941965.984663,2546694.089979,433.576064,GR
1511,6941964.776971,2546695.247009,432.406782,TE
1512,6941963.088680,2546696.279084,430.880084,H2O
1513,6941960.135051,2546699.146964,429.214407,H2O
1514,6941955.482440,2546703.814342,429.391924,H2O
1515,6941954.045786,2546703.710032,432.479894,TE
1516,6941953.356029,2546704.194254,433.560081,GR
1517,6941951.293384,2546705.672803,435.300074,GR
1518,6941947.543663,2546708.473512,436.438030,CB
1519,6941931.165374,2546724.359787,437.227820,GR
1520,6941913.854726,2546743.018525,437.245209,GR
1521,6941874.036643,2546776.837245,437.620433,GR
1522,6941836.153448,2546840.181588,436.981907,ALPT1_WOOD
1523,6941873.575233,2546793.952005,437.420170,CB
1524,6941877.731473,2546796.082403,435.996992,GR
1525,6941882.557226,2546798.954245,432.620232,TE
1526,6941884.421730,2546800.789063,431.915383,H2O
1527,6941887.377939,2546801.669780,432.064870,H2O
1528,6941890.219341,2546801.852970,432.077152,H2O
1529,6941891.355686,2546802.407461,432.635254,TE
1530,6941894.012573,2546803.108847,434.850779,GR
1531,6941897.054051,2546804.699261,437.163939,CB
1532,6942051.549038,2546723.218869,435.518473,CB
1533,6942050.971343,2546724.931797,432.270296,TE
1534,6942050.291615,2546725.914446,431.547988,H2O
1535,6942049.776362,2546726.574399,431.466192,H2O
1536,6942051.079367,2546729.927278,431.703462,H2O
1537,6942050.595696,2546730.916083,432.354275,TE
1538,6942051.280485,2546732.208044,435.642878,CB
1539,6941949.867017,2546639.249901,431.564796,DS_IN

Appendix B
Stream 4C6
Cross Section 13

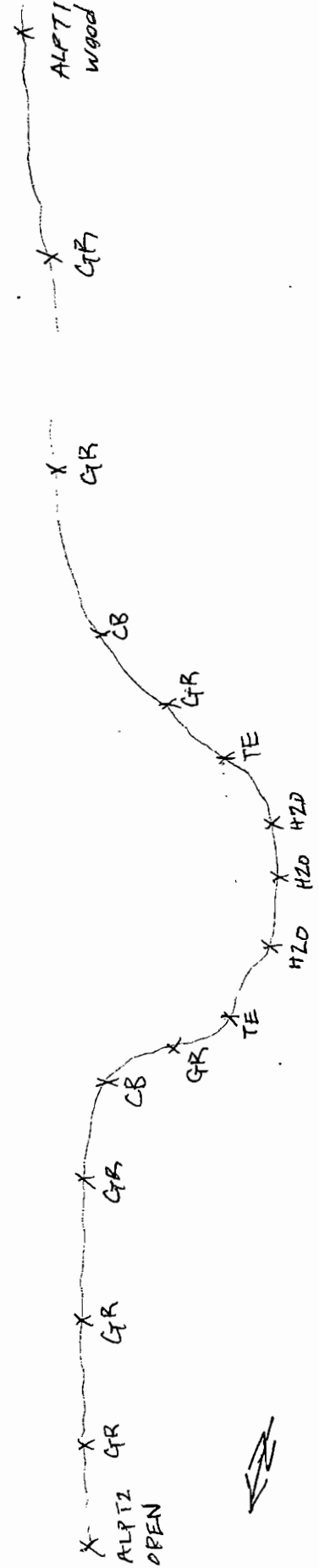
Stream Name Trib 1 Trib 2 meeting Point Location Sego, Wille, Road Date 4-19-20
 Instrument B. Dierks Rodman B. GARCIA Benchmark: ID A 2005 ELEV 5300 GFI 0
 Type: BR () CULV () DAM () Structure Name X 5 - 13

Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bls Type Length Size: H X W Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew

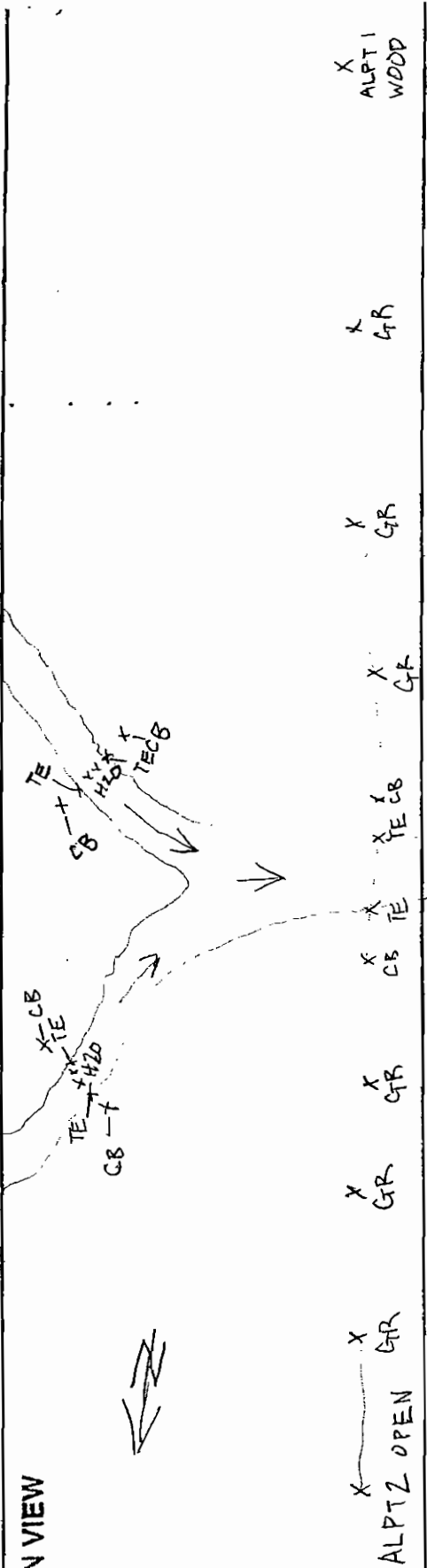
Photo IDs:
 Looking U/S 1617 Looking D/S 1518 con.
 U/S Face D/S Face Noise

Additional Comments:
 ERM Description: A 2005 Trav SN @ top of bank, +/- 30' N of Confluences

PROFILE VIEW



PLAN VIEW



XS 13



XS 13 looking upstream



XS 13 looking upstream



XS 13 looking downstream



Xs 13 looking downstream

xs13.txt

XS_13

1002085,6944126.339653,2549929.777877,455.266997,XS_XS_13
1002087,6944579.710634,2549918.265909,460.801220,XS_13
1002085,6944126.339653,2549929.777877,455.266997,OCC
1002087,6944579.710634,2549918.265909,460.801220,BS
2103,6944579.791704,2549918.263851,460.737465,CHKIN_BS_2087
2104,6944248.603201,2549868.245357,455.193397,ALPT1_OPEN
2105,6944205.025140,2549895.394065,455.499138,GR
2106,6944149.349412,2549927.773289,454.789359,GR
2107,6944129.234475,2549941.919056,454.986631,CB
2108,6944109.093677,2549949.716329,452.193877,GR
2109,6944103.102977,2549952.649359,450.476388,GR
2110,6944100.161372,2549953.600911,447.742209,TE
2111,6944098.697705,2549955.410305,446.518448,H2O
2112,6944098.596496,2549955.287861,446.257412,H2O
2113,6944172.813467,2549963.685689,453.828318,CB
2114,6944169.542086,2549971.936001,447.905918,TE
2115,6944169.040588,2549973.777608,447.245890,H2O
2116,6944168.248459,2549975.384709,446.900452,H2O
2117,6944168.996051,2549978.500867,446.713146,H2O
2118,6944168.969882,2549980.341505,447.839849,TE
2119,6944165.962717,2549984.323056,451.590503,CB
2120,6944104.365741,2549998.136994,452.861554,CB
2121,6944096.818092,2549997.703742,446.944365,TE
2122,6944095.105553,2549997.758017,446.422100,H2O
2123,6944092.154425,2549997.966844,446.844081,H2O
2124,6944090.893250,2549997.950733,447.907969,H2O
2125,6944088.945355,2549997.987559,448.314334,TE
2126,6944078.036956,2549998.079877,453.059825,CB
2127,6944078.531492,2549953.539338,447.798642,TE
2128,6944075.979336,2549955.813254,452.301345,CB
2129,6944067.699010,2549959.751501,452.465100,GR
2130,6944055.449564,2549963.646140,454.683285,GR
2131,6944019.506579,2549980.082821,455.149651,GR
2132,6943987.045316,2549996.252968,454.839666,GR
2133,6943919.357554,2550028.554199,453.943407,ALPT1_WOOD
2134,6944089.331347,2549957.537949,448.057306,H2O
2135,6944080.637536,2549862.374258,454.630645,CHKIN_FS_2086

Appendix B
Stream 4C6
Cross Section 14

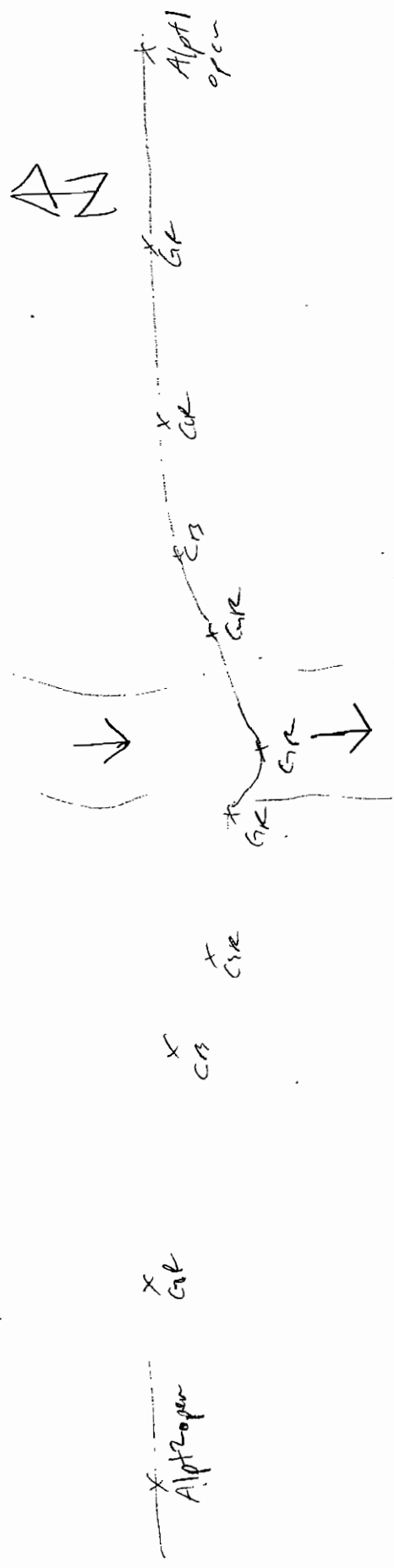
Stream Name 4C6 Trib 1 Location backlot lot 4-600' W of Seayville Rd Date 4-13-10
 Instrument A Garcia Rodman B Dicks Benchmark: ID 2083 Elevation 5380.6170 Survey File 5380.6170
 Type: XS (✓) BR () CULV () DAM () Structure Name XS-14

Bridge: Rail _____ Deck _____ Width _____ Piers(s) _____ @ _____ Skew _____
 Culvert: #Bis _____ Type _____ Length _____ Size: H _____ X W _____ Skew _____
 Dam: Top Width _____ Side Slope: U/S _____ D/S _____ Riser _____ X _____ Skew _____

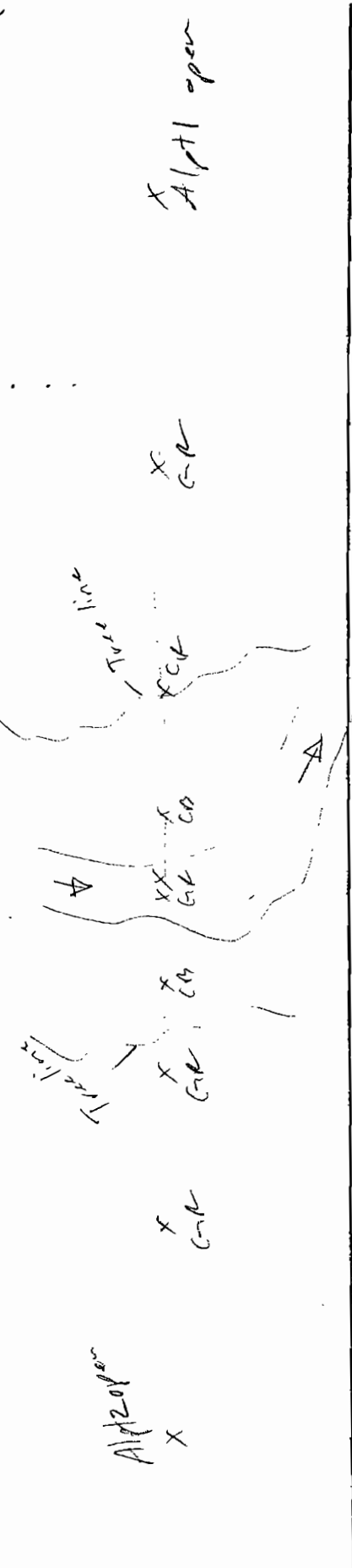
Photo IDs:
 Looking U/S: 4 Looking D/S: S
 U/S Face _____ D/S Face 6 Looking W @ Sec _____

Additional Comments: No water flow. Damed up with trees & trash.
 ERM Description: 2083 Turn SN 4-50' E of Creek on 50' S of A. fac line

PROFILE VIEW



PLAN VIEW



XS 14



XS 14 looking upstream



XS 14 looking downstream



XS 14 looking west

xs14.txt

XS_14

1002084,6945804.489203,2550352.092485,463.438696,XS_XS_14
1002082,6945870.138997,2550653.966104,468.846295,XS_14
1002084,6945804.489203,2550352.092485,463.438696,OCC
1002082,6945870.138997,2550653.966104,468.846295,BS
2089,6945870.153629,2550654.026339,468.891890,CHKIN_BS_2082
2090,6945851.819021,2550332.538740,463.659855,CHKIN_FS_2083
2091,6945767.949548,2550409.280810,463.633480,ALPT1_OPEN
2092,6945789.583577,2550367.734993,463.363233,GR
2093,6945827.661431,2550314.647571,463.632020,GR
2094,6945844.545621,2550273.587870,463.182877,GR
2095,6945854.747290,2550259.012104,462.060530,CB
2096,6945855.356174,2550255.282104,460.499279,GR
2097,6945855.857751,2550252.938913,460.449214,GR
2098,6945856.775037,2550249.519333,461.814524,CB
2099,6945868.916589,2550230.824974,463.110292,GR
2100,6945895.118618,2550184.493283,464.353304,GR
2101,6945925.023911,2550128.327358,466.050827,GR
2102,6945959.104563,2550067.113748,467.722437,ALPT2_OPEN
2083,6945851.764076,2550332.541996,463.705168,TRAV_SN

Appendix B
Stream 4C6 Tributary 2
Cross Section 18

Stream Name 406 Trib 2 Location @ Park off of Horseshoe St Woodland Park Date 4-13-10
 Instrument B. Dicks Rodman A. Garcia Benchmark: ID A2081 Elev Survey File SE80 Grid
 Type: XS () BR () DAM () Structure Name X5-1B

Bridge: Rail Deck Width Piers(s) @ Skew
 Culvert: #Bls Type Length Size: H X W Skew
 Dam: Top Width Side Slope: U/S D/S Riser X Skew

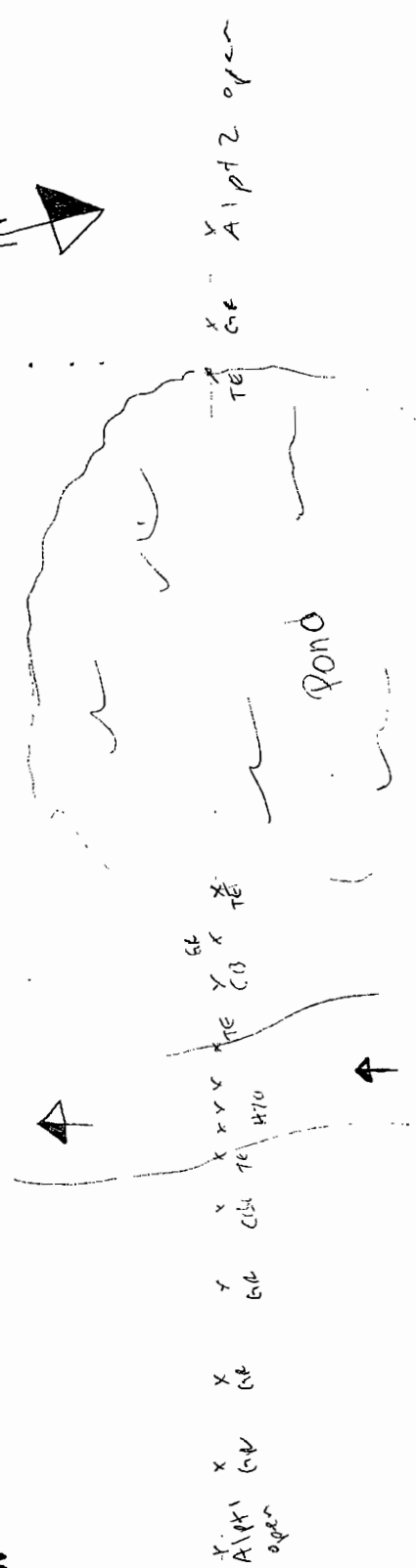
Photo IDs:
 Looking U/S Looking D/S
 U/S Face D/S Face
3 from N.E. Cont. point looking DS

Additional Comments:
 ERM Description: A2081 Truss SIV on E. CB of Creek

PROFILE VIEW



PLAN VIEW



XS 18



XS 18 looking upstream



XS 18 looking downstream

xs18.txt

XS18

1001909,6942975.096000,2552021.022000,477.380000,XS_XS_18
1002062,6943562.124758,2551477.244482,462.963257,XS_18
1001909,6942975.096000,2552021.022000,477.380000,OCC
1002062,6943562.124758,2551477.244482,462.963257,FS
2063,6945740.392183,2553657.258737,484.968694,TE
2064,6945741.094050,2553661.213802,486.028455,GR
2065,6945746.445113,2553680.687369,487.912132,CB
2066,6945758.671007,2553732.150360,488.376804,GR
2067,6945772.727976,2553800.483782,490.468423,GR
2068,6945775.799940,2553855.585552,491.242754,GR
2069,6945784.189263,2553889.326057,491.965879,ALPT1_OPEN
2070,6945740.381070,2553656.698417,484.752619,H2O
2071,6945740.216131,2553655.926801,484.627206,H2O
2072,6945739.877687,2553654.925734,484.627234,H2O
2073,6945739.897221,2553654.115964,484.923219,TE
2074,6945738.947326,2553650.166826,485.822215,GR
2075,6945738.076626,2553643.185282,488.038069,CB
2076,6945734.986351,2553615.792717,488.346286,GR
2077,6945733.100680,2553607.649211,488.163534,TE
2078,6945708.106995,2553439.585696,488.159669,TE
2079,6945701.233265,2553424.377451,490.108544,CB
2080,6945689.707155,2553399.855668,490.857932,ALPT2_OPEN
2081,6945868.744503,2553665.065058,490.152602,ERM



Table C.1 -Hickory Creek- Time of Concentration (Tc)

Table C.1 -Hickory Creek- Time of Concentration (Tc)																	
DA Name	Flow Regime	P ₂ (in)	SHEET AND CHANNEL	Sheet Flow N-Value	US Elevation (ft)	DS Elevation (ft)	Length (ft)	Slope (ft/ft)	Slope (ft/ft)	CHANNEL AND/OR PIPE VELOCITY (ft/s)	TR-55 equations for shallow concentrated	TR-55 Calculated Velocity (ft/s)	ΔT _c (hr)	Total Tc (hr)	Tlag (hr)	T lag (min)	NOTES
MES_B01	sheet	4.1		0.41	542.78	539.60	90.33	0.0352	0.0352				0.237	0.5083	0.31	18.3	
MES_B01	Shallow Paved				539.60	538.42	113.53	0.0104	0.0104			2.07	0.015	0.5083	0.31	18.3	
MES_B01	Shallow Unpaved				538.42	537.17	337.19	0.0037	0.0050			1.14	0.082	0.5083	0.31	18.3	
MES_B01	Shallow Paved				537.17	527.60	1021.38	0.0094	0.0094			1.97	0.144	0.5083	0.31	18.3	
MES_B01	Pipe				527.60	515.94	1070.31	0.0109	0.0109	10.00			0.030	0.5083	0.31	18.3	
MES_B02	sheet	4.1		0.41	533.48	531.07	75.09	0.0321	0.0321				0.212	0.3864	0.23	13.9	
MES_B02	Shallow Unpaved				531.07	526.16	480.01	0.0102	0.0102			1.63	0.082	0.3864	0.23	13.9	
MES_B02	Ditch				526.16	519.13	906.94	0.0078	0.0078	5.00			0.050	0.3864	0.23	13.9	
MES_B02	Pipe			519.13	505.38	1512.72	0.0091	0.0091	10.00			0.042	0.3864	0.23	13.9		
MES_B03	Sheet	4.1		0.41	511.70	510.50	96.32	0.0125	0.0125				0.333	0.3745	0.22	13.5	
MES_B03	Ditch				511.22	506.48	746.96	0.0063	0.0063	5.00			0.041	0.3745	0.22	13.5	
MES_B04	Sheet	4.1		0.41	546.64	546.35	85.36	0.0034	0.0050				0.333	0.8411	0.50	30.3	
MES_B04	Shallow Unpaved				546.35	544.09	347.28	0.0065	0.0065			1.30	0.074	0.8411	0.50	30.3	
MES_B04	Shallow Paved				544.09	519.78	2904.99	0.0084	0.0084			1.86	0.434	0.8411	0.50	30.3	
MES_B05	Sheet	4.1		0.41	524.39	524.00	97.72	0.0040	0.0050				0.333	0.6081	0.36	21.9	
MES_B05	Shallow Unpaved				524.00	516.94	745.10	0.0095	0.0095			1.57	0.132	0.6081	0.36	21.9	
MES_B05	Ditch				516.94	501.05	2578.81	0.0062	0.0062	5.00			0.143	0.6081	0.36	21.9	
MES_B06	Sheet	4.1		0.24	520.26	518.89	90.64	0.0151	0.0151				0.217	0.6055	0.36	21.8	
MES_B06	Shallow Unpaved				518.89	513.95	1064.25	0.0046	0.0050			1.14	0.259	0.6055	0.36	21.8	
MES_B06	Ditch				513.95	501.95	2324.12	0.0052	0.0052	5.00			1.14	0.129	0.6055	0.36	21.8
HC_B04	Sheet	4.1		0.41	524.29	522.14	85.64	0.0251	0.0251				0.260	0.5791	0.35	20.8	
HC_B04	Shallow Paved				522.14	517.75	882.89	0.0050	0.0050			1.44	0.171	0.5791	0.35	20.8	
HC_B04	Pipe				517.75	515.44	186.08	0.0124	0.0124	10.00			0.005	0.5791	0.35	20.8	
HC_B04	Ditch			515.44	500.91	2577.11	0.0056	0.0056	5.00			0.143	0.5791	0.35	20.8		
HC_B05	Sheet	4.1		0.41	521.62	520.98	57.28	0.0112	0.0112				0.261	0.5425	0.33	19.5	
HC_B05	Shallow Paved				520.98	513.27	1311.45	0.0059	0.0059			1.56	0.234	0.5425	0.33	19.5	
HC_B05	Pipe				513.27	500.73	1733.11	0.0072	0.0072	10.00			0.048	0.5425	0.33	19.5	
HC_B06	Sheet	4.1		0.41	536.17	535.61	85.87	0.0065	0.0065	11.00			0.333	1.0797	0.65	38.9	
HC_B06	Shallow Unpaved				535.61	527.19	979.80	0.0086	0.0086			1.50	0.182	1.0797	0.65	38.9	
HC_B06	Shallow Paved				527.19	506.59	1775.10	0.0116	0.0116			2.19	0.225	1.0797	0.65	38.9	
HC_B06	Shallow Unpaved				506.59	504.07	1012.76	0.0025	0.0050			1.14	0.247	1.0797	0.65	38.9	
HC_B06	Ditch				504.07	495.57	1286.02	0.0066	0.0066	5.00			0.071	1.0797	0.65	38.9	
HC_B06	Channel			495.57	494.30	427.19	0.0030	0.0050	5.50			0.022	1.0797	0.65	38.9		
HC_B07	Sheet	4.1		0.41	529.75	529.25	83.72	0.0059	0.0059				0.333	0.9991	0.60	36.0	
HC_B07	Shallow Unpaved				529.25	518.40	751.03	0.0144	0.0144			1.94	0.108	0.9991	0.60	36.0	
HC_B07	Shallow Paved				518.40	516.05	402.51	0.0058	0.0058			1.55	0.072	0.9991	0.60	36.0	
HC_B07	Shallow Unpaved				516.05	503.74	1290.73	0.0095	0.0095			1.58	0.228	0.9991	0.60	36.0	
HC_B07	Shallow Paved				503.74	502.36	284.01	0.0049	0.0050			1.44	0.055	0.9991	0.60	36.0	
HC_B07	Channel				502.36	489.10	1380.79	0.0096	0.0096	5.00			0.077	0.9991	0.60	36.0	
HC_B07	Channel				489.10	484.47	2030.41	0.0023	0.0050	4.43			0.127	0.9991	0.60	36.0	

DA Name	Flow Regime	P ₂ (in)	Sheet Flow N-Value	US Elevation (ft)	DS Elevation (ft)	Length (ft)	Slope (ft/ft)	Slope (ft/ft)	CHANNEL AND/OR PIPE VELOCITY (ft/s)	TR-55 Calculated Velocity (ft/s)	ΔT _c (hr)	Total Tc (hr)	Tlag (hr)	T lag (min)	NOTES	
HC_B08	Sheet	4.1	0.41	514.60	512.78	84.27	0.0216	0.0216		2.17	0.273	0.5968	0.36	21.5		
HC_B08	Shallow Paved			512.78	496.43	1439.05	0.0114	0.0114			0.184	0.5968	0.36	21.5		
HC_B08	Ditch			496.43	494.20	219.12	0.0102	0.0102	5.00		0.012	0.5968	0.36	21.5		
HC_B08	Pipe			494.20	485.57	2391.05	0.0036	0.0050	10.00		0.066	0.5968	0.36	21.5		
HC_B08	Ditch			485.57	477.74	666.61	0.0117	0.0117	5.00		0.037	0.5968	0.36	21.5		
HC_B08	Channel	4.1	0.41	477.74	474.86	485.28	0.0059	0.0059	5.62	1.44	0.024	0.5968	0.36	21.5		
HC_B09	Sheet			505.43	505.27	65.26	0.0025	0.0050			0.333	0.8569	0.51	30.8		
HC_B09	Shallow Paved			506.37	502.87	694.40	0.0050	0.0050			0.134	0.8569	0.51	30.8		
HC_B09	Shallow Unpaved			502.87	485.07	951.41	0.0187	0.0187			2.21	0.120	0.8569	0.51	30.8	
HC_B09	Ditch			487.07	468.19	1589.58	0.0119	0.0119	5.00		0.088	0.8569	0.51	30.8		
HC_B09	Channel	4.1	0.41	468.19	456.19	3042.80	0.0039	0.0050	4.64	1.59	0.182	0.8569	0.51	30.8		
HC_B10	Sheet			478.04	476.90	82.07	0.0139	0.0139			0.319	0.8326	0.50	30.0		
HC_B10	Shallow Paved			476.90	466.17	1762.50	0.0061	0.0061			3.77	0.017	0.8326	0.50	30.0	
HC_B10	Shallow Unpaved			466.17	453.33	235.67	0.0545	0.0545			0.188	0.8326	0.50	30.0		
HC_B10	Channel			453.33	442.11	2828.23	0.0040	0.0050	4.18		0.300	0.5573	0.33	20.1		
HC_B11	Sheet	4.1	0.41	475.60	473.63	93.79	0.0210	0.0210		1.58	0.122	0.5573	0.33	20.1		
HC_B11	Shallow Unpaved			476.42	469.78	694.57	0.0096	0.0096			0.096	0.5573	0.33	20.1		
HC_B11	Channel			469.78	438.88	1726.18	0.0179	0.0179	5.00		0.039	0.5573	0.33	20.1		
HC_B11	Channel			438.88	437.13	502.69	0.0035	0.0050	3.61		0.216	0.5689	0.34	20.5		
HC_B12	Sheet			487.05	484.63	76.20	0.0318	0.0318			0.117	0.5689	0.34	20.5		
HC_B12	Shallow Paved	4.1	0.41	484.63	469.92	1578.23	0.0093	0.0093		1.96	0.223	0.5689	0.34	20.5		
HC_B12	Pipe			469.92	437.60	4203.40	0.0077	0.0077	10.00		0.013	0.5689	0.34	20.5		
HC_B12	Channel			437.60	435.52	171.21	0.0121	0.0121	3.64		0.282	0.4946	0.30	17.8		
HC_B13	Sheet			469.63	467.75	87.65	0.0214	0.0214			0.101	0.4946	0.30	17.8		
HC_B13	Shallow Unpaved			467.75	464.76	469.09	0.0064	0.0064			0.056	0.4946	0.30	17.8		
HC_B13	Ditch	4.1	0.41	464.76	455.86	1005.79	0.0088	0.0088	5.00	1.29	0.014	0.4946	0.30	17.8		
HC_B13	Pipe			455.86	449.61	510.83	0.0122	0.0122	10.00		0.032	0.4946	0.30	17.8		
HC_B13	Ditch			449.61	437.50	568.02	0.0213	0.0213	5.00		0.010	0.4946	0.30	17.8		
HC_B13	Channel			437.50	432.39	158.13	0.0323	0.0323	4.59		0.252	0.5485	0.33	19.7		
HC_B14	Sheet			463.06	462.05	64.76	0.0156	0.0156			0.093	0.5485	0.33	19.7		
HC_B14	Shallow Unpaved	4.1	0.41	462.05	447.70	746.41	0.0192	0.0192		2.24	0.026	0.5485	0.33	19.7		
HC_B14	Pipe			447.70	437.25	923.13	0.0113	0.0113	10.00		0.175	0.5485	0.33	19.7		
HC_B14	Shallow Unpaved			437.25	431.03	862.20	0.0072	0.0072			0.004	0.5485	0.33	19.7		
HC_B14	Channel			431.03	430.63	66.23	0.0060	0.0060	4.89		0.124	0.4346	0.26	15.6		
HC_B15	Sheet			464.60	457.91	96.31	0.0695	0.0695			0.207	0.4346	0.26	15.6		
HC_B15	Shallow Unpaved	4.1	0.24	457.91	442.10	959.92	0.0165	0.0165		2.07	0.003	0.4346	0.26	15.6		
HC_B15	Pipe			442.10	441.25	114.93	0.0074	0.0074	10.00		0.073	0.4346	0.26	15.6		
HC_B15	Shallow Unpaved			441.25	431.68	555.00	0.0172	0.0172			0.106	0.4346	0.26	15.6		
HC_B15	Channel			431.68	428.11	1492.67	0.0024	0.0050	3.91		0.230	0.7372	0.44	26.5		
HCT4_B01	Sheet			514.91	514.62	56.58	0.0051	0.0051			1.75	0.259	0.7372	0.44	26.5	
HCT4_B01	Shallow Unpaved	4.1	0.24	514.62	495.37	1633.88	0.0118	0.0118		1.65	0.090	0.7372	0.44	26.5		
HCT4_B01	Shallow Paved			495.37	491.86	535.21	0.0066	0.0066			0.088	0.7372	0.44	26.5		
HCT4_B01	Shallow Unpaved			491.86	487.51	483.79	0.0090	0.0090			0.070	0.7372	0.44	26.5		
HCT4_B01	Pipe			487.51	474.72	2529.21	0.0051	0.0051	10.00		0.243	0.7635	0.46	27.5		
HCT4_B02	Sheet			524.32	523.82	70.99	0.0070	0.0070			0.239	0.7635	0.46	27.5		
HCT4_B02	Ditch	523.82	479.35	4300.84	0.0103	0.0103	5.00									

DA Name	Flow Regime	P ₂ (in)	Sheet Flow N-Value	US Elevation (ft)	DS Elevation (ft)	Length (ft)	Slope (ft/ft)	Slope (ft/ft)	CHANNEL AND/OR PIPE VELOCITY (ft/s)	TR-55 Calculated Velocity (ft/s)	ΔT _c (hr)	Total Tc (hr)	Flag (hr)	T lag (min)	NOTES
HCT4_B02	Pipe	4.1	0.41	479.35	464.05	2766.93	0.0055	0.0055	10.00	1.51	0.077	0.7635	0.46	27.5	
HCT4_B02	Channel			464.05	442.11	2535.40	0.0087	0.0087	3.43		0.205	0.7635	0.46	27.5	
4C6_B01	Sheet	4.1	0.41	510.57	509.91	84.17	0.0079	0.0079		2.30	0.333	0.4946	0.30	17.8	
4C6_B01	Shallow Unpaved			509.91	503.09	782.02	0.0087	0.0087			0.144	0.4946	0.30	17.8	
4C6_B01	Pipe	4.1	0.41	503.09	497.63	626.68	0.0087	0.0087	10.00	1.88	0.017	0.4946	0.30	17.8	
4C6_B01	Shallow Paved			503.09	497.63	626.68	0.0087	0.0087			0.162	0.4946	0.30	17.8	
4C6_B02	Sheet	4.1	0.41	513.33	512.00	84.19	0.0158	0.0158		2.16	0.309	0.5568	0.33	20.0	
4C6_B02	Shallow Unpaved			512.00	497.66	707.96	0.0203	0.0203			0.086	0.5568	0.33	20.0	
4C6_B02	Channel	4.1	0.41	497.66	487.88	1566.45	0.0062	0.0062	2.68	1.88	0.162	0.5568	0.33	20.0	
4C6_B02	Shallow Paved			497.66	487.88	1566.45	0.0062	0.0062			0.162	0.5568	0.33	20.0	
4C6_B03	Sheet	4.1	0.41	513.08	513.00	77.07	0.0010	0.0050		2.16	0.333	0.6907	0.41	24.9	
4C6_B03	Shallow Unpaved			513.08	513.00	77.07	0.0010	0.0050			0.045	0.6907	0.41	24.9	
4C6_B03	Shallow Paved	4.1	0.41	506.71	496.90	1146.39	0.0086	0.0086		1.88	0.169	0.6907	0.41	24.9	
4C6_B03	Ditch			506.71	496.90	1146.39	0.0086	0.0086			0.169	0.6907	0.41	24.9	
4C6_B03	Channel	4.1	0.41	484.66	474.05	1904.79	0.0056	0.0056	5.80	2.42	0.091	0.6907	0.41	24.9	
4C6_B03	Shallow Unpaved			484.66	474.05	1904.79	0.0056	0.0056			0.091	0.6907	0.41	24.9	
4C6_B04	Sheet	4.1	0.41	510.41	509.93	86.62	0.0055	0.0055		1.61	0.333	0.5586	0.34	20.1	
4C6_B04	Shallow Paved			510.41	509.93	86.62	0.0055	0.0055			0.333	0.5586	0.34	20.1	
4C6_B04	Pipe	4.1	0.41	486.60	472.00	551.06	0.0265	0.0265	10.00	2.42	0.015	0.5586	0.34	20.1	
4C6_B04	Channel			486.60	472.00	551.06	0.0265	0.0265			0.015	0.5586	0.34	20.1	
4C6_B04	Channel	4.1	0.41	472.00	470.89	396.52	0.0028	0.0050	5.23	1.61	0.021	0.5586	0.34	20.1	
4C6_B04	Shallow Unpaved			472.00	470.89	396.52	0.0028	0.0050			0.021	0.5586	0.34	20.1	
4C6_B05	Sheet	4.1	0.41	510.41	510.09	81.58	0.0039	0.0050		2.42	0.333	0.5606	0.34	20.2	
4C6_B05	Shallow Paved			510.41	510.09	81.58	0.0039	0.0050			0.333	0.5606	0.34	20.2	
4C6_B05	Shallow Unpaved	4.1	0.41	510.09	508.99	175.08	0.0063	0.0063		1.61	0.030	0.5606	0.34	20.2	
4C6_B05	Pipe			510.09	508.99	175.08	0.0063	0.0063			0.030	0.5606	0.34	20.2	
4C6_B05	Channel	4.1	0.41	508.99	467.30	2153.96	0.0194	0.0194	10.00	2.42	0.060	0.5606	0.34	20.2	
4C6_B05	Shallow Paved			508.99	467.30	2153.96	0.0194	0.0194			0.060	0.5606	0.34	20.2	
4C6_B05	Channel	4.1	0.41	467.30	460.50	1761.26	0.0039	0.0050	3.56	1.61	0.138	0.5606	0.34	20.2	
4C6_B05	Shallow Unpaved			467.30	460.50	1761.26	0.0039	0.0050			0.138	0.5606	0.34	20.2	
4C6_B06	Sheet	4.1	0.41	478.10	477.56	87.26	0.0062	0.0062		2.42	0.333	0.7187	0.43	25.9	
4C6_B06	Shallow Unpaved			478.10	477.56	87.26	0.0062	0.0062			0.333	0.7187	0.43	25.9	
4C6_B06	Shallow Paved	4.1	0.41	477.56	476.00	113.34	0.0138	0.0138		1.89	0.017	0.7187	0.43	25.9	
4C6_B06	Shallow Unpaved			477.56	476.00	113.34	0.0138	0.0138			0.017	0.7187	0.43	25.9	
4C6_B06	Channel	4.1	0.41	477.56	471.79	755.95	0.0076	0.0076		1.78	0.118	0.7187	0.43	25.9	
4C6_B06	Shallow Unpaved			477.56	471.79	755.95	0.0076	0.0076			0.118	0.7187	0.43	25.9	
4C6_B06	Channel	4.1	0.41	471.79	462.00	699.37	0.0140	0.0140		1.91	0.102	0.7187	0.43	25.9	
4C6_B06	Shallow Unpaved			471.79	462.00	699.37	0.0140	0.0140			0.102	0.7187	0.43	25.9	
4C6_B06	Channel	4.1	0.41	462.00	448.85	1744.43	0.0075	0.0075	3.25	2.42	0.149	0.7187	0.43	25.9	
4C6_B06	Shallow Paved			462.00	448.85	1744.43	0.0075	0.0075			0.149	0.7187	0.43	25.9	
4C6_B07	Sheet	4.1	0.41	461.23	461.07	59.97	0.0027	0.0050		1.47	0.333	0.5484	0.33	19.7	
4C6_B07	Shallow Paved			461.23	461.07	59.97	0.0027	0.0050			0.333	0.5484	0.33	19.7	
4C6_B07	Shallow Unpaved	4.1	0.41	461.07	455.23	1108.92	0.0053	0.0053		1.47	0.209	0.5484	0.33	19.7	
4C6_B07	Pipe			461.07	455.23	1108.92	0.0053	0.0053			0.209	0.5484	0.33	19.7	
4C6_B07	Channel	4.1	0.41	455.23	448.15	236.42	0.0300	0.0300	10.00	1.47	0.007	0.5484	0.33	19.7	
4C6_B07	Shallow Unpaved			455.23	448.15	236.42	0.0300	0.0300			0.007	0.5484	0.33	19.7	
4C6_B08	Ditch	4.1	0.41	484.59	453.53	1964.76	0.0158	0.0158	5.00	1.47	0.109	0.1774	0.11	6.4	
4C6_B08	Channel			484.59	453.53	1964.76	0.0158	0.0158			0.109	0.1774	0.11	6.4	
4C6_B08	Pipe	4.1	0.41	453.53	443.68	292.87	0.0336	0.0336	10.00	1.47	0.008	0.1774	0.11	6.4	
4C6_B08	Channel			453.53	443.68	292.87	0.0336	0.0336			0.008	0.1774	0.11	6.4	
4C6_B08	Channel	4.1	0.41	443.68	440.91	1095.29	0.0025	0.0050	5.06	1.47	0.060	0.1774	0.11	6.4	
4C6_B08	Shallow Unpaved			443.68	440.91	1095.29	0.0025	0.0050			0.060	0.1774	0.11	6.4	
4C6_B09	Sheet	4.1	0.41	481.11	480.88	75.68	0.0030	0.0050		2.88	0.333	0.5141	0.31	18.5	
4C6_B09	Shallow Unpaved			481.11	480.88	75.68	0.0030	0.0050			0.333	0.5141	0.31	18.5	
4C6_B09	Channel	4.1	0.41	480.88	443.29	1179.90	0.0319	0.0319		2.88	0.114	0.5141	0.31	18.5	
4C6_B09	Shallow Paved			480.88	443.29	1179.90	0.0319	0.0319			0.114	0.5141	0.31	18.5	
4C6_B09	Channel	4.1	0.41	443.29	435.12	1168.83	0.0070	0.0070	4.82	2.88	0.067	0.5141	0.31	18.5	
4C6_B09	Shallow Unpaved			443.29	435.12	1168.83	0.0070	0.0070			0.067	0.5141	0.31	18.5	
4C6_B10	Sheet	4.1	0.41	458.62	456.86	98.37	0.0179	0.0179		2.39	0.333	0.4995	0.30	18.0	
4C6_B10	Shallow Unpaved			458.62	456.86	98.37	0.0179	0.0179			0.333	0.4995	0.30	18.0	
4C6_B10	Channel	4.1	0.41	456.86	438.10	856.33	0.0219	0.0219		2.39	0.100	0.4995	0.30	18.0	
4C6_B10	Shallow Paved			456.86	438.10	856.33	0.0219	0.0219			0.100	0.4995	0.30	18.0	
4C6_B10	Channel	4.1	0.41	438.10	431.55	795.57	0.0082	0.0082	3.29	2.39	0.067	0.4995	0.30	18.0	
4C6_B10	Shallow Unpaved			438.10	431.55	795.57	0.0082	0.0082			0.067	0.4995	0.30	18.0	
4C6_B11	Sheet	4.1	0.41	469.58	468.83	67.95	0.0110	0.0110		3.29	0.300	0.4903	0.29	17.7	
4C6_B11	Shallow Paved			469.58	468.83	67.95	0.0110	0.0110			0.300	0.4903	0.29	17.7	
4C6_B11	Ditch	4.1	0.41	468.83	462.70	234.28	0.0262	0.0262		3.29	0.020	0.4903	0.29	17.7	
4C6_B11	Shallow Unpaved			468.83	462.70	234.28	0.0262	0.0262			0.020	0.4903	0.29	17.7	
4C6_B11	Channel	4.1	0.41	462.70	438.32	1796.01	0.0136	0.0136	5.00	2.49	0.100	0.4903	0.29	17.7	
4C6_B11	Shallow Unpaved			462.70	438.32	1796.01	0.0136	0.0136			0.100	0.4903	0.29	17.7	
4C6_B11	Channel	4.1	0.41	438.32	432.53	243.65	0.0238	0.0238		2.49	0.027	0.4903	0.29	17.7	
4C6_B11	Shallow Paved			438.32	432.53	243.65	0.0238	0.0238			0.027	0.4903	0.29	17.7	
4C6_B11	Channel	4.1	0.41	432.53	428.11	486.39	0.0091	0.0091	3.13	2.49	0.043	0.4903	0.29	17.7	
4C6_B11	Shallow Unpaved			432.53	428.11	486.39	0.0091	0.0091			0.043	0.4903	0.29	17.7	
4C6T1_B01	Sheet	4.1	0.41	510.94	510.78	99.29	0.0016	0.0050		2.10	0.333	0.6948	0.42	25.0	
4C6T1_B01	Shallow Unpaved			510.94	510.78	99.29									

DA Name	Flow Regime	P ₂ (in)	Sheet Flow N-Value	US Elevation (ft)	DS Elevation (ft)	Length (ft)	Slope (ft/ft)	Slope (ft/ft)	CHANNEL AND/OR PIPE VELOCITY (ft/s)	TR-55 Calculated Velocity (ft/s)	ΔT _c (hr)	Total Tc (hr)	Tlag (hr)	T lag (min)	NOTES
4C6T1_B01	Channel	4.1	0.24	461.71	455.39	1562.10	0.0040	0.0050	5.00	1.66	0.087	0.6948	0.42	25.0	
4C6T1_B02	Sheet			473.67	472.74	86.95	0.0107	0.0107			0.242	0.5564	0.33	20.0	
4C6T1_B02	Shallow Unpaved	4.1	0.24	472.74	455.43	1644.53	0.0105	0.0105		2.88	0.276	0.5564	0.33	20.0	
4C6T1_B02	Shallow Paved			455.43	450.33	254.98	0.0200	0.0200			0.025	0.5564	0.33	20.0	
4C6T1_B02	Channel	4.1	0.24	450.33	446.82	307.18	0.0114	0.0114	6.04	1.87	0.014	0.5564	0.33	20.0	
4C6T1_B03	Sheet			475.42	473.90	89.66	0.0170	0.0170			0.206	0.5457	0.33	19.6	
4C6T1_B03	Shallow Paved	4.1	0.24	473.90	461.10	1513.11	0.0085	0.0085		1.84	0.225	0.5457	0.33	19.6	
4C6T1_B03	Pipe			461.10	447.94	1444.17	0.0091	0.0091	10.00		0.040	0.5457	0.33	19.6	
4C6T1_B03	Channel	4.1	0.24	447.94	442.54	1068.42	0.0051	0.0051	3.95	2.05	0.075	0.5457	0.33	19.6	
4C6T1_B04	Sheet			459.75	458.92	98.95	0.0084	0.0084			0.295	0.5881	0.35	21.2	
4C6T1_B04	Shallow Unpaved	4.1	0.24	458.92	449.25	745.27	0.0130	0.0130		1.84	0.113	0.5881	0.35	21.2	
4C6T1_B04	Pipe			449.25	439.91	265.17	0.0352	0.0352	10.00		0.007	0.5881	0.35	21.2	
4C6T1_B04	Channel	4.1	0.24	439.91	431.55	2234.56	0.0037	0.0050	3.59	2.05	0.173	0.5881	0.35	21.2	
4C6T2_B01	Sheet			516.66	512.70	91.29	0.0434	0.0434			0.220	0.3672	0.22	13.2	
4C6T2_B01	Shallow Paved	4.1	0.41	512.70	504.87	772.33	0.0101	0.0101		2.05	0.105	0.3672	0.22	13.2	
4C6T2_B01	Pipe			504.87	491.21	1530.68	0.0089	0.0089	10.00		0.043	0.3672	0.22	13.2	
4C6T2_B02A	Sheet	4.1	0.41	508.97	508.71	48.32	0.0054	0.0054		1.67	0.305	0.6317	0.38	22.7	
4C6T2_B02A	Shallow Unpaved			508.71	506.76	182.14	0.0107	0.0107			0.030	0.6317	0.38	22.7	
4C6T2_B02A	Shallow Paved	4.1	0.41	506.76	484.16	2111.81	0.0107	0.0107		2.85	0.279	0.6317	0.38	22.7	
4C6T2_B02A	Shallow Unpaved			484.16	478.46	182.14	0.0313	0.0313			0.018	0.6317	0.38	22.7	
4C6T2_B02B	Sheet	4.1	0.41	496.09	494.71	92.93	0.0148	0.0148	5.01	1.54	0.333	0.6530	0.39	23.5	
4C6T2_B02B	Shallow Paved			494.71	488.70	1052.86	0.0057	0.0057			0.190	0.6530	0.39	23.5	
4C6T2_B02B	Channel	4.1	0.24	488.70	472.55	1060.64	0.0152	0.0152	5.00	2.05	0.059	0.6530	0.39	23.5	
4C6T2_B02B	Channel			472.55	467.35	1027.12	0.0051	0.0051	4.04		0.071	0.6530	0.39	23.5	
4C6T2_B03	Sheet	4.1	0.24	505.79	505.68	96.69	0.0011	0.0050		1.65	0.333	0.6327	0.38	22.8	
4C6T2_B03	Shallow Unpaved			505.68	500.08	345.70	0.0162	0.0162			0.047	0.6327	0.38	22.8	
4C6T2_B03	Ditch	4.1	0.41	500.08	462.50	3846.15	0.0098	0.0098	5.00	1.95	0.214	0.6327	0.38	22.8	
4C6T2_B03	Pipe			462.50	459.81	369.07	0.0073	0.0073	10.00		0.010	0.6327	0.38	22.8	
4C6T2_B03	Channel	4.1	0.41	459.81	454.44	721.37	0.0074	0.0074	6.90	1.65	0.029	0.6327	0.38	22.8	
4C6T2_B04	Sheet			496.21	494.87	97.81	0.0137	0.0137			0.333	0.7403	0.44	26.7	
4C6T2_B04	Shallow Unpaved	4.1	0.41	494.87	475.67	1834.48	0.0105	0.0105		1.65	0.309	0.7403	0.44	26.7	
4C6T2_B04	Pipe			475.67	452.54	1792.78	0.0129	0.0129	10.00		0.050	0.7403	0.44	26.7	
4C6T2_B04	Channel	4.1	0.41	452.54	450.22	665.78	0.0035	0.0050	3.79	1.95	0.049	0.7403	0.44	26.7	
4C6T3_B01	Sheet			515.51	513.85	91.51	0.0181	0.0181			0.312	0.4522	0.27	16.3	
4C6T3_B01	Shallow Paved	4.1	0.41	513.85	508.21	610.61	0.0092	0.0092		1.95	0.087	0.4522	0.27	16.3	
4C6T3_B01	Pipe			508.21	495.10	1472.80	0.0089	0.0089	10.00		0.041	0.4522	0.27	16.3	
4C6T3_B01	Channel	4.1	0.41	495.10	488.00	217.92	0.0326	0.0326	5.00	1.95	0.012	0.4522	0.27	16.3	



Appendix D.1
HEC-HMS Results
Existing Conditions

Table D.1 HEC-HMS Results Existing Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
4C3_010	0.82	364.7	708.7	943.2	1229.2	1450.1	1691.2	2035.8	2336.4
4C3_020	0.32	196.8	346.5	444.5	562.3	652.8	752	893.5	1015.8
4C3_030	0.25	136.9	245.6	317.5	404	470.5	543.2	647.1	736.8
4C3_040	0.53	329	612.3	801.9	1031.9	1208.8	1402.5	1678.7	1918
4C3_050	0.56	253.3	492	654.7	852.5	1005.9	1173.6	1413.2	1622.2
4C6_B01	0.055	55.4	95.2	121.1	152.7	176.7	203.1	240.6	272.8
4C6_B02	0.14	125.8	220.8	283	358.6	416.3	479.7	569.6	647.1
4C6_B03	0.147	121.7	209.8	266.9	335.8	388.9	447.2	530.1	601.4
4C6_B04	0.142	145.5	242	304	379.1	436.6	499.8	589.7	666.7
4C6_B05	0.136	116	207	267.3	340.7	396.7	458.2	545.4	620.7
4C6_B06	0.114	54	114.5	157	210.1	251.3	296.5	361	417.9
4C6_B07	0.041	28.9	55.9	74.2	96.8	114.2	133.2	160.2	183.6
4C6_B08	0.088	106.4	190	245.5	313.9	365.9	422.2	500.9	569
4C6_B09	0.081	56.1	110.4	147.6	194	229.6	268.5	323.8	372.1
4C6_B10	0.016	10	20.6	28.1	37.3	44.5	52.3	63.4	73.2
4C6_B11	0.036	24.1	48.6	65.6	86.7	102.9	120.6	145.8	167.8
4C6_J01	0.055	55.4	95.2	121.1	152.7	176.7	203.1	240.6	272.8
4C6_J02	0.195	150.4	263.5	337.4	426.1	492.8	564.8	665.6	750.4
4C6_J03	0.342	141.8	251.5	323.1	408.2	472.6	540.4	633.3	713.5
4C6_J04	0.484	263.2	456.6	584.2	737.3	853.7	979.5	1174	1326.8
4C6_J05	0.62	318.5	566.2	740.8	950.4	1117.6	1295.5	1546.6	1758
4C6_J06	1.5489	817.8	1536.1	2048.9	2718.2	3273.6	3862.9	4661.6	5239.3
4C6_J07	1.5899	808.2	1497.1	2001.6	2663.2	3202	3781	4581.1	5156
4C6_J08	1.6779	799.8	1504.9	2013.9	2681.4	3214.3	3803	4604.9	5207.2
4C6_J09	1.7589	792	1518.7	2039.6	2720.1	3257.9	3874.5	4705.5	5328
4C6_J10	2.3099	777.4	1285.9	1566.1	2204.3	3235.3	4279.1	5599.4	6508.5
4C6_R01	0.055	43.5	74.9	95.1	114.3	129.7	147	172.1	194.2
4C6_R02	0.195	101.4	156	195.7	255.9	300.4	347.7	413.3	465.3
4C6_R03	0.342	138.5	246.2	316.3	398.9	461.1	531.6	626	705.7
4C6_R04	0.484	246.2	430.3	556.5	705.3	821.9	947.5	1126.4	1274.9

Table D.1 HEC-HMS Results Existing Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
4C6_R05	0.62	307.2	552	717.6	923.7	1085.1	1258.5	1498.9	1649.1
4C6_R06	1.5489	792.2	1466.3	1958.4	2608.2	3132	3692	4474.4	5040.3
4C6_R07	1.5899	783.9	1476.3	1975.4	2630.4	3151.7	3732.9	4522.6	5116.7
4C6_R08	1.6779	776.4	1483.6	1990.9	2650.6	3174.3	3770	4569.8	5174.5
4C6_R09	1.7589	665.4	1108.4	1359.1	1866.9	2578.7	3324.5	4269.9	4995.3
4C6_R10	2.3099	771.4	1269.6	1534.2	2194.1	3149.6	4205.7	5537.5	6474
4C6T1_B01	0.34	231.2	430.3	563.2	724.9	849.1	985.2	1178.9	1346.8
4C6T1_B02	0.057	31.6	66.7	91.4	122.5	146.5	172.8	210.3	243.2
4C6T1_B03	0.094	52.7	111.2	152.7	204.5	244.5	288.3	350.7	405.7
4C6T1_B04	0.044	25	51.7	70.4	93.6	111.4	131	159	183.5
4C6T1_J01	0.34	231.2	430.3	563.2	724.9	849.1	985.2	1178.9	1346.8
4C6T1_J02	0.397	242.9	461.5	610.9	793.8	934.1	1087.4	1306.4	1497.7
4C6T1_J03	0.491	268.8	518.7	680.4	883.5	1030.9	1191.5	1412.9	1613.6
4C6T1_R01	0.34	217.3	407.2	535.4	693.1	813.4	944.7	1132.2	1295.8
4C6T1_R02	0.397	236	448.8	587.9	761.8	889.7	1030	1226.2	1400
4C6T1_R03	0.491	263.9	507.2	662.9	850.1	991.1	1149.1	1360	1605
4C6T2_B00	0.091	107.4	183.3	232.7	293.2	339.2	389.6	460.7	521.9
4C6T2_B01	0.0769	70.4	119	150.4	188.5	217.7	249.8	295.4	334.6
4C6T2_B02	0.035	27.3	48.9	63.1	80.3	93.5	108	128.5	146.3
4C6T2_B03	0.299	226.5	412.3	535.4	685.1	800.5	926.8	1106.3	1261.7
4C6T2_B04	0.195	127.4	237.1	310.3	399.2	467.7	543	650	742.9
4C6T2_J00	0.091	107.4	183.3	232.7	293.2	339.2	389.6	460.7	521.9
4C6T2_J01	0.1679	167.3	287.3	362.4	458	528.8	607.1	718.5	817.7
4C6T2_J02	0.3209	194.8	333.2	451.6	650.7	860.5	1048.9	1283.5	1470.7
4C6T2_J03	0.6199	416	737.1	972.2	1301.5	1616.3	1930.9	2328.6	2620
4C6T2_J04	0.8149	533.6	962.6	1269.4	1690.1	2064.9	2455.5	2950.9	3314.8
4C6T2_R00	0.091	109.8	183.1	234.9	293	340.7	391.1	462.2	521.6
4C6T2_R01	0.1679	166.8	283.6	360	452.7	523.5	601.1	711.3	807.8
4C6T2_R02	0.3209	190.7	324.8	442.6	637.6	829.5	1005.3	1223.9	1373.2
4C6T2_R03	0.6199	407.9	726.6	962	1293.8	1597.4	1913.2	2301.8	2583.2
4C6T3_B01	0.118	124.4	213.9	272.2	343.2	397.4	456.7	540.7	613

Table D.1 HEC-HMS Results Existing Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
4C6T3_RES01	0.118	99.6	144.3	164.9	178.7	181.8	184	186.4	187.9
4C6T3_RES02	0.118	17.5	82.6	110.5	124.7	130.2	134.1	138.4	141.5
H_0060	0.86	330.6	670.9	906.8	1197.2	1422.2	1667.9	2019.5	2327.9
H_0070	1.01	340.4	691.8	936.5	1237	1469.7	1722.9	2087.1	2407.2
H_0080	0.34	268.2	470.8	603.2	763.1	885.8	1020.5	1212.4	1377.9
H_0090	1	361.5	734.3	993.4	1311.2	1558	1827.1	2212.6	2550.9
HC_B04	0.071	71.4	118.5	148.9	185.7	213.9	244.9	289	326.7
HC_B05	0.12	120	202.8	256.3	321.1	370.7	425.2	502.8	569.3
HC_B06	0.0146	217.9	364.1	457.7	569.7	655.9	750.7	886.5	1003
HC_B07	0.54	354.1	611.9	779.5	981.1	1136.1	1306	1548.7	1757.4
HC_B08	0.425	383.9	661.5	841.7	1060.1	1227.2	1410.7	1671.8	1896.3
HC_B09	0.293	348.8	649.6	850.7	1094.5	1282	1487.5	1781.2	2036.1
HC_B10	0.269	146.9	284.9	378.4	493.3	582	679	817.3	937.9
HC_B11	0.183	141.9	262.8	344.3	443.9	520.1	603.6	722.1	824.7
HC_B12	0.2	185.8	319.3	406.7	512.7	593.7	682.6	808.8	917.3
HC_B13	0.104	90.7	165.1	214.5	274.9	321.1	371.6	443.2	505.2
HC_B14	0.069	65.6	112.9	143.6	181	209.5	240.9	285.4	323.6
HC_B15	0.097	65.6	135.2	183.8	244.4	291.1	342.1	414.5	477.9
HC_J02	0.936	195.7	359.2	465.3	847.3	1246.9	1674.2	2242.4	2616.6
HC_J03	1.056	288.4	519.2	666.6	968	1387.3	1847.2	2444.3	2890.5
HC_J04	1.3756	480.5	827.2	1040.9	1388.2	1892.1	2405.6	3108.4	3710.8
HC_J05	1.9156	718.3	1209.5	1530.2	1995.5	2482.4	3139.4	4048	4868.1
HC_J06	1.9156	691.9	1156.4	1464.6	1902.3	2342.1	2886.8	3797.2	4585.7
HC_J07	2.3406	762	1266.6	1601.1	2061	2512.7	3061.2	3947	4773.2
HC_J08	2.9249	811.4	1362.5	1724.4	2208.1	2657.7	3193.2	4063.9	4902
HC_J09	3.8709	1201.8	2029.3	2563.4	3204.1	3657.8	4190.3	5151.9	5998.7
HC_J10	4.0539	1237.9	2035.1	2534.1	3174.8	3676	4242.9	5140	5936.5
HC_J11	4.2539	1062.6	1710.6	2430.9	3162.8	3709	4293.8	5176.3	5928.4
HC_J12	4.3579	1068.6	1716.5	2438	3185.4	3739.6	4337.4	5230.5	5989.4
HC_J13	4.4269	1073.1	1721.3	2426.1	3181.6	3743.8	4349.7	5245.7	6001.9
HC_R01	0.936	191.1	349.4	456	827.7	1186.7	1580.1	2085.8	2490.9

Table D.1 HEC-HMS Results Existing Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
HC_R02	1.056	263.8	466.2	595.6	899.7	1281	1681	2235.8	2723.5
HC_R03	1.3756	449	764.9	978.4	1343.4	1755.8	2232.8	2902	3549.9
HC_R04	1.9156	691.9	1156.4	1464.6	1902.3	2342.1	2886.8	3797.2	4585.7
HC_R05	1.9156	683.5	1146.2	1452.2	1888.7	2318.7	2838.8	3670	4460.2
HC_R06	2.3406	736.3	1231.1	1558.7	2011.2	2432.1	2928.5	3728.2	4507.1
HC_R07	2.9249	806.5	1352.3	1712.4	2186.4	2623.9	3155.5	4008.7	4833.1
HC_R08	3.8709	1194.4	1973.7	2467	3087	3578.6	4137.7	5017.3	5799
HC_R09	4.0539	1041.3	1680.9	2378.1	3087.3	3618	4190.1	5053.9	5790.3
HC_R10	4.2539	1060.5	1704.1	2415.3	3152.4	3699.4	4289.9	5172.1	5922.4
HC_R11	4.3579	1067.6	1713	2411.2	3160.3	3717.3	4318.2	5207.5	5957.9
HC_R12	4.4269	1067.2	1704.4	2376.2	3140.5	3703.6	4328.1	5226.9	5978.5
HCT4_B01	0.197	157.1	270.6	344.4	433.9	502.5	577.7	684.9	777.1
HCT4_B02	0.48	373.4	645.1	821.4	1033.8	1196.8	1375.8	1630.9	1850.2
HCT4_J01	0.197	157.1	270.6	344.4	433.9	502.5	577.7	684.9	777.1
HCT4_J02	0.677	456.1	813.5	1021.6	1269.9	1459.7	1666.6	1957.7	2206
HCT4_R01	0.197	145.4	246.6	310.8	387.5	438	497.7	589.5	667.5
JA4C3_010	0.82	364.7	708.7	943.2	1229.2	1450.1	1691.2	2035.8	2336.4
JA4C3_020	0.32	196.8	346.5	444.5	562.3	652.8	752	893.5	1015.8
JA4C3_030	1.07	476	907	1208.4	1577.9	1859.2	2163.6	2600.3	2983.7
JA4C3_040	1.92	741.4	1410.4	1837.1	2368.9	2816	3348.6	3985.5	4518.2
JA4C3_050	2.48	823.1	1619.7	2118.6	2732.7	3241	3866.9	4713.4	5253.2
JAH_0070	1.01	340.4	691.8	936.5	1237	1469.7	1722.9	2087.1	2407.2
JAH_0080	8.0698	1445.6	2507	3372.8	4522.1	5401.9	6384.4	7936.7	9202.2
JAH_0090	10.0798	1385.5	2527.3	3434.8	4657.1	5739.4	6912.1	8787.8	10471
JC_Outlet	12.5598	1705.8	3405.2	4704.6	6413	7776.9	9326	11972.2	14505.5
JC4C3_030	1.39	642.6	1201.4	1597.7	2074.5	2445.9	2840.1	3404.1	3898.2
JCH_0080	9.0798	1505.1	2640.8	3556.6	4818.3	5824.9	6952.9	8754.2	10247.3
JH_0060	7.7298	1482.5	2537.3	3419.2	4549.9	5416.6	6387.7	7912.8	9173.9
MES_B01	0.158	170.7	283.6	356.2	444.5	511.9	586	691.2	781.4
MES_B02	0.276	331.8	558	704.5	883.6	1019.9	1169.1	1379.8	1560.8
MES_B03	0.04	42.6	75.5	97.2	123.9	144.2	166.3	197.6	224.6

Table D.1 HEC-HMS Results Existing Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
MES_B04	0.229	145.4	265.5	344.9	441.6	516	597.4	713.5	813.9
MES_B05	0.074	60.2	107.6	138.9	176.9	206	237.9	283.2	322.3
MES_B06	0.088	75.2	132.1	169.3	214.4	248.9	286.8	340.6	387
MES_J01	0.434	347	579.3	728.4	910	1048.2	1199.4	1413.1	1597.1
MES_J02	0.474	110.3	235.7	433.6	823.5	1068.4	1293	1576.1	1790.4
MES_J03	0.703	190.8	323.7	528.7	916.4	1161	1389.1	1677.7	1897.8
MES_J04	0.777	161.3	323	525.6	959.8	1251.1	1523.7	1874.1	2142.9
MES_J05	0.865	154.9	290.7	398.6	743.7	1088.6	1470	1971.1	2304.1
MES_R01	0	0	0	0	0	80.3	226.4	440.4	606.7
MES_R04	0.229	83	102.4	111.3	122.1	127	128.7	130.3	131.2
MES_Res01	0.158	25	30.5	33.9	37.9	40.6	41.5	42.2	42.7
MES_RES01_36"Co	0.158	25	30.5	33.9	37.9	40.6	41.5	42.2	42.7
MES_RES01_48"Co	0.158	25	30.5	33.9	37.9	40.6	41.5	42.2	42.7
MES_RES01_72"Co	0.158	25	30.5	33.9	37.9	40.6	41.5	42.2	42.7
MES_Res02	0.434	98.8	204.1	386.6	729.6	937.6	1139.8	1384.2	1572.3
MES_Res03	0.703	152.9	294.4	434.5	791	1047.1	1285.8	1593.1	1831.8
MES_Res05	0.777	149	272.2	362	622.5	898.8	1219.2	1643.1	1931.6
Outfall	6.8698	1729	2770.3	3882.1	5085.9	5864.8	6735.7	8507.1	10473.2
R4C3_030	0.82	354.6	688.5	920.5	1204.7	1422.9	1659.2	1997.4	2295.1
R4C3_040	1.39	620.1	1172.2	1545.4	2000.1	2367.2	2776.6	3318.8	3792.6
R4C3_050	1.92	718	1387	1812.8	2338	2768.8	3272.9	3953.6	4449.9
RH_0060	6.8698	1425.1	2425.3	3266.1	4306.1	5078.2	5937.9	7281.2	8372.5
RH_0080	7.7298	1431	2476.6	3330.2	4456.9	5313.2	6266.9	7773.9	9000.3
RH_0090	9.0798	1350.6	2445.8	3314.1	4468.1	5466.4	6534.6	8239.6	9769.1

Appendix D.2
HEC-HMS Results
Ultimate Conditions

Table D.2 HEC-HMS Results Ultimate Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
4C3_010	0.82	364.7	708.7	943.2	1229.2	1450.1	1691.2	2035.8	2336.4
4C3_020	0.32	196.8	346.5	444.5	562.3	652.8	752	893.5	1015.8
4C3_030	0.25	136.9	245.6	317.5	404	470.5	543.2	647.1	736.8
4C3_040	0.53	329	612.3	801.9	1031.9	1208.8	1402.5	1678.7	1918
4C3_050	0.56	253.3	492	654.7	852.5	1005.9	1173.6	1413.2	1622.2
4C6_B01	0.055	55.4	95.2	121.1	152.7	176.7	203.1	240.6	272.8
4C6_B02	0.14	125.8	220.8	283	358.6	416.3	479.7	569.6	647.1
4C6_B03	0.147	121.7	209.8	266.9	335.8	388.9	447.2	530.1	601.4
4C6_B04	0.142	145.5	242	304	379.1	436.6	499.8	589.7	666.7
4C6_B05	0.136	116	207	267.3	340.7	396.7	458.2	545.4	620.7
4C6_B06	0.114	54	114.5	157	210.1	251.3	296.5	361	417.9
4C6_B07	0.041	28.9	55.9	74.2	96.8	114.2	133.2	160.2	183.6
4C6_B08	0.088	106.4	190	245.5	313.9	365.9	422.2	500.9	569
4C6_B09	0.081	56.1	110.4	147.6	194	229.6	268.5	323.8	372.1
4C6_B10	0.016	10	20.6	28.1	37.3	44.5	52.3	63.4	73.2
4C6_B11	0.036	24.1	48.6	65.6	86.7	102.9	120.6	145.8	167.8
4C6_J01	0.055	55.4	95.2	121.1	152.7	176.7	203.1	240.6	272.8
4C6_J02	0.195	150.4	263.5	337.4	426.1	492.8	564.8	665.6	750.4
4C6_J03	0.342	141.8	251.5	323.1	408.2	472.6	540.4	633.3	713.5
4C6_J04	0.484	263.2	456.6	584.2	737.3	853.7	979.5	1174	1326.8
4C6_J05	0.62	318.5	566.2	740.8	950.4	1117.6	1295.5	1546.6	1758
4C6_J06	1.5489	817.8	1536.1	2048.9	2718.2	3273.6	3862.9	4661.6	5239.3
4C6_J07	1.5899	808.2	1497.1	2001.6	2663.2	3202	3781	4581.1	5156
4C6_J08	1.6779	799.8	1504.9	2013.9	2681.4	3214.3	3803	4604.9	5207.2
4C6_J09	1.7589	792	1518.7	2039.6	2720.1	3257.9	3874.5	4705.5	5328
4C6_J10	2.3099	777.4	1285.9	1566.1	2204.3	3235.3	4279.1	5599.4	6508.5
4C6_R01	0.055	43.5	74.9	95.1	114.3	129.7	147	172.1	194.2
4C6_R02	0.195	101.4	156	195.7	255.9	300.4	347.7	413.3	465.3
4C6_R03	0.342	138.5	246.2	316.3	398.9	461.1	531.6	626	705.7
4C6_R04	0.484	246.2	430.3	556.5	705.3	821.9	947.5	1126.4	1274.9

Table D.2 HEC-HMS Results Ultimate Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
4C6_R05	0.62	307.2	552	717.6	923.7	1085.1	1258.5	1498.9	1649.1
4C6_R06	1.5489	792.2	1466.3	1958.4	2608.2	3132	3692	4474.4	5040.3
4C6_R07	1.5899	783.9	1476.3	1975.4	2630.4	3151.7	3732.9	4522.6	5116.7
4C6_R08	1.6779	776.4	1483.6	1990.9	2650.6	3174.3	3770	4569.8	5174.5
4C6_R09	1.7589	665.4	1108.4	1359.1	1866.9	2578.7	3324.5	4269.9	4995.3
4C6_R10	2.3099	771.4	1269.6	1534.2	2194.1	3149.6	4205.7	5537.5	6474
4C6T1_B01	0.34	231.2	430.3	563.2	724.9	849.1	985.2	1178.9	1346.8
4C6T1_B02	0.057	31.6	66.7	91.4	122.5	146.5	172.8	210.3	243.2
4C6T1_B03	0.094	52.7	111.2	152.7	204.5	244.5	288.3	350.7	405.7
4C6T1_B04	0.044	25	51.7	70.4	93.6	111.4	131	159	183.5
4C6T1_J01	0.34	231.2	430.3	563.2	724.9	849.1	985.2	1178.9	1346.8
4C6T1_J02	0.397	242.9	461.5	610.9	793.8	934.1	1087.4	1306.4	1497.7
4C6T1_J03	0.491	268.8	518.7	680.4	883.5	1030.9	1191.5	1412.9	1613.6
4C6T1_R01	0.34	217.3	407.2	535.4	693.1	813.4	944.7	1132.2	1295.8
4C6T1_R02	0.397	236	448.8	587.9	761.8	889.7	1030	1226.2	1400
4C6T1_R03	0.491	263.9	507.2	662.9	850.1	991.1	1149.1	1360	1605
4C6T2_B00	0.091	107.4	183.3	232.7	293.2	339.2	389.6	460.7	521.9
4C6T2_B01	0.0769	70.4	119	150.4	188.5	217.7	249.8	295.4	334.6
4C6T2_B02	0.035	27.3	48.9	63.1	80.3	93.5	108	128.5	146.3
4C6T2_B03	0.299	226.5	412.3	535.4	685.1	800.5	926.8	1106.3	1261.7
4C6T2_B04	0.195	127.4	237.1	310.3	399.2	467.7	543	650	742.9
4C6T2_J00	0.091	107.4	183.3	232.7	293.2	339.2	389.6	460.7	521.9
4C6T2_J01	0.1679	167.3	287.3	362.4	458	528.8	607.1	718.5	817.7
4C6T2_J02	0.3209	194.8	333.2	451.6	650.7	860.5	1048.9	1283.5	1470.7
4C6T2_J03	0.6199	416	737.1	972.2	1301.5	1616.3	1930.9	2328.6	2620
4C6T2_J04	0.8149	533.6	962.6	1269.4	1690.1	2064.9	2455.5	2950.9	3314.8
4C6T2_R00	0.091	109.8	183.1	234.9	293	340.7	391.1	462.2	521.6
4C6T2_R01	0.1679	166.8	283.6	360	452.7	523.5	601.1	711.3	807.8
4C6T2_R02	0.3209	190.7	324.8	442.6	637.6	829.5	1005.3	1223.9	1373.2
4C6T2_R03	0.6199	407.9	726.6	962	1293.8	1597.4	1913.2	2301.8	2583.2
4C6T3_B01	0.118	124.4	213.9	272.2	343.2	397.4	456.7	540.7	613

Table D.2 HEC-HMS Results Ultimate Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
4C6T3_RES01	0.118	99.6	144.3	164.9	178.7	181.8	184	186.4	187.9
4C6T3_RES02	0.118	17.5	82.6	110.5	124.7	130.2	134.1	138.4	141.5
H_0060	0.86	330.6	670.9	906.8	1197.2	1422.2	1667.9	2019.5	2327.9
H_0070	1.01	340.4	691.8	936.5	1237	1469.7	1722.9	2087.1	2407.2
H_0080	0.34	268.2	470.8	603.2	763.1	885.8	1020.5	1212.4	1377.9
H_0090	1	361.5	734.3	993.4	1311.2	1558	1827.1	2212.6	2550.9
HC_B04	0.071	71.4	118.5	148.9	185.7	213.9	244.9	289	326.7
HC_B05	0.12	120	202.8	256.3	321.1	370.7	425.2	502.8	569.3
HC_B06	0.0146	217.9	364.1	457.7	569.7	655.9	750.7	886.5	1003
HC_B07	0.54	354.1	611.9	779.5	981.1	1136.1	1306	1548.7	1757.4
HC_B08	0.425	383.9	661.5	841.7	1060.1	1227.2	1410.7	1671.8	1896.3
HC_B09	0.293	348.8	649.6	850.7	1094.5	1282	1487.5	1781.2	2036.1
HC_B10	0.269	146.9	284.9	378.4	493.3	582	679	817.3	937.9
HC_B11	0.183	141.9	262.8	344.3	443.9	520.1	603.6	722.1	824.7
HC_B12	0.2	185.8	319.3	406.7	512.7	593.7	682.6	808.8	917.3
HC_B13	0.104	90.7	165.1	214.5	274.9	321.1	371.6	443.2	505.2
HC_B14	0.069	65.6	112.9	143.6	181	209.5	240.9	285.4	323.6
HC_B15	0.097	65.6	135.2	183.8	244.4	291.1	342.1	414.5	477.9
HC_J02	0.936	195.7	359.2	465.3	847.3	1246.9	1674.2	2242.4	2616.6
HC_J03	1.056	288.4	519.2	666.6	968	1387.3	1847.2	2444.3	2890.5
HC_J04	1.3756	480.5	827.2	1040.9	1388.2	1892.1	2405.6	3108.4	3710.8
HC_J05	1.9156	718.3	1209.5	1530.2	1995.5	2482.4	3139.4	4048	4868.1
HC_J06	1.9156	691.9	1156.4	1464.6	1902.3	2342.1	2886.8	3797.2	4585.7
HC_J07	2.3406	762	1266.6	1601.1	2061	2512.7	3061.2	3947	4773.2
HC_J08	2.9249	811.4	1362.5	1724.4	2208.1	2657.7	3193.2	4063.9	4902
HC_J09	3.8709	1201.8	2029.3	2563.4	3204.1	3657.8	4190.3	5151.9	5998.7
HC_J10	4.0539	1237.9	2035.1	2534.1	3174.8	3676	4242.9	5140	5936.5
HC_J11	4.2539	1062.6	1710.6	2430.9	3162.8	3709	4293.8	5176.3	5928.4
HC_J12	4.3579	1068.6	1716.5	2438	3185.4	3739.6	4337.4	5230.5	5989.4
HC_J13	4.4269	1073.1	1721.3	2426.1	3181.6	3743.8	4349.7	5245.7	6001.9
HC_R01	0.936	191.1	349.4	456	827.7	1186.7	1580.1	2085.8	2490.9

Table D.2 HEC-HMS Results Ultimate Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
HC_R02	1.056	263.8	466.2	595.6	899.7	1281	1681	2235.8	2723.5
HC_R03	1.3756	449	764.9	978.4	1343.4	1755.8	2232.8	2902	3549.9
HC_R04	1.9156	691.9	1156.4	1464.6	1902.3	2342.1	2886.8	3797.2	4585.7
HC_R05	1.9156	683.5	1146.2	1452.2	1888.7	2318.7	2838.8	3670	4460.2
HC_R06	2.3406	736.3	1231.1	1558.7	2011.2	2432.1	2928.5	3728.2	4507.1
HC_R07	2.9249	806.5	1352.3	1712.4	2186.4	2623.9	3155.5	4008.7	4833.1
HC_R08	3.8709	1194.4	1973.7	2467	3087	3578.6	4137.7	5017.3	5799
HC_R09	4.0539	1041.3	1680.9	2378.1	3087.3	3618	4190.1	5053.9	5790.3
HC_R10	4.2539	1060.5	1704.1	2415.3	3152.4	3699.4	4289.9	5172.1	5922.4
HC_R11	4.3579	1067.6	1713	2411.2	3160.3	3717.3	4318.2	5207.5	5957.9
HC_R12	4.4269	1067.2	1704.4	2376.2	3140.5	3703.6	4328.1	5226.9	5978.5
HCT4_B01	0.197	157.1	270.6	344.4	433.9	502.5	577.7	684.9	777.1
HCT4_B02	0.48	373.4	645.1	821.4	1033.8	1196.8	1375.8	1630.9	1850.2
HCT4_J01	0.197	157.1	270.6	344.4	433.9	502.5	577.7	684.9	777.1
HCT4_J02	0.677	456.1	813.5	1021.6	1269.9	1459.7	1666.6	1957.7	2206
HCT4_R01	0.197	145.4	246.6	310.8	387.5	438	497.7	589.5	667.5
JA4C3_010	0.82	364.7	708.7	943.2	1229.2	1450.1	1691.2	2035.8	2336.4
JA4C3_020	0.32	196.8	346.5	444.5	562.3	652.8	752	893.5	1015.8
JA4C3_030	1.07	476	907	1208.4	1577.9	1859.2	2163.6	2600.3	2983.7
JA4C3_040	1.92	741.4	1410.4	1837.1	2368.9	2816	3348.6	3985.5	4518.2
JA4C3_050	2.48	823.1	1619.7	2118.6	2732.7	3241	3866.9	4713.4	5253.2
JAH_0070	1.01	340.4	691.8	936.5	1237	1469.7	1722.9	2087.1	2407.2
JAH_0080	8.0698	1445.6	2507	3372.8	4522.1	5401.9	6384.4	7936.7	9202.2
JAH_0090	10.0798	1385.5	2527.3	3434.8	4657.1	5739.4	6912.1	8787.8	10471
JC_Outlet	12.5598	1705.8	3405.2	4704.6	6413	7776.9	9326	11972.2	14505.5
JC4C3_030	1.39	642.6	1201.4	1597.7	2074.5	2445.9	2840.1	3404.1	3898.2
JCH_0080	9.0798	1505.1	2640.8	3556.6	4818.3	5824.9	6952.9	8754.2	10247.3
JH_0060	7.7298	1482.5	2537.3	3419.2	4549.9	5416.6	6387.7	7912.8	9173.9
MES_B01	0.158	170.7	283.6	356.2	444.5	511.9	586	691.2	781.4
MES_B02	0.276	331.8	558	704.5	883.6	1019.9	1169.1	1379.8	1560.8
MES_B03	0.04	42.6	75.5	97.2	123.9	144.2	166.3	197.6	224.6

Table D.2 HEC-HMS Results Ultimate Conditions

Basin	DA (sq mi)	Existing 2 Year	Existing 5 Year	Existing 10 Year	Existing 25 Year	Existing 50 Year	Existing 100 Year	Existing 250 Year	Existing 500 Year
MES_B04	0.229	145.4	265.5	344.9	441.6	516	597.4	713.5	813.9
MES_B05	0.074	60.2	107.6	138.9	176.9	206	237.9	283.2	322.3
MES_B06	0.088	75.2	132.1	169.3	214.4	248.9	286.8	340.6	387
MES_J01	0.434	347	579.3	728.4	910	1048.2	1199.4	1413.1	1597.1
MES_J02	0.474	110.3	235.7	433.6	823.5	1068.4	1293	1576.1	1790.4
MES_J03	0.703	190.8	323.7	528.7	916.4	1161	1389.1	1677.7	1897.8
MES_J04	0.777	161.3	323	525.6	959.8	1251.1	1523.7	1874.1	2142.9
MES_J05	0.865	154.9	290.7	398.6	743.7	1088.6	1470	1971.1	2304.1
MES_R01	0	0	0	0	0	80.3	226.4	440.4	606.7
MES_R04	0.229	83	102.4	111.3	122.1	127	128.7	130.3	131.2
MES_Res01	0.158	25	30.5	33.9	37.9	40.6	41.5	42.2	42.7
MES_RES01_36"Co	0.158	25	30.5	33.9	37.9	40.6	41.5	42.2	42.7
MES_RES01_48"Co	0.158	25	30.5	33.9	37.9	40.6	41.5	42.2	42.7
MES_RES01_72"Co	0.158	25	30.5	33.9	37.9	40.6	41.5	42.2	42.7
MES_Res02	0.434	98.8	204.1	386.6	729.6	937.6	1139.8	1384.2	1572.3
MES_Res03	0.703	152.9	294.4	434.5	791	1047.1	1285.8	1593.1	1831.8
MES_Res05	0.777	149	272.2	362	622.5	898.8	1219.2	1643.1	1931.6
Outfall	6.8698	1729	2770.3	3882.1	5085.9	5864.8	6735.7	8507.1	10473.2
R4C3_030	0.82	354.6	688.5	920.5	1204.7	1422.9	1659.2	1997.4	2295.1
R4C3_040	1.39	620.1	1172.2	1545.4	2000.1	2367.2	2776.6	3318.8	3792.6
R4C3_050	1.92	718	1387	1812.8	2338	2768.8	3272.9	3953.6	4449.9
RH_0060	6.8698	1425.1	2425.3	3266.1	4306.1	5078.2	5937.9	7281.2	8372.5
RH_0080	7.7298	1431	2476.6	3330.2	4456.9	5313.2	6266.9	7773.9	9000.3
RH_0090	9.0798	1350.6	2445.8	3314.1	4468.1	5466.4	6534.6	8239.6	9769.1



Appendix E.1
HEC-RAS Output
Existing Conditions

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	15204	50% Annual Chanc	50	494.9	496.71		496.73	0.001167	1.34	37.23	28.27	0.21
Stream 4C6	3	15204	20% Annual Chanc	100	494.9	497.44		497.48	0.0012	1.68	59.68	33.04	0.22
Stream 4C6	3	15204	10% Annual Chanc	125	494.9	497.72		497.78	0.00122	1.8	69.39	34.84	0.22
Stream 4C6	3	15204	4% Annual Chance	150	494.9	497.98		498.04	0.001236	1.91	78.57	36.46	0.23
Stream 4C6	3	15204	2% Annual Chance	175	494.9	498.21		498.27	0.001268	2.01	87.14	38.19	0.23
Stream 4C6	3	15204	1% Annual Chance	200	494.9	498.42		498.49	0.001309	2.1	95.28	40.02	0.24
Stream 4C6	3	15204	0.4% Annual Chan	250	494.9	498.78		498.86	0.001393	2.27	110.23	43.17	0.25
Stream 4C6	3	15204	0.2% Annual Chan	275	494.9	498.94		499.02	0.001435	2.35	117.18	44.56	0.26
Stream 4C6	3	15106*	50% Annual Chanc	50	494.73	496.58		496.61	0.001387	1.3	38.49	28.99	0.2
Stream 4C6	3	15106*	20% Annual Chanc	100	494.73	497.31		497.35	0.001453	1.63	61.46	34.07	0.21
Stream 4C6	3	15106*	10% Annual Chanc	125	494.73	497.59		497.64	0.001508	1.75	71.42	36.46	0.22
Stream 4C6	3	15106*	4% Annual Chance	150	494.73	497.85		497.9	0.00155	1.85	81.02	38.76	0.23
Stream 4C6	3	15106*	2% Annual Chance	175	494.73	498.08		498.14	0.001577	1.94	90.08	40.6	0.23
Stream 4C6	3	15106*	1% Annual Chance	200	494.73	498.28		498.35	0.001608	2.03	98.56	42.2	0.23
Stream 4C6	3	15106*	0.4% Annual Chan	250	494.73	498.63		498.71	0.001695	2.2	113.89	45.07	0.24
Stream 4C6	3	15106*	0.2% Annual Chan	275	494.73	498.79		498.87	0.001746	2.27	120.93	46.4	0.25
Stream 4C6	3	15008*	50% Annual Chanc	50	494.56	496.44		496.46	0.001638	1.26	39.71	30.1	0.19
Stream 4C6	3	15008*	20% Annual Chanc	100	494.56	497.16		497.2	0.001757	1.57	63.81	36.59	0.21
Stream 4C6	3	15008*	10% Annual Chanc	125	494.56	497.44		497.48	0.001741	1.68	74.27	37.92	0.21
Stream 4C6	3	15008*	4% Annual Chance	150	494.56	497.69		497.74	0.001752	1.79	84.01	39.38	0.22
Stream 4C6	3	15008*	2% Annual Chance	175	494.56	497.92		497.97	0.001786	1.88	93.04	40.87	0.22
Stream 4C6	3	15008*	1% Annual Chance	200	494.56	498.12		498.18	0.001829	1.97	101.4	42.2	0.22
Stream 4C6	3	15008*	0.4% Annual Chan	250	494.56	498.46		498.53	0.00195	2.15	116.17	44.46	0.23
Stream 4C6	3	15008*	0.2% Annual Chan	275	494.56	498.61		498.68	0.002033	2.24	122.8	45.67	0.24
Stream 4C6	3	14910*	50% Annual Chanc	50	494.4	496.26		496.29	0.001988	1.21	41.15	32.81	0.19
Stream 4C6	3	14910*	20% Annual Chanc	100	494.4	496.98		497.02	0.001892	1.52	65.98	36.09	0.2
Stream 4C6	3	14910*	10% Annual Chanc	125	494.4	497.26		497.3	0.001903	1.64	76.27	37.16	0.2
Stream 4C6	3	14910*	4% Annual Chance	150	494.4	497.51		497.56	0.001952	1.75	85.7	38.48	0.21
Stream 4C6	3	14910*	2% Annual Chance	175	494.4	497.73		497.79	0.002026	1.86	94.29	39.82	0.21
Stream 4C6	3	14910*	1% Annual Chance	200	494.4	497.93		497.99	0.002108	1.96	102.17	41.01	0.22
Stream 4C6	3	14910*	0.4% Annual Chan	250	494.4	498.25		498.32	0.002325	2.16	115.73	43.06	0.23
Stream 4C6	3	14910*	0.2% Annual Chan	275	494.4	498.39		498.47	0.00246	2.26	121.65	44.09	0.24
Stream 4C6	3	14813*	50% Annual Chanc	50	494.23	496.07		496.09	0.002022	1.16	42.95	32.1	0.18
Stream 4C6	3	14813*	20% Annual Chanc	100	494.23	496.79		496.82	0.002053	1.49	67.15	34.73	0.19
Stream 4C6	3	14813*	10% Annual Chanc	125	494.23	497.07		497.11	0.00212	1.63	76.89	35.58	0.19
Stream 4C6	3	14813*	4% Annual Chance	150	494.23	497.31		497.36	0.002247	1.75	85.56	36.85	0.2
Stream 4C6	3	14813*	2% Annual Chance	175	494.23	497.52		497.57	0.002396	1.87	93.36	38.11	0.21
Stream 4C6	3	14813*	1% Annual Chance	200	494.23	497.7		497.76	0.002554	1.99	100.42	39.22	0.22
Stream 4C6	3	14813*	0.4% Annual Chan	250	494.23	497.99		498.07	0.002943	2.23	112.1	41.05	0.24
Stream 4C6	3	14813*	0.2% Annual Chan	275	494.23	498.11		498.19	0.003175	2.35	117.35	42.23	0.25
Stream 4C6	3	14714	50% Annual Chanc	50	494.06	495.87		495.89	0.002149	1.14	43.85	30.92	0.17
Stream 4C6	3	14714	20% Annual Chanc	100	494.06	496.58		496.61	0.002371	1.5	66.52	32.92	0.19
Stream 4C6	3	14714	10% Annual Chanc	125	494.06	496.84		496.88	0.002532	1.66	75.31	33.59	0.2
Stream 4C6	3	14714	4% Annual Chance	150	494.06	497.06		497.11	0.002784	1.81	82.82	34.72	0.21
Stream 4C6	3	14714	2% Annual Chance	175	494.06	497.25		497.3	0.003079	1.96	89.36	35.89	0.22
Stream 4C6	3	14714	1% Annual Chance	200	494.06	497.4		497.47	0.003391	2.1	95.13	36.9	0.23
Stream 4C6	3	14714	0.4% Annual Chan	250	494.06	497.64		497.73	0.004029	2.37	117.5	38.19	0.25
Stream 4C6	3	14714	0.2% Annual Chan	275	494.06	497.74		497.83	0.004252	2.46	136.92	40.02	0.26
Stream 4C6	3	14629*	50% Annual Chanc	50	493.73	495.68		495.7	0.002401	1.19	41.89	30.12	0.18
Stream 4C6	3	14629*	20% Annual Chanc	100	493.73	496.36		496.4	0.002708	1.58	63.3	32.35	0.2
Stream 4C6	3	14629*	10% Annual Chanc	125	493.73	496.61		496.65	0.003025	1.75	71.34	33.84	0.21
Stream 4C6	3	14629*	4% Annual Chance	150	493.73	496.8		496.86	0.003427	1.92	77.99	35.3	0.23
Stream 4C6	3	14629*	2% Annual Chance	175	493.73	496.95		497.02	0.003874	2.09	84.94	36.85	0.24
Stream 4C6	3	14629*	1% Annual Chance	200	493.73	497.08		497.16	0.004272	2.24	98.76	38.36	0.26
Stream 4C6	3	14629*	0.4% Annual Chan	250	493.73	497.28		497.37	0.004766	2.43	137.21	40.02	0.27
Stream 4C6	3	14629*	0.2% Annual Chan	275	493.73	497.37		497.45	0.005014	2.51	159.09	41.53	0.28
Stream 4C6	3	14544*	50% Annual Chanc	50	493.4	495.46		495.48	0.002863	1.27	39.22	29.25	0.19
Stream 4C6	3	14544*	20% Annual Chanc	100	493.4	496.1		496.15	0.003419	1.69	59.11	32.73	0.22
Stream 4C6	3	14544*	10% Annual Chanc	125	493.4	496.31		496.37	0.003951	1.88	68.68	33.15	0.24
Stream 4C6	3	14544*	4% Annual Chance	150	493.4	496.47		496.53	0.00441	2.04	83.24	34.34	0.26
Stream 4C6	3	14544*	2% Annual Chance	175	493.4	496.59		496.66	0.004816	2.17	90.99	35.82	0.27
Stream 4C6	3	14544*	1% Annual Chance	200	493.4	496.7		496.77	0.005206	2.27	100.09	37.36	0.28
Stream 4C6	3	14544*	0.4% Annual Chan	250	493.4	496.87		496.94	0.005695	2.39	117.33	38.86	0.29
Stream 4C6	3	14544*	0.2% Annual Chan	275	493.4	496.94		497.01	0.005866	2.44	134.77	40.35	0.3
Stream 4C6	3	14459*	50% Annual Chanc	50	493.08	495.17		495.2	0.004029	1.44	34.77	28.02	0.23
Stream 4C6	3	14459*	20% Annual Chanc	100	493.08	495.77		495.82	0.004731	1.81	63.97	31.03	0.26
Stream 4C6	3	14459*	10% Annual Chanc	125	493.08	495.94		496	0.005199	1.93	71.86	32.63	0.27
Stream 4C6	3	14459*	4% Annual Chance	150	493.08	496.07		496.12	0.005658	2.03	80.09	34.17	0.28
Stream 4C6	3	14459*	2% Annual Chance	175	493.08	496.16		496.22	0.006047	2.13	88.19	35.72	0.29

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	14459*	1% Annual Chance	200	493.08	496.25		496.31	0.006169	2.21	134.74	214.63	0.3
Stream 4C6	3	14459*	0.4% Annual Chan	250	493.08	496.38		496.45	0.006535	2.39	166.23	256.47	0.31
Stream 4C6	3	14459*	0.2% Annual Chan	275	493.08	496.44		496.51	0.006669	2.46	181.14	272.37	0.31
Stream 4C6	3	14383	50% Annual Chanc	50	492.75	494.67		494.73	0.008786	1.97	25.75	31.02	0.33
Stream 4C6	3	14383	20% Annual Chanc	100	492.75	495.25		495.31	0.008416	2.01	64.89	103.81	0.33
Stream 4C6	3	14383	10% Annual Chanc	125	492.75	495.42		495.47	0.00803	2.03	86.39	159.94	0.32
Stream 4C6	3	14383	4% Annual Chance	150	492.75	495.52		495.57	0.008302	2.15	103.24	196.93	0.33
Stream 4C6	3	14383	2% Annual Chance	175	492.75	495.61		495.66	0.008071	2.21	122.97	235.78	0.33
Stream 4C6	3	14383	1% Annual Chance	200	492.75	495.69		495.74	0.007905	2.27	143.22	270.82	0.33
Stream 4C6	3	14383	0.4% Annual Chan	250	492.75	495.81		495.87	0.0079	2.4	180.29	310.06	0.33
Stream 4C6	3	14383	0.2% Annual Chan	275	492.75	495.87		495.93	0.007856	2.45	197.66	325.07	0.33
Stream 4C6	3	14288*	50% Annual Chanc	50	491.93	493.8		493.86	0.009449	1.93	25.85	25.35	0.34
Stream 4C6	3	14288*	20% Annual Chanc	100	491.93	494.53		494.59	0.006744	2.06	51.07	64.55	0.3
Stream 4C6	3	14288*	10% Annual Chanc	125	491.93	494.7		494.77	0.006719	2.22	69.85	161.45	0.31
Stream 4C6	3	14288*	4% Annual Chance	150	491.93	494.89		494.95	0.005394	2.14	104.39	208.27	0.28
Stream 4C6	3	14288*	2% Annual Chance	175	491.93	494.98		495.05	0.005506	2.24	125.83	247.09	0.29
Stream 4C6	3	14288*	1% Annual Chance	200	491.93	495.06		495.12	0.00575	2.34	143.75	261.05	0.29
Stream 4C6	3	14288*	0.4% Annual Chan	250	491.93	495.21		495.27	0.005457	2.4	186.07	285.98	0.29
Stream 4C6	3	14288*	0.2% Annual Chan	275	491.93	495.31		495.36	0.005028	2.37	214.11	305.12	0.28
Stream 4C6	3	14193*	50% Annual Chanc	50	491.11	492.95		493	0.008322	1.9	26.38	24.22	0.32
Stream 4C6	3	14193*	20% Annual Chanc	100	491.11	494.39		494.4	0.000872	1.04	164.62	209.76	0.12
Stream 4C6	3	14193*	10% Annual Chanc	125	491.11	494.57		494.58	0.000871	1.09	206.92	255.86	0.12
Stream 4C6	3	14193*	4% Annual Chance	150	491.11	494.77		494.78	0.000832	1.12	263.96	310.91	0.12
Stream 4C6	3	14193*	2% Annual Chance	175	491.11	494.85		494.86	0.000913	1.2	290.29	319.05	0.12
Stream 4C6	3	14193*	1% Annual Chance	200	491.11	494.9		494.92	0.001046	1.3	307.16	324.19	0.13
Stream 4C6	3	14193*	0.4% Annual Chan	250	491.11	495.04		495.06	0.001166	1.42	354.18	337.98	0.14
Stream 4C6	3	14193*	0.2% Annual Chan	275	491.11	495.14		495.16	0.001132	1.43	389	351.33	0.14
Stream 4C6	3	14094	50% Annual Chanc	50	490.29	492.56		492.59	0.002483	1.38	44.9	77.31	0.19
Stream 4C6	3	14094	20% Annual Chanc	100	490.29	494.36		494.37	0.000155	0.56	364.39	286.05	0.05
Stream 4C6	3	14094	10% Annual Chanc	125	490.29	494.54		494.55	0.000172	0.61	416.7	299	0.06
Stream 4C6	3	14094	4% Annual Chance	150	490.29	494.74		494.74	0.000175	0.64	478	314.99	0.06
Stream 4C6	3	14094	2% Annual Chance	175	490.29	494.82		494.82	0.000208	0.7	503.21	320.23	0.06
Stream 4C6	3	14094	1% Annual Chance	200	490.29	494.87		494.87	0.000251	0.78	518.29	323.3	0.07
Stream 4C6	3	14094	0.4% Annual Chan	250	490.29	495		495.01	0.000317	0.89	562.29	332.37	0.08
Stream 4C6	3	14094	0.2% Annual Chan	275	490.29	495.1		495.11	0.000354	0.96	595.32	343.49	0.08
Stream 4C6	3	13739	50% Annual Chanc	50	486.49	492.54		492.54	0.000044	0.3	217.55	143.88	0.03
Stream 4C6	3	13739	20% Annual Chanc	100	486.49	494.35		494.35	0.000015	0.23	781.69	471.35	0.02
Stream 4C6	3	13739	10% Annual Chanc	125	486.49	494.53		494.53	0.000019	0.26	867.06	492.76	0.02
Stream 4C6	3	13739	4% Annual Chance	150	486.49	494.73		494.73	0.000023	0.29	968.12	572.11	0.02
Stream 4C6	3	13739	2% Annual Chance	175	486.49	494.8		494.8	0.000028	0.33	1011.86	583.42	0.02
Stream 4C6	3	13739	1% Annual Chance	200	486.49	494.84		494.85	0.000035	0.37	1036.73	591.66	0.03
Stream 4C6	3	13739	0.4% Annual Chan	250	486.49	494.97		494.97	0.000047	0.44	1112.63	608.29	0.03
Stream 4C6	3	13739	0.2% Annual Chan	275	486.49	495.06		495.07	0.00005	0.46	1170.55	613.38	0.03
Stream 4C6	3	13570.7*	50% Annual Chanc	50	485.78	492.53		492.53	0.000048	0.27	199.36	74.22	0.02
Stream 4C6	3	13570.7*	20% Annual Chanc	100	485.78	494.35		494.35	0.000024	0.24	535.44	312.37	0.02
Stream 4C6	3	13570.7*	10% Annual Chanc	125	485.78	494.52		494.53	0.000031	0.27	598.49	400.91	0.02
Stream 4C6	3	13570.7*	4% Annual Chance	150	485.78	494.72		494.72	0.000036	0.3	679.64	429.89	0.02
Stream 4C6	3	13570.7*	2% Annual Chance	175	485.78	494.8		494.8	0.000045	0.34	711.99	439.59	0.02
Stream 4C6	3	13570.7*	1% Annual Chance	200	485.78	494.84		494.84	0.000056	0.38	729.95	441.33	0.03
Stream 4C6	3	13570.7*	0.4% Annual Chan	250	485.78	494.96		494.96	0.000075	0.44	784.7	446.4	0.03
Stream 4C6	3	13570.7*	0.2% Annual Chan	275	485.78	495.05		495.06	0.000081	0.46	826.85	450.92	0.03
Stream 4C6	3	13471	50% Annual Chanc	150	485.42	492.51	487.19	492.52	0.000041	0.8	197.2	62.5	0.06
Stream 4C6	3	13471	20% Annual Chanc	275	485.42	494.33	487.84	494.34	0.000042	0.98	477.72	237.99	0.06
Stream 4C6	3	13471	10% Annual Chanc	325	485.42	494.5	488.05	494.52	0.000053	1.12	520.78	283.02	0.07
Stream 4C6	3	13471	4% Annual Chance	450	485.42	494.68	488.54	494.71	0.000091	1.49	572.87	315.05	0.1
Stream 4C6	3	13471	2% Annual Chance	500	485.42	494.74	488.71	494.78	0.00011	1.64	594.27	347.26	0.11
Stream 4C6	3	13471	1% Annual Chance	550	485.42	494.77	488.87	494.82	0.00013	1.79	605.03	351.91	0.12
Stream 4C6	3	13471	0.4% Annual Chan	650	485.42	494.88	489.18	494.93	0.000169	2.06	642.34	366.17	0.13
Stream 4C6	3	13471	0.2% Annual Chan	750	485.42	494.95	489.48	495.02	0.000215	2.34	668.91	374.61	0.15
Stream 4C6	3	13400	Culvert										
Stream 4C6	3	13373	50% Annual Chanc	150	483.8	485.84	485.6	486.22	0.005105	5	30.02	23.07	0.77
Stream 4C6	3	13373	20% Annual Chanc	275	483.8	486.62	486.21	487.09	0.004032	5.49	50.12	27.89	0.72
Stream 4C6	3	13373	10% Annual Chanc	325	483.8	486.86	486.41	487.37	0.003967	5.71	56.89	29.4	0.72
Stream 4C6	3	13373	4% Annual Chance	450	483.8	487.34	486.87	487.95	0.004002	6.26	71.83	32.47	0.74
Stream 4C6	3	13373	2% Annual Chance	500	483.8	487.52	487.03	488.16	0.004007	6.45	77.48	33.5	0.75
Stream 4C6	3	13373	1% Annual Chance	550	483.8	487.67	487.18	488.36	0.004019	6.63	82.91	34.45	0.75
Stream 4C6	3	13373	0.4% Annual Chan	650	483.8	487.98	487.46	488.73	0.004023	6.95	93.55	36.25	0.76
Stream 4C6	3	13373	0.2% Annual Chan	750	483.8	488.26	487.73	489.07	0.004018	7.21	104.02	38.05	0.77

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	13141	50% Annual Chanc	150	482.88	485.24		485.45	0.001941	3.64	41.16	24.24	0.49
Stream 4C6	3	13141	20% Annual Chanc	275	482.88	486.05		486.34	0.002152	4.27	64.34	32.27	0.53
Stream 4C6	3	13141	10% Annual Chanc	325	482.88	486.31		486.62	0.002115	4.47	72.84	34.54	0.54
Stream 4C6	3	13141	4% Annual Chance	450	482.88	486.83		487.21	0.001973	4.96	92.03	38.73	0.54
Stream 4C6	3	13141	2% Annual Chance	500	482.88	487		487.42	0.001963	5.16	98.93	39.82	0.54
Stream 4C6	3	13141	1% Annual Chance	550	482.88	487.16		487.61	0.001978	5.37	105.29	40.8	0.55
Stream 4C6	3	13141	0.4% Annual Chan	650	482.88	487.46		487.97	0.002006	5.76	117.65	42.77	0.56
Stream 4C6	3	13141	0.2% Annual Chan	750	482.88	487.73		488.31	0.002031	6.12	129.66	44.66	0.57
Stream 4C6	3	12859	50% Annual Chanc	150	482.39	484.59		484.82	0.002537	3.88	38.68	25.65	0.56
Stream 4C6	3	12859	20% Annual Chanc	275	482.39	485.37		485.69	0.002405	4.52	60.85	30.69	0.57
Stream 4C6	3	12859	10% Annual Chanc	325	482.39	485.65		485.99	0.002301	4.66	69.7	32.42	0.56
Stream 4C6	3	12859	4% Annual Chance	450	482.39	486.21		486.61	0.002262	5.06	88.85	35.97	0.57
Stream 4C6	3	12859	2% Annual Chance	500	482.39	486.39		486.82	0.002272	5.24	95.4	37.11	0.57
Stream 4C6	3	12859	1% Annual Chance	550	482.39	486.56		487.01	0.002245	5.43	101.52	38.24	0.58
Stream 4C6	3	12859	0.4% Annual Chan	650	482.39	486.85		487.37	0.002225	5.78	113.22	40.3	0.58
Stream 4C6	3	12859	0.2% Annual Chan	750	482.39	487.13		487.71	0.00222	6.12	124.51	42.19	0.59
Stream 4C6	3	12708	50% Annual Chanc	150	481.74	484.25		484.46	0.002131	3.75	40.03	24.38	0.52
Stream 4C6	3	12708	20% Annual Chanc	275	481.74	485.01		485.33	0.002305	4.56	60.36	28.79	0.55
Stream 4C6	3	12708	10% Annual Chanc	325	481.74	485.28		485.63	0.00247	4.76	68.26	30.59	0.56
Stream 4C6	3	12708	4% Annual Chance	450	481.74	485.82		486.25	0.002524	5.26	85.83	34.68	0.57
Stream 4C6	3	12708	2% Annual Chance	500	481.74	485.98		486.45	0.002538	5.5	91.73	36.03	0.58
Stream 4C6	3	12708	1% Annual Chance	550	481.74	486.14		486.64	0.002568	5.73	97.34	37.26	0.58
Stream 4C6	3	12708	0.4% Annual Chan	650	481.74	486.41		487	0.002652	6.17	107.84	39.15	0.6
Stream 4C6	3	12708	0.2% Annual Chan	750	481.74	486.66		487.33	0.002724	6.58	117.94	40.76	0.62
Stream 4C6	3	12620.9*	50% Annual Chanc	150	481.36	484		484.19	0.004802	3.5	42.84	26.37	0.48
Stream 4C6	3	12620.9*	20% Annual Chanc	275	481.36	484.75		485.03	0.005277	4.27	64.45	31.26	0.52
Stream 4C6	3	12620.9*	10% Annual Chanc	325	481.36	485		485.31	0.005486	4.48	72.47	33.07	0.53
Stream 4C6	3	12620.9*	4% Annual Chance	450	481.36	485.54		485.92	0.005403	4.92	91.71	37.26	0.54
Stream 4C6	3	12620.9*	2% Annual Chance	500	481.36	485.72		486.12	0.005375	5.12	98.22	38.64	0.54
Stream 4C6	3	12620.9*	1% Annual Chance	550	481.36	485.87		486.31	0.005408	5.33	104.29	39.88	0.55
Stream 4C6	3	12620.9*	0.4% Annual Chan	650	481.36	486.14		486.65	0.005564	5.73	115.45	41.89	0.57
Stream 4C6	3	12620.9*	0.2% Annual Chan	750	481.36	486.4		486.97	0.005686	6.1	126.26	43.56	0.58
Stream 4C6	3	12534.2*	50% Annual Chanc	150	480.99	483.56		483.77	0.004646	3.74	40.12	26.77	0.54
Stream 4C6	3	12534.2*	20% Annual Chanc	275	480.99	484.26		484.58	0.005022	4.52	60.85	32.03	0.58
Stream 4C6	3	12534.2*	10% Annual Chanc	325	480.99	484.49		484.84	0.005156	4.75	68.42	33.67	0.59
Stream 4C6	3	12534.2*	4% Annual Chance	450	480.99	485.03		485.44	0.005534	5.13	87.75	37.9	0.59
Stream 4C6	3	12534.2*	2% Annual Chance	500	480.99	485.22		485.65	0.005426	5.26	95.01	39.39	0.59
Stream 4C6	3	12534.2*	1% Annual Chance	550	480.99	485.39		485.84	0.005267	5.42	101.74	40.73	0.59
Stream 4C6	3	12534.2*	0.4% Annual Chan	650	480.99	485.65		486.18	0.005328	5.81	112.82	42.85	0.6
Stream 4C6	3	12534.2*	0.2% Annual Chan	750	480.99	485.89		486.48	0.005405	6.17	123.4	44.69	0.61
Stream 4C6	3	12447.4*	50% Annual Chanc	150	480.61	483.12		483.38	0.004425	4.05	37.08	26.75	0.61
Stream 4C6	3	12447.4*	20% Annual Chanc	275	480.61	483.79		484.16	0.004599	4.82	57.02	32.48	0.64
Stream 4C6	3	12447.4*	10% Annual Chanc	325	480.61	484.01		484.41	0.004708	5.05	64.3	34.28	0.65
Stream 4C6	3	12447.4*	4% Annual Chance	450	480.61	484.51		484.97	0.005154	5.48	82.19	38.31	0.66
Stream 4C6	3	12447.4*	2% Annual Chance	500	480.61	484.69		485.18	0.005347	5.59	89.43	39.85	0.66
Stream 4C6	3	12447.4*	1% Annual Chance	550	480.61	484.86		485.37	0.005514	5.7	96.5	41.3	0.66
Stream 4C6	3	12447.4*	0.4% Annual Chan	650	480.61	485.15		485.71	0.005334	5.99	108.63	43.6	0.66
Stream 4C6	3	12447.4*	0.2% Annual Chan	750	480.61	485.41		486.02	0.005181	6.29	120.07	45.66	0.66
Stream 4C6	3	12359	50% Annual Chanc	150	480.24	482.5	482.33	482.91	0.006045	5.16	29.06	24.17	0.83
Stream 4C6	3	12359	20% Annual Chanc	275	480.24	483.08	482.94	483.66	0.006388	6.14	44.8	29.93	0.88
Stream 4C6	3	12359	10% Annual Chanc	325	480.24	483.27	483.13	483.91	0.006441	6.43	50.57	31.73	0.9
Stream 4C6	3	12359	4% Annual Chance	450	480.24	483.66	483.55	484.43	0.006604	7.05	63.84	35.52	0.93
Stream 4C6	3	12359	2% Annual Chance	500	480.24	483.8	483.7	484.62	0.006831	7.26	68.89	36.77	0.93
Stream 4C6	3	12359	1% Annual Chance	550	480.24	483.94	483.84	484.8	0.006993	7.42	74.11	38.01	0.94
Stream 4C6	3	12359	0.4% Annual Chan	650	480.24	484.16	484.1	485.12	0.007558	7.85	82.81	39.98	0.96
Stream 4C6	3	12359	0.2% Annual Chan	750	480.24	484.36	484.34	485.42	0.00812	8.26	90.79	41.71	0.99
Stream 4C6	3	12286*	50% Annual Chanc	150	479.74	481.79	481.79	482.36	0.009193	6.04	24.82	22.32	1.01
Stream 4C6	3	12286*	20% Annual Chanc	275	479.74	482.41	482.41	483.13	0.008276	6.77	40.64	28.5	1
Stream 4C6	3	12286*	10% Annual Chanc	325	479.74	482.61	482.61	483.37	0.008145	7.02	46.32	30.4	1
Stream 4C6	3	12286*	4% Annual Chance	450	479.74	483.03	483.03	483.9	0.007761	7.48	60.18	34.61	1
Stream 4C6	3	12286*	2% Annual Chance	500	479.74	483.18	483.18	484.09	0.00745	7.64	65.44	35.98	1
Stream 4C6	3	12286*	1% Annual Chance	550	479.74	483.32	483.32	484.27	0.007256	7.81	70.41	37.23	1
Stream 4C6	3	12286*	0.4% Annual Chan	650	479.74	483.57	483.57	484.59	0.006941	8.1	80.24	39.58	1
Stream 4C6	3	12286*	0.2% Annual Chan	750	479.74	483.82	483.82	484.89	0.006618	8.31	90.31	41.85	1
Stream 4C6	3	12138	50% Annual Chanc	150	478.75	481.27	480.73	481.51	0.002835	3.9	38.46	27.59	0.58
Stream 4C6	3	12138	20% Annual Chanc	275	478.75	482.02	481.35	482.33	0.002692	4.43	62.04	35.33	0.59
Stream 4C6	3	12138	10% Annual Chanc	325	478.75	482.26	481.55	482.59	0.002654	4.6	70.71	37.72	0.59
Stream 4C6	3	12138	4% Annual Chance	450	478.75	482.75	481.97	483.13	0.002454	5	90.35	42.43	0.59

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	12138	2% Annual Chance	500	478.75	482.91	482.11	483.32	0.002403	5.18	97.31	43.89	0.59
Stream 4C6	3	12138	1% Annual Chance	550	478.75	483.07	482.26	483.51	0.002352	5.34	104.32	45.32	0.59
Stream 4C6	3	12138	0.4% Annual Chan	650	478.75	483.35	482.51	483.85	0.002296	5.67	117.7	47.92	0.59
Stream 4C6	3	12138	0.2% Annual Chan	750	478.75	483.61	482.72	484.16	0.002279	5.98	130.29	50.21	0.6
Stream 4C6	3	12100	Bridge										
Stream 4C6	3	12078	50% Annual Chanc	150	477.72	479.81	479.81	480.38	0.009048	6.07	24.69	21.64	1
Stream 4C6	3	12078	20% Annual Chanc	275	477.72	480.45	480.45	481.15	0.008406	6.7	41.04	29.46	1
Stream 4C6	3	12078	10% Annual Chanc	325	477.72	480.82	480.65	481.41	0.006091	6.19	52.53	33.39	0.87
Stream 4C6	3	12078	4% Annual Chance	450	477.72	481.33	481.06	481.95	0.005035	6.32	71.25	38.79	0.81
Stream 4C6	3	12078	2% Annual Chance	500	477.72	481.62	481.2	482.2	0.003852	6.08	82.8	41.45	0.73
Stream 4C6	3	12078	1% Annual Chance	550	477.72	482.02	481.32	482.51	0.002639	5.63	99.99	45.23	0.62
Stream 4C6	3	12078	0.4% Annual Chan	650	477.72	482.43	481.56	482.93	0.002206	5.69	119.52	48.99	0.58
Stream 4C6	3	12078	0.2% Annual Chan	750	477.72	482.47	481.78	483.12	0.002807	6.47	121.45	49.32	0.66
Stream 4C6	3	11996.7*	50% Annual Chanc	150	476.92	478.98	478.98	479.53	0.009093	5.97	25.11	22.73	1
Stream 4C6	3	11996.7*	20% Annual Chanc	275	476.92	479.58	479.58	480.29	0.008416	6.72	40.92	29.32	1
Stream 4C6	3	11996.7*	10% Annual Chanc	325	476.92	480.67		480.95	0.001698	4.25	79.28	41.39	0.49
Stream 4C6	3	11996.7*	4% Annual Chance	450	476.92	481.21		481.55	0.001597	4.73	102.9	47.38	0.49
Stream 4C6	3	11996.7*	2% Annual Chance	500	476.92	481.52		481.85	0.001363	4.68	118.41	50.91	0.46
Stream 4C6	3	11996.7*	1% Annual Chance	550	476.92	481.95		482.25	0.001048	4.47	141.22	55.64	0.41
Stream 4C6	3	11996.7*	0.4% Annual Chan	650	476.92	482.37		482.69	0.000976	4.64	165.84	60.34	0.41
Stream 4C6	3	11996.7*	0.2% Annual Chan	750	476.92	482.39		482.81	0.001277	5.33	167.05	60.56	0.47
Stream 4C6	3	11915.5*	50% Annual Chanc	150	476.12	478.12	478.12	478.67	0.009072	5.96	25.18	22.89	1
Stream 4C6	3	11915.5*	20% Annual Chanc	275	476.12	479.61		479.87	0.00157	4.15	73.42	44.81	0.47
Stream 4C6	3	11915.5*	10% Annual Chanc	325	476.12	480.7		480.84	0.000542	3.14	133.12	65.19	0.3
Stream 4C6	3	11915.5*	4% Annual Chance	450	476.12	481.24		481.42	0.000591	3.61	172.27	79.5	0.32
Stream 4C6	3	11915.5*	2% Annual Chance	500	476.12	481.56		481.74	0.000544	3.64	199.48	93.61	0.31
Stream 4C6	3	11915.5*	1% Annual Chance	550	476.12	481.99		482.15	0.000458	3.56	246.01	130.16	0.29
Stream 4C6	3	11915.5*	0.4% Annual Chan	650	476.12	482.43		482.59	0.000433	3.67	320.57	194.81	0.28
Stream 4C6	3	11915.5*	0.2% Annual Chan	750	476.12	482.47		482.68	0.000551	4.16	329.08	197.61	0.32
Stream 4C6	3	11834.2*	50% Annual Chanc	150	475.32	477.25	477.25	477.82	0.008856	6.07	24.76	22.97	1
Stream 4C6	3	11834.2*	20% Annual Chanc	275	475.32	479.72		479.76	0.000246	2.17	280.79	220.94	0.2
Stream 4C6	3	11834.2*	10% Annual Chanc	325	475.32	480.77		480.79	0.000075	1.42	543.11	274.85	0.12
Stream 4C6	3	11834.2*	4% Annual Chance	450	475.32	481.35		481.36	0.000073	1.51	707.44	297.41	0.12
Stream 4C6	3	11834.2*	2% Annual Chance	500	475.32	481.66		481.68	0.000064	1.47	803.64	304.02	0.11
Stream 4C6	3	11834.2*	1% Annual Chance	550	475.32	482.08		482.1	0.000051	1.38	932.7	310.83	0.1
Stream 4C6	3	11834.2*	0.4% Annual Chan	650	475.32	482.53		482.54	0.000048	1.4	1071.11	317.43	0.1
Stream 4C6	3	11834.2*	0.2% Annual Chan	750	475.32	482.6		482.61	0.00006	1.58	1094.23	318.52	0.11
Stream 4C6	3	11751	50% Annual Chanc	150	474.52	477.49		477.5	0.000059	0.84	399.31	266.61	0.09
Stream 4C6	3	11751	20% Annual Chanc	275	474.52	479.75		479.75	0.00001	0.53	1079.49	322.39	0.04
Stream 4C6	3	11751	10% Annual Chanc	325	474.52	480.78		480.78	0.000006	0.47	1419.79	335.14	0.03
Stream 4C6	3	11751	4% Annual Chance	450	474.52	481.35		481.36	0.000008	0.57	1613.34	342.19	0.04
Stream 4C6	3	11751	2% Annual Chance	500	474.52	481.67		481.67	0.000008	0.59	1723.01	346.15	0.04
Stream 4C6	3	11751	1% Annual Chance	550	474.52	482.09		482.09	0.000008	0.6	1868.85	351.23	0.04
Stream 4C6	3	11751	0.4% Annual Chan	650	474.52	482.53		482.53	0.000008	0.65	2024.68	356.62	0.04
Stream 4C6	3	11751	0.2% Annual Chan	750	474.52	482.6		482.61	0.000011	0.74	2051.16	357.51	0.05
Stream 4C6	3	11383	50% Annual Chanc	150	472.96	477.49		477.49	0.000008	0.38	834.96	361.45	0.04
Stream 4C6	3	11383	20% Annual Chanc	275	472.96	479.75		479.75	0.000003	0.32	1680.07	385.57	0.02
Stream 4C6	3	11383	10% Annual Chanc	325	472.96	480.78		480.78	0.000002	0.3	2083.86	394.37	0.02
Stream 4C6	3	11383	4% Annual Chance	450	472.96	481.35		481.35	0.000003	0.38	2310.47	398.94	0.02
Stream 4C6	3	11383	2% Annual Chance	500	472.96	481.67		481.67	0.000003	0.4	2438	401.49	0.03
Stream 4C6	3	11383	1% Annual Chance	550	472.96	482.09		482.09	0.000003	0.41	2606.65	404.84	0.03
Stream 4C6	3	11383	0.4% Annual Chan	650	472.96	482.53		482.53	0.000003	0.45	2785.65	408.38	0.03
Stream 4C6	3	11383	0.2% Annual Chan	750	472.96	482.6		482.61	0.000004	0.51	2815.84	408.97	0.03
Stream 4C6	3	11124	50% Annual Chanc	150	471.89	477.47	473.77	477.48	0.000065	0.98	172.38	493.44	0.09
Stream 4C6	3	11124	20% Annual Chanc	250	471.89	479.73	474.33	479.74	0.000032	0.94	315.01	578.85	0.07
Stream 4C6	3	11124	10% Annual Chanc	325	471.89	480.76	474.66	480.78	0.000031	1.01	383.22	647.41	0.07
Stream 4C6	3	11124	4% Annual Chance	400	471.89	481.33	474.95	481.35	0.000035	1.14	420.63	671.18	0.07
Stream 4C6	3	11124	2% Annual Chance	450	471.89	481.64	475.15	481.66	0.000038	1.22	441.44	681.11	0.08
Stream 4C6	3	11124	1% Annual Chance	550	471.89	482.05	475.48	482.08	0.000047	1.41	468.49	696.24	0.09
Stream 4C6	3	11124	0.4% Annual Chan	650	471.89	482.53	475.75	482.53	0.000002	0.31	3894.62	714.03	0.02
Stream 4C6	3	11124	0.2% Annual Chan	700	471.89	482.6	475.87	482.6	0.000002	0.33	3947.45	716.71	0.02
Stream 4C6	3	11100	Culvert										
Stream 4C6	3	11054	50% Annual Chanc	150	471.2	473.94	473.27	474.23	0.008708	4.37	34.3	19.23	0.58
Stream 4C6	3	11054	20% Annual Chanc	250	471.2	475.01	473.88	475.3	0.006232	4.34	57.66	25.37	0.51
Stream 4C6	3	11054	10% Annual Chanc	325	471.2	476.03	474.26	476.24	0.00369	3.69	88.19	33.55	0.4
Stream 4C6	3	11054	4% Annual Chance	400	471.2	476.47	474.6	476.71	0.003571	3.86	103.73	37.85	0.4
Stream 4C6	3	11054	2% Annual Chance	450	471.2	476.88	474.8	477.1	0.002907	3.8	120.74	46.23	0.37

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	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)	
Stream 4C6	3	11054	1% Annual Chance	550	471.2	477.39	475.26	477.63	0.002657	4	147.94	117.81	0.36
Stream 4C6	3	11054	0.4% Annual Chan	650	471.2	477.8	475.58	478.07	0.002573	4.21	174.78	159.67	0.36
Stream 4C6	3	11054	0.2% Annual Chan	700	471.2	478.02	475.72	478.3	0.002477	4.28	189.66	214.63	0.36
Stream 4C6	3	11050	Bridge										
Stream 4C6	3	11039	50% Annual Chanc	150	470.98	473.7	473.12	474.01	0.009603	4.52	33.22	19.18	0.6
Stream 4C6	3	11039	20% Annual Chanc	250	470.98	474.62	473.71	474.97	0.007409	4.75	52.59	22.89	0.55
Stream 4C6	3	11039	10% Annual Chanc	325	470.98	475.32	474.08	475.66	0.005863	4.66	69.8	26.2	0.5
Stream 4C6	3	11039	4% Annual Chance	400	470.98	476.07	474.41	476.37	0.004464	4.41	90.75	30.12	0.45
Stream 4C6	3	11039	2% Annual Chance	450	470.98	476.58	474.6	476.86	0.003449	4.21	107.1	33.39	0.4
Stream 4C6	3	11039	1% Annual Chance	550	470.98	477.09	474.98	477.4	0.003224	4.47	125.1	37.5	0.4
Stream 4C6	3	11039	0.4% Annual Chan	650	470.98	477.47	475.32	477.83	0.003313	4.82	139.5	55.37	0.41
Stream 4C6	3	11039	0.2% Annual Chan	700	470.98	477.69	475.5	478.06	0.003241	4.92	150.94	131.6	0.41
Stream 4C6	3	10944	50% Annual Chanc	150	470.53	473.31	471.98	473.44	0.00275	2.85	52.6	23.31	0.33
Stream 4C6	3	10944	20% Annual Chanc	250	470.53	474.29	472.47	474.45	0.002575	3.26	76.68	26.04	0.33
Stream 4C6	3	10944	10% Annual Chanc	325	470.53	475.05	472.83	475.22	0.002216	3.34	97.28	28.18	0.32
Stream 4C6	3	10944	4% Annual Chance	400	470.53	475.85	473.13	476.02	0.001809	3.31	121.88	40.77	0.29
Stream 4C6	3	10944	2% Annual Chance	450	470.53	476.41	473.32	476.57	0.001457	3.24	146.85	50.69	0.27
Stream 4C6	3	10944	1% Annual Chance	550	470.53	476.93	473.67	477.12	0.001492	3.53	176.26	61.36	0.28
Stream 4C6	3	10944	0.4% Annual Chan	650	470.53	477.29	473.99	477.52	0.001646	3.88	207.34	140.74	0.29
Stream 4C6	3	10944	0.2% Annual Chan	700	470.53	477.52	474.15	477.75	0.001608	3.94	241.96	160.09	0.29
Stream 4C6	3	10900	Culvert										
Stream 4C6	3	10846	50% Annual Chanc	150	469.9	472.75	471.59	472.91	0.00375	3.24	46.25	21.27	0.39
Stream 4C6	3	10846	20% Annual Chanc	250	469.9	473.47	472.14	473.71	0.004694	3.98	62.8	25.06	0.44
Stream 4C6	3	10846	10% Annual Chanc	325	469.9	474	472.48	474.28	0.004692	4.23	76.92	28.03	0.45
Stream 4C6	3	10846	4% Annual Chance	400	469.9	474.48	472.81	474.78	0.004632	4.4	90.98	30.95	0.45
Stream 4C6	3	10846	2% Annual Chance	450	469.9	474.77	473.02	475.09	0.004553	4.48	100.4	32.75	0.45
Stream 4C6	3	10846	1% Annual Chance	550	469.9	475.19	473.42	475.55	0.004707	4.81	114.52	35.37	0.46
Stream 4C6	3	10846	0.4% Annual Chan	650	469.9	475.55	473.77	475.96	0.004647	5.11	127.88	37.77	0.47
Stream 4C6	3	10846	0.2% Annual Chan	700	469.9	475.99	473.93	476.37	0.003685	4.91	145.31	42.1	0.43
Stream 4C6	3	10477	50% Annual Chanc	275	469.39	471.41	470.5	471.54	0.00364	2.92	94.15	52.19	0.38
Stream 4C6	3	10477	20% Annual Chanc	450	469.39	472.31	470.9	472.47	0.002746	3.14	143.24	57.39	0.35
Stream 4C6	3	10477	10% Annual Chanc	600	469.39	472.89	471.2	473.07	0.002607	3.38	177.75	61.39	0.35
Stream 4C6	3	10477	4% Annual Chance	750	469.39	473.41	471.47	473.61	0.002512	3.57	210.26	64.93	0.35
Stream 4C6	3	10477	2% Annual Chance	850	469.39	473.73	471.64	473.94	0.002448	3.67	231.57	67.15	0.35
Stream 4C6	3	10477	1% Annual Chance	1000	469.39	474.19	471.88	474.42	0.002306	3.79	270.24	115.37	0.34
Stream 4C6	3	10477	0.4% Annual Chan	1150	469.39	474.64	472.12	474.87	0.002121	3.88	312.84	150.04	0.33
Stream 4C6	3	10477	0.2% Annual Chan	1350	469.39	475.21	472.41	475.45	0.001891	3.97	370.64	206.49	0.32
Stream 4C6	3	10400	Culvert										
Stream 4C6	3	10330	50% Annual Chanc	275	467.26	471.1	468.36	471.13	0.000374	1.35	204.17	68.27	0.13
Stream 4C6	3	10330	20% Annual Chanc	450	467.26	471.91	468.77	471.96	0.000471	1.74	273.28	136.44	0.16
Stream 4C6	3	10330	10% Annual Chanc	600	467.26	472.35	469.06	472.42	0.000584	2.06	315.97	160.79	0.18
Stream 4C6	3	10330	4% Annual Chance	750	467.26	472.7	469.33	472.79	0.000701	2.37	350.4	167.17	0.19
Stream 4C6	3	10330	2% Annual Chance	850	467.26	472.91	469.5	473.01	0.000771	2.56	370.83	171.08	0.21
Stream 4C6	3	10330	1% Annual Chance	1000	467.26	473.18	469.75	473.3	0.000877	2.83	398.49	175.47	0.22
Stream 4C6	3	10330	0.4% Annual Chan	1150	467.26	473.42	469.96	473.57	0.000985	3.09	423.02	179.27	0.24
Stream 4C6	3	10330	0.2% Annual Chan	1350	467.26	473.68	470.24	473.86	0.001149	3.45	452.09	212.37	0.26
Stream 4C6	3	10290	50% Annual Chanc	275	466.45	471.02		471.09	0.001648	2.12	147.62	94.55	0.22
Stream 4C6	3	10290	20% Annual Chanc	450	466.45	471.83		471.91	0.001601	2.48	240.51	147.79	0.23
Stream 4C6	3	10290	10% Annual Chanc	600	466.45	472.27		472.37	0.001661	2.73	313.83	174.15	0.24
Stream 4C6	3	10290	4% Annual Chance	750	466.45	472.63		472.74	0.001695	2.92	378.93	186.06	0.25
Stream 4C6	3	10290	2% Annual Chance	850	466.45	472.85		472.96	0.001716	3.03	420.02	195.84	0.25
Stream 4C6	3	10290	1% Annual Chance	1000	466.45	473.14		473.25	0.001752	3.19	478.57	211.32	0.25
Stream 4C6	3	10290	0.4% Annual Chan	1150	466.45	473.38		473.51	0.001793	3.34	530.93	217.21	0.26
Stream 4C6	3	10290	0.2% Annual Chan	1350	466.45	473.64		473.78	0.001904	3.55	588.6	223.21	0.27
Stream 4C6	3	9831	50% Annual Chanc	275	465.78	469.15		469.42	0.013521	4.14	66.37	33.31	0.52
Stream 4C6	3	9831	20% Annual Chanc	450	465.78	469.88		470.22	0.015073	4.75	101.4	90.14	0.56
Stream 4C6	3	9831	10% Annual Chanc	600	465.78	470.2	469.35	470.61	0.015888	5.33	134.11	110.92	0.59
Stream 4C6	3	9831	4% Annual Chance	750	465.78	470.41		470.91	0.017491	5.9	158.87	116.24	0.62
Stream 4C6	3	9831	2% Annual Chance	850	465.78	470.54	470.25	471.09	0.018489	6.25	173.89	121.11	0.65
Stream 4C6	3	9831	1% Annual Chance	1000	465.78	470.74	470.48	471.33	0.019122	6.64	200.28	149.53	0.66
Stream 4C6	3	9831	0.4% Annual Chan	1150	465.78	470.93	470.69	471.55	0.019031	6.89	238.08	258.68	0.67
Stream 4C6	3	9831	0.2% Annual Chan	1350	465.78	471.21	471.06	471.79	0.017165	6.91	316.11	289.59	0.64
Stream 4C6	3	9306	50% Annual Chanc	275	463.83	467.13		467.15	0.002045	1.63	272.83	278.57	0.18
Stream 4C6	3	9306	20% Annual Chanc	450	463.83	467.45		467.49	0.002561	1.98	367.62	304.46	0.21
Stream 4C6	3	9306	10% Annual Chanc	600	463.83	467.71		467.75	0.00266	2.14	452.6	338.63	0.22
Stream 4C6	3	9306	4% Annual Chance	750	463.83	467.95		468	0.002614	2.23	537.08	365.72	0.22

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	9306	2% Annual Chance	850	463.83	468.1		468.14	0.002583	2.28	591.25	379.76	0.22
Stream 4C6	3	9306	1% Annual Chance	1000	463.83	468.28		468.33	0.002621	2.38	660.71	393.16	0.22
Stream 4C6	3	9306	0.4% Annual Chan	1150	463.83	468.43		468.48	0.002714	2.49	720.72	404.12	0.23
Stream 4C6	3	9306	0.2% Annual Chan	1350	463.83	468.58		468.64	0.002962	2.67	782.4	413.95	0.24
Stream 4C6	3	8542	50% Annual Chanc	325	460.45	463.88	463.49	463.99	0.012195	3.01	159.11	247.22	0.41
Stream 4C6	3	8542	20% Annual Chanc	550	460.45	464.36		464.45	0.008021	2.9	287.38	293.77	0.35
Stream 4C6	3	8542	10% Annual Chanc	750	460.45	464.62		464.71	0.00782	3.09	366.24	323.02	0.35
Stream 4C6	3	8542	4% Annual Chance	950	460.45	464.79		464.9	0.008454	3.37	423.29	339.15	0.37
Stream 4C6	3	8542	2% Annual Chance	1100	460.45	464.92		465.03	0.008665	3.52	466.38	349.62	0.38
Stream 4C6	3	8542	1% Annual Chance	1300	460.45	465.08		465.21	0.008661	3.66	526.72	367.98	0.38
Stream 4C6	3	8542	0.4% Annual Chan	1550	460.45	465.35		465.47	0.00756	3.63	627.24	392.31	0.36
Stream 4C6	3	8542	0.2% Annual Chan	1750	460.45	465.55		465.67	0.006798	3.59	709.89	410.1	0.35
Stream 4C6	3	7726	50% Annual Chanc	325	453.52	459.66	456.71	459.78	0.002985	2.79	120.49	58.06	0.26
Stream 4C6	3	7726	20% Annual Chanc	550	453.52	460.64		460.77	0.003298	3.08	224.76	138.76	0.28
Stream 4C6	3	7726	10% Annual Chanc	750	453.52	461.24		461.37	0.002984	3.19	327.44	212.66	0.27
Stream 4C6	3	7726	4% Annual Chance	950	453.52	461.67	458.89	461.79	0.002638	3.19	425.84	243.31	0.26
Stream 4C6	3	7726	2% Annual Chance	1100	453.52	461.96	459.41	462.07	0.002453	3.2	498.5	260.34	0.25
Stream 4C6	3	7726	1% Annual Chance	1300	453.52	462.29	460.49	462.39	0.00231	3.23	585.95	274.91	0.24
Stream 4C6	3	7726	0.4% Annual Chan	1550	453.52	462.51	460.8	462.63	0.002567	3.5	649.05	299.62	0.26
Stream 4C6	3	7726	0.2% Annual Chan	1750	453.52	462.62	461.05	462.76	0.002867	3.75	684.89	305.04	0.27
Stream 4C6	3	7315	50% Annual Chanc	325	452.69	455.75	455.6	456.49	0.056192	6.93	46.91	25.33	0.9
Stream 4C6	3	7315	20% Annual Chanc	550	452.69	457.31		457.85	0.024229	5.92	92.83	33.42	0.63
Stream 4C6	3	7315	10% Annual Chanc	750	452.69	457.81		458.53	0.028782	6.81	110.2	36.65	0.69
Stream 4C6	3	7315	4% Annual Chance	950	452.69	458.26		459.12	0.032012	7.45	127.53	40.16	0.74
Stream 4C6	3	7315	2% Annual Chance	1100	452.69	458.59	457.84	459.53	0.032935	7.77	143.27	61.26	0.75
Stream 4C6	3	7315	1% Annual Chance	1300	452.69	459.01	458.28	459.99	0.031486	8.01	175.26	92.73	0.75
Stream 4C6	3	7315	0.4% Annual Chan	1550	452.69	459.89	459.19	460.47	0.016016	6.61	338.73	263.24	0.55
Stream 4C6	3	7315	0.2% Annual Chan	1750	452.69	460.41		460.78	0.010064	5.64	488.64	306.24	0.45
Stream 4C6	3	7010	50% Annual Chanc	325	451.68	456.05	453.15	456.09	0.000041	1.69	193.23	56.1	0.16
Stream 4C6	3	7010	20% Annual Chanc	550	451.68	457.51	453.69	457.57	0.000037	2.01	279.9	62.66	0.16
Stream 4C6	3	7010	10% Annual Chanc	750	451.68	458.07	454.1	458.16	0.000048	2.45	315.56	65.17	0.18
Stream 4C6	3	7010	4% Annual Chance	950	451.68	458.56	454.47	458.69	0.000057	2.83	348.52	67.41	0.2
Stream 4C6	3	7010	2% Annual Chance	1100	451.68	458.92	454.72	459.06	0.000062	3.09	372.83	80.87	0.21
Stream 4C6	3	7010	1% Annual Chance	1300	451.68	459.33	455.04	459.51	0.00007	3.41	401.65	162.94	0.23
Stream 4C6	3	7010	0.4% Annual Chan	1550	451.68	460	455.41	460.2	0.000069	3.61	570.23	310.96	0.23
Stream 4C6	3	7010	0.2% Annual Chan	1750	451.68	460.42	455.68	460.62	0.000071	3.78	706.16	354.08	0.24
Stream 4C6	3	7000		Culvert									
Stream 4C6	3	6894	50% Annual Chanc	325	451.38	455.96	452.85	456	0.000033	1.59	206.28	58.27	0.14
Stream 4C6	3	6894	20% Annual Chanc	550	451.38	457.37	453.39	457.43	0.000033	1.94	292.29	63.99	0.15
Stream 4C6	3	6894	10% Annual Chanc	750	451.38	457.85	453.8	457.94	0.000045	2.41	323.26	130.03	0.18
Stream 4C6	3	6894	4% Annual Chance	950	451.38	458.25	454.17	458.37	0.000057	2.83	351.34	188.22	0.2
Stream 4C6	3	6894	2% Annual Chance	1100	451.38	458.53	454.42	458.68	0.000065	3.12	377.16	222.27	0.22
Stream 4C6	3	6894	1% Annual Chance	1300	451.38	458.83	454.74	459.01	0.000077	3.49	404.91	245.29	0.24
Stream 4C6	3	6894	0.4% Annual Chan	1550	451.38	459.18	455.11	459.41	0.00009	3.91	438.61	292.5	0.26
Stream 4C6	3	6894	0.2% Annual Chan	1750	451.38	459.43	455.37	459.69	0.000101	4.24	461.47	334.24	0.28
Stream 4C6	3	6842	50% Annual Chanc	325	448.85	455.83		455.97	0.0044	2.98	109.8	32.26	0.27
Stream 4C6	3	6842	20% Annual Chanc	550	448.85	457.19		457.38	0.004307	3.61	186.3	163.78	0.28
Stream 4C6	3	6842	10% Annual Chanc	750	448.85	457.65		457.89	0.004958	4.1	278.09	212.97	0.3
Stream 4C6	3	6842	4% Annual Chance	950	448.85	458.11		458.33	0.004878	4.28	383.45	257.12	0.31
Stream 4C6	3	6842	2% Annual Chance	1100	448.85	458.43		458.65	0.004648	4.33	474.26	304.16	0.3
Stream 4C6	3	6842	1% Annual Chance	1300	448.85	458.8		458.99	0.004238	4.29	590.62	323.53	0.29
Stream 4C6	3	6842	0.4% Annual Chan	1550	448.85	459.2		459.37	0.003934	4.29	722.77	351.34	0.28
Stream 4C6	3	6842	0.2% Annual Chan	1750	448.85	459.46		459.63	0.004035	4.45	819.08	390.43	0.29
Stream 4C6	3	6694	50% Annual Chanc	325	448.57	455.53		455.59	0.001519	2.06	192.45	91.96	0.17
Stream 4C6	3	6694	20% Annual Chanc	550	448.57	456.96		457.03	0.001289	2.27	429.01	306.38	0.16
Stream 4C6	3	6694	10% Annual Chanc	750	448.57	457.42		457.49	0.001403	2.48	574.42	325.58	0.17
Stream 4C6	3	6694	4% Annual Chance	950	448.57	457.88		457.94	0.001391	2.58	729.35	358.99	0.17
Stream 4C6	3	6694	2% Annual Chance	1100	448.57	458.22		458.28	0.00132	2.6	854.31	378.56	0.17
Stream 4C6	3	6694	1% Annual Chance	1300	448.57	458.58		458.64	0.00135	2.71	997.92	423.44	0.17
Stream 4C6	3	6694	0.4% Annual Chan	1550	448.57	458.97		459.03	0.001323	2.77	1171.56	446.97	0.17
Stream 4C6	3	6694	0.2% Annual Chan	1750	448.57	459.23		459.29	0.001334	2.84	1287.47	456.7	0.17
Stream 4C6	2	6239	50% Annual Chanc	800	446.26	454.72		454.91	0.001995	3.68	263.92	106.53	0.26
Stream 4C6	2	6239	20% Annual Chanc	1550	446.26	456.04		456.28	0.002417	4.62	688.85	499.82	0.3
Stream 4C6	2	6239	10% Annual Chanc	2050	446.26	456.55		456.76	0.002261	4.68	965.19	563.67	0.29
Stream 4C6	2	6239	4% Annual Chance	2700	446.26	457.03		457.22	0.002211	4.81	1245.37	597.53	0.29
Stream 4C6	2	6239	2% Annual Chance	3250	446.26	457.39		457.57	0.002189	4.92	1463.47	626.5	0.29
Stream 4C6	2	6239	1% Annual Chance	3850	446.26	457.76		457.94	0.002165	5.03	1699.1	653.26	0.29
Stream 4C6	2	6239	0.4% Annual Chan	4650	446.26	458.15		458.33	0.002175	5.19	1961	672.3	0.3

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	2	6239	0.2% Annual Chan	5250	446.26	458.37		458.56	0.002287	5.4	2110.2	684.39	0.31
Stream 4C6	2	6059	50% Annual Chanc	800	445.85	454.15	452.06	454.43	0.003808	4.64	224.58	106.17	0.35
Stream 4C6	2	6059	20% Annual Chanc	1550	445.85	455.49	453.68	455.77	0.003832	5.39	559.89	340.01	0.36
Stream 4C6	2	6059	10% Annual Chanc	2050	445.85	456.08	454.25	456.32	0.003359	5.33	769.77	374.45	0.35
Stream 4C6	2	6059	4% Annual Chance	2700	445.85	456.52	455.58	456.78	0.003609	5.74	943.05	404	0.36
Stream 4C6	2	6059	2% Annual Chance	3250	445.85	456.87	455.82	457.13	0.003731	6.01	1085.08	429.89	0.37
Stream 4C6	2	6059	1% Annual Chance	3850	445.85	457.24	456.06	457.5	0.0037	6.16	1249.24	456.54	0.37
Stream 4C6	2	6059	0.4% Annual Chan	4650	445.85	457.61	456.32	457.89	0.003869	6.48	1422.67	471.5	0.38
Stream 4C6	2	6059	0.2% Annual Chan	5250	445.85	457.77		458.08	0.004276	6.9	1500.49	475.55	0.4
Stream 4C6	2	5757	50% Annual Chanc	800	445.25	450.07	450.07	451.72	0.034636	10.29	77.86	25.44	0.99
Stream 4C6	2	5757	20% Annual Chanc	1550	445.25	452.15	452.15	453.41	0.022091	9.55	192.97	79.5	0.84
Stream 4C6	2	5757	10% Annual Chanc	2050	445.25	452.74	452.74	454.16	0.021707	10.36	242.1	88.29	0.85
Stream 4C6	2	5757	4% Annual Chance	2700	445.25	453.88	453.88	454.89	0.012952	9.27	438.89	269.11	0.68
Stream 4C6	2	5757	2% Annual Chance	3250	445.25	454.31	454.31	455.26	0.012037	9.37	562.5	313.74	0.66
Stream 4C6	2	5757	1% Annual Chance	3850	445.25	454.58	454.58	455.6	0.012842	9.95	649.98	342.16	0.69
Stream 4C6	2	5757	0.4% Annual Chan	4650	445.25	455.03	455.01	455.99	0.011983	10.06	814.66	372.36	0.67
Stream 4C6	2	5757	0.2% Annual Chan	5250	445.25	456		456.53	0.00674	8.23	1293.46	565.04	0.52
Stream 4C6	2	5525	50% Annual Chanc	800	443.85	448.83	446.76	448.91	0.001643	2.3	347.61	112.04	0.23
Stream 4C6	2	5525	20% Annual Chanc	1500	443.85	450.39	447.41	450.52	0.001616	2.83	530.54	123.64	0.24
Stream 4C6	2	5525	10% Annual Chanc	2000	443.85	451.24	447.81	451.39	0.001629	3.14	638.39	131.51	0.25
Stream 4C6	2	5525	4% Annual Chance	2650	443.85	452.15	448.29	452.34	0.001629	3.51	761.74	139.28	0.25
Stream 4C6	2	5525	2% Annual Chance	3200	443.85	452.83	448.65	453.05	0.001639	3.79	859.14	145.13	0.26
Stream 4C6	2	5525	1% Annual Chance	3800	443.85	453.58	449.02	453.83	0.001602	4.02	969.75	150.58	0.26
Stream 4C6	2	5525	0.4% Annual Chan	4600	443.85	454.56	449.49	454.84	0.001529	4.27	1127.85	180.45	0.26
Stream 4C6	2	5525	0.2% Annual Chan	5150	443.85	455.5	449.81	455.78	0.001312	4.25	1317.62	253.97	0.25
Stream 4C6	2	5400		Culvert									
Stream 4C6	2	4891	50% Annual Chanc	800	442.34	448.57	446.05	448.72	0.004156	3.09	261.22	130.16	0.28
Stream 4C6	2	4891	20% Annual Chanc	1500	442.34	449.93	447.17	450.15	0.004276	3.87	460.24	306.5	0.3
Stream 4C6	2	4891	10% Annual Chanc	2000	442.34	450.56	447.79	450.8	0.004281	4.2	594.42	338.94	0.31
Stream 4C6	2	4891	4% Annual Chance	2650	442.34	451.13	448.5	451.41	0.004607	4.65	717.99	354.36	0.33
Stream 4C6	2	4891	2% Annual Chance	3200	442.34	451.48	449.36	451.81	0.00511	5.08	793.07	364.87	0.35
Stream 4C6	2	4891	1% Annual Chance	3800	442.34	451.85	450.04	452.22	0.005525	5.47	870.84	372.27	0.37
Stream 4C6	2	4891	0.4% Annual Chan	4600	442.34	452.27	450.48	452.72	0.006054	5.96	962.09	377.72	0.39
Stream 4C6	2	4891	0.2% Annual Chan	5150	442.34	452.55	450.73	453.04	0.006354	6.26	1021.31	383.59	0.4
Stream 4C6	2	4553	50% Annual Chanc	800	440.92	447.09		447.23	0.004655	3.02	273.32	99.12	0.29
Stream 4C6	2	4553	20% Annual Chanc	1500	440.92	448.08		448.35	0.006863	4.18	407.65	199.67	0.36
Stream 4C6	2	4553	10% Annual Chanc	2000	440.92	448.57		448.9	0.007697	4.77	537.12	354.87	0.39
Stream 4C6	2	4553	4% Annual Chance	2650	440.92	449.1		449.45	0.007813	5.16	764.17	488.57	0.4
Stream 4C6	2	4553	2% Annual Chance	3200	440.92	449.49		449.82	0.007313	5.24	963.13	521.34	0.39
Stream 4C6	2	4553	1% Annual Chance	3800	440.92	449.84		450.17	0.007106	5.38	1148.92	539.71	0.39
Stream 4C6	2	4553	0.4% Annual Chan	4600	440.92	450.23		450.56	0.006985	5.57	1361.82	567.63	0.39
Stream 4C6	2	4553	0.2% Annual Chan	5150	440.92	450.48		450.81	0.006949	5.7	1508.23	580.25	0.39
Stream 4C6	2	3968	50% Annual Chanc	800	438.42	445.53	442.77	445.62	0.001767	2.68	499.54	521.95	0.24
Stream 4C6	2	3968	20% Annual Chanc	1500	438.42	446.27	444.17	446.36	0.001879	3.12	917.35	614.92	0.26
Stream 4C6	2	3968	10% Annual Chanc	2000	438.42	446.6	445.51	446.7	0.002057	3.42	1112.32	633.46	0.28
Stream 4C6	2	3968	4% Annual Chance	2700	438.42	446.96	445.83	447.08	0.002321	3.82	1334.87	657.61	0.3
Stream 4C6	2	3968	2% Annual Chance	3200	438.42	447.18	446	447.32	0.002694	4.23	1470.9	747.71	0.32
Stream 4C6	2	3968	1% Annual Chance	3800	438.42	447.41	446.14	447.57	0.002957	4.55	1639.88	806.43	0.34
Stream 4C6	2	3968	0.4% Annual Chan	4600	438.42	447.7	446.44	447.88	0.003175	4.88	1864.88	864.14	0.35
Stream 4C6	2	3968	0.2% Annual Chan	5200	438.42	447.9	446.57	448.09	0.003311	5.1	2025.23	898.3	0.36
Stream 4C6	2	3900		Culvert									
Stream 4C6	2	3868	50% Annual Chanc	800	438.32	445.42	443.29	445.47	0.00256	2.26	656.55	565.79	0.21
Stream 4C6	2	3868	20% Annual Chanc	1500	438.32	446.21	445	446.25	0.00209	2.34	1143.6	671.06	0.2
Stream 4C6	2	3868	10% Annual Chanc	2000	438.32	446.53	445.24	446.57	0.00223	2.53	1360.68	695.84	0.21
Stream 4C6	2	3868	4% Annual Chance	2700	438.32	446.9	445.47	446.96	0.002396	2.76	1625.96	738.37	0.22
Stream 4C6	2	3868	2% Annual Chance	3200	438.32	447.13	445.62	447.19	0.002484	2.9	1803	770.72	0.22
Stream 4C6	2	3868	1% Annual Chance	3800	438.32	447.39	445.76	447.46	0.002585	3.06	2005.36	820.94	0.23
Stream 4C6	2	3868	0.4% Annual Chan	4600	438.32	447.7	445.94	447.78	0.002719	3.25	2274.94	897.37	0.24
Stream 4C6	2	3868	0.2% Annual Chan	5200	438.32	447.9	446.08	447.98	0.002744	3.34	2454.97	911.7	0.24
Stream 4C6	2	3113	50% Annual Chanc	800	435.02	442.34		442.65	0.007923	4.51	191.94	115.3	0.38
Stream 4C6	2	3113	20% Annual Chanc	1500	435.02	443.27	441.29	443.74	0.010697	5.96	406.44	343.45	0.45
Stream 4C6	2	3113	10% Annual Chanc	2000	435.02	443.77	443.39	444.19	0.009802	6.05	604.53	416.52	0.44
Stream 4C6	2	3113	4% Annual Chance	2700	435.02	444.32		444.68	0.008881	6.11	838.55	449.66	0.43
Stream 4C6	2	3113	2% Annual Chance	3200	435.02	444.65		444.99	0.008338	6.13	993.11	478.77	0.42
Stream 4C6	2	3113	1% Annual Chance	3800	435.02	444.99		445.3	0.007841	6.14	1160.29	499.29	0.41
Stream 4C6	2	3113	0.4% Annual Chan	4600	435.02	445.4		445.69	0.007154	6.09	1367.55	511.6	0.39
Stream 4C6	2	3113	0.2% Annual Chan	5200	435.02	445.69		445.98	0.006698	6.05	1519.81	523.84	0.38

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	2	2759	50% Annual Chanc	800	434.54	441.92	438.28	441.95	0.000586	1.69	964.53	505.59	0.13
Stream 4C6	2	2759	20% Annual Chanc	1500	434.54	442.58	439.84	442.62	0.000977	2.35	1308.72	536.7	0.17
Stream 4C6	2	2759	10% Annual Chanc	2000	434.54	442.93	440.38	442.99	0.001207	2.71	1498.54	548.25	0.19
Stream 4C6	2	2759	4% Annual Chance	2700	434.54	443.25	441.22	443.33	0.001606	3.23	1677.68	568.56	0.22
Stream 4C6	2	2759	2% Annual Chance	3200	434.54	443.5	441.23	443.59	0.001795	3.5	1820.8	590.49	0.23
Stream 4C6	2	2759	1% Annual Chance	3800	434.54	443.76	441.47	443.86	0.001985	3.77	1977.99	602.48	0.25
Stream 4C6	2	2759	0.4% Annual Chan	4600	434.54	444.21	441.96	444.31	0.001955	3.89	2250.61	626.21	0.25
Stream 4C6	2	2759	0.2% Annual Chan	5200	434.54	444.56	442.14	444.66	0.001866	3.91	2472.6	639.8	0.24
Stream 4C6	2	2750	Bridge										
Stream 4C6	2	2728	50% Annual Chanc	800	433.95	441.87	437.88	441.91	0.00074	1.8	772.95	430.91	0.14
Stream 4C6	2	2728	20% Annual Chanc	1500	433.95	442.49	439.43	442.56	0.001335	2.61	1084.28	529.67	0.19
Stream 4C6	2	2728	10% Annual Chanc	2050	433.95	442.82	440.21	442.91	0.001755	3.11	1264.01	557.98	0.22
Stream 4C6	2	2728	4% Annual Chance	2700	433.95	443.1	441.1	443.22	0.00224	3.63	1425.61	572.76	0.25
Stream 4C6	2	2728	2% Annual Chance	3250	433.95	443.34	441.38	443.48	0.002554	3.97	1561.09	586.22	0.27
Stream 4C6	2	2728	1% Annual Chance	3850	433.95	443.58	441.73	443.74	0.002826	4.28	1707.68	608.26	0.29
Stream 4C6	2	2728	0.4% Annual Chan	4700	433.95	444.04	442.29	444.2	0.002695	4.36	1993.94	637.46	0.29
Stream 4C6	2	2728	0.2% Annual Chan	5350	433.95	444.41	442.49	444.56	0.002517	4.36	2230.35	661.51	0.28
Stream 4C6	2	2700	Culvert										
Stream 4C6	2	2672	50% Annual Chanc	800	431.22	439.99	434.94	440.09	0.001558	2.54	382.4	226.8	0.18
Stream 4C6	2	2672	20% Annual Chanc	1500	431.22	441.03	436.32	441.17	0.00226	3.38	720.95	413.64	0.22
Stream 4C6	2	2672	10% Annual Chanc	2050	431.22	441.5	437.24	441.68	0.002867	3.97	946.34	540.43	0.25
Stream 4C6	2	2672	4% Annual Chance	2700	431.22	442.18	438.17	442.34	0.002572	3.98	1315.92	569.15	0.24
Stream 4C6	2	2672	2% Annual Chance	3250	431.22	442.82	440.16	442.95	0.002092	3.77	1670.91	608.82	0.22
Stream 4C6	2	2672	1% Annual Chance	3850	431.22	443.38	440.62	443.48	0.001769	3.6	2057.95	666.75	0.2
Stream 4C6	2	2672	0.4% Annual Chan	4700	431.22	443.98	441.22	444.08	0.00156	3.52	2468.37	686.78	0.19
Stream 4C6	2	2672	0.2% Annual Chan	5350	431.22	444.4	441.74	444.49	0.001449	3.48	2757.85	701.58	0.19
Stream 4C6	1	2063	50% Annual Chanc	800	430.04	439.08		439.14	0.001774	2.62	611.46	345.38	0.18
Stream 4C6	1	2063	20% Annual Chanc	1300	430.04	439.89		439.95	0.001947	2.96	943.63	463.22	0.19
Stream 4C6	1	2063	10% Annual Chanc	1550	430.04	440.21		440.28	0.001951	3.05	1101.96	514.61	0.19
Stream 4C6	1	2063	4% Annual Chance	2200	430.04	440.85		440.93	0.002304	3.5	1477.34	620.78	0.21
Stream 4C6	1	2063	2% Annual Chance	3250	430.04	441.57		441.65	0.002482	3.83	1954.47	693.59	0.22
Stream 4C6	1	2063	1% Annual Chance	4300	430.04	442.21		442.29	0.002474	4	2412.26	738.64	0.22
Stream 4C6	1	2063	0.4% Annual Chan	5600	430.04	442.87		442.95	0.002541	4.23	2917.04	796.35	0.23
Stream 4C6	1	2063	0.2% Annual Chan	6500	430.04	443.35		443.43	0.002412	4.25	3305.52	823.87	0.23
Stream 4C6	1	1542	50% Annual Chanc	800	429.21	438.33		438.38	0.001657	2.23	683.3	465.05	0.17
Stream 4C6	1	1542	20% Annual Chanc	1300	429.21	439.15		439.2	0.001598	2.42	1129.42	622.19	0.18
Stream 4C6	1	1542	10% Annual Chanc	1550	429.21	439.57		439.61	0.001324	2.31	1390.5	633.87	0.16
Stream 4C6	1	1542	4% Annual Chance	2200	429.21	440.17		440.21	0.001357	2.48	1776.74	648.65	0.17
Stream 4C6	1	1542	2% Annual Chance	3250	429.21	440.79		440.85	0.001672	2.91	2193.51	701.82	0.19
Stream 4C6	1	1542	1% Annual Chance	4300	429.21	441.36		441.43	0.001969	3.32	2624.09	789.28	0.2
Stream 4C6	1	1542	0.4% Annual Chan	5600	429.21	442.01		442.08	0.002004	3.52	3148.42	844.91	0.21
Stream 4C6	1	1542	0.2% Annual Chan	6500	429.21	442.52		442.59	0.00198	3.63	3596.77	906.37	0.21
Stream 4C6	1	725	50% Annual Chanc	800	427.16	437.6		437.64	0.000837	1.94	778.58	465.85	0.13
Stream 4C6	1	725	20% Annual Chanc	1300	427.16	438.48		438.52	0.000903	2.17	1235.47	588.07	0.13
Stream 4C6	1	725	10% Annual Chanc	1550	427.16	439.05		439.09	0.000752	2.07	1575.31	604.85	0.12
Stream 4C6	1	725	4% Annual Chance	2200	427.16	439.64		439.68	0.000891	2.36	1940.28	642.63	0.14
Stream 4C6	1	725	2% Annual Chance	3250	427.16	440.08		440.14	0.001356	3	2228.08	650.52	0.17
Stream 4C6	1	725	1% Annual Chance	4300	427.16	440.52		440.6	0.001713	3.47	2516.15	668.81	0.19
Stream 4C6	1	725	0.4% Annual Chan	5600	427.16	441.16		441.25	0.00187	3.78	2956.27	700.18	0.2
Stream 4C6	1	725	0.2% Annual Chan	6500	427.16	441.73		441.81	0.001763	3.79	3356.94	719.65	0.2
Hickory Trib 4	1	3766	50% Annual Chanc	150	469.95	472.52	471.99	472.58	0.007131	1.95	77.01	96.91	0.39
Hickory Trib 4	1	3766	20% Annual Chanc	275	469.95	472.83	472.28	472.92	0.00833	2.51	116.25	161.23	0.43
Hickory Trib 4	1	3766	10% Annual Chanc	350	469.95	472.98	472.46	473.09	0.008135	2.72	142.02	174.39	0.44
Hickory Trib 4	1	3766	4% Annual Chance	450	469.95	473.19	472.61	473.31	0.007371	2.88	179.87	192.6	0.43
Hickory Trib 4	1	3766	2% Annual Chance	500	469.95	473.28	472.7	473.41	0.007084	2.95	198.39	200.52	0.43
Hickory Trib 4	1	3766	1% Annual Chance	600	469.95	473.47	472.85	473.6	0.00642	3.04	237.62	215.82	0.41
Hickory Trib 4	1	3766	0.4% Annual Chan	700	469.95	473.65	472.96	473.78	0.005898	3.11	276.91	232.51	0.4
Hickory Trib 4	1	3766	0.2% Annual Chan	800	469.95	473.81	473.06	473.94	0.005509	3.18	315.09	243.96	0.4
Hickory Trib 4	1	3243	50% Annual Chanc	150	467.3	469.01		469.08	0.006304	2.2	68.14	65.38	0.38
Hickory Trib 4	1	3243	20% Annual Chanc	275	467.3	469.57		469.67	0.004853	2.53	113.71	104.44	0.36
Hickory Trib 4	1	3243	10% Annual Chanc	350	467.3	469.79		469.9	0.004802	2.75	137.93	120.22	0.36
Hickory Trib 4	1	3243	4% Annual Chance	450	467.3	469.99		470.12	0.005215	3.07	163.25	136.32	0.38
Hickory Trib 4	1	3243	2% Annual Chance	500	467.3	470.07		470.22	0.005415	3.22	175.48	147.67	0.39
Hickory Trib 4	1	3243	1% Annual Chance	600	467.3	470.19		470.37	0.006149	3.56	194.85	174.45	0.42
Hickory Trib 4	1	3243	0.4% Annual Chan	700	467.3	470.29	469.59	470.5	0.006966	3.9	213.09	201.67	0.46
Hickory Trib 4	1	3243	0.2% Annual Chan	800	467.3	470.37	469.74	470.61	0.007818	4.22	229.07	214.9	0.48

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Trib 4	1	2325	50% Annual Chanc	150	461.48	464.17		464.26	0.004433	2.47	60.78	37.37	0.34
Hickory Trib 4	1	2325	20% Annual Chanc	275	461.48	464.78		464.94	0.005478	3.21	90	76.07	0.39
Hickory Trib 4	1	2325	10% Annual Chanc	350	461.48	465.06		465.24	0.005438	3.48	122.1	149.56	0.4
Hickory Trib 4	1	2325	4% Annual Chance	450	461.48	465.39		465.57	0.004882	3.6	178.25	183.89	0.39
Hickory Trib 4	1	2325	2% Annual Chance	500	461.48	465.52		465.7	0.004702	3.65	203.46	189.17	0.38
Hickory Trib 4	1	2325	1% Annual Chance	600	461.48	465.82		465.98	0.004068	3.63	260.92	202.37	0.36
Hickory Trib 4	1	2325	0.4% Annual Chan	700	461.48	466.11		466.26	0.003509	3.58	320.58	207.19	0.34
Hickory Trib 4	1	2325	0.2% Annual Chan	800	461.48	466.38		466.52	0.003078	3.53	377.35	210.62	0.33
Hickory Trib 4	1	1814	50% Annual Chanc	150	459.09	461.48		461.6	0.006198	2.74	54.72	36.99	0.4
Hickory Trib 4	1	1814	20% Annual Chanc	275	459.09	462.44		462.58	0.003927	2.98	93.82	44.79	0.34
Hickory Trib 4	1	1814	10% Annual Chanc	350	459.09	462.87		463.02	0.003542	3.16	113.88	48.26	0.33
Hickory Trib 4	1	1814	4% Annual Chance	450	459.09	463.33		463.51	0.003377	3.42	137.14	51.99	0.33
Hickory Trib 4	1	1814	2% Annual Chance	500	459.09	463.72		463.88	0.002779	3.34	157.6	55.1	0.31
Hickory Trib 4	1	1814	1% Annual Chance	600	459.09	464.08		464.27	0.002808	3.58	178.62	59.35	0.32
Hickory Trib 4	1	1814	0.4% Annual Chan	700	459.09	464.49		464.69	0.002677	3.73	203.78	66.5	0.31
Hickory Trib 4	1	1814	0.2% Annual Chan	800	459.09	464.82		465.04	0.002688	3.92	227.82	81.57	0.32
Hickory Trib 4	1	1418	50% Annual Chanc	450	455.44	460.1		460.24	0.002907	2.99	150.43	68.09	0.35
Hickory Trib 4	1	1418	20% Annual Chanc	825	455.44	461.34		461.51	0.002384	3.39	244.27	82.9	0.34
Hickory Trib 4	1	1418	10% Annual Chanc	1025	455.44	461.84		462.04	0.002216	3.61	287.1	88.11	0.34
Hickory Trib 4	1	1418	4% Annual Chance	1250	455.44	462.36		462.58	0.002071	3.82	334.47	93.64	0.33
Hickory Trib 4	1	1418	2% Annual Chance	1450	455.44	462.78		463.02	0.001989	3.99	374.64	97.9	0.33
Hickory Trib 4	1	1418	1% Annual Chance	1650	455.44	463.16		463.43	0.001936	4.16	413.12	102.93	0.33
Hickory Trib 4	1	1418	0.4% Annual Chan	1950	455.44	463.42		463.75	0.002258	4.65	439.96	106.39	0.36
Hickory Trib 4	1	1418	0.2% Annual Chan	2200	455.44	463.65		464.03	0.002459	4.99	465.06	110.98	0.38
Hickory Trib 4	1	907	50% Annual Chanc	450	453.14	457.29		457.81	0.008773	5.8	77.61	28.68	0.62
Hickory Trib 4	1	907	20% Annual Chanc	825	453.14	458.68		459.38	0.008358	6.76	122.25	35.9	0.63
Hickory Trib 4	1	907	10% Annual Chanc	1025	453.14	459.37		460.13	0.007044	6.99	148.56	39.99	0.6
Hickory Trib 4	1	907	4% Annual Chance	1250	453.14	459.77		460.69	0.00766	7.74	167.97	65.65	0.63
Hickory Trib 4	1	907	2% Annual Chance	1450	453.14	459.99	458.97	461.08	0.008598	8.47	183.86	74.41	0.68
Hickory Trib 4	1	907	1% Annual Chance	1650	453.14	460.18	459.32	461.44	0.009545	9.15	198.96	84.1	0.72
Hickory Trib 4	1	907	0.4% Annual Chan	1950	453.14	460.99	460.99	461.88	0.006279	8.19	339.44	247.51	0.6
Hickory Trib 4	1	907	0.2% Annual Chan	2200	453.14	461.23	461.23	462.1	0.006096	8.29	401.85	267.5	0.59
Hickory Trib 4	1	565	50% Annual Chanc	450	451.75	456.24	454.12	456.36	0.001805	2.77	162.61	57.68	0.29
Hickory Trib 4	1	565	20% Annual Chanc	825	451.75	457.99	454.97	458.13	0.001188	2.97	283.8	95.1	0.25
Hickory Trib 4	1	565	10% Annual Chanc	1025	451.75	458.92	455.34	459.04	0.000844	2.86	447.92	401.2	0.22
Hickory Trib 4	1	565	4% Annual Chance	1250	451.75	459.39	455.73	459.5	0.000792	2.93	601.58	520.84	0.22
Hickory Trib 4	1	565	2% Annual Chance	1450	451.75	459.61	456.07	459.74	0.000842	3.1	695.83	597.99	0.22
Hickory Trib 4	1	565	1% Annual Chance	1650	451.75	459.81	456.41	459.94	0.000885	3.25	790.5	640.47	0.23
Hickory Trib 4	1	565	0.4% Annual Chan	1950	451.75	460.02	456.79	460.16	0.000963	3.46	893.68	653.15	0.24
Hickory Trib 4	1	565	0.2% Annual Chan	2200	451.75	460.19	457.08	460.33	0.001005	3.6	978.91	660.26	0.25
Hickory Trib 4	1	500		Culvert									
Hickory Trib 4	1	481	50% Annual Chanc	450	450.72	455.88	452.92	455.97	0.001643	2.51	179.68	264.66	0.23
Hickory Trib 4	1	481	20% Annual Chanc	825	450.72	456.85	453.82	457.05	0.002444	3.56	240.43	347.31	0.29
Hickory Trib 4	1	481	10% Annual Chanc	1025	450.72	457.2	454.22	457.45	0.002916	4.08	262.11	353.08	0.32
Hickory Trib 4	1	481	4% Annual Chance	1250	450.72	457.52	454.65	457.59	0.00109	2.6	834.4	360.28	0.2
Hickory Trib 4	1	481	2% Annual Chance	1450	450.72	457.81	455	457.88	0.001086	2.69	930.86	366.69	0.2
Hickory Trib 4	1	481	1% Annual Chance	1650	450.72	458.06	455.34	458.13	0.001104	2.8	1014.09	372.66	0.21
Hickory Trib 4	1	481	0.4% Annual Chan	1950	450.72	458.48	455.9	458.55	0.00106	2.87	1154.06	400.94	0.2
Hickory Trib 4	1	481	0.2% Annual Chan	2200	450.72	458.85	456.31	458.92	0.000986	2.88	1290.21	471.05	0.2
Hickory Trib 4	1	327.5*	50% Annual Chanc	450	450.03	455.53		455.64	0.003223	2.79	221.93	236.82	0.27
Hickory Trib 4	1	327.5*	20% Annual Chanc	825	450.03	456.56		456.62	0.002134	2.55	528.61	342.67	0.23
Hickory Trib 4	1	327.5*	10% Annual Chanc	1025	450.03	456.91		456.97	0.001971	2.6	659.75	391.63	0.22
Hickory Trib 4	1	327.5*	4% Annual Chance	1250	450.03	457.34		457.39	0.001592	2.49	833.83	414.61	0.2
Hickory Trib 4	1	327.5*	2% Annual Chance	1450	450.03	457.64		457.69	0.001462	2.49	964.64	443.93	0.2
Hickory Trib 4	1	327.5*	1% Annual Chance	1650	450.03	457.89		457.95	0.001404	2.52	1083.43	498.47	0.19
Hickory Trib 4	1	327.5*	0.4% Annual Chan	1950	450.03	458.33		458.37	0.001182	2.44	1307.13	523.28	0.18
Hickory Trib 4	1	327.5*	0.2% Annual Chan	2200	450.03	458.72		458.76	0.000992	2.33	1515	544.56	0.17
Hickory Trib 4	1	184	50% Annual Chanc	450	449.34	454.28		454.77	0.012022	5.61	80.16	28.75	0.59
Hickory Trib 4	1	184	20% Annual Chanc	825	449.34	456.05		456.19	0.004232	3.64	404.45	332.55	0.36
Hickory Trib 4	1	184	10% Annual Chanc	1025	449.34	456.54		456.63	0.002821	3.18	582.61	435.84	0.3
Hickory Trib 4	1	184	4% Annual Chance	1250	449.34	457.09		457.16	0.001727	2.74	855.76	511.99	0.24
Hickory Trib 4	1	184	2% Annual Chance	1450	449.34	457.42		457.48	0.001492	2.69	1029.1	540.71	0.23
Hickory Trib 4	1	184	1% Annual Chance	1650	449.34	457.69		457.75	0.001355	2.67	1177.97	565.77	0.22
Hickory Trib 4	1	184	0.4% Annual Chan	1950	449.34	458.17		458.21	0.00107	2.53	1453.09	596.75	0.2
Hickory Trib 4	1	184	0.2% Annual Chan	2200	449.34	458.59		458.63	0.000867	2.4	1708.21	620.48	0.18
Hickory Creek	3	62348	50% Annual Chanc	300	499.02	503.85	500.93	503.85	0.000002	0.11	3399.71	1253.16	0.01
Hickory Creek	3	62348	20% Annual Chanc	500	499.02	504.26	501.25	504.26	0.000004	0.15	3854.26	1269.58	0.01
Hickory Creek	3	62348	10% Annual Chanc	650	499.02	504.43	501.41	504.43	0.000006	0.19	4041.61	1277.21	0.02

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	62348	4% Annual Chance	950	499.02	504.7	501.69	504.7	0.00001	0.26	4353.31	1308.35	0.02
Hickory Creek	3	62348	2% Annual Chance	1400	499.02	504.97	502.07	504.97	0.000018	0.35	4658.22	1329.88	0.03
Hickory Creek	3	62348	1% Annual Chance	1850	499.02	505.19	502.4	505.2	0.000027	0.43	4916.22	1360.11	0.03
Hickory Creek	3	62348	0.4% Annual Chan	2450	499.02	505.45	502.79	505.46	0.000038	0.54	5215.5	1383.69	0.04
Hickory Creek	3	62348	0.2% Annual Chan	2900	499.02	505.62	503.07	505.63	0.000047	0.61	5412.09	1397.55	0.04
Hickory Creek	3	62300	Mult Open										
Hickory Creek	3	62267	50% Annual Chanc	300	496.69	501.23	499.1	501.28	0.001688	1.68	178.92	210.61	0.22
Hickory Creek	3	62267	20% Annual Chanc	500	496.69	501.81	500.14	501.88	0.001948	2.11	238.03	420.75	0.24
Hickory Creek	3	62267	10% Annual Chanc	650	496.69	502.15	500.39	502.24	0.002096	2.39	276.02	892.25	0.26
Hickory Creek	3	62267	4% Annual Chance	950	496.69	502.74	500.78	502.86	0.002249	2.82	348.18	1014.34	0.27
Hickory Creek	3	62267	2% Annual Chance	1400	496.69	502.97	501.26	502.99	0.000671	1.57	1419.08	1020.93	0.15
Hickory Creek	3	62267	1% Annual Chance	1850	496.69	503.37	501.65	503.39	0.000555	1.53	1825.24	1028.85	0.14
Hickory Creek	3	62267	0.4% Annual Chan	2450	496.69	503.83	502.14	503.85	0.000484	1.54	2290.4	1042.03	0.13
Hickory Creek	3	62267	0.2% Annual Chan	2900	496.69	504.13	502.51	504.15	0.000457	1.57	2603.72	1082.35	0.13
Hickory Creek	3	61930	50% Annual Chanc	300	496.3	500.51		500.56	0.002174	2.2	229.26	193.67	0.25
Hickory Creek	3	61930	20% Annual Chanc	500	496.3	501.01		501.07	0.002321	2.52	328.61	207.27	0.27
Hickory Creek	3	61930	10% Annual Chanc	650	496.3	501.3		501.37	0.00243	2.75	390.11	216.45	0.28
Hickory Creek	3	61930	4% Annual Chance	950	496.3	501.81		501.9	0.0027	3.22	507.19	247.87	0.3
Hickory Creek	3	61930	2% Annual Chance	1400	496.3	502.31		502.42	0.003095	3.75	630.92	254.79	0.33
Hickory Creek	3	61930	1% Annual Chance	1850	496.3	502.71		502.85	0.003459	4.23	736.51	263.82	0.35
Hickory Creek	3	61930	0.4% Annual Chan	2450	496.3	503.15		503.33	0.003876	4.76	855.45	279.9	0.38
Hickory Creek	3	61930	0.2% Annual Chan	2900	496.3	503.45		503.64	0.00406	5.07	965.64	493.68	0.39
Hickory Creek	3	61571	50% Annual Chanc	300	494.02	498.8		499.07	0.010373	4.21	79.42	94.35	0.52
Hickory Creek	3	61571	20% Annual Chanc	500	494.02	499.34		499.58	0.008819	4.39	153.1	167.44	0.5
Hickory Creek	3	61571	10% Annual Chanc	650	494.02	499.56		499.82	0.00882	4.65	192.48	185.37	0.51
Hickory Creek	3	61571	4% Annual Chance	950	494.02	499.93		500.21	0.009312	5.21	269.14	248.41	0.53
Hickory Creek	3	61571	2% Annual Chance	1400	494.02	500.36		500.64	0.008476	5.44	390.66	305.13	0.52
Hickory Creek	3	61571	1% Annual Chance	1850	494.02	500.67		500.97	0.008286	5.71	490.79	337.64	0.52
Hickory Creek	3	61571	0.4% Annual Chan	2450	494.02	500.99		501.31	0.008227	6	599.31	350.13	0.53
Hickory Creek	3	61571	0.2% Annual Chan	2900	494.02	501.17		501.53	0.008495	6.28	665.07	359.61	0.54
Hickory Creek	3	61068	50% Annual Chanc	300	492.22	497.72		497.76	0.00107	1.76	221.78	222.56	0.2
Hickory Creek	3	61068	20% Annual Chanc	500	492.22	498.27		498.31	0.001086	1.92	432.66	580.6	0.2
Hickory Creek	3	61068	10% Annual Chanc	650	492.22	498.47		498.51	0.001117	2.04	557.24	649.89	0.21
Hickory Creek	3	61068	4% Annual Chance	950	492.22	498.78		498.82	0.001192	2.24	762.64	684.93	0.22
Hickory Creek	3	61068	2% Annual Chance	1400	492.22	499.15		499.2	0.001289	2.51	1068.12	953.76	0.23
Hickory Creek	3	61068	1% Annual Chance	1850	492.22	499.45		499.5	0.00133	2.68	1366.49	1039.08	0.24
Hickory Creek	3	61068	0.4% Annual Chan	2450	492.22	499.77		499.82	0.001349	2.84	1710.6	1112.89	0.24
Hickory Creek	3	61068	0.2% Annual Chan	2900	492.22	500		500.06	0.001297	2.89	1976.38	1155.35	0.24
Hickory Creek	3	60694	50% Annual Chanc	500	491.38	496.87		496.99	0.003403	2.85	196.64	260.82	0.39
Hickory Creek	3	60694	20% Annual Chanc	850	491.38	497.34		497.48	0.003839	3.19	344.71	353.49	0.39
Hickory Creek	3	60694	10% Annual Chanc	1050	491.38	497.53	496.26	497.68	0.003975	3.37	413.72	377.32	0.4
Hickory Creek	3	60694	4% Annual Chance	1400	491.38	497.81	497.21	497.96	0.004139	3.62	521.75	427.72	0.4
Hickory Creek	3	60694	2% Annual Chance	1900	491.38	498.07	497.49	498.26	0.004795	4.08	642.87	520.39	0.43
Hickory Creek	3	60694	1% Annual Chance	2400	491.38	498.3	497.68	498.52	0.005104	4.4	772.26	599.19	0.45
Hickory Creek	3	60694	0.4% Annual Chan	3100	491.38	498.52	497.93	498.79	0.006019	4.96	923.61	823.16	0.49
Hickory Creek	3	60694	0.2% Annual Chan	3700	491.38	498.68	498.13	498.99	0.006774	5.4	1060.68	927.95	0.52
Hickory Creek	3	60052	50% Annual Chanc	500	490.54	495.13		495.19	0.002249	2.25	344.11	685.6	0.26
Hickory Creek	3	60052	20% Annual Chanc	850	490.54	495.43		495.49	0.002449	2.54	574.24	856.34	0.28
Hickory Creek	3	60052	10% Annual Chanc	1050	490.54	495.56		495.62	0.002498	2.65	689.63	934.89	0.28
Hickory Creek	3	60052	4% Annual Chance	1400	490.54	495.76		495.83	0.002574	2.82	900	1131.06	0.29
Hickory Creek	3	60052	2% Annual Chance	1900	490.54	496.01		496.07	0.002372	2.85	1190.37	1302.41	0.28
Hickory Creek	3	60052	1% Annual Chance	2400	490.54	496.21		496.28	0.002345	2.96	1472.22	1420.25	0.28
Hickory Creek	3	60052	0.4% Annual Chan	3100	490.54	496.47		496.53	0.0021	2.94	1851.86	1494.21	0.27
Hickory Creek	3	60052	0.2% Annual Chan	3700	490.54	496.66		496.72	0.001959	2.93	2135.26	1519.25	0.26
Hickory Creek	3	59797	50% Annual Chanc	500	490.2	494.46		494.51	0.00327	1.98	330.5	620.48	0.29
Hickory Creek	3	59797	20% Annual Chanc	850	490.2	494.86		494.9	0.002267	1.94	642.8	911.09	0.25
Hickory Creek	3	59797	10% Annual Chanc	1050	490.2	495.03		495.06	0.001988	1.92	796.84	961.01	0.24
Hickory Creek	3	59797	4% Annual Chance	1400	490.2	495.26		495.3	0.001758	1.95	1029.76	1033.26	0.23
Hickory Creek	3	59797	2% Annual Chance	1900	490.2	495.55		495.58	0.001576	2	1349.5	1159.1	0.22
Hickory Creek	3	59797	1% Annual Chance	2400	490.2	495.78		495.82	0.001476	2.05	1624.36	1213.48	0.22
Hickory Creek	3	59797	0.4% Annual Chan	3100	490.2	496.07		496.11	0.001392	2.12	1984.4	1274.57	0.21
Hickory Creek	3	59797	0.2% Annual Chan	3700	490.2	496.27		496.32	0.001372	2.2	2250.61	1366.07	0.21
Hickory Creek	3	59418	50% Annual Chanc	500	488.2	492.66		492.85	0.005773	3.66	156.8	130.36	0.41
Hickory Creek	3	59418	20% Annual Chanc	850	488.2	493.32		493.54	0.005574	4.1	265.27	251.71	0.42
Hickory Creek	3	59418	10% Annual Chanc	1050	488.2	493.53		493.76	0.005793	4.37	326.34	337.8	0.43
Hickory Creek	3	59418	4% Annual Chance	1400	488.2	493.85	493.19	494.09	0.005648	4.61	447.83	411.95	0.44
Hickory Creek	3	59418	2% Annual Chance	1900	488.2	494.23	493.71	494.47	0.005343	4.8	624.62	528.62	0.43
Hickory Creek	3	59418	1% Annual Chance	2400	488.2	494.5	493.94	494.75	0.005362	5.03	777.72	652.76	0.44

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	59418	0.4% Annual Chan	3100	488.2	494.82		495.07	0.005301	5.26	1026.69	916.04	0.44
Hickory Creek	3	59418	0.2% Annual Chan	3700	488.2	495.05		495.3	0.005078	5.32	1244.72	973.96	0.43
Hickory Creek	3	58747	50% Annual Chanc	500	483.82	491.05		491.11	0.001414	2.13	329.74	376.03	0.21
Hickory Creek	3	58747	20% Annual Chanc	850	483.82	491.46		491.53	0.001773	2.58	528.48	567.3	0.24
Hickory Creek	3	58747	10% Annual Chanc	1050	483.82	491.66		491.73	0.001755	2.67	647.65	604.28	0.24
Hickory Creek	3	58747	4% Annual Chance	1400	483.82	491.91		491.98	0.001876	2.88	802.81	653.72	0.25
Hickory Creek	3	58747	2% Annual Chance	1900	483.82	492.17		492.25	0.002106	3.18	975.7	696.46	0.27
Hickory Creek	3	58747	1% Annual Chance	2400	483.82	492.42		492.52	0.002135	3.33	1168.44	801.85	0.28
Hickory Creek	3	58747	0.4% Annual Chan	3100	483.82	492.74		492.83	0.002145	3.49	1438.32	918.8	0.28
Hickory Creek	3	58747	0.2% Annual Chan	3700	483.82	492.99		493.09	0.002156	3.62	1675.78	959.67	0.28
Hickory Creek	3	58357	50% Annual Chanc	700	484.2	490.31		490.36	0.002358	2.14	484.66	800.18	0.26
Hickory Creek	3	58357	20% Annual Chanc	1200	484.2	490.71	489.88	490.75	0.001976	2.2	813.38	837.93	0.24
Hickory Creek	3	58357	10% Annual Chanc	1550	484.2	490.88	490.28	490.94	0.00205	2.34	963.18	844.59	0.25
Hickory Creek	3	58357	4% Annual Chance	2000	484.2	491.08	490.42	491.14	0.002119	2.5	1133.95	854.15	0.26
Hickory Creek	3	58357	2% Annual Chance	2500	484.2	491.28	490.54	491.35	0.002188	2.65	1303.73	873.07	0.27
Hickory Creek	3	58357	1% Annual Chance	3150	484.2	491.51	490.67	491.59	0.002264	2.83	1503.97	896.2	0.27
Hickory Creek	3	58357	0.4% Annual Chan	4050	484.2	491.81		491.9	0.002237	2.98	1787.26	994.63	0.28
Hickory Creek	3	58357	0.2% Annual Chan	4850	484.2	492.1		492.19	0.002095	3.04	2070.61	1008.08	0.27
Hickory Creek	3	57697	50% Annual Chanc	700	483.6	488.13		488.26	0.004841	3.13	403.73	561.67	0.37
Hickory Creek	3	57697	20% Annual Chanc	1200	483.6	488.45		488.64	0.006909	4.09	620.83	823.88	0.46
Hickory Creek	3	57697	10% Annual Chanc	1550	483.6	488.72		488.89	0.006316	4.18	850.3	915.9	0.44
Hickory Creek	3	57697	4% Annual Chance	2000	483.6	489.06		489.21	0.005339	4.16	1180.58	1026.54	0.42
Hickory Creek	3	57697	2% Annual Chance	2500	483.6	489.35		489.49	0.004706	4.15	1488.1	1052.41	0.4
Hickory Creek	3	57697	1% Annual Chance	3150	483.6	489.77		489.88	0.00373	3.99	1928.6	1077.82	0.36
Hickory Creek	3	57697	0.4% Annual Chan	4050	483.6	490.32		490.42	0.002859	3.83	2542.08	1130.34	0.32
Hickory Creek	3	57697	0.2% Annual Chan	4850	483.6	490.79		490.87	0.002389	3.74	3081.04	1192.88	0.3
Hickory Creek	3	56929	50% Annual Chanc	700	481.22	485.96		486.02	0.001981	2.13	432.92	420.03	0.24
Hickory Creek	3	56929	20% Annual Chanc	1200	481.22	487.14		487.18	0.000917	1.85	1275.57	987.86	0.18
Hickory Creek	3	56929	10% Annual Chanc	1550	481.22	487.6		487.63	0.000793	1.86	1792.31	1225.45	0.17
Hickory Creek	3	56929	4% Annual Chance	2000	481.22	487.96		488	0.000829	2.02	2256.56	1315.44	0.17
Hickory Creek	3	56929	2% Annual Chance	2500	481.22	488.47		488.51	0.000671	1.96	2955.37	1390.78	0.16
Hickory Creek	3	56929	1% Annual Chance	3150	481.22	489.09		489.12	0.000529	1.88	3828.28	1441.42	0.14
Hickory Creek	3	56929	0.4% Annual Chan	4050	481.22	489.77		489.79	0.000461	1.9	4830.61	1530.61	0.14
Hickory Creek	3	56929	0.2% Annual Chan	4850	481.22	490.3		490.32	0.000422	1.92	5665.15	1605.99	0.13
Hickory Creek	3	56771	50% Annual Chanc	700	481.13	485.01	483.93	485.4	0.009565	5.12	155.43	82.34	0.54
Hickory Creek	3	56771	20% Annual Chanc	1200	481.13	486.76	485	486.89	0.005195	3.45	749.18	881.41	0.32
Hickory Creek	3	56771	10% Annual Chanc	1550	481.13	487.34	485.7	487.41	0.003103	2.94	1302.97	1156.88	0.25
Hickory Creek	3	56771	4% Annual Chance	2000	481.13	487.72	486.48	487.78	0.002655	2.89	1730.07	1227.46	0.24
Hickory Creek	3	56771	2% Annual Chance	2500	481.13	488.3	486.85	488.34	0.001754	2.54	2451.29	1380.4	0.2
Hickory Creek	3	56771	1% Annual Chance	3150	481.13	488.97	487.06	489	0.001159	2.24	3338.28	1454.84	0.16
Hickory Creek	3	56771	0.4% Annual Chan	4050	481.13	489.67	487.32	489.69	0.000909	2.14	4316.66	1580.79	0.15
Hickory Creek	3	56771	0.2% Annual Chan	4850	481.13	490.21	487.51	490.23	0.000779	2.09	5113.9	1656.07	0.14
Hickory Creek	3	56727	50% Annual Chanc	700	480.89	483.92	483.92	485.03	0.001906	8.46	85.8	52.83	0.99
Hickory Creek	3	56727	20% Annual Chanc	1200	480.89	484.99	484.99	486.39	0.001659	9.54	164.83	113.3	0.96
Hickory Creek	3	56727	10% Annual Chanc	1550	480.89	486.03	486.03	487	0.003314	8.3	388.38	351.22	0.76
Hickory Creek	3	56727	4% Annual Chance	2000	480.89	486.67	486.67	487.41	0.006263	7.8	658.34	709.16	0.69
Hickory Creek	3	56727	2% Annual Chance	2500	480.89	488.02	487.06	488.22	0.00182	4.89	1781.36	1287.65	0.38
Hickory Creek	3	56727	1% Annual Chance	3150	480.89	488.78	487.35	488.92	0.001216	4.38	2610.51	1458.31	0.31
Hickory Creek	3	56727	0.4% Annual Chan	4050	480.89	489.52	487.68	489.63	0.000982	4.25	3510.25	1588.27	0.29
Hickory Creek	3	56727	0.2% Annual Chan	4850	480.89	490.08	487.93	490.18	0.000843	4.15	4248.3	1714.28	0.27
Hickory Creek	3	56662	50% Annual Chanc	700	480.47	484.08	483.07	484.58	0.000619	5.66	131.16	56.89	0.58
Hickory Creek	3	56662	20% Annual Chanc	1150	480.47	485.2	484.01	485.86	0.000604	6.56	231.81	137.33	0.6
Hickory Creek	3	56662	10% Annual Chanc	1450	480.47	485.75	484.55	486.52	0.000618	7.09	352.63	314.15	0.61
Hickory Creek	3	56662	4% Annual Chance	1900	480.47	486.13	485.31	487.18	0.000794	8.38	485.73	480.23	0.7
Hickory Creek	3	56662	2% Annual Chance	2350	480.47	486.21	486.21	487.73	0.00114	10.13	518.94	493.25	0.84
Hickory Creek	3	56662	1% Annual Chance	2900	480.47	486.74	486.74	488.39	0.001144	10.74	762.55	688.21	0.85
Hickory Creek	3	56662	0.4% Annual Chan	3800	480.47	487.83	487.83	489.19	0.000812	10.34	1627.11	1251.44	0.74
Hickory Creek	3	56662	0.2% Annual Chan	4600	480.47	488.41	488.41	489.75	0.00076	10.63	2222.01	1316.11	0.73
Hickory Creek	3	56600	Mult Open										
Hickory Creek	3	56499	50% Annual Chanc	700	479.96	483.01	482.12	483.48	0.00081	5.93	175.47	67.98	0.65
Hickory Creek	3	56499	20% Annual Chanc	1150	479.96	483.32	482.97	484.33	0.001548	8.69	197.24	70.65	0.91
Hickory Creek	3	56499	10% Annual Chanc	1450	479.96	483.45	483.44	484.92	0.002166	10.5	206.07	71.7	1.09
Hickory Creek	3	56499	4% Annual Chance	1900	479.96	484.1	484.1	485.78	0.002039	11.19	255.63	83.74	1.07
Hickory Creek	3	56499	2% Annual Chance	2350	479.96	484.78	484.78	486.51	0.001798	11.4	334.13	178.85	1.03
Hickory Creek	3	56499	1% Annual Chance	2900	479.96	485.54	485.54	487.25	0.00157	11.47	543.61	396.94	0.98
Hickory Creek	3	56499	0.4% Annual Chan	3800	479.96	486.78	486.78	487.97	0.000936	10.2	1487.5	1033.99	0.78
Hickory Creek	3	56499	0.2% Annual Chan	4600	479.96	487.18	487.18	488.45	0.000956	10.83	1922.44	1166.2	0.8

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	56427	50% Annual Chanc	700	479.71	483		483.22	0.007485	4.38	216.21	171.17	0.47
Hickory Creek	3	56427	20% Annual Chanc	1150	479.71	483.47		483.74	0.008453	5.04	311.11	224.59	0.51
Hickory Creek	3	56427	10% Annual Chanc	1450	479.71	483.76		484.04	0.008474	5.23	378.53	240.36	0.52
Hickory Creek	3	56427	4% Annual Chance	1900	479.71	484.13		484.43	0.008507	5.43	474.18	278.84	0.52
Hickory Creek	3	56427	2% Annual Chance	2350	479.71	484.45		484.76	0.00857	5.61	572.94	385.11	0.53
Hickory Creek	3	56427	1% Annual Chance	2900	479.71	484.77		485.08	0.008939	5.93	736.33	597.35	0.54
Hickory Creek	3	56427	0.4% Annual Chan	3800	479.71	485.17		485.49	0.00896	6.36	995.37	747.72	0.55
Hickory Creek	3	56427	0.2% Annual Chan	4600	479.71	485.46		485.79	0.009288	6.78	1237.45	934.79	0.57
Hickory Creek	3	56077	50% Annual Chanc	700	476.24	481.28		481.4	0.005038	2.94	255.08	179.19	0.37
Hickory Creek	3	56077	20% Annual Chanc	1150	476.24	482.16		482.26	0.003361	3.07	464.01	304.63	0.32
Hickory Creek	3	56077	10% Annual Chanc	1450	476.24	482.54		482.65	0.003124	3.23	611.76	458.43	0.32
Hickory Creek	3	56077	4% Annual Chance	1900	476.24	482.98		483.09	0.002998	3.44	856.89	676.46	0.32
Hickory Creek	3	56077	2% Annual Chance	2350	476.24	483.33		483.44	0.002951	3.64	1144.12	946.6	0.32
Hickory Creek	3	56077	1% Annual Chance	2900	476.24	483.66		483.77	0.002915	3.81	1486.58	1132.46	0.32
Hickory Creek	3	56077	0.4% Annual Chan	3800	476.24	484.08		484.19	0.002908	4.05	2031.12	1463.71	0.33
Hickory Creek	3	56077	0.2% Annual Chan	4600	476.24	484.36		484.47	0.002947	4.24	2464.19	1600.9	0.33
Hickory Creek	3	55901	50% Annual Chanc	700	475.48	480.87		480.95	0.001747	2.61	335.05	142.15	0.24
Hickory Creek	3	55901	20% Annual Chanc	1150	475.48	481.67		481.8	0.002427	3.49	473.78	223.64	0.29
Hickory Creek	3	55901	10% Annual Chanc	1450	475.48	482.04		482.19	0.002577	3.79	564.81	265.03	0.3
Hickory Creek	3	55901	4% Annual Chance	1900	475.48	482.44		482.62	0.002807	4.17	690.76	401.99	0.32
Hickory Creek	3	55901	2% Annual Chance	2350	475.48	482.77		482.95	0.003073	4.54	880.1	721.95	0.34
Hickory Creek	3	55901	1% Annual Chance	2900	475.48	483.1		483.28	0.003159	4.78	1207.68	1199.84	0.35
Hickory Creek	3	55901	0.4% Annual Chan	3800	475.48	483.54		483.72	0.00319	5.04	1772.05	1403.86	0.35
Hickory Creek	3	55901	0.2% Annual Chan	4600	475.48	483.84		484	0.003179	5.19	2213.1	1598.94	0.35
Hickory Creek	3	55723	50% Annual Chanc	700	473.28	480.41		480.51	0.005375	2.57	272.81	141.58	0.33
Hickory Creek	3	55723	20% Annual Chanc	1150	473.28	481.15		481.29	0.004789	2.99	402.74	235.43	0.32
Hickory Creek	3	55723	10% Annual Chanc	1450	473.28	481.52		481.67	0.004612	3.21	504.4	322.71	0.33
Hickory Creek	3	55723	4% Annual Chance	1900	473.28	481.93		482.1	0.00453	3.46	667.95	488.82	0.33
Hickory Creek	3	55723	2% Annual Chance	2350	473.28	482.26		482.43	0.004418	3.63	832.95	516.9	0.33
Hickory Creek	3	55723	1% Annual Chance	2900	473.28	482.61		482.79	0.004241	3.78	1051.9	756.72	0.33
Hickory Creek	3	55723	0.4% Annual Chan	3800	473.28	483.09		483.27	0.004	3.95	1576.36	1404.34	0.32
Hickory Creek	3	55723	0.2% Annual Chan	4600	473.28	483.43		483.6	0.00366	3.96	2080.36	1564.09	0.31
Hickory Creek	3	55259	50% Annual Chanc	750	472.58	479.62	476.54	479.67	0.000854	2.11	601.54	420.59	0.18
Hickory Creek	3	55259	20% Annual Chanc	1250	472.58	480.27	477.8	480.33	0.001048	2.56	944.99	607.72	0.2
Hickory Creek	3	55259	10% Annual Chanc	1600	472.58	480.58	478.34	480.65	0.00117	2.82	1146.17	671.98	0.21
Hickory Creek	3	55259	4% Annual Chance	2050	472.58	480.88	478.98	480.96	0.001384	3.17	1355.44	763.04	0.23
Hickory Creek	3	55259	2% Annual Chance	2500	472.58	481.14	479.28	481.23	0.001521	3.42	1568.73	852.02	0.25
Hickory Creek	3	55259	1% Annual Chance	3050	472.58	481.42	479.6	481.52	0.001698	3.73	1842.6	1042.73	0.26
Hickory Creek	3	55259	0.4% Annual Chan	3950	472.58	481.91	480.08	482.01	0.001713	3.94	2398.35	1248.51	0.27
Hickory Creek	3	55259	0.2% Annual Chan	4750	472.58	482.32	480.33	482.42	0.001634	4	2923.35	1304.33	0.26
Hickory Creek	3	55200	Culvert										
Hickory Creek	3	55185	50% Annual Chanc	750	469.93	478.15	473.82	478.28	0.001632	2.81	267.3	51.06	0.22
Hickory Creek	3	55185	20% Annual Chanc	1250	469.93	479.27	474.97	479.48	0.002314	3.76	382.83	190.8	0.26
Hickory Creek	3	55185	10% Annual Chanc	1600	469.93	479.8	475.61	480.06	0.002613	4.21	510.44	294.03	0.28
Hickory Creek	3	55185	4% Annual Chance	2050	469.93	480.31	476.27	480.59	0.00286	4.62	690.61	403.25	0.3
Hickory Creek	3	55185	2% Annual Chance	2500	469.93	480.71	476.89	481.01	0.003026	4.93	881.29	521.28	0.31
Hickory Creek	3	55185	1% Annual Chance	3050	469.93	481.1	477.57	481.41	0.003176	5.21	1101.16	644.43	0.32
Hickory Creek	3	55185	0.4% Annual Chan	3950	469.93	481.65	479.84	481.95	0.003239	5.5	1481.32	744.11	0.33
Hickory Creek	3	55185	0.2% Annual Chan	4750	469.93	482.05	480.75	482.36	0.003294	5.72	1837.8	975.36	0.33
Hickory Creek	3	54456	50% Annual Chanc	750	469	475.8		476.05	0.00721	4.16	223.84	200.94	0.51
Hickory Creek	3	54456	20% Annual Chanc	1250	469	476.54		476.79	0.006867	4.4	401.49	292.19	0.47
Hickory Creek	3	54456	10% Annual Chanc	1600	469	476.91		477.16	0.006865	4.61	516.44	335.56	0.46
Hickory Creek	3	54456	4% Annual Chance	2050	469	477.28		477.54	0.006785	4.81	649.72	372.67	0.45
Hickory Creek	3	54456	2% Annual Chance	2500	469	477.59		477.86	0.006846	5.02	774.05	442.46	0.45
Hickory Creek	3	54456	1% Annual Chance	3050	469	477.96		478.23	0.006557	5.14	954.45	528.52	0.44
Hickory Creek	3	54456	0.4% Annual Chan	3950	469	478.48		478.76	0.006558	5.45	1268.42	696.92	0.44
Hickory Creek	3	54456	0.2% Annual Chan	4750	469	478.86		479.14	0.006494	5.66	1560.78	837.91	0.44
Hickory Creek	3	53366	50% Annual Chanc	750	464.46	472.05		472.15	0.002124	2.6	365.88	279.62	0.3
Hickory Creek	3	53366	20% Annual Chanc	1250	464.46	472.94		473.03	0.002091	2.6	720.51	476.89	0.26
Hickory Creek	3	53366	10% Annual Chanc	1600	464.46	473.37		473.45	0.002079	2.66	937.31	552.3	0.25
Hickory Creek	3	53366	4% Annual Chance	2050	464.46	473.85		473.92	0.002013	2.7	1221.78	638.05	0.24
Hickory Creek	3	53366	2% Annual Chance	2500	464.46	474.22		474.3	0.001965	2.74	1468.06	671.71	0.23
Hickory Creek	3	53366	1% Annual Chance	3050	464.46	474.69		474.77	0.00193	2.82	1806.87	764.61	0.23
Hickory Creek	3	53366	0.4% Annual Chan	3950	464.46	475.24		475.32	0.001927	2.94	2244.16	846.22	0.22
Hickory Creek	3	53366	0.2% Annual Chan	4750	464.46	475.65		475.73	0.001933	3.04	2599.03	895.54	0.22
Hickory Creek	3	52649	50% Annual Chanc	750	463.6	470.52		470.59	0.002227	2.34	423.49	224.76	0.27
Hickory Creek	3	52649	20% Annual Chanc	1250	463.6	471.34		471.42	0.002411	2.7	652.53	347.06	0.27
Hickory Creek	3	52649	10% Annual Chanc	1600	463.6	471.77		471.85	0.002407	2.85	803.3	365.53	0.26

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	52649	4% Annual Chance	2050	463.6	472.26		472.35	0.002382	3.01	1000.17	441.83	0.26
Hickory Creek	3	52649	2% Annual Chance	2500	463.6	472.66		472.76	0.002369	3.15	1183.59	469.82	0.26
Hickory Creek	3	52649	1% Annual Chance	3050	463.6	473.12		473.22	0.002446	3.37	1411.87	568.6	0.27
Hickory Creek	3	52649	0.4% Annual Chan	3950	463.6	473.64		473.75	0.00249	3.59	1733.68	643.04	0.27
Hickory Creek	3	52649	0.2% Annual Chan	4750	463.6	474.03		474.15	0.002499	3.73	1992.04	668.81	0.27
Hickory Creek	3	51842	50% Annual Chanc	750	460.18	468.21	464.78	468.31	0.003652	2.66	362.51	243.79	0.26
Hickory Creek	3	51842	20% Annual Chanc	1250	460.18	469.08		469.18	0.003197	2.93	592.08	286.33	0.26
Hickory Creek	3	51842	10% Annual Chanc	1600	460.18	469.6	466.84	469.71	0.002933	3.04	750.09	321.36	0.25
Hickory Creek	3	51842	4% Annual Chance	2050	460.18	470.11		470.22	0.002919	3.25	941.9	475.05	0.25
Hickory Creek	3	51842	2% Annual Chance	2500	460.18	470.45		470.58	0.0031	3.5	1131.39	629.72	0.27
Hickory Creek	3	51842	1% Annual Chance	3050	460.18	470.82		470.96	0.003197	3.72	1390.03	766.8	0.27
Hickory Creek	3	51842	0.4% Annual Chan	3950	460.18	471.39		471.52	0.003072	3.88	1867.32	927.62	0.27
Hickory Creek	3	51842	0.2% Annual Chan	4750	460.18	471.81		471.95	0.002992	4	2291.96	1069.8	0.27
Hickory Creek	3	50980	50% Annual Chanc	750	456.66	461.31		462.1	0.019023	7.13	105.21	32.84	0.7
Hickory Creek	3	50980	20% Annual Chanc	1250	456.66	462.99		463.87	0.014765	7.55	165.8	40.06	0.64
Hickory Creek	3	50980	10% Annual Chanc	1600	456.66	463.79	462.41	464.8	0.013582	8.08	202.36	64.59	0.64
Hickory Creek	3	50980	4% Annual Chance	2050	456.66	464.77	463.17	465.71	0.010669	8.06	335.64	182.22	0.58
Hickory Creek	3	50980	2% Annual Chance	2500	456.66	465.54		466.33	0.008414	7.76	480.2	193.01	0.53
Hickory Creek	3	50980	1% Annual Chance	3050	456.66	466.36		467.02	0.006713	7.48	652.24	230.37	0.48
Hickory Creek	3	50980	0.4% Annual Chan	3950	456.66	467.21		467.84	0.006146	7.68	890.95	320.47	0.47
Hickory Creek	3	50980	0.2% Annual Chan	4750	456.66	467.98		468.54	0.005361	7.6	1163.14	405.64	0.44
Hickory Creek	3	50293	50% Annual Chanc	800	455.28	460.35	456.75	460.4	0.00072	1.83	438.23	91.77	0.15
Hickory Creek	3	50293	20% Annual Chanc	1350	455.28	462.02	457.34	462.1	0.000788	2.27	594.28	94.6	0.16
Hickory Creek	3	50293	10% Annual Chanc	1700	455.28	462.76	457.67	462.86	0.000885	2.56	664.02	100.47	0.17
Hickory Creek	3	50293	4% Annual Chance	2200	455.28	463.59	458.11	463.73	0.001025	2.95	745.9	214.96	0.19
Hickory Creek	3	50293	2% Annual Chance	2650	455.28	464.23	458.45	464.4	0.001141	3.28	812.48	266.19	0.2
Hickory Creek	3	50293	1% Annual Chance	3200	455.28	464.95	458.88	465.16	0.001257	3.64	893.45	400.61	0.21
Hickory Creek	3	50293	0.4% Annual Chan	4050	455.28	466.12	459.48	466.28	0.000994	3.51	1714.19	609.57	0.19
Hickory Creek	3	50293	0.2% Annual Chan	4900	455.28	466.95	460.01	467.12	0.000959	3.64	2127.87	676.59	0.19
Hickory Creek	3	50200		Culvert									
Hickory Creek	3	50127	50% Annual Chanc	800	454.82	460.29	456.23	460.31	0.000347	1.28	626.36	133.23	0.1
Hickory Creek	3	50127	20% Annual Chanc	1350	454.82	461.92	456.75	461.96	0.000384	1.59	848.22	138.89	0.11
Hickory Creek	3	50127	10% Annual Chanc	1700	454.82	462.62	457.04	462.67	0.000437	1.8	946.17	141.94	0.12
Hickory Creek	3	50127	4% Annual Chance	2200	454.82	463.34	457.42	463.41	0.000535	2.1	1050.08	169.75	0.14
Hickory Creek	3	50127	2% Annual Chance	2650	454.82	463.83	457.72	463.92	0.000625	2.36	1124.93	255.13	0.15
Hickory Creek	3	50127	1% Annual Chance	3200	454.82	464.33	458.09	464.44	0.000737	2.68	1206.82	387.49	0.16
Hickory Creek	3	50127	0.4% Annual Chan	4050	454.82	464.95	458.56	465.1	0.000922	3.14	1311.86	472.2	0.19
Hickory Creek	3	50127	0.2% Annual Chan	4900	454.82	465.44	459.01	465.64	0.001121	3.59	1395.76	540.64	0.21
Hickory Creek	3	49815	50% Annual Chanc	800	450.29	459.93		460.07	0.001652	3.05	275.51	91.77	0.22
Hickory Creek	3	49815	20% Annual Chanc	1350	450.29	461.52		461.7	0.001684	3.6	557.8	299.16	0.23
Hickory Creek	3	49815	10% Annual Chanc	1700	450.29	462.24		462.4	0.001516	3.64	784.12	317.9	0.23
Hickory Creek	3	49815	4% Annual Chance	2200	450.29	462.96		463.12	0.001488	3.81	1015.1	325.55	0.23
Hickory Creek	3	49815	2% Annual Chance	2650	450.29	463.42		463.6	0.001573	4.06	1169.58	334.61	0.23
Hickory Creek	3	49815	1% Annual Chance	3200	450.29	463.89		464.08	0.001706	4.37	1327.89	344.09	0.25
Hickory Creek	3	49815	0.4% Annual Chan	4050	450.29	464.45		464.67	0.001962	4.86	1523.75	355.69	0.27
Hickory Creek	3	49815	0.2% Annual Chan	4900	450.29	464.86		465.13	0.002297	5.4	1673.29	368.71	0.29
Hickory Creek	3	49487	50% Annual Chanc	800	448.88	459.22		459.36	0.003008	2.91	275.35	70.93	0.25
Hickory Creek	3	49487	20% Annual Chanc	1350	448.88	460.84		461.01	0.002675	3.41	452.12	152.33	0.25
Hickory Creek	3	49487	10% Annual Chanc	1700	448.88	461.59		461.77	0.002527	3.6	621.55	340.63	0.25
Hickory Creek	3	49487	4% Annual Chance	2200	448.88	462.34		462.51	0.002359	3.73	939.93	496.14	0.24
Hickory Creek	3	49487	2% Annual Chance	2650	448.88	462.81		462.99	0.0023	3.84	1188.61	550.11	0.24
Hickory Creek	3	49487	1% Annual Chance	3200	448.88	463.26		463.43	0.002328	4.01	1495.33	799.29	0.25
Hickory Creek	3	49487	0.4% Annual Chan	4050	448.88	463.77		463.95	0.002478	4.31	1944.82	944.2	0.26
Hickory Creek	3	49487	0.2% Annual Chan	4900	448.88	464.15		464.33	0.002499	4.45	2310.78	956.43	0.26
Hickory Creek	3	48376	50% Annual Chanc	800	447.54	455.61		455.83	0.003352	3.78	211.63	46.34	0.31
Hickory Creek	3	48376	20% Annual Chanc	1350	447.54	457.16		457.49	0.003774	4.65	292.43	56.68	0.34
Hickory Creek	3	48376	10% Annual Chanc	1700	447.54	457.71		458.14	0.004332	5.3	340.5	152.06	0.37
Hickory Creek	3	48376	4% Annual Chance	2200	447.54	458.31		458.84	0.004894	5.99	485.79	321.05	0.4
Hickory Creek	3	48376	2% Annual Chance	2650	447.54	458.75	455.8	459.31	0.005104	6.38	657.85	449.42	0.42
Hickory Creek	3	48376	1% Annual Chance	3200	447.54	459.22		459.77	0.00501	6.59	882.43	515.2	0.42
Hickory Creek	3	48376	0.4% Annual Chan	4050	447.54	459.91		460.38	0.004386	6.52	1268.92	592.39	0.4
Hickory Creek	3	48376	0.2% Annual Chan	4900	447.54	460.48		460.9	0.003996	6.51	1619.23	644.19	0.38
Hickory Creek	3	48153	50% Annual Chanc	800	446.48	455.01		455.18	0.002461	3.31	282.52	141.1	0.27
Hickory Creek	3	48153	20% Annual Chanc	1350	446.48	456.76		456.89	0.001678	3.24	693.63	361.57	0.23
Hickory Creek	3	48153	10% Annual Chanc	1700	446.48	457.39		457.51	0.001512	3.29	953.47	438.41	0.22
Hickory Creek	3	48153	4% Annual Chance	2200	446.48	458.08		458.19	0.001386	3.36	1262.15	473.27	0.22
Hickory Creek	3	48153	2% Annual Chance	2650	446.48	458.52		458.64	0.001385	3.49	1479.08	490.09	0.22
Hickory Creek	3	48153	1% Annual Chance	3200	446.48	458.98		459.09	0.00142	3.67	1706.48	528.06	0.22

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	48153	0.4% Annual Chan	4050	446.48	459.62		459.75	0.001451	3.9	2063.89	586.28	0.23
Hickory Creek	3	48153	0.2% Annual Chan	4900	446.48	460.17		460.3	0.00148	4.1	2393.28	631.41	0.23
Hickory Creek	3	47504	50% Annual Chanc	800	443.18	453.8		453.92	0.001526	2.73	292.65	54.34	0.21
Hickory Creek	3	47504	20% Annual Chanc	1350	443.18	455.82		455.95	0.001303	2.89	560.43	236.01	0.21
Hickory Creek	3	47504	10% Annual Chanc	1700	443.18	456.47		456.61	0.001357	3.09	739.9	297.08	0.22
Hickory Creek	3	47504	4% Annual Chance	2200	443.18	457.13		457.28	0.001496	3.4	947.59	356.78	0.23
Hickory Creek	3	47504	2% Annual Chance	2650	443.18	457.51		457.68	0.001684	3.7	1085.63	370.39	0.24
Hickory Creek	3	47504	1% Annual Chance	3200	443.18	457.83		458.05	0.002013	4.13	1210.32	399.44	0.26
Hickory Creek	3	47504	0.4% Annual Chan	4050	443.18	458.38		458.62	0.002304	4.57	1446.42	456.21	0.28
Hickory Creek	3	47504	0.2% Annual Chan	4900	443.18	458.85		459.12	0.002499	4.9	1671.31	483.56	0.29
Hickory Creek	2	47034	50% Annual Chanc	1200	441.66	452.36	447.39	452.61	0.004168	4.07	294.65	45.16	0.28
Hickory Creek	2	47034	20% Annual Chanc	2050	441.66	454.79	449.11	454.99	0.002695	3.99	805.53	492.22	0.24
Hickory Creek	2	47034	10% Annual Chanc	2550	441.66	455.75	449.95	455.87	0.001687	3.39	1361.93	563.37	0.19
Hickory Creek	2	47034	4% Annual Chance	3200	441.66	456.44	450.92	456.54	0.001492	3.33	1767.98	623.11	0.18
Hickory Creek	2	47034	2% Annual Chance	3650	441.66	456.81	451.56	456.91	0.001434	3.34	2001.83	637.75	0.18
Hickory Creek	2	47034	1% Annual Chance	4200	441.66	457.04	452.27	457.14	0.001587	3.57	2148.02	644.2	0.19
Hickory Creek	2	47034	0.4% Annual Chan	5150	441.66	457.51	454.95	457.62	0.00169	3.79	2455.11	663.2	0.2
Hickory Creek	2	47034	0.2% Annual Chan	6000	441.66	457.95	455.24	458.07	0.001701	3.89	2757.22	693.63	0.2
Hickory Creek	2	47025	Bridge										
Hickory Creek	2	46992	50% Annual Chanc	1200	441.32	452.17	447.06	452.42	0.003782	4	299.69	74.67	0.27
Hickory Creek	2	46992	20% Annual Chanc	2050	441.32	454.23	448.77	454.47	0.003138	4.31	700.19	315.09	0.25
Hickory Creek	2	46992	10% Annual Chanc	2550	441.32	454.99	449.61	455.19	0.002726	4.24	992.57	424.7	0.24
Hickory Creek	2	46992	4% Annual Chance	3200	441.32	455.67	450.58	455.85	0.002459	4.22	1316.21	527.92	0.23
Hickory Creek	2	46992	2% Annual Chance	3650	441.32	456.01	451.16	456.19	0.002435	4.29	1503.5	579.55	0.23
Hickory Creek	2	46992	1% Annual Chance	4200	441.32	456.45	453.71	456.61	0.00234	4.32	1761.53	600.66	0.23
Hickory Creek	2	46992	0.4% Annual Chan	5150	441.32	457.1	454.17	457.25	0.002148	4.3	2161.16	622.07	0.22
Hickory Creek	2	46992	0.2% Annual Chan	6000	441.32	457.61	454.99	457.76	0.002047	4.31	2487.44	654.97	0.22
Hickory Creek	2	46975	Bridge										
Hickory Creek	2	46952	50% Annual Chanc	1200	440.63	451.82		452.04	0.002729	3.82	314.17	49.53	0.27
Hickory Creek	2	46952	20% Annual Chanc	2050	440.63	453.74		454.11	0.00346	4.86	442.37	131.48	0.31
Hickory Creek	2	46952	10% Annual Chanc	2550	440.63	454.41		454.84	0.003774	5.37	578.26	301.44	0.33
Hickory Creek	2	46952	4% Annual Chance	3200	440.63	455.08		455.53	0.003861	5.72	829.53	408.14	0.34
Hickory Creek	2	46952	2% Annual Chance	3650	440.63	455.44		455.89	0.003861	5.88	982.14	434.77	0.34
Hickory Creek	2	46952	1% Annual Chance	4200	440.63	455.87	451.47	456.3	0.003737	5.96	1182.72	481.64	0.34
Hickory Creek	2	46952	0.4% Annual Chan	5150	440.63	456.58	452.63	456.97	0.003377	5.94	1540.54	548.76	0.32
Hickory Creek	2	46952	0.2% Annual Chan	6000	440.63	457.15		457.5	0.003073	5.87	1864.72	582.61	0.31
Hickory Creek	2	46221	50% Annual Chanc	1200	440.42	449.6		449.82	0.003437	3.97	342.2	86.14	0.3
Hickory Creek	2	46221	20% Annual Chanc	2050	440.42	451.26		451.55	0.00347	4.71	622.12	247.48	0.31
Hickory Creek	2	46221	10% Annual Chanc	2550	440.42	451.73		452.06	0.003764	5.12	744.42	285.81	0.33
Hickory Creek	2	46221	4% Annual Chance	3200	440.42	452.43		452.77	0.00367	5.37	962.59	332.1	0.33
Hickory Creek	2	46221	2% Annual Chance	3650	440.42	453.02		453.32	0.003168	5.22	1163.19	352.56	0.31
Hickory Creek	2	46221	1% Annual Chance	4200	440.42	453.71		453.97	0.002702	5.07	1415.32	383.89	0.29
Hickory Creek	2	46221	0.4% Annual Chan	5150	440.42	454.67		454.91	0.002381	5.08	1818.11	450.07	0.28
Hickory Creek	2	46221	0.2% Annual Chan	6000	440.42	455.51		455.72	0.001993	4.89	2212.13	481.89	0.26
Hickory Creek	2	45407	50% Annual Chanc	1200	437.65	447.7	442.52	447.83	0.001761	2.91	412.97	75.8	0.22
Hickory Creek	2	45407	20% Annual Chanc	2050	437.65	449.46	443.97	449.63	0.001666	3.4	777.11	481.22	0.22
Hickory Creek	2	45407	10% Annual Chanc	2550	437.65	450.86	444.66	450.92	0.000631	2.36	1733.66	755.85	0.14
Hickory Creek	2	45407	4% Annual Chance	3200	437.65	451.9	445.45	451.94	0.000369	1.95	2586.15	926.29	0.11
Hickory Creek	2	45407	2% Annual Chance	3650	437.65	452.65	445.93	452.68	0.000262	1.72	3331.48	1037.35	0.09
Hickory Creek	2	45407	1% Annual Chance	4200	437.65	453.44	446.48	453.46	0.000195	1.56	4180.79	1128.41	0.08
Hickory Creek	2	45407	0.4% Annual Chan	5150	437.65	454.47	447.35	454.49	0.000152	1.46	5344.58	1137.35	0.07
Hickory Creek	2	45407	0.2% Annual Chan	6000	437.65	455.34	449.78	455.36	0.000129	1.41	6362.61	1190.33	0.07
Hickory Creek	2	45400	Bridge										
Hickory Creek	2	45386	50% Annual Chanc	1200	437.65	447.34	441.06	447.43	0.00093	2.43	509.13	134.33	0.17
Hickory Creek	2	45386	20% Annual Chanc	2050	437.65	449.31	442.28	449.38	0.000705	2.49	1190.17	517.34	0.15
Hickory Creek	2	45386	10% Annual Chanc	2550	437.65	450.84	442.91	450.88	0.00031	1.84	2138.64	701.18	0.1
Hickory Creek	2	45386	4% Annual Chance	3200	437.65	451.89	443.66	451.92	0.000228	1.68	2963.33	845.72	0.09
Hickory Creek	2	45386	2% Annual Chance	3650	437.65	452.64	444.15	452.66	0.000177	1.54	3647.34	975.62	0.08
Hickory Creek	2	45386	1% Annual Chance	4200	437.65	453.43	444.7	453.45	0.000144	1.45	4478.9	1095.5	0.07
Hickory Creek	2	45386	0.4% Annual Chan	5150	437.65	454.46	445.58	454.48	0.000122	1.41	5631.19	1133.77	0.07
Hickory Creek	2	45386	0.2% Annual Chan	6000	437.65	455.34	446.43	455.35	0.000108	1.38	6632.86	1153.67	0.06
Hickory Creek	2	45349	50% Annual Chanc	1200	437.68	447.28	443.5	447.38	0.001789	2.6	488.09	230.84	0.21
Hickory Creek	2	45349	20% Annual Chanc	2050	437.68	449.22	444.78	449.33	0.001319	2.81	781.83	390.42	0.19
Hickory Creek	2	45349	10% Annual Chanc	2550	437.68	450.82	445.29	450.86	0.000458	1.92	1750.88	563.22	0.12
Hickory Creek	2	45349	4% Annual Chance	3200	437.68	451.88	445.88	451.91	0.000307	1.7	2571.25	795.21	0.1
Hickory Creek	2	45349	2% Annual Chance	3650	437.68	452.63	446.33	452.65	0.000254	1.63	3241.98	1005.92	0.09

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	45349	1% Annual Chance	4200	437.68	453.42	446.79	453.44	0.000204	1.54	4118.41	1188.58	0.08
Hickory Creek	2	45349	0.4% Annual Chan	5150	437.68	454.45	447.36	454.47	0.00016	1.45	5378.75	1275.81	0.07
Hickory Creek	2	45349	0.2% Annual Chan	6000	437.68	455.33	447.8	455.35	0.000135	1.39	6522.52	1320.2	0.07
Hickory Creek	2	45300	Bridge										
Hickory Creek	2	45229	50% Annual Chanc	1200	437.4	447.03	441.96	447.1	0.000672	2.18	576.22	213.69	0.16
Hickory Creek	2	45229	20% Annual Chanc	2050	437.4	448.93	443.09	449.02	0.00065	2.6	855.85	544.04	0.17
Hickory Creek	2	45229	10% Annual Chanc	2550	437.4	450.38	443.72	450.41	0.000235	1.76	2214.86	718.45	0.1
Hickory Creek	2	45229	4% Annual Chance	3200	437.4	451.76	444.44	451.78	0.000133	1.46	3315.16	867.07	0.08
Hickory Creek	2	45229	2% Annual Chance	3650	437.4	452.59	444.91	452.61	0.000103	1.35	4091.71	981.2	0.07
Hickory Creek	2	45229	1% Annual Chance	4200	437.4	453.32	445.36	453.34	0.000095	1.35	4849.15	1093.49	0.07
Hickory Creek	2	45229	0.4% Annual Chan	5150	437.4	454.4	445.93	454.41	0.000077	1.29	6107.33	1217.59	0.06
Hickory Creek	2	45229	0.2% Annual Chan	6000	437.4	455.3	446.63	455.31	0.000068	1.27	7276.09	1357.78	0.06
Hickory Creek	2	45134	50% Annual Chanc	1250	436.98	446.78	442.84	446.95	0.002018	3.3	378.42	80.25	0.27
Hickory Creek	2	45134	20% Annual Chanc	2050	436.98	448.64	444.13	448.86	0.0017	3.74	544.19	97.83	0.26
Hickory Creek	2	45134	10% Annual Chanc	2550	436.98	450	444.77	450.24	0.001185	3.55	685.44	107.73	0.22
Hickory Creek	2	45134	4% Annual Chance	3150	436.98	451.3	445.42	451.6	0.000904	3.43	830.25	114.89	0.2
Hickory Creek	2	45134	2% Annual Chance	3700	436.98	452.03	445.95	452.4	0.000872	3.55	915.58	118.91	0.2
Hickory Creek	2	45134	1% Annual Chance	4250	436.98	452.65	446.45	453.09	0.000862	3.68	990.34	122.32	0.2
Hickory Creek	2	45134	0.4% Annual Chan	5150	436.98	453.56	447.17	454.11	0.000851	3.86	1103.68	127.32	0.2
Hickory Creek	2	45134	0.2% Annual Chan	5950	436.98	454.32	447.76	454.96	0.000834	3.99	1201.6	132.01	0.2
Hickory Creek	2	45100	Bridge										
Hickory Creek	2	44987	50% Annual Chanc	1250	436.79	446.35	441.69	446.49	0.001409	3	416.38	79.25	0.23
Hickory Creek	2	44987	20% Annual Chanc	2050	436.79	448.03	442.98	448.24	0.001485	3.66	559.61	91.66	0.25
Hickory Creek	2	44987	10% Annual Chanc	2550	436.79	449.36	443.64	449.59	0.001149	3.62	688.48	101.54	0.22
Hickory Creek	2	44987	4% Annual Chance	3150	436.79	450.63	444.32	450.89	0.000945	3.62	823.02	110.92	0.21
Hickory Creek	2	44987	2% Annual Chance	3700	436.79	451.23	444.88	451.55	0.000983	3.85	890.92	114.84	0.21
Hickory Creek	2	44987	1% Annual Chance	4250	436.79	451.71	445.38	452.11	0.001042	4.09	946.58	117.76	0.22
Hickory Creek	2	44987	0.4% Annual Chan	5150	436.79	452.38	446.14	452.9	0.00114	4.45	1026.47	121.83	0.24
Hickory Creek	2	44987	0.2% Annual Chan	5950	436.79	452.91	446.75	453.56	0.001212	4.74	1091.56	124.46	0.24
Hickory Creek	2	44900	Bridge										
Hickory Creek	2	44833	50% Annual Chanc	1250	435.98	446.03	440.88	446.15	0.00111	2.74	455.43	82.82	0.21
Hickory Creek	2	44833	20% Annual Chanc	2050	435.98	447.62	442.17	447.8	0.001393	3.44	596.42	94.59	0.24
Hickory Creek	2	44833	10% Annual Chanc	2550	435.98	448.98	442.83	449.17	0.001101	3.47	732.37	104.7	0.22
Hickory Creek	2	44833	4% Annual Chance	3150	435.98	450.19	443.51	450.4	0.000966	3.57	863.78	113.38	0.21
Hickory Creek	2	44833	2% Annual Chance	3700	435.98	450.7	444.06	450.97	0.001062	3.89	922.42	116.5	0.22
Hickory Creek	2	44833	1% Annual Chance	4250	435.98	451.08	444.58	451.41	0.00119	4.22	966.74	118.8	0.24
Hickory Creek	2	44833	0.4% Annual Chan	5150	435.98	451.55	445.34	452	0.001425	4.77	1024.31	121.72	0.26
Hickory Creek	2	44833	0.2% Annual Chan	5950	435.98	451.9	445.95	452.47	0.001643	5.23	1067.21	123.53	0.28
Hickory Creek	2	44690	50% Annual Chanc	1250	436.83	445.91	441.09	445.97	0.000884	2.05	609.94	130.65	0.17
Hickory Creek	2	44690	20% Annual Chanc	2050	436.83	447.49	442.75	447.58	0.000924	2.5	822.26	137.94	0.18
Hickory Creek	2	44690	10% Annual Chanc	2550	436.83	448.89	443.14	448.98	0.000701	2.47	1121.92	305.16	0.16
Hickory Creek	2	44690	4% Annual Chance	3150	436.83	450.13	443.57	450.21	0.000551	2.39	1562.01	398.24	0.14
Hickory Creek	2	44690	2% Annual Chance	3700	436.83	450.65	443.92	450.73	0.000576	2.53	1774.52	421.83	0.15
Hickory Creek	2	44690	1% Annual Chance	4250	436.83	451.03	444.25	451.12	0.000618	2.68	1937.9	429.74	0.15
Hickory Creek	2	44690	0.4% Annual Chan	5150	436.83	451.52	444.76	451.63	0.000703	2.94	2151.15	438.27	0.16
Hickory Creek	2	44690	0.2% Annual Chan	5950	436.83	451.89	445.17	452.01	0.000782	3.17	2311.97	444.68	0.17
Hickory Creek	2	44650	Bridge										
Hickory Creek	2	44598	50% Annual Chanc	1250	435.95	445.76	441.33	445.84	0.001144	2.27	549.51	121.15	0.19
Hickory Creek	2	44598	20% Annual Chanc	2050	435.95	447.13	442.47	447.26	0.001371	2.83	724.76	133.71	0.21
Hickory Creek	2	44598	10% Annual Chanc	2550	435.95	448.36	443.03	448.49	0.001079	2.84	924.16	229.69	0.19
Hickory Creek	2	44598	4% Annual Chance	3150	435.95	449.67	443.6	449.76	0.000658	2.47	1538.78	651.42	0.15
Hickory Creek	2	44598	2% Annual Chance	3700	435.95	450.12	444	450.21	0.000647	2.53	1839.53	692.31	0.15
Hickory Creek	2	44598	1% Annual Chance	4250	435.95	450.62	444.4	450.71	0.000593	2.5	2193.15	727.38	0.15
Hickory Creek	2	44598	0.4% Annual Chan	5150	435.95	451.17	444.95	451.26	0.000594	2.59	2601.89	762.83	0.15
Hickory Creek	2	44598	0.2% Annual Chan	5950	435.95	451.55	445.4	451.66	0.000615	2.7	2899.97	784.65	0.15
Hickory Creek	2	44558	50% Annual Chanc	1250	435.57	445.59	441.26	445.74	0.002394	3.13	399.77	87.67	0.26
Hickory Creek	2	44558	20% Annual Chanc	2050	435.57	446.88	442.02	447.12	0.003009	3.93	523.64	104	0.3
Hickory Creek	2	44558	10% Annual Chanc	2550	435.57	448.16	443.38	448.38	0.002234	3.85	747.79	294.54	0.26
Hickory Creek	2	44558	4% Annual Chance	3150	435.57	449.57	444.7	449.7	0.001173	3.12	1277.44	476.97	0.19
Hickory Creek	2	44558	2% Annual Chance	3700	435.57	450.01	445.15	450.15	0.001157	3.19	1494.82	504.05	0.19
Hickory Creek	2	44558	1% Annual Chance	4250	435.57	450.51	445.65	450.65	0.001055	3.15	1752.68	542.27	0.18
Hickory Creek	2	44558	0.4% Annual Chan	5150	435.57	451.04	446.15	451.2	0.001069	3.27	2053.54	595.96	0.19
Hickory Creek	2	44558	0.2% Annual Chan	5950	435.57	451.42	446.65	451.59	0.001104	3.4	2279.22	611.9	0.19
Hickory Creek	2	44503	50% Annual Chanc	1050	435.52	445.52	441.26	445.6	0.001026	2.25	465.93	89.14	0.17
Hickory Creek	2	44503	20% Annual Chanc	1700	435.52	446.8	442.02	446.94	0.001339	2.92	585.24	97.27	0.2

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	44503	10% Annual Chanc	2450	435.52	448.06	442.78	448.24	0.001544	3.48	752.58	251.28	0.22
Hickory Creek	2	44503	4% Annual Chance	3150	435.52	449.49	443.41	449.63	0.001029	3.13	1307.58	461.41	0.18
Hickory Creek	2	44503	2% Annual Chance	3700	435.52	449.93	443.86	450.07	0.001032	3.22	1517.39	491.65	0.18
Hickory Creek	2	44503	1% Annual Chance	4300	435.52	450.43	444.32	450.57	0.000998	3.26	1776.27	557.2	0.18
Hickory Creek	2	44503	0.4% Annual Chan	5200	435.52	450.96	444.97	451.12	0.001011	3.37	2084.22	591.51	0.18
Hickory Creek	2	44503	0.2% Annual Chan	5950	435.52	451.33	445.46	451.5	0.00104	3.49	2307.21	616.01	0.19
Hickory Creek	2	44500	Bridge										
Hickory Creek	2	44487	50% Annual Chanc	1050	435.52	445.44	440.66	445.51	0.000609	2.02	518.91	94.77	0.15
Hickory Creek	2	44487	20% Annual Chanc	1700	435.52	446.71	441.58	446.81	0.000803	2.66	642.71	102.02	0.18
Hickory Creek	2	44487	10% Annual Chanc	2450	435.52	447.96	442.31	448.12	0.000935	3.21	771.59	114.7	0.2
Hickory Creek	2	44487	4% Annual Chance	3150	435.52	449.41	442.9	449.58	0.000799	3.32	1162.81	433.27	0.19
Hickory Creek	2	44487	2% Annual Chance	3700	435.52	449.84	443.33	450.03	0.000888	3.61	1358.89	507.76	0.2
Hickory Creek	2	44487	1% Annual Chance	4300	435.52	450.29	443.76	450.5	0.000949	3.84	1600.92	563.68	0.21
Hickory Creek	2	44487	0.4% Annual Chan	5200	435.52	450.77	444.39	451.01	0.001075	4.22	1902.32	658.88	0.23
Hickory Creek	2	44487	0.2% Annual Chan	5950	435.52	451.1	444.87	451.36	0.001166	4.48	2123.77	676.35	0.24
Hickory Creek	2	44450	Bridge										
Hickory Creek	2	44385	50% Annual Chanc	1050	435.54	445.17	440.81	445.3	0.001271	2.85	368.17	92.44	0.23
Hickory Creek	2	44385	20% Annual Chanc	1700	435.54	446.31	442.48	446.53	0.001627	3.69	462.97	114.51	0.27
Hickory Creek	2	44385	10% Annual Chanc	2450	435.54	447.57	443.36	447.86	0.001697	4.3	574.32	193.1	0.29
Hickory Creek	2	44385	4% Annual Chance	3150	435.54	448.82	444.05	449.07	0.001307	4.21	949.33	290.12	0.26
Hickory Creek	2	44385	2% Annual Chance	3700	435.54	449.21	444.54	449.48	0.001368	4.45	1082.41	383.29	0.27
Hickory Creek	2	44385	1% Annual Chance	4300	435.54	449.75	445.03	450	0.001246	4.42	1328.72	511.81	0.26
Hickory Creek	2	44385	0.4% Annual Chan	5200	435.54	450.41	445.69	450.63	0.001125	4.4	1680.89	564.06	0.25
Hickory Creek	2	44385	0.2% Annual Chan	5950	435.54	450.83	446.21	451.05	0.00109	4.46	1924.05	597.37	0.25
Hickory Creek	2	44360	50% Annual Chanc	1050	435.35	444.99	442.95	445.2	0.003934	3.75	287.93	109.67	0.35
Hickory Creek	2	44360	20% Annual Chanc	1700	435.35	446.21	443.78	446.45	0.003147	4.09	473.27	202.7	0.33
Hickory Creek	2	44360	10% Annual Chanc	2450	435.35	447.55	444.57	447.74	0.002009	3.86	756.3	265.94	0.28
Hickory Creek	2	44360	4% Annual Chance	3150	435.35	448.81	445.44	448.94	0.001208	3.39	1172.62	378.06	0.22
Hickory Creek	2	44360	2% Annual Chance	3700	435.35	449.21	446	449.35	0.001198	3.5	1337.45	444.91	0.22
Hickory Creek	2	44360	1% Annual Chance	4300	435.35	449.75	446.42	449.88	0.001018	3.38	1618.11	544.18	0.21
Hickory Creek	2	44360	0.4% Annual Chan	5200	435.35	450.4	446.84	450.52	0.000877	3.3	1980.84	567.21	0.19
Hickory Creek	2	44360	0.2% Annual Chan	5950	435.35	450.82	447.15	450.95	0.000837	3.32	2221.32	577.14	0.19
Hickory Creek	2	44200	Bridge										
Hickory Creek	2	44136	50% Annual Chanc	1050	434.54	443.09	440.5	443.38	0.004427	4.48	259.49	92.9	0.38
Hickory Creek	2	44136	20% Annual Chanc	1700	434.54	444.24	442.27	444.64	0.004622	5.37	357.82	117.48	0.41
Hickory Creek	2	44136	10% Annual Chanc	2450	434.54	445.22	443.06	445.67	0.00451	5.93	512.62	149.91	0.41
Hickory Creek	2	44136	4% Annual Chance	3150	434.54	446	443.68	446.5	0.004496	6.4	655.41	204.97	0.42
Hickory Creek	2	44136	2% Annual Chance	3700	434.54	446.53	444.11	447.03	0.004281	6.55	769.46	229.74	0.42
Hickory Creek	2	44136	1% Annual Chance	4300	434.54	447.05	444.58	447.55	0.004111	6.7	895.92	266.76	0.41
Hickory Creek	2	44136	0.4% Annual Chan	5200	434.54	447.76	445.27	448.26	0.003896	6.9	1106.18	347.9	0.41
Hickory Creek	2	44136	0.2% Annual Chan	5950	434.54	448.37	446.13	448.84	0.003543	6.87	1331.56	404.74	0.39
Hickory Creek	2	44065	50% Annual Chanc	1050	434.41	442.89		443.07	0.00248	3.37	311.39	75.97	0.29
Hickory Creek	2	44065	20% Annual Chanc	1700	434.41	444.02		444.29	0.002801	4.18	424.71	114.69	0.32
Hickory Creek	2	44065	10% Annual Chanc	2450	434.41	444.99		445.35	0.003046	4.89	547.2	145.08	0.35
Hickory Creek	2	44065	4% Annual Chance	3150	434.41	445.76		446.18	0.003152	5.39	676.84	191.6	0.36
Hickory Creek	2	44065	2% Annual Chance	3700	434.41	446.29		446.73	0.003105	5.62	788.34	228.13	0.36
Hickory Creek	2	44065	1% Annual Chance	4300	434.41	446.82		447.27	0.003046	5.82	917.75	269.14	0.36
Hickory Creek	2	44065	0.4% Annual Chan	5200	434.41	447.54		448	0.002895	6.01	1146.79	360.53	0.36
Hickory Creek	2	44065	0.2% Annual Chan	5950	434.41	448.17		448.6	0.002604	5.98	1386.86	396.88	0.34
Hickory Creek	2	44009	50% Annual Chanc	1050	433.88	442.78		442.93	0.002164	3.07	342.11	87.01	0.27
Hickory Creek	2	44009	20% Annual Chanc	1700	433.88	443.91		444.13	0.002428	3.79	464.94	129.43	0.3
Hickory Creek	2	44009	10% Annual Chanc	2450	433.88	444.88		445.17	0.002585	4.41	603.05	155.63	0.32
Hickory Creek	2	44009	4% Annual Chance	3150	433.88	445.66		446	0.002637	4.83	733.38	181.35	0.33
Hickory Creek	2	44009	2% Annual Chance	3700	433.88	446.18		446.55	0.00271	5.15	834.9	211.21	0.34
Hickory Creek	2	44009	1% Annual Chance	4300	433.88	446.7		447.1	0.002694	5.38	950.37	232.21	0.34
Hickory Creek	2	44009	0.4% Annual Chan	5200	433.88	447.42		447.84	0.002614	5.62	1136.57	303.53	0.34
Hickory Creek	2	44009	0.2% Annual Chan	5950	433.88	448.05		448.46	0.002426	5.68	1343.49	345.74	0.33
Hickory Creek	2	43941	50% Annual Chanc	1050	433.55	442.52		442.72	0.004266	3.65	287.81	93.73	0.37
Hickory Creek	2	43941	20% Annual Chanc	1700	433.55	443.66		443.93	0.003757	4.2	424.18	136.74	0.36
Hickory Creek	2	43941	10% Annual Chanc	2450	433.55	444.64		444.96	0.003532	4.69	571.41	162.31	0.36
Hickory Creek	2	43941	4% Annual Chance	3150	433.55	445.44		445.79	0.003329	5.01	709.15	184.12	0.36
Hickory Creek	2	43941	2% Annual Chance	3700	433.55	445.97		446.35	0.003258	5.24	811.34	200.87	0.36
Hickory Creek	2	43941	1% Annual Chance	4300	433.55	446.49		446.9	0.003221	5.48	920.02	220.57	0.36
Hickory Creek	2	43941	0.4% Annual Chan	5200	433.55	447.21		447.64	0.003095	5.74	1094.37	279.67	0.36
Hickory Creek	2	43941	0.2% Annual Chan	5950	433.55	447.86		448.28	0.002807	5.77	1299.94	343.69	0.35
Hickory Creek	2	43839	50% Annual Chanc	1050	432.94	442.16		442.34	0.003261	3.33	322.8	109.92	0.31

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	43839	20% Annual Chanc	1700	432.94	443.33		443.55	0.003343	3.83	471.42	144.45	0.32
Hickory Creek	2	43839	10% Annual Chanc	2450	432.94	444.34		444.6	0.003313	4.26	632.31	174.79	0.32
Hickory Creek	2	43839	4% Annual Chance	3150	432.94	445.16		445.44	0.003203	4.5	785.1	197.43	0.31
Hickory Creek	2	43839	2% Annual Chance	3700	432.94	445.7		446	0.003182	4.68	896.03	211.47	0.31
Hickory Creek	2	43839	1% Annual Chance	4300	432.94	446.22		446.54	0.003192	4.86	1010.73	226.43	0.31
Hickory Creek	2	43839	0.4% Annual Chan	5200	432.94	446.95		447.29	0.003186	5.09	1184.62	253.42	0.31
Hickory Creek	2	43839	0.2% Annual Chan	5950	432.94	447.61		447.96	0.003088	5.2	1365.04	302.35	0.31
Hickory Creek	2	43648	50% Annual Chanc	1050	432.6	441.74		441.88	0.001741	3.1	403.74	194.12	0.25
Hickory Creek	2	43648	20% Annual Chanc	1700	432.6	442.95		443.1	0.001588	3.44	665.07	236.36	0.25
Hickory Creek	2	43648	10% Annual Chanc	2450	432.6	444		444.16	0.001497	3.72	932.13	271.73	0.25
Hickory Creek	2	43648	4% Annual Chance	3150	432.6	444.85		445.02	0.00139	3.87	1172.86	291.81	0.24
Hickory Creek	2	43648	2% Annual Chance	3700	432.6	445.41		445.58	0.001366	4.01	1338.97	307.26	0.24
Hickory Creek	2	43648	1% Annual Chance	4300	432.6	445.94		446.12	0.001364	4.17	1506.46	323.98	0.25
Hickory Creek	2	43648	0.4% Annual Chan	5200	432.6	446.68		446.87	0.001349	4.38	1762.12	368.49	0.25
Hickory Creek	2	43648	0.2% Annual Chan	5950	432.6	447.37		447.56	0.001255	4.42	2030.08	402.41	0.24
Hickory Creek	2	43505	50% Annual Chanc	1050	432.4	441.74		441.76	0.00026	1.46	1113.32	387.1	0.1
Hickory Creek	2	43505	20% Annual Chanc	1700	432.4	442.97		442.99	0.000241	1.57	1626.18	473.15	0.1
Hickory Creek	2	43505	10% Annual Chanc	2450	432.4	444.02		444.04	0.000236	1.68	2138.22	493.24	0.1
Hickory Creek	2	43505	4% Annual Chance	3150	432.4	444.88		444.91	0.000231	1.76	2565.83	501.68	0.1
Hickory Creek	2	43505	2% Annual Chance	3700	432.4	445.43		445.47	0.000235	1.85	2846.98	507.74	0.1
Hickory Creek	2	43505	1% Annual Chance	4300	432.4	445.97		446	0.000243	1.94	3119.52	514.63	0.1
Hickory Creek	2	43505	0.4% Annual Chan	5200	432.4	446.71		446.75	0.000255	2.07	3505.82	528.66	0.11
Hickory Creek	2	43505	0.2% Annual Chan	5950	432.4	447.4		447.44	0.000253	2.14	3875.52	548.79	0.11
Hickory Creek	2	43440	50% Annual Chanc	1050	432.26	441.64	436.48	441.71	0.000862	2.12	545.46	148.51	0.18
Hickory Creek	2	43440	20% Annual Chanc	1700	432.26	442.82	437.73	442.92	0.001005	2.64	751.57	200.73	0.2
Hickory Creek	2	43440	10% Annual Chanc	2450	432.26	443.82	438.82	443.95	0.001153	3.16	970.92	282.24	0.22
Hickory Creek	2	43440	4% Annual Chance	3200	432.26	444.66	439.72	444.81	0.001145	3.41	1274.32	424.26	0.22
Hickory Creek	2	43440	2% Annual Chance	3750	432.26	445.22	440.14	445.37	0.00109	3.5	1495.28	489.2	0.22
Hickory Creek	2	43440	1% Annual Chance	4350	432.26	445.76	440.61	445.91	0.001053	3.59	1706.54	518.4	0.22
Hickory Creek	2	43440	0.4% Annual Chan	5250	432.26	446.5	441.27	446.66	0.001002	3.7	2002.51	552.13	0.21
Hickory Creek	2	43440	0.2% Annual Chan	6000	432.26	447.2	441.71	447.35	0.000912	3.71	2284.01	589.02	0.21
Hickory Creek	2	43400	Bridge										
Hickory Creek	2	43285	50% Annual Chanc	1050	432.12	441.49	437.64	441.54	0.000759	1.8	583.85	207.01	0.19
Hickory Creek	2	43285	20% Annual Chanc	1700	432.12	442.66	438.77	442.72	0.000712	1.99	856.24	250.9	0.19
Hickory Creek	2	43285	10% Annual Chanc	2450	432.12	443.67	439.69	443.74	0.000633	2.2	1115.61	260.32	0.19
Hickory Creek	2	43285	4% Annual Chance	3200	432.12	444.51	440.23	444.6	0.000592	2.39	1338.25	263.88	0.18
Hickory Creek	2	43285	2% Annual Chance	3750	432.12	445.08	440.58	445.18	0.000573	2.52	1487.58	266.24	0.18
Hickory Creek	2	43285	1% Annual Chance	4350	432.12	445.61	440.92	445.72	0.000569	2.67	1630.08	268.47	0.19
Hickory Creek	2	43285	0.4% Annual Chan	5250	432.12	446.35	441.35	446.48	0.000565	2.86	1829.99	271.57	0.19
Hickory Creek	2	43285	0.2% Annual Chan	6000	432.12	447.04	441.67	447.18	0.000533	2.96	2019.02	274.47	0.19
Hickory Creek	2	43200	Bridge										
Hickory Creek	2	43170	50% Annual Chanc	1050	430.93	441.3	437.04	441.39	0.001968	2.49	472.2	159.15	0.22
Hickory Creek	2	43170	20% Annual Chanc	1700	430.93	442.44	438.9	442.56	0.001959	2.93	700.03	226.48	0.23
Hickory Creek	2	43170	10% Annual Chanc	2450	430.93	443.44	439.81	443.58	0.001973	3.3	956.63	350.37	0.23
Hickory Creek	2	43170	4% Annual Chance	3200	430.93	444.29	440.45	444.45	0.00191	3.54	1198.14	457.43	0.23
Hickory Creek	2	43170	2% Annual Chance	3750	430.93	444.86	440.88	445.02	0.001871	3.69	1361.42	490.7	0.24
Hickory Creek	2	43170	1% Annual Chance	4350	430.93	445.39	441.27	445.56	0.001874	3.86	1516.74	500.72	0.24
Hickory Creek	2	43170	0.4% Annual Chan	5250	430.93	446.13	441.78	446.32	0.001874	4.09	1736.14	511.52	0.24
Hickory Creek	2	43170	0.2% Annual Chan	6000	430.93	446.81	442.23	447.02	0.001869	4.29	1957.86	552.4	0.24
Hickory Creek	2	43123	50% Annual Chanc	1050	430.88	441.21	437.88	441.29	0.001971	2.57	560.08	192.57	0.19
Hickory Creek	2	43123	20% Annual Chanc	1700	430.88	442.35	438.83	442.46	0.002151	3.04	788.95	206.75	0.21
Hickory Creek	2	43123	10% Annual Chanc	2450	430.88	443.34	439.56	443.47	0.002359	3.5	999.85	240.72	0.22
Hickory Creek	2	43123	4% Annual Chance	3200	430.88	444.19	440.32	444.34	0.002413	3.79	1289.55	419.77	0.23
Hickory Creek	2	43123	2% Annual Chance	3750	430.88	444.75	440.7	444.91	0.00254	4.06	1508.27	462.17	0.24
Hickory Creek	2	43123	1% Annual Chance	4350	430.88	445.29	441.13	445.45	0.002452	4.15	1725.09	481.17	0.24
Hickory Creek	2	43123	0.4% Annual Chan	5250	430.88	446.03	441.59	446.19	0.00234	4.26	2029.25	496.77	0.23
Hickory Creek	2	43123	0.2% Annual Chan	6000	430.88	446.73	441.93	446.88	0.002136	4.25	2317.46	505.86	0.23
Hickory Creek	2	43100	Bridge										
Hickory Creek	2	42925	50% Annual Chanc	1050	430.53	440.73	436.6	440.87	0.002026	3.03	355.42	135.22	0.26
Hickory Creek	2	42925	20% Annual Chanc	1700	430.53	441.77	438.02	441.98	0.002295	3.75	537.66	188.96	0.29
Hickory Creek	2	42925	10% Annual Chanc	2450	430.53	442.65	439.13	442.92	0.002557	4.4	713.56	223.1	0.32
Hickory Creek	2	42925	4% Annual Chance	3200	430.53	443.44	440.03	443.76	0.002626	4.84	934.19	329.28	0.33
Hickory Creek	2	42925	2% Annual Chance	3750	430.53	443.95	440.66	444.3	0.002719	5.16	1114.28	380.12	0.34
Hickory Creek	2	42925	1% Annual Chance	4350	430.53	444.51	441.33	444.85	0.002546	5.25	1327.76	411.09	0.33
Hickory Creek	2	42925	0.4% Annual Chan	5250	430.53	445.29	441.91	445.63	0.002328	5.35	1628.72	422.24	0.32
Hickory Creek	2	42925	0.2% Annual Chan	6000	430.53	446.06	442.32	446.37	0.00201	5.26	1927.32	429.17	0.3

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	42800	50% Annual Chanc	1050	431.25	440.36		440.55	0.002939	3.5	324.09	113.51	0.31
Hickory Creek	2	42800	20% Annual Chanc	1700	431.25	441.33		441.61	0.003405	4.32	484.64	241.44	0.35
Hickory Creek	2	42800	10% Annual Chanc	2450	431.25	442.22		442.54	0.003421	4.86	712.97	272.35	0.36
Hickory Creek	2	42800	4% Annual Chance	3200	431.25	443.05		443.4	0.003218	5.17	975.69	345.76	0.36
Hickory Creek	2	42800	2% Annual Chance	3750	431.25	443.62		443.96	0.00295	5.24	1175.89	362.54	0.35
Hickory Creek	2	42800	1% Annual Chance	4350	431.25	444.21		444.53	0.002682	5.27	1392.9	372.2	0.34
Hickory Creek	2	42800	0.4% Annual Chan	5250	431.25	445.03		445.34	0.002399	5.34	1707.45	395.47	0.32
Hickory Creek	2	42800	0.2% Annual Chan	6000	431.25	445.84		446.12	0.002015	5.2	2035.31	412.6	0.3
Hickory Creek	2	42697	50% Annual Chanc	1050	430.84	440.25		440.33	0.00145	2.69	612.75	249.04	0.22
Hickory Creek	2	42697	20% Annual Chanc	1700	430.84	441.25		441.35	0.001626	3.09	879.5	277.11	0.24
Hickory Creek	2	42697	10% Annual Chanc	2450	430.84	442.16		442.29	0.001637	3.46	1140.36	298.21	0.25
Hickory Creek	2	42697	4% Annual Chance	3200	430.84	443.02		443.15	0.001573	3.71	1401.82	313.52	0.25
Hickory Creek	2	42697	2% Annual Chance	3750	430.84	443.58		443.73	0.001536	3.87	1581.78	322.4	0.25
Hickory Creek	2	42697	1% Annual Chance	4350	430.84	444.17		444.32	0.001493	4.02	1773.42	330.01	0.25
Hickory Creek	2	42697	0.4% Annual Chan	5250	430.84	444.98		445.15	0.001446	4.22	2044.78	339.13	0.25
Hickory Creek	2	42697	0.2% Annual Chan	6000	430.84	445.79		445.96	0.001305	4.25	2323.43	347.35	0.24
Hickory Creek	2	42412	50% Annual Chanc	1050	431.08	439.78		439.86	0.002115	2.57	565.4	251.37	0.22
Hickory Creek	2	42412	20% Annual Chanc	1700	431.08	440.79		440.88	0.001956	2.83	830.31	275.42	0.21
Hickory Creek	2	42412	10% Annual Chanc	2450	431.08	441.72		441.82	0.001874	3.08	1106.22	316.91	0.22
Hickory Creek	2	42412	4% Annual Chance	3200	431.08	442.61		442.71	0.00172	3.22	1437.49	411.63	0.21
Hickory Creek	2	42412	2% Annual Chance	3750	431.08	443.21		443.31	0.00156	3.24	1691.16	429.86	0.2
Hickory Creek	2	42412	1% Annual Chance	4350	431.08	443.84		443.94	0.00138	3.2	1968.21	448.36	0.19
Hickory Creek	2	42412	0.4% Annual Chan	5250	431.08	444.69		444.79	0.001204	3.19	2356.65	466.81	0.18
Hickory Creek	2	42412	0.2% Annual Chan	6000	431.08	445.56		445.64	0.000991	3.07	2770.65	487.26	0.17
Hickory Creek	2	42348	50% Annual Chanc	1050	430.46	439.64	435.85	439.71	0.001412	2.16	493.72	183.56	0.21
Hickory Creek	2	42348	20% Annual Chanc	1700	430.46	440.61	437.28	440.71	0.001473	2.63	672.75	249.31	0.23
Hickory Creek	2	42348	10% Annual Chanc	2450	430.46	441.49	438.07	441.64	0.001554	3.08	838.48	393.72	0.24
Hickory Creek	2	42348	4% Annual Chance	3200	430.46	442.35	438.72	442.52	0.001532	3.4	998.64	516.24	0.25
Hickory Creek	2	42348	2% Annual Chance	3750	430.46	442.92	439.14	443.12	0.001524	3.61	1105.67	537.91	0.25
Hickory Creek	2	42348	1% Annual Chance	4350	430.46	443.52	439.43	443.73	0.001508	3.81	1217.45	579.91	0.25
Hickory Creek	2	42348	0.4% Annual Chan	5250	430.46	444.55	439.83	444.67	0.000854	3.14	2655.78	669.1	0.2
Hickory Creek	2	42348	0.2% Annual Chan	6000	430.46	445.45	440.17	445.55	0.00068	3.01	3280.21	719.24	0.18
Hickory Creek	2	42300	Bridge										
Hickory Creek	2	42259	50% Annual Chanc	1050	430.78	439.48	436.41	439.6	0.001619	2.81	387.19	130.19	0.26
Hickory Creek	2	42259	20% Annual Chanc	1700	430.78	440.35	437.38	440.55	0.002033	3.63	500.19	183.49	0.3
Hickory Creek	2	42259	10% Annual Chanc	2450	430.78	441.06	438.43	441.36	0.002532	4.46	604	366.93	0.34
Hickory Creek	2	42259	4% Annual Chance	3200	430.78	441.64	439	442.04	0.002983	5.19	688.71	473.94	0.38
Hickory Creek	2	42259	2% Annual Chance	3750	430.78	442.03	439.36	442.5	0.003251	5.65	746.21	553.15	0.4
Hickory Creek	2	42259	1% Annual Chance	4350	430.78	442.41	439.72	442.96	0.00354	6.14	802.2	571.89	0.42
Hickory Creek	2	42259	0.4% Annual Chan	5250	430.78	442.99	440.21	443.35	0.002586	5.54	1721.57	597.64	0.36
Hickory Creek	2	42259	0.2% Annual Chan	6000	430.78	443.44	440.71	443.8	0.002461	5.63	1999.18	623.05	0.36
Hickory Creek	2	42205	50% Annual Chanc	1050	429.97	439.29		439.46	0.002656	3.45	343.1	135.21	0.3
Hickory Creek	2	42205	20% Annual Chanc	1700	429.97	440.14		440.39	0.003203	4.29	481.25	208.02	0.34
Hickory Creek	2	42205	10% Annual Chanc	2450	429.97	440.86		441.18	0.003673	5.04	655.1	302.99	0.37
Hickory Creek	2	42205	4% Annual Chance	3200	429.97	441.47		441.83	0.003847	5.52	912.32	489.55	0.39
Hickory Creek	2	42205	2% Annual Chance	3750	429.97	441.87		442.24	0.003756	5.69	1118.36	526.03	0.39
Hickory Creek	2	42205	1% Annual Chance	4350	429.97	442.27		442.64	0.003738	5.9	1333.03	567.96	0.39
Hickory Creek	2	42205	0.4% Annual Chan	5250	429.97	442.83		443.18	0.003469	5.98	1657.13	587.29	0.38
Hickory Creek	2	42205	0.2% Annual Chan	6000	429.97	443.3		443.63	0.003192	5.97	1939.42	612.3	0.37
Hickory Creek	2	42006	50% Annual Chanc	1050	429.57	439.18		439.21	0.000572	1.64	1188.29	532.93	0.14
Hickory Creek	2	42006	20% Annual Chanc	1700	429.57	440.06		440.09	0.000622	1.94	1673.35	567.83	0.15
Hickory Creek	2	42006	10% Annual Chanc	2450	429.57	440.8		440.84	0.000673	2.21	2096.97	576.87	0.16
Hickory Creek	2	42006	4% Annual Chance	3200	429.57	441.41		441.46	0.00073	2.46	2456.16	598.77	0.17
Hickory Creek	2	42006	2% Annual Chance	3750	429.57	441.8		441.85	0.000776	2.64	2693.54	610.91	0.18
Hickory Creek	2	42006	1% Annual Chance	4350	429.57	442.18		442.24	0.000835	2.83	2929	634.9	0.19
Hickory Creek	2	42006	0.4% Annual Chan	5250	429.57	442.71		442.78	0.00091	3.1	3273.06	668.56	0.2
Hickory Creek	2	42006	0.2% Annual Chan	6000	429.57	443.16		443.24	0.000948	3.29	3582.71	704.91	0.2
Hickory Creek	2	41696	50% Annual Chanc	1050	429.63	438.88		438.95	0.001577	2.2	604.4	402.69	0.22
Hickory Creek	2	41696	20% Annual Chanc	1700	429.63	439.76		439.84	0.001392	2.46	1074.77	596.86	0.22
Hickory Creek	2	41696	10% Annual Chanc	2450	429.63	440.52		440.6	0.001243	2.61	1556.42	673.66	0.21
Hickory Creek	2	41696	4% Annual Chance	3200	429.63	441.14		441.22	0.001158	2.74	2006.93	752.5	0.21
Hickory Creek	2	41696	2% Annual Chance	3750	429.63	441.53		441.62	0.001125	2.84	2310.42	795.94	0.21
Hickory Creek	2	41696	1% Annual Chance	4350	429.63	441.91		442	0.00111	2.94	2616.8	828.74	0.21
Hickory Creek	2	41696	0.4% Annual Chan	5250	429.63	442.44		442.53	0.001088	3.08	3070.1	889.55	0.21
Hickory Creek	2	41696	0.2% Annual Chan	6000	429.63	442.9		442.99	0.001027	3.13	3490.59	928.69	0.21
Hickory Creek	2	41463	50% Annual Chanc	1050	429.4	438.48		438.55	0.001885	2.7	652.5	281.87	0.22
Hickory Creek	2	41463	20% Annual Chanc	1700	429.4	439.34		439.44	0.002187	3.25	918.92	340.63	0.24
Hickory Creek	2	41463	10% Annual Chanc	2450	429.4	440.06		440.19	0.002536	3.79	1189.28	416.49	0.26

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	41463	4% Annual Chance	3200	429.4	440.66		440.81	0.002788	4.22	1470.58	516.44	0.28
Hickory Creek	2	41463	2% Annual Chance	3750	429.4	441.05		441.21	0.002896	4.46	1684.55	585.35	0.29
Hickory Creek	2	41463	1% Annual Chance	4350	429.4	441.43		441.59	0.002862	4.58	1914.4	607.5	0.29
Hickory Creek	2	41463	0.4% Annual Chan	5250	429.4	441.97		442.13	0.002807	4.75	2249.45	647.02	0.29
Hickory Creek	2	41463	0.2% Annual Chan	6000	429.4	442.46		442.62	0.002616	4.76	2574.18	677.68	0.28
Hickory Creek	2	41168	50% Annual Chanc	1050	429.25	437.94		438.01	0.002172	2.39	620.58	356.44	0.23
Hickory Creek	2	41168	20% Annual Chanc	1700	429.25	438.8		438.88	0.002058	2.69	955.01	405.45	0.23
Hickory Creek	2	41168	10% Annual Chanc	2450	429.25	439.48		439.58	0.002174	3.05	1250.87	446.98	0.24
Hickory Creek	2	41168	4% Annual Chance	3200	429.25	440.05		440.17	0.002261	3.34	1517.77	499.95	0.25
Hickory Creek	2	41168	2% Annual Chance	3750	429.25	440.41		440.54	0.002347	3.55	1707.12	544.72	0.26
Hickory Creek	2	41168	1% Annual Chance	4350	429.25	440.78		440.92	0.002445	3.77	1913.79	593.44	0.26
Hickory Creek	2	41168	0.4% Annual Chan	5250	429.25	441.32		441.47	0.002383	3.94	2250.48	630.73	0.27
Hickory Creek	2	41168	0.2% Annual Chan	6000	429.25	441.86		442.01	0.002168	3.95	2605.91	679.67	0.26
Hickory Creek	2	40781	50% Annual Chanc	1050	428.52	437.3		437.35	0.001491	2.19	773.91	388.49	0.19
Hickory Creek	2	40781	20% Annual Chanc	1700	428.52	438.16		438.22	0.001587	2.56	1161.6	524.94	0.2
Hickory Creek	2	40781	10% Annual Chanc	2450	428.52	438.8		438.87	0.001738	2.9	1522.11	574.96	0.22
Hickory Creek	2	40781	4% Annual Chance	3200	428.52	439.34		439.42	0.001831	3.17	1839.71	601.52	0.22
Hickory Creek	2	40781	2% Annual Chance	3750	428.52	439.68		439.77	0.001906	3.35	2044.52	614.2	0.23
Hickory Creek	2	40781	1% Annual Chance	4350	428.52	440.01		440.11	0.001975	3.52	2252.44	621.35	0.24
Hickory Creek	2	40781	0.4% Annual Chan	5250	428.52	440.58		440.68	0.001939	3.68	2615.02	681.73	0.24
Hickory Creek	2	40781	0.2% Annual Chan	6000	428.52	441.15		441.25	0.001952	3.88	3017.98	730.37	0.24
Hickory Creek	2	40678	50% Annual Chanc	1050	427.73	437.27	430.82	437.28	0.000202	1.22	1498.88	601.93	0.08
Hickory Creek	2	40678	20% Annual Chanc	1700	427.73	438.12	431.85	438.14	0.000264	1.49	2037.71	658.91	0.09
Hickory Creek	2	40678	10% Annual Chanc	2450	427.73	438.75	432.78	438.78	0.000338	1.78	2459.41	678.93	0.1
Hickory Creek	2	40678	4% Annual Chance	3200	427.73	439.28	433.58	439.32	0.000404	2.02	2829.17	707.49	0.12
Hickory Creek	2	40678	2% Annual Chance	3750	427.73	439.61	434.12	439.65	0.000448	2.17	3064.67	719.4	0.12
Hickory Creek	2	40678	1% Annual Chance	4350	427.73	439.94	434.63	439.99	0.000497	2.34	3305.11	737.48	0.13
Hickory Creek	2	40678	0.4% Annual Chan	5250	427.73	440.51	435.91	440.55	0.000522	2.48	3727.97	758.38	0.13
Hickory Creek	2	40678	0.2% Annual Chan	6000	427.73	441.07	436.29	441.12	0.000512	2.55	4168.76	802.35	0.13
Hickory Creek	2	40650		Culvert									
Hickory Creek	2	40614	50% Annual Chanc	1050	427.71	437.23	430.8	437.26	0.000288	1.48	1179.96	532.8	0.09
Hickory Creek	2	40614	20% Annual Chanc	1700	427.71	438.07	431.84	438.11	0.00038	1.82	1693.8	672.44	0.11
Hickory Creek	2	40614	10% Annual Chanc	2450	427.71	438.7	432.78	438.74	0.000465	2.11	2127.73	706.37	0.12
Hickory Creek	2	40614	4% Annual Chance	3200	427.71	439.24	433.58	439.29	0.00052	2.32	2516.09	729.63	0.13
Hickory Creek	2	40614	2% Annual Chance	3750	427.71	439.55	434.05	439.6	0.00057	2.48	2742.6	734.46	0.14
Hickory Creek	2	40614	1% Annual Chance	4350	427.71	439.89	434.52	439.94	0.000608	2.62	2989.88	738.91	0.14
Hickory Creek	2	40614	0.4% Annual Chan	5250	427.71	440.45	436.01	440.51	0.000616	2.73	3412.57	749.63	0.15
Hickory Creek	2	40614	0.2% Annual Chan	6000	427.71	441.03	436.62	441.08	0.000576	2.73	3843.06	761.29	0.14
Hickory Creek	2	40504	50% Annual Chanc	1050	427.79	437.09		437.17	0.001932	2.65	611.74	367.71	0.22
Hickory Creek	2	40504	20% Annual Chanc	1700	427.79	437.92		438.01	0.001997	3.01	966.47	557.58	0.23
Hickory Creek	2	40504	10% Annual Chanc	2450	427.79	438.53		438.63	0.002091	3.31	1328.25	611.01	0.24
Hickory Creek	2	40504	4% Annual Chance	3200	427.79	439.06		439.17	0.002115	3.52	1661.55	648.43	0.24
Hickory Creek	2	40504	2% Annual Chance	3750	427.79	439.36		439.48	0.002178	3.68	1857.65	655.19	0.25
Hickory Creek	2	40504	1% Annual Chance	4350	427.79	439.7		439.81	0.002182	3.8	2076.24	663.69	0.25
Hickory Creek	2	40504	0.4% Annual Chan	5250	427.79	440.28		440.39	0.001984	3.82	2464.62	676.08	0.24
Hickory Creek	2	40504	0.2% Annual Chan	6000	427.79	440.87		440.97	0.00169	3.7	2870.94	721.43	0.23
Hickory Creek	1	40166	50% Annual Chanc	1750	423.96	436.37		436.48	0.002056	3.26	976.51	615.99	0.21
Hickory Creek	1	40166	20% Annual Chanc	2750	423.96	437.14		437.26	0.002291	3.68	1567.16	874.03	0.23
Hickory Creek	1	40166	10% Annual Chanc	3900	423.96	437.76		437.87	0.002286	3.86	2133.7	948.75	0.23
Hickory Creek	1	40166	4% Annual Chance	5100	423.96	438.31		438.41	0.002224	3.96	2666.02	993.52	0.23
Hickory Creek	1	40166	2% Annual Chance	5850	423.96	438.61		438.71	0.002214	4.04	2964.59	1004.22	0.23
Hickory Creek	1	40166	1% Annual Chance	6750	423.96	438.95		439.05	0.002184	4.11	3306.22	1010.64	0.23
Hickory Creek	1	40166	0.4% Annual Chan	8500	423.96	439.55		439.66	0.002148	4.24	3932.6	1060.8	0.23
Hickory Creek	1	40166	0.2% Annual Chan	10450	423.96	440.19		440.3	0.002054	4.32	4616.71	1082.68	0.23
Hickory Creek	1	39628	50% Annual Chanc	1750	423.34	434.94	431.77	435.08	0.005112	3.79	766.7	540.52	0.33
Hickory Creek	1	39628	20% Annual Chanc	2750	423.34	435.85	434.37	435.97	0.00414	3.83	1432.7	766.69	0.3
Hickory Creek	1	39628	10% Annual Chanc	3900	423.34	436.66	434.8	436.76	0.003258	3.72	2087.22	833.99	0.27
Hickory Creek	1	39628	4% Annual Chance	5100	423.34	437.28	435.08	437.38	0.00304	3.82	2624.53	901.58	0.26
Hickory Creek	1	39628	2% Annual Chance	5850	423.34	437.61	435.1	437.71	0.002925	3.87	2923.95	910.67	0.26
Hickory Creek	1	39628	1% Annual Chance	6750	423.34	437.99	435.1	438.09	0.002806	3.92	3268.69	920.27	0.26
Hickory Creek	1	39628	0.4% Annual Chan	8500	423.34	438.64	436.09	438.75	0.002696	4.05	3881.31	978.97	0.25
Hickory Creek	1	39628	0.2% Annual Chan	10450	423.34	439.32	436.46	439.43	0.002621	4.21	4553.29	1000.97	0.25
Hickory Creek	1	39572	50% Annual Chanc	1750	423.34	434.8	429.7	434.9	0.001939	2.8	855.17	487.71	0.21
Hickory Creek	1	39572	20% Annual Chanc	2750	423.34	435.68	431.07	435.81	0.00217	3.26	1444.13	747.72	0.23
Hickory Creek	1	39572	10% Annual Chanc	3900	423.34	436.48	432.48	436.61	0.002133	3.49	2074.06	832.54	0.23
Hickory Creek	1	39572	4% Annual Chance	5100	423.34	437.11	434.08	437.24	0.002136	3.69	2611.27	871.76	0.23
Hickory Creek	1	39572	2% Annual Chance	5850	423.34	437.44	434.21	437.57	0.002164	3.81	2900.41	888.48	0.24
Hickory Creek	1	39572	1% Annual Chance	6750	423.34	437.82	435.11	437.95	0.002175	3.94	3238.3	908.2	0.24

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	39572	0.4% Annual Chan	8500	423.34	438.46	435.49	438.61	0.002227	4.18	3842.53	953.91	0.25
Hickory Creek	1	39572	0.2% Annual Chan	10450	423.34	439.14	436.2	439.29	0.002275	4.43	4511.57	1023.65	0.25
Hickory Creek	1	38283	50% Annual Chanc	1750	419.86	432	428.73	432.07	0.00294	2.34	877.5	347.13	0.24
Hickory Creek	1	38283	20% Annual Chanc	2750	419.86	433.11	430.29	433.18	0.002305	2.55	1418.54	663.99	0.22
Hickory Creek	1	38283	10% Annual Chanc	3900	419.86	434.02	430.74	434.11	0.002215	2.85	2068.88	726.32	0.22
Hickory Creek	1	38283	4% Annual Chance	5100	419.86	434.69	431.3	434.79	0.002223	3.11	2577.98	823.39	0.23
Hickory Creek	1	38283	2% Annual Chance	5850	419.86	435.05	431.51	435.16	0.002177	3.2	2881.74	845.92	0.23
Hickory Creek	1	38283	1% Annual Chance	6750	419.86	435.46	431.76	435.57	0.002155	3.33	3230.71	882.03	0.23
Hickory Creek	1	38283	0.4% Annual Chan	8500	419.86	436.16	432.32	436.27	0.002085	3.5	3851.38	903.85	0.23
Hickory Creek	1	38283	0.2% Annual Chan	10450	419.86	436.86	432.9	436.98	0.002052	3.7	4494.42	942.12	0.23
Hickory Creek	1	37389	50% Annual Chanc	1750	420.31	430.29		430.41	0.001367	3.4	953.41	343.88	0.23
Hickory Creek	1	37389	20% Annual Chanc	2750	420.31	431.69		431.81	0.001186	3.59	1627.55	592.61	0.22
Hickory Creek	1	37389	10% Annual Chanc	3900	420.31	432.6		432.73	0.001239	3.95	2180.52	622.83	0.23
Hickory Creek	1	37389	4% Annual Chance	5100	420.31	432.98		433.16	0.001661	4.7	2418.55	636.58	0.27
Hickory Creek	1	37389	2% Annual Chance	5850	420.31	433.23		433.43	0.00187	5.07	2581.88	646.44	0.29
Hickory Creek	1	37389	1% Annual Chance	6750	420.31	433.51		433.74	0.00212	5.51	2762.67	662.23	0.31
Hickory Creek	1	37389	0.4% Annual Chan	8500	420.31	434		434.29	0.002598	6.3	3095.9	704.91	0.34
Hickory Creek	1	37389	0.2% Annual Chan	10450	420.31	434.45		434.82	0.003188	7.18	3426.95	752.57	0.38
Hickory Creek	1	37356	50% Annual Chanc	1750	420.31	430.08	427.03	430.31	0.004138	3.89	482.11	412.54	0.31
Hickory Creek	1	37356	20% Annual Chanc	2750	420.31	431.64	428.22	431.76	0.002047	3.28	1436.88	580.82	0.23
Hickory Creek	1	37356	10% Annual Chanc	3900	420.31	432.56	429.09	432.68	0.001919	3.46	1989.91	621.36	0.22
Hickory Creek	1	37356	4% Annual Chance	5100	420.31	432.92	429.86	433.08	0.00249	4.07	2219.15	630.27	0.26
Hickory Creek	1	37356	2% Annual Chance	5850	420.31	433.17	430.77	433.35	0.00274	4.36	2377.17	636.34	0.27
Hickory Creek	1	37356	1% Annual Chance	6750	420.31	433.44	431.14	433.65	0.003045	4.7	2550.4	646.31	0.29
Hickory Creek	1	37356	0.4% Annual Chan	8500	420.31	433.92	431.6	434.17	0.003599	5.3	2865.71	671.73	0.31
Hickory Creek	1	37356	0.2% Annual Chan	10450	420.31	434.37	432.01	434.67	0.00423	5.94	3173.77	706.19	0.34
Hickory Creek	1	37295	Bridge										
Hickory Creek	1	37262	50% Annual Chanc	1750	418.5	429.21	425.12	429.45	0.002926	3.97	450.07	133.19	0.27
Hickory Creek	1	37262	20% Annual Chanc	2750	418.5	430.44	426.31	430.86	0.004036	5.21	539.87	398.61	0.32
Hickory Creek	1	37262	10% Annual Chanc	3900	418.5	432.08	427.38	432.21	0.00156	3.67	1778.26	582.22	0.21
Hickory Creek	1	37262	4% Annual Chance	5100	418.5	432.28	428.33	432.48	0.002302	4.52	1897.34	592.14	0.25
Hickory Creek	1	37262	2% Annual Chance	5850	418.5	432.58	428.89	432.81	0.002455	4.76	2080.44	612.88	0.26
Hickory Creek	1	37262	1% Annual Chance	6750	418.5	432.91	429.49	433.15	0.002632	5.03	2281.56	631.15	0.27
Hickory Creek	1	37262	0.4% Annual Chan	8500	418.5	433.49	431.15	433.77	0.002881	5.46	2661.71	661.97	0.29
Hickory Creek	1	37262	0.2% Annual Chan	10450	418.5	434.03	431.64	434.34	0.00316	5.9	3023.43	680.78	0.31
Hickory Creek	1	37198	50% Annual Chanc	1750	418.4	428.52		429.09	0.006065	6.07	296.09	73.95	0.43
Hickory Creek	1	37198	20% Annual Chanc	2750	418.4	429.12	426.89	430.25	0.011232	8.58	352.64	132.43	0.59
Hickory Creek	1	37198	10% Annual Chanc	3900	418.4	429.32	428.54	431.4	0.002088	11.69	382.53	161.58	0.79
Hickory Creek	1	37198	4% Annual Chance	5100	418.4	430.9	430.9	431.96	0.010499	9.46	941.32	457.86	0.58
Hickory Creek	1	37198	2% Annual Chance	5850	418.4	431.15	431.15	432.26	0.011022	9.9	1060.27	476.61	0.6
Hickory Creek	1	37198	1% Annual Chance	6750	418.4	431.44	431.44	432.58	0.011465	10.32	1200.14	499.2	0.62
Hickory Creek	1	37198	0.4% Annual Chan	8500	418.4	431.86	431.86	433.14	0.012851	11.28	1420.29	536.36	0.66
Hickory Creek	1	37198	0.2% Annual Chan	10450	418.4	432.36	432.36	433.69	0.013311	11.9	1701.23	595.26	0.68
Hickory Creek	1	36613	50% Annual Chanc	1750	418.78	427.32		427.35	0.00176	1.83	1381.68	702.01	0.17
Hickory Creek	1	36613	20% Annual Chanc	2750	418.78	428.17		428.2	0.001512	1.94	2051.99	810.05	0.16
Hickory Creek	1	36613	10% Annual Chanc	3900	418.78	428.86		428.9	0.001431	2.08	2618.19	825.49	0.16
Hickory Creek	1	36613	4% Annual Chance	5100	418.78	429.49		429.53	0.001391	2.22	3137.05	845.17	0.16
Hickory Creek	1	36613	2% Annual Chance	5850	418.78	429.84		429.89	0.001381	2.3	3443.35	866.96	0.16
Hickory Creek	1	36613	1% Annual Chance	6750	418.78	430.24		430.3	0.001356	2.38	3792.85	877.97	0.16
Hickory Creek	1	36613	0.4% Annual Chan	8500	418.78	430.96		431.02	0.001313	2.51	4430.81	895.11	0.17
Hickory Creek	1	36613	0.2% Annual Chan	10450	418.78	431.66		431.73	0.001312	2.67	5057.86	917.56	0.17
Hickory Creek	1	35082	50% Annual Chanc	1750	412.14	424.48		424.65	0.002601	3.62	766.81	397.56	0.22
Hickory Creek	1	35082	20% Annual Chanc	2750	412.14	425.43		425.63	0.003071	4.23	1175.41	462.62	0.24
Hickory Creek	1	35082	10% Annual Chanc	3900	412.14	426.24		426.44	0.003211	4.57	1578.05	531.91	0.25
Hickory Creek	1	35082	4% Annual Chance	5100	412.14	426.91		427.11	0.003329	4.85	1944.58	564.69	0.26
Hickory Creek	1	35082	2% Annual Chance	5850	412.14	427.32		427.52	0.003272	4.94	2183	582.18	0.26
Hickory Creek	1	35082	1% Annual Chance	6750	412.14	427.83		428.02	0.003129	4.97	2480.72	604.22	0.26
Hickory Creek	1	35082	0.4% Annual Chan	8500	412.14	428.69		428.89	0.002935	5.05	3020.6	638.67	0.25
Hickory Creek	1	35082	0.2% Annual Chan	10450	412.14	429.35		429.56	0.003081	5.35	3446.25	657.28	0.26
Hickory Creek	1	34069	50% Annual Chanc	1750	410.91	421.6		421.77	0.00358	3.88	783.63	377.74	0.27
Hickory Creek	1	34069	20% Annual Chanc	2750	410.91	422.95		423.07	0.002525	3.7	1451.66	549.47	0.23
Hickory Creek	1	34069	10% Annual Chanc	3900	410.91	423.91		424.02	0.002313	3.81	2005.4	644.72	0.23
Hickory Creek	1	34069	4% Annual Chance	5100	410.91	424.89		424.98	0.001842	3.65	2671.99	705.24	0.2
Hickory Creek	1	34069	2% Annual Chance	5850	410.91	425.53		425.61	0.001579	3.52	3131.22	743.63	0.19
Hickory Creek	1	34069	1% Annual Chance	6750	410.91	426.24		426.31	0.001363	3.42	3669.57	774.17	0.18
Hickory Creek	1	34069	0.4% Annual Chan	8500	410.91	427.25		427.33	0.001243	3.46	4483.92	821.97	0.17
Hickory Creek	1	34069	0.2% Annual Chan	10450	410.91	427.71		427.81	0.001496	3.89	4862.44	835.18	0.19

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	33366	50% Annual Chanc	1500	410.3	420.52	414.88	420.61	0.000901	2.59	845.6	364.74	0.16
Hickory Creek	1	33366	20% Annual Chanc	2550	410.3	421.95	416.1	422.07	0.001049	3.12	1398.18	494.7	0.18
Hickory Creek	1	33366	10% Annual Chanc	3400	410.3	422.93	416.87	423.06	0.001067	3.36	1784.49	637.32	0.18
Hickory Creek	1	33366	4% Annual Chance	4550	410.3	423.97	417.82	424.11	0.001131	3.68	2197.65	684.66	0.19
Hickory Creek	1	33366	2% Annual Chance	5400	410.3	424.64	418.46	424.79	0.001175	3.9	2465.22	712.05	0.2
Hickory Creek	1	33366	1% Annual Chance	6400	410.3	425.38	420.56	425.54	0.001213	4.12	2764.96	739.4	0.2
Hickory Creek	1	33366	0.4% Annual Chan	7900	410.3	426.41	421.31	426.58	0.001273	4.44	3203.44	806.95	0.21
Hickory Creek	1	33366	0.2% Annual Chan	9150	410.3	427.02	421.72	427.13	0.000934	3.92	5009.66	821.96	0.18
Hickory Creek	1	33312	50% Annual Chanc	1500	410.21	420.45	416.99	420.54	0.002233	2.4	641.44	278.53	0.23
Hickory Creek	1	33312	20% Annual Chanc	2550	410.21	421.88	418.57	422	0.001849	2.76	996.81	587.57	0.22
Hickory Creek	1	33312	10% Annual Chanc	3400	410.21	422.85	419.09	422.98	0.001685	2.98	1246.68	713.46	0.22
Hickory Creek	1	33312	4% Annual Chance	4550	410.21	423.87	419.68	424.03	0.001677	3.32	1508.72	788.5	0.22
Hickory Creek	1	33312	2% Annual Chance	5400	410.21	424.53	420.07	424.71	0.001698	3.55	1676.48	815.19	0.23
Hickory Creek	1	33312	1% Annual Chance	6400	410.21	425.25	420.47	425.46	0.001709	3.79	1862.97	850.86	0.23
Hickory Creek	1	33312	0.4% Annual Chan	7900	410.21	426.41	421.01	426.48	0.00071	2.67	4932.47	969.13	0.15
Hickory Creek	1	33312	0.2% Annual Chan	9150	410.21	427	421.41	427.07	0.000711	2.78	5519.9	1029.07	0.16
Hickory Creek	1	33252	Bridge										
Hickory Creek	1	33215	50% Annual Chanc	1500	410.21	420.21	417	420.34	0.001331	2.81	533.7	145.66	0.26
Hickory Creek	1	33215	20% Annual Chanc	2550	410.21	421.6	418.53	421.78	0.001393	3.44	740.98	154.22	0.28
Hickory Creek	1	33215	10% Annual Chanc	3400	410.21	422.53	419.04	422.75	0.001429	3.83	886.93	159.97	0.29
Hickory Creek	1	33215	4% Annual Chance	4550	410.21	423.47	419.64	423.77	0.001571	4.37	1040.94	168.37	0.31
Hickory Creek	1	33215	2% Annual Chance	5400	410.21	424.07	420.04	424.42	0.001658	4.73	1145.39	180.65	0.32
Hickory Creek	1	33215	1% Annual Chance	6400	410.21	424.74	420.48	425.14	0.00169	5.08	1275.24	207.36	0.33
Hickory Creek	1	33215	0.4% Annual Chan	7900	410.21	425.64	421.1	426.11	0.001723	5.54	1457.8	237.75	0.34
Hickory Creek	1	33215	0.2% Annual Chan	9150	410.21	426.35	421.57	426.86	0.001695	5.8	1687.5	553.82	0.34
Hickory Creek	1	33214	50% Annual Chanc	1500	410.21	420.21	416.99	420.33	0.001333	2.81	533.48	145.65	0.26
Hickory Creek	1	33214	20% Annual Chanc	2550	410.21	421.59	418.54	421.78	0.001394	3.44	740.74	154.21	0.28
Hickory Creek	1	33214	10% Annual Chanc	3400	410.21	422.52	419.05	422.75	0.00143	3.83	886.67	159.96	0.29
Hickory Creek	1	33214	4% Annual Chance	4550	410.21	423.47	419.64	423.76	0.001573	4.37	1040.63	168.34	0.31
Hickory Creek	1	33214	2% Annual Chance	5400	410.21	424.07	420.03	424.41	0.00166	4.73	1144.99	180.6	0.32
Hickory Creek	1	33214	1% Annual Chance	6400	410.21	424.74	420.47	425.14	0.001698	5.09	1273.83	207.2	0.33
Hickory Creek	1	33214	0.4% Annual Chan	7900	410.21	425.63	421.09	426.11	0.001743	5.56	1456.6	237.5	0.34
Hickory Creek	1	33214	0.2% Annual Chan	9150	410.21	426.31	421.58	426.85	0.001772	5.91	1596.37	491.9	0.35
Hickory Creek	1	33173	Bridge										
Hickory Creek	1	33138	50% Annual Chanc	1500	410.21	420	417	420.14	0.001609	2.99	502.26	144.32	0.28
Hickory Creek	1	33138	20% Annual Chanc	2550	410.21	421.36	418.52	421.56	0.001624	3.62	704.87	152.76	0.3
Hickory Creek	1	33138	10% Annual Chanc	3400	410.21	422.28	419.05	422.53	0.001638	4.01	848.13	158.46	0.31
Hickory Creek	1	33138	4% Annual Chance	4550	410.21	423.2	419.64	423.52	0.001801	4.57	995.87	164.13	0.33
Hickory Creek	1	33138	2% Annual Chance	5400	410.21	423.76	420.04	424.14	0.001939	4.95	1089.99	174.38	0.34
Hickory Creek	1	33138	1% Annual Chance	6400	410.21	424.4	420.47	424.84	0.002014	5.35	1197.98	192.87	0.35
Hickory Creek	1	33138	0.4% Annual Chan	7900	410.21	425.23	421.09	425.77	0.002108	5.89	1353.51	226.12	0.37
Hickory Creek	1	33138	0.2% Annual Chan	9150	410.21	425.86	421.57	426.47	0.002167	6.29	1479.48	242.44	0.38
Hickory Creek	1	33137	50% Annual Chanc	1500	410.21	419.99	416.98	420.13	0.001612	2.99	502	144.31	0.28
Hickory Creek	1	33137	20% Annual Chanc	2550	410.21	421.36	418.53	421.56	0.001626	3.62	704.59	152.75	0.3
Hickory Creek	1	33137	10% Annual Chanc	3400	410.21	422.28	419.05	422.53	0.001639	4.01	847.83	158.45	0.31
Hickory Creek	1	33137	4% Annual Chance	4550	410.21	423.2	419.63	423.52	0.001803	4.57	995.52	164.12	0.33
Hickory Creek	1	33137	2% Annual Chance	5400	410.21	423.76	420.05	424.14	0.002027	4.95	1090.82	174.34	0.35
Hickory Creek	1	33137	1% Annual Chance	6400	410.21	424.4	420.48	424.83	0.002225	5.31	1206.59	192.9	0.37
Hickory Creek	1	33137	0.4% Annual Chan	7900	410.21	425.24	421.09	425.75	0.002407	5.76	1376.15	226.35	0.39
Hickory Creek	1	33137	0.2% Annual Chan	9150	410.21	425.88	421.57	426.45	0.002394	6.1	1508.41	242.81	0.39
Hickory Creek	1	33097	Bridge										
Hickory Creek	1	33054	50% Annual Chanc	1500	410.21	419.77	416.99	419.93	0.001991	3.2	469.22	142.9	0.31
Hickory Creek	1	33054	20% Annual Chanc	2550	410.21	421.12	418.53	421.34	0.00192	3.82	667.62	151.24	0.32
Hickory Creek	1	33054	10% Annual Chanc	3400	410.21	422.02	419.05	422.29	0.001909	4.22	806.62	156.83	0.33
Hickory Creek	1	33054	4% Annual Chance	4550	410.21	422.88	419.64	423.24	0.002115	4.82	944.44	162.18	0.35
Hickory Creek	1	33054	2% Annual Chance	5400	410.21	423.4	420.04	423.82	0.002328	5.25	1028.62	166.87	0.37
Hickory Creek	1	33054	1% Annual Chance	6400	410.21	423.97	420.47	424.47	0.002553	5.68	1127.33	178.65	0.39
Hickory Creek	1	33054	0.4% Annual Chan	7900	410.21	424.72	421.09	425.33	0.002708	6.28	1262.43	206.42	0.41
Hickory Creek	1	33054	0.2% Annual Chan	9150	410.21	425.28	421.58	425.99	0.002812	6.73	1373.76	227.64	0.43
Hickory Creek	1	33053	50% Annual Chanc	1500	410.21	419.76	417	419.92	0.001996	3.2	468.88	142.88	0.31
Hickory Creek	1	33053	20% Annual Chanc	2550	410.21	421.11	418.52	421.34	0.001923	3.82	667.27	151.23	0.32
Hickory Creek	1	33053	10% Annual Chanc	3400	410.21	422.02	419.05	422.29	0.001911	4.22	806.25	156.81	0.33
Hickory Creek	1	33053	4% Annual Chance	4550	410.21	422.88	419.64	423.24	0.002118	4.82	944	162.16	0.35
Hickory Creek	1	33053	2% Annual Chance	5400	410.21	423.39	420.02	423.82	0.002331	5.25	1028.11	166.81	0.37
Hickory Creek	1	33053	1% Annual Chance	6400	410.21	423.97	420.47	424.47	0.002632	5.68	1127.35	178.59	0.4
Hickory Creek	1	33053	0.4% Annual Chan	7900	410.21	424.72	421.09	425.32	0.002984	6.23	1268.62	206.45	0.43
Hickory Creek	1	33053	0.2% Annual Chan	9150	410.21	425.29	421.57	425.97	0.003146	6.63	1382.87	227.81	0.44

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	33019		Bridge									
Hickory Creek	1	32952	50% Annual Chanc	1500	410.25	419.1	416.68	419.29	0.003786	3.64	485.43	150.26	0.29
Hickory Creek	1	32952	20% Annual Chanc	2550	410.25	420.28	417.64	420.57	0.004553	4.63	672.22	199.56	0.34
Hickory Creek	1	32952	10% Annual Chanc	3400	410.25	421.11	418.32	421.46	0.004842	5.2	812.98	269.31	0.35
Hickory Creek	1	32952	4% Annual Chance	4550	410.25	421.84	419.11	422.32	0.005731	6.06	947.15	310.01	0.39
Hickory Creek	1	32952	2% Annual Chance	5400	410.25	422.25	419.56	422.83	0.006472	6.68	1023.77	477.99	0.42
Hickory Creek	1	32952	1% Annual Chance	6400	410.25	422.72	420.04	423.4	0.007205	7.32	1109.46	674.63	0.45
Hickory Creek	1	32952	0.4% Annual Chan	7900	410.25	423.3	420.74	424.15	0.00837	8.25	1216.72	755.82	0.49
Hickory Creek	1	32952	0.2% Annual Chan	9150	410.25	423.73	421.16	424.73	0.009292	8.97	1296.52	784.99	0.52
Hickory Creek	1	32759	50% Annual Chanc	1500	411.15	418.33	415.49	418.55	0.003728	3.82	428.7	121.51	0.3
Hickory Creek	1	32759	20% Annual Chanc	2550	411.15	418.91	416.56	419.41	0.00738	5.78	526.44	240.3	0.43
Hickory Creek	1	32759	10% Annual Chanc	3400	411.15	419.58	417.3	420.19	0.008172	6.55	719.79	357.92	0.46
Hickory Creek	1	32759	4% Annual Chance	4550	411.15	420.56	418.24	421.09	0.006711	6.53	1180.66	576.15	0.42
Hickory Creek	1	32759	2% Annual Chance	5400	411.15	421.06	419.4	421.55	0.006183	6.55	1479.68	632.53	0.41
Hickory Creek	1	32759	1% Annual Chance	6400	411.15	421.6	420.34	422.04	0.005625	6.53	1842.27	717.94	0.4
Hickory Creek	1	32759	0.4% Annual Chan	7900	411.15	422.3	420.83	422.68	0.004879	6.42	2371.91	806.34	0.38
Hickory Creek	1	32759	0.2% Annual Chan	9150	411.15	422.88	421.24	423.21	0.004232	6.23	2829.66	925.47	0.35
Hickory Creek	1	30580	50% Annual Chanc	1500	400.85	408.96		409.12	0.005345	3.34	464.69	145.3	0.28
Hickory Creek	1	30580	20% Annual Chanc	2550	400.85	411.38		411.52	0.002289	2.9	894.7	188.91	0.2
Hickory Creek	1	30580	10% Annual Chanc	3400	400.85	412.58		412.74	0.002027	3.05	1127.06	199.39	0.19
Hickory Creek	1	30580	4% Annual Chance	4550	400.85	413.4		413.62	0.002403	3.55	1293.92	206.82	0.21
Hickory Creek	1	30580	2% Annual Chance	5400	400.85	414.05		414.3	0.002511	3.81	1429.65	211.29	0.22
Hickory Creek	1	30580	1% Annual Chance	6400	400.85	414.75		415.05	0.002618	4.08	1579.81	216.14	0.23
Hickory Creek	1	30580	0.4% Annual Chan	7900	400.85	415.57		415.94	0.002881	4.51	1762.77	232.6	0.24
Hickory Creek	1	30580	0.2% Annual Chan	9150	400.85	416.17		416.6	0.003194	4.93	1944.9	399.21	0.26
Hickory Creek	1	29889	50% Annual Chanc	1500	401.19	408.36		408.39	0.000504	1.22	1017.04	232.33	0.09
Hickory Creek	1	29889	20% Annual Chanc	2550	401.19	411.08		411.12	0.000314	1.25	1761.1	299.31	0.08
Hickory Creek	1	29889	10% Annual Chanc	3400	401.19	412.31		412.35	0.000321	1.39	2150.69	329.28	0.08
Hickory Creek	1	29889	4% Annual Chance	4550	401.19	413.03		413.09	0.000465	1.75	2394.47	345.41	0.1
Hickory Creek	1	29889	2% Annual Chance	5400	401.19	413.69		413.75	0.000485	1.87	2662.43	556.72	0.1
Hickory Creek	1	29889	1% Annual Chance	6400	401.19	414.36		414.43	0.000558	2.08	3069	617.07	0.11
Hickory Creek	1	29889	0.4% Annual Chan	7900	401.19	415.21		415.29	0.00057	2.2	3613.36	663.4	0.11
Hickory Creek	1	29889	0.2% Annual Chan	9150	401.19	415.82		415.91	0.000582	2.3	4029.7	702.14	0.11
Hickory Creek	1	28825	50% Annual Chanc	1500	396.9	407.85		407.91	0.000486	1.88	799.33	124	0.13
Hickory Creek	1	28825	20% Annual Chanc	2550	396.9	410.69		410.77	0.000411	2.19	1227.66	232.23	0.13
Hickory Creek	1	28825	10% Annual Chanc	3400	396.9	411.88		411.98	0.000454	2.51	1607.65	404.8	0.14
Hickory Creek	1	28825	4% Annual Chance	4550	396.9	412.41		412.56	0.000654	3.12	1829.61	433.58	0.17
Hickory Creek	1	28825	2% Annual Chance	5400	396.9	413.02		413.18	0.000719	3.39	2099.37	458.07	0.18
Hickory Creek	1	28825	1% Annual Chance	6400	396.9	413.6		413.78	0.000803	3.71	2370.55	486.22	0.19
Hickory Creek	1	28825	0.4% Annual Chan	7900	396.9	414.36		414.59	0.000925	4.15	2779.52	584.82	0.2
Hickory Creek	1	28825	0.2% Annual Chan	9150	396.9	414.92		415.18	0.001006	4.46	3120.24	631.45	0.21
Hickory Creek	1	28641	50% Annual Chanc	1450	395.84	407.8		407.83	0.000325	1.49	975.69	144.85	0.1
Hickory Creek	1	28641	20% Annual Chanc	2500	395.84	410.65		410.69	0.000294	1.75	1725.89	474.96	0.1
Hickory Creek	1	28641	10% Annual Chanc	3350	395.84	411.84		411.9	0.00031	1.94	2436.56	657.16	0.1
Hickory Creek	1	28641	4% Annual Chance	4500	395.84	412.36		412.44	0.00044	2.38	2782.27	673.95	0.12
Hickory Creek	1	28641	2% Annual Chance	5400	395.84	412.97		413.05	0.000483	2.58	3194.32	690.69	0.13
Hickory Creek	1	28641	1% Annual Chance	6400	395.84	413.54		413.64	0.000529	2.79	3597.52	708.23	0.14
Hickory Creek	1	28641	0.4% Annual Chan	7950	395.84	414.31		414.42	0.000599	3.08	4156.03	742.51	0.15
Hickory Creek	1	28641	0.2% Annual Chan	9200	395.84	414.87		414.99	0.000649	3.3	4575.47	769.03	0.15
Hickory Creek	1	28592	50% Annual Chanc	1450	395.84	407.78	401.46	407.81	0.000326	1.49	974.53	144.52	0.1
Hickory Creek	1	28592	20% Annual Chanc	2500	395.84	410.63	402.23	410.68	0.000309	1.8	1574.42	410.06	0.1
Hickory Creek	1	28592	10% Annual Chanc	3350	395.84	411.81	402.78	411.88	0.000353	2.07	2056.11	607.36	0.11
Hickory Creek	1	28592	4% Annual Chance	4500	395.84	412.31	403.44	412.4	0.000525	2.6	2297.44	657.66	0.13
Hickory Creek	1	28592	2% Annual Chance	5400	395.84	412.9	403.92	413.01	0.000601	2.87	2591.83	672.27	0.15
Hickory Creek	1	28592	1% Annual Chance	6400	395.84	413.45	404.42	413.59	0.000683	3.15	2875.43	683.73	0.16
Hickory Creek	1	28592	0.4% Annual Chan	7950	395.84	414.2	405.13	414.36	0.000805	3.56	3257.69	699.76	0.17
Hickory Creek	1	28592	0.2% Annual Chan	9200	395.84	414.73	405.66	414.92	0.000904	3.87	3542.05	738.15	0.18
Hickory Creek	1	28511		Bridge									
Hickory Creek	1	28440	50% Annual Chanc	1450	396.8	407.49	401.71	407.62	0.0016	2.94	493.34	70.65	0.2
Hickory Creek	1	28440	20% Annual Chanc	2500	396.8	410.28	403.08	410.46	0.001668	3.4	838.48	306.34	0.21
Hickory Creek	1	28440	10% Annual Chanc	3350	396.8	411.41	403.94	411.6	0.001624	3.66	1352.55	523.7	0.21
Hickory Creek	1	28440	4% Annual Chance	4500	396.8	411.68	405	411.97	0.002514	4.63	1496.63	540.74	0.26
Hickory Creek	1	28440	2% Annual Chance	5400	396.8	412.21	405.75	412.52	0.002656	4.93	1796.28	586.7	0.27
Hickory Creek	1	28440	1% Annual Chance	6400	396.8	412.73	406.65	413.05	0.002756	5.19	2106.34	621.91	0.28
Hickory Creek	1	28440	0.4% Annual Chan	7950	396.8	413.41	407.95	413.75	0.002856	5.51	2537.63	725.71	0.29
Hickory Creek	1	28440	0.2% Annual Chan	9200	396.8	413.92	408.92	414.26	0.002912	5.72	2859.88	766.52	0.29

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	28330	50% Annual Chanc	1500	396.8	407.29	401.68	407.44	0.001589	3.09	489.21	72.72	0.2
Hickory Creek	1	28330	20% Annual Chanc	2650	396.8	410.15	403.16	410.3	0.001266	3.41	1272.06	504.11	0.19
Hickory Creek	1	28330	10% Annual Chanc	3550	396.8	411.31	404.11	411.45	0.001144	3.48	1894.16	564.25	0.18
Hickory Creek	1	28330	4% Annual Chance	4800	396.8	411.52	405.23	411.74	0.001851	4.48	2013.21	571.86	0.23
Hickory Creek	1	28330	2% Annual Chance	5800	396.8	412.05	406.05	412.29	0.002016	4.82	2322.03	601.61	0.24
Hickory Creek	1	28330	1% Annual Chance	6950	396.8	412.55	406.93	412.82	0.00221	5.18	2632.56	631.35	0.26
Hickory Creek	1	28330	0.4% Annual Chan	8750	396.8	413.23	409.23	413.53	0.002463	5.66	3075.57	667.3	0.27
Hickory Creek	1	28330	0.2% Annual Chan	10250	396.8	413.72	410.72	414.04	0.002633	6	3409.79	693.98	0.28
Hickory Creek	1	27557	50% Annual Chanc	1500	393.71	405.68	399.25	405.91	0.002486	3.85	389.7	111.65	0.24
Hickory Creek	1	27557	20% Annual Chanc	2650	393.71	408.77	401.28	409.05	0.002417	4.46	724.65	343.35	0.24
Hickory Creek	1	27557	10% Annual Chanc	3550	393.71	410.01	402.57	410.32	0.00249	4.88	1170.16	759.13	0.25
Hickory Creek	1	27557	4% Annual Chance	4800	393.71	410.39	404.11	410.56	0.001826	4.27	2264.58	789.7	0.22
Hickory Creek	1	27557	2% Annual Chance	5800	393.71	410.94	405.2	411.1	0.001807	4.38	2679.93	830.75	0.22
Hickory Creek	1	27557	1% Annual Chance	6950	393.71	411.41	407.09	411.58	0.001886	4.59	3054.47	865.76	0.22
Hickory Creek	1	27557	0.4% Annual Chan	8750	393.71	412.05	408.57	412.23	0.001996	4.87	3571.86	900.14	0.23
Hickory Creek	1	27557	0.2% Annual Chan	10250	393.71	412.51	410.33	412.7	0.002083	5.09	3958.66	922.24	0.24
Hickory Creek	1	26438	50% Annual Chanc	1500	386.5	403.28		403.44	0.001943	3.22	466.45	54.96	0.19
Hickory Creek	1	26438	20% Annual Chanc	2650	386.5	405.92		406.2	0.002741	4.21	634.32	70.34	0.24
Hickory Creek	1	26438	10% Annual Chanc	3550	386.5	407.35		407.6	0.002505	4.33	1160.54	623.43	0.23
Hickory Creek	1	26438	4% Annual Chance	4800	386.5	408.4		408.58	0.002061	4.12	1883.79	731.11	0.21
Hickory Creek	1	26438	2% Annual Chance	5800	386.5	409.41		409.53	0.001375	3.55	2687.87	823.1	0.17
Hickory Creek	1	26438	1% Annual Chance	6950	386.5	409.82		409.94	0.001471	3.74	3023.93	845.17	0.18
Hickory Creek	1	26438	0.4% Annual Chan	8750	386.5	410.34		410.48	0.00162	4.03	3473.6	869.01	0.19
Hickory Creek	1	26438	0.2% Annual Chan	10250	386.5	410.71		410.87	0.001742	4.26	3800.31	883.53	0.2
Hickory Creek	1	25770	50% Annual Chanc	1500	388.92	401.67		401.9	0.002767	3.84	390.88	72.5	0.29
Hickory Creek	1	25770	20% Annual Chanc	2650	388.92	404.15		404.47	0.002437	4.61	592.7	90.62	0.29
Hickory Creek	1	25770	10% Annual Chanc	3550	388.92	405.56		405.96	0.002444	5.15	748.54	260.63	0.3
Hickory Creek	1	25770	4% Annual Chance	4800	388.92	407.18		407.44	0.001613	4.65	1755.71	874	0.25
Hickory Creek	1	25770	2% Annual Chance	5800	388.92	408.91		409	0.000601	3.13	3381.85	985.31	0.15
Hickory Creek	1	25770	1% Annual Chance	6950	388.92	409.26		409.36	0.000675	3.38	3731.84	999.04	0.16
Hickory Creek	1	25770	0.4% Annual Chan	8750	388.92	409.71		409.82	0.000801	3.76	4176.67	1014.09	0.18
Hickory Creek	1	25770	0.2% Annual Chan	10250	388.92	410.01		410.14	0.00091	4.07	4484.59	1024.31	0.19
Hickory Creek	1	25739	50% Annual Chanc	1500	388.92	401.54	396.16	401.8	0.002831	4.11	364.81	59.33	0.29
Hickory Creek	1	25739	20% Annual Chanc	2650	388.92	403.96	398.6	404.36	0.003349	5.08	521.33	70.06	0.33
Hickory Creek	1	25739	10% Annual Chanc	3550	388.92	405.33	399.9	405.84	0.003666	5.71	624.11	159.89	0.35
Hickory Creek	1	25739	4% Annual Chance	4800	388.92	406.55	401.23	407.23	0.004293	6.66	741.74	746.2	0.39
Hickory Creek	1	25739	2% Annual Chance	5800	388.92	408.89	402.15	408.98	0.000678	3.08	3316.72	1004.48	0.16
Hickory Creek	1	25739	1% Annual Chance	6950	388.92	409.24	403.11	409.34	0.000753	3.31	3672.15	1021.78	0.17
Hickory Creek	1	25739	0.4% Annual Chan	8750	388.92	409.68	404.45	409.79	0.000882	3.67	4126.82	1049.8	0.18
Hickory Creek	1	25739	0.2% Annual Chan	10250	388.92	409.98	405.52	410.11	0.000995	3.96	4442.68	1061.11	0.2
Hickory Creek	1	25660	Bridge										
Hickory Creek	1	25586	50% Annual Chanc	1500	388.92	401.29		401.54	0.002781	4.08	367.93	81.17	0.34
Hickory Creek	1	25586	20% Annual Chanc	2650	388.92	403.56		403.88	0.00246	4.59	577.27	97.46	0.33
Hickory Creek	1	25586	10% Annual Chanc	3550	388.92	404.8		405.19	0.002423	5.04	734.27	288.67	0.34
Hickory Creek	1	25586	4% Annual Chance	4800	388.92	405.73		406.17	0.002463	5.54	1227.55	708.78	0.35
Hickory Creek	1	25586	2% Annual Chance	5800	388.92	406.12		406.59	0.00269	5.97	1509.51	759.21	0.37
Hickory Creek	1	25586	1% Annual Chance	6950	388.92	406.5		407.01	0.002892	6.38	1821.54	892.64	0.38
Hickory Creek	1	25586	0.4% Annual Chan	8750	388.92	407.04		407.58	0.003025	6.8	2343.2	1009.94	0.4
Hickory Creek	1	25586	0.2% Annual Chan	10250	388.92	407.43		407.96	0.003062	7.03	2739.35	1035.11	0.4
Hickory Creek	1	25511	50% Annual Chanc	1500	388.84	401.23		401.36	0.000685	2.82	531.26	72.66	0.18
Hickory Creek	1	25511	20% Annual Chanc	2650	388.84	403.48		403.71	0.000876	3.8	708.6	85	0.22
Hickory Creek	1	25511	10% Annual Chanc	3550	388.84	404.71		405.02	0.001027	4.46	895.56	462.89	0.24
Hickory Creek	1	25511	4% Annual Chance	4800	388.84	405.63		405.99	0.001194	5.08	1500.72	801.9	0.26
Hickory Creek	1	25511	2% Annual Chance	5800	388.84	405.99		406.41	0.001398	5.61	1817.69	926.57	0.28
Hickory Creek	1	25511	1% Annual Chance	6950	388.84	406.36		406.82	0.001592	6.1	2168.22	1001.35	0.3
Hickory Creek	1	25511	0.4% Annual Chan	8750	388.84	406.89		407.38	0.001759	6.59	2710.1	1029.03	0.32
Hickory Creek	1	25511	0.2% Annual Chan	10250	388.84	407.26		407.77	0.001889	6.96	3097.52	1048.69	0.33
Hickory Creek	1	25007	50% Annual Chanc	1500	388.27	400.44		400.76	0.0023	4.57	332.86	61.81	0.32
Hickory Creek	1	25007	20% Annual Chanc	2650	388.27	402.43		402.96	0.002696	5.95	472.61	83.09	0.37
Hickory Creek	1	25007	10% Annual Chanc	3550	388.27	403.5	399.42	404.17	0.002968	6.77	631.05	377.14	0.39
Hickory Creek	1	25007	4% Annual Chance	4800	388.27	404.45	400.73	405.1	0.002936	7.19	1250.81	970.42	0.4
Hickory Creek	1	25007	2% Annual Chance	5800	388.27	405.09		405.57	0.00238	6.74	1914.68	1091.64	0.36
Hickory Creek	1	25007	1% Annual Chance	6950	388.27	405.53		405.95	0.002252	6.73	2404.59	1127.1	0.35
Hickory Creek	1	25007	0.4% Annual Chan	8750	388.27	406.12		406.49	0.002132	6.77	3088.4	1195.38	0.35
Hickory Creek	1	25007	0.2% Annual Chan	10250	388.27	406.5		406.86	0.002146	6.94	3545.57	1234.94	0.35
Hickory Creek	1	24071	50% Annual Chanc	1500	387.22	398	393.37	398.16	0.003363	3.23	516.67	162.84	0.25
Hickory Creek	1	24071	20% Annual Chanc	2650	387.22	400.19	395	400.35	0.002894	3.46	954.46	241.83	0.24
Hickory Creek	1	24071	10% Annual Chanc	3550	387.22	401.31	396	401.48	0.002842	3.71	1272.34	337.13	0.24

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	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)	
Hickory Creek	1	24071	4% Annual Chance	4800	387.22	402.22	397.46	402.43	0.003111	4.19	1618.18	514.75	0.25
Hickory Creek	1	24071	2% Annual Chance	5800	387.22	403.05	398.41	403.28	0.003213	4.53	2156.4	846.45	0.26
Hickory Creek	1	24071	1% Annual Chance	6950	387.22	403.67	399.04	403.9	0.003019	4.59	2680.58	955.57	0.26
Hickory Creek	1	24071	0.4% Annual Chan	8750	387.22	404.47	399.69	404.68	0.002763	4.62	3416.35	1129.95	0.25
Hickory Creek	1	24071	0.2% Annual Chan	10250	387.22	404.74	400.45	404.97	0.003181	5.04	3688.33	1155.68	0.27
Hickory Creek	1	23607	50% Annual Chanc	1500	386.7	397.4	391.61	397.44	0.000914	1.68	1029.51	822.02	0.13
Hickory Creek	1	23607	20% Annual Chanc	2650	386.7	399.66	393.44	399.71	0.000884	1.97	1568.39	904.01	0.13
Hickory Creek	1	23607	10% Annual Chanc	3550	386.7	400.74	393.94	400.81	0.000986	2.27	1861	948.73	0.14
Hickory Creek	1	23607	4% Annual Chance	4800	386.7	401.49	394.7	401.59	0.001394	2.86	2086.04	1054.09	0.17
Hickory Creek	1	23607	2% Annual Chance	5800	386.7	402.1	395.17	402.25	0.001919	3.52	2381.05	1338.41	0.2
Hickory Creek	1	23607	1% Annual Chance	6950	386.7	402.74	395.73	402.91	0.001996	3.75	2808.2	1461.01	0.21
Hickory Creek	1	23607	0.4% Annual Chan	8750	386.7	403.59	396.39	403.76	0.001982	3.95	3470.71	1583.33	0.21
Hickory Creek	1	23607	0.2% Annual Chan	10250	386.7	403.62	396.88	403.85	0.002683	4.6	3491.83	1592.21	0.25
Hickory Creek	1	23218	50% Annual Chanc	1500	387.18	396.97	391.58	397.03	0.001094	2	749.34	327.15	0.15
Hickory Creek	1	23218	20% Annual Chanc	2650	387.18	399.21	393.24	399.3	0.001162	2.4	1135.36	436.27	0.17
Hickory Creek	1	23218	10% Annual Chanc	3550	387.18	400.24	393.84	400.35	0.001269	2.71	1395.83	503.97	0.17
Hickory Creek	1	23218	4% Annual Chance	4800	387.18	400.78	394.58	400.95	0.001782	3.36	1583.77	665.21	0.21
Hickory Creek	1	23218	2% Annual Chance	5800	387.18	401.25	395.12	401.45	0.002074	3.75	1839.3	882.09	0.23
Hickory Creek	1	23218	1% Annual Chance	6950	387.18	401.9	395.68	402.1	0.002042	3.9	2338.12	1062.12	0.23
Hickory Creek	1	23218	0.4% Annual Chan	8750	387.18	402.86	396.48	403.04	0.001713	3.81	3200.88	1269.74	0.21
Hickory Creek	1	23218	0.2% Annual Chan	10250	387.18	403.34	397.12	403.52	0.001734	3.95	3692.72	1307.31	0.21
Hickory Creek	1	22342	50% Annual Chanc	1500	382.8	396.14	387.96	396.2	0.000977	2.12	795.49	350.72	0.14
Hickory Creek	1	22342	20% Annual Chanc	2650	382.8	398.41	389.92	398.48	0.000964	2.42	1229.66	410.2	0.15
Hickory Creek	1	22342	10% Annual Chanc	3550	382.8	399.34	391.28	399.44	0.001146	2.81	1454.09	476.11	0.16
Hickory Creek	1	22342	4% Annual Chance	4800	382.8	400.35	393.61	400.38	0.00045	1.88	3540.45	782.73	0.1
Hickory Creek	1	22342	2% Annual Chance	5800	382.8	400.78	394.72	400.82	0.000501	2.04	3879.91	788.06	0.11
Hickory Creek	1	22342	1% Annual Chance	6950	382.8	401.47	395.33	401.51	0.000484	2.09	4422.66	796.45	0.11
Hickory Creek	1	22342	0.4% Annual Chan	8750	382.8	402.5	396.04	402.54	0.000452	2.14	5254.15	824.14	0.11
Hickory Creek	1	22342	0.2% Annual Chan	10250	382.8	403.13	396.59	403.18	0.000464	2.24	5783.98	852.88	0.11
Hickory Creek	1	21994	50% Annual Chanc	1500	382.2	395.85	387.53	395.92	0.000674	2.01	746.24	90.05	0.12
Hickory Creek	1	21994	20% Annual Chanc	2650	382.2	398	388.97	398.12	0.001027	2.79	956.4	110.41	0.16
Hickory Creek	1	21994	10% Annual Chanc	3550	382.2	398.78	389.9	398.97	0.001429	3.46	1048.65	234.97	0.19
Hickory Creek	1	21994	4% Annual Chance	4800	382.2	399.53	391.01	399.81	0.002061	4.34	1151.44	518.29	0.23
Hickory Creek	1	21994	2% Annual Chance	5800	382.2	400.05	391.82	400.43	0.002533	4.96	1249.26	592.47	0.25
Hickory Creek	1	21994	1% Annual Chance	6950	382.2	400.63	392.68	401.09	0.003015	5.58	1357.66	610.76	0.28
Hickory Creek	1	21994	0.4% Annual Chan	8750	382.2	401.52	393.86	402.12	0.003599	6.38	1532.68	646.96	0.31
Hickory Creek	1	21994	0.2% Annual Chan	10250	382.2	402.63	394.75	402.85	0.001624	4.52	3293.16	710.13	0.21
Hickory Creek	1	21949	50% Annual Chanc	1500	382.23	395.75	388.01	395.86	0.00138	2.68	559.6	83.73	0.18
Hickory Creek	1	21949	20% Annual Chanc	2650	382.23	397.84	390.11	398.03	0.002031	3.52	753.06	101.91	0.23
Hickory Creek	1	21949	10% Annual Chanc	3550	382.23	398.57	391.42	398.85	0.002782	4.29	830.41	126.39	0.27
Hickory Creek	1	21949	4% Annual Chance	4800	382.23	399.2	392.87	399.64	0.004067	5.36	900.11	367.05	0.33
Hickory Creek	1	21949	2% Annual Chance	5800	382.23	399.62	393.84	400.21	0.005137	6.15	948.27	467.59	0.37
Hickory Creek	1	21949	1% Annual Chance	6950	382.23	400.06	394.81	400.82	0.006381	7	998.86	548.55	0.41
Hickory Creek	1	21949	0.4% Annual Chan	8750	382.23	400.72	396.13	401.75	0.008202	8.17	1076.66	596.42	0.47
Hickory Creek	1	21949	0.2% Annual Chan	10250	382.23	401.06	397.05	402.37	0.010138	9.22	1117.66	607.14	0.53
Hickory Creek	1	21911	Bridge										
Hickory Creek	1	21863	50% Annual Chanc	1500	382.3	395.71	386.96	395.76	0.000529	1.78	847.78	111.33	0.11
Hickory Creek	1	21863	20% Annual Chanc	2650	382.3	397.78	388.42	397.87	0.00077	2.47	1102.46	256.46	0.14
Hickory Creek	1	21863	10% Annual Chanc	3550	382.3	398.46	389.33	398.61	0.001088	3.07	1199.09	591.23	0.17
Hickory Creek	1	21863	4% Annual Chance	4800	382.3	399.02	390.42	399.25	0.001655	3.91	1277.31	817.82	0.21
Hickory Creek	1	21863	2% Annual Chance	5800	382.3	399.37	391.21	399.68	0.002162	4.56	1326.29	839.02	0.24
Hickory Creek	1	21863	1% Annual Chance	6950	382.3	399.69	391.99	400.12	0.002806	5.3	1372.13	847.96	0.27
Hickory Creek	1	21863	0.4% Annual Chan	8750	382.3	400.11	393.12	400.73	0.003919	6.41	1431.17	862.42	0.32
Hickory Creek	1	21863	0.2% Annual Chan	10250	382.3	400.52	394.06	400.9	0.002912	5.65	2971.76	891.65	0.28
Hickory Creek	1	21744	50% Annual Chanc	1500	382.2	395.56		395.66	0.001239	2.44	613.89	88.89	0.16
Hickory Creek	1	21744	20% Annual Chanc	2650	382.2	397.57		397.73	0.001582	3.22	922.83	314.65	0.19
Hickory Creek	1	21744	10% Annual Chanc	3550	382.2	398.26		398.44	0.001813	3.63	1344.17	764.75	0.21
Hickory Creek	1	21744	4% Annual Chance	4800	382.2	398.84		399.02	0.001948	3.91	1796.62	779.62	0.22
Hickory Creek	1	21744	2% Annual Chance	5800	382.2	399.19		399.39	0.002083	4.14	2077.36	823.86	0.23
Hickory Creek	1	21744	1% Annual Chance	6950	382.2	399.53		399.74	0.002229	4.37	2366.82	895.23	0.23
Hickory Creek	1	21744	0.4% Annual Chan	8750	382.2	399.99		400.21	0.002367	4.63	2798.18	1006.35	0.24
Hickory Creek	1	21744	0.2% Annual Chan	10250	382.2	400.34		400.56	0.002431	4.79	3159.39	1068.26	0.25
Hickory Creek	1	21042	50% Annual Chanc	1500	379.86	394.57		394.71	0.001452	3.01	498.33	52.61	0.17
Hickory Creek	1	21042	20% Annual Chanc	2650	379.86	396.19		396.42	0.002311	4.02	835.12	421.88	0.22
Hickory Creek	1	21042	10% Annual Chanc	3550	379.86	396.72		396.97	0.002748	4.49	1111.56	613.22	0.24
Hickory Creek	1	21042	4% Annual Chance	4800	379.86	397.24		397.51	0.003096	4.92	1502.78	838.65	0.26
Hickory Creek	1	21042	2% Annual Chance	5800	379.86	397.64		397.89	0.003047	4.99	1841.12	886.09	0.26
Hickory Creek	1	21042	1% Annual Chance	6950	379.86	397.99		398.24	0.003052	5.1	2156.52	900.45	0.26

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	21042	0.4% Annual Chan	8750	379.86	398.5		398.74	0.00299	5.18	2627.27	947.69	0.26
Hickory Creek	1	21042	0.2% Annual Chan	10250	379.86	398.9		399.14	0.002891	5.21	3016.2	990.93	0.25
Hickory Creek	1	20583	50% Annual Chanc	1400	382.96	393.9	387.8	394	0.001603	2.65	550.92	204.25	0.18
Hickory Creek	1	20583	20% Annual Chanc	2550	382.96	395.4	389.44	395.51	0.001603	3.01	1194.21	834.66	0.19
Hickory Creek	1	20583	10% Annual Chanc	3450	382.96	395.89	390.47	396	0.001601	3.14	1630.38	917.3	0.19
Hickory Creek	1	20583	4% Annual Chance	4650	382.96	396.38	391.66	396.49	0.001603	3.26	2089.95	940.21	0.19
Hickory Creek	1	20583	2% Annual Chance	5750	382.96	396.78	392.59	396.89	0.001601	3.36	2476.54	979.76	0.2
Hickory Creek	1	20583	1% Annual Chance	6900	382.96	397.14	395.33	397.25	0.001601	3.45	2823.48	994.49	0.2
Hickory Creek	1	20583	0.4% Annual Chan	8800	382.96	397.65	395.85	397.78	0.0016	3.57	3342.95	1015.81	0.2
Hickory Creek	1	20583	0.2% Annual Chan	10450	382.96	398.06	396.06	398.2	0.001601	3.67	3762.88	1046.55	0.2
4C6 Trib 2	1	5752	50% Annual Chanc	100	490.31	491.79	491.56	491.98	0.009716	3.47	28.78	86.94	0.7
4C6 Trib 2	1	5752	20% Annual Chanc	175	490.31	492.12	491.93	492.37	0.009404	4.02	46.58	136.39	0.72
4C6 Trib 2	1	5752	10% Annual Chanc	225	490.31	492.25	492.25	492.52	0.009096	4.29	65.39	185.16	0.72
4C6 Trib 2	1	5752	4% Annual Chance	300	490.31	492.43	492.43	492.65	0.00709	4.19	108.63	263.57	0.65
4C6 Trib 2	1	5752	2% Annual Chance	350	490.31	492.49	492.49	492.72	0.007304	4.39	124.7	268.03	0.67
4C6 Trib 2	1	5752	1% Annual Chance	400	490.31	492.54	492.54	492.78	0.007514	4.57	139.28	272.92	0.68
4C6 Trib 2	1	5752	0.4% Annual Chan	450	490.31	492.59	492.59	492.84	0.007968	4.8	150.79	282.15	0.71
4C6 Trib 2	1	5752	0.2% Annual Chan	500	490.31	492.64	492.64	492.9	0.007989	4.92	166.24	321.11	0.71
4C6 Trib 2	1	5615	50% Annual Chanc	100	488.56	489.75	489.75	490.13	0.019382	4.98	20.09	37.81	0.99
4C6 Trib 2	1	5615	20% Annual Chanc	175	488.56	490.12	490.12	490.63	0.017695	5.75	30.45	47.1	1
4C6 Trib 2	1	5615	10% Annual Chanc	225	488.56	490.42	490.42	490.91	0.012266	5.64	42.41	56.67	0.86
4C6 Trib 2	1	5615	4% Annual Chance	300	488.56	490.7	490.7	491.19	0.010089	5.81	59.64	67.09	0.81
4C6 Trib 2	1	5615	2% Annual Chance	350	488.56	490.84	490.84	491.34	0.009582	5.99	69.45	75.21	0.8
4C6 Trib 2	1	5615	1% Annual Chance	400	488.56	491.11	491.11	491.44	0.009596	5.2	117.71	272.94	0.65
4C6 Trib 2	1	5615	0.4% Annual Chan	450	488.56	491.22	491.22	491.51	0.005199	5.04	150.11	289.26	0.61
4C6 Trib 2	1	5615	0.2% Annual Chan	500	488.56	491.28	491.28	491.57	0.005323	5.19	166.6	292.99	0.62
4C6 Trib 2	1	5506	50% Annual Chanc	100	487.04	488.51		488.71	0.006587	3.65	27.39	24.94	0.61
4C6 Trib 2	1	5506	20% Annual Chanc	175	487.04	488.92		489.25	0.006971	4.61	39.03	34.91	0.66
4C6 Trib 2	1	5506	10% Annual Chanc	225	487.04	489.15		489.54	0.006988	5.06	47.42	39.48	0.68
4C6 Trib 2	1	5506	4% Annual Chance	300	487.04	489.45		489.9	0.006808	5.56	60.24	45.68	0.69
4C6 Trib 2	1	5506	2% Annual Chance	350	487.04	489.63		490.12	0.006663	5.82	68.95	50.51	0.69
4C6 Trib 2	1	5506	1% Annual Chance	400	487.04	489.78	489.49	490.31	0.006743	6.12	76.72	54.71	0.7
4C6 Trib 2	1	5506	0.4% Annual Chan	450	487.04	489.91	489.65	490.49	0.006938	6.43	84.09	60.06	0.72
4C6 Trib 2	1	5506	0.2% Annual Chan	500	487.04	490	489.77	490.64	0.007361	6.79	90.91	80.98	0.74
4C6 Trib 2	1	5496.58*	50% Annual Chanc	100	486.91	488.45		488.65	0.006492	3.62	27.67	25.3	0.61
4C6 Trib 2	1	5496.58*	20% Annual Chanc	175	486.91	488.86		489.19	0.006888	4.57	39.09	34.85	0.66
4C6 Trib 2	1	5496.58*	10% Annual Chanc	225	486.91	489.09		489.47	0.006951	5.04	47.41	39.68	0.68
4C6 Trib 2	1	5496.58*	4% Annual Chance	300	486.91	489.39		489.84	0.006707	5.52	60.56	46.5	0.68
4C6 Trib 2	1	5496.58*	2% Annual Chance	350	486.91	489.57		490.06	0.006603	5.79	69.25	51.56	0.69
4C6 Trib 2	1	5496.58*	1% Annual Chance	400	486.91	489.72	489.43	490.24	0.006658	6.07	77.26	56.19	0.7
4C6 Trib 2	1	5496.58*	0.4% Annual Chan	450	486.91	489.85	489.59	490.42	0.006814	6.36	85.06	69.83	0.71
4C6 Trib 2	1	5496.58*	0.2% Annual Chan	500	486.91	489.94	489.7	490.56	0.007276	6.73	91.96	87.2	0.74
4C6 Trib 2	1	5487.16*	50% Annual Chanc	100	486.78	488.4		488.6	0.0064	3.58	27.94	25.62	0.6
4C6 Trib 2	1	5487.16*	20% Annual Chanc	175	486.78	488.81		489.12	0.006785	4.52	39.4	30.26	0.65
4C6 Trib 2	1	5487.16*	10% Annual Chanc	225	486.78	489.03		489.41	0.006932	5.01	47.35	39.71	0.67
4C6 Trib 2	1	5487.16*	4% Annual Chance	300	486.78	489.33		489.78	0.006781	5.51	60.26	47.02	0.69
4C6 Trib 2	1	5487.16*	2% Annual Chance	350	486.78	489.5	489.2	489.99	0.006633	5.77	69.19	52.5	0.69
4C6 Trib 2	1	5487.16*	1% Annual Chance	400	486.78	489.65	489.37	490.18	0.006666	6.05	77.43	57.6	0.7
4C6 Trib 2	1	5487.16*	0.4% Annual Chan	450	486.78	489.79	489.53	490.35	0.006777	6.33	85.9	76.41	0.71
4C6 Trib 2	1	5487.16*	0.2% Annual Chan	500	486.78	489.87	489.63	490.49	0.007191	6.67	93.46	98.85	0.73
4C6 Trib 2	1	5477.75*	50% Annual Chanc	100	486.65	488.34		488.54	0.006395	3.56	28.12	25.96	0.6
4C6 Trib 2	1	5477.75*	20% Annual Chanc	175	486.65	488.75		489.06	0.006731	4.49	39.74	30.85	0.65
4C6 Trib 2	1	5477.75*	10% Annual Chanc	225	486.65	488.97		489.35	0.006942	4.99	47.29	39.77	0.67
4C6 Trib 2	1	5477.75*	4% Annual Chance	300	486.65	489.26		489.71	0.006882	5.52	59.94	47.52	0.69
4C6 Trib 2	1	5477.75*	2% Annual Chance	350	486.65	489.44	489.14	489.93	0.00665	5.75	69.28	53.63	0.69
4C6 Trib 2	1	5477.75*	1% Annual Chance	400	486.65	489.59	489.31	490.11	0.006637	6.02	77.9	59.53	0.69
4C6 Trib 2	1	5477.75*	0.4% Annual Chan	450	486.65	489.73	489.49	490.29	0.006651	6.26	87.47	84.83	0.7
4C6 Trib 2	1	5477.75*	0.2% Annual Chan	500	486.65	489.82	489.59	490.42	0.006976	6.56	96.35	111.82	0.72
4C6 Trib 2	1	5468.33*	50% Annual Chanc	100	486.52	488.29		488.48	0.006335	3.52	28.38	26.33	0.6
4C6 Trib 2	1	5468.33*	20% Annual Chanc	175	486.52	488.7		489	0.006617	4.44	40.19	31.41	0.64
4C6 Trib 2	1	5468.33*	10% Annual Chanc	225	486.52	488.91		489.28	0.006868	4.94	47.42	39.67	0.67
4C6 Trib 2	1	5468.33*	4% Annual Chance	300	486.52	489.2		489.65	0.00682	5.48	60.14	48.29	0.69
4C6 Trib 2	1	5468.33*	2% Annual Chance	350	486.52	489.38	489.06	489.86	0.006617	5.72	69.5	54.74	0.69
4C6 Trib 2	1	5468.33*	1% Annual Chance	400	486.52	489.54	489.25	490.05	0.006553	5.96	78.52	61.49	0.69
4C6 Trib 2	1	5468.33*	0.4% Annual Chan	450	486.52	489.69	489.42	490.22	0.006394	6.14	90.15	102.43	0.69
4C6 Trib 2	1	5468.33*	0.2% Annual Chan	500	486.52	489.78	489.54	490.34	0.006633	6.41	100.68	124.37	0.71
4C6 Trib 2	1	5458.91*	50% Annual Chanc	100	486.39	488.23		488.42	0.00629	3.49	28.62	26.7	0.59
4C6 Trib 2	1	5458.91*	20% Annual Chanc	175	486.39	488.64		488.94	0.006522	4.39	40.63	32.01	0.64

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 2	1	5458.91*	10% Annual Chanc	225	486.39	488.85		489.22	0.006781	4.9	47.69	35.43	0.67
4C6 Trib 2	1	5458.91*	4% Annual Chance	300	486.39	489.14		489.59	0.006776	5.44	60.35	49.07	0.68
4C6 Trib 2	1	5458.91*	2% Annual Chance	350	486.39	489.32	488.98	489.8	0.006663	5.7	69.6	55.87	0.69
4C6 Trib 2	1	5458.91*	1% Annual Chance	400	486.39	489.48	489.18	489.99	0.006468	5.91	79.35	64.25	0.69
4C6 Trib 2	1	5458.91*	0.4% Annual Chan	450	486.39	489.65	489.36	490.15	0.006028	5.98	94.97	118.24	0.67
4C6 Trib 2	1	5458.91*	0.2% Annual Chan	500	486.39	489.74	489.65	490.27	0.006274	6.24	107.33	160.17	0.69
4C6 Trib 2	1	5449.5*	50% Annual Chanc	100	486.26	488.18		488.37	0.00629	3.48	28.75	27	0.59
4C6 Trib 2	1	5449.5*	20% Annual Chanc	175	486.26	488.59		488.88	0.006488	4.36	40.94	32.59	0.64
4C6 Trib 2	1	5449.5*	10% Annual Chanc	225	486.26	488.8		489.16	0.006736	4.86	48.11	35.52	0.66
4C6 Trib 2	1	5449.5*	4% Annual Chance	300	486.26	489.08		489.53	0.006783	5.42	60.42	49.75	0.68
4C6 Trib 2	1	5449.5*	2% Annual Chance	350	486.26	489.25	488.9	489.73	0.006761	5.71	69.24	56.75	0.69
4C6 Trib 2	1	5449.5*	1% Annual Chance	400	486.26	489.42	489.12	489.92	0.006514	5.9	79.65	74.4	0.69
4C6 Trib 2	1	5449.5*	0.4% Annual Chan	450	486.26	489.61	489.31	490.08	0.005743	5.84	100.9	147.47	0.65
4C6 Trib 2	1	5449.5*	0.2% Annual Chan	500	486.26	489.83	489.83	490.17	0.004148	5.25	155.01	267.74	0.56
4C6 Trib 2	1	5440.08*	50% Annual Chanc	100	486.14	488.12		488.31	0.006302	3.46	28.9	27.37	0.59
4C6 Trib 2	1	5440.08*	20% Annual Chanc	175	486.14	488.53		488.82	0.006434	4.32	41.32	33.23	0.63
4C6 Trib 2	1	5440.08*	10% Annual Chanc	225	486.14	488.74		489.1	0.006663	4.81	48.62	36.31	0.66
4C6 Trib 2	1	5440.08*	4% Annual Chance	300	486.14	489.02	488.64	489.46	0.006875	5.41	60.16	50.03	0.69
4C6 Trib 2	1	5440.08*	2% Annual Chance	350	486.14	489.19	488.83	489.67	0.006787	5.68	69.34	58.1	0.69
4C6 Trib 2	1	5440.08*	1% Annual Chance	400	486.14	489.37	489.05	489.86	0.006401	5.83	81.31	89.34	0.68
4C6 Trib 2	1	5440.08*	0.4% Annual Chan	450	486.14	489.67	489.24	489.99	0.004035	5.03	140.53	264.26	0.55
4C6 Trib 2	1	5440.08*	0.2% Annual Chan	500	486.14	489.74	489.74	490.06	0.004119	5.17	158.17	271.06	0.56
4C6 Trib 2	1	5397	50% Annual Chanc	100	485.49	487.73	487.44	487.96	0.008816	3.85	25.95	26.72	0.69
4C6 Trib 2	1	5397	20% Annual Chanc	175	485.49	488.14	487.88	488.47	0.008848	4.62	38.31	34.11	0.72
4C6 Trib 2	1	5397	10% Annual Chanc	225	485.49	488.34	488.09	488.74	0.008741	5.07	45.75	38.22	0.74
4C6 Trib 2	1	5397	4% Annual Chance	300	485.49	488.6	488.37	489.09	0.008871	5.68	56.34	45.29	0.76
4C6 Trib 2	1	5397	2% Annual Chance	350	485.49	488.74	488.54	489.29	0.009058	6.06	63.14	49.73	0.78
4C6 Trib 2	1	5397	1% Annual Chance	400	485.49	488.84	488.71	489.48	0.00976	6.51	68.55	55.9	0.82
4C6 Trib 2	1	5397	0.4% Annual Chan	450	485.49	488.86	488.86	489.64	0.011963	7.25	69.53	56.94	0.91
4C6 Trib 2	1	5397	0.2% Annual Chan	500	485.49	489.27	489.27	489.53	0.004093	4.8	167.13	283.49	0.55
4C6 Trib 2	1	5321	50% Annual Chanc	100	484.63	486.7	486.62	487.08	0.014992	4.95	20.22	21.27	0.89
4C6 Trib 2	1	5321	20% Annual Chanc	175	484.63	487.23	487.08	487.66	0.012807	5.25	33.34	28.58	0.86
4C6 Trib 2	1	5321	10% Annual Chanc	225	484.63	487.49	487.32	487.95	0.012249	5.46	41.18	32.17	0.85
4C6 Trib 2	1	5321	4% Annual Chance	300	484.63	487.83	487.62	488.33	0.011338	5.67	52.88	181.84	0.83
4C6 Trib 2	1	5321	2% Annual Chance	350	484.63	488.04	487.8	488.55	0.010048	5.72	62.1	214.79	0.8
4C6 Trib 2	1	5321	1% Annual Chance	400	484.63	488.25	487.96	488.74	0.008473	5.69	77.34	269.12	0.75
4C6 Trib 2	1	5321	0.4% Annual Chan	450	484.63	488.52	488.19	488.83	0.00495	4.78	140.57	313.59	0.59
4C6 Trib 2	1	5321	0.2% Annual Chan	500	484.63	488.74	488.62	488.9	0.002746	3.81	211.48	334.32	0.44
4C6 Trib 2	1	5246	50% Annual Chanc	100	484.23	486.16		486.37	0.005796	3.67	27.23	21.9	0.58
4C6 Trib 2	1	5246	20% Annual Chanc	175	484.23	486.65		486.96	0.006466	4.5	39.1	27.46	0.64
4C6 Trib 2	1	5246	10% Annual Chanc	225	484.23	486.88		487.27	0.006636	5.01	45.96	31.08	0.66
4C6 Trib 2	1	5246	4% Annual Chance	300	484.23	487.16		487.66	0.007149	5.72	55.25	36.27	0.7
4C6 Trib 2	1	5246	2% Annual Chance	350	484.23	487.28	486.96	487.88	0.007919	6.26	59.85	38.67	0.75
4C6 Trib 2	1	5246	1% Annual Chance	400	484.23	487.4	487.16	488.09	0.008576	6.74	64.56	41.85	0.78
4C6 Trib 2	1	5246	0.4% Annual Chan	450	484.23	487.5	487.31	488.28	0.009322	7.22	68.79	44.65	0.82
4C6 Trib 2	1	5246	0.2% Annual Chan	500	484.23	487.57	487.52	488.47	0.010372	7.76	71.94	48.51	0.87
4C6 Trib 2	1	5143	50% Annual Chanc	100	483.8	485.71		485.85	0.004155	3.02	33.11	28.32	0.49
4C6 Trib 2	1	5143	20% Annual Chanc	175	483.8	486.23		486.43	0.003846	3.59	50.27	40.72	0.5
4C6 Trib 2	1	5143	10% Annual Chanc	225	483.8	486.52		486.74	0.003506	3.83	65.14	61.45	0.49
4C6 Trib 2	1	5143	4% Annual Chance	300	483.8	486.9		487.13	0.002983	3.99	92.91	81.72	0.46
4C6 Trib 2	1	5143	2% Annual Chance	350	483.8	487.02		487.28	0.003242	4.31	103.32	87.16	0.49
4C6 Trib 2	1	5143	1% Annual Chance	400	483.8	487.18		487.45	0.00322	4.48	117.71	95.7	0.49
4C6 Trib 2	1	5143	0.4% Annual Chan	450	483.8	487.32		487.61	0.003207	4.63	131.93	103.63	0.5
4C6 Trib 2	1	5143	0.2% Annual Chan	500	483.8	487.42		487.73	0.003368	4.86	142.32	108.6	0.51
4C6 Trib 2	1	4997	50% Annual Chanc	100	482.56	484.19	484.19	484.71	0.017652	5.81	17.29	16.9	0.99
4C6 Trib 2	1	4997	20% Annual Chanc	175	482.56	484.69	484.69	485.4	0.014682	6.79	26.67	20.36	0.96
4C6 Trib 2	1	4997	10% Annual Chanc	225	482.56	484.98	484.98	485.78	0.01353	7.29	32.7	22.31	0.95
4C6 Trib 2	1	4997	4% Annual Chance	300	482.56	485.38	485.38	486.29	0.011866	7.8	42.89	28.99	0.92
4C6 Trib 2	1	4997	2% Annual Chance	350	482.56	485.82	485.82	486.54	0.007803	7.13	64.43	60.45	0.77
4C6 Trib 2	1	4997	1% Annual Chance	400	482.56	486.01	486.01	486.72	0.007434	7.28	76.55	69.17	0.76
4C6 Trib 2	1	4997	0.4% Annual Chan	450	482.56	486.18	486.18	486.89	0.007136	7.41	89.12	79.19	0.75
4C6 Trib 2	1	4997	0.2% Annual Chan	500	482.56	486.38	486.38	487.04	0.006296	7.27	106.8	103.59	0.71
4C6 Trib 2	1	4770	50% Annual Chanc	175	476.69	478.73		478.97	0.020874	4.14	45.02	50.38	0.69
4C6 Trib 2	1	4770	20% Annual Chanc	275	476.69	479.06		479.38	0.01938	4.74	62.89	57.48	0.7
4C6 Trib 2	1	4770	10% Annual Chanc	350	476.69	479.28		479.64	0.01819	5.05	76.07	60.54	0.69
4C6 Trib 2	1	4770	4% Annual Chance	450	476.69	479.55		479.94	0.016838	5.36	92.25	61.27	0.68
4C6 Trib 2	1	4770	2% Annual Chance	525	476.69	479.73		480.16	0.016016	5.56	103.7	61.79	0.67
4C6 Trib 2	1	4770	1% Annual Chance	600	476.69	479.91		480.36	0.015432	5.75	114.43	62.31	0.67
4C6 Trib 2	1	4770	0.4% Annual Chan	725	476.69	480.17		480.67	0.014806	6.06	130.98	63.11	0.67

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 2	1	4770	0.2% Annual Chan	800	476.69	480.32		480.85	0.014383	6.21	140.83	63.82	0.67
4C6 Trib 2	1	4588	50% Annual Chanc	175	473.59	476.28		476.45	0.009698	3.34	52.45	36.88	0.49
4C6 Trib 2	1	4588	20% Annual Chanc	275	473.59	476.75		476.99	0.009294	3.9	71.01	41.12	0.5
4C6 Trib 2	1	4588	10% Annual Chanc	350	473.59	477.04		477.32	0.009187	4.27	83.32	43.53	0.51
4C6 Trib 2	1	4588	4% Annual Chance	450	473.59	477.39		477.73	0.00906	4.69	98.9	46.18	0.52
4C6 Trib 2	1	4588	2% Annual Chance	525	473.59	477.63		478	0.00898	4.96	109.99	47.46	0.53
4C6 Trib 2	1	4588	1% Annual Chance	600	473.59	477.87		478.27	0.00874	5.17	121.44	48.72	0.53
4C6 Trib 2	1	4588	0.4% Annual Chan	725	473.59	478.3		478.73	0.007892	5.38	142.91	51	0.51
4C6 Trib 2	1	4588	0.2% Annual Chan	800	473.59	478.55		479	0.0074	5.47	156.22	52.36	0.5
4C6 Trib 2	1	4378	50% Annual Chanc	175	471.74	475.04		475.16	0.00418	2.75	67.8	55.6	0.34
4C6 Trib 2	1	4378	20% Annual Chanc	275	471.74	475.55		475.7	0.004246	3.22	96.72	58.43	0.36
4C6 Trib 2	1	4378	10% Annual Chanc	350	471.74	475.88		476.05	0.004162	3.46	116.44	60.29	0.36
4C6 Trib 2	1	4378	4% Annual Chance	450	471.74	476.29		476.48	0.004001	3.71	141.43	62.56	0.36
4C6 Trib 2	1	4378	2% Annual Chance	525	471.74	476.56		476.76	0.003936	3.88	158.62	64.12	0.36
4C6 Trib 2	1	4378	1% Annual Chance	600	471.74	476.93		477.13	0.003441	3.88	182.64	66.27	0.35
4C6 Trib 2	1	4378	0.4% Annual Chan	725	471.74	477.57		477.76	0.002726	3.82	226.44	70.38	0.32
4C6 Trib 2	1	4378	0.2% Annual Chan	800	471.74	477.91		478.09	0.002491	3.83	250.51	72.52	0.31
4C6 Trib 2	1	4196	50% Annual Chanc	175	470.81	473.11		473.55	0.026543	5.32	32.9	24.39	0.8
4C6 Trib 2	1	4196	20% Annual Chanc	275	470.81	473.69		474.21	0.02008	5.8	48.06	27.87	0.74
4C6 Trib 2	1	4196	10% Annual Chanc	350	470.81	474.04		474.63	0.018337	6.2	58.07	29.85	0.73
4C6 Trib 2	1	4196	4% Annual Chance	450	470.81	474.45		475.12	0.016847	6.65	70.89	32.21	0.72
4C6 Trib 2	1	4196	2% Annual Chance	525	470.81	475		475.59	0.011749	6.29	89.46	35.25	0.62
4C6 Trib 2	1	4196	1% Annual Chance	600	470.81	475.84		476.28	0.006606	5.5	120.79	39.87	0.48
4C6 Trib 2	1	4196	0.4% Annual Chan	725	470.81	476.75		477.13	0.004522	5.21	159.5	45.58	0.41
4C6 Trib 2	1	4196	0.2% Annual Chan	800	470.81	477.14		477.52	0.004106	5.22	178	48.16	0.4
4C6 Trib 2	1	4126	50% Annual Chanc	175	469.36	472.79		472.91	0.003735	2.96	67.62	37.89	0.33
4C6 Trib 2	1	4126	20% Annual Chanc	275	469.36	473.46		473.62	0.003575	3.4	93.93	40.52	0.34
4C6 Trib 2	1	4126	10% Annual Chanc	350	469.36	473.84		474.02	0.00372	3.74	109.42	41.99	0.35
4C6 Trib 2	1	4126	4% Annual Chance	450	469.36	474.28		474.5	0.00386	4.12	128.53	43.78	0.37
4C6 Trib 2	1	4126	2% Annual Chance	525	469.36	474.92		475.12	0.002963	3.99	157.11	46.7	0.33
4C6 Trib 2	1	4126	1% Annual Chance	600	469.36	475.81		475.97	0.001939	3.63	200.62	50.85	0.27
4C6 Trib 2	1	4126	0.4% Annual Chan	725	469.36	476.74		476.89	0.001532	3.58	249.87	55.15	0.25
4C6 Trib 2	1	4126	0.2% Annual Chan	800	469.36	477.14		477.3	0.00147	3.65	272.27	57	0.25
4C6 Trib 2	1	3916	50% Annual Chanc	175	467.32	470.21	470.21	470.99	0.042081	7.1	24.63	15.73	1
4C6 Trib 2	1	3916	20% Annual Chanc	275	467.32	470.84	470.84	471.76	0.03955	7.73	35.57	19.14	1
4C6 Trib 2	1	3916	10% Annual Chanc	350	467.32	471.43	471.22	472.26	0.029241	7.31	47.87	22.36	0.88
4C6 Trib 2	1	3916	4% Annual Chance	450	467.32	472.86		473.31	0.008858	5.4	84.9	29.26	0.52
4C6 Trib 2	1	3916	2% Annual Chance	525	467.32	474.08		474.39	0.00401	4.48	124.25	34.85	0.37
4C6 Trib 2	1	3916	1% Annual Chance	600	467.32	475.31		475.53	0.002188	3.88	170.93	41.19	0.28
4C6 Trib 2	1	3916	0.4% Annual Chan	725	467.32	476.34		476.55	0.001726	3.84	215.94	47.31	0.26
4C6 Trib 2	1	3916	0.2% Annual Chan	800	467.32	476.74		476.96	0.001694	3.96	235.99	52.11	0.26
4C6 Trib 2	1	3706	50% Annual Chanc	175	464.64	469.41		469.46	0.000935	1.79	97.53	27.48	0.17
4C6 Trib 2	1	3706	20% Annual Chanc	275	464.64	470.48		470.55	0.001062	2.13	129.27	31.67	0.18
4C6 Trib 2	1	3706	10% Annual Chanc	350	464.64	471.43		471.5	0.000864	2.2	161.45	36.27	0.17
4C6 Trib 2	1	3706	4% Annual Chance	450	464.64	472.79		472.87	0.000626	2.19	215.8	43.59	0.15
4C6 Trib 2	1	3706	2% Annual Chance	525	464.64	474.04		474.11	0.000448	2.09	274.61	50.98	0.13
4C6 Trib 2	1	3706	1% Annual Chance	600	464.64	475.28		475.34	0.000332	1.98	343.5	60.06	0.12
4C6 Trib 2	1	3706	0.4% Annual Chan	725	464.64	476.31		476.37	0.000316	2.08	420.94	117.75	0.12
4C6 Trib 2	1	3706	0.2% Annual Chan	800	464.64	476.71		476.78	0.00034	2.21	475.57	156.23	0.12
4C6 Trib 2	1	3650	Lat Struct										
4C6 Trib 2	1	3617	50% Annual Chanc	200	464.12	469.28		469.34	0.001629	2.06	96.9	35.39	0.22
4C6 Trib 2	1	3617	20% Annual Chanc	325	464.12	470.34		470.43	0.00165	2.36	137.92	41.67	0.23
4C6 Trib 2	1	3617	10% Annual Chanc	450	464.12	471.3		471.39	0.001532	2.49	180.39	47.3	0.23
4C6 Trib 2	1	3617	4% Annual Chance	650	464.12	472.67		472.78	0.001186	2.61	251.35	56.17	0.21
4C6 Trib 2	1	3617	2% Annual Chance	850	464.12	473.92		474.03	0.000935	2.69	326.69	108.78	0.19
4C6 Trib 2	1	3617	1% Annual Chance	1048.55	464.12	475.17		475.28	0.000733	2.69	420.87	329.79	0.17
4C6 Trib 2	1	3617	0.4% Annual Chan	1219.86	464.12	476.21		476.32	0.000593	2.64	512.3	437.87	0.16
4C6 Trib 2	1	3617	0.2% Annual Chan	1288.69	464.12	476.63		476.73	0.000548	2.62	548.69	541.58	0.16
4C6 Trib 2	1	3595	50% Annual Chanc	200	466.82	468.83	468.28	469.22	0.001164	4.96	40.29	20	0.62
4C6 Trib 2	1	3595	20% Annual Chanc	325	466.82	469.84	468.84	470.29	0.000951	5.38	60.44	20	0.55
4C6 Trib 2	1	3595	10% Annual Chanc	450	466.82	470.73	469.32	471.24	0.000892	5.76	78.11	20	0.51
4C6 Trib 2	1	3595	4% Annual Chance	650	466.82	471.99	470.02	472.6	0.000874	6.29	103.33	20	0.49
4C6 Trib 2	1	3595	2% Annual Chance	850	466.82	473.13	470.65	473.83	0.000886	6.74	126.1	20	0.47
4C6 Trib 2	1	3595	1% Annual Chance	1048.55	466.82	474.15	471.22	475.02	0.001639	7.49	140		0.49
4C6 Trib 2	1	3595	0.4% Annual Chan	1219.86	466.82	474.79	471.69	475.97	0.002219	8.71	140		0.54
4C6 Trib 2	1	3595	0.2% Annual Chan	1288.69	466.82	475.02	471.87	476.34	0.002476	9.2	140		0.57
4C6 Trib 2	1	3567	50% Annual Chanc	200	466.65	468.85	468.11	469.17	0.000901	4.55	43.97	20	0.54

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 2	1	3567	20% Annual Chanc	325	466.65	469.85	468.67	470.25	0.000808	5.08	64.03	20	0.5
4C6 Trib 2	1	3567	10% Annual Chanc	450	466.65	470.73	469.15	471.2	0.00079	5.51	81.65	20	0.48
4C6 Trib 2	1	3567	4% Annual Chanc	650	466.65	471.99	469.85	472.57	0.0008	6.09	106.82	20	0.46
4C6 Trib 2	1	3567	2% Annual Chanc	850	466.65	473.13	470.48	473.8	0.000826	6.56	129.54	20	0.45
4C6 Trib 2	1	3567	1% Annual Chance	1048.55	466.65	474.11	471.06	474.98	0.001639	7.49	140		0.48
4C6 Trib 2	1	3567	0.4% Annual Chan	1219.86	466.65	474.73	471.52	475.91	0.002219	8.71	140		0.54
4C6 Trib 2	1	3567	0.2% Annual Chan	1288.69	466.65	474.96	471.71	476.27	0.002476	9.2	140		0.56
4C6 Trib 2	1	3496	50% Annual Chanc	200	466.22	468.07	468.07	469	0.003548	7.73	25.88	14	1
4C6 Trib 2	1	3496	20% Annual Chanc	325	466.22	468.78	468.78	470.06	0.003751	9.08	35.79	14	1
4C6 Trib 2	1	3496	10% Annual Chanc	450	466.22	469.4	469.4	470.99	0.003953	10.1	44.54	14	1
4C6 Trib 2	1	3496	4% Annual Chance	650	466.22	470.28	470.28	472.31	0.004312	11.43	56.85	14	1
4C6 Trib 2	1	3496	2% Annual Chance	850	466.22	471.07	471.07	473.5	0.004647	12.51	67.96	14	1
4C6 Trib 2	1	3496	1% Annual Chance	1048.55	466.22	471.79	471.79	474.6	0.004978	13.43	78.05	14	1
4C6 Trib 2	1	3496	0.4% Annual Chan	1219.86	466.22	472.4	472.4	475.49	0.00521	14.1	86.51	14	1
4C6 Trib 2	1	3496	0.2% Annual Chan	1288.69	466.22	472.62	472.62	475.83	0.005329	14.38	89.61	14	1
4C6 Trib 2	1	2806	50% Annual Chanc	200	462.09	463.94	463.94	464.87	0.003522	7.71	25.94	14	1
4C6 Trib 2	1	2806	20% Annual Chanc	325	462.09	464.64	464.64	465.93	0.003764	9.09	35.75	14	1
4C6 Trib 2	1	2806	10% Annual Chanc	450	462.09	465.27	465.27	466.86	0.003961	10.11	44.51	14	1
4C6 Trib 2	1	2806	4% Annual Chance	650	462.09	466.15	466.15	468.18	0.004311	11.43	56.86	14	1
4C6 Trib 2	1	2806	2% Annual Chance	850	462.09	466.94	466.94	469.37	0.004664	12.52	67.87	14	1
4C6 Trib 2	1	2806	1% Annual Chance	1048.55	462.09	467.67	467.67	470.47	0.004972	13.43	78.09	14	1
4C6 Trib 2	1	2806	0.4% Annual Chan	1219.86	462.09	468.27	468.27	471.36	0.005215	14.11	86.48	14	1
4C6 Trib 2	1	2806	0.2% Annual Chan	1288.69	462.09	468.51	468.51	471.7	0.005296	14.34	89.84	14	1
4C6 Trib 2	1	2790	50% Annual Chanc	200	461.99	463.56	463.56	464.34	0.003141	7.08	28.23	18	1
4C6 Trib 2	1	2790	20% Annual Chanc	325	461.99	464.15	464.15	465.24	0.00322	8.35	38.92	18	1
4C6 Trib 2	1	2790	10% Annual Chanc	450	461.99	464.67	464.67	466.02	0.003322	9.31	48.31	18	1
4C6 Trib 2	1	2790	4% Annual Chance	650	461.99	465.43	465.43	467.14	0.003474	10.51	61.85	18	1
4C6 Trib 2	1	2790	2% Annual Chance	850	461.99	466.1	466.1	468.15	0.003647	11.49	73.97	18	1
4C6 Trib 2	1	2790	1% Annual Chance	1048.55	461.99	466.71	466.71	469.08	0.003822	12.33	85.04	18	1
4C6 Trib 2	1	2790	0.4% Annual Chan	1219.86	461.99	467.27	467.22	469.83	0.003864	12.84	95.01	18	0.98
4C6 Trib 2	1	2790	0.2% Annual Chan	1288.69	461.99	469.46	467.39	471.08	0.003245	10.23	126		0.66
4C6 Trib 2	1	2778	50% Annual Chanc	200	461.92	463.49	463.49	464.27	0.003153	7.09	28.19	18	1
4C6 Trib 2	1	2778	20% Annual Chanc	325	461.92	464.09	464.09	465.17	0.003195	8.33	39.03	18	1
4C6 Trib 2	1	2778	10% Annual Chanc	450	461.92	464.61	464.61	465.95	0.003318	9.31	48.33	18	1
4C6 Trib 2	1	2778	4% Annual Chance	650	461.92	465.35	465.35	467.07	0.003479	10.51	61.82	18	1
4C6 Trib 2	1	2778	2% Annual Chance	850	461.92	466.02	466.02	468.08	0.003659	11.51	73.88	18	1
4C6 Trib 2	1	2778	1% Annual Chance	1048.55	461.92	466.65	466.65	469.01	0.003817	12.32	85.09	18	1
4C6 Trib 2	1	2778	0.4% Annual Chan	1219.86	461.92	467.28	467.15	469.76	0.003704	12.63	96.56	18	0.96
4C6 Trib 2	1	2778	0.2% Annual Chan	1288.69	461.92	468.77	467.34	470.98	0.004977	11.93	108		0.8
4C6 Trib 2	1	2517	50% Annual Chanc	200	460.36	461.92	461.92	462.71	0.003172	7.11	28.14	18	1
4C6 Trib 2	1	2517	20% Annual Chanc	325	460.36	462.53	462.53	463.61	0.003198	8.33	39.02	18	1
4C6 Trib 2	1	2517	10% Annual Chanc	450	460.36	463.05	463.05	464.39	0.003315	9.31	48.35	18	1
4C6 Trib 2	1	2517	4% Annual Chance	650	460.36	463.8	463.8	465.51	0.003468	10.5	61.89	18	1
4C6 Trib 2	1	2517	2% Annual Chance	850	460.36	464.47	464.47	466.52	0.003647	11.49	73.97	18	1
4C6 Trib 2	1	2517	1% Annual Chance	1048.55	460.36	465.09	465.09	467.45	0.003815	12.32	85.1	18	1
4C6 Trib 2	1	2517	0.4% Annual Chan	1219.86	460.36	466.57	465.59	468.56	0.00446	11.29	108		0.8
4C6 Trib 2	1	2517	0.2% Annual Chan	1288.69	460.36	467.47	465.79	469.68	0.004977	11.93	108		0.79
4C6 Trib 2	1	2461	50% Annual Chanc	200	460.02	461.45	461.13	461.79	0.001447	4.66	42.88	30	0.69
4C6 Trib 2	1	2461	20% Annual Chanc	325	460.02	462	461.56	462.46	0.001445	5.48	59.3	30	0.69
4C6 Trib 2	1	2461	10% Annual Chanc	450	460.02	462.55	461.93	463.1	0.001345	5.93	75.94	30	0.66
4C6 Trib 2	1	2461	4% Annual Chance	650	460.02	463.43	462.46	464.06	0.001205	6.35	102.28	30	0.61
4C6 Trib 2	1	2461	2% Annual Chance	850	460.02	464.35	462.95	465.02	0.001065	6.54	129.96	30	0.55
4C6 Trib 2	1	2461	1% Annual Chance	1048.55	460.02	465.67	463.37	466.27	0.000797	6.18	169.53	30	0.46
4C6 Trib 2	1	2461	0.4% Annual Chan	1219.86	460.02	467.33	463.74	468.04	0.00152	6.78	180		0.44
4C6 Trib 2	1	2461	0.2% Annual Chan	1288.69	460.02	468.31	463.87	469.1	0.001697	7.16	180		0.44
4C6 Trib 2	1	2367	50% Annual Chanc	200	459.83	461.36	460.95	461.65	0.001188	4.37	45.75	30	0.62
4C6 Trib 2	1	2367	20% Annual Chanc	325	459.83	461.9	461.37	462.32	0.001264	5.24	62.05	30	0.64
4C6 Trib 2	1	2367	10% Annual Chanc	450	459.83	462.46	461.74	462.97	0.001205	5.7	78.9	30	0.62
4C6 Trib 2	1	2367	4% Annual Chance	650	459.83	463.35	462.27	463.94	0.001104	6.16	105.53	30	0.58
4C6 Trib 2	1	2367	2% Annual Chance	850	459.83	464.28	462.75	464.91	0.000991	6.37	133.5	30	0.53
4C6 Trib 2	1	2367	1% Annual Chance	1048.55	459.83	465.62	463.19	466.18	0.000749	6.04	173.64	30	0.44
4C6 Trib 2	1	2367	0.4% Annual Chan	1219.86	459.83	467.18	463.55	467.9	0.00152	6.78	180		0.44
4C6 Trib 2	1	2367	0.2% Annual Chan	1288.69	459.83	468.15	463.68	468.94	0.001697	7.16	180		0.44
4C6 Trib 2	1	2250	50% Annual Chanc	200	457.74	461.26	459.96	461.39	0.003175	2.93	68.36	33.76	0.36
4C6 Trib 2	1	2250	20% Annual Chanc	325	457.74	461.8		462.01	0.004293	3.69	87.97		0.43
4C6 Trib 2	1	2250	10% Annual Chanc	450	457.74	462.4		462.65	0.004293	4	112.49	51.38	0.44
4C6 Trib 2	1	2250	4% Annual Chance	650	457.74	463.36		463.62	0.003685	4.08	159.45	70.61	0.42
4C6 Trib 2	1	2250	2% Annual Chance	850	457.74	464.37		464.61	0.002752	3.89	218.24	87.88	0.37
4C6 Trib 2	1	2250	1% Annual Chance	1048.55	457.74	465.78		465.95	0.001409	3.33	319.91	143.59	0.28

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 2	1	2250	0.4% Annual Chan	1219.86	457.74	467.5		467.61	0.00059	2.67	502.02	249.63	0.19
4C6 Trib 2	1	2250	0.2% Annual Chan	1288.69	457.74	468.58		468.65	0.000342	2.26	645.87	298.82	0.15
4C6 Trib 2	1	2023	50% Annual Chanc	200	456.69	458.95	458.95	459.62	0.027417	6.56	30.47	22.63	1
4C6 Trib 2	1	2023	20% Annual Chanc	325	456.69	460.37		460.71	0.00749	4.7	69.15	31.82	0.56
4C6 Trib 2	1	2023	10% Annual Chanc	450	456.69	461.09		461.45	0.006214	4.79	93.87	36.36	0.53
4C6 Trib 2	1	2023	4% Annual Chance	650	456.69	462.51		462.79	0.003539	4.29	151.68	45.43	0.41
4C6 Trib 2	1	2023	2% Annual Chance	850	456.69	463.78		464.02	0.00241	3.95	214.97	55.3	0.35
4C6 Trib 2	1	2023	1% Annual Chance	1048.55	456.69	465.5		465.65	0.001143	3.18	357.05	124.34	0.25
4C6 Trib 2	1	2023	0.4% Annual Chan	1219.86	456.69	467.43		467.49	0.000319	2.09	838.65	355.26	0.14
4C6 Trib 2	1	2023	0.2% Annual Chan	1288.69	456.69	468.55		468.58	0.000148	1.58	1252.84	402.82	0.1
4C6 Trib 2	1	1719	50% Annual Chanc	425	452.76	458.19	455.9	458.32	0.001173	2.84	149.6	41.66	0.26
4C6 Trib 2	1	1719	20% Annual Chanc	750	452.76	460.03	456.65	460.2	0.000902	3.27	229.53	45.37	0.26
4C6 Trib 2	1	1719	10% Annual Chanc	950	452.76	460.72	457.05	460.93	0.000948	3.63	261.46	46.77	0.27
4C6 Trib 2	1	1719	4% Annual Chance	1300	452.76	462.16	457.69	462.4	0.000827	3.93	330.96	80.84	0.27
4C6 Trib 2	1	1719	2% Annual Chance	1600	452.76	463.5	458.18	463.74	0.000647	3.92	423.15	133.81	0.25
4C6 Trib 2	1	1719	1% Annual Chance	1948.55	452.76	465.32	458.72	465.49	0.000361	3.37	647.3	285.1	0.19
4C6 Trib 2	1	1719	0.4% Annual Chan	2269.86	452.76	467.28	459.17	467.4	0.000184	2.71	966.65	321.13	0.14
4C6 Trib 2	1	1719	0.2% Annual Chan	2438.69	452.76	468.41	459.4	468.52	0.00013	2.43	1151.24	399.38	0.12
4C6 Trib 2	1	1200	Culvert										
4C6 Trib 2	1	640	50% Annual Chanc	425	452.13	457.91	454.06	457.94	0.000519	1.51	283.64	71.56	0.13
4C6 Trib 2	1	640	20% Annual Chanc	750	452.13	459.52	454.71	459.56	0.000503	1.83	485.7	239.15	0.13
4C6 Trib 2	1	640	10% Annual Chanc	950	452.13	459.88	455.05	459.95	0.00062	2.11	546.84	246.16	0.15
4C6 Trib 2	1	640	4% Annual Chance	1300	452.13	460.4	455.58	460.49	0.00082	2.56	632.38	337.93	0.17
4C6 Trib 2	1	640	2% Annual Chance	1600	452.13	460.69	456	460.81	0.001027	2.94	682.08	462.33	0.19
4C6 Trib 2	1	640	1% Annual Chance	1948.55	452.13	460.97	456.44	461.12	0.00128	3.37	729.71	508.88	0.22
4C6 Trib 2	1	640	0.4% Annual Chan	2269.86	452.13	461.27	456.82	461.44	0.00146	3.69	779.94	534.34	0.23
4C6 Trib 2	1	640	0.2% Annual Chan	2438.69	452.13	461.44	456.99	461.63	0.001534	3.84	809.95	545.96	0.24
4C6 Trib 2	1	609	50% Annual Chanc	525	452.14	457.8		457.89	0.002089	2.5	209.96	54.89	0.23
4C6 Trib 2	1	609	20% Annual Chanc	950	452.14	459.38		459.51	0.001989	2.95	394.04	240.43	0.23
4C6 Trib 2	1	609	10% Annual Chanc	1250	452.14	459.7		459.87	0.002561	3.49	479.26	296.22	0.26
4C6 Trib 2	1	609	4% Annual Chance	1700	452.14	460.21		460.4	0.002768	3.85	650.13	458.82	0.28
4C6 Trib 2	1	609	2% Annual Chance	2050	452.14	460.53		460.72	0.00282	4.03	814.78	543.3	0.28
4C6 Trib 2	1	609	1% Annual Chance	2450	452.14	460.85		461.04	0.002788	4.14	993.39	569.49	0.28
4C6 Trib 2	1	609	0.4% Annual Chan	2950	452.14	461.17		461.36	0.002824	4.3	1178.76	586.53	0.29
4C6 Trib 2	1	609	0.2% Annual Chan	3300	452.14	461.34		461.54	0.002927	4.45	1280.24	591.42	0.3
4C6 Trib 2	1	309	50% Annual Chanc	525	450.24	455.44		456.33	0.023394	7.57	69.38	25.66	0.81
4C6 Trib 2	1	309	20% Annual Chanc	950	450.24	456.68	456.31	457.96	0.022704	9.08	106.05	35.07	0.84
4C6 Trib 2	1	309	10% Annual Chanc	1250	450.24	457.85	457.85	458.46	0.009374	7.03	332.13	314.24	0.57
4C6 Trib 2	1	309	4% Annual Chance	1700	450.24	458.22	458.22	458.84	0.010045	7.64	454.02	349.91	0.59
4C6 Trib 2	1	309	2% Annual Chance	2050	450.24	458.42	458.42	459.08	0.01093	8.17	524.52	361.38	0.62
4C6 Trib 2	1	309	1% Annual Chance	2450	450.24	458.59	458.59	459.33	0.012281	8.85	588.43	374.2	0.66
4C6 Trib 2	1	309	0.4% Annual Chan	2950	450.24	458.9	458.77	459.63	0.012226	9.16	711.59	420.94	0.67
4C6 Trib 2	1	309	0.2% Annual Chan	3300	450.24	459.2	458.94	459.84	0.01085	8.92	846.25	477.5	0.63
4C6 Trib 1	1	3883	50% Annual Chanc	225	451.04	455.42		455.45	0.001717	1.76	257.22	391.2	0.19
4C6 Trib 1	1	3883	20% Annual Chanc	450	451.04	455.89	455.02	455.92	0.001967	2.1	447.15	421.45	0.21
4C6 Trib 1	1	3883	10% Annual Chanc	550	451.04	456.05	455.23	456.08	0.001998	2.18	513.97	427.21	0.21
4C6 Trib 1	1	3883	4% Annual Chance	700	451.04	456.22		456.26	0.002206	2.37	588.6	434.15	0.22
4C6 Trib 1	1	3883	2% Annual Chance	850	451.04	456.38		456.42	0.002371	2.54	660.83	446.86	0.24
4C6 Trib 1	1	3883	1% Annual Chance	1000	451.04	456.53		456.57	0.002486	2.67	726.78	453.17	0.24
4C6 Trib 1	1	3883	0.4% Annual Chan	1200	451.04	456.71		456.76	0.002607	2.82	808.84	460	0.25
4C6 Trib 1	1	3883	0.2% Annual Chan	1350	451.04	456.85		456.9	0.002631	2.9	872.29	464.69	0.25
4C6 Trib 1	1	3459	50% Annual Chanc	225	450.04	453.15	452.8	453.62	0.031181	5.53	45.36	75.81	0.76
4C6 Trib 1	1	3459	20% Annual Chanc	450	450.04	453.93	453.84	454.23	0.017533	5.26	152.48	217.4	0.6
4C6 Trib 1	1	3459	10% Annual Chanc	550	450.04	454.11	453.97	454.41	0.016865	5.43	197.44	261.94	0.6
4C6 Trib 1	1	3459	4% Annual Chance	700	450.04	454.37		454.61	0.013589	5.2	268.95	283.94	0.54
4C6 Trib 1	1	3459	2% Annual Chance	850	450.04	454.62		454.82	0.011014	4.95	344.07	312.62	0.5
4C6 Trib 1	1	3459	1% Annual Chance	1000	450.04	454.86		455.03	0.009163	4.75	422.81	349.45	0.46
4C6 Trib 1	1	3459	0.4% Annual Chan	1200	450.04	455.14		455.29	0.007585	4.56	525.73	381.39	0.42
4C6 Trib 1	1	3459	0.2% Annual Chan	1350	450.04	455.33		455.46	0.007024	4.54	599.13	405.9	0.41
4C6 Trib 1	1	3187	50% Annual Chanc	225	446.8	449.83		449.96	0.007165	2.92	77.06	40.97	0.38
4C6 Trib 1	1	3187	20% Annual Chanc	450	446.8	450.74		450.97	0.008679	3.83	117.5	47.86	0.43
4C6 Trib 1	1	3187	10% Annual Chanc	550	446.8	451.26		451.49	0.007376	3.83	143.72	51.81	0.4
4C6 Trib 1	1	3187	4% Annual Chance	700	446.8	451.93		452.17	0.00643	3.89	180.2	59.09	0.39
4C6 Trib 1	1	3187	2% Annual Chance	850	446.8	452.35		452.62	0.006206	4.15	210.04	98.17	0.39
4C6 Trib 1	1	3187	1% Annual Chance	1000	446.8	452.63		452.94	0.006528	4.48	248.59	168.61	0.4
4C6 Trib 1	1	3187	0.4% Annual Chan	1200	446.8	452.86		453.23	0.007449	4.97	289.47	191.67	0.43
4C6 Trib 1	1	3187	0.2% Annual Chan	1350	446.8	453.07		453.46	0.007607	5.19	331.45	211.79	0.44

Table E.1: HEC-RAS Plan: Hickory Creek Combined Existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 1	1	662	50% Annual Chanc	275	434.25	439.94	437.41	440.03	0.00093	2.44	119.49	103.75	0.24
4C6 Trib 1	1	662	20% Annual Chanc	500	434.25	440.85	438.41	441.01	0.001252	3.32	190.23	161.01	0.29
4C6 Trib 1	1	662	10% Annual Chanc	700	434.25	441.24	439	441.49	0.001741	4.16	221.46	229.12	0.34
4C6 Trib 1	1	662	4% Annual Chance	900	434.25	441.94	439.44	442.14	0.001321	3.98	412.15	329.31	0.3
4C6 Trib 1	1	662	2% Annual Chance	1050	434.25	442.67	439.77	442.84	0.001012	3.8	550.19	401.42	0.27
4C6 Trib 1	1	662	1% Annual Chance	1200	434.25	443.22	440.08	443.32	0.000665	3.26	1034.01	466.96	0.22
4C6 Trib 1	1	662	0.4% Annual Chan	1400	434.25	443.86	440.65	443.95	0.000535	3.11	1360.52	555.04	0.2
4C6 Trib 1	1	662	0.2% Annual Chan	1600	434.25	444.29	440.96	444.37	0.000486	3.08	1603.94	582.84	0.2

Appendix E.2
HEC-RAS Output
Ultimate Conditions

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	15204	50% Annual Chanc	50	494.9	496.71		496.73	0.001167	1.34	37.23	28.27	0.21
Stream 4C6	3	15204	20% Annual Chanc	100	494.9	497.44		497.48	0.0012	1.68	59.68	33.04	0.22
Stream 4C6	3	15204	10% Annual Chanc	125	494.9	497.72		497.78	0.00122	1.8	69.39	34.84	0.22
Stream 4C6	3	15204	4% Annual Chance	150	494.9	497.98		498.04	0.001236	1.91	78.57	36.46	0.23
Stream 4C6	3	15204	2% Annual Chance	175	494.9	498.21		498.27	0.001268	2.01	87.14	38.19	0.23
Stream 4C6	3	15204	1% Annual Chance	200	494.9	498.42		498.49	0.001309	2.1	95.29	40.02	0.24
Stream 4C6	3	15204	0.4% Annual Chan	250	494.9	498.78		498.86	0.001393	2.27	110.23	43.17	0.25
Stream 4C6	3	15204	0.2% Annual Chan	275	494.9	498.94		499.02	0.001435	2.35	117.18	44.56	0.26
Stream 4C6	3	15106*	50% Annual Chanc	50	494.73	496.58		496.61	0.001387	1.3	38.49	28.99	0.2
Stream 4C6	3	15106*	20% Annual Chanc	100	494.73	497.31		497.35	0.001453	1.63	61.46	34.07	0.21
Stream 4C6	3	15106*	10% Annual Chanc	125	494.73	497.59		497.64	0.001508	1.75	71.42	36.46	0.22
Stream 4C6	3	15106*	4% Annual Chance	150	494.73	497.85		497.9	0.00155	1.85	81.02	38.76	0.23
Stream 4C6	3	15106*	2% Annual Chance	175	494.73	498.08		498.14	0.001577	1.94	90.08	40.6	0.23
Stream 4C6	3	15106*	1% Annual Chance	200	494.73	498.28		498.35	0.001608	2.03	98.56	42.21	0.23
Stream 4C6	3	15106*	0.4% Annual Chan	250	494.73	498.63		498.71	0.001695	2.2	113.89	45.07	0.24
Stream 4C6	3	15106*	0.2% Annual Chan	275	494.73	498.79		498.87	0.001746	2.27	120.93	46.4	0.25
Stream 4C6	3	15008*	50% Annual Chanc	50	494.56	496.44		496.46	0.001638	1.26	39.72	30.1	0.19
Stream 4C6	3	15008*	20% Annual Chanc	100	494.56	497.16		497.2	0.001757	1.57	63.81	36.59	0.21
Stream 4C6	3	15008*	10% Annual Chanc	125	494.56	497.44		497.48	0.001741	1.68	74.26	37.92	0.21
Stream 4C6	3	15008*	4% Annual Chance	150	494.56	497.69		497.74	0.001752	1.79	84.01	39.38	0.22
Stream 4C6	3	15008*	2% Annual Chance	175	494.56	497.92		497.97	0.001786	1.88	93.04	40.87	0.22
Stream 4C6	3	15008*	1% Annual Chance	200	494.56	498.12		498.18	0.001829	1.97	101.41	42.2	0.22
Stream 4C6	3	15008*	0.4% Annual Chan	250	494.56	498.46		498.53	0.00195	2.15	116.17	44.46	0.23
Stream 4C6	3	15008*	0.2% Annual Chan	275	494.56	498.61		498.68	0.002033	2.24	122.8	45.67	0.24
Stream 4C6	3	14910*	50% Annual Chanc	50	494.4	496.26		496.29	0.001987	1.21	41.16	32.81	0.19
Stream 4C6	3	14910*	20% Annual Chanc	100	494.4	496.98		497.02	0.001892	1.52	65.98	36.09	0.2
Stream 4C6	3	14910*	10% Annual Chanc	125	494.4	497.26		497.3	0.001903	1.64	76.27	37.16	0.2
Stream 4C6	3	14910*	4% Annual Chance	150	494.4	497.51		497.56	0.001952	1.75	85.7	38.48	0.21
Stream 4C6	3	14910*	2% Annual Chance	175	494.4	497.73		497.79	0.002026	1.86	94.29	39.82	0.21
Stream 4C6	3	14910*	1% Annual Chance	200	494.4	497.93		497.99	0.002108	1.96	102.18	41.01	0.22
Stream 4C6	3	14910*	0.4% Annual Chan	250	494.4	498.25		498.32	0.002325	2.16	115.73	43.06	0.23
Stream 4C6	3	14910*	0.2% Annual Chan	275	494.4	498.39		498.47	0.00246	2.26	121.65	44.09	0.24
Stream 4C6	3	14813*	50% Annual Chanc	50	494.23	496.07		496.09	0.002022	1.16	42.95	32.1	0.18
Stream 4C6	3	14813*	20% Annual Chanc	100	494.23	496.79		496.82	0.002053	1.49	67.15	34.73	0.19
Stream 4C6	3	14813*	10% Annual Chanc	125	494.23	497.07		497.11	0.00212	1.63	76.89	35.58	0.19
Stream 4C6	3	14813*	4% Annual Chance	150	494.23	497.31		497.36	0.002247	1.75	85.56	36.85	0.2
Stream 4C6	3	14813*	2% Annual Chance	175	494.23	497.52		497.57	0.002396	1.87	93.36	38.11	0.21
Stream 4C6	3	14813*	1% Annual Chance	200	494.23	497.7		497.76	0.002553	1.99	100.43	39.23	0.22
Stream 4C6	3	14813*	0.4% Annual Chan	250	494.23	497.99		498.07	0.002943	2.23	112.1	41.05	0.24
Stream 4C6	3	14813*	0.2% Annual Chan	275	494.23	498.11		498.19	0.003175	2.35	117.35	42.83	0.25
Stream 4C6	3	14714	50% Annual Chanc	50	494.06	495.87		495.89	0.002147	1.14	43.86	30.92	0.17
Stream 4C6	3	14714	20% Annual Chanc	100	494.06	496.58		496.61	0.002371	1.5	66.52	32.92	0.19
Stream 4C6	3	14714	10% Annual Chanc	125	494.06	496.84		496.88	0.002532	1.66	75.31	33.59	0.2
Stream 4C6	3	14714	4% Annual Chance	150	494.06	497.06		497.11	0.002784	1.81	82.82	34.72	0.21
Stream 4C6	3	14714	2% Annual Chance	175	494.06	497.25		497.3	0.003079	1.96	89.36	35.89	0.22
Stream 4C6	3	14714	1% Annual Chance	200	494.06	497.4		497.47	0.003389	2.1	95.15	36.9	0.23
Stream 4C6	3	14714	0.4% Annual Chan	250	494.06	497.64		497.73	0.004029	2.37	117.5	38.05	0.25
Stream 4C6	3	14714	0.2% Annual Chan	275	494.06	497.74		497.83	0.004252	2.46	136.92	40.55	0.26
Stream 4C6	3	14629*	50% Annual Chanc	50	493.73	495.68		495.7	0.002399	1.19	41.91	30.12	0.18
Stream 4C6	3	14629*	20% Annual Chanc	100	493.73	496.36		496.4	0.002708	1.58	63.3	32.35	0.2
Stream 4C6	3	14629*	10% Annual Chanc	125	493.73	496.61		496.65	0.003025	1.75	71.34	33.84	0.21
Stream 4C6	3	14629*	4% Annual Chance	150	493.73	496.8		496.86	0.003427	1.92	77.99	35.3	0.23
Stream 4C6	3	14629*	2% Annual Chance	175	493.73	496.95		497.02	0.003874	2.09	84.94	36.85	0.24
Stream 4C6	3	14629*	1% Annual Chance	200	493.73	497.08		497.16	0.004266	2.24	98.9	38.31	0.26
Stream 4C6	3	14629*	0.4% Annual Chan	250	493.73	497.28		497.37	0.004766	2.43	137.21	40.12	0.27
Stream 4C6	3	14629*	0.2% Annual Chan	275	493.73	497.37		497.45	0.005014	2.51	159.09	41.63	0.28
Stream 4C6	3	14544*	50% Annual Chanc	50	493.4	495.46		495.48	0.002858	1.27	39.25	29.25	0.19
Stream 4C6	3	14544*	20% Annual Chanc	100	493.4	496.1		496.15	0.003419	1.69	59.11	32.73	0.22
Stream 4C6	3	14544*	10% Annual Chanc	125	493.4	496.31		496.37	0.003953	1.88	68.66	34.09	0.24
Stream 4C6	3	14544*	4% Annual Chance	150	493.4	496.47		496.53	0.00441	2.04	83.24	35.34	0.26
Stream 4C6	3	14544*	2% Annual Chance	175	493.4	496.59		496.66	0.004816	2.17	90.99	36.66	0.27
Stream 4C6	3	14544*	1% Annual Chance	200	493.4	496.7		496.77	0.005184	2.26	100.99	38.03	0.28
Stream 4C6	3	14544*	0.4% Annual Chan	250	493.4	496.87		496.94	0.005693	2.39	117.36	39.36	0.29
Stream 4C6	3	14544*	0.2% Annual Chan	275	493.4	496.94		497.01	0.005866	2.44	131.77	40.73	0.3
Stream 4C6	3	14459*	50% Annual Chanc	50	493.08	495.17		495.2	0.004017	1.44	34.81	28.03	0.23
Stream 4C6	3	14459*	20% Annual Chanc	100	493.08	495.77		495.82	0.004731	1.81	63.97	31.03	0.26
Stream 4C6	3	14459*	10% Annual Chanc	125	493.08	495.94		495.99	0.005207	1.93	81.76	32.38	0.27
Stream 4C6	3	14459*	4% Annual Chance	150	493.08	496.07		496.12	0.005658	2.03	100.09	33.74	0.28
Stream 4C6	3	14459*	2% Annual Chance	175	493.08	496.16		496.22	0.006047	2.13	117.19	35.09	0.29

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	14459*	1% Annual Chance	200	493.08	496.25		496.31	0.006222	2.21	134.13	213.85	0.3
Stream 4C6	3	14459*	0.4% Annual Chan	250	493.08	496.38		496.45	0.006531	2.39	166.29	256.52	0.31
Stream 4C6	3	14459*	0.2% Annual Chan	275	493.08	496.44		496.51	0.006669	2.46	181.14	272.37	0.31
Stream 4C6	3	14383	50% Annual Chanc	50	492.75	494.67		494.73	0.008707	1.96	25.89	31.37	0.33
Stream 4C6	3	14383	20% Annual Chanc	100	492.75	495.25		495.31	0.008416	2.01	64.89	103.81	0.33
Stream 4C6	3	14383	10% Annual Chanc	125	492.75	495.42		495.47	0.008103	2.04	85.94	158.88	0.32
Stream 4C6	3	14383	4% Annual Chance	150	492.75	495.52		495.57	0.008302	2.15	103.24	196.93	0.33
Stream 4C6	3	14383	2% Annual Chance	175	492.75	495.61		495.66	0.008071	2.21	122.97	235.78	0.33
Stream 4C6	3	14383	1% Annual Chance	200	492.75	495.68		495.73	0.008232	2.31	140.31	268.15	0.34
Stream 4C6	3	14383	0.4% Annual Chan	250	492.75	495.81		495.87	0.007991	2.41	179.31	309.11	0.34
Stream 4C6	3	14383	0.2% Annual Chan	275	492.75	495.87		495.93	0.007856	2.45	197.66	325.07	0.33
Stream 4C6	3	14288*	50% Annual Chanc	50	491.93	493.79		493.85	0.009612	1.95	25.67	25.23	0.34
Stream 4C6	3	14288*	20% Annual Chanc	100	491.93	494.53		494.59	0.006744	2.06	51.07	64.55	0.3
Stream 4C6	3	14288*	10% Annual Chanc	125	491.93	494.72		494.79	0.00635	2.18	72.94	165.26	0.3
Stream 4C6	3	14288*	4% Annual Chance	150	491.93	494.89		494.95	0.005394	2.14	104.39	208.27	0.28
Stream 4C6	3	14288*	2% Annual Chance	175	491.93	494.98		495.05	0.005506	2.24	125.83	247.09	0.29
Stream 4C6	3	14288*	1% Annual Chance	200	491.93	495.12		495.18	0.004599	2.14	162.07	270.77	0.26
Stream 4C6	3	14288*	0.4% Annual Chan	250	491.93	495.23		495.29	0.005104	2.34	192.31	292.04	0.28
Stream 4C6	3	14288*	0.2% Annual Chan	275	491.93	495.31		495.36	0.005028	2.37	214.11	305.12	0.28
Stream 4C6	3	14193*	50% Annual Chanc	50	491.11	493.11		493.15	0.005622	1.64	30.4	25.72	0.27
Stream 4C6	3	14193*	20% Annual Chanc	100	491.11	494.39		494.4	0.000872	1.04	164.62	209.76	0.12
Stream 4C6	3	14193*	10% Annual Chanc	125	491.11	494.59		494.61	0.000814	1.06	214.23	261.9	0.12
Stream 4C6	3	14193*	4% Annual Chance	150	491.11	494.77		494.78	0.000832	1.12	263.96	310.91	0.12
Stream 4C6	3	14193*	2% Annual Chance	175	491.11	494.85		494.86	0.000913	1.2	290.29	319.05	0.12
Stream 4C6	3	14193*	1% Annual Chance	200	491.11	495		495.02	0.000816	1.17	341.08	333.69	0.12
Stream 4C6	3	14193*	0.4% Annual Chan	250	491.11	495.08		495.09	0.001079	1.37	365.8	341.39	0.14
Stream 4C6	3	14193*	0.2% Annual Chan	275	491.11	495.14		495.16	0.001132	1.43	389	351.33	0.14
Stream 4C6	3	14094	50% Annual Chanc	50	490.29	492.95		492.96	0.000897	0.95	82.51	118.95	0.12
Stream 4C6	3	14094	20% Annual Chanc	100	490.29	494.36		494.37	0.000155	0.56	364.39	286.05	0.05
Stream 4C6	3	14094	10% Annual Chanc	125	490.29	494.57		494.58	0.000163	0.6	425.59	301.53	0.05
Stream 4C6	3	14094	4% Annual Chance	150	490.29	494.74		494.74	0.000175	0.64	478	314.99	0.06
Stream 4C6	3	14094	2% Annual Chance	175	490.29	494.82		494.82	0.000208	0.7	503.21	320.23	0.06
Stream 4C6	3	14094	1% Annual Chance	200	490.29	494.98		494.98	0.000211	0.73	553.84	330.6	0.06
Stream 4C6	3	14094	0.4% Annual Chan	250	490.29	495.04		495.04	0.000299	0.87	574.5	334.92	0.08
Stream 4C6	3	14094	0.2% Annual Chan	275	490.29	495.1		495.11	0.000354	0.96	595.32	343.49	0.08
Stream 4C6	3	13739	50% Annual Chanc	50	486.49	492.93		492.93	0.000027	0.25	296.56	256.88	0.02
Stream 4C6	3	13739	20% Annual Chanc	100	486.49	494.35		494.35	0.000015	0.23	781.69	471.35	0.02
Stream 4C6	3	13739	10% Annual Chanc	125	486.49	494.56		494.56	0.000018	0.26	881.93	494.69	0.02
Stream 4C6	3	13739	4% Annual Chance	150	486.49	494.73		494.73	0.000023	0.29	968.12	572.11	0.02
Stream 4C6	3	13739	2% Annual Chance	175	486.49	494.8		494.8	0.000028	0.33	1011.86	583.42	0.02
Stream 4C6	3	13739	1% Annual Chance	200	486.49	494.96		494.96	0.000031	0.35	1103.93	607.52	0.03
Stream 4C6	3	13739	0.4% Annual Chan	250	486.49	495.01		495.01	0.000045	0.43	1135.89	610.34	0.03
Stream 4C6	3	13739	0.2% Annual Chan	275	486.49	495.06		495.07	0.00005	0.46	1170.55	613.38	0.03
Stream 4C6	3	13570.7*	50% Annual Chanc	50	485.78	492.93		492.93	0.000034	0.24	234.01	106.7	0.02
Stream 4C6	3	13570.7*	20% Annual Chanc	100	485.78	494.35		494.35	0.000024	0.24	535.44	312.37	0.02
Stream 4C6	3	13570.7*	10% Annual Chanc	125	485.78	494.56		494.56	0.00003	0.27	610.7	404.92	0.02
Stream 4C6	3	13570.7*	4% Annual Chance	150	485.78	494.72		494.72	0.000036	0.3	679.64	429.89	0.02
Stream 4C6	3	13570.7*	2% Annual Chance	175	485.78	494.8		494.8	0.000045	0.34	711.99	439.59	0.02
Stream 4C6	3	13570.7*	1% Annual Chance	200	485.78	494.95		494.95	0.000048	0.36	779.99	445.94	0.02
Stream 4C6	3	13570.7*	0.4% Annual Chan	250	485.78	495		495	0.000071	0.43	801.99	448.18	0.03
Stream 4C6	3	13570.7*	0.2% Annual Chan	275	485.78	495.05		495.06	0.000081	0.46	826.85	450.92	0.03
Stream 4C6	3	13471	50% Annual Chanc	175	485.42	492.91	487.34	492.92	0.000043	0.85	216.73	91.25	0.06
Stream 4C6	3	13471	20% Annual Chanc	275	485.42	494.33	487.84	494.34	0.000042	0.98	477.72	237.99	0.06
Stream 4C6	3	13471	10% Annual Chanc	350	485.42	494.53	488.16	494.55	0.000061	1.2	528.37	285.61	0.08
Stream 4C6	3	13471	4% Annual Chance	450	485.42	494.68	488.54	494.71	0.000091	1.49	572.87	315.05	0.1
Stream 4C6	3	13471	2% Annual Chance	500	485.42	494.74	488.71	494.78	0.00011	1.64	594.27	347.26	0.11
Stream 4C6	3	13471	1% Annual Chance	600	485.42	494.88	489.03	494.93	0.000144	1.9	643.06	366.41	0.12
Stream 4C6	3	13471	0.4% Annual Chan	700	485.42	494.9	489.33	494.97	0.000193	2.21	652.39	369.39	0.14
Stream 4C6	3	13471	0.2% Annual Chan	750	485.42	494.95	489.48	495.02	0.000215	2.34	668.91	374.61	0.15
Stream 4C6	3	13400	Culvert										
Stream 4C6	3	13373	50% Annual Chanc	175	483.8	486.03	485.74	486.43	0.004654	5.06	34.56	24.24	0.75
Stream 4C6	3	13373	20% Annual Chanc	275	483.8	486.62	486.21	487.09	0.004033	5.49	50.12	27.89	0.72
Stream 4C6	3	13373	10% Annual Chanc	350	483.8	486.97	486.51	487.49	0.003968	5.83	60.04	30.09	0.73
Stream 4C6	3	13373	4% Annual Chance	450	483.8	487.34	486.87	487.95	0.004002	6.26	71.83	32.47	0.74
Stream 4C6	3	13373	2% Annual Chance	500	483.8	487.52	487.03	488.16	0.004007	6.45	77.48	33.5	0.75
Stream 4C6	3	13373	1% Annual Chance	600	483.8	487.83	487.33	488.55	0.004024	6.8	88.26	35.37	0.76
Stream 4C6	3	13373	0.4% Annual Chan	700	483.8	488.12	487.58	488.9	0.004021	7.09	98.79	37.13	0.77
Stream 4C6	3	13373	0.2% Annual Chan	750	483.8	488.26	487.73	489.07	0.004018	7.21	104.02	38.05	0.77

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	13141	50% Annual Chanc	175	482.88	485.43		485.66	0.002036	3.8	46.04	26.4	0.51
Stream 4C6	3	13141	20% Annual Chanc	275	482.88	486.05		486.34	0.002152	4.27	64.34	32.27	0.53
Stream 4C6	3	13141	10% Annual Chanc	350	482.88	486.42		486.75	0.002079	4.56	76.9	35.58	0.54
Stream 4C6	3	13141	4% Annual Chance	450	482.88	486.83		487.21	0.001973	4.96	92.03	38.73	0.54
Stream 4C6	3	13141	2% Annual Chance	500	482.88	487		487.42	0.001963	5.16	98.93	39.82	0.54
Stream 4C6	3	13141	1% Annual Chance	600	482.88	487.31		487.79	0.001992	5.57	111.52	41.77	0.55
Stream 4C6	3	13141	0.4% Annual Chan	700	482.88	487.6		488.14	0.002019	5.94	123.69	43.73	0.57
Stream 4C6	3	13141	0.2% Annual Chan	750	482.88	487.73		488.31	0.002031	6.12	129.65	44.66	0.57
Stream 4C6	3	12859	50% Annual Chanc	175	482.39	484.77		485.02	0.0025	4.03	43.38	26.8	0.56
Stream 4C6	3	12859	20% Annual Chanc	275	482.39	485.37		485.69	0.002405	4.52	60.84	30.69	0.57
Stream 4C6	3	12859	10% Annual Chanc	350	482.39	485.79		486.13	0.002261	4.73	74.03	33.26	0.56
Stream 4C6	3	12859	4% Annual Chance	450	482.39	486.21		486.61	0.002263	5.06	88.85	35.97	0.57
Stream 4C6	3	12859	2% Annual Chance	500	482.39	486.39		486.82	0.002272	5.24	95.4	37.11	0.57
Stream 4C6	3	12859	1% Annual Chance	600	482.39	486.71		487.2	0.002231	5.61	107.44	39.29	0.58
Stream 4C6	3	12859	0.4% Annual Chan	700	482.39	486.99		487.54	0.002222	5.95	118.89	41.26	0.59
Stream 4C6	3	12859	0.2% Annual Chan	750	482.39	487.13		487.71	0.002221	6.12	124.49	42.19	0.59
Stream 4C6	3	12708	50% Annual Chanc	175	481.74	484.42		484.66	0.002168	3.94	44.41	25.39	0.53
Stream 4C6	3	12708	20% Annual Chanc	275	481.74	485.01		485.33	0.002306	4.56	60.36	28.79	0.55
Stream 4C6	3	12708	10% Annual Chanc	350	481.74	485.4		485.77	0.002534	4.85	72.19	31.44	0.56
Stream 4C6	3	12708	4% Annual Chance	450	481.74	485.82		486.25	0.002525	5.26	85.83	34.68	0.57
Stream 4C6	3	12708	2% Annual Chance	500	481.74	485.98		486.45	0.002538	5.5	91.73	36.03	0.58
Stream 4C6	3	12708	1% Annual Chance	600	481.74	486.28		486.83	0.002609	5.95	102.68	38.3	0.59
Stream 4C6	3	12708	0.4% Annual Chan	700	481.74	486.54		487.17	0.002691	6.38	112.9	39.97	0.61
Stream 4C6	3	12708	0.2% Annual Chan	750	481.74	486.66		487.33	0.002726	6.58	117.9	40.76	0.62
Stream 4C6	3	12620.9*	50% Annual Chanc	175	481.36	484.17		484.38	0.004904	3.68	47.5	27.5	0.49
Stream 4C6	3	12620.9*	20% Annual Chanc	275	481.36	484.75		485.03	0.005279	4.27	64.44	31.26	0.52
Stream 4C6	3	12620.9*	10% Annual Chanc	350	481.36	485.12		485.44	0.005548	4.57	76.5	33.95	0.54
Stream 4C6	3	12620.9*	4% Annual Chance	450	481.36	485.54		485.92	0.005404	4.92	91.7	37.26	0.54
Stream 4C6	3	12620.9*	2% Annual Chance	500	481.36	485.72		486.12	0.005376	5.12	98.22	38.64	0.54
Stream 4C6	3	12620.9*	1% Annual Chance	600	481.36	486.01		486.48	0.005482	5.53	109.98	41.01	0.56
Stream 4C6	3	12620.9*	0.4% Annual Chan	700	481.36	486.27		486.81	0.005636	5.92	120.84	42.73	0.57
Stream 4C6	3	12620.9*	0.2% Annual Chan	750	481.36	486.39		486.97	0.005695	6.1	126.19	43.55	0.58
Stream 4C6	3	12534.2*	50% Annual Chanc	175	480.99	483.72		483.96	0.004722	3.92	44.59	28	0.55
Stream 4C6	3	12534.2*	20% Annual Chanc	275	480.99	484.26		484.58	0.005028	4.52	60.82	32.02	0.58
Stream 4C6	3	12534.2*	10% Annual Chanc	350	480.99	484.6		484.97	0.005263	4.85	72.2	34.53	0.59
Stream 4C6	3	12534.2*	4% Annual Chance	450	480.99	485.03		485.44	0.005536	5.13	87.74	37.9	0.59
Stream 4C6	3	12534.2*	2% Annual Chance	500	480.99	485.22		485.65	0.005431	5.27	94.99	39.38	0.59
Stream 4C6	3	12534.2*	1% Annual Chance	600	480.99	485.53		486.02	0.005274	5.61	107.49	41.85	0.59
Stream 4C6	3	12534.2*	0.4% Annual Chan	700	480.99	485.77		486.33	0.005403	6.01	117.9	43.79	0.61
Stream 4C6	3	12534.2*	0.2% Annual Chan	750	480.99	485.89		486.48	0.005431	6.18	123.2	44.66	0.62
Stream 4C6	3	12447.4*	50% Annual Chanc	175	480.61	483.28		483.56	0.004465	4.23	41.37	28.09	0.61
Stream 4C6	3	12447.4*	20% Annual Chanc	275	480.61	483.79		484.15	0.004616	4.83	56.94	32.46	0.64
Stream 4C6	3	12447.4*	10% Annual Chanc	350	480.61	484.11		484.53	0.004797	5.17	67.73	35.07	0.66
Stream 4C6	3	12447.4*	4% Annual Chance	450	480.61	484.5		484.97	0.005158	5.48	82.16	38.3	0.66
Stream 4C6	3	12447.4*	2% Annual Chance	500	480.61	484.69		485.18	0.005355	5.6	89.36	39.84	0.66
Stream 4C6	3	12447.4*	1% Annual Chance	600	480.61	485.02		485.55	0.005407	5.83	102.96	42.54	0.65
Stream 4C6	3	12447.4*	0.4% Annual Chan	700	480.61	485.26		485.86	0.005384	6.19	113.48	44.48	0.66
Stream 4C6	3	12447.4*	0.2% Annual Chan	750	480.61	485.39		486.01	0.005274	6.32	119.38	45.53	0.66
Stream 4C6	3	12359	50% Annual Chanc	175	480.24	482.64	482.46	483.09	0.006076	5.37	32.57	25.61	0.84
Stream 4C6	3	12359	20% Annual Chanc	275	480.24	483.09	482.93	483.67	0.00628	6.1	45.09	30.03	0.88
Stream 4C6	3	12359	10% Annual Chanc	350	480.24	483.37	483.22	484.02	0.006337	6.51	53.76	32.67	0.89
Stream 4C6	3	12359	4% Annual Chance	450	480.24	483.66	483.54	484.43	0.006583	7.04	63.92	35.54	0.93
Stream 4C6	3	12359	2% Annual Chance	500	480.24	483.81	483.69	484.62	0.006788	7.24	69.07	36.82	0.93
Stream 4C6	3	12359	1% Annual Chance	600	480.24	484.04	483.96	484.96	0.007405	7.7	77.96	38.89	0.96
Stream 4C6	3	12359	0.4% Annual Chan	700	480.24	484.33	484.21	485.28	0.007263	7.8	89.77	41.49	0.93
Stream 4C6	3	12359	0.2% Annual Chan	750	480.24	484.4	484.32	485.42	0.007758	8.1	92.57	42.09	0.96
Stream 4C6	3	12286*	50% Annual Chanc	175	479.74	481.93	481.93	482.54	0.00904	6.24	28.03	23.72	1.01
Stream 4C6	3	12286*	20% Annual Chanc	275	479.74	482.4	482.4	483.13	0.008427	6.81	40.37	28.41	1.01
Stream 4C6	3	12286*	10% Annual Chanc	350	479.74	482.69	482.69	483.49	0.008246	7.18	48.74	31.18	1.01
Stream 4C6	3	12286*	4% Annual Chance	450	479.74	483.03	483.03	483.9	0.007784	7.49	60.11	34.59	1
Stream 4C6	3	12286*	2% Annual Chance	500	479.74	483.18	483.18	484.09	0.007492	7.65	65.32	35.95	1
Stream 4C6	3	12286*	1% Annual Chance	600	479.74	483.45	483.45	484.43	0.007062	7.95	75.44	38.45	1
Stream 4C6	3	12286*	0.4% Annual Chan	700	479.74	483.68	483.68	484.75	0.006935	8.28	84.56	40.57	1.01
Stream 4C6	3	12286*	0.2% Annual Chan	750	479.74	483.8	483.8	484.89	0.006774	8.37	89.56	41.69	1.01
Stream 4C6	3	12138	50% Annual Chanc	175	478.75	481.44	480.88	481.7	0.002816	4.04	43.37	29.41	0.59
Stream 4C6	3	12138	20% Annual Chanc	275	478.75	482.02	481.35	482.33	0.002692	4.43	62.04	35.33	0.59
Stream 4C6	3	12138	10% Annual Chanc	350	478.75	482.36	481.63	482.7	0.002666	4.69	74.62	38.75	0.6
Stream 4C6	3	12138	4% Annual Chance	450	478.75	482.75	481.97	483.13	0.002454	5	90.35	42.43	0.59

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	12138	2% Annual Chance	500	478.75	482.91	482.11	483.32	0.002403	5.18	97.31	43.89	0.59
Stream 4C6	3	12138	1% Annual Chance	600	478.75	483.2	482.4	483.67	0.002356	5.53	110.49	46.54	0.59
Stream 4C6	3	12138	0.4% Annual Chan	700	478.75	483.47	482.62	484	0.002315	5.85	123.51	49.01	0.6
Stream 4C6	3	12138	0.2% Annual Chan	750	478.75	483.61	482.72	484.16	0.002279	5.98	130.29	50.21	0.6
Stream 4C6	3	12100	Bridge										
Stream 4C6	3	12078	50% Annual Chanc	175	477.72	479.96	479.96	480.56	0.008875	6.22	28.15	23.51	1
Stream 4C6	3	12078	20% Annual Chanc	275	477.72	480.45	480.45	481.15	0.008406	6.7	41.04	29.46	1
Stream 4C6	3	12078	10% Annual Chanc	350	477.72	481.01	480.74	481.55	0.005158	5.92	59.09	35.4	0.81
Stream 4C6	3	12078	4% Annual Chance	450	477.72	481.63	481.06	482.09	0.00308	5.45	83.15	41.53	0.65
Stream 4C6	3	12078	2% Annual Chance	500	477.72	481.72	481.2	482.24	0.003332	5.82	86.8	42.36	0.68
Stream 4C6	3	12078	1% Annual Chance	600	477.72	482	481.44	482.6	0.003202	6.18	99.33	45.09	0.68
Stream 4C6	3	12078	0.4% Annual Chan	700	477.72	482.41	481.67	483	0.002629	6.18	118.37	48.79	0.63
Stream 4C6	3	12078	0.2% Annual Chan	750	477.72	482.57	481.78	483.17	0.002507	6.25	126.43	50.15	0.62
Stream 4C6	3	11996.7*	50% Annual Chanc	175	476.92	479.11	479.11	479.71	0.009089	6.18	28.3	24.33	1.01
Stream 4C6	3	11996.7*	20% Annual Chanc	275	476.92	480.16		480.5	0.002818	4.64	59.59	35.5	0.61
Stream 4C6	3	11996.7*	10% Annual Chanc	350	476.92	480.89		481.16	0.001455	4.17	88.41	43.86	0.46
Stream 4C6	3	11996.7*	4% Annual Chance	450	476.92	481.55		481.81	0.001065	4.17	120.06	51.27	0.41
Stream 4C6	3	11996.7*	2% Annual Chance	500	476.92	481.63		481.94	0.001207	4.51	124.07	52.14	0.44
Stream 4C6	3	11996.7*	1% Annual Chance	600	476.92	481.92		482.28	0.001289	4.92	139.43	55.28	0.46
Stream 4C6	3	11996.7*	0.4% Annual Chan	700	476.92	482.34		482.71	0.001171	5.06	163.63	59.94	0.45
Stream 4C6	3	11996.7*	0.2% Annual Chan	750	476.92	482.5		482.89	0.001158	5.16	173.74	61.82	0.45
Stream 4C6	3	11915.5*	50% Annual Chanc	175	476.12	478.25	478.25	478.85	0.009095	6.2	28.21	24.19	1.01
Stream 4C6	3	11915.5*	20% Annual Chanc	275	476.12	480.19		480.34	0.00071	3.23	102.3	55.21	0.33
Stream 4C6	3	11915.5*	10% Annual Chanc	350	476.12	480.91		481.05	0.000499	3.13	147.67	70.17	0.29
Stream 4C6	3	11915.5*	4% Annual Chance	450	476.12	481.58		481.73	0.000431	3.26	201.57	94.7	0.27
Stream 4C6	3	11915.5*	2% Annual Chance	500	476.12	481.67		481.83	0.000493	3.53	209.84	99.16	0.29
Stream 4C6	3	11915.5*	1% Annual Chance	600	476.12	481.96		482.16	0.000556	3.91	243.08	128.57	0.32
Stream 4C6	3	11915.5*	0.4% Annual Chan	700	476.12	482.4		482.6	0.000516	3.99	315.39	192.94	0.31
Stream 4C6	3	11915.5*	0.2% Annual Chan	750	476.12	482.58		482.77	0.000493	3.99	351.71	206.15	0.3
Stream 4C6	3	11834.2*	50% Annual Chanc	175	475.32	477.37	477.37	478.01	0.008597	6.4	27.71	25.66	1
Stream 4C6	3	11834.2*	20% Annual Chanc	275	475.32	480.26		480.28	0.000106	1.56	408.27	249.67	0.14
Stream 4C6	3	11834.2*	10% Annual Chanc	350	475.32	480.99		481	0.000067	1.38	603.5	285.1	0.11
Stream 4C6	3	11834.2*	4% Annual Chance	450	475.32	481.67		481.68	0.000051	1.32	804.01	304.05	0.1
Stream 4C6	3	11834.2*	2% Annual Chance	500	475.32	481.77		481.78	0.000057	1.41	834.42	305.69	0.1
Stream 4C6	3	11834.2*	1% Annual Chance	600	475.32	482.08		482.1	0.00006	1.5	932.18	310.8	0.11
Stream 4C6	3	11834.2*	0.4% Annual Chan	700	475.32	482.52		482.53	0.000056	1.51	1069.11	317.34	0.11
Stream 4C6	3	11834.2*	0.2% Annual Chan	750	475.32	482.7		482.71	0.000055	1.53	1125.86	319.98	0.11
Stream 4C6	3	11751	50% Annual Chanc	175	474.52	477.5		477.5	0.000081	0.98	399.79	266.7	0.11
Stream 4C6	3	11751	20% Annual Chanc	275	474.52	480.27		480.27	0.000007	0.45	1250.62	328.9	0.03
Stream 4C6	3	11751	10% Annual Chanc	350	474.52	481		481	0.000006	0.48	1492.1	337.76	0.03
Stream 4C6	3	11751	4% Annual Chance	450	474.52	481.67		481.67	0.000006	0.53	1722.94	346.14	0.04
Stream 4C6	3	11751	2% Annual Chance	500	474.52	481.77		481.77	0.000008	0.58	1757.76	347.37	0.04
Stream 4C6	3	11751	1% Annual Chance	600	474.52	482.09		482.09	0.000009	0.65	1868.66	351.23	0.04
Stream 4C6	3	11751	0.4% Annual Chan	700	474.52	482.53		482.53	0.00001	0.7	2022.78	356.56	0.04
Stream 4C6	3	11751	0.2% Annual Chan	750	474.52	482.7		482.71	0.00001	0.73	2086.44	358.7	0.05
Stream 4C6	3	11383	50% Annual Chanc	175	472.96	477.49		477.49	0.000011	0.44	835.16	361.46	0.04
Stream 4C6	3	11383	20% Annual Chanc	275	472.96	480.27		480.27	0.000002	0.29	1884	390.08	0.02
Stream 4C6	3	11383	10% Annual Chanc	350	472.96	481		481	0.000002	0.31	2168.8	396.09	0.02
Stream 4C6	3	11383	4% Annual Chance	450	472.96	481.67		481.67	0.000003	0.36	2438	401.49	0.02
Stream 4C6	3	11383	2% Annual Chance	500	472.96	481.77		481.77	0.000003	0.39	2478.3	402.29	0.02
Stream 4C6	3	11383	1% Annual Chance	600	472.96	482.09		482.09	0.000004	0.44	2606.36	404.84	0.03
Stream 4C6	3	11383	0.4% Annual Chan	700	472.96	482.52		482.53	0.000004	0.48	2783.39	408.33	0.03
Stream 4C6	3	11383	0.2% Annual Chan	750	472.96	482.7		482.7	0.000004	0.5	2856.2	409.76	0.03
Stream 4C6	3	11124	50% Annual Chanc	150	471.89	477.47	473.77	477.48	0.000065	0.98	172.38	493.44	0.09
Stream 4C6	3	11124	20% Annual Chanc	275	471.89	480.26	474.44	480.27	0.000029	0.94	349.76	591.4	0.06
Stream 4C6	3	11124	10% Annual Chanc	350	471.89	480.98	474.76	480.99	0.000032	1.05	397.32	659.26	0.07
Stream 4C6	3	11124	4% Annual Chance	450	471.89	481.64	475.15	481.66	0.000038	1.22	441.44	681.11	0.08
Stream 4C6	3	11124	2% Annual Chance	500	471.89	481.74	475.32	481.76	0.000045	1.34	447.71	684.44	0.08
Stream 4C6	3	11124	1% Annual Chance	550	471.89	482.05	475.48	482.08	0.000047	1.41	468.44	696.22	0.09
Stream 4C6	3	11124	0.4% Annual Chan	650	471.89	482.52	475.75	482.52	0.000002	0.31	3890.7	713.83	0.02
Stream 4C6	3	11124	0.2% Annual Chan	750	471.89	482.7	475.99	482.7	0.000003	0.35	4018.21	720.35	0.02
Stream 4C6	3	11100	Culvert										
Stream 4C6	3	11054	50% Annual Chanc	150	471.2	473.94	473.27	474.23	0.008708	4.37	34.3	19.23	0.58
Stream 4C6	3	11054	20% Annual Chanc	275	471.2	475.43	474.02	475.67	0.005036	3.98	69.06	29.52	0.46
Stream 4C6	3	11054	10% Annual Chanc	350	471.2	476.16	474.38	476.38	0.003792	3.79	92.37	34.41	0.41
Stream 4C6	3	11054	4% Annual Chance	450	471.2	476.84	474.8	477.07	0.003032	3.85	118.88	45.37	0.38
Stream 4C6	3	11054	2% Annual Chance	500	471.2	477.1	475.04	477.34	0.002879	3.95	131.41	70.04	0.37

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	11054	1% Annual Chance	550	471.2	477.39	475.26	477.64	0.002656	4	147.95	117.82	0.36
Stream 4C6	3	11054	0.4% Annual Chan	650	471.2	477.81	475.58	478.08	0.002536	4.19	175.89	160.63	0.36
Stream 4C6	3	11054	0.2% Annual Chan	750	471.2	478.16	475.87	478.45	0.002539	4.42	199.33	224.5	0.36
Stream 4C6	3	11050	Bridge										
Stream 4C6	3	11039	50% Annual Chanc	150	470.98	473.7	473.12	474.01	0.009603	4.52	33.22	19.18	0.6
Stream 4C6	3	11039	20% Annual Chanc	275	470.98	474.85	473.84	475.2	0.006891	4.74	57.96	23.93	0.54
Stream 4C6	3	11039	10% Annual Chanc	350	470.98	475.56	474.19	475.89	0.005375	4.59	76.24	27.36	0.48
Stream 4C6	3	11039	4% Annual Chance	450	470.98	476.52	474.6	476.81	0.003658	4.29	105.12	32.98	0.41
Stream 4C6	3	11039	2% Annual Chance	500	470.98	476.79	474.8	477.09	0.003497	4.41	114.16	34.81	0.41
Stream 4C6	3	11039	1% Annual Chance	550	470.98	477.09	474.98	477.4	0.003224	4.47	125.11	37.52	0.4
Stream 4C6	3	11039	0.4% Annual Chan	650	470.98	477.49	475.32	477.85	0.003255	4.79	140.42	57	0.41
Stream 4C6	3	11039	0.2% Annual Chan	750	470.98	477.8	475.64	478.21	0.003424	5.14	158.13	159.62	0.42
Stream 4C6	3	10944	50% Annual Chanc	150	470.53	473.31	471.98	473.44	0.00275	2.85	52.6	23.31	0.33
Stream 4C6	3	10944	20% Annual Chanc	275	470.53	474.53	472.61	474.7	0.002467	3.3	83.23	26.74	0.33
Stream 4C6	3	10944	10% Annual Chanc	350	470.53	475.3	472.92	475.48	0.002091	3.34	104.67	28.9	0.31
Stream 4C6	3	10944	4% Annual Chance	450	470.53	476.34	473.32	476.51	0.001537	3.3	143.65	49.45	0.27
Stream 4C6	3	10944	2% Annual Chance	500	470.53	476.61	473.49	476.79	0.001548	3.44	158.17	54.22	0.28
Stream 4C6	3	10944	1% Annual Chance	550	470.53	476.93	473.67	477.12	0.001492	3.53	176.26	61.36	0.28
Stream 4C6	3	10944	0.4% Annual Chan	650	470.53	477.32	473.99	477.54	0.001615	3.85	211.05	144.02	0.29
Stream 4C6	3	10944	0.2% Annual Chan	750	470.53	477.62	474.29	477.87	0.001706	4.1	258.62	166.05	0.3
Stream 4C6	3	10900	Culvert										
Stream 4C6	3	10846	50% Annual Chanc	150	469.9	472.75	471.59	472.91	0.00375	3.24	46.25	21.27	0.39
Stream 4C6	3	10846	20% Annual Chanc	275	469.9	473.65	472.26	473.91	0.004707	4.07	67.53	26.09	0.45
Stream 4C6	3	10846	10% Annual Chanc	350	469.9	474.03	472.6	474.35	0.005274	4.49	77.87	28.24	0.48
Stream 4C6	3	10846	4% Annual Chance	450	469.9	474.53	473.02	474.9	0.005608	4.86	92.57	31.26	0.5
Stream 4C6	3	10846	2% Annual Chance	500	469.9	474.82	473.23	475.19	0.005423	4.91	101.81	33.01	0.49
Stream 4C6	3	10846	1% Annual Chance	550	469.9	475.19	473.42	475.55	0.004707	4.81	114.51	35.37	0.46
Stream 4C6	3	10846	0.4% Annual Chan	650	469.9	475.66	473.77	476.04	0.004226	4.97	131.91	38.46	0.45
Stream 4C6	3	10846	0.2% Annual Chan	750	469.9	476.01	474.09	476.43	0.004183	5.24	145.88	42.34	0.45
Stream 4C6	3	10477	50% Annual Chanc	275	469.39	471.41	470.5	471.54	0.003641	2.92	94.15	52.19	0.38
Stream 4C6	3	10477	20% Annual Chanc	500	469.39	472.52	471	472.68	0.002673	3.22	155.4	58.83	0.35
Stream 4C6	3	10477	10% Annual Chanc	600	469.39	472.89	471.2	473.07	0.002607	3.38	177.75	61.39	0.35
Stream 4C6	3	10477	4% Annual Chance	750	469.39	473.41	471.47	473.61	0.002506	3.56	210.43	64.95	0.35
Stream 4C6	3	10477	2% Annual Chance	850	469.39	473.73	471.64	473.94	0.002446	3.67	231.64	67.16	0.35
Stream 4C6	3	10477	1% Annual Chance	1000	469.39	474.19	471.88	474.42	0.002306	3.79	270.23	115.36	0.34
Stream 4C6	3	10477	0.4% Annual Chan	1200	469.39	474.78	472.19	475.01	0.00207	3.9	326.58	160.46	0.33
Stream 4C6	3	10477	0.2% Annual Chan	1350	469.39	475.21	472.41	475.45	0.00189	3.97	370.73	206.59	0.32
Stream 4C6	3	10400	Culvert										
Stream 4C6	3	10330	50% Annual Chanc	275	467.26	471.1	468.36	471.13	0.000374	1.35	204.17	68.27	0.13
Stream 4C6	3	10330	20% Annual Chanc	500	467.26	472.08	468.87	472.13	0.000504	1.84	289.57	153.6	0.16
Stream 4C6	3	10330	10% Annual Chanc	600	467.26	472.35	469.06	472.42	0.000584	2.06	315.97	160.78	0.18
Stream 4C6	3	10330	4% Annual Chance	750	467.26	472.71	469.33	472.79	0.000698	2.36	350.9	167.24	0.19
Stream 4C6	3	10330	2% Annual Chance	850	467.26	472.91	469.5	473.01	0.00077	2.55	371.04	171.12	0.21
Stream 4C6	3	10330	1% Annual Chance	1000	467.26	473.18	469.75	473.3	0.000877	2.83	398.46	175.46	0.22
Stream 4C6	3	10330	0.4% Annual Chan	1200	467.26	473.49	470.04	473.64	0.001028	3.18	429.7	181.22	0.24
Stream 4C6	3	10330	0.2% Annual Chan	1350	467.26	473.68	470.24	473.86	0.001146	3.44	452.66	212.45	0.26
Stream 4C6	3	10290	50% Annual Chanc	275	466.45	471.02		471.09	0.001649	2.12	147.61	94.54	0.22
Stream 4C6	3	10290	20% Annual Chanc	500	466.45	472		472.09	0.00163	2.58	266.79	166.91	0.23
Stream 4C6	3	10290	10% Annual Chanc	600	466.45	472.27		472.37	0.001661	2.73	313.82	174.15	0.24
Stream 4C6	3	10290	4% Annual Chance	750	466.45	472.64		472.74	0.001684	2.91	380.01	186.3	0.24
Stream 4C6	3	10290	2% Annual Chance	850	466.45	472.85		472.96	0.001712	3.03	420.48	195.96	0.25
Stream 4C6	3	10290	1% Annual Chance	1000	466.45	473.14		473.25	0.001753	3.19	478.5	211.31	0.25
Stream 4C6	3	10290	0.4% Annual Chan	1200	466.45	473.45		473.57	0.001827	3.4	545.18	218.81	0.26
Stream 4C6	3	10290	0.2% Annual Chan	1350	466.45	473.65		473.78	0.001896	3.55	589.62	223.31	0.27
Stream 4C6	3	9831	50% Annual Chanc	275	465.78	469.15		469.42	0.013484	4.14	66.44	33.32	0.52
Stream 4C6	3	9831	20% Annual Chanc	500	465.78	470		470.37	0.01517	4.94	113.29	100.19	0.56
Stream 4C6	3	9831	10% Annual Chanc	600	465.78	470.2	469.32	470.61	0.01588	5.32	134.15	110.92	0.59
Stream 4C6	3	9831	4% Annual Chance	750	465.78	470.38	470.01	470.9	0.018499	6.02	154.73	114.86	0.64
Stream 4C6	3	9831	2% Annual Chance	850	465.78	470.51	470.24	471.08	0.019501	6.37	169.67	119.76	0.66
Stream 4C6	3	9831	1% Annual Chance	1000	465.78	470.74	470.47	471.33	0.019051	6.63	200.66	149.88	0.66
Stream 4C6	3	9831	0.4% Annual Chan	1200	465.78	471.02	470.73	471.62	0.01804	6.84	263.14	280.62	0.65
Stream 4C6	3	9831	0.2% Annual Chan	1350	465.78	471.19	471.06	471.79	0.017568	6.97	311.79	289.23	0.65
Stream 4C6	3	9306	50% Annual Chanc	275	463.83	467.13		467.15	0.00205	1.63	272.57	278.47	0.18
Stream 4C6	3	9306	20% Annual Chanc	500	463.83	467.54		467.57	0.002632	2.05	394.15	311.47	0.21
Stream 4C6	3	9306	10% Annual Chanc	600	463.83	467.71		467.75	0.002661	2.14	452.53	338.61	0.22
Stream 4C6	3	9306	4% Annual Chance	750	463.83	467.98		468.02	0.002497	2.19	546.43	369.11	0.21

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	3	9306	2% Annual Chance	850	463.83	468.12		468.16	0.002488	2.25	599.34	381.6	0.21
Stream 4C6	3	9306	1% Annual Chance	1000	463.83	468.28		468.32	0.002631	2.38	659.81	393	0.22
Stream 4C6	3	9306	0.4% Annual Chan	1200	463.83	468.45		468.51	0.002836	2.55	731.24	405.85	0.23
Stream 4C6	3	9306	0.2% Annual Chan	1350	463.83	468.59		468.65	0.002911	2.65	787.15	414.69	0.24
Stream 4C6	3	8542	50% Annual Chanc	350	460.45	463.97	463.61	464.07	0.010516	2.9	180.67	253.97	0.39
Stream 4C6	3	8542	20% Annual Chanc	600	460.45	464.43		464.52	0.008025	2.96	306.87	300.9	0.35
Stream 4C6	3	8542	10% Annual Chanc	750	460.45	464.62		464.71	0.00781	3.09	366.4	323.1	0.35
Stream 4C6	3	8542	4% Annual Chance	1000	460.45	464.83		464.94	0.008572	3.43	437.11	342.51	0.38
Stream 4C6	3	8542	2% Annual Chance	1150	460.45	464.96		465.07	0.008699	3.56	480.96	353.76	0.38
Stream 4C6	3	8542	1% Annual Chance	1300	460.45	465.09		465.21	0.008577	3.65	528.58	368.53	0.38
Stream 4C6	3	8542	0.4% Annual Chan	1550	460.45	465.36		465.47	0.007461	3.61	630.16	392.96	0.36
Stream 4C6	3	8542	0.2% Annual Chan	1800	460.45	465.6		465.71	0.006689	3.6	728.25	413.8	0.35
Stream 4C6	3	7726	50% Annual Chanc	350	453.52	459.76		459.89	0.003215	2.91	126.8	68.79	0.27
Stream 4C6	3	7726	20% Annual Chanc	600	453.52	460.81		460.93	0.003203	3.1	248.34	152.59	0.27
Stream 4C6	3	7726	10% Annual Chanc	750	453.52	461.24		461.37	0.002987	3.19	327.26	212.62	0.27
Stream 4C6	3	7726	4% Annual Chance	1000	453.52	461.77	459	461.88	0.002567	3.19	450.06	248.49	0.25
Stream 4C6	3	7726	2% Annual Chance	1150	453.52	462.05	460.22	462.16	0.002404	3.2	521.95	264.96	0.25
Stream 4C6	3	7726	1% Annual Chance	1300	453.52	462.28	460.47	462.39	0.002338	3.25	583.08	274.51	0.25
Stream 4C6	3	7726	0.4% Annual Chan	1550	453.52	462.49	460.77	462.62	0.002615	3.52	644.17	298.81	0.26
Stream 4C6	3	7726	0.2% Annual Chan	1800	453.52	462.67		462.81	0.002902	3.79	698.03	307.85	0.28
Stream 4C6	3	7315	50% Annual Chanc	350	452.69	456.19		456.74	0.034807	5.96	58.7	27.63	0.72
Stream 4C6	3	7315	20% Annual Chanc	600	452.69	457.43		458.03	0.025512	6.18	97.07	34.07	0.65
Stream 4C6	3	7315	10% Annual Chanc	750	452.69	457.85		458.55	0.027827	6.71	111.7	36.97	0.68
Stream 4C6	3	7315	4% Annual Chance	1000	452.69	458.36		459.26	0.032682	7.59	131.74	40.96	0.75
Stream 4C6	3	7315	2% Annual Chance	1150	452.69	458.69	457.96	459.65	0.033223	7.86	149.71	67.94	0.76
Stream 4C6	3	7315	1% Annual Chance	1300	452.69	459.09	458.27	460.01	0.028715	7.77	184.09	112.84	0.71
Stream 4C6	3	7315	0.4% Annual Chan	1550	452.69	459.93	459.19	460.48	0.015146	6.47	349.69	267.18	0.54
Stream 4C6	3	7315	0.2% Annual Chan	1800	452.69	460.48		460.84	0.009682	5.58	510.94	311.7	0.44
Stream 4C6	3	7010	50% Annual Chanc	350	451.68	456.41	453.21	456.45	0.000034	1.65	213.52	57.7	0.15
Stream 4C6	3	7010	20% Annual Chanc	600	451.68	457.65	453.8	457.72	0.00004	2.13	288.88	63.3	0.16
Stream 4C6	3	7010	10% Annual Chanc	750	451.68	458.1	454.1	458.19	0.000047	2.44	317.71	65.32	0.18
Stream 4C6	3	7010	4% Annual Chance	1000	451.68	458.68	454.55	458.81	0.000059	2.92	356.23	67.92	0.21
Stream 4C6	3	7010	2% Annual Chance	1150	451.68	459.02	454.81	459.18	0.000064	3.17	380.06	91.64	0.22
Stream 4C6	3	7010	1% Annual Chance	1300	451.68	459.39	455.04	459.56	0.000068	3.37	405.8	173.61	0.23
Stream 4C6	3	7010	0.4% Annual Chan	1550	451.68	460.03	455.41	460.22	0.000068	3.6	579.23	318.63	0.23
Stream 4C6	3	7010	0.2% Annual Chan	1800	451.68	460.48	455.73	460.69	0.000073	3.85	726.99	360.66	0.24
Stream 4C6	3	7000		Culvert									
Stream 4C6	3	6894	50% Annual Chanc	350	451.38	456.32	452.91	456.36	0.000029	1.56	227.4	59.73	0.13
Stream 4C6	3	6894	20% Annual Chanc	600	451.38	457.49	453.5	457.56	0.000036	2.06	300.19	64.59	0.16
Stream 4C6	3	6894	10% Annual Chanc	750	451.38	457.88	453.8	457.97	0.000044	2.39	325.62	138.58	0.18
Stream 4C6	3	6894	4% Annual Chance	1000	451.38	458.34	454.26	458.47	0.00006	2.94	358.99	207.36	0.21
Stream 4C6	3	6894	2% Annual Chance	1150	451.38	458.61	454.5	458.76	0.000068	3.22	384.3	227.88	0.22
Stream 4C6	3	6894	1% Annual Chance	1300	451.38	458.86	454.74	459.04	0.000075	3.47	407.81	248.26	0.24
Stream 4C6	3	6894	0.4% Annual Chan	1550	451.38	459.21	455.11	459.44	0.000088	3.89	441.27	298.03	0.26
Stream 4C6	3	6894	0.2% Annual Chan	1800	451.38	459.45	455.44	459.73	0.000105	4.34	463.96	335.58	0.28
Stream 4C6	3	6842	50% Annual Chanc	350	448.85	456.19		456.33	0.00375	2.92	122.1	35.36	0.25
Stream 4C6	3	6842	20% Annual Chanc	600	448.85	457.3		457.51	0.004627	3.79	206.23	188.04	0.29
Stream 4C6	3	6842	10% Annual Chanc	750	448.85	457.7		457.92	0.004701	4.02	288.76	216.72	0.3
Stream 4C6	3	6842	4% Annual Chance	1000	448.85	458.2		458.43	0.00485	4.31	409.24	266.69	0.31
Stream 4C6	3	6842	2% Annual Chance	1150	448.85	458.53		458.74	0.004533	4.32	503.81	308.33	0.3
Stream 4C6	3	6842	1% Annual Chance	1300	448.85	458.84		459.02	0.004063	4.22	603.27	326.41	0.28
Stream 4C6	3	6842	0.4% Annual Chan	1550	448.85	459.23		459.4	0.003817	4.24	733.28	356.71	0.28
Stream 4C6	3	6842	0.2% Annual Chan	1800	448.85	459.49		459.67	0.004133	4.51	830.92	391.88	0.29
Stream 4C6	3	6694	50% Annual Chanc	350	448.57	455.96		456.01	0.001201	1.94	234.69	106.39	0.15
Stream 4C6	3	6694	20% Annual Chanc	600	448.57	457.06		457.13	0.001364	2.36	460.09	312.09	0.17
Stream 4C6	3	6694	10% Annual Chanc	750	448.57	457.49		457.55	0.001298	2.4	596.86	327.85	0.16
Stream 4C6	3	6694	4% Annual Chance	1000	448.57	457.98		458.04	0.00139	2.61	765.01	364.3	0.17
Stream 4C6	3	6694	2% Annual Chance	1150	448.57	458.31		458.37	0.001322	2.62	890.43	387.6	0.17
Stream 4C6	3	6694	1% Annual Chance	1300	448.57	458.62		458.69	0.001299	2.67	1018.14	429.95	0.17
Stream 4C6	3	6694	0.4% Annual Chan	1550	448.57	459.01		459.07	0.001277	2.73	1188.33	448.33	0.17
Stream 4C6	3	6694	0.2% Annual Chan	1800	448.57	459.25		459.32	0.001384	2.9	1297.24	457.5	0.18
Stream 4C6	2	6239	50% Annual Chanc	950	446.26	455.16		455.37	0.002025	3.89	338.13	235.94	0.27
Stream 4C6	2	6239	20% Annual Chanc	1650	446.26	456.15		456.38	0.002375	4.63	745.34	519.2	0.3
Stream 4C6	2	6239	10% Annual Chanc	2150	446.26	456.66		456.85	0.002178	4.63	1025.93	571.71	0.29
Stream 4C6	2	6239	4% Annual Chance	2850	446.26	457.14		457.33	0.002198	4.84	1308.22	606.18	0.29
Stream 4C6	2	6239	2% Annual Chance	3400	446.26	457.49		457.67	0.002162	4.93	1528.97	638.98	0.29
Stream 4C6	2	6239	1% Annual Chance	3950	446.26	457.81		457.98	0.002173	5.06	1730.97	655.61	0.3
Stream 4C6	2	6239	0.4% Annual Chan	4750	446.26	458.18		458.36	0.002211	5.24	1981.09	674.06	0.3

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	2	6239	0.2% Annual Chan	5300	446.26	458.38		458.57	0.002311	5.44	2116.85	684.8	0.31
Stream 4C6	2	6059	50% Annual Chanc	950	445.85	454.55	452.63	454.87	0.004152	5.08	288.96	219.7	0.37
Stream 4C6	2	6059	20% Annual Chanc	1650	445.85	455.62	453.85	455.89	0.003691	5.35	605.76	350.45	0.36
Stream 4C6	2	6059	10% Annual Chanc	2150	445.85	456.21	455.22	456.43	0.003206	5.27	818.2	380.54	0.34
Stream 4C6	2	6059	4% Annual Chance	2850	445.85	456.63	455.61	456.88	0.003623	5.8	984.98	411.65	0.36
Stream 4C6	2	6059	2% Annual Chance	3400	445.85	456.98	455.89	457.24	0.003672	6.01	1133.58	438.13	0.37
Stream 4C6	2	6059	1% Annual Chance	3950	445.85	457.28	456.02	457.54	0.003747	6.22	1268.65	461.21	0.37
Stream 4C6	2	6059	0.4% Annual Chan	4750	445.85	457.62	456.32	457.91	0.003988	6.59	1429.16	471.84	0.39
Stream 4C6	2	6059	0.2% Annual Chan	5300	445.85	457.77		458.09	0.004366	6.97	1499.46	475.5	0.41
Stream 4C6	2	5757	50% Annual Chanc	950	445.25	450.97	450.97	452.24	0.02608	9.15	112.31	52.02	0.87
Stream 4C6	2	5757	20% Annual Chanc	1650	445.25	452.25	452.25	453.57	0.022511	9.8	201.21	80.83	0.85
Stream 4C6	2	5757	10% Annual Chanc	2150	445.25	452.79	452.79	454.3	0.022751	10.69	246.89	93.1	0.87
Stream 4C6	2	5757	4% Annual Chance	2850	445.25	454	454	455.01	0.012751	9.32	471.99	276.65	0.68
Stream 4C6	2	5757	2% Annual Chance	3400	445.25	454.34	454.34	455.35	0.012693	9.66	573.56	316.56	0.68
Stream 4C6	2	5757	1% Annual Chance	3950	445.25	454.65	454.65	455.65	0.012499	9.9	677.24	352.58	0.68
Stream 4C6	2	5757	0.4% Annual Chan	4750	445.25	455.19	455.03	456.05	0.010841	9.71	874.88	403.15	0.64
Stream 4C6	2	5757	0.2% Annual Chan	5300	445.25	456.11		456.59	0.006118	7.91	1355.37	569.81	0.49
Stream 4C6	2	5525	50% Annual Chanc	900	443.85	449.11	446.86	449.19	0.001585	2.37	379.16	113.45	0.23
Stream 4C6	2	5525	20% Annual Chanc	1600	443.85	450.57	447.5	450.7	0.001633	2.89	552.99	125.47	0.24
Stream 4C6	2	5525	10% Annual Chanc	2150	443.85	451.46	447.93	451.62	0.001628	3.23	667.77	133.4	0.25
Stream 4C6	2	5525	4% Annual Chance	2800	443.85	452.34	448.39	452.54	0.001631	3.59	788.94	140.94	0.26
Stream 4C6	2	5525	2% Annual Chance	3300	443.85	452.96	448.72	453.18	0.001636	3.83	877.14	146.18	0.26
Stream 4C6	2	5525	1% Annual Chance	3900	443.85	453.7	449.09	453.96	0.001594	4.06	988.28	151.22	0.26
Stream 4C6	2	5525	0.4% Annual Chan	4700	443.85	454.7	449.55	454.98	0.001509	4.29	1152.66	186.8	0.26
Stream 4C6	2	5525	0.2% Annual Chan	5200	443.85	455.61	449.83	455.89	0.00128	4.23	1341.99	261.97	0.24
Stream 4C6	2	5400		Culvert									
Stream 4C6	2	4891	50% Annual Chanc	900	442.34	448.82	446.24	448.98	0.004181	3.24	283.28	164.98	0.29
Stream 4C6	2	4891	20% Annual Chanc	1600	442.34	450.07	447.31	450.29	0.004277	3.95	489.84	317.42	0.31
Stream 4C6	2	4891	10% Annual Chanc	2150	442.34	450.71	447.96	450.96	0.004336	4.3	626.48	344.27	0.31
Stream 4C6	2	4891	4% Annual Chance	2800	442.34	451.24	448.64	451.53	0.004717	4.76	741.24	359.73	0.33
Stream 4C6	2	4891	2% Annual Chance	3300	442.34	451.54	449.45	451.88	0.005194	5.15	805.95	366.09	0.35
Stream 4C6	2	4891	1% Annual Chance	3900	442.34	451.9	450.1	452.29	0.005593	5.54	882.92	372.99	0.37
Stream 4C6	2	4891	0.4% Annual Chan	4700	442.34	452.32	450.52	452.77	0.006118	6.02	972.74	378.34	0.39
Stream 4C6	2	4891	0.2% Annual Chan	5200	442.34	452.57	450.74	453.06	0.006386	6.29	1026.2	388.06	0.4
Stream 4C6	2	4553	50% Annual Chanc	900	440.92	447.27		447.43	0.005096	3.21	291.65	105.75	0.3
Stream 4C6	2	4553	20% Annual Chanc	1600	440.92	448.2		448.48	0.006977	4.3	433.39	226.57	0.37
Stream 4C6	2	4553	10% Annual Chanc	2150	440.92	448.7		449.04	0.007807	4.89	585.92	405.55	0.39
Stream 4C6	2	4553	4% Annual Chance	2800	440.92	449.19		449.54	0.00787	5.24	808.47	495.63	0.4
Stream 4C6	2	4553	2% Annual Chance	3300	440.92	449.58		449.9	0.007061	5.21	1009.42	526.5	0.39
Stream 4C6	2	4553	1% Annual Chance	3900	440.92	449.89		450.22	0.007091	5.41	1176.3	541.41	0.39
Stream 4C6	2	4553	0.4% Annual Chan	4700	440.92	450.27		450.6	0.006981	5.59	1386.88	571.76	0.39
Stream 4C6	2	4553	0.2% Annual Chan	5200	440.92	450.51		450.84	0.006933	5.71	1521.33	580.97	0.39
Stream 4C6	2	3968	50% Annual Chanc	900	438.42	445.67	443.01	445.76	0.001745	2.73	576.57	540.09	0.24
Stream 4C6	2	3968	20% Annual Chanc	1650	438.42	446.38	445.11	446.48	0.001909	3.2	984.86	622.14	0.26
Stream 4C6	2	3968	10% Annual Chanc	2150	438.42	446.68	445.59	446.79	0.002111	3.51	1164.37	638.53	0.28
Stream 4C6	2	3968	4% Annual Chance	2800	438.42	447	445.87	447.12	0.002388	3.89	1357.33	660.67	0.3
Stream 4C6	2	3968	2% Annual Chance	3350	438.42	447.22	446.06	447.37	0.002842	4.36	1500.14	767.36	0.33
Stream 4C6	2	3968	1% Annual Chance	3900	438.42	447.44	446.2	447.61	0.002989	4.6	1666.91	811.06	0.34
Stream 4C6	2	3968	0.4% Annual Chan	4700	438.42	447.74	446.46	447.92	0.003193	4.92	1893.79	871.18	0.36
Stream 4C6	2	3968	0.2% Annual Chan	5250	438.42	447.91	446.57	448.1	0.003343	5.13	2032.87	899.49	0.37
Stream 4C6	2	3900		Culvert									
Stream 4C6	2	3868	50% Annual Chanc	900	438.32	445.57	443.54	445.61	0.0024	2.25	740.2	583.46	0.21
Stream 4C6	2	3868	20% Annual Chanc	1650	438.32	446.32	445.07	446.37	0.002133	2.4	1219.61	688.37	0.2
Stream 4C6	2	3868	10% Annual Chanc	2150	438.32	446.61	445.3	446.66	0.002251	2.58	1420.7	700.21	0.21
Stream 4C6	2	3868	4% Annual Chance	2800	438.32	446.94	445.5	447	0.002418	2.79	1659.41	741.72	0.22
Stream 4C6	2	3868	2% Annual Chance	3350	438.32	447.2	445.66	447.27	0.002489	2.93	1857.19	778.47	0.22
Stream 4C6	2	3868	1% Annual Chance	3900	438.32	447.43	445.78	447.5	0.002603	3.08	2036.63	828.3	0.23
Stream 4C6	2	3868	0.4% Annual Chan	4700	438.32	447.73	445.96	447.81	0.002728	3.27	2304.27	899.57	0.24
Stream 4C6	2	3868	0.2% Annual Chan	5250	438.32	447.91	446.09	448	0.002746	3.35	2469.03	912.3	0.24
Stream 4C6	2	3113	50% Annual Chanc	900	435.02	442.51		442.87	0.00859	4.82	214.77	147.71	0.4
Stream 4C6	2	3113	20% Annual Chanc	1650	435.02	443.43	441.59	443.89	0.010483	6.01	466.29	388.14	0.45
Stream 4C6	2	3113	10% Annual Chanc	2150	435.02	443.89	443.44	444.3	0.009707	6.1	653.18	422.99	0.44
Stream 4C6	2	3113	4% Annual Chance	2800	435.02	444.39		444.74	0.008743	6.11	870.86	455.32	0.42
Stream 4C6	2	3113	2% Annual Chance	3350	435.02	444.74		445.07	0.008268	6.16	1037.71	492.14	0.42
Stream 4C6	2	3113	1% Annual Chance	3900	435.02	445.04		445.35	0.007754	6.14	1186.65	500.85	0.41
Stream 4C6	2	3113	0.4% Annual Chan	4700	435.02	445.45		445.74	0.007081	6.09	1392.46	513.14	0.39
Stream 4C6	2	3113	0.2% Annual Chan	5250	435.02	445.73		446.01	0.006589	6.02	1538.25	525.58	0.38

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Stream 4C6	2	2759	50% Annual Chanc	900	434.54	442.07	438.51	442.1	0.000622	1.77	1040.33	516.06	0.13
Stream 4C6	2	2759	20% Annual Chanc	1650	434.54	442.69	440.02	442.74	0.001053	2.47	1367.48	540.35	0.17
Stream 4C6	2	2759	10% Annual Chanc	2150	434.54	442.95	440.52	443.02	0.001363	2.89	1511.33	549.06	0.2
Stream 4C6	2	2759	4% Annual Chance	2800	434.54	443.31	441.02	443.39	0.001633	3.28	1711.6	572.65	0.22
Stream 4C6	2	2759	2% Annual Chance	3350	434.54	443.55	441.27	443.65	0.001877	3.6	1853.4	596.5	0.24
Stream 4C6	2	2759	1% Annual Chance	3900	434.54	443.81	441.52	443.91	0.001995	3.8	2008.48	604.04	0.25
Stream 4C6	2	2759	0.4% Annual Chan	4700	434.54	444.26	441.98	444.36	0.00195	3.9	2284.34	629.76	0.25
Stream 4C6	2	2759	0.2% Annual Chan	5250	434.54	444.62	442.15	444.72	0.001803	3.87	2515.46	644.12	0.24
Stream 4C6	2	2750	Bridge										
Stream 4C6	2	2728	50% Annual Chanc	900	433.95	442.02	438.13	442.06	0.000814	1.93	839.79	502.69	0.15
Stream 4C6	2	2728	20% Annual Chanc	1650	433.95	442.59	439.61	442.67	0.001463	2.77	1138.27	544.76	0.2
Stream 4C6	2	2728	10% Annual Chanc	2150	433.95	442.83	440.32	442.93	0.001916	3.25	1267.84	558.31	0.23
Stream 4C6	2	2728	4% Annual Chance	2850	433.95	443.16	441.2	443.29	0.00235	3.74	1458.9	575.75	0.26
Stream 4C6	2	2728	2% Annual Chance	3400	433.95	443.39	441.46	443.53	0.002665	4.07	1589.24	589.52	0.28
Stream 4C6	2	2728	1% Annual Chance	4000	433.95	443.63	441.82	443.79	0.002898	4.35	1738.75	612.7	0.29
Stream 4C6	2	2728	0.4% Annual Chan	4800	433.95	444.1	442.32	444.25	0.002671	4.37	2029.32	640.67	0.29
Stream 4C6	2	2728	0.2% Annual Chan	5400	433.95	444.48	442.55	444.62	0.002407	4.29	2279.31	666.96	0.27
Stream 4C6	2	2700	Culvert										
Stream 4C6	2	2672	50% Annual Chanc	900	431.22	440.21	435.17	440.3	0.001585	2.62	471.01	239.58	0.18
Stream 4C6	2	2672	20% Annual Chanc	1650	431.22	441.15	436.6	441.3	0.00246	3.57	773.58	445.58	0.23
Stream 4C6	2	2672	10% Annual Chanc	2150	431.22	441.64	437.39	441.81	0.002756	3.94	1019.63	546.88	0.25
Stream 4C6	2	2672	4% Annual Chance	2850	431.22	442.33	438.37	442.48	0.002498	3.97	1396.96	574.78	0.24
Stream 4C6	2	2672	2% Annual Chance	3400	431.22	442.97	440.29	443.09	0.00202	3.74	1753.91	630.74	0.22
Stream 4C6	2	2672	1% Annual Chance	4000	431.22	443.48	440.75	443.58	0.001741	3.6	2126.98	669.71	0.2
Stream 4C6	2	2672	0.4% Annual Chan	4800	431.22	444.07	441.22	444.16	0.001516	3.49	2527.63	689.71	0.19
Stream 4C6	2	2672	0.2% Annual Chan	5400	431.22	444.45	441.76	444.54	0.001421	3.46	2792.83	703.07	0.19
Stream 4C6	1	2063	50% Annual Chanc	900	430.04	439.26		439.33	0.00186	2.73	677.67	380.42	0.18
Stream 4C6	1	2063	20% Annual Chanc	1350	430.04	439.97		440.03	0.001917	2.96	982.05	471.67	0.19
Stream 4C6	1	2063	10% Annual Chanc	1650	430.04	440.35		440.41	0.002028	3.15	1172.92	552.38	0.2
Stream 4C6	1	2063	4% Annual Chance	2400	430.04	441.02		441.09	0.002305	3.54	1581.87	635.54	0.21
Stream 4C6	1	2063	2% Annual Chance	3500	430.04	441.74		441.82	0.002479	3.87	2068.85	706.15	0.22
Stream 4C6	1	2063	1% Annual Chance	4500	430.04	442.33		442.41	0.002469	4.03	2495.97	746.16	0.22
Stream 4C6	1	2063	0.4% Annual Chan	5800	430.04	442.97		443.06	0.00251	4.23	3002.83	801.54	0.23
Stream 4C6	1	2063	0.2% Annual Chan	6600	430.04	443.41		443.5	0.002374	4.23	3361.22	828.1	0.22
Stream 4C6	1	1542	50% Annual Chanc	900	429.21	438.52		438.56	0.001618	2.26	773.1	490.75	0.17
Stream 4C6	1	1542	20% Annual Chanc	1350	429.21	439.28		439.33	0.001441	2.33	1211.91	625.87	0.17
Stream 4C6	1	1542	10% Annual Chanc	1650	429.21	439.71		439.75	0.001263	2.28	1481.9	637	0.16
Stream 4C6	1	1542	4% Annual Chance	2400	429.21	440.34		440.38	0.001366	2.53	1885.87	653.72	0.17
Stream 4C6	1	1542	2% Annual Chance	3500	429.21	440.94		441	0.001729	3	2301.04	739.04	0.19
Stream 4C6	1	1542	1% Annual Chance	4500	429.21	441.48		441.55	0.001947	3.33	2719.79	794.21	0.2
Stream 4C6	1	1542	0.4% Annual Chan	5800	429.21	442.13		442.2	0.001964	3.52	3254.2	864.27	0.21
Stream 4C6	1	1542	0.2% Annual Chan	6600	429.21	442.6		442.68	0.001923	3.6	3676.66	913.85	0.21
Stream 4C6	1	725	50% Annual Chanc	900	427.16	437.81		437.85	0.000841	1.98	881.36	485.02	0.13
Stream 4C6	1	725	20% Annual Chanc	1350	427.16	438.69		438.73	0.000817	2.1	1359.95	594.37	0.13
Stream 4C6	1	725	10% Annual Chanc	1650	427.16	439.23		439.26	0.000724	2.06	1682.83	614.18	0.12
Stream 4C6	1	725	4% Annual Chance	2400	427.16	439.8		439.84	0.00094	2.45	2042.27	646.87	0.14
Stream 4C6	1	725	2% Annual Chance	3500	427.16	440.22		440.28	0.001414	3.09	2314.28	652.15	0.17
Stream 4C6	1	725	1% Annual Chance	4500	427.16	440.66		440.74	0.001705	3.49	2607.73	676.56	0.19
Stream 4C6	1	725	0.4% Annual Chan	5800	427.16	441.32		441.4	0.001811	3.75	3064.67	704.34	0.2
Stream 4C6	1	725	0.2% Annual Chan	6600	427.16	441.85		441.93	0.001686	3.73	3445.43	722.66	0.19
Hickory Trib 4	1	3766	50% Annual Chanc	200	469.95	472.68	472.12	472.75	0.007486	2.16	93.38	134.57	0.4
Hickory Trib 4	1	3766	20% Annual Chanc	300	469.95	472.88	472.35	472.98	0.008208	2.58	125.3	166.06	0.44
Hickory Trib 4	1	3766	10% Annual Chanc	375	469.95	473.04	472.49	473.15	0.007903	2.76	151.65	179.07	0.44
Hickory Trib 4	1	3766	4% Annual Chance	450	469.95	473.18	472.62	473.3	0.00756	2.9	178.09	191.83	0.43
Hickory Trib 4	1	3766	2% Annual Chance	550	469.95	473.38	472.78	473.51	0.006707	2.99	218.34	208.48	0.42
Hickory Trib 4	1	3766	1% Annual Chance	600	469.95	473.47	472.85	473.6	0.006404	3.04	237.85	215.92	0.41
Hickory Trib 4	1	3766	0.4% Annual Chan	700	469.95	473.65	472.95	473.78	0.005868	3.11	277.47	232.7	0.4
Hickory Trib 4	1	3766	0.2% Annual Chan	800	469.95	473.81	473.05	473.94	0.005478	3.17	315.78	244.15	0.39
Hickory Trib 4	1	3243	50% Annual Chanc	200	467.3	469.25		469.34	0.005739	2.36	84.64	69.58	0.37
Hickory Trib 4	1	3243	20% Annual Chanc	300	467.3	469.65		469.75	0.004868	2.61	121.52	109.61	0.36
Hickory Trib 4	1	3243	10% Annual Chanc	375	467.3	469.84		469.96	0.00492	2.83	144.3	124.14	0.37
Hickory Trib 4	1	3243	4% Annual Chance	450	467.3	470		470.14	0.005059	3.04	165.28	137.57	0.38
Hickory Trib 4	1	3243	2% Annual Chance	550	467.3	470.13		470.3	0.00581	3.4	184.93	160.44	0.41
Hickory Trib 4	1	3243	1% Annual Chance	600	467.3	470.19		470.37	0.006173	3.57	194.5	173	0.43
Hickory Trib 4	1	3243	0.4% Annual Chan	700	467.3	470.28	469.58	470.5	0.007024	3.91	212.24	201.01	0.46
Hickory Trib 4	1	3243	0.2% Annual Chan	800	467.3	470.36	469.73	470.6	0.007894	4.24	227.99	213.86	0.49

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Trib 4	1	2325	50% Annual Chanc	200	461.48	464.51		464.62	0.004627	2.7	74.53	48.43	0.35
Hickory Trib 4	1	2325	20% Annual Chanc	300	461.48	464.89		465.05	0.005386	3.29	100.04	105.98	0.39
Hickory Trib 4	1	2325	10% Annual Chanc	375	461.48	465.15		465.34	0.005246	3.51	137.05	160.79	0.4
Hickory Trib 4	1	2325	4% Annual Chance	450	461.48	465.37		465.55	0.005084	3.65	174.27	183.03	0.4
Hickory Trib 4	1	2325	2% Annual Chance	550	461.48	465.68		465.85	0.004326	3.63	233.24	195.89	0.37
Hickory Trib 4	1	2325	1% Annual Chance	600	461.48	465.82		465.98	0.004043	3.62	261.68	202.54	0.36
Hickory Trib 4	1	2325	0.4% Annual Chan	700	461.48	466.11		466.26	0.003477	3.57	321.8	207.27	0.34
Hickory Trib 4	1	2325	0.2% Annual Chan	800	461.48	466.39		466.52	0.003046	3.52	378.9	210.71	0.32
Hickory Trib 4	1	1814	50% Annual Chanc	200	459.09	461.8		461.94	0.006014	2.99	66.99	39.64	0.4
Hickory Trib 4	1	1814	20% Annual Chanc	300	459.09	462.55		462.7	0.003973	3.09	98.95	45.71	0.35
Hickory Trib 4	1	1814	10% Annual Chanc	375	459.09	462.98		463.14	0.003559	3.25	119.08	49.12	0.34
Hickory Trib 4	1	1814	4% Annual Chance	450	459.09	463.52		463.68	0.002749	3.2	147.13	53.51	0.3
Hickory Trib 4	1	1814	2% Annual Chance	550	459.09	463.81		464	0.003058	3.57	162.94	56.21	0.33
Hickory Trib 4	1	1814	1% Annual Chance	600	459.09	464.17		464.35	0.002589	3.49	183.88	60.37	0.3
Hickory Trib 4	1	1814	0.4% Annual Chan	700	459.09	464.55		464.75	0.002535	3.66	208.23	68.54	0.31
Hickory Trib 4	1	1814	0.2% Annual Chan	800	459.09	464.89		465.1	0.00254	3.85	233.56	85.12	0.31
Hickory Trib 4	1	1418	50% Annual Chanc	550	455.44	460.49		460.64	0.002754	3.1	177.68	73.35	0.35
Hickory Trib 4	1	1418	20% Annual Chanc	875	455.44	461.46		461.65	0.002346	3.45	254.74	84.11	0.34
Hickory Trib 4	1	1418	10% Annual Chanc	1075	455.44	461.96		462.17	0.002174	3.66	297.98	89.42	0.33
Hickory Trib 4	1	1418	4% Annual Chance	1350	455.44	462.57		462.81	0.002023	3.91	354.93	95.83	0.33
Hickory Trib 4	1	1418	2% Annual Chance	1500	455.44	462.88		463.12	0.001976	4.04	384.2	99.01	0.33
Hickory Trib 4	1	1418	1% Annual Chance	1700	455.44	463.26		463.52	0.001923	4.2	422.81	104.19	0.33
Hickory Trib 4	1	1418	0.4% Annual Chan	2000	455.44	463.47		463.8	0.002297	4.72	445.14	107.05	0.36
Hickory Trib 4	1	1418	0.2% Annual Chan	2250	455.44	463.72		464.1	0.002464	5.04	472.39	112.6	0.38
Hickory Trib 4	1	907	50% Annual Chanc	550	453.14	457.73		458.3	0.008514	6.05	90.86	30.71	0.62
Hickory Trib 4	1	907	20% Annual Chanc	875	453.14	458.88		459.59	0.007793	6.78	129.69	37.03	0.62
Hickory Trib 4	1	907	10% Annual Chanc	1075	453.14	459.48		460.27	0.007079	7.14	153.18	41.19	0.6
Hickory Trib 4	1	907	4% Annual Chance	1350	453.14	459.89	458.77	460.89	0.008072	8.09	176.65	70.95	0.65
Hickory Trib 4	1	907	2% Annual Chance	1500	453.14	460.06	459.05	461.18	0.008748	8.61	188.62	77.54	0.68
Hickory Trib 4	1	907	1% Annual Chance	1700	453.14	460.22	459.43	461.53	0.009863	9.34	201.79	86.25	0.73
Hickory Trib 4	1	907	0.4% Annual Chan	2000	453.14	461.04	461.04	461.93	0.006233	8.21	352.5	251.95	0.6
Hickory Trib 4	1	907	0.2% Annual Chan	2250	453.14	461.24	461.24	462.13	0.006331	8.46	403.53	267.96	0.6
Hickory Trib 4	1	565	50% Annual Chanc	550	451.75	456.79	454.38	456.91	0.001633	2.8	197.04	67.24	0.28
Hickory Trib 4	1	565	20% Annual Chanc	875	451.75	458.27	455.07	458.41	0.001069	2.94	304.54	106.19	0.24
Hickory Trib 4	1	565	10% Annual Chanc	1075	451.75	459.08	455.43	459.19	0.000793	2.82	494.43	440.35	0.21
Hickory Trib 4	1	565	4% Annual Chance	1350	451.75	459.52	455.89	459.64	0.000811	3.01	653.92	558.29	0.22
Hickory Trib 4	1	565	2% Annual Chance	1500	451.75	459.67	456.14	459.79	0.00087	3.17	720.48	623.5	0.23
Hickory Trib 4	1	565	1% Annual Chance	1700	451.75	459.83	456.49	459.97	0.000911	3.3	803.05	644.43	0.24
Hickory Trib 4	1	565	0.4% Annual Chan	2000	451.75	460.06	456.84	460.2	0.000964	3.48	914.74	654.95	0.24
Hickory Trib 4	1	565	0.2% Annual Chan	2250	451.75	460.22	457.13	460.37	0.001009	3.62	996.64	663.12	0.25
Hickory Trib 4	1	500		Culvert									
Hickory Trib 4	1	481	50% Annual Chanc	550	450.72	456.32	453.17	456.43	0.00168	2.71	206.89	329.73	0.24
Hickory Trib 4	1	481	20% Annual Chanc	875	450.72	456.97	453.93	457.18	0.002507	3.67	248.04	349.32	0.3
Hickory Trib 4	1	481	10% Annual Chanc	1075	450.72	457.27	454.32	457.33	0.001066	2.49	751.55	354.33	0.2
Hickory Trib 4	1	481	4% Annual Chance	1350	450.72	457.67	454.83	457.74	0.001087	2.65	883.81	363.72	0.2
Hickory Trib 4	1	481	2% Annual Chance	1500	450.72	457.89	455.07	457.96	0.001075	2.71	957.44	368.36	0.2
Hickory Trib 4	1	481	1% Annual Chance	1700	450.72	458.16	455.45	458.23	0.001073	2.79	1045.84	375.15	0.2
Hickory Trib 4	1	481	0.4% Annual Chan	2000	450.72	458.58	456	458.65	0.001024	2.85	1188.03	403.99	0.2
Hickory Trib 4	1	481	0.2% Annual Chan	2250	450.72	458.94	456.38	459.01	0.000956	2.86	1326.89	496.78	0.2
Hickory Trib 4	1	327.5*	50% Annual Chanc	550	450.03	456.05		456.12	0.002154	2.38	364.82	292.9	0.22
Hickory Trib 4	1	327.5*	20% Annual Chanc	875	450.03	456.7		456.76	0.00194	2.49	578.23	371.43	0.22
Hickory Trib 4	1	327.5*	10% Annual Chanc	1075	450.03	457.08		457.14	0.001675	2.46	729.46	402.57	0.21
Hickory Trib 4	1	327.5*	4% Annual Chance	1350	450.03	457.49		457.55	0.001526	2.49	900.02	439.05	0.2
Hickory Trib 4	1	327.5*	2% Annual Chance	1500	450.03	457.72		457.78	0.001411	2.47	1002.4	452.7	0.19
Hickory Trib 4	1	327.5*	1% Annual Chance	1700	450.03	457.99		458.05	0.001318	2.47	1135.55	511.76	0.19
Hickory Trib 4	1	327.5*	0.4% Annual Chan	2000	450.03	458.43		458.48	0.001104	2.39	1363.61	527.18	0.17
Hickory Trib 4	1	327.5*	0.2% Annual Chan	2250	450.03	458.81		458.85	0.000943	2.3	1566.88	554.34	0.16
Hickory Trib 4	1	184	50% Annual Chanc	550	449.34	455.21	453.54	455.55	0.007935	4.74	154.37	258.91	0.49
Hickory Trib 4	1	184	20% Annual Chanc	875	449.34	456.31		456.41	0.003051	3.18	492.22	357.96	0.31
Hickory Trib 4	1	184	10% Annual Chanc	1075	449.34	456.81		456.88	0.001998	2.81	710.85	500.36	0.26
Hickory Trib 4	1	184	4% Annual Chance	1350	449.34	457.27		457.33	0.001566	2.69	945.74	523.05	0.23
Hickory Trib 4	1	184	2% Annual Chance	1500	449.34	457.52		457.57	0.0014	2.64	1081.37	546.8	0.22
Hickory Trib 4	1	184	1% Annual Chance	1700	449.34	457.81		457.86	0.001238	2.59	1245.35	574.01	0.21
Hickory Trib 4	1	184	0.4% Annual Chan	2000	449.34	458.29		458.33	0.000985	2.46	1524.87	603.38	0.19
Hickory Trib 4	1	184	0.2% Annual Chan	2250	449.34	458.69		458.73	0.000818	2.36	1771.63	626.66	0.18
Hickory Creek	3	62348	50% Annual Chanc	300	499.02	503.85	500.93	503.85	0.000002	0.11	3399.71	1253.16	0.01
Hickory Creek	3	62348	20% Annual Chanc	550	499.02	504.32	501.3	504.32	0.000005	0.17	3928.72	1272.38	0.01
Hickory Creek	3	62348	10% Annual Chanc	700	499.02	504.49	501.46	504.49	0.000007	0.2	4110.52	1280.66	0.02

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	62348	4% Annual Chance	1000	499.02	504.74	501.74	504.74	0.000011	0.27	4397.59	1312.01	0.02
Hickory Creek	3	62348	2% Annual Chance	1400	499.02	504.97	502.07	504.97	0.000018	0.35	4657.14	1329.67	0.03
Hickory Creek	3	62348	1% Annual Chance	1850	499.02	505.19	502.4	505.2	0.000027	0.43	4916.53	1360.14	0.03
Hickory Creek	3	62348	0.4% Annual Chan	2450	499.02	505.44	502.79	505.45	0.000039	0.54	5204.06	1382.99	0.04
Hickory Creek	3	62348	0.2% Annual Chan	2900	499.02	505.59	503.07	505.6	0.000049	0.62	5372.69	1394.49	0.04
Hickory Creek	3	62300	Mult Open										
Hickory Creek	3	62267	50% Annual Chanc	300	496.69	501.23	499.1	501.28	0.001688	1.68	178.91	210.61	0.22
Hickory Creek	3	62267	20% Annual Chanc	550	496.69	501.92	500.22	502	0.002012	2.21	250.43	550.54	0.25
Hickory Creek	3	62267	10% Annual Chanc	700	496.69	502.25	500.46	502.35	0.002144	2.47	288.1	929.76	0.26
Hickory Creek	3	62267	4% Annual Chance	1000	496.69	502.81	500.84	502.94	0.002304	2.89	357.23	1016.83	0.28
Hickory Creek	3	62267	2% Annual Chance	1400	496.69	502.97	501.26	502.99	0.000669	1.57	1420.46	1020.96	0.15
Hickory Creek	3	62267	1% Annual Chance	1850	496.69	503.37	501.65	503.39	0.000554	1.53	1826.33	1028.87	0.14
Hickory Creek	3	62267	0.4% Annual Chan	2450	496.69	503.83	502.14	503.85	0.000483	1.54	2292.51	1042.13	0.13
Hickory Creek	3	62267	0.2% Annual Chan	2900	496.69	504.13	502.51	504.15	0.000458	1.57	2602.43	1082.23	0.13
Hickory Creek	3	61930	50% Annual Chanc	300	496.3	500.51		500.56	0.002174	2.2	229.26	193.67	0.25
Hickory Creek	3	61930	20% Annual Chanc	550	496.3	501.1		501.16	0.002413	2.62	346.92	209.96	0.27
Hickory Creek	3	61930	10% Annual Chanc	700	496.3	501.37		501.44	0.002538	2.86	405.15	218.85	0.28
Hickory Creek	3	61930	4% Annual Chance	1000	496.3	501.87		501.96	0.002764	3.29	521.05	248.38	0.3
Hickory Creek	3	61930	2% Annual Chance	1400	496.3	502.31		502.42	0.003082	3.75	631.86	254.85	0.33
Hickory Creek	3	61930	1% Annual Chance	1850	496.3	502.72		502.86	0.00345	4.22	737.15	263.88	0.35
Hickory Creek	3	61930	0.4% Annual Chan	2450	496.3	503.16		503.33	0.003859	4.75	856.65	280.08	0.38
Hickory Creek	3	61930	0.2% Annual Chan	2900	496.3	503.45		503.64	0.004071	5.07	964.41	488.6	0.39
Hickory Creek	3	61571	50% Annual Chanc	300	494.02	498.8		499.07	0.010372	4.21	79.43	94.37	0.52
Hickory Creek	3	61571	20% Annual Chanc	550	494.02	499.47		499.69	0.00793	4.3	174.53	177.42	0.48
Hickory Creek	3	61571	10% Annual Chanc	700	494.02	499.66		499.9	0.008198	4.6	211.38	193.61	0.49
Hickory Creek	3	61571	4% Annual Chance	1000	494.02	500.01		500.28	0.008694	5.12	288.61	254.78	0.52
Hickory Creek	3	61571	2% Annual Chance	1400	494.02	500.35		500.64	0.008629	5.48	388.04	304.69	0.52
Hickory Creek	3	61571	1% Annual Chance	1850	494.02	500.67		500.96	0.00839	5.73	488.1	336.18	0.52
Hickory Creek	3	61571	0.4% Annual Chan	2450	494.02	500.98		501.31	0.008361	6.04	596.01	349.88	0.53
Hickory Creek	3	61571	0.2% Annual Chan	2900	494.02	501.17		501.53	0.008572	6.3	663.03	359.28	0.54
Hickory Creek	3	61068	50% Annual Chanc	300	492.22	497.72		497.76	0.001071	1.76	221.52	222.29	0.2
Hickory Creek	3	61068	20% Annual Chanc	550	492.22	498.29		498.34	0.001233	2.05	447.46	589.22	0.22
Hickory Creek	3	61068	10% Annual Chanc	700	492.22	498.49		498.54	0.001231	2.15	571.32	657.3	0.22
Hickory Creek	3	61068	4% Annual Chance	1000	492.22	498.8		498.84	0.001276	2.33	774.33	692.56	0.22
Hickory Creek	3	61068	2% Annual Chance	1400	492.22	499.18		499.22	0.001243	2.47	1092.4	966.76	0.23
Hickory Creek	3	61068	1% Annual Chance	1850	492.22	499.46		499.51	0.001302	2.66	1378.58	1041.39	0.23
Hickory Creek	3	61068	0.4% Annual Chan	2450	492.22	499.79		499.84	0.001307	2.81	1731.76	1116.65	0.24
Hickory Creek	3	61068	0.2% Annual Chan	2900	492.22	500.02		500.07	0.001271	2.86	1991.1	1158.62	0.24
Hickory Creek	3	60694	50% Annual Chanc	500	491.38	496.86		496.98	0.00345	2.87	194.32	258.51	0.39
Hickory Creek	3	60694	20% Annual Chanc	850	491.38	497.34		497.48	0.003834	3.19	344.94	353.62	0.39
Hickory Creek	3	60694	10% Annual Chanc	1050	491.38	497.53	496.89	497.68	0.003972	3.36	413.86	377.36	0.4
Hickory Creek	3	60694	4% Annual Chance	1400	491.38	497.81	497.2	497.96	0.004138	3.62	521.78	427.74	0.4
Hickory Creek	3	60694	2% Annual Chance	1950	491.38	498.11	497.49	498.3	0.004678	4.07	665.66	529.42	0.43
Hickory Creek	3	60694	1% Annual Chance	2450	491.38	498.33	497.7	498.54	0.005105	4.42	787.46	614.19	0.45
Hickory Creek	3	60694	0.4% Annual Chan	3150	491.38	498.53	497.94	498.81	0.006091	5	934.31	837.23	0.49
Hickory Creek	3	60694	0.2% Annual Chan	3750	491.38	498.69	498.09	499	0.006831	5.43	1072.08	935.73	0.52
Hickory Creek	3	60052	50% Annual Chanc	500	490.54	495.13		495.19	0.002252	2.25	343.86	685.38	0.26
Hickory Creek	3	60052	20% Annual Chanc	850	490.54	495.43		495.49	0.002451	2.54	574.09	856.28	0.28
Hickory Creek	3	60052	10% Annual Chanc	1050	490.54	495.56		495.62	0.002498	2.65	689.6	934.86	0.28
Hickory Creek	3	60052	4% Annual Chance	1400	490.54	495.76		495.83	0.002574	2.82	900	1131.06	0.29
Hickory Creek	3	60052	2% Annual Chance	1950	490.54	496.03		496.09	0.002446	2.91	1221.67	1326.57	0.28
Hickory Creek	3	60052	1% Annual Chance	2450	490.54	496.24		496.3	0.00235	2.97	1504.56	1431.44	0.28
Hickory Creek	3	60052	0.4% Annual Chan	3150	490.54	496.49		496.55	0.002087	2.94	1876.23	1497.02	0.27
Hickory Creek	3	60052	0.2% Annual Chan	3750	490.54	496.68		496.74	0.001949	2.93	2157.85	1520.51	0.26
Hickory Creek	3	59797	50% Annual Chanc	500	490.2	494.46		494.51	0.003245	1.98	331.75	621.41	0.29
Hickory Creek	3	59797	20% Annual Chanc	850	490.2	494.86		494.9	0.002258	1.94	643.83	911.63	0.25
Hickory Creek	3	59797	10% Annual Chanc	1050	490.2	495.03		495.07	0.001976	1.92	798.72	961.35	0.24
Hickory Creek	3	59797	4% Annual Chance	1400	490.2	495.26		495.3	0.001756	1.95	1030.04	1033.45	0.23
Hickory Creek	3	59797	2% Annual Chance	1950	490.2	495.57		495.61	0.001563	2	1377.82	1163.31	0.22
Hickory Creek	3	59797	1% Annual Chance	2450	490.2	495.8		495.84	0.001459	2.05	1654.16	1218.14	0.22
Hickory Creek	3	59797	0.4% Annual Chan	3150	490.2	496.09		496.13	0.00139	2.13	2006.75	1277	0.21
Hickory Creek	3	59797	0.2% Annual Chan	3750	490.2	496.29		496.33	0.001371	2.21	2272.35	1375.78	0.21
Hickory Creek	3	59418	50% Annual Chanc	500	488.2	492.62		492.83	0.006053	3.74	152.41	128.23	0.42
Hickory Creek	3	59418	20% Annual Chanc	850	488.2	493.31		493.53	0.0057	4.14	262.22	249.44	0.42
Hickory Creek	3	59418	10% Annual Chanc	1050	488.2	493.51		493.75	0.005981	4.43	320.63	333.31	0.44
Hickory Creek	3	59418	4% Annual Chance	1400	488.2	493.84	493.13	494.08	0.005793	4.65	442.27	409.39	0.44
Hickory Creek	3	59418	2% Annual Chance	1950	488.2	494.26	493.72	494.5	0.005315	4.81	641.38	531.79	0.43
Hickory Creek	3	59418	1% Annual Chance	2450	488.2	494.55		494.79	0.005154	4.98	813.44	683.18	0.43

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	59418	0.4% Annual Chan	3150	488.2	494.84		495.09	0.005283	5.26	1045.03	921.64	0.44
Hickory Creek	3	59418	0.2% Annual Chan	3750	488.2	495.06		495.31	0.005114	5.35	1256.45	976.79	0.44
Hickory Creek	3	58747	50% Annual Chanc	500	483.82	491.12		491.17	0.001276	2.05	357.06	442.32	0.2
Hickory Creek	3	58747	20% Annual Chanc	850	483.82	491.48		491.55	0.001699	2.54	539.85	573.76	0.24
Hickory Creek	3	58747	10% Annual Chanc	1050	483.82	491.68		491.75	0.001689	2.62	658.44	607.12	0.24
Hickory Creek	3	58747	4% Annual Chance	1400	483.82	491.92		492	0.00182	2.84	812.72	655.93	0.25
Hickory Creek	3	58747	2% Annual Chance	1950	483.82	492.19		492.28	0.002124	3.2	992.12	701.15	0.27
Hickory Creek	3	58747	1% Annual Chance	2450	483.82	492.45		492.55	0.002205	3.4	1191.93	812.36	0.28
Hickory Creek	3	58747	0.4% Annual Chan	3150	483.82	492.75		492.85	0.002154	3.5	1453.59	921.66	0.28
Hickory Creek	3	58747	0.2% Annual Chan	3750	483.82	493.01		493.12	0.00213	3.61	1698.58	960.89	0.28
Hickory Creek	3	58357	50% Annual Chanc	800	484.2	490.4		490.45	0.002278	2.16	557.09	816.09	0.26
Hickory Creek	3	58357	20% Annual Chanc	1250	484.2	490.73	490	490.78	0.001975	2.21	838.02	839.03	0.25
Hickory Creek	3	58357	10% Annual Chanc	1600	484.2	490.91	490.28	490.96	0.00207	2.37	981.34	845.39	0.25
Hickory Creek	3	58357	4% Annual Chance	2050	484.2	491.11	490.43	491.17	0.002127	2.52	1151.52	856.5	0.26
Hickory Creek	3	58357	2% Annual Chance	2550	484.2	491.3	490.53	491.37	0.002196	2.67	1319.63	874.77	0.27
Hickory Creek	3	58357	1% Annual Chance	3200	484.2	491.52	490.61	491.6	0.002278	2.85	1516.47	897.27	0.28
Hickory Creek	3	58357	0.4% Annual Chan	4100	484.2	491.83		491.92	0.002231	2.99	1804.14	995.27	0.28
Hickory Creek	3	58357	0.2% Annual Chan	4950	484.2	492.14		492.23	0.002063	3.03	2110.81	1010.82	0.27
Hickory Creek	3	57697	50% Annual Chanc	800	483.6	488.22		488.35	0.00521	3.32	451.37	595.36	0.39
Hickory Creek	3	57697	20% Annual Chanc	1250	483.6	488.49		488.67	0.00698	4.15	646.47	843.25	0.46
Hickory Creek	3	57697	10% Annual Chanc	1600	483.6	488.76		488.93	0.00611	4.16	890.25	925.14	0.44
Hickory Creek	3	57697	4% Annual Chance	2050	483.6	489.09		489.24	0.005265	4.16	1212.29	1029.14	0.41
Hickory Creek	3	57697	2% Annual Chance	2550	483.6	489.38		489.52	0.004632	4.14	1520.24	1054.29	0.39
Hickory Creek	3	57697	1% Annual Chance	3200	483.6	489.82		489.92	0.003559	3.93	1983.91	1080.97	0.35
Hickory Creek	3	57697	0.4% Annual Chan	4100	483.6	490.36		490.45	0.002811	3.81	2579.03	1132.87	0.32
Hickory Creek	3	57697	0.2% Annual Chan	4950	483.6	490.83		490.91	0.002425	3.79	3128.37	1209.36	0.3
Hickory Creek	3	56929	50% Annual Chanc	800	481.22	486.24		486.3	0.001675	2.06	575.26	583.94	0.23
Hickory Creek	3	56929	20% Annual Chanc	1250	481.22	487.23		487.27	0.000868	1.83	1368.89	1058.21	0.17
Hickory Creek	3	56929	10% Annual Chanc	1600	481.22	487.62		487.66	0.000819	1.9	1821	1235.81	0.17
Hickory Creek	3	56929	4% Annual Chance	2050	481.22	487.99		488.03	0.000836	2.04	2295.87	1321.36	0.18
Hickory Creek	3	56929	2% Annual Chance	2550	481.22	488.53		488.56	0.000654	1.95	3029.25	1395.12	0.16
Hickory Creek	3	56929	1% Annual Chance	3200	481.22	489.18		489.21	0.000496	1.84	3962.93	1450.79	0.14
Hickory Creek	3	56929	0.4% Annual Chan	4100	481.22	489.81		489.83	0.000456	1.9	4892.46	1535.42	0.14
Hickory Creek	3	56929	0.2% Annual Chan	4950	481.22	490.33		490.36	0.000428	1.94	5717.49	1608.8	0.13
Hickory Creek	3	56771	50% Annual Chanc	800	481.13	485.36	484.15	485.74	0.009926	5.05	193	137.73	0.52
Hickory Creek	3	56771	20% Annual Chanc	1250	481.13	486.89	485.15	487	0.004373	3.24	867.96	986.76	0.3
Hickory Creek	3	56771	10% Annual Chanc	1600	481.13	487.35	485.7	487.43	0.003217	3	1318.99	1162.02	0.26
Hickory Creek	3	56771	4% Annual Chance	2050	481.13	487.75	486.48	487.81	0.002659	2.9	1763.2	1234.94	0.24
Hickory Creek	3	56771	2% Annual Chance	2550	481.13	488.36	486.76	488.4	0.001676	2.5	2528.46	1390.6	0.19
Hickory Creek	3	56771	1% Annual Chance	3200	481.13	489.07	487.07	489.1	0.001062	2.17	3477	1467.59	0.16
Hickory Creek	3	56771	0.4% Annual Chan	4100	481.13	489.71	487.33	489.73	0.000893	2.13	4377.8	1582.58	0.15
Hickory Creek	3	56771	0.2% Annual Chan	4950	481.13	490.24	487.53	490.27	0.000789	2.11	5160.19	1659.85	0.14
Hickory Creek	3	56727	50% Annual Chanc	800	480.89	484.16	484.16	485.34	0.001843	8.73	99.27	60.34	0.98
Hickory Creek	3	56727	20% Annual Chanc	1250	480.89	485.1	485.1	486.5	0.001624	9.57	177.77	130.68	0.96
Hickory Creek	3	56727	10% Annual Chanc	1600	480.89	486.26	486.26	487.05	0.004186	7.66	467.44	454.96	0.7
Hickory Creek	3	56727	4% Annual Chance	2050	480.89	486.79	486.79	487.46	0.006124	7.51	738.43	803.93	0.66
Hickory Creek	3	56727	2% Annual Chance	2550	480.89	488.09	487.09	488.28	0.001719	4.8	1861.99	1299.93	0.37
Hickory Creek	3	56727	1% Annual Chance	3200	480.89	488.89	487.39	489.02	0.001181	4.36	2733.61	1501.77	0.31
Hickory Creek	3	56727	0.4% Annual Chan	4100	480.89	489.56	487.69	489.67	0.000963	4.22	3567.28	1593.92	0.29
Hickory Creek	3	56727	0.2% Annual Chan	4950	480.89	490.11	488.03	490.21	0.000856	4.19	4287.98	1717.98	0.27
Hickory Creek	3	56662	50% Annual Chanc	750	480.47	484.22	483.18	484.74	0.000621	5.79	139.4	63.36	0.59
Hickory Creek	3	56662	20% Annual Chanc	1200	480.47	485.32	484.1	485.99	0.000599	6.63	250.35	201.19	0.6
Hickory Creek	3	56662	10% Annual Chanc	1500	480.47	485.82	484.64	486.61	0.000629	7.21	371.68	340.3	0.62
Hickory Creek	3	56662	4% Annual Chance	1950	480.47	486.14	485.39	487.24	0.000828	8.57	490.71	483.04	0.71
Hickory Creek	3	56662	2% Annual Chance	2400	480.47	486.27	486.27	487.79	0.001132	10.16	544.91	500.74	0.84
Hickory Creek	3	56662	1% Annual Chance	2950	480.47	486.68	486.68	488.45	0.001242	11.11	731.3	636.89	0.89
Hickory Creek	3	56662	0.4% Annual Chan	3850	480.47	487.84	487.84	489.23	0.000824	10.43	1641.33	1256.21	0.75
Hickory Creek	3	56662	0.2% Annual Chan	4650	480.47	488.43	488.43	489.78	0.000762	10.67	2246.23	1317.6	0.73
Hickory Creek	3	56600		Mult Open									
Hickory Creek	3	56499	50% Annual Chanc	750	479.96	483.05	482.22	483.57	0.000892	6.27	177.89	68.28	0.69
Hickory Creek	3	56499	20% Annual Chanc	1200	479.96	483.35	483.04	484.43	0.001649	9	198.72	70.82	0.94
Hickory Creek	3	56499	10% Annual Chanc	1500	479.96	483.52	483.52	485.02	0.002164	10.61	211.02	72.28	1.09
Hickory Creek	3	56499	4% Annual Chance	1950	479.96	484.17	484.17	485.86	0.002025	11.24	261.61	86.43	1.07
Hickory Creek	3	56499	2% Annual Chance	2400	479.96	484.81	484.81	486.58	0.001839	11.56	338.7	184.72	1.04
Hickory Creek	3	56499	1% Annual Chance	2950	479.96	485.57	485.57	487.31	0.001592	11.57	555.34	423.74	0.98
Hickory Creek	3	56499	0.4% Annual Chan	3850	479.96	486.79	486.79	488	0.000944	10.27	1506.78	1038.59	0.78
Hickory Creek	3	56499	0.2% Annual Chan	4650	479.96	487.2	487.2	488.48	0.000959	10.87	1946.3	1173.53	0.8

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	56427	50% Annual Chanc	750	479.71	483.04		483.28	0.007856	4.53	223.97	175.27	0.49
Hickory Creek	3	56427	20% Annual Chanc	1200	479.71	483.51		483.79	0.008542	5.1	321.16	229.11	0.52
Hickory Creek	3	56427	10% Annual Chanc	1500	479.71	483.8		484.09	0.008478	5.25	389.3	241.41	0.52
Hickory Creek	3	56427	4% Annual Chance	1950	479.71	484.17		484.47	0.008534	5.46	484.25	282.44	0.52
Hickory Creek	3	56427	2% Annual Chance	2400	479.71	484.48		484.79	0.008612	5.64	584.63	409.78	0.53
Hickory Creek	3	56427	1% Annual Chance	2950	479.71	484.8		485.11	0.008943	5.96	750.67	600.51	0.55
Hickory Creek	3	56427	0.4% Annual Chan	3850	479.71	485.19		485.51	0.008973	6.38	1009.82	758.3	0.56
Hickory Creek	3	56427	0.2% Annual Chan	4650	479.71	485.48		485.81	0.009208	6.77	1258.86	946.14	0.57
Hickory Creek	3	56077	50% Annual Chanc	750	476.24	481.41		481.53	0.004573	2.92	279.71	193.27	0.36
Hickory Creek	3	56077	20% Annual Chanc	1200	476.24	482.24		482.34	0.003255	3.08	489.9	331.62	0.32
Hickory Creek	3	56077	10% Annual Chanc	1500	476.24	482.59		482.7	0.003106	3.25	636.45	470.13	0.32
Hickory Creek	3	56077	4% Annual Chance	1950	476.24	483.02		483.13	0.002983	3.46	886.04	701.79	0.32
Hickory Creek	3	56077	2% Annual Chance	2400	476.24	483.37		483.47	0.002929	3.64	1178.6	965.18	0.32
Hickory Creek	3	56077	1% Annual Chance	2950	476.24	483.69		483.8	0.002907	3.82	1518.95	1146.84	0.32
Hickory Creek	3	56077	0.4% Annual Chan	3850	476.24	484.1		484.21	0.002912	4.07	2058.67	1476.5	0.33
Hickory Creek	3	56077	0.2% Annual Chan	4650	476.24	484.38		484.5	0.002964	4.26	2496.9	1607.02	0.34
Hickory Creek	3	55901	50% Annual Chanc	750	475.48	481.01		481.09	0.00176	2.67	355.42	149.02	0.24
Hickory Creek	3	55901	20% Annual Chanc	1200	475.48	481.75		481.89	0.00244	3.54	492.77	233.96	0.29
Hickory Creek	3	55901	10% Annual Chanc	1500	475.48	482.09		482.24	0.002603	3.83	578.09	269.99	0.3
Hickory Creek	3	55901	4% Annual Chance	1950	475.48	482.48		482.66	0.002833	4.21	707.36	447.23	0.32
Hickory Creek	3	55901	2% Annual Chance	2400	475.48	482.81		482.99	0.003058	4.55	910.73	793.71	0.34
Hickory Creek	3	55901	1% Annual Chance	2950	475.48	483.14		483.32	0.003122	4.77	1250.75	1217.03	0.34
Hickory Creek	3	55901	0.4% Annual Chan	3850	475.48	483.56		483.74	0.003187	5.05	1799.93	1420.53	0.35
Hickory Creek	3	55901	0.2% Annual Chan	4650	475.48	483.86		484.03	0.003141	5.17	2253.69	1613.33	0.35
Hickory Creek	3	55723	50% Annual Chanc	750	473.28	480.57		480.67	0.004735	2.53	296.51	146.88	0.31
Hickory Creek	3	55723	20% Annual Chanc	1200	473.28	481.25		481.38	0.004559	2.99	426.28	248.24	0.32
Hickory Creek	3	55723	10% Annual Chanc	1500	473.28	481.57		481.73	0.004614	3.24	520.6	339.32	0.33
Hickory Creek	3	55723	4% Annual Chance	1950	473.28	481.97		482.14	0.004509	3.48	687.9	492.69	0.33
Hickory Creek	3	55723	2% Annual Chance	2400	473.28	482.31		482.48	0.0043	3.61	860.04	533.93	0.33
Hickory Creek	3	55723	1% Annual Chance	2950	473.28	482.66		482.83	0.004141	3.76	1087.24	800.17	0.33
Hickory Creek	3	55723	0.4% Annual Chan	3850	473.28	483.11		483.29	0.003991	3.95	1606.56	1413.93	0.32
Hickory Creek	3	55723	0.2% Annual Chan	4650	473.28	483.47		483.63	0.003556	3.92	2139.36	1607.31	0.31
Hickory Creek	3	55259	50% Annual Chanc	850	472.58	479.77	476.9	479.83	0.000937	2.26	669.95	501.47	0.18
Hickory Creek	3	55259	20% Annual Chanc	1350	472.58	480.37	477.94	480.43	0.001081	2.63	1005.97	625.76	0.2
Hickory Creek	3	55259	10% Annual Chanc	1650	472.58	480.62	478.46	480.69	0.001198	2.86	1167.7	678.07	0.21
Hickory Creek	3	55259	4% Annual Chance	2100	472.58	480.92	479.01	481	0.001381	3.18	1389.08	773.83	0.23
Hickory Creek	3	55259	2% Annual Chance	2600	472.58	481.18	479.35	481.27	0.001577	3.5	1601.57	896.09	0.25
Hickory Creek	3	55259	1% Annual Chance	3150	472.58	481.48	479.53	481.58	0.001689	3.74	1908	1060.93	0.26
Hickory Creek	3	55259	0.4% Annual Chan	4000	472.58	481.95	480.1	482.05	0.001686	3.92	2446.12	1256.62	0.26
Hickory Creek	3	55259	0.2% Annual Chan	4850	472.58	482.39	480.36	482.48	0.001596	3.98	3009.61	1308.9	0.26
Hickory Creek	3	55200	Culvert										
Hickory Creek	3	55185	50% Annual Chanc	850	469.93	478.43	474.09	478.57	0.001813	3.02	281.94	63.37	0.23
Hickory Creek	3	55185	20% Annual Chanc	1350	469.93	479.43	475.17	479.66	0.002423	3.91	416.42	222.2	0.27
Hickory Creek	3	55185	10% Annual Chanc	1650	469.93	479.86	475.66	480.13	0.002653	4.27	529.46	313.24	0.29
Hickory Creek	3	55185	4% Annual Chance	2100	469.93	480.36	476.33	480.64	0.002884	4.66	710.04	415.27	0.3
Hickory Creek	3	55185	2% Annual Chance	2600	469.93	480.79	477	481.09	0.003051	4.98	922	530.98	0.31
Hickory Creek	3	55185	1% Annual Chance	3150	469.93	481.17	477.7	481.48	0.003184	5.25	1146.49	660.35	0.32
Hickory Creek	3	55185	0.4% Annual Chan	4000	469.93	481.67	480.18	481.98	0.003244	5.52	1500.9	759.19	0.33
Hickory Creek	3	55185	0.2% Annual Chan	4850	469.93	482.1	480.79	482.4	0.003309	5.75	1879.17	1001.8	0.34
Hickory Creek	3	54456	50% Annual Chanc	850	469	476		476.24	0.006869	4.13	264.95	215.63	0.49
Hickory Creek	3	54456	20% Annual Chanc	1350	469	476.65		476.9	0.006795	4.44	435.57	301.87	0.46
Hickory Creek	3	54456	10% Annual Chanc	1650	469	476.96		477.21	0.006816	4.63	533.15	341.14	0.46
Hickory Creek	3	54456	4% Annual Chance	2100	469	477.32		477.59	0.006755	4.83	664.95	377.81	0.45
Hickory Creek	3	54456	2% Annual Chance	2600	469	477.65		477.93	0.006859	5.07	801.88	456.04	0.45
Hickory Creek	3	54456	1% Annual Chance	3150	469	478.02		478.29	0.006559	5.18	987.14	547.3	0.44
Hickory Creek	3	54456	0.4% Annual Chan	4000	469	478.5		478.78	0.006551	5.47	1285.62	702.2	0.44
Hickory Creek	3	54456	0.2% Annual Chan	4850	469	478.9		479.18	0.006464	5.67	1594.88	846.52	0.44
Hickory Creek	3	53366	50% Annual Chanc	850	464.46	472.27		472.37	0.002164	2.61	435.64	358.98	0.29
Hickory Creek	3	53366	20% Annual Chanc	1350	464.46	473.07		473.15	0.002101	2.63	781.84	503.5	0.26
Hickory Creek	3	53366	10% Annual Chanc	1650	464.46	473.42		473.5	0.002072	2.66	967.79	561.66	0.25
Hickory Creek	3	53366	4% Annual Chance	2100	464.46	473.88		473.96	0.002021	2.72	1246.16	644.12	0.24
Hickory Creek	3	53366	2% Annual Chance	2600	464.46	474.3		474.38	0.001952	2.75	1521.45	678.17	0.23
Hickory Creek	3	53366	1% Annual Chance	3150	464.46	474.76		474.84	0.001928	2.83	1856.85	771.7	0.22
Hickory Creek	3	53366	0.4% Annual Chan	4000	464.46	475.26		475.34	0.001928	2.94	2266.55	848.38	0.22
Hickory Creek	3	53366	0.2% Annual Chan	4850	464.46	475.69		475.77	0.001934	3.05	2642.07	900.29	0.22
Hickory Creek	3	52649	50% Annual Chanc	850	463.6	470.71		470.78	0.002255	2.41	467.23	236.16	0.26
Hickory Creek	3	52649	20% Annual Chanc	1350	463.6	471.47		471.55	0.002427	2.76	695.16	352.14	0.27
Hickory Creek	3	52649	10% Annual Chanc	1650	463.6	471.83		471.91	0.0024	2.87	824.73	368.81	0.26

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	52649	4% Annual Chance	2100	463.6	472.3		472.4	0.002387	3.03	1019.98	444.29	0.26
Hickory Creek	3	52649	2% Annual Chance	2600	463.6	472.75		472.84	0.002371	3.18	1221.95	476.05	0.26
Hickory Creek	3	52649	1% Annual Chance	3150	463.6	473.18		473.28	0.00246	3.4	1446.32	585.12	0.27
Hickory Creek	3	52649	0.4% Annual Chan	4000	463.6	473.66		473.78	0.00249	3.59	1750.73	644.26	0.27
Hickory Creek	3	52649	0.2% Annual Chan	4850	463.6	474.08		474.2	0.002503	3.75	2022.61	674.02	0.27
Hickory Creek	3	51842	50% Annual Chanc	850	460.18	468.38		468.48	0.003662	2.76	404.42	250.39	0.27
Hickory Creek	3	51842	20% Annual Chanc	1350	460.18	469.24	466.33	469.34	0.003109	2.96	637.5	294.35	0.25
Hickory Creek	3	51842	10% Annual Chanc	1650	460.18	469.66	466.85	469.77	0.002935	3.07	769.26	326.9	0.25
Hickory Creek	3	51842	4% Annual Chance	2100	460.18	470.13		470.25	0.003006	3.31	950.92	482.91	0.26
Hickory Creek	3	51842	2% Annual Chance	2600	460.18	470.52		470.65	0.00312	3.55	1177.4	650.62	0.27
Hickory Creek	3	51842	1% Annual Chance	3150	460.18	470.89		471.03	0.003171	3.73	1445.84	780.17	0.27
Hickory Creek	3	51842	0.4% Annual Chan	4000	460.18	471.41		471.54	0.003089	3.9	1886.19	931.78	0.27
Hickory Creek	3	51842	0.2% Annual Chan	4850	460.18	471.87		472	0.002958	4	2354.38	1084.36	0.27
Hickory Creek	3	50980	50% Annual Chanc	850	456.66	461.81		462.56	0.016141	6.96	122.1	34.76	0.65
Hickory Creek	3	50980	20% Annual Chanc	1350	456.66	463.23		464.15	0.014445	7.7	175.89	41.74	0.64
Hickory Creek	3	50980	10% Annual Chanc	1650	456.66	463.98	462.49	464.97	0.012644	7.99	217.25	95.8	0.62
Hickory Creek	3	50980	4% Annual Chance	2100	456.66	464.94	463.23	465.81	0.009738	7.84	366.21	184.28	0.56
Hickory Creek	3	50980	2% Annual Chance	2600	456.66	465.7		466.45	0.008054	7.71	510.26	195.37	0.52
Hickory Creek	3	50980	1% Annual Chance	3150	456.66	466.44		467.1	0.006764	7.56	671.17	244.04	0.48
Hickory Creek	3	50980	0.4% Annual Chan	4000	456.66	467.31		467.92	0.005898	7.58	922.58	330.16	0.46
Hickory Creek	3	50980	0.2% Annual Chan	4850	456.66	468		468.58	0.005489	7.71	1174.19	408.73	0.45
Hickory Creek	3	50293	50% Annual Chanc	950	455.28	460.9	456.93	460.96	0.000717	1.94	489.39	92.71	0.15
Hickory Creek	3	50293	20% Annual Chanc	1450	455.28	462.25	457.44	462.33	0.000815	2.36	615.62	94.99	0.16
Hickory Creek	3	50293	10% Annual Chanc	1800	455.28	462.93	457.75	463.04	0.000919	2.64	680.73	116.27	0.18
Hickory Creek	3	50293	4% Annual Chance	2300	455.28	463.74	458.18	463.88	0.001052	3.03	760.91	225.52	0.19
Hickory Creek	3	50293	2% Annual Chance	2750	455.28	464.36	458.54	464.53	0.001166	3.36	826.62	275.67	0.2
Hickory Creek	3	50293	1% Annual Chance	3250	455.28	465.01	458.91	465.22	0.001269	3.68	900.12	408.38	0.21
Hickory Creek	3	50293	0.4% Annual Chan	4150	455.28	466.24	459.53	466.41	0.000979	3.52	1774.73	632.84	0.19
Hickory Creek	3	50293	0.2% Annual Chan	5000	455.28	466.93	460.08	467.1	0.001012	3.73	2114.19	669.46	0.2
Hickory Creek	3	50200		Culvert									
Hickory Creek	3	50127	50% Annual Chanc	950	454.82	460.83	456.38	460.86	0.000347	1.36	699.34	135.11	0.11
Hickory Creek	3	50127	20% Annual Chanc	1450	454.82	462.13	456.83	462.18	0.000398	1.65	878.26	139.64	0.12
Hickory Creek	3	50127	10% Annual Chanc	1800	454.82	462.78	457.12	462.83	0.000455	1.86	969.44	142.74	0.13
Hickory Creek	3	50127	4% Annual Chance	2300	454.82	463.46	457.5	463.53	0.000556	2.16	1067.36	175.79	0.14
Hickory Creek	3	50127	2% Annual Chance	2750	454.82	463.92	457.8	464.02	0.000646	2.42	1140.08	293.8	0.15
Hickory Creek	3	50127	1% Annual Chance	3250	454.82	464.37	458.12	464.48	0.000749	2.71	1212.64	394.26	0.17
Hickory Creek	3	50127	0.4% Annual Chan	4150	454.82	465.01	458.63	465.17	0.000946	3.2	1321.73	481.01	0.19
Hickory Creek	3	50127	0.2% Annual Chan	5000	454.82	465.49	459.06	465.7	0.001144	3.64	1404.8	546.99	0.21
Hickory Creek	3	49815	50% Annual Chanc	950	450.29	460.46		460.62	0.001687	3.25	332.09	124.91	0.23
Hickory Creek	3	49815	20% Annual Chanc	1450	450.29	461.74		461.91	0.001639	3.62	626.24	312.56	0.23
Hickory Creek	3	49815	10% Annual Chanc	1800	450.29	462.4		462.56	0.001497	3.66	836.72	319.66	0.22
Hickory Creek	3	49815	4% Annual Chance	2300	450.29	463.07		463.23	0.001503	3.86	1052.04	327.5	0.23
Hickory Creek	3	49815	2% Annual Chance	2750	450.29	463.51		463.69	0.001602	4.12	1198.53	336.34	0.24
Hickory Creek	3	49815	1% Annual Chance	3250	450.29	463.92		464.11	0.001728	4.4	1338.1	344.7	0.25
Hickory Creek	3	49815	0.4% Annual Chan	4150	450.29	464.5		464.73	0.002005	4.93	1540.75	356.68	0.27
Hickory Creek	3	49815	0.2% Annual Chan	5000	450.29	464.91		465.18	0.002339	5.46	1689.3	370.39	0.29
Hickory Creek	3	49487	50% Annual Chanc	950	448.88	459.76		459.91	0.002814	3.05	318.29	87.52	0.25
Hickory Creek	3	49487	20% Annual Chanc	1450	448.88	461.07		461.24	0.002633	3.47	488.43	171.98	0.25
Hickory Creek	3	49487	10% Annual Chanc	1800	448.88	461.76		461.94	0.002489	3.63	683.53	378.15	0.25
Hickory Creek	3	49487	4% Annual Chance	2300	448.88	462.45		462.63	0.00235	3.76	997.2	510.39	0.24
Hickory Creek	3	49487	2% Annual Chance	2750	448.88	462.89		463.07	0.002309	3.88	1234.96	595.84	0.24
Hickory Creek	3	49487	1% Annual Chance	3250	448.88	463.28		463.46	0.002353	4.04	1513.51	804.46	0.25
Hickory Creek	3	49487	0.4% Annual Chan	4150	448.88	463.81		463.99	0.002501	4.34	1982.31	945.54	0.26
Hickory Creek	3	49487	0.2% Annual Chan	5000	448.88	464.19		464.37	0.002513	4.48	2346.91	957.69	0.26
Hickory Creek	3	48376	50% Annual Chanc	950	447.54	456.23		456.46	0.003406	3.92	242.41	51.92	0.32
Hickory Creek	3	48376	20% Annual Chanc	1450	447.54	457.39		457.74	0.003798	4.79	305.87	58.48	0.35
Hickory Creek	3	48376	10% Annual Chanc	1800	447.54	457.88		458.33	0.004368	5.42	372.15	209.66	0.38
Hickory Creek	3	48376	4% Annual Chance	2300	447.54	458.44	455.2	458.98	0.004876	6.06	530.82	370.11	0.4
Hickory Creek	3	48376	2% Annual Chance	2750	447.54	458.85	455.92	459.41	0.005038	6.39	704.19	458.5	0.42
Hickory Creek	3	48376	1% Annual Chance	3250	447.54	459.29		459.82	0.004856	6.52	918.8	521.28	0.41
Hickory Creek	3	48376	0.4% Annual Chan	4150	447.54	460		460.45	0.004244	6.47	1323.83	597.11	0.39
Hickory Creek	3	48376	0.2% Annual Chan	5000	447.54	460.56		460.96	0.0039	6.47	1670.05	649.4	0.38
Hickory Creek	3	48153	50% Annual Chanc	950	446.48	455.72		455.86	0.002038	3.15	411.35	217.02	0.25
Hickory Creek	3	48153	20% Annual Chanc	1450	446.48	457.03		457.16	0.00156	3.22	798.51	418.08	0.23
Hickory Creek	3	48153	10% Annual Chanc	1800	446.48	457.62		457.73	0.001375	3.2	1051.72	445.7	0.21
Hickory Creek	3	48153	4% Annual Chance	2300	446.48	458.22		458.33	0.00134	3.34	1332.37	480.97	0.21
Hickory Creek	3	48153	2% Annual Chance	2750	446.48	458.63		458.74	0.001374	3.51	1529.22	492.91	0.22
Hickory Creek	3	48153	1% Annual Chance	3250	446.48	459.05		459.17	0.001387	3.65	1745.12	532.4	0.22

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	3	48153	0.4% Annual Chan	4150	446.48	459.71		459.84	0.001429	3.9	2118.36	593.74	0.23
Hickory Creek	3	48153	0.2% Annual Chan	5000	446.48	460.24		460.37	0.001469	4.1	2442.93	641.82	0.23
Hickory Creek	3	47504	50% Annual Chanc	950	443.18	454.72		454.83	0.001253	2.63	370.44	111.97	0.22
Hickory Creek	3	47504	20% Annual Chanc	1450	443.18	456.17		456.29	0.00121	2.86	650.61	280.98	0.21
Hickory Creek	3	47504	10% Annual Chanc	1800	443.18	456.78		456.9	0.001243	3.02	831.58	308.51	0.21
Hickory Creek	3	47504	4% Annual Chance	2300	443.18	457.31		457.46	0.001452	3.39	1011.58	362.85	0.22
Hickory Creek	3	47504	2% Annual Chance	2750	443.18	457.61		457.79	0.001698	3.74	1123.34	377.57	0.24
Hickory Creek	3	47504	1% Annual Chance	3250	443.18	457.95		458.15	0.001926	4.07	1257.31	423.99	0.26
Hickory Creek	3	47504	0.4% Annual Chan	4150	443.18	458.5		458.74	0.002241	4.54	1502.62	466.4	0.28
Hickory Creek	3	47504	0.2% Annual Chan	5000	443.18	458.95		459.22	0.002445	4.88	1719.82	488.89	0.29
Hickory Creek	2	47034	50% Annual Chanc	1500	441.66	453.29	448.05	453.59	0.004249	4.42	345.1	157.97	0.29
Hickory Creek	2	47034	20% Annual Chanc	2300	441.66	455.31	449.54	455.47	0.002159	3.71	1012.74	542.25	0.21
Hickory Creek	2	47034	10% Annual Chanc	2850	441.66	456.12	450.41	456.22	0.001548	3.32	1571.57	593.54	0.18
Hickory Creek	2	47034	4% Annual Chance	3450	441.66	456.63	451.29	456.73	0.001487	3.37	1884.97	632.43	0.18
Hickory Creek	2	47034	2% Annual Chance	3850	441.66	456.89	451.83	456.99	0.001497	3.43	2052.67	639.94	0.18
Hickory Creek	2	47034	1% Annual Chance	4450	441.66	457.15	454.35	457.26	0.001633	3.64	2221.85	647.6	0.19
Hickory Creek	2	47034	0.4% Annual Chan	5400	441.66	457.63	455.05	457.75	0.001711	3.84	2537.97	674.02	0.2
Hickory Creek	2	47034	0.2% Annual Chan	6200	441.66	458.07	455.36	458.18	0.001688	3.9	2836.07	702.65	0.2
Hickory Creek	2	47025	Bridge										
Hickory Creek	2	46992	50% Annual Chanc	1500	441.32	453.09	447.71	453.39	0.00388	4.38	352.76	169.78	0.28
Hickory Creek	2	46992	20% Annual Chanc	2300	441.32	454.64	449.21	454.86	0.002918	4.28	846.42	395.04	0.25
Hickory Creek	2	46992	10% Annual Chanc	2850	441.32	455.33	450.07	455.52	0.002575	4.22	1145.28	471.42	0.23
Hickory Creek	2	46992	4% Annual Chance	3450	441.32	455.87	450.9	456.04	0.00244	4.25	1420.91	553.81	0.23
Hickory Creek	2	46992	2% Annual Chance	3850	441.32	456.18	451.41	456.35	0.002366	4.27	1602.59	589.28	0.23
Hickory Creek	2	46992	1% Annual Chance	4450	441.32	456.62	453.82	456.78	0.002293	4.32	1866.68	605.91	0.23
Hickory Creek	2	46992	0.4% Annual Chan	5400	441.32	457.25	454.66	457.4	0.002126	4.31	2253.72	627.85	0.22
Hickory Creek	2	46992	0.2% Annual Chan	6200	441.32	457.74	455.06	457.89	0.00202	4.31	2569.59	675.46	0.22
Hickory Creek	2	46975	Bridge										
Hickory Creek	2	46952	50% Annual Chanc	1500	440.63	452.71		452.97	0.003061	4.14	362.15	56.94	0.29
Hickory Creek	2	46952	20% Annual Chanc	2300	440.63	454.1		454.5	0.003648	5.15	497.36	187.16	0.32
Hickory Creek	2	46952	10% Annual Chanc	2850	440.63	454.73		455.18	0.003858	5.57	690.18	392.32	0.34
Hickory Creek	2	46952	4% Annual Chance	3450	440.63	455.28		455.73	0.003876	5.82	913.97	424.61	0.34
Hickory Creek	2	46952	2% Annual Chance	3850	440.63	455.6		456.04	0.003843	5.93	1052.67	459.25	0.34
Hickory Creek	2	46952	1% Annual Chance	4450	440.63	456.06	451.78	456.48	0.00367	5.98	1270.82	490.01	0.34
Hickory Creek	2	46952	0.4% Annual Chan	5400	440.63	456.74	452.85	457.12	0.003311	5.94	1629.81	559.66	0.32
Hickory Creek	2	46952	0.2% Annual Chan	6200	440.63	457.3		457.63	0.002984	5.84	1947.49	589.81	0.31
Hickory Creek	2	46221	50% Annual Chanc	1500	440.42	450.34		450.6	0.003484	4.3	427.24	157.21	0.31
Hickory Creek	2	46221	20% Annual Chanc	2300	440.42	451.52		451.82	0.003595	4.91	687.25	257.33	0.32
Hickory Creek	2	46221	10% Annual Chanc	2850	440.42	452.05		452.38	0.003726	5.24	840.68	308.11	0.33
Hickory Creek	2	46221	4% Annual Chance	3450	440.42	452.7		453.02	0.003537	5.38	1050.29	339.52	0.33
Hickory Creek	2	46221	2% Annual Chance	3850	440.42	453.25		453.54	0.003206	5.19	1245.44	361.92	0.3
Hickory Creek	2	46221	1% Annual Chance	4450	440.42	453.93		454.19	0.002663	5.11	1500.86	396.92	0.29
Hickory Creek	2	46221	0.4% Annual Chan	5400	440.42	454.89		455.12	0.002303	5.06	1916.87	460.55	0.27
Hickory Creek	2	46221	0.2% Annual Chan	6200	440.42	455.72		455.92	0.001907	4.84	2311.84	491.77	0.25
Hickory Creek	2	45407	50% Annual Chanc	1500	437.65	448.35	443.09	448.51	0.001889	3.24	466.22	87.02	0.23
Hickory Creek	2	45407	20% Annual Chanc	2300	437.65	450.13	444.33	450.24	0.001141	2.99	1192.86	735.86	0.19
Hickory Creek	2	45407	10% Annual Chanc	2850	437.65	451.4	445.04	451.44	0.000462	2.1	2151.89	810.36	0.12
Hickory Creek	2	45407	4% Annual Chance	3450	437.65	452.23	445.73	452.26	0.000328	1.87	2901.06	998.15	0.1
Hickory Creek	2	45407	2% Annual Chance	3850	437.65	452.92	446.14	452.94	0.000238	1.67	3612.52	1069.18	0.09
Hickory Creek	2	45407	1% Annual Chance	4450	437.65	453.67	446.72	453.69	0.000187	1.55	4443.82	1129.61	0.08
Hickory Creek	2	45407	0.4% Annual Chan	5400	437.65	454.69	447.61	454.71	0.000148	1.46	5600.7	1141.92	0.07
Hickory Creek	2	45407	0.2% Annual Chan	6200	437.65	455.56	450.09	455.57	0.000123	1.39	6617.71	1195.21	0.07
Hickory Creek	2	45400	Bridge										
Hickory Creek	2	45386	50% Annual Chanc	1500	437.65	448	441.52	448.11	0.001013	2.69	617.37	236.97	0.18
Hickory Creek	2	45386	20% Annual Chanc	2300	437.65	450.11	442.6	450.16	0.000456	2.12	1659.93	610.89	0.12
Hickory Creek	2	45386	10% Annual Chanc	2850	437.65	451.38	443.26	451.41	0.000263	1.75	2545.09	793.16	0.09
Hickory Creek	2	45386	4% Annual Chance	3450	437.65	452.22	443.93	452.24	0.000211	1.64	3247.34	897.83	0.09
Hickory Creek	2	45386	2% Annual Chance	3850	437.65	452.91	444.34	452.93	0.000167	1.52	3916.48	1039.19	0.08
Hickory Creek	2	45386	1% Annual Chance	4450	437.65	453.67	444.94	453.68	0.000141	1.46	4735.98	1108.78	0.07
Hickory Creek	2	45386	0.4% Annual Chan	5400	437.65	454.69	445.83	454.7	0.00012	1.41	5886.62	1138.48	0.07
Hickory Creek	2	45386	0.2% Annual Chan	6200	437.65	455.55	446.84	455.57	0.000104	1.37	6880.5	1160.13	0.06
Hickory Creek	2	45349	50% Annual Chanc	1500	437.68	447.95	444.18	448.06	0.001658	2.73	585.67	278.54	0.21
Hickory Creek	2	45349	20% Annual Chanc	2300	437.68	450.09	445.03	450.14	0.000613	2.08	1415.6	450.02	0.13
Hickory Creek	2	45349	10% Annual Chanc	2850	437.68	451.36	445.58	451.39	0.00039	1.85	2056.08	670.22	0.11
Hickory Creek	2	45349	4% Annual Chance	3450	437.68	452.2	446.15	452.23	0.000291	1.7	2840.99	880.08	0.1
Hickory Creek	2	45349	2% Annual Chance	3850	437.68	452.9	446.46	452.92	0.000237	1.6	3519.98	1068.32	0.09

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	45349	1% Annual Chance	4450	437.68	453.66	446.98	453.68	0.000196	1.53	4397.41	1197.13	0.08
Hickory Creek	2	45349	0.4% Annual Chan	5400	437.68	454.68	447.48	454.7	0.000158	1.46	5668.45	1298.61	0.07
Hickory Creek	2	45349	0.2% Annual Chan	6200	437.68	455.55	447.89	455.56	0.000128	1.37	6807.12	1331.66	0.07
Hickory Creek	2	45300	Bridge										
Hickory Creek	2	45229	50% Annual Chanc	1500	437.4	447.67	442.39	447.75	0.000706	2.4	659.76	233.53	0.17
Hickory Creek	2	45229	20% Annual Chanc	2300	437.4	449.63	443.39	449.67	0.000323	1.95	1700.12	612.12	0.12
Hickory Creek	2	45229	10% Annual Chanc	2850	437.4	451.08	444.08	451.11	0.000171	1.58	2744.83	803.65	0.09
Hickory Creek	2	45229	4% Annual Chance	3450	437.4	452.13	444.69	452.15	0.000123	1.43	3647.29	936.87	0.08
Hickory Creek	2	45229	2% Annual Chance	3850	437.4	452.87	445.08	452.88	0.000098	1.34	4366.49	1026.34	0.07
Hickory Creek	2	45229	1% Annual Chance	4450	437.4	453.57	445.53	453.58	0.000091	1.34	5127.6	1146.41	0.07
Hickory Creek	2	45229	0.4% Annual Chan	5400	437.4	454.63	446.28	454.64	0.000075	1.29	6395.3	1282.99	0.06
Hickory Creek	2	45229	0.2% Annual Chan	6200	437.4	455.51	446.76	455.53	0.000066	1.26	7573.19	1374.73	0.06
Hickory Creek	2	45134	50% Annual Chanc	1550	436.98	447.38	443.37	447.58	0.002128	3.62	428.41	86.09	0.28
Hickory Creek	2	45134	20% Annual Chanc	2300	436.98	449.27	444.46	449.5	0.001476	3.71	607.41	103.35	0.25
Hickory Creek	2	45134	10% Annual Chanc	2800	436.98	450.68	445.05	450.94	0.000987	3.42	759.7	111.46	0.21
Hickory Creek	2	45134	4% Annual Chance	3400	436.98	451.63	445.66	451.95	0.000898	3.5	867.37	116.66	0.2
Hickory Creek	2	45134	2% Annual Chance	3900	436.98	452.27	446.13	452.66	0.000866	3.6	943.84	120.21	0.2
Hickory Creek	2	45134	1% Annual Chance	4450	436.98	452.86	446.61	453.32	0.000861	3.72	1015.96	123.47	0.2
Hickory Creek	2	45134	0.4% Annual Chan	5350	436.98	453.76	447.31	454.33	0.000847	3.9	1128.43	128.46	0.2
Hickory Creek	2	45134	0.2% Annual Chan	6150	436.98	454.5	447.9	455.17	0.000829	4.02	1226.11	133.18	0.2
Hickory Creek	2	45100	Bridge										
Hickory Creek	2	44987	50% Annual Chanc	1550	436.79	446.88	442.22	447.06	0.001621	3.38	459.12	83.15	0.25
Hickory Creek	2	44987	20% Annual Chanc	2300	436.79	448.61	443.32	448.83	0.001377	3.72	613.8	95.94	0.24
Hickory Creek	2	44987	10% Annual Chanc	2800	436.79	450.06	443.93	450.29	0.000981	3.54	761.18	106.71	0.21
Hickory Creek	2	44987	4% Annual Chance	3400	436.79	450.89	444.58	451.18	0.000975	3.74	851.78	112.74	0.21
Hickory Creek	2	44987	2% Annual Chance	3900	436.79	451.42	445.07	451.77	0.001002	3.93	912.45	115.98	0.22
Hickory Creek	2	44987	1% Annual Chance	4450	436.79	451.86	445.56	452.29	0.001066	4.17	964.88	118.7	0.23
Hickory Creek	2	44987	0.4% Annual Chan	5350	436.79	452.52	446.3	453.07	0.001159	4.53	1043.46	122.64	0.24
Hickory Creek	2	44987	0.2% Annual Chan	6150	436.79	453.03	446.91	453.72	0.001226	4.8	1107.53	125.06	0.25
Hickory Creek	2	44900	Bridge										
Hickory Creek	2	44833	50% Annual Chanc	1550	435.98	446.48	441.42	446.64	0.001377	3.14	493.52	86.16	0.23
Hickory Creek	2	44833	20% Annual Chanc	2300	435.98	448.21	442.53	448.4	0.001302	3.52	653.24	98.94	0.23
Hickory Creek	2	44833	10% Annual Chanc	2800	435.98	449.67	443.11	449.86	0.000966	3.44	805.69	109.76	0.21
Hickory Creek	2	44833	4% Annual Chance	3400	435.98	450.4	443.78	450.64	0.001024	3.74	887.8	114.67	0.22
Hickory Creek	2	44833	2% Annual Chance	3900	435.98	450.85	444.26	451.14	0.001104	4.01	940.12	117.42	0.23
Hickory Creek	2	44833	1% Annual Chance	4450	435.98	451.19	444.75	451.54	0.001242	4.35	980.39	119.5	0.24
Hickory Creek	2	44833	0.4% Annual Chan	5350	435.98	451.65	445.49	452.13	0.001478	4.88	1035.89	122.3	0.27
Hickory Creek	2	44833	0.2% Annual Chan	6150	435.98	451.99	446.1	452.59	0.001696	5.34	1077.38	123.92	0.29
Hickory Creek	2	44690	50% Annual Chanc	1550	436.83	446.33	441.61	446.42	0.001027	2.33	666.33	132.69	0.18
Hickory Creek	2	44690	20% Annual Chanc	2300	436.83	448.09	442.96	448.19	0.000857	2.55	921.79	190.43	0.17
Hickory Creek	2	44690	10% Annual Chanc	2800	436.83	449.6	443.33	449.68	0.00058	2.37	1358.79	363.33	0.14
Hickory Creek	2	44690	4% Annual Chance	3400	436.83	450.34	443.73	450.42	0.000573	2.47	1647.43	407.75	0.14
Hickory Creek	2	44690	2% Annual Chance	3900	436.83	450.8	444.05	450.89	0.000588	2.58	1839.8	425.26	0.15
Hickory Creek	2	44690	1% Annual Chance	4450	436.83	451.15	444.37	451.25	0.000637	2.74	1988.28	431.98	0.15
Hickory Creek	2	44690	0.4% Annual Chan	5350	436.83	451.62	444.87	451.73	0.000721	3	2194.3	439.93	0.16
Hickory Creek	2	44690	0.2% Annual Chan	6150	436.83	451.97	445.28	452.1	0.0008	3.22	2350.58	446.28	0.17
Hickory Creek	2	44650	Bridge										
Hickory Creek	2	44598	50% Annual Chanc	1550	435.95	446.15	441.83	446.26	0.00138	2.59	598.12	124.58	0.21
Hickory Creek	2	44598	20% Annual Chanc	2300	435.95	447.64	442.77	447.77	0.001302	2.91	793.91	141.6	0.21
Hickory Creek	2	44598	10% Annual Chanc	2800	435.95	449.08	443.33	449.18	0.000806	2.61	1210.87	475.94	0.17
Hickory Creek	2	44598	4% Annual Chance	3400	435.95	449.84	443.79	449.93	0.000677	2.53	1646.22	663.3	0.16
Hickory Creek	2	44598	2% Annual Chance	3900	435.95	450.34	444.16	450.42	0.000613	2.5	1989.49	709.6	0.15
Hickory Creek	2	44598	1% Annual Chance	4450	435.95	450.75	444.52	450.84	0.00059	2.52	2291.73	734.83	0.15
Hickory Creek	2	44598	0.4% Annual Chan	5350	435.95	451.27	445.06	451.37	0.000596	2.61	2683.57	768.47	0.15
Hickory Creek	2	44598	0.2% Annual Chan	6150	435.95	451.64	445.51	451.75	0.000619	2.72	2971.94	790.11	0.15
Hickory Creek	2	44558	50% Annual Chanc	1550	435.57	445.93	441.61	446.13	0.003019	3.6	430.48	91.74	0.29
Hickory Creek	2	44558	20% Annual Chanc	2300	435.57	447.38	442.77	447.64	0.002838	4.03	579.4	126.4	0.29
Hickory Creek	2	44558	10% Annual Chanc	2800	435.57	448.94	444.11	449.1	0.001524	3.39	1015.52	394.68	0.22
Hickory Creek	2	44558	4% Annual Chance	3400	435.57	449.73	444.87	449.87	0.001224	3.22	1352.53	489.84	0.2
Hickory Creek	2	44558	2% Annual Chance	3900	435.57	450.23	445.36	450.36	0.001089	3.14	1605.51	514.82	0.19
Hickory Creek	2	44558	1% Annual Chance	4450	435.57	450.64	445.78	450.78	0.001051	3.17	1825.06	552.65	0.18
Hickory Creek	2	44558	0.4% Annual Chan	5350	435.57	451.15	446.31	451.31	0.001073	3.3	2115.75	601.73	0.19
Hickory Creek	2	44558	0.2% Annual Chan	6150	435.57	451.5	446.68	451.68	0.001112	3.43	2333.44	614.68	0.19
Hickory Creek	2	44503	50% Annual Chanc	1200	435.52	445.86	441.43	445.95	0.001111	2.42	496.38	91.03	0.18
Hickory Creek	2	44503	20% Annual Chanc	2000	435.52	447.3	442.33	447.46	0.001458	3.18	634.38	102.46	0.21

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	44503	10% Annual Chanc	2750	435.52	448.86	443.04	449.01	0.001227	3.28	1028.66	410.7	0.2
Hickory Creek	2	44503	4% Annual Chance	3400	435.52	449.64	443.6	449.79	0.001073	3.23	1378.84	470.65	0.19
Hickory Creek	2	44503	2% Annual Chance	3950	435.52	450.15	444.04	450.29	0.00101	3.22	1624.33	517.18	0.18
Hickory Creek	2	44503	1% Annual Chance	4500	435.52	450.56	444.46	450.7	0.000996	3.28	1850.98	565.56	0.18
Hickory Creek	2	44503	0.4% Annual Chan	5400	435.52	451.06	445.09	451.22	0.001018	3.4	2145.54	598.84	0.18
Hickory Creek	2	44503	0.2% Annual Chan	6150	435.52	451.42	445.55	451.59	0.001051	3.52	2361.11	621.97	0.19
Hickory Creek	2	44500	Bridge										
Hickory Creek	2	44487	50% Annual Chanc	1200	435.52	445.78	440.99	445.85	0.00066	2.18	550.79	96.45	0.16
Hickory Creek	2	44487	20% Annual Chanc	2000	435.52	447.2	441.88	447.33	0.000876	2.91	692.55	104.95	0.19
Hickory Creek	2	44487	10% Annual Chanc	2750	435.52	448.78	442.57	448.93	0.000822	3.22	915.67	284.17	0.19
Hickory Creek	2	44487	4% Annual Chance	3400	435.52	449.56	443.1	449.74	0.000863	3.49	1228.87	455.83	0.2
Hickory Creek	2	44487	2% Annual Chance	3950	435.52	450.04	443.52	450.24	0.000912	3.7	1464.05	528.54	0.21
Hickory Creek	2	44487	1% Annual Chance	4500	435.52	450.41	443.9	450.63	0.000981	3.94	1671.29	613.26	0.22
Hickory Creek	2	44487	0.4% Annual Chan	5400	435.52	450.86	444.51	451.11	0.0011	4.29	1963.19	663.49	0.23
Hickory Creek	2	44487	0.2% Annual Chan	6150	435.52	451.18	445	451.44	0.001192	4.55	2176.59	680.71	0.24
Hickory Creek	2	44450	Bridge										
Hickory Creek	2	44385	50% Annual Chanc	1200	435.54	445.48	441.19	445.62	0.001376	3.06	392.51	97.87	0.24
Hickory Creek	2	44385	20% Annual Chanc	2000	435.54	446.75	442.86	447	0.001749	4.02	501.03	122.74	0.29
Hickory Creek	2	44385	10% Annual Chanc	2750	435.54	448.26	443.66	448.51	0.001412	4.18	800.9	231.22	0.27
Hickory Creek	2	44385	4% Annual Chance	3400	435.54	448.91	444.28	449.18	0.001431	4.44	975.61	295.07	0.27
Hickory Creek	2	44385	2% Annual Chance	3950	435.54	449.45	444.73	449.71	0.001317	4.44	1178.6	438.63	0.26
Hickory Creek	2	44385	1% Annual Chance	4500	435.54	449.92	445.18	450.16	0.001207	4.41	1414.54	528.08	0.25
Hickory Creek	2	44385	0.4% Annual Chan	5400	435.54	450.53	445.82	450.75	0.001108	4.41	1752.29	570.95	0.25
Hickory Creek	2	44385	0.2% Annual Chan	6150	435.54	450.93	446.33	451.15	0.001085	4.47	1984.88	608.51	0.25
Hickory Creek	2	44360	50% Annual Chanc	1200	435.35	445.3	443.16	445.53	0.003769	3.88	324.42	127.48	0.35
Hickory Creek	2	44360	20% Annual Chanc	2000	435.35	446.7	444.1	446.93	0.00276	4.09	575.38	219.5	0.32
Hickory Creek	2	44360	10% Annual Chanc	2750	435.35	448.24	444.98	448.39	0.001437	3.51	981.22	304.01	0.24
Hickory Creek	2	44360	4% Annual Chance	3400	435.35	448.9	445.69	449.05	0.001311	3.56	1207.75	397.14	0.23
Hickory Creek	2	44360	2% Annual Chance	3950	435.35	449.44	446.16	449.58	0.001118	3.45	1452.5	526.1	0.22
Hickory Creek	2	44360	1% Annual Chance	4500	435.35	449.92	446.53	450.04	0.000971	3.34	1708.63	551.35	0.22
Hickory Creek	2	44360	0.4% Annual Chan	5400	435.35	450.53	446.92	450.65	0.000859	3.29	2052.34	570.4	0.19
Hickory Creek	2	44360	0.2% Annual Chan	6150	435.35	450.93	447.22	451.05	0.000831	3.33	2279.57	579.29	0.19
Hickory Creek	2	44200	Bridge										
Hickory Creek	2	44136	50% Annual Chanc	1200	434.54	443.41	440.95	443.71	0.004385	4.67	285.52	101.22	0.39
Hickory Creek	2	44136	20% Annual Chanc	2000	434.54	444.66	442.63	445.11	0.004797	5.75	396.97	129.31	0.42
Hickory Creek	2	44136	10% Annual Chanc	2750	434.54	445.56	443.34	446.06	0.004725	6.29	569.36	186.97	0.43
Hickory Creek	2	44136	4% Annual Chance	3400	434.54	446.24	443.88	446.74	0.00441	6.48	705.98	214.78	0.42
Hickory Creek	2	44136	2% Annual Chance	3950	434.54	446.75	444.31	447.25	0.004209	6.61	821.14	240.68	0.42
Hickory Creek	2	44136	1% Annual Chance	4500	434.54	447.21	444.67	447.71	0.004063	6.75	939.43	274.85	0.41
Hickory Creek	2	44136	0.4% Annual Chan	5400	434.54	447.92	445.32	448.41	0.003811	6.9	1163.1	356.07	0.4
Hickory Creek	2	44136	0.2% Annual Chan	6150	434.54	448.53	446.23	448.99	0.003453	6.86	1398.76	428.88	0.39
Hickory Creek	2	44065	50% Annual Chanc	1200	434.41	443.2		443.4	0.002574	3.57	338.18	94.71	0.3
Hickory Creek	2	44065	20% Annual Chanc	2000	434.41	444.44		444.74	0.002907	4.49	474.36	124.03	0.33
Hickory Creek	2	44065	10% Annual Chanc	2750	434.41	445.33		445.71	0.003113	5.13	599.81	164.99	0.35
Hickory Creek	2	44065	4% Annual Chance	3400	434.41	446		446.43	0.003147	5.51	725.15	208.38	0.36
Hickory Creek	2	44065	2% Annual Chance	3950	434.41	446.52		446.96	0.003086	5.71	840.64	244.7	0.36
Hickory Creek	2	44065	1% Annual Chance	4500	434.41	446.98		447.44	0.003033	5.88	962.49	285.64	0.36
Hickory Creek	2	44065	0.4% Annual Chan	5400	434.41	447.71		448.16	0.002823	6.01	1208.27	370.67	0.36
Hickory Creek	2	44065	0.2% Annual Chan	6150	434.41	448.34		448.76	0.00253	5.96	1453.52	409.43	0.34
Hickory Creek	2	44009	50% Annual Chanc	1200	433.88	443.09		443.26	0.002255	3.25	369.73	96.69	0.28
Hickory Creek	2	44009	20% Annual Chanc	2000	433.88	444.33		444.58	0.002497	4.06	521.28	140.56	0.31
Hickory Creek	2	44009	10% Annual Chanc	2750	433.88	445.22		445.53	0.002622	4.61	657.73	165.77	0.32
Hickory Creek	2	44009	4% Annual Chance	3400	433.88	445.89		446.25	0.002678	4.99	777.55	192.27	0.33
Hickory Creek	2	44009	2% Annual Chance	3950	433.88	446.4		446.79	0.00272	5.26	882.15	220.41	0.34
Hickory Creek	2	44009	1% Annual Chance	4500	433.88	446.86		447.27	0.002684	5.44	988.37	238.62	0.34
Hickory Creek	2	44009	0.4% Annual Chan	5400	433.88	447.58		448	0.002568	5.65	1188.67	316.87	0.34
Hickory Creek	2	44009	0.2% Annual Chan	6150	433.88	448.21		448.62	0.002382	5.7	1401.24	358.21	0.33
Hickory Creek	2	43941	50% Annual Chanc	1200	433.55	442.83		443.05	0.004068	3.78	320.23	113.91	0.36
Hickory Creek	2	43941	20% Annual Chanc	2000	433.55	444.08		444.37	0.003643	4.41	484.45	147.77	0.36
Hickory Creek	2	43941	10% Annual Chanc	2750	433.55	444.99		445.33	0.003456	4.84	629.36	171.54	0.36
Hickory Creek	2	43941	4% Annual Chance	3400	433.55	445.68		446.05	0.00331	5.13	754.28	191.18	0.36
Hickory Creek	2	43941	2% Annual Chance	3950	433.55	446.19		446.58	0.003245	5.35	856.15	208.72	0.36
Hickory Creek	2	43941	1% Annual Chance	4500	433.55	446.64		447.06	0.003217	5.56	955.52	227.34	0.37
Hickory Creek	2	43941	0.4% Annual Chan	5400	433.55	447.38		447.81	0.003026	5.76	1143.99	299.71	0.36
Hickory Creek	2	43941	0.2% Annual Chan	6150	433.55	448.03		448.45	0.002725	5.76	1360.47	357.11	0.35
Hickory Creek	2	43839	50% Annual Chanc	1200	432.94	442.48		442.66	0.003372	3.46	359.09	119.57	0.31

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	43839	20% Annual Chanc	2000	432.94	443.77		444	0.00332	4.02	537.06	157.94	0.32
Hickory Creek	2	43839	10% Annual Chanc	2750	432.94	444.69		444.96	0.003286	4.38	696.35	184.85	0.32
Hickory Creek	2	43839	4% Annual Chance	3400	432.94	445.4		445.69	0.003212	4.6	834.03	203.8	0.31
Hickory Creek	2	43839	2% Annual Chance	3950	432.94	445.92		446.23	0.003191	4.76	943.6	217.73	0.31
Hickory Creek	2	43839	1% Annual Chance	4500	432.94	446.38		446.71	0.003205	4.93	1047.3	231.64	0.31
Hickory Creek	2	43839	0.4% Annual Chan	5400	432.94	447.13		447.47	0.003153	5.11	1229.73	261.9	0.31
Hickory Creek	2	43839	0.2% Annual Chan	6150	432.94	447.79		448.14	0.003065	5.23	1419.27	321.26	0.31
Hickory Creek	2	43648	50% Annual Chanc	1200	432.6	442.06		442.21	0.001694	3.19	468.3	206.41	0.25
Hickory Creek	2	43648	20% Annual Chanc	2000	432.6	443.4		443.56	0.001544	3.56	775.56	253.52	0.25
Hickory Creek	2	43648	10% Annual Chanc	2750	432.6	444.37		444.53	0.001457	3.79	1034.15	278.92	0.25
Hickory Creek	2	43648	4% Annual Chance	3400	432.6	445.1		445.27	0.001388	3.94	1245.96	298.41	0.24
Hickory Creek	2	43648	2% Annual Chance	3950	432.6	445.63		445.81	0.001367	4.08	1408.65	314.01	0.24
Hickory Creek	2	43648	1% Annual Chance	4500	432.6	446.1		446.29	0.001368	4.23	1558.98	330.67	0.25
Hickory Creek	2	43648	0.4% Annual Chan	5400	432.6	446.86		447.06	0.001328	4.4	1830.93	385.06	0.25
Hickory Creek	2	43648	0.2% Annual Chan	6150	432.6	447.55		447.74	0.00123	4.42	2103.31	410.04	0.24
Hickory Creek	2	43505	50% Annual Chanc	1200	432.4	442.07		442.09	0.000248	1.47	1241.48	395.61	0.1
Hickory Creek	2	43505	20% Annual Chanc	2000	432.4	443.42		443.44	0.000239	1.62	1845.76	487.39	0.1
Hickory Creek	2	43505	10% Annual Chanc	2750	432.4	444.39		444.42	0.000235	1.72	2322.49	496.82	0.1
Hickory Creek	2	43505	4% Annual Chance	3400	432.4	445.13		445.16	0.000234	1.81	2691	504.26	0.1
Hickory Creek	2	43505	2% Annual Chance	3950	432.4	445.66		445.69	0.000239	1.89	2961.71	510.48	0.1
Hickory Creek	2	43505	1% Annual Chance	4500	432.4	446.13		446.17	0.000247	1.97	3202.81	517.19	0.1
Hickory Creek	2	43505	0.4% Annual Chan	5400	432.4	446.89		446.93	0.000255	2.09	3602.21	533.56	0.11
Hickory Creek	2	43505	0.2% Annual Chan	6150	432.4	447.58		447.62	0.000252	2.16	3974.68	554.21	0.11
Hickory Creek	2	43440	50% Annual Chanc	1200	432.26	441.96	436.76	442.03	0.000906	2.25	594.37	163.5	0.18
Hickory Creek	2	43440	20% Annual Chanc	2000	432.26	443.24	438.19	443.36	0.0011	2.9	842.3	217.31	0.21
Hickory Creek	2	43440	10% Annual Chanc	2750	432.26	444.18	439.24	444.32	0.001161	3.29	1089.06	368.47	0.22
Hickory Creek	2	43440	4% Annual Chance	3450	432.26	444.91	439.93	445.06	0.001129	3.47	1372.19	454	0.22
Hickory Creek	2	43440	2% Annual Chance	4000	432.26	445.45	440.36	445.6	0.001075	3.54	1584.38	503.49	0.22
Hickory Creek	2	43440	1% Annual Chance	4550	432.26	445.92	440.76	446.07	0.001047	3.62	1770.36	524.75	0.22
Hickory Creek	2	43440	0.4% Annual Chan	5450	432.26	446.68	441.4	446.84	0.000979	3.71	2076.4	560.87	0.21
Hickory Creek	2	43440	0.2% Annual Chan	6200	432.26	447.38	441.81	447.53	0.00089	3.71	2358.53	600.11	0.21
Hickory Creek	2	43400	Bridge										
Hickory Creek	2	43285	50% Annual Chanc	1200	432.12	441.8	437.96	441.85	0.000756	1.84	650.63	221.74	0.19
Hickory Creek	2	43285	20% Annual Chanc	2000	432.12	443.09	439.21	443.15	0.000681	2.07	965.64	257.9	0.19
Hickory Creek	2	43285	10% Annual Chanc	2750	432.12	444.03	439.9	444.11	0.000608	2.27	1211.23	261.86	0.18
Hickory Creek	2	43285	4% Annual Chance	3450	432.12	444.76	440.4	444.86	0.000587	2.46	1404.06	264.92	0.19
Hickory Creek	2	43285	2% Annual Chance	4000	432.12	445.3	440.73	445.41	0.000572	2.58	1547.59	267.18	0.19
Hickory Creek	2	43285	1% Annual Chance	4550	432.12	445.77	441.01	445.89	0.000572	2.72	1672.95	269.14	0.19
Hickory Creek	2	43285	0.4% Annual Chan	5450	432.12	446.54	441.44	446.67	0.000557	2.89	1880.33	272.35	0.19
Hickory Creek	2	43285	0.2% Annual Chan	6200	432.12	447.22	441.75	447.36	0.000526	2.98	2068.19	275.22	0.19
Hickory Creek	2	43200	Bridge										
Hickory Creek	2	43170	50% Annual Chanc	1200	430.93	441.6	437.85	441.7	0.001958	2.61	522.72	175.15	0.22
Hickory Creek	2	43170	20% Annual Chanc	2000	430.93	442.87	439.28	442.99	0.001971	3.1	799.33	252.97	0.23
Hickory Creek	2	43170	10% Annual Chanc	2750	430.93	443.81	440.09	443.95	0.001924	3.39	1060.9	438.43	0.23
Hickory Creek	2	43170	4% Annual Chance	3450	430.93	444.54	440.65	444.7	0.001909	3.62	1269.38	468.56	0.24
Hickory Creek	2	43170	2% Annual Chance	4000	430.93	445.08	440.99	445.25	0.001875	3.76	1426.62	495.95	0.24
Hickory Creek	2	43170	1% Annual Chance	4550	430.93	445.55	441.38	445.73	0.001886	3.92	1563.26	503.01	0.24
Hickory Creek	2	43170	0.4% Annual Chan	5450	430.93	446.32	441.88	446.51	0.001847	4.12	1794.04	530.31	0.24
Hickory Creek	2	43170	0.2% Annual Chan	6200	430.93	447	442.33	447.21	0.001824	4.29	2020.77	554.95	0.24
Hickory Creek	2	43123	50% Annual Chanc	1200	430.88	441.51	438.13	441.6	0.002009	2.69	619.25	196.98	0.2
Hickory Creek	2	43123	20% Annual Chanc	2000	430.88	442.77	439.14	442.89	0.002243	3.24	876.3	210.81	0.21
Hickory Creek	2	43123	10% Annual Chanc	2750	430.88	443.71	439.83	443.85	0.002384	3.63	1111.13	378.14	0.23
Hickory Creek	2	43123	4% Annual Chance	3450	430.88	444.44	440.49	444.59	0.002422	3.87	1384.36	436.59	0.23
Hickory Creek	2	43123	2% Annual Chance	4000	430.88	444.98	440.84	445.14	0.002506	4.1	1599.48	470.69	0.24
Hickory Creek	2	43123	1% Annual Chance	4550	430.88	445.44	441.24	445.61	0.002444	4.18	1789.48	487.73	0.24
Hickory Creek	2	43123	0.4% Annual Chan	5450	430.88	446.22	441.68	446.38	0.002278	4.25	2107.83	499.12	0.23
Hickory Creek	2	43123	0.2% Annual Chan	6200	430.88	446.91	442.01	447.07	0.002084	4.24	2395.96	508.54	0.22
Hickory Creek	2	43100	Bridge										
Hickory Creek	2	42925	50% Annual Chanc	1200	430.53	441.01	437	441.17	0.002103	3.23	397.64	175.97	0.27
Hickory Creek	2	42925	20% Annual Chanc	2000	430.53	442.14	438.5	442.38	0.002418	4.03	608.95	195.38	0.3
Hickory Creek	2	42925	10% Annual Chanc	2750	430.53	442.99	439.51	443.29	0.002571	4.58	799.46	281.08	0.32
Hickory Creek	2	42925	4% Annual Chance	3450	430.53	443.67	440.33	444	0.002634	4.96	1013.78	352.95	0.33
Hickory Creek	2	42925	2% Annual Chance	4000	430.53	444.18	440.9	444.53	0.002651	5.21	1203.25	391.01	0.33
Hickory Creek	2	42925	1% Annual Chance	4550	430.53	444.66	441.47	445.01	0.002526	5.3	1388.28	414.55	0.33
Hickory Creek	2	42925	0.4% Annual Chan	5450	430.53	445.5	442.02	445.83	0.002225	5.31	1711.8	424.17	0.31
Hickory Creek	2	42925	0.2% Annual Chan	6200	430.53	446.25	442.43	446.56	0.001946	5.24	2002.8	430.96	0.3

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	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)	
Hickory Creek	2	42800	50% Annual Chanc	1200	431.25	440.62		440.83	0.003107	3.71	354.49	121.53	0.33
Hickory Creek	2	42800	20% Annual Chanc	2000	431.25	441.7		442	0.003464	4.58	575.68	255.13	0.36
Hickory Creek	2	42800	10% Annual Chanc	2750	431.25	442.57		442.91	0.003371	5.03	816.4	316.73	0.36
Hickory Creek	2	42800	4% Annual Chance	3450	431.25	443.32		443.66	0.003072	5.19	1069.18	351.34	0.35
Hickory Creek	2	42800	2% Annual Chance	4000	431.25	443.87		444.2	0.002839	5.26	1265.79	367.18	0.34
Hickory Creek	2	42800	1% Annual Chance	4550	431.25	444.37		444.7	0.00265	5.31	1453.3	379.3	0.34
Hickory Creek	2	42800	0.4% Annual Chan	5450	431.25	445.25		445.55	0.00227	5.29	1798.5	399.48	0.32
Hickory Creek	2	42800	0.2% Annual Chan	6200	431.25	446.04		446.32	0.001942	5.18	2119.09	417.31	0.3
Hickory Creek	2	42697	50% Annual Chanc	1200	430.84	440.51		440.6	0.001533	2.78	679.7	257.67	0.23
Hickory Creek	2	42697	20% Annual Chanc	2000	430.84	441.63		441.74	0.001641	3.25	984.88	282.74	0.25
Hickory Creek	2	42697	10% Annual Chanc	2750	430.84	442.53		442.66	0.001597	3.56	1250.89	305.67	0.25
Hickory Creek	2	42697	4% Annual Chance	3450	430.84	443.28		443.43	0.001549	3.78	1486.45	317.82	0.25
Hickory Creek	2	42697	2% Annual Chance	4000	430.84	443.83		443.98	0.001521	3.94	1661.28	325.95	0.25
Hickory Creek	2	42697	1% Annual Chance	4550	430.84	444.33		444.49	0.001502	4.08	1826.45	331.92	0.25
Hickory Creek	2	42697	0.4% Annual Chan	5450	430.84	445.21		445.38	0.001399	4.22	2122.62	341.47	0.25
Hickory Creek	2	42697	0.2% Annual Chan	6200	430.84	445.99		446.16	0.001278	4.27	2393.65	349.28	0.24
Hickory Creek	2	42412	50% Annual Chanc	1200	431.08	440.04		440.12	0.002069	2.64	631.07	257.66	0.22
Hickory Creek	2	42412	20% Annual Chanc	2000	431.08	441.17		441.26	0.001946	2.95	937.82	291.43	0.22
Hickory Creek	2	42412	10% Annual Chanc	2750	431.08	442.1		442.2	0.001826	3.16	1235.3	370.98	0.21
Hickory Creek	2	42412	4% Annual Chance	3450	431.08	442.89		443	0.001665	3.25	1555.15	422.84	0.21
Hickory Creek	2	42412	2% Annual Chance	4000	431.08	443.47		443.57	0.001491	3.23	1805.05	442.48	0.2
Hickory Creek	2	42412	1% Annual Chance	4550	431.08	444.01		444.1	0.001357	3.22	2042.75	450.49	0.19
Hickory Creek	2	42412	0.4% Annual Chan	5450	431.08	444.94		445.03	0.001135	3.15	2472.45	474.97	0.18
Hickory Creek	2	42412	0.2% Annual Chan	6200	431.08	445.77		445.86	0.00095	3.05	2874.4	491.03	0.17
Hickory Creek	2	42348	50% Annual Chanc	1200	430.46	439.9	436.32	439.98	0.001417	2.28	539.32	201.44	0.22
Hickory Creek	2	42348	20% Annual Chanc	2000	430.46	440.97	437.62	441.09	0.001523	2.83	740.13	281.89	0.24
Hickory Creek	2	42348	10% Annual Chanc	2750	430.46	441.86	438.34	442.02	0.001529	3.21	907.58	476.73	0.24
Hickory Creek	2	42348	4% Annual Chance	3450	430.46	442.62	438.94	442.8	0.001524	3.5	1049.14	526.61	0.25
Hickory Creek	2	42348	2% Annual Chance	4000	430.46	443.17	439.26	443.37	0.001522	3.7	1151.96	550.47	0.25
Hickory Creek	2	42348	1% Annual Chance	4600	430.46	443.78	439.55	443.94	0.001167	3.43	1913.98	604.62	0.22
Hickory Creek	2	42348	0.4% Annual Chan	5450	430.46	444.81	439.94	444.92	0.000796	3.1	2829.03	684.94	0.19
Hickory Creek	2	42348	0.2% Annual Chan	6200	430.46	445.66	440.25	445.76	0.000648	2.98	3438.3	728.22	0.17
Hickory Creek	2	42300		Bridge									
Hickory Creek	2	42259	50% Annual Chanc	1200	430.78	439.71	436.66	439.85	0.001713	3.01	416.17	135.3	0.27
Hickory Creek	2	42259	20% Annual Chanc	2000	430.78	440.67	437.76	440.9	0.002233	3.98	545.33	300.24	0.32
Hickory Creek	2	42259	10% Annual Chanc	2750	430.78	441.29	438.67	441.63	0.002745	4.78	637.38	403.15	0.36
Hickory Creek	2	42259	4% Annual Chance	3450	430.78	441.83	439.17	442.26	0.00309	5.39	716.87	526.54	0.39
Hickory Creek	2	42259	2% Annual Chance	4000	430.78	442.19	439.52	442.69	0.003382	5.86	769.47	566.86	0.41
Hickory Creek	2	42259	1% Annual Chance	4600	430.78	442.59	439.87	443.02	0.002959	5.71	1290.17	583.43	0.39
Hickory Creek	2	42259	0.4% Annual Chan	5450	430.78	443.12	440.33	443.49	0.002526	5.55	1804.1	606.03	0.36
Hickory Creek	2	42259	0.2% Annual Chan	6200	430.78	443.55	440.81	443.91	0.002447	5.67	2067	629.97	0.36
Hickory Creek	2	42205	50% Annual Chanc	1200	429.97	439.51		439.71	0.002796	3.66	373.73	138.89	0.31
Hickory Creek	2	42205	20% Annual Chanc	2000	429.97	440.45		440.74	0.003399	4.61	549.03	226.8	0.36
Hickory Creek	2	42205	10% Annual Chanc	2750	429.97	441.1		441.45	0.003795	5.27	741.16	417.76	0.38
Hickory Creek	2	42205	4% Annual Chance	3450	429.97	441.67		442.03	0.003777	5.59	1011.63	508.52	0.39
Hickory Creek	2	42205	2% Annual Chance	4000	429.97	442.04		442.41	0.003746	5.78	1205.75	542.25	0.39
Hickory Creek	2	42205	1% Annual Chance	4600	429.97	442.43		442.8	0.003669	5.94	1423.86	575.67	0.39
Hickory Creek	2	42205	0.4% Annual Chan	5450	429.97	442.97		443.32	0.00335	5.95	1742.2	597.79	0.38
Hickory Creek	2	42205	0.2% Annual Chan	6200	429.97	443.41		443.74	0.003151	5.99	2007.4	620.3	0.37
Hickory Creek	2	42006	50% Annual Chanc	1200	429.57	439.41		439.44	0.00058	1.71	1312.85	546.59	0.14
Hickory Creek	2	42006	20% Annual Chanc	2000	429.57	440.38		440.41	0.000638	2.04	1857.68	571	0.15
Hickory Creek	2	42006	10% Annual Chanc	2750	429.57	441.05		441.09	0.0007	2.32	2242.29	583.72	0.17
Hickory Creek	2	42006	4% Annual Chance	3450	429.57	441.6		441.65	0.000751	2.54	2572.11	606.45	0.17
Hickory Creek	2	42006	2% Annual Chance	4000	429.57	441.96		442.02	0.000797	2.71	2791	615.06	0.18
Hickory Creek	2	42006	1% Annual Chance	4600	429.57	442.33		442.39	0.000856	2.91	3025.08	642.44	0.19
Hickory Creek	2	42006	0.4% Annual Chan	5450	429.57	442.85		442.92	0.000914	3.14	3366.24	679.21	0.2
Hickory Creek	2	42006	0.2% Annual Chan	6200	429.57	443.27		443.35	0.000956	3.33	3658.82	709.93	0.2
Hickory Creek	2	41696	50% Annual Chanc	1200	429.63	439.11		439.19	0.00154	2.28	705.52	522	0.22
Hickory Creek	2	41696	20% Annual Chanc	2000	429.63	440.1		440.17	0.001315	2.52	1280.53	637.83	0.22
Hickory Creek	2	41696	10% Annual Chanc	2750	429.63	440.77		440.85	0.001215	2.67	1733.09	721.51	0.21
Hickory Creek	2	41696	4% Annual Chance	3450	429.63	441.33		441.42	0.001129	2.77	2154.82	771.48	0.21
Hickory Creek	2	41696	2% Annual Chance	4000	429.63	441.69		441.78	0.001121	2.88	2436.94	803.18	0.21
Hickory Creek	2	41696	1% Annual Chance	4600	429.63	442.06		442.15	0.001103	2.98	2742.59	840.96	0.21
Hickory Creek	2	41696	0.4% Annual Chan	5450	429.63	442.58		442.68	0.001057	3.08	3199.58	902.85	0.21
Hickory Creek	2	41696	0.2% Annual Chan	6200	429.63	443.01		443.1	0.001018	3.15	3592.7	935.35	0.21
Hickory Creek	2	41463	50% Annual Chanc	1200	429.4	438.7		438.78	0.001952	2.83	717.5	291.95	0.22
Hickory Creek	2	41463	20% Annual Chanc	2000	429.4	439.65		439.76	0.002393	3.52	1030.32	368.68	0.25
Hickory Creek	2	41463	10% Annual Chanc	2750	429.4	440.31		440.44	0.002636	3.96	1296.41	460.13	0.27

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	2	41463	4% Annual Chance	3450	429.4	440.85		441.01	0.00288	4.36	1571.57	566.28	0.29
Hickory Creek	2	41463	2% Annual Chance	4000	429.4	441.2		441.37	0.002908	4.53	1777.39	601.91	0.29
Hickory Creek	2	41463	1% Annual Chance	4600	429.4	441.58		441.75	0.002839	4.63	2008.36	613.48	0.29
Hickory Creek	2	41463	0.4% Annual Chan	5450	429.4	442.13		442.29	0.002694	4.71	2354.38	653.44	0.29
Hickory Creek	2	41463	0.2% Annual Chan	6200	429.4	442.57		442.73	0.002588	4.78	2651.43	682.59	0.28
Hickory Creek	2	41168	50% Annual Chanc	1200	429.25	438.16		438.24	0.002148	2.48	704.06	383.11	0.23
Hickory Creek	2	41168	20% Annual Chanc	2000	429.25	439.08		439.17	0.002136	2.86	1074.58	435.28	0.23
Hickory Creek	2	41168	10% Annual Chanc	2750	429.25	439.71		439.81	0.002229	3.18	1352.86	460.03	0.25
Hickory Creek	2	41168	4% Annual Chance	3450	429.25	440.23		440.35	0.002291	3.44	1609.5	523.71	0.25
Hickory Creek	2	41168	2% Annual Chance	4000	429.25	440.56		440.69	0.00239	3.65	1788.13	556.94	0.26
Hickory Creek	2	41168	1% Annual Chance	4600	429.25	440.93		441.08	0.002436	3.83	2006.92	610.14	0.27
Hickory Creek	2	41168	0.4% Annual Chan	5450	429.25	441.52		441.66	0.002247	3.9	2373.79	642.77	0.26
Hickory Creek	2	41168	0.2% Annual Chan	6200	429.25	441.98		442.13	0.002139	3.97	2687.62	683.7	0.26
Hickory Creek	2	40781	50% Annual Chanc	1200	428.52	437.53		437.58	0.001508	2.28	865.73	417.22	0.19
Hickory Creek	2	40781	20% Annual Chanc	2000	428.52	438.41		438.48	0.001705	2.74	1300.21	562.08	0.21
Hickory Creek	2	40781	10% Annual Chanc	2750	428.52	439		439.08	0.001815	3.04	1639.29	582.86	0.22
Hickory Creek	2	40781	4% Annual Chance	3450	428.52	439.52		439.6	0.001839	3.23	1946.29	609.73	0.23
Hickory Creek	2	40781	2% Annual Chance	4000	428.52	439.81		439.9	0.001955	3.43	2125.28	616.98	0.23
Hickory Creek	2	40781	1% Annual Chance	4600	428.52	440.18		440.27	0.001962	3.56	2352.69	625.5	0.24
Hickory Creek	2	40781	0.4% Annual Chan	5450	428.52	440.76		440.87	0.002076	3.87	2739.26	708.22	0.25
Hickory Creek	2	40781	0.2% Annual Chan	6200	428.52	441.28		441.39	0.001899	3.87	3118.13	733.44	0.24
Hickory Creek	2	40678	50% Annual Chanc	1200	427.73	437.49	431.07	437.51	0.000218	1.29	1636.33	617.79	0.08
Hickory Creek	2	40678	20% Annual Chanc	2000	427.73	438.36	432.25	438.39	0.000301	1.63	2200.64	666.6	0.1
Hickory Creek	2	40678	10% Annual Chanc	2750	427.73	438.95	433.11	438.98	0.000372	1.89	2594.51	690.44	0.11
Hickory Creek	2	40678	4% Annual Chance	3450	427.73	439.46	433.83	439.49	0.000418	2.08	2952.71	712.82	0.12
Hickory Creek	2	40678	2% Annual Chance	4000	427.73	439.74	434.34	439.78	0.000473	2.25	3157.06	727.03	0.13
Hickory Creek	2	40678	1% Annual Chance	4600	427.73	440.1	434.83	440.15	0.000506	2.38	3423.59	744.25	0.13
Hickory Creek	2	40678	0.4% Annual Chan	5450	427.73	440.69	435.91	440.73	0.000511	2.49	3865.15	768.51	0.13
Hickory Creek	2	40678	0.2% Annual Chan	6200	427.73	441.21	436.36	441.26	0.000509	2.56	4279.36	808.43	0.13
Hickory Creek	2	40650		Culvert									
Hickory Creek	2	40614	50% Annual Chanc	1200	427.71	437.45	431.04	437.48	0.000313	1.57	1301.61	568.17	0.1
Hickory Creek	2	40614	20% Annual Chanc	2000	427.71	438.33	432.24	438.36	0.000425	1.96	1865.25	689.59	0.12
Hickory Creek	2	40614	10% Annual Chanc	2750	427.71	438.9	433.12	438.94	0.000501	2.22	2266.18	711.95	0.13
Hickory Creek	2	40614	4% Annual Chance	3450	427.71	439.39	433.81	439.44	0.000543	2.39	2622.87	732.13	0.13
Hickory Creek	2	40614	2% Annual Chance	4000	427.71	439.67	434.25	439.73	0.000595	2.55	2832.6	736.08	0.14
Hickory Creek	2	40614	1% Annual Chance	4600	427.71	440.03	434.71	440.09	0.00062	2.67	3093.44	741.28	0.15
Hickory Creek	2	40614	0.4% Annual Chan	5450	427.71	440.62	436.16	440.68	0.000601	2.73	3534.6	752.31	0.14
Hickory Creek	2	40614	0.2% Annual Chan	6200	427.71	441.16	436.66	441.22	0.000569	2.74	3949.11	765.24	0.14
Hickory Creek	2	40504	50% Annual Chanc	1200	427.79	437.31		437.4	0.001933	2.74	694.01	384.85	0.22
Hickory Creek	2	40504	20% Annual Chanc	2000	427.79	438.16		438.26	0.002112	3.19	1103.72	589.44	0.24
Hickory Creek	2	40504	10% Annual Chanc	2750	427.79	438.72		438.82	0.002161	3.43	1443.69	620.11	0.24
Hickory Creek	2	40504	4% Annual Chance	3450	427.79	439.21		439.31	0.00214	3.59	1754.19	651.66	0.24
Hickory Creek	2	40504	2% Annual Chance	4000	427.79	439.48		439.6	0.002227	3.76	1934.38	657.75	0.25
Hickory Creek	2	40504	1% Annual Chance	4600	427.79	439.84		439.95	0.002168	3.84	2169.19	667.25	0.25
Hickory Creek	2	40504	0.4% Annual Chan	5450	427.79	440.45		440.55	0.001879	3.77	2580	679	0.24
Hickory Creek	2	40504	0.2% Annual Chan	6200	427.79	441.01		441.11	0.001656	3.7	2974.81	752.16	0.22
Hickory Creek	1	40166	50% Annual Chanc	1950	423.96	436.61		436.71	0.002015	3.29	1132.99	736.9	0.21
Hickory Creek	1	40166	20% Annual Chanc	3150	423.96	437.38		437.49	0.002297	3.75	1775.69	920.63	0.23
Hickory Creek	1	40166	10% Annual Chanc	4300	423.96	437.94		438.05	0.002285	3.91	2308.51	955.85	0.23
Hickory Creek	1	40166	4% Annual Chance	5450	423.96	438.45		438.55	0.002227	4.01	2806.14	1001.22	0.23
Hickory Creek	1	40166	2% Annual Chance	6150	423.96	438.72		438.83	0.002207	4.07	3079.15	1006.37	0.23
Hickory Creek	1	40166	1% Annual Chance	7150	423.96	439.09		439.2	0.00217	4.14	3452.49	1013.37	0.23
Hickory Creek	1	40166	0.4% Annual Chan	9050	423.96	439.74		439.85	0.002117	4.26	4131.93	1067.34	0.23
Hickory Creek	1	40166	0.2% Annual Chan	10950	423.96	440.34		440.45	0.002044	4.34	4776.64	1087.62	0.23
Hickory Creek	1	39628	50% Annual Chanc	1950	423.34	435.12	432.24	435.29	0.005638	4.08	849.79	606.24	0.34
Hickory Creek	1	39628	20% Annual Chanc	3150	423.34	436.21	434.49	436.32	0.003479	3.66	1718.58	814.29	0.28
Hickory Creek	1	39628	10% Annual Chanc	4300	423.34	436.87	434.92	436.97	0.003139	3.73	2266.85	840.79	0.27
Hickory Creek	1	39628	4% Annual Chance	5450	423.34	437.44	435.08	437.54	0.00298	3.84	2767.12	905.92	0.26
Hickory Creek	1	39628	2% Annual Chance	6150	423.34	437.74	435.1	437.84	0.00289	3.89	3038.23	914.12	0.26
Hickory Creek	1	39628	1% Annual Chance	7150	423.34	438.15	435.1	438.25	0.002767	3.94	3414.01	924.01	0.26
Hickory Creek	1	39628	0.4% Annual Chan	9050	423.34	438.83	436.14	438.94	0.002746	4.15	4064.76	983.92	0.26
Hickory Creek	1	39628	0.2% Annual Chan	10950	423.34	439.47	436.52	439.59	0.002611	4.25	4706.56	1006.83	0.25
Hickory Creek	1	39572	50% Annual Chanc	1950	423.34	434.98	430.01	435.09	0.002001	2.9	998.1	529.1	0.22
Hickory Creek	1	39572	20% Annual Chanc	3150	423.34	436.05	431.55	436.17	0.002004	3.25	1727.51	775.26	0.22
Hickory Creek	1	39572	10% Annual Chanc	4300	423.34	436.69	433.61	436.82	0.00217	3.59	2251.91	853.21	0.23
Hickory Creek	1	39572	4% Annual Chance	5450	423.34	437.27	434.12	437.4	0.002149	3.75	2748.54	879.89	0.24
Hickory Creek	1	39572	2% Annual Chance	6150	423.34	437.56	434.59	437.7	0.002174	3.86	3011.53	894.71	0.24
Hickory Creek	1	39572	1% Annual Chance	7150	423.34	437.97	435.23	438.11	0.002196	4	3381.12	924.65	0.24

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	39572	0.4% Annual Chan	9050	423.34	438.65	435.94	438.79	0.002235	4.24	4022.48	973	0.25
Hickory Creek	1	39572	0.2% Annual Chan	10950	423.34	439.29	436.2	439.45	0.002275	4.47	4669.02	1030.16	0.25
Hickory Creek	1	38283	50% Annual Chanc	1950	419.86	432.3	428.96	432.37	0.002629	2.35	990.07	421.33	0.23
Hickory Creek	1	38283	20% Annual Chanc	3150	419.86	433.5	430.65	433.59	0.002453	2.79	1692.02	709.26	0.23
Hickory Creek	1	38283	10% Annual Chanc	4300	419.86	434.24	431.1	434.33	0.002212	2.93	2222.74	731.4	0.23
Hickory Creek	1	38283	4% Annual Chance	5450	419.86	434.86	431.4	434.97	0.002198	3.15	2723.35	835.31	0.23
Hickory Creek	1	38283	2% Annual Chance	6150	419.86	435.19	431.59	435.3	0.002162	3.24	2997.89	852.5	0.23
Hickory Creek	1	38283	1% Annual Chance	7150	419.86	435.62	431.84	435.73	0.002136	3.37	3376.38	885.75	0.23
Hickory Creek	1	38283	0.4% Annual Chan	9050	419.86	436.35	432.47	436.47	0.002075	3.56	4031.25	909.61	0.23
Hickory Creek	1	38283	0.2% Annual Chan	10950	419.86	437.02	433	437.15	0.002058	3.75	4647.77	954.95	0.23
Hickory Creek	1	37389	50% Annual Chanc	1950	420.31	430.79	430.91	430.91	0.001191	3.33	1153.21	440.54	0.22
Hickory Creek	1	37389	20% Annual Chanc	3150	420.31	432.06	432.18	432.18	0.00118	3.69	1849.07	605.31	0.22
Hickory Creek	1	37389	10% Annual Chanc	4300	420.31	432.67	432.82	432.82	0.001437	4.27	2224.4	624.83	0.25
Hickory Creek	1	37389	4% Annual Chance	5450	420.31	433.11	433.29	433.29	0.001754	4.87	2499.7	641.49	0.28
Hickory Creek	1	37389	2% Annual Chance	6150	420.31	433.33	433.54	433.54	0.001949	5.22	2645.57	650.35	0.3
Hickory Creek	1	37389	1% Annual Chance	7150	420.31	433.63	433.87	433.87	0.002228	5.69	2840.1	669.56	0.32
Hickory Creek	1	37389	0.4% Annual Chan	9050	420.31	434.14	434.45	434.45	0.002737	6.52	3195.65	714.96	0.35
Hickory Creek	1	37389	0.2% Annual Chan	10950	420.31	434.56	434.95	434.95	0.003313	7.37	3509.77	760.27	0.39
Hickory Creek	1	37356	50% Annual Chanc	1950	420.31	430.59	427.38	430.81	0.003619	3.88	550.41	449.25	0.29
Hickory Creek	1	37356	20% Annual Chanc	3150	420.31	432.02	428.54	432.13	0.001943	3.32	1657.99	602.26	0.22
Hickory Creek	1	37356	10% Annual Chanc	4300	420.31	432.62	429.35	432.76	0.002221	3.75	2029.35	622.9	0.24
Hickory Creek	1	37356	4% Annual Chance	5450	420.31	433.05	430.15	433.21	0.002598	4.21	2297.95	633.3	0.26
Hickory Creek	1	37356	2% Annual Chance	6150	420.31	433.27	430.83	433.46	0.002833	4.47	2438.66	638.69	0.28
Hickory Creek	1	37356	1% Annual Chance	7150	420.31	433.56	431.27	433.77	0.003184	4.85	2624	652.83	0.29
Hickory Creek	1	37356	0.4% Annual Chan	9050	420.31	434.06	431.7	434.32	0.003783	5.49	2958.17	686.31	0.32
Hickory Creek	1	37356	0.2% Annual Chan	10950	420.31	434.47	432.1	434.79	0.00438	6.09	3249.21	712.97	0.35
Hickory Creek	1	37295	Bridge										
Hickory Creek	1	37262	50% Annual Chanc	1950	418.5	429.47	425.4	429.75	0.003176	4.24	469.48	241.57	0.28
Hickory Creek	1	37262	20% Annual Chanc	3150	418.5	431.1	426.71	431.29	0.002143	4	1235.4	526.33	0.24
Hickory Creek	1	37262	10% Annual Chanc	4300	418.5	431.93	427.69	432.12	0.002111	4.22	1693.42	573.16	0.24
Hickory Creek	1	37262	4% Annual Chance	5450	418.5	432.43	428.6	432.64	0.00236	4.62	1989.24	601.79	0.26
Hickory Creek	1	37262	2% Annual Chance	6150	418.5	432.71	429.09	432.93	0.002497	4.84	2155.39	619.02	0.27
Hickory Creek	1	37262	1% Annual Chance	7150	418.5	433.05	429.76	433.3	0.00269	5.13	2373.79	640.17	0.28
Hickory Creek	1	37262	0.4% Annual Chan	9050	418.5	433.67	431.32	433.95	0.002938	5.57	2777.16	668.13	0.29
Hickory Creek	1	37262	0.2% Annual Chan	10950	418.5	434.16	431.75	434.48	0.00322	6	3113.13	685.35	0.31
Hickory Creek	1	37198	50% Annual Chanc	1950	418.4	428.67	429.34	429.34	0.007003	6.58	307.83	80.18	0.46
Hickory Creek	1	37198	20% Annual Chanc	3150	418.4	429.24	427.39	430.65	0.013843	9.59	370.08	149.14	0.65
Hickory Creek	1	37198	10% Annual Chanc	4300	418.4	430.53	430.53	431.6	0.01034	9.14	777.15	430.74	0.58
Hickory Creek	1	37198	4% Annual Chance	5450	418.4	431	431	432.11	0.010934	9.74	988.95	465.4	0.6
Hickory Creek	1	37198	2% Annual Chance	6150	418.4	431.23	431.23	432.37	0.011394	10.12	1097.16	483.93	0.61
Hickory Creek	1	37198	1% Annual Chance	7150	418.4	431.53	431.53	432.72	0.011879	10.58	1248.25	507.38	0.63
Hickory Creek	1	37198	0.4% Annual Chan	9050	418.4	431.98	431.98	433.31	0.01332	11.58	1482.8	548.18	0.67
Hickory Creek	1	37198	0.2% Annual Chan	10950	418.4	432.45	432.45	433.82	0.013624	12.11	1757.52	608.82	0.68
Hickory Creek	1	36613	50% Annual Chanc	1950	418.78	427.53	427.56	427.56	0.001649	1.83	1541.99	770.98	0.17
Hickory Creek	1	36613	20% Annual Chanc	3150	418.78	428.43	428.46	428.46	0.001474	1.99	2261.2	816.28	0.16
Hickory Creek	1	36613	10% Annual Chanc	4300	418.78	429.08	429.12	429.12	0.001407	2.12	2800.54	830.16	0.16
Hickory Creek	1	36613	4% Annual Chance	5450	418.78	429.65	429.7	429.7	0.001387	2.26	3279.75	854.57	0.16
Hickory Creek	1	36613	2% Annual Chance	6150	418.78	429.98	430.03	430.03	0.001373	2.33	3561.43	870.75	0.16
Hickory Creek	1	36613	1% Annual Chance	7150	418.78	430.42	430.47	430.47	0.001346	2.41	3942.81	882.61	0.16
Hickory Creek	1	36613	0.4% Annual Chan	9050	418.78	431.16	431.22	431.22	0.001311	2.56	4609.74	899.26	0.17
Hickory Creek	1	36613	0.2% Annual Chan	10950	418.78	431.83	431.9	431.9	0.001307	2.7	5213.99	920.11	0.17
Hickory Creek	1	35082	50% Annual Chanc	1950	412.14	424.71	424.89	424.89	0.002781	3.81	862.55	416.95	0.23
Hickory Creek	1	35082	20% Annual Chanc	3150	412.14	425.72	425.91	425.91	0.003188	4.39	1308.52	485.11	0.25
Hickory Creek	1	35082	10% Annual Chanc	4300	412.14	426.47	426.67	426.67	0.003282	4.69	1699.02	543.45	0.26
Hickory Creek	1	35082	4% Annual Chance	5450	412.14	427.1	427.3	427.3	0.003323	4.91	2051.87	571.73	0.26
Hickory Creek	1	35082	2% Annual Chance	6150	412.14	427.49	427.69	427.69	0.003225	4.95	2282.77	590.12	0.26
Hickory Creek	1	35082	1% Annual Chance	7150	412.14	428.03	428.22	428.22	0.003086	4.99	2604.89	611.97	0.26
Hickory Creek	1	35082	0.4% Annual Chan	9050	412.14	428.87	429.07	429.07	0.003004	5.16	3136.22	644.36	0.26
Hickory Creek	1	35082	0.2% Annual Chan	10950	412.14	429.53	429.74	429.74	0.003072	5.4	3566.31	662.22	0.26
Hickory Creek	1	34069	50% Annual Chanc	1950	410.91	421.9	422.05	422.05	0.003292	3.83	902.04	438.75	0.26
Hickory Creek	1	34069	20% Annual Chanc	3150	410.91	423.3	423.41	423.41	0.00241	3.71	1643.81	557.73	0.23
Hickory Creek	1	34069	10% Annual Chanc	4300	410.91	424.23	424.34	424.34	0.002149	3.77	2220.7	669.12	0.22
Hickory Creek	1	34069	4% Annual Chance	5450	410.91	425.16	425.25	425.25	0.001748	3.62	2860.77	719.13	0.2
Hickory Creek	1	34069	2% Annual Chance	6150	410.91	425.78	425.86	425.86	0.001487	3.47	3321.41	754.66	0.19
Hickory Creek	1	34069	1% Annual Chance	7150	410.91	426.48	426.55	426.55	0.001331	3.43	3858.45	784.81	0.18
Hickory Creek	1	34069	0.4% Annual Chan	9050	410.91	427.35	427.43	427.43	0.001341	3.61	4564.01	824.91	0.18
Hickory Creek	1	34069	0.2% Annual Chan	10950	410.91	427.89	427.99	427.99	0.001504	3.94	5014.86	839.91	0.19

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	33366	50% Annual Chanc	1700	410.3	420.81	415.14	420.91	0.000957	2.73	953	381.96	0.17
Hickory Creek	1	33366	20% Annual Chanc	2850	410.3	422.31	416.39	422.43	0.00106	3.21	1538.94	542.46	0.18
Hickory Creek	1	33366	10% Annual Chanc	3750	410.3	423.28	417.17	423.41	0.001081	3.45	1922.38	658.46	0.19
Hickory Creek	1	33366	4% Annual Chance	4900	410.3	424.24	418.09	424.39	0.001157	3.78	2305.69	694.99	0.19
Hickory Creek	1	33366	2% Annual Chance	5750	410.3	424.91	418.76	425.06	0.001186	3.97	2573.55	723.55	0.2
Hickory Creek	1	33366	1% Annual Chance	6750	410.3	425.63	420.75	425.79	0.001229	4.2	2864.51	748.99	0.2
Hickory Creek	1	33366	0.4% Annual Chan	8250	410.3	426.44	421.43	426.63	0.001373	4.62	3217.36	808.22	0.22
Hickory Creek	1	33366	0.2% Annual Chan	9500	410.3	427.21	421.83	427.32	0.000929	3.94	5161.86	826.23	0.18
Hickory Creek	1	33312	50% Annual Chanc	1700	410.21	420.74	417.32	420.83	0.002156	2.49	709.17	386.14	0.23
Hickory Creek	1	33312	20% Annual Chanc	2850	410.21	422.24	418.76	422.36	0.001781	2.84	1088.47	636.52	0.22
Hickory Creek	1	33312	10% Annual Chanc	3750	410.21	423.2	419.27	423.33	0.001664	3.08	1334.59	743.52	0.22
Hickory Creek	1	33312	4% Annual Chance	4900	410.21	424.14	419.84	424.31	0.001695	3.42	1576.46	801.93	0.23
Hickory Creek	1	33312	2% Annual Chance	5750	410.21	424.79	420.22	424.98	0.001699	3.63	1744.19	826.52	0.23
Hickory Creek	1	33312	1% Annual Chance	6750	410.21	425.49	420.61	425.7	0.001717	3.87	1923.84	863.33	0.24
Hickory Creek	1	33312	0.4% Annual Chan	8250	410.21	426.44	421.13	426.52	0.000762	2.77	4962.43	971.5	0.16
Hickory Creek	1	33312	0.2% Annual Chan	9500	410.21	427.18	421.56	427.26	0.000703	2.8	5711.37	1044.68	0.16
Hickory Creek	1	33252	Bridge										
Hickory Creek	1	33215	50% Annual Chanc	1700	410.21	420.49	417.32	420.63	0.001357	2.96	574.7	147.39	0.26
Hickory Creek	1	33215	20% Annual Chanc	2850	410.21	421.94	418.72	422.14	0.001408	3.59	793.89	156.33	0.28
Hickory Creek	1	33215	10% Annual Chanc	3750	410.21	422.85	419.23	423.09	0.001464	4	938.61	161.95	0.29
Hickory Creek	1	33215	4% Annual Chance	4900	410.21	423.71	419.81	424.03	0.00162	4.54	1081.64	173.26	0.31
Hickory Creek	1	33215	2% Annual Chance	5750	410.21	424.31	420.2	424.68	0.001671	4.86	1190.59	189.39	0.32
Hickory Creek	1	33215	1% Annual Chance	6750	410.21	424.96	420.61	425.38	0.001699	5.2	1319.72	216.56	0.33
Hickory Creek	1	33215	0.4% Annual Chan	8250	410.21	425.84	421.22	426.32	0.001729	5.63	1497.92	243.24	0.34
Hickory Creek	1	33215	0.2% Annual Chan	9500	410.21	426.53	421.7	427.04	0.001678	5.84	1807.96	758.92	0.34
Hickory Creek	1	33214	50% Annual Chanc	1700	410.21	420.49	417.32	420.63	0.001359	2.96	574.47	147.38	0.26
Hickory Creek	1	33214	20% Annual Chanc	2850	410.21	421.94	418.71	422.14	0.001409	3.59	793.65	156.32	0.28
Hickory Creek	1	33214	10% Annual Chanc	3750	410.21	422.84	419.23	423.09	0.001465	4	938.33	161.94	0.29
Hickory Creek	1	33214	4% Annual Chance	4900	410.21	423.71	419.81	424.03	0.001622	4.54	1081.3	173.22	0.31
Hickory Creek	1	33214	2% Annual Chance	5750	410.21	424.31	420.19	424.68	0.001674	4.86	1190.11	189.28	0.32
Hickory Creek	1	33214	1% Annual Chance	6750	410.21	424.95	420.62	425.37	0.001711	5.21	1317.85	216.33	0.33
Hickory Creek	1	33214	0.4% Annual Chan	8250	410.21	425.83	421.23	426.32	0.001751	5.66	1496.9	242.96	0.34
Hickory Creek	1	33214	0.2% Annual Chan	9500	410.21	426.49	421.7	427.04	0.00178	6	1633.52	732.72	0.35
Hickory Creek	1	33173	Bridge										
Hickory Creek	1	33138	50% Annual Chanc	1700	410.21	420.27	417.33	420.42	0.001629	3.14	542.01	146.01	0.29
Hickory Creek	1	33138	20% Annual Chanc	2850	410.21	421.7	418.72	421.92	0.001631	3.77	756.67	154.85	0.3
Hickory Creek	1	33138	10% Annual Chanc	3750	410.21	422.6	419.23	422.87	0.001672	4.17	898.42	160.41	0.31
Hickory Creek	1	33138	4% Annual Chance	4900	410.21	423.42	419.81	423.77	0.00189	4.74	1033.14	167.42	0.34
Hickory Creek	1	33138	2% Annual Chance	5750	410.21	423.99	420.2	424.4	0.001969	5.09	1128.91	179.11	0.35
Hickory Creek	1	33138	1% Annual Chance	6750	410.21	424.6	420.61	425.07	0.002038	5.48	1234.32	201.42	0.36
Hickory Creek	1	33138	0.4% Annual Chan	8250	410.21	425.41	421.24	425.97	0.002125	6.01	1389.84	230.83	0.37
Hickory Creek	1	33138	0.2% Annual Chan	9500	410.21	426.03	421.71	426.66	0.002184	6.4	1512.86	246.75	0.38
Hickory Creek	1	33137	50% Annual Chanc	1700	410.21	420.27	417.32	420.42	0.001632	3.14	541.74	146	0.29
Hickory Creek	1	33137	20% Annual Chanc	2850	410.21	421.7	418.72	421.92	0.001633	3.77	756.38	154.83	0.3
Hickory Creek	1	33137	10% Annual Chanc	3750	410.21	422.59	419.24	422.87	0.001674	4.18	898.1	160.4	0.31
Hickory Creek	1	33137	4% Annual Chance	4900	410.21	423.42	419.8	423.77	0.001899	4.74	1032.77	167.38	0.34
Hickory Creek	1	33137	2% Annual Chance	5750	410.21	423.99	420.19	424.39	0.002105	5.08	1131.74	179.09	0.36
Hickory Creek	1	33137	1% Annual Chance	6750	410.21	424.6	420.63	425.06	0.002282	5.42	1246.76	201.51	0.37
Hickory Creek	1	33137	0.4% Annual Chan	8250	410.21	425.42	421.23	425.96	0.002401	5.86	1414.35	231.11	0.39
Hickory Creek	1	33137	0.2% Annual Chan	9500	410.21	426.05	421.7	426.64	0.002395	6.19	1543.43	247.16	0.39
Hickory Creek	1	33097	Bridge										
Hickory Creek	1	33054	50% Annual Chanc	1700	410.21	420.03	417.32	420.21	0.001998	3.35	507.74	144.55	0.31
Hickory Creek	1	33054	20% Annual Chanc	2850	410.21	421.45	418.72	421.69	0.001916	3.97	718.03	153.29	0.32
Hickory Creek	1	33054	10% Annual Chanc	3750	410.21	422.32	419.23	422.62	0.001948	4.39	854.39	158.7	0.33
Hickory Creek	1	33054	4% Annual Chance	4900	410.21	423.09	419.8	423.48	0.002209	5.01	977.6	163.44	0.36
Hickory Creek	1	33054	2% Annual Chance	5750	410.21	423.61	420.19	424.06	0.002437	5.4	1064.1	171.17	0.38
Hickory Creek	1	33054	1% Annual Chance	6750	410.21	424.15	420.63	424.68	0.0026	5.82	1159.28	182.67	0.4
Hickory Creek	1	33054	0.4% Annual Chan	8250	410.21	424.88	421.23	425.52	0.002739	6.41	1293.7	213.27	0.42
Hickory Creek	1	33054	0.2% Annual Chan	9500	410.21	425.43	421.7	426.16	0.002841	6.85	1404.35	231.58	0.43
Hickory Creek	1	33053	50% Annual Chanc	1700	410.21	420.03	417.32	420.21	0.002002	3.35	507.39	144.54	0.32
Hickory Creek	1	33053	20% Annual Chanc	2850	410.21	421.44	418.72	421.69	0.001919	3.97	717.67	153.28	0.32
Hickory Creek	1	33053	10% Annual Chanc	3750	410.21	422.32	419.23	422.62	0.001951	4.39	854.01	158.69	0.33
Hickory Creek	1	33053	4% Annual Chance	4900	410.21	423.08	419.8	423.47	0.002213	5.01	977.13	163.42	0.36
Hickory Creek	1	33053	2% Annual Chance	5750	410.21	423.6	420.2	424.06	0.00244	5.41	1063.54	171.11	0.38
Hickory Creek	1	33053	1% Annual Chance	6750	410.21	424.15	420.63	424.68	0.002732	5.82	1160.44	182.58	0.41
Hickory Creek	1	33053	0.4% Annual Chan	8250	410.21	424.88	421.23	425.51	0.003052	6.35	1301.01	213.35	0.43
Hickory Creek	1	33053	0.2% Annual Chan	9500	410.21	425.44	421.69	426.14	0.003157	6.74	1413.18	231.78	0.45

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	33019		Bridge									
Hickory Creek	1	32952	50% Annual Chanc	1700	410.25	419.32	416.89	419.53	0.004067	3.88	518.76	154.86	0.31
Hickory Creek	1	32952	20% Annual Chanc	2850	410.25	420.58	417.86	420.9	0.004671	4.84	722.67	233.58	0.34
Hickory Creek	1	32952	10% Annual Chanc	3750	410.25	421.37	418.56	421.76	0.005076	5.47	860.69	281.44	0.36
Hickory Creek	1	32952	4% Annual Chance	4900	410.25	422	419.31	422.52	0.006102	6.34	976.28	386.67	0.4
Hickory Creek	1	32952	2% Annual Chance	5750	410.25	422.43	419.74	423.03	0.006719	6.9	1055.6	566.26	0.43
Hickory Creek	1	32952	1% Annual Chance	6750	410.25	422.86	420.24	423.58	0.007482	7.55	1135.89	704.21	0.46
Hickory Creek	1	32952	0.4% Annual Chan	8250	410.25	423.42	420.88	424.32	0.008633	8.46	1239.78	763.96	0.5
Hickory Creek	1	32952	0.2% Annual Chan	9500	410.25	423.84	421.51	424.88	0.009567	9.17	1316.52	794.08	0.53
Hickory Creek	1	32759	50% Annual Chanc	1700	411.15	418.41	415.73	418.69	0.004519	4.26	438.83	123.78	0.33
Hickory Creek	1	32759	20% Annual Chanc	2850	411.15	419.12	416.83	419.67	0.007931	6.14	577.67	252.35	0.45
Hickory Creek	1	32759	10% Annual Chanc	3750	411.15	419.88	417.61	420.49	0.007901	6.64	834.23	418.27	0.45
Hickory Creek	1	32759	4% Annual Chance	4900	411.15	420.78	418.52	421.29	0.006468	6.54	1305.05	591.16	0.42
Hickory Creek	1	32759	2% Annual Chance	5750	411.15	421.26	419.91	421.73	0.00594	6.53	1610.67	665.34	0.41
Hickory Creek	1	32759	1% Annual Chance	6750	411.15	421.77	420.56	422.19	0.005427	6.5	1967.38	733.08	0.39
Hickory Creek	1	32759	0.4% Annual Chan	8250	411.15	422.46	420.83	422.83	0.004726	6.39	2495.04	867.78	0.37
Hickory Creek	1	32759	0.2% Annual Chan	9500	411.15	423.01	421.24	423.34	0.004148	6.22	2936.84	939.64	0.35
Hickory Creek	1	30580	50% Annual Chanc	1700	400.85	409.55		409.7	0.003997	3.12	561.44	170.92	0.25
Hickory Creek	1	30580	20% Annual Chanc	2850	400.85	411.87		412.01	0.002118	2.92	987.71	192.45	0.19
Hickory Creek	1	30580	10% Annual Chanc	3750	400.85	412.92		413.09	0.002067	3.17	1195.55	202.71	0.2
Hickory Creek	1	30580	4% Annual Chance	4900	400.85	413.68		413.91	0.002447	3.66	1351.46	208.73	0.22
Hickory Creek	1	30580	2% Annual Chance	5750	400.85	414.28		414.55	0.002572	3.92	1479.13	212.9	0.22
Hickory Creek	1	30580	1% Annual Chance	6750	400.85	414.95		415.27	0.002687	4.19	1623.05	217.51	0.23
Hickory Creek	1	30580	0.4% Annual Chan	8250	400.85	415.74		416.12	0.002951	4.61	1801.51	242.68	0.25
Hickory Creek	1	30580	0.2% Annual Chan	9500	400.85	416.33		416.76	0.003241	5.01	2013.47	441.98	0.26
Hickory Creek	1	29889	50% Annual Chanc	1700	401.19	409.09		409.12	0.000411	1.2	1195.9	254.29	0.09
Hickory Creek	1	29889	20% Annual Chanc	2850	401.19	411.59		411.62	0.000309	1.29	1917.29	318.31	0.08
Hickory Creek	1	29889	10% Annual Chanc	3750	401.19	412.64		412.69	0.000337	1.46	2261.72	333.42	0.08
Hickory Creek	1	29889	4% Annual Chance	4900	401.19	413.31		413.37	0.000473	1.8	2491.5	369.87	0.1
Hickory Creek	1	29889	2% Annual Chance	5750	401.19	413.92		413.99	0.000495	1.91	2799.46	598.63	0.1
Hickory Creek	1	29889	1% Annual Chance	6750	401.19	414.57		414.64	0.000562	2.11	3196.26	627.63	0.11
Hickory Creek	1	29889	0.4% Annual Chan	8250	401.19	415.38		415.46	0.000576	2.24	3726.26	671.31	0.11
Hickory Creek	1	29889	0.2% Annual Chan	9500	401.19	415.98		416.06	0.000587	2.33	4140.92	713.86	0.11
Hickory Creek	1	28825	50% Annual Chanc	1700	396.9	408.66		408.72	0.000423	1.89	901.19	128.56	0.12
Hickory Creek	1	28825	20% Annual Chanc	2850	396.9	411.19		411.27	0.00042	2.3	1361.06	302.67	0.13
Hickory Creek	1	28825	10% Annual Chanc	3750	396.9	412.19		412.29	0.000487	2.65	1734.43	420.09	0.14
Hickory Creek	1	28825	4% Annual Chance	4900	396.9	412.67		412.82	0.000682	3.23	1942.99	443.57	0.17
Hickory Creek	1	28825	2% Annual Chance	5750	396.9	413.23		413.4	0.000748	3.5	2197.04	466.58	0.18
Hickory Creek	1	28825	1% Annual Chance	6750	396.9	413.78		413.98	0.000833	3.81	2461.69	498.73	0.19
Hickory Creek	1	28825	0.4% Annual Chan	8250	396.9	414.51		414.75	0.000959	4.26	2866.44	605.23	0.21
Hickory Creek	1	28825	0.2% Annual Chan	9500	396.9	415.06		415.33	0.00103	4.54	3210.29	644.05	0.22
Hickory Creek	1	28641	50% Annual Chanc	1650	395.84	408.61		408.65	0.000299	1.52	1099.97	159.22	0.1
Hickory Creek	1	28641	20% Annual Chanc	2850	395.84	411.15		411.2	0.00031	1.86	1995.39	603.71	0.1
Hickory Creek	1	28641	10% Annual Chanc	3700	395.84	412.15		412.21	0.000328	2.03	2640.34	668.89	0.11
Hickory Creek	1	28641	4% Annual Chance	4850	395.84	412.62		412.7	0.000454	2.46	2957.65	680.15	0.13
Hickory Creek	1	28641	2% Annual Chance	5750	395.84	413.18		413.27	0.000499	2.66	3340.85	697.08	0.13
Hickory Creek	1	28641	1% Annual Chance	6750	395.84	413.73		413.83	0.000546	2.86	3729.04	717	0.14
Hickory Creek	1	28641	0.4% Annual Chan	8250	395.84	414.46		414.57	0.000609	3.13	4266.16	748.2	0.15
Hickory Creek	1	28641	0.2% Annual Chan	9550	395.84	415.01		415.14	0.000664	3.36	4684.17	776.69	0.16
Hickory Creek	1	28592	50% Annual Chanc	1650	395.84	408.59	401.62	408.63	0.0003	1.52	1099.68	166.27	0.1
Hickory Creek	1	28592	20% Annual Chanc	2850	395.84	411.12	402.46	411.18	0.000333	1.92	1760.33	483.86	0.11
Hickory Creek	1	28592	10% Annual Chanc	3700	395.84	412.11	402.99	412.18	0.000384	2.19	2201.37	651.36	0.11
Hickory Creek	1	28592	4% Annual Chance	4850	395.84	412.56	403.63	412.66	0.000552	2.7	2423.33	664.61	0.14
Hickory Creek	1	28592	2% Annual Chance	5750	395.84	413.1	404.09	413.22	0.00063	2.97	2695.29	676.8	0.15
Hickory Creek	1	28592	1% Annual Chance	6750	395.84	413.63	404.57	413.77	0.000711	3.25	2967	687.23	0.16
Hickory Creek	1	28592	0.4% Annual Chan	8250	395.84	414.34	405.25	414.51	0.000826	3.63	3331.96	705.57	0.17
Hickory Creek	1	28592	0.2% Annual Chan	9550	395.84	414.86	405.81	415.06	0.00093	3.95	3615.63	748.75	0.19
Hickory Creek	1	28511		Bridge									
Hickory Creek	1	28440	50% Annual Chanc	1650	396.8	408.3	402.01	408.44	0.001581	2.98	553.76	77.34	0.2
Hickory Creek	1	28440	20% Annual Chanc	2850	396.8	410.75	403.44	410.93	0.001716	3.58	1023.24	470.75	0.21
Hickory Creek	1	28440	10% Annual Chanc	3700	396.8	411.68	404.28	411.88	0.001697	3.81	1497.6	540.81	0.21
Hickory Creek	1	28440	4% Annual Chance	4850	396.8	411.91	405.3	412.21	0.002544	4.73	1624.77	555.54	0.26
Hickory Creek	1	28440	2% Annual Chance	5750	396.8	412.4	406.05	412.71	0.002703	5.04	1906.69	602.36	0.27
Hickory Creek	1	28440	1% Annual Chance	6750	396.8	412.89	406.94	413.22	0.00278	5.27	2209.61	631.11	0.28
Hickory Creek	1	28440	0.4% Annual Chan	8250	396.8	413.55	408.18	413.89	0.002847	5.54	2626.43	744.73	0.29
Hickory Creek	1	28440	0.2% Annual Chan	9550	396.8	414.04	409.35	414.39	0.00293	5.78	2942.43	770.86	0.29

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	28330	50% Annual Chanc	1750	396.8	408.1	402.04	408.26	0.001528	3.23	575.35	143.09	0.2
Hickory Creek	1	28330	20% Annual Chanc	2950	396.8	410.63	403.49	410.77	0.001177	3.39	1521.04	526.3	0.18
Hickory Creek	1	28330	10% Annual Chanc	3900	396.8	411.58	404.43	411.73	0.001178	3.59	2049.51	574.18	0.18
Hickory Creek	1	28330	4% Annual Chance	5200	396.8	411.75	405.56	411.98	0.001904	4.61	2148	583	0.24
Hickory Creek	1	28330	2% Annual Chance	6200	396.8	412.23	406.35	412.48	0.002086	4.95	2432.8	611.69	0.25
Hickory Creek	1	28330	1% Annual Chance	7350	396.8	412.71	407.2	412.99	0.002279	5.31	2737.44	648.97	0.26
Hickory Creek	1	28330	0.4% Annual Chan	9150	396.8	413.36	410.33	413.67	0.00251	5.76	3167.26	671.94	0.28
Hickory Creek	1	28330	0.2% Annual Chan	10650	396.8	413.85	410.86	414.17	0.002675	6.08	3495.69	702.49	0.29
Hickory Creek	1	27557	50% Annual Chanc	1750	393.71	406.52	399.74	406.77	0.002488	4.03	456.71	163.78	0.24
Hickory Creek	1	27557	20% Annual Chanc	2950	393.71	409.32	401.72	409.61	0.002375	4.58	872.9	620.41	0.24
Hickory Creek	1	27557	10% Annual Chanc	3900	393.71	410.26	403.03	410.59	0.002583	5.05	1287.26	779.46	0.26
Hickory Creek	1	27557	4% Annual Chance	5200	393.71	410.66	404.57	410.82	0.001764	4.26	2467.08	808.4	0.21
Hickory Creek	1	27557	2% Annual Chance	6200	393.71	411.11	405.62	411.27	0.001837	4.46	2813.94	843.98	0.22
Hickory Creek	1	27557	1% Annual Chance	7350	393.71	411.56	407.53	411.73	0.001912	4.65	3176.2	876.76	0.23
Hickory Creek	1	27557	0.4% Annual Chan	9150	393.71	412.18	409.42	412.36	0.00202	4.93	3678.33	906.05	0.23
Hickory Creek	1	27557	0.2% Annual Chan	10650	393.71	412.63	410.33	412.82	0.0021	5.14	4059.08	926.93	0.24
Hickory Creek	1	26438	50% Annual Chanc	1750	386.5	403.97		404.15	0.002185	3.47	505.27	59.45	0.21
Hickory Creek	1	26438	20% Annual Chanc	2950	386.5	406.46		406.75	0.00283	4.4	726.45	313.76	0.24
Hickory Creek	1	26438	10% Annual Chanc	3900	386.5	407.73		407.96	0.002292	4.22	1413.4	681.67	0.22
Hickory Creek	1	26438	4% Annual Chance	5200	386.5	409.17		409.28	0.001333	3.45	2487.68	805.41	0.17
Hickory Creek	1	26438	2% Annual Chance	6200	386.5	409.56		409.68	0.001405	3.61	2810.63	832.19	0.18
Hickory Creek	1	26438	1% Annual Chance	7350	386.5	409.94		410.08	0.001501	3.81	3132.82	851.13	0.18
Hickory Creek	1	26438	0.4% Annual Chan	9150	386.5	410.45		410.59	0.001651	4.09	3565.3	873.05	0.19
Hickory Creek	1	26438	0.2% Annual Chan	10650	386.5	410.81		410.97	0.001776	4.32	3885.29	890.01	0.2
Hickory Creek	1	25770	50% Annual Chanc	1750	388.92	402.3		402.55	0.00262	4.02	438.07	77.1	0.29
Hickory Creek	1	25770	20% Annual Chanc	2950	388.92	404.66		405.01	0.002426	4.8	639.87	94.23	0.29
Hickory Creek	1	25770	10% Annual Chanc	3900	388.92	406.02		406.42	0.002379	5.24	904.67	431.69	0.29
Hickory Creek	1	25770	4% Annual Chance	5200	388.92	408.69		408.77	0.000569	3.01	3161.55	976.71	0.15
Hickory Creek	1	25770	2% Annual Chance	6200	388.92	409.04		409.13	0.000626	3.21	3512.3	990.45	0.16
Hickory Creek	1	25770	1% Annual Chance	7350	388.92	409.38		409.48	0.000701	3.46	3843.93	1003.01	0.17
Hickory Creek	1	25770	0.4% Annual Chan	9150	388.92	409.79		409.91	0.000829	3.84	4265.34	1017.05	0.18
Hickory Creek	1	25770	0.2% Annual Chan	10650	388.92	410.09		410.22	0.000938	4.14	4564.75	1026.95	0.2
Hickory Creek	1	25739	50% Annual Chanc	1750	388.92	402.16	396.73	402.45	0.002951	4.35	402.35	62.08	0.3
Hickory Creek	1	25739	20% Annual Chanc	2950	388.92	404.45	399.08	404.89	0.003476	5.3	556.59	72.26	0.34
Hickory Creek	1	25739	10% Annual Chanc	3900	388.92	405.73	400.28	406.29	0.003838	5.97	659.08	317.02	0.36
Hickory Creek	1	25739	4% Annual Chance	5200	388.92	408.67	401.6	408.75	0.000646	2.97	3093.21	992.74	0.16
Hickory Creek	1	25739	2% Annual Chance	6200	388.92	409.02	402.48	409.11	0.000702	3.16	3449.2	1011.9	0.16
Hickory Creek	1	25739	1% Annual Chance	7350	388.92	409.36	403.41	409.45	0.000778	3.38	3786.23	1027.48	0.17
Hickory Creek	1	25739	0.4% Annual Chan	9150	388.92	409.77	404.72	409.89	0.00091	3.74	4217.92	1052.95	0.19
Hickory Creek	1	25739	0.2% Annual Chan	10650	388.92	410.06	405.84	410.19	0.001022	4.03	4525.02	1064.5	0.2
Hickory Creek	1	25660		Bridge									
Hickory Creek	1	25586	50% Annual Chanc	1750	388.92	401.87		402.14	0.002833	4.18	418.77	90.8	0.34
Hickory Creek	1	25586	20% Annual Chanc	2950	388.92	404.01		404.36	0.002438	4.74	622.01	99.26	0.33
Hickory Creek	1	25586	10% Annual Chanc	3900	388.92	405.13		405.55	0.00242	5.2	862.3	515.9	0.34
Hickory Creek	1	25586	4% Annual Chance	5200	388.92	405.9		406.35	0.002548	5.71	1348.23	729.78	0.36
Hickory Creek	1	25586	2% Annual Chance	6200	388.92	406.25		406.74	0.002777	6.13	1611.89	777.58	0.37
Hickory Creek	1	25586	1% Annual Chance	7350	388.92	406.63		407.15	0.002928	6.48	1937.27	915.24	0.39
Hickory Creek	1	25586	0.4% Annual Chan	9150	388.92	407.13		407.67	0.003091	6.92	2429.32	1015.17	0.4
Hickory Creek	1	25586	0.2% Annual Chan	10650	388.92	407.52		408.05	0.003084	7.1	2832.78	1040.21	0.4
Hickory Creek	1	25511	50% Annual Chanc	1750	388.84	401.81		401.96	0.000728	3.05	574.31	75.81	0.19
Hickory Creek	1	25511	20% Annual Chanc	2950	388.84	403.93		404.18	0.000928	4.04	747.41	87.74	0.22
Hickory Creek	1	25511	10% Annual Chanc	3900	388.84	405.05		405.37	0.001074	4.65	1078.49	635.86	0.25
Hickory Creek	1	25511	4% Annual Chance	5200	388.84	405.79		406.17	0.001276	5.3	1632.99	876.52	0.27
Hickory Creek	1	25511	2% Annual Chance	6200	388.84	406.12		406.55	0.001474	5.8	1935.8	951.82	0.29
Hickory Creek	1	25511	1% Annual Chance	7350	388.84	406.48		406.95	0.001638	6.23	2293.14	1010.66	0.31
Hickory Creek	1	25511	0.4% Annual Chan	9150	388.84	406.97		407.47	0.001826	6.74	2790.91	1032.72	0.33
Hickory Creek	1	25511	0.2% Annual Chan	10650	388.84	407.35		407.87	0.001929	7.07	3187.88	1053.43	0.34
Hickory Creek	1	25007	50% Annual Chanc	1750	388.27	400.96		401.33	0.002373	4.9	366.29	66.04	0.33
Hickory Creek	1	25007	20% Annual Chanc	2950	388.27	402.82		403.4	0.002805	6.26	506.77	93.13	0.38
Hickory Creek	1	25007	10% Annual Chanc	3900	388.27	403.82	399.73	404.5	0.003014	6.98	777.65	576.38	0.4
Hickory Creek	1	25007	4% Annual Chance	5200	388.27	404.7	401.1	405.29	0.002763	7.08	1497.83	1032.92	0.38
Hickory Creek	1	25007	2% Annual Chance	6200	388.27	405.27		405.72	0.002289	6.68	2111.42	1103.47	0.35
Hickory Creek	1	25007	1% Annual Chance	7350	388.27	405.67		406.08	0.002227	6.74	2559.58	1141.74	0.35
Hickory Creek	1	25007	0.4% Annual Chan	9150	388.27	406.16	405.19	406.55	0.002265	6.99	3129.41	1199.47	0.36
Hickory Creek	1	25007	0.2% Annual Chan	10650	388.27	406.57	405.45	406.94	0.002185	7.02	3637.09	1242.4	0.35
Hickory Creek	1	24071	50% Annual Chanc	1750	387.22	398.57	393.78	398.73	0.003245	3.29	615.53	180.61	0.24
Hickory Creek	1	24071	20% Annual Chanc	2950	387.22	400.6	395.35	400.77	0.002845	3.53	1058.08	268.89	0.24
Hickory Creek	1	24071	10% Annual Chanc	3900	387.22	401.66	396.34	401.84	0.002788	3.79	1396.88	372.29	0.24

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	24071	4% Annual Chance	5200	387.22	402.46	397.93	402.7	0.003298	4.4	1746.33	648.37	0.26
Hickory Creek	1	24071	2% Annual Chance	6200	387.22	403.29	398.65	403.53	0.003181	4.59	2355.37	917.85	0.26
Hickory Creek	1	24071	1% Annual Chance	7350	387.22	403.87	399.25	404.09	0.002931	4.58	2852.97	975.32	0.25
Hickory Creek	1	24071	0.4% Annual Chan	9150	387.22	403.57	400.01	404	0.005627	6.23	2594.35	951.03	0.35
Hickory Creek	1	24071	0.2% Annual Chan	10650	387.22	403.51	400.62	404.11	0.007998	7.39	2538.11	948.06	0.42
Hickory Creek	1	23607	50% Annual Chanc	1750	386.7	398.01	392	398.05	0.000876	1.74	1166.39	840.57	0.13
Hickory Creek	1	23607	20% Annual Chanc	2950	386.7	400.06	393.53	400.12	0.000914	2.07	1674.62	919.38	0.13
Hickory Creek	1	23607	10% Annual Chanc	3900	386.7	401.09	394.16	401.16	0.00103	2.39	1960.85	969.14	0.15
Hickory Creek	1	23607	4% Annual Chance	5200	386.7	401.67	394.89	401.78	0.001529	3.04	2158.17	1128.69	0.18
Hickory Creek	1	23607	2% Annual Chance	6200	386.7	402.35	395.4	402.5	0.001949	3.61	2537.06	1386.03	0.21
Hickory Creek	1	23607	1% Annual Chance	7350	386.7	402.94	395.89	403.11	0.002038	3.84	2953.9	1483.83	0.21
Hickory Creek	1	23607	0.4% Annual Chan	9150	386.7	403.74	396.52	403.76	0.000085	0.82	11256.01	1596.07	0.04
Hickory Creek	1	23607	0.2% Annual Chan	10650	386.7	403.76	397.01	403.77	0.000114	0.96	11278.85	1596.21	0.05
Hickory Creek	1	23218	50% Annual Chanc	1750	387.18	397.59	391.91	397.65	0.001087	2.09	836.48	339.71	0.15
Hickory Creek	1	23218	20% Annual Chanc	2950	387.18	399.6	393.44	397.7	0.001192	2.5	1227.06	456.74	0.17
Hickory Creek	1	23218	10% Annual Chanc	3900	387.18	400.57	394.05	400.69	0.001308	2.83	1497.43	580.94	0.18
Hickory Creek	1	23218	4% Annual Chance	5200	387.18	400.89	394.8	401.08	0.001983	3.57	1632.43	699.69	0.22
Hickory Creek	1	23218	2% Annual Chance	6200	387.18	401.48	395.32	401.69	0.002112	3.85	2001.33	990.4	0.23
Hickory Creek	1	23218	1% Annual Chance	7350	387.18	402.11	395.87	402.31	0.001976	3.89	2518.85	1080.7	0.22
Hickory Creek	1	23218	0.4% Annual Chan	9150	387.18	403.01	396.65	403.19	0.001699	3.83	3354.03	1280.3	0.21
Hickory Creek	1	23218	0.2% Annual Chan	10650	387.18	403.53	397.3	403.58	0.000479	2.1	6413.41	1352.42	0.11
Hickory Creek	1	22342	50% Annual Chanc	1750	382.8	396.79	388.43	396.85	0.000937	2.15	909.69	363.5	0.14
Hickory Creek	1	22342	20% Annual Chanc	2950	382.8	398.77	390.38	398.85	0.001012	2.54	1312.14	423.68	0.15
Hickory Creek	1	22342	10% Annual Chanc	3900	382.8	399.62	391.8	399.73	0.001231	2.97	1541.33	522.97	0.17
Hickory Creek	1	22342	4% Annual Chance	5200	382.8	400.4	394.11	400.44	0.00051	2.01	3582.67	783.4	0.11
Hickory Creek	1	22342	2% Annual Chance	6200	382.8	401.02	394.96	401.06	0.000496	2.06	4070.89	791.04	0.11
Hickory Creek	1	22342	1% Annual Chance	7350	382.8	401.7	395.51	401.74	0.000478	2.1	4607.59	799.38	0.11
Hickory Creek	1	22342	0.4% Annual Chan	9150	382.8	402.65	396.2	402.69	0.000461	2.17	5377.36	833.67	0.11
Hickory Creek	1	22342	0.2% Annual Chan	10650	382.8	403.31	396.73	403.36	0.000462	2.25	5938.96	857.88	0.11
Hickory Creek	1	21994	50% Annual Chanc	1750	382.2	396.48	387.91	396.55	0.000755	2.18	803.5	93.41	0.13
Hickory Creek	1	21994	20% Annual Chanc	2950	382.2	398.32	389.3	398.46	0.001148	3.01	992.52	114.83	0.17
Hickory Creek	1	21994	10% Annual Chanc	3900	382.2	399	390.23	399.21	0.001609	3.72	1077.14	294.91	0.2
Hickory Creek	1	21994	4% Annual Chance	5200	382.2	399.74	391.33	400.06	0.002258	4.6	1190.57	578.84	0.24
Hickory Creek	1	21994	2% Annual Chance	6200	382.2	400.26	392.12	400.66	0.002709	5.18	1287.04	598.54	0.26
Hickory Creek	1	21994	1% Annual Chance	7350	382.2	400.83	393	401.32	0.003164	5.78	1395.53	617.52	0.28
Hickory Creek	1	21994	0.4% Annual Chan	9150	382.2	402.14	394.1	402.37	0.001673	4.48	2951.89	680	0.21
Hickory Creek	1	21994	0.2% Annual Chan	10650	382.2	402.82	394.99	403.04	0.001597	4.52	3427.61	725.17	0.21
Hickory Creek	1	21949	50% Annual Chanc	1750	382.23	396.36	388.51	396.49	0.001498	2.86	612.59	88.77	0.19
Hickory Creek	1	21949	20% Annual Chanc	2950	382.23	398.14	390.56	398.36	0.002244	3.76	784.83	108.09	0.24
Hickory Creek	1	21949	10% Annual Chanc	3900	382.23	398.75	391.87	399.08	0.003138	4.6	850.94	217.58	0.29
Hickory Creek	1	21949	4% Annual Chance	5200	382.23	399.37	393.26	399.87	0.004497	5.68	919.62	396.8	0.34
Hickory Creek	1	21949	2% Annual Chance	6200	382.23	399.78	394.19	400.42	0.005572	6.45	966.14	506	0.39
Hickory Creek	1	21949	1% Annual Chance	7350	382.23	400.21	395.13	401.02	0.006805	7.28	1015.99	560.42	0.43
Hickory Creek	1	21949	0.4% Annual Chan	9150	382.23	400.87	396.37	401.96	0.008566	8.41	1094.52	602.8	0.48
Hickory Creek	1	21949	0.2% Annual Chan	10650	382.23	401.14	397.29	402.53	0.010687	9.5	1127.23	608.92	0.54
Hickory Creek	1	21911	Bridge										
Hickory Creek	1	21863	50% Annual Chanc	1750	382.3	396.32	387.33	396.38	0.000577	1.92	917.5	117.44	0.12
Hickory Creek	1	21863	20% Annual Chanc	2950	382.3	398.07	388.74	398.18	0.00086	2.66	1143.56	337.92	0.15
Hickory Creek	1	21863	10% Annual Chanc	3900	382.3	398.63	389.66	398.8	0.00124	3.31	1222.87	687.32	0.18
Hickory Creek	1	21863	4% Annual Chance	5200	382.3	399.16	390.73	399.43	0.001854	4.18	1297.61	833.42	0.22
Hickory Creek	1	21863	2% Annual Chance	6200	382.3	399.49	391.5	399.84	0.00238	4.82	1343.13	842.31	0.25
Hickory Creek	1	21863	1% Annual Chance	7350	382.3	399.79	392.24	400.26	0.003043	5.55	1386.29	851.18	0.28
Hickory Creek	1	21863	0.4% Annual Chan	9150	382.3	400.19	393.38	400.86	0.004181	6.65	1442.87	865.39	0.33
Hickory Creek	1	21863	0.2% Annual Chan	10650	382.3	400.6	394.29	401	0.003001	5.76	3040.04	906.1	0.28
Hickory Creek	1	21744	50% Annual Chanc	1750	382.2	396.16		396.26	0.001321	2.62	668.52	94.92	0.17
Hickory Creek	1	21744	20% Annual Chanc	2950	382.2	397.85		398.02	0.00169	3.4	1055.24	631.55	0.2
Hickory Creek	1	21744	10% Annual Chanc	3900	382.2	398.44		398.62	0.001852	3.71	1487.13	769.6	0.21
Hickory Creek	1	21744	4% Annual Chance	5200	382.2	398.99		399.17	0.002005	4.01	1909.84	784.16	0.22
Hickory Creek	1	21744	2% Annual Chance	6200	382.2	399.32		399.51	0.002137	4.22	2179.23	837.04	0.23
Hickory Creek	1	21744	1% Annual Chance	7350	382.2	399.64		399.85	0.002271	4.44	2464.01	914.08	0.24
Hickory Creek	1	21744	0.4% Annual Chan	9150	382.2	400.09		400.31	0.002392	4.68	2896.79	1047	0.24
Hickory Creek	1	21744	0.2% Annual Chan	10650	382.2	400.42		400.65	0.002444	4.83	3250.74	1074.61	0.25
Hickory Creek	1	21042	50% Annual Chanc	1750	379.86	395.02		395.2	0.001739	3.35	523.03	77.15	0.19
Hickory Creek	1	21042	20% Annual Chanc	2950	379.86	396.39		396.63	0.00248	4.2	930.32	501.41	0.23
Hickory Creek	1	21042	10% Annual Chanc	3900	379.86	396.86		397.13	0.002913	4.66	1208.44	689.82	0.25
Hickory Creek	1	21042	4% Annual Chance	5200	379.86	397.39		397.66	0.003106	4.97	1630.84	853.75	0.26
Hickory Creek	1	21042	2% Annual Chance	6200	379.86	397.76		398.02	0.003053	5.03	1954.16	891.34	0.26
Hickory Creek	1	21042	1% Annual Chance	7350	379.86	398.12		398.36	0.003017	5.1	2269.61	905.39	0.26

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Hickory Creek	1	21042	0.4% Annual Chan	9150	379.86	398.6		398.84	0.002989	5.21	2723.07	959.62	0.26
Hickory Creek	1	21042	0.2% Annual Chan	10650	379.86	399		399.24	0.002858	5.2	3116.33	999.83	0.25
Hickory Creek	1	20583	50% Annual Chanc	1600	382.96	394.3	388.11	394.41	0.001602	2.74	638.71	230.51	0.19
Hickory Creek	1	20583	20% Annual Chanc	2850	382.96	395.59	389.8	395.7	0.001602	3.06	1356.49	899.44	0.19
Hickory Creek	1	20583	10% Annual Chanc	3750	382.96	396.02	390.78	396.13	0.001603	3.17	1752.34	922.6	0.19
Hickory Creek	1	20583	4% Annual Chance	5050	382.96	396.53	391.97	396.64	0.001601	3.3	2233.05	952	0.2
Hickory Creek	1	20583	2% Annual Chance	6150	382.96	396.91	392.82	397.02	0.001602	3.39	2600.15	985.17	0.2
Hickory Creek	1	20583	1% Annual Chance	7350	382.96	397.26	395.53	397.38	0.001602	3.48	2951.22	1000.16	0.2
Hickory Creek	1	20583	0.4% Annual Chan	9200	382.96	397.75	395.9	397.88	0.001601	3.59	3445.08	1019.38	0.2
Hickory Creek	1	20583	0.2% Annual Chan	10900	382.96	398.17	396.1	398.3	0.001601	3.69	3872.07	1050.11	0.2
4C6 Trib 2	1	5752	50% Annual Chanc	100	490.31	491.8	491.55	491.98	0.009482	3.44	29.08	88.38	0.69
4C6 Trib 2	1	5752	20% Annual Chanc	200	490.31	492.21	492.01	492.45	0.008687	4.08	58.29	149.82	0.7
4C6 Trib 2	1	5752	10% Annual Chanc	225	490.31	492.26	492.26	492.52	0.008866	4.25	66.51	191.5	0.71
4C6 Trib 2	1	5752	4% Annual Chance	300	490.31	492.43	492.43	492.65	0.007221	4.22	107.6	263.27	0.66
4C6 Trib 2	1	5752	2% Annual Chance	350	490.31	492.48	492.48	492.72	0.007505	4.43	123.09	267.6	0.68
4C6 Trib 2	1	5752	1% Annual Chance	400	490.31	492.53	492.53	492.78	0.007962	4.67	135.66	271.2	0.7
4C6 Trib 2	1	5752	0.4% Annual Chan	475	490.31	492.59	492.59	492.87	0.008578	5	153.11	283.98	0.73
4C6 Trib 2	1	5752	0.2% Annual Chan	550	490.31	492.67	492.67	492.95	0.008294	5.09	178.49	329.67	0.73
4C6 Trib 2	1	5615	50% Annual Chanc	100	488.56	489.74	489.74	490.13	0.020069	5.04	19.85	37.58	1.01
4C6 Trib 2	1	5615	20% Annual Chanc	200	488.56	490.21	490.21	490.78	0.017785	6.05	33.07	49.53	1.01
4C6 Trib 2	1	5615	10% Annual Chanc	225	488.56	490.42	490.42	490.91	0.012342	5.65	42.28	56.59	0.87
4C6 Trib 2	1	5615	4% Annual Chance	300	488.56	490.7	490.7	491.19	0.010113	5.82	59.58	67.05	0.81
4C6 Trib 2	1	5615	2% Annual Chance	350	488.56	490.81	490.81	491.34	0.010203	6.12	67.61	73.52	0.82
4C6 Trib 2	1	5615	1% Annual Chance	400	488.56	491.14	491.14	491.44	0.00549	5.04	125.2	282.24	0.62
4C6 Trib 2	1	5615	0.4% Annual Chan	475	488.56	491.23	491.23	491.54	0.005665	5.27	152.06	289.77	0.64
4C6 Trib 2	1	5615	0.2% Annual Chan	550	488.56	491.32	491.32	491.63	0.005638	5.41	178.62	295.52	0.64
4C6 Trib 2	1	5506	50% Annual Chanc	100	487.04	488.51		488.71	0.006587	3.65	27.39	24.94	0.61
4C6 Trib 2	1	5506	20% Annual Chanc	200	487.04	489.04		489.4	0.00699	4.85	43.24	37.27	0.67
4C6 Trib 2	1	5506	10% Annual Chanc	225	487.04	489.15		489.54	0.006988	5.06	47.42	39.48	0.68
4C6 Trib 2	1	5506	4% Annual Chance	300	487.04	489.45		489.9	0.006808	5.56	60.24	45.68	0.69
4C6 Trib 2	1	5506	2% Annual Chance	350	487.04	489.63		490.12	0.006663	5.82	68.95	50.51	0.69
4C6 Trib 2	1	5506	1% Annual Chance	400	487.04	489.78	489.48	490.31	0.006743	6.12	76.72	54.71	0.7
4C6 Trib 2	1	5506	0.4% Annual Chan	475	487.04	489.96	489.7	490.56	0.007128	6.6	87.54	73.3	0.73
4C6 Trib 2	1	5506	0.2% Annual Chan	550	487.04	490.15	490.09	490.77	0.006914	6.82	105.19	111.39	0.73
4C6 Trib 2	1	5496.58*	50% Annual Chanc	100	486.91	488.45		488.65	0.006492	3.62	27.67	25.3	0.61
4C6 Trib 2	1	5496.58*	20% Annual Chanc	200	486.91	488.98		489.33	0.006944	4.82	43.24	37.33	0.67
4C6 Trib 2	1	5496.58*	10% Annual Chanc	225	486.91	489.09		489.47	0.006951	5.04	47.41	39.68	0.68
4C6 Trib 2	1	5496.58*	4% Annual Chance	300	486.91	489.39		489.84	0.006707	5.52	60.56	46.5	0.68
4C6 Trib 2	1	5496.58*	2% Annual Chance	350	486.91	489.57		490.06	0.006603	5.79	69.25	51.56	0.69
4C6 Trib 2	1	5496.58*	1% Annual Chance	400	486.91	489.72	489.42	490.24	0.006657	6.07	77.27	56.2	0.7
4C6 Trib 2	1	5496.58*	0.4% Annual Chan	475	486.91	489.9	489.66	490.49	0.007034	6.55	88.54	79.16	0.72
4C6 Trib 2	1	5496.58*	0.2% Annual Chan	550	486.91	490.11	490	490.69	0.00644	6.61	110.83	125.58	0.7
4C6 Trib 2	1	5487.16*	50% Annual Chanc	100	486.78	488.4		488.6	0.0064	3.58	27.94	25.62	0.6
4C6 Trib 2	1	5487.16*	20% Annual Chanc	200	486.78	488.92		489.27	0.0069	4.79	43.23	37.22	0.67
4C6 Trib 2	1	5487.16*	10% Annual Chanc	225	486.78	489.03		489.41	0.006932	5.01	47.35	39.71	0.67
4C6 Trib 2	1	5487.16*	4% Annual Chance	300	486.78	489.33		489.78	0.006781	5.51	60.26	47.02	0.69
4C6 Trib 2	1	5487.16*	2% Annual Chance	350	486.78	489.5	489.19	489.99	0.006633	5.77	69.19	52.5	0.69
4C6 Trib 2	1	5487.16*	1% Annual Chance	400	486.78	489.65	489.36	490.18	0.006666	6.05	77.43	57.6	0.7
4C6 Trib 2	1	5487.16*	0.4% Annual Chan	475	486.78	489.81	489.59	490.42	0.007215	6.58	88.07	82.15	0.73
4C6 Trib 2	1	5487.16*	0.2% Annual Chan	550	486.78	490.08	489.95	490.62	0.006037	6.43	118.06	148.73	0.68
4C6 Trib 2	1	5477.75*	50% Annual Chanc	100	486.65	488.34		488.54	0.006395	3.56	28.12	25.96	0.6
4C6 Trib 2	1	5477.75*	20% Annual Chanc	200	486.65	488.86		489.21	0.006874	4.76	43.25	35.7	0.66
4C6 Trib 2	1	5477.75*	10% Annual Chanc	225	486.65	488.97		489.35	0.006942	4.99	47.29	39.77	0.67
4C6 Trib 2	1	5477.75*	4% Annual Chance	300	486.65	489.26		489.71	0.006882	5.52	59.94	47.52	0.69
4C6 Trib 2	1	5477.75*	2% Annual Chance	350	486.65	489.44	489.12	489.93	0.00665	5.75	69.28	53.63	0.69
4C6 Trib 2	1	5477.75*	1% Annual Chance	400	486.65	489.59	489.3	490.11	0.006638	6.02	77.89	59.53	0.69
4C6 Trib 2	1	5477.75*	0.4% Annual Chan	475	486.65	489.75	489.54	490.35	0.007127	6.52	89.38	90.85	0.73
4C6 Trib 2	1	5477.75*	0.2% Annual Chan	550	486.65	490.13	490.13	490.54	0.004606	5.75	153.71	268.62	0.6
4C6 Trib 2	1	5468.33*	50% Annual Chanc	100	486.52	488.29		488.48	0.006335	3.52	28.38	26.33	0.6
4C6 Trib 2	1	5468.33*	20% Annual Chanc	200	486.52	488.81		489.15	0.006754	4.7	43.72	32.78	0.66
4C6 Trib 2	1	5468.33*	10% Annual Chanc	225	486.52	488.91		489.28	0.006868	4.94	47.42	39.67	0.67
4C6 Trib 2	1	5468.33*	4% Annual Chance	300	486.52	489.2		489.65	0.00682	5.48	60.14	48.29	0.69
4C6 Trib 2	1	5468.33*	2% Annual Chance	350	486.52	489.38	489.05	489.86	0.006617	5.72	69.5	54.74	0.69
4C6 Trib 2	1	5468.33*	1% Annual Chance	400	486.52	489.54	489.24	490.05	0.006554	5.96	78.52	61.48	0.69
4C6 Trib 2	1	5468.33*	0.4% Annual Chan	475	486.52	489.7	489.47	490.28	0.006945	6.42	91.64	109.98	0.72
4C6 Trib 2	1	5468.33*	0.2% Annual Chan	550	486.52	490.04	490.04	490.44	0.004549	5.66	158.12	269.72	0.59
4C6 Trib 2	1	5458.91*	50% Annual Chanc	100	486.39	488.23		488.42	0.00629	3.49	28.62	26.7	0.59
4C6 Trib 2	1	5458.91*	20% Annual Chanc	200	486.39	488.75		489.09	0.006653	4.65	44.22	33.45	0.65

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 2	1	5458.91*	10% Annual Chanc	225	486.39	488.85		489.22	0.006781	4.9	47.69	35.43	0.67
4C6 Trib 2	1	5458.91*	4% Annual Chance	300	486.39	489.14		489.59	0.006776	5.44	60.35	49.07	0.68
4C6 Trib 2	1	5458.91*	2% Annual Chance	350	486.39	489.32	488.97	489.8	0.00663	5.7	69.6	55.87	0.69
4C6 Trib 2	1	5458.91*	1% Annual Chance	400	486.39	489.48	489.18	489.99	0.006468	5.91	79.35	64.25	0.69
4C6 Trib 2	1	5458.91*	0.4% Annual Chan	475	486.39	489.65	489.35	490.2	0.006648	6.28	95.62	119.25	0.7
4C6 Trib 2	1	5458.91*	0.2% Annual Chan	550	486.39	489.98	489.98	490.33	0.004232	5.44	168.39	275.37	0.57
4C6 Trib 2	1	5449.5*	50% Annual Chanc	100	486.26	488.18		488.37	0.00629	3.48	28.75	27	0.59
4C6 Trib 2	1	5449.5*	20% Annual Chanc	200	486.26	488.7		489.02	0.006617	4.62	44.57	34.11	0.65
4C6 Trib 2	1	5449.5*	10% Annual Chanc	225	486.26	488.8		489.16	0.006736	4.86	48.11	35.52	0.66
4C6 Trib 2	1	5449.5*	4% Annual Chance	300	486.26	489.08		489.53	0.006783	5.42	60.42	49.75	0.68
4C6 Trib 2	1	5449.5*	2% Annual Chance	350	486.26	489.25	488.89	489.73	0.006761	5.71	69.24	56.75	0.69
4C6 Trib 2	1	5449.5*	1% Annual Chance	400	486.26	489.42	489.12	489.92	0.006515	5.9	79.65	74.37	0.69
4C6 Trib 2	1	5449.5*	0.4% Annual Chan	475	486.26	489.6	489.32	490.14	0.006479	6.19	99.98	144.4	0.69
4C6 Trib 2	1	5449.5*	0.2% Annual Chan	550	486.26	489.89	489.89	490.23	0.004289	5.41	170.52	276.56	0.57
4C6 Trib 2	1	5440.08*	50% Annual Chanc	100	486.14	488.12		488.31	0.006302	3.46	28.9	27.37	0.59
4C6 Trib 2	1	5440.08*	20% Annual Chanc	200	486.14	488.64		488.96	0.006553	4.57	45.01	34.82	0.65
4C6 Trib 2	1	5440.08*	10% Annual Chanc	225	486.14	488.74		489.1	0.006663	4.81	48.62	36.31	0.66
4C6 Trib 2	1	5440.08*	4% Annual Chance	300	486.14	489.02	488.64	489.46	0.006876	5.41	60.16	50.02	0.69
4C6 Trib 2	1	5440.08*	2% Annual Chance	350	486.14	489.19	488.82	489.67	0.006787	5.68	69.34	58.1	0.69
4C6 Trib 2	1	5440.08*	1% Annual Chance	400	486.14	489.37	489.05	489.86	0.006402	5.83	81.3	89.32	0.68
4C6 Trib 2	1	5440.08*	0.4% Annual Chan	475	486.14	489.69	489.69	490.03	0.004215	5.17	146.5	266.39	0.56
4C6 Trib 2	1	5440.08*	0.2% Annual Chan	550	486.14	489.79	489.79	490.12	0.004271	5.34	172.91	278.97	0.57
4C6 Trib 2	1	5397	50% Annual Chanc	100	485.49	487.73	487.44	487.96	0.008816	3.85	25.95	26.72	0.69
4C6 Trib 2	1	5397	20% Annual Chanc	200	485.49	488.24	487.99	488.61	0.008714	4.84	42.17	36.3	0.73
4C6 Trib 2	1	5397	10% Annual Chanc	225	485.49	488.34	488.09	488.74	0.00874	5.07	45.76	38.22	0.74
4C6 Trib 2	1	5397	4% Annual Chance	300	485.49	488.6	488.37	489.09	0.008862	5.68	56.37	45.3	0.76
4C6 Trib 2	1	5397	2% Annual Chance	350	485.49	488.74	488.54	489.29	0.009059	6.06	63.13	49.73	0.78
4C6 Trib 2	1	5397	1% Annual Chance	400	485.49	488.84	488.71	489.48	0.009759	6.51	68.56	55.9	0.82
4C6 Trib 2	1	5397	0.4% Annual Chan	475	485.49	489.24	489.24	489.5	0.004016	4.73	160.64	281.17	0.54
4C6 Trib 2	1	5397	0.2% Annual Chan	550	485.49	489.31	489.31	489.58	0.004207	4.93	180.04	287.65	0.56
4C6 Trib 2	1	5321	50% Annual Chanc	100	484.63	486.7	486.6	487.08	0.014994	4.95	20.22	21.27	0.89
4C6 Trib 2	1	5321	20% Annual Chanc	200	484.63	487.36	487.2	487.81	0.012546	5.37	37.26	30.43	0.85
4C6 Trib 2	1	5321	10% Annual Chanc	225	484.63	487.49	487.32	487.95	0.012249	5.46	41.18	32.17	0.85
4C6 Trib 2	1	5321	4% Annual Chance	300	484.63	487.83	487.61	488.33	0.011365	5.68	52.83	181.73	0.84
4C6 Trib 2	1	5321	2% Annual Chance	350	484.63	488.04	487.79	488.55	0.010047	5.72	62.1	214.79	0.8
4C6 Trib 2	1	5321	1% Annual Chance	400	484.63	488.25	487.94	488.74	0.008476	5.7	77.32	269.09	0.75
4C6 Trib 2	1	5321	0.4% Annual Chan	475	484.63	488.64	488.59	488.85	0.003536	4.2	178.93	323.58	0.5
4C6 Trib 2	1	5321	0.2% Annual Chan	550	484.63	488.89	488.63	489	0.00202	3.41	260.86	345.04	0.38
4C6 Trib 2	1	5246	50% Annual Chanc	100	484.23	486.16		486.37	0.005791	3.67	27.24	21.9	0.58
4C6 Trib 2	1	5246	20% Annual Chanc	200	484.23	486.77		487.12	0.006516	4.76	42.62	29.38	0.65
4C6 Trib 2	1	5246	10% Annual Chanc	225	484.23	486.88		487.27	0.006625	5	45.98	31.1	0.66
4C6 Trib 2	1	5246	4% Annual Chance	300	484.23	487.17		487.66	0.007089	5.7	55.43	36.37	0.7
4C6 Trib 2	1	5246	2% Annual Chance	350	484.23	487.28	486.95	487.88	0.00792	6.26	59.85	38.67	0.75
4C6 Trib 2	1	5246	1% Annual Chance	400	484.23	487.4	487.15	488.09	0.008571	6.74	64.57	41.86	0.78
4C6 Trib 2	1	5246	0.4% Annual Chan	475	484.23	487.53	487.41	488.37	0.00984	7.5	70.39	45.78	0.85
4C6 Trib 2	1	5246	0.2% Annual Chan	550	484.23	487.75	487.75	488.64	0.009471	7.79	83.94	77.66	0.84
4C6 Trib 2	1	5143	50% Annual Chanc	100	483.8	485.71		485.86	0.004129	3.01	33.19	28.36	0.49
4C6 Trib 2	1	5143	20% Annual Chanc	200	483.8	486.38		486.59	0.003652	3.72	57.32	52	0.49
4C6 Trib 2	1	5143	10% Annual Chanc	225	483.8	486.52		486.74	0.003478	3.82	65.38	61.67	0.49
4C6 Trib 2	1	5143	4% Annual Chance	300	483.8	486.92		487.14	0.002894	3.95	94.25	82.43	0.46
4C6 Trib 2	1	5143	2% Annual Chance	350	483.8	487.02		487.28	0.003245	4.31	103.29	87.14	0.49
4C6 Trib 2	1	5143	1% Annual Chance	400	483.8	487.18		487.45	0.003213	4.47	117.84	95.78	0.49
4C6 Trib 2	1	5143	0.4% Annual Chan	475	483.8	487.36		487.66	0.003344	4.78	136.09	105.63	0.51
4C6 Trib 2	1	5143	0.2% Annual Chan	550	483.8	487.58		487.89	0.003183	4.91	161.23	123.22	0.5
4C6 Trib 2	1	4997	50% Annual Chanc	100	482.56	484.18	484.18	484.71	0.017954	5.85	17.19	16.86	1
4C6 Trib 2	1	4997	20% Annual Chanc	200	482.56	484.83	484.83	485.6	0.014304	7.09	29.51	21.3	0.96
4C6 Trib 2	1	4997	10% Annual Chanc	225	482.56	484.96	484.96	485.78	0.013817	7.34	32.45	22.23	0.96
4C6 Trib 2	1	4997	4% Annual Chance	300	482.56	485.33	485.33	486.29	0.012833	8	41.54	28.05	0.95
4C6 Trib 2	1	4997	2% Annual Chance	350	482.56	485.82	485.82	486.54	0.007791	7.13	64.48	60.49	0.77
4C6 Trib 2	1	4997	1% Annual Chance	400	482.56	486.01	486.01	486.72	0.007475	7.3	76.31	68.98	0.76
4C6 Trib 2	1	4997	0.4% Annual Chan	475	482.56	486.31	486.31	486.97	0.006408	7.23	100.11	86.65	0.72
4C6 Trib 2	1	4997	0.2% Annual Chan	550	482.56	486.41	486.41	487.17	0.007278	7.86	109.73	109.93	0.77
4C6 Trib 2	1	4770	50% Annual Chanc	175	476.69	478.73		478.97	0.020874	4.14	45.02	50.38	0.69
4C6 Trib 2	1	4770	20% Annual Chanc	300	476.69	479.14		479.47	0.018992	4.86	67.45	60.15	0.69
4C6 Trib 2	1	4770	10% Annual Chanc	375	476.69	479.35		479.72	0.017878	5.14	80.14	60.72	0.69
4C6 Trib 2	1	4770	4% Annual Chance	475	476.69	479.61		480.02	0.016546	5.43	96.13	61.44	0.68
4C6 Trib 2	1	4770	2% Annual Chance	525	476.69	479.73		480.16	0.016018	5.56	103.7	61.79	0.67
4C6 Trib 2	1	4770	1% Annual Chance	625	476.69	479.96		480.42	0.01522	5.81	118.01	62.49	0.67
4C6 Trib 2	1	4770	0.4% Annual Chan	725	476.69	480.17		480.67	0.014806	6.06	130.98	63.11	0.67

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 2	1	4770	0.2% Annual Chan	800	476.69	480.32		480.85	0.014453	6.22	140.61	63.79	0.67
4C6 Trib 2	1	4588	50% Annual Chanc	175	473.59	476.28		476.45	0.009698	3.34	52.45	36.88	0.49
4C6 Trib 2	1	4588	20% Annual Chanc	300	473.59	476.85		477.1	0.009245	4.03	75.21	41.99	0.51
4C6 Trib 2	1	4588	10% Annual Chanc	375	473.59	477.14		477.43	0.009109	4.38	87.43	44.24	0.52
4C6 Trib 2	1	4588	4% Annual Chance	475	473.59	477.47		477.82	0.009034	4.78	102.64	46.63	0.53
4C6 Trib 2	1	4588	2% Annual Chance	525	473.59	477.63		478	0.008978	4.96	110	47.46	0.53
4C6 Trib 2	1	4588	1% Annual Chance	625	473.59	477.94		478.35	0.008702	5.24	125.02	49.11	0.53
4C6 Trib 2	1	4588	0.4% Annual Chan	725	473.59	478.3		478.73	0.007892	5.38	142.91	51	0.51
4C6 Trib 2	1	4588	0.2% Annual Chan	800	473.59	478.58		479.02	0.007221	5.43	157.53	52.49	0.5
4C6 Trib 2	1	4378	50% Annual Chanc	175	471.74	475.04		475.16	0.00418	2.75	67.79	55.6	0.34
4C6 Trib 2	1	4378	20% Annual Chanc	300	471.74	475.66		475.82	0.004234	3.31	103.34	59.06	0.36
4C6 Trib 2	1	4378	10% Annual Chanc	375	471.74	475.98		476.16	0.004144	3.53	122.59	60.86	0.36
4C6 Trib 2	1	4378	4% Annual Chance	475	471.74	476.38		476.57	0.003983	3.77	147.18	63.09	0.36
4C6 Trib 2	1	4378	2% Annual Chance	525	471.74	476.56		476.77	0.003917	3.87	158.89	64.15	0.36
4C6 Trib 2	1	4378	1% Annual Chance	625	471.74	477.01		477.21	0.003447	3.93	187.84	66.78	0.35
4C6 Trib 2	1	4378	0.4% Annual Chan	725	471.74	477.57		477.76	0.002726	3.82	226.44	70.38	0.32
4C6 Trib 2	1	4378	0.2% Annual Chan	800	471.74	477.96		478.14	0.002382	3.77	254.48	72.85	0.3
4C6 Trib 2	1	4196	50% Annual Chanc	175	470.81	473.12		473.55	0.026447	5.31	32.94	24.41	0.8
4C6 Trib 2	1	4196	20% Annual Chanc	300	470.81	473.82		474.36	0.019073	5.91	51.74	28.61	0.73
4C6 Trib 2	1	4196	10% Annual Chanc	375	470.81	474.17		474.77	0.017268	6.25	62.08	30.6	0.71
4C6 Trib 2	1	4196	4% Annual Chance	475	470.81	474.59		475.26	0.015774	6.64	75.28	32.98	0.7
4C6 Trib 2	1	4196	2% Annual Chance	525	470.81	475.14		475.67	0.010142	6	94.22	35.98	0.58
4C6 Trib 2	1	4196	1% Annual Chance	625	470.81	475.88		476.34	0.00692	5.66	122.33	40.09	0.49
4C6 Trib 2	1	4196	0.4% Annual Chan	725	470.81	476.75		477.13	0.004522	5.21	159.5	45.58	0.41
4C6 Trib 2	1	4196	0.2% Annual Chan	800	470.81	477.24		477.6	0.003826	5.1	182.8	48.83	0.39
4C6 Trib 2	1	4126	50% Annual Chanc	175	469.36	472.8		472.92	0.003704	2.95	67.82	37.91	0.33
4C6 Trib 2	1	4126	20% Annual Chanc	300	469.36	473.61		473.77	0.003555	3.49	99.94	41.1	0.34
4C6 Trib 2	1	4126	10% Annual Chanc	375	469.36	473.99		474.18	0.003613	3.79	115.91	42.6	0.35
4C6 Trib 2	1	4126	4% Annual Chance	475	469.36	474.44		474.66	0.003708	4.15	135.36	44.48	0.36
4C6 Trib 2	1	4126	2% Annual Chance	525	469.36	475.07		475.25	0.00261	3.82	164.27	47.41	0.31
4C6 Trib 2	1	4126	1% Annual Chance	625	469.36	475.85		476.02	0.002049	3.75	202.53	51.02	0.28
4C6 Trib 2	1	4126	0.4% Annual Chan	725	469.36	476.74		476.89	0.001532	3.58	249.87	55.15	0.25
4C6 Trib 2	1	4126	0.2% Annual Chan	800	469.36	477.24		477.39	0.001387	3.58	278.01	57.47	0.24
4C6 Trib 2	1	3916	50% Annual Chanc	175	467.32	470.2	470.2	470.99	0.042914	7.16	24.45	15.67	1.01
4C6 Trib 2	1	3916	20% Annual Chanc	300	467.32	470.97	470.97	471.93	0.039204	7.87	38.12	19.85	1
4C6 Trib 2	1	3916	10% Annual Chanc	375	467.32	471.42	471.33	472.38	0.03382	7.86	47.74	22.32	0.95
4C6 Trib 2	1	3916	4% Annual Chance	475	467.32	473.17		473.59	0.007217	5.18	94.37	30.69	0.48
4C6 Trib 2	1	3916	2% Annual Chance	525	467.32	474.38		474.64	0.003201	4.18	134.71	36.29	0.33
4C6 Trib 2	1	3916	1% Annual Chance	625	467.32	475.31		475.55	0.002377	4.05	170.84	41.18	0.3
4C6 Trib 2	1	3916	0.4% Annual Chan	725	467.32	476.34		476.55	0.001726	3.84	215.94	47.31	0.26
4C6 Trib 2	1	3916	0.2% Annual Chan	800	467.32	476.86		477.07	0.001587	3.87	242.55	53.59	0.25
4C6 Trib 2	1	3706	50% Annual Chanc	175	464.64	469.41		469.46	0.000935	1.79	97.53	27.48	0.17
4C6 Trib 2	1	3706	20% Annual Chanc	300	464.64	470.67		470.75	0.001088	2.22	135.51	32.59	0.19
4C6 Trib 2	1	3706	10% Annual Chanc	375	464.64	471.42		471.51	0.000997	2.36	161.17	36.23	0.18
4C6 Trib 2	1	3706	4% Annual Chance	475	464.64	473.11		473.19	0.000587	2.19	230.02	45.38	0.15
4C6 Trib 2	1	3706	2% Annual Chance	525	464.64	474.34		474.4	0.000389	1.99	290.28	53.1	0.12
4C6 Trib 2	1	3706	1% Annual Chance	625	464.64	475.28		475.34	0.000361	2.07	343.21	60.01	0.12
4C6 Trib 2	1	3706	0.4% Annual Chan	725	464.64	476.31		476.37	0.000316	2.08	420.94	117.75	0.12
4C6 Trib 2	1	3706	0.2% Annual Chan	800	464.64	476.84		476.9	0.000321	2.17	496.12	167.79	0.12
4C6 Trib 2	1	3650		Lat Struct									
4C6 Trib 2	1	3617	50% Annual Chanc	200	464.12	469.28		469.34	0.001629	2.06	96.9	35.39	0.22
4C6 Trib 2	1	3617	20% Annual Chanc	350	464.12	470.54		470.63	0.001632	2.39	146.29	42.84	0.23
4C6 Trib 2	1	3617	10% Annual Chanc	450	464.12	471.3		471.39	0.001532	2.49	180.39	47.3	0.23
4C6 Trib 2	1	3617	4% Annual Chance	700	464.12	472.99		473.1	0.00111	2.63	269.77	58.35	0.2
4C6 Trib 2	1	3617	2% Annual Chance	900	464.12	474.21		474.33	0.000893	2.71	346.82	165.73	0.19
4C6 Trib 2	1	3617	1% Annual Chance	1048.55	464.12	475.17		475.28	0.000733	2.69	420.87	329.79	0.17
4C6 Trib 2	1	3617	0.4% Annual Chan	1219.86	464.12	476.21		476.32	0.000593	2.64	512.3	437.87	0.16
4C6 Trib 2	1	3617	0.2% Annual Chan	1309.82	464.12	476.75		476.85	0.000535	2.62	559.7	543.89	0.15
4C6 Trib 2	1	3595	50% Annual Chanc	200	466.82	468.83	468.28	469.22	0.001164	4.96	40.29	20	0.62
4C6 Trib 2	1	3595	20% Annual Chanc	350	466.82	470.03	468.94	470.49	0.000934	5.46	64.12	20	0.54
4C6 Trib 2	1	3595	10% Annual Chanc	450	466.82	470.73	469.32	471.24	0.000892	5.76	78.11	20	0.51
4C6 Trib 2	1	3595	4% Annual Chance	700	466.82	472.28	470.19	472.92	0.000875	6.41	109.21	20	0.48
4C6 Trib 2	1	3595	2% Annual Chance	900	466.82	473.4	470.8	474.12	0.000891	6.84	131.5	20	0.47
4C6 Trib 2	1	3595	1% Annual Chance	1048.55	466.82	474.15	471.23	475.02	0.001639	7.49	140		0.49
4C6 Trib 2	1	3595	0.4% Annual Chan	1219.86	466.82	474.79	471.69	475.97	0.002219	8.71	140		0.54
4C6 Trib 2	1	3595	0.2% Annual Chan	1309.82	466.82	475.09	471.94	476.45	0.002558	9.36	140		0.57
4C6 Trib 2	1	3567	50% Annual Chanc	200	466.65	468.85	468.11	469.17	0.000901	4.55	43.97	20	0.54

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 2	1	3567	20% Annual Chanc	350	466.65	470.04	468.77	470.45	0.000802	5.17	67.71	20	0.5
4C6 Trib 2	1	3567	10% Annual Chanc	450	466.65	470.73	469.15	471.2	0.00079	5.51	81.65	20	0.48
4C6 Trib 2	1	3567	4% Annual Chanc	700	466.65	472.28	470.02	472.88	0.000806	6.21	112.68	20	0.46
4C6 Trib 2	1	3567	2% Annual Chanc	900	466.65	473.4	470.63	474.09	0.000834	6.67	134.93	20	0.45
4C6 Trib 2	1	3567	1% Annual Chance	1048.55	466.65	474.11	471.05	474.98	0.001639	7.49	140		0.48
4C6 Trib 2	1	3567	0.4% Annual Chan	1219.86	466.65	474.73	471.52	475.91	0.002219	8.71	140		0.54
4C6 Trib 2	1	3567	0.2% Annual Chan	1309.82	466.65	475.02	471.76	476.38	0.002558	9.36	140		0.57
4C6 Trib 2	1	3496	50% Annual Chanc	200	466.22	468.07	468.07	469	0.003548	7.73	25.88	14	1
4C6 Trib 2	1	3496	20% Annual Chanc	350	466.22	468.91	468.91	470.25	0.00378	9.29	37.66	14	1
4C6 Trib 2	1	3496	10% Annual Chanc	450	466.22	469.4	469.4	470.99	0.003953	10.1	44.54	14	1
4C6 Trib 2	1	3496	4% Annual Chance	700	466.22	470.48	470.48	472.62	0.004402	11.72	59.71	14	1
4C6 Trib 2	1	3496	2% Annual Chance	900	466.22	471.26	471.26	473.79	0.004731	12.75	70.58	14	1
4C6 Trib 2	1	3496	1% Annual Chance	1048.55	466.22	471.79	471.79	474.6	0.004978	13.43	78.05	14	1
4C6 Trib 2	1	3496	0.4% Annual Chan	1219.86	466.22	472.4	472.4	475.49	0.00521	14.1	86.51	14	1
4C6 Trib 2	1	3496	0.2% Annual Chan	1309.82	466.22	472.69	472.69	475.94	0.005354	14.45	90.63	14	1
4C6 Trib 2	1	2806	50% Annual Chanc	200	462.09	463.94	463.94	464.87	0.003522	7.71	25.94	14	1
4C6 Trib 2	1	2806	20% Annual Chanc	350	462.09	464.77	464.77	466.12	0.003803	9.31	37.58	14	1
4C6 Trib 2	1	2806	10% Annual Chanc	450	462.09	465.27	465.27	466.86	0.003961	10.11	44.51	14	1
4C6 Trib 2	1	2806	4% Annual Chance	700	462.09	466.36	466.36	468.49	0.00438	11.7	59.82	14	1
4C6 Trib 2	1	2806	2% Annual Chance	900	462.09	467.13	467.13	469.66	0.004742	12.76	70.51	14	1
4C6 Trib 2	1	2806	1% Annual Chance	1048.55	462.09	467.67	467.67	470.47	0.004974	13.43	78.08	14	1
4C6 Trib 2	1	2806	0.4% Annual Chan	1219.86	462.09	468.27	468.27	471.36	0.005215	14.11	86.48	14	1
4C6 Trib 2	1	2806	0.2% Annual Chan	1309.82	462.09	468.68	468.57	471.81	0.005133	14.21	92.19	14	0.98
4C6 Trib 2	1	2790	50% Annual Chanc	200	461.99	463.56	463.56	464.34	0.003141	7.08	28.23	18	1
4C6 Trib 2	1	2790	20% Annual Chanc	350	461.99	464.27	464.27	465.4	0.003216	8.54	40.99	18	1
4C6 Trib 2	1	2790	10% Annual Chanc	450	461.99	464.67	464.67	466.02	0.003322	9.31	48.31	18	1
4C6 Trib 2	1	2790	4% Annual Chance	700	461.99	465.59	465.59	467.4	0.003536	10.79	64.86	18	1
4C6 Trib 2	1	2790	2% Annual Chance	900	461.99	466.26	466.26	468.39	0.003682	11.7	76.91	18	1
4C6 Trib 2	1	2790	1% Annual Chance	1048.55	461.99	466.71	466.71	469.08	0.003833	12.34	84.95	18	1
4C6 Trib 2	1	2790	0.4% Annual Chan	1219.86	461.99	467.34	467.22	469.83	0.003729	12.67	96.31	18	0.96
4C6 Trib 2	1	2790	0.2% Annual Chan	1309.82	461.99	469.63	467.47	471.3	0.003352	10.4	126		0.66
4C6 Trib 2	1	2778	50% Annual Chanc	200	461.92	463.49	463.49	464.27	0.003153	7.09	28.19	18	1
4C6 Trib 2	1	2778	20% Annual Chanc	350	461.92	464.19	464.19	465.33	0.003251	8.57	40.83	18	1
4C6 Trib 2	1	2778	10% Annual Chanc	450	461.92	464.61	464.61	465.95	0.003318	9.31	48.33	18	1
4C6 Trib 2	1	2778	4% Annual Chance	700	461.92	465.53	465.53	467.33	0.003515	10.77	65	18	1
4C6 Trib 2	1	2778	2% Annual Chance	900	461.92	466.17	466.17	468.32	0.003724	11.75	76.58	18	1
4C6 Trib 2	1	2778	1% Annual Chance	1048.55	461.92	466.64	466.64	469.01	0.003824	12.33	85.03	18	1
4C6 Trib 2	1	2778	0.4% Annual Chan	1219.86	461.92	467.33	467.15	469.77	0.003628	12.53	97.34	18	0.95
4C6 Trib 2	1	2778	0.2% Annual Chan	1309.82	461.92	468.91	467.4	471.19	0.005142	12.13	108		0.81
4C6 Trib 2	1	2517	50% Annual Chanc	200	460.36	461.92	461.92	462.71	0.003172	7.11	28.14	18	1
4C6 Trib 2	1	2517	20% Annual Chanc	350	460.36	462.63	462.63	463.77	0.003232	8.55	40.92	18	1
4C6 Trib 2	1	2517	10% Annual Chanc	450	460.36	463.05	463.05	464.39	0.003315	9.31	48.35	18	1
4C6 Trib 2	1	2517	4% Annual Chance	700	460.36	463.97	463.97	465.77	0.003513	10.77	65.01	18	1
4C6 Trib 2	1	2517	2% Annual Chance	900	460.36	464.63	464.63	466.76	0.003698	11.72	76.78	18	1
4C6 Trib 2	1	2517	1% Annual Chance	1048.55	460.36	465.09	465.09	467.45	0.003812	12.32	85.13	18	1
4C6 Trib 2	1	2517	0.4% Annual Chan	1219.86	460.36	466.6	465.59	468.58	0.00446	11.29	108		0.8
4C6 Trib 2	1	2517	0.2% Annual Chan	1309.82	460.36	467.57	465.84	469.85	0.005142	12.13	108		0.8
4C6 Trib 2	1	2461	50% Annual Chanc	200	460.02	461.45	461.13	461.79	0.001434	4.65	43	30	0.68
4C6 Trib 2	1	2461	20% Annual Chanc	350	460.02	462.12	461.64	462.6	0.001411	5.57	62.87	30	0.68
4C6 Trib 2	1	2461	10% Annual Chanc	450	460.02	462.59	461.93	463.12	0.001289	5.84	77.08	30	0.64
4C6 Trib 2	1	2461	4% Annual Chance	700	460.02	463.62	462.58	464.27	0.001203	6.49	107.93	30	0.6
4C6 Trib 2	1	2461	2% Annual Chance	900	460.02	464.56	463.06	465.24	0.001049	6.6	136.34	30	0.55
4C6 Trib 2	1	2461	1% Annual Chance	1048.55	460.02	465.74	463.37	466.32	0.000774	6.12	171.47	30	0.45
4C6 Trib 2	1	2461	0.4% Annual Chan	1219.86	460.02	467.35	463.74	468.07	0.00152	6.78	180		0.44
4C6 Trib 2	1	2461	0.2% Annual Chan	1309.82	460.02	468.44	463.93	469.26	0.001753	7.28	180		0.44
4C6 Trib 2	1	2367	50% Annual Chanc	200	459.83	461.36	460.95	461.66	0.001175	4.36	45.92	30	0.62
4C6 Trib 2	1	2367	20% Annual Chanc	350	459.83	462.02	461.45	462.46	0.00124	5.33	65.7	30	0.63
4C6 Trib 2	1	2367	10% Annual Chanc	450	459.83	462.5	461.74	462.99	0.00115	5.61	80.2	30	0.6
4C6 Trib 2	1	2367	4% Annual Chance	700	459.83	463.54	462.39	464.15	0.001109	6.3	111.17	30	0.58
4C6 Trib 2	1	2367	2% Annual Chance	900	459.83	464.49	462.86	465.14	0.000979	6.43	139.9	30	0.52
4C6 Trib 2	1	2367	1% Annual Chance	1048.55	459.83	465.68	463.19	466.24	0.000727	5.97	175.63	30	0.43
4C6 Trib 2	1	2367	0.4% Annual Chan	1219.86	459.83	467.21	463.55	467.92	0.00152	6.78	180		0.44
4C6 Trib 2	1	2367	0.2% Annual Chan	1309.82	459.83	468.27	463.73	469.09	0.001753	7.28	180		0.44
4C6 Trib 2	1	2250	50% Annual Chanc	200	457.74	461.26	459.96	461.39	0.003146	2.92	68.6	33.82	0.36
4C6 Trib 2	1	2250	20% Annual Chanc	350	457.74	461.93		462.15	0.004295	3.76	93	42.06	0.43
4C6 Trib 2	1	2250	10% Annual Chanc	450	457.74	462.45		462.69	0.00409	3.92	114.67	52.4	0.43
4C6 Trib 2	1	2250	4% Annual Chance	700	457.74	463.57		463.83	0.003546	4.1	170.7	73.9	0.41
4C6 Trib 2	1	2250	2% Annual Chance	900	457.74	464.6		464.84	0.002615	3.86	233.06	92.21	0.36
4C6 Trib 2	1	2250	1% Annual Chance	1048.55	457.74	465.84		466.01	0.00134	3.28	325.6	147.83	0.27

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 2	1	2250	0.4% Annual Chan	1219.86	457.74	467.53		467.64	0.00058	2.66	505.66	258.85	0.19
4C6 Trib 2	1	2250	0.2% Annual Chan	1309.82	457.74	468.72		468.79	0.000325	2.23	665.23	303.11	0.14
4C6 Trib 2	1	2023	50% Annual Chanc	200	456.69	458.94	458.94	459.62	0.028232	6.63	30.14	22.53	1.01
4C6 Trib 2	1	2023	20% Annual Chanc	350	456.69	460.72		461.01	0.005669	4.33	80.78	34.03	0.5
4C6 Trib 2	1	2023	10% Annual Chanc	450	456.69	461.46		461.73	0.004305	4.19	107.4	38.61	0.44
4C6 Trib 2	1	2023	4% Annual Chance	700	456.69	462.75		463.04	0.003395	4.3	162.76	46.98	0.41
4C6 Trib 2	1	2023	2% Annual Chance	900	456.69	464.04		464.28	0.00228	3.92	230.87	65.32	0.34
4C6 Trib 2	1	2023	1% Annual Chance	1048.55	456.69	465.58		465.73	0.001075	3.12	367.52	131.42	0.24
4C6 Trib 2	1	2023	0.4% Annual Chan	1219.86	456.69	467.46		467.52	0.00031	2.07	849.8	355.97	0.14
4C6 Trib 2	1	2023	0.2% Annual Chan	1309.82	456.69	468.7		468.73	0.000139	1.54	1313.56	420.1	0.09
4C6 Trib 2	1	1719	50% Annual Chanc	450	452.76	458.55	455.97	458.67	0.000959	2.73	164.76	42.39	0.24
4C6 Trib 2	1	1719	20% Annual Chanc	800	452.76	460.41	456.75	460.57	0.000809	3.24	246.95	46.14	0.25
4C6 Trib 2	1	1719	10% Annual Chanc	1050	452.76	461.07	457.23	461.29	0.00095	3.78	277.85	55.34	0.28
4C6 Trib 2	1	1719	4% Annual Chance	1350	452.76	462.42	457.77	462.66	0.00079	3.93	343.71	92.07	0.26
4C6 Trib 2	1	1719	2% Annual Chance	1650	452.76	463.79	458.25	464.01	0.000592	3.84	450.15	141.2	0.24
4C6 Trib 2	1	1719	1% Annual Chance	1948.55	452.76	465.41	458.71	465.58	0.000345	3.31	661.72	287.02	0.19
4C6 Trib 2	1	1719	0.4% Annual Chan	2269.86	452.76	467.31	459.17	467.43	0.000181	2.7	971.91	322.29	0.14
4C6 Trib 2	1	1719	0.2% Annual Chan	2459.82	452.76	468.56	459.43	468.67	0.000125	2.4	1175.67	411.32	0.12
4C6 Trib 2	1	1200	Culvert										
4C6 Trib 2	1	640	50% Annual Chanc	450	452.13	458.29	454.12	458.32	0.00044	1.47	311.27	84.92	0.12
4C6 Trib 2	1	640	20% Annual Chanc	800	452.13	459.83	454.8	459.87	0.000458	1.81	537.02	244.86	0.13
4C6 Trib 2	1	640	10% Annual Chanc	1050	452.13	460.02	455.21	460.09	0.00069	2.26	569.28	249.86	0.16
4C6 Trib 2	1	640	4% Annual Chance	1350	452.13	460.49	455.66	460.58	0.000831	2.6	648.44	371.76	0.17
4C6 Trib 2	1	640	2% Annual Chance	1650	452.13	460.77	456.06	460.89	0.001039	2.98	695.48	480.09	0.19
4C6 Trib 2	1	640	1% Annual Chance	1948.55	452.13	461.06	456.44	461.2	0.001218	3.31	743.7	515.55	0.21
4C6 Trib 2	1	640	0.4% Annual Chan	2269.86	452.13	461.3	456.82	461.47	0.001434	3.67	785.4	537.25	0.23
4C6 Trib 2	1	640	0.2% Annual Chan	2459.82	452.13	461.46	457.04	461.65	0.001539	3.85	814.39	546.54	0.24
4C6 Trib 2	1	609	50% Annual Chanc	600	452.14	458.16		458.27	0.002154	2.6	230.74	58.16	0.23
4C6 Trib 2	1	609	20% Annual Chanc	1050	452.14	459.7		459.82	0.001816	2.94	477.86	296.18	0.22
4C6 Trib 2	1	609	10% Annual Chanc	1350	452.14	459.84		460.01	0.00258	3.56	520.52	297.42	0.27
4C6 Trib 2	1	609	4% Annual Chance	1800	452.14	460.31		460.5	0.002799	3.91	695.85	508.91	0.28
4C6 Trib 2	1	609	2% Annual Chance	2150	452.14	460.61		460.8	0.002824	4.06	859.38	549.86	0.28
4C6 Trib 2	1	609	1% Annual Chance	2550	452.14	460.93		461.12	0.002763	4.15	1038.58	576.14	0.28
4C6 Trib 2	1	609	0.4% Annual Chan	3000	452.14	461.2		461.39	0.002832	4.32	1195.08	587.49	0.29
4C6 Trib 2	1	609	0.2% Annual Chan	3350	452.14	461.37		461.56	0.002937	4.47	1294.94	592.08	0.3
4C6 Trib 2	1	309	50% Annual Chanc	600	450.24	455.89		456.73	0.019977	7.35	81.59	28.01	0.76
4C6 Trib 2	1	309	20% Annual Chanc	1050	450.24	456.61	456.55	458.24	0.029881	10.27	103.34	34.05	0.96
4C6 Trib 2	1	309	10% Annual Chanc	1350	450.24	457.91	457.91	458.55	0.00998	7.31	350.89	320.37	0.58
4C6 Trib 2	1	309	4% Annual Chance	1800	450.24	458.29	458.29	458.91	0.010205	7.77	477.26	353.44	0.6
4C6 Trib 2	1	309	2% Annual Chance	2150	450.24	458.47	458.47	459.15	0.011212	8.33	542.39	364.39	0.63
4C6 Trib 2	1	309	1% Annual Chance	2550	450.24	458.62	458.62	459.39	0.01279	9.07	600.1	377.97	0.68
4C6 Trib 2	1	309	0.4% Annual Chan	3000	450.24	458.95	458.83	459.67	0.011987	9.12	732.64	432.5	0.66
4C6 Trib 2	1	309	0.2% Annual Chan	3350	450.24	459.22		459.87	0.010841	8.94	857.43	479.91	0.63
4C6 Trib 1	1	3883	50% Annual Chanc	275	451.04	455.56		455.59	0.001699	1.81	312.69	403.42	0.19
4C6 Trib 1	1	3883	20% Annual Chanc	450	451.04	455.91	455.03	455.94	0.001872	2.05	455.35	422.11	0.2
4C6 Trib 1	1	3883	10% Annual Chanc	600	451.04	456.1	455.27	456.14	0.002085	2.26	538.6	429.54	0.22
4C6 Trib 1	1	3883	4% Annual Chance	750	451.04	456.28		456.31	0.002264	2.43	613.56	438.76	0.23
4C6 Trib 1	1	3883	2% Annual Chance	900	451.04	456.43		456.47	0.002416	2.59	682.97	449.15	0.24
4C6 Trib 1	1	3883	1% Annual Chance	1000	451.04	456.53		456.58	0.002475	2.66	727.92	453.27	0.24
4C6 Trib 1	1	3883	0.4% Annual Chan	1200	451.04	456.71		456.76	0.002602	2.82	809.4	460.04	0.25
4C6 Trib 1	1	3883	0.2% Annual Chan	1400	451.04	456.88		456.94	0.002667	2.93	889.72	466.28	0.25
4C6 Trib 1	1	3459	50% Annual Chanc	275	450.04	453.36	453.31	453.82	0.029081	5.65	62.75	105.12	0.74
4C6 Trib 1	1	3459	20% Annual Chanc	450	450.04	453.86	453.82	454.23	0.020775	5.63	139.66	193.96	0.65
4C6 Trib 1	1	3459	10% Annual Chanc	600	450.04	454.21	454.1	454.48	0.015171	5.28	224.55	271.28	0.57
4C6 Trib 1	1	3459	4% Annual Chance	750	450.04	454.45		454.68	0.01273	5.13	292.62	290.6	0.53
4C6 Trib 1	1	3459	2% Annual Chance	900	450.04	454.71		454.89	0.010314	4.88	370.3	327.49	0.48
4C6 Trib 1	1	3459	1% Annual Chance	1000	450.04	454.85		455.02	0.009439	4.8	417.83	347.84	0.47
4C6 Trib 1	1	3459	0.4% Annual Chan	1200	450.04	455.13		455.28	0.007746	4.6	521.5	380.22	0.43
4C6 Trib 1	1	3459	0.2% Annual Chan	1400	450.04	455.38		455.52	0.006809	4.51	622.4	410.16	0.41
4C6 Trib 1	1	3187	50% Annual Chanc	275	446.8	450.11		450.26	0.007147	3.1	88.83	43.14	0.38
4C6 Trib 1	1	3187	20% Annual Chanc	450	446.8	450.92		451.12	0.007081	3.56	126.33	49.23	0.39
4C6 Trib 1	1	3187	10% Annual Chanc	600	446.8	451.42		451.67	0.007497	3.95	152.09	53	0.41
4C6 Trib 1	1	3187	4% Annual Chance	750	446.8	452.1		452.34	0.006227	3.96	190.18	62.44	0.38
4C6 Trib 1	1	3187	2% Annual Chance	900	446.8	452.46		452.74	0.006247	4.25	222.9	133.26	0.39
4C6 Trib 1	1	3187	1% Annual Chance	1000	446.8	452.72		453	0.005989	4.35	263.23	178.43	0.39
4C6 Trib 1	1	3187	0.4% Annual Chan	1200	446.8	452.92		453.27	0.00699	4.86	301.47	197.88	0.42
4C6 Trib 1	1	3187	0.2% Annual Chan	1400	446.8	453.11		453.52	0.007802	5.29	341.18	215.41	0.45

Table E.2: HEC-RAS Plan: Hickory Creek Combined Ultimate

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
4C6 Trib 1	1	662	50% Annual Chanc	325	434.25	440.17	437.65	440.28	0.001029	2.68	135.91	130.91	0.25
4C6 Trib 1	1	662	20% Annual Chanc	600	434.25	440.97	438.74	441.19	0.001615	3.85	199.96	164.44	0.33
4C6 Trib 1	1	662	10% Annual Chanc	750	434.25	441.37	439.12	441.58	0.001524	3.96	318.29	270.16	0.32
4C6 Trib 1	1	662	4% Annual Chance	950	434.25	442.1	439.56	442.3	0.001288	4.01	440.37	341.14	0.3
4C6 Trib 1	1	662	2% Annual Chance	1100	434.25	442.77	439.88	442.9	0.000805	3.43	834.53	417.39	0.24
4C6 Trib 1	1	662	1% Annual Chance	1250	434.25	443.33	440.37	443.43	0.000656	3.27	1084.69	477.15	0.22
4C6 Trib 1	1	662	0.4% Annual Chan	1450	434.25	443.96	440.73	444.04	0.000528	3.12	1414.05	561.11	0.2
4C6 Trib 1	1	662	0.2% Annual Chan	1650	434.25	444.35	441.03	444.42	0.000495	3.13	1636.95	588.26	0.2

Appendix E.3
HEC-RAS Output
Existing vs. Ultimate Conditions WSEL

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Stream 4C6	3	15204	50% Annual Chanc	494.9	50	496.71	50	496.71	0	0.0
Stream 4C6	3	15204	20% Annual Chanc	494.9	100	497.44	100	497.44	0	0.0
Stream 4C6	3	15204	10% Annual Chanc	494.9	125	497.72	125	497.72	0	0.0
Stream 4C6	3	15204	4% Annual Chance	494.9	150	497.98	150	497.98	0	0.0
Stream 4C6	3	15204	2% Annual Chance	494.9	175	498.21	175	498.21	0	0.0
Stream 4C6	3	15204	1% Annual Chance	494.9	200	498.42	200	498.42	0	0.0
Stream 4C6	3	15204	0.4% Annual Chan	494.9	250	498.78	250	498.78	0	0.0
Stream 4C6	3	15204	0.2% Annual Chan	494.9	275	498.94	275	498.94	0	0.0
Stream 4C6	3	15106*	50% Annual Chanc	494.73	50	496.58	50	496.58	0	0.0
Stream 4C6	3	15106*	20% Annual Chanc	494.73	100	497.31	100	497.31	0	0.0
Stream 4C6	3	15106*	10% Annual Chanc	494.73	125	497.59	125	497.59	0	0.0
Stream 4C6	3	15106*	4% Annual Chance	494.73	150	497.85	150	497.85	0	0.0
Stream 4C6	3	15106*	2% Annual Chance	494.73	175	498.08	175	498.08	0	0.0
Stream 4C6	3	15106*	1% Annual Chance	494.73	200	498.28	200	498.28	0	0.0
Stream 4C6	3	15106*	0.4% Annual Chan	494.73	250	498.63	250	498.63	0	0.0
Stream 4C6	3	15106*	0.2% Annual Chan	494.73	275	498.79	275	498.79	0	0.0
Stream 4C6	3	15008*	50% Annual Chanc	494.56	50	496.44	50	496.44	0	0.0
Stream 4C6	3	15008*	20% Annual Chanc	494.56	100	497.16	100	497.16	0	0.0
Stream 4C6	3	15008*	10% Annual Chanc	494.56	125	497.44	125	497.44	0	0.0
Stream 4C6	3	15008*	4% Annual Chance	494.56	150	497.69	150	497.69	0	0.0
Stream 4C6	3	15008*	2% Annual Chance	494.56	175	497.92	175	497.92	0	0.0
Stream 4C6	3	15008*	1% Annual Chance	494.56	200	498.12	200	498.12	0	0.0
Stream 4C6	3	15008*	0.4% Annual Chan	494.56	250	498.46	250	498.46	0	0.0
Stream 4C6	3	15008*	0.2% Annual Chan	494.56	275	498.61	275	498.61	0	0.0
Stream 4C6	3	14910*	50% Annual Chanc	494.4	50	496.26	50	496.26	0	0.0
Stream 4C6	3	14910*	20% Annual Chanc	494.4	100	496.98	100	496.98	0	0.0
Stream 4C6	3	14910*	10% Annual Chanc	494.4	125	497.26	125	497.26	0	0.0
Stream 4C6	3	14910*	4% Annual Chance	494.4	150	497.51	150	497.51	0	0.0
Stream 4C6	3	14910*	2% Annual Chance	494.4	175	497.73	175	497.73	0	0.0
Stream 4C6	3	14910*	1% Annual Chance	494.4	200	497.93	200	497.93	0	0.0
Stream 4C6	3	14910*	0.4% Annual Chan	494.4	250	498.25	250	498.25	0	0.0
Stream 4C6	3	14910*	0.2% Annual Chan	494.4	275	498.39	275	498.39	0	0.0
Stream 4C6	3	14813*	50% Annual Chanc	494.23	50	496.07	50	496.07	0	0.0
Stream 4C6	3	14813*	20% Annual Chanc	494.23	100	496.79	100	496.79	0	0.0
Stream 4C6	3	14813*	10% Annual Chanc	494.23	125	497.07	125	497.07	0	0.0
Stream 4C6	3	14813*	4% Annual Chance	494.23	150	497.31	150	497.31	0	0.0
Stream 4C6	3	14813*	2% Annual Chance	494.23	175	497.52	175	497.52	0	0.0
Stream 4C6	3	14813*	1% Annual Chance	494.23	200	497.7	200	497.7	0	0.0
Stream 4C6	3	14813*	0.4% Annual Chan	494.23	250	497.99	250	497.99	0	0.0
Stream 4C6	3	14813*	0.2% Annual Chan	494.23	275	498.11	275	498.11	0	0.0
Stream 4C6	3	14714	50% Annual Chanc	494.06	50	495.87	50	495.87	0	0.0
Stream 4C6	3	14714	20% Annual Chanc	494.06	100	496.58	100	496.58	0	0.0
Stream 4C6	3	14714	10% Annual Chanc	494.06	125	496.84	125	496.84	0	0.0
Stream 4C6	3	14714	4% Annual Chance	494.06	150	497.06	150	497.06	0	0.0
Stream 4C6	3	14714	2% Annual Chance	494.06	175	497.25	175	497.25	0	0.0
Stream 4C6	3	14714	1% Annual Chance	494.06	200	497.4	200	497.4	0	0.0
Stream 4C6	3	14714	0.4% Annual Chan	494.06	250	497.64	250	497.64	0	0.0
Stream 4C6	3	14714	0.2% Annual Chan	494.06	275	497.74	275	497.74	0	0.0
Stream 4C6	3	14629*	50% Annual Chanc	493.73	50	495.68	50	495.68	0	0.0
Stream 4C6	3	14629*	20% Annual Chanc	493.73	100	496.36	100	496.36	0	0.0
Stream 4C6	3	14629*	10% Annual Chanc	493.73	125	496.61	125	496.61	0	0.0
Stream 4C6	3	14629*	4% Annual Chance	493.73	150	496.8	150	496.8	0	0.0
Stream 4C6	3	14629*	2% Annual Chance	493.73	175	496.95	175	496.95	0	0.0
Stream 4C6	3	14629*	1% Annual Chance	493.73	200	497.08	200	497.08	0	0.0
Stream 4C6	3	14629*	0.4% Annual Chan	493.73	250	497.28	250	497.28	0	0.0
Stream 4C6	3	14629*	0.2% Annual Chan	493.73	275	497.37	275	497.37	0	0.0
Stream 4C6	3	14544*	50% Annual Chanc	493.4	50	495.46	50	495.46	0	0.0
Stream 4C6	3	14544*	20% Annual Chanc	493.4	100	496.1	100	496.1	0	0.0
Stream 4C6	3	14544*	10% Annual Chanc	493.4	125	496.31	125	496.31	0	0.0
Stream 4C6	3	14544*	4% Annual Chance	493.4	150	496.47	150	496.47	0	0.0
Stream 4C6	3	14544*	2% Annual Chance	493.4	175	496.59	175	496.59	0	0.0
Stream 4C6	3	14544*	1% Annual Chance	493.4	200	496.7	200	496.7	0	0.0
Stream 4C6	3	14544*	0.4% Annual Chan	493.4	250	496.87	250	496.87	0	0.0
Stream 4C6	3	14544*	0.2% Annual Chan	493.4	275	496.94	275	496.94	0	0.0
Stream 4C6	3	14459*	50% Annual Chanc	493.08	50	495.17	50	495.17	0	0.0
Stream 4C6	3	14459*	20% Annual Chanc	493.08	100	495.77	100	495.77	0	0.0
Stream 4C6	3	14459*	10% Annual Chanc	493.08	125	495.94	125	495.94	0	0.0

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations											
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference		
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	
Stream 4C6	3	14459*	4% Annual Chance	493.08	150	496.07	150	496.07	0	0.0	
Stream 4C6	3	14459*	2% Annual Chance	493.08	175	496.16	175	496.16	0	0.0	
Stream 4C6	3	14459*	1% Annual Chance	493.08	200	496.25	200	496.25	0	0.0	
Stream 4C6	3	14459*	0.4% Annual Chan	493.08	250	496.38	250	496.38	0	0.0	
Stream 4C6	3	14459*	0.2% Annual Chan	493.08	275	496.44	275	496.44	0	0.0	
									0	0.0	
Stream 4C6	3	14383	50% Annual Chanc	492.75	50	494.67	50	494.67	0	0.0	
Stream 4C6	3	14383	20% Annual Chanc	492.75	100	495.25	100	495.25	0	0.0	
Stream 4C6	3	14383	10% Annual Chanc	492.75	125	495.42	125	495.42	0	0.0	
Stream 4C6	3	14383	4% Annual Chance	492.75	150	495.52	150	495.52	0	0.0	
Stream 4C6	3	14383	2% Annual Chance	492.75	175	495.61	175	495.61	0	0.0	
Stream 4C6	3	14383	1% Annual Chance	492.75	200	495.69	200	495.68	0	0.0	
Stream 4C6	3	14383	0.4% Annual Chan	492.75	250	495.81	250	495.81	0	0.0	
Stream 4C6	3	14383	0.2% Annual Chan	492.75	275	495.87	275	495.87	0	0.0	
Stream 4C6	3	14288*	50% Annual Chanc	491.93	50	493.8	50	493.79	0	0.0	
Stream 4C6	3	14288*	20% Annual Chanc	491.93	100	494.53	100	494.53	0	0.0	
Stream 4C6	3	14288*	10% Annual Chanc	491.93	125	494.7	125	494.72	0	0.0	
Stream 4C6	3	14288*	4% Annual Chance	491.93	150	494.89	150	494.89	0	0.0	
Stream 4C6	3	14288*	2% Annual Chance	491.93	175	494.98	175	494.98	0	0.0	
Stream 4C6	3	14288*	1% Annual Chance	491.93	200	495.06	200	495.12	0	0.1	
Stream 4C6	3	14288*	0.4% Annual Chan	491.93	250	495.21	250	495.23	0	0.0	
Stream 4C6	3	14288*	0.2% Annual Chan	491.93	275	495.31	275	495.31	0	0.0	
Stream 4C6	3	14193*	50% Annual Chanc	491.11	50	492.95	50	493.11	0	0.2	
Stream 4C6	3	14193*	20% Annual Chanc	491.11	100	494.39	100	494.39	0	0.0	
Stream 4C6	3	14193*	10% Annual Chanc	491.11	125	494.57	125	494.59	0	0.0	
Stream 4C6	3	14193*	4% Annual Chance	491.11	150	494.77	150	494.77	0	0.0	
Stream 4C6	3	14193*	2% Annual Chance	491.11	175	494.85	175	494.85	0	0.0	
Stream 4C6	3	14193*	1% Annual Chance	491.11	200	494.9	200	495	0	0.1	
Stream 4C6	3	14193*	0.4% Annual Chan	491.11	250	495.04	250	495.08	0	0.0	
Stream 4C6	3	14193*	0.2% Annual Chan	491.11	275	495.14	275	495.14	0	0.0	
Stream 4C6	3	14094	50% Annual Chanc	490.29	50	492.56	50	492.95	0	0.4	
Stream 4C6	3	14094	20% Annual Chanc	490.29	100	494.36	100	494.36	0	0.0	
Stream 4C6	3	14094	10% Annual Chanc	490.29	125	494.54	125	494.57	0	0.0	
Stream 4C6	3	14094	4% Annual Chance	490.29	150	494.74	150	494.74	0	0.0	
Stream 4C6	3	14094	2% Annual Chance	490.29	175	494.82	175	494.82	0	0.0	
Stream 4C6	3	14094	1% Annual Chance	490.29	200	494.87	200	494.98	0	0.1	
Stream 4C6	3	14094	0.4% Annual Chan	490.29	250	495	250	495.04	0	0.0	
Stream 4C6	3	14094	0.2% Annual Chan	490.29	275	495.1	275	495.1	0	0.0	
Stream 4C6	3	13739	50% Annual Chanc	486.49	50	492.54	50	492.93	0	0.4	
Stream 4C6	3	13739	20% Annual Chanc	486.49	100	494.35	100	494.35	0	0.0	
Stream 4C6	3	13739	10% Annual Chanc	486.49	125	494.53	125	494.56	0	0.0	
Stream 4C6	3	13739	4% Annual Chance	486.49	150	494.73	150	494.73	0	0.0	
Stream 4C6	3	13739	2% Annual Chance	486.49	175	494.8	175	494.8	0	0.0	
Stream 4C6	3	13739	1% Annual Chance	486.49	200	494.84	200	494.96	0	0.1	
Stream 4C6	3	13739	0.4% Annual Chan	486.49	250	494.97	250	495.01	0	0.0	
Stream 4C6	3	13739	0.2% Annual Chan	486.49	275	495.06	275	495.06	0	0.0	
Stream 4C6	3	13570.7*	50% Annual Chanc	485.78	50	492.53	50	492.93	0	0.4	
Stream 4C6	3	13570.7*	20% Annual Chanc	485.78	100	494.35	100	494.35	0	0.0	
Stream 4C6	3	13570.7*	10% Annual Chanc	485.78	125	494.52	125	494.56	0	0.0	
Stream 4C6	3	13570.7*	4% Annual Chance	485.78	150	494.72	150	494.72	0	0.0	
Stream 4C6	3	13570.7*	2% Annual Chance	485.78	175	494.8	175	494.8	0	0.0	
Stream 4C6	3	13570.7*	1% Annual Chance	485.78	200	494.84	200	494.95	0	0.1	
Stream 4C6	3	13570.7*	0.4% Annual Chan	485.78	250	494.96	250	495	0	0.0	
Stream 4C6	3	13570.7*	0.2% Annual Chan	485.78	275	495.05	275	495.05	0	0.0	
Stream 4C6	3	13471	50% Annual Chanc	485.42	150	492.51	175	492.91	25	0.4	
Stream 4C6	3	13471	20% Annual Chanc	485.42	275	494.33	275	494.33	0	0.0	
Stream 4C6	3	13471	10% Annual Chanc	485.42	325	494.5	350	494.53	25	0.0	
Stream 4C6	3	13471	4% Annual Chance	485.42	450	494.68	450	494.68	0	0.0	
Stream 4C6	3	13471	2% Annual Chance	485.42	500	494.74	500	494.74	0	0.0	
Stream 4C6	3	13471	1% Annual Chance	485.42	550	494.77	600	494.88	50	0.1	
Stream 4C6	3	13471	0.4% Annual Chan	485.42	650	494.88	700	494.9	50	0.0	
Stream 4C6	3	13471	0.2% Annual Chan	485.42	750	494.95	750	494.95	0	0.0	
Stream 4C6	3	13400			Culvert		Culvert				
Stream 4C6	3	13373	50% Annual Chanc	483.8	150	485.84	175	486.03	25	0.2	
Stream 4C6	3	13373	20% Annual Chanc	483.8	275	486.62	275	486.62	0	0.0	
Stream 4C6	3	13373	10% Annual Chanc	483.8	325	486.86	350	486.97	25	0.1	
Stream 4C6	3	13373	4% Annual Chance	483.8	450	487.34	450	487.34	0	0.0	

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Stream 4C6	3	13373	2% Annual Chance	483.8	500	487.52	500	487.52	0	0.0
Stream 4C6	3	13373	1% Annual Chance	483.8	550	487.67	600	487.83	50	0.2
Stream 4C6	3	13373	0.4% Annual Chan	483.8	650	487.98	700	488.12	50	0.1
Stream 4C6	3	13373	0.2% Annual Chan	483.8	750	488.26	750	488.26	0	0.0
Stream 4C6	3	13141	50% Annual Chanc	482.88	150	485.24	175	485.43	25	0.2
Stream 4C6	3	13141	20% Annual Chanc	482.88	275	486.05	275	486.05	0	0.0
Stream 4C6	3	13141	10% Annual Chanc	482.88	325	486.31	350	486.42	25	0.1
Stream 4C6	3	13141	4% Annual Chance	482.88	450	486.83	450	486.83	0	0.0
Stream 4C6	3	13141	2% Annual Chance	482.88	500	487	500	487	0	0.0
Stream 4C6	3	13141	1% Annual Chance	482.88	550	487.16	600	487.31	50	0.1
Stream 4C6	3	13141	0.4% Annual Chan	482.88	650	487.46	700	487.6	50	0.1
Stream 4C6	3	13141	0.2% Annual Chan	482.88	750	487.73	750	487.73	0	0.0
Stream 4C6	3	12859	50% Annual Chanc	482.39	150	484.59	175	484.77	25	0.2
Stream 4C6	3	12859	20% Annual Chanc	482.39	275	485.37	275	485.37	0	0.0
Stream 4C6	3	12859	10% Annual Chanc	482.39	325	485.65	350	485.79	25	0.1
Stream 4C6	3	12859	4% Annual Chance	482.39	450	486.21	450	486.21	0	0.0
Stream 4C6	3	12859	2% Annual Chance	482.39	500	486.39	500	486.39	0	0.0
Stream 4C6	3	12859	1% Annual Chance	482.39	550	486.56	600	486.71	50	0.1
Stream 4C6	3	12859	0.4% Annual Chan	482.39	650	486.85	700	486.99	50	0.1
Stream 4C6	3	12859	0.2% Annual Chan	482.39	750	487.13	750	487.13	0	0.0
Stream 4C6	3	12708	50% Annual Chanc	481.74	150	484.25	175	484.42	25	0.2
Stream 4C6	3	12708	20% Annual Chanc	481.74	275	485.01	275	485.01	0	0.0
Stream 4C6	3	12708	10% Annual Chanc	481.74	325	485.28	350	485.4	25	0.1
Stream 4C6	3	12708	4% Annual Chance	481.74	450	485.82	450	485.82	0	0.0
Stream 4C6	3	12708	2% Annual Chance	481.74	500	485.98	500	485.98	0	0.0
Stream 4C6	3	12708	1% Annual Chance	481.74	550	486.14	600	486.28	50	0.1
Stream 4C6	3	12708	0.4% Annual Chan	481.74	650	486.41	700	486.54	50	0.1
Stream 4C6	3	12708	0.2% Annual Chan	481.74	750	486.66	750	486.66	0	0.0
Stream 4C6	3	12620.9*	50% Annual Chanc	481.36	150	484	175	484.17	25	0.2
Stream 4C6	3	12620.9*	20% Annual Chanc	481.36	275	484.75	275	484.75	0	0.0
Stream 4C6	3	12620.9*	10% Annual Chanc	481.36	325	485	350	485.12	25	0.1
Stream 4C6	3	12620.9*	4% Annual Chance	481.36	450	485.54	450	485.54	0	0.0
Stream 4C6	3	12620.9*	2% Annual Chance	481.36	500	485.72	500	485.72	0	0.0
Stream 4C6	3	12620.9*	1% Annual Chance	481.36	550	485.87	600	486.01	50	0.1
Stream 4C6	3	12620.9*	0.4% Annual Chan	481.36	650	486.14	700	486.27	50	0.1
Stream 4C6	3	12620.9*	0.2% Annual Chan	481.36	750	486.4	750	486.39	0	0.0
Stream 4C6	3	12534.2*	50% Annual Chanc	480.99	150	483.56	175	483.72	25	0.2
Stream 4C6	3	12534.2*	20% Annual Chanc	480.99	275	484.26	275	484.26	0	0.0
Stream 4C6	3	12534.2*	10% Annual Chanc	480.99	325	484.49	350	484.6	25	0.1
Stream 4C6	3	12534.2*	4% Annual Chance	480.99	450	485.03	450	485.03	0	0.0
Stream 4C6	3	12534.2*	2% Annual Chance	480.99	500	485.22	500	485.22	0	0.0
Stream 4C6	3	12534.2*	1% Annual Chance	480.99	550	485.39	600	485.53	50	0.1
Stream 4C6	3	12534.2*	0.4% Annual Chan	480.99	650	485.65	700	485.77	50	0.1
Stream 4C6	3	12534.2*	0.2% Annual Chan	480.99	750	485.89	750	485.89	0	0.0
Stream 4C6	3	12447.4*	50% Annual Chanc	480.61	150	483.12	175	483.28	25	0.2
Stream 4C6	3	12447.4*	20% Annual Chanc	480.61	275	483.79	275	483.79	0	0.0
Stream 4C6	3	12447.4*	10% Annual Chanc	480.61	325	484.01	350	484.11	25	0.1
Stream 4C6	3	12447.4*	4% Annual Chance	480.61	450	484.51	450	484.5	0	0.0
Stream 4C6	3	12447.4*	2% Annual Chance	480.61	500	484.69	500	484.69	0	0.0
Stream 4C6	3	12447.4*	1% Annual Chance	480.61	550	484.86	600	485.02	50	0.2
Stream 4C6	3	12447.4*	0.4% Annual Chan	480.61	650	485.15	700	485.26	50	0.1
Stream 4C6	3	12447.4*	0.2% Annual Chan	480.61	750	485.41	750	485.39	0	0.0
Stream 4C6	3	12359	50% Annual Chanc	480.24	150	482.5	175	482.64	25	0.1
Stream 4C6	3	12359	20% Annual Chanc	480.24	275	483.08	275	483.09	0	0.0
Stream 4C6	3	12359	10% Annual Chanc	480.24	325	483.27	350	483.37	25	0.1
Stream 4C6	3	12359	4% Annual Chance	480.24	450	483.66	450	483.66	0	0.0
Stream 4C6	3	12359	2% Annual Chance	480.24	500	483.8	500	483.81	0	0.0
Stream 4C6	3	12359	1% Annual Chance	480.24	550	483.94	600	484.04	50	0.1
Stream 4C6	3	12359	0.4% Annual Chan	480.24	650	484.16	700	484.33	50	0.2
Stream 4C6	3	12359	0.2% Annual Chan	480.24	750	484.36	750	484.4	0	0.0
Stream 4C6	3	12286*	50% Annual Chanc	479.74	150	481.79	175	481.93	25	0.1
Stream 4C6	3	12286*	20% Annual Chanc	479.74	275	482.41	275	482.4	0	0.0
Stream 4C6	3	12286*	10% Annual Chanc	479.74	325	482.61	350	482.69	25	0.1
Stream 4C6	3	12286*	4% Annual Chance	479.74	450	483.03	450	483.03	0	0.0
Stream 4C6	3	12286*	2% Annual Chance	479.74	500	483.18	500	483.18	0	0.0
Stream 4C6	3	12286*	1% Annual Chance	479.74	550	483.32	600	483.45	50	0.1
Stream 4C6	3	12286*	0.4% Annual Chan	479.74	650	483.57	700	483.68	50	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Stream 4C6	3	12286*	0.2% Annual Chan	479.74	750	483.82	750	483.8	0	0.0
Stream 4C6	3	12138	50% Annual Chanc	478.75	150	481.27	175	481.44	25	0.2
Stream 4C6	3	12138	20% Annual Chanc	478.75	275	482.02	275	482.02	0	0.0
Stream 4C6	3	12138	10% Annual Chanc	478.75	325	482.26	350	482.36	25	0.1
Stream 4C6	3	12138	4% Annual Chance	478.75	450	482.75	450	482.75	0	0.0
Stream 4C6	3	12138	2% Annual Chance	478.75	500	482.91	500	482.91	0	0.0
Stream 4C6	3	12138	1% Annual Chance	478.75	550	483.07	600	483.2	50	0.1
Stream 4C6	3	12138	0.4% Annual Chan	478.75	650	483.35	700	483.47	50	0.1
Stream 4C6	3	12138	0.2% Annual Chan	478.75	750	483.61	750	483.61	0	0.0
Stream 4C6	3	12100			Bridge		Bridge			
Stream 4C6	3	12078	50% Annual Chanc	477.72	150	479.81	175	479.96	25	0.1
Stream 4C6	3	12078	20% Annual Chanc	477.72	275	480.45	275	480.45	0	0.0
Stream 4C6	3	12078	10% Annual Chanc	477.72	325	480.82	350	481.01	25	0.2
Stream 4C6	3	12078	4% Annual Chance	477.72	450	481.33	450	481.63	0	0.3
Stream 4C6	3	12078	2% Annual Chance	477.72	500	481.62	500	481.72	0	0.1
Stream 4C6	3	12078	1% Annual Chance	477.72	550	482.02	600	482	50	0.0
Stream 4C6	3	12078	0.4% Annual Chan	477.72	650	482.43	700	482.41	50	0.0
Stream 4C6	3	12078	0.2% Annual Chan	477.72	750	482.47	750	482.57	0	0.1
Stream 4C6	3	11996.7*	50% Annual Chanc	476.92	150	478.98	175	479.11	25	0.1
Stream 4C6	3	11996.7*	20% Annual Chanc	476.92	275	479.58	275	480.16	0	0.6
Stream 4C6	3	11996.7*	10% Annual Chanc	476.92	325	480.67	350	480.89	25	0.2
Stream 4C6	3	11996.7*	4% Annual Chance	476.92	450	481.21	450	481.55	0	0.3
Stream 4C6	3	11996.7*	2% Annual Chance	476.92	500	481.52	500	481.63	0	0.1
Stream 4C6	3	11996.7*	1% Annual Chance	476.92	550	481.95	600	481.92	50	0.0
Stream 4C6	3	11996.7*	0.4% Annual Chan	476.92	650	482.37	700	482.34	50	0.0
Stream 4C6	3	11996.7*	0.2% Annual Chan	476.92	750	482.39	750	482.5	0	0.1
Stream 4C6	3	11915.5*	50% Annual Chanc	476.12	150	478.12	175	478.25	25	0.1
Stream 4C6	3	11915.5*	20% Annual Chanc	476.12	275	479.61	275	480.19	0	0.6
Stream 4C6	3	11915.5*	10% Annual Chanc	476.12	325	480.7	350	480.91	25	0.2
Stream 4C6	3	11915.5*	4% Annual Chance	476.12	450	481.24	450	481.58	0	0.3
Stream 4C6	3	11915.5*	2% Annual Chance	476.12	500	481.56	500	481.67	0	0.1
Stream 4C6	3	11915.5*	1% Annual Chance	476.12	550	481.99	600	481.96	50	0.0
Stream 4C6	3	11915.5*	0.4% Annual Chan	476.12	650	482.43	700	482.4	50	0.0
Stream 4C6	3	11915.5*	0.2% Annual Chan	476.12	750	482.47	750	482.58	0	0.1
Stream 4C6	3	11834.2*	50% Annual Chanc	475.32	150	477.25	175	477.37	25	0.1
Stream 4C6	3	11834.2*	20% Annual Chanc	475.32	275	479.72	275	480.26	0	0.5
Stream 4C6	3	11834.2*	10% Annual Chanc	475.32	325	480.77	350	480.99	25	0.2
Stream 4C6	3	11834.2*	4% Annual Chance	475.32	450	481.35	450	481.67	0	0.3
Stream 4C6	3	11834.2*	2% Annual Chance	475.32	500	481.66	500	481.77	0	0.1
Stream 4C6	3	11834.2*	1% Annual Chance	475.32	550	482.08	600	482.08	50	0.0
Stream 4C6	3	11834.2*	0.4% Annual Chan	475.32	650	482.53	700	482.52	50	0.0
Stream 4C6	3	11834.2*	0.2% Annual Chan	475.32	750	482.6	750	482.7	0	0.1
Stream 4C6	3	11751	50% Annual Chanc	474.52	150	477.49	175	477.5	25	0.0
Stream 4C6	3	11751	20% Annual Chanc	474.52	275	479.75	275	480.27	0	0.5
Stream 4C6	3	11751	10% Annual Chanc	474.52	325	480.78	350	481	25	0.2
Stream 4C6	3	11751	4% Annual Chance	474.52	450	481.35	450	481.67	0	0.3
Stream 4C6	3	11751	2% Annual Chance	474.52	500	481.67	500	481.77	0	0.1
Stream 4C6	3	11751	1% Annual Chance	474.52	550	482.09	600	482.09	50	0.0
Stream 4C6	3	11751	0.4% Annual Chan	474.52	650	482.53	700	482.53	50	0.0
Stream 4C6	3	11751	0.2% Annual Chan	474.52	750	482.6	750	482.7	0	0.1
Stream 4C6	3	11383	50% Annual Chanc	472.96	150	477.49	175	477.49	25	0.0
Stream 4C6	3	11383	20% Annual Chanc	472.96	275	479.75	275	480.27	0	0.5
Stream 4C6	3	11383	10% Annual Chanc	472.96	325	480.78	350	481	25	0.2
Stream 4C6	3	11383	4% Annual Chance	472.96	450	481.35	450	481.67	0	0.3
Stream 4C6	3	11383	2% Annual Chance	472.96	500	481.67	500	481.77	0	0.1
Stream 4C6	3	11383	1% Annual Chance	472.96	550	482.09	600	482.09	50	0.0
Stream 4C6	3	11383	0.4% Annual Chan	472.96	650	482.53	700	482.52	50	0.0
Stream 4C6	3	11383	0.2% Annual Chan	472.96	750	482.6	750	482.7	0	0.1
Stream 4C6	3	11124	50% Annual Chanc	471.89	150	477.47	150	477.47	0	0.0
Stream 4C6	3	11124	20% Annual Chanc	471.89	250	479.73	275	480.26	25	0.5
Stream 4C6	3	11124	10% Annual Chanc	471.89	325	480.76	350	480.98	25	0.2
Stream 4C6	3	11124	4% Annual Chance	471.89	400	481.33	450	481.64	50	0.3
Stream 4C6	3	11124	2% Annual Chance	471.89	450	481.64	500	481.74	50	0.1
Stream 4C6	3	11124	1% Annual Chance	471.89	550	482.05	550	482.05	0	0.0
Stream 4C6	3	11124	0.4% Annual Chan	471.89	650	482.53	650	482.52	0	0.0
Stream 4C6	3	11124	0.2% Annual Chan	471.89	700	482.6	750	482.7	50	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations											
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference		
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	
Stream 4C6	3	11100				Culvert		Culvert			
Stream 4C6	3	11054	50% Annual Chanc	471.2	150	473.94	150	473.94	0	0.0	
Stream 4C6	3	11054	20% Annual Chanc	471.2	250	475.01	275	475.43	25	0.4	
Stream 4C6	3	11054	10% Annual Chanc	471.2	325	476.03	350	476.16	25	0.1	
Stream 4C6	3	11054	4% Annual Chance	471.2	400	476.47	450	476.84	50	0.4	
Stream 4C6	3	11054	2% Annual Chance	471.2	450	476.88	500	477.1	50	0.2	
Stream 4C6	3	11054	1% Annual Chance	471.2	550	477.39	550	477.39	0	0.0	
Stream 4C6	3	11054	0.4% Annual Chan	471.2	650	477.8	650	477.81	0	0.0	
Stream 4C6	3	11054	0.2% Annual Chan	471.2	700	478.02	750	478.16	50	0.1	
Stream 4C6	3	11050				Bridge		Bridge			
Stream 4C6	3	11039	50% Annual Chanc	470.98	150	473.7	150	473.7	0	0.0	
Stream 4C6	3	11039	20% Annual Chanc	470.98	250	474.62	275	474.85	25	0.2	
Stream 4C6	3	11039	10% Annual Chanc	470.98	325	475.32	350	475.56	25	0.2	
Stream 4C6	3	11039	4% Annual Chance	470.98	400	476.07	450	476.52	50	0.4	
Stream 4C6	3	11039	2% Annual Chance	470.98	450	476.58	500	476.79	50	0.2	
Stream 4C6	3	11039	1% Annual Chance	470.98	550	477.09	550	477.09	0	0.0	
Stream 4C6	3	11039	0.4% Annual Chan	470.98	650	477.47	650	477.49	0	0.0	
Stream 4C6	3	11039	0.2% Annual Chan	470.98	700	477.69	750	477.8	50	0.1	
Stream 4C6	3	10944	50% Annual Chanc	470.53	150	473.31	150	473.31	0	0.0	
Stream 4C6	3	10944	20% Annual Chanc	470.53	250	474.29	275	474.53	25	0.2	
Stream 4C6	3	10944	10% Annual Chanc	470.53	325	475.05	350	475.3	25	0.3	
Stream 4C6	3	10944	4% Annual Chance	470.53	400	475.85	450	476.34	50	0.5	
Stream 4C6	3	10944	2% Annual Chance	470.53	450	476.41	500	476.61	50	0.2	
Stream 4C6	3	10944	1% Annual Chance	470.53	550	476.93	550	476.93	0	0.0	
Stream 4C6	3	10944	0.4% Annual Chan	470.53	650	477.29	650	477.32	0	0.0	
Stream 4C6	3	10944	0.2% Annual Chan	470.53	700	477.52	750	477.62	50	0.1	
Stream 4C6	3	10900				Culvert		Culvert			
Stream 4C6	3	10846	50% Annual Chanc	469.9	150	472.75	150	472.75	0	0.0	
Stream 4C6	3	10846	20% Annual Chanc	469.9	250	473.47	275	473.65	25	0.2	
Stream 4C6	3	10846	10% Annual Chanc	469.9	325	474	350	474.03	25	0.0	
Stream 4C6	3	10846	4% Annual Chance	469.9	400	474.48	450	474.53	50	0.0	
Stream 4C6	3	10846	2% Annual Chance	469.9	450	474.77	500	474.82	50	0.1	
Stream 4C6	3	10846	1% Annual Chance	469.9	550	475.19	550	475.19	0	0.0	
Stream 4C6	3	10846	0.4% Annual Chan	469.9	650	475.55	650	475.66	0	0.1	
Stream 4C6	3	10846	0.2% Annual Chan	469.9	700	475.99	750	476.01	50	0.0	
Stream 4C6	3	10477	50% Annual Chanc	469.39	275	471.41	275	471.41	0	0.0	
Stream 4C6	3	10477	20% Annual Chanc	469.39	450	472.31	500	472.52	50	0.2	
Stream 4C6	3	10477	10% Annual Chanc	469.39	600	472.89	600	472.89	0	0.0	
Stream 4C6	3	10477	4% Annual Chance	469.39	750	473.41	750	473.41	0	0.0	
Stream 4C6	3	10477	2% Annual Chance	469.39	850	473.73	850	473.73	0	0.0	
Stream 4C6	3	10477	1% Annual Chance	469.39	1000	474.19	1000	474.19	0	0.0	
Stream 4C6	3	10477	0.4% Annual Chan	469.39	1150	474.64	1200	474.78	50	0.1	
Stream 4C6	3	10477	0.2% Annual Chan	469.39	1350	475.21	1350	475.21	0	0.0	
Stream 4C6	3	10400				Culvert		Culvert			
Stream 4C6	3	10330	50% Annual Chanc	467.26	275	471.1	275	471.1	0	0.0	
Stream 4C6	3	10330	20% Annual Chanc	467.26	450	471.91	500	472.08	50	0.2	
Stream 4C6	3	10330	10% Annual Chanc	467.26	600	472.35	600	472.35	0	0.0	
Stream 4C6	3	10330	4% Annual Chance	467.26	750	472.7	750	472.71	0	0.0	
Stream 4C6	3	10330	2% Annual Chance	467.26	850	472.91	850	472.91	0	0.0	
Stream 4C6	3	10330	1% Annual Chance	467.26	1000	473.18	1000	473.18	0	0.0	
Stream 4C6	3	10330	0.4% Annual Chan	467.26	1150	473.42	1200	473.49	50	0.1	
Stream 4C6	3	10330	0.2% Annual Chan	467.26	1350	473.68	1350	473.68	0	0.0	
Stream 4C6	3	10290	50% Annual Chanc	466.45	275	471.02	275	471.02	0	0.0	
Stream 4C6	3	10290	20% Annual Chanc	466.45	450	471.83	500	472	50	0.2	
Stream 4C6	3	10290	10% Annual Chanc	466.45	600	472.27	600	472.27	0	0.0	
Stream 4C6	3	10290	4% Annual Chance	466.45	750	472.63	750	472.64	0	0.0	
Stream 4C6	3	10290	2% Annual Chance	466.45	850	472.85	850	472.85	0	0.0	
Stream 4C6	3	10290	1% Annual Chance	466.45	1000	473.14	1000	473.14	0	0.0	
Stream 4C6	3	10290	0.4% Annual Chan	466.45	1150	473.38	1200	473.45	50	0.1	
Stream 4C6	3	10290	0.2% Annual Chan	466.45	1350	473.64	1350	473.65	0	0.0	
Stream 4C6	3	9831	50% Annual Chanc	465.78	275	469.15	275	469.15	0	0.0	
Stream 4C6	3	9831	20% Annual Chanc	465.78	450	469.88	500	470	50	0.1	
Stream 4C6	3	9831	10% Annual Chanc	465.78	600	470.2	600	470.2	0	0.0	

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Stream 4C6	3	9831	4% Annual Chance	465.78	750	470.41	750	470.38	0	0.0
Stream 4C6	3	9831	2% Annual Chance	465.78	850	470.54	850	470.51	0	0.0
Stream 4C6	3	9831	1% Annual Chance	465.78	1000	470.74	1000	470.74	0	0.0
Stream 4C6	3	9831	0.4% Annual Chan	465.78	1150	470.93	1200	471.02	50	0.1
Stream 4C6	3	9831	0.2% Annual Chan	465.78	1350	471.21	1350	471.19	0	0.0
Stream 4C6	3	9306	50% Annual Chanc	463.83	275	467.13	275	467.13	0	0.0
Stream 4C6	3	9306	20% Annual Chanc	463.83	450	467.45	500	467.54	50	0.1
Stream 4C6	3	9306	10% Annual Chanc	463.83	600	467.71	600	467.71	0	0.0
Stream 4C6	3	9306	4% Annual Chance	463.83	750	467.95	750	467.98	0	0.0
Stream 4C6	3	9306	2% Annual Chance	463.83	850	468.1	850	468.12	0	0.0
Stream 4C6	3	9306	1% Annual Chance	463.83	1000	468.28	1000	468.28	0	0.0
Stream 4C6	3	9306	0.4% Annual Chan	463.83	1150	468.43	1200	468.45	50	0.0
Stream 4C6	3	9306	0.2% Annual Chan	463.83	1350	468.58	1350	468.59	0	0.0
Stream 4C6	3	8542	50% Annual Chanc	460.45	325	463.88	350	463.97	25	0.1
Stream 4C6	3	8542	20% Annual Chanc	460.45	550	464.36	600	464.43	50	0.1
Stream 4C6	3	8542	10% Annual Chanc	460.45	750	464.62	750	464.62	0	0.0
Stream 4C6	3	8542	4% Annual Chance	460.45	950	464.79	1000	464.83	50	0.0
Stream 4C6	3	8542	2% Annual Chance	460.45	1100	464.92	1150	464.96	50	0.0
Stream 4C6	3	8542	1% Annual Chance	460.45	1300	465.08	1300	465.09	0	0.0
Stream 4C6	3	8542	0.4% Annual Chan	460.45	1550	465.35	1550	465.36	0	0.0
Stream 4C6	3	8542	0.2% Annual Chan	460.45	1750	465.55	1800	465.6	50	0.1
Stream 4C6	3	7726	50% Annual Chanc	453.52	325	459.66	350	459.76	25	0.1
Stream 4C6	3	7726	20% Annual Chanc	453.52	550	460.64	600	460.81	50	0.2
Stream 4C6	3	7726	10% Annual Chanc	453.52	750	461.24	750	461.24	0	0.0
Stream 4C6	3	7726	4% Annual Chance	453.52	950	461.67	1000	461.77	50	0.1
Stream 4C6	3	7726	2% Annual Chance	453.52	1100	461.96	1150	462.05	50	0.1
Stream 4C6	3	7726	1% Annual Chance	453.52	1300	462.29	1300	462.28	0	0.0
Stream 4C6	3	7726	0.4% Annual Chan	453.52	1550	462.51	1550	462.49	0	0.0
Stream 4C6	3	7726	0.2% Annual Chan	453.52	1750	462.62	1800	462.67	50	0.1
Stream 4C6	3	7315	50% Annual Chanc	452.69	325	455.75	350	456.19	25	0.4
Stream 4C6	3	7315	20% Annual Chanc	452.69	550	457.31	600	457.43	50	0.1
Stream 4C6	3	7315	10% Annual Chanc	452.69	750	457.81	750	457.85	0	0.0
Stream 4C6	3	7315	4% Annual Chance	452.69	950	458.26	1000	458.36	50	0.1
Stream 4C6	3	7315	2% Annual Chance	452.69	1100	458.59	1150	458.69	50	0.1
Stream 4C6	3	7315	1% Annual Chance	452.69	1300	459.01	1300	459.09	0	0.1
Stream 4C6	3	7315	0.4% Annual Chan	452.69	1550	459.89	1550	459.93	0	0.0
Stream 4C6	3	7315	0.2% Annual Chan	452.69	1750	460.41	1800	460.48	50	0.1
Stream 4C6	3	7010	50% Annual Chanc	451.68	325	456.05	350	456.41	25	0.4
Stream 4C6	3	7010	20% Annual Chanc	451.68	550	457.51	600	457.65	50	0.1
Stream 4C6	3	7010	10% Annual Chanc	451.68	750	458.07	750	458.1	0	0.0
Stream 4C6	3	7010	4% Annual Chance	451.68	950	458.56	1000	458.68	50	0.1
Stream 4C6	3	7010	2% Annual Chance	451.68	1100	458.92	1150	459.02	50	0.1
Stream 4C6	3	7010	1% Annual Chance	451.68	1300	459.33	1300	459.39	0	0.1
Stream 4C6	3	7010	0.4% Annual Chan	451.68	1550	460	1550	460.03	0	0.0
Stream 4C6	3	7010	0.2% Annual Chan	451.68	1750	460.42	1800	460.48	50	0.1
Stream 4C6	3	7000			Culvert		Culvert			
Stream 4C6	3	6894	50% Annual Chanc	451.38	325	455.96	350	456.32	25	0.4
Stream 4C6	3	6894	20% Annual Chanc	451.38	550	457.37	600	457.49	50	0.1
Stream 4C6	3	6894	10% Annual Chanc	451.38	750	457.85	750	457.88	0	0.0
Stream 4C6	3	6894	4% Annual Chance	451.38	950	458.25	1000	458.34	50	0.1
Stream 4C6	3	6894	2% Annual Chance	451.38	1100	458.53	1150	458.61	50	0.1
Stream 4C6	3	6894	1% Annual Chance	451.38	1300	458.83	1300	458.86	0	0.0
Stream 4C6	3	6894	0.4% Annual Chan	451.38	1550	459.18	1550	459.21	0	0.0
Stream 4C6	3	6894	0.2% Annual Chan	451.38	1750	459.43	1800	459.45	50	0.0
Stream 4C6	3	6842	50% Annual Chanc	448.85	325	455.83	350	456.19	25	0.4
Stream 4C6	3	6842	20% Annual Chanc	448.85	550	457.19	600	457.3	50	0.1
Stream 4C6	3	6842	10% Annual Chanc	448.85	750	457.65	750	457.7	0	0.1
Stream 4C6	3	6842	4% Annual Chance	448.85	950	458.11	1000	458.2	50	0.1
Stream 4C6	3	6842	2% Annual Chance	448.85	1100	458.43	1150	458.53	50	0.1
Stream 4C6	3	6842	1% Annual Chance	448.85	1300	458.8	1300	458.84	0	0.0
Stream 4C6	3	6842	0.4% Annual Chan	448.85	1550	459.2	1550	459.23	0	0.0
Stream 4C6	3	6842	0.2% Annual Chan	448.85	1750	459.46	1800	459.49	50	0.0
Stream 4C6	3	6694	50% Annual Chanc	448.57	325	455.53	350	455.96	25	0.4
Stream 4C6	3	6694	20% Annual Chanc	448.57	550	456.96	600	457.06	50	0.1
Stream 4C6	3	6694	10% Annual Chanc	448.57	750	457.42	750	457.49	0	0.1
Stream 4C6	3	6694	4% Annual Chance	448.57	950	457.88	1000	457.98	50	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations											
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference		
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	
Stream 4C6	3	6694	2% Annual Chance	448.57	1100	458.22	1150	458.31	50	0.1	
Stream 4C6	3	6694	1% Annual Chance	448.57	1300	458.58	1300	458.62	0	0.0	
Stream 4C6	3	6694	0.4% Annual Chan	448.57	1550	458.97	1550	459.01	0	0.0	
Stream 4C6	3	6694	0.2% Annual Chan	448.57	1750	459.23	1800	459.25	50	0.0	
Stream 4C6	2	6239	50% Annual Chanc	446.26	800	454.72	950	455.16	150	0.4	
Stream 4C6	2	6239	20% Annual Chanc	446.26	1550	456.04	1650	456.15	100	0.1	
Stream 4C6	2	6239	10% Annual Chanc	446.26	2050	456.55	2150	456.66	100	0.1	
Stream 4C6	2	6239	4% Annual Chance	446.26	2700	457.03	2850	457.14	150	0.1	
Stream 4C6	2	6239	2% Annual Chance	446.26	3250	457.39	3400	457.49	150	0.1	
Stream 4C6	2	6239	1% Annual Chance	446.26	3850	457.76	3950	457.81	100	0.1	
Stream 4C6	2	6239	0.4% Annual Chan	446.26	4650	458.15	4750	458.18	100	0.0	
Stream 4C6	2	6239	0.2% Annual Chan	446.26	5250	458.37	5300	458.38	50	0.0	
Stream 4C6	2	6059	50% Annual Chanc	445.85	800	454.15	950	454.55	150	0.4	
Stream 4C6	2	6059	20% Annual Chanc	445.85	1550	455.49	1650	455.62	100	0.1	
Stream 4C6	2	6059	10% Annual Chanc	445.85	2050	456.08	2150	456.21	100	0.1	
Stream 4C6	2	6059	4% Annual Chance	445.85	2700	456.52	2850	456.63	150	0.1	
Stream 4C6	2	6059	2% Annual Chance	445.85	3250	456.87	3400	456.98	150	0.1	
Stream 4C6	2	6059	1% Annual Chance	445.85	3850	457.24	3950	457.28	100	0.0	
Stream 4C6	2	6059	0.4% Annual Chan	445.85	4650	457.61	4750	457.62	100	0.0	
Stream 4C6	2	6059	0.2% Annual Chan	445.85	5250	457.77	5300	457.77	50	0.0	
Stream 4C6	2	5757	50% Annual Chanc	445.25	800	450.07	950	450.97	150	0.9	
Stream 4C6	2	5757	20% Annual Chanc	445.25	1550	452.15	1650	452.25	100	0.1	
Stream 4C6	2	5757	10% Annual Chanc	445.25	2050	452.74	2150	452.79	100	0.1	
Stream 4C6	2	5757	4% Annual Chance	445.25	2700	453.88	2850	454	150	0.1	
Stream 4C6	2	5757	2% Annual Chance	445.25	3250	454.31	3400	454.34	150	0.0	
Stream 4C6	2	5757	1% Annual Chance	445.25	3850	454.58	3950	454.65	100	0.1	
Stream 4C6	2	5757	0.4% Annual Chan	445.25	4650	455.03	4750	455.19	100	0.2	
Stream 4C6	2	5757	0.2% Annual Chan	445.25	5250	456	5300	456.11	50	0.1	
Stream 4C6	2	5525	50% Annual Chanc	443.85	800	448.83	900	449.11	100	0.3	
Stream 4C6	2	5525	20% Annual Chanc	443.85	1500	450.39	1600	450.57	100	0.2	
Stream 4C6	2	5525	10% Annual Chanc	443.85	2000	451.24	2150	451.46	150	0.2	
Stream 4C6	2	5525	4% Annual Chance	443.85	2650	452.15	2800	452.34	150	0.2	
Stream 4C6	2	5525	2% Annual Chance	443.85	3200	452.83	3300	452.96	100	0.1	
Stream 4C6	2	5525	1% Annual Chance	443.85	3800	453.58	3900	453.7	100	0.1	
Stream 4C6	2	5525	0.4% Annual Chan	443.85	4600	454.56	4700	454.7	100	0.1	
Stream 4C6	2	5525	0.2% Annual Chan	443.85	5150	455.5	5200	455.61	50	0.1	
Stream 4C6	2	5400			Culvert		Culvert				
Stream 4C6	2	4891	50% Annual Chanc	442.34	800	448.57	900	448.82	100	0.3	
Stream 4C6	2	4891	20% Annual Chanc	442.34	1500	449.93	1600	450.07	100	0.1	
Stream 4C6	2	4891	10% Annual Chanc	442.34	2000	450.56	2150	450.71	150	0.1	
Stream 4C6	2	4891	4% Annual Chance	442.34	2650	451.13	2800	451.24	150	0.1	
Stream 4C6	2	4891	2% Annual Chance	442.34	3200	451.48	3300	451.54	100	0.1	
Stream 4C6	2	4891	1% Annual Chance	442.34	3800	451.85	3900	451.9	100	0.0	
Stream 4C6	2	4891	0.4% Annual Chan	442.34	4600	452.27	4700	452.32	100	0.1	
Stream 4C6	2	4891	0.2% Annual Chan	442.34	5150	452.55	5200	452.57	50	0.0	
Stream 4C6	2	4553	50% Annual Chanc	440.92	800	447.09	900	447.27	100	0.2	
Stream 4C6	2	4553	20% Annual Chanc	440.92	1500	448.08	1600	448.2	100	0.1	
Stream 4C6	2	4553	10% Annual Chanc	440.92	2000	448.57	2150	448.7	150	0.1	
Stream 4C6	2	4553	4% Annual Chance	440.92	2650	449.1	2800	449.19	150	0.1	
Stream 4C6	2	4553	2% Annual Chance	440.92	3200	449.49	3300	449.58	100	0.1	
Stream 4C6	2	4553	1% Annual Chance	440.92	3800	449.84	3900	449.89	100	0.1	
Stream 4C6	2	4553	0.4% Annual Chan	440.92	4600	450.23	4700	450.27	100	0.0	
Stream 4C6	2	4553	0.2% Annual Chan	440.92	5150	450.48	5200	450.51	50	0.0	
Stream 4C6	2	3968	50% Annual Chanc	438.42	800	445.53	900	445.67	100	0.1	
Stream 4C6	2	3968	20% Annual Chanc	438.42	1500	446.27	1650	446.38	150	0.1	
Stream 4C6	2	3968	10% Annual Chanc	438.42	2000	446.6	2150	446.68	150	0.1	
Stream 4C6	2	3968	4% Annual Chance	438.42	2700	446.96	2800	447	100	0.0	
Stream 4C6	2	3968	2% Annual Chance	438.42	3200	447.18	3350	447.22	150	0.0	
Stream 4C6	2	3968	1% Annual Chance	438.42	3800	447.41	3900	447.44	100	0.0	
Stream 4C6	2	3968	0.4% Annual Chan	438.42	4600	447.7	4700	447.74	100	0.0	
Stream 4C6	2	3968	0.2% Annual Chan	438.42	5200	447.9	5250	447.91	50	0.0	
Stream 4C6	2	3900			Culvert		Culvert				
Stream 4C6	2	3868	50% Annual Chanc	438.32	800	445.42	900	445.57	100	0.1	
Stream 4C6	2	3868	20% Annual Chanc	438.32	1500	446.21	1650	446.32	150	0.1	
Stream 4C6	2	3868	10% Annual Chanc	438.32	2000	446.53	2150	446.61	150	0.1	

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Stream 4C6	2	3868	4% Annual Chance	438.32	2700	446.9	2800	446.94	100	0.0
Stream 4C6	2	3868	2% Annual Chance	438.32	3200	447.13	3350	447.2	150	0.1
Stream 4C6	2	3868	1% Annual Chance	438.32	3800	447.39	3900	447.43	100	0.0
Stream 4C6	2	3868	0.4% Annual Chan	438.32	4600	447.7	4700	447.73	100	0.0
Stream 4C6	2	3868	0.2% Annual Chan	438.32	5200	447.9	5250	447.91	50	0.0
Stream 4C6	2	3113	50% Annual Chanc	435.02	800	442.34	900	442.51	100	0.2
Stream 4C6	2	3113	20% Annual Chanc	435.02	1500	443.27	1650	443.43	150	0.2
Stream 4C6	2	3113	10% Annual Chanc	435.02	2000	443.77	2150	443.89	150	0.1
Stream 4C6	2	3113	4% Annual Chance	435.02	2700	444.32	2800	444.39	100	0.1
Stream 4C6	2	3113	2% Annual Chance	435.02	3200	444.65	3350	444.74	150	0.1
Stream 4C6	2	3113	1% Annual Chance	435.02	3800	444.99	3900	445.04	100	0.1
Stream 4C6	2	3113	0.4% Annual Chan	435.02	4600	445.4	4700	445.45	100	0.1
Stream 4C6	2	3113	0.2% Annual Chan	435.02	5200	445.69	5250	445.73	50	0.0
Stream 4C6	2	2759	50% Annual Chanc	434.54	800	441.92	900	442.07	100	0.1
Stream 4C6	2	2759	20% Annual Chanc	434.54	1500	442.58	1650	442.69	150	0.1
Stream 4C6	2	2759	10% Annual Chanc	434.54	2000	442.93	2150	442.95	150	0.0
Stream 4C6	2	2759	4% Annual Chance	434.54	2700	443.25	2800	443.31	100	0.1
Stream 4C6	2	2759	2% Annual Chance	434.54	3200	443.5	3350	443.55	150	0.1
Stream 4C6	2	2759	1% Annual Chance	434.54	3800	443.76	3900	443.81	100	0.1
Stream 4C6	2	2759	0.4% Annual Chan	434.54	4600	444.21	4700	444.26	100	0.1
Stream 4C6	2	2759	0.2% Annual Chan	434.54	5200	444.56	5250	444.62	50	0.1
Stream 4C6	2	2750			Bridge		Bridge			
Stream 4C6	2	2728	50% Annual Chanc	433.95	800	441.87	900	442.02	100	0.1
Stream 4C6	2	2728	20% Annual Chanc	433.95	1500	442.49	1650	442.59	150	0.1
Stream 4C6	2	2728	10% Annual Chanc	433.95	2050	442.82	2150	442.83	100	0.0
Stream 4C6	2	2728	4% Annual Chance	433.95	2700	443.1	2850	443.16	150	0.1
Stream 4C6	2	2728	2% Annual Chance	433.95	3250	443.34	3400	443.39	150	0.1
Stream 4C6	2	2728	1% Annual Chance	433.95	3850	443.58	4000	443.63	150	0.1
Stream 4C6	2	2728	0.4% Annual Chan	433.95	4700	444.04	4800	444.1	100	0.1
Stream 4C6	2	2728	0.2% Annual Chan	433.95	5350	444.41	5400	444.48	50	0.1
Stream 4C6	2	2700			Culvert		Culvert			
Stream 4C6	2	2672	50% Annual Chanc	431.22	800	439.99	900	440.21	100	0.2
Stream 4C6	2	2672	20% Annual Chanc	431.22	1500	441.03	1650	441.15	150	0.1
Stream 4C6	2	2672	10% Annual Chanc	431.22	2050	441.5	2150	441.64	100	0.1
Stream 4C6	2	2672	4% Annual Chance	431.22	2700	442.18	2850	442.33	150	0.1
Stream 4C6	2	2672	2% Annual Chance	431.22	3250	442.82	3400	442.97	150	0.2
Stream 4C6	2	2672	1% Annual Chance	431.22	3850	443.38	4000	443.48	150	0.1
Stream 4C6	2	2672	0.4% Annual Chan	431.22	4700	443.98	4800	444.07	100	0.1
Stream 4C6	2	2672	0.2% Annual Chan	431.22	5350	444.4	5400	444.45	50	0.1
Stream 4C6	1	2063	50% Annual Chanc	430.04	800	439.08	900	439.26	100	0.2
Stream 4C6	1	2063	20% Annual Chanc	430.04	1300	439.89	1350	439.97	50	0.1
Stream 4C6	1	2063	10% Annual Chanc	430.04	1550	440.21	1650	440.35	100	0.1
Stream 4C6	1	2063	4% Annual Chance	430.04	2200	440.85	2400	441.02	200	0.2
Stream 4C6	1	2063	2% Annual Chance	430.04	3250	441.57	3500	441.74	250	0.2
Stream 4C6	1	2063	1% Annual Chance	430.04	4300	442.21	4500	442.33	200	0.1
Stream 4C6	1	2063	0.4% Annual Chan	430.04	5600	442.87	5800	442.97	200	0.1
Stream 4C6	1	2063	0.2% Annual Chan	430.04	6500	443.35	6600	443.41	100	0.1
Stream 4C6	1	1542	50% Annual Chanc	429.21	800	438.33	900	438.52	100	0.2
Stream 4C6	1	1542	20% Annual Chanc	429.21	1300	439.15	1350	439.28	50	0.1
Stream 4C6	1	1542	10% Annual Chanc	429.21	1550	439.57	1650	439.71	100	0.1
Stream 4C6	1	1542	4% Annual Chance	429.21	2200	440.17	2400	440.34	200	0.2
Stream 4C6	1	1542	2% Annual Chance	429.21	3250	440.79	3500	440.94	250	0.1
Stream 4C6	1	1542	1% Annual Chance	429.21	4300	441.36	4500	441.48	200	0.1
Stream 4C6	1	1542	0.4% Annual Chan	429.21	5600	442.01	5800	442.13	200	0.1
Stream 4C6	1	1542	0.2% Annual Chan	429.21	6500	442.52	6600	442.6	100	0.1
Stream 4C6	1	725	50% Annual Chanc	427.16	800	437.6	900	437.81	100	0.2
Stream 4C6	1	725	20% Annual Chanc	427.16	1300	438.48	1350	438.69	50	0.2
Stream 4C6	1	725	10% Annual Chanc	427.16	1550	439.05	1650	439.23	100	0.2
Stream 4C6	1	725	4% Annual Chance	427.16	2200	439.64	2400	439.8	200	0.2
Stream 4C6	1	725	2% Annual Chance	427.16	3250	440.08	3500	440.22	250	0.1
Stream 4C6	1	725	1% Annual Chance	427.16	4300	440.52	4500	440.66	200	0.1
Stream 4C6	1	725	0.4% Annual Chan	427.16	5600	441.16	5800	441.32	200	0.2
Stream 4C6	1	725	0.2% Annual Chan	427.16	6500	441.73	6600	441.85	100	0.1
Hickory Trib 4	1	3766	50% Annual Chanc	469.95	150	472.52	200	472.68	50	0.2
Hickory Trib 4	1	3766	20% Annual Chanc	469.95	275	472.83	300	472.88	25	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Trib 4	1	3766	10% Annual Chanc	469.95	350	472.98	375	473.04	25	0.1
Hickory Trib 4	1	3766	4% Annual Chance	469.95	450	473.19	450	473.18	0	0.0
Hickory Trib 4	1	3766	2% Annual Chance	469.95	500	473.28	550	473.38	50	0.1
Hickory Trib 4	1	3766	1% Annual Chance	469.95	600	473.47	600	473.47	0	0.0
Hickory Trib 4	1	3766	0.4% Annual Chan	469.95	700	473.65	700	473.65	0	0.0
Hickory Trib 4	1	3766	0.2% Annual Chan	469.95	800	473.81	800	473.81	0	0.0
Hickory Trib 4	1	3243	50% Annual Chanc	467.3	150	469.01	200	469.25	50	0.2
Hickory Trib 4	1	3243	20% Annual Chanc	467.3	275	469.57	300	469.65	25	0.1
Hickory Trib 4	1	3243	10% Annual Chanc	467.3	350	469.79	375	469.84	25	0.0
Hickory Trib 4	1	3243	4% Annual Chance	467.3	450	469.99	450	470	0	0.0
Hickory Trib 4	1	3243	2% Annual Chance	467.3	500	470.07	550	470.13	50	0.1
Hickory Trib 4	1	3243	1% Annual Chance	467.3	600	470.19	600	470.19	0	0.0
Hickory Trib 4	1	3243	0.4% Annual Chan	467.3	700	470.29	700	470.28	0	0.0
Hickory Trib 4	1	3243	0.2% Annual Chan	467.3	800	470.37	800	470.36	0	0.0
Hickory Trib 4	1	2325	50% Annual Chanc	461.48	150	464.17	200	464.51	50	0.3
Hickory Trib 4	1	2325	20% Annual Chanc	461.48	275	464.78	300	464.89	25	0.1
Hickory Trib 4	1	2325	10% Annual Chanc	461.48	350	465.06	375	465.15	25	0.1
Hickory Trib 4	1	2325	4% Annual Chance	461.48	450	465.39	450	465.37	0	0.0
Hickory Trib 4	1	2325	2% Annual Chance	461.48	500	465.52	550	465.68	50	0.2
Hickory Trib 4	1	2325	1% Annual Chance	461.48	600	465.82	600	465.82	0	0.0
Hickory Trib 4	1	2325	0.4% Annual Chan	461.48	700	466.11	700	466.11	0	0.0
Hickory Trib 4	1	2325	0.2% Annual Chan	461.48	800	466.38	800	466.39	0	0.0
Hickory Trib 4	1	1814	50% Annual Chanc	459.09	150	461.48	200	461.8	50	0.3
Hickory Trib 4	1	1814	20% Annual Chanc	459.09	275	462.44	300	462.55	25	0.1
Hickory Trib 4	1	1814	10% Annual Chanc	459.09	350	462.87	375	462.98	25	0.1
Hickory Trib 4	1	1814	4% Annual Chance	459.09	450	463.33	450	463.52	0	0.2
Hickory Trib 4	1	1814	2% Annual Chance	459.09	500	463.72	550	463.81	50	0.1
Hickory Trib 4	1	1814	1% Annual Chance	459.09	600	464.08	600	464.17	0	0.1
Hickory Trib 4	1	1814	0.4% Annual Chan	459.09	700	464.49	700	464.55	0	0.1
Hickory Trib 4	1	1814	0.2% Annual Chan	459.09	800	464.82	800	464.89	0	0.1
Hickory Trib 4	1	1418	50% Annual Chanc	455.44	450	460.1	550	460.49	100	0.4
Hickory Trib 4	1	1418	20% Annual Chanc	455.44	825	461.34	875	461.46	50	0.1
Hickory Trib 4	1	1418	10% Annual Chanc	455.44	1025	461.84	1075	461.96	50	0.1
Hickory Trib 4	1	1418	4% Annual Chance	455.44	1250	462.36	1350	462.57	100	0.2
Hickory Trib 4	1	1418	2% Annual Chance	455.44	1450	462.78	1500	462.88	50	0.1
Hickory Trib 4	1	1418	1% Annual Chance	455.44	1650	463.16	1700	463.26	50	0.1
Hickory Trib 4	1	1418	0.4% Annual Chan	455.44	1950	463.42	2000	463.47	50	0.1
Hickory Trib 4	1	1418	0.2% Annual Chan	455.44	2200	463.65	2250	463.72	50	0.1
Hickory Trib 4	1	907	50% Annual Chanc	453.14	450	457.29	550	457.73	100	0.4
Hickory Trib 4	1	907	20% Annual Chanc	453.14	825	458.68	875	458.88	50	0.2
Hickory Trib 4	1	907	10% Annual Chanc	453.14	1025	459.37	1075	459.48	50	0.1
Hickory Trib 4	1	907	4% Annual Chance	453.14	1250	459.77	1350	459.89	100	0.1
Hickory Trib 4	1	907	2% Annual Chance	453.14	1450	459.99	1500	460.06	50	0.1
Hickory Trib 4	1	907	1% Annual Chance	453.14	1650	460.18	1700	460.22	50	0.0
Hickory Trib 4	1	907	0.4% Annual Chan	453.14	1950	460.99	2000	461.04	50	0.1
Hickory Trib 4	1	907	0.2% Annual Chan	453.14	2200	461.23	2250	461.24	50	0.0
Hickory Trib 4	1	565	50% Annual Chanc	451.75	450	456.24	550	456.79	100	0.6
Hickory Trib 4	1	565	20% Annual Chanc	451.75	825	457.99	875	458.27	50	0.3
Hickory Trib 4	1	565	10% Annual Chanc	451.75	1025	458.92	1075	459.08	50	0.2
Hickory Trib 4	1	565	4% Annual Chance	451.75	1250	459.39	1350	459.52	100	0.1
Hickory Trib 4	1	565	2% Annual Chance	451.75	1450	459.61	1500	459.67	50	0.1
Hickory Trib 4	1	565	1% Annual Chance	451.75	1650	459.81	1700	459.83	50	0.0
Hickory Trib 4	1	565	0.4% Annual Chan	451.75	1950	460.02	2000	460.06	50	0.0
Hickory Trib 4	1	565	0.2% Annual Chan	451.75	2200	460.19	2250	460.22	50	0.0
Hickory Trib 4	1	500			Culvert		Culvert			
Hickory Trib 4	1	481	50% Annual Chanc	450.72	450	455.88	550	456.32	100	0.4
Hickory Trib 4	1	481	20% Annual Chanc	450.72	825	456.85	875	456.97	50	0.1
Hickory Trib 4	1	481	10% Annual Chanc	450.72	1025	457.2	1075	457.27	50	0.1
Hickory Trib 4	1	481	4% Annual Chance	450.72	1250	457.52	1350	457.67	100	0.2
Hickory Trib 4	1	481	2% Annual Chance	450.72	1450	457.81	1500	457.89	50	0.1
Hickory Trib 4	1	481	1% Annual Chance	450.72	1650	458.06	1700	458.16	50	0.1
Hickory Trib 4	1	481	0.4% Annual Chan	450.72	1950	458.48	2000	458.58	50	0.1
Hickory Trib 4	1	481	0.2% Annual Chan	450.72	2200	458.85	2250	458.94	50	0.1
Hickory Trib 4	1	327.5*	50% Annual Chanc	450.03	450	455.53	550	456.05	100	0.5
Hickory Trib 4	1	327.5*	20% Annual Chanc	450.03	825	456.56	875	456.7	50	0.1
Hickory Trib 4	1	327.5*	10% Annual Chanc	450.03	1025	456.91	1075	457.08	50	0.2

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Trib 4	1	327.5*	4% Annual Chance	450.03	1250	457.34	1350	457.49	100	0.2
Hickory Trib 4	1	327.5*	2% Annual Chance	450.03	1450	457.64	1500	457.72	50	0.1
Hickory Trib 4	1	327.5*	1% Annual Chance	450.03	1650	457.89	1700	457.99	50	0.1
Hickory Trib 4	1	327.5*	0.4% Annual Chan	450.03	1950	458.33	2000	458.43	50	0.1
Hickory Trib 4	1	327.5*	0.2% Annual Chan	450.03	2200	458.72	2250	458.81	50	0.1
Hickory Trib 4	1	184	50% Annual Chanc	449.34	450	454.28	550	455.21	100	0.9
Hickory Trib 4	1	184	20% Annual Chanc	449.34	825	456.05	875	456.31	50	0.3
Hickory Trib 4	1	184	10% Annual Chanc	449.34	1025	456.54	1075	456.81	50	0.3
Hickory Trib 4	1	184	4% Annual Chance	449.34	1250	457.09	1350	457.27	100	0.2
Hickory Trib 4	1	184	2% Annual Chance	449.34	1450	457.42	1500	457.52	50	0.1
Hickory Trib 4	1	184	1% Annual Chance	449.34	1650	457.69	1700	457.81	50	0.1
Hickory Trib 4	1	184	0.4% Annual Chan	449.34	1950	458.17	2000	458.29	50	0.1
Hickory Trib 4	1	184	0.2% Annual Chan	449.34	2200	458.59	2250	458.69	50	0.1
Hickory Creek	3	62348	50% Annual Chanc	499.02	300	503.85	300	503.85	0	0.0
Hickory Creek	3	62348	20% Annual Chanc	499.02	500	504.26	550	504.32	50	0.1
Hickory Creek	3	62348	10% Annual Chanc	499.02	650	504.43	700	504.49	50	0.1
Hickory Creek	3	62348	4% Annual Chance	499.02	950	504.7	1000	504.74	50	0.0
Hickory Creek	3	62348	2% Annual Chance	499.02	1400	504.97	1400	504.97	0	0.0
Hickory Creek	3	62348	1% Annual Chance	499.02	1850	505.19	1850	505.19	0	0.0
Hickory Creek	3	62348	0.4% Annual Chan	499.02	2450	505.45	2450	505.44	0	0.0
Hickory Creek	3	62348	0.2% Annual Chan	499.02	2900	505.62	2900	505.59	0	0.0
Hickory Creek	3	62300			Mult Open		Mult Open			
Hickory Creek	3	62267	50% Annual Chanc	496.69	300	501.23	300	501.23	0	0.0
Hickory Creek	3	62267	20% Annual Chanc	496.69	500	501.81	550	501.92	50	0.1
Hickory Creek	3	62267	10% Annual Chanc	496.69	650	502.15	700	502.25	50	0.1
Hickory Creek	3	62267	4% Annual Chance	496.69	950	502.74	1000	502.81	50	0.1
Hickory Creek	3	62267	2% Annual Chance	496.69	1400	502.97	1400	502.97	0	0.0
Hickory Creek	3	62267	1% Annual Chance	496.69	1850	503.37	1850	503.37	0	0.0
Hickory Creek	3	62267	0.4% Annual Chan	496.69	2450	503.83	2450	503.83	0	0.0
Hickory Creek	3	62267	0.2% Annual Chan	496.69	2900	504.13	2900	504.13	0	0.0
Hickory Creek	3	61930	50% Annual Chanc	496.3	300	500.51	300	500.51	0	0.0
Hickory Creek	3	61930	20% Annual Chanc	496.3	500	501.01	550	501.1	50	0.1
Hickory Creek	3	61930	10% Annual Chanc	496.3	650	501.3	700	501.37	50	0.1
Hickory Creek	3	61930	4% Annual Chance	496.3	950	501.81	1000	501.87	50	0.1
Hickory Creek	3	61930	2% Annual Chance	496.3	1400	502.31	1400	502.31	0	0.0
Hickory Creek	3	61930	1% Annual Chance	496.3	1850	502.71	1850	502.72	0	0.0
Hickory Creek	3	61930	0.4% Annual Chan	496.3	2450	503.15	2450	503.16	0	0.0
Hickory Creek	3	61930	0.2% Annual Chan	496.3	2900	503.45	2900	503.45	0	0.0
Hickory Creek	3	61571	50% Annual Chanc	494.02	300	498.8	300	498.8	0	0.0
Hickory Creek	3	61571	20% Annual Chanc	494.02	500	499.34	550	499.47	50	0.1
Hickory Creek	3	61571	10% Annual Chanc	494.02	650	499.56	700	499.66	50	0.1
Hickory Creek	3	61571	4% Annual Chance	494.02	950	499.93	1000	500.01	50	0.1
Hickory Creek	3	61571	2% Annual Chance	494.02	1400	500.36	1400	500.35	0	0.0
Hickory Creek	3	61571	1% Annual Chance	494.02	1850	500.67	1850	500.67	0	0.0
Hickory Creek	3	61571	0.4% Annual Chan	494.02	2450	500.99	2450	500.98	0	0.0
Hickory Creek	3	61571	0.2% Annual Chan	494.02	2900	501.17	2900	501.17	0	0.0
Hickory Creek	3	61068	50% Annual Chanc	492.22	300	497.72	300	497.72	0	0.0
Hickory Creek	3	61068	20% Annual Chanc	492.22	500	498.27	550	498.29	50	0.0
Hickory Creek	3	61068	10% Annual Chanc	492.22	650	498.47	700	498.49	50	0.0
Hickory Creek	3	61068	4% Annual Chance	492.22	950	498.78	1000	498.8	50	0.0
Hickory Creek	3	61068	2% Annual Chance	492.22	1400	499.15	1400	499.18	0	0.0
Hickory Creek	3	61068	1% Annual Chance	492.22	1850	499.45	1850	499.46	0	0.0
Hickory Creek	3	61068	0.4% Annual Chan	492.22	2450	499.77	2450	499.79	0	0.0
Hickory Creek	3	61068	0.2% Annual Chan	492.22	2900	500	2900	500.02	0	0.0
Hickory Creek	3	60694	50% Annual Chanc	491.38	500	496.87	500	496.86	0	0.0
Hickory Creek	3	60694	20% Annual Chanc	491.38	850	497.34	850	497.34	0	0.0
Hickory Creek	3	60694	10% Annual Chanc	491.38	1050	497.53	1050	497.53	0	0.0
Hickory Creek	3	60694	4% Annual Chance	491.38	1400	497.81	1400	497.81	0	0.0
Hickory Creek	3	60694	2% Annual Chance	491.38	1900	498.07	1950	498.11	50	0.0
Hickory Creek	3	60694	1% Annual Chance	491.38	2400	498.3	2450	498.33	50	0.0
Hickory Creek	3	60694	0.4% Annual Chan	491.38	3100	498.52	3150	498.53	50	0.0
Hickory Creek	3	60694	0.2% Annual Chan	491.38	3700	498.68	3750	498.69	50	0.0
Hickory Creek	3	60052	50% Annual Chanc	490.54	500	495.13	500	495.13	0	0.0
Hickory Creek	3	60052	20% Annual Chanc	490.54	850	495.43	850	495.43	0	0.0
Hickory Creek	3	60052	10% Annual Chanc	490.54	1050	495.56	1050	495.56	0	0.0
Hickory Creek	3	60052	4% Annual Chance	490.54	1400	495.76	1400	495.76	0	0.0

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	3	60052	2% Annual Chance	490.54	1900	496.01	1950	496.03	50	0.0
Hickory Creek	3	60052	1% Annual Chance	490.54	2400	496.21	2450	496.24	50	0.0
Hickory Creek	3	60052	0.4% Annual Chan	490.54	3100	496.47	3150	496.49	50	0.0
Hickory Creek	3	60052	0.2% Annual Chan	490.54	3700	496.66	3750	496.68	50	0.0
Hickory Creek	3	59797	50% Annual Chanc	490.2	500	494.46	500	494.46	0	0.0
Hickory Creek	3	59797	20% Annual Chanc	490.2	850	494.86	850	494.86	0	0.0
Hickory Creek	3	59797	10% Annual Chanc	490.2	1050	495.03	1050	495.03	0	0.0
Hickory Creek	3	59797	4% Annual Chance	490.2	1400	495.26	1400	495.26	0	0.0
Hickory Creek	3	59797	2% Annual Chance	490.2	1900	495.55	1950	495.57	50	0.0
Hickory Creek	3	59797	1% Annual Chance	490.2	2400	495.78	2450	495.8	50	0.0
Hickory Creek	3	59797	0.4% Annual Chan	490.2	3100	496.07	3150	496.09	50	0.0
Hickory Creek	3	59797	0.2% Annual Chan	490.2	3700	496.27	3750	496.29	50	0.0
Hickory Creek	3	59418	50% Annual Chanc	488.2	500	492.66	500	492.62	0	0.0
Hickory Creek	3	59418	20% Annual Chanc	488.2	850	493.32	850	493.31	0	0.0
Hickory Creek	3	59418	10% Annual Chanc	488.2	1050	493.53	1050	493.51	0	0.0
Hickory Creek	3	59418	4% Annual Chance	488.2	1400	493.85	1400	493.84	0	0.0
Hickory Creek	3	59418	2% Annual Chance	488.2	1900	494.23	1950	494.26	50	0.0
Hickory Creek	3	59418	1% Annual Chance	488.2	2400	494.5	2450	494.55	50	0.1
Hickory Creek	3	59418	0.4% Annual Chan	488.2	3100	494.82	3150	494.84	50	0.0
Hickory Creek	3	59418	0.2% Annual Chan	488.2	3700	495.05	3750	495.06	50	0.0
Hickory Creek	3	58747	50% Annual Chanc	483.82	500	491.05	500	491.12	0	0.1
Hickory Creek	3	58747	20% Annual Chanc	483.82	850	491.46	850	491.48	0	0.0
Hickory Creek	3	58747	10% Annual Chanc	483.82	1050	491.66	1050	491.68	0	0.0
Hickory Creek	3	58747	4% Annual Chance	483.82	1400	491.91	1400	491.92	0	0.0
Hickory Creek	3	58747	2% Annual Chance	483.82	1900	492.17	1950	492.19	50	0.0
Hickory Creek	3	58747	1% Annual Chance	483.82	2400	492.42	2450	492.45	50	0.0
Hickory Creek	3	58747	0.4% Annual Chan	483.82	3100	492.74	3150	492.75	50	0.0
Hickory Creek	3	58747	0.2% Annual Chan	483.82	3700	492.99	3750	493.01	50	0.0
Hickory Creek	3	58357	50% Annual Chanc	484.2	700	490.31	800	490.4	100	0.1
Hickory Creek	3	58357	20% Annual Chanc	484.2	1200	490.71	1250	490.73	50	0.0
Hickory Creek	3	58357	10% Annual Chanc	484.2	1550	490.88	1600	490.91	50	0.0
Hickory Creek	3	58357	4% Annual Chance	484.2	2000	491.08	2050	491.11	50	0.0
Hickory Creek	3	58357	2% Annual Chance	484.2	2500	491.28	2550	491.3	50	0.0
Hickory Creek	3	58357	1% Annual Chance	484.2	3150	491.51	3200	491.52	50	0.0
Hickory Creek	3	58357	0.4% Annual Chan	484.2	4050	491.81	4100	491.83	50	0.0
Hickory Creek	3	58357	0.2% Annual Chan	484.2	4850	492.1	4950	492.14	100	0.0
Hickory Creek	3	57697	50% Annual Chanc	483.6	700	488.13	800	488.22	100	0.1
Hickory Creek	3	57697	20% Annual Chanc	483.6	1200	488.45	1250	488.49	50	0.0
Hickory Creek	3	57697	10% Annual Chanc	483.6	1550	488.72	1600	488.76	50	0.0
Hickory Creek	3	57697	4% Annual Chance	483.6	2000	489.06	2050	489.09	50	0.0
Hickory Creek	3	57697	2% Annual Chance	483.6	2500	489.35	2550	489.38	50	0.0
Hickory Creek	3	57697	1% Annual Chance	483.6	3150	489.77	3200	489.82	50	0.1
Hickory Creek	3	57697	0.4% Annual Chan	483.6	4050	490.32	4100	490.36	50	0.0
Hickory Creek	3	57697	0.2% Annual Chan	483.6	4850	490.79	4950	490.83	100	0.0
Hickory Creek	3	56929	50% Annual Chanc	481.22	700	485.96	800	486.24	100	0.3
Hickory Creek	3	56929	20% Annual Chanc	481.22	1200	487.14	1250	487.23	50	0.1
Hickory Creek	3	56929	10% Annual Chanc	481.22	1550	487.6	1600	487.62	50	0.0
Hickory Creek	3	56929	4% Annual Chance	481.22	2000	487.96	2050	487.99	50	0.0
Hickory Creek	3	56929	2% Annual Chance	481.22	2500	488.47	2550	488.53	50	0.1
Hickory Creek	3	56929	1% Annual Chance	481.22	3150	489.09	3200	489.18	50	0.1
Hickory Creek	3	56929	0.4% Annual Chan	481.22	4050	489.77	4100	489.81	50	0.0
Hickory Creek	3	56929	0.2% Annual Chan	481.22	4850	490.3	4950	490.33	100	0.0
Hickory Creek	3	56771	50% Annual Chanc	481.13	700	485.01	800	485.36	100	0.4
Hickory Creek	3	56771	20% Annual Chanc	481.13	1200	486.76	1250	486.89	50	0.1
Hickory Creek	3	56771	10% Annual Chanc	481.13	1550	487.34	1600	487.35	50	0.0
Hickory Creek	3	56771	4% Annual Chance	481.13	2000	487.72	2050	487.75	50	0.0
Hickory Creek	3	56771	2% Annual Chance	481.13	2500	488.3	2550	488.36	50	0.1
Hickory Creek	3	56771	1% Annual Chance	481.13	3150	488.97	3200	489.07	50	0.1
Hickory Creek	3	56771	0.4% Annual Chan	481.13	4050	489.67	4100	489.71	50	0.0
Hickory Creek	3	56771	0.2% Annual Chan	481.13	4850	490.21	4950	490.24	100	0.0
Hickory Creek	3	56727	50% Annual Chanc	480.89	700	483.92	800	484.16	100	0.2
Hickory Creek	3	56727	20% Annual Chanc	480.89	1200	484.99	1250	485.1	50	0.1
Hickory Creek	3	56727	10% Annual Chanc	480.89	1550	486.03	1600	486.26	50	0.2
Hickory Creek	3	56727	4% Annual Chance	480.89	2000	486.67	2050	486.79	50	0.1
Hickory Creek	3	56727	2% Annual Chance	480.89	2500	488.02	2550	488.09	50	0.1
Hickory Creek	3	56727	1% Annual Chance	480.89	3150	488.78	3200	488.89	50	0.1
Hickory Creek	3	56727	0.4% Annual Chan	480.89	4050	489.52	4100	489.56	50	0.0

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations											
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference		
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	
Hickory Creek	3	56727	0.2% Annual Chan	480.89	4850	490.08	4950	490.11	100	0.0	
Hickory Creek	3	56662	50% Annual Chanc	480.47	700	484.08	750	484.22	50	0.1	
Hickory Creek	3	56662	20% Annual Chanc	480.47	1150	485.2	1200	485.32	50	0.1	
Hickory Creek	3	56662	10% Annual Chanc	480.47	1450	485.75	1500	485.82	50	0.1	
Hickory Creek	3	56662	4% Annual Chance	480.47	1900	486.13	1950	486.14	50	0.0	
Hickory Creek	3	56662	2% Annual Chance	480.47	2350	486.21	2400	486.27	50	0.1	
Hickory Creek	3	56662	1% Annual Chance	480.47	2900	486.74	2950	486.68	50	-0.1	
Hickory Creek	3	56662	0.4% Annual Chan	480.47	3800	487.83	3850	487.84	50	0.0	
Hickory Creek	3	56662	0.2% Annual Chan	480.47	4600	488.41	4650	488.43	50	0.0	
Hickory Creek	3	56600			Mult Open		Mult Open				
Hickory Creek	3	56499	50% Annual Chanc	479.96	700	483.01	750	483.05	50	0.0	
Hickory Creek	3	56499	20% Annual Chanc	479.96	1150	483.32	1200	483.35	50	0.0	
Hickory Creek	3	56499	10% Annual Chanc	479.96	1450	483.45	1500	483.52	50	0.1	
Hickory Creek	3	56499	4% Annual Chance	479.96	1900	484.1	1950	484.17	50	0.1	
Hickory Creek	3	56499	2% Annual Chance	479.96	2350	484.78	2400	484.81	50	0.0	
Hickory Creek	3	56499	1% Annual Chance	479.96	2900	485.54	2950	485.57	50	0.0	
Hickory Creek	3	56499	0.4% Annual Chan	479.96	3800	486.78	3850	486.79	50	0.0	
Hickory Creek	3	56499	0.2% Annual Chan	479.96	4600	487.18	4650	487.2	50	0.0	
Hickory Creek	3	56427	50% Annual Chanc	479.71	700	483	750	483.04	50	0.0	
Hickory Creek	3	56427	20% Annual Chanc	479.71	1150	483.47	1200	483.51	50	0.0	
Hickory Creek	3	56427	10% Annual Chanc	479.71	1450	483.76	1500	483.8	50	0.0	
Hickory Creek	3	56427	4% Annual Chance	479.71	1900	484.13	1950	484.17	50	0.0	
Hickory Creek	3	56427	2% Annual Chance	479.71	2350	484.45	2400	484.48	50	0.0	
Hickory Creek	3	56427	1% Annual Chance	479.71	2900	484.77	2950	484.8	50	0.0	
Hickory Creek	3	56427	0.4% Annual Chan	479.71	3800	485.17	3850	485.19	50	0.0	
Hickory Creek	3	56427	0.2% Annual Chan	479.71	4600	485.46	4650	485.48	50	0.0	
Hickory Creek	3	56077	50% Annual Chanc	476.24	700	481.28	750	481.41	50	0.1	
Hickory Creek	3	56077	20% Annual Chanc	476.24	1150	482.16	1200	482.24	50	0.1	
Hickory Creek	3	56077	10% Annual Chanc	476.24	1450	482.54	1500	482.59	50	0.0	
Hickory Creek	3	56077	4% Annual Chance	476.24	1900	482.98	1950	483.02	50	0.0	
Hickory Creek	3	56077	2% Annual Chance	476.24	2350	483.33	2400	483.37	50	0.0	
Hickory Creek	3	56077	1% Annual Chance	476.24	2900	483.66	2950	483.69	50	0.0	
Hickory Creek	3	56077	0.4% Annual Chan	476.24	3800	484.08	3850	484.1	50	0.0	
Hickory Creek	3	56077	0.2% Annual Chan	476.24	4600	484.36	4650	484.38	50	0.0	
Hickory Creek	3	55901	50% Annual Chanc	475.48	700	480.87	750	481.01	50	0.1	
Hickory Creek	3	55901	20% Annual Chanc	475.48	1150	481.67	1200	481.75	50	0.1	
Hickory Creek	3	55901	10% Annual Chanc	475.48	1450	482.04	1500	482.09	50	0.0	
Hickory Creek	3	55901	4% Annual Chance	475.48	1900	482.44	1950	482.48	50	0.0	
Hickory Creek	3	55901	2% Annual Chance	475.48	2350	482.77	2400	482.81	50	0.0	
Hickory Creek	3	55901	1% Annual Chance	475.48	2900	483.1	2950	483.14	50	0.0	
Hickory Creek	3	55901	0.4% Annual Chan	475.48	3800	483.54	3850	483.56	50	0.0	
Hickory Creek	3	55901	0.2% Annual Chan	475.48	4600	483.84	4650	483.86	50	0.0	
Hickory Creek	3	55723	50% Annual Chanc	473.28	700	480.41	750	480.57	50	0.2	
Hickory Creek	3	55723	20% Annual Chanc	473.28	1150	481.15	1200	481.25	50	0.1	
Hickory Creek	3	55723	10% Annual Chanc	473.28	1450	481.52	1500	481.57	50	0.1	
Hickory Creek	3	55723	4% Annual Chance	473.28	1900	481.93	1950	481.97	50	0.0	
Hickory Creek	3	55723	2% Annual Chance	473.28	2350	482.26	2400	482.31	50	0.1	
Hickory Creek	3	55723	1% Annual Chance	473.28	2900	482.61	2950	482.66	50	0.1	
Hickory Creek	3	55723	0.4% Annual Chan	473.28	3800	483.09	3850	483.11	50	0.0	
Hickory Creek	3	55723	0.2% Annual Chan	473.28	4600	483.43	4650	483.47	50	0.0	
Hickory Creek	3	55259	50% Annual Chanc	472.58	750	479.62	850	479.77	100	0.1	
Hickory Creek	3	55259	20% Annual Chanc	472.58	1250	480.27	1350	480.37	100	0.1	
Hickory Creek	3	55259	10% Annual Chanc	472.58	1600	480.58	1650	480.62	50	0.0	
Hickory Creek	3	55259	4% Annual Chance	472.58	2050	480.88	2100	480.92	50	0.0	
Hickory Creek	3	55259	2% Annual Chance	472.58	2500	481.14	2600	481.18	100	0.0	
Hickory Creek	3	55259	1% Annual Chance	472.58	3050	481.42	3150	481.48	100	0.1	
Hickory Creek	3	55259	0.4% Annual Chan	472.58	3950	481.91	4000	481.95	50	0.0	
Hickory Creek	3	55259	0.2% Annual Chan	472.58	4750	482.32	4850	482.39	100	0.1	
Hickory Creek	3	55200			Culvert		Culvert				
Hickory Creek	3	55185	50% Annual Chanc	469.93	750	478.15	850	478.43	100	0.3	
Hickory Creek	3	55185	20% Annual Chanc	469.93	1250	479.27	1350	479.43	100	0.2	
Hickory Creek	3	55185	10% Annual Chanc	469.93	1600	479.8	1650	479.86	50	0.1	
Hickory Creek	3	55185	4% Annual Chance	469.93	2050	480.31	2100	480.36	50	0.1	
Hickory Creek	3	55185	2% Annual Chance	469.93	2500	480.71	2600	480.79	100	0.1	
Hickory Creek	3	55185	1% Annual Chance	469.93	3050	481.1	3150	481.17	100	0.1	

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	3	55185	0.4% Annual Chan	469.93	3950	481.65	4000	481.67	50	0.0
Hickory Creek	3	55185	0.2% Annual Chan	469.93	4750	482.05	4850	482.1	100	0.1
Hickory Creek	3	54456	50% Annual Chanc	469	750	475.8	850	476	100	0.2
Hickory Creek	3	54456	20% Annual Chanc	469	1250	476.54	1350	476.65	100	0.1
Hickory Creek	3	54456	10% Annual Chanc	469	1600	476.91	1650	476.96	50	0.0
Hickory Creek	3	54456	4% Annual Chance	469	2050	477.28	2100	477.32	50	0.0
Hickory Creek	3	54456	2% Annual Chance	469	2500	477.59	2600	477.65	100	0.1
Hickory Creek	3	54456	1% Annual Chance	469	3050	477.96	3150	478.02	100	0.1
Hickory Creek	3	54456	0.4% Annual Chan	469	3950	478.48	4000	478.5	50	0.0
Hickory Creek	3	54456	0.2% Annual Chan	469	4750	478.86	4850	478.9	100	0.0
Hickory Creek	3	53366	50% Annual Chanc	464.46	750	472.05	850	472.27	100	0.2
Hickory Creek	3	53366	20% Annual Chanc	464.46	1250	472.94	1350	473.07	100	0.1
Hickory Creek	3	53366	10% Annual Chanc	464.46	1600	473.37	1650	473.42	50	0.1
Hickory Creek	3	53366	4% Annual Chance	464.46	2050	473.85	2100	473.88	50	0.0
Hickory Creek	3	53366	2% Annual Chance	464.46	2500	474.22	2600	474.3	100	0.1
Hickory Creek	3	53366	1% Annual Chance	464.46	3050	474.69	3150	474.76	100	0.1
Hickory Creek	3	53366	0.4% Annual Chan	464.46	3950	475.24	4000	475.26	50	0.0
Hickory Creek	3	53366	0.2% Annual Chan	464.46	4750	475.65	4850	475.69	100	0.0
Hickory Creek	3	52649	50% Annual Chanc	463.6	750	470.52	850	470.71	100	0.2
Hickory Creek	3	52649	20% Annual Chanc	463.6	1250	471.34	1350	471.47	100	0.1
Hickory Creek	3	52649	10% Annual Chanc	463.6	1600	471.77	1650	471.83	50	0.1
Hickory Creek	3	52649	4% Annual Chance	463.6	2050	472.26	2100	472.3	50	0.0
Hickory Creek	3	52649	2% Annual Chance	463.6	2500	472.66	2600	472.75	100	0.1
Hickory Creek	3	52649	1% Annual Chance	463.6	3050	473.12	3150	473.18	100	0.1
Hickory Creek	3	52649	0.4% Annual Chan	463.6	3950	473.64	4000	473.66	50	0.0
Hickory Creek	3	52649	0.2% Annual Chan	463.6	4750	474.03	4850	474.08	100	0.1
Hickory Creek	3	51842	50% Annual Chanc	460.18	750	468.21	850	468.38	100	0.2
Hickory Creek	3	51842	20% Annual Chanc	460.18	1250	469.08	1350	469.24	100	0.2
Hickory Creek	3	51842	10% Annual Chanc	460.18	1600	469.6	1650	469.66	50	0.1
Hickory Creek	3	51842	4% Annual Chance	460.18	2050	470.11	2100	470.13	50	0.0
Hickory Creek	3	51842	2% Annual Chance	460.18	2500	470.45	2600	470.52	100	0.1
Hickory Creek	3	51842	1% Annual Chance	460.18	3050	470.82	3150	470.89	100	0.1
Hickory Creek	3	51842	0.4% Annual Chan	460.18	3950	471.39	4000	471.41	50	0.0
Hickory Creek	3	51842	0.2% Annual Chan	460.18	4750	471.81	4850	471.87	100	0.1
Hickory Creek	3	50980	50% Annual Chanc	456.66	750	461.31	850	461.81	100	0.5
Hickory Creek	3	50980	20% Annual Chanc	456.66	1250	462.99	1350	463.23	100	0.2
Hickory Creek	3	50980	10% Annual Chanc	456.66	1600	463.79	1650	463.98	50	0.2
Hickory Creek	3	50980	4% Annual Chance	456.66	2050	464.77	2100	464.94	50	0.2
Hickory Creek	3	50980	2% Annual Chance	456.66	2500	465.54	2600	465.7	100	0.2
Hickory Creek	3	50980	1% Annual Chance	456.66	3050	466.36	3150	466.44	100	0.1
Hickory Creek	3	50980	0.4% Annual Chan	456.66	3950	467.21	4000	467.31	50	0.1
Hickory Creek	3	50980	0.2% Annual Chan	456.66	4750	467.98	4850	468	100	0.0
Hickory Creek	3	50293	50% Annual Chanc	455.28	800	460.35	950	460.9	150	0.5
Hickory Creek	3	50293	20% Annual Chanc	455.28	1350	462.02	1450	462.25	100	0.2
Hickory Creek	3	50293	10% Annual Chanc	455.28	1700	462.76	1800	462.93	100	0.2
Hickory Creek	3	50293	4% Annual Chance	455.28	2200	463.59	2300	463.74	100	0.2
Hickory Creek	3	50293	2% Annual Chance	455.28	2650	464.23	2750	464.36	100	0.1
Hickory Creek	3	50293	1% Annual Chance	455.28	3200	464.95	3250	465.01	50	0.1
Hickory Creek	3	50293	0.4% Annual Chan	455.28	4050	466.12	4150	466.24	100	0.1
Hickory Creek	3	50293	0.2% Annual Chan	455.28	4900	466.95	5000	466.93	100	0.0
Hickory Creek	3	50200			Culvert		Culvert			
Hickory Creek	3	50127	50% Annual Chanc	454.82	800	460.29	950	460.83	150	0.5
Hickory Creek	3	50127	20% Annual Chanc	454.82	1350	461.92	1450	462.13	100	0.2
Hickory Creek	3	50127	10% Annual Chanc	454.82	1700	462.62	1800	462.78	100	0.2
Hickory Creek	3	50127	4% Annual Chance	454.82	2200	463.34	2300	463.46	100	0.1
Hickory Creek	3	50127	2% Annual Chance	454.82	2650	463.83	2750	463.92	100	0.1
Hickory Creek	3	50127	1% Annual Chance	454.82	3200	464.33	3250	464.37	50	0.0
Hickory Creek	3	50127	0.4% Annual Chan	454.82	4050	464.95	4150	465.01	100	0.1
Hickory Creek	3	50127	0.2% Annual Chan	454.82	4900	465.44	5000	465.49	100	0.1
Hickory Creek	3	49815	50% Annual Chanc	450.29	800	459.93	950	460.46	150	0.5
Hickory Creek	3	49815	20% Annual Chanc	450.29	1350	461.52	1450	461.74	100	0.2
Hickory Creek	3	49815	10% Annual Chanc	450.29	1700	462.24	1800	462.4	100	0.2
Hickory Creek	3	49815	4% Annual Chance	450.29	2200	462.96	2300	463.07	100	0.1
Hickory Creek	3	49815	2% Annual Chance	450.29	2650	463.42	2750	463.51	100	0.1
Hickory Creek	3	49815	1% Annual Chance	450.29	3200	463.89	3250	463.92	50	0.0
Hickory Creek	3	49815	0.4% Annual Chan	450.29	4050	464.45	4150	464.5	100	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations											
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference		
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	
Hickory Creek	3	49815	0.2% Annual Chan	450.29	4900	464.86	5000	464.91	100	0.1	
Hickory Creek	3	49487	50% Annual Chanc	448.88	800	459.22	950	459.76	150	0.5	
Hickory Creek	3	49487	20% Annual Chanc	448.88	1350	460.84	1450	461.07	100	0.2	
Hickory Creek	3	49487	10% Annual Chanc	448.88	1700	461.59	1800	461.76	100	0.2	
Hickory Creek	3	49487	4% Annual Chance	448.88	2200	462.34	2300	462.45	100	0.1	
Hickory Creek	3	49487	2% Annual Chance	448.88	2650	462.81	2750	462.89	100	0.1	
Hickory Creek	3	49487	1% Annual Chance	448.88	3200	463.26	3250	463.28	50	0.0	
Hickory Creek	3	49487	0.4% Annual Chan	448.88	4050	463.77	4150	463.81	100	0.0	
Hickory Creek	3	49487	0.2% Annual Chan	448.88	4900	464.15	5000	464.19	100	0.0	
Hickory Creek	3	48376	50% Annual Chanc	447.54	800	455.61	950	456.23	150	0.6	
Hickory Creek	3	48376	20% Annual Chanc	447.54	1350	457.16	1450	457.39	100	0.2	
Hickory Creek	3	48376	10% Annual Chanc	447.54	1700	457.71	1800	457.88	100	0.2	
Hickory Creek	3	48376	4% Annual Chance	447.54	2200	458.31	2300	458.44	100	0.1	
Hickory Creek	3	48376	2% Annual Chance	447.54	2650	458.75	2750	458.85	100	0.1	
Hickory Creek	3	48376	1% Annual Chance	447.54	3200	459.22	3250	459.29	50	0.1	
Hickory Creek	3	48376	0.4% Annual Chan	447.54	4050	459.91	4150	460	100	0.1	
Hickory Creek	3	48376	0.2% Annual Chan	447.54	4900	460.48	5000	460.56	100	0.1	
Hickory Creek	3	48153	50% Annual Chanc	446.48	800	455.01	950	455.72	150	0.7	
Hickory Creek	3	48153	20% Annual Chanc	446.48	1350	456.76	1450	457.03	100	0.3	
Hickory Creek	3	48153	10% Annual Chanc	446.48	1700	457.39	1800	457.62	100	0.2	
Hickory Creek	3	48153	4% Annual Chance	446.48	2200	458.08	2300	458.22	100	0.1	
Hickory Creek	3	48153	2% Annual Chance	446.48	2650	458.52	2750	458.63	100	0.1	
Hickory Creek	3	48153	1% Annual Chance	446.48	3200	458.98	3250	459.05	50	0.1	
Hickory Creek	3	48153	0.4% Annual Chan	446.48	4050	459.62	4150	459.71	100	0.1	
Hickory Creek	3	48153	0.2% Annual Chan	446.48	4900	460.17	5000	460.24	100	0.1	
Hickory Creek	3	47504	50% Annual Chanc	443.18	800	453.8	950	454.72	150	0.9	
Hickory Creek	3	47504	20% Annual Chanc	443.18	1350	455.82	1450	456.17	100	0.4	
Hickory Creek	3	47504	10% Annual Chanc	443.18	1700	456.47	1800	456.78	100	0.3	
Hickory Creek	3	47504	4% Annual Chance	443.18	2200	457.13	2300	457.31	100	0.2	
Hickory Creek	3	47504	2% Annual Chance	443.18	2650	457.51	2750	457.61	100	0.1	
Hickory Creek	3	47504	1% Annual Chance	443.18	3200	457.83	3250	457.95	50	0.1	
Hickory Creek	3	47504	0.4% Annual Chan	443.18	4050	458.38	4150	458.5	100	0.1	
Hickory Creek	3	47504	0.2% Annual Chan	443.18	4900	458.85	5000	458.95	100	0.1	
Hickory Creek	2	47034	50% Annual Chanc	441.66	1200	452.36	1500	453.29	300	0.9	
Hickory Creek	2	47034	20% Annual Chanc	441.66	2050	454.79	2300	455.31	250	0.5	
Hickory Creek	2	47034	10% Annual Chanc	441.66	2550	455.75	2850	456.12	300	0.4	
Hickory Creek	2	47034	4% Annual Chance	441.66	3200	456.44	3450	456.63	250	0.2	
Hickory Creek	2	47034	2% Annual Chance	441.66	3650	456.81	3850	456.89	200	0.1	
Hickory Creek	2	47034	1% Annual Chance	441.66	4200	457.04	4450	457.15	250	0.1	
Hickory Creek	2	47034	0.4% Annual Chan	441.66	5150	457.51	5400	457.63	250	0.1	
Hickory Creek	2	47034	0.2% Annual Chan	441.66	6000	457.95	6200	458.07	200	0.1	
Hickory Creek	2	47025			Bridge		Bridge				
Hickory Creek	2	46992	50% Annual Chanc	441.32	1200	452.17	1500	453.09	300	0.9	
Hickory Creek	2	46992	20% Annual Chanc	441.32	2050	454.23	2300	454.64	250	0.4	
Hickory Creek	2	46992	10% Annual Chanc	441.32	2550	454.99	2850	455.33	300	0.3	
Hickory Creek	2	46992	4% Annual Chance	441.32	3200	455.67	3450	455.87	250	0.2	
Hickory Creek	2	46992	2% Annual Chance	441.32	3650	456.01	3850	456.18	200	0.2	
Hickory Creek	2	46992	1% Annual Chance	441.32	4200	456.45	4450	456.62	250	0.2	
Hickory Creek	2	46992	0.4% Annual Chan	441.32	5150	457.1	5400	457.25	250	0.1	
Hickory Creek	2	46992	0.2% Annual Chan	441.32	6000	457.61	6200	457.74	200	0.1	
Hickory Creek	2	46975			Bridge		Bridge				
Hickory Creek	2	46952	50% Annual Chanc	440.63	1200	451.82	1500	452.71	300	0.9	
Hickory Creek	2	46952	20% Annual Chanc	440.63	2050	453.74	2300	454.1	250	0.4	
Hickory Creek	2	46952	10% Annual Chanc	440.63	2550	454.41	2850	454.73	300	0.3	
Hickory Creek	2	46952	4% Annual Chance	440.63	3200	455.08	3450	455.28	250	0.2	
Hickory Creek	2	46952	2% Annual Chance	440.63	3650	455.44	3850	455.6	200	0.2	
Hickory Creek	2	46952	1% Annual Chance	440.63	4200	455.87	4450	456.06	250	0.2	
Hickory Creek	2	46952	0.4% Annual Chan	440.63	5150	456.58	5400	456.74	250	0.2	
Hickory Creek	2	46952	0.2% Annual Chan	440.63	6000	457.15	6200	457.3	200	0.2	
Hickory Creek	2	46221	50% Annual Chanc	440.42	1200	449.6	1500	450.34	300	0.7	
Hickory Creek	2	46221	20% Annual Chanc	440.42	2050	451.26	2300	451.52	250	0.3	
Hickory Creek	2	46221	10% Annual Chanc	440.42	2550	451.73	2850	452.05	300	0.3	
Hickory Creek	2	46221	4% Annual Chance	440.42	3200	452.43	3450	452.7	250	0.3	
Hickory Creek	2	46221	2% Annual Chance	440.42	3650	453.02	3850	453.25	200	0.2	
Hickory Creek	2	46221	1% Annual Chance	440.42	4200	453.71	4450	453.93	250	0.2	

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations											
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference		
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	
Hickory Creek	2	46221	0.4% Annual Chan	440.42	5150	454.67	5400	454.89	250	0.2	
Hickory Creek	2	46221	0.2% Annual Chan	440.42	6000	455.51	6200	455.72	200	0.2	
Hickory Creek	2	45407	50% Annual Chanc	437.65	1200	447.7	1500	448.35	300	0.7	
Hickory Creek	2	45407	20% Annual Chanc	437.65	2050	449.46	2300	450.13	250	0.7	
Hickory Creek	2	45407	10% Annual Chanc	437.65	2550	450.86	2850	451.4	300	0.5	
Hickory Creek	2	45407	4% Annual Chance	437.65	3200	451.9	3450	452.23	250	0.3	
Hickory Creek	2	45407	2% Annual Chance	437.65	3650	452.65	3850	452.92	200	0.3	
Hickory Creek	2	45407	1% Annual Chance	437.65	4200	453.44	4450	453.67	250	0.2	
Hickory Creek	2	45407	0.4% Annual Chan	437.65	5150	454.47	5400	454.69	250	0.2	
Hickory Creek	2	45407	0.2% Annual Chan	437.65	6000	455.34	6200	455.56	200	0.2	
Hickory Creek	2	45400			Bridge		Bridge				
Hickory Creek	2	45386	50% Annual Chanc	437.65	1200	447.34	1500	448	300	0.7	
Hickory Creek	2	45386	20% Annual Chanc	437.65	2050	449.31	2300	450.11	250	0.8	
Hickory Creek	2	45386	10% Annual Chanc	437.65	2550	450.84	2850	451.38	300	0.5	
Hickory Creek	2	45386	4% Annual Chance	437.65	3200	451.89	3450	452.22	250	0.3	
Hickory Creek	2	45386	2% Annual Chance	437.65	3650	452.64	3850	452.91	200	0.3	
Hickory Creek	2	45386	1% Annual Chance	437.65	4200	453.43	4450	453.67	250	0.2	
Hickory Creek	2	45386	0.4% Annual Chan	437.65	5150	454.46	5400	454.69	250	0.2	
Hickory Creek	2	45386	0.2% Annual Chan	437.65	6000	455.34	6200	455.55	200	0.2	
Hickory Creek	2	45349	50% Annual Chanc	437.68	1200	447.28	1500	447.95	300	0.7	
Hickory Creek	2	45349	20% Annual Chanc	437.68	2050	449.22	2300	450.09	250	0.9	
Hickory Creek	2	45349	10% Annual Chanc	437.68	2550	450.82	2850	451.36	300	0.5	
Hickory Creek	2	45349	4% Annual Chance	437.68	3200	451.88	3450	452.2	250	0.3	
Hickory Creek	2	45349	2% Annual Chance	437.68	3650	452.63	3850	452.9	200	0.3	
Hickory Creek	2	45349	1% Annual Chance	437.68	4200	453.42	4450	453.66	250	0.2	
Hickory Creek	2	45349	0.4% Annual Chan	437.68	5150	454.45	5400	454.68	250	0.2	
Hickory Creek	2	45349	0.2% Annual Chan	437.68	6000	455.33	6200	455.55	200	0.2	
Hickory Creek	2	45300			Bridge		Bridge				
Hickory Creek	2	45229	50% Annual Chanc	437.4	1200	447.03	1500	447.67	300	0.6	
Hickory Creek	2	45229	20% Annual Chanc	437.4	2050	448.93	2300	449.63	250	0.7	
Hickory Creek	2	45229	10% Annual Chanc	437.4	2550	450.38	2850	451.08	300	0.7	
Hickory Creek	2	45229	4% Annual Chance	437.4	3200	451.76	3450	452.13	250	0.4	
Hickory Creek	2	45229	2% Annual Chance	437.4	3650	452.59	3850	452.87	200	0.3	
Hickory Creek	2	45229	1% Annual Chance	437.4	4200	453.32	4450	453.57	250	0.3	
Hickory Creek	2	45229	0.4% Annual Chan	437.4	5150	454.4	5400	454.63	250	0.2	
Hickory Creek	2	45229	0.2% Annual Chan	437.4	6000	455.3	6200	455.51	200	0.2	
Hickory Creek	2	45134	50% Annual Chanc	436.98	1250	446.78	1550	447.38	300	0.6	
Hickory Creek	2	45134	20% Annual Chanc	436.98	2050	448.64	2300	449.27	250	0.6	
Hickory Creek	2	45134	10% Annual Chanc	436.98	2550	450	2800	450.68	250	0.7	
Hickory Creek	2	45134	4% Annual Chance	436.98	3150	451.3	3400	451.63	250	0.3	
Hickory Creek	2	45134	2% Annual Chance	436.98	3700	452.03	3900	452.27	200	0.2	
Hickory Creek	2	45134	1% Annual Chance	436.98	4250	452.65	4450	452.86	200	0.2	
Hickory Creek	2	45134	0.4% Annual Chan	436.98	5150	453.56	5350	453.76	200	0.2	
Hickory Creek	2	45134	0.2% Annual Chan	436.98	5950	454.32	6150	454.5	200	0.2	
Hickory Creek	2	45100			Bridge		Bridge				
Hickory Creek	2	44987	50% Annual Chanc	436.79	1250	446.35	1550	446.88	300	0.5	
Hickory Creek	2	44987	20% Annual Chanc	436.79	2050	448.03	2300	448.61	250	0.6	
Hickory Creek	2	44987	10% Annual Chanc	436.79	2550	449.36	2800	450.06	250	0.7	
Hickory Creek	2	44987	4% Annual Chance	436.79	3150	450.63	3400	450.89	250	0.3	
Hickory Creek	2	44987	2% Annual Chance	436.79	3700	451.23	3900	451.42	200	0.2	
Hickory Creek	2	44987	1% Annual Chance	436.79	4250	451.71	4450	451.86	200	0.2	
Hickory Creek	2	44987	0.4% Annual Chan	436.79	5150	452.38	5350	452.52	200	0.1	
Hickory Creek	2	44987	0.2% Annual Chan	436.79	5950	452.91	6150	453.03	200	0.1	
Hickory Creek	2	44900			Bridge		Bridge				
Hickory Creek	2	44833	50% Annual Chanc	435.98	1250	446.03	1550	446.48	300	0.5	
Hickory Creek	2	44833	20% Annual Chanc	435.98	2050	447.62	2300	448.21	250	0.6	
Hickory Creek	2	44833	10% Annual Chanc	435.98	2550	448.98	2800	449.67	250	0.7	
Hickory Creek	2	44833	4% Annual Chance	435.98	3150	450.19	3400	450.4	250	0.2	
Hickory Creek	2	44833	2% Annual Chance	435.98	3700	450.7	3900	450.85	200	0.2	
Hickory Creek	2	44833	1% Annual Chance	435.98	4250	451.08	4450	451.19	200	0.1	
Hickory Creek	2	44833	0.4% Annual Chan	435.98	5150	451.55	5350	451.65	200	0.1	
Hickory Creek	2	44833	0.2% Annual Chan	435.98	5950	451.9	6150	451.99	200	0.1	
Hickory Creek	2	44690	50% Annual Chanc	436.83	1250	445.91	1550	446.33	300	0.4	

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	2	44690	20% Annual Chanc	436.83	2050	447.49	2300	448.09	250	0.6
Hickory Creek	2	44690	10% Annual Chanc	436.83	2550	448.89	2800	449.6	250	0.7
Hickory Creek	2	44690	4% Annual Chance	436.83	3150	450.13	3400	450.34	250	0.2
Hickory Creek	2	44690	2% Annual Chance	436.83	3700	450.65	3900	450.8	200	0.2
Hickory Creek	2	44690	1% Annual Chance	436.83	4250	451.03	4450	451.15	200	0.1
Hickory Creek	2	44690	0.4% Annual Chan	436.83	5150	451.52	5350	451.62	200	0.1
Hickory Creek	2	44690	0.2% Annual Chan	436.83	5950	451.89	6150	451.97	200	0.1
Hickory Creek	2	44650			Bridge		Bridge			
Hickory Creek	2	44598	50% Annual Chanc	435.95	1250	445.76	1550	446.15	300	0.4
Hickory Creek	2	44598	20% Annual Chanc	435.95	2050	447.13	2300	447.64	250	0.5
Hickory Creek	2	44598	10% Annual Chanc	435.95	2550	448.36	2800	449.08	250	0.7
Hickory Creek	2	44598	4% Annual Chance	435.95	3150	449.67	3400	449.84	250	0.2
Hickory Creek	2	44598	2% Annual Chance	435.95	3700	450.12	3900	450.34	200	0.2
Hickory Creek	2	44598	1% Annual Chance	435.95	4250	450.62	4450	450.75	200	0.1
Hickory Creek	2	44598	0.4% Annual Chan	435.95	5150	451.17	5350	451.27	200	0.1
Hickory Creek	2	44598	0.2% Annual Chan	435.95	5950	451.55	6150	451.64	200	0.1
Hickory Creek	2	44558	50% Annual Chanc	435.57	1250	445.59	1550	445.93	300	0.3
Hickory Creek	2	44558	20% Annual Chanc	435.57	2050	446.88	2300	447.38	250	0.5
Hickory Creek	2	44558	10% Annual Chanc	435.57	2550	448.16	2800	448.94	250	0.8
Hickory Creek	2	44558	4% Annual Chance	435.57	3150	449.57	3400	449.73	250	0.2
Hickory Creek	2	44558	2% Annual Chance	435.57	3700	450.01	3900	450.23	200	0.2
Hickory Creek	2	44558	1% Annual Chance	435.57	4250	450.51	4450	450.64	200	0.1
Hickory Creek	2	44558	0.4% Annual Chan	435.57	5150	451.04	5350	451.15	200	0.1
Hickory Creek	2	44558	0.2% Annual Chan	435.57	5950	451.42	6150	451.5	200	0.1
Hickory Creek	2	44503	50% Annual Chanc	435.52	1050	445.52	1200	445.86	150	0.3
Hickory Creek	2	44503	20% Annual Chanc	435.52	1700	446.8	2000	447.3	300	0.5
Hickory Creek	2	44503	10% Annual Chanc	435.52	2450	448.06	2750	448.86	300	0.8
Hickory Creek	2	44503	4% Annual Chance	435.52	3150	449.49	3400	449.64	250	0.1
Hickory Creek	2	44503	2% Annual Chance	435.52	3700	449.93	3950	450.15	250	0.2
Hickory Creek	2	44503	1% Annual Chance	435.52	4300	450.43	4500	450.56	200	0.1
Hickory Creek	2	44503	0.4% Annual Chan	435.52	5200	450.96	5400	451.06	200	0.1
Hickory Creek	2	44503	0.2% Annual Chan	435.52	5950	451.33	6150	451.42	200	0.1
Hickory Creek	2	44500			Bridge		Bridge			
Hickory Creek	2	44487	50% Annual Chanc	435.52	1050	445.44	1200	445.78	150	0.3
Hickory Creek	2	44487	20% Annual Chanc	435.52	1700	446.71	2000	447.2	300	0.5
Hickory Creek	2	44487	10% Annual Chanc	435.52	2450	447.96	2750	448.78	300	0.8
Hickory Creek	2	44487	4% Annual Chance	435.52	3150	449.41	3400	449.56	250	0.1
Hickory Creek	2	44487	2% Annual Chance	435.52	3700	449.84	3950	450.04	250	0.2
Hickory Creek	2	44487	1% Annual Chance	435.52	4300	450.29	4500	450.41	200	0.1
Hickory Creek	2	44487	0.4% Annual Chan	435.52	5200	450.77	5400	450.86	200	0.1
Hickory Creek	2	44487	0.2% Annual Chan	435.52	5950	451.1	6150	451.18	200	0.1
Hickory Creek	2	44450			Bridge		Bridge			
Hickory Creek	2	44385	50% Annual Chanc	435.54	1050	445.17	1200	445.48	150	0.3
Hickory Creek	2	44385	20% Annual Chanc	435.54	1700	446.31	2000	446.75	300	0.4
Hickory Creek	2	44385	10% Annual Chanc	435.54	2450	447.57	2750	448.26	300	0.7
Hickory Creek	2	44385	4% Annual Chance	435.54	3150	448.82	3400	448.91	250	0.1
Hickory Creek	2	44385	2% Annual Chance	435.54	3700	449.21	3950	449.45	250	0.2
Hickory Creek	2	44385	1% Annual Chance	435.54	4300	449.75	4500	449.92	200	0.2
Hickory Creek	2	44385	0.4% Annual Chan	435.54	5200	450.41	5400	450.53	200	0.1
Hickory Creek	2	44385	0.2% Annual Chan	435.54	5950	450.83	6150	450.93	200	0.1
Hickory Creek	2	44360	50% Annual Chanc	435.35	1050	444.99	1200	445.3	150	0.3
Hickory Creek	2	44360	20% Annual Chanc	435.35	1700	446.21	2000	446.7	300	0.5
Hickory Creek	2	44360	10% Annual Chanc	435.35	2450	447.55	2750	448.24	300	0.7
Hickory Creek	2	44360	4% Annual Chance	435.35	3150	448.81	3400	448.9	250	0.1
Hickory Creek	2	44360	2% Annual Chance	435.35	3700	449.21	3950	449.44	250	0.2
Hickory Creek	2	44360	1% Annual Chance	435.35	4300	449.75	4500	449.92	200	0.2
Hickory Creek	2	44360	0.4% Annual Chan	435.35	5200	450.4	5400	450.53	200	0.1
Hickory Creek	2	44360	0.2% Annual Chan	435.35	5950	450.82	6150	450.93	200	0.1
Hickory Creek	2	44200			Bridge		Bridge			
Hickory Creek	2	44136	50% Annual Chanc	434.54	1050	443.09	1200	443.41	150	0.3
Hickory Creek	2	44136	20% Annual Chanc	434.54	1700	444.24	2000	444.66	300	0.4
Hickory Creek	2	44136	10% Annual Chanc	434.54	2450	445.22	2750	445.56	300	0.3
Hickory Creek	2	44136	4% Annual Chance	434.54	3150	446	3400	446.24	250	0.2
Hickory Creek	2	44136	2% Annual Chance	434.54	3700	446.53	3950	446.75	250	0.2

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	2	44136	1% Annual Chance	434.54	4300	447.05	4500	447.21	200	0.2
Hickory Creek	2	44136	0.4% Annual Chan	434.54	5200	447.76	5400	447.92	200	0.2
Hickory Creek	2	44136	0.2% Annual Chan	434.54	5950	448.37	6150	448.53	200	0.2
Hickory Creek	2	44065	50% Annual Chanc	434.41	1050	442.89	1200	443.2	150	0.3
Hickory Creek	2	44065	20% Annual Chanc	434.41	1700	444.02	2000	444.44	300	0.4
Hickory Creek	2	44065	10% Annual Chanc	434.41	2450	444.99	2750	445.33	300	0.3
Hickory Creek	2	44065	4% Annual Chance	434.41	3150	445.76	3400	446	250	0.2
Hickory Creek	2	44065	2% Annual Chance	434.41	3700	446.29	3950	446.52	250	0.2
Hickory Creek	2	44065	1% Annual Chance	434.41	4300	446.82	4500	446.98	200	0.2
Hickory Creek	2	44065	0.4% Annual Chan	434.41	5200	447.54	5400	447.71	200	0.2
Hickory Creek	2	44065	0.2% Annual Chan	434.41	5950	448.17	6150	448.34	200	0.2
Hickory Creek	2	44009	50% Annual Chanc	433.88	1050	442.78	1200	443.09	150	0.3
Hickory Creek	2	44009	20% Annual Chanc	433.88	1700	443.91	2000	444.33	300	0.4
Hickory Creek	2	44009	10% Annual Chanc	433.88	2450	444.88	2750	445.22	300	0.3
Hickory Creek	2	44009	4% Annual Chance	433.88	3150	445.66	3400	445.89	250	0.2
Hickory Creek	2	44009	2% Annual Chance	433.88	3700	446.18	3950	446.4	250	0.2
Hickory Creek	2	44009	1% Annual Chance	433.88	4300	446.7	4500	446.86	200	0.2
Hickory Creek	2	44009	0.4% Annual Chan	433.88	5200	447.42	5400	447.58	200	0.2
Hickory Creek	2	44009	0.2% Annual Chan	433.88	5950	448.05	6150	448.21	200	0.2
Hickory Creek	2	43941	50% Annual Chanc	433.55	1050	442.52	1200	442.83	150	0.3
Hickory Creek	2	43941	20% Annual Chanc	433.55	1700	443.66	2000	444.08	300	0.4
Hickory Creek	2	43941	10% Annual Chanc	433.55	2450	444.64	2750	444.99	300	0.4
Hickory Creek	2	43941	4% Annual Chance	433.55	3150	445.44	3400	445.68	250	0.2
Hickory Creek	2	43941	2% Annual Chance	433.55	3700	445.97	3950	446.19	250	0.2
Hickory Creek	2	43941	1% Annual Chance	433.55	4300	446.49	4500	446.64	200	0.1
Hickory Creek	2	43941	0.4% Annual Chan	433.55	5200	447.21	5400	447.38	200	0.2
Hickory Creek	2	43941	0.2% Annual Chan	433.55	5950	447.86	6150	448.03	200	0.2
Hickory Creek	2	43839	50% Annual Chanc	432.94	1050	442.16	1200	442.48	150	0.3
Hickory Creek	2	43839	20% Annual Chanc	432.94	1700	443.33	2000	443.77	300	0.4
Hickory Creek	2	43839	10% Annual Chanc	432.94	2450	444.34	2750	444.69	300	0.4
Hickory Creek	2	43839	4% Annual Chance	432.94	3150	445.16	3400	445.4	250	0.2
Hickory Creek	2	43839	2% Annual Chance	432.94	3700	445.7	3950	445.92	250	0.2
Hickory Creek	2	43839	1% Annual Chance	432.94	4300	446.22	4500	446.38	200	0.2
Hickory Creek	2	43839	0.4% Annual Chan	432.94	5200	446.95	5400	447.13	200	0.2
Hickory Creek	2	43839	0.2% Annual Chan	432.94	5950	447.61	6150	447.79	200	0.2
Hickory Creek	2	43648	50% Annual Chanc	432.6	1050	441.74	1200	442.06	150	0.3
Hickory Creek	2	43648	20% Annual Chanc	432.6	1700	442.95	2000	443.4	300	0.4
Hickory Creek	2	43648	10% Annual Chanc	432.6	2450	444	2750	444.37	300	0.4
Hickory Creek	2	43648	4% Annual Chance	432.6	3150	444.85	3400	445.1	250	0.3
Hickory Creek	2	43648	2% Annual Chance	432.6	3700	445.41	3950	445.63	250	0.2
Hickory Creek	2	43648	1% Annual Chance	432.6	4300	445.94	4500	446.1	200	0.2
Hickory Creek	2	43648	0.4% Annual Chan	432.6	5200	446.68	5400	446.86	200	0.2
Hickory Creek	2	43648	0.2% Annual Chan	432.6	5950	447.37	6150	447.55	200	0.2
Hickory Creek	2	43505	50% Annual Chanc	432.4	1050	441.74	1200	442.07	150	0.3
Hickory Creek	2	43505	20% Annual Chanc	432.4	1700	442.97	2000	443.42	300	0.4
Hickory Creek	2	43505	10% Annual Chanc	432.4	2450	444.02	2750	444.39	300	0.4
Hickory Creek	2	43505	4% Annual Chance	432.4	3150	444.88	3400	445.13	250	0.3
Hickory Creek	2	43505	2% Annual Chance	432.4	3700	445.43	3950	445.66	250	0.2
Hickory Creek	2	43505	1% Annual Chance	432.4	4300	445.97	4500	446.13	200	0.2
Hickory Creek	2	43505	0.4% Annual Chan	432.4	5200	446.71	5400	446.89	200	0.2
Hickory Creek	2	43505	0.2% Annual Chan	432.4	5950	447.4	6150	447.58	200	0.2
Hickory Creek	2	43440	50% Annual Chanc	432.26	1050	441.64	1200	441.96	150	0.3
Hickory Creek	2	43440	20% Annual Chanc	432.26	1700	442.82	2000	443.24	300	0.4
Hickory Creek	2	43440	10% Annual Chanc	432.26	2450	443.82	2750	444.18	300	0.4
Hickory Creek	2	43440	4% Annual Chance	432.26	3200	444.66	3450	444.91	250	0.3
Hickory Creek	2	43440	2% Annual Chance	432.26	3750	445.22	4000	445.45	250	0.2
Hickory Creek	2	43440	1% Annual Chance	432.26	4350	445.76	4550	445.92	200	0.2
Hickory Creek	2	43440	0.4% Annual Chan	432.26	5250	446.5	5450	446.68	200	0.2
Hickory Creek	2	43440	0.2% Annual Chan	432.26	6000	447.2	6200	447.38	200	0.2
Hickory Creek	2	43400			Bridge		Bridge			
Hickory Creek	2	43285	50% Annual Chanc	432.12	1050	441.49	1200	441.8	150	0.3
Hickory Creek	2	43285	20% Annual Chanc	432.12	1700	442.66	2000	443.09	300	0.4
Hickory Creek	2	43285	10% Annual Chanc	432.12	2450	443.67	2750	444.03	300	0.4
Hickory Creek	2	43285	4% Annual Chance	432.12	3200	444.51	3450	444.76	250	0.3
Hickory Creek	2	43285	2% Annual Chance	432.12	3750	445.08	4000	445.3	250	0.2
Hickory Creek	2	43285	1% Annual Chance	432.12	4350	445.61	4550	445.77	200	0.2

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	2	43285	0.4% Annual Chan	432.12	5250	446.35	5450	446.54	200	0.2
Hickory Creek	2	43285	0.2% Annual Chan	432.12	6000	447.04	6200	447.22	200	0.2
Hickory Creek	2	43200			Bridge		Bridge			
Hickory Creek	2	43170	50% Annual Chanc	430.93	1050	441.3	1200	441.6	150	0.3
Hickory Creek	2	43170	20% Annual Chanc	430.93	1700	442.44	2000	442.87	300	0.4
Hickory Creek	2	43170	10% Annual Chanc	430.93	2450	443.44	2750	443.81	300	0.4
Hickory Creek	2	43170	4% Annual Chance	430.93	3200	444.29	3450	444.54	250	0.3
Hickory Creek	2	43170	2% Annual Chance	430.93	3750	444.86	4000	445.08	250	0.2
Hickory Creek	2	43170	1% Annual Chance	430.93	4350	445.39	4550	445.55	200	0.2
Hickory Creek	2	43170	0.4% Annual Chan	430.93	5250	446.13	5450	446.32	200	0.2
Hickory Creek	2	43170	0.2% Annual Chan	430.93	6000	446.81	6200	447	200	0.2
Hickory Creek	2	43123	50% Annual Chanc	430.88	1050	441.21	1200	441.51	150	0.3
Hickory Creek	2	43123	20% Annual Chanc	430.88	1700	442.35	2000	442.77	300	0.4
Hickory Creek	2	43123	10% Annual Chanc	430.88	2450	443.34	2750	443.71	300	0.4
Hickory Creek	2	43123	4% Annual Chance	430.88	3200	444.19	3450	444.44	250	0.3
Hickory Creek	2	43123	2% Annual Chance	430.88	3750	444.75	4000	444.98	250	0.2
Hickory Creek	2	43123	1% Annual Chance	430.88	4350	445.29	4550	445.44	200	0.1
Hickory Creek	2	43123	0.4% Annual Chan	430.88	5250	446.03	5450	446.22	200	0.2
Hickory Creek	2	43123	0.2% Annual Chan	430.88	6000	446.73	6200	446.91	200	0.2
Hickory Creek	2	43100			Bridge		Bridge			
Hickory Creek	2	42925	50% Annual Chanc	430.53	1050	440.73	1200	441.01	150	0.3
Hickory Creek	2	42925	20% Annual Chanc	430.53	1700	441.77	2000	442.14	300	0.4
Hickory Creek	2	42925	10% Annual Chanc	430.53	2450	442.65	2750	442.99	300	0.3
Hickory Creek	2	42925	4% Annual Chance	430.53	3200	443.44	3450	443.67	250	0.2
Hickory Creek	2	42925	2% Annual Chance	430.53	3750	443.95	4000	444.18	250	0.2
Hickory Creek	2	42925	1% Annual Chance	430.53	4350	444.51	4550	444.66	200	0.2
Hickory Creek	2	42925	0.4% Annual Chan	430.53	5250	445.29	5450	445.5	200	0.2
Hickory Creek	2	42925	0.2% Annual Chan	430.53	6000	446.06	6200	446.25	200	0.2
Hickory Creek	2	42800	50% Annual Chanc	431.25	1050	440.36	1200	440.62	150	0.3
Hickory Creek	2	42800	20% Annual Chanc	431.25	1700	441.33	2000	441.7	300	0.4
Hickory Creek	2	42800	10% Annual Chanc	431.25	2450	442.22	2750	442.57	300	0.3
Hickory Creek	2	42800	4% Annual Chance	431.25	3200	443.05	3450	443.32	250	0.3
Hickory Creek	2	42800	2% Annual Chance	431.25	3750	443.62	4000	443.87	250	0.3
Hickory Creek	2	42800	1% Annual Chance	431.25	4350	444.21	4550	444.37	200	0.2
Hickory Creek	2	42800	0.4% Annual Chan	431.25	5250	445.03	5450	445.25	200	0.2
Hickory Creek	2	42800	0.2% Annual Chan	431.25	6000	445.84	6200	446.04	200	0.2
Hickory Creek	2	42697	50% Annual Chanc	430.84	1050	440.25	1200	440.51	150	0.3
Hickory Creek	2	42697	20% Annual Chanc	430.84	1700	441.25	2000	441.63	300	0.4
Hickory Creek	2	42697	10% Annual Chanc	430.84	2450	442.16	2750	442.53	300	0.4
Hickory Creek	2	42697	4% Annual Chance	430.84	3200	443.02	3450	443.28	250	0.3
Hickory Creek	2	42697	2% Annual Chance	430.84	3750	443.58	4000	443.83	250	0.3
Hickory Creek	2	42697	1% Annual Chance	430.84	4350	444.17	4550	444.33	200	0.2
Hickory Creek	2	42697	0.4% Annual Chan	430.84	5250	444.98	5450	445.21	200	0.2
Hickory Creek	2	42697	0.2% Annual Chan	430.84	6000	445.79	6200	445.99	200	0.2
Hickory Creek	2	42412	50% Annual Chanc	431.08	1050	439.78	1200	440.04	150	0.3
Hickory Creek	2	42412	20% Annual Chanc	431.08	1700	440.79	2000	441.17	300	0.4
Hickory Creek	2	42412	10% Annual Chanc	431.08	2450	441.72	2750	442.1	300	0.4
Hickory Creek	2	42412	4% Annual Chance	431.08	3200	442.61	3450	442.89	250	0.3
Hickory Creek	2	42412	2% Annual Chance	431.08	3750	443.21	4000	443.47	250	0.3
Hickory Creek	2	42412	1% Annual Chance	431.08	4350	443.84	4550	444.01	200	0.2
Hickory Creek	2	42412	0.4% Annual Chan	431.08	5250	444.69	5450	444.94	200	0.3
Hickory Creek	2	42412	0.2% Annual Chan	431.08	6000	445.56	6200	445.77	200	0.2
Hickory Creek	2	42348	50% Annual Chanc	430.46	1050	439.64	1200	439.9	150	0.3
Hickory Creek	2	42348	20% Annual Chanc	430.46	1700	440.61	2000	440.97	300	0.4
Hickory Creek	2	42348	10% Annual Chanc	430.46	2450	441.49	2750	441.86	300	0.4
Hickory Creek	2	42348	4% Annual Chance	430.46	3200	442.35	3450	442.62	250	0.3
Hickory Creek	2	42348	2% Annual Chance	430.46	3750	442.92	4000	443.17	250	0.3
Hickory Creek	2	42348	1% Annual Chance	430.46	4350	443.52	4600	443.78	250	0.3
Hickory Creek	2	42348	0.4% Annual Chan	430.46	5250	444.55	5450	444.81	200	0.3
Hickory Creek	2	42348	0.2% Annual Chan	430.46	6000	445.45	6200	445.66	200	0.2
Hickory Creek	2	42300			Bridge		Bridge			
Hickory Creek	2	42259	50% Annual Chanc	430.78	1050	439.48	1200	439.71	150	0.2
Hickory Creek	2	42259	20% Annual Chanc	430.78	1700	440.35	2000	440.67	300	0.3
Hickory Creek	2	42259	10% Annual Chanc	430.78	2450	441.06	2750	441.29	300	0.2

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	2	42259	4% Annual Chance	430.78	3200	441.64	3450	441.83	250	0.2
Hickory Creek	2	42259	2% Annual Chance	430.78	3750	442.03	4000	442.19	250	0.2
Hickory Creek	2	42259	1% Annual Chance	430.78	4350	442.41	4600	442.59	250	0.2
Hickory Creek	2	42259	0.4% Annual Chan	430.78	5250	442.99	5450	443.12	200	0.1
Hickory Creek	2	42259	0.2% Annual Chan	430.78	6000	443.44	6200	443.55	200	0.1
Hickory Creek	2	42205	50% Annual Chanc	429.97	1050	439.29	1200	439.51	150	0.2
Hickory Creek	2	42205	20% Annual Chanc	429.97	1700	440.14	2000	440.45	300	0.3
Hickory Creek	2	42205	10% Annual Chanc	429.97	2450	440.86	2750	441.1	300	0.2
Hickory Creek	2	42205	4% Annual Chance	429.97	3200	441.47	3450	441.67	250	0.2
Hickory Creek	2	42205	2% Annual Chance	429.97	3750	441.87	4000	442.04	250	0.2
Hickory Creek	2	42205	1% Annual Chance	429.97	4350	442.27	4600	442.43	250	0.2
Hickory Creek	2	42205	0.4% Annual Chan	429.97	5250	442.83	5450	442.97	200	0.1
Hickory Creek	2	42205	0.2% Annual Chan	429.97	6000	443.3	6200	443.41	200	0.1
Hickory Creek	2	42006	50% Annual Chanc	429.57	1050	439.18	1200	439.41	150	0.2
Hickory Creek	2	42006	20% Annual Chanc	429.57	1700	440.06	2000	440.38	300	0.3
Hickory Creek	2	42006	10% Annual Chanc	429.57	2450	440.8	2750	441.05	300	0.3
Hickory Creek	2	42006	4% Annual Chance	429.57	3200	441.41	3450	441.6	250	0.2
Hickory Creek	2	42006	2% Annual Chance	429.57	3750	441.8	4000	441.96	250	0.2
Hickory Creek	2	42006	1% Annual Chance	429.57	4350	442.18	4600	442.33	250	0.1
Hickory Creek	2	42006	0.4% Annual Chan	429.57	5250	442.71	5450	442.85	200	0.1
Hickory Creek	2	42006	0.2% Annual Chan	429.57	6000	443.16	6200	443.27	200	0.1
Hickory Creek	2	41696	50% Annual Chanc	429.63	1050	438.88	1200	439.11	150	0.2
Hickory Creek	2	41696	20% Annual Chanc	429.63	1700	439.76	2000	440.1	300	0.3
Hickory Creek	2	41696	10% Annual Chanc	429.63	2450	440.52	2750	440.77	300	0.3
Hickory Creek	2	41696	4% Annual Chance	429.63	3200	441.14	3450	441.33	250	0.2
Hickory Creek	2	41696	2% Annual Chance	429.63	3750	441.53	4000	441.69	250	0.2
Hickory Creek	2	41696	1% Annual Chance	429.63	4350	441.91	4600	442.06	250	0.1
Hickory Creek	2	41696	0.4% Annual Chan	429.63	5250	442.44	5450	442.58	200	0.1
Hickory Creek	2	41696	0.2% Annual Chan	429.63	6000	442.9	6200	443.01	200	0.1
Hickory Creek	2	41463	50% Annual Chanc	429.4	1050	438.48	1200	438.7	150	0.2
Hickory Creek	2	41463	20% Annual Chanc	429.4	1700	439.34	2000	439.65	300	0.3
Hickory Creek	2	41463	10% Annual Chanc	429.4	2450	440.06	2750	440.31	300	0.3
Hickory Creek	2	41463	4% Annual Chance	429.4	3200	440.66	3450	440.85	250	0.2
Hickory Creek	2	41463	2% Annual Chance	429.4	3750	441.05	4000	441.2	250	0.1
Hickory Creek	2	41463	1% Annual Chance	429.4	4350	441.43	4600	441.58	250	0.1
Hickory Creek	2	41463	0.4% Annual Chan	429.4	5250	441.97	5450	442.13	200	0.2
Hickory Creek	2	41463	0.2% Annual Chan	429.4	6000	442.46	6200	442.57	200	0.1
Hickory Creek	2	41168	50% Annual Chanc	429.25	1050	437.94	1200	438.16	150	0.2
Hickory Creek	2	41168	20% Annual Chanc	429.25	1700	438.8	2000	439.08	300	0.3
Hickory Creek	2	41168	10% Annual Chanc	429.25	2450	439.48	2750	439.71	300	0.2
Hickory Creek	2	41168	4% Annual Chance	429.25	3200	440.05	3450	440.23	250	0.2
Hickory Creek	2	41168	2% Annual Chance	429.25	3750	440.41	4000	440.56	250	0.1
Hickory Creek	2	41168	1% Annual Chance	429.25	4350	440.78	4600	440.93	250	0.2
Hickory Creek	2	41168	0.4% Annual Chan	429.25	5250	441.32	5450	441.52	200	0.2
Hickory Creek	2	41168	0.2% Annual Chan	429.25	6000	441.86	6200	441.98	200	0.1
Hickory Creek	2	40781	50% Annual Chanc	428.52	1050	437.3	1200	437.53	150	0.2
Hickory Creek	2	40781	20% Annual Chanc	428.52	1700	438.16	2000	438.41	300	0.3
Hickory Creek	2	40781	10% Annual Chanc	428.52	2450	438.8	2750	439	300	0.2
Hickory Creek	2	40781	4% Annual Chance	428.52	3200	439.34	3450	439.52	250	0.2
Hickory Creek	2	40781	2% Annual Chance	428.52	3750	439.68	4000	439.81	250	0.1
Hickory Creek	2	40781	1% Annual Chance	428.52	4350	440.01	4600	440.18	250	0.2
Hickory Creek	2	40781	0.4% Annual Chan	428.52	5250	440.58	5450	440.76	200	0.2
Hickory Creek	2	40781	0.2% Annual Chan	428.52	6000	441.15	6200	441.28	200	0.1
Hickory Creek	2	40678	50% Annual Chanc	427.73	1050	437.27	1200	437.49	150	0.2
Hickory Creek	2	40678	20% Annual Chanc	427.73	1700	438.12	2000	438.36	300	0.2
Hickory Creek	2	40678	10% Annual Chanc	427.73	2450	438.75	2750	438.95	300	0.2
Hickory Creek	2	40678	4% Annual Chance	427.73	3200	439.28	3450	439.46	250	0.2
Hickory Creek	2	40678	2% Annual Chance	427.73	3750	439.61	4000	439.74	250	0.1
Hickory Creek	2	40678	1% Annual Chance	427.73	4350	439.94	4600	440.1	250	0.2
Hickory Creek	2	40678	0.4% Annual Chan	427.73	5250	440.51	5450	440.69	200	0.2
Hickory Creek	2	40678	0.2% Annual Chan	427.73	6000	441.07	6200	441.21	200	0.1
Hickory Creek	2	40650			Culvert		Culvert			
Hickory Creek	2	40614	50% Annual Chanc	427.71	1050	437.23	1200	437.45	150	0.2
Hickory Creek	2	40614	20% Annual Chanc	427.71	1700	438.07	2000	438.33	300	0.3
Hickory Creek	2	40614	10% Annual Chanc	427.71	2450	438.7	2750	438.9	300	0.2
Hickory Creek	2	40614	4% Annual Chance	427.71	3200	439.24	3450	439.39	250	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	2	40614	2% Annual Chance	427.71	3750	439.55	4000	439.67	250	0.1
Hickory Creek	2	40614	1% Annual Chance	427.71	4350	439.89	4600	440.03	250	0.1
Hickory Creek	2	40614	0.4% Annual Chan	427.71	5250	440.45	5450	440.62	200	0.2
Hickory Creek	2	40614	0.2% Annual Chan	427.71	6000	441.03	6200	441.16	200	0.1
Hickory Creek	2	40504	50% Annual Chanc	427.79	1050	437.09	1200	437.31	150	0.2
Hickory Creek	2	40504	20% Annual Chanc	427.79	1700	437.92	2000	438.16	300	0.2
Hickory Creek	2	40504	10% Annual Chanc	427.79	2450	438.53	2750	438.72	300	0.2
Hickory Creek	2	40504	4% Annual Chance	427.79	3200	439.06	3450	439.21	250	0.1
Hickory Creek	2	40504	2% Annual Chance	427.79	3750	439.36	4000	439.48	250	0.1
Hickory Creek	2	40504	1% Annual Chance	427.79	4350	439.7	4600	439.84	250	0.1
Hickory Creek	2	40504	0.4% Annual Chan	427.79	5250	440.28	5450	440.45	200	0.2
Hickory Creek	2	40504	0.2% Annual Chan	427.79	6000	440.87	6200	441.01	200	0.1
Hickory Creek	1	40166	50% Annual Chanc	423.96	1750	436.37	1950	436.61	200	0.2
Hickory Creek	1	40166	20% Annual Chanc	423.96	2750	437.14	3150	437.38	400	0.2
Hickory Creek	1	40166	10% Annual Chanc	423.96	3900	437.76	4300	437.94	400	0.2
Hickory Creek	1	40166	4% Annual Chance	423.96	5100	438.31	5450	438.45	350	0.1
Hickory Creek	1	40166	2% Annual Chance	423.96	5850	438.61	6150	438.72	300	0.1
Hickory Creek	1	40166	1% Annual Chance	423.96	6750	438.95	7150	439.09	400	0.1
Hickory Creek	1	40166	0.4% Annual Chan	423.96	8500	439.55	9050	439.74	550	0.2
Hickory Creek	1	40166	0.2% Annual Chan	423.96	10450	440.19	10950	440.34	500	0.1
Hickory Creek	1	39628	50% Annual Chanc	423.34	1750	434.94	1950	435.12	200	0.2
Hickory Creek	1	39628	20% Annual Chanc	423.34	2750	435.85	3150	436.21	400	0.4
Hickory Creek	1	39628	10% Annual Chanc	423.34	3900	436.66	4300	436.87	400	0.2
Hickory Creek	1	39628	4% Annual Chance	423.34	5100	437.28	5450	437.44	350	0.2
Hickory Creek	1	39628	2% Annual Chance	423.34	5850	437.61	6150	437.74	300	0.1
Hickory Creek	1	39628	1% Annual Chance	423.34	6750	437.99	7150	438.15	400	0.2
Hickory Creek	1	39628	0.4% Annual Chan	423.34	8500	438.64	9050	438.83	550	0.2
Hickory Creek	1	39628	0.2% Annual Chan	423.34	10450	439.32	10950	439.47	500	0.2
Hickory Creek	1	39572	50% Annual Chanc	423.34	1750	434.8	1950	434.98	200	0.2
Hickory Creek	1	39572	20% Annual Chanc	423.34	2750	435.68	3150	436.05	400	0.4
Hickory Creek	1	39572	10% Annual Chanc	423.34	3900	436.48	4300	436.69	400	0.2
Hickory Creek	1	39572	4% Annual Chance	423.34	5100	437.11	5450	437.27	350	0.2
Hickory Creek	1	39572	2% Annual Chance	423.34	5850	437.44	6150	437.56	300	0.1
Hickory Creek	1	39572	1% Annual Chance	423.34	6750	437.82	7150	437.97	400	0.2
Hickory Creek	1	39572	0.4% Annual Chan	423.34	8500	438.46	9050	438.65	550	0.2
Hickory Creek	1	39572	0.2% Annual Chan	423.34	10450	439.14	10950	439.29	500	0.2
Hickory Creek	1	38283	50% Annual Chanc	419.86	1750	432	1950	432.3	200	0.3
Hickory Creek	1	38283	20% Annual Chanc	419.86	2750	433.11	3150	433.5	400	0.4
Hickory Creek	1	38283	10% Annual Chanc	419.86	3900	434.02	4300	434.24	400	0.2
Hickory Creek	1	38283	4% Annual Chance	419.86	5100	434.69	5450	434.86	350	0.2
Hickory Creek	1	38283	2% Annual Chance	419.86	5850	435.05	6150	435.19	300	0.1
Hickory Creek	1	38283	1% Annual Chance	419.86	6750	435.46	7150	435.62	400	0.2
Hickory Creek	1	38283	0.4% Annual Chan	419.86	8500	436.16	9050	436.35	550	0.2
Hickory Creek	1	38283	0.2% Annual Chan	419.86	10450	436.86	10950	437.02	500	0.2
Hickory Creek	1	37389	50% Annual Chanc	420.31	1750	430.29	1950	430.79	200	0.5
Hickory Creek	1	37389	20% Annual Chanc	420.31	2750	431.69	3150	432.06	400	0.4
Hickory Creek	1	37389	10% Annual Chanc	420.31	3900	432.6	4300	432.67	400	0.1
Hickory Creek	1	37389	4% Annual Chance	420.31	5100	432.98	5450	433.11	350	0.1
Hickory Creek	1	37389	2% Annual Chance	420.31	5850	433.23	6150	433.33	300	0.1
Hickory Creek	1	37389	1% Annual Chance	420.31	6750	433.51	7150	433.63	400	0.1
Hickory Creek	1	37389	0.4% Annual Chan	420.31	8500	434	9050	434.14	550	0.1
Hickory Creek	1	37389	0.2% Annual Chan	420.31	10450	434.45	10950	434.56	500	0.1
Hickory Creek	1	37356	50% Annual Chanc	420.31	1750	430.08	1950	430.59	200	0.5
Hickory Creek	1	37356	20% Annual Chanc	420.31	2750	431.64	3150	432.02	400	0.4
Hickory Creek	1	37356	10% Annual Chanc	420.31	3900	432.56	4300	432.62	400	0.1
Hickory Creek	1	37356	4% Annual Chance	420.31	5100	432.92	5450	433.05	350	0.1
Hickory Creek	1	37356	2% Annual Chance	420.31	5850	433.17	6150	433.27	300	0.1
Hickory Creek	1	37356	1% Annual Chance	420.31	6750	433.44	7150	433.56	400	0.1
Hickory Creek	1	37356	0.4% Annual Chan	420.31	8500	433.92	9050	434.06	550	0.1
Hickory Creek	1	37356	0.2% Annual Chan	420.31	10450	434.37	10950	434.47	500	0.1
Hickory Creek	1	37295			Bridge		Bridge			
Hickory Creek	1	37262	50% Annual Chanc	418.5	1750	429.21	1950	429.47	200	0.3
Hickory Creek	1	37262	20% Annual Chanc	418.5	2750	430.44	3150	431.1	400	0.7
Hickory Creek	1	37262	10% Annual Chanc	418.5	3900	432.08	4300	431.93	400	-0.1
Hickory Creek	1	37262	4% Annual Chance	418.5	5100	432.28	5450	432.43	350	0.2
Hickory Creek	1	37262	2% Annual Chance	418.5	5850	432.58	6150	432.71	300	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	1	37262	1% Annual Chance	418.5	6750	432.91	7150	433.05	400	0.1
Hickory Creek	1	37262	0.4% Annual Chan	418.5	8500	433.49	9050	433.67	550	0.2
Hickory Creek	1	37262	0.2% Annual Chan	418.5	10450	434.03	10950	434.16	500	0.1
Hickory Creek	1	37198	50% Annual Chanc	418.4	1750	428.52	1950	428.67	200	0.2
Hickory Creek	1	37198	20% Annual Chanc	418.4	2750	429.12	3150	429.24	400	0.1
Hickory Creek	1	37198	10% Annual Chanc	418.4	3900	429.32	4300	430.53	400	1.2
Hickory Creek	1	37198	4% Annual Chance	418.4	5100	430.9	5450	431	350	0.1
Hickory Creek	1	37198	2% Annual Chance	418.4	5850	431.15	6150	431.23	300	0.1
Hickory Creek	1	37198	1% Annual Chance	418.4	6750	431.44	7150	431.53	400	0.1
Hickory Creek	1	37198	0.4% Annual Chan	418.4	8500	431.86	9050	431.98	550	0.1
Hickory Creek	1	37198	0.2% Annual Chan	418.4	10450	432.36	10950	432.45	500	0.1
Hickory Creek	1	36613	50% Annual Chanc	418.78	1750	427.32	1950	427.53	200	0.2
Hickory Creek	1	36613	20% Annual Chanc	418.78	2750	428.17	3150	428.43	400	0.3
Hickory Creek	1	36613	10% Annual Chanc	418.78	3900	428.86	4300	429.08	400	0.2
Hickory Creek	1	36613	4% Annual Chance	418.78	5100	429.49	5450	429.65	350	0.2
Hickory Creek	1	36613	2% Annual Chance	418.78	5850	429.84	6150	429.98	300	0.1
Hickory Creek	1	36613	1% Annual Chance	418.78	6750	430.24	7150	430.42	400	0.2
Hickory Creek	1	36613	0.4% Annual Chan	418.78	8500	430.96	9050	431.16	550	0.2
Hickory Creek	1	36613	0.2% Annual Chan	418.78	10450	431.66	10950	431.83	500	0.2
Hickory Creek	1	35082	50% Annual Chanc	412.14	1750	424.48	1950	424.71	200	0.2
Hickory Creek	1	35082	20% Annual Chanc	412.14	2750	425.43	3150	425.72	400	0.3
Hickory Creek	1	35082	10% Annual Chanc	412.14	3900	426.24	4300	426.47	400	0.2
Hickory Creek	1	35082	4% Annual Chance	412.14	5100	426.91	5450	427.1	350	0.2
Hickory Creek	1	35082	2% Annual Chance	412.14	5850	427.32	6150	427.49	300	0.2
Hickory Creek	1	35082	1% Annual Chance	412.14	6750	427.83	7150	428.03	400	0.2
Hickory Creek	1	35082	0.4% Annual Chan	412.14	8500	428.69	9050	428.87	550	0.2
Hickory Creek	1	35082	0.2% Annual Chan	412.14	10450	429.35	10950	429.53	500	0.2
Hickory Creek	1	34069	50% Annual Chanc	410.91	1750	421.6	1950	421.9	200	0.3
Hickory Creek	1	34069	20% Annual Chanc	410.91	2750	422.95	3150	423.3	400	0.4
Hickory Creek	1	34069	10% Annual Chanc	410.91	3900	423.91	4300	424.23	400	0.3
Hickory Creek	1	34069	4% Annual Chance	410.91	5100	424.89	5450	425.16	350	0.3
Hickory Creek	1	34069	2% Annual Chance	410.91	5850	425.53	6150	425.78	300	0.3
Hickory Creek	1	34069	1% Annual Chance	410.91	6750	426.24	7150	426.48	400	0.2
Hickory Creek	1	34069	0.4% Annual Chan	410.91	8500	427.25	9050	427.35	550	0.1
Hickory Creek	1	34069	0.2% Annual Chan	410.91	10450	427.71	10950	427.89	500	0.2
Hickory Creek	1	33366	50% Annual Chanc	410.3	1500	420.52	1700	420.81	200	0.3
Hickory Creek	1	33366	20% Annual Chanc	410.3	2550	421.95	2850	422.31	300	0.4
Hickory Creek	1	33366	10% Annual Chanc	410.3	3400	422.93	3750	423.28	350	0.3
Hickory Creek	1	33366	4% Annual Chance	410.3	4550	423.97	4900	424.24	350	0.3
Hickory Creek	1	33366	2% Annual Chance	410.3	5400	424.64	5750	424.91	350	0.3
Hickory Creek	1	33366	1% Annual Chance	410.3	6400	425.38	6750	425.63	350	0.3
Hickory Creek	1	33366	0.4% Annual Chan	410.3	7900	426.41	8250	426.44	350	0.0
Hickory Creek	1	33366	0.2% Annual Chan	410.3	9150	427.02	9500	427.21	350	0.2
Hickory Creek	1	33312	50% Annual Chanc	410.21	1500	420.45	1700	420.74	200	0.3
Hickory Creek	1	33312	20% Annual Chanc	410.21	2550	421.88	2850	422.24	300	0.4
Hickory Creek	1	33312	10% Annual Chanc	410.21	3400	422.85	3750	423.2	350	0.3
Hickory Creek	1	33312	4% Annual Chance	410.21	4550	423.87	4900	424.14	350	0.3
Hickory Creek	1	33312	2% Annual Chance	410.21	5400	424.53	5750	424.79	350	0.3
Hickory Creek	1	33312	1% Annual Chance	410.21	6400	425.25	6750	425.49	350	0.2
Hickory Creek	1	33312	0.4% Annual Chan	410.21	7900	426.41	8250	426.44	350	0.0
Hickory Creek	1	33312	0.2% Annual Chan	410.21	9150	427	9500	427.18	350	0.2
Hickory Creek	1	33252			Bridge		Bridge			
Hickory Creek	1	33215	50% Annual Chanc	410.21	1500	420.21	1700	420.49	200	0.3
Hickory Creek	1	33215	20% Annual Chanc	410.21	2550	421.6	2850	421.94	300	0.3
Hickory Creek	1	33215	10% Annual Chanc	410.21	3400	422.53	3750	422.85	350	0.3
Hickory Creek	1	33215	4% Annual Chance	410.21	4550	423.47	4900	423.71	350	0.2
Hickory Creek	1	33215	2% Annual Chance	410.21	5400	424.07	5750	424.31	350	0.2
Hickory Creek	1	33215	1% Annual Chance	410.21	6400	424.74	6750	424.96	350	0.2
Hickory Creek	1	33215	0.4% Annual Chan	410.21	7900	425.64	8250	425.84	350	0.2
Hickory Creek	1	33215	0.2% Annual Chan	410.21	9150	426.35	9500			
Hickory Creek	1	33214	50% Annual Chanc	410.21	1500	420.21	1700	420.49	200	0.3
Hickory Creek	1	33214	20% Annual Chanc	410.21	2550	421.59	2850	421.94	300	0.4
Hickory Creek	1	33214	10% Annual Chanc	410.21	3400	422.52	3750	422.84	350	0.3
Hickory Creek	1	33214	4% Annual Chance	410.21	4550	423.47	4900	423.71	350	0.2
Hickory Creek	1	33214	2% Annual Chance	410.21	5400	424.07	5750	424.31	350	0.2
Hickory Creek	1	33214	1% Annual Chance	410.21	6400	424.74	6750	424.95	350	0.2

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	1	33214	0.4% Annual Chan	410.21	7900	425.63	8250	425.83	350	0.2
Hickory Creek	1	33214	0.2% Annual Chan	410.21	9150	426.31	9500	426.49	350	0.2
Hickory Creek	1	33173			Bridge		Bridge			
Hickory Creek	1	33138	50% Annual Chanc	410.21	1500	420	1700	420.27	200	0.3
Hickory Creek	1	33138	20% Annual Chanc	410.21	2550	421.36	2850	421.7	300	0.3
Hickory Creek	1	33138	10% Annual Chanc	410.21	3400	422.28	3750	422.6	350	0.3
Hickory Creek	1	33138	4% Annual Chance	410.21	4550	423.2	4900	423.42	350	0.2
Hickory Creek	1	33138	2% Annual Chance	410.21	5400	423.76	5750	423.99	350	0.2
Hickory Creek	1	33138	1% Annual Chance	410.21	6400	424.4	6750	424.6	350	0.2
Hickory Creek	1	33138	0.4% Annual Chan	410.21	7900	425.23	8250	425.41	350	0.2
Hickory Creek	1	33138	0.2% Annual Chan	410.21	9150	425.86	9500	426.03	350	0.2
Hickory Creek	1	33137	50% Annual Chanc	410.21	1500	419.99	1700	420.27	200	0.3
Hickory Creek	1	33137	20% Annual Chanc	410.21	2550	421.36	2850	421.7	300	0.3
Hickory Creek	1	33137	10% Annual Chanc	410.21	3400	422.28	3750	422.59	350	0.3
Hickory Creek	1	33137	4% Annual Chance	410.21	4550	423.2	4900	423.42	350	0.2
Hickory Creek	1	33137	2% Annual Chance	410.21	5400	423.76	5750	423.99	350	0.2
Hickory Creek	1	33137	1% Annual Chance	410.21	6400	424.4	6750	424.6	350	0.2
Hickory Creek	1	33137	0.4% Annual Chan	410.21	7900	425.24	8250	425.42	350	0.2
Hickory Creek	1	33137	0.2% Annual Chan	410.21	9150	425.88	9500	426.05	350	0.2
Hickory Creek	1	33097			Bridge		Bridge			
Hickory Creek	1	33054	50% Annual Chanc	410.21	1500	419.77	1700	420.03	200	0.3
Hickory Creek	1	33054	20% Annual Chanc	410.21	2550	421.12	2850	421.45	300	0.3
Hickory Creek	1	33054	10% Annual Chanc	410.21	3400	422.02	3750	422.32	350	0.3
Hickory Creek	1	33054	4% Annual Chance	410.21	4550	422.88	4900	423.09	350	0.2
Hickory Creek	1	33054	2% Annual Chance	410.21	5400	423.4	5750	423.61	350	0.2
Hickory Creek	1	33054	1% Annual Chance	410.21	6400	423.97	6750	424.15	350	0.2
Hickory Creek	1	33054	0.4% Annual Chan	410.21	7900	424.72	8250	424.88	350	0.2
Hickory Creek	1	33054	0.2% Annual Chan	410.21	9150	425.28	9500	425.43	350	0.2
Hickory Creek	1	33053	50% Annual Chanc	410.21	1500	419.76	1700	420.03	200	0.3
Hickory Creek	1	33053	20% Annual Chanc	410.21	2550	421.11	2850	421.44	300	0.3
Hickory Creek	1	33053	10% Annual Chanc	410.21	3400	422.02	3750	422.32	350	0.3
Hickory Creek	1	33053	4% Annual Chance	410.21	4550	422.88	4900	423.08	350	0.2
Hickory Creek	1	33053	2% Annual Chance	410.21	5400	423.39	5750	423.6	350	0.2
Hickory Creek	1	33053	1% Annual Chance	410.21	6400	423.97	6750	424.15	350	0.2
Hickory Creek	1	33053	0.4% Annual Chan	410.21	7900	424.72	8250	424.88	350	0.2
Hickory Creek	1	33053	0.2% Annual Chan	410.21	9150	425.29	9500	425.44	350	0.1
Hickory Creek	1	33019			Bridge		Bridge			
Hickory Creek	1	32952	50% Annual Chanc	410.25	1500	419.1	1700	419.32	200	0.2
Hickory Creek	1	32952	20% Annual Chanc	410.25	2550	420.28	2850	420.58	300	0.3
Hickory Creek	1	32952	10% Annual Chanc	410.25	3400	421.11	3750	421.37	350	0.3
Hickory Creek	1	32952	4% Annual Chance	410.25	4550	421.84	4900	422	350	0.2
Hickory Creek	1	32952	2% Annual Chance	410.25	5400	422.25	5750	422.43	350	0.2
Hickory Creek	1	32952	1% Annual Chance	410.25	6400	422.72	6750	422.86	350	0.1
Hickory Creek	1	32952	0.4% Annual Chan	410.25	7900	423.3	8250	423.42	350	0.1
Hickory Creek	1	32952	0.2% Annual Chan	410.25	9150	423.73	9500	423.84	350	0.1
Hickory Creek	1	32759	50% Annual Chanc	411.15	1500	418.33	1700	418.41	200	0.1
Hickory Creek	1	32759	20% Annual Chanc	411.15	2550	418.91	2850	419.12	300	0.2
Hickory Creek	1	32759	10% Annual Chanc	411.15	3400	419.58	3750	419.88	350	0.3
Hickory Creek	1	32759	4% Annual Chance	411.15	4550	420.56	4900	420.78	350	0.2
Hickory Creek	1	32759	2% Annual Chance	411.15	5400	421.06	5750	421.26	350	0.2
Hickory Creek	1	32759	1% Annual Chance	411.15	6400	421.6	6750	421.77	350	0.2
Hickory Creek	1	32759	0.4% Annual Chan	411.15	7900	422.3	8250	422.46	350	0.2
Hickory Creek	1	32759	0.2% Annual Chan	411.15	9150	422.88	9500	423.01	350	0.1
Hickory Creek	1	30580	50% Annual Chanc	400.85	1500	408.96	1700	409.55	200	0.6
Hickory Creek	1	30580	20% Annual Chanc	400.85	2550	411.38	2850	411.87	300	0.5
Hickory Creek	1	30580	10% Annual Chanc	400.85	3400	412.58	3750	412.92	350	0.3
Hickory Creek	1	30580	4% Annual Chance	400.85	4550	413.4	4900	413.68	350	0.3
Hickory Creek	1	30580	2% Annual Chance	400.85	5400	414.05	5750	414.28	350	0.2
Hickory Creek	1	30580	1% Annual Chance	400.85	6400	414.75	6750	414.95	350	0.2
Hickory Creek	1	30580	0.4% Annual Chan	400.85	7900	415.57	8250	415.74	350	0.2
Hickory Creek	1	30580	0.2% Annual Chan	400.85	9150	416.17	9500	416.33	350	0.2
Hickory Creek	1	29889	50% Annual Chanc	401.19	1500	408.36	1700	409.09	200	0.7
Hickory Creek	1	29889	20% Annual Chanc	401.19	2550	411.08	2850	411.59	300	0.5
Hickory Creek	1	29889	10% Annual Chanc	401.19	3400	412.31	3750	412.64	350	0.3

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	1	29889	4% Annual Chance	401.19	4550	413.03	4900	413.31	350	0.3
Hickory Creek	1	29889	2% Annual Chance	401.19	5400	413.69	5750	413.92	350	0.2
Hickory Creek	1	29889	1% Annual Chance	401.19	6400	414.36	6750	414.57	350	0.2
Hickory Creek	1	29889	0.4% Annual Chan	401.19	7900	415.21	8250	415.38	350	0.2
Hickory Creek	1	29889	0.2% Annual Chan	401.19	9150	415.82	9500	415.98	350	0.2
Hickory Creek	1	28825	50% Annual Chanc	396.9	1500	407.85	1700	408.66	200	0.8
Hickory Creek	1	28825	20% Annual Chanc	396.9	2550	410.69	2850	411.19	300	0.5
Hickory Creek	1	28825	10% Annual Chanc	396.9	3400	411.88	3750	412.19	350	0.3
Hickory Creek	1	28825	4% Annual Chance	396.9	4550	412.41	4900	412.67	350	0.3
Hickory Creek	1	28825	2% Annual Chance	396.9	5400	413.02	5750	413.23	350	0.2
Hickory Creek	1	28825	1% Annual Chance	396.9	6400	413.6	6750	413.78	350	0.2
Hickory Creek	1	28825	0.4% Annual Chan	396.9	7900	414.36	8250	414.51	350	0.1
Hickory Creek	1	28825	0.2% Annual Chan	396.9	9150	414.92	9500	415.06	350	0.1
Hickory Creek	1	28641	50% Annual Chanc	395.84	1450	407.8	1650	408.61	200	0.8
Hickory Creek	1	28641	20% Annual Chanc	395.84	2500	410.65	2850	411.15	350	0.5
Hickory Creek	1	28641	10% Annual Chanc	395.84	3350	411.84	3700	412.15	350	0.3
Hickory Creek	1	28641	4% Annual Chance	395.84	4500	412.36	4850	412.62	350	0.3
Hickory Creek	1	28641	2% Annual Chance	395.84	5400	412.97	5750	413.18	350	0.2
Hickory Creek	1	28641	1% Annual Chance	395.84	6400	413.54	6750	413.73	350	0.2
Hickory Creek	1	28641	0.4% Annual Chan	395.84	7950	414.31	8250	414.46	300	0.1
Hickory Creek	1	28641	0.2% Annual Chan	395.84	9200	414.87	9550	415.01	350	0.1
Hickory Creek	1	28592	50% Annual Chanc	395.84	1450	407.78	1650	408.59	200	0.8
Hickory Creek	1	28592	20% Annual Chanc	395.84	2500	410.63	2850	411.12	350	0.5
Hickory Creek	1	28592	10% Annual Chanc	395.84	3350	411.81	3700	412.11	350	0.3
Hickory Creek	1	28592	4% Annual Chance	395.84	4500	412.31	4850	412.56	350	0.3
Hickory Creek	1	28592	2% Annual Chance	395.84	5400	412.9	5750	413.1	350	0.2
Hickory Creek	1	28592	1% Annual Chance	395.84	6400	413.45	6750	413.63	350	0.2
Hickory Creek	1	28592	0.4% Annual Chan	395.84	7950	414.2	8250	414.34	300	0.1
Hickory Creek	1	28592	0.2% Annual Chan	395.84	9200	414.73	9550	414.86	350	0.1
Hickory Creek	1	28511			Bridge		Bridge			
Hickory Creek	1	28440	50% Annual Chanc	396.8	1450	407.49	1650	408.3	200	0.8
Hickory Creek	1	28440	20% Annual Chanc	396.8	2500	410.28	2850	410.75	350	0.5
Hickory Creek	1	28440	10% Annual Chanc	396.8	3350	411.41	3700	411.68	350	0.3
Hickory Creek	1	28440	4% Annual Chance	396.8	4500	411.68	4850	411.91	350	0.2
Hickory Creek	1	28440	2% Annual Chance	396.8	5400	412.21	5750	412.4	350	0.2
Hickory Creek	1	28440	1% Annual Chance	396.8	6400	412.73	6750	412.89	350	0.2
Hickory Creek	1	28440	0.4% Annual Chan	396.8	7950	413.41	8250	413.55	300	0.1
Hickory Creek	1	28440	0.2% Annual Chan	396.8	9200	413.92	9550	414.04	350	0.1
Hickory Creek	1	28330	50% Annual Chanc	396.8	1500	407.29	1750	408.1	250	0.8
Hickory Creek	1	28330	20% Annual Chanc	396.8	2650	410.15	2950	410.63	300	0.5
Hickory Creek	1	28330	10% Annual Chanc	396.8	3550	411.31	3900	411.58	350	0.3
Hickory Creek	1	28330	4% Annual Chance	396.8	4800	411.52	5200	411.75	400	0.2
Hickory Creek	1	28330	2% Annual Chance	396.8	5800	412.05	6200	412.23	400	0.2
Hickory Creek	1	28330	1% Annual Chance	396.8	6950	412.55	7350	412.71	400	0.2
Hickory Creek	1	28330	0.4% Annual Chan	396.8	8750	413.23	9150	413.36	400	0.1
Hickory Creek	1	28330	0.2% Annual Chan	396.8	10250	413.72	10650	413.85	400	0.1
Hickory Creek	1	27557	50% Annual Chanc	393.71	1500	405.68	1750	406.52	250	0.8
Hickory Creek	1	27557	20% Annual Chanc	393.71	2650	408.77	2950	409.32	300	0.6
Hickory Creek	1	27557	10% Annual Chanc	393.71	3550	410.01	3900	410.26	350	0.3
Hickory Creek	1	27557	4% Annual Chance	393.71	4800	410.39	5200	410.66	400	0.3
Hickory Creek	1	27557	2% Annual Chance	393.71	5800	410.94	6200	411.11	400	0.2
Hickory Creek	1	27557	1% Annual Chance	393.71	6950	411.41	7350	411.56	400	0.1
Hickory Creek	1	27557	0.4% Annual Chan	393.71	8750	412.05	9150	412.18	400	0.1
Hickory Creek	1	27557	0.2% Annual Chan	393.71	10250	412.51	10650	412.63	400	0.1
Hickory Creek	1	26438	50% Annual Chanc	386.5	1500	403.28	1750	403.97	250	0.7
Hickory Creek	1	26438	20% Annual Chanc	386.5	2650	405.92	2950	406.46	300	0.5
Hickory Creek	1	26438	10% Annual Chanc	386.5	3550	407.35	3900	407.73	350	0.4
Hickory Creek	1	26438	4% Annual Chance	386.5	4800	408.4	5200	409.17	400	0.8
Hickory Creek	1	26438	2% Annual Chance	386.5	5800	409.41	6200	409.56	400	0.1
Hickory Creek	1	26438	1% Annual Chance	386.5	6950	409.82	7350	409.94	400	0.1
Hickory Creek	1	26438	0.4% Annual Chan	386.5	8750	410.34	9150	410.45	400	0.1
Hickory Creek	1	26438	0.2% Annual Chan	386.5	10250	410.71	10650	410.81	400	0.1
Hickory Creek	1	25770	50% Annual Chanc	388.92	1500	401.67	1750	402.3	250	0.6
Hickory Creek	1	25770	20% Annual Chanc	388.92	2650	404.15	2950	404.66	300	0.5
Hickory Creek	1	25770	10% Annual Chanc	388.92	3550	405.56	3900	406.02	350	0.5
Hickory Creek	1	25770	4% Annual Chance	388.92	4800	407.18	5200	408.69	400	1.5

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	1	25770	2% Annual Chance	388.92	5800	408.91	6200	409.04	400	0.1
Hickory Creek	1	25770	1% Annual Chance	388.92	6950	409.26	7350	409.38	400	0.1
Hickory Creek	1	25770	0.4% Annual Chan	388.92	8750	409.71	9150	409.79	400	0.1
Hickory Creek	1	25770	0.2% Annual Chan	388.92	10250	410.01	10650	410.09	400	0.1
Hickory Creek	1	25739	50% Annual Chanc	388.92	1500	401.54	1750	402.16	250	0.6
Hickory Creek	1	25739	20% Annual Chanc	388.92	2650	403.96	2950	404.45	300	0.5
Hickory Creek	1	25739	10% Annual Chanc	388.92	3550	405.33	3900	405.73	350	0.4
Hickory Creek	1	25739	4% Annual Chance	388.92	4800	406.55	5200	408.67	400	2.1
Hickory Creek	1	25739	2% Annual Chance	388.92	5800	408.89	6200	409.02	400	0.1
Hickory Creek	1	25739	1% Annual Chance	388.92	6950	409.24	7350	409.36	400	0.1
Hickory Creek	1	25739	0.4% Annual Chan	388.92	8750	409.68	9150	409.77	400	0.1
Hickory Creek	1	25739	0.2% Annual Chan	388.92	10250	409.98	10650	410.06	400	0.1
Hickory Creek	1	25660			Bridge		Bridge			
Hickory Creek	1	25586	50% Annual Chanc	388.92	1500	401.29	1750	401.87	250	0.6
Hickory Creek	1	25586	20% Annual Chanc	388.92	2650	403.56	2950	404.01	300	0.4
Hickory Creek	1	25586	10% Annual Chanc	388.92	3550	404.8	3900	405.13	350	0.3
Hickory Creek	1	25586	4% Annual Chance	388.92	4800	405.73	5200	405.9	400	0.2
Hickory Creek	1	25586	2% Annual Chance	388.92	5800	406.12	6200	406.25	400	0.1
Hickory Creek	1	25586	1% Annual Chance	388.92	6950	406.5	7350	406.63	400	0.1
Hickory Creek	1	25586	0.4% Annual Chan	388.92	8750	407.04	9150	407.13	400	0.1
Hickory Creek	1	25586	0.2% Annual Chan	388.92	10250	407.43	10650	407.52	400	0.1
Hickory Creek	1	25511	50% Annual Chanc	388.84	1500	401.23	1750	401.81	250	0.6
Hickory Creek	1	25511	20% Annual Chanc	388.84	2650	403.48	2950	403.93	300	0.4
Hickory Creek	1	25511	10% Annual Chanc	388.84	3550	404.71	3900	405.05	350	0.3
Hickory Creek	1	25511	4% Annual Chance	388.84	4800	405.63	5200	405.79	400	0.2
Hickory Creek	1	25511	2% Annual Chance	388.84	5800	405.99	6200	406.12	400	0.1
Hickory Creek	1	25511	1% Annual Chance	388.84	6950	406.36	7350	406.48	400	0.1
Hickory Creek	1	25511	0.4% Annual Chan	388.84	8750	406.89	9150	406.97	400	0.1
Hickory Creek	1	25511	0.2% Annual Chan	388.84	10250	407.26	10650	407.35	400	0.1
Hickory Creek	1	25007	50% Annual Chanc	388.27	1500	400.44	1750	400.96	250	0.5
Hickory Creek	1	25007	20% Annual Chanc	388.27	2650	402.43	2950	402.82	300	0.4
Hickory Creek	1	25007	10% Annual Chanc	388.27	3550	403.5	3900	403.82	350	0.3
Hickory Creek	1	25007	4% Annual Chance	388.27	4800	404.45	5200	404.7	400	0.3
Hickory Creek	1	25007	2% Annual Chance	388.27	5800	405.09	6200	405.27	400	0.2
Hickory Creek	1	25007	1% Annual Chance	388.27	6950	405.53	7350	405.67	400	0.1
Hickory Creek	1	25007	0.4% Annual Chan	388.27	8750	406.12	9150	406.16	400	0.0
Hickory Creek	1	25007	0.2% Annual Chan	388.27	10250	406.5	10650	406.57	400	0.1
Hickory Creek	1	24071	50% Annual Chanc	387.22	1500	398	1750	398.57	250	0.6
Hickory Creek	1	24071	20% Annual Chanc	387.22	2650	400.19	2950	400.6	300	0.4
Hickory Creek	1	24071	10% Annual Chanc	387.22	3550	401.31	3900	401.66	350	0.4
Hickory Creek	1	24071	4% Annual Chance	387.22	4800	402.22	5200	402.46	400	0.2
Hickory Creek	1	24071	2% Annual Chance	387.22	5800	403.05	6200	403.29	400	0.2
Hickory Creek	1	24071	1% Annual Chance	387.22	6950	403.67	7350	403.87	400	0.2
Hickory Creek	1	24071	0.4% Annual Chan	387.22	8750	404.47	9150	403.57	400	-0.9
Hickory Creek	1	24071	0.2% Annual Chan	387.22	10250	404.74	10650	403.51	400	-1.2
Hickory Creek	1	23607	50% Annual Chanc	386.7	1500	397.4	1750	398.01	250	0.6
Hickory Creek	1	23607	20% Annual Chanc	386.7	2650	399.66	2950	400.06	300	0.4
Hickory Creek	1	23607	10% Annual Chanc	386.7	3550	400.74	3900	401.09	350	0.3
Hickory Creek	1	23607	4% Annual Chance	386.7	4800	401.49	5200	401.67	400	0.2
Hickory Creek	1	23607	2% Annual Chance	386.7	5800	402.1	6200	402.35	400	0.3
Hickory Creek	1	23607	1% Annual Chance	386.7	6950	402.74	7350	402.94	400	0.2
Hickory Creek	1	23607	0.4% Annual Chan	386.7	8750	403.59	9150	403.74	400	0.2
Hickory Creek	1	23607	0.2% Annual Chan	386.7	10250	403.62	10650	403.76	400	0.1
Hickory Creek	1	23218	50% Annual Chanc	387.18	1500	396.97	1750	397.59	250	0.6
Hickory Creek	1	23218	20% Annual Chanc	387.18	2650	399.21	2950	399.6	300	0.4
Hickory Creek	1	23218	10% Annual Chanc	387.18	3550	400.24	3900	400.57	350	0.3
Hickory Creek	1	23218	4% Annual Chance	387.18	4800	400.78	5200	400.89	400	0.1
Hickory Creek	1	23218	2% Annual Chance	387.18	5800	401.25	6200	401.48	400	0.2
Hickory Creek	1	23218	1% Annual Chance	387.18	6950	401.9	7350	402.11	400	0.2
Hickory Creek	1	23218	0.4% Annual Chan	387.18	8750	402.86	9150	403.01	400	0.1
Hickory Creek	1	23218	0.2% Annual Chan	387.18	10250	403.34	10650	403.53	400	0.2
Hickory Creek	1	22342	50% Annual Chanc	382.8	1500	396.14	1750	396.79	250	0.7
Hickory Creek	1	22342	20% Annual Chanc	382.8	2650	398.41	2950	398.77	300	0.4
Hickory Creek	1	22342	10% Annual Chanc	382.8	3550	399.34	3900	399.62	350	0.3
Hickory Creek	1	22342	4% Annual Chance	382.8	4800	400.35	5200	400.4	400	0.0
Hickory Creek	1	22342	2% Annual Chance	382.8	5800	400.78	6200	401.02	400	0.2

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
Hickory Creek	1	22342	1% Annual Chance	382.8	6950	401.47	7350	401.7	400	0.2
Hickory Creek	1	22342	0.4% Annual Chan	382.8	8750	402.5	9150	402.65	400	0.1
Hickory Creek	1	22342	0.2% Annual Chan	382.8	10250	403.13	10650	403.31	400	0.2
Hickory Creek	1	21994	50% Annual Chanc	382.2	1500	395.85	1750	396.48	250	0.6
Hickory Creek	1	21994	20% Annual Chanc	382.2	2650	398	2950	398.32	300	0.3
Hickory Creek	1	21994	10% Annual Chanc	382.2	3550	398.78	3900	399	350	0.2
Hickory Creek	1	21994	4% Annual Chance	382.2	4800	399.53	5200	399.74	400	0.2
Hickory Creek	1	21994	2% Annual Chance	382.2	5800	400.05	6200	400.26	400	0.2
Hickory Creek	1	21994	1% Annual Chance	382.2	6950	400.63	7350	400.83	400	0.2
Hickory Creek	1	21994	0.4% Annual Chan	382.2	8750	401.52	9150	402.14	400	0.6
Hickory Creek	1	21994	0.2% Annual Chan	382.2	10250	402.63	10650	402.82	400	0.2
Hickory Creek	1	21949	50% Annual Chanc	382.23	1500	395.75	1750	396.36	250	0.6
Hickory Creek	1	21949	20% Annual Chanc	382.23	2650	397.84	2950	398.14	300	0.3
Hickory Creek	1	21949	10% Annual Chanc	382.23	3550	398.57	3900	398.75	350	0.2
Hickory Creek	1	21949	4% Annual Chance	382.23	4800	399.2	5200	399.37	400	0.2
Hickory Creek	1	21949	2% Annual Chance	382.23	5800	399.62	6200	399.78	400	0.2
Hickory Creek	1	21949	1% Annual Chance	382.23	6950	400.06	7350	400.21	400	0.1
Hickory Creek	1	21949	0.4% Annual Chan	382.23	8750	400.72	9150	400.87	400	0.1
Hickory Creek	1	21949	0.2% Annual Chan	382.23	10250	401.06	10650	401.14	400	0.1
Hickory Creek	1	21911			Bridge		Bridge			
Hickory Creek	1	21863	50% Annual Chanc	382.3	1500	395.71	1750	396.32	250	0.6
Hickory Creek	1	21863	20% Annual Chanc	382.3	2650	397.78	2950	398.07	300	0.3
Hickory Creek	1	21863	10% Annual Chanc	382.3	3550	398.46	3900	398.63	350	0.2
Hickory Creek	1	21863	4% Annual Chance	382.3	4800	399.02	5200	399.16	400	0.1
Hickory Creek	1	21863	2% Annual Chance	382.3	5800	399.37	6200	399.49	400	0.1
Hickory Creek	1	21863	1% Annual Chance	382.3	6950	399.69	7350	399.79	400	0.1
Hickory Creek	1	21863	0.4% Annual Chan	382.3	8750	400.11	9150	400.19	400	0.1
Hickory Creek	1	21863	0.2% Annual Chan	382.3	10250	400.52	10650	400.6	400	0.1
Hickory Creek	1	21744	50% Annual Chanc	382.2	1500	395.56	1750	396.16	250	0.6
Hickory Creek	1	21744	20% Annual Chanc	382.2	2650	397.57	2950	397.85	300	0.3
Hickory Creek	1	21744	10% Annual Chanc	382.2	3550	398.26	3900	398.44	350	0.2
Hickory Creek	1	21744	4% Annual Chance	382.2	4800	398.84	5200	398.99	400	0.2
Hickory Creek	1	21744	2% Annual Chance	382.2	5800	399.19	6200	399.32	400	0.1
Hickory Creek	1	21744	1% Annual Chance	382.2	6950	399.53	7350	399.64	400	0.1
Hickory Creek	1	21744	0.4% Annual Chan	382.2	8750	399.99	9150	400.09	400	0.1
Hickory Creek	1	21744	0.2% Annual Chan	382.2	10250	400.34	10650	400.42	400	0.1
Hickory Creek	1	21042	50% Annual Chanc	379.86	1500	394.57	1750	395.02	250	0.4
Hickory Creek	1	21042	20% Annual Chanc	379.86	2650	396.19	2950	396.39	300	0.2
Hickory Creek	1	21042	10% Annual Chanc	379.86	3550	396.72	3900	396.86	350	0.1
Hickory Creek	1	21042	4% Annual Chance	379.86	4800	397.24	5200	397.39	400	0.1
Hickory Creek	1	21042	2% Annual Chance	379.86	5800	397.64	6200	397.76	400	0.1
Hickory Creek	1	21042	1% Annual Chance	379.86	6950	397.99	7350	398.12	400	0.1
Hickory Creek	1	21042	0.4% Annual Chan	379.86	8750	398.5	9150	398.6	400	0.1
Hickory Creek	1	21042	0.2% Annual Chan	379.86	10250	398.9	10650	399	400	0.1
Hickory Creek	1	20583	50% Annual Chanc	382.96	1400	393.9	1600	394.3	200	0.4
Hickory Creek	1	20583	20% Annual Chanc	382.96	2550	395.4	2850	395.59	300	0.2
Hickory Creek	1	20583	10% Annual Chanc	382.96	3450	395.89	3750	396.02	300	0.1
Hickory Creek	1	20583	4% Annual Chance	382.96	4650	396.38	5050	396.53	400	0.1
Hickory Creek	1	20583	2% Annual Chance	382.96	5750	396.78	6150	396.91	400	0.1
Hickory Creek	1	20583	1% Annual Chance	382.96	6900	397.14	7350	397.26	450	0.1
Hickory Creek	1	20583	0.4% Annual Chan	382.96	8800	397.65	9200	397.75	400	0.1
Hickory Creek	1	20583	0.2% Annual Chan	382.96	10450	398.06	10900	398.17	450	0.1
4C6 Trib 2	1	5752	50% Annual Chanc	490.31	100	491.79	100	491.8	0	0.0
4C6 Trib 2	1	5752	20% Annual Chanc	490.31	175	492.12	200	492.21	25	0.1
4C6 Trib 2	1	5752	10% Annual Chanc	490.31	225	492.25	225	492.26	0	0.0
4C6 Trib 2	1	5752	4% Annual Chance	490.31	300	492.43	300	492.43	0	0.0
4C6 Trib 2	1	5752	2% Annual Chance	490.31	350	492.49	350	492.48	0	0.0
4C6 Trib 2	1	5752	1% Annual Chance	490.31	400	492.54	400	492.53	0	0.0
4C6 Trib 2	1	5752	0.4% Annual Chan	490.31	450	492.59	475	492.59	25	0.0
4C6 Trib 2	1	5752	0.2% Annual Chan	490.31	500	492.64	550	492.67	50	0.0
4C6 Trib 2	1	5615	50% Annual Chanc	488.56	100	489.75	100	489.74	0	0.0
4C6 Trib 2	1	5615	20% Annual Chanc	488.56	175	490.12	200	490.21	25	0.1
4C6 Trib 2	1	5615	10% Annual Chanc	488.56	225	490.42	225	490.42	0	0.0
4C6 Trib 2	1	5615	4% Annual Chance	488.56	300	490.7	300	490.7	0	0.0
4C6 Trib 2	1	5615	2% Annual Chance	488.56	350	490.84	350	490.81	0	0.0
4C6 Trib 2	1	5615	1% Annual Chance	488.56	400	491.11	400	491.14	0	0.0

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
4C6 Trib 2	1	5615	0.4% Annual Chan	488.56	450	491.22	475	491.23	25	0.0
4C6 Trib 2	1	5615	0.2% Annual Chan	488.56	500	491.28	550	491.32	50	0.0
4C6 Trib 2	1	5506	50% Annual Chanc	487.04	100	488.51	100	488.51	0	0.0
4C6 Trib 2	1	5506	20% Annual Chanc	487.04	175	488.92	200	489.04	25	0.1
4C6 Trib 2	1	5506	10% Annual Chanc	487.04	225	489.15	225	489.15	0	0.0
4C6 Trib 2	1	5506	4% Annual Chance	487.04	300	489.45	300	489.45	0	0.0
4C6 Trib 2	1	5506	2% Annual Chance	487.04	350	489.63	350	489.63	0	0.0
4C6 Trib 2	1	5506	1% Annual Chance	487.04	400	489.78	400	489.78	0	0.0
4C6 Trib 2	1	5506	0.4% Annual Chan	487.04	450	489.91	475	489.96	25	0.0
4C6 Trib 2	1	5506	0.2% Annual Chan	487.04	500	490	550	490.15	50	0.1
4C6 Trib 2	1	5496.58*	50% Annual Chanc	486.91	100	488.45	100	488.45	0	0.0
4C6 Trib 2	1	5496.58*	20% Annual Chanc	486.91	175	488.86	200	488.98	25	0.1
4C6 Trib 2	1	5496.58*	10% Annual Chanc	486.91	225	489.09	225	489.09	0	0.0
4C6 Trib 2	1	5496.58*	4% Annual Chance	486.91	300	489.39	300	489.39	0	0.0
4C6 Trib 2	1	5496.58*	2% Annual Chance	486.91	350	489.57	350	489.57	0	0.0
4C6 Trib 2	1	5496.58*	1% Annual Chance	486.91	400	489.72	400	489.72	0	0.0
4C6 Trib 2	1	5496.58*	0.4% Annual Chan	486.91	450	489.85	475	489.9	25	0.0
4C6 Trib 2	1	5496.58*	0.2% Annual Chan	486.91	500	489.94	550	490.11	50	0.2
4C6 Trib 2	1	5487.16*	50% Annual Chanc	486.78	100	488.4	100	488.4	0	0.0
4C6 Trib 2	1	5487.16*	20% Annual Chanc	486.78	175	488.81	200	488.92	25	0.1
4C6 Trib 2	1	5487.16*	10% Annual Chanc	486.78	225	489.03	225	489.03	0	0.0
4C6 Trib 2	1	5487.16*	4% Annual Chance	486.78	300	489.33	300	489.33	0	0.0
4C6 Trib 2	1	5487.16*	2% Annual Chance	486.78	350	489.5	350	489.5	0	0.0
4C6 Trib 2	1	5487.16*	1% Annual Chance	486.78	400	489.65	400	489.65	0	0.0
4C6 Trib 2	1	5487.16*	0.4% Annual Chan	486.78	450	489.79	475	489.81	25	0.0
4C6 Trib 2	1	5487.16*	0.2% Annual Chan	486.78	500	489.87	550	490.08	50	0.2
4C6 Trib 2	1	5477.75*	50% Annual Chanc	486.65	100	488.34	100	488.34	0	0.0
4C6 Trib 2	1	5477.75*	20% Annual Chanc	486.65	175	488.75	200	488.86	25	0.1
4C6 Trib 2	1	5477.75*	10% Annual Chanc	486.65	225	488.97	225	488.97	0	0.0
4C6 Trib 2	1	5477.75*	4% Annual Chance	486.65	300	489.26	300	489.26	0	0.0
4C6 Trib 2	1	5477.75*	2% Annual Chance	486.65	350	489.44	350	489.44	0	0.0
4C6 Trib 2	1	5477.75*	1% Annual Chance	486.65	400	489.59	400	489.59	0	0.0
4C6 Trib 2	1	5477.75*	0.4% Annual Chan	486.65	450	489.73	475	489.75	25	0.0
4C6 Trib 2	1	5477.75*	0.2% Annual Chan	486.65	500	489.82	550	490.13	50	0.3
4C6 Trib 2	1	5468.33*	50% Annual Chanc	486.52	100	488.29	100	488.29	0	0.0
4C6 Trib 2	1	5468.33*	20% Annual Chanc	486.52	175	488.7	200	488.81	25	0.1
4C6 Trib 2	1	5468.33*	10% Annual Chanc	486.52	225	488.91	225	488.91	0	0.0
4C6 Trib 2	1	5468.33*	4% Annual Chance	486.52	300	489.2	300	489.2	0	0.0
4C6 Trib 2	1	5468.33*	2% Annual Chance	486.52	350	489.38	350	489.38	0	0.0
4C6 Trib 2	1	5468.33*	1% Annual Chance	486.52	400	489.54	400	489.54	0	0.0
4C6 Trib 2	1	5468.33*	0.4% Annual Chan	486.52	450	489.69	475	489.7	25	0.0
4C6 Trib 2	1	5468.33*	0.2% Annual Chan	486.52	500	489.78	550	490.04	50	0.3
4C6 Trib 2	1	5458.91*	50% Annual Chanc	486.39	100	488.23	100	488.23	0	0.0
4C6 Trib 2	1	5458.91*	20% Annual Chanc	486.39	175	488.64	200	488.75	25	0.1
4C6 Trib 2	1	5458.91*	10% Annual Chanc	486.39	225	488.85	225	488.85	0	0.0
4C6 Trib 2	1	5458.91*	4% Annual Chance	486.39	300	489.14	300	489.14	0	0.0
4C6 Trib 2	1	5458.91*	2% Annual Chance	486.39	350	489.32	350	489.32	0	0.0
4C6 Trib 2	1	5458.91*	1% Annual Chance	486.39	400	489.48	400	489.48	0	0.0
4C6 Trib 2	1	5458.91*	0.4% Annual Chan	486.39	450	489.65	475	489.65	25	0.0
4C6 Trib 2	1	5458.91*	0.2% Annual Chan	486.39	500	489.74	550	489.98	50	0.2
4C6 Trib 2	1	5449.5*	50% Annual Chanc	486.26	100	488.18	100	488.18	0	0.0
4C6 Trib 2	1	5449.5*	20% Annual Chanc	486.26	175	488.59	200	488.7	25	0.1
4C6 Trib 2	1	5449.5*	10% Annual Chanc	486.26	225	488.8	225	488.8	0	0.0
4C6 Trib 2	1	5449.5*	4% Annual Chance	486.26	300	489.08	300	489.08	0	0.0
4C6 Trib 2	1	5449.5*	2% Annual Chance	486.26	350	489.25	350	489.25	0	0.0
4C6 Trib 2	1	5449.5*	1% Annual Chance	486.26	400	489.42	400	489.42	0	0.0
4C6 Trib 2	1	5449.5*	0.4% Annual Chan	486.26	450	489.61	475	489.6	25	0.0
4C6 Trib 2	1	5449.5*	0.2% Annual Chan	486.26	500	489.83	550	489.89	50	0.1
4C6 Trib 2	1	5440.08*	50% Annual Chanc	486.14	100	488.12	100	488.12	0	0.0
4C6 Trib 2	1	5440.08*	20% Annual Chanc	486.14	175	488.53	200	488.64	25	0.1
4C6 Trib 2	1	5440.08*	10% Annual Chanc	486.14	225	488.74	225	488.74	0	0.0
4C6 Trib 2	1	5440.08*	4% Annual Chance	486.14	300	489.02	300	489.02	0	0.0
4C6 Trib 2	1	5440.08*	2% Annual Chance	486.14	350	489.19	350	489.19	0	0.0
4C6 Trib 2	1	5440.08*	1% Annual Chance	486.14	400	489.37	400	489.37	0	0.0
4C6 Trib 2	1	5440.08*	0.4% Annual Chan	486.14	450	489.67	475	489.69	25	0.0
4C6 Trib 2	1	5440.08*	0.2% Annual Chan	486.14	500	489.74	550	489.79	50	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
4C6 Trib 2	1	5397	50% Annual Chanc	485.49	100	487.73	100	487.73	0	0.0
4C6 Trib 2	1	5397	20% Annual Chanc	485.49	175	488.14	200	488.24	25	0.1
4C6 Trib 2	1	5397	10% Annual Chanc	485.49	225	488.34	225	488.34	0	0.0
4C6 Trib 2	1	5397	4% Annual Chance	485.49	300	488.6	300	488.6	0	0.0
4C6 Trib 2	1	5397	2% Annual Chance	485.49	350	488.74	350	488.74	0	0.0
4C6 Trib 2	1	5397	1% Annual Chance	485.49	400	488.84	400	488.84	0	0.0
4C6 Trib 2	1	5397	0.4% Annual Chan	485.49	450	488.86	475	489.24	25	0.4
4C6 Trib 2	1	5397	0.2% Annual Chan	485.49	500	489.27	550	489.31	50	0.0
4C6 Trib 2	1	5321	50% Annual Chanc	484.63	100	486.7	100	486.7	0	0.0
4C6 Trib 2	1	5321	20% Annual Chanc	484.63	175	487.23	200	487.36	25	0.1
4C6 Trib 2	1	5321	10% Annual Chanc	484.63	225	487.49	225	487.49	0	0.0
4C6 Trib 2	1	5321	4% Annual Chance	484.63	300	487.83	300	487.83	0	0.0
4C6 Trib 2	1	5321	2% Annual Chance	484.63	350	488.04	350	488.04	0	0.0
4C6 Trib 2	1	5321	1% Annual Chance	484.63	400	488.25	400	488.25	0	0.0
4C6 Trib 2	1	5321	0.4% Annual Chan	484.63	450	488.52	475	488.64	25	0.1
4C6 Trib 2	1	5321	0.2% Annual Chan	484.63	500	488.74	550	488.89	50	0.1
4C6 Trib 2	1	5246	50% Annual Chanc	484.23	100	486.16	100	486.16	0	0.0
4C6 Trib 2	1	5246	20% Annual Chanc	484.23	175	486.65	200	486.77	25	0.1
4C6 Trib 2	1	5246	10% Annual Chanc	484.23	225	486.88	225	486.88	0	0.0
4C6 Trib 2	1	5246	4% Annual Chance	484.23	300	487.16	300	487.17	0	0.0
4C6 Trib 2	1	5246	2% Annual Chance	484.23	350	487.28	350	487.28	0	0.0
4C6 Trib 2	1	5246	1% Annual Chance	484.23	400	487.4	400	487.4	0	0.0
4C6 Trib 2	1	5246	0.4% Annual Chan	484.23	450	487.5	475	487.53	25	0.0
4C6 Trib 2	1	5246	0.2% Annual Chan	484.23	500	487.57	550	487.75	50	0.2
4C6 Trib 2	1	5143	50% Annual Chanc	483.8	100	485.71	100	485.71	0	0.0
4C6 Trib 2	1	5143	20% Annual Chanc	483.8	175	486.23	200	486.38	25	0.1
4C6 Trib 2	1	5143	10% Annual Chanc	483.8	225	486.52	225	486.52	0	0.0
4C6 Trib 2	1	5143	4% Annual Chance	483.8	300	486.9	300	486.92	0	0.0
4C6 Trib 2	1	5143	2% Annual Chance	483.8	350	487.02	350	487.02	0	0.0
4C6 Trib 2	1	5143	1% Annual Chance	483.8	400	487.18	400	487.18	0	0.0
4C6 Trib 2	1	5143	0.4% Annual Chan	483.8	450	487.32	475	487.36	25	0.0
4C6 Trib 2	1	5143	0.2% Annual Chan	483.8	500	487.42	550	487.58	50	0.2
4C6 Trib 2	1	4997	50% Annual Chanc	482.56	100	484.19	100	484.18	0	0.0
4C6 Trib 2	1	4997	20% Annual Chanc	482.56	175	484.69	200	484.83	25	0.1
4C6 Trib 2	1	4997	10% Annual Chanc	482.56	225	484.98	225	484.96	0	0.0
4C6 Trib 2	1	4997	4% Annual Chance	482.56	300	485.38	300	485.33	0	-0.1
4C6 Trib 2	1	4997	2% Annual Chance	482.56	350	485.82	350	485.82	0	0.0
4C6 Trib 2	1	4997	1% Annual Chance	482.56	400	486.01	400	486.01	0	0.0
4C6 Trib 2	1	4997	0.4% Annual Chan	482.56	450	486.18	475	486.31	25	0.1
4C6 Trib 2	1	4997	0.2% Annual Chan	482.56	500	486.38	550	486.41	50	0.0
4C6 Trib 2	1	4770	50% Annual Chanc	476.69	175	478.73	175	478.73	0	0.0
4C6 Trib 2	1	4770	20% Annual Chanc	476.69	275	479.06	300	479.14	25	0.1
4C6 Trib 2	1	4770	10% Annual Chanc	476.69	350	479.28	375	479.35	25	0.1
4C6 Trib 2	1	4770	4% Annual Chance	476.69	450	479.55	475	479.61	25	0.1
4C6 Trib 2	1	4770	2% Annual Chance	476.69	525	479.73	525	479.73	0	0.0
4C6 Trib 2	1	4770	1% Annual Chance	476.69	600	479.91	625	479.96	25	0.0
4C6 Trib 2	1	4770	0.4% Annual Chan	476.69	725	480.17	725	480.17	0	0.0
4C6 Trib 2	1	4770	0.2% Annual Chan	476.69	800	480.32	800	480.32	0	0.0
4C6 Trib 2	1	4588	50% Annual Chanc	473.59	175	476.28	175	476.28	0	0.0
4C6 Trib 2	1	4588	20% Annual Chanc	473.59	275	476.75	300	476.85	25	0.1
4C6 Trib 2	1	4588	10% Annual Chanc	473.59	350	477.04	375	477.14	25	0.1
4C6 Trib 2	1	4588	4% Annual Chance	473.59	450	477.39	475	477.47	25	0.1
4C6 Trib 2	1	4588	2% Annual Chance	473.59	525	477.63	525	477.63	0	0.0
4C6 Trib 2	1	4588	1% Annual Chance	473.59	600	477.87	625	477.94	25	0.1
4C6 Trib 2	1	4588	0.4% Annual Chan	473.59	725	478.3	725	478.3	0	0.0
4C6 Trib 2	1	4588	0.2% Annual Chan	473.59	800	478.55	800	478.58	0	0.0
4C6 Trib 2	1	4378	50% Annual Chanc	471.74	175	475.04	175	475.04	0	0.0
4C6 Trib 2	1	4378	20% Annual Chanc	471.74	275	475.55	300	475.66	25	0.1
4C6 Trib 2	1	4378	10% Annual Chanc	471.74	350	475.88	375	475.98	25	0.1
4C6 Trib 2	1	4378	4% Annual Chance	471.74	450	476.29	475	476.38	25	0.1
4C6 Trib 2	1	4378	2% Annual Chance	471.74	525	476.56	525	476.56	0	0.0
4C6 Trib 2	1	4378	1% Annual Chance	471.74	600	476.93	625	477.01	25	0.1
4C6 Trib 2	1	4378	0.4% Annual Chan	471.74	725	477.57	725	477.57	0	0.0
4C6 Trib 2	1	4378	0.2% Annual Chan	471.74	800	477.91	800	477.96	0	0.0
4C6 Trib 2	1	4196	50% Annual Chanc	470.81	175	473.11	175	473.12	0	0.0
4C6 Trib 2	1	4196	20% Annual Chanc	470.81	275	473.69	300	473.82	25	0.1
4C6 Trib 2	1	4196	10% Annual Chanc	470.81	350	474.04	375	474.17	25	0.1

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
4C6 Trib 2	1	4196	4% Annual Chance	470.81	450	474.45	475	474.59	25	0.1
4C6 Trib 2	1	4196	2% Annual Chance	470.81	525	475	525	475.14	0	0.1
4C6 Trib 2	1	4196	1% Annual Chance	470.81	600	475.84	625	475.88	25	0.0
4C6 Trib 2	1	4196	0.4% Annual Chan	470.81	725	476.75	725	476.75	0	0.0
4C6 Trib 2	1	4196	0.2% Annual Chan	470.81	800	477.14	800	477.24	0	0.1
4C6 Trib 2	1	4126	50% Annual Chanc	469.36	175	472.79	175	472.8	0	0.0
4C6 Trib 2	1	4126	20% Annual Chanc	469.36	275	473.46	300	473.61	25	0.2
4C6 Trib 2	1	4126	10% Annual Chanc	469.36	350	473.84	375	473.99	25	0.2
4C6 Trib 2	1	4126	4% Annual Chance	469.36	450	474.28	475	474.44	25	0.2
4C6 Trib 2	1	4126	2% Annual Chance	469.36	525	474.92	525	475.07	0	0.1
4C6 Trib 2	1	4126	1% Annual Chance	469.36	600	475.81	625	475.85	25	0.0
4C6 Trib 2	1	4126	0.4% Annual Chan	469.36	725	476.74	725	476.74	0	0.0
4C6 Trib 2	1	4126	0.2% Annual Chan	469.36	800	477.14	800	477.24	0	0.1
4C6 Trib 2	1	3916	50% Annual Chanc	467.32	175	470.21	175	470.2	0	0.0
4C6 Trib 2	1	3916	20% Annual Chanc	467.32	275	470.84	300	470.97	25	0.1
4C6 Trib 2	1	3916	10% Annual Chanc	467.32	350	471.43	375	471.42	25	0.0
4C6 Trib 2	1	3916	4% Annual Chance	467.32	450	472.86	475	473.17	25	0.3
4C6 Trib 2	1	3916	2% Annual Chance	467.32	525	474.08	525	474.38	0	0.3
4C6 Trib 2	1	3916	1% Annual Chance	467.32	600	475.31	625	475.31	25	0.0
4C6 Trib 2	1	3916	0.4% Annual Chan	467.32	725	476.34	725	476.34	0	0.0
4C6 Trib 2	1	3916	0.2% Annual Chan	467.32	800	476.74	800	476.86	0	0.1
4C6 Trib 2	1	3706	50% Annual Chanc	464.64	175	469.41	175	469.41	0	0.0
4C6 Trib 2	1	3706	20% Annual Chanc	464.64	275	470.48	300	470.67	25	0.2
4C6 Trib 2	1	3706	10% Annual Chanc	464.64	350	471.43	375	471.42	25	0.0
4C6 Trib 2	1	3706	4% Annual Chance	464.64	450	472.79	475	473.11	25	0.3
4C6 Trib 2	1	3706	2% Annual Chance	464.64	525	474.04	525	474.34	0	0.3
4C6 Trib 2	1	3706	1% Annual Chance	464.64	600	475.28	625	475.28	25	0.0
4C6 Trib 2	1	3706	0.4% Annual Chan	464.64	725	476.31	725	476.31	0	0.0
4C6 Trib 2	1	3706	0.2% Annual Chan	464.64	800	476.71	800	476.84	0	0.1
4C6 Trib 2	1	3650			Lat Struct		Lat Struct			
4C6 Trib 2	1	3617	50% Annual Chanc	464.12	200	469.28	200	469.28	0	0.0
4C6 Trib 2	1	3617	20% Annual Chanc	464.12	325	470.34	350	470.54	25	0.2
4C6 Trib 2	1	3617	10% Annual Chanc	464.12	450	471.3	450	471.3	0	0.0
4C6 Trib 2	1	3617	4% Annual Chance	464.12	650	472.67	700	472.99	50	0.3
4C6 Trib 2	1	3617	2% Annual Chance	464.12	850	473.92	900	474.21	50	0.3
4C6 Trib 2	1	3617	1% Annual Chance	464.12	1048.55	475.17	1048.55	475.17	0	0.0
4C6 Trib 2	1	3617	0.4% Annual Chan	464.12	1219.86	476.21	1219.86	476.21	0	0.0
4C6 Trib 2	1	3617	0.2% Annual Chan	464.12	1288.69	476.63	1309.82	476.75	21.13	0.1
4C6 Trib 2	1	3595	50% Annual Chanc	466.82	200	468.83	200	468.83	0	0.0
4C6 Trib 2	1	3595	20% Annual Chanc	466.82	325	469.84	350	470.03	25	0.2
4C6 Trib 2	1	3595	10% Annual Chanc	466.82	450	470.73	450	470.73	0	0.0
4C6 Trib 2	1	3595	4% Annual Chance	466.82	650	471.99	700	472.28	50	0.3
4C6 Trib 2	1	3595	2% Annual Chance	466.82	850	473.13	900	473.4	50	0.3
4C6 Trib 2	1	3595	1% Annual Chance	466.82	1048.55	474.15	1048.55	474.15	0	0.0
4C6 Trib 2	1	3595	0.4% Annual Chan	466.82	1219.86	474.79	1219.86	474.79	0	0.0
4C6 Trib 2	1	3595	0.2% Annual Chan	466.82	1288.69	475.02	1309.82	475.09	21.13	0.1
4C6 Trib 2	1	3567	50% Annual Chanc	466.65	200	468.85	200	468.85	0	0.0
4C6 Trib 2	1	3567	20% Annual Chanc	466.65	325	469.85	350	470.04	25	0.2
4C6 Trib 2	1	3567	10% Annual Chanc	466.65	450	470.73	450	470.73	0	0.0
4C6 Trib 2	1	3567	4% Annual Chance	466.65	650	471.99	700	472.28	50	0.3
4C6 Trib 2	1	3567	2% Annual Chance	466.65	850	473.13	900	473.4	50	0.3
4C6 Trib 2	1	3567	1% Annual Chance	466.65	1048.55	474.11	1048.55	474.11	0	0.0
4C6 Trib 2	1	3567	0.4% Annual Chan	466.65	1219.86	474.73	1219.86	474.73	0	0.0
4C6 Trib 2	1	3567	0.2% Annual Chan	466.65	1288.69	474.96	1309.82	475.02	21.13	0.1
4C6 Trib 2	1	3496	50% Annual Chanc	466.22	200	468.07	200	468.07	0	0.0
4C6 Trib 2	1	3496	20% Annual Chanc	466.22	325	468.78	350	468.91	25	0.1
4C6 Trib 2	1	3496	10% Annual Chanc	466.22	450	469.4	450	469.4	0	0.0
4C6 Trib 2	1	3496	4% Annual Chance	466.22	650	470.28	700	470.48	50	0.2
4C6 Trib 2	1	3496	2% Annual Chance	466.22	850	471.07	900	471.26	50	0.2
4C6 Trib 2	1	3496	1% Annual Chance	466.22	1048.55	471.79	1048.55	471.79	0	0.0
4C6 Trib 2	1	3496	0.4% Annual Chan	466.22	1219.86	472.4	1219.86	472.4	0	0.0
4C6 Trib 2	1	3496	0.2% Annual Chan	466.22	1288.69	472.62	1309.82	472.69	21.13	0.1
4C6 Trib 2	1	2806	50% Annual Chanc	462.09	200	463.94	200	463.94	0	0.0
4C6 Trib 2	1	2806	20% Annual Chanc	462.09	325	464.64	350	464.77	25	0.1
4C6 Trib 2	1	2806	10% Annual Chanc	462.09	450	465.27	450	465.27	0	0.0
4C6 Trib 2	1	2806	4% Annual Chance	462.09	650	466.15	700	466.36	50	0.2

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
4C6 Trib 2	1	2806	2% Annual Chance	462.09	850	466.94	900	467.13	50	0.2
4C6 Trib 2	1	2806	1% Annual Chance	462.09	1048.55	467.67	1048.55	467.67	0	0.0
4C6 Trib 2	1	2806	0.4% Annual Chan	462.09	1219.86	468.27	1219.86	468.27	0	0.0
4C6 Trib 2	1	2806	0.2% Annual Chan	462.09	1288.69	468.51	1309.82	468.68	21.13	0.2
4C6 Trib 2	1	2790	50% Annual Chanc	461.99	200	463.56	200	463.56	0	0.0
4C6 Trib 2	1	2790	20% Annual Chanc	461.99	325	464.15	350	464.27	25	0.1
4C6 Trib 2	1	2790	10% Annual Chanc	461.99	450	464.67	450	464.67	0	0.0
4C6 Trib 2	1	2790	4% Annual Chance	461.99	650	465.43	700	465.59	50	0.2
4C6 Trib 2	1	2790	2% Annual Chance	461.99	850	466.1	900	466.26	50	0.2
4C6 Trib 2	1	2790	1% Annual Chance	461.99	1048.55	466.71	1048.55	466.71	0	0.0
4C6 Trib 2	1	2790	0.4% Annual Chan	461.99	1219.86	467.27	1219.86	467.34	0	0.1
4C6 Trib 2	1	2790	0.2% Annual Chan	461.99	1288.69	469.46	1309.82	469.63	21.13	0.2
4C6 Trib 2	1	2778	50% Annual Chanc	461.92	200	463.49	200	463.49	0	0.0
4C6 Trib 2	1	2778	20% Annual Chanc	461.92	325	464.09	350	464.19	25	0.1
4C6 Trib 2	1	2778	10% Annual Chanc	461.92	450	464.61	450	464.61	0	0.0
4C6 Trib 2	1	2778	4% Annual Chance	461.92	650	465.35	700	465.53	50	0.2
4C6 Trib 2	1	2778	2% Annual Chance	461.92	850	466.02	900	466.17	50	0.2
4C6 Trib 2	1	2778	1% Annual Chance	461.92	1048.55	466.65	1048.55	466.64	0	0.0
4C6 Trib 2	1	2778	0.4% Annual Chan	461.92	1219.86	467.28	1219.86	467.33	0	0.1
4C6 Trib 2	1	2778	0.2% Annual Chan	461.92	1288.69	468.77	1309.82	468.91	21.13	0.1
4C6 Trib 2	1	2517	50% Annual Chanc	460.36	200	461.92	200	461.92	0	0.0
4C6 Trib 2	1	2517	20% Annual Chanc	460.36	325	462.53	350	462.63	25	0.1
4C6 Trib 2	1	2517	10% Annual Chanc	460.36	450	463.05	450	463.05	0	0.0
4C6 Trib 2	1	2517	4% Annual Chance	460.36	650	463.8	700	463.97	50	0.2
4C6 Trib 2	1	2517	2% Annual Chance	460.36	850	464.47	900	464.63	50	0.2
4C6 Trib 2	1	2517	1% Annual Chance	460.36	1048.55	465.09	1048.55	465.09	0	0.0
4C6 Trib 2	1	2517	0.4% Annual Chan	460.36	1219.86	466.57	1219.86	466.6	0	0.0
4C6 Trib 2	1	2517	0.2% Annual Chan	460.36	1288.69	467.47	1309.82	467.57	21.13	0.1
4C6 Trib 2	1	2461	50% Annual Chanc	460.02	200	461.45	200	461.45	0	0.0
4C6 Trib 2	1	2461	20% Annual Chanc	460.02	325	462	350	462.12	25	0.1
4C6 Trib 2	1	2461	10% Annual Chanc	460.02	450	462.55	450	462.59	0	0.0
4C6 Trib 2	1	2461	4% Annual Chance	460.02	650	463.43	700	463.62	50	0.2
4C6 Trib 2	1	2461	2% Annual Chance	460.02	850	464.35	900	464.56	50	0.2
4C6 Trib 2	1	2461	1% Annual Chance	460.02	1048.55	465.67	1048.55	465.74	0	0.1
4C6 Trib 2	1	2461	0.4% Annual Chan	460.02	1219.86	467.33	1219.86	467.35	0	0.0
4C6 Trib 2	1	2461	0.2% Annual Chan	460.02	1288.69	468.31	1309.82	468.44	21.13	0.1
4C6 Trib 2	1	2367	50% Annual Chanc	459.83	200	461.36	200	461.36	0	0.0
4C6 Trib 2	1	2367	20% Annual Chanc	459.83	325	461.9	350	462.02	25	0.1
4C6 Trib 2	1	2367	10% Annual Chanc	459.83	450	462.46	450	462.5	0	0.0
4C6 Trib 2	1	2367	4% Annual Chance	459.83	650	463.35	700	463.54	50	0.2
4C6 Trib 2	1	2367	2% Annual Chance	459.83	850	464.28	900	464.49	50	0.2
4C6 Trib 2	1	2367	1% Annual Chance	459.83	1048.55	465.62	1048.55	465.68	0	0.1
4C6 Trib 2	1	2367	0.4% Annual Chan	459.83	1219.86	467.18	1219.86	467.21	0	0.0
4C6 Trib 2	1	2367	0.2% Annual Chan	459.83	1288.69	468.15	1309.82	468.27	21.13	0.1
4C6 Trib 2	1	2250	50% Annual Chanc	457.74	200	461.26	200	461.26	0	0.0
4C6 Trib 2	1	2250	20% Annual Chanc	457.74	325	461.8	350	461.93	25	0.1
4C6 Trib 2	1	2250	10% Annual Chanc	457.74	450	462.4	450	462.45	0	0.1
4C6 Trib 2	1	2250	4% Annual Chance	457.74	650	463.36	700	463.57	50	0.2
4C6 Trib 2	1	2250	2% Annual Chance	457.74	850	464.37	900	464.6	50	0.2
4C6 Trib 2	1	2250	1% Annual Chance	457.74	1048.55	465.78	1048.55	465.84	0	0.1
4C6 Trib 2	1	2250	0.4% Annual Chan	457.74	1219.86	467.5	1219.86	467.53	0	0.0
4C6 Trib 2	1	2250	0.2% Annual Chan	457.74	1288.69	468.58	1309.82	468.72	21.13	0.1
4C6 Trib 2	1	2023	50% Annual Chanc	456.69	200	458.95	200	458.94	0	0.0
4C6 Trib 2	1	2023	20% Annual Chanc	456.69	325	460.37	350	460.72	25	0.4
4C6 Trib 2	1	2023	10% Annual Chanc	456.69	450	461.09	450	461.46	0	0.4
4C6 Trib 2	1	2023	4% Annual Chance	456.69	650	462.51	700	462.75	50	0.2
4C6 Trib 2	1	2023	2% Annual Chance	456.69	850	463.78	900	464.04	50	0.3
4C6 Trib 2	1	2023	1% Annual Chance	456.69	1048.55	465.5	1048.55	465.58	0	0.1
4C6 Trib 2	1	2023	0.4% Annual Chan	456.69	1219.86	467.43	1219.86	467.46	0	0.0
4C6 Trib 2	1	2023	0.2% Annual Chan	456.69	1288.69	468.55	1309.82	468.7	21.13	0.1
4C6 Trib 2	1	1719	50% Annual Chanc	452.76	425	458.19	450	458.55	25	0.4
4C6 Trib 2	1	1719	20% Annual Chanc	452.76	750	460.03	800	460.41	50	0.4
4C6 Trib 2	1	1719	10% Annual Chanc	452.76	950	460.72	1050	461.07	100	0.3
4C6 Trib 2	1	1719	4% Annual Chance	452.76	1300	462.16	1350	462.42	50	0.3
4C6 Trib 2	1	1719	2% Annual Chance	452.76	1600	463.5	1650	463.79	50	0.3
4C6 Trib 2	1	1719	1% Annual Chance	452.76	1948.55	465.32	1948.55	465.41	0	0.1
4C6 Trib 2	1	1719	0.4% Annual Chan	452.76	2269.86	467.28	2269.86	467.31	0	0.0

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

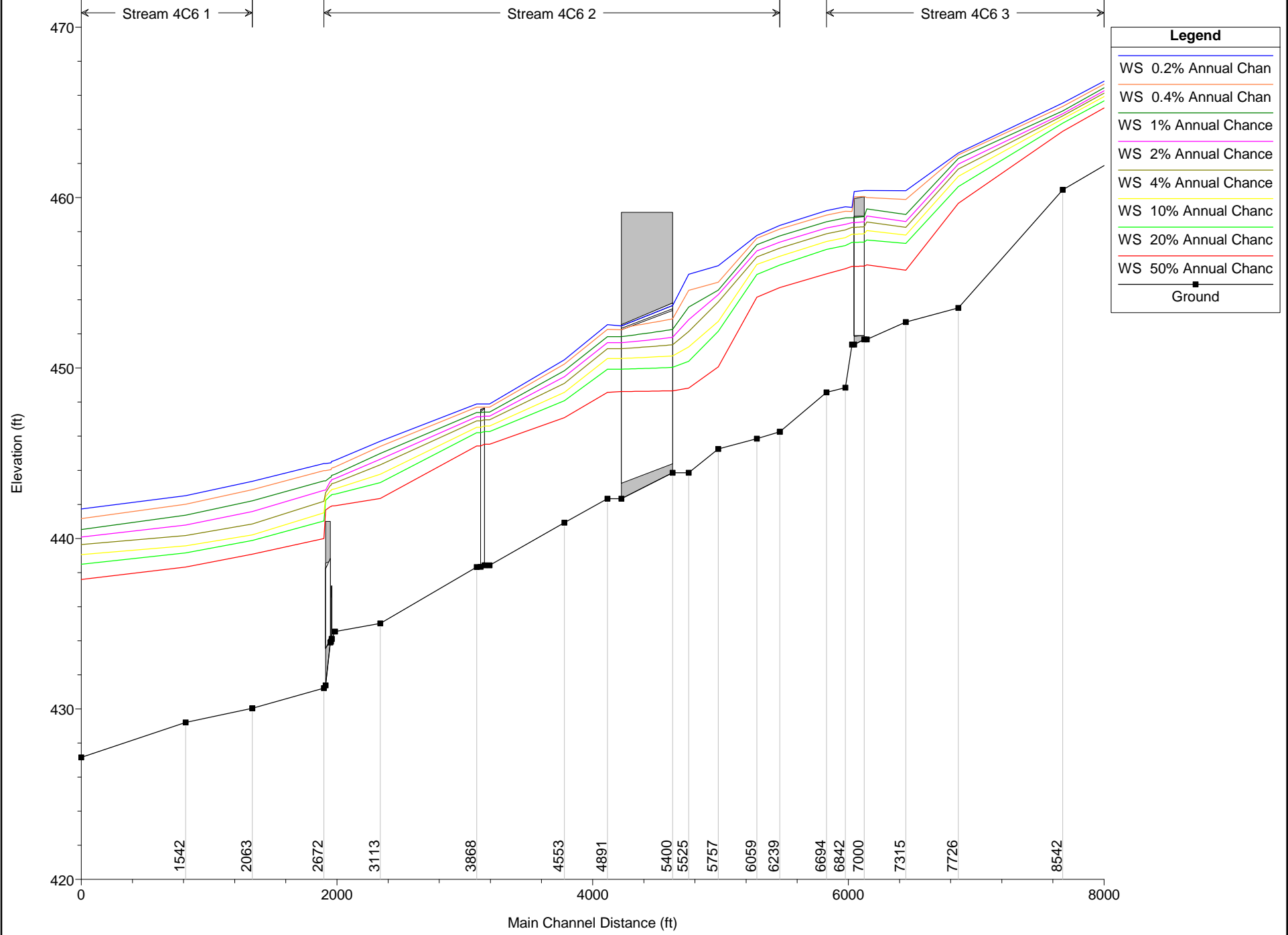
Existing vs Ultimate Water Surface Elevations											
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference		
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	
4C6 Trib 2	1	1719	0.2% Annual Chan	452.76	2438.69	468.41	2459.82	468.56	21.13	0.1	
4C6 Trib 2	1	1200			Culvert		Culvert				
4C6 Trib 2	1	640	50% Annual Chanc	452.13	425	457.91	450	458.29	25	0.4	
4C6 Trib 2	1	640	20% Annual Chanc	452.13	750	459.52	800	459.83	50	0.3	
4C6 Trib 2	1	640	10% Annual Chanc	452.13	950	459.88	1050	460.02	100	0.1	
4C6 Trib 2	1	640	4% Annual Chance	452.13	1300	460.4	1350	460.49	50	0.1	
4C6 Trib 2	1	640	2% Annual Chance	452.13	1600	460.69	1650	460.77	50	0.1	
4C6 Trib 2	1	640	1% Annual Chance	452.13	1948.55	460.97	1948.55	461.06	0	0.1	
4C6 Trib 2	1	640	0.4% Annual Chan	452.13	2269.86	461.27	2269.86	461.3	0	0.0	
4C6 Trib 2	1	640	0.2% Annual Chan	452.13	2438.69	461.44	2459.82	461.46	21.13	0.0	
4C6 Trib 2	1	609	50% Annual Chanc	452.14	525	457.8	600	458.16	75	0.4	
4C6 Trib 2	1	609	20% Annual Chanc	452.14	950	459.38	1050	459.7	100	0.3	
4C6 Trib 2	1	609	10% Annual Chanc	452.14	1250	459.7	1350	459.84	100	0.1	
4C6 Trib 2	1	609	4% Annual Chance	452.14	1700	460.21	1800	460.31	100	0.1	
4C6 Trib 2	1	609	2% Annual Chance	452.14	2050	460.53	2150	460.61	100	0.1	
4C6 Trib 2	1	609	1% Annual Chance	452.14	2450	460.85	2550	460.93	100	0.1	
4C6 Trib 2	1	609	0.4% Annual Chan	452.14	2950	461.17	3000	461.2	50	0.0	
4C6 Trib 2	1	609	0.2% Annual Chan	452.14	3300	461.34	3350	461.37	50	0.0	
4C6 Trib 2	1	309	50% Annual Chanc	450.24	525	455.44	600	455.89	75	0.4	
4C6 Trib 2	1	309	20% Annual Chanc	450.24	950	456.68	1050	456.61	100	-0.1	
4C6 Trib 2	1	309	10% Annual Chanc	450.24	1250	457.85	1350	457.91	100	0.1	
4C6 Trib 2	1	309	4% Annual Chance	450.24	1700	458.22	1800	458.29	100	0.1	
4C6 Trib 2	1	309	2% Annual Chance	450.24	2050	458.42	2150	458.47	100	0.1	
4C6 Trib 2	1	309	1% Annual Chance	450.24	2450	458.59	2550	458.62	100	0.0	
4C6 Trib 2	1	309	0.4% Annual Chan	450.24	2950	458.9	3000	458.95	50	0.1	
4C6 Trib 2	1	309	0.2% Annual Chan	450.24	3300	459.2	3350	459.22	50	0.0	
4C6 Trib 1	1	3883	50% Annual Chanc	451.04	225	455.42	275	455.56	50	0.1	
4C6 Trib 1	1	3883	20% Annual Chanc	451.04	450	455.89	450	455.91	0	0.0	
4C6 Trib 1	1	3883	10% Annual Chanc	451.04	550	456.05	600	456.1	50	0.1	
4C6 Trib 1	1	3883	4% Annual Chance	451.04	700	456.22	750	456.28	50	0.1	
4C6 Trib 1	1	3883	2% Annual Chance	451.04	850	456.38	900	456.43	50	0.1	
4C6 Trib 1	1	3883	1% Annual Chance	451.04	1000	456.53	1000	456.53	0	0.0	
4C6 Trib 1	1	3883	0.4% Annual Chan	451.04	1200	456.71	1200	456.71	0	0.0	
4C6 Trib 1	1	3883	0.2% Annual Chan	451.04	1350	456.85	1400	456.88	50	0.0	
4C6 Trib 1	1	3459	50% Annual Chanc	450.04	225	453.15	275	453.36	50	0.2	
4C6 Trib 1	1	3459	20% Annual Chanc	450.04	450	453.93	450	453.86	0	-0.1	
4C6 Trib 1	1	3459	10% Annual Chanc	450.04	550	454.11	600	454.21	50	0.1	
4C6 Trib 1	1	3459	4% Annual Chance	450.04	700	454.37	750	454.45	50	0.1	
4C6 Trib 1	1	3459	2% Annual Chance	450.04	850	454.62	900	454.71	50	0.1	
4C6 Trib 1	1	3459	1% Annual Chance	450.04	1000	454.86	1000	454.85	0	0.0	
4C6 Trib 1	1	3459	0.4% Annual Chan	450.04	1200	455.14	1200	455.13	0	0.0	
4C6 Trib 1	1	3459	0.2% Annual Chan	450.04	1350	455.33	1400	455.38	50	0.1	
4C6 Trib 1	1	3187	50% Annual Chanc	446.8	225	449.83	275	450.11	50	0.3	
4C6 Trib 1	1	3187	20% Annual Chanc	446.8	450	450.74	450	450.92	0	0.2	
4C6 Trib 1	1	3187	10% Annual Chanc	446.8	550	451.26	600	451.42	50	0.2	
4C6 Trib 1	1	3187	4% Annual Chance	446.8	700	451.93	750	452.1	50	0.2	
4C6 Trib 1	1	3187	2% Annual Chance	446.8	850	452.35	900	452.46	50	0.1	
4C6 Trib 1	1	3187	1% Annual Chance	446.8	1000	452.63	1000	452.72	0	0.1	
4C6 Trib 1	1	3187	0.4% Annual Chan	446.8	1200	452.86	1200	452.92	0	0.1	
4C6 Trib 1	1	3187	0.2% Annual Chan	446.8	1350	453.07	1400	453.11	50	0.0	
4C6 Trib 1	1	3124	50% Annual Chanc	445.89	250	449.87	300	450.15	50	0.3	
4C6 Trib 1	1	3124	20% Annual Chanc	445.89	450	450.8	500	450.96	50	0.2	
4C6 Trib 1	1	3124	10% Annual Chanc	445.89	600	451.31	650	451.47	50	0.2	
4C6 Trib 1	1	3124	4% Annual Chance	445.89	800	451.97	850	452.13	50	0.2	
4C6 Trib 1	1	3124	2% Annual Chance	445.89	950	452.39	1000	452.51	50	0.1	
4C6 Trib 1	1	3124	1% Annual Chance	445.89	1100	452.68	1150	452.75	50	0.1	
4C6 Trib 1	1	3124	0.4% Annual Chan	445.89	1300	452.91	1350	452.95	50	0.0	
4C6 Trib 1	1	3124	0.2% Annual Chan	445.89	1500	453.1	1550	453.14	50	0.0	
4C6 Trib 1	1	3000			Culvert		Culvert				
4C6 Trib 1	1	2909	50% Annual Chanc	444.88	250	449.81	300	450.07	50	0.3	
4C6 Trib 1	1	2909	20% Annual Chanc	444.88	450	450.6	500	450.71	50	0.1	
4C6 Trib 1	1	2909	10% Annual Chanc	444.88	600	450.93	650	451.02	50	0.1	
4C6 Trib 1	1	2909	4% Annual Chance	444.88	800	451.24	850	451.3	50	0.1	
4C6 Trib 1	1	2909	2% Annual Chance	444.88	950	451.41	1000	451.46	50	0.0	
4C6 Trib 1	1	2909	1% Annual Chance	444.88	1100	451.58	1150	451.62	50	0.0	

Table E.3: HEC-RAS Plan: Hickory Creek Existing vs Ultimate Water Surface Elevations

Existing vs Ultimate Water Surface Elevations										
River	Reach	River Sta	Profile	Min Ch El (ft)	Existing		Ultimate		Difference	
					Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)	Q Total (cfs)	W.S. Elev (ft)
4C6 Trib 1	1	2909	0.4% Annual Chan	444.88	1300	451.77	1350	451.81	50	0.0
4C6 Trib 1	1	2909	0.2% Annual Chan	444.88	1500	451.94	1550	451.99	50	0.1
4C6 Trib 1	1	2838	50% Annual Chanc	445.38	250	449.72	300	449.97	50	0.3
4C6 Trib 1	1	2838	20% Annual Chanc	445.38	450	450.52	500	450.64	50	0.1
4C6 Trib 1	1	2838	10% Annual Chanc	445.38	600	450.88	650	450.98	50	0.1
4C6 Trib 1	1	2838	4% Annual Chance	445.38	800	451.23	850	451.29	50	0.1
4C6 Trib 1	1	2838	2% Annual Chance	445.38	950	451.41	1000	451.47	50	0.1
4C6 Trib 1	1	2838	1% Annual Chance	445.38	1100	451.59	1150	451.64	50	0.1
4C6 Trib 1	1	2838	0.4% Annual Chan	445.38	1300	451.79	1350	451.84	50	0.0
4C6 Trib 1	1	2838	0.2% Annual Chan	445.38	1500	451.98	1550	452.04	50	0.1
4C6 Trib 1	1	2386	50% Annual Chanc	441.5	250	446.58	300	446.84	50	0.3
4C6 Trib 1	1	2386	20% Annual Chanc	441.5	450	447.53	500	447.8	50	0.3
4C6 Trib 1	1	2386	10% Annual Chanc	441.5	600	448.12	650	448.27	50	0.1
4C6 Trib 1	1	2386	4% Annual Chance	441.5	800	448.69	850	448.81	50	0.1
4C6 Trib 1	1	2386	2% Annual Chance	441.5	950	449.06	1000	449.18	50	0.1
4C6 Trib 1	1	2386	1% Annual Chance	441.5	1100	449.42	1150	449.53	50	0.1
4C6 Trib 1	1	2386	0.4% Annual Chan	441.5	1300	449.88	1350	450	50	0.1
4C6 Trib 1	1	2386	0.2% Annual Chan	441.5	1500	450.36	1550	450.48	50	0.1
4C6 Trib 1	1	1999	50% Annual Chanc	438.58	275	445.06	325	445.29	50	0.2
4C6 Trib 1	1	1999	20% Annual Chanc	438.58	500	445.95	600	446.28	100	0.3
4C6 Trib 1	1	1999	10% Annual Chanc	438.58	700	446.6	750	446.83	50	0.2
4C6 Trib 1	1	1999	4% Annual Chance	438.58	900	447.3	950	447.44	50	0.1
4C6 Trib 1	1	1999	2% Annual Chance	438.58	1050	447.76	1100	447.91	50	0.2
4C6 Trib 1	1	1999	1% Annual Chance	438.58	1200	448.21	1250	448.35	50	0.1
4C6 Trib 1	1	1999	0.4% Annual Chan	438.58	1400	448.79	1450	448.93	50	0.1
4C6 Trib 1	1	1999	0.2% Annual Chan	438.58	1600	449.38	1650	449.53	50	0.1
4C6 Trib 1	1	1800			Culvert		Culvert			
4C6 Trib 1	1	1637	50% Annual Chanc	439.18	275	444.94	325	445.13	50	0.2
4C6 Trib 1	1	1637	20% Annual Chanc	439.18	500	445.62	600	445.86	100	0.2
4C6 Trib 1	1	1637	10% Annual Chanc	439.18	700	446.07	750	446.24	50	0.2
4C6 Trib 1	1	1637	4% Annual Chance	439.18	900	446.52	950	446.6	50	0.1
4C6 Trib 1	1	1637	2% Annual Chance	439.18	1050	446.78	1100	446.86	50	0.1
4C6 Trib 1	1	1637	1% Annual Chance	439.18	1200	447.02	1250	447.07	50	0.1
4C6 Trib 1	1	1637	0.4% Annual Chan	439.18	1400	447.28	1450	447.34	50	0.1
4C6 Trib 1	1	1637	0.2% Annual Chan	439.18	1600	447.57	1650	447.64	50	0.1
4C6 Trib 1	1	1210	50% Annual Chanc	438.35	275	442.71	325	442.94	50	0.2
4C6 Trib 1	1	1210	20% Annual Chanc	438.35	500	443.49	600	443.77	100	0.3
4C6 Trib 1	1	1210	10% Annual Chanc	438.35	700	444.02	750	444.01	50	0.0
4C6 Trib 1	1	1210	4% Annual Chance	438.35	900	444.32	950	444.45	50	0.1
4C6 Trib 1	1	1210	2% Annual Chance	438.35	1050	444.72	1100	444.84	50	0.1
4C6 Trib 1	1	1210	1% Annual Chance	438.35	1200	445.09	1250	445.21	50	0.1
4C6 Trib 1	1	1210	0.4% Annual Chan	438.35	1400	445.41	1450	445.48	50	0.1
4C6 Trib 1	1	1210	0.2% Annual Chan	438.35	1600	445.59	1650	445.64	50	0.1
4C6 Trib 1	1	769	50% Annual Chanc	434.55	275	440.38	325	440.7	50	0.3
4C6 Trib 1	1	769	20% Annual Chanc	434.55	500	441.67	600	442.06	100	0.4
4C6 Trib 1	1	769	10% Annual Chanc	434.55	700	442.55	750	442.79	50	0.2
4C6 Trib 1	1	769	4% Annual Chance	434.55	900	443.55	950	443.77	50	0.2
4C6 Trib 1	1	769	2% Annual Chance	434.55	1050	444.17	1100	444.31	50	0.1
4C6 Trib 1	1	769	1% Annual Chance	434.55	1200	444.65	1250	444.78	50	0.1
4C6 Trib 1	1	769	0.4% Annual Chan	434.55	1400	444.97	1450	445.04	50	0.1
4C6 Trib 1	1	769	0.2% Annual Chan	434.55	1600	445.09	1650	445.13	50	0.0
4C6 Trib 1	1	700			Bridge		Bridge			
4C6 Trib 1	1	662	50% Annual Chanc	434.25	275	439.94	325	440.17	50	0.2
4C6 Trib 1	1	662	20% Annual Chanc	434.25	500	440.85	600	440.97	100	0.1
4C6 Trib 1	1	662	10% Annual Chanc	434.25	700	441.24	750	441.37	50	0.1
4C6 Trib 1	1	662	4% Annual Chance	434.25	900	441.94	950	442.1	50	0.2
4C6 Trib 1	1	662	2% Annual Chance	434.25	1050	442.67	1100	442.77	50	0.1
4C6 Trib 1	1	662	1% Annual Chance	434.25	1200	443.22	1250	443.33	50	0.1
4C6 Trib 1	1	662	0.4% Annual Chan	434.25	1400	443.86	1450	443.96	50	0.1
4C6 Trib 1	1	662	0.2% Annual Chan	434.25	1600	444.29	1650	444.35	50	0.1

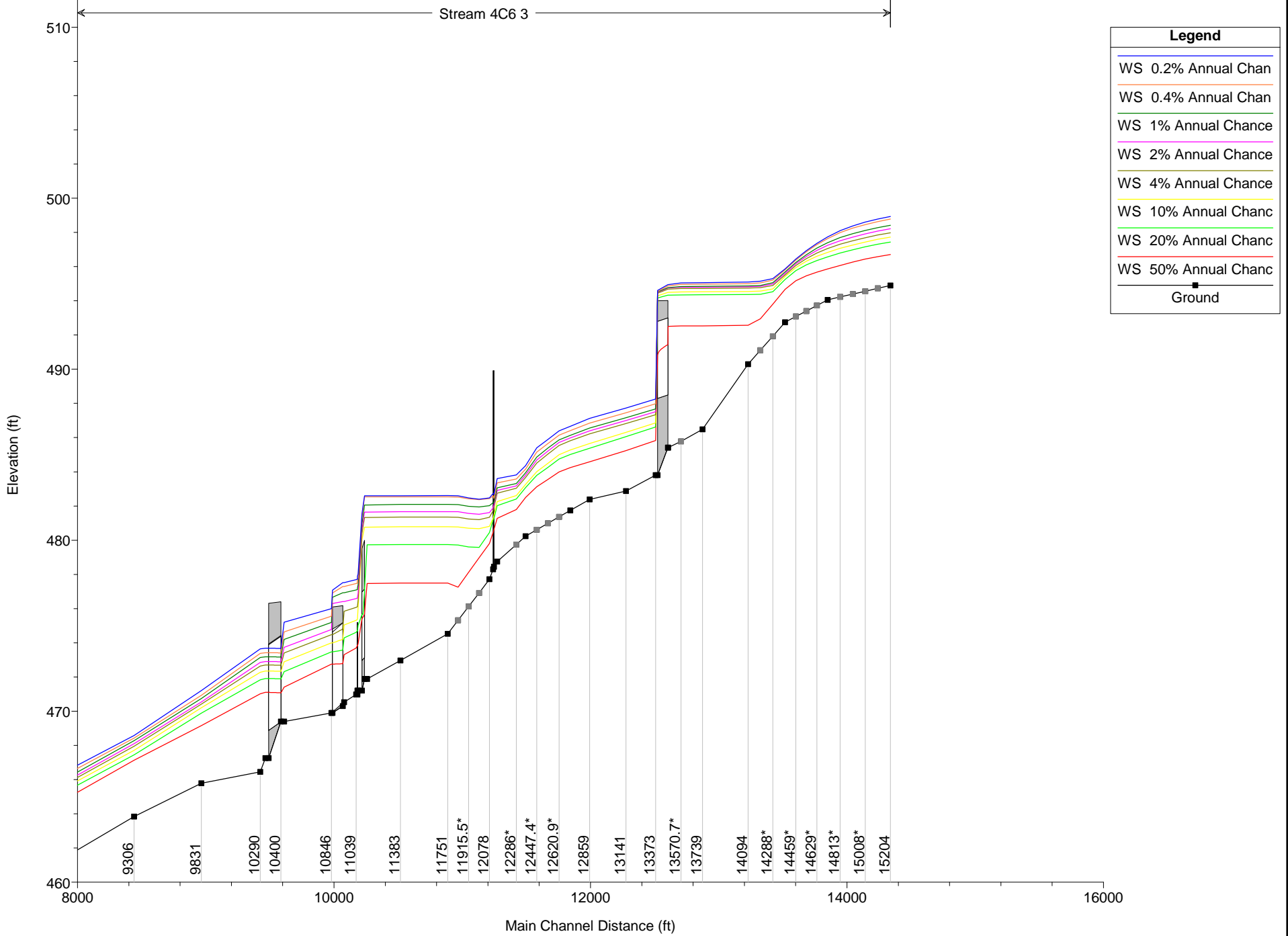
Appendix E.4
HEC-RAS Profiles
Existing Conditions

Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011



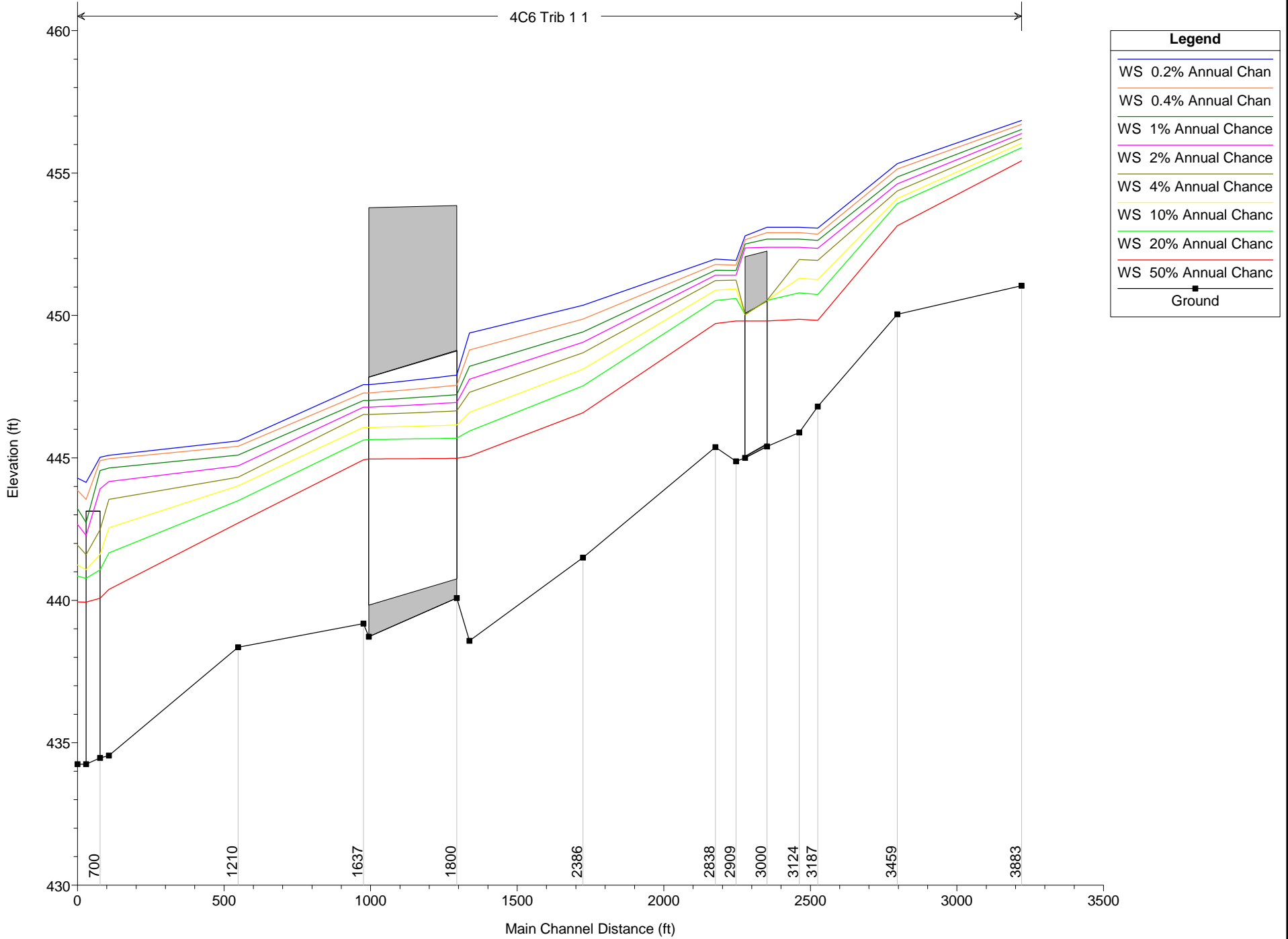
Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011

Stream 4C6 3



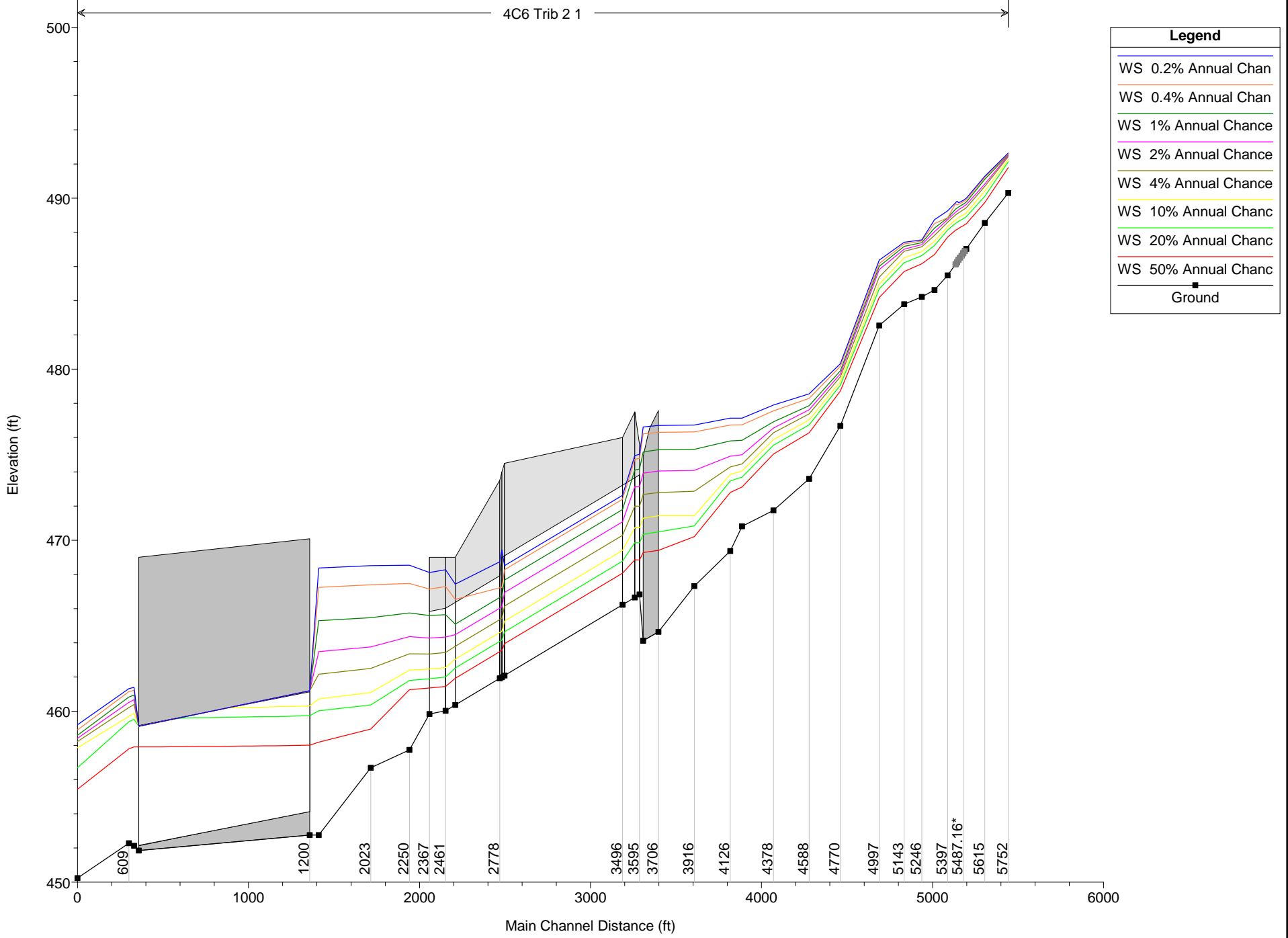
Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011

4C6 Trib 1 1



Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011

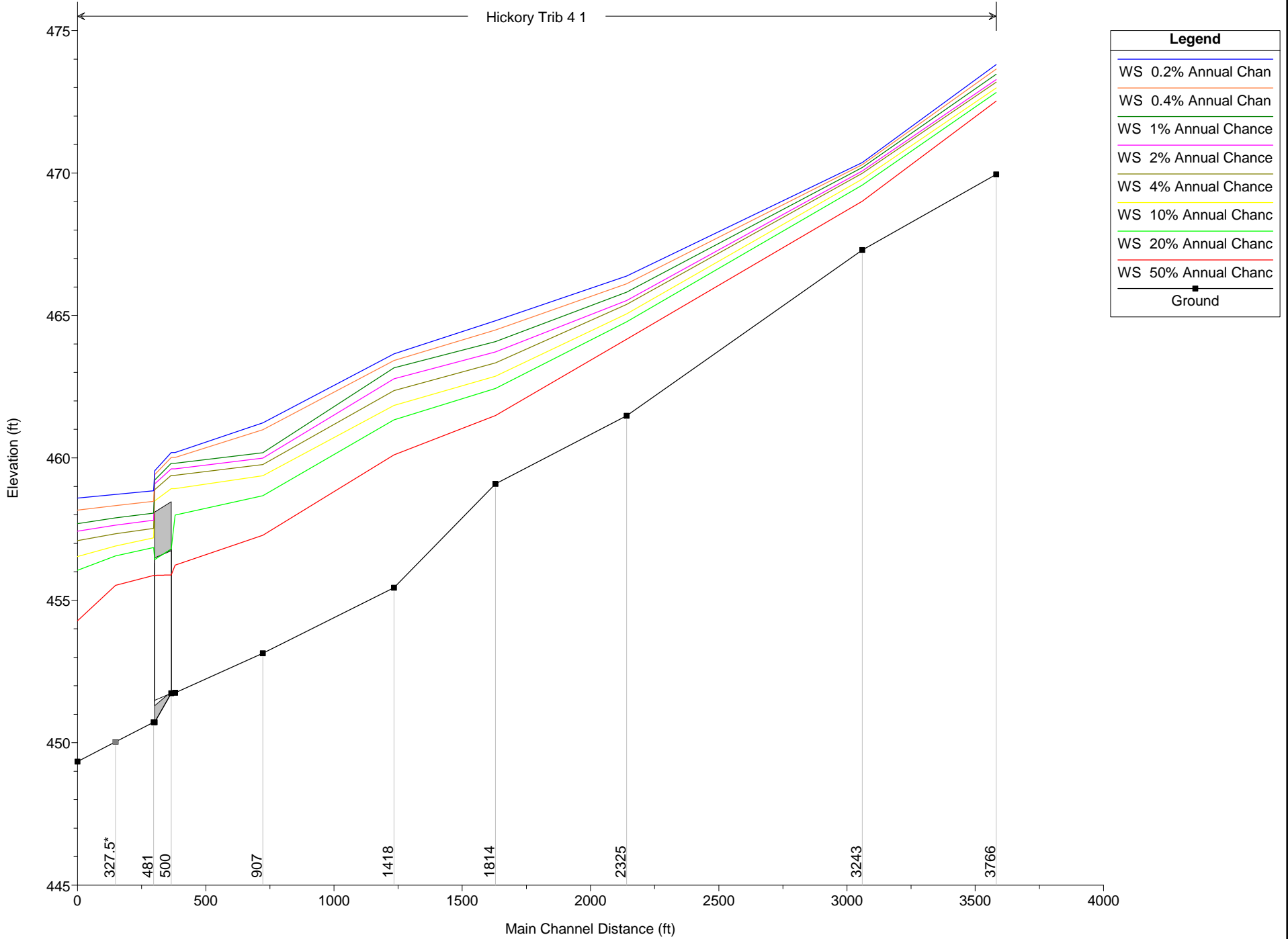
4C6 Trib 2 1



Legend	
WS 0.2% Annual Chan	(Blue line)
WS 0.4% Annual Chan	(Orange line)
WS 1% Annual Chance	(Green line)
WS 2% Annual Chance	(Magenta line)
WS 4% Annual Chance	(Yellow line)
WS 10% Annual Chanc	(Light Green line)
WS 20% Annual Chanc	(Red line)
WS 50% Annual Chanc	(Black line)
Ground	(Black square)

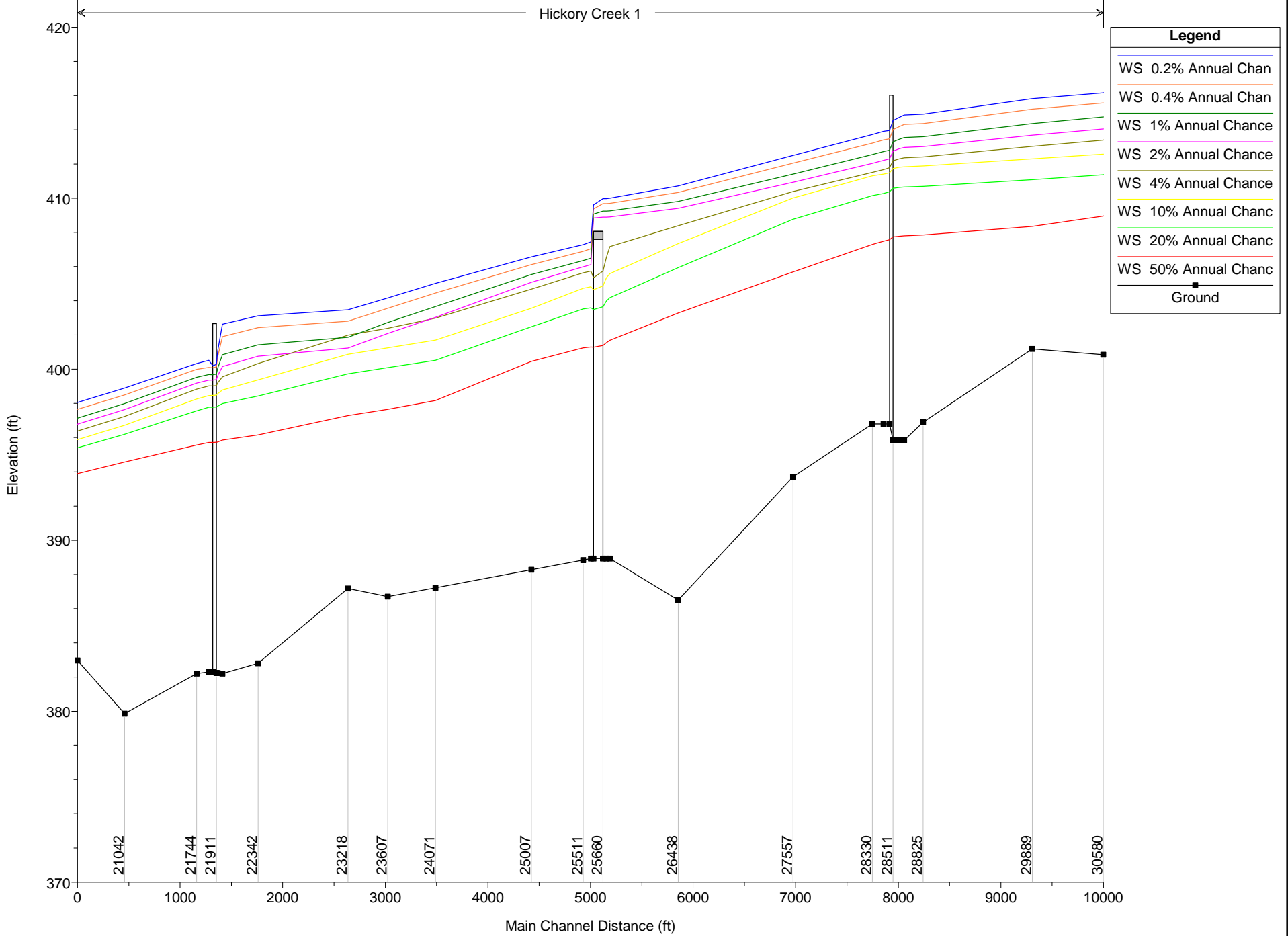
Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011

Hickory Trib 4 1



Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011

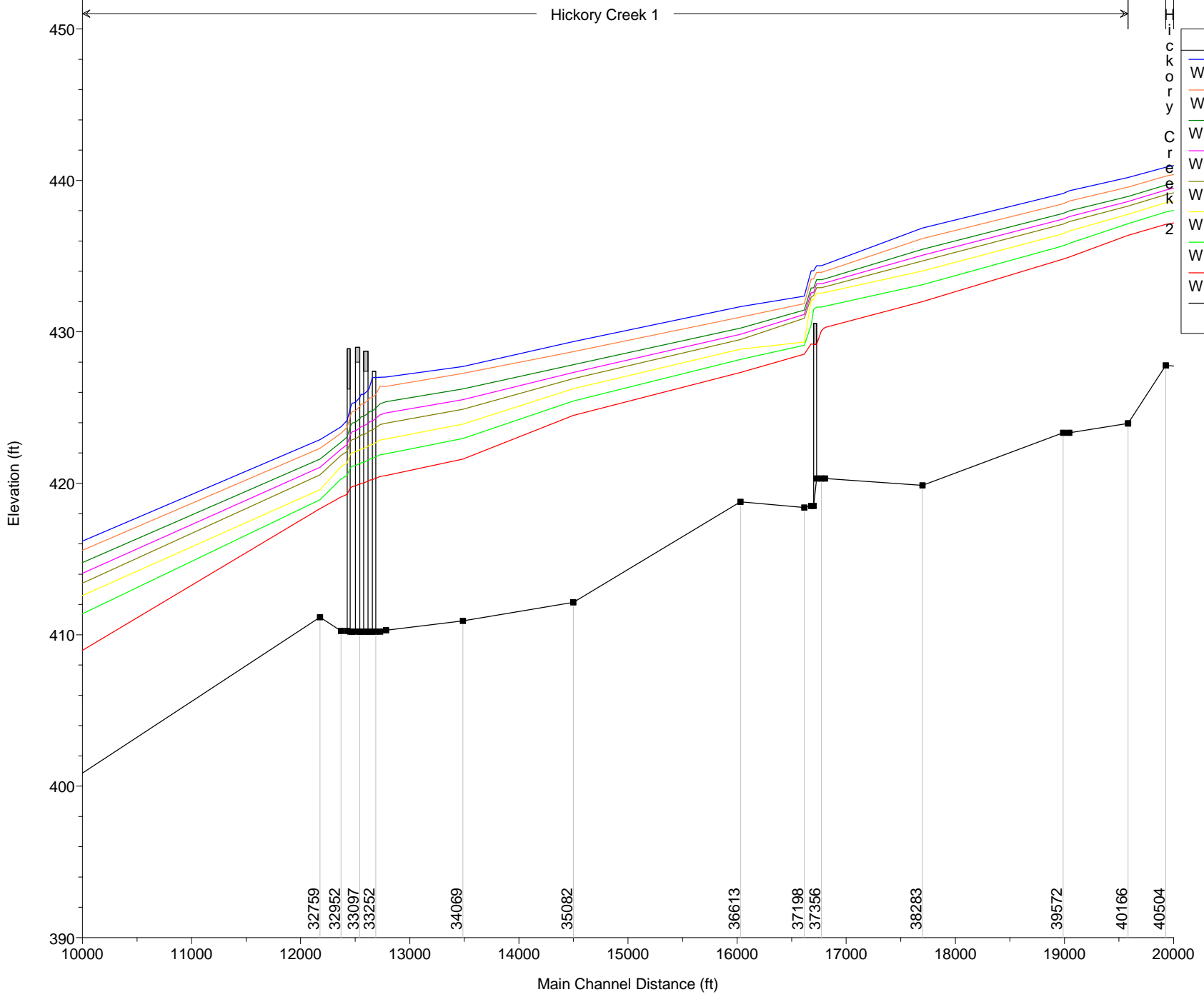
Hickory Creek 1



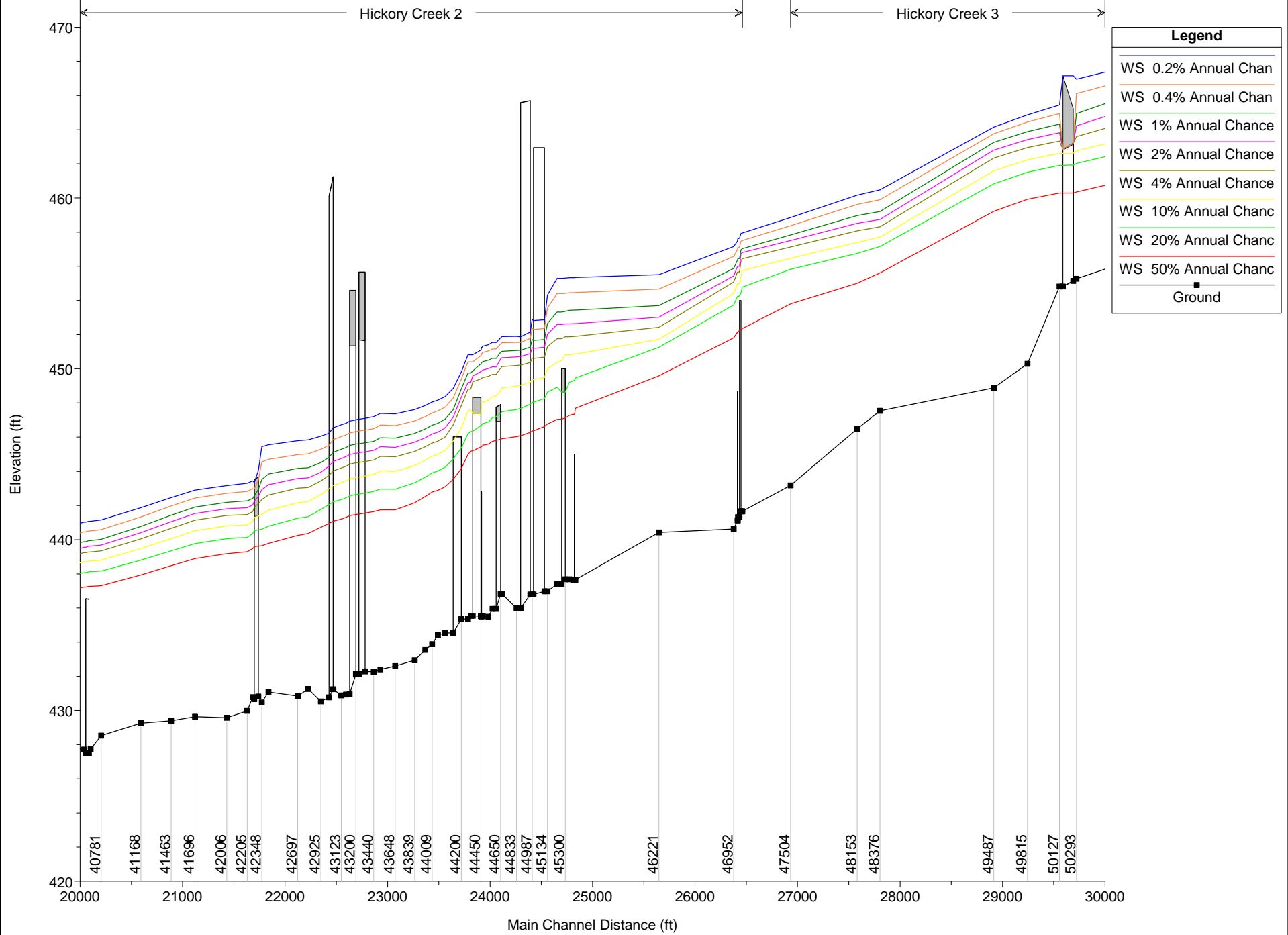
Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011

Hickory Creek 1

Legend	
WS 0.2% Annual Chan	
WS 0.4% Annual Chan	
WS 1% Annual Chance	
WS 2% Annual Chance	
WS 4% Annual Chance	
WS 10% Annual Chanc	
WS 20% Annual Chanc	
WS 50% Annual Chanc	
Ground	

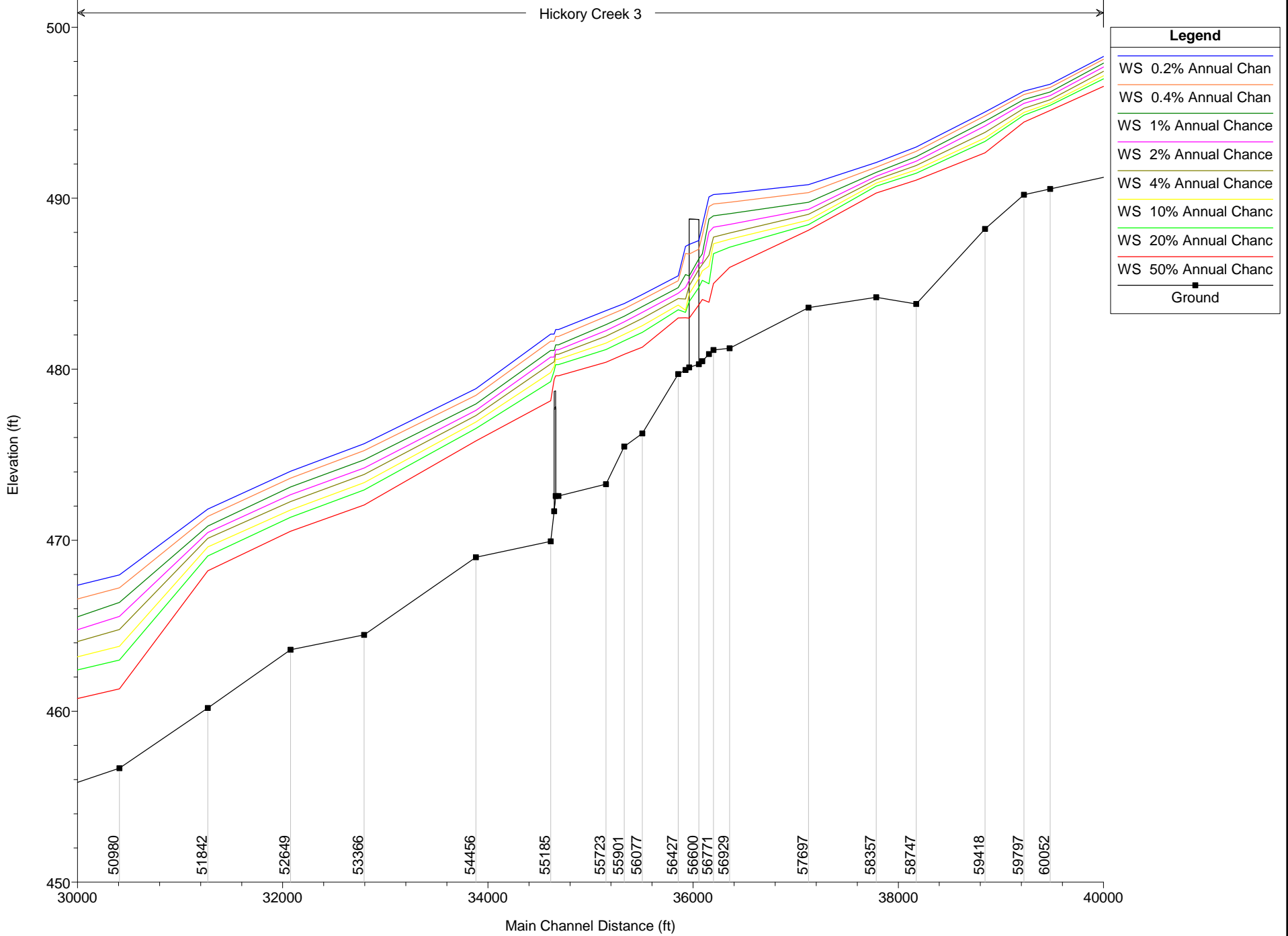


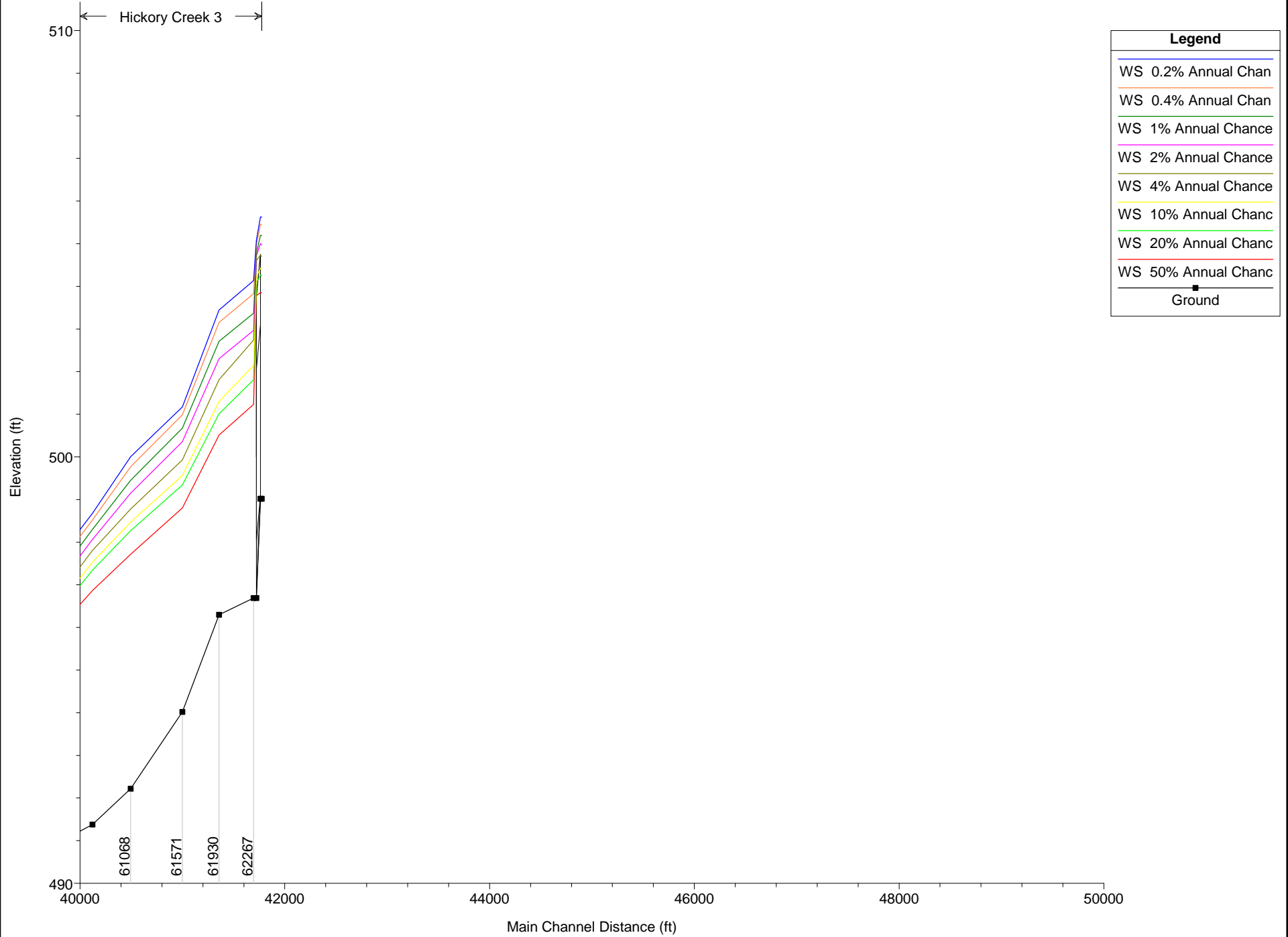
Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011



Hickory Creek Combined Plan: Hickory Creek Combined Existing 4/19/2011

Hickory Creek 3



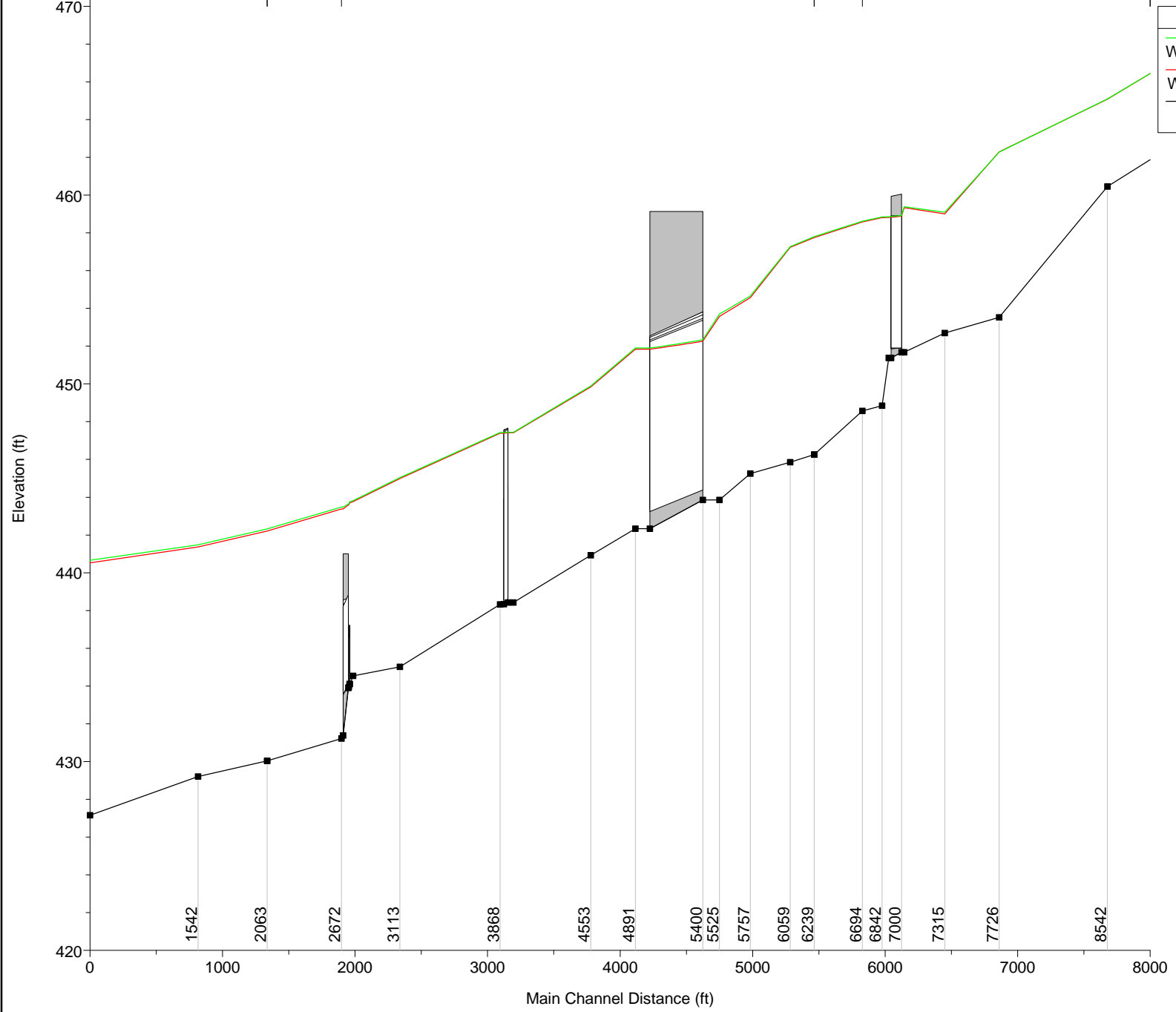


Appendix E.5
HEC-RAS Profiles
Existing vs. Ultimate Conditions




Hickory Creek Combined Plan: 1) Existing 4/19/2011 2) Ultimate 4/13/2011

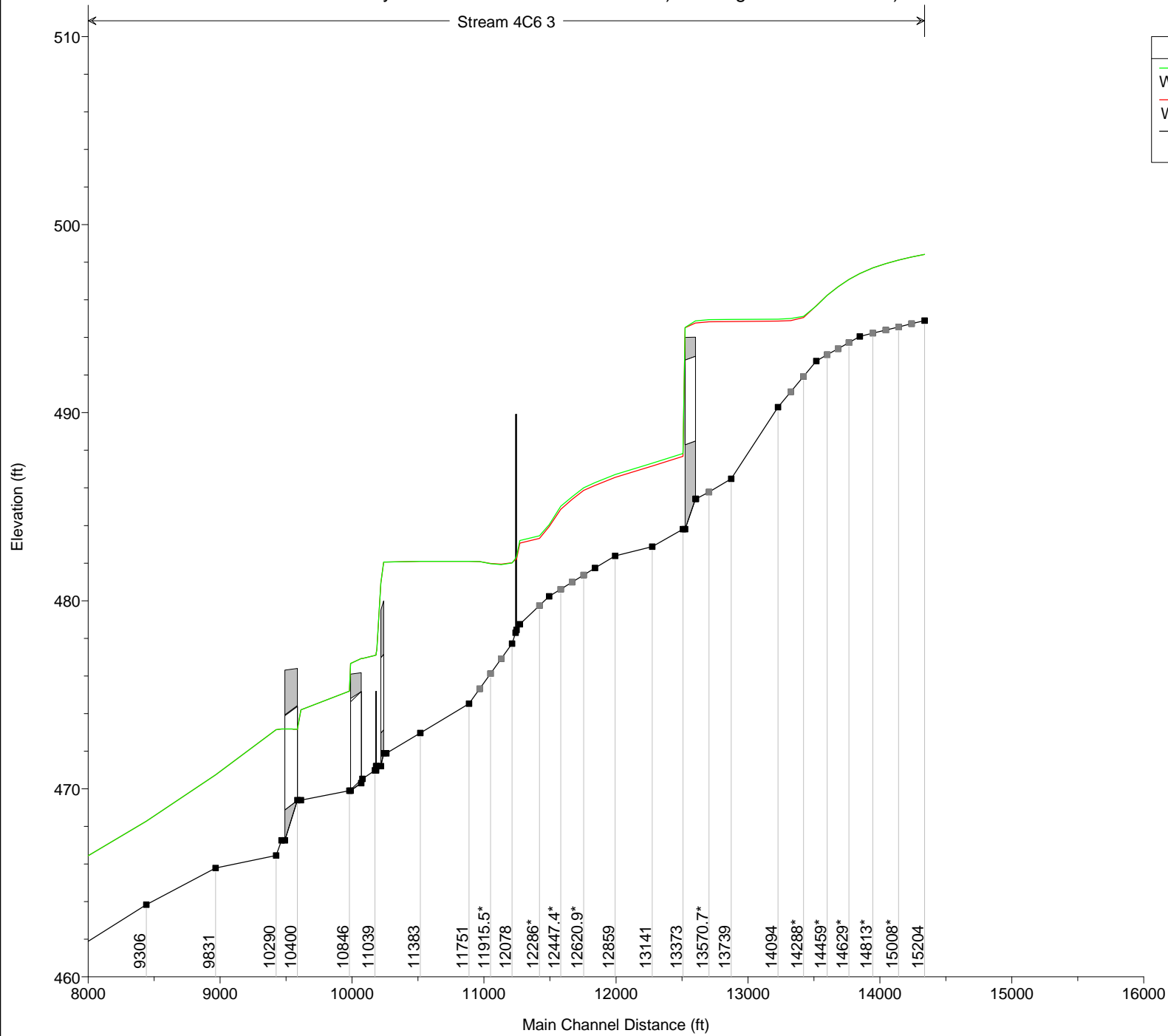
← Stream 4C6 1 → ← Stream 4C6 2 → ← Stream 4C6 3 →

Legend	
WS 1% Annual Chance - Ultimate	
WS 1% Annual Chance - Existing	
Ground	






Stream 4C6 3

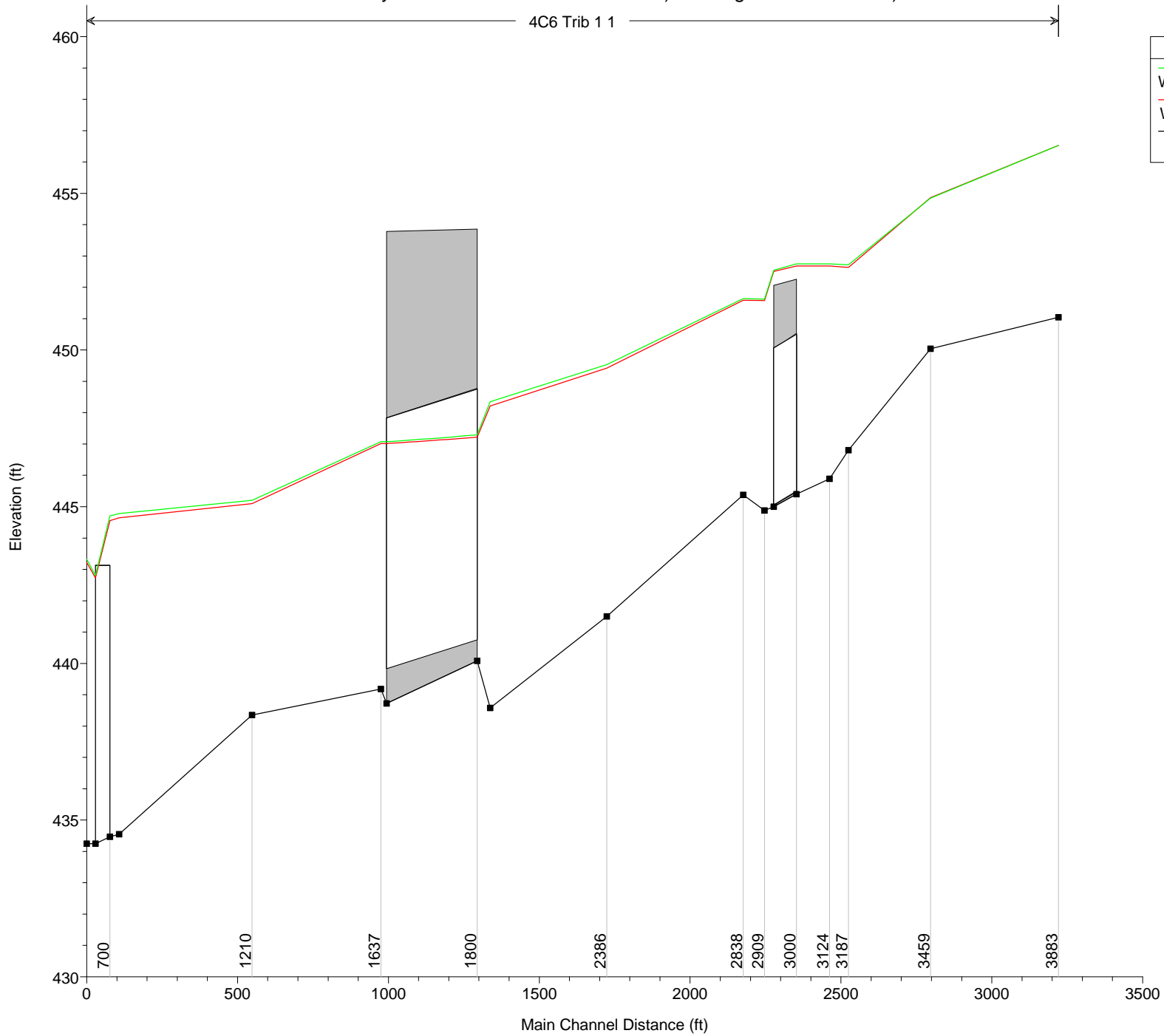
Legend	
	WS 1% Annual Chance - Ultimate
	WS 1% Annual Chance - Existing
	Ground



Hickory Creek Combined Plan: 1) Existing 4/19/2011 2) Ultimate 4/13/2011




4C6 Trib 1 1

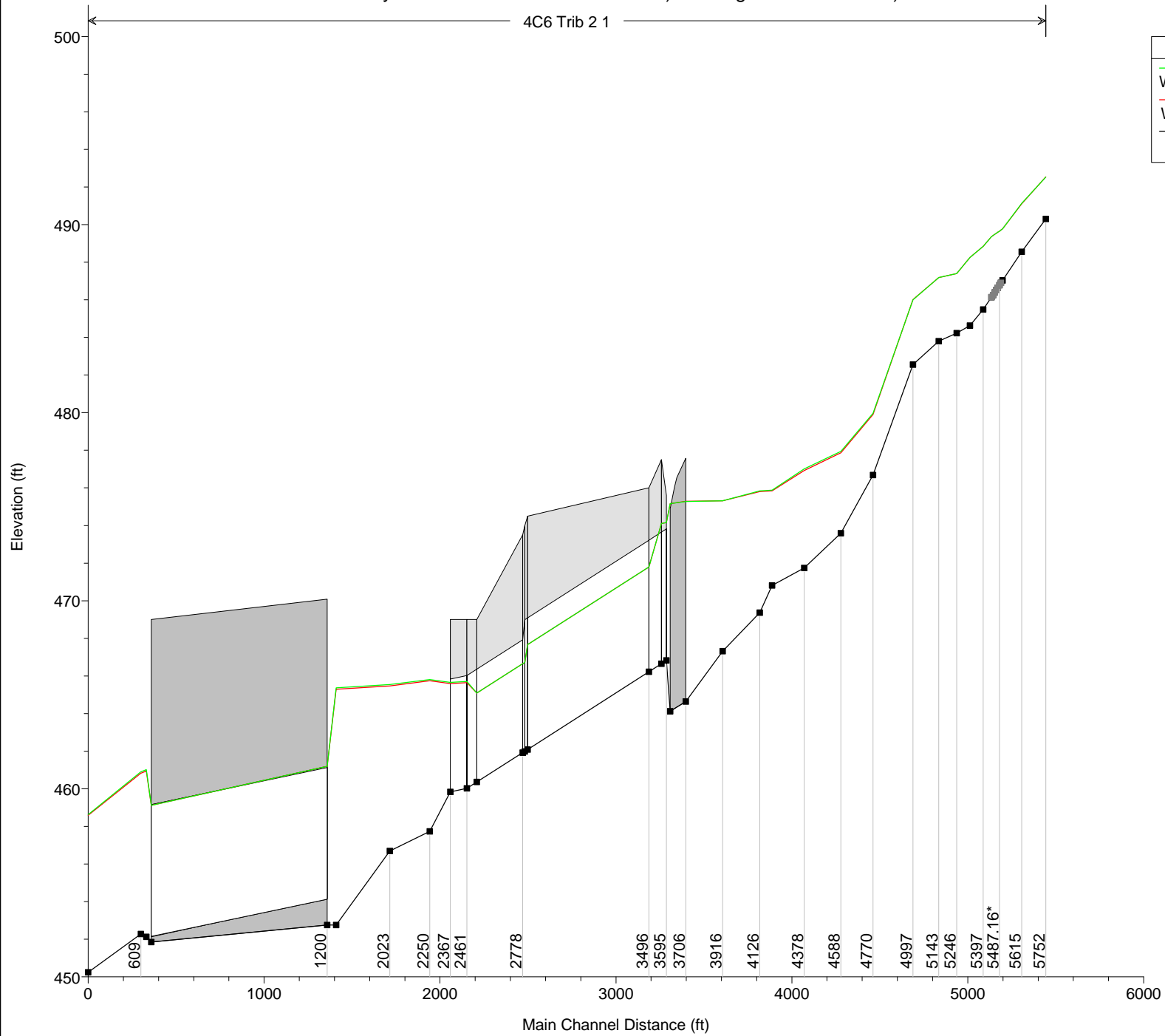
Legend	
	WS 1% Annual Chance - Ultimate
	WS 1% Annual Chance - Existing
	Ground



Hickory Creek Combined Plan: 1) Existing 4/19/2011 2) Ultimate 4/13/2011

4C6 Trib 2 1

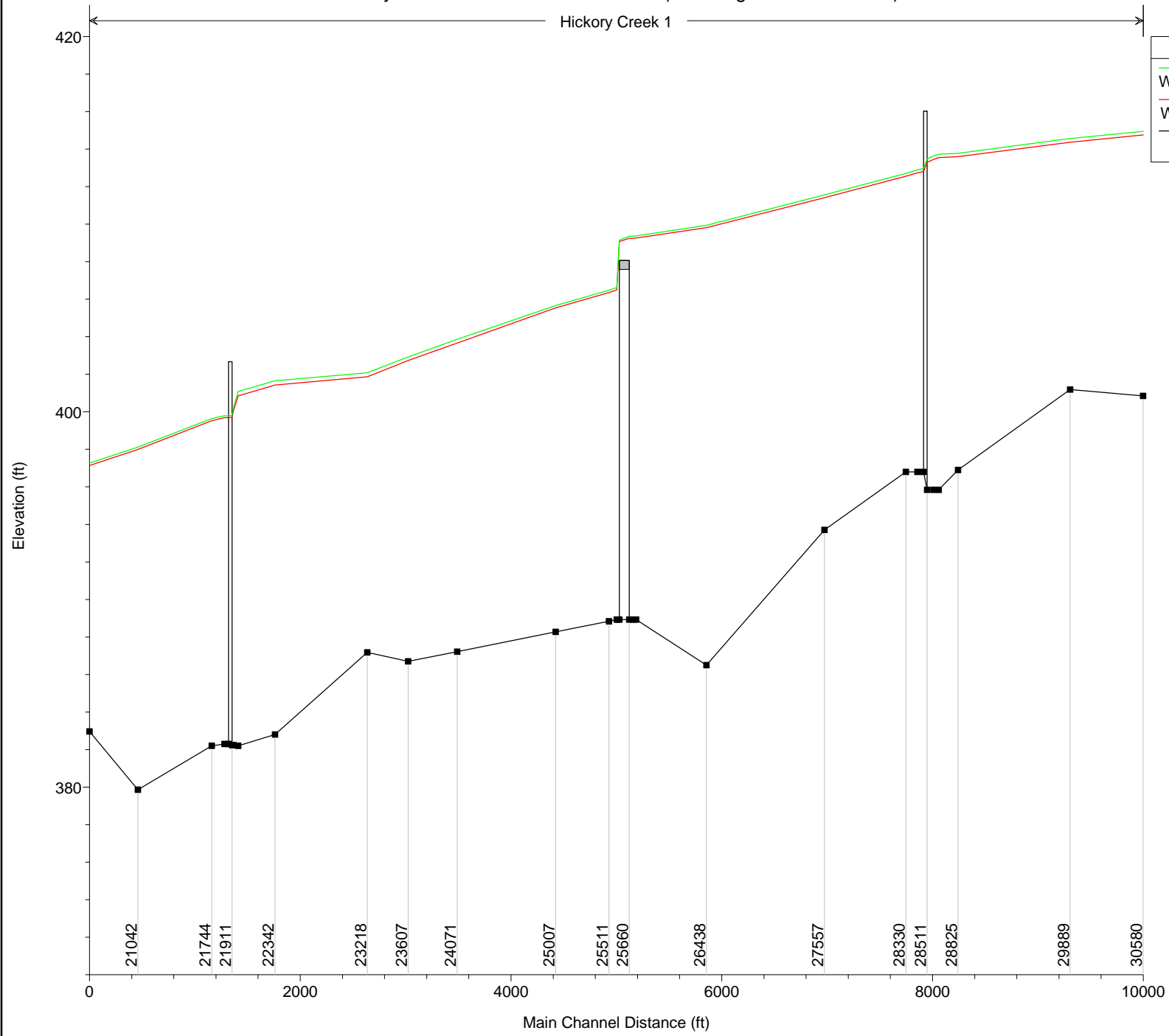
Legend	
	WS 1% Annual Chance - Ultimate
	WS 1% Annual Chance - Existing
	Ground



Hickory Creek 1




Legend

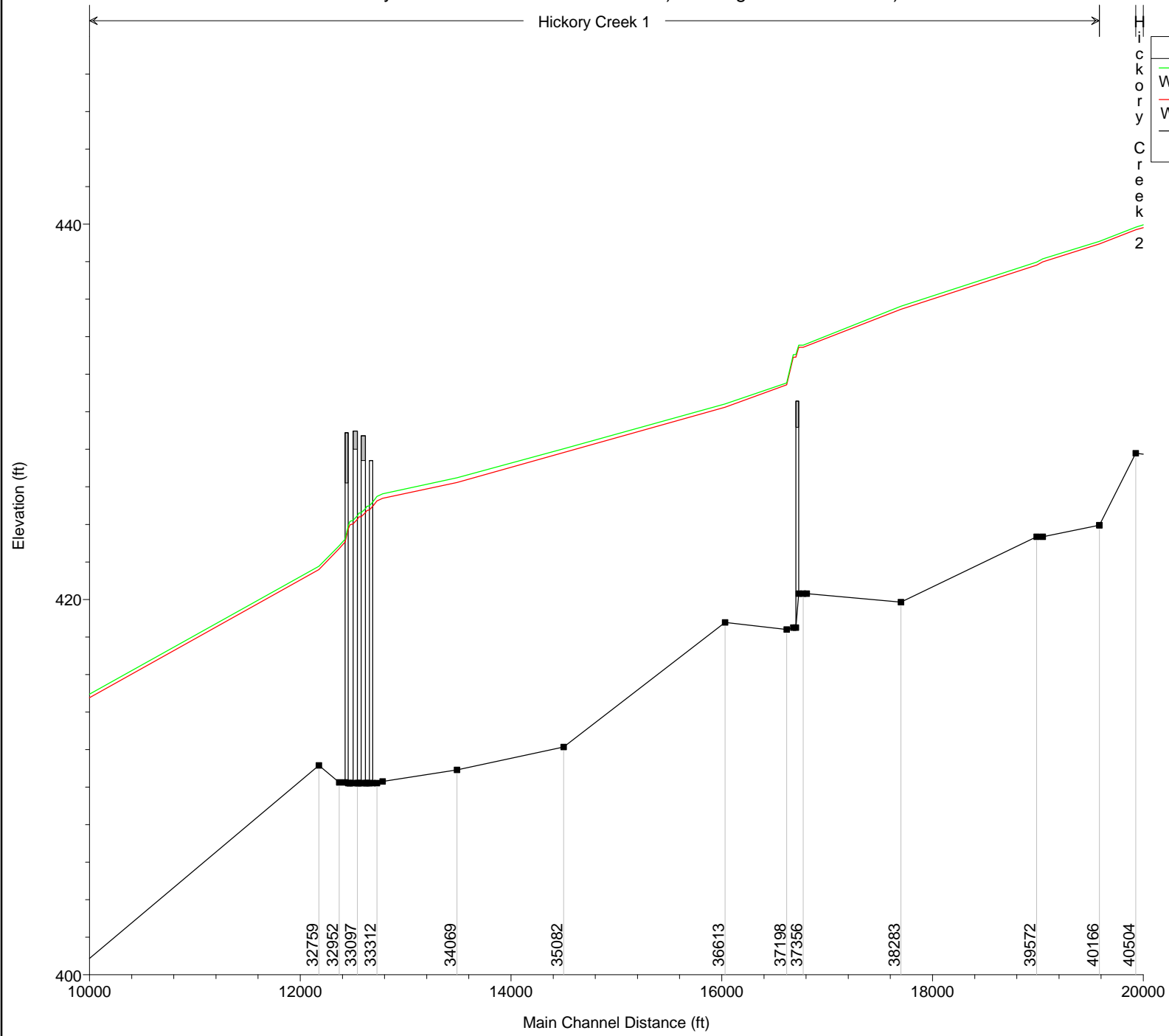
- WS 1% Annual Chance - Ultimate
- WS 1% Annual Chance - Existing
- Ground



Hickory Creek 1

Hickory Creek 2




Legend	
	WS 1% Annual Chance - Ultimate
	WS 1% Annual Chance - Existing
	Ground

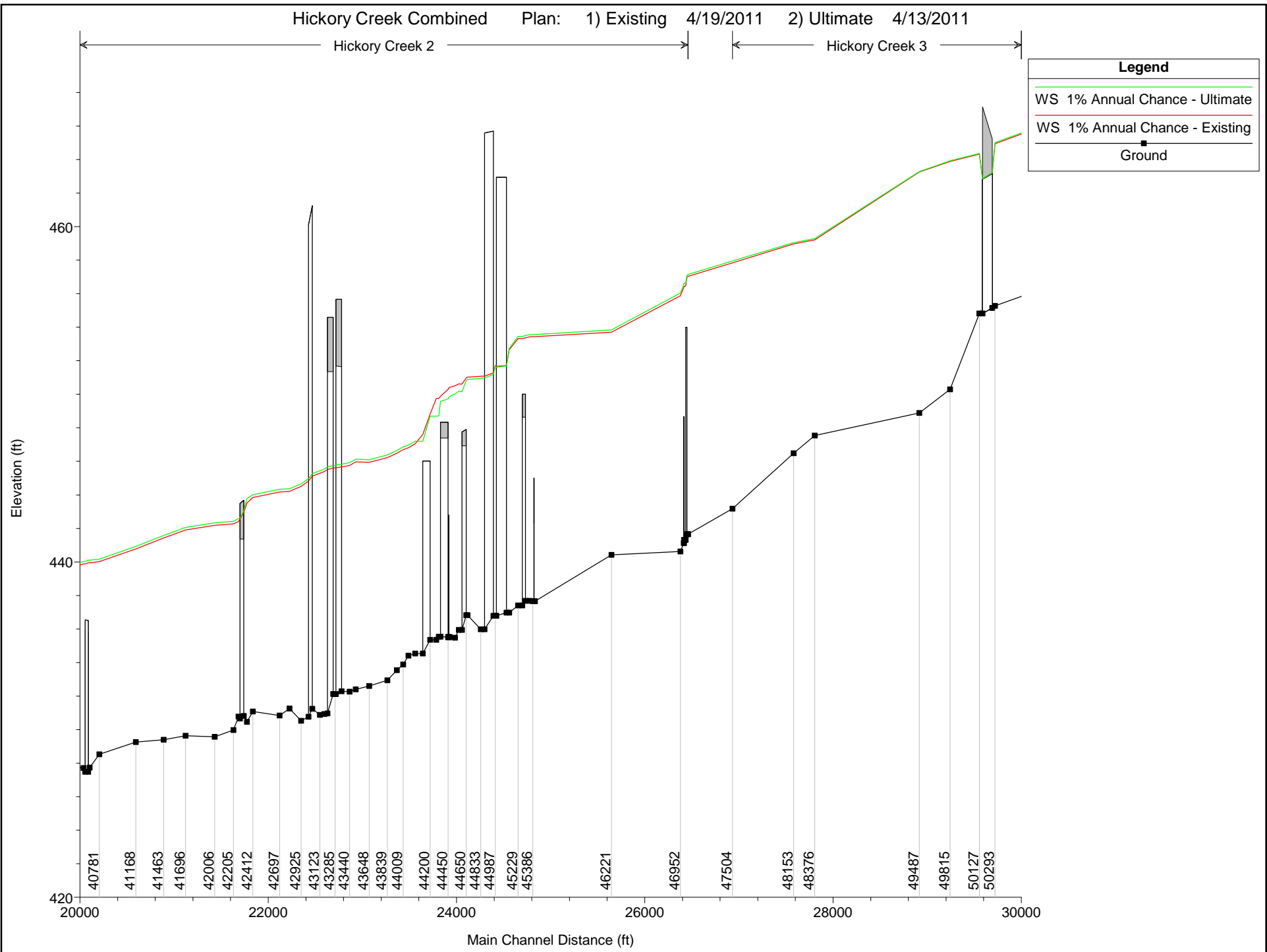


Hickory Creek Combined Plan: 1) Existing 4/19/2011 2) Ultimate 4/13/2011




Hickory Creek 2

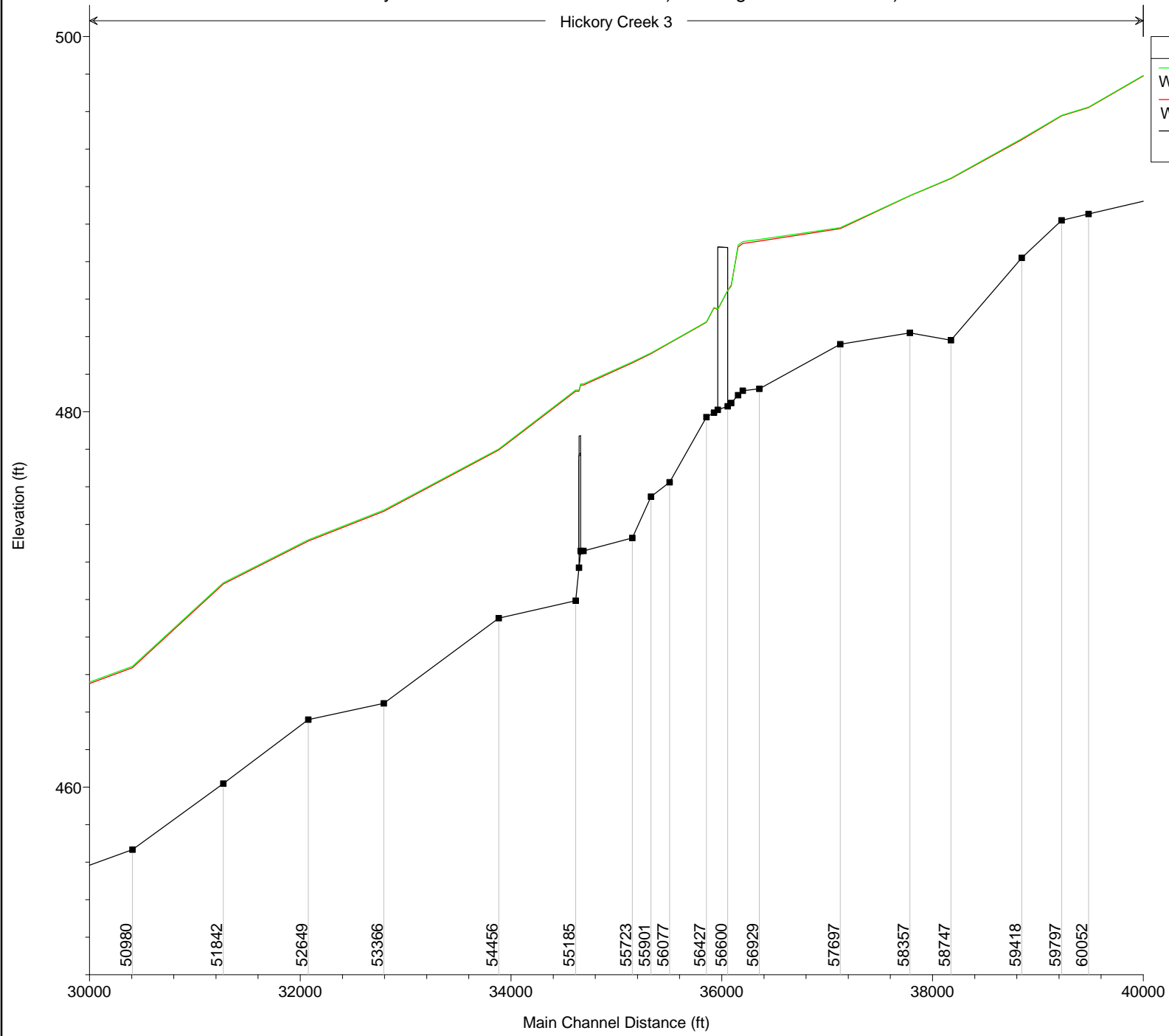
Hickory Creek 3

Legend	
	WS 1% Annual Chance - Ultimate
	WS 1% Annual Chance - Existing
	Ground

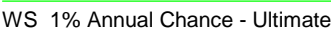
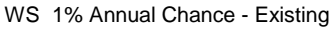
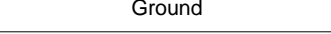


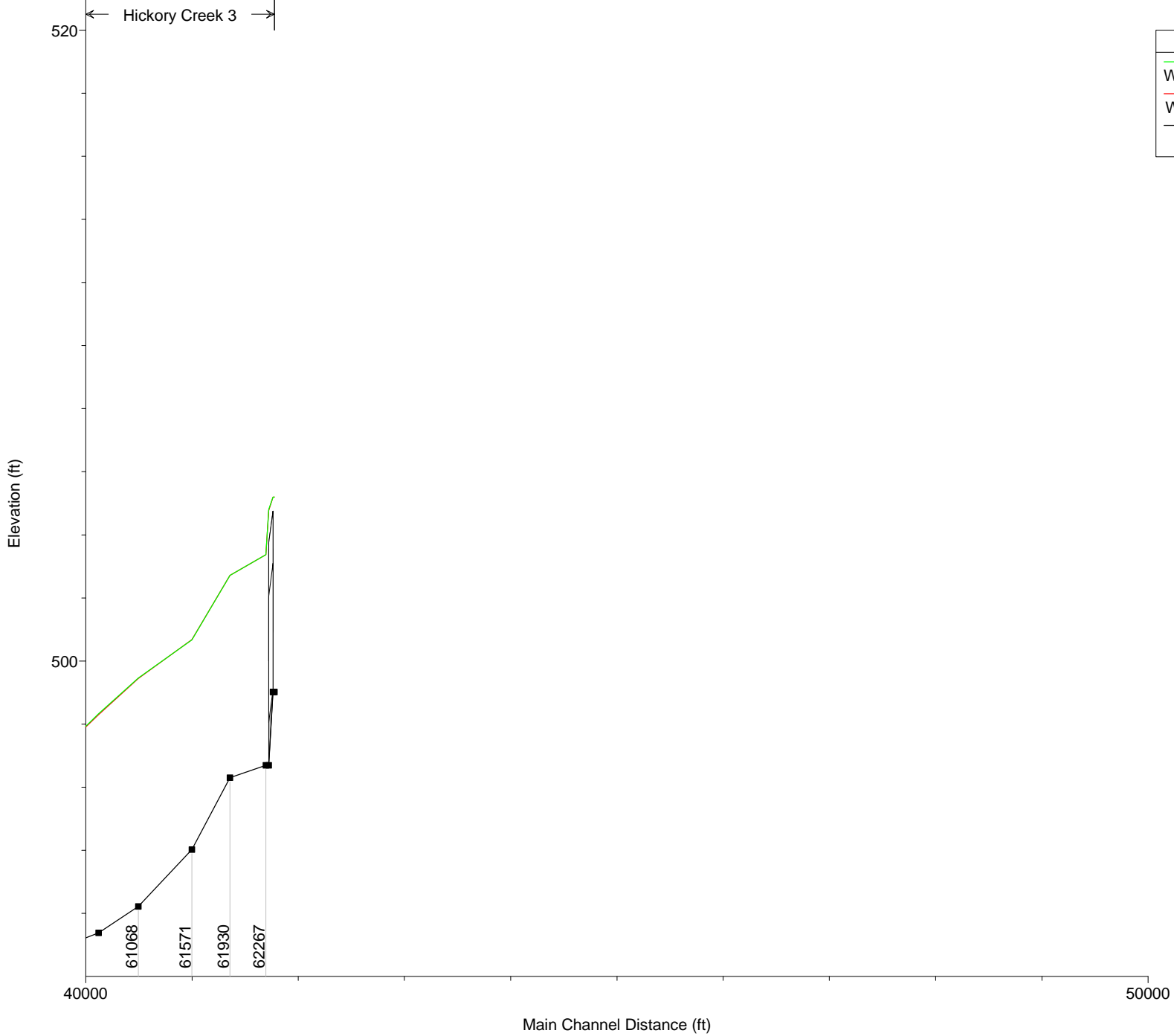
Hickory Creek 3

Legend	
	WS 1% Annual Chance - Ultimate
	WS 1% Annual Chance - Existing
	Ground



← Hickory Creek 3 →

Legend	
WS 1% Annual Chance - Ultimate	
WS 1% Annual Chance - Existing	
Ground	



Hickory Creek Combined Plan: 1) Existing 4/19/2011 2) Ultimate 4/13/2011

Hickory Trib 4 1

Legend	
WS 1% Annual Chance - Ultimate	
WS 1% Annual Chance - Existing	
Ground	

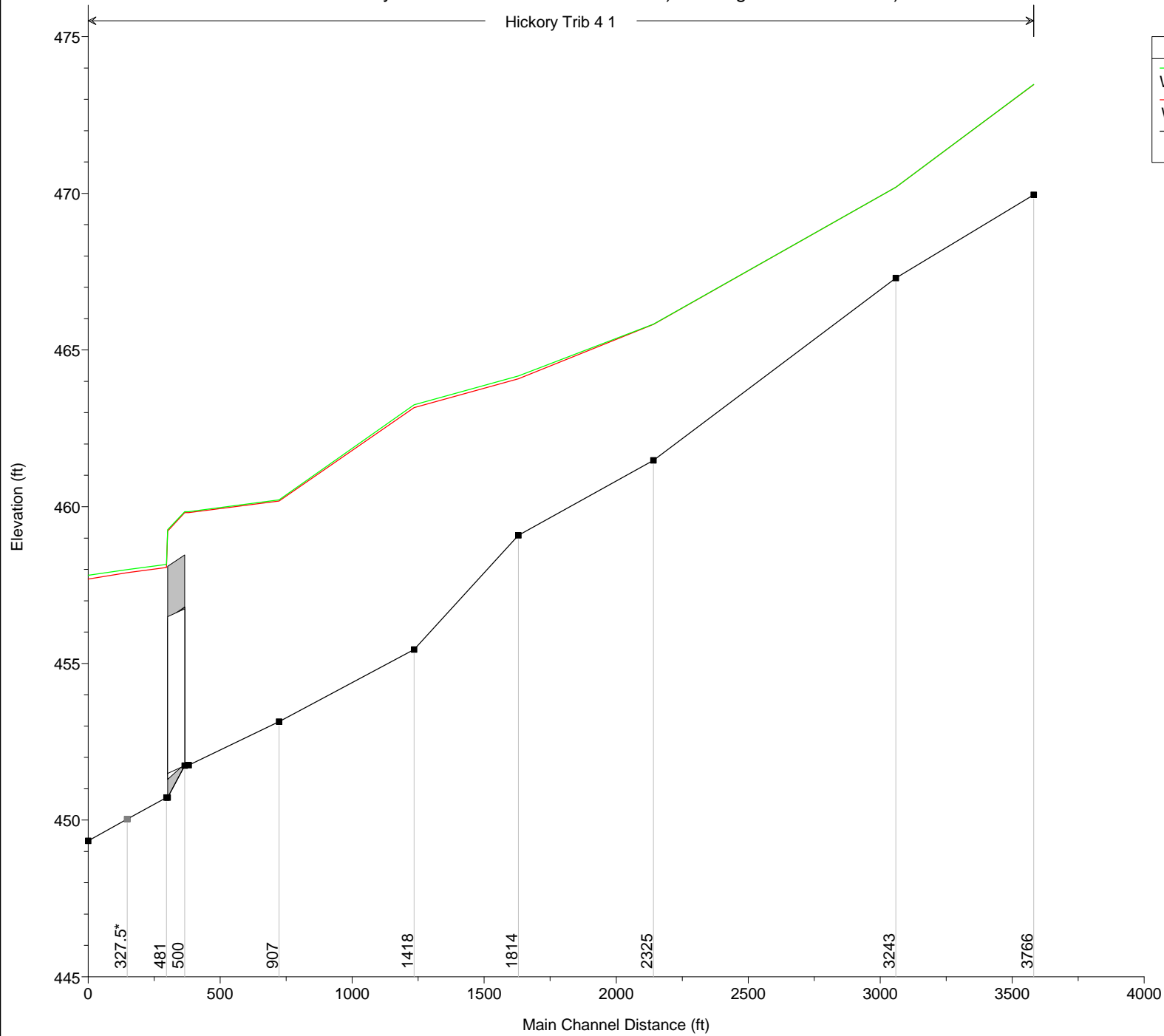




Table F.1 - Probable Construction Cost DCIALTI
CONSTRUCTION COSTS

ITEM	TXDOT #	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	COST
1	110 2002	EXCAVATION (POND)	324,343	CY	\$5.09	\$1,650,907
2	132 2001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	8,455	CY	\$7.72	\$65,274
3	420 2009	CL C CONC (HDWL)	3	CY	\$760.00	\$1,968
4	462 2013	CONC BOX CULV (6 FT X 6 FT)	180	LF	\$258.99	\$46,618
5	420 2002	CL B CONC (FLUME)	563	CY	\$326.81	\$183,994
6	160 2005	FURNISHING AND PLACING TOPSOIL	151,459	SY	\$10.61	\$1,606,980
7	164 2007	BROADCAST SEED (PERM) (URBAN) (CLAY)	151,459	SY	\$0.08	\$12,117
Subtotal						\$3,567,858
Mobilization (8%)						\$285,429
Storm Pollution Control (5%)						\$178,393
Contingencies (30%)						\$1,070,358
Total						\$5,110,000
Annual Estimated Cost						\$302,000

Table F.2 - Probable Construction Cost DCIALTII
CONSTRUCTION COSTS

ITEM	TXDOT #	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	COST
1	110 2002	EXCAVATION (POND)	324,343	CY	\$5.09	\$1,650,907
2	110 2002	EXCAVATION (CHANNEL)	504,448	CY	\$5.09	\$2,567,640
3	132 2001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	8,455	CY	\$7.72	\$65,274
4	420 2009	CL C CONC (HDWL)	3	CY	\$760.00	\$1,968
5	462 2013	CONC BOX CULV (6 FT X 6 FT)	180	LF	\$258.99	\$46,618
6	420 2002	CL B CONC (FLUME)	563	CY	\$326.81	\$183,994
7	432 2047	RIPRAP (CONC)(CL A)(6 IN)	5,143	CY	\$250.00	\$1,285,750
8	160 2005	FURNISHING AND PLACING TOPSOIL	151,459	SY	\$10.61	\$1,606,980
9	164 2007	BROADCAST SEED (PERM) (URBAN) (CLAY)	151,459	SY	\$0.08	\$12,117
Subtotal						\$7,421,248
Mobilization (8%)						\$593,700
Storm Pollution Control (5%)						\$371,062
Contingencies (30%)						\$2,226,374
Total						\$10,620,000
Annual Estimated Cost						\$627,000

Table F.3 - Probable Cost DCIALTIII – Buyout – Upstream of Lake June Road

Item No.	Description	Damage Center Affected	Quantity	Unit	Amount ¹
1	DCI_PROP1	Damage Center I	1	LS	\$68,670.00
2	DCI_PROP2	Damage Center I	1	LS	\$82,500.00
3	DCI_PROP3	Damage Center I	1	LS	\$69,130.00
4	DCI_PROP4	Damage Center I	1	LS	\$69,610.00
5	DCI_PROP5	Damage Center I	1	LS	\$57,760.00
6	DCI_PROP6	Damage Center I	1	LS	\$76,270.00
Subtotal					\$423,940.00
15% Market Adjustment / Purchase Price					\$63,591.00
					\$487,531.00
50% Closing/Relocation/Demolition Price					\$243,765.50
Total					\$731,296.50
Total Annual Cost					\$43,191.43
Estimated Annual Reduction In Flood Damages					\$48,130.00
Cost / Benefit Ratio					1.11

¹Dallas County Appraisal District 2008 Value for Land and Improvements

Table F.4 - Probable Construction Cost DCIIALTI
CONSTRUCTION COSTS

ITEM	TXDOT #	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	COST
1	110 2002	EXCAVATION (POND)	644,759	CY	\$5.09	\$3,281,824
2	132 2001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	259	CY	\$7.72	\$1,999
3	464 2013	RC PIPE (CL III)(60 IN)	268	LF	\$153.44	\$41,130
4	466 2073	HEADWALL (CH-FW-0)(DIA= 60 IN)	2	EA	\$10,300.00	\$20,600
5	464 2007	RC PIPE (CL III)(30 IN)	96	LF	\$51.04	\$4,898
6	466 2069	HEADWALL (CH-FW-0)(DIA= 36 IN)	2	EA	\$3,835.22	\$7,670
7	462 2013	CONC BOX CULV (6 FT X 6 FT)	180	LF	\$258.99	\$46,618
8	420 2009	CL C CONC (HDWL)	13	CY	\$760.00	\$10,131
9	420 2002	CL B CONC (FLUME)	668	CY	\$326.81	\$218,224
10	160 2005	FURNISHING AND PLACING TOPSOIL	107,376	SY	\$10.61	\$1,139,260
11	164 2007	BROADCAST SEED (PERM) (URBAN) (CLAY)	107,376	SY	\$0.08	\$8,590
SUBTOTAL						\$4,780,945
Mobilization (8%)						\$382,476
Storm Pollution Control (5%)						\$239,047
Contingencies (30%)						\$1,434,283
TOTAL						\$6,840,000
Annual Estimated Cost						\$404,000

Table F.5 - Probable Construction Cost DCIIALTI
CONSTRUCTION COSTS

ITEM	TXDOT #	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	COST
1	110 2002	EXCAVATION (POND)	1,632,184	CY	\$5.09	\$8,307,817
2	132 2001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	5,447	CY	\$7.72	\$42,051
3	464 2013	RC PIPE (CL III)(60 IN)	268	LF	\$153.44	\$41,130
4	466 2073	HEADWALL (CH-FW-0)(DIA= 60 IN)	2	EA	\$10,300.00	\$20,600
5	464 2007	RC PIPE (CL III)(30 IN)	96	LF	\$51.04	\$4,898
6	466 2069	HEADWALL (CH-FW-0)(DIA= 36 IN)	2	EA	\$3,835.22	\$7,670
7	462 2013	CONC BOX CULV (6 FT X 6 FT)	180	LF	\$258.99	\$46,618
	462 2034	CONC BOX CULV (10 FT X 10 FT)	270	LF	\$458.77	\$123,868
8	420 2009	CL C CONC (HDWL)	17	CY	\$760.00	\$12,684
9	420 2002	CL B CONC (FLUME)	705	CY	\$326.81	\$230,401
10	160 2005	FURNISHING AND PLACING TOPSOIL	238,741	SY	\$10.61	\$2,533,042
11	164 2007	BROADCAST SEED (PERM) (URBAN) (CLAY)	238,741	SY	\$0.08	\$19,099
					SUBTOTAL	\$11,389,879
					Mobilization (8%)	\$911,190
					Storm Pollution Control (5%)	\$569,494
					Contingencies (30%)	\$3,416,964
					TOTAL	\$16,290,000
					Annual Estimated Cost	\$962,000

Table F.6 - Probable Cost DCIIALTIII – Buyout – Upstream of Lake June Road

Item No.	Description	Damage Center Affected	Quantity	Unit	Amount
1	DCII_PROP1	Damage Center II	1	LS	\$101,950.00
	Subtotal				\$101,950.00
	15% Market Adjustment / Purchase Price				\$15,292.50
					\$117,242.50
	50% Closing/Relocation/Demolition Price				\$58,621.25
	Total				\$175,863.75
	Total Annual Cost				\$10,386.77
	Estimated Annual Reduction In Flood Damages				\$10,370.00
	Cost / Benefit Ratio				1.00

¹Dallas County Appraisal District 2008 Value for Land and Improvements

CITY OF BALCH SPRINGS

Table F.7 - Probable Cost Damage Center I & II – Buyout

Item No.	Description	Damage Center Affected	Quantity	Unit	Amount
1	DCI_PROP1	Damage Center I	1	LS	\$68,670.00
2	DCI_PROP2	Damage Center I	1	LS	\$82,500.00
3	DCI_PROP3	Damage Center I	1	LS	\$69,130.00
4	DCI_PROP4	Damage Center I	1	LS	\$69,610.00
5	DCI_PROP5	Damage Center I	1	LS	\$57,760.00
6	DCI_PROP6	Damage Center I	1	LS	\$76,270.00
7	DCII_PROP1	Damage Center II	1	LS	\$101,950.00
Subtotal					\$525,890.00
15% Market Adjustment / Purchase Price					\$78,883.50
					\$604,773.50
50% Closing/Relocation/Demolition Price					\$302,386.75
Total					\$907,160.25
Total Annual Cost					\$53,578.20
Estimated Annual Reduction In Flood Damages					\$58,500.00
Cost / Benefit Ratio					1.09

¹Dallas County Appraisal District 2008 Value for Land and Improvements



Appendix G
Hickory Creek Watershed
Hydrology QA/QC Checklist

New Detailed Study Hydrology QA/QC Checklist

Watershed Name: Hickory Creek
Modeler's Name: Jack Young
Model Name: N:\27000s\27171\Hydrology\Balch_Springs\Balch_Springs.hms
Reviewer's Name: Mayra Ortiz/Jeffrey Alvarez

I. WATERSHED DELINEATION:

Modeler's Initials: JMY Date Submitted: 2010-2-22
Reviewer's Initials: MO Date Reviewed: 2010-2-24
Modeler's Initials: JMY Date Responded: 2010-2-25

DATA FILES RECEIVED:

- ArcMap project file (watershed boundaries (name and area), study stream centerlines, topographic data, images, and etc.
N:\27000s\27171\Hydrology\Balch_Hydrology.mxd
- Description of modeler's assumptions, notes, and special issues.
Existing Model: I:\27000s\27171\Received\From 25113\Hydrology

TECHNICAL REVIEW:

- DA breaks at headwater limits of detailed hydraulic study.
- DA breaks at pertinent locations such as confluences, detention facilities, major highways, gages, etc.
- DA breaks at location common to current effective if applicable and feasible.
- Compare DA to previous studies.
Compared to DA in AVO 23153, both are 6.9 square miles.
- Is DA size reasonable for type of study?
- Do DA boundaries agree with available contours and images?

REVIEW COMMENTS:

Shapefile has been created that shows areas commented on.
N:\27000s\27171\QAQC\Drainage_Area_comments.shp

1. Adjust boundary between HC_B03 and HC_B04, south of Potter Lane, Oriole Street forms a ridge. See shapefile for "adjust DA boundary" areas.
2. Divide sub-basin for detention in HC_B02. Determine in field if this detention area is connected to the open channel east of Peachtree. Eight point sections will be needed in subbasin HC_B01 to model open channel that is not studied in RAS.
3. HC_B01, 02, and 03 outfall to the open channel in the SE corner of Peachtree and Bruton. Will the open channel be studied in this area where it is parallel to Bruton?
4. A portion of HC_B06 will drain to HC_B07 and bypass the crossing at Lake June Road because there's a culvert and ditch located about 350 ft to the east. Storm sewer maps will likely aid in this.
5. Divide sub-basin to reflect area draining to two detention ponds in 4C6T2_B02.
6. A separate sub-basin for the area draining to the detention pond in 4C6_B03 doesn't need to be done to model it as a detention basin in HMS as long as enough cross sections are used to model the pond with storage-outflow routing.

7. Plans for 635 may be needed to determine outfall of HCT4_B01 because whole area may not outfall at the headwaters of Hickory Creek Tributary 4. Field visit. AVO 23153 drainage area has a split along the highway.
8. Searched USGS website and USGS-NHD gage GIS file. None found.

RESPONSE TO COMMENTS:

1. Drainage Area adjusted
2. Drainage Area realigned. Will use detention pond and connect east of peachtree
3. The outfall channel will not be modeled. Will be added in downstream of HC_B06
4. DA adjusted
5. Will model two detention ponds in new subbasin 4C6T3_B01
6. Will use cross sections to model detention area.

II. "SKELETON" MODEL:

Modeler's Initials: JMY Date Submitted: 4/1/2010
Reviewer's Initials: JJA Date Reviewed: 4/14/2010
Modeler's Initials: JMY Date Responded: 4/16/2010

DATA FILES RECEIVED:

- ArcMap project file with Land Use, Soils, Drainage Paths, etc.
N:\27000s\27171\Hydrology\Balch_Hydrology_QAQC.mxd
- Description of modeler's assumptions, data sources.

- HMS model paths
N:\27000s\27171\Hydrology\Balch_Springs\Balch_Springs.hms
Note: HEC-HMS 3.4
- Loss Rate computations

- Time of Concentration / Lag Time computations
N:\27000s\27171\Hydrology\Balch_Tc.xls

TECHNICAL REVIEW:

Total Drainage Area: 6.879
Total No. of Subbasins: 36
Min DA sq. mi.: 0.018
Max DA sq. mi.: 0.577
Basin Models: Existing Conditions
Unit Hydrograph Method: SCS
Computation Interval: 2 min
Peaking Factor: N/A
Min Tc / Lag: 7.8 min
Max Tc / Lag: 39.6 min
Loss Rate Method: SCS
Min CN: 74/78
Max CN: 88/91
Min Initial Loss: N/A
Max Initial Loss: N/A
Min Uniform Loss: N/A
Max Uniform Loss: N/A
Rainfall Source: _____
Rainfall Distribution: _____

REVIEW COMMENTS:

1. In the HMS basin model, all of the lag times are not entered.
2. Sheet flows should not be greater than 100 feet as a general rule. You have several that are. Please reduce these.
3. Before running the HMS model change the control window to a current date and make the total running time equal to 24 hours at least.
4. In subarea HC_B01, the portion of shallow paved flow along State Highway 352 should be pipe flow as the water gets picked up in storm sewer in this area. See my suggested adjustment to the flowpath in purple graphics in the mxd. Also see my pink graphic at the top part of the subbasin for an adjustment to the boundary per the storm sewer inlet locations.

5. The Shallow paved section in HC_B01 extends through a dry detention pond downstream of SH 352. This area should be modeled as a reservoir because it is about 6 acres in surface area and approximately 6 feet of depth. Subarea HC_B01 should be split up further to accommodate adding in this reservoir.
6. You have the entire HC_B01 going into the HC_Res02 reservoir and then being routed downstream through an 8-point cross section. Why? You can only route the portion of the subarea through the area that goes into it not the entire area. The way you have it you are double routing some of the area once through a reservoir and then through a routing reach. Break up the subarea smaller so that you have an area that only goes into the reservoir and then another area that enters what you are calling the 8-point cross sections. I don't like 8-point cross sections.
7. Frankly in subarea HC_B01 you have a more complicated detention pond situation than you are modeling. You have 4 ponds connected consecutively in series through this subarea. This situation should be modeled in either unsteady RAS or PondPack or some manual calculation method in order to show the true effects of these ponds on each other and on discharges downstream. My opinion.
8. Reservoir HC_Res01 should be modeled with a diversion structure because you have a 42 inch RCP discharging the pond into what you have modeled now as an 8-point routing reach HC_R01 on the other side of Sam Houston Road. This reservoir also has concrete overflow spillway that spills over into the roadside ditch along Sam Houston, flow south down through that ditch, and ultimately combine with the outflow from the ponds in subarea HC_B01 at the intersection of Sam Houston, Bruton, and PeachTree Roads. You need to adjust your HMS model to reflect this situation.
9. In subbasin HC_B04, at the end of Nectar Street the flow enters storm sewer before entering the roadside ditch along Peach Tree. See the storm sewer file attached in the mxd to see where to adjust your flow path flow designation in this area.
10. For HC_B05, where the flowpath changes from shallow paved to shallow unpaved at the intersection of Powell and Potter Roads, there are several storm sewer inlets that collect the flow and goes to storm sewer at this point. See my adjustment in your flowpath to follow the storm sewer that I have shown in purple graphics in the mxd. Also, see my adjustment in the mxd for the drainage area boundary because of this shown in pink.
11. Junction HC_J02 is directly connected to Junction HC_J04, which is located at the drainage boundary for HC_B06 and HC_B07. This is not where the storm sewer from underneath Bruton Road (2 –large box culverts) enters into Hickory Creek. It enters the southern roadside ditch of Bruton Road at that intersection. Because of this, Junction HC_J02 should be connected to Junction HC_J03 via another routing reach for that southern roadside ditch. Please make this adjustment.
12. In subbasin HC_B06, the shallow unpaved section of your flowpath along Limestone and Peachtree roads should be channel flow as this portion of the flow is in a roadside ditch. The ditch flow should start just west of Lombardy Road along Limestone.
13. For subbasin HC_B07, 148.8 foot shallow unpaved section of the flowpath should be channel flow as it is in a roadside ditch. There is also a section of your shallow unpaved section of flow path along Russell Street that should be "shallow paved".

14. For HC_B08, a flowpath adjustment that comes from north of Lake June road and extends through that secondary ditch that runs parallel to Hickory Creek just to the west of Dinah Road may give you a longer Tc. Verify if this adjustment makes sense.
15. For Subarea HCT4_B01, the long path of shallow unpaved in the center of IH-635 should be channel flow. From looking at the pictures along 635, I believe the grassy area between the highway lanes is a standard TXDOT drainage ditch.
16. Also, at the point along IH-635 where your channel flow turns to shallow paved flow and jumps out of the ditch onto the highway, what causes this to occur? At this point I think that the water goes into storm sewer pipe as this is a low point in the highway ditch. The way you have the flowpath drawn the water is going uphill which of course is not happening. How do we know that the drainage from IH-635 enters at the top of HCT4_B02? I think that it all discharges through an outfall pipe into a ditch along the ramp just south of Echo Drive. However, we need to find out IH-635's drainage from plans to verify this. Also, see my adjusted subbasin boundary in pink along IH-635 between subareas HCT4_B02 and HC_B12 as shown in the mxd.
17. For subbasin HC_B09 the flowpath continues straight through Peachtree Road, continues along a ditch, and enters the stream earlier than you have shown. See my suggested alteration in the mxd in purple graphics.
18. Close off the subbasin boundary for HC_B10 along Elam Road per my pink graphics in the mxd and make that finger to the north part of subbasin HC_B09. There should also be another adjustment made to subbasin boundary HC_B10 along Peachtree Road. See my pink graphics.
19. For subarea HC_B13 all of your shallow unpaved should be changed to channel flow in your flowpath. Also, once your shallow paved section of your flowpath reaches Seagoville Road it then enters storm sewer until your shallow unpaved section begins approximately. Make these adjustments.
20. For Subarea 4C6_B01, once the flowpath hits Pioneer Road it enters storm sewer until it reaches the channel downstream. Adjust flowpath to reflect.
21. For subbasin HC_B12, between Timothy Road and the subdivision where your flowpath enters Summer Hill road the flowpath should be channel flow. At that point it should continue on as storm sewer flow until it reaches Shepard Road, at which point it enters a concrete lined roadside ditch and then reenters storm sewer on the west side of Shepard road. See my adjusted flowpath in purple graphics in the mxd. At that point I am unclear where the storm sewer goes. A field trip out there is necessary to find out. Also, see my adjusted subbasin boundary with 4C6T1_B01 in pink graphics.
22. For subbasin 4C6_B03, you flowpath starts with sheet flow, but it starts on top of a building. Remove the sheet flow. Also, see my suggested adjustment to the flowpath in purple graphics to follow a concrete alley between Marsha and Oakwood Streets.
23. For subbasin 4C6_B05, the flowpath should enter storm sewer pipe approximately where Pioneer Oaks Road intersects and continue along the Pioneer Drive until it outfalls into the channel crossing. Remove the portion of "shallow unpaved" flowpath. From Pioneer Oaks to the stream crossing the flowpath should be pipe flow.
24. For subbasin 4C6_B04, see my suggested adjustment to the flowpath in purple graphics. Also, once the flowpath is approximately at the location where Rustic Drive intersects, it enters storm sewer until it outfalls into the stream. Make the adjustments.

25. For subarea 4C6T2_B01, there is a storm sewer inlet in the cul de sac of Cedar Creek Way. The flowpath from that point should be pipe flow. Also, see my suggested adjustments to the subbasin boundary per pink graphics in the mxd. Also, see my suggested adjustments to the subarea boundary per the pink graphics in the mxd.
26. For subarea 4C6T3_B01, the shallow paved section of the flowpath should end at approximately 488 feet from where it starts. From that point on it should be pipe flow as the water would enter storm sewer at this point until it reaches the channel downstream. Also reservoir 4C6T3_RES02 should be modeled as a routing reach instead of a reservoir.
27. For subarea 4C6T2_B03, the shallow unpaved portion of your flowpath along the IH-635 drainage ditch should probably be channel flow. At the downstream most limits of your flowpath, you are missing about 470 feet of pipe flow as it extends under IH-635.
28. For subarea 4C6_B07, see my suggested adjustments to your flowpath per the purple graphics in the mxd.
29. For subarea 4C6T2_B04, see my suggested adjustments to the flowpath per the purple graphics in the mxd. However, at the point where the purple graphics meet your existing flowpath the flow enters storm sewer, but I can't see where the storm sewer ends. A field trip to the site is probably necessary to find out unless we can get some storm sewer info from the City.
30. For subarea 4C6_B06, where the flowpath reaches Seagoville Road it enters storm sewer and remains in storm sewer along the remainder of your flowpath until it outfalls into the creek. Make the adjustment in your flowpath designation.
31. You have pond flow along the flowpath for subarea 4C6_B06 that you are not reflecting.
32. See my suggested adjustment to the flowpath for subarea 4C6T1_B03. Along Halfway along my suggested adjustment along Seagoville Road the flow enters storm sewer and continues as pipe flow until it reaches the stream.
- 33.

RESPONSE TO COMMENTS:

1. Lag times added to HMS model.
2. Sheet flows adjusted to be less than 100 feet
3. Current running time set at 36 hours
4. Flowpaths adjusted
5. All Mesquite detention ponds have been added
6. Area was adjusted based on NDMCE hydrology model
7. All ponds have been added to HMS
8. Diversion added. Spillway also added.
9. Flowpaths adjusted to include storm sewers
10. DA adjusted to reflect storm sewers.
11. Fixed
12. Fixed
13. Fixed
14. Fixed
15. Fixed
16. Revised based on plans

- 17. Fixed
- 18. Fixed
- 19. Fixed
- 20. Fixed
- 21. Fixed
- 22. Fixed
- 23. Fixed
- 24. Fixed
- 25. Fixed
- 26. Fixed
- 27. Fixed
- 28. Fixed
- 29. Fixed
- 30. Fixed
- 31. Fixed
- 32. Fixed

III. FLOOD ROUTING:

Modeler's Initials: JMY Date Submitted: 8/31/2010
Reviewer's Initials: JJA Date Reviewed: 9-14-10
Modeler's Initials: JMY Date Responded: 9/20/2010

DATA FILES RECEIVED:

- ArcMap project file with Land Use, Soils, Drainage Paths, etc.
N:\27000s\27171\Hydrology\Balch_Hydrology_QAQC.mxd
- Description of modeler's assumptions, notes, and special issues.
Summary of Qs: N:\27000s\27171\Hydrology\Qs.xlsx
- Data sources, hydraulic models, computations, record plans, etc.

Routing Method(s):

Channel/Floodplain Storage: Modified Puls/Kinematic Wave
Detention Routing: Reservoir

REVIEW COMMENTS:

1. Between MES_Res01 and junction MES_J01 you should have routing reaches representing the storm sewer pipe connection between them unless you are using the NDM HEC-1 import "as is" and not making any adjustments. Otherwise, if you are adjusting their data anywhere you should make this adjustment as well. Also, the outlet shows a 48"RCP and the storm sewer file shows a 36"RCP. The outlet number of barrels is not defined.
2. MES Diversion does not have the diversion method defined and therefore does not divert any water anywhere. Fix.
3. For routing reach MES_B06 where does the invert elevation come from? Also, the length of this routing reach should be extended to the point where the flow enters this ditch, maybe another 1700 feet.
4. For MES_R04, the spillway elevation is set at 516. The 2001 contours show elevation 512 across the concrete spillway. Where did the 516 elevation come from? The outlet number of barrels is not defined.
5. For MES_Res02, shouldn't there be two culvert outlets? Where does the dam top information come from? I don't see anywhere on the topography where the top of dam would be at elevation 514. The number of barrels is also not defined for the outlets. I am also not sure where the Dam top information comes from. I don't see anywhere the pond is contained by elevation 514 per the topography?
6. For MES_Res03, the outlet culverts do not have the number of barrels defined. Also, the diameter of all 4 culverts in the storm sewer file show 36"RCPs, but the HMS model shows 30" RCPs.
7. For MES_R05 the outlet number of barrels is not defined. Also, the wsel in the pond is 2 foot higher than the spillway top elevation of 504.05. However, there is no dam top defined to account for all of the flow that will overtop Sam Houston and Peachtree which appear to be at elevation 504 according to the contours. Frankly, I don't see a spillway, just the two roads confining the pond.
8. Split the routing reach HC_R03 up into two reaches at the point where DA HC_B07 enters the stream. This location is about halfway up the reach per your longest flowpath and approximately 90% of HC_B07 enters at this point so there should be a junction to represent a Qbreak at this location.
9. In the description window of all of your routing reaches you should add detail regarding what cross sections in the HEC-RAS model the information comes from.

10. Should split DA 4C6_B05 along the halfway mark because about 50% of the DA will have entered the stream at the point where it makes that 90 degree turn to the south. This will allow for the routing reach to be split at this location and have another Qbreak at the created junction.
11. For junction 4C6_J03, make sure in the HEC-RAS model that this Qbreak location occurs at the cross section on the upstream side of the online pond rather than at the end of the routing reach cross section.
12. For reservoir and 4C6T3_RES02 the outlet definition does not include the number of culvert barrels.
13. For 4C6T3_Res01 why is there an auxillary connection set at 4C6T2_J02?
14. For reservoir 4C6T2_J02 where does the information for the outlet come from? From the aerial photos that the outfall structure is a typical detention pond riser pipe structure which would need to be input as a elevation-storage-discharge relationship.
15. For reservoir 4C6T3_RES01, how far up the stream do you define the reservoir? Does the pond definition stop at the end of your longest flowpath?
- 16.

RESPONSE TO COMMENTS:

1. Added reaches for each pipe.
2. Removed Diversion. Have the auxiliary connection instead.
3. Invert elevation based on elevation on the east side of Peachtree
4. Redid spillway. Created cross section and included spillway in dam top.
5. Redid spillway. Created cross section and included spillway in dam top. Number of barrels included in model.
6. Pipe size adjusted. Barrels included.
7. Dam top added. Barrels included.
8. Split the reach in two. **Adjusted all basin/reach/junction numbers downstream accordingly.**
9. Cross section information is included in storage/discharge tables. Will add to reaches.
10. Drainage area split. Calculated new flowpaths, CN, and routing storage values for new DA. **Adjusted all basin/reach/junction numbers downstream accordingly.**
11. Adjusted the Q break location
12. Barrel numbers are included in model.
13. Auxiliary connection represents the overflow exiting the pond to the west into the channel.
14. Redid the outlet. Modeled the riser in Hydraflow.
15. Adjusted the flowpath to end where the pond definition begins.

IV. FINAL MODEL:

Modeler's Initials: JMY Date Submitted: 9/17/2010
Reviewer's Initials: JJA Date Reviewed: 9-29-10
Modeler's Initials: JMY Date Responded: 10/1/2010

DATA FILES RECEIVED:

- Calibration
- Frequency Analysis
- Table of Discharges
- Comparison of Discharges

CALIBRATION PROCEDURES/RESULTS:

FREQUENCY ANALYSIS PROCEDURES/RESULTS:

DISCHARGE DIFFERENCES GREATER THAN 10% OF CURRENT FIS:

Summary of Q's - N:\27000s\27171\Hydrology\QsREVB.xlsx
Comparison to old study: N:\27000s\27171\Hydrology\ComparisonQs.xlsx

REVIEW COMMENTS:

1. Per your Qbreak spreadsheet, why isn't there a Qbreak from junction HC_J05 included in the RAS model?
 2. Should the # of subreaches for HC_R03 be set at 1? In your Balch Routing Reach.xls file it suggests that it should be higher.
 3. The discharges along Stream HCT4 does not incorporate the DA HCT4_B02. The model should have a junction before junction HC_J09 that connects DA HCT4_B02 to the downstream end of routing reach HCT4_R01 then that junction connects to junction HC_J09. The new junction's discharge should be entered at cross section 1412 on HCT4.
 4. For the Qbreak at junction 4C6_J03 should be rounded to 750cfs rather than 800cfs.
 5. I don't see the need to hold the same constant discharge for the areas highlighted in yellow in the spreadsheet. If the routing reduces the discharges based upon offset peaks then the discharges HMS is reporting at the junctions should be used.
 6. Add another junction along 4C6T2 at the end of routing reach 4C6T2_R03. Connect 4C6T2_B04 to that junction and then connect the new junction to junction 4C6_J06. In RAS, add in a Qbreak from this new junction at cross section 599.
 - 7.



RESPONSE TO COMMENTS:

1. Q break added
2. Fixed
3. Adjusted
4. Fixed
5. Discharges adjusted
6. Added, Q break adjusted

QA/QC APPROVAL:

This New Detailed Study Hydrology QC review is in compliance with the contract requirements and all task "check points" are complete. Task checklists have been appropriately documented and signed by the reviewer, approved by the QA Manager and then forwarded to the production team along with all check prints/drafts and text. A meeting was conducted with the QC Team and Production Team to formally review the QC comments and resolve any problems/conflicts. Task production leaders have signed the QC document to confirm that all comments are received, addressed and documented appropriately.

QA Manager: Jeffrey J. Albrey Date: 4/26/2011
Task Leader: [Signature] Date: 4/26/2011
Project Manager: Jessica D. Baker Date: 4/26/2011

Appendix G
Hickory Creek Watershed
Hydraulics QA/QC Checklist

New Detailed Study Hydraulics QA/QC Checklist

Stream Name: Hickory Creek
 Modeler's Name: Jack Young
 Model Name: Hickory Creek Combined
 Reviewer's Name: Jeffrey Alvarez

I. CROSS SECTION LAYOUT:

Modeler's Initials: JMY Date Submitted: 5/3/10
 Reviewer's Initials: JJA Date Reviewed: 5/6/10
 Modeler's Initials: JMY Date Responded: 5/6/10

SUBMITTED ITEMS:

- ArcMap project file name:
N:\27000s\27171\Hydraulics\BalchSprings_Hydraulics_QAQC.mxd
- GeoRAS Geodatabase
N:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers
 - Study Stream Centerlines-for Scoping Categories
N:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
 CL
 - Topographic Maps
\\Srvd50\DFS-
 Citrix\Misc\Texas_Data\NCTCOG\NCTCOG_FEMA_PROJECTS_ONLY\2007\DVD_200
 80730\Contours_Dallas\47--41A.shp
 - Images
N:\Imagery\Landiscor2009\Dallas-FtWorth0409_1ft\
 - Q3 or Current Floodplains
N:\27000s\27171\S_FLD_HAZ_Balch.shp
 - Watershed Location
N:\27000s\27171\Hydrology\DA\Balch_DA_REV.shp
 - Any previous study workmaps
N:\27000s\27171\Hydraulics\23731_XS.shp
 - Road network for names
N:\22000s\22205B\Production\2006DFIRM\DALLAS_2006_DFIRM\PRELIMP_DB\s_trns
 port_In.shp

TECHNICAL REVIEW:

- Cross Sections Extend to Assumed Limits of Floodplains
- Reasonably perpendicular to flow
- Reasonable location of the 4 bridge cross section
- Reasonable spacing
- Reasonable transitions, constrictions and expansion on floodplain

REVIEW COMMENTS:

1. Why cross sections 9394 through 9314 on Hickory Creek? Why so close together?
2. Remove cross section 9577 on Hickory Creek. Don't need.
3. Remove cross sections 5502 and 5400, 5614 and 5819. Replace with my red graphic cross sections.
4. See all of my suggested adjustments in red graphics in the mxd.

RESPONSE TO COMMENTS:

1. There is a structure between 9394 and 9352. 9314 was added for comparison because it was a cross section in a previous study.
2. Cross section removed.
3. Cross sections moved.
4. All comments have been adjusted except in the locations where survey was available.

New Detailed Study Hydraulics QA/QC Checklist

Stream Name: Hickory Creek
 Modeler's Name: Jack Young
 Model Name: **Tribs 4C6, 4C6 Trib1, 4C6 Trib 2**
 Reviewer's Name: Jeffrey Alvarez

I. CROSS SECTION LAYOUT:

Modeler's Initials: JMY Date Submitted: 5/3/10
 Reviewer's Initials: JJA Date Reviewed: 5/6/10
 Modeler's Initials: JMY Date Responded: 5/6/10

SUBMITTED ITEMS:

ArcMap project file name:

- N:\27000s\27171\Hydraulics\BalchSprings_Hydraulics_QAQC.mxd
- GeoRAS Geodatabase
N:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers
- Study Stream Centerlines-for Scoping Categories
N:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP_CL
- Topographic Maps
\\Srvd50\DFS-Citrix\Misc\Texas_Data\NCTCOG\NCTCOG_FEMA_PROJECTS_ONLY\2007\DVD_20080730\Contours_Dallas\47--41A.shp
- Images
N:\Imagery\Landiscor2009\Dallas-FtWorth0409_1ft\
- Q3 or Current Floodplains
N:\27000s\27171\S_FLD_HAZ_Balch.shp
- Watershed Location
N:\27000s\27171\Hydrology\DA\Balch_DA_REV.shp
- Any previous study workmaps
N:\27000s\27171\Hydraulics\23731_XS.shp
- Road network for names
N:\22000s\22205B\Production\2006DFIRM\DALLAS_2006_DFIRM\PRELIMP_DB\s_trnsport_ln.shp

TECHNICAL REVIEW:

- Cross Sections Extend to Assumed Limits of Floodplains
- Reasonably perpendicular to flow
- Reasonable location of the 4 bridge cross section
- Reasonable spacing
- Reasonable transitions, constrictions and expansion on floodplain

REVIEW COMMENTS:

1. Why cross sections 9394 through 9314 on Hickory Creek? Why so close together?
2. Remove cross section 9577 on Hickory Creek. Don't need.
3. Remove cross sections 5502 and 5400, 5614 and 5819. Replace with my red graphic cross sections.
4. See all of my suggested adjustments in red graphics in the mxd.

RESPONSE TO COMMENTS:

1. There is a structure between 9394 and 9352. 9314 was added for comparison because it was a cross section in a previous study.
2. Cross section removed.
3. Cross sections moved.
4. All comments have been adjusted except in the locations where survey was available.

II. RAS GEOMETRY: NOTE – Hickory Creek and Hickory Creek Trib 4

Modeler's Initials: JMY Date Submitted: 7/28/2010
 Reviewer's Initials: JJA Date Reviewed: 8/20/10
 Modeler's Initials: JMY Date Responded: 8/23/10

SUBMITTED ITEMS:

ArcMap project file name:

N:\27000s\27171\Hydraulics\BalchSprings_Hydraulics_QAQC.mxd

 ArcMap project has all files listed in Milestone I Stream CenterlineN:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
CL FlowpathsN:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
FL Field Surveys sketches, photos, and points fileSee Hydraulics notes Bridge Record Plans Stationing assumptions and calculations for field surveys Manning's n-values assumptionsN:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
NvaluesTECHNICAL REVIEW:

- Top of bank at reasonable locations
- Bridge Geometry Corresponds to Surveys or Record Plans
- Bridge Geometry assumptions documented
- Contraction and expansion coefficients
- Proper use of Ineffective flow areas
- Reasonable Manning's n-values
- No Crossing profiles

REVIEW COMMENTS:

1. Cross section stations in model do not match the xsection file in the mxd.
2. For Trib 4, raise the banks stations on cross section 3127 to stations 254.34 and 369.04.
3. For Trib 4, raise the banks stations on cross section 3598 to stations 258.59 and 387.89.
4. For Trib 4, at STR18 on the upstream bounding cross section the left ineffective area elevation should be lowered to the minimum deck elevation (approximately 458.31) to prevent blocking conveyance over the deck.
5. What about your downstream flowline survey shot for STR18?
6. The n-values don't seem to match the specified N-value shapefile for Trib 4?
7. Culvert information at STR18 is incomplete (no n-values or entrance loss coefficient). Chart and scale #s do not match what I see in the surveys.

Hickory Creek

1. At cross section 4784 there are no bank stations defined.
2. On Cross sections 3911 to 3130 the channel n-value reads 0.65. Adjust.

3. Another cross section should be added downstream of cross section 19053 to represent the beginning of the concrete lined portion of the channel. Should be able to use the surveyed channel shots at STR03 with flowline adjustments.
4. An additional cross section should be added at the location of the downstream flowline survey shot to represent the end of the concrete lined channel. Should be able to use the surveyed channel shots at STR03 with flowline adjustments
5. The metal rail at Lake June should not be included in the modeling, just the concrete portion of the rail and the CCWall at the ends of the rail.
6. Channel Manning's n-values at cross sections 18945 and 18782 should be adjusted to reflect concrete lining.
7. At Lake June, why would you not include the culvert under the road in the left overbank as a multiple opening like you did on the Bruton crossing?
8. The left ineffective area is blocking conveyance across the bridge deck. Lower its elevation to the lowest bridge deck elevation in the left overbank to prevent this.
9. At cross section 18782, where does point 1807.75 come from? The notes in the description state that this cross section is adjusted per survey. That point does not seem to fit based upon the upstream surveyed cross section. Check.
10. The pier at Lake June should also include the square portion of the pier at the top that is wider than the circular portion of the pier at the bottom.
11. At cross section 19975 in the right overbank, there is a small triangular area of heavy trees that the n-values do not reflect. Fix.
12. DA HC_B08 should be combined with DA HC_B07 along Lake June and Hickory Tree roads to accommodate the way the cross sections 19975 through 18945 are drawn.
13. Cross sections 17537 and 17461 straddle across DAs HC_B08 and HC_B09 in the left overbank. Adjust the DA boundary to fix this issue.
14. At Stein Road, the surveys show the length of the culverts as 15.8 feet. The model shows 20 feet. Also, the rail could be removed from the deck data.
15. At Elam Road, the deck data on the upstream interior cross section goes up at station 514.35 from elevation 468.62 to 469.25. I see the survey TR point at elevation 468.62, but where does the 469.25 come from? It does not show up on the downstream side?
16. At Elam Road, change your chart and scale number to be 8- flared wingwalls with 1- Wingwall flared 30 to 75 deg. Adjust your entrance loss coeff to reflect as needed.
17. At cross section 9858 realign the cross section in the ROB so that it does not cross the DA boundary.
18. At Eleanor Lane, the ineffective area placements are higher than the minimum elevation of the deck on both sides of the bridge. Lower their elevations to reflect.
19. What about the pipeline crossing downstream of Eleanor bridge crossing?
20. At Eleanor Lane the field notes show a width of 14.9 feet that is confirmed by the US_Struct and DS_Struct shots in the mxd. The model shows a deck width of 20 feet.
21. Check your bridge deck information at Eleanor. It shows vertical abutments where in the picture it appears that the bridge is just laying across the top of the creek.
22. At Hickory Tree Bridge the ineffective area elevations are higher than the minimum elevation of the bridge deck data.

23. The bridge deck width at Hickory Tree should be approximately 35 feet unless your deck skew altered that distance. Check your distance to the upstream cross section.
24. Underneath the southbound and northbound IH-635 bridges the slopes are concrete lined and also on cross section 7343. N-values should reflect the concrete slopes.
25. IH-635 southbound, upstream internal cross section the ineffective area in the left overbank is higher than the minimum deck elevation in the LOB.
26. The ineffective area on the downstream internal cross section of the IH-635 northbound bridge in the LOB is higher than the minimum deck elevation in that overbank.
27. It looks like from the pictures that there may be more large piers from the Exit 480 ramp that impact the channel on cross sections 7068 through 6881. Check to make sure that more blocked obstructions are not required.
28. Adjust the DA boundary in the LOB of cross sections 6891 and 6876 so that the cross sections do not straddle between them.
29. For the Kleburg Crossing, the IH-20 bridge crossings, the IH-20 Ramp, and the Arrowdell crossing, on some of the internal cross sections there aren't any n-values included in the cross section information. Fix.
30. At the Arrowdell crossing, the ineffective areas should be lowered to the minimum elevation of the road deck.
31. Why are you using 0.015 n-value for the Arrowdale culverts and everywhere else upstream you used 0.011 for culverts?
32. Adjust cross sections 2612 and 2098 in the LOB to follow the DA boundary rather than crossing it.
33. The ineffective areas on the Aerial crossing upstream of Seagoville Road are not necessary. Remove.

RESPONSE TO COMMENTS:

1. Cross Section numbering has been adjusted
2. Fixed
3. Fixed
4. Adjusted
5. Used the survey shot in the calculation of slope closer to the confluence with Hickory Creek
6. Used the shapefile of n values as a guide then adjusted in the model for the channel and other small areas.
7. Fixed

Hickory Creek

1. Fixed
2. Adjusted
3. XSEC added
4. XSEC added
5. Discussed and determined to leave rail
6. N values adjusted
7. Does not daylight on north side.
8. Ineffective area adjusted

9. Point was interpolated, it has been removed
10. Checked in field – square portion same width as circular.
11. N value adjusted
12. Discussed. Left as is.
13. DA reflects culverts. Discussed left as is.
14. Deck adjusted
15. The upstream and downstream rails are different. The downstream rail tapers into the ground.
16. Adjusted
17. Confluence was adjusted which changed the DA. No need to adjust XSEC
18. Ineffective area adjusted
19. Pipeline added
20. Deck adjusted
21. Internal XSEC adjusted
22. Ineffective area adjusted
23. Bridge Deck Adjusted
24. N values adjusted
25. Ineffective area adjusted
26. Ineffective area adjusted
27. Remaining piers found and added to model
28. DA adjusted
29. Fixed
30. Ineffective area adjusted
31. Adjusted
32. Cross Sections are copies of 23731. Did not adjust for comparison purposes. Adjusted DA.
33. Ineffective area adjusted

III. HEC-RAS MODEL REVIEW: ALL STREAMS

Modeler's Initials: JMY Date Submitted: 9/17/10
 Reviewer's Initials: JJA Date Reviewed: 9/20/10
 Modeler's Initials: JMY Date Responded: 9/23/10

SUBMITTED ITEMS:

Name of RAS Project:

N:\27000s\27171\Hydraulics\RAS\Balch_Springs_FPP.prj

Name of RAS Plan:

N:\27000s\27171\Hydraulics\RAS\Balch_Springs_FPP.p03

ArcMap project file name:

N:\27000s\27171\Hydraulics\BalchSprings_Hydraulics_QAQC.mxd GeoRAS GeodatabaseN:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb Study Stream Centerlines for Scoping CategoriesN:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
CL Topographic Maps\Srvd50\DFS-Citrix\Misc\Texas_Data\NCTCOG\NCTCOG_FEMA_PROJECTS_ONLY\2007\DVD_200
80730\Contours_Dallas\ ImagesN:\Imagery\Landiscor2009\Dallas-FtWorth0409_1ft\ Preliminary floodplain runs Watershed LocationN:\27000s\27171\Hydrology\DA\Balch_DA_Final.shp Discharge Points Locations N-values shape fileN:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
Nvalues Any previous study workmaps Road network for namesN:\22000s\22205B\Production\2006DFIRM\DALLAS_2006_DFIRM\PRELIMP_DB\s_trns
port_In.shpDESCRIPTION OF MODELER'S ASSUMPTIONS, NOTES, OR SPECIAL SITUATIONS. Check RAS output N-value table Any record plans needed Descriptions of assumptionsN:\27000s\27171\QAQC\Balch_Springs_Hydraulics_notes.docx Any special situation

TECHNICAL REVIEW:

- Discharge Locations and Values
- Starting boundary conditions
- Cross Section Geometry-needs to extend to limits of floodplain
- Manning's n values
- Contraction and expansion Coefficients
- Bridge/Culverts
- Ineffective flow-Top widths
- Special Features (weirs, overflow, split)
- Profiles
- Errors, Warning and Special Notes
- Check-RAS

REVIEW COMMENTS:

1. Where does the starting slope come from? It does not match what the ground slope shows at the downstream limits of the model.
2. Cross section 599 on 4C6 Trib 2 does not contain in the left overbank.
3. On 4C6 Trib 1, cross sections 3049 and 2727 have expansion and contraction coefficients of 0.5 and 0.7. Why?
4. On 4C6 Trib2, the expansion and contraction coefficients do not need to be adjusted on cross sections 3701 and 3612 due to the lateral structure.
5. On 4C6 Trib2, why is the expansion and contraction coefficients increased to 0.3 and 0.5 on cross section 2251?
6. Along Hickory Creek, at cross section 19218 the contraction coefficient is set to 1. Fix.
7. Along Hickory Creek, cross section 19018 should have expansion and contraction coefficients set to 0.3 and 0.5 and at cross section 19062 should be set to default values.
8. Along Hickory Creek, cross section 9314 should have expansion and contraction coefficients set to 0.3 and 0.5.
9. Along Hickory Creek, cross section 4698 should have expansion and contraction coefficients set to 0.3 and 0.5.
10. Along Stream 4C6, cross section 11580 should have expansion and contraction coefficients set to 0.3 and 0.5.
11. Along Stream 4C6, cross section 10408 should have expansion and contraction coefficients set to 0.3 and 0.5.
12. Along Stream 4C6, the expansion and contraction coefficients are set to 0.3 and 0.5 from cross section 5838 through 2450. Why? Make the necessary adjustments to reflect the structures in this reach.
13. Along Stream 4C6, change the expansion and contraction coefficients on cross section 2417 to 0.3 and 0.5 due to the structures upstream and downstream.
14. Along stream 4C6 Trib1, STR19, the upstream internal cross section shows bridge deck ending before tying in with natural ground in the LOB.
15. For structure 10450 along Stream 4C6, the weir coefficient for the concrete spillway section over the culverts should be see higher than 2.6, probably should be 3.0.
16. On many of the concrete pipe culverts in the model where you use a chart # and scale # set to 1, you use varying entrance loss coefficients depending on the structure location. This should be remedied. All culverts' that have like chart and scale numbers should also agree in entrance loss coefficient setting. This should

- be checked for all culvert crossings making sure that culvert parameters consistently match the settings posed. Correct this problem throughout the model.
17. Throughout the model, the bridge high flow methods are sometimes set at Energy only and sometimes set at pressure and weir. How did you determine what bridge settings to make?
 18. On 4C6 Trib 2, the lateral structure at station 3650 should be set so that it prevents negative flow across it.
 19. There are crossing profiles at Lake June Road along Hickory Creek reach 3 on the downstream side.
 20. There are crossing profiles at Bruton Road along Hickory Creek.
 21. Critical depth is occurring at cross sections 22966 and 21697 for one or more wprofiles.
 22. On 4C6 Trib1, cross section 3049 is defaulting to critical depth for all profiles.
 23. There are crossing profiles at station 300 of 4C6 Trib 2.
 24. There is critical depth occurring along 4C6 Trib 2 at cross sections 5272.33, 5486, and 5732.
 25. On Hickory Trib 4, there is critical depth occurring on cross section 901.
 26. In the areas where you interpolated cross sections, I don't understand how the interpolated cross sections end up on a different slope than what would occur between the bounding cross sections that they are interpolated from? Is there a new feature in RAS 4.1 that allows a change in slope when interpolating? In most cases are the cross section interpolations because of profile crossings? I would prefer that additional cross sections be pulled rather than interpolated in most cases.
 27. There is critical depth occurring on Stream 4C6 at cross sections 12073 – 12739 that appears to be due to a very steep slope. Check and make sure that critical depth is warranted because of that.
 28. There is critical depth occurring on Stream 4C6 at cross section 13716.
 29. Make sure that on all cross sections that the overbank n-value also incorporates the channel value that is what you want to happen. Verify that you don't want your channel to have a different roughness value based upon the cross sections upstream and downstream, aerial photos, and field photos. Go through and recheck to be sure.
 30. Along Stream 4C6 from cross section 3622 upstream, the station number and the actual measured distances due to reach lengths don't match up. Check your reach lengths for errors.
 31. Along Hickory Creek, the stationing and reach lengths do not agree from cross section 8590 on upstream. Check for reach length errors.
 32. Along 4C6 Trib2, the stationing and reach lengths do not agree from cross section 3491 on upstream. Check for reach length errors.
 - 33.

RESPONSE TO COMMENTS:

1. Additional Cross sections were added from previous model. Boundary conditions were adjusted to match slope of new downstream cross sections.
2. Cross Section adjusted

3. Was advised to change to 0.5 and 0.7 to account for 90-degree bend.
4. Expansion and Contraction coefficients adjusted.
5. Originally added to the cross sections upstream of the cross section with lids representing the highway. Removed because lateral structure is present.
6. Fixed.
7. Fixed
8. Fixed
9. Fixed
10. Fixed
11. Fixed
12. Result of added interpolated sections. Fixed.
13. Fixed
14. The deck represents top of guardrail which ties into the top of road which is below upstream cross section.
15. Fixed
16. All culvert adjusted to be consistent.
17. Preliminary flows were run and each bridge/culvert was adjusted if deemed necessary.
18. Lateral structure adjusted to have "Flaps prevent Negative flow"
19. Cross sections added – Fixed
20. Fixed
21.
22. Fixed
23. Fixed
24. ...
25. Fixed
26. When I interpolated the cross sections the program did not adjust the original reach lengths. The reach lengths have been fixed.
27. Critical depth a result of the steep slope
28. Fixed
29. Checked all cross sections and adjusted n values where necessary.
30. Fixed
31. Fixed
32. Fixed

IV. FLOODWAY MODEL:

Modeler's Initials: JY Date Submitted: 4/13/11
Reviewer's Initials: JJA Date Reviewed: 4/14/11
Modeler's Initials: JMY Date Responded: 4/14/11

SUBMITTED ITEMS:

Name of RAS Project:

Name of RAS Plan:

ArcMap project file name:

- GeoRAS Geodatabase
- Study Stream Centerlines for Scoping Categories
- Topographic Maps
- Images
- Preliminary floodplain runs
- Watershed Location
- Discharge Points Locations
- N-values shape file
- Any previous study workmaps
- Road network for names
- Floodway Points
- Floodway Lines

TECHNICAL REVIEW:

- Discharge consistent with multiple profile plan
- Surcharges between 0 and max allowed
- Check starting boundary conditions with friction slope
- Negative surcharges

REVIEW COMMENTS:

1. Make sure when running floodways that you have the equal conveyance box checked. It was not when I started looking at the model.
2. The floodway has to be pulled out in the LOB around Lake June road in order for the floodway to work.
3. The island of high ground is likely going to have to be mapped as floodplain in order for the floodway to make sense. I don't see any other way around the floodway problem.

RESPONSE TO COMMENTS:

1. Done
2. Fixed
3. Discussed and decided to leave it as island since its larger than 2 acres and will not be mapped as floodplain.

II. RAS GEOMETRY: NOTE – Tribs 4C6, 4C6 Trib1, 4C6 Trib 2

Modeler's Initials: JMY Date Submitted: 7/28/2010
 Reviewer's Initials: JJA Date Reviewed: 8/23/2010
 Modeler's Initials: JMY Date Responded: 8/25/2010

SUBMITTED ITEMS:

ArcMap project file name:

N:\27000s\27171\Hydraulics\BalchSprings_Hydraulics_QAQC.mxd

ArcMap project has all files listed in Milestone I

Stream Centerline

N:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
CL

Flowpaths

N:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
FL

Field Surveys sketches, photos, and points file

See Hydraulics notes

Bridge Record Plans

Stationing assumptions and calculations for field surveys

Manning's n-values assumptions

N:\27000s\27171\Hydraulics\balchsprings_hydraulics.mdb\Layers\Balch_Springs_FPP
Nvalues

TECHNICAL REVIEW:

- Top of bank at reasonable locations
- Bridge Geometry Corresponds to Surveys or Record Plans
- Bridge Geometry assumptions documented
- Contraction and expansion coefficients
- Proper use of Ineffective flow areas
- Reasonable Manning's n-values
- No Crossing profiles

REVIEW COMMENTS:

1. **Stream 4C6**
 1. Cross section 14545 has 0.45 for n-value in the channel.
 2. Expansion and contraction coefficients on cross section 14545 should be 0.1 and 0.3.
 3. On Green Valley crossing the top of road information should be pulled from topo to append the one field point shot by mobile GIS instead of assuming a flat elevation for the entire length.
 4. Lower the culvert flowlines at Green Valley Road to match the flowlines of the cross sections.
 5. Adjust the boundary for DA 4C6_B03 along Green Valley Road so that XS 12739 does not straddle between it and DA 4C6_B02.
 6. What about the structure between cross sections 11507 and 11447? It is missing.

7. There is a concrete pilot channel on cross sections 12739 through 10493 that is not reflected in the n-values.
8. The bridge deck data for the 104+50 crossing looks like it should drop across the culverts according to the pictures as the top of the culverts acts like an overflow spillway. See pictures. The proper adjustments should be made to reflect as closely to way is shown in the pictures as possible. Also, the deck weir coefficient should be approximately 3.1 because of the concrete spillway type overflow area.
9. There is a pipeline crossing downstream of the 104+50 culvert crossing according to the pictures that is not modeled.
10. Cross sections 9858 and 9706 should show concrete in the channel according to the aerial and pictures. Add another cross sections downstream of 9706 at the DS_IN survey shot to show the limits of the concrete.
11. At the Pioneer St. crossing why is the bridge deck at elevation 479.99 longer than the downstream side? Is that supposed to be representing the chain link fence? If so, the fence is on both sides according to the pictures. Did you skew this structure manually?
12. For the Pioneer Street crossing, the left ineffective area is placed too high. It will block conveyance where there is not bridge deck. Fix.
13. At Seagoville Road, I don't think that the rail should be modeled according to the pictures. Also, the survey shows 4 culverts, but the pictures show 5?
14. At Seagoville Road, the survey says that the culvert sizes are 7' X 9', but the model shows 5' X 9'? Surveyed culvert length says 78.64', but model culvert length shows 84'? The skew angle appears to be less than 20 degrees so no adjustments should be required.
15. At Seagoville Road, verify your n-value used in the culvert description in the model (0.011 used instead of 0.013 used on other culverts).
16. Add another cross section downstream of cross section 6383 at the DS_IN survey shot to represent the end of the concrete.
17. Adjust boundary of DA 4C6_B06/4C6_B05/4C6T2_B04 according to my thick yellow graphics in the mxd.
18. Adjust cross section 6202 in the LOB so that it does not cross the DA 4C6T2_B04 boundary.
19. Lower the right ineffective area on the upstream internal cross section of STR24 – IH20 to the minimum elevation of the road deck.
20. Extend cross section 5119 in the ROB until you hit the 460 contours. It should contain the bridge deck information at that point. Adjust cross section 4490 in the ROB per my purple graphics.
21. Adjust the boundary of DAs 4C6_B08/4C6_B07 per my thick yellow graphics in the mxd.
22. Lower the right ineffective areas in the ROB to fall at the minimum elevation of the road deck at the Rylie Crest crossing.
23. Adjust DA boundary 4C6_B08/4C6_B09 per my yellow graphics in the mxd.
24. At the Woodsboro/Verdant crossing, the culvert roughness values should be adjusted to reflect CMP. Also, the scale number should be changed to be "projecting from fill" and the entrance loss coefficient be adjusted to reflect.
25. There is a pipeline crossing just upstream of the STR22 crossing with a concrete pier that is not modeled.
26. Adjust cross section 1453 such that it does not cross over into more than one DA.
- 27.

4C6 Trib1

1. Cross section 2513 should show concrete in the channel. Also, add another cross section downstream of 2513 at the survey DS_IN shot to reflect the end of the concrete.
2. At Old Seagoville Road (STR 21) why is the deck data different from upstream to downstream?
3. Because of the 90 degree bend in the channel upstream of Old Seagoville Road, the expansion and contraction coefficient at cross section 2727 should be increased to reflect this.
4. At IH20, the ROB ineffective area should be lowered to the minimum elevation of the road deck.
5. At Rylie Crest lower the ineffective areas such that they are at the minimum elevation of the road deck.
6. The channel roughness value at cross section 565 should be lowered to reflect the maintained vegetation as shown on the pictures. Should be somewhere around 0.035 to 0.04.

4C6 Trib2

1. For STR18, increase the culvert n-value to account for the 45 degree bend in the alignment.
2. Lower the LOB ineffective area placement on the upstream side of STR18.
3. Cross section 1709 should show concrete in the channel per the pictures and aerial photography.
4. Cross section 630 should reflect concrete in the channel area per the aerial photography. Add another cross section downstream of XS 630 to show the end of the concrete lined channel.
5. Cross section 5284 shows a n-value of 0.001 in the ROB. Adjust to the correct value.
6. It may be necessary to extend cross sections 4115 through 3700 in the ROB across the dry detention pond or adding in a lateral structure depending on that the wsels do. Check during the next phase.
- 7.

RESPONSE TO COMMENTS:**Stream 4C6**

1. Adjusted
2. Adjusted
3. Deck elevation adjusted
4. Flowline adjusted
5. DA adjusted
6. Bridge added
7. N value adjusted
8. Spillway added
9. Pipeline added
10. XSEC added
11. Deck adjusted to not reflect wood fence upstream
12. Ineffective area adjusted
13. Rail removed. Both pictures and drawings show 4 culverts.
14. Culverts and deck adjusted. No skew entered
15. N value adjusted throughout model
16. XSEC added
17. DA adjusted

18. XSEC adjusted
19. Ineffective Areas adjusted
20. XSEC 5119 and 4490 adjusted
21. DA adjusted
22. Ineffective area adjusted
23. DA adjusted
24. N value adjusted to 0.02. The n scale number was left at mitered to slope to reflect the upstream conditions.
25. Pipeline added
26. XSEC adjusted
- 27.

46C Trib1

1. N value adjusted and XSEC added
2. Upstream the bridge rail meets a guardrail on the LOB. Downstream there is only the bridge rail.
3. Expansion/Contraction coefficients were adjusted to 0.5 and 0.7
4. Ineffective area has been adjusted
5. Ineffective area has been adjusted
6. N value adjusted
- 7.

4C6 Trib 2

1. Comment is addressed
2. Ineffective area has been adjusted
3. N values adjusted to reflect concrete
4. XSEC added
5. N value adjusted to reflect water
6. Will address after Hydrology

QA/QC APPROVAL:

This New Detailed Study Hydraulics QC review is in compliance with the contract requirements and all task "check points" are complete. Task checklists have been appropriately documented and signed by the reviewer, approved by the QA Manager and then forwarded to the production team along with all check prints/drafts and text. A meeting was conducted with the QC Team and Production Team to formally review the QC comments and resolve any problems/conflicts. Task production leaders have signed the QC document to confirm that all comments are received, addressed and documented appropriately.

QA Manager: *Jeffrey J. Algray* Date: *4/26/2011*
Task Leader: *[Signature]* Date: *4/26/2011*
Project Manager: *Jessica D. Bunker* Date: *4/26/2011*

Appendix G
Hickory Creek Watershed
Mapping QA/QC Checklist

New Detailed Study Mapping QA/QC Checklist

Stream Name: Hickory Creek and Tribs

RAS Model Name: Hickory Combined

Mapper's Name: Jack Young

Reviewer's Name: Jeffrey Alvarez

SUBMITTED ITEMS:

ArcMap project file name:

N:\27000s\27171\Mapping\BalchSprings Mapping QAQC.mxd

Attached Layers:

- Floodplains as Polygons
- Cross Sections
- Cross Section Boundary Polygon
- BFEs
- Stream Centerline
- Floodway
- Contours
- Imagery
- Ground Surface DTM
- Water Surface DTM
- Watershed Boundary
- Current/Q3 Floodplain/Floodway
- Transportation Network (roads, railroads, airports)
- All layers have the same defined projection system

PROJECTION SYSTEM:

Projection (i.e. Stateplane, UTM, etc.):

Stateplane

Zone or FIPSZone:

4202

Horizontal Datum:

NAD83

Horizontal Units:

ft

Vertical Datum:

NAVD88

Vertical Units:

ft

I. FLOODPLAIN MAPPING:

Mapper's Initials: JMY Date Submitted: 4/21/11
 Reviewer's Initials: JJA Date Reviewed: 4/21/11
 Mapper's Initials: JMY Date Responded: 4/21/11

FLOODPLAIN DATA FORMAT:

- Geodatabase
 Shapefile
 Coverage

FLOODPLAIN DELINEATION METHOD:

- Raster intersection
 TIN intersection
 Other:

TECHNICAL REVIEW:

- Floodplain delineation appears to agree with DTM/Contours
 1% chance (100-yr) top widths match between RAS model and mapping
 Zone AE backwater mapped for unstudied tributaries
 Zone A delineations beyond limits of detailed study
 Floodplain delineations are reasonably smooth, based on final scale
 Cross sections extend beyond 0.2% chance (500-yr) floodplain
 Stream centerline is contained within the floodplain
 Water bodies (pond, lakes, etc.) are contained within the flood zone
 If areas of shallow flooding exist, have they been identified (zone and elevation)
 Floodplain delineation ties in with existing floodplains (if applicable)

REVIEW COMMENTS:

1. Mapping at cross section 62350 does not match the RAS floodplain limits.
2. Mapping at cross section 61933 does not match RAS floodplain limits for the 500year.
3. On cross section 56502, the left 100-year floodplain limit does not match the RAS water surface extent. Also, the 500-year limit on the right side does not match the RAS water surface extent.
4. On cross section 56080, the left 100-year floodplain limit does not match the RAS water surface extents.
5. On cross section 52651, the right 100-year floodplain limit does not match the RAS water surface extent.
6. On cross section 50295, the 100-year floodplain limits do not match the RAS water surface extents. The 500-year limit in the LOB looks like it was cutoff by the bounding polygon.
7. Elam road shows water on the road for the 500-year, but the RAS model does not. The mapping should be adjusted to reflect the survey top of road to match what the RAS models is showing. Also, these are culverts through Elam Road which means the mapping should not be shown though the culverts for the 500-year, but should show a gap in the floodplain where the culverts are since the road does not overtop.
8. On cross section 50130, the left 100-year floodplain limit does not match the RAS water surface extent.

9. On cross section 48156, the right 100-year and 500-year floodplain limits do not match the RAS water surface extents.
10. Cross sections 47037 through 46955 have 100-year floodplain limits that do not match the RAS water surface extents in the LOB.
11. The 500-year limit in the ROB of cross section 45232 does not match the RAS water surface extent.
12. On cross sections 44561 through 44363, the 500-year floodplain limits in the LOB do not match the RAS water surface extents.
13. On cross section 42208 the 500-year floodplain limit in the ROB does not match the RAS water surface extents.
14. On cross section 41698 the 100-year floodplain limit in the LOB does not match the RAS water surface extents.
15. On cross section 39574 the 500-year floodplain limit in the LOB does not match the RAS water surface extents.
16. On cross sections 37389 through 37198, the 500-year floodplain limits do not match the RAS water surface extents in the LOB. For cross section 37198, the 100-year floodplain limits do not match the RAS extents as well.
17. On cross sections 35082 through 33366, the floodplain limits in the LOB do not match the RAS water surface extents.
18. At cross sections 33214 and 33215, in the ROB the mapping looks suspect. The 100-year and 500-year limits do not match the RAS water surface extents in the ROB.
19. RAS water surface extents do not match the floodplain for the remainder of the mapping from cross section 33215 on downstream.
20. The 100-year mapping should be connected in the overbanks at Beltline Road.

Stream 4C6

1. On cross sections 12620.9 through 12286 the floodplain limits to not match the RAS water surface extents.
2. On cross sections 11915.5 through 11834.2 the floodplain limits to not match the RAS water surface extents.
3. On cross sections 11054 through 11039 the floodplain limits to not match the RAS water surface extents in the LOB.
4. On cross sections 9831 the 100-year floodplain limits to not match the RAS water surface extents in the ROB.
5. At IH-20, the floodplain mapping shows flowing onto the roads, but the RAS model shows the road deck 7 feet higher than the 500-year flood elevations at the bridge. Why is this happening?
6. On cross section 3868 the 100-year floodplain limit in the ROB does not match the RAS water surface extents.

4C6 Trib 1

1. On cross section 3868 the 100-year floodplain limit in the ROB does not match the RAS water surface extents.
2. On cross section 3124 the 100-year floodplain limit in the ROB does not match the RAS water surface extents.

4C6 Trib 2

1. On cross section 5397 the 100-year mapping limits do not match the RAS water surface extent in the ROB.

2. On cross section 3617 the 100-year mapping limits do not match the RAS water surface extent in the ROB.
3. On cross sections 640 and 609 the mapping is cut off in the LOB. On XS 640 it does not contain in either overbank. The RAS model cross section is also not containing in the ROB. The cross section needs to be extended.
4. On cross section 309 the mapping limits do not match the RAS model water surface extents in the ROB.

Hickory Trib 4

1. On cross section 327.5 in the ROB the 100-year floodplain limit does not match the RAS water surface extents.

RESPONSE TO COMMENTS:

Hickory Creek

1. Floodplain extent represents island that was cleaned up in the mapping process.
2. Island
3. Adjusted
4. Island
5. Island
6. Cross Section was not cutoff. Mapped to topo. Adjusted
7. Elam road adjusted
8. Adjusted
9. Island
10. Adjusted
11. Adjusted
12. Adjusted
13. Adjusted
14. Adjusted
15. Adjusted
- 16-20. Differences are a result of RAS geometry not being based on 2010 Topo. Mapping not shown in exhibits.

Hickory 4

1. Adjusted

Stream 4C6

1. These sections are interpolated sections so the CL is slightly off. Elevation is correct.
2. Interpolated sections
3. Adjusted
4. Adjusted
5. Adjusted
6. Adjusted

Stream 4C6 Trib 1

1. Adjusted
2. Adjusted

Stream 4C6 Trib 2

1. Floodplain was adjusted to encompass existing lake
2. Adjusted
3. Cross Sections and floodplain adjusted
4. Cross Sections and floodplain adjusted

III. FLOODWAY:Mapper's Initials: JMY Date Submitted: 4/21/11Reviewer's Initials: JJA Date Reviewed: 4/21/11

Mapper's Initials: _____ Date Responded: _____

Do floodways currently exist along this study reach? Yes NoAre new floodways being created for this study reach? Yes No**TECHNICAL REVIEW:**

- Floodway does not extend beyond limits of detailed study (1% chance floodplain)
- Floodway lines are reasonably smooth
- Floodway is contained within the 1% change (100-yr) floodplain
- If floodway currently exists, does new FW reasonably match effective FW
- Floodway top widths match between RAS model and mapping
- Floodway ties in to other floodways at downstream end (if applicable)
- Floodway mapped correctly at structures

REVIEW COMMENTS:

1. The left floodway boundary on cross section 61070 does not match the RAS limit.
2. The floodway limit is off from the RAS encroachment limits on cross section 45137 and 44989.
3. The floodway limit in RAS in the LOB on cross sections 44388, 44068 through 43842 are outside of the 100-year floodplain limits and do not match what is mapped. Adjust.
4. In the ROB on cross sections 44363 through 44138 the floodway does not match the encroachment limits in RAS.
5. Floodway stops between cross sections 40506 and 40168, but the RAS model has encroachment limits through cross section 39574???
6. See my suggested corrections in graphics in the mxd.
- 7.

RESPONSE TO COMMENTS:

1. Adjusted
2. Adjusted
3. Adjusted
4. Adjusted
5. Extended so downstream limits could be accurately mapped. Removed section in dallas
6. Fixed

QA/QC APPROVAL:

This New Detailed Study Mapping QC review is in compliance with the contract requirements and all task "check points" are complete. Task checklists have been appropriately documented and signed by the reviewer, approved by the QA Manager and then forwarded to the production team along with all check prints/drafts and text. A meeting was conducted with the QC Team and Production Team to formally review the QC comments and resolve any problems/conflicts. Task production leaders have signed the QC document to confirm that all comments are received, addressed and documented appropriately.

QA Manager: Jeffrey J. Albrecht Date: 4/26/2011
Task Leader: John Y. Yung Date: 4/26/2011
Project Manager: Jessica D. Baker Date: 4/26/2011



Appendix H: Official TWDB Comments and Halff Responses

Official TWDB comments and Halff response (shown in italics) are listed below.

1. Please conduct a final edit for typos, grammar, inconsistent usage of acronyms, and abbreviations. In addition, there were several references that were stated in the text as used, but not cited properly. Please ensure that proper citation standards are followed and include a reference list in the final report.
The document has been reviewed for errors. References were also added to the text and a reference list was added to the end of the document.
2. Section 3.3.5: states that the Modified Puls routing method was utilized to establish storage-outflow relationships. Please provide a discussion of the Modified Puls routing methodology and why this method was selected over other possible routing methods.
Section 3.3.5 was expanded to include a more in depth discussion of the method used Flood Routing.
3. Section 3.3.6: states that "...the model was adjusted to more accurately reflect the ponds outfall structures." Please provide a discussion describing how this adjustment was accomplished.
Section 3.3.6 was expanded to discuss the methods used to convert the pond modeling from HEC-1 to HEC-HMS.
4. Section 4.7: the street addresses for the houses proposed for buyout under Damage Center I Alternative III, Damage Center II Alternative III, and those addresses listed on Figure 15 are information that is covered by the Privacy Act and should not be provided in the report. The properties may be identified as a point on a map. Please ensure that specific addresses are not included in the report.
Specific Addresses were removed from the report, exhibits, and cost estimates. Addresses were replaced with generic labels such as "DCI_PROP1" which are consistent on the exhibit and cost estimates.
5. The approved scope of work states that the report should identify permitting requirements to implement proposed alternatives. The report did not include a discussion of permitting requirements. Please include any potential permitting requirements in the final report.
Section 4.6: Permitting was added to the report to discuss the possible permitting requirements that might arise with the implementation of any structural alternatives.
6. In general, this study follows standard methodologies and practice. Mitigation alternatives identified by this study are eligible for funding under the Board's financial assistance programs. Application requirements and eligibility criteria is identified by Board rules specifies in Section 363 of the Texas Administrative Code. This report would be appropriate for use in support of an application to the Board's for financing the propped improvements. All additional information required by Board rules, 31 TAC 363, 401-404, as well as necessary information to make legal findings required by Texas Water Code Chapter 17.771-776, would be required at the time of the loan.
This information was added to Section 5.3: Funding as a possible funding source to implement the identified alternatives.





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