

FLOODING INVESTIGATION REPORT

DRAFT

***DERBY-MILFORD ROAD NEIGHBORHOOD INCLUDING
BROOKSIDE ROAD, GLENBROOK ROAD, DERBY-MILFORD ROAD,
EAST SLOPE DRIVE, AND HIGH RIDGE ROAD***



Prepared by:

CARDINAL
ENGINEERING ASSOCIATES

Prepared _____ Date: _____

by: Darin Lemire, PE

Reviewed _____ Date: _____

by: Gary Giroux, P.E.

**Flooding Investigation Report
Derby-Milford Road Neighborhood including Brookside Drive,
Glenbrook Road, Derby-Milford Road, East Slope Drive, and High Ridge Road**

TABLE OF CONTENTS

	<u>Page</u>
Executive Summary.....	i
Introduction.....	1
Hydrologic Analysis.....	3
Hydraulic Analysis.....	5
Existing Hydraulic Analysis.....	6
Mitigation Analysis.....	10
Conclusions and Recommendations.....	14

Figures

Figure 1 Site Vicinity Map.....	2a
Figure 2 Existing Drainage Areas.....	4a
Figure 3 Water Surface Profiles – Existing 2-year through 100-year Frequency.....	9a
Figure 4 Water Surface Profiles – Existing at 25-year and 100-year Frequency.....	9b
Figure 5 Water Surface Profiles – Proposed Option 2C -25-year & 100-year.....	13d
Figure 6 Water Surface Profiles – Proposed Option 2D -25-year & 100-year.....	13e
Figure 7 Water Surface Profiles – Proposed Option 2E -25-year & 100-year.....	13f
Figure 8 Water Surface Profiles – Proposed Option 2C & 2D -25-year & 100-year.....	13g
Figure 9 Water Surface Profiles – Proposed Option 2C & 2E -25-year & 100-year.....	13h
Figure 10 Water Surface Profiles – Proposed Option 3 -25-year & 100-year.....	13i
Figure 11 Water Surface Profiles – Proposed Option 3E -25-year & 100-year.....	13j
Figure 12 Water Surface Profiles – Proposed Option 3F -25-year & 100-year.. ..	13k
Figure 13 Water Surface Profiles – Proposed Option 4C -25-year & 100-year.. ..	13l
Figure 14 Water Surface Profiles – Proposed Option 6A -25-year & 100-year.....	13m
Figure 15 Water Surface Profiles – Proposed Option 6C -25-year & 100-year.. ..	13n

Tables

Table 1	Calculated Flood Flows.....	5
Table 2	Flood Calculations Brookside Drive Existing.....	7
Table 3	Flood Calculations Glenbrook Rd/Derby Milford Rd Existing.....	8
Table 4	Decision Matrix (Options 1 through 4).....	13a,b
Table 5	Decision Matrix (Options 5 through 7).....	13c
Table 6	Flood Calculations Option 2C Brookside Drive.....	17
Table 7	Flood Calculations Option 2C Glenbrook Rd.....	18
Table 8	Flood Calculations Option 2D Brookside Drive.....	19
Table 9	Flood Calculations Option 2D Glenbrook Rd.....	20
Table 10	Flood Calculations Option 2E Brookside Drive.....	21
Table 11	Flood Calculations Option 2E Glenbrook Rd.....	22
Table 12	Flood Calculations Option 2C & 2D Brookside Drive.....	23
Table 13	Flood Calculations Option 2C & 2D Glenbrook Rd.....	24
Table 14	Flood Calculations Option 2C & 2E Brookside Drive.....	25
Table 15	Flood Calculations Option 2C & 2E Glenbrook Rd.....	26
Table 16	Flood Calculations Option 3 Brookside Drive.....	27
Table 17	Flood Calculations Option 3 Glenbrook Rd.....	28
Table 18	Flood Calculations Option 3F Brookside Drive.....	29
Table 19	Flood Calculations Option 3F Glenbrook Rd.....	30
Table 20	Flood Calculations Option 4C Brookside Drive.....	31
Table 21	Flood Calculations Option 4C Glenbrook Rd	32
Table 22	Flood Calculations Option 6A Brookside Drive.....	33
Table 23	Flood Calculations Option 6A Glenbrook Rd	34
Table 24	Flood Calculations Option 6C Brookside Drive.....	35
Table 25	Flood Calculations Option 6C Glenbrook Rd	36

Appendices

Appendix A FEMA Maps

Appendix B Rainfall Data

Appendix C Hydrology Calculations

Appendix D Hydraulic Modeling Data and Calculations

Appendix E Site Photographs

Appendix F Cost Estimates

EXECUTIVE SUMMARY

A drainage study was performed by Cardinal Engineering Associates, Inc. at the request of the Town of Orange related to flooding that occurred in the Derby-Milford Road neighborhood of during 2021 due to Tropical Storms Elsa and Ida. Tropical Storm Elsa occurred on July 9th dropping 4.09 inches of rain and Storm Ida occurred on September 1st dropping 5.77 inches of rain. In the Derby-Milford Road area, there was flooding (20-inches to 48-inches during Storm Ida) at residences on Brookside Road and Glenbrook Road. Other flooding occurred at the stone railroad culvert, Derby-Milford Road culvert, and at a driveway culvert on East Slope Drive. Four residential buildings on Brookside Road/Glenbrook Drive were determined to be impacted (833 Brookside Drive, 827 Brookside Drive, 837 Glenbrook Road, and 840 Glenbrook Road).

The unnamed brook flows through the Derby-Milford Road neighborhood through a series of culverts. The culverts include two culverts from Brookside Drive to Glenbrook Road, a stone railroad culvert, the Derby-Milford Road culvert, East Slope Driveway culvert, and High Ridge Road culvert. During the tropical storms, the neighborhood brook flowed over its banks and entered the residences by way of their garage door openings. It was determined that the existing neighborhood culverts only have the capacity for a 10-year storm. Tropical Storm Elsa can be classified as a 25-year storm event and Storm Ida as a 100-year storm.

Cardinal conducted a drainage study and prepared a hydraulic model of the neighborhood's culverts to simulate the flooding that occurred during the 2021 storms. After verifying the flooding amounts, Cardinal used the model to determine potential mitigation measures. The options evaluated included culvert removal, culvert replacement, floodproofing, and the town acquiring residential properties prone to flooding. The decision matrix summarizes the options including the pros and cons, the associated costs, property owner permissions, and the impact with regard to the 100-year flooding if the option was selected.

The best options identified to reduce flooding in the Derby-Milford Road neighborhood are listed in order of increasing cost below. Each option reduces flooding by varying degrees except options 2A and 2B. The estimated cost of acquiring and removing houses subject to flooding is included in the cost estimates, but no costs are included for acquiring easements for construction of proposed drainage improvements. The hydraulic model indicates that even with replacement of the Derby-Milford Road culvert and removal or replacement of the culvert between Brookside Drive and Glenbrook Road, there would be essentially no improvement in flooding upstream from the railroad culvert unless the culvert was removed or replaced with a much larger culvert.

The best options are as follows:

- Option 3-Removal of the stone railroad culvert and restoration of the brook to open channel flow between Glenbrook Road and Derby-Milford Road

Estimated Cost \$256,000

This option significantly reduces flooding significantly at houses on Brookside Drive and Glenbrook Road. 840 Glenbrook may still have water levels slightly higher (2 inches) above the garage floor elevation during 100-year storm events. The option is inexpensive compared to other options, but there would still be road flooding. The town would still need to maintain the culverts and the option eliminates the driveway access between the Winkle properties.

- Option 2A- Acquire and remove 2 houses (Brookside Drive)

Estimated Cost \$676,000

This option involves acquiring two houses (827 and 833 Brookside Drive). The acquired houses on Brookside would be demolished. Floodproofing of 837 and 840 Glenbrook Road may be feasible, and would require eliminating basement garage doors. Otherwise, these houses would continue to flood. Roads, driveways, and yards would continue to flood.

- Option 2B- Acquire and remove 4 houses (Brookside/Glenbrook)

Estimated Cost \$1.32M

This option involves acquiring four houses (827 and 833 Brookside Drive, 837 and 840 Glenbrook Road) and demolishing the structures. Under this option, there would be no construction required and the affected residents with the worst flooding problems would have their flooding issues resolved. Roads would continue to flood.

- Option 3F- Remove old railroad culvert and restore open channel from Brookside to Glenbrook, install 2 road cross culverts, acquire 2 houses, and replace Derby-Milford Road culvert

Estimated Cost \$2.70 Million

All of the flooding is removed from Brookside to and including Derby-Milford Road for storms of less than the 100-year frequency and less. With this option, water doesn't

flood the road on Brookside Drive and Glenbrook Road, but it flows over the driveway on East Slope. The hydraulic results with this option are shown on Tables 18 and 19.

- Option 4C- Remove old railroad culvert, replace Derby-Milford Road culvert, and replace Brookside to Glenbrook culverts

Estimated Cost \$2.80 Million

All of the flooding is removed from Brookside to and including Derby-Milford Road for storms of 100-year frequency and less. With this option, water doesn't flood the road on Brookside Drive and Glenbrook Road, but it flows over the driveway on East Slope.

- Option 6C- Replace railroad culvert with a 10x5 precast culvert box culvert, replace Derby-Milford Road culvert (10x5 box culvert), install and restore open channel from Brookside to Glenbrook and install road cross culverts for Brookside and Glenbrook

Estimated Cost \$2.78 Million

Most of the flooding is removed. There would be no flooding of the houses at Brookside and Glenbrook. The flooding level is only 5 inches higher than the shed floor elevations located at Brookside Drive. At Glenbrook Road, the flood elevations would be a few inches less. With this option, water doesn't flood the road on Brookside Drive and Glenbrook Road during the 50-year storm frequency or less. Water does flood Glenbrook road during the 100-year storm or greater. The driveway on East Slope Drive still floods during the storms of 25-years or greater

- Option 6A- Replace railroad culvert with a 10x5 precast culvert box culvert, replace Derby-Milford Road culvert (10x5 box culvert), and replace Brookside to Glenbrook culverts with a 10x4 box culvert

Estimated Cost \$3.11 Million

Most of the flooding is removed. There would be no flooding of the houses at Brookside and Glenbrook. The flooding level is only 6 inches higher than the shed floor elevations located at Brookside Drive. With this option, water doesn't flood the road on Brookside Drive and Glenbrook Road during the 50-year storm frequency or less. Water does flood these roads during the 100-year storm or greater. The driveway on East Slope Drive still floods during the storms of 25-years or greater.

Introduction

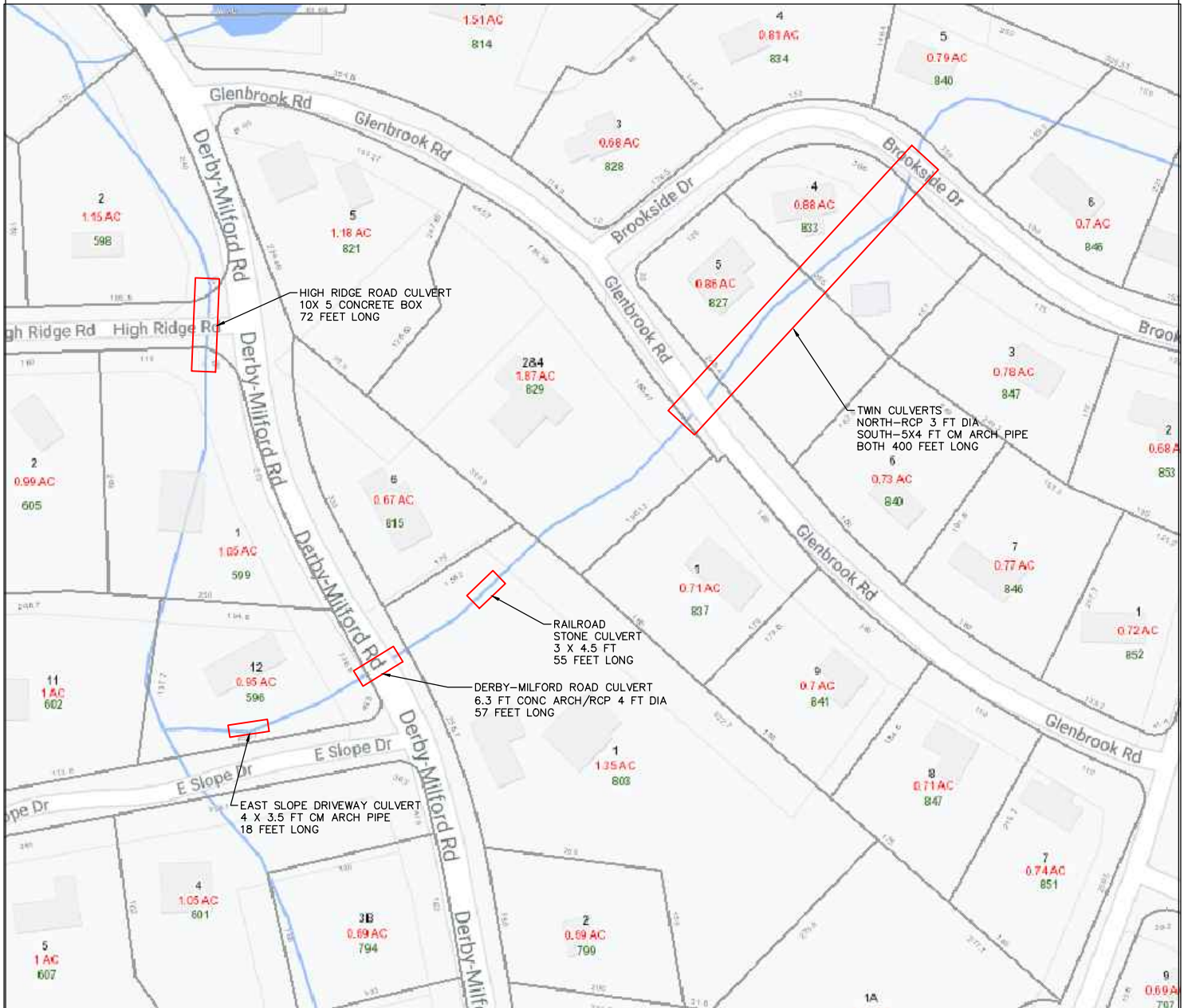
The Town of Orange engaged the services of Cardinal Engineering to perform a drainage study of Derby-Milford Road neighborhood due to flooding that occurred during 2021. The residences that had flooding issues were located on Brookside Drive, Glenbrook Road, Derby-Milford Road, and East Slope Drive. The flooding was caused by the neighborhood brook overflowing its banks along with the neighborhood culverts being overwhelmed especially the railroad culvert. The floodwaters entered the residences from the garage door openings and migrated to some of the finished basements. This neighborhood is located in northwest part of Orange close to Route 34 and Derby. The location is shown on Figure 1, Site Vicinity Map.

The Town of Orange, along with other parts of Connecticut, particularly Fairfield County, experienced significant rainfall events in 2021 most notably in July and September due to tropical storms. On July 9th 2021, Tropical Storm Elsa affected Connecticut with significant rainfall. On September 1st 2021, Tropical Storm Ida hit Connecticut. Both storm events were large rain producing events which were very intense, but with a relatively short duration (6 hour).

Tropical Storm Elsa was a 25-year storm (4% recurrence chance any given year) and Tropical Storm Ida was a 100-year storm (1% recurrence chance any given year). The heavy rain from both events resulted in flooding including road and residential property flooding. In the Derby-Milford Road area, there was flooding (30 to 50 inches) on Brookside Road, Glenbrook Road, Derby-Milford Road, and East Slope Drive. In this neighborhood, 4 houses on Brookside Road/Glenbrook Drive were flooded. The existing culvert capacity was analyzed and it was determined that the culverts in the neighborhood are only able to pass approximately the 10-year storm without resulting in flooding.

The flooding was a result of the area's culverts, especially the railroad culvert, being undersized and the unnamed brook overtopping its banks. At the Derby-Milford Road culvert, the brook has a drainage area of approximately 264 acres or 0.41 square miles. The brook in the Derby-Milford Road neighborhood is conveyed through a series of culverts along with open channel flow. The brook flows as open channel from Garden Road to Brookside Road. At Brookside Road, the brook enters two 400-foot long culverts that discharge to a channel west of Glenbrook Road. From Glenbrook Road, the brook flows westerly until passing through a stone railroad culvert. Following the railroad culvert, the brook enters a short stretch of open channel flow until entering the Derby-Milford Road culvert. The brook continues flowing to the west where it passes through a driveway culvert at 596 East Slope Drive and a box culvert underneath High Ridge Road before discharging to Turkey Hill Brook.

The Derby-Milford neighborhood is identified on the FEMA map with sporadic pockets of Zone X (defined by FEMA as 0.2% annual chance flooding (500 year storm event) or 1% annual chance with average depth of less than one foot or with drainage areas of less than one square mile).



DRAFTER: DL	DATE: 4/7/2022	DRAWING NUMBER: FIGURE 1
-----------------------	--------------------------	------------------------------------

210 RESEARCH POND | MERIDEN, CT 06450 | 203-238-1999
457 BANTAM RD | LITCHFIELD, CT 06769 | 860-597-9106

Hydrologic Analysis

The unnamed brook that is the source of flooding in the Derby-Milford neighborhood originates in a swampy area off of Hilltop Road and discharges into Turkey Hill Brook. The brook is conveyed under several roads and driveways in the neighborhood via culverts. After Hilltop road, the brook flows to the south where it merges with another brook before it crosses Garden Road within a concrete culvert. The brook flows westerly to Brookside Drive when it enters two culverts under Brookside Drive/Glenbrook Road then passes through an abandoned railroad embankment within a stone culvert. Following the railroad stone culvert, the brook enters a short stretch of open channel until entering the Derby-Milford Road culvert. The brook continues flowing to the west where it passes through a driveway culvert at 596 East Slope Drive and a box culvert underneath High Ridge Road before discharging to Turkey Hill Brook approximately 500 feet downstream of High Ridge Road. Turkey Hill Brook flows approximately 3000 feet to the northwest via a steep open channel and discharges into the Housatonic River.

FEMA Flows

The current Flood Insurance Study (FIS) prepared by the Federal Emergency Management Agency (FEMA) for the Town of Orange is dated October 16, 2013. The FIS discusses major rivers in Orange including the Indian River and Housatonic River, but there is no discussion or any detailed analysis on flows for the unnamed Brook in the Derby-Milford Road area.

The area is shown on map number 09009C0416J with a revision date of May 16, 2017. The Derby-Milford neighborhood (only that area located east of Derby-Milford Road) is identified on the FEMA map as having flooding issues of the approximate severity witnessed by residents during the 2021 storms. The FEMA map indicates that the significant flooding occurs rarely (500-year events) and that 100-year events are on the magnitude of less than 1 foot or with drainage areas of less than one square mile.

Determination of brook flows

The brook flows were determined by preparing a hydrologic model of the watershed. Hydraflow software was used for the hydrologic modeling based on NRCS methodology using TR-55 for time of concentration. The runoff curve numbers were based on soil types and land use. Land use was determined from GIS mapping and aerial photography. Soil types were determined from Natural Resources Conservation Service (NRCS) web soil survey.

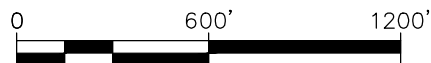
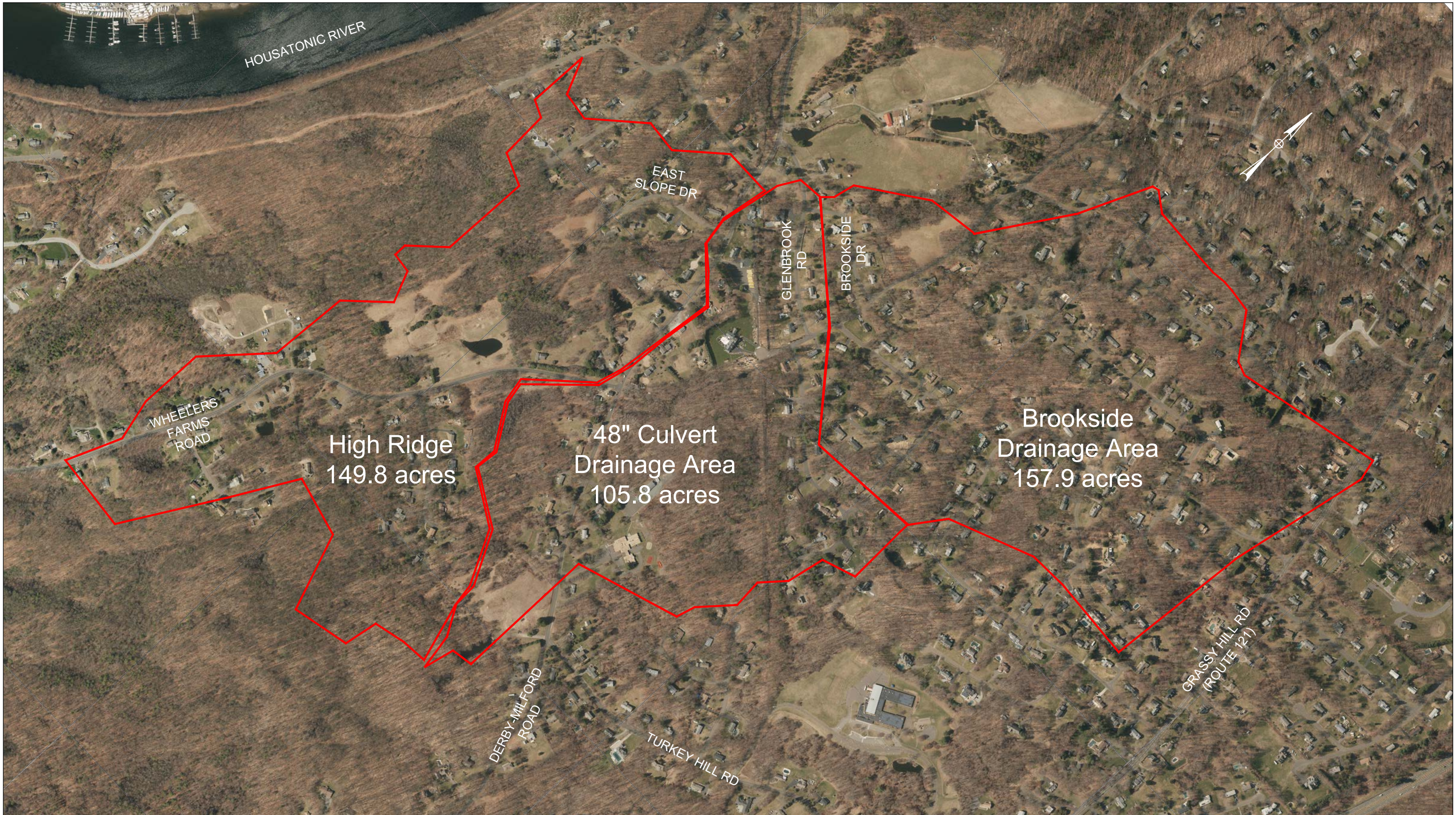
The drainage area was delineated using Town of Orange topographic maps (prepared by Milone and MacBroom scale 1" =100'), USGS topographical maps, USGS StreamStats program, and through field survey. The drainage area for the brook or watershed consists of three areas with a

total area of 413.5 acres or 0.646 square miles as measured from the most downstream point (the culvert at High Ridge Road). The first area drains to the culverts at Brookside Drive. This area was determined to be 157.9 acres. The area consists of primarily 1-acre residential lots and the soils consist of Hydrologic Soil Group (HSG) type B, HSG type C, and HSG type D soils. Of the 157.9 acres, there were 95.8 acres that were type C and type D which are more prone to stormwater runoff. The composite runoff curve number (CN) was calculated to be 69. The time of concentration for this area was calculated to be 53.5 minutes consisting of sheet flow, concentrated flow, and channel flow. The second area drains to a 48-inch concrete culvert that discharges close to the upstream opening of the stone railroad culvert. This area was determined to be 105.8 acres. The area consists of 1-acre residential lots and forested lands with soils that are both HSG type B and HSG type D. The soils are primarily HSG type B and the CN was calculated to be 61. The time of concentration for this area was calculated to be 37.8 minutes consisting of sheet flow, concentrated flow, channel flow, and pipe flow (48-inch culvert). The third area is composed of drainage area located to the west of Derby-Milford Road mainly on both sides of Wheelers Farms Road. The water from this area discharges to brook immediately downstream of the driveway culvert at East Slope Drive. This area was determined to be 149.8 acres. The area consists of residential 1 acre lots, forested lands, and a meadow area. The soils are all HSG type C. The CN was calculated to be 67 and time of concentration was calculated to be 36.5 minutes.

Rainfall Data

Rainfall values used for the hydrologic modeling were taken from the official National Weather Service Station gage at Sikorsky Airport in Bridgeport. This gage is located approximately 10 miles to the southwest of the site. On July 9th 2021 during Tropical Storm Elsa, the gage measured 4.09 inches of rainfall. The gage began collecting data at approximately 4 AM and stopped approximately at 10 AM for a duration of 6 hours. The rainfall amount was consistent with other reported values reported in Weather Underground Station Network located in Orange. The gage also measured over 1 inch of rainfall on the previous day and 1.3 inches of rainfall the previous week. For the entire month of July, there was a reported 8.55 inches of rainfall.

On September 1st 2021 during Tropical Storm Ida, the gage measured 5.77 inches of rainfall. The gage began collecting data at approximately 6 PM and stopped approximately at 12 AM for a duration of 6 hours. The rainfall amount was consistent with other reported values reported in Weather Underground Network located in Orange. During Ida, there was an extremely heavy rainfall between 10 PM and 11 PM with over 3 inches reported. As with the July storm, there was heavy rainfall only a short period before the storm. On August 22nd and August 23rd during Tropical Storm Henri, there was 1.5 to 2.0 inches of rainfall.



PROJECT TITLE: DERBY MILFORD FLOODING INVESTIGATION REPORT ORANGE, CT		
DRAWING TITLE: EXISTING DRAINAGE AREAS		
DRAFTER: DL	DATE: 2/23/2022	DRAWING NUMBER: FIGURE 2

CARDINAL
ENGINEERING ASSOCIATES
200 RESEARCH PROMYTH AVENUE, CT 06480-2000-200-1000
407 BANTAM RD 1 LITCHFIELD, CT 06749-1000-507-2300

As described above, both rainfall events occurred when the ground was saturated by previous rainfall. This condition magnified the runoff from the storms studied as the ground had reduced ability to infiltrate the rainfall during these events.

Both rainfall amounts were compared to the NOAA Atlas 14 rainfall data to determine the storm magnitude. Storm Elsa was determined to be a 25-year storm (4.09 inches measured vs. 4.30 inches Atlas 14 value) and Storm Ida was determined to be a 100-year storm (5.77 inches measured vs. 5.44 inches Atlas 14 value). Atlas 14 values for the other 6-hour storms: 2 year (2.38 inches), 10 year (3.56 inches), and 50 year (4.85 inches) were used in the hydrologic models.

Calculated Brook Flows

Based on the hydrologic analysis and modeling, the brook flows were calculated to be as shown in Table 1.

Table 1
Calculated Flood Flows

LOCATION	DRAINAGE AREA (square miles)	PEAK DISCHARGE (cfs)			
		10 Yr	25 Yr	50 Yr	100 Yr
Upstream of Brookside Drive	0.247	68.2	91.6	143	202
Upstream of Railroad Culvert	0.412	94.1	131	212	308
Downstream of East Slope Culvert to High Ridge Culvert	0.646	161	223	361	522

Hydraulic Analysis

Following hydrologic modeling, hydraulic analysis was conducted using both HY-8 culvert modeling software and Army Corps of Engineers, Hydrologic Engineering Center, River Analysis System computer program (HEC-RAS Version 5.0.7 computer program). HY-8 analysis was first performed and then a more detailed HEC-RAS model was prepared since the HY-8 model could not reproduce the measured flooding depths reported by the residents during the flooding. The HEC-RAS hydraulic model was used to determine the brook water surface elevations, depths, and velocities using the computed flows from Table 1 above. Water surface profiles were computed for the 2-, 10-, 25-, 50-, and 100-year storm events for the existing conditions and for the proposed conditions.

The HEC-RAS hydraulic model consisting of approximately 25 cross sections was built using topographic data provided by the Town of Orange, UCONN 2016 Lidar data, and Cardinal field

survey. The field survey was performed in 2021 with topographic cross sections collected in the areas of Brookside Drive, Glenbrook Road, railroad culvert, Derby-Milford Road crossing, East Slope Drive, and High Ridge Road. The resulting cross sections were introduced into the Existing Conditions model. The model started approximately 500 feet upstream of the Brookside Drive crossing and was ended 100 feet downstream of the High Ridge culvert. The characteristics of the stream channel, overbank areas upstream and downstream of the bridge and entrance coefficients for the existing and selected proposed structures were determined and incorporated into the model. In order to determine the starting water surface elevation, the general slope of the reach at the downstream end of the model was introduced into the HEC-RAS model. Normal depth into the channel was used as downstream boundary condition for the design analyses. The upstream boundary condition is the critical depth in the upstream channel.

The topographic survey performed by Cardinal determined the following sizes of the existing culverts in the field. The dimensions of these culverts along with the HEC-RAS cross section IDs are provided below:

Brookside Drive to Glenbrook Road (XS 4718)

- North Culvert- 3 foot diameter RCP (400 feet long), slope=0.13%
- South Culvert- 5 foot wide by 4 foot high corrugated metal arch (400 feet long) slope=0.08%, inspection showed heavy siltation
- Downstream Channel: 8 foot width, slope=0.005 ft/ft, estimated 3H:1V side slopes with 4 foot depth

Railroad Culvert (XS 4230)

- 3 foot wide by 4.5 foot high concrete box culvert (55 feet long), slope= -0.15%, adverse slope

Derby-Milford Road (XS 4093.5)

- 6.3 foot wide by 4.0 foot high stone arch (22 feet long) connected to 4.0 foot diameter RCP (35 feet) downstream, slope= 0.22%

East Slope Driveway Culvert (XS 3955)

- 4 foot wide by 3.5 foot high corrugated metal arch (18 feet long), slope= 0.40%

High Ridge Road (XS 3455)

- 10 foot wide by 5 foot high concrete box culvert (72 feet long), slope= 1.2%

Existing Hydraulic Analysis Results

The results of the existing hydraulics analysis are provided in the following tables (Table 2 and Table 3). The modeled flood amounts are provided in the tables along with reported flood values provided by residents. Figures 2 and 3 show the existing water surface profiles.

Table 2 – Flood Calculations
July 9th and September 1st Storm Events
Brookside Drive
Existing Conditions

Property Location	July 9, 2021 Storm (Elsa)				September 1, 2021 Storm (Ida)			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	112.84	+0.5	+6	112.34	115.29 (estimated 21” or 114.09)	+2.95	+35
833 Brookside	110.56 shed	112.84	+2.28	+27	110.56 shed	115.27 (estimated 3.5’ or 114.06)	+4.73	+57
827 Brookside	112.43	112.84	+0.41	0	112.43	115.29 (estimated-3.0’ or 115.43)	+2.84	+34
827 Brookside	110.55 shed	112.84	+2.29	+27	110.55 shed	115.29	+4.74	+567

Notes: 1. WSE=Water Surface Elevation

2. Brookside Drive Centerline Elev 111.47

**Table 3 – Flood Calculations
July 9th and September 1st Storm Events
Glenbrook Road/Derby Milford Road
Existing Conditions**

Property Location	July 9, 2021 Storm (Elsa)				September 1, 2021 Storm (Ida)			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	112.84	+1.79	+21	111.05	115.29 (estimated-3.5' or 114.55' on garage)	+4.24	+51
837 Glenbrook	112.23	112.84	+0.61	+7	112.23	115.28 (estimated 25" or 114.33)	+3.05	+37
837 Glenbrook	110.50 pool	112.84	+2.34	+28	110.50 pool	115.28 (estimated 48" or 114.50)	+4.78	+57
829 Glenbrook	111.41 Adj to pool fence	112.74	+1.33	+16	111.41 Adj to pool fence	115.25	+3.84	+46
596 East Slope	104.42	105.28	+0.86	+10	104.42	105.75	+1.33	+16
596 East Shed	102.76	102.82	0	0	102.76 Shed	103.66	+0.90	+10

**Notes: 1. WSE=Water Surface Elevation
2. Glenbrook Road Centerline Elev. 111.0 ft
3. Derby-Milford Road Centerline Elev. 109.0 ft**

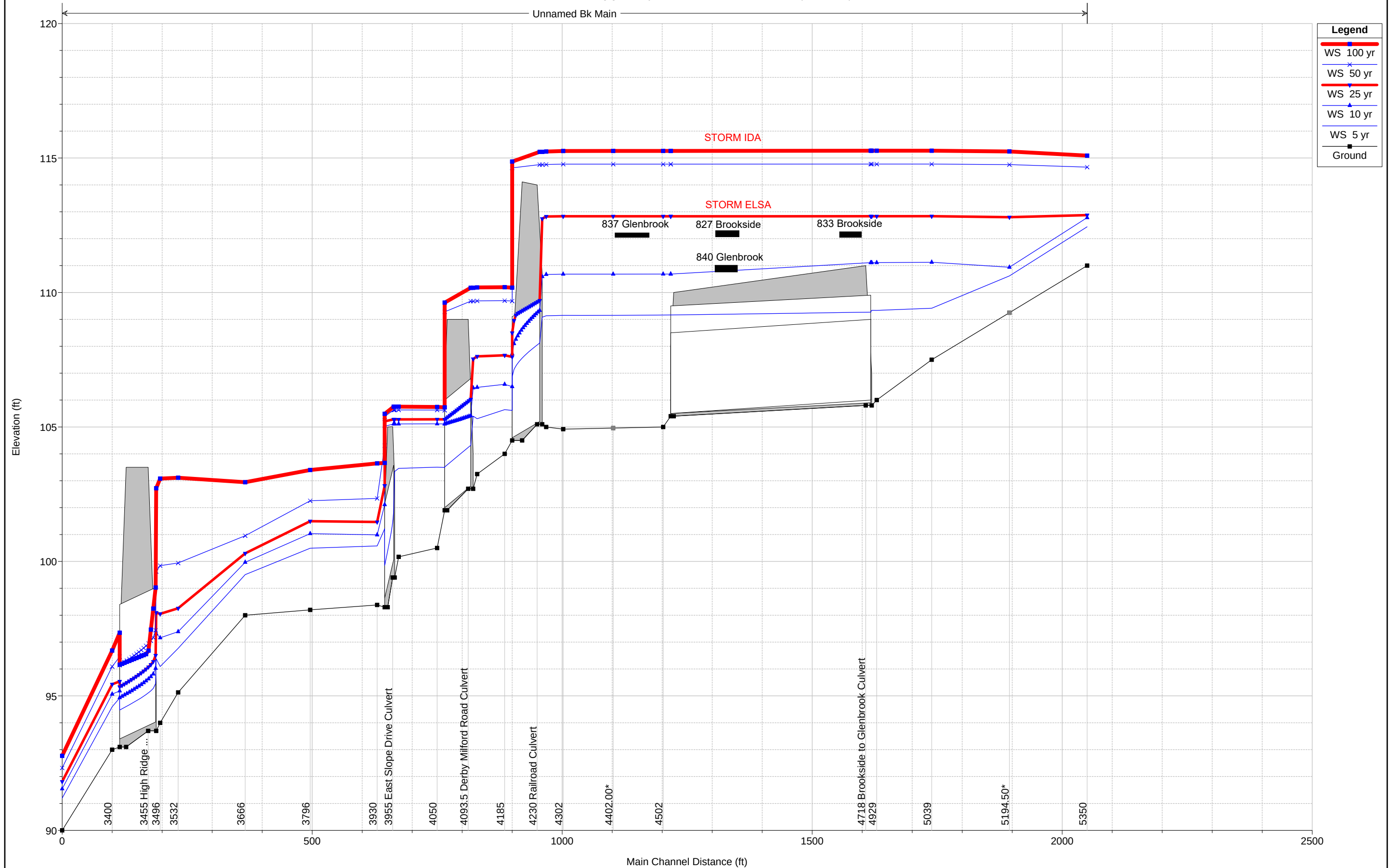


FIGURE 3 WATER SURFACE PROFILES-EXISTING 2-YEAR THROUGH 100-YEAR FREQUENCY

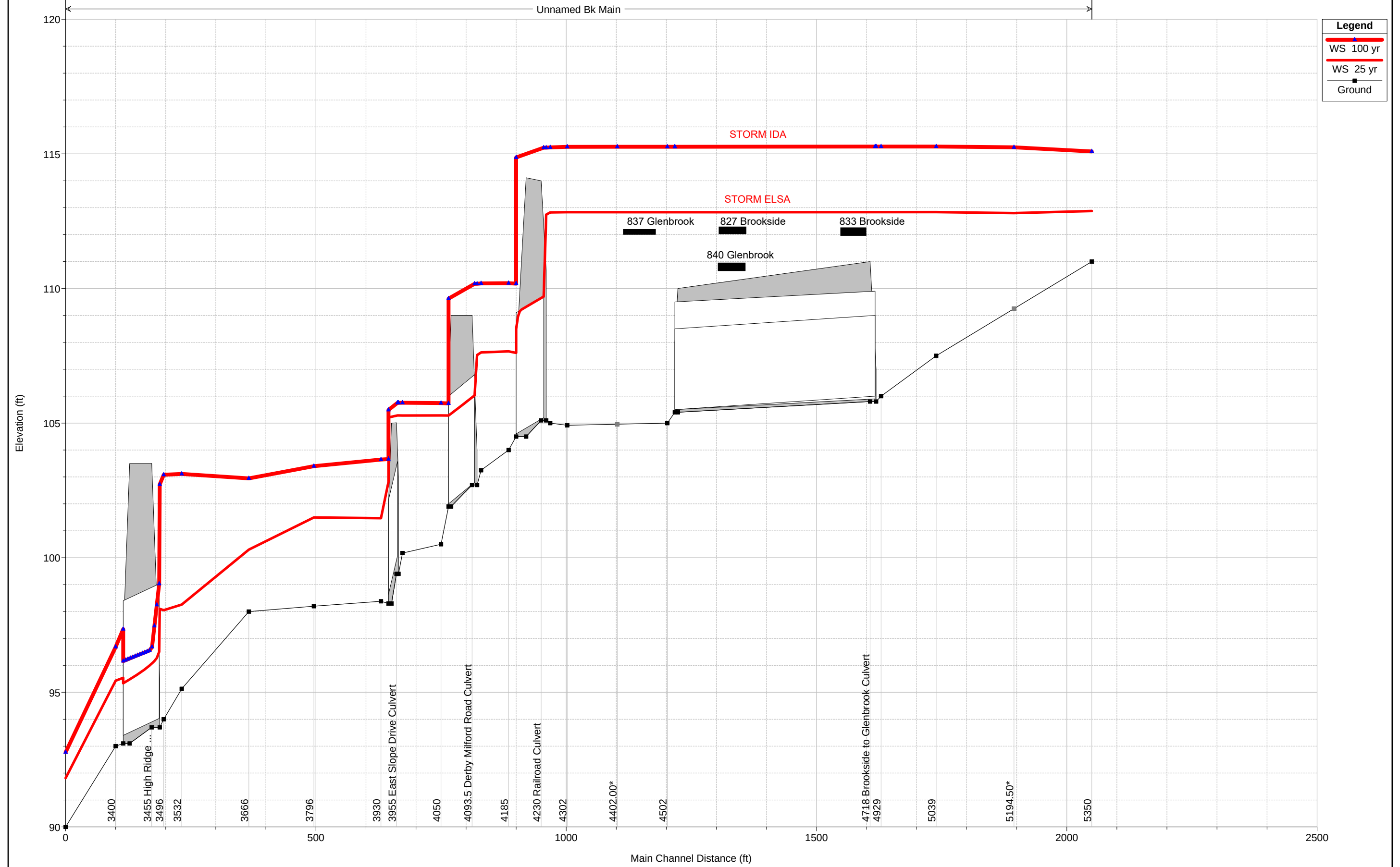


FIGURE 4-WATER SURFACE PROFILES-EXISTING 25-YEAR AND 100-YEAR PROFILES

Mitigation Analysis

The Town of Orange requested Cardinal evaluate potential strategies to alleviate the flooding in the Derby-Milford residential neighborhood. The strategies involved construction work (culvert removal and replacement of culverts) as well as property acquisition and removal of houses. The four houses most impacted by the flooding that were considered for property acquisition were identified as:

- 827 Brookside Drive, 0.71 acre lot, 2017 town appraised value \$314,600
- 833 Brookside Drive, 0.71 acre lot, 2017 town appraised value \$300,600
- 837 Glenbrook Road, 0.73 acre lot, 2017 town appraised value \$313,100
- 840 Glenbrook Road, 0.73 acre lot, 2017 town appraised value \$249,800

It should be noted that the Town already has drainage easements for the Brookside to Glenbrook culvert and the 48-inch pipe culvert outlet near the railroad embankment. The 15 to 20 foot wide drainage easement between Brookside Drive and Glenbrook Road was deeded to the town in 1973 (see Map 804). Map 876 shows the 15-foot wide drainage easement for the 48-inch RCP.

The following potential improvements and stormwater construction projects were evaluated and identified as viable mitigation options. There are 7 options (Option 1 through 7) with slightly different modifications within each option.

Option 1

- Option 1-Do nothing

Option 2

- Option 2A-Acquire and remove 2 houses
- Option 2B-Acquire and remove 4 houses
- Option 2C-Replace Derby Milford Road Culvert (10x5 box culvert)
- Option 2D-Replace culverts from Brookside to Glenbrook with larger culvert (12x4 box culvert)
- Option 2E-Open Channel from Brookside to Glenbrook, install road cross culverts (12x4 box Brookside, 13x4 Glenbrook) at Brookside and Glenbrook, acquire 2 houses
- Option 2C and 2D Combined
- Option 2C and 2E Combined

Option 3

- Option 3-Remove old railroad culvert
- Option 3A- Remove old railroad culvert and acquire 4 houses
- Option 3B- Remove old railroad culvert and replace culverts from Brookside to Glenbrook with larger culvert (12x4 box culvert)
- Option 3C- Remove old railroad culvert and replace culverts from Brookside to Glenbrook with larger 12x4 box culvert (and acquire houses)

- Option 3D- Remove old railroad culvert and restore open channel from Brookside to Glenbrook, install 2 short cross culverts (12x4 box Brookside, 13x4 Glenbrook)
- Option 3E- Remove old railroad culvert and restore open channel from Brookside to Glenbrook, install 2 short cross culverts (12x4 box Brookside, 13x4 Glenbrook) and acquire 2 houses
- Option 3F- Remove old railroad culvert and restore open channel from Brookside to Glenbrook, install 2 short cross culverts (12x4 box Brookside, 13x4 Glenbrook), acquire 2 houses, and new Derby-Milford culvert (10x5)

Option 4

- Option 4-Remove old railroad culvert and replace Derby-Milford Road culvert with larger box culvert (10x5)
- Option 4A-Remove old railroad culvert and replace Derby-Milford Road culvert with larger box culvert (10x5) and acquire 2 houses
- Option 4B-Remove old railroad culvert and replace Derby-Milford Road culvert with larger box culvert (10x5) and acquire 4 houses
- Option 4C- Remove old railroad culvert, replace Derby-Milford Road culvert with larger box culvert (10x5), and replace Brookside to Glenbrook culverts

Option 5

- Option 5-Replace old railroad culvert with larger box culvert (10x5)
- Option 5A-Replace old railroad culvert with larger box culvert (10x5) and acquire 4 houses

Option 6

- Option 6-Replace old railroad culvert with larger box culvert (10x5) and replace Derby-Milford Road culvert (10x5 box culvert)
- Option 6A-Replace old railroad culvert with larger box culvert (10x5) and replace Derby-Milford Road culvert (10x5) and replace Brookside to Glenbrook culverts (10x4)
- Option 6B-Replace old railroad culvert with larger box culvert (10x5) and replace Derby-Milford Road culvert (10x5 box) and restore open channel from Brookside to Glenbrook and install two short cross culverts
- Option 6C-Replace old railroad culvert with larger box culvert and replace Derby-Milford Road culvert and restore open channel from Brookside to Glenbrook, install two short cross culverts (12x4 box Brookside, 13x4 Glenbrook, and acquire 2 houses

Option 7

- Option 7-Replace driveway culvert at 596 East Slope

Hydraulic Design Criteria

The Town of Orange requested that the 100-year design storm be used as the design basis for any new culverts in this neighborhood. Based on the frequency and magnitude of flooding, this appeared reasonable and conservative. The 100-year design standard for new culverts is more conservative than if the DOT design criteria was used. Based on the CTDOT classification any of the replacement culverts would be classified as “Small Structures”. These crossings include culverts and bridges with drainage areas less than one square mile (see CTDOT Drainage Manual Table 8-4). Small structures shall be designed to pass the 50-year frequency discharge. The effects of a discharge equal to the 100-year storm passing through the proposed culvert shall be investigated.

Mitigation Results and Discussion

The hydraulic and mitigation analysis that was developed by Cardinal identified several mitigation strategies that would have different levels of effectiveness (reduced flooding) at several different levels of costs. The mitigation results are shown on the Decision Matrix in Tables 4 and 5. It should be noted that the water surface elevation and velocities were evaluated at the culverts downstream from location of culvert removals or replacements. Any differences were determined to be de minimis. Tables comparing hydraulic properties of the existing and proposed options are provided in the appendices.

Mitigation of the environmental impacts of construction will be a key component to any of the strategies and options involving construction. Environmental permitting requirements may differ if state or federal funding is involved. The expected environmental permits required for the construction options (all identified options except 1, 2A, 2B) are anticipated to include the following:

- Town of Orange Wetlands Permitting
- Town of Orange Planning and Zoning Approval
- Town of Orange Flood Management Approval
- Army Corps of Engineers Self-Verification (SV) Permit
- CT DEEP 401 Water Quality Certificate
- CT DEEP Fisheries Consultation

A review of the NDDDB mapping for the Town of Orange determined that none of the project areas are located in mapped CT DEEP NDDDB areas (areas associated with state listed species of special concern).

The estimated timeframes for design, permitting, and construction will depend on the option selected and scope involved. With regard to estimated timeframes, it is anticipated that final design could be completed in 6 to 8 weeks upon survey completion, permitting in 3 to 4 months, and construction in 3 to 6 months.



**Table 4 Decision Matrix
Options 1 through 4
Flooding Investigation Report
Derby-Milford Neighborhood**

[illegible]

Table 4 Decision Matrix
Options 1 through 4
Flooding Investigation Report
Derby-Milford Neighborhood



ID #	Alternative	Pros	Cons	Estimated Costs*	Property Impacts	100 Yr Flooding Identified	Permission Needed
3A	Remove Old Railroad Culvert and acquire/demo 4 houses			\$1.50M Total			Purchase or eminent domain for 827, 833 Brookside Drive, 840 Glenbrook
3B	Remove Old Railroad Culvert and replace culvert from Brookside to Glenbrook with larger culvert (12x4 Box Culvert)	1. Would remove 99% of flooding issues in Brookside/Glenbrook area	1. Eliminates driveway access between Winkle Properties	\$256K Remove RR Culvert	Flooding at 1 house on Brookside/Glenbrook	2" at 840 Glenbrook house	Permission of property owner at 803 Derby Milford Rd (Winkle)
			2. Still have flooding at Derby Milford Road	\$2.03M Install 12x4 Culvert	Flood overtops Derby Milford Road	>6" in yards of Brookside/Glenbrook	Permission of property owner at 815 Derby Milford Rd (Winkle)
			3. Costly option	\$2.38M Total	Flooding in driveway/yard of 1 property on East Slope	Derby Milford Rd-14 inches	
			4. Road flooding still expected			596 East Slope-16 inches	
3C	Remove Old Railroad Culvert and replace culvert from Brookside to Glenbrook with larger culvert; acquire 2 houses			\$2.76M Total			Purchase or eminent domain for 827 and 833 Brookside Drive
3D	Remove Old Railroad Culvert and restore open channel from Brookside to Glenbrook and install 2 road cross culverts (12x4 Brookside, 13x4 Glenbrook)	1. Would completely remove flooding issues in Brookside/Glenbrook area	1. Eliminates driveway access between Winkle Properties	\$1.31M Total	Flood overtops Derby Milford Road	Derby Milford Rd-14 inches	Permission of property owner at 803 Derby Milford Rd (Winkle)
			2. Still have flooding at Derby Milford Road		Flooding in driveway/yard of 1 property on East Slope	596 East Slope-16 inches	
			3. Road flooding still expected				
3E	Remove Old Railroad Culvert and restore open channel from Brookside to Glenbrook; 2 cross culverts (12x4 Brookside, 13x4 Glenbrook) and acquire 2 houses	1. Would completely remove flooding issues in Brookside/Glenbrook area	1. Eliminates driveway access between Winkle Properties	\$1.99M Total	Flooding in driveway/yard of 1 property on East Slope	596 East Slope-16 inches	Purchase or eminent domain for 827,833 Brookside Drive
3F	Remove Old Railroad Culvert and restore open channel from Brookside to Glenbrook; 2 cross culverts (10X4), acquire 2 houses, new Derby Milford Culvert (12X5)	1. Would completely remove flooding issues in Brookside/Glenbrook area & over Derby Milford Rd	1. Eliminates driveway access between Winkle Properties	\$2.70M Total	Flooding in driveway/yard of 1 property on East Slope	596 East Slope-16 inches	Purchase or eminent domain for 827,833 Brookside Drive
4	Remove Old Railroad Culvert and replace Derby Milford Road culvert (10x5 box)	1. Would remove 95% of flooding issues in Brookside/Glenbrook area	1.Will reduce accessibility of Winkle Property	RR Culvert Work \$256K	Flooding at 1 house on Brookside/Glenbrook	6" at 840 Glenbrook house	Permission of property owner at 803 Derby Milford Rd (Winkle)
		2. Would remove flooding on Derby Milford	2 Still have flooding at Brookside/Glenbrook area	Derby Milford Culvert \$713K	Flooding in driveway/yard of 1 property on East Slope	>12" in yards of Brookside/Glenbrook	Permission of property owner at 815 Derby Milford Rd (Winkle)
		3. Do not need to repair/rehabilitate 400 foot culvert at this time	3. Culverts on Brookside/Glenbrook would need routine repairs	\$969K Total		596 East Slope-16 inches	
4A	Remove Old Railroad Culvert and replace Derby Milford Road culvert (10x5 box); acquire 2 houses			\$1.64M			Purchase or eminent domain for 827 and 833 Brookside Drive
4B	Remove Old Railroad Culvert and replace Derby Milford Road culvert (10x5 box); acquire 4 houses			\$2.27M			Purchase or eminent domain for 827,833 Brookside Drive; 837/840 Glenbrook
4C	Remove Old Railroad Culvert, replace Derby Milford Road culvert (10x5 box), replace Brookside/Glenbrook culvert (10x4 box)	1. Removes all flooding issues except for East Slope	1. Eliminates driveway access between Winkle Properties	RR Culvert Work \$256K	Flooding in driveway/yard of 1 property on East Slope	596 East Slope-16 inches	Permission of property owner at 803 Derby Milford Rd (Winkle)
			2. Very costly alternative	Derby Milford Culvert \$713K			Permission of property owner at 815 Derby Milford Rd (Winkle)
				Brookside/Glenbrook Culvert \$1.83M			
				\$2.80M Total			

*Notes:

1. The cost estimates do not include drainage right-of-way or easement costs.
2. Estimated costs include design and permitting; break outs are shown in cost estimates located in appendix F
3. Costs associated with design work including geotechnical, wetlands flagging/reporting, and additional survey if needed are included



Table 5-Decision Matrix
Options 5 through 7
Derby-Milford Neighborhood Flooding Investigation
Orange, CT

ID #	Alternative	Pros	Cons	Estimated Costs	Property Impacts	100 Yr Flooding Identified	Permitting Needed
5	Replace old railroad culvert with larger culvert (10x5 box)	1. Easy to implement	1. Additional property damage likely to reoccur	\$565K Total	Flooding at 1 house on Brookside/Glenbrook	9" at 840 Glenbrook house	Permission of property owner at 803 Derby Milford Rd (Winkle)
		2. Reasonable cost			Flood overtops Derby Milford Road	15" in yards of Brookside/Glenbrook	Permission of property owner at 815 Derby Milford Rd (Winkle)
		3. No acquisitions needed			Flooding in driveway/yard of 1 property on East Slope	Derby Milford Rd-14 inches	
						596 East Slope-16 inches	
5A	Replace old railroad culvert with larger culvert(10x5); acquire 4 houses			\$1.86M Total			Agreement with 827/833 Brookside and 837/840 Glenbrook
6	Replace old railroad culvert with larger culvert (10x5 box) and replace Derby Milford Road Culvert (10x5 box)	1. Would significantly reduce amount of flooding in Brookside/Glenbrook area	1 Still have flooding at Brookside/Glenbrook area	RR Culvert Work \$565K	Flooding at 1 house on Brookside/Glenbrook	7" at 840 Glenbrook house	Permission of property owner at 803 Derby Milford Rd (Winkle)
		2. Would remove flooding on Derby Milford	2. Culverts on Brookside/Glenbrook would need	Derby Milford Culvert \$713K	Flooding in driveway/yard of 1 property on East Slope	13" in yards of Brookside/Glenbrook	Permission of property owner at 815 Derby Milford Rd (Winkle)
		3. Would not need replace/rehabilitate	routine repairs	\$1.28M Total		596 East Slope-16 inches	
		the 400 foot culverts at this time					
6A	Replace old railroad culvert with larger culvert (10x5 box) and replace Derby Milford Road Culvert (10x5 box) and replace Brookside/Glenbrook culvert (10x4 box)	1. Would significantly reduce flooding in Brookside/Glenbrook area	1. Costly option that still has flooding issues	RR Culvert Work \$565K	Flooding at 4 properties on Brookside/Glenbrook	Brookside/Glenbrook-3 inches	Permission of property owner at 803 Derby Milford Rd (Winkle)
		2. Would remove flooding on Derby Milford		Derby Milford Culvert \$713K	Flooding in driveway/yard of 1 property on East Slope	596 East Slope-16 inches	Permission of property owner at 815 Derby Milford Rd (Winkle)
		3. Don't change access at Winkle property		Brookside culvert \$1.83 M			
				\$3.11M Total			
6B	Replace old railroad culvert with larger culvert (10x5 box) and replace Derby Milford Road Culvert (10x5 box) and restore open channel from Brookside to Glenbrook	1. Would completely remove flooding issues in Brookside/Glenbrook area	1. May need to acquire two houses if open channel presents issues	RR Culvert Work \$565K	Flooding in driveway/yard of 1 property on East Slope	596 East Slope-16 inches	Permission of property owner at 803 Derby Milford Rd (Winkle)
	Install 2 cross culverts for Brookside and Glenbrook	2. Maintains driveway access between	2. Costly option	Derby Milford Culvert \$713K			Permission of property owner at 815 Derby Milford Rd (Winkle)
		Winkle Properties		Cross Culverts \$804K			
		3. Would remove flooding on Derby Milford		\$2.08M Total			
6C	Same as above, acquire 2 houses			\$2.78M Total			Agreement with 827/833 Brookside
7	Replace 596 East Slope Drive culvert (10x5 box)	1. Removes flooding issue at East Slope		\$438K		596 East Slope-0 inches	Permission of property owner at 596 East Slope

*Notes:

1. The cost estimates do not include drainage right-of-way or easement costs.
2. Estimated costs include design and permitting; break outs are shown in cost estimates located in appendix F
3. Costs associated with design work including geotechnical, wetlands flagging/reporting, and additional survey (if needed)
needed) are included

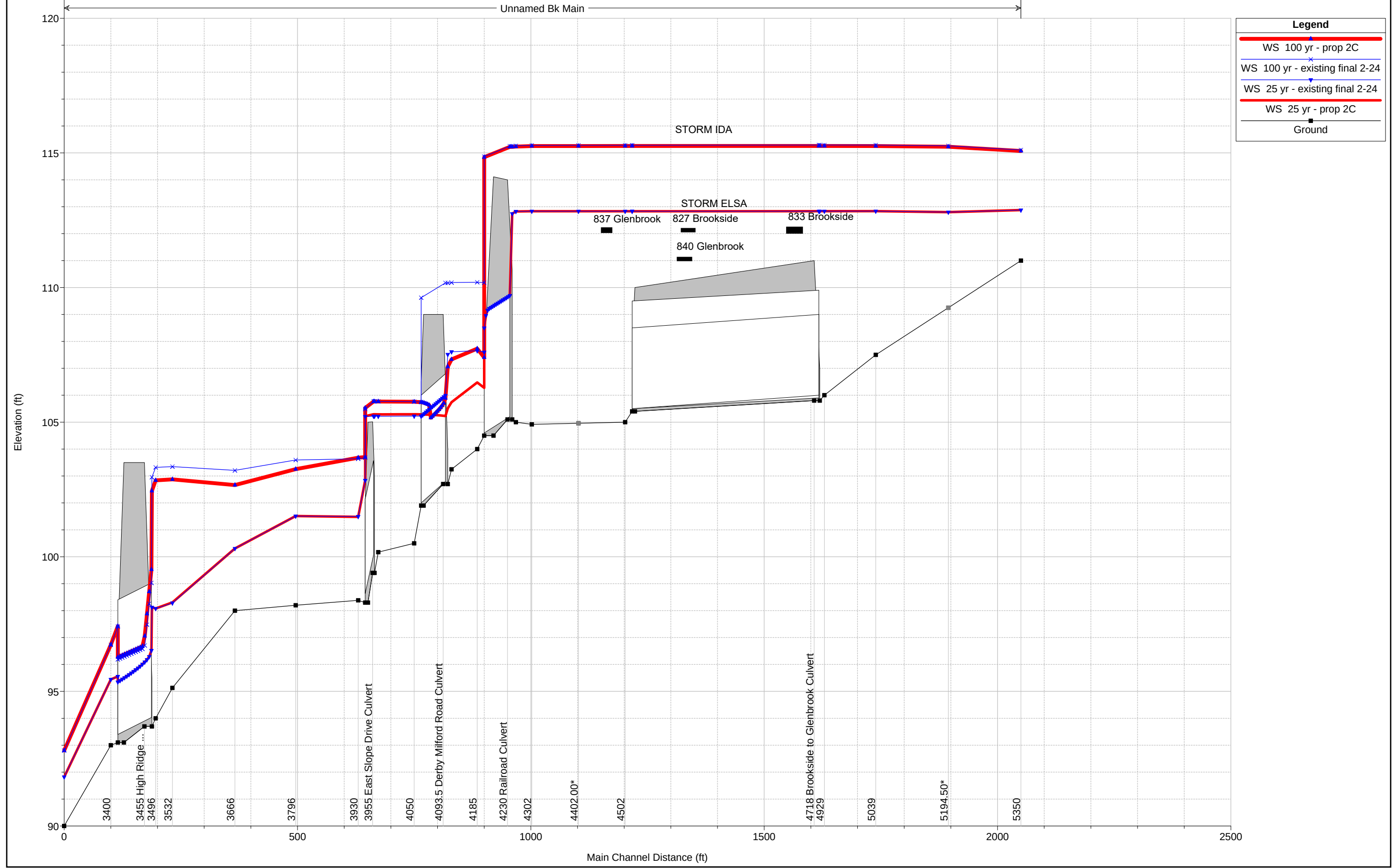


FIGURE 5-WATER SURFACE PROFILES-OPTION 2C

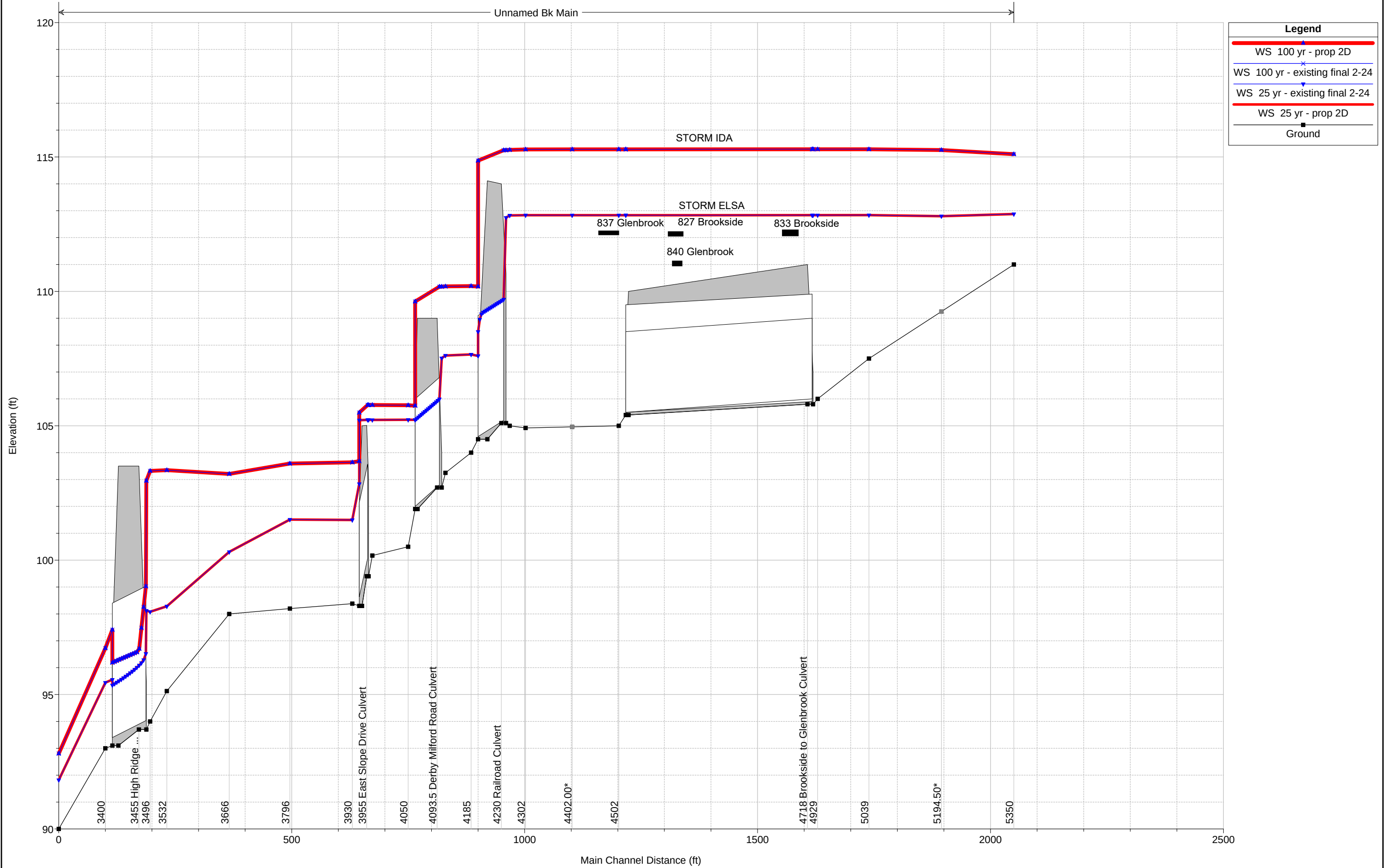


FIGURE 6-WATER SURFACE PROFILES-OPTION 2D

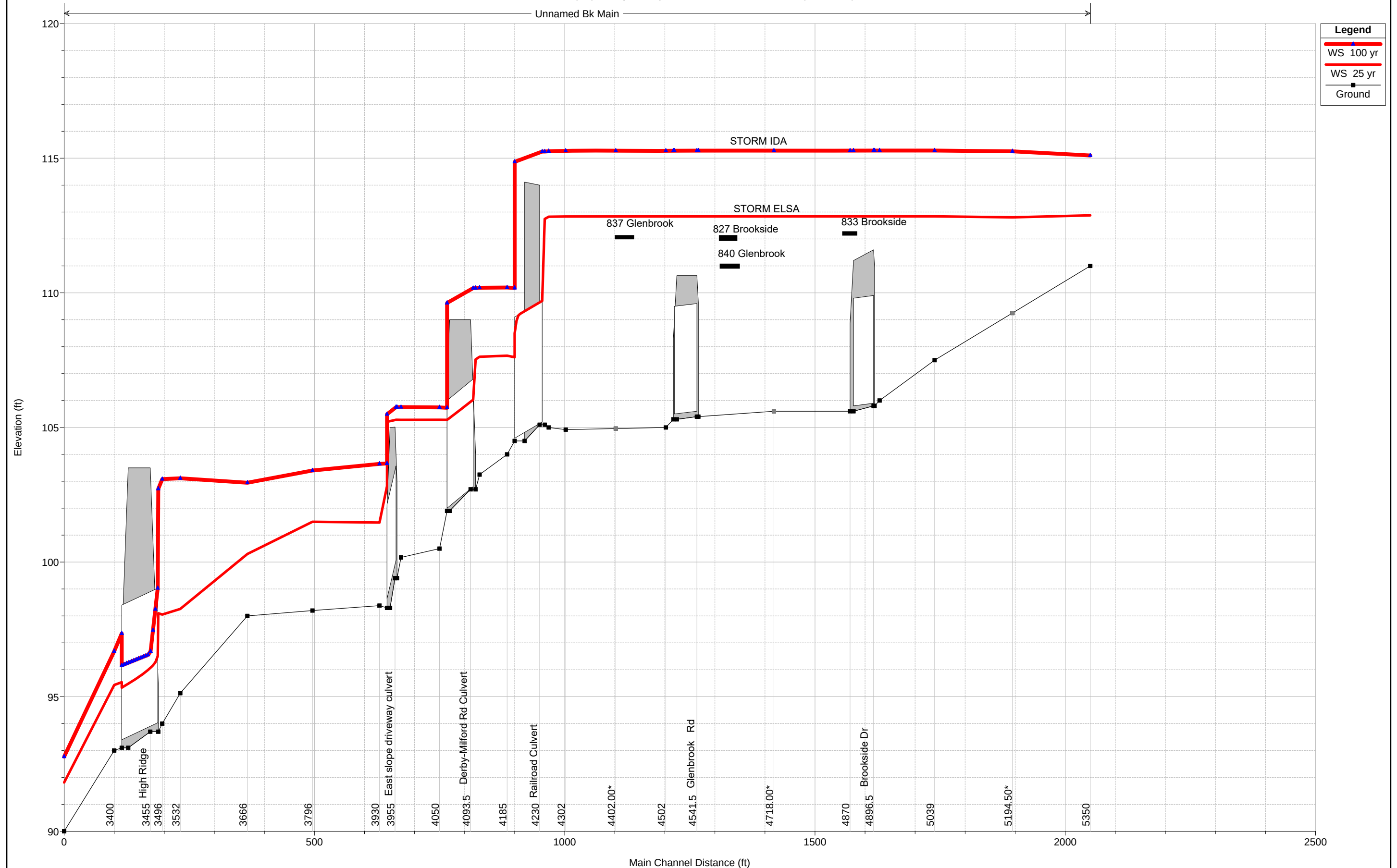


FIGURE 7 WATER SURFACE PROFILES-OPTION 2E

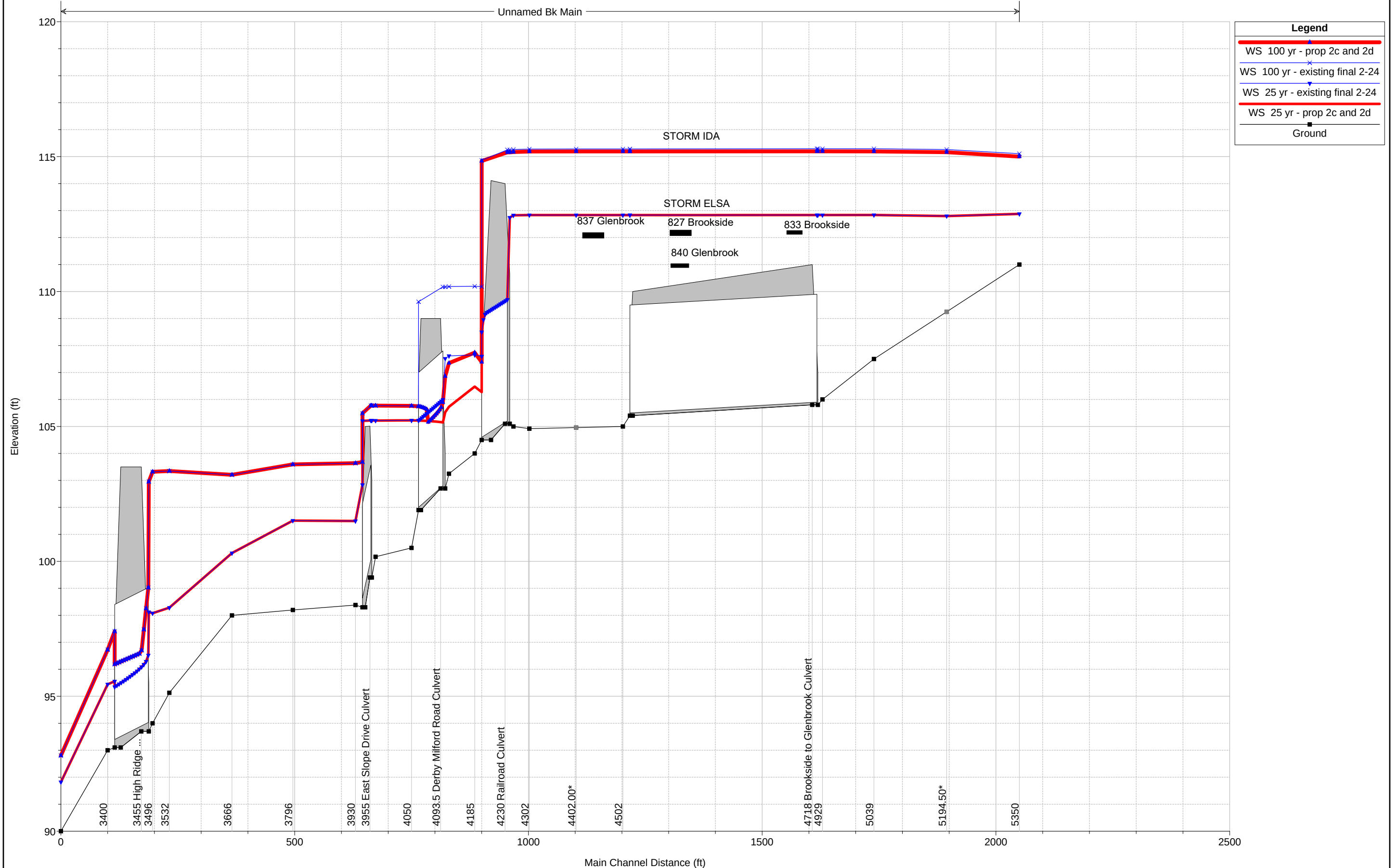


FIGURE 8-WATER SURFACE PROFILES-OPTION 2C AND 2D

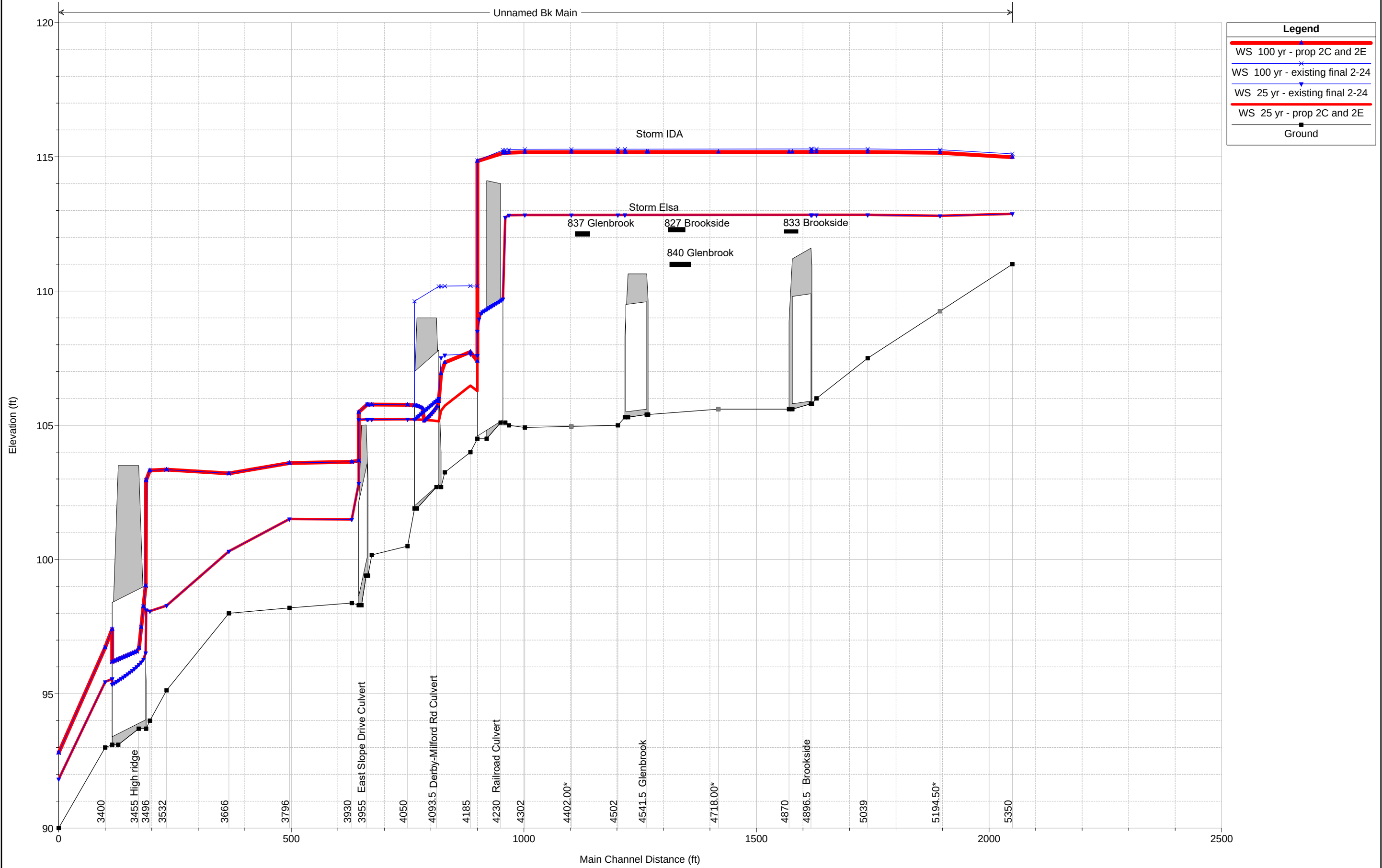


FIGURE 9-WATER SURFACE PROFILES-OPTION 2C AND 2E

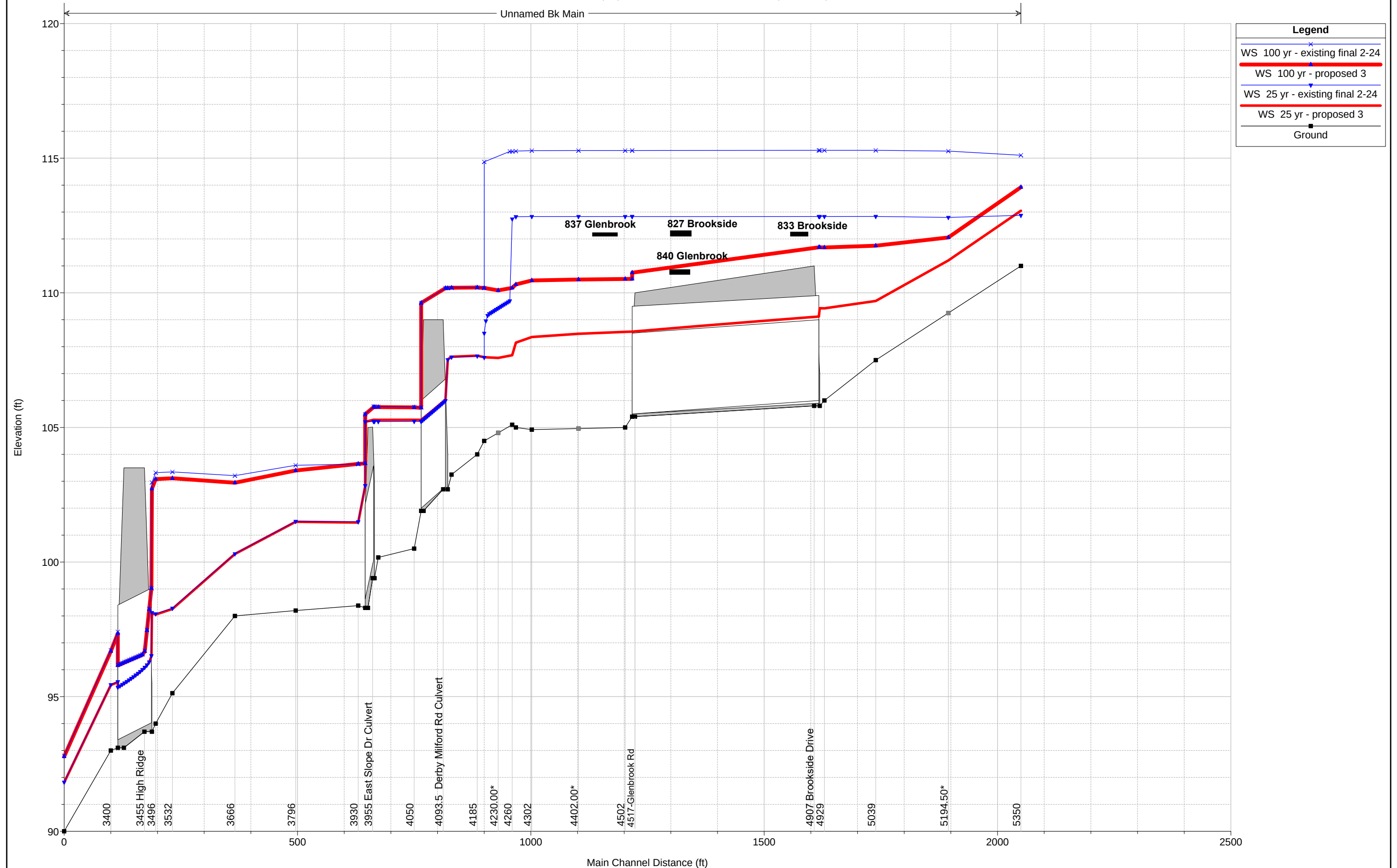


Figure 10-Water Surface Elevations-Proposed Option 3

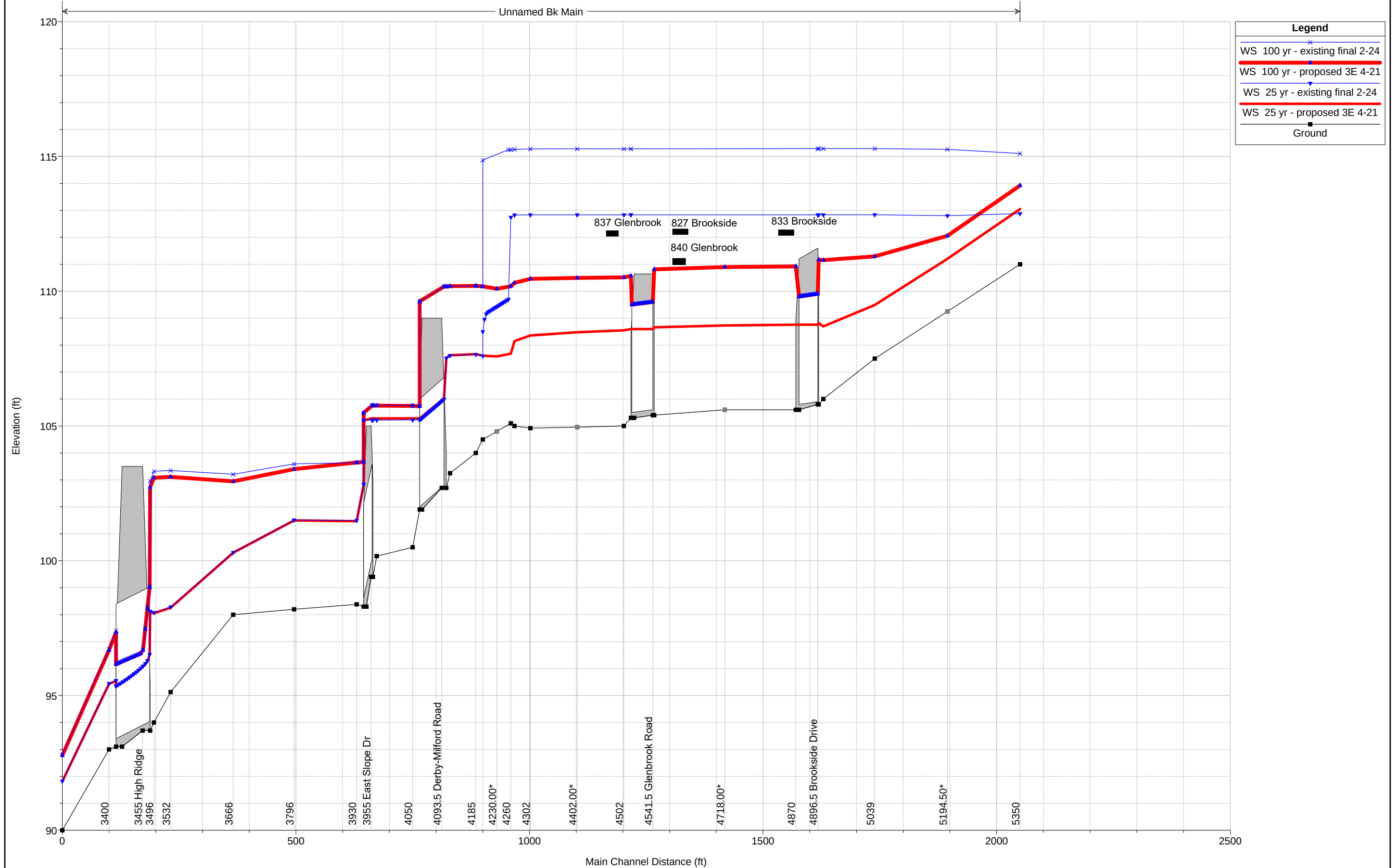


Figure 11-Water Surface Elevation Option 3E

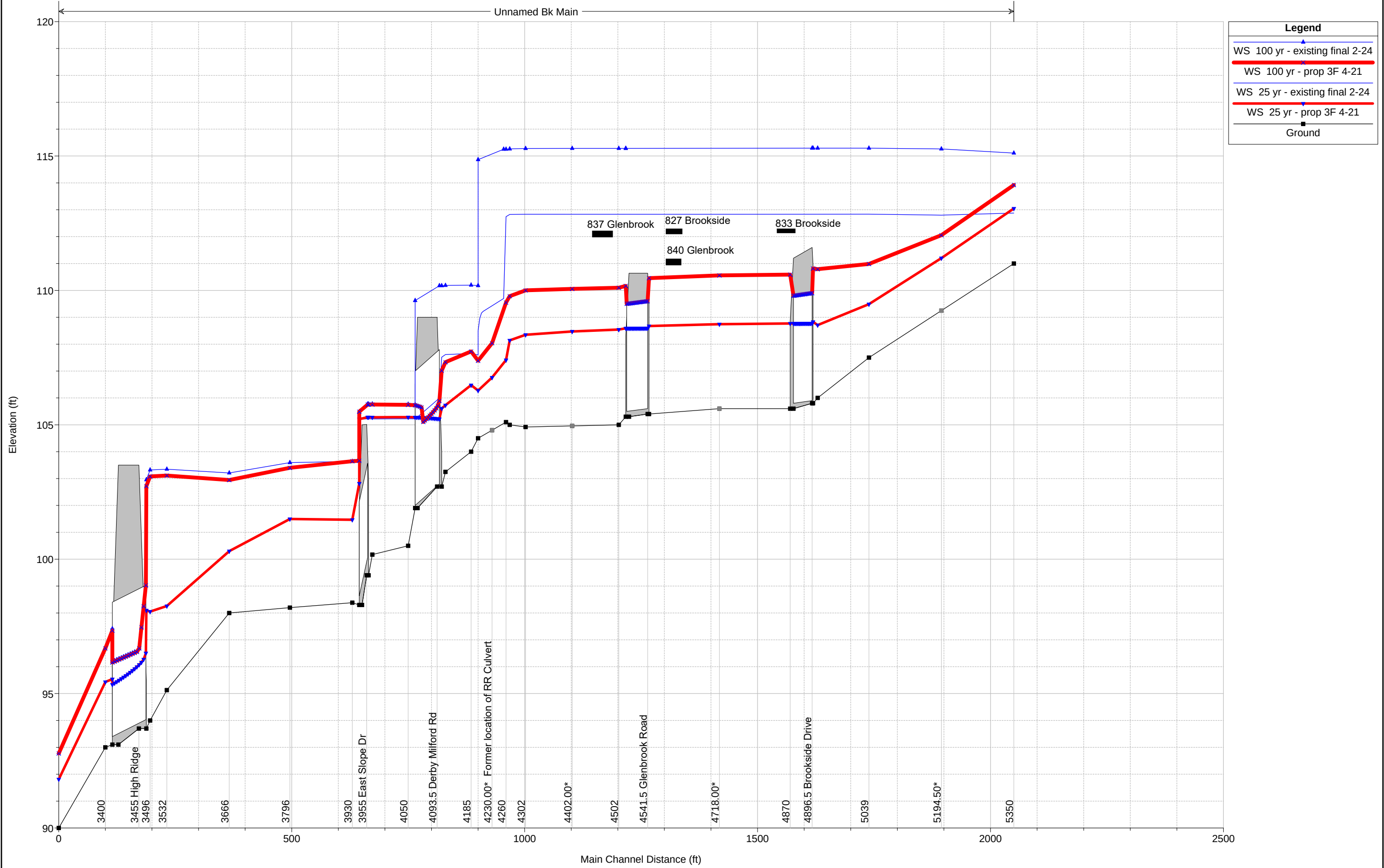


Figure 12-Water Surface Elevations-Proposed Option 3F

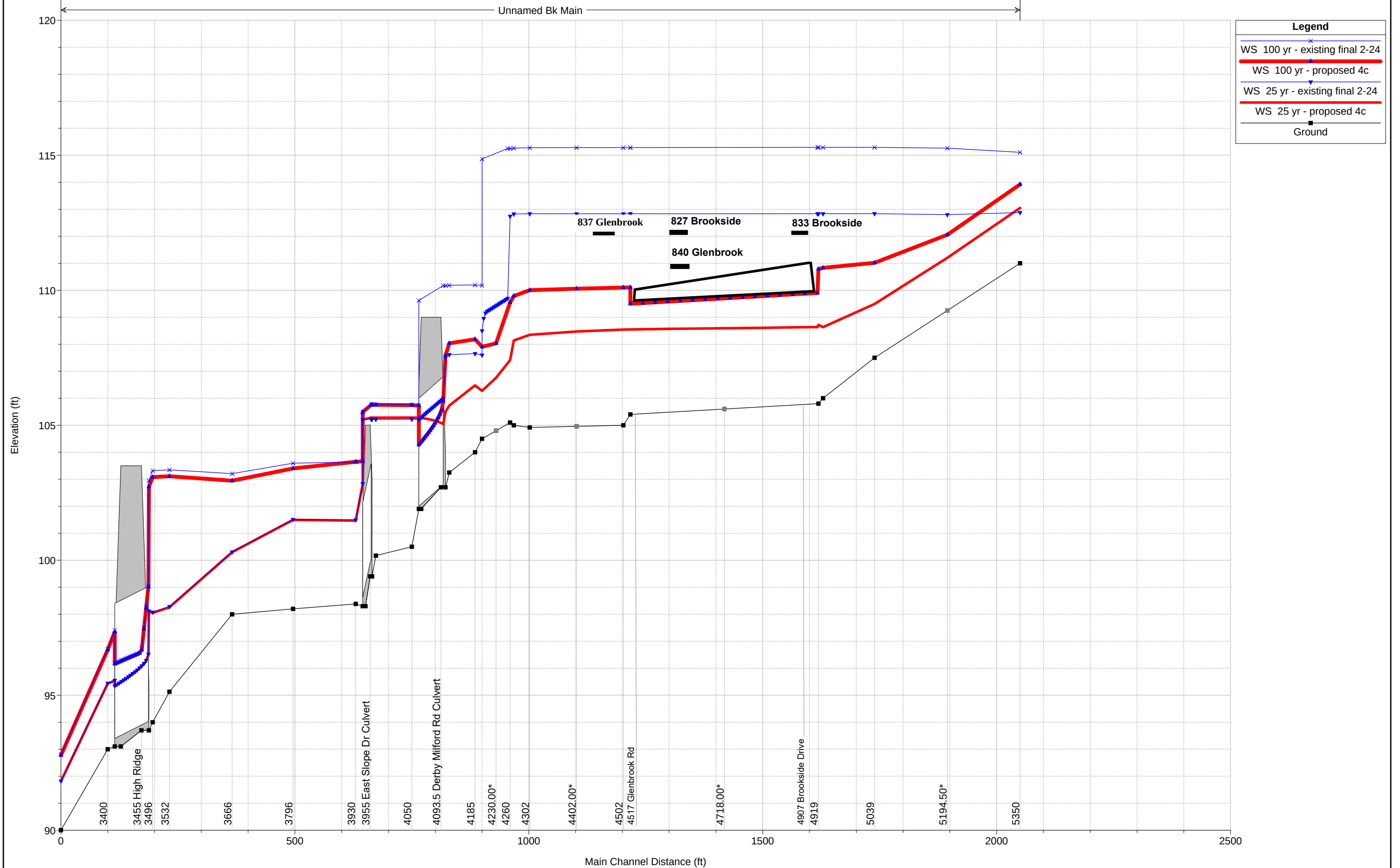


FIGURE 13-Water Surface Profiles-Option 4C

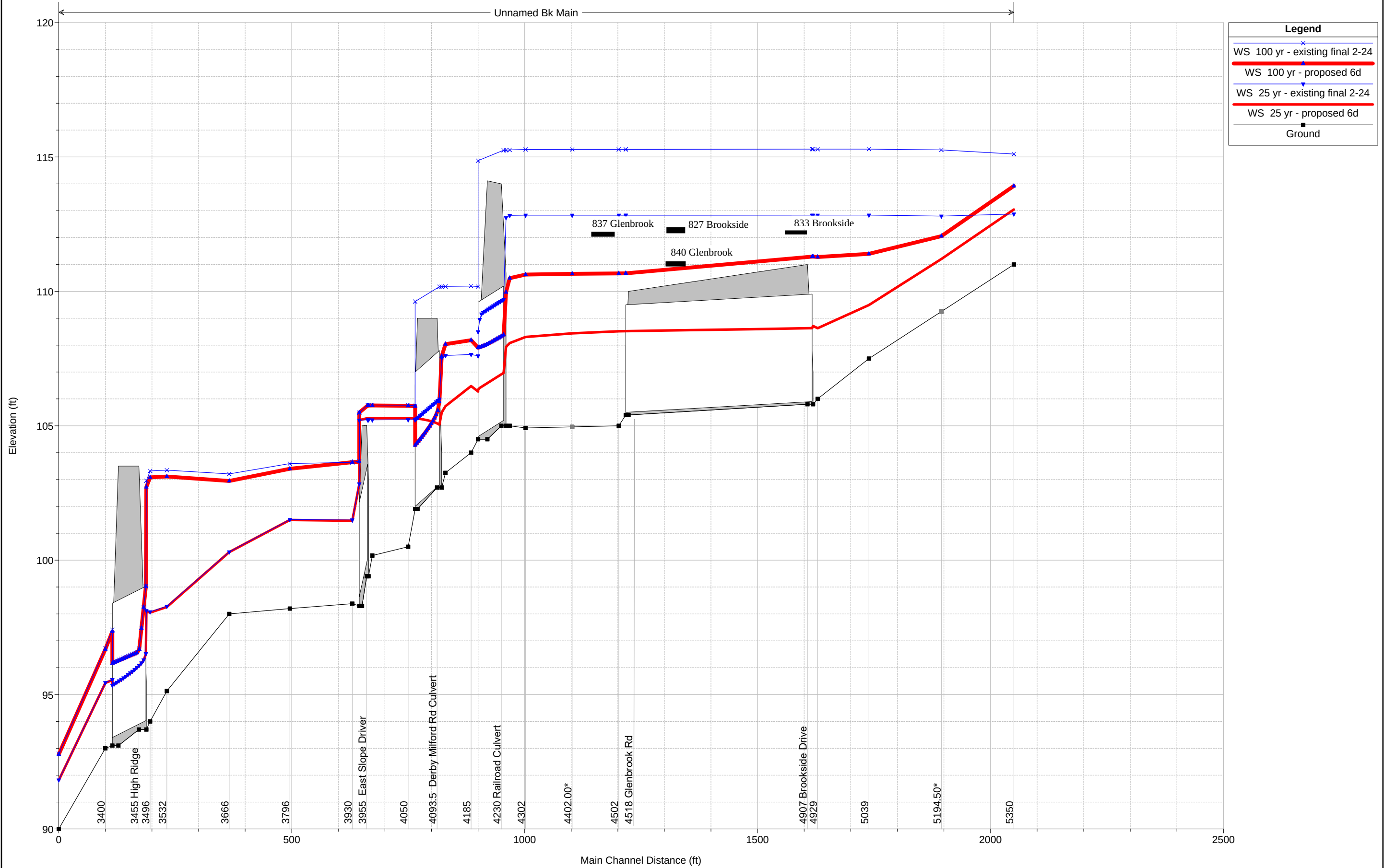


FIGURE 14-WATER SURFACE PROFILES-PROPOSED OPTION 6A

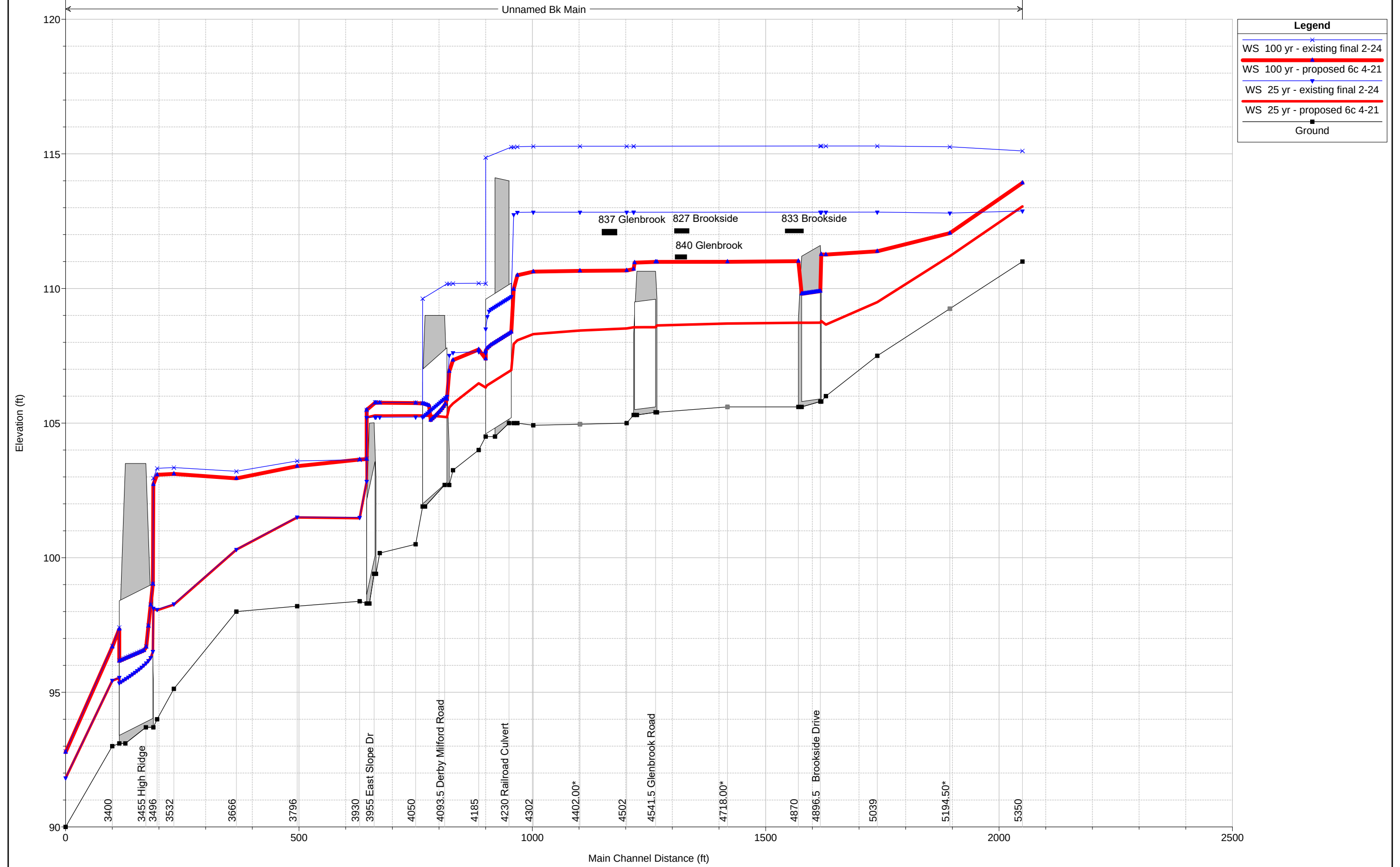


Figure 15-Water Surface Elevations -Proposed Option 6C

Conclusions and Recommendations

The decision matrix summarizes the options including the pros and cons, the associated costs, property owner permissions, and the impact with regard to the 100-year flooding if the option was selected. The estimated cost of acquiring and removing houses subject to flooding is included in the cost estimates, but no costs are included for acquiring easements for construction of proposed drainage improvements. The hydraulic model indicates that even with replacement of the Derby-Milford Road culvert and removal or replacement of the culvert between Brookside Drive and Glenbrook Road, there would be essentially no improvement in flooding upstream from the railroad culvert unless the culvert was removed or replaced with a much larger culvert. Some of the options may warrant splitting the option into different projects to make sure adequate funding (including state funding sources) could be obtained. Based on the decision matrix, the following strategies seem the most feasible if adequate funding and permitting can be obtained:

- Option 2A- Acquire and remove 2 houses (Brookside Drive)

Estimated Cost \$676,000

This option involves acquiring two houses (827 and 833 Brookside Drive) and floodproofing two houses (837 and 840 Glenbrook Road). The acquired houses on Brookside would be demolished. Floodproofing of 837 and 840 Glenbrook Road may be feasible, and would require eliminating basement garage doors. Otherwise, these houses would continue to flood. Roads, driveways, and yards would continue to flood.

- Option 2B- Acquire and remove 4 houses (Brookside/Glenbrook)

Estimated Cost \$1.32M

This option involves acquiring four houses (827 and 833 Brookside Drive, 837 and 840 Glenbrook Road) and demolishing the structures. Under this option, there would be no construction required and the affected residents with the worst flooding problems would have their flooding issues resolved. Roads would continue to flood.

- Option 3-Removal of the stone railroad culvert and restoration of the brook to open channel flow between Glenbrook Road to Derby-Milford Road

Estimated Cost \$256,000

This option significantly reduces flooding significantly at houses on Brookside Drive and Glenbrook Road. 840 Glenbrook may still have water levels slightly higher (2 inches) above the garage floor elevation during 100-year storm events. The option is inexpensive compared to other options, but there would still be road flooding. The town would still

need to maintain the culverts and the option eliminates the driveway access between the Winkle properties. The hydraulic results with this option are shown on Tables 16 and 17.

- **Option 3F- Remove old railroad culvert and restore open channel from Brookside to Glenbrook, install 2 road cross culverts, acquire 2 houses, and replace Derby-Milford Road culvert**

Estimated Cost \$2.70 Million

All of the flooding is removed from Brookside to and including Derby-Milford Road for storms of less than the 100-year frequency and less. With this option, water doesn't flood the road on Brookside Drive and Glenbrook Road, but it flows over the driveway on East Slope. The hydraulic results with this option are shown on Tables 18 and 19.

- **Option 4C- Remove old railroad culvert, replace Derby-Milford Road culvert, and replace Brookside to Glenbrook culverts**

Estimated Cost \$2.80 Million

All of the flooding is removed from Brookside to and including Derby-Milford Road for storms of 100-year frequency and less. With this option, water doesn't flood the road on Brookside Drive and Glenbrook Road, but it flows over the driveway on East Slope. The hydraulic results with this option are shown on Tables 20 and 21.

- **Option 6A- Replace railroad culvert with a 10x5 precast culvert box culvert, replace Derby-Milford Road culvert (10x5 box culvert), and replace Brookside to Glenbrook culverts with a 10x4 box culvert**

Estimated Cost \$3.11 Million

Most of the flooding is removed. There would be no flooding of the houses at Brookside and Glenbrook. The flooding level is only 6 inches higher than the shed floor elevations located at Brookside Drive. With this option, water doesn't flood the road on Brookside Drive and Glenbrook Road during the 50-year storm frequency or less. Water does flood these roads during the 100-year storm or greater. The driveway on East Slope Drive still floods during the storms of 25-years or greater.

- **Option 6C- Replace railroad culvert with a 10x5 precast culvert box culvert, replace Derby-Milford Road culvert (10x5 box culvert), install and restore open channel from Brookside to Glenbrook and install road cross culverts for Brookside and Glenbrook**

Estimated Cost \$2.78 Million

Most of the flooding is removed. There would be no flooding of the houses at Brookside and Glenbrook. The flooding level is only 5 inches higher than the shed floor elevations located at Brookside Drive. At Glenbrook Road, the flood elevations would be a few inches less. With this option, water doesn't flood the road on Brookside Drive and Glenbrook Road during the 50-year storm frequency or less. Water does flood Glenbrook road during the 100-year storm or greater. The driveway on East Slope Drive still floods during the storms of 25-years or greater.

Table 6 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive
Option 2C-Replace Derby-Milford
Culvert with 10x5 Box Culvert

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	112.84	+0.5	+6	112.34	115.26	+2.92	+35
833 Brookside	110.56 shed	112.84	+2.28	+27	110.56 shed	115.26	+4.70	+56
827 Brookside	112.43	112.84	+0.41	0	112.43	115.26	+2.83	+34
827 Brookside	110.55 shed	112.84	+2.29	+27	110.55 shed	115.26	+4.71	+56

**Table 7 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road
Option 2C-Replace Derby-Milford
Culvert with 10x5 Box Culvert**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	112.84	+1.79	+21	111.05	115.26	+4.21	+50
837 Glenbrook	112.23	112.84	+0.61	+7	112.23	115.25	+3.02	+36
837 Glenbrook	110.50 pool	112.84	+2.34	+28	110.50 pool	115.25	+4.75	+57
829 Glenbrook	111.41 Adj to pool fence	112.74	+0.86	+16	111.41 Adj to pool fence	115.22	+3.81	+46

Table 8 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive
Option 2D-Replace Brookside
culverts with 12x4Box Culvert

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	112.84	+0.5	+6	112.34	115.29	+2.95	+35
833 Brookside	110.56 shed	112.84	+2.28	+27	110.56 shed	115.29	+4.73	+57
827 Brookside	112.43	112.84	+0.41	0	112.43	115.29	+2.86	+34
827 Brookside	110.55 shed	112.84	+2.29	+27	110.55 shed	115.29	+4.74	+57

Table 9 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road
Option 2D-Replace Brookside to
Glenbrook Culverts with 12x4 box

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	112.84	+1.79	+21	111.05	115.29	+4.24	+51
837 Glenbrook	112.23	112.84	+0.61	+7	112.23	115.28	+3.05	+37
837 Glenbrook	110.50 pool	112.84	+2.34	+28	110.50 pool	115.28	+4.78	+57
829 Glenbrook	111.41 Adj to pool fence	112.74	+0.86	+16	111.41 Adj to pool fence	115.25	+3.84	+46

**Table 10 – Flood Calculations
25-Year and 100-Year Storm Events**

Brookside Drive

Option 2E-Open Channel from Brookside to Glenbrook, install road cross culverts at Brookside & Glenbrook

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	112.84	+0.5	+6	112.34	115.28	+2.94	+35
833 Brookside	110.56 shed	112.84	+2.28	+27	110.56 shed	115.28	+4.72	+57
827 Brookside	112.43	112.84	+0.41	0	112.43	115.28	+2.85	+34
827 Brookside	110.55 shed	112.84	+2.29	+27	110.55 shed	115.28	+4.74	+57

**Table 11 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road**

Option 2E-Open Channel from Brookside to Glenbrook, install cross culverts at Brookside and Glenbrook

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	112.84	+1.79	+21	111.05	115.28	+4.23	+51
837 Glenbrook	112.23	112.84	+0.61	+7	112.23	115.27	+3.04	+37
837 Glenbrook	110.50 pool	112.84	+2.34	+28	110.50 pool	115.27	+4.77	+57
829 Glenbrook	111.41 Adj to pool fence	112.74	+0.86	+16	111.41 Adj to pool fence	115.24	+3.83	+46

Table 12 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive
Option 2C & 2D

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	112.84	+0.5	+6	112.34	115.19	+2.85	+34
833 Brookside	110.56 shed	112.84	+2.28	+27	110.56 shed	115.19	+4.63	+55
827 Brookside	112.43	112.84	+0.41	0	112.43	115.19	+2.76	+33
827 Brookside	110.55 shed	112.84	+2.29	+27	110.55 shed	115.19	+4.64	+56

Table 13 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road
Option 2C & 2D

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	112.84	+1.79	+21	111.05	115.19	+4.14	+50
837 Glenbrook	112.23	112.84	+0.61	+7	112.23	115.18	+2.95	+35
837 Glenbrook	110.50 pool	112.84	+2.34	+28	110.50 pool	115.18	+4.68	+56
829 Glenbrook	111.41 Adj to pool fence	112.74	+0.86	+16	111.41 Adj to pool fence	115.15	+3.74	+45

**Table 14 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive
Option 2C and 2E**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	112.84	+0.5	+6	112.34	115.18	+2.84	+34
833 Brookside	110.56 shed	112.84	+2.28	+27	110.56 shed	115.18	+4.62	+55
827 Brookside	112.43	112.84	+0.41	0	112.43	115.18	+2.75	+33
827 Brookside	110.55 shed	112.84	+2.29	+27	110.55 shed	115.18	+4.64	+56

**Table 15 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road
Option 2C & 2E**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	112.84	+1.79	+21	111.05	115.18	+4.13	+50
837 Glenbrook	112.23	112.84	+0.61	+7	112.23	115.17	+2.94	+35
837 Glenbrook	110.50 pool	112.84	+2.34	+28	110.50 pool	115.17	+4.67	+56
829 Glenbrook	111.41 Adj to pool fence	112.74	+0.86	+16	111.41 Adj to pool fence	115.14	+3.73	+45

**Table 16 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive
Option 3-Remove Railroad Culvert**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	109.11	0	0	112.34	111.65	0	0
833 Brookside	110.56 shed	109.11	0	0	110.56 shed	111.65	+1.09	+13
827 Brookside	112.43	108.83	0	0	112.43	111.18	0	0
827 Brookside	110.55 shed	108.83	0	0	110.55 shed	111.18	+0.63	+8

**Table 17 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road
Option 3-Remove Railroad Culvert**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	108.83	0	0	111.05	111.18	+0.60	+2
837 Glenbrook	112.23	108.55	0	0	112.23	110.51	0	0
837 Glenbrook	110.50 pool	108.55	0	0	110.50 pool	110.51	+0.01	+0.1
829 Glenbrook	111.41 Adj to pool fence	108.55	0	0	111.41 Adj to pool fence	110.51	0	0

**Table 18 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive**

**Option 3F-Remove Railroad Culvert and restore open channel from Brookside to Glenbrook
& Replace Derby Milford Culvert (10x5 Box Culvert)**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	108.77	0	0	112.34	110.59	0	0
833 Brookside	110.56 shed	108.77	0	0	110.56 shed	110.59	+0.03	+0.4
827 Brookside	112.43	108.77	0	0	112.43	110.59	0	0
827 Brookside	110.55 shed	108.77	0	0	110.55 shed	110.59	+0.04	+0.5

**Table 19 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road
Option 3F-Remove Railroad Culvert and restore open channel from Brookside to
Glenbrook & Replace Derby-Milford Culvert (10x5 box)**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	108.77	0	0	111.05	110.59	0	0
837 Glenbrook	112.23	108.77	0	0	112.23	110.59	0	0
837 Glenbrook	110.50 pool	108.77	0	0	110.50 pool	110.59	0	0
829 Glenbrook	111.41 Adj to pool fence	108.77	0	0	111.41 Adj to pool fence	110.59	0	0

**Table 20 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive**

**Option 4C- Remove Old Railroad Culvert, replace Derby Milford Road culvert (10x5 box), replace Brookside/
Glenbrook culvert (10x4 box)**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	108.64	0	0	112.34	109.89	0	0
833 Brookside	110.56 shed	108.64	0	0	110.56 shed	109.89	0	0
827 Brookside	112.43	108.64	0	0	112.43	109.89	0	0
827 Brookside	110.55 shed	108.64	0	0	110.55 shed	109.89	0	0

**Table 21 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road**

**Option 4C- Remove Old Railroad Culvert, replace Derby Milford Road culvert (10x5 box), replace Brookside/
Glenbrook culvert (10x4 box)**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	108.64	0	0	111.05	109.89	0	0
837 Glenbrook	112.23	108.64	0	0	112.23	109.89	0	0
837 Glenbrook	110.50 pool	108.64	0	0	110.50 pool	109.89	0	0
829 Glenbrook	111.41 Adj to pool fence	108.64	0	0	111.41 Adj to pool fence	109.89	0	0

**Table 22 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive**

**Option 6A- Replace Railroad culvert with larger culvert (10x5 box), replace Derby Milford Road Culvert (10x5)
and replace Brookside/Glenbrook culvert (10x4 box)**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	109.07	0	0	112.34	111.27	0	0
833 Brookside	110.56 shed	109.07	0	0	110.56 shed	111.27	+0.71	+8
827 Brookside	112.43	109.07	0	0	112.43	110.96	0	0
827 Brookside	110.55 shed	109.07	0	0	110.55 shed	110.96	+0.41	+5

**Table 23 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road**

**Option 6A- Replace Railroad culvert with larger culvert (10x5 box), replace Derby Milford Road Culvert (10x5),
and replace Brookside/Glenbrook culvert (10x4 box)**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	109.07	0	0	111.05	110.96	0	0
837 Glenbrook	112.23	109.07	0	0	112.23	110.67	0	0
837 Glenbrook	110.50 pool	109.07	0	0	110.50 pool	110.67	+0.17	+2
829 Glenbrook	111.41 Adj to pool fence	109.07	0	0	111.41 Adj to pool fence	110.67	0	0

Table 24 – Flood Calculations
25-Year and 100-Year Storm Events
Brookside Drive

**Option 6C- Replace old railroad culvert with larger culvert (10x5) and replace Derby Milford Road Culvert (10x5)
and restore open channel from Brookside to Glenbrook, acquire 2 houses**

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
833 Brookside	112.34	108.73	0	0	112.34	111.01	0	0
833 Brookside	110.56 shed	108.73	0	0	110.56 shed	111.01	+0.45	+5
827 Brookside	112.43	108.73	0	0	112.43	111.01	0	0
827 Brookside	110.55 shed	108.73	0	0	110.55 shed	111.01	+0.46	+5

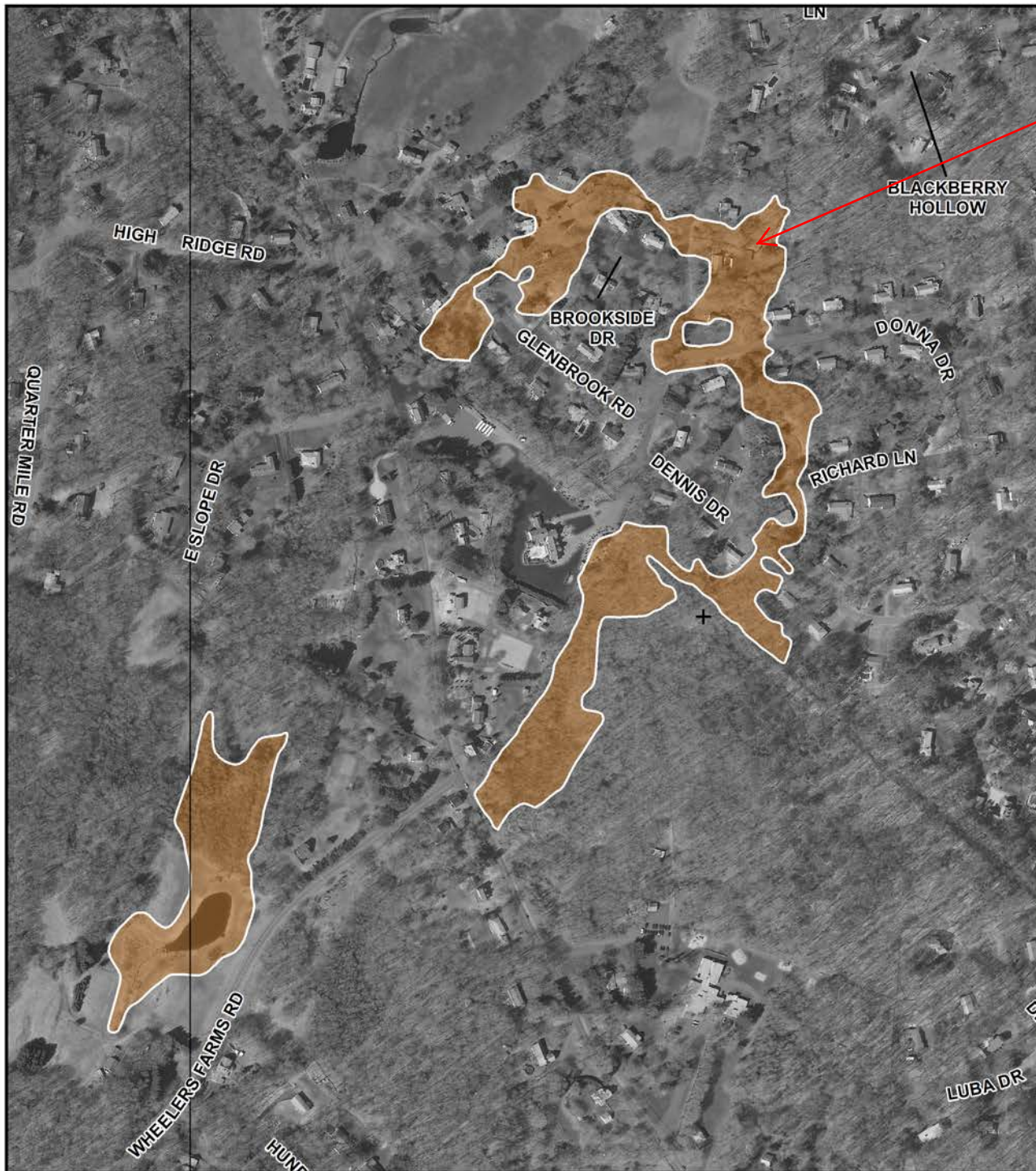
**Table 25 – Flood Calculations
25-Year and 100-Year Storm Events
Glenbrook Road**

Option 6C- Replace old railroad culvert with larger culvert (10x5) and replace Derby Milford Road Culvert (10x5) and restore open channel from Brookside to Glenbrook, acquire 2 houses

Property Location	25-Year Storm				100-Year Storm			
	Garage Elev (1)	Calculated WSE (2)	Difference (2 -1)		Garage Elev (3)	Calculated WSE (4)	Difference (4-3)	
	(feet)	(feet)	(feet)	(inches)	(feet)	(feet)	(feet)	(inches)
840 Glenbrook	111.05	108.71	0	0	111.05	111.01	0	0
837 Glenbrook	112.23	108.73	0	0	112.23	111.01	0	0
837 Glenbrook	110.50 pool	108.73	0	0	110.50 pool	111.01	+0.51	+2
829 Glenbrook	111.41 Adj to pool fence	108.73	0	0	111.41 Adj to pool fence	111.01	0	0

APPENDIX A

FEMA MAP



FEMA ZONE X
=500 YEAR
FLOOD

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

New Haven County, CT
(ALL JURISDICTIONS)
PANEL **0416** OF **0635**



Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
DERBY, CITY OF	090075	0416	J
ORANGE, TOWN OF	090087	0416	J

VERSION NUMBER
2.3.3.2

MAP NUMBER
09009C0416J

MAP REVISED
May 16, 2017

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at <https://msc.fema.gov>.

APPENDIX B

RAINFALL DATA



NOAA Atlas 14, Volume 10, Version 3
Location name: Orange, Connecticut, USA*
Latitude: 41.2712°, Longitude: -73.0216°
Elevation: 212.93 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.351 (0.282-0.436)	0.422 (0.338-0.524)	0.537 (0.428-0.669)	0.633 (0.501-0.793)	0.764 (0.583-1.00)	0.863 (0.644-1.16)	0.967 (0.697-1.34)	1.08 (0.736-1.54)	1.25 (0.812-1.84)	1.38 (0.876-2.08)
10-min	0.498 (0.399-0.618)	0.598 (0.478-0.742)	0.761 (0.607-0.948)	0.896 (0.710-1.12)	1.08 (0.826-1.42)	1.22 (0.912-1.64)	1.37 (0.987-1.90)	1.53 (1.04-2.18)	1.77 (1.15-2.60)	1.96 (1.24-2.94)
15-min	0.586 (0.469-0.727)	0.703 (0.563-0.873)	0.895 (0.714-1.12)	1.05 (0.835-1.32)	1.27 (0.972-1.67)	1.44 (1.07-1.93)	1.61 (1.16-2.24)	1.80 (1.23-2.57)	2.08 (1.35-3.06)	2.31 (1.46-3.46)
30-min	0.812 (0.651-1.01)	0.975 (0.781-1.21)	1.24 (0.990-1.55)	1.46 (1.16-1.83)	1.77 (1.35-2.32)	2.00 (1.49-2.67)	2.24 (1.61-3.11)	2.51 (1.70-3.56)	2.89 (1.88-4.25)	3.20 (2.03-4.81)
60-min	1.04 (0.832-1.29)	1.25 (0.998-1.55)	1.59 (1.27-1.98)	1.87 (1.48-2.35)	2.26 (1.73-2.96)	2.55 (1.90-3.42)	2.86 (2.06-3.97)	3.21 (2.18-4.56)	3.70 (2.40-5.44)	4.10 (2.59-6.16)
2-hr	1.35 (1.09-1.66)	1.61 (1.30-1.99)	2.05 (1.65-2.54)	2.41 (1.93-3.01)	2.91 (2.24-3.80)	3.29 (2.47-4.38)	3.69 (2.68-5.10)	4.14 (2.82-5.85)	4.80 (3.13-7.02)	5.35 (3.40-7.99)
3-hr	1.56 (1.26-1.91)	1.87 (1.51-2.29)	2.37 (1.91-2.93)	2.79 (2.23-3.46)	3.37 (2.60-4.38)	3.80 (2.86-5.05)	4.26 (3.10-5.88)	4.79 (3.27-6.74)	5.57 (3.64-8.12)	6.22 (3.96-9.25)
6-hr	1.98 (1.62-2.42)	2.38 (1.94-2.90)	3.03 (2.45-3.71)	3.56 (2.87-4.39)	4.30 (3.34-5.55)	4.85 (3.68-6.40)	5.44 (3.99-7.46)	6.12 (4.20-8.55)	7.14 (4.68-10.3)	7.99 (5.10-11.8)
12-hr	2.48 (2.03-3.00)	2.98 (2.44-3.61)	3.80 (3.10-4.63)	4.49 (3.64-5.49)	5.43 (4.23-6.96)	6.13 (4.67-8.04)	6.88 (5.07-9.38)	7.75 (5.34-10.8)	9.06 (5.96-13.0)	10.2 (6.50-14.9)
24-hr	2.92 (2.41-3.52)	3.56 (2.94-4.29)	4.60 (3.78-5.56)	5.46 (4.45-6.64)	6.65 (5.22-8.48)	7.52 (5.78-9.83)	8.47 (6.30-11.5)	9.62 (6.64-13.3)	11.3 (7.48-16.2)	12.8 (8.23-18.7)
2-day	3.28 (2.73-3.92)	4.06 (3.37-4.86)	5.34 (4.41-6.41)	6.40 (5.25-7.73)	7.86 (6.22-10.00)	8.93 (6.92-11.6)	10.1 (7.59-13.8)	11.6 (8.02-15.9)	13.9 (9.18-19.7)	15.9 (10.2-23.0)
3-day	3.56 (2.97-4.23)	4.42 (3.68-5.26)	5.82 (4.83-6.96)	6.99 (5.76-8.40)	8.59 (6.83-10.9)	9.77 (7.59-12.7)	11.1 (8.34-15.0)	12.7 (8.81-17.3)	15.3 (10.1-21.6)	17.5 (11.3-25.2)
4-day	3.82 (3.19-4.53)	4.72 (3.95-5.61)	6.21 (5.16-7.40)	7.44 (6.14-8.92)	9.13 (7.27-11.5)	10.4 (8.07-13.4)	11.7 (8.86-15.9)	13.5 (9.36-18.3)	16.1 (10.7-22.7)	18.5 (11.9-26.5)
7-day	4.56	5.54	7.14	8.48	10.3	11.7	13.1	14.9	17.7	20.0

	(3.83-5.38)	(4.65-6.54)	(5.97-8.47)	(7.04-10.1)	(8.24-12.9)	(9.10-15.0)	(9.91-17.6)	(10.4-20.2)	(11.8-24.7)	(13.0-28.6)
10-day	5.27 (4.45-6.20)	6.30 (5.31-7.42)	7.98 (6.69-9.42)	9.37 (7.80-11.1)	11.3 (9.03-14.0)	12.7 (9.92-16.2)	14.2 (10.7-18.9)	16.1 (11.2-21.6)	18.8 (12.5-26.2)	21.1 (13.7-30.0)
20-day	7.43 (6.32-8.68)	8.55 (7.26-10.0)	10.4 (8.77-12.2)	11.9 (9.98-14.0)	14.0 (11.2-17.2)	15.6 (12.2-19.5)	17.2 (12.9-22.4)	19.0 (13.4-25.4)	21.6 (14.5-29.9)	23.8 (15.4-33.5)
30-day	9.23 (7.87-10.7)	10.4 (8.86-12.1)	12.3 (10.5-14.4)	13.9 (11.7-16.4)	16.1 (13.0-19.7)	17.8 (13.9-22.2)	19.5 (14.6-25.1)	21.3 (15.1-28.3)	23.8 (16.0-32.7)	25.7 (16.8-36.2)
45-day	11.4 (9.81-13.3)	12.7 (10.8-14.7)	14.7 (12.5-17.1)	16.4 (13.8-19.2)	18.7 (15.1-22.6)	20.4 (16.0-25.3)	22.2 (16.6-28.3)	24.0 (17.0-31.7)	26.3 (17.8-36.0)	28.0 (18.3-39.3)
60-day	13.3 (11.4-15.4)	14.6 (12.5-16.9)	16.6 (14.2-19.3)	18.4 (15.6-21.4)	20.7 (16.8-25.0)	22.6 (17.8-27.8)	24.4 (18.3-30.9)	26.1 (18.6-34.4)	28.3 (19.1-38.6)	29.8 (19.5-41.7)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

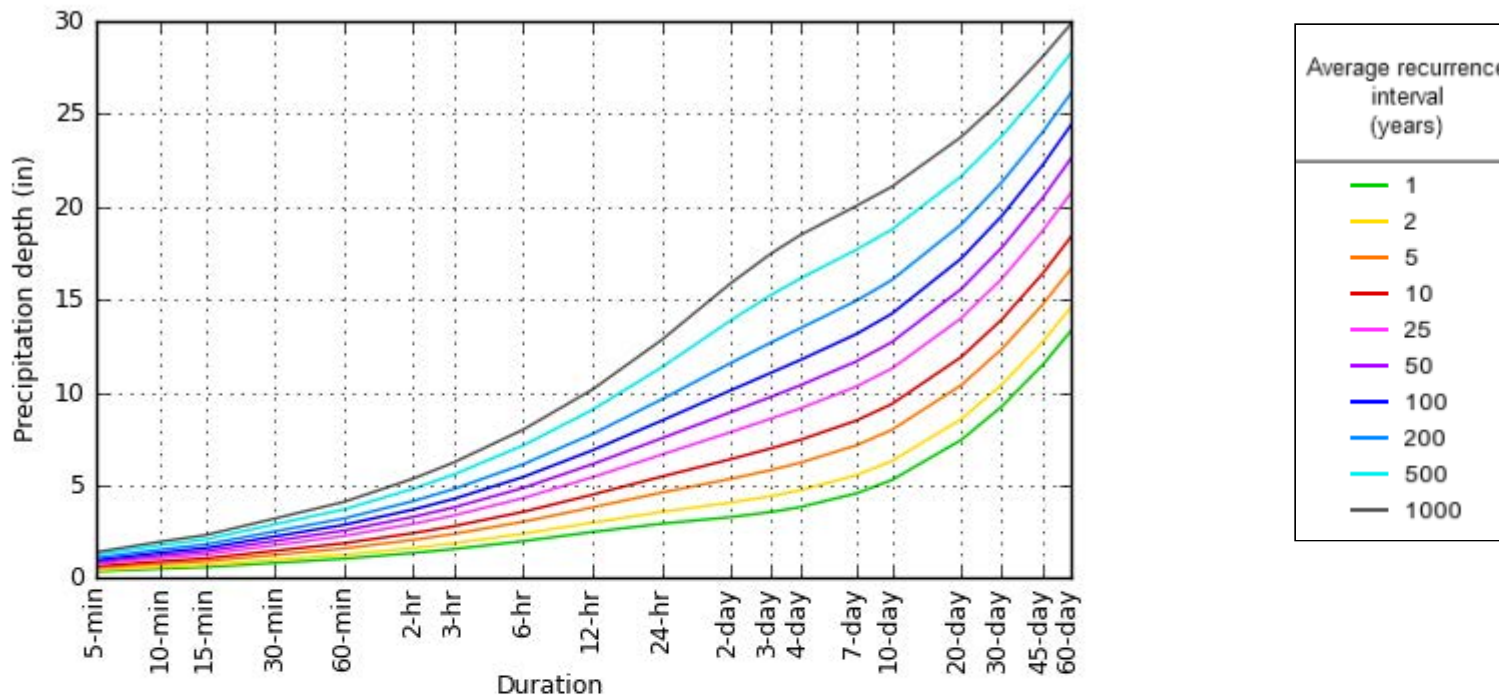
Please refer to NOAA Atlas 14 document for more information.

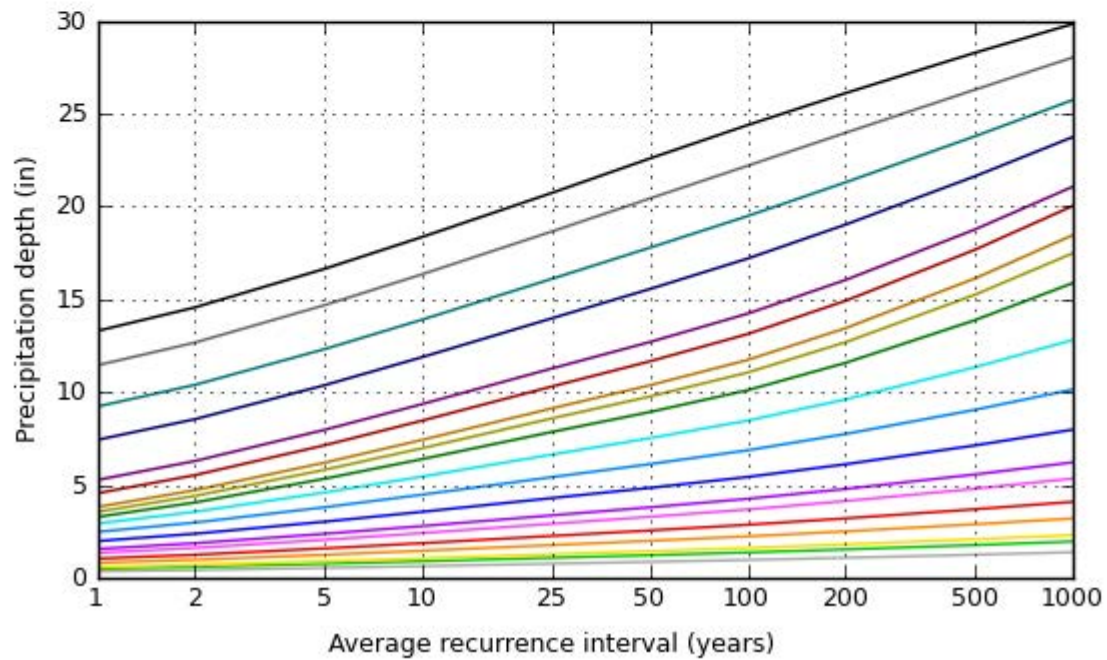
[Back to Top](#)

PF graphical

PDS-based depth-duration-frequency (DDF) curves

Latitude: 41.2712°, Longitude: -73.0216°





Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Tue Nov 23 19:55:10 2021

[Back to Top](#)

Maps & aerals

Small scale terrain

Local Climatological Data
Hourly Observations
July 2021

Generated on 12/01/2021

Department of Commerce
National Oceanic & Atmospheric Administration

National Environmental Satellite, Data, and Information Service

Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W

Station: IGOR I SIKORSKY MEMORIAL AIRPORT, CT US WBAN: 72504094702

Weather Type (see documentation) AU | AW | MW 6

Date	Time (LST)	Station Type	Sky Conditions	Visi- bility	Weather Type (see documentation)		Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3-Hr Change (inHg)	Sea Level Press (inHg)	Report Type	Precip Total (in)	Atti- meter Setting (inHg)
							(F)	(C)	(F)	(C)	(F)	(C)											
09	0048	7	SCT:04 6 BKN:07 120	8.00			72	22.2	71	21.7	70	21.1	94	3	080		29.92			29.94	FM-16	T	29.94
09	0052	7	FEW:02 6 SCT:04 29 BKN:07 120	8.00			72	22.2	71	21.7	71	21.7	97	3	070		29.92	6	+0.04	29.94	FM-15	T	29.94
09	0100	4	5 ~	7.46			72	22.2	71	21.7	71	21.7	97	3	070		29.91	6	+0.04	29.94	FM-12		29.94
09	0110	7	BKN:07 4 BKN:07 19 BKN:07 120	8.00			73	22.8	72	22.2	71	21.7	94	5	100		29.92				FM-16	0.01	29.94
09	0118	7	SCT:04 4 BKN:07 17 OVC:08 29	8.00			73	22.8	72	22.2	72	22.2	94	5	120		29.91				FM-16	0.01	29.93
09	0148	7	BKN:07 12 OVC:08 18	10.00			73	22.8	72	22.2	71	21.7	94	3	110		29.90			29.92	FM-15	0.01	29.92
09	0152	7	BKN:07 10 OVC:08 15	10.00			73	22.8	72	22.2	71	21.7	94	6	080		29.89				FM-16	0.01	29.91
09	0224	7	SCT:04 10 SCT:04 120	10.00			73	22.8	72	22.2	71	21.7	94	8	050		29.86			29.88	FM-15	0.03	29.88
09	0252	7	BKN:07 120	7.00			73	22.8	72	22.2	71	21.7	94	10	070		29.85				FM-16	0.02	29.87
09	0312	7	BKN:07 7 BKN:07 70 BKN:07 110	6.00			73	22.8	72	22.2	71	21.7	94	13	060		29.84				FM-16	0.04	29.86
09	0333	7	BKN:07 3 OVC:08 8	6.00			73	22.8	72	22.2	71	21.7	94	14	060		29.82	8	+0.08	29.84	FM-15	0.10	29.84
09	0352	7	OVC:08 3 BKN:07 3	5.00			73	22.8	72	22.2	72	22.2	96	15	070		29.80				FM-16	0.19	29.82
09	0423	7	OVC:08 20	1.75			73	22.8	72	22.2	72	22.2	96	10	060		29.80				FM-16	0.51	29.82
09	0433	7	SCT:04 3 BKN:07 10 OVC:08 15	2.00			73	22.8	72	22.2	72	22.2	96	14	070		29.80				FM-16	0.57	29.82
09	0437	7	BKN:07 3 BKN:07 9 OVC:08 15	3.00			73	22.8	72	22.2	72	22.2	96	16	080		29.79				FM-16	0.60	29.81
09	0449	7	BKN:07 5 OVC:08 9	5.00			73	22.8	72	22.2	72	22.2	94	17	080		29.79			29.80	FM-15	0.63	29.81
09	0452	7	BKN:07 5 OVC:08 9	4.00			73	22.8	72	22.2	72	22.2	96	15	070		29.78				FM-16	0.09	29.80
09	0508	7	SCT:04 5 BKN:07 14 OVC:08 47	4.00			73	22.8	72	22.2	72	22.2	96	17	060		29.76				FM-16	0.17	29.78
09	0527	7	FEW:02 11 BKN:07 50 OVC:08 70	4.00			73	22.8	72	22.2	72	22.2	94	21	060		29.75				FM-16	0.22	29.77
09	0541	7	BKN:07 11 BKN:07 25 OVC:08 70	4.00			73	22.8	72	22.2	72	22.2	96	17	050		29.75				FM-15	0.35	29.77
09	0552	7	BKN:07 10 BKN:07 23 OVC:08 50	2.50			73	22.8	72	22.2	72	22.2	94	16	070		29.74				FM-16	0.22	29.76
09	0605	7	BKN:07 7 BKN:07 12 OVC:08 18	2.00			74	23.3	73	22.8	72	22.2	94	16	070		29.74				FM-16	0.22	29.76

09	0623	7	SCT:04 7 OVC:08 16	2.00	+RA:02 BR:1 RA RA	73	22.8	72	22.2	72	22.2	96	18	070	29	29.73				FM-16	0.49	29.75
09	0629	7	BKN:07 7 BKN:07 13 OVC:08 18	2.00V	+RA:02 BR:1 RA RA	73	22.8	72	22.2	71	21.7	94	18	070		29.72				FM-16	0.55	29.74
09	0633	7	SCT:04 7 BKN:07 11 OVC:08 20	1.50	+RA:02 BR:1 RA RA	73	22.8	72	22.2	72	22.2	96	18	070		29.73				FM-16	0.60	29.75
09	0650	6	SCT:04 9 OVC:08 16	1.50	+RA:02 BR:1 RA RA	73	22.8	72	22.2	72	22.2	94	21	050	32	29.70				FM-16		29.72
09	0652	7	FEW:02 7 SCT:04 11 OVC:08 16	1.50	+RA:02 BR:1 RA RA	73	22.8	72	22.2	71	21.7	94	20	050		29.70	8	+0.09	29.72	FM-15	1.26	29.72
09	0700	4	8 SCT:04 9 OVC:08 14	1.49	RA	73	22.8	72	22.2	71	21.7	94	20	050		29.69	8	+0.09	29.72	FM-12		
09	0700	7	SCT:04 9 OVC:08 14	1.25	+RA:02 BR:1 RA RA	73	22.8	72	22.2	71	21.7	94	20	050	28	29.69				FM-16	0.22	29.71
09	0721	7	BKN:07 6 OVC:08 15	2.50	+RA:02 BR:1 RA RA	72	22.2	71	21.7	70	21.1	94	26	060	34	29.68				FM-16	0.55	29.70
09	0737	7	SCT:04 8 SCT:04 13 OVC:08 31	2.50	+RA:02 BR:1 RA RA	72	22.2	70	21.1	69	20.6	91	24	050	34	29.67				FM-16	0.64	29.69
09	0746	7	FEW:02 8 BKN:07 21 OVC:08 36	1.75	+RA:02 BR:1 RA RA	72	22.2	71	21.7	70	21.1	94	24	040	39	29.67				FM-16	0.68	29.69
09	0752	7	FEW:02 10 BKN:07 21 OVC:08 32	1.50	+RA:02 BR:1 RA RA	71	21.7	70	21.1	69	20.6	94	22	040	39	29.66			29.68	FM-15	0.56	29.68
09	0755	7	FEW:02 11 BKN:07 23 OVC:08 32	2.00	RA:02 BR:1 RA RA	71	21.7	70	21.1	69	20.6	94	23	040	34	29.67				FM-16	0.01	29.69
09	0819	7	FEW:02 11 BKN:07 27 OVC:08 37	1.00	+RA:02 BR:1 RA RA	70	21.1	69	20.6	68	20.0	93	26	030	33	29.67				FM-16	0.17	29.69
09	0852	7	BKN:07 28 OVC:08 50	1.00	+RA:02 BR:1 RA RA	70	21.1	68	20.0	67	19.4	90	32	050	41	29.64			29.65	FM-15	0.90	29.66
09	0906	7	BKN:07 34 OVC:08 70	1.75	+RA:02 BR:1 RA RA	70	21.1	69	20.6	68	20.0	93	22	040	36	29.63				FM-16	0.26	29.65
09	0911	7	BKN:07 36 BKN:07 50 OVC:08 90	3.00	+RA:02 BR:1 RA RA	71	21.7	69	20.6	68	20.0	90	20	030	33	29.64				FM-16	0.29	29.66
09	0952	7	SCT:04 19 BKN:07 75 OVC:08 100	10.00	-RA:02 RA RA	71	21.7	69	20.6	68	20.0	90	17	350		29.64	5	+0.02	29.66	FM-15	0.21	29.66
09	1014	7	BKN:07 18 BKN:07 40 BKN:07 95	10.00	-RA:02 RA RA	71	21.7	69	20.6	68	20.0	90	14	310	21	29.66				FM-16	0.02	29.68
09	1047	7	FEW:02 17 BKN:07 32 BKN:07 41	10.00		73	22.8	71	21.7	70	21.1	89	16	320	22	29.68				FM-16	0.05	29.70
09	1052	7	FEW:02 23 BKN:07 32	10.00		73	22.8	70	21.1	69	20.6	87	14	320		29.68			29.70	FM-15	0.04	29.70
09	1152	7	FEW:02 19	10.00		76	24.4	71	21.7	68	20.0	77	13	330		29.72			29.74	FM-15	0.00	29.74
09	1252	7	SCT:04 29 SCT:04 35	10.00		80	26.7	71	21.7	67	19.4	64	14	320	22	29.76	3	-0.07	29.78	FM-15	0.00	29.78
09	1300	4	26	9.94		80	26.7	71	21.7	67	19.4	64	14	320		29.75	3	-0.07	29.78	FM-12		
09	1352	7	FEW:02 35 BKN:07 47	10.00		82	27.8	74	23.3	70	21.1	67	10	280		29.77			29.79	FM-15	T	29.79
09	1452	7	FEW:02 37	10.00		82	27.8	73	22.8	69	20.6	65	9	220		29.77			29.79	FM-15	0.00	29.79
09	1552	7	SCT:04 43	10.00		81	27.2	73	22.8	69	20.6	67	13	210		29.78	1	-0.02	29.79	FM-15	0.00	29.80
09	1652	7	CLR:00	10.00		83	28.3	72	22.2	67	19.4	59	10	220		29.78			29.80	FM-15	0.00	29.80
09	1752	7	CLR:00	10.00		82	27.8	72	22.2	67	19.4	60	7	210		29.79			29.81	FM-15	0.00	29.81
09	1852	7	CLR:00	10.00		79	26.1	72	22.2	69	20.6	72	14	180		29.79	1	-0.02	29.81	FM-15	0.00	29.81
09	1900	4		9.94		79	26.1	72	22.2	69	20.6	72	14	180		29.78	1	-0.02	29.81	FM-12		
09	1952	7	FEW:02 49	10.00		77	25.0	72	22.2	70	21.1	79	8	210		29.82			29.84	FM-15	0.00	29.84

09	2052	7	FEW:02 46 OVC:08 100	10.00		76	24.4	72	22.2	70	21.1	82	9	230		29.86			29.88	FM-15	0.00	29.88
09	2152	7	SCT:04 60	10.00		75	23.9	72	22.2	70	21.1	84	3	260		29.87	1	-0.08	29.89	FM-15	0.00	29.89
09	2252	7	SCT:04 85 BKN:07 110	6.00	+RA:02 BR:1 RA RA	75	23.9	72	22.2	71	21.7	88	10	360		29.85			29.87	FM-15	0.05	29.87
09	2352	7	FEW:02 70	10.00		74	23.3	73	22.8	72	22.2	94	0	000		29.86			29.88	FM-15	0.01	29.88

Local Climatological Data
Hourly Remarks
July 2021

Generated on 12/01/2021

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W
Station: IGOR I SIKORSKY MEMORIAL AIRPORT, CT US WBAN: 72504094702
(KBDR)

Date	Time (LST)	Remarks
09	0048	MET09807/09/21 00:48:02 SPECI KBDR 090548Z 08003KT 8SM -RA SCT006 BKN120 22/21 A2994 RMK AO2 RAB01 P0000
09	0052	MET14607/09/21 00:52:02 METAR KBDR 090552Z 07003KT 8SM -RA FEW006 SCT029 BKN120 22/22 A2994 RMK AO2 RAB01 SLP139 P0000 60008 T02220217 10222 20217 56015
09	0100	SYNO9272504 17262 60703 10222 20217 30130 40139 56015 60021 761// 90552 333 10250 20217 555 90906=
09	0110	MET12107/09/21 01:10:02 SPECI KBDR 090610Z 10004KT 8SM -RA BKN004 BKN119 BKN120 23/22 A2994 RMK AO2 CIG 003V010 P0001 T02280217
09	0118	MET10907/09/21 01:18:02 SPECI KBDR 090618Z 10004KT 8SM -RA SCT004 BKN017 OVC029 23/22 A2994 RMK AO2 P0001 T02280217
09	0148	MET09307/09/21 01:48:02 SPECI KBDR 090648Z 12004KT 10SM -RA BKN012 OVC018 23/22 A2993 RMK AO2 P0001
09	0152	MET11007/09/21 01:52:02 METAR KBDR 090652Z 11003KT 10SM -RA BKN010 OVC015 23/22 A2992 RMK AO2 SLP133 P0001 T02280217
09	0224	MET10307/09/21 02:24:02 SPECI KBDR 090724Z 08005KT 10SM -RA SCT010 SCT120 23/22 A2991 RMK AO2 P0001 T02280217
09	0252	MET10207/09/21 02:52:02 METAR KBDR 090752Z 05007KT 7SM -RA BKN120 23/22 A2988 RMK AO2 SLP118 P0002 T02280217
09	0312	MET11207/09/21 03:12:02 SPECI KBDR 090812Z 07009KT 6SM -RA BR BKN007 BKN070 BKN110 23/22 A2987 RMK AO2 P0002 T02280217
09	0333	MET10407/09/21 03:33:02 SPECI KBDR 090833Z 06011KT 6SM RA BR BKN003 OVC008 23/22 A2986 RMK AO2 P0004 T02280217
09	0352	MET11607/09/21 03:52:02 METAR KBDR 090852Z 06012KT 5SM RA BR OVC003 23/22 A2984 RMK AO2 SLP105 P0009 60012 T02280217 58028
09	0423	MET10907/09/21 04:23:02 SPECI KBDR 090923Z 07013KT 1 3/4SM +RA BR BKN003 OVC020 23/22 A2982 RMK AO2 P0019 T02280222
09	0433	MET11207/09/21 04:33:02 SPECI KBDR 090933Z 06009KT 2SM +RA BR SCT003 BKN010 OVC015 23/22 A2982 RMK AO2 P0051 T02280222
09	0437	MET11207/09/21 04:37:02 SPECI KBDR 090937Z 07012KT 3SM +RA BR BKN003 BKN009 OVC015 23/22 A2982 RMK AO2 P0057 T02280222
09	0449	MET09507/09/21 04:49:02 SPECI KBDR 090949Z 08014KT 5SM +RA BR BKN005 OVC009 23/22 A2981 RMK AO2 P0060
09	0452	MET11207/09/21 04:52:02 METAR KBDR 090952Z 08015KT 4SM +RA BR BKN005 OVC009 23/22 A2981 RMK AO2 SLP093 P0061 T02280222
09	0508	MET11207/09/21 05:08:02 SPECI KBDR 091008Z 07013KT 4SM +RA BR SCT005 BKN014 OVC047 23/22 A2980 RMK AO2 P0009 T02280222
09	0527	MET11207/09/21 05:27:02 SPECI KBDR 091027Z 06015KT 4SM +RA BR FEW011 BKN050 OVC070 23/22 A2978 RMK AO2 P0017 T02280222
09	0541	MET11707/09/21 05:41:02 SPECI KBDR 091041Z 06018KT 4SM +RA BR BKN011 BKN025 OVC070 23/22 A2977 RMK AO2 SLP082 P0033 T02280222 (WH)
09	0552	MET12807/09/21 05:52:02 METAR KBDR 091052Z 05015KT 2 1/2SM +RA BR BKN010 BKN023 OVC050 23/22 A2976 RMK AO2 P0022 T02280222 (WH)
09	0605	MET11707/09/21 06:05:02 SPECI KBDR 091105Z 07014KT 2SM +RA BR SCT007 OVC016 23/22 A2975 RMK AO2 P0049 T02280222 (WH)
09	0623	MET11307/09/21 06:23:02 SPECI KBDR 091123Z 07016G25KT 2SM +RA BR BKN007 BKN012 OVC018 23/22 A2974 RMK AO2 VIS 1 1/2V2 1/2 P0055 T02280217 (WH)
09	0629	MET13307/09/21 06:29:02 SPECI KBDR 091129Z 07016KT 2SM +RA BR BKN007 BKN013 OVC020 23/22 A2975 RMK AO2 P0060 T02280222 (WH)
09	0633	MET12107/09/21 06:33:02 SPECI KBDR 091133Z 07016KT 1 1/2SM +RA BR SCT007 BKN011 OVC020 23/22 A2972 RMK AO2 PK WND 06028/1142 P0107 FIBI (WH)
09	0650	MET13007/09/21 06:50:02 SPECI KBDR 091150Z 05018G28KT 1 1/2SM +RA BR SCT009 OVC016 23/22 A2972 RMK AO2 PK WND 06028/1142 SLP064 P0112 60218 70325 T02280217 10233
09	0652	MET17607/09/21 06:52:02 METAR KBDR 091152Z 05017KT 1 1/2SM +RA BR FEW007 SCT011 OVC016 23/22 A2972 RMK AO2 PK WND 06028/1142 SLP064 P0112 60218 70325 T02280217 10233
09	0700	SYN10472504 11324 80517 10228 20217 30055 40064 58030 60551 765// 91152 333 10250 20217 70826 96010 555 90912=
09	0700	MET11707/09/21 07:00:02 SPECI KBDR 091200Z 05017G24KT 1 1/4SM +RA BR SCT009 OVC014 23/22 A2971 RMK AO2 P0022 T02280217 (WH)
09	0721	MET13007/09/21 07:21:02 SPECI KBDR 091221Z 06023G30KT 2 1/2SM +RA BR BKN006 OVC015 23/21 A2970 RMK AO2 PK WND 06031/1203 P0055 T02220211
09	0737	MET14207/09/21 07:37:02 SPECI KBDR 091237Z 05021G30KT 2 1/2SM +RA BR SCT008 SCT013 OVC031 23/21 A2969 RMK AO2 PK WND 05033/1226 P0064 T02220206 (WH)
09	0746	MET13207/09/21 07:46:02 SPECI KBDR 091246Z 04021G34KT 1 3/4SM +RA BR FEW008 BKN021 OVC036 23/21 A2969 RMK AO2 PK WND 04034/1244 SLP052 P0074 T02170206 (WH)
09	0755	MET14907/09/21 07:52:02 METAR KBDR 091252Z 04019G34KT 1 1/2SM +RA BR FEW010 BKN023 OVC032 23/21 A2968 RMK AO2 PK WND 04030/1253 P0001 T02170206 (WH)
09	0819	MET13707/09/21 07:55:02 SPECI KBDR 091319Z 03023G29KT 1SM +RA BR BKN028 OVC050 21/19 A2966 RMK AO2 PK WND 03033/1306 P0017 T0210200 (WH)
09	0852	MET13807/09/21 08:52:02 METAR KBDR 091352Z 05028G39KT 1SM +RA BR FEW011 BKN027 OVC037 21/20 A2969 RMK AO2 PK WND 04037/1341 SLP042 P0076 T02110194 (WH)
09	0906	MET13807/09/21 09:06:02 SPECI KBDR 091406Z 04019G34KT 1 3/4SM +RA BR BKN036 BKN050 OVC070 21/20 A2965 RMK AO2 PK WND 06034/1353 P0026 T0210200 (WH)
09	0911	MET13807/09/21 09:11:02 SPECI KBDR 091411Z 03017G29KT 3SM +RA BR BKN036 BKN050 OVC090 22/20 A2966 RMK AO2 PK WND 06034/1353 P0029 T02170200 (WH)
09	0952	MET15207/09/21 09:52:02 METAR KBDR 091524Z 31012G18KT 10SM -RA BKN018 BKN040 BKN095 22/20 A2968 RMK AO2 P0002 T02170200 (WH)
09	1014	MET11807/09/21 10:14:02 SPECI KBDR 091547Z 32014G19KT 10SM FEW017 BKN032 BKN041 23/21 A2970 RMK AO2 RAE46 SLP057 P0005 T02280206 (WH)
09	1047	MET11707/09/21 10:47:02 SPECI KBDR 091552Z 32012G18KT 10SM FEW023 BKN032 23/21 A2970 RMK AO2 SLP070 T02440200 (PD)
09	1052	MET109807/09/21 10:52:02 METAR KBDR 091652Z 33011KT 10SM FEW019 24/20 A2974 RMK AO2 SLP070 T02440200 (PD)
09	1152	MET13207/09/21 11:52:02 METAR KBDR 091752Z 32012G19KT 10SM SCT029 SCT035 27/19 A2978 RMK AO2 SLP083 60191 T02670194 10272 20206 53025 (PD)
09	1252	SYNO9272504 12566 43212 10267 20194 30076 40083 53025 60491 91752 333 10272 20206 91019 555 90918=
09	1300	MET12007/09/21 12:52:02 METAR KBDR 091852Z 28009KT 10SM FEW035 BKN047 28/21 A2979 RMK AO2 SLP087 P0000 T02780211 (PD)
09	1352	MET12007/09/21 13:52:02 METAR KBDR 091952Z 22008KT 10SM FEW037 28/21 A2979 RMK AO2 SLP089 T02780206 (PD)
09	1452	MET11007/09/21 14:52:02 METAR KBDR 092052Z 21011KT 10SM SCT043 27/21 A2980 RMK AO2 SLP089 60000 T02720206 51006 (PD)
09	1552	MET11007/09/21 15:52:02 METAR KBDR 092052Z 21011KT 10SM SCT043 27/21 A2980 RMK AO2 SLP089 60000 T02720206 51006 (PD)

09	1652	MET09507/09/21 16:52:02 METAR KBDR 092152Z 22009KT 10SM CLR 28/19 A2980 RMK AO2 SLP091 T02830194 (BR)	
09	1752	MET09507/09/21 17:52:02 METAR KBDR 092252Z 21006KT 10SM CLR 28/19 A2981 RMK AO2 SLP095 T02780194 (BR)	
09	1852	MET11907/09/21 18:52:02 METAR KBDR 092352Z 18012KT 10SM CLR 26/21 A2981 RMK AO2 SLP096 60000 T02610206 10289 20256 51006 (BR)	
09	1900	SYN08672504 12966 01812 10261 20206 30086 40096 51006 69901 92352 333 10289 20222 555 91000=	
09	1952	MET09307/09/21 19:52:01 METAR KBDR 100052Z 21007KT 10SM FEW049 25/21 A2984 RMK AO2 SLP105 T02500211	
09	2052	MET11107/09/21 20:52:01 METAR KBDR 100152Z 23008KT 10SM FEW046 OVC100 24/21 A2988 RMK AO2 LTG DSNT N SLP117 T02440211	
09	2152	MET11107/09/21 21:52:01 METAR KBDR 100252Z 26003KT 10SM SCT060 24/21 A2989 RMK AO2 LTG DSNT SW SLP122 T02390211 51026	
09	2252	MET12507/09/21 22:52:02 METAR KBDR 100352Z 36009KT 6SM +RA BR SCT085 BKN110 24/22 A2987 RMK AO2 RAB34 PRESFR SLP114 P0003 T02390217	
09	2352	MET11507/09/21 23:52:02 METAR KBDR 100452Z 00000KT 10SM FEW070 23/22 A2988 RMK AO2 RAE16 SLP117 P0003 T02330222 402890206	

Local Climatological Data
Hourly Precipitation
July 2021

Generated on 12/01/2021

Station: IGOR I SIKORSKY MEMORIAL AIRPORT, CT US WBAN: 72504094702
Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W
(KBDR)

Date	For Hour (LST) Ending at																								Maximum Short Duration Precipitation											Date		
	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	NOON	1 PM 0.32s	2 PM 0.20	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	MID														
01																			0.02	0.10	0.10	0.28	0.28	T	T	01												
02	0.05	T	0.03	0.02	0.01													0.02	0.10	0.10	0.01	T	0.01	0.04	0.01	02												
03																										03												
04	T	T	T	T	T		0.01		T	T	T		0.11	0.02	T	T	T				0.06				T	04												
05																										05												
06																		0.21	0.02	0.05	0.03					06												
07																										07												
08		T												T	T	0.88s	0.04	0.05	0.02	0.07	0.01				T	08												
09	T	0.01	0.03	0.10	0.63	0.35	1.26	0.56	0.90	0.21	0.04			T								0.05	0.01	0.01	0.01	09												
10																										10												
11																										11												
12	T	T	0.03	0.03																T			T	T	T	12												
13	0.02	T				T	0.01																			13												
14																										14												
15																										15												
16																										16												
17																										17												
18	0.07s	0.05	T			T					T					T	T	T	T			T	T	0.01	0.01	18												
19																										19												
20																										20												
21														T			0.29	0.01	T							21												
22																										22												
23																										23												
24																										24												
25					0.02	0.01	T	T														0.02	T	T	T	25												
26																										26												
27																				T	T		T	T	T	27												
28	0.07s	0.04																								28												
29														T	T	0.03	0.01	0.05	T	0.12	0.02					29												
30																										30												
31																										31												
Time Period (Minutes)			5			10			15			20			30			45			60			80			100			120			150			180		
Precipitation (inches)			0.29			0.50			0.61			0.75			0.87			1.08			1.29			1.60			1.79			1.91			2.25			2.72		
Ending Date Time (yyyy-mm-dd hh:mi)			2021-07-08 15:37			2021-07-08 15:38			2021-07-08 15:43			2021-07-08 15:46			2021-07-08 15:52			2021-07-09 07:15			2021-07-09 07:15			2021-07-09 07:20			2021-07-09 07:20			2021-07-09 07:49			2021-07-09 09:05			2021-07-09 09:02		

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
s = Suspect
* = Erroneous
blank = No precipitation observed
M = Missing

Degree Days				Number of days with...													
Monthly				Season-to-date		Temperature				Precipitation				Snow		Weather	
Total		Departure		Total	Departure	Max		Min									
Heating		10		-54		13		>=90°	<=32°	<=32°	<=0°	>=0.1"				>=1"	
Cooling		154		56		1053		0	0	0	0	10				0	
Date of 5-sec to 3-sec wind equipment change				Sea Level Pressure										Greatest...			
2009-06-17				Maximum		Minimum		Date		Time		24-Hr...				Snow Depth	
								21		0952		Precip				Snowfall	
								01		2152		5.94				0.0	
												Date					
												01-02					
Station Augmentation																	
Name:BRIDGEPORT-SUCCESS HILL, CT Lat: 41.2004 Lon: -73.1569 Elevation: N/A Distance: 1mi S Elements: PRECIP. SNOW Equipment: SRG, SNOWBOARD																	

Local Climatological Data
Hourly Observations
September 2021
Generated on 12/01/2021

D a t e	Time (LST)	Sta- tion Type	Sky Con- ditions	Visi- bility	Weather Type (see documentation)		Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Hum %	Wind Speed (MPH)	Wind Dir (Deg)	Wind Gusts (MPH)	Station Press (inHg)	Press. Tend	Net 3- Hr Change (inHg)	Sea Level Press. (inHg)	Report Type	Precip Total (in)	Alti- meter Setting (inHg)
					AU AW MW	6	(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5			7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
01	0052	7	BKN:07 95	10.00			73	22.8	67	19.4	63	17.2	71	7	360		29.78	3	-0.01	29.80	FM-15	0.00	29.80
01	0100	4		9.94			73	22.8	67	19.4	63	17.2	71	7	360		29.78	3	-0.01	29.80	FM-12		
01	0152	7	OVC:08 95	10.00			73	22.8	67	19.4	63	17.2	71	5	040		29.77			29.78	FM-15	0.00	29.79
01	0252	7	OVC:08 100	10.00			73	22.8	67	19.4	64	17.8	74	0	000		29.77			29.79	FM-15	0.00	29.79
01	0352	7	OVC:08 110	10.00			72	22.2	67	19.4	64	17.8	76	3	060		29.77	6	+0.01	29.79	FM-15	0.00	29.79
01	0452	7	FEW:02 75 OVC:08 95	10.00	-RA:02 RA	RA	71	21.7	67	19.4	65	18.3	81	0	000		29.79			29.81	FM-15	T	29.81
01	0552	7	OVC:08 100	10.00	-RA:02 RA	RA	70	21.1	67	19.4	65	18.3	84	5	360		29.81			29.83	FM-15	T	29.83
01	0652	7	FEW:02 80 SCT:04 100 BKN:07 110	10.00	-RA:02 RA	RA	70	21.1	67	19.4	65	18.3	84	6	360		29.82	1	-0.05	29.84	FM-15	0.02	29.84
01	0700	4	74	9.94	RA		70	21.1	67	19.4	65	18.3	84	6	360		29.81	1	-0.05	29.84	FM-12		
01	0752	7	OVC:08 100	10.00	-RA:02 RA	RA	70	21.1	67	19.4	66	18.9	87	7	360		29.82			29.84	FM-15	0.02	29.84
01	0852	7	BKN:07 120	10.00	-RA:02 RA	RA	69	20.6	66	18.9	64	17.8	84	7	020		29.81			29.83	FM-15	0.01	29.83
01	0952	7	FEW:02 70 SCT:04 90 OVC:08 110	9.00	-RA:02 RA	RA	70	21.1	67	19.4	66	18.9	87	8	010		29.82	5	+0.01	29.83	FM-15	0.03	29.84
01	1052	7	BKN:07 50 OVC:08 60	10.00	-RA:02 RA	RA	70	21.1	67	19.4	66	18.9	87	9	040		29.81			29.83	FM-15	T	29.83
01	1152	7	FEW:02 90 OVC:08 110	10.00	-RA:02 RA	RA	70	21.1	68	20.0	67	19.4	90	9	030		29.79			29.81	FM-15	0.01	29.81
01	1252	7	SCT:04 55 BKN:07 70 BKN:07 80	10.00			70	21.1	67	19.4	66	18.9	87	10	060		29.78	8	+0.03	29.80	FM-15	0.01	29.80
01	1300	4	57	9.94			70	21.1	67	19.4	66	18.9	87	10	060		29.78	8	+0.03	29.80	FM-12		
01	1321	7	FEW:02 8 BKN:07 50 BKN:07 65	10.00			70	21.1	68	20.0	67	19.4	90	13	050		29.77			FM-16	0.01	29.79	
01	1352	7	SCT:04 10 BKN:07 48 OVC:08 60	10.00			70	21.1	68	20.0	67	19.4	90	11	050		29.77			29.79	FM-15	T	29.79
01	1450	6	FEW:02 9 OVC:08 37	10.00			70	21.1	67	19.4	66	18.9	88	14	030		29.75			FM-16		29.77	
01	1452	7	FEW:02 9 OVC:08 37	10.00			70	21.1	67	19.4	66	18.9	87	14	030		29.75			29.77	FM-15	0.00	29.77
01	1552	7	BKN:07 31 OVC:08 38	10.00			69	20.6	66	18.9	65	18.3	87	15	030		29.74	6	+0.04	29.76	FM-15	0.00	29.76
01	1650	6	BKN:07 29 BKN:07 39 OVC:08 100	10.00			70	21.1	66	18.9	64	17.8	83	15	020		29.73			FM-16		29.75	
01	1652	7	BKN:07 29 OVC:08 100	10.00			69	20.6	66	18.9	64	17.8	84	13	020		29.74			29.75	FM-15	0.00	29.76
01	1752	7	BKN:07 27 BKN:07 43 OVC:08 110	10.00			68	20.0	66	18.9	64	17.8	87	14	030		29.72			29.74	FM-15	0.03	29.74
01	1803	7	SCT:04 27 BKN:07 60 BKN:07 120	10.00	RA:02 RA	RA	68	20.0	66	18.9	65	18.3	90	13	030		29.72			FM-16	T	29.74	
01	1850	6	SCT:04 22 BKN:07 28 OVC:08 80	4.00	+RA:02 BR:1 RA	RA	66	18.9	65	18.3	64	17.8	94	17	030		29.69			FM-16		29.71	

01	1852	7	SCT:04 22 BKN:07 28 OVC:08 75	3.00	+RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	20	040		29.69	8	+0.05	29.70	FM-15	0.25s	29.71
01	1900	4	26	2.98	RA	67	19.4	65	18.3	64	17.8	91	20	040		29.68	8	+0.05	29.70	FM-12		
01	1901	7	FEW:02 23 BKN:07 28 OVC:08 65	2.50	+RA:02 BR:1 RA RA	67	19.4	66	18.9	65	18.3	93	22	040	30	29.67				FM-16	0.13	29.69
01	1911	7	BKN:07 26 BKN:07 38 OVC:08 49	3.00	+RA:02 BR:1 RA RA	67	19.4	66	18.9	65	18.3	93	21	040	26	29.67				FM-16	0.20	29.69
01	1921	7	FEW:02 14 BKN:07 32 OVC:08 46	4.00	+RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	25	050	32	29.66				FM-16	0.26	29.68
01	1935	7	FEW:02 8 BKN:07 34 OVC:08 46	5.00	RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	21	050	28	29.67				FM-16	0.31	29.69
01	1947	7	FEW:02 8 BKN:07 23 OVC:08 35	6.00	RA:02 BR:1 RA RA	66	18.9	65	18.3	64	17.8	94	22	050	32	29.66				FM-16	0.37	29.68
01	1952	7	FEW:02 14 BKN:07 24 OVC:08 35	5.00	+RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	23	060	33	29.65			29.67	FM-15	0.34	29.67
01	2017	7	SCT:04 10 BKN:07 20 OVC:08 43	6.00	VCTS:7 RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	23	050	34	29.62				FM-16	0.15	29.64
01	2032	7	SCT:04 10 BKN:07 20 OVC:08 32	6.00	RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	25	050	40	29.59				FM-16	0.21	29.61
01	2048	7	FEW:02 10 BKN:07 18 OVC:08 30	3.00	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	94	29	050	41	29.59				FM-16	0.24	29.61
01	2050	6	FEW:02 10 BKN:07 18 OVC:08 30	2.50	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	94	30	050	41	29.60				FM-16		29.62
01	2052	7	FEW:02 10 BKN:07 21 OVC:08 30	1.75	TS:7 +RA:02 BR:1 RA TS RA	67	19.4	65	18.3	64	17.8	91	23	050	41	29.59			29.61	FM-15	0.45	29.61
01	2057	7	FEW:02 8 BKN:07 15 OVC:08 28	1.50	VCTS:7 +RA:02 BR:1 RA RA	67	19.4	65	18.3	64	17.8	91	25	050	38	29.58				FM-16	0.21	29.60
01	2109	7	FEW:02 10 BKN:07 21 OVC:08 33	2.00	VCTS:7 +RA:02 BR:1 RA RA	66	18.9	65	18.3	64	17.8	93	23	050	36	29.58				FM-16	0.41	29.60
01	2114	7	FEW:02 8 BKN:07 19 OVC:08 19	1.75	VCTS:7 +RA:02 BR:1 RA RA	66	18.9	65	18.3	64	17.8	93	25	050	32	29.57				FM-16	0.58	29.59
01	2122	7	FEW:02 8 BKN:07 21 OVC:08 27	1.75	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	22	050	37	29.57				FM-16	0.74	29.59
01	2130	7	FEW:02 15 BKN:07 23 OVC:08 30	2.50	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	28	050	37	29.54				FM-16	0.83	29.56
01	2143	7	FEW:02 15 BKN:07 21 OVC:08 33	2.00	VCTS:7 +RA:02 BR:1 RA RA	66	18.9	64	17.8	63	17.2	90	24	050	34	29.53				FM-16	1.06	29.55
01	2150	7	FEW:02 13 BKN:07 21 OVC:08 30	2.50V	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	94	26	050	39	29.49				FM-16	1.13	29.51
01	2152	7	FEW:02 11 BKN:07 21 OVC:08 30	2.00V	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	24	050	39	29.50	5	+0.09	29.52	FM-15	1.04	29.52
01	2203	7	SCT:04 9 BKN:07 16 OVC:08 21	2.00	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	26	060	33	29.48				FM-16	0.26	29.50
01	2207	7	FEW:02 7 BKN:07 10 OVC:08 23	1.75	TS:7 +RA:02 BR:1 RA TS RA	66	18.9	65	18.3	64	17.8	93	28	060	37	29.47				FM-16	0.30	29.49

01	2217	7	BKN:07 9 OVC:08 18	1.00	VCTS:7 +RA:02 BR:1 RA RA	65	18.3	64	17.8	63	17.2	93	32	030	46	29.46			FM-16	0.59	29.48
01	2226	7	OVC:08 7	0.75	VCTS:7 +RA:02 BR:1 RA RA	65	18.3	64	17.8	64	17.8	97	30	280	39	29.58			FM-16	0.98	29.60
01	2229	7	VV:09 6	0.50	TS:7 +RA:02 FG:2 FG RA TS RA	65	18.3	64	17.8	63	17.2	93	25	350	39	29.54			FM-16	1.07	29.56
01	2240	7	VV:09 6	0.75	TS:7 +RA:02 BR:1 RA TS RA	64	17.8	63	17.2	63	17.2	96	17	340	37	29.56			FM-16	2.11	29.58
01	2252	7	VV:09 7	0.75	TS:7 +RA:02 BR:1 RA TS RA	64	17.8	63	17.2	62	16.7	93	26	010	32	29.52		29.54	FM-15	2.98	29.54
01	2259	7	VV:09 10	1.00	TS:7 +RA:02 BR:1 RA TS RA	64	17.8	63	17.2	62	16.7	93	24	020	36	29.53			FM-16	0.25	29.55
01	2310	7	BKN:07 11 OVC:08 33	1.25	VCTS:7 +RA:02 BR:1 RA RA	63	17.2	62	16.7	62	16.7	97	29	030	37	29.51			FM-16	0.59	29.53
01	2315	7	BKN:07 15 BKN:07 33 OVC:08 42	2.00	VCTS:7 +RA:02 BR:1 RA RA	63	17.2	62	16.7	62	16.7	97	26	020	38	29.51			FM-16	0.72	29.53
01	2324	7	BKN:07 23 BKN:07 45 OVC:08 55	7.00	-RA:02 RA RA	64	17.8	63	17.2	62	16.7	93	23	020	38	29.51			FM-16	0.74	29.53
01	2333	7	FEW:02 29 BKN:07 35 OVC:08 48	5.00	+RA:02 BR:1 RA RA	64	17.8	63	17.2	62	16.7	93	20	020	34	29.51			FM-16	0.74	29.53
01	2352	7	FEW:02 28 BKN:07 37 OVC:08 50	6.00	VCTS:7 RA:02 BR:1 RA RA	64	17.8	62	16.7	61	16.1	90	22	010	34	29.51		29.53	FM-15	0.58	29.53

Local Climatological Data
Hourly Remarks
September 2021
Generated on 12/01/2021

Date	Time (LST)	Remarks
01	0052	MET11109/01/21 00:52:02 METAR KBDR 010552Z 360008KT 10SM BKN095 23/17 A2980 RMK AO2 SLP092 T02280172 10261 20217 53005
01	0100	SYN08072504 35966 63606 10228 20172 30083 40092 53005 90552 333 10283 20217 555 90106=
01	0152	MET09309/01/21 01:52:02 METAR KBDR 010652Z 04004KT 10SM OVC095 23/17 A2979 RMK AO2 SLP086 T02280172
01	0252	MET09309/01/21 02:52:02 METAR KBDR 010752Z 00000KT 10SM OVC100 23/18 A2979 RMK AO2 SLP089 T02280178
01	0352	MET09309/01/21 03:52:02 METAR KBDR 010852Z 06003KT 10SM OVC110 22/18 A2979 RMK AO2 SLP088 T0220178 56004
01	0452	MET11609/01/21 04:52:02 METAR KBDR 010952Z 00000KT 10SM -RA FEW075 OVC095 22/18 A2981 RMK AO2 RAB05 SLP094 P0000 T02170183
01	0552	MET10809/01/21 05:52:02 METAR KBDR 011052Z 36004KT 10SM -RA OVC100 21/18 A2983 RMK AO2 SLP102 P0000 T02110183 (BR)
01	0652	MET15209/01/21 06:52:02 METAR KBDR 011152Z 36005KT 10SM -RA FEW080 SCT100 BKN110 21/18 A2984 RMK AO2 SLP106 P0002 60002 70002 T02110183 10239 20211 51017 (BR)
01	0700	SYN09872504 11866 63605 10211 20183 30096 40106 51017 69951 761// 91152 333 10289 20211 70005 555 90112=
01	0752	MET10809/01/21 07:52:02 METAR KBDR 011252Z 36006KT 10SM -RA OVC100 21/19 A2984 RMK AO2 SLP104 P0002 T02110189 (BR)
01	0852	MET10809/01/21 08:52:02 METAR KBDR 011352Z 02006KT 10SM -RA BKN120 21/18 A2983 RMK AO2 SLP103 P0001 T02060178 (BR)
01	0952	MET13309/01/21 09:52:02 METAR KBDR 011452Z 01007KT 9SM -RA FEW070 SCT090 OVC110 21/19 A2984 RMK AO2 SLP103 P0003 60006 T02110189 55003 (BR)
01	1052	MET12409/01/21 10:52:02 METAR KBDR 011552Z 04008KT 10SM -RA BKN050 OVC060 21/19 A2983 RMK AO2 RAE20B51 SLP101 P0000 T02110189 (BR)
01	1152	MET11509/01/21 11:52:02 METAR KBDR 011652Z 03008KT 10SM -RA FEW090 OVC110 21/19 A2981 RMK AO2 SLP095 P0001 T02110194 (BR)
01	1252	MET15409/01/21 12:52:02 METAR KBDR 011752Z 06009KT 10SM SCT055 BKN070 BKN080 21/19 A2980 RMK AO2 RAE12B30E40 SLP092 P0000 60007 T02110189 10217 20206 58011 (BR)
01	1300	SYN08872504 12766 60609 10211 20189 30083 40092 58011 60021 91752 333 10239 20206 555 90118=
01	1321	MET12209/01/21 13:21:02 SPECI KBDR 011821Z 05011KT 10SM FEW008 BKN050 BKN065 21/19 A2979 RMK AO2 RAB1754E16 P0001 T02110194 (BN)
01	1352	MET15509/01/21 13:52:02 METAR KBDR 011852Z 05010KT 10SM SCT010 BKN048 OVC060 21/19 A2979 RMK AO2 LTG DSNT SE AND W RAB1754E16B37E46 SLP088 P0001 T02110194 (BN)
01	1450	MET09309/01/21 14:50:02 SPECI KBDR 011950Z 03012KT 10SM FEW009 OVC037 21/19 A2977 RMK AO2 FIBI (BN)
01	1452	MET10509/01/21 14:52:02 METAR KBDR 011952Z 03012KT 10SM FEW009 OVC037 21/19 A2977 RMK AO2 SLP080 T02110189 (BN)
01	1552	MET11709/01/21 15:52:02 METAR KBDR 012052Z 03013KT 10SM BKN031 OVC038 21/18 A2976 RMK AO2 SLP077 60001 T02060183 56015 (BN)
01	1650	MET10009/01/21 16:50:02 SPECI KBDR 012150Z 02013KT 10SM BKN029 BKN039 OVC100 21/18 A2975 RMK AO2 FIBI (BN)
01	1652	MET10509/01/21 16:52:02 METAR KBDR 012152Z 02011KT 10SM BKN029 OVC100 21/18 A2976 RMK AO2 SLP076 T02060178 (BN)
01	1752	MET12709/01/21 17:52:02 METAR KBDR 012252Z 03012KT 10SM BKN027 BKN043 OVC110 20/18 A2974 RMK AO2 RAB19E47 SLP071 P0003 T02000178 (BN)
01	1803	MET12209/01/21 18:03:02 SPECI KBDR 012303Z 03011KT 10SM RA SCT027 BKN060 BKN120 20/18 A2974 RMK AO2 RAB2257 P0000 T02000183 (BN)
01	1850	MET12009/01/21 18:50:02 SPECI KBDR 012350Z 03015KT 4SM +RA BR SCT022 BKN028 OVC080 19/18 A2971 RMK AO2 RAB2257 P0011 FIBI (BN)
01	1852	MET15609/01/21 18:52:02 METAR KBDR 012352Z 04017KT 3SM +RA BR SCT022 BKN028 OVC075 19/18 A2971 RMK AO2 RAB2257 SLP059 P0013 60017 T01940178 10211 20194 58018 (BN)
01	1900	SYN09872504 11548 80417 10194 20178 30052 40059 58018 60041 765// 92352 333 10217 20194 96010 555 90200=
01	1901	MET14409/01/21 19:01:01 SPECI KBDR 020001Z 04019G26KT 2 1/2SM +RA BR FEW023 BKN065 19/18 A2969 RMK AO2 PK WND 04026/2358 PRESFR P0013 T01940183
01	1911	MET13309/01/21 19:11:01 SPECI KBDR 020011Z 04018G23KT 3SM +RA BR BKN026 BKN038 OVC049 19/18 A2969 RMK AO2 PK WND 04026/2358 P0020 T01940183
01	1921	MET13309/01/21 19:21:01 SPECI KBDR 020021Z 05022G28KT 4SM +RA BR FEW014 BKN032 OVC046 19/18 A2968 RMK AO2 PK WND 04028/0016 P0026 T01940178
01	1935	MET14409/01/21 19:35:01 SPECI KBDR 020035Z 05018G24KT 5SM RA BR FEW008 BKN034 OVC046 19/18 A2969 RMK AO2 PK WND 04028/0016 LTG DSNT SW P0031 T01940178
01	1947	MET13409/01/21 19:47:01 SPECI KBDR 020047Z 05019G28KT 6SM RA BR FEW008 BKN023 OVC035 19/18 A2968 RMK AO2 PK WND 04028/0016 LTG DSNT SW P0037
01	1952	MET15809/01/21 19:52:01 METAR KBDR 020052Z 06020G29KT 5SM +RA BR FEW014 BKN024 OVC035 19/18 A2967 RMK AO2 PK WND 05029/0051 LTG DSNT SW AND W SLP047 P0037 T01940178
01	2017	MET15509/01/21 20:17:01 SPECI KBDR 020117Z 05020G30KT 6SM VCTS RA BR SCT010 BKN020 OVC043 19/18 A2964 RMK AO2 PK WND 05030/0107 LTG DSNT E AND SW P0015 T01940178
01	2032	MET14509/01/21 20:32:01 SPECI KBDR 020132Z 05022G35KT 6SM RA BR SCT010 BKN020 OVC032 19/18 A2961 RMK AO2 PK WND 05035/0123 LTG DSNT S-W P0021 T01940178
01	2048	MET14509/01/21 20:48:01 SPECI KBDR 020148Z 05025G36KT 3SM +TSRA BR FEW010 BKN018 OVC030 19/18 A2961 RMK AO2 PK WND 04036/0143 LTG DSNT SW-N TSB42 P0024
01	2050	MET15809/01/21 20:50:03 SPECI KBDR 020150Z 05026G36KT 2 1/2SM +TSRA BR FEW010 BKN018 OVC030 19/18 A2962 RMK AO2 PK WND 04036/0143 LTG DSNT W-N TSB42 P0026 FIBI (BN)
01	2052	MET16509/01/21 20:52:01 METAR KBDR 020152Z 05020G36KT 1 3/4SM +TSRA BR FEW010 BKN021 OVC030 19/18 A2961 RMK AO2 PK WND 04036/0143 LTG DSNT W-N TSB42 SLP027 P0028 T01940178
01	2057	MET16309/01/21 20:57:01 SPECI KBDR 020157Z 05022G33KT 1 1/2SM VCTS +RA BR FEW008 BKN015 OVC028 19/18 A2960 RMK AO2 PK WND 04032/0154 LTG DSNT ALQDS TSE57 P0021 T01940178
01	2109	MET16109/01/21 21:09:01 SPECI KBDR 020209Z 05020G31KT 2SM VCTS +RA BR FEW010 BKN021 OVC033 19/18 A2960 RMK AO2 PK WND 04032/0154 LTG DSNT ALQDS TSE0157 P0041 T01890178
01	2114	MET15609/01/21 21:14:01 SPECI KBDR 020214Z 05022G28KT 1 3/4SM VCTS +RA BR FEW008 OVC019 19/18 A2959 RMK AO2 PK WND 04032/0154 LTG DSNT S-W TSE0157 P0058 T01890178
01	2122	MET16509/01/21 21:22:01 SPECI KBDR 020222Z 05019G32KT 1 3/4SM +TSRA BR FEW008 BKN021 OVC027 19/18 A2959 RMK AO2 PK WND 04032/0154 LTG DSNT SW-NW TSE0157B16 P0074 T01890178
01	2130	MET17209/01/21 21:30:01 SPECI KBDR 020230Z 05024G32KT 2 1/2SM +TSRA BR FEW015 BKN023 OVC030 19/18 A2956 RMK AO2 PK WND 06032/0229 LTG DSNT SW-NW TSE0157B16 PRESFR P0083 T01890178

01	2143	MET16709/01/21 21:43:01 SPECI KBDR 020243Z 05021G30KT 2SM VCTS +RA BR FEW015 BKN021 OVC033 19/17 A2955 RMK AO2 PK WND 06032/0229 LTG DSNT ALQDS TSE0157B16E37 P0106 T01890172
01	2150	MET18009/01/21 21:50:02 SPECI KBDR 020250Z 05023G34KT 2 1/2SM +TSRA BR FEW013 BKN021 OVC030 19/18 A2951 RMK AO2 PK WND 05034/0250 VIS 1 1/2V3 LTG DSNT ALQDS TSE0157B16E37B44 PRESFR P0113
01	2152	MET20509/01/21 21:52:02 METAR KBDR 020252Z 05021G34KT 2SM +TSRA BR FEW011 BKN021 OVC030 19/18 A2952 RMK AO2 PK WND 05034/0250 VIS 1 1/2V3 LTG DSNT ALQDS TSE0157B16E37B44 PRESFR SLP995 P0116 60181 T01890178 55032
01	2203	MET15709/01/21 22:03:02 SPECI KBDR 020303Z 06023G29KT 2SM +TSRA BR SCT009 BKN016 OVC021 19/18 A2950 RMK AO2 PK WND 06029/0303 LTG DSNT ALQDS PRESFR P0026 T01890178
01	2207	MET16109/01/21 22:07:02 SPECI KBDR 020307Z 06024G32KT 1 3/4SM +TSRA BR FEW007 BKN010 OVC023 19/18 A2949 RMK AO2 PK WND 07032/0306 LTG DSNT ALQDS PRESFR P0030 T01890178
01	2217	MET15209/01/21 22:17:02 SPECI KBDR 020317Z 03028G40KT 1SM VCTS +RA BR BKN009 OVC018 18/17 A2948 RMK AO2 PK WND 04040/0311 LTG DSNT ALQDS TSE17 P0059 T01830172
01	2226	MET16509/01/21 22:26:02 SPECI KBDR 020326Z 28026G34KT 3/4SM VCTS +RA BR OVC007 18/18 A2960 RMK AO2 PK WND 04040/0311 WSHFT 0312 LTG DSNT ALQDS TSE17 PRESRR P0098 T01830178
01	2229	MET15709/01/21 22:29:02 SPECI KBDR 020329Z 35022G34KT 1/2SM +TSRA FG V006 18/17 A2956 RMK AO2 PK WND 04040/0311 WSHFT 0312 LTG DSNT ALQDS TSE17B27 P0107 T01830172
01	2240	MET15709/01/21 22:40:02 SPECI KBDR 020340Z 34015G32KT 3/4SM +TSRA BR V006 18/17 A2958 RMK AO2 PK WND 04040/0311 WSHFT 0326 LTG DSNT ALQDS TSE17B27 P0211 T01780172
01	2252	MET16409/01/21 22:52:02 METAR KBDR 020352Z 01023G28KT 3/4SM +TSRA BR V007 18/17 A2954 RMK AO2 PK WND 04040/0311 WSHFT 0326 LTG DSNT ALQDS TSE17B27 SLP002 P0287 T01780167
01	2259	MET13409/01/21 22:59:02 SPECI KBDR 020359Z 02021G31KT 1SM +TSRA BR V010 18/17 A2955 RMK AO2 PK WND 01031/0355 LTG DSNT NE-S P0025 T01780167
01	2310	MET15509/01/21 23:10:02 SPECI KBDR 020410Z 03025G32KT 1 1/4SM VCTS +RA BR BKN011 OVC033 17/17 A2953 RMK AO2 PK WND 01032/0408 LTG DSNT NE-S TSE04 P0059 T01720167
01	2315	MET15809/01/21 23:15:02 SPECI KBDR 020415Z 02023G33KT 2SM VCTS +RA BR BKN015 BKN033 OVC042 17/17 A2953 RMK AO2 PK WND 03033/0411 LTG DSNT NE-S TSE04 P0072 T01720167
01	2324	MET15009/01/21 23:24:02 SPECI KBDR 020424Z 02020G33KT 7SM -RA BKN023 BKN045 OVC055 18/17 A2953 RMK AO2 PK WND 03033/0416 LTG DSNT NE-S TSE04 P0074 T01780167
01	2333	MET15309/01/21 23:33:02 SPECI KBDR 020433Z 02017G30KT 5SM +RA BR FEW029 BKN035 OVC048 18/17 A2953 RMK AO2 PK WND 03033/0416 LTG DSNT NE-S TSE04 P0074 T01780167
01	2352	MET17409/01/21 23:52:02 METAR KBDR 020452Z 01019G30KT 6SM VCTS RA BR FEW028 BKN037 OVC050 18/16 A2953 RMK AO2 PK WND 03033/0416 LTG DSNT NE-S TSE04 SLP000 P0081 T01780161 402390172

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W

Current Location: Elev: 5 ft. Lat: 41.1642° N Lon: -73.1267° W

Station: IGBOR | SIKORSKY MEMORIAL AIRPORT CT US W

Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

T = Trace
 s = Suspect
 * = Erroneous
 blank = No precipitation observed
 M = Missing

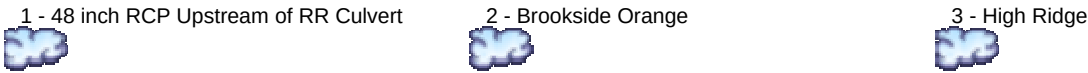
Hourly, daily, and monthly totals on the Daily Summary page and the Hourly Precipitation Table are shown as reported by the instrumentation at the site. However, NWS does not edit hourly values for its ASOS sites, but may edit the daily and monthly totals for selected sites which will be reflected on the Daily Summary page.

APPENDIX C

HYDROLOGY CALCULATIONS

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

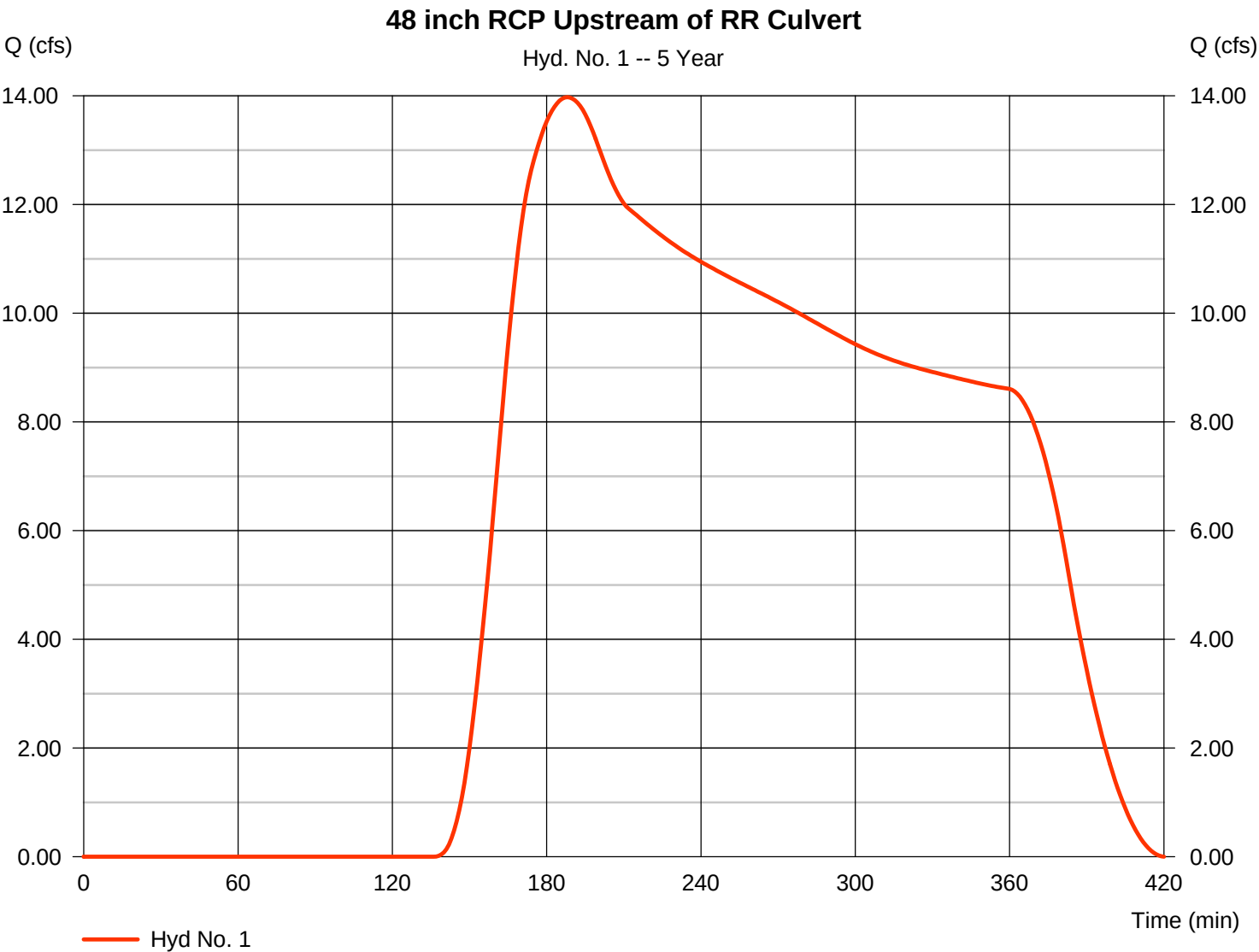
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	13.97	1	188	143,826	-----	-----	-----	48 inch RCP Upstream of RR Culvert
2	SCS Runoff	43.63	1	189	391,800	-----	-----	-----	Brookside Orange
3	SCS Runoff	40.90	1	173	328,082	-----	-----	-----	High Ridge
NRCS Stormwater runoff 2-4.gpw					Return Period: 5 Year			Thursday, 02 / 24 / 2022	

Hydrograph Report

Hyd. No. 1

48 inch RCP Upstream of RR Culvert

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.97 cfs
Storm frequency	=	5 yrs	Time to peak	=	188 min
Time interval	=	1 min	Hyd. volume	=	143,826 cuft
Drainage area	=	105.800 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.80 min
Total precip.	=	3.03 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



Hydrograph Report

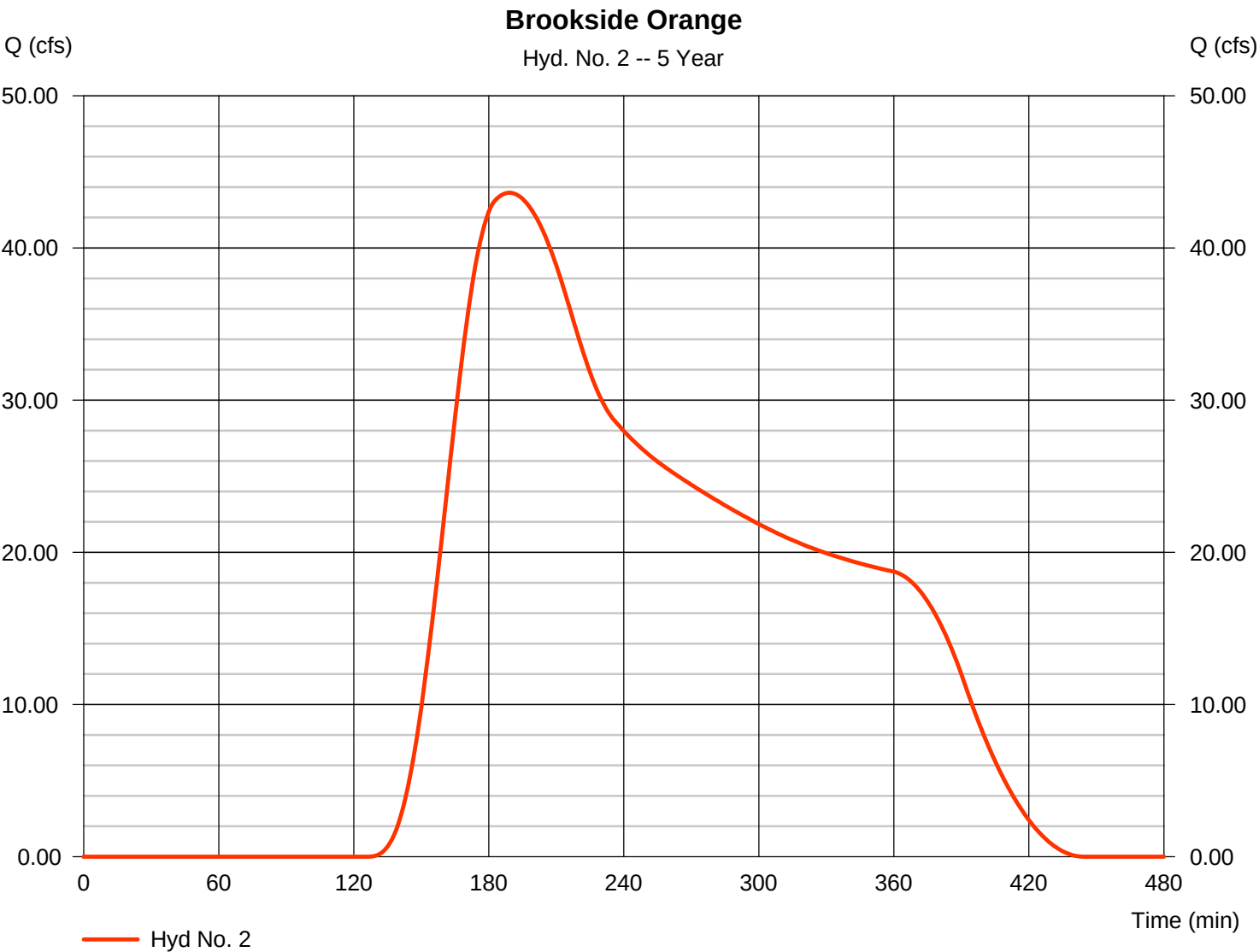
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Thursday, 02 / 24 / 2022

Hyd. No. 2

Brookside Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 43.63 cfs
Storm frequency	= 5 yrs	Time to peak	= 189 min
Time interval	= 1 min	Hyd. volume	= 391,800 cuft
Drainage area	= 158.000 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 53.50 min
Total precip.	= 3.03 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484

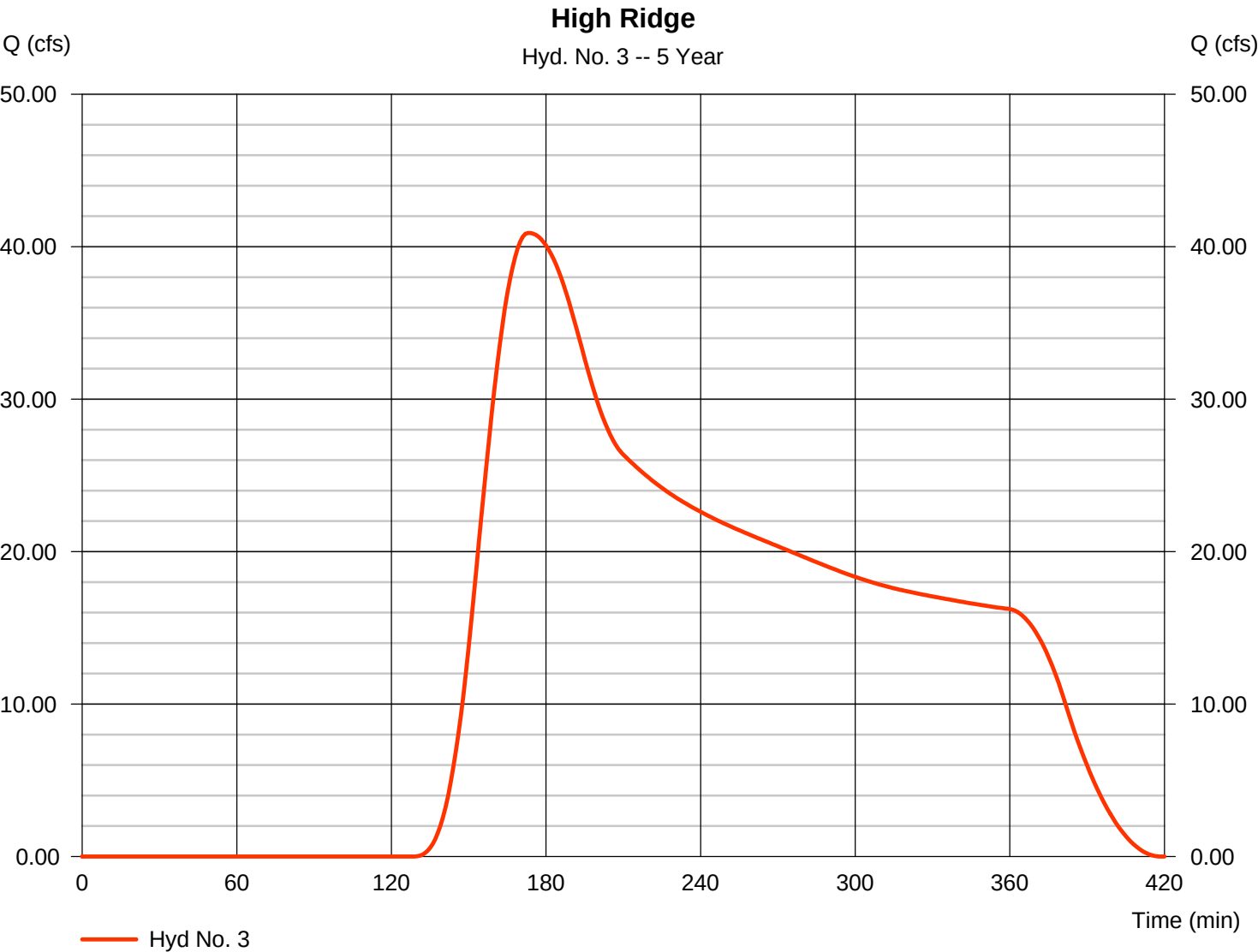


Hydrograph Report

Hyd. No. 3

High Ridge

Hydrograph type	= SCS Runoff	Peak discharge	= 40.90 cfs
Storm frequency	= 5 yrs	Time to peak	= 173 min
Time interval	= 1 min	Hyd. volume	= 328,082 cuft
Drainage area	= 149.800 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.50 min
Total precip.	= 3.03 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

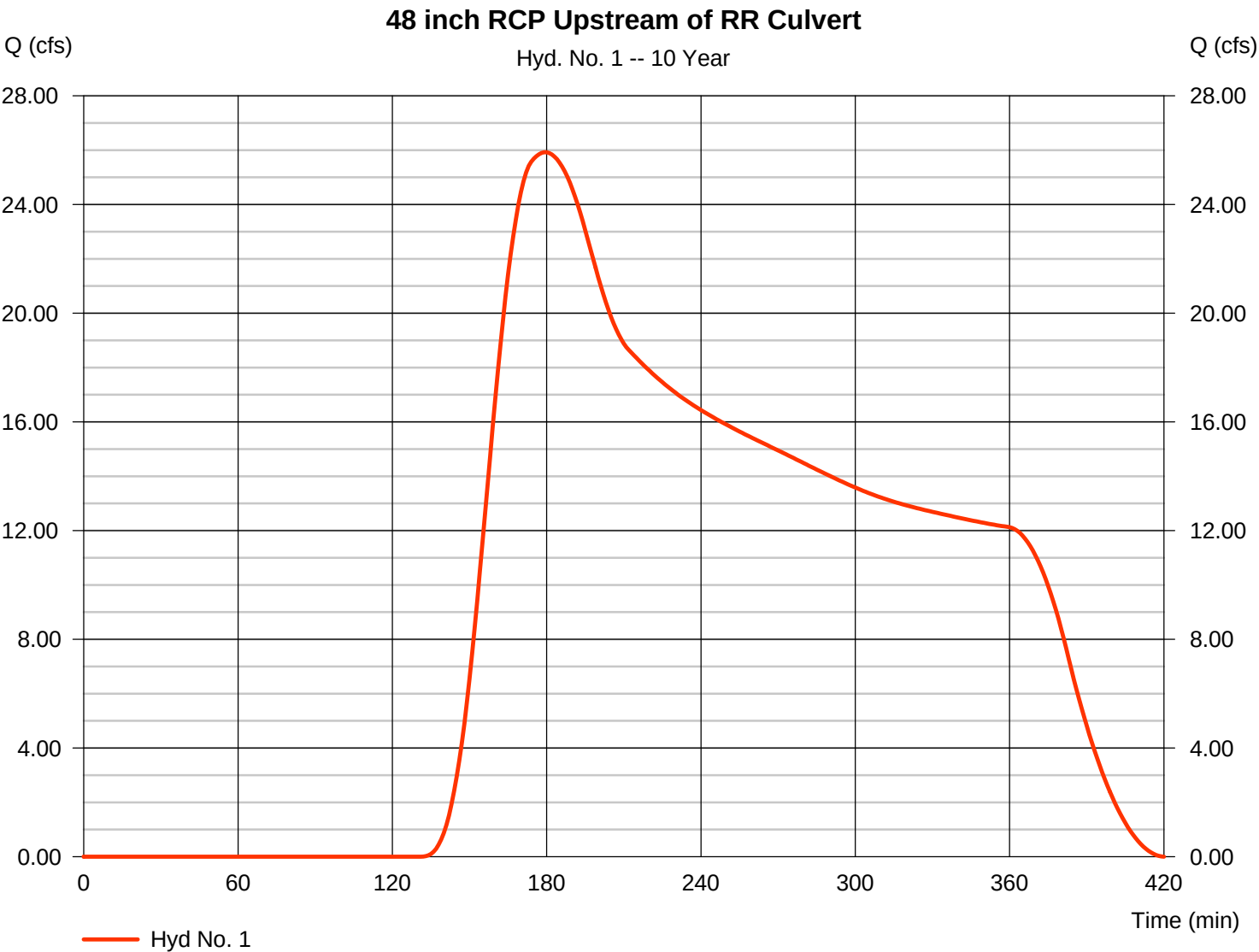
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	25.92	1	179	229,149	-----	-----	-----	48 inch RCP Upstream of RR Culvert
2	SCS Runoff	68.16	1	184	565,638	-----	-----	-----	Brookside Orange
3	SCS Runoff	67.37	1	171	483,422	-----	-----	-----	High Ridge
NRCS Stormwater runoff 2-4.gpw					Return Period: 10 Year			Thursday, 02 / 24 / 2022	

Hydrograph Report

Hyd. No. 1

48 inch RCP Upstream of RR Culvert

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.92 cfs
Storm frequency	=	10 yrs	Time to peak	=	179 min
Time interval	=	1 min	Hyd. volume	=	229,149 cuft
Drainage area	=	105.800 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.80 min
Total precip.	=	3.56 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

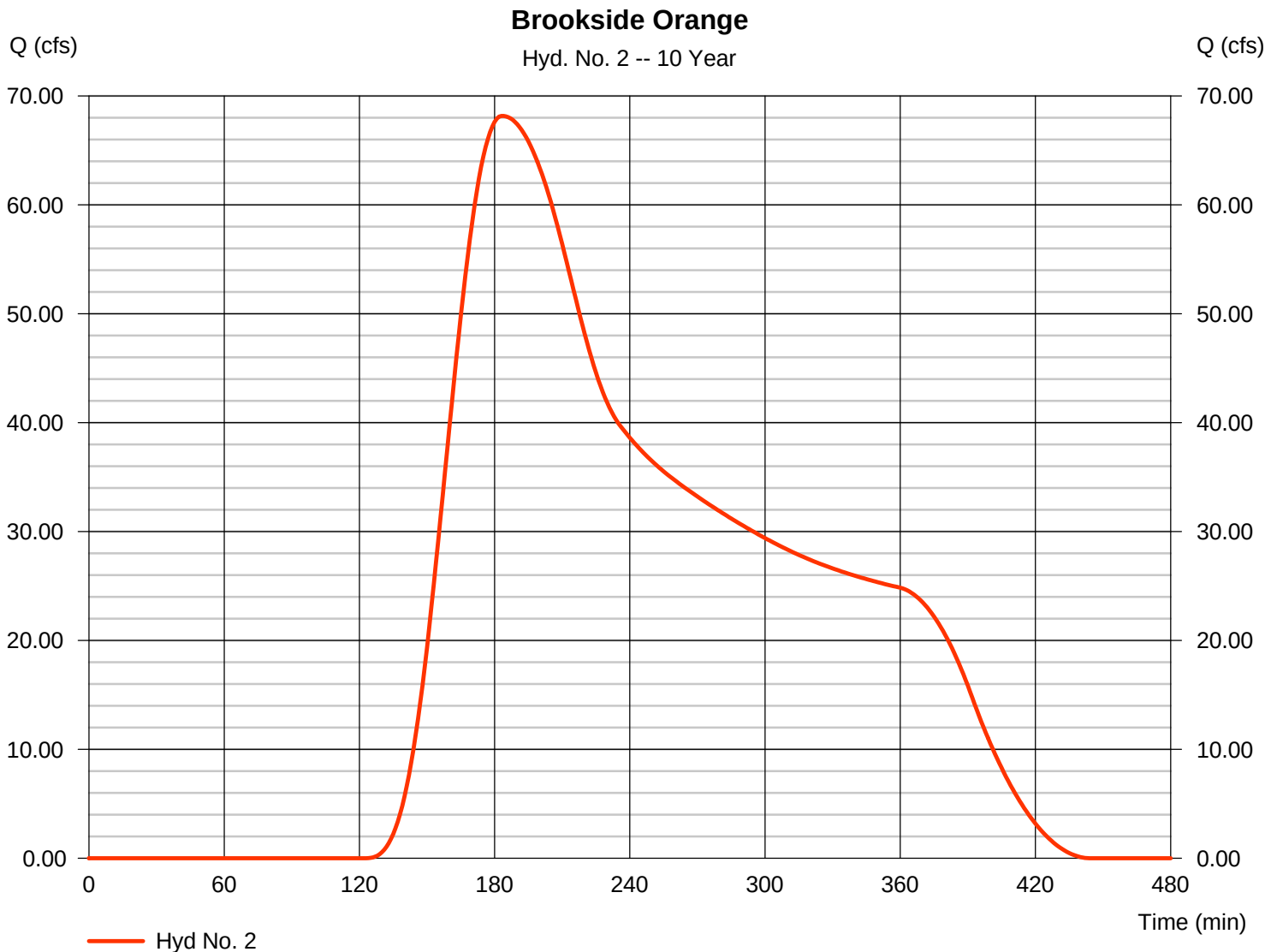
Thursday, 02 / 24 / 2022

Hyd. No. 2

Brookside Orange

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 158.000 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 3.56 in
 Storm duration = 6.00 hrs

Peak discharge = 68.16 cfs
 Time to peak = 184 min
 Hyd. volume = 565,638 cuft
 Curve number = 69
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 53.50 min
 Distribution = SCS 6-Hr
 Shape factor = 484



Hydrograph Report

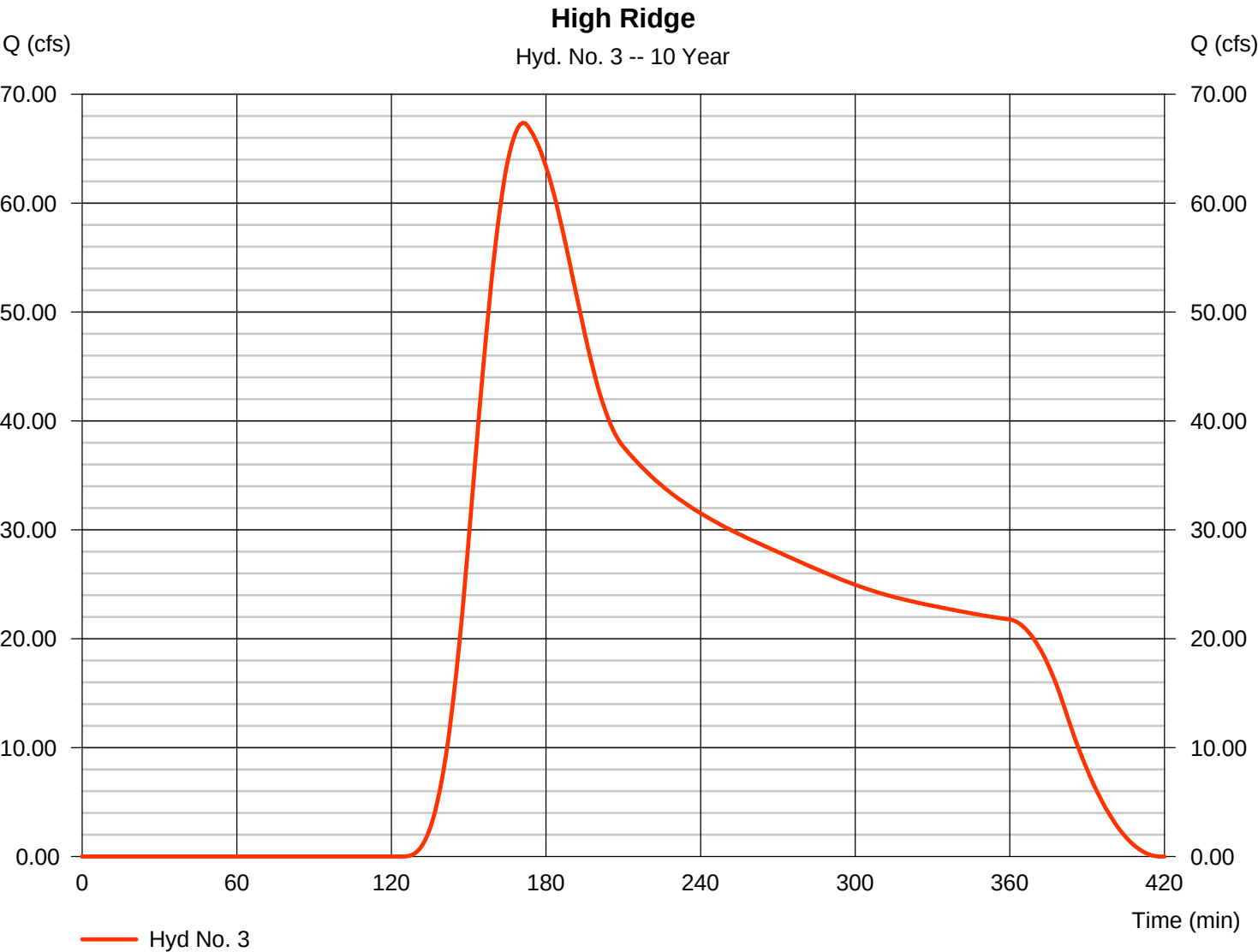
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Thursday, 02 / 24 / 2022

Hyd. No. 3

High Ridge

Hydrograph type	= SCS Runoff	Peak discharge	= 67.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 171 min
Time interval	= 1 min	Hyd. volume	= 483,422 cuft
Drainage area	= 149.800 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.50 min
Total precip.	= 3.56 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

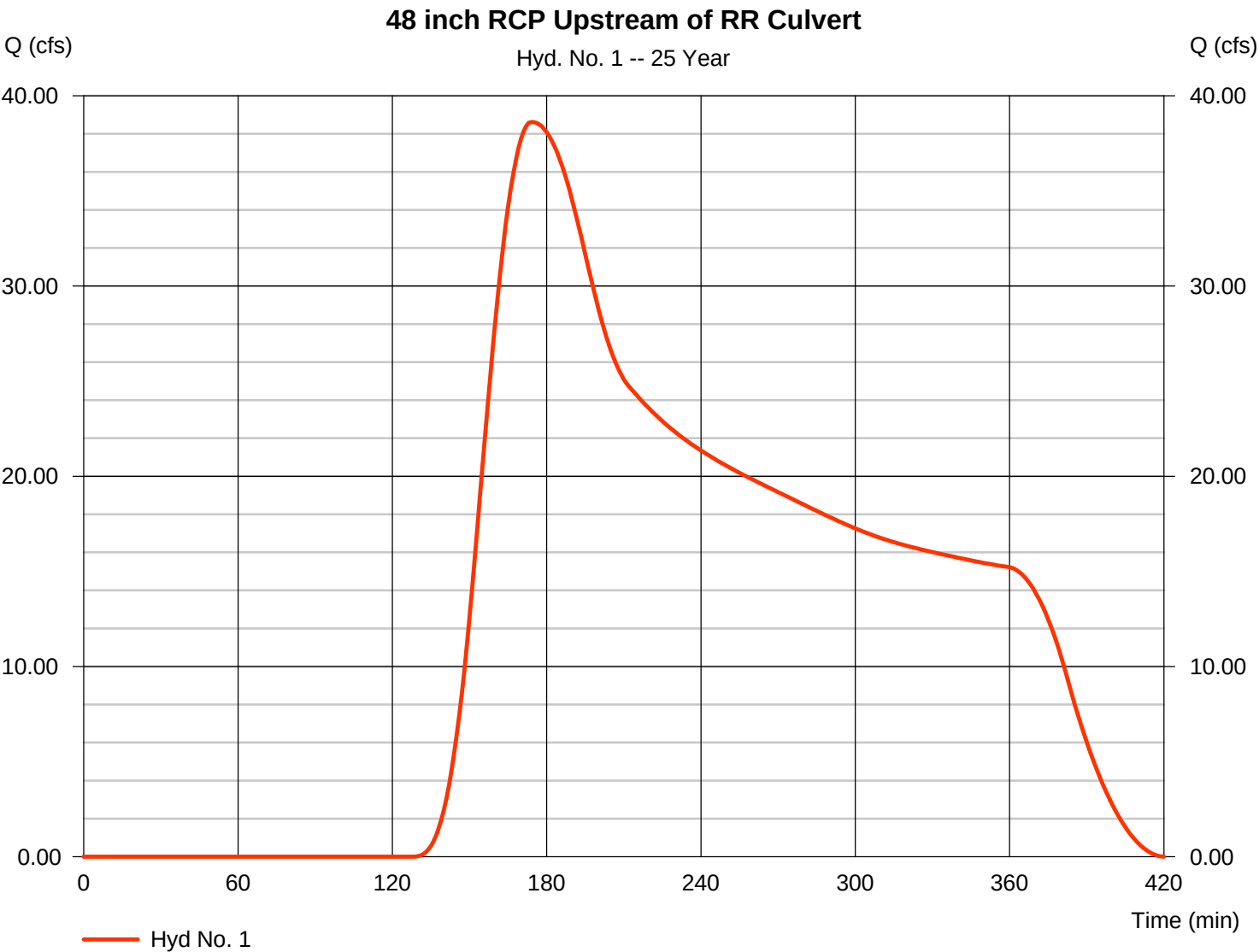
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	38.62	1	174	310,312	-----	-----	-----	48 inch RCP Upstream of RR Culvert
2	SCS Runoff	91.60	1	182	723,620	-----	-----	-----	Brookside Orange
3	SCS Runoff	92.67	1	170	626,028	-----	-----	-----	High Ridge
NRCS Stormwater runoff 2-4.gpw					Return Period: 25 Year			Thursday, 02 / 24 / 2022	

Hydrograph Report

Hyd. No. 1

48 inch RCP Upstream of RR Culvert

Hydrograph type	=	SCS Runoff	Peak discharge	=	38.62 cfs
Storm frequency	=	25 yrs	Time to peak	=	174 min
Time interval	=	1 min	Hyd. volume	=	310,312 cuft
Drainage area	=	105.800 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.80 min
Total precip.	=	4.00 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484

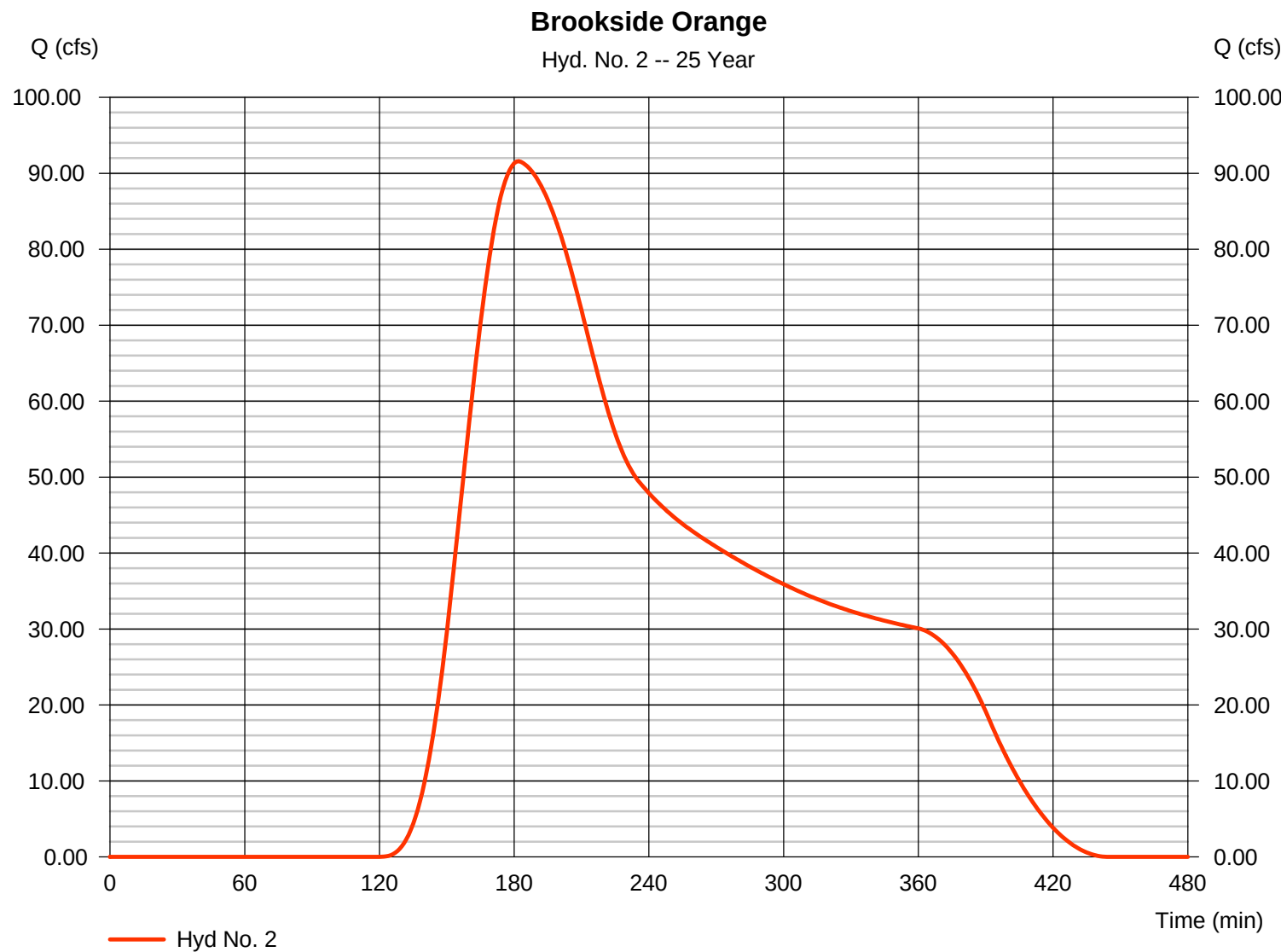


Hydrograph Report

Hyd. No. 2

Brookside Orange

Hydrograph type	=	SCS Runoff	Peak discharge	=	91.60 cfs
Storm frequency	=	25 yrs	Time to peak	=	182 min
Time interval	=	1 min	Hyd. volume	=	723,620 cuft
Drainage area	=	158.000 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	53.50 min
Total precip.	=	4.00 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



Hydrograph Report

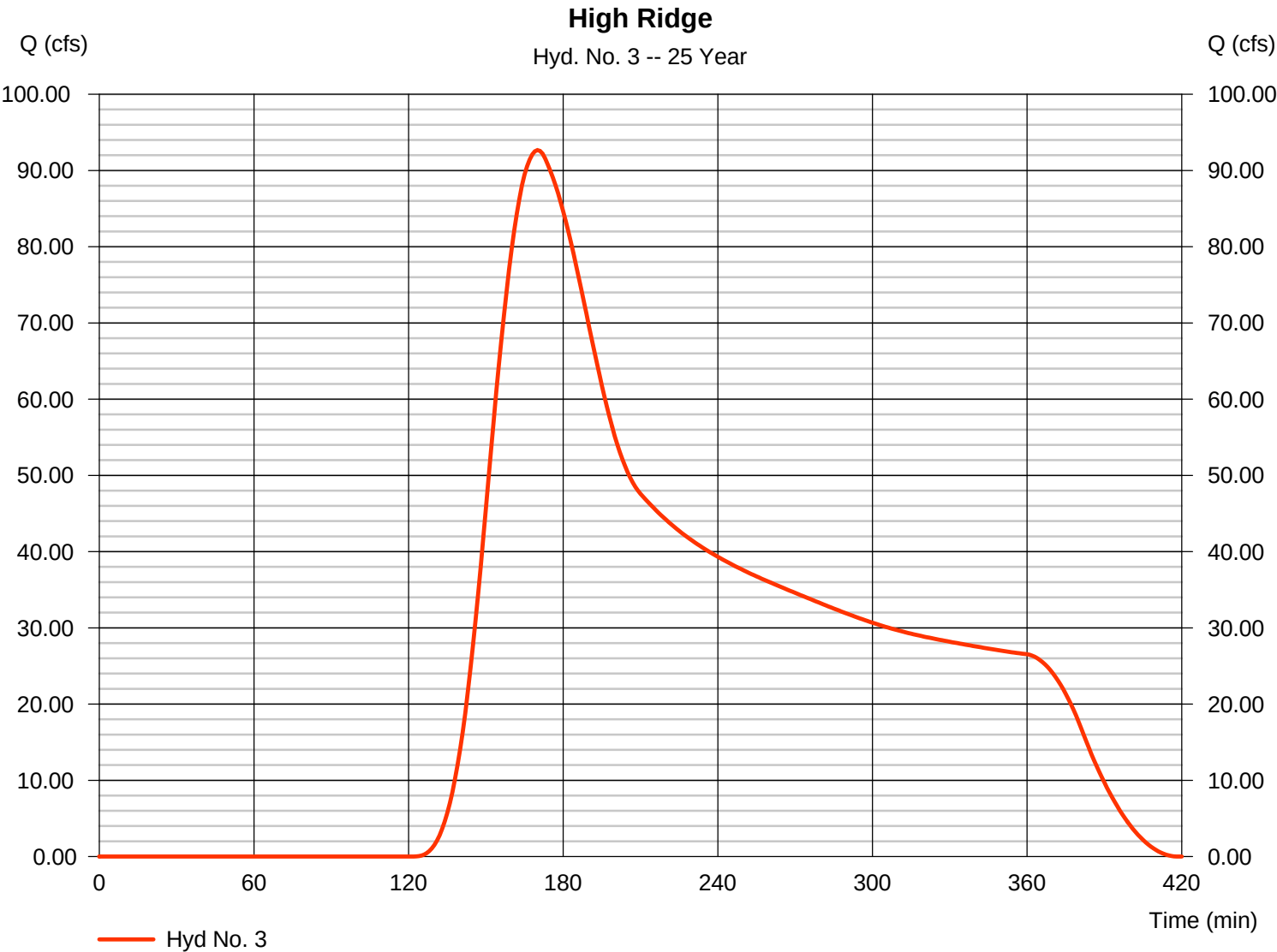
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Thursday, 02 / 24 / 2022

Hyd. No. 3

High Ridge

Hydrograph type	= SCS Runoff	Peak discharge	= 92.67 cfs
Storm frequency	= 25 yrs	Time to peak	= 170 min
Time interval	= 1 min	Hyd. volume	= 626,028 cuft
Drainage area	= 149.800 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.50 min
Total precip.	= 4.00 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	69.26	1	172	491,142	-----	-----	-----	48 inch RCP Upstream of RR Culvert
2	SCS Runoff	143.13	1	180	1,060,466	-----	-----	-----	Brookside Orange
3	SCS Runoff	148.95	1	168	933,050	-----	-----	-----	High Ridge
NRCS Stormwater runoff 2-4.gpw					Return Period: 50 Year			Thursday, 02 / 24 / 2022	

Hydrograph Report

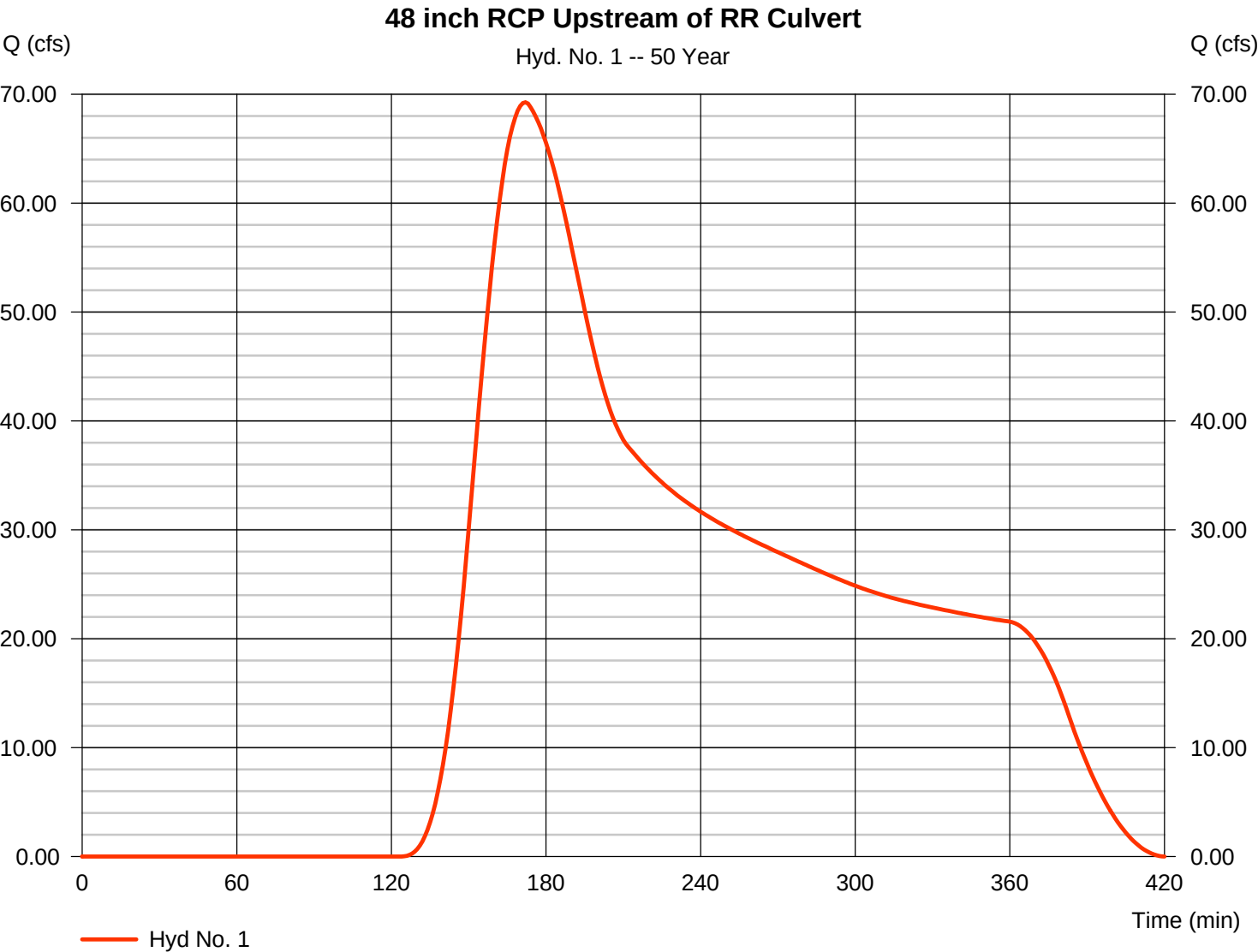
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Thursday, 02 / 24 / 2022

Hyd. No. 1

48 inch RCP Upstream of RR Culvert

Hydrograph type	=	SCS Runoff	Peak discharge	=	69.26 cfs
Storm frequency	=	50 yrs	Time to peak	=	172 min
Time interval	=	1 min	Hyd. volume	=	491,142 cuft
Drainage area	=	105.800 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.80 min
Total precip.	=	4.86 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



Hydrograph Report

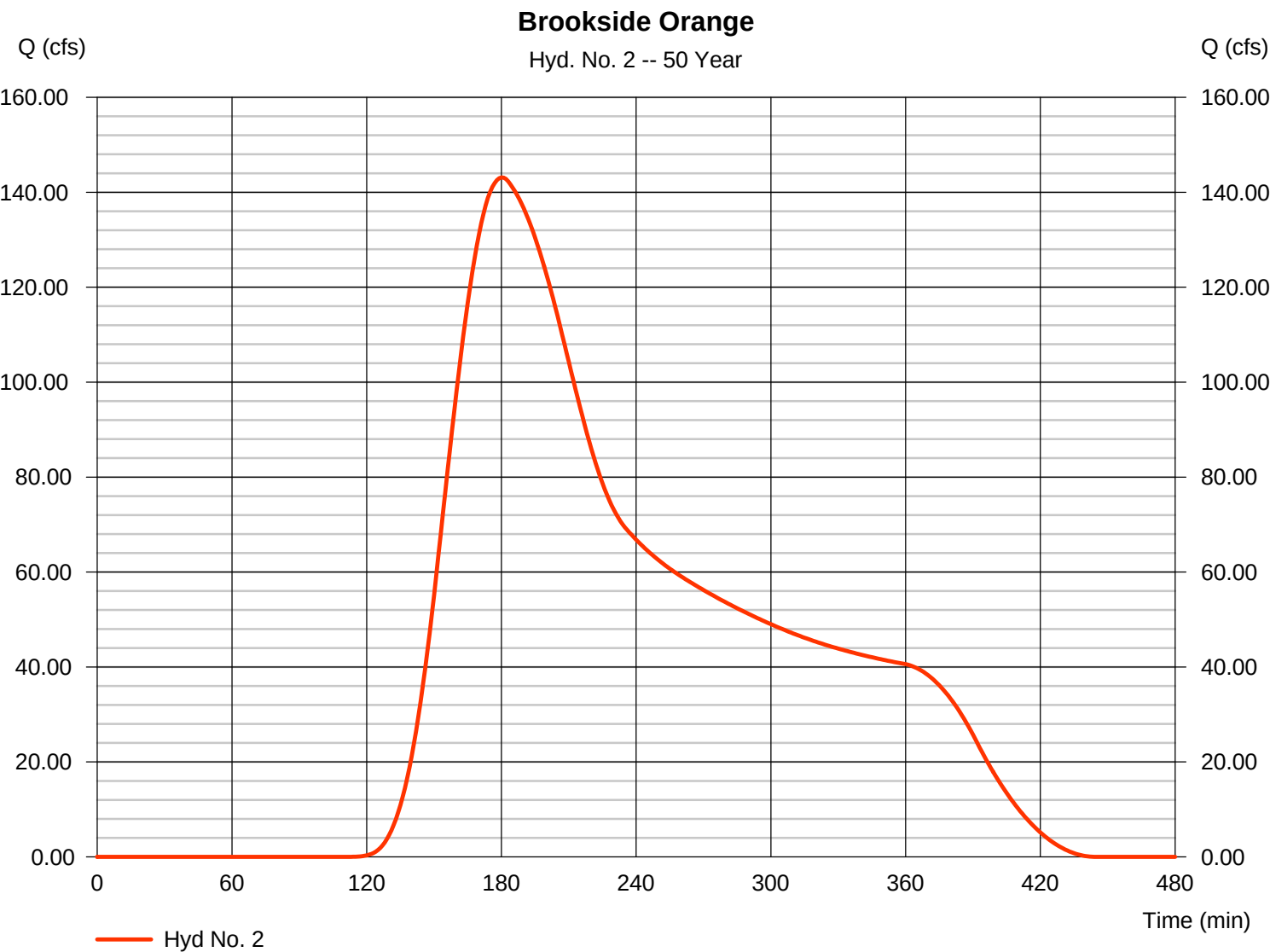
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Thursday, 02 / 24 / 2022

Hyd. No. 2

Brookside Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 143.13 cfs
Storm frequency	= 50 yrs	Time to peak	= 180 min
Time interval	= 1 min	Hyd. volume	= 1,060,466 cuft
Drainage area	= 158.000 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 53.50 min
Total precip.	= 4.86 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484

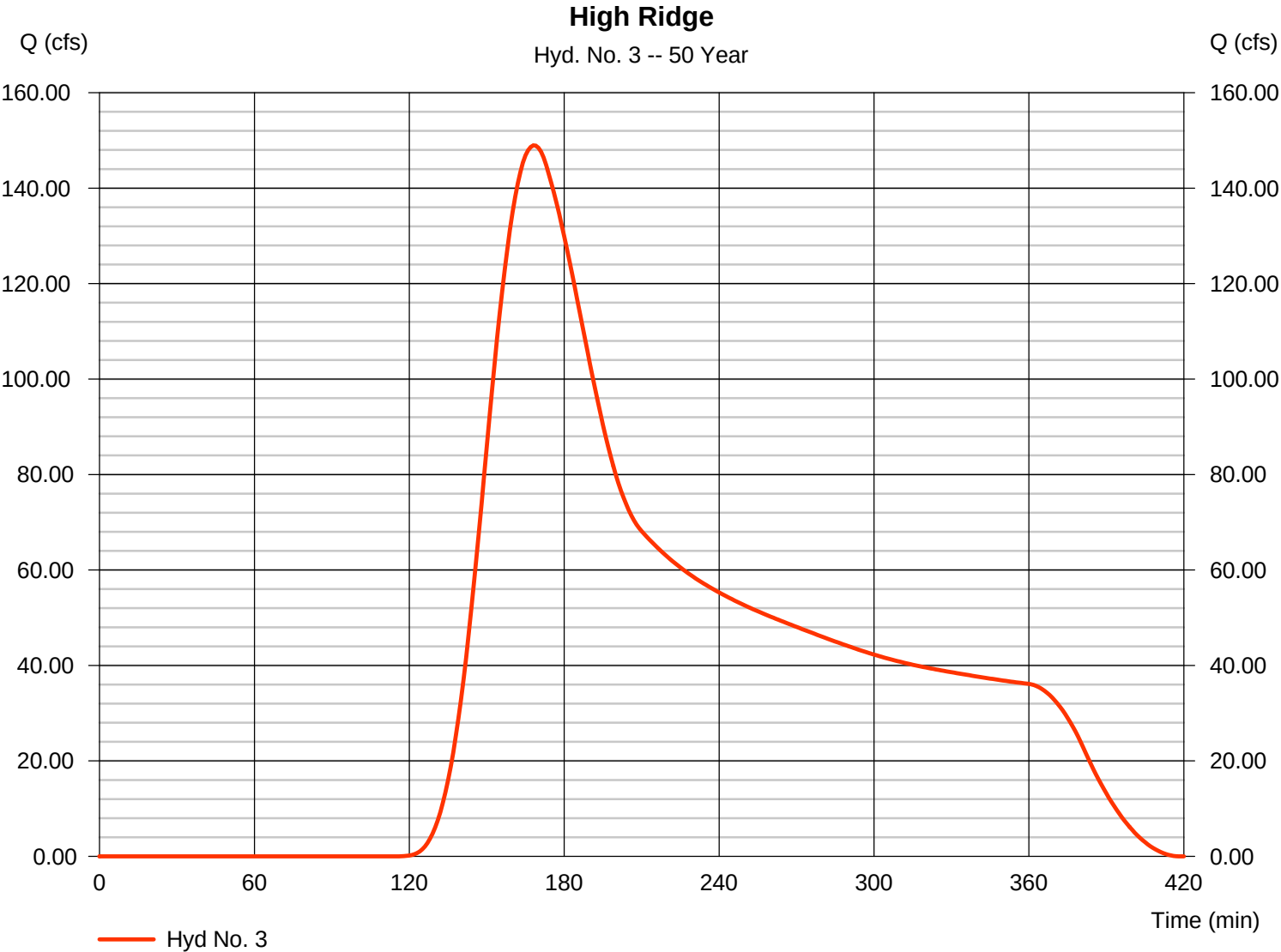


Hydrograph Report

Hyd. No. 3

High Ridge

Hydrograph type	= SCS Runoff	Peak discharge	= 148.95 cfs
Storm frequency	= 50 yrs	Time to peak	= 168 min
Time interval	= 1 min	Hyd. volume	= 933,050 cuft
Drainage area	= 149.800 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.50 min
Total precip.	= 4.86 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	106.39	1	170	700,369	-----	-----	-----	48 inch RCP Upstream of RR Culvert
2	SCS Runoff	201.78	1	179	1,434,616	-----	-----	-----	Brookside Orange
3	SCS Runoff	213.69	1	167	1,277,255	-----	-----	-----	High Ridge
NRCS Stormwater runoff 2-4.gpw					Return Period: 100 Year			Thursday, 02 / 24 / 2022	

Hydrograph Report

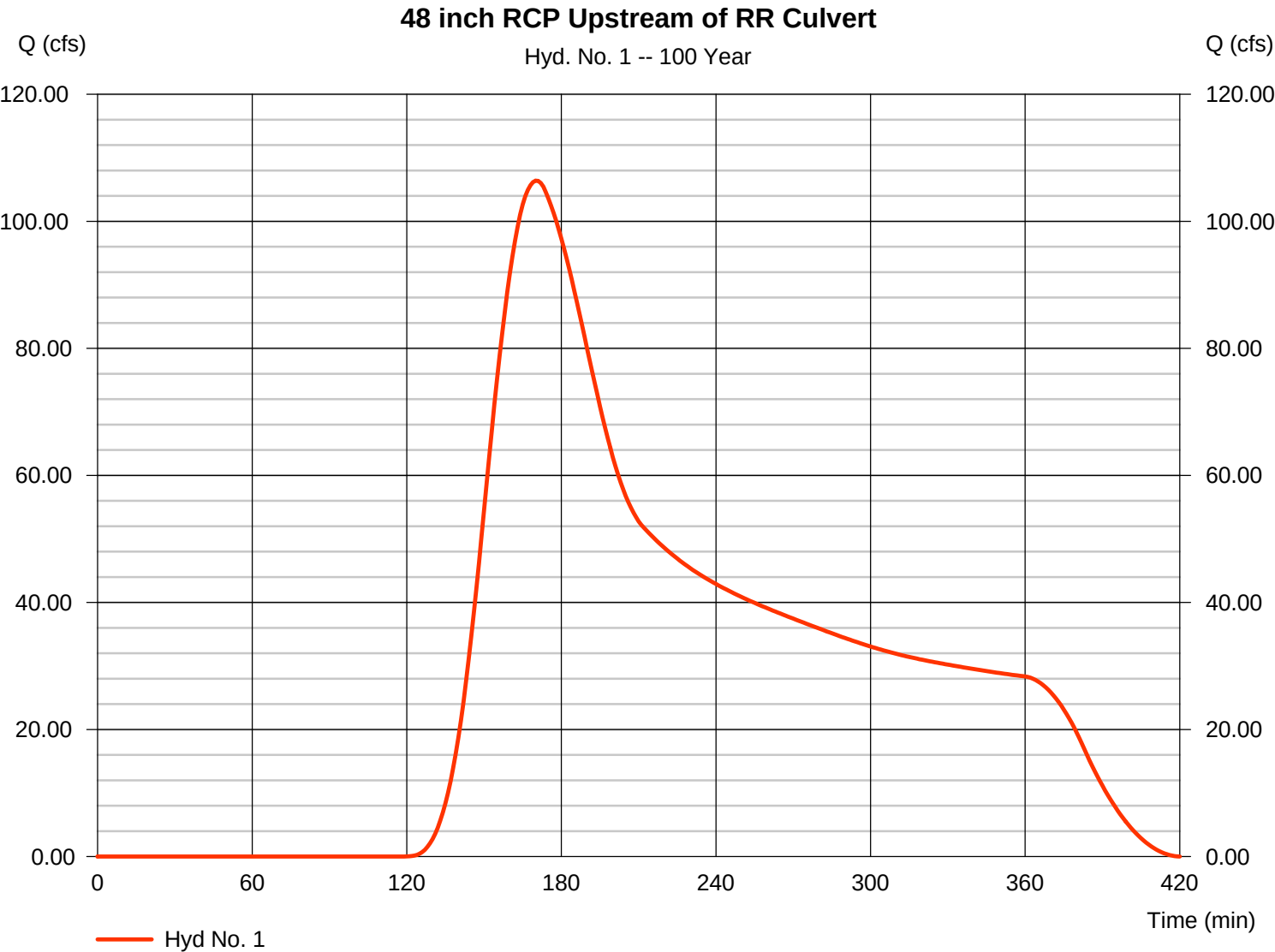
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Thursday, 02 / 24 / 2022

Hyd. No. 1

48 inch RCP Upstream of RR Culvert

Hydrograph type	=	SCS Runoff	Peak discharge	=	106.39 cfs
Storm frequency	=	100 yrs	Time to peak	=	170 min
Time interval	=	1 min	Hyd. volume	=	700,369 cuft
Drainage area	=	105.800 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	37.80 min
Total precip.	=	5.74 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



Hydrograph Report

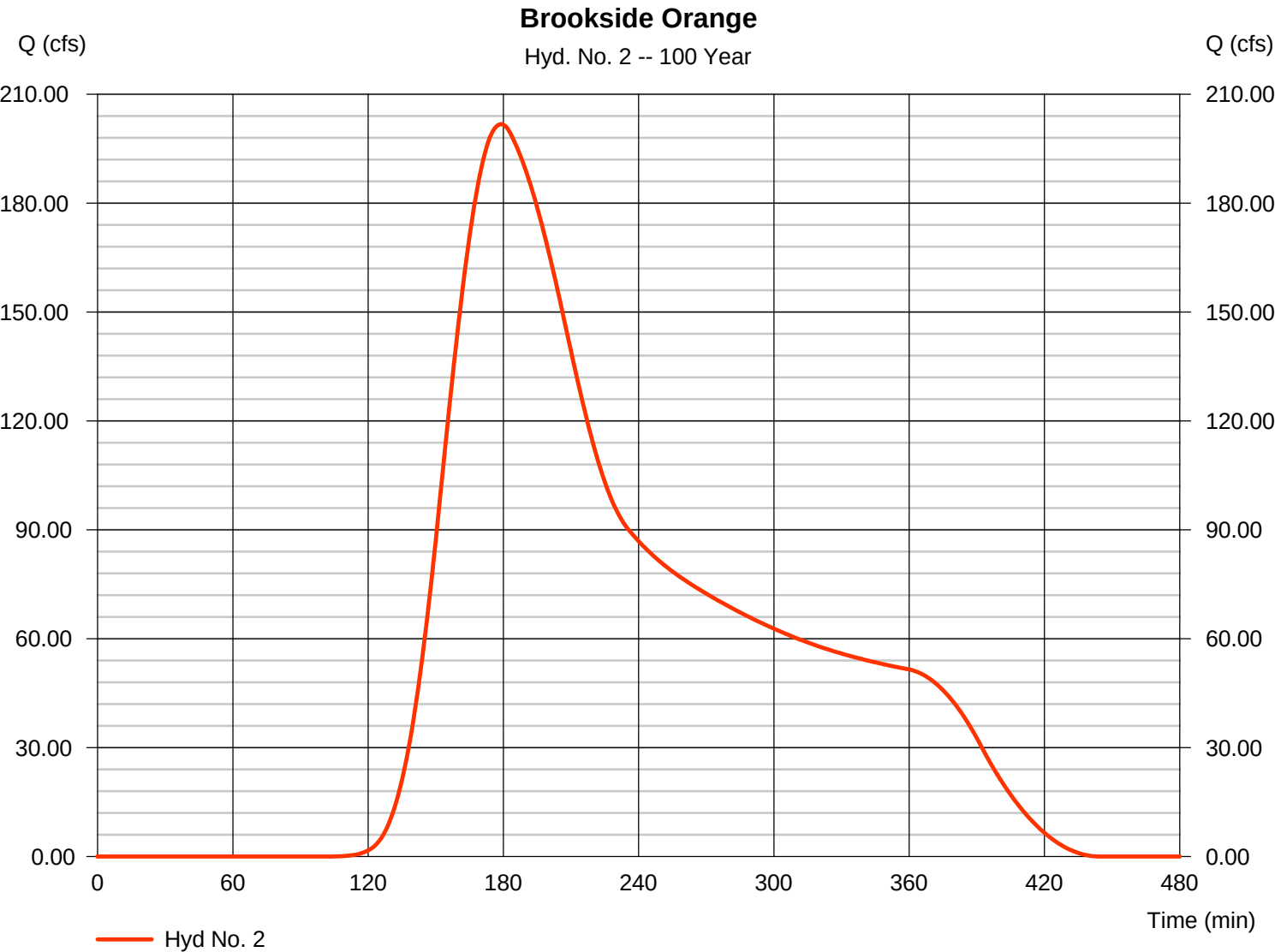
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Thursday, 02 / 24 / 2022

Hyd. No. 2

Brookside Orange

Hydrograph type	= SCS Runoff	Peak discharge	= 201.78 cfs
Storm frequency	= 100 yrs	Time to peak	= 179 min
Time interval	= 1 min	Hyd. volume	= 1,434,616 cuft
Drainage area	= 158.000 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 53.50 min
Total precip.	= 5.74 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Hydrograph Report

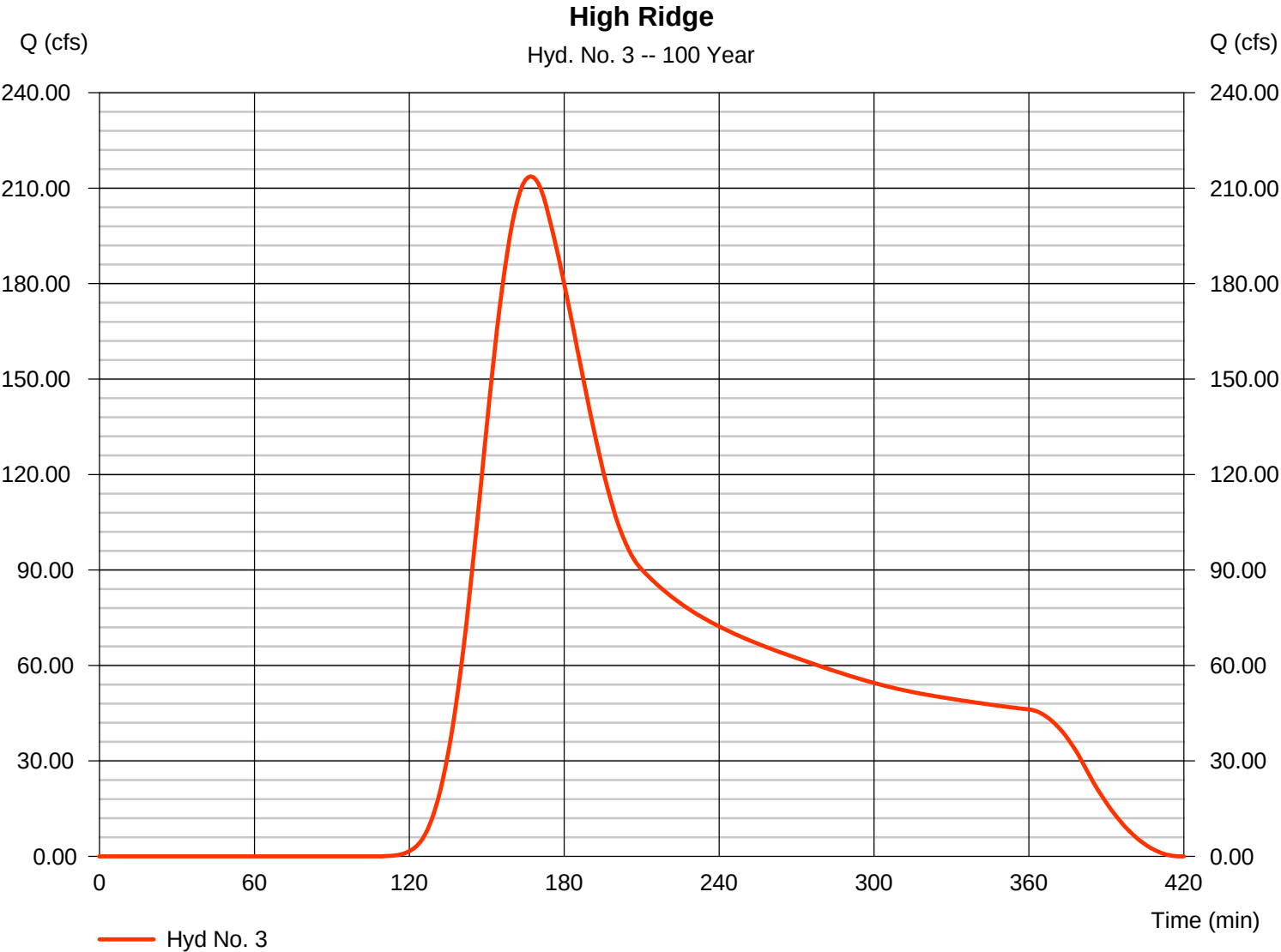
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Thursday, 02 / 24 / 2022

Hyd. No. 3

High Ridge

Hydrograph type	= SCS Runoff	Peak discharge	= 213.69 cfs
Storm frequency	= 100 yrs	Time to peak	= 167 min
Time interval	= 1 min	Hyd. volume	= 1,277,255 cuft
Drainage area	= 149.800 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 36.50 min
Total precip.	= 5.74 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



Derby Milford Neighborhood

Orange, CT

Existing Drainage to Brookside (Area #1)

	Area (SF)	Area (Ac)	Percentage of Total Area (%)	CN*	CN Description
61C Canton and charlton fsl, 8 to 15%	3,606,332.00	82.79	52.4	74	residential, 1 acre lots
3D Ridgebury, leicester 0 to 8%	566,280.00	13.00	8.2	80	residential, 1 acre lots
Remaining Soils HSG B	2,706,037.00	62.12	39.3	61	residential, 1 acre lots
Total Drainage Area	6,878,649.00	157.9			

Existing Conditions:
Composite CN

69

Derby Milford Culvert

Orange, CT

Existing Drainage Area (Derby Milford Area # 2 conveyed by 48" culvert)

TR-20

	Area (SF)	Area (Ac)	Percentage of Total Area (%)	CN*	CN Description
4D Leicester fsl	554,954.40	12.74	12.0	67	forest good cover
4D Leicester fsl	237,838.00	5.46	5.2	80	residential 1 acre lots
Remaining Soils HSG B	634,207.00	14.56	13.8	50	forest good cover
Remaining Soils HSG B	3,183,365.00	73.08	69.0	61	residential 1 acre lots
Total Drainage Area	4,610,364.40	105.8			

Existing Conditions:

Composite CN

61

Derby Milford Culvert

Orange, CT

Existing Drainage Area 3 (High Ridge discharging to East Slope culvert)

TR-20

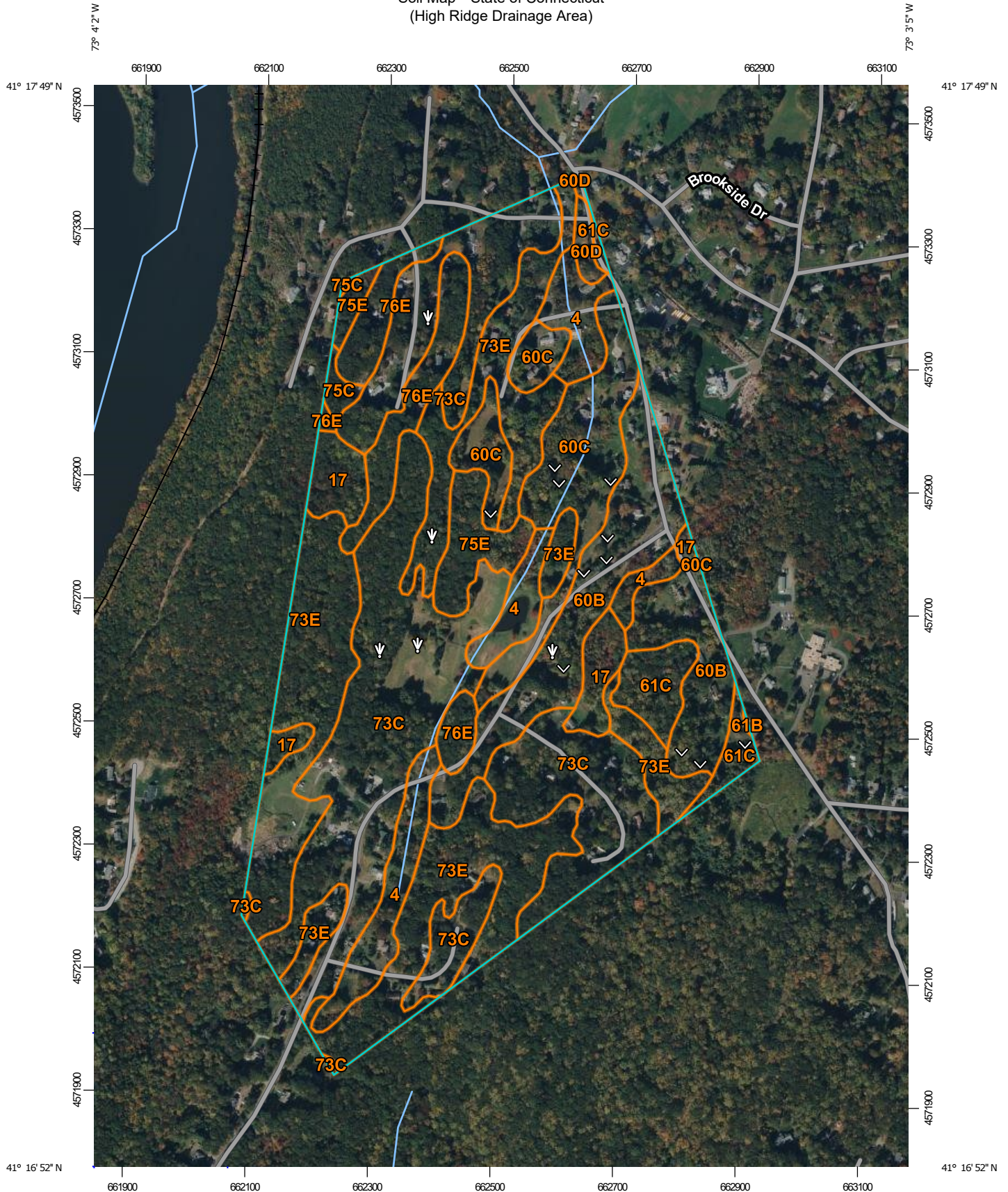
	Area (SF)	Area (Ac)	Percentage of Total Area (%)	CN*	CN Description	
HSG C soils	3,111,926.00	71.44	47.7	60	forest good cover	
HSG C soils	2,778,692.00	63.79	42.6	74	residential 1 acre lots	
HSG C soils	634,207.00	14.56	9.7	70	meadow good condition	
Remaining Soils HSG B	-	0.00	0.0	0		0
Total Drainage Area	6,524,825.00	149.8				

Existing Conditions:

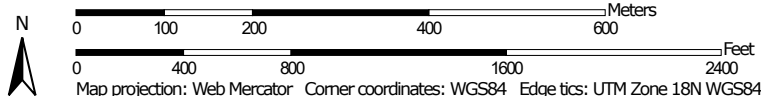
Composite CN

67

Soil Map—State of Connecticut (High Ridge Drainage Area)



Map Scale: 1:8,570 if printed on A portrait (8.5" x 11") sheet.



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

2/4/2022
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: State of Connecticut

Survey Area Data: Version 21, Sep 7, 2021

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

Date(s) aerial images were photographed: Oct 8, 2020—Oct 14, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4	Leicester fine sandy loam	13.4	7.1%
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	6.7	3.6%
60B	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	22.5	12.0%
60C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes	16.5	8.8%
60D	Canton and Charlton soils, 15 to 25 percent slopes	1.0	0.5%
61B	Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony	0.0	0.0%
61C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes, very stony	5.5	2.9%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	58.1	31.1%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	46.4	24.8%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	1.0	0.5%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	5.6	3.0%
76E	Rock outcrop-Hollis complex, 3 to 45 percent slopes	10.3	5.5%
Totals for Area of Interest		187.0	100.0%

APPENDIX D

HYDRAULIC MODELING DATA AND CALCULATIONS

Orange Culverts Flooding Issues
Existing Elevation Survey Information
April 2022

833 Brookside

Garage Elev 112.34 feet surveyed

First Floor Elev (FF) 114.7 estimated

Basement Elev 105.3 estimated

827 Brookside

Garage Elev 112.43 feet surveyed

First Floor Elev (FF) 114.2 estimated

Basement Elev 107.2 estimated

840 Glenbrook

Garage Elev 111.05 feet surveyed

First Floor Elev (FF) 118.05 estimated

Basement Elev 111.05 estimated

837 Glenbrook

Garage Elev 112.23 feet surveyed

First Floor Elev (FF) 115.73 estimated

Basement Elev 112.23 estimated

803 Derby Milford

25 foot x 25 foot Shed Elev 117.26 feet surveyed

Bituminous Drive on Embankment Low Spot Elev (FF) 115.2 surveyed

596 East Slope Drive

Garage Elev 104.42 feet surveyed

First Floor Elev (FF) 108.73 surveyed

Basement Elev 104.42 estimated

Brookside Drive Centerline Elevation @ culvert crossing 111.42 feet

Glenbrook Road Centerline Elevation @ culvert crossing 110.96 feet

Derby-Milford Road Centerline Elevation @ culvert crossing 109.01 feet

596 East Slope Drive Centerline Elevation @ culvert crossing 105.34 feet

High Ridge Road Centerline Elevation @ culvert crossing 102.94 feet

Note: Elevations are in NAVD88 datum.

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	5350	5 yr	44.00	111.00	112.44		112.77	0.008306	4.58	9.61	8.32	0.75
Main	5350	10 yr	68.00	111.00	112.78		113.24	0.009300	5.41	12.58	9.10	0.81
Main	5350	25 yr	92.00	111.00	112.88	112.88	113.61	0.014156	6.85	13.43	9.32	1.01
Main	5350	50 yr	143.00	111.00	114.66		114.94	0.002785	4.22	33.85	13.82	0.48
Main	5350	100 yr	202.00	111.00	115.09		115.48	0.003494	5.05	40.03	15.12	0.54
Main	5194.50*	5 yr	44.00	109.25	110.62	110.62	111.05	0.015047	5.31	8.29	9.64	1.01
Main	5194.50*	10 yr	68.00	109.25	110.94	110.94	111.47	0.014226	5.81	11.70	11.36	1.01
Main	5194.50*	25 yr	92.00	109.25	112.80		112.88	0.000780	2.23	41.45	20.50	0.27
Main	5194.50*	50 yr	143.00	109.25	114.75		114.79	0.000185	1.67	112.16	70.72	0.14
Main	5194.50*	100 yr	202.00	109.25	115.24		115.29	0.000217	1.94	152.25	93.06	0.16
Main	5039	5 yr	44.00	107.50	109.41		109.48	0.001763	2.12	20.72	19.68	0.36
Main	5039	10 yr	68.00	107.50	111.13		111.14	0.000142	1.09	72.48	48.95	0.12
Main	5039	25 yr	92.00	107.50	112.84		112.84	0.000027	0.67	215.47	119.60	0.06
Main	5039	50 yr	143.00	107.50	114.78		114.78	0.000009	0.49	551.01	223.12	0.03
Main	5039	100 yr	202.00	107.50	115.27		115.27	0.000011	0.58	666.72	247.07	0.04
Main	4929	5 yr	44.00	106.00	109.33		109.37	0.000613	1.41	31.44	17.11	0.17
Main	4929	10 yr	68.00	106.00	111.11		111.13	0.000156	1.08	74.56	50.07	0.10
Main	4929	25 yr	92.00	106.00	112.84		112.84	0.000031	0.61	293.49	267.82	0.05
Main	4929	50 yr	143.00	106.00	114.78		114.78	0.000005	0.29	926.54	375.36	0.02
Main	4929	100 yr	202.00	106.00	115.27		115.27	0.000005	0.33	1119.40	400.36	0.02
Main	4919	5 yr	44.00	105.80	109.34	106.73	109.36	0.000286	1.19	36.83	17.12	0.12
Main	4919	10 yr	68.00	105.80	111.11	107.02	111.12	0.000116	0.95	83.59	50.28	0.08
Main	4919	25 yr	92.00	105.80	112.84	107.28	112.84	0.000028	0.58	302.44	267.82	0.04
Main	4919	50 yr	143.00	105.80	114.78	107.75	114.78	0.000004	0.28	935.49	375.36	0.02
Main	4919	100 yr	202.00	105.80	115.27	108.21	115.27	0.000005	0.31	1128.35	400.36	0.02
Main	4718		Culvert									
Main	4517	5 yr	44.00	105.40	109.16		109.17	0.000089	0.67	65.49	23.47	0.07
Main	4517	10 yr	68.00	105.40	110.69		110.69	0.000049	0.66	112.64	44.85	0.06
Main	4517	25 yr	92.00	105.40	112.84		112.84	0.000007	0.32	507.98	279.73	0.02
Main	4517	50 yr	143.00	105.40	114.77		114.77	0.000002	0.21	1211.33	436.94	0.01
Main	4517	100 yr	202.00	105.40	115.27		115.27	0.000003	0.25	1433.43	465.99	0.01
Main	4502	5 yr	44.00	105.00	109.16		109.17	0.000069	0.65	72.62	30.33	0.06
Main	4502	10 yr	68.00	105.00	110.68		110.69	0.000040	0.64	131.14	54.37	0.05
Main	4502	25 yr	92.00	105.00	112.84		112.84	0.000009	0.38	529.02	268.10	0.03
Main	4502	50 yr	143.00	105.00	114.77		114.77	0.000004	0.29	1203.13	413.80	0.02
Main	4502	100 yr	202.00	105.00	115.26		115.27	0.000005	0.34	1412.70	440.21	0.02
Main	4402.00*	5 yr	44.00	104.96	109.15		109.16	0.000070	0.65	78.93	47.35	0.06
Main	4402.00*	10 yr	68.00	104.96	110.68		110.69	0.000027	0.53	221.88	132.79	0.04
Main	4402.00*	25 yr	92.00	104.96	112.84		112.84	0.000005	0.30	627.49	229.43	0.02
Main	4402.00*	50 yr	143.00	104.96	114.77		114.77	0.000003	0.27	1149.81	309.75	0.02
Main	4402.00*	100 yr	202.00	104.96	115.26		115.26	0.000004	0.33	1305.59	325.61	0.02
Main	4302	5 yr	58.00	104.92	109.15		109.15	0.000066	0.63	143.10	86.36	0.06
Main	4302	10 yr	94.00	104.92	110.68		110.68	0.000027	0.53	298.33	114.17	0.04
Main	4302	25 yr	131.00	104.92	112.83		112.84	0.000009	0.39	601.70	168.11	0.03
Main	4302	50 yr	212.00	104.92	114.77		114.77	0.000007	0.41	962.15	203.40	0.02
Main	4302	100 yr	308.00	104.92	115.26		115.26	0.000012	0.55	1063.68	211.28	0.03
Main	4268	5 yr	58.00	105.00	109.14		109.15	0.000169	0.97	72.78	34.02	0.10
Main	4268	10 yr	94.00	105.00	110.67		110.68	0.000093	0.94	128.79	39.25	0.08
Main	4268	25 yr	131.00	105.00	112.83		112.83	0.000041	0.81	221.01	46.06	0.05
Main	4268	50 yr	212.00	105.00	114.76		114.77	0.000041	0.95	317.40	56.06	0.06
Main	4268	100 yr	308.00	105.00	115.24		115.26	0.000071	1.30	345.57	62.25	0.08
Main	4260	5 yr	58.00	105.10	109.08	106.44	109.14	0.000525	1.98	29.31	27.69	0.18
Main	4260	10 yr	94.00	105.10	110.59	106.91	110.67	0.000459	2.31	40.78	31.20	0.18
Main	4260	25 yr	131.00	105.10	112.74	107.32	112.83	0.000289	2.29	57.15	37.21	0.15
Main	4260	50 yr	212.00	105.10	114.76	108.12	114.77	0.000078	1.27	262.78	51.55	0.07
Main	4260	100 yr	308.00	105.10	115.23	108.93	115.26	0.000140	1.76	288.46	56.06	0.10
Main	4230		Culvert									
Main	4200	5 yr	58.00	104.50	105.62	105.62	106.07	0.014555	5.41	10.71	11.91	1.01
Main	4200	10 yr	94.00	104.50	106.50		106.77	0.003900	4.19	22.80	15.30	0.57
Main	4200	25 yr	131.00	104.50	107.61		107.78	0.001281	3.38	41.63	18.12	0.36
Main	4200	50 yr	212.00	104.50	109.68		109.73	0.000244	2.14	151.39	81.38	0.17
Main	4200	100 yr	308.00	104.50	110.18		110.24	0.000293	2.51	195.08	95.21	0.19
Main	4185	5 yr	58.00	104.00	105.64		105.71	0.001224	2.12	27.32	18.77	0.31
Main	4185	10 yr	94.00	104.00	106.59		106.65	0.000615	2.03	47.69	25.61	0.24
Main	4185	25 yr	131.00	104.00	107.67		107.71	0.000277	1.76	94.16	63.54	0.17
Main	4185	50 yr	212.00	104.00	109.70		109.71	0.000076	1.26	252.84	90.66	0.10
Main	4185	100 yr	308.00	104.00	110.20		110.22	0.000104	1.57	299.68	96.42	0.11
Main	4130	5 yr	58.00	103.25	105.31		105.57	0.006129	4.08	14.23	12.40	0.67
Main	4130	10 yr	94.00	103.25	106.47		106.59	0.001509	2.81	35.11	26.30	0.36
Main	4130	25 yr	131.00	103.25	107.63		107.69	0.000458	2.13	79.14	52.57	0.22

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	4130	50 yr	212.00	103.25	109.69		109.71	0.000100	1.41	240.01	97.61	0.11
Main	4130	100 yr	308.00	103.25	110.19		110.22	0.000131	1.72	290.59	105.12	0.13
Main	4122	5 yr	58.00	102.70	105.40	103.92	105.50	0.001096	2.53	22.97	14.24	0.28
Main	4122	10 yr	94.00	102.70	106.45	104.37	106.58	0.000881	2.87	32.76	20.50	0.27
Main	4122	25 yr	131.00	102.70	107.53	104.76	107.67	0.000704	3.06	42.76	28.74	0.25
Main	4122	50 yr	212.00	102.70	109.68	105.46	109.71	0.000126	1.58	209.11	105.96	0.12
Main	4122	100 yr	308.00	102.70	110.17	106.17	110.21	0.000163	1.90	264.01	115.82	0.14
Main	4093.5		Culvert									
Main	4065	5 yr	58.00	101.90	103.49		103.55	0.001189	1.93	30.03	24.48	0.31
Main	4065	10 yr	94.00	101.90	105.11		105.14	0.000181	1.27	79.39	39.23	0.14
Main	4065	25 yr	131.00	101.90	105.28		105.32	0.000284	1.67	86.19	41.65	0.17
Main	4065	50 yr	212.00	101.90	105.62		105.71	0.000502	2.38	101.20	46.55	0.23
Main	4065	100 yr	308.00	101.90	105.73		105.90	0.000942	3.34	106.25	48.09	0.32
Main	4050	5 yr	58.00	100.50	103.51		103.53	0.000185	1.24	51.45	29.65	0.14
Main	4050	10 yr	94.00	100.50	105.12		105.13	0.000077	1.11	122.09	58.83	0.10
Main	4050	25 yr	131.00	100.50	105.29		105.31	0.000127	1.46	132.34	62.04	0.12
Main	4050	50 yr	212.00	100.50	105.63		105.69	0.000242	2.13	154.99	69.49	0.17
Main	4050	100 yr	308.00	100.50	105.74		105.86	0.000462	2.98	163.13	71.98	0.24
Main	3973	5 yr	58.00	100.17	103.46		103.51	0.000471	1.71	34.24	17.29	0.20
Main	3973	10 yr	94.00	100.17	105.11		105.12	0.000092	1.10	184.26	142.26	0.10
Main	3973	25 yr	131.00	100.17	105.28		105.30	0.000136	1.37	208.57	143.57	0.12
Main	3973	50 yr	212.00	100.17	105.63		105.66	0.000214	1.83	259.30	146.27	0.15
Main	3973	100 yr	308.00	100.17	105.75		105.81	0.000384	2.49	277.21	147.21	0.21
Main	3965	5 yr	58.00	99.40	103.35	101.15	103.49	0.000685	3.05	19.01	52.83	0.28
Main	3965	10 yr	94.00	99.40	105.11	101.77	105.12	0.000074	1.17	211.71	120.04	0.09
Main	3965	25 yr	131.00	99.40	105.28	102.32	105.30	0.000116	1.49	232.40	123.35	0.11
Main	3965	50 yr	212.00	99.40	105.63	103.37	105.66	0.000200	2.04	276.64	130.15	0.15
Main	3965	100 yr	308.00	99.40	105.75	104.45	105.81	0.000369	2.80	292.55	132.51	0.20
Main	3955		Culvert									
Main	3945	5 yr	58.00	98.30	101.22		101.34	0.001559	2.84	21.55	12.23	0.34
Main	3945	10 yr	94.00	98.30	102.11		102.26	0.001201	3.16	33.49	14.43	0.32
Main	3945	25 yr	131.00	98.30	102.82		103.00	0.001111	3.49	44.35	16.47	0.32
Main	3945	50 yr	212.00	98.30	104.31		104.41	0.000544	3.06	167.96	148.60	0.24
Main	3945	100 yr	308.00	98.30	103.66	102.28	104.26	0.002931	6.50	80.00	106.63	0.54
Main	3930	5 yr	97.00	98.38	100.58	100.39	101.15	0.009142	6.07	16.17	10.69	0.84
Main	3930	10 yr	160.00	98.38	100.99	100.99	101.96	0.012205	7.94	20.76	11.68	0.99
Main	3930	25 yr	221.00	98.38	101.47	101.47	102.64	0.011187	8.77	26.66	12.83	0.98
Main	3930	50 yr	357.00	98.38	102.34	102.34	103.94	0.010285	10.28	39.02	16.12	0.99
Main	3930	100 yr	510.00	98.38	103.65	103.65	104.19	0.003279	7.22	176.40	150.11	0.59
Main	3796	5 yr	97.00	98.20	100.49		100.56	0.001652	2.14	45.36	40.94	0.36
Main	3796	10 yr	160.00	98.20	101.03		101.11	0.001447	2.26	70.70	53.12	0.35
Main	3796	25 yr	221.00	98.20	101.50		101.57	0.001375	2.20	100.59	76.25	0.34
Main	3796	50 yr	357.00	98.20	102.26		102.32	0.000888	2.08	171.77	104.80	0.28
Main	3796	100 yr	510.00	98.20	103.40		103.44	0.000305	1.72	330.68	166.28	0.18
Main	3666	5 yr	97.00	98.00	99.51	99.51	100.04	0.013649	5.86	16.56	15.77	1.01
Main	3666	10 yr	160.00	98.00	99.97	99.97	100.63	0.012678	6.55	24.44	18.59	1.01
Main	3666	25 yr	221.00	98.00	100.30	100.30	101.10	0.011511	7.20	31.17	22.36	0.99
Main	3666	50 yr	357.00	98.00	100.96	100.96	101.96	0.009310	8.12	48.49	30.24	0.95
Main	3666	100 yr	510.00	98.00	102.95		103.33	0.001777	5.38	141.22	64.01	0.46
Main	3532	5 yr	97.00	95.13	96.77	96.77	97.36	0.013506	6.14	15.79	13.70	1.01
Main	3532	10 yr	160.00	95.13	97.39	97.28	98.01	0.010443	6.35	25.20	17.01	0.92
Main	3532	25 yr	221.00	95.13	98.26		98.68	0.005164	5.22	42.33	22.45	0.67
Main	3532	50 yr	357.00	95.13	99.94		100.20	0.001609	4.11	89.91	34.65	0.41
Main	3532	100 yr	510.00	95.13	103.11		103.17	0.000198	2.29	401.47	158.11	0.16
Main	3496	5 yr	97.00	94.00	96.09	96.02	96.75	0.012229	6.52	14.89	10.13	0.95
Main	3496	10 yr	160.00	94.00	97.16		97.70	0.006583	5.87	27.26	13.33	0.72
Main	3496	25 yr	221.00	94.00	98.05		98.50	0.004617	5.38	41.08	17.82	0.62
Main	3496	50 yr	357.00	94.00	99.84		100.14	0.001787	4.37	83.61	29.13	0.42
Main	3496	100 yr	510.00	94.00	103.08		103.16	0.000254	2.58	372.21	135.35	0.18
Main	3488	5 yr	97.00	93.70	96.38	95.11	96.57	0.002193	3.45	28.10	10.81	0.38
Main	3488	10 yr	160.00	93.70	97.32	95.66	97.59	0.002473	4.17	38.33	11.11	0.40
Main	3488	25 yr	221.00	93.70	98.10	96.12	98.44	0.002539	4.69	47.08	11.30	0.40
Main	3488	50 yr	357.00	93.70	99.63	97.03	100.10	0.002493	5.55	64.36	15.60	0.41
Main	3488	100 yr	510.00	93.70	102.72	97.90	103.13	0.001191	5.12	99.51	90.67	0.31
Main	3455		Culvert									
Main	3415	5 yr	97.00	93.10	94.93		95.34	0.007319	5.19	18.67	10.36	0.68
Main	3415	10 yr	160.00	93.10	95.18	95.07	96.06	0.013379	7.49	21.35	10.41	0.92
Main	3415	25 yr	221.00	93.10	95.54	95.54	96.75	0.015955	8.81	25.07	10.48	1.00
Main	3415	50 yr	357.00	93.10	96.46	96.46	98.09	0.016341	10.26	34.78	10.72	1.00

HEC-RAS Plan: existing (5 thru 100) River: Unnamed Bk Reach: Main (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3415	100 yr	510.00	93.10	97.35	97.35	99.39	0.016850	11.47	44.46	10.98	1.00
Main	3400	5 yr	97.00	93.00	94.60	94.60	95.15	0.013767	5.99	16.19	14.71	1.01
Main	3400	10 yr	160.00	93.00	95.07	95.07	95.78	0.012840	6.77	23.64	16.85	1.01
Main	3400	25 yr	221.00	93.00	95.43	95.43	96.27	0.012239	7.36	30.01	18.05	1.01
Main	3400	50 yr	357.00	93.00	96.09	96.09	97.18	0.011446	8.37	42.65	20.25	1.01
Main	3400	100 yr	510.00	93.00	96.69	96.69	98.04	0.010299	9.35	55.31	22.40	1.00
Main	3300	5 yr	97.00	90.00	91.20	91.20	91.61	0.014624	5.11	18.98	23.85	1.01
Main	3300	10 yr	160.00	90.00	91.54	91.54	92.06	0.013324	5.77	27.73	27.03	1.00
Main	3300	25 yr	221.00	90.00	91.81	91.81	92.42	0.012804	6.26	35.30	29.50	1.01
Main	3300	50 yr	357.00	90.00	92.32	92.32	93.06	0.012012	6.89	51.81	35.70	1.01
Main	3300	100 yr	510.00	90.00	92.77	92.77	93.61	0.011528	7.36	69.30	41.95	1.01

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	5350	100 yr	proposed 3	202.00	111.00	113.92	113.92	114.98	0.013129	8.26	24.45	11.72	1.01
Main	5350	100 yr	existing final 2-24	202.00	111.00	115.11		115.50	0.003400	5.01	40.37	15.20	0.53
Main	5194.50*	100 yr	proposed 3	202.00	109.25	112.05	112.05	112.89	0.012345	7.32	27.59	16.92	1.01
Main	5194.50*	100 yr	existing final 2-24	202.00	109.25	115.26		115.31	0.000213	1.93	154.17	93.97	0.16
Main	5039	100 yr	proposed 3	202.00	107.50	111.75		111.83	0.000519	2.41	110.65	73.57	0.24
Main	5039	100 yr	existing final 2-24	202.00	107.50	115.29		115.29	0.000011	0.58	671.67	248.22	0.04
Main	4929	100 yr	proposed 3	202.00	106.00	111.69		111.76	0.000673	2.46	117.03	89.26	0.21
Main	4929	100 yr	existing final 2-24	202.00	106.00	115.29		115.29	0.000005	0.32	1127.41	401.10	0.02
Main	4919	100 yr	proposed 3	202.00	105.80	111.69	108.21	111.75	0.000542	2.21	126.29	89.44	0.17
Main	4919	100 yr	existing final 2-24	202.00	105.80	115.29	108.21	115.29	0.000005	0.31	1136.35	401.10	0.02
Main	4718			Culvert									
Main	4517	100 yr	proposed 3	202.00	105.40	110.52		110.58	0.000497	2.05	105.63	39.72	0.17
Main	4517	100 yr	existing final 2-24	202.00	105.40	115.29		115.29	0.000003	0.25	1442.76	466.99	0.01
Main	4502	100 yr	proposed 3	202.00	105.00	110.51		110.57	0.000409	1.98	122.51	47.53	0.16
Main	4502	100 yr	existing final 2-24	202.00	105.00	115.28		115.29	0.000005	0.34	1421.52	441.24	0.02
Main	4402.00*	100 yr	proposed 3	202.00	104.96	110.49		110.53	0.000295	1.70	197.65	123.07	0.14
Main	4402.00*	100 yr	existing final 2-24	202.00	104.96	115.28		115.28	0.000004	0.33	1312.11	326.26	0.02
Main	4302	100 yr	proposed 3	308.00	104.92	110.46		110.49	0.000366	1.89	273.64	110.16	0.16
Main	4302	100 yr	existing final 2-24	308.00	104.92	115.28		115.28	0.000011	0.54	1067.92	211.59	0.03
Main	4268	100 yr	proposed 3	308.00	105.00	110.31		110.46	0.001365	3.42	114.91	37.88	0.29
Main	4268	100 yr	existing final 2-24	308.00	105.00	115.26		115.28	0.000070	1.30	346.83	62.60	0.08
Main	4260	100 yr	proposed 3	308.00	105.10	110.18		110.44	0.002702	4.77	91.37	30.30	0.39
Main	4260	100 yr	existing final 2-24	308.00	105.10	115.25	108.93	115.28	0.000139	1.75	289.60	56.21	0.10
Main	4230.00*	100 yr	proposed 3	308.00	104.80	110.09		110.37	0.001592	4.60	90.75	35.16	0.36
Main	4200	100 yr	proposed 3	308.00	104.50	110.18		110.24	0.000293	2.51	195.08	95.21	0.19
Main	4200	100 yr	existing final 2-24	308.00	104.50	110.18		110.24	0.000294	2.51	194.99	95.17	0.19
Main	4185	100 yr	proposed 3	308.00	104.00	110.20		110.22	0.000104	1.57	299.68	96.42	0.11
Main	4185	100 yr	existing final 2-24	308.00	104.00	110.20		110.22	0.000104	1.57	299.60	96.41	0.11
Main	4130	100 yr	proposed 3	308.00	103.25	110.19		110.22	0.000131	1.72	290.59	105.12	0.13
Main	4130	100 yr	existing final 2-24	308.00	103.25	110.19		110.22	0.000131	1.72	290.50	105.11	0.13
Main	4122	100 yr	proposed 3	308.00	102.70	110.17	106.17	110.21	0.000163	1.90	264.01	115.82	0.14
Main	4122	100 yr	existing final 2-24	308.00	102.70	110.17	106.17	110.21	0.000163	1.90	263.90	115.80	0.14
Main	4093.5			Culvert									
Main	4065	100 yr	proposed 3	308.00	101.90	105.73		105.90	0.000942	3.34	106.25	48.09	0.32
Main	4065	100 yr	existing final 2-24	308.00	101.90	105.75		105.91	0.000923	3.31	107.14	48.36	0.32
Main	4050	100 yr	proposed 3	308.00	100.50	105.74		105.86	0.000462	2.98	163.13	71.98	0.24
Main	4050	100 yr	existing final 2-24	308.00	100.50	105.76		105.88	0.000454	2.97	164.44	72.37	0.24
Main	3973	100 yr	proposed 3	308.00	100.17	105.75		105.81	0.000384	2.49	277.21	147.21	0.21
Main	3973	100 yr	existing final 2-24	308.00	100.17	105.77		105.83	0.000375	2.47	279.97	147.35	0.20
Main	3965	100 yr	proposed 3	308.00	99.40	105.75	104.45	105.81	0.000369	2.80	292.55	132.51	0.20
Main	3965	100 yr	existing final 2-24	308.00	99.40	105.77	104.45	105.82	0.000361	2.78	295.03	132.87	0.20
Main	3955			Culvert									
Main	3945	100 yr	proposed 3	308.00	98.30	103.66	102.28	104.26	0.002931	6.50	80.00	106.63	0.54
Main	3945	100 yr	existing final 2-24	308.00	98.30	103.68	102.28	104.27	0.002853	6.43	82.32	109.19	0.53
Main	3930	100 yr	proposed 3	510.00	98.38	103.65	103.65	104.19	0.003279	7.22	176.40	150.11	0.59
Main	3930	100 yr	existing final 2-24	522.00	98.38	103.64	103.64	104.22	0.003464	7.42	175.63	150.08	0.61
Main	3796	100 yr	proposed 3	510.00	98.20	103.40		103.44	0.000305	1.72	330.68	166.28	0.18
Main	3796	100 yr	existing final 2-24	522.00	98.20	103.59		103.63	0.000252	1.64	363.14	168.49	0.17
Main	3666	100 yr	proposed 3	510.00	98.00	102.95		103.33	0.001777	5.38	141.22	64.01	0.46
Main	3666	100 yr	existing final 2-24	522.00	98.00	103.21		103.54	0.001445	5.05	158.47	67.03	0.42
Main	3532	100 yr	proposed 3	510.00	95.13	103.11		103.17	0.000198	2.29	401.47	158.11	0.16
Main	3532	100 yr	existing final 2-24	522.00	95.13	103.35		103.40	0.000172	2.18	439.28	160.48	0.15
Main	3496	100 yr	proposed 3	510.00	94.00	103.08		103.16	0.000254	2.58	372.21	135.35	0.18
Main	3496	100 yr	existing final 2-24	522.00	94.00	103.32		103.40	0.000225	2.49	404.76	137.02	0.17
Main	3488	100 yr	proposed 3	510.00	93.70	102.72	97.90	103.13	0.001191	5.12	99.51	90.67	0.31
Main	3488	100 yr	existing final 2-24	522.00	93.70	102.95	97.97	103.36	0.001143	5.11	102.17	92.24	0.30
Main	3455			Culvert									
Main	3415	100 yr	proposed 3	510.00	93.10	97.35	97.35	99.39	0.016850	11.47	44.46	10.98	1.00
Main	3415	100 yr	existing final 2-24	522.00	93.10	97.41	97.41	99.49	0.016900	11.56	45.17	10.99	1.01
Main	3400	100 yr	proposed 3	510.00	93.00	96.69	96.69	98.04	0.010299	9.35	55.31	22.40	1.00

Reach	River Sta	Profile	Plan	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)	
Main	3400	100 yr	existing final 2-24	522.00	93.00	96.73	96.73	98.11	0.010277	9.43	56.21	22.55	1.00
Main	3300	100 yr	proposed 3	510.00	90.00	92.77	92.77	93.61	0.011490	7.35	69.38	41.97	1.01
Main	3300	100 yr	existing final 2-24	522.00	90.00	92.80	92.80	93.65	0.011487	7.39	70.64	42.39	1.01

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	5350	100 yr	prop 3F 4-21	202.00	111.00	113.92	113.92	114.98	0.013129	8.26	24.45	11.72	1.01
Main	5350	100 yr	existing final 2-24	202.00	111.00	115.11		115.50	0.003400	5.01	40.37	15.20	0.53
Main	5194.50*	100 yr	prop 3F 4-21	202.00	109.25	112.05	112.05	112.89	0.012348	7.32	27.59	16.92	1.01
Main	5194.50*	100 yr	existing final 2-24	202.00	109.25	115.26		115.31	0.000213	1.93	154.17	93.97	0.16
Main	5039	100 yr	prop 3F 4-21	202.00	107.50	110.99		111.16	0.001541	3.46	66.00	43.69	0.39
Main	5039	100 yr	existing final 2-24	202.00	107.50	115.29		115.29	0.000011	0.58	671.67	248.22	0.04
Main	4929	100 yr	prop 3F 4-21	202.00	106.00	110.79		110.98	0.001893	3.54	63.63	29.42	0.33
Main	4929	100 yr	existing final 2-24	202.00	106.00	115.29		115.29	0.000005	0.32	1127.41	401.10	0.02
Main	4919	100 yr	prop 3F 4-21	202.00	105.80	110.82	107.67	110.95	0.000781	2.88	70.19	65.16	0.23
Main	4919	100 yr	existing final 2-24	202.00	105.80	115.29	108.21	115.29	0.000005	0.31	1136.35	401.10	0.02
Main	4896.5			Culvert									
Main	4870	100 yr	prop 3F 4-21	202.00	105.60	110.59		110.60	0.000073	0.78	257.48	64.69	0.07
Main	4718.00*	100 yr	prop 3F 4-21	202.00	105.60	110.56		110.58	0.000174	1.14	177.55	48.36	0.10
Main	4567	100 yr	prop 3F 4-21	202.00	105.40	110.46	107.00	110.53	0.000418	2.23	90.58	68.25	0.18
Main	4541.5			Culvert									
Main	4517	100 yr	prop 3F 4-21	202.00	105.30	110.17		110.18	0.000098	0.85	237.15	65.88	0.08
Main	4517	100 yr	existing final 2-24	202.00	105.40	115.29		115.29	0.000003	0.25	1442.76	466.99	0.01
Main	4502	100 yr	prop 3F 4-21	202.00	105.00	110.10		110.17	0.000580	2.22	104.74	39.04	0.19
Main	4502	100 yr	existing final 2-24	202.00	105.00	115.28		115.29	0.000005	0.34	1421.52	441.24	0.02
Main	4402.00*	100 yr	prop 3F 4-21	202.00	104.96	110.06		110.11	0.000500	2.06	148.48	102.95	0.18
Main	4402.00*	100 yr	existing final 2-24	202.00	104.96	115.28		115.28	0.000004	0.33	1312.11	326.26	0.02
Main	4302	100 yr	prop 3F 4-21	308.00	104.92	110.00		110.05	0.000610	2.27	224.61	104.26	0.20
Main	4302	100 yr	existing final 2-24	308.00	104.92	115.28		115.28	0.000011	0.54	1067.92	211.59	0.03
Main	4268	100 yr	prop 3F 4-21	308.00	105.00	109.79		110.00	0.002263	4.04	95.57	36.04	0.37
Main	4268	100 yr	existing final 2-24	308.00	105.00	115.26		115.28	0.000070	1.30	346.83	62.60	0.08
Main	4260	100 yr	prop 3F 4-21	308.00	105.10	109.55	108.67	109.96	0.005071	5.93	72.61	28.82	0.52
Main	4260	100 yr	existing final 2-24	308.00	105.10	115.25	108.93	115.28	0.000139	1.75	289.60	56.21	0.10
Main	4230.00*	100 yr	prop 3F 4-21	308.00	104.80	108.04	108.04	109.43	0.013930	9.51	33.73	13.24	0.99
Main	4200	100 yr	prop 3F 4-21	308.00	104.50	107.39	107.39	108.53	0.009517	8.71	37.62	17.74	0.96
Main	4200	100 yr	existing final 2-24	308.00	104.50	110.18		110.24	0.000294	2.51	194.99	95.17	0.19
Main	4185	100 yr	prop 3F 4-21	308.00	104.00	107.73		107.96	0.001403	4.01	98.33	64.62	0.38
Main	4185	100 yr	existing final 2-24	308.00	104.00	110.20		110.22	0.000104	1.57	299.60	96.41	0.11
Main	4130	100 yr	prop 3F 4-21	308.00	103.25	107.33		107.81	0.003878	5.80	64.84	44.68	0.62
Main	4130	100 yr	existing final 2-24	308.00	103.25	110.19		110.22	0.000131	1.72	290.50	105.11	0.13
Main	4122	100 yr	prop 3F 4-21	308.00	102.70	107.02	105.72	107.75	0.003371	6.88	44.80	23.57	0.58
Main	4122	100 yr	existing final 2-24	308.00	102.70	110.17	106.17	110.21	0.000163	1.90	263.90	115.80	0.14
Main	4093.5			Culvert									
Main	4065	100 yr	prop 3F 4-21	308.00	101.90	105.73		105.90	0.000942	3.34	106.25	48.09	0.32
Main	4065	100 yr	existing final 2-24	308.00	101.90	105.75		105.91	0.000923	3.31	107.14	48.36	0.32
Main	4050	100 yr	prop 3F 4-21	308.00	100.50	105.74		105.86	0.000462	2.98	163.13	71.98	0.24
Main	4050	100 yr	existing final 2-24	308.00	100.50	105.76		105.88	0.000454	2.97	164.44	72.37	0.24
Main	3973	100 yr	prop 3F 4-21	308.00	100.17	105.75		105.81	0.000384	2.49	277.21	147.21	0.21
Main	3973	100 yr	existing final 2-24	308.00	100.17	105.77		105.83	0.000375	2.47	279.97	147.35	0.20
Main	3965	100 yr	prop 3F 4-21	308.00	99.40	105.75	104.45	105.81	0.000369	2.80	292.55	132.51	0.20
Main	3965	100 yr	existing final 2-24	308.00	99.40	105.77	104.45	105.82	0.000361	2.78	295.03	132.87	0.20
Main	3955			Culvert									
Main	3945	100 yr	prop 3F 4-21	308.00	98.30	103.66	102.28	104.26	0.002931	6.50	80.00	106.63	0.54
Main	3945	100 yr	existing final 2-24	308.00	98.30	103.68	102.28	104.27	0.002853	6.43	82.32	109.19	0.53
Main	3930	100 yr	prop 3F 4-21	510.00	98.38	103.65	103.65	104.19	0.003279	7.22	176.40	150.11	0.59
Main	3930	100 yr	existing final 2-24	522.00	98.38	103.64	103.64	104.22	0.003464	7.42	175.63	150.08	0.61
Main	3796	100 yr	prop 3F 4-21	510.00	98.20	103.40		103.44	0.000305	1.72	330.68	166.28	0.18
Main	3796	100 yr	existing final 2-24	522.00	98.20	103.59		103.63	0.000252	1.64	363.14	168.49	0.17
Main	3666	100 yr	prop 3F 4-21	510.00	98.00	102.95		103.33	0.001777	5.38	141.22	64.01	0.46
Main	3666	100 yr	existing final 2-24	522.00	98.00	103.21		103.54	0.001445	5.05	158.47	67.03	0.42
Main	3532	100 yr	prop 3F 4-21	510.00	95.13	103.11		103.17	0.000198	2.29	401.47	158.11	0.16
Main	3532	100 yr	existing final 2-24	522.00	95.13	103.35		103.40	0.000172	2.18	439.28	160.48	0.15
Main	3496	100 yr	prop 3F 4-21	510.00	94.00	103.08		103.16	0.000254	2.58	372.21	135.35	0.18
Main	3496	100 yr	existing final 2-24	522.00	94.00	103.32		103.40	0.000225	2.49	404.76	137.02	0.17
Main	3488	100 yr	prop 3F 4-21	510.00	93.70	102.72	97.90	103.13	0.001191	5.12	99.51	90.67	0.31

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3488	100 yr	existing final 2-24	522.00	93.70	102.95	97.97	103.36	0.001143	5.11	102.17	92.24	0.30
Main	3455			Culvert									
Main	3415	100 yr	prop 3F 4-21	510.00	93.10	97.35	97.35	99.39	0.016850	11.47	44.46	10.98	1.00
Main	3415	100 yr	existing final 2-24	522.00	93.10	97.41	97.41	99.49	0.016900	11.56	45.17	10.99	1.01
Main	3400	100 yr	prop 3F 4-21	510.00	93.00	96.69	96.69	98.04	0.010299	9.35	55.31	22.40	1.00
Main	3400	100 yr	existing final 2-24	522.00	93.00	96.73	96.73	98.11	0.010277	9.43	56.21	22.55	1.00
Main	3300	100 yr	prop 3F 4-21	510.00	90.00	92.77	92.77	93.61	0.011491	7.35	69.38	41.97	1.01
Main	3300	100 yr	existing final 2-24	522.00	90.00	92.80	92.80	93.65	0.011487	7.39	70.64	42.39	1.01

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	5350	100 yr	proposed 4c	202.00	111.00	113.92	113.92	114.98	0.013129	8.26	24.45	11.72	1.01
Main	5350	100 yr	existing final 2-24	202.00	111.00	115.11		115.50	0.003400	5.01	40.37	15.20	0.53
Main	5194.50*	100 yr	proposed 4c	202.00	109.25	112.05	112.05	112.89	0.012348	7.32	27.59	16.92	1.01
Main	5194.50*	100 yr	existing final 2-24	202.00	109.25	115.26		115.31	0.000213	1.93	154.17	93.97	0.16
Main	5039	100 yr	proposed 4c	202.00	107.50	111.02		111.19	0.001468	3.40	67.41	44.67	0.38
Main	5039	100 yr	existing final 2-24	202.00	107.50	115.29		115.29	0.000011	0.58	671.67	248.22	0.04
Main	4929	100 yr	proposed 4c	202.00	106.00	110.83		111.01	0.001810	3.49	64.84	29.96	0.33
Main	4929	100 yr	existing final 2-24	202.00	106.00	115.29		115.29	0.000005	0.32	1127.41	401.10	0.02
Main	4919	100 yr	proposed 4c	202.00	105.80	110.78	108.00	110.99	0.001725	3.65	55.36	29.30	0.29
Main	4919	100 yr	existing final 2-24	202.00	105.80	115.29	108.21	115.29	0.000005	0.31	1136.35	401.10	0.02
Main	4718			Culvert									
Main	4517	100 yr	proposed 4c	202.00	105.40	110.10		110.18	0.000689	2.27	92.26	31.65	0.20
Main	4517	100 yr	existing final 2-24	202.00	105.40	115.29		115.29	0.000003	0.25	1442.76	466.99	0.01
Main	4502	100 yr	proposed 4c	202.00	105.00	110.10		110.17	0.000580	2.22	104.74	39.04	0.19
Main	4502	100 yr	existing final 2-24	202.00	105.00	115.28		115.29	0.000005	0.34	1421.52	441.24	0.02
Main	4402.00*	100 yr	proposed 4c	202.00	104.96	110.06		110.11	0.000500	2.06	148.48	102.95	0.18
Main	4402.00*	100 yr	existing final 2-24	202.00	104.96	115.28		115.28	0.000004	0.33	1312.11	326.26	0.02
Main	4302	100 yr	proposed 4c	308.00	104.92	110.00		110.05	0.000610	2.27	224.61	104.26	0.20
Main	4302	100 yr	existing final 2-24	308.00	104.92	115.28		115.28	0.000011	0.54	1067.92	211.59	0.03
Main	4268	100 yr	proposed 4c	308.00	105.00	109.79		110.00	0.002263	4.04	95.57	36.04	0.37
Main	4268	100 yr	existing final 2-24	308.00	105.00	115.26		115.28	0.000070	1.30	346.83	62.60	0.08
Main	4260	100 yr	proposed 4c	308.00	105.10	109.55	108.67	109.96	0.005071	5.93	72.61	28.82	0.52
Main	4260	100 yr	existing final 2-24	308.00	105.10	115.25	108.93	115.28	0.000139	1.75	289.60	56.21	0.10
Main	4230.00*	100 yr	proposed 4c	308.00	104.80	108.04	108.04	109.43	0.013930	9.51	33.73	13.24	0.99
Main	4200	100 yr	proposed 4c	308.00	104.50	107.90	107.39	108.65	0.004947	7.10	47.57	28.08	0.72
Main	4200	100 yr	existing final 2-24	308.00	104.50	110.18		110.24	0.000294	2.51	194.99	95.17	0.19
Main	4185	100 yr	proposed 4c	308.00	104.00	108.18		108.33	0.000786	3.26	129.43	72.06	0.29
Main	4185	100 yr	existing final 2-24	308.00	104.00	110.20		110.22	0.000104	1.57	299.60	96.41	0.11
Main	4130	100 yr	proposed 4c	308.00	103.25	108.04		108.26	0.001447	4.13	103.06	63.67	0.39
Main	4130	100 yr	existing final 2-24	308.00	103.25	110.19		110.22	0.000131	1.72	290.50	105.11	0.13
Main	4122	100 yr	proposed 4c	308.00	102.70	107.59	105.79	108.21	0.001950	6.30	48.89	29.34	0.50
Main	4122	100 yr	existing final 2-24	308.00	102.70	110.17	106.17	110.21	0.000163	1.90	263.90	115.80	0.14
Main	4093.5			Culvert									
Main	4065	100 yr	proposed 4c	308.00	101.90	105.73		105.90	0.000942	3.34	106.25	48.09	0.32
Main	4065	100 yr	existing final 2-24	308.00	101.90	105.75		105.91	0.000923	3.31	107.14	48.36	0.32
Main	4050	100 yr	proposed 4c	308.00	100.50	105.74		105.86	0.000462	2.98	163.13	71.98	0.24
Main	4050	100 yr	existing final 2-24	308.00	100.50	105.76		105.88	0.000454	2.97	164.44	72.37	0.24
Main	3973	100 yr	proposed 4c	308.00	100.17	105.75		105.81	0.000384	2.49	277.21	147.21	0.21
Main	3973	100 yr	existing final 2-24	308.00	100.17	105.77		105.83	0.000375	2.47	279.97	147.35	0.20
Main	3965	100 yr	proposed 4c	308.00	99.40	105.75	104.45	105.81	0.000369	2.80	292.55	132.51	0.20
Main	3965	100 yr	existing final 2-24	308.00	99.40	105.77	104.45	105.82	0.000361	2.78	295.03	132.87	0.20
Main	3955			Culvert									
Main	3945	100 yr	proposed 4c	308.00	98.30	103.66	102.28	104.26	0.002931	6.50	80.00	106.63	0.54
Main	3945	100 yr	existing final 2-24	308.00	98.30	103.68	102.28	104.27	0.002853	6.43	82.32	109.19	0.53
Main	3930	100 yr	proposed 4c	510.00	98.38	103.65	103.65	104.19	0.003279	7.22	176.40	150.11	0.59
Main	3930	100 yr	existing final 2-24	522.00	98.38	103.64	103.64	104.22	0.003464	7.42	175.63	150.08	0.61
Main	3796	100 yr	proposed 4c	510.00	98.20	103.40		103.44	0.000305	1.72	330.68	166.28	0.18
Main	3796	100 yr	existing final 2-24	522.00	98.20	103.59		103.63	0.000252	1.64	363.14	168.49	0.17
Main	3666	100 yr	proposed 4c	510.00	98.00	102.95		103.33	0.001777	5.38	141.22	64.01	0.46
Main	3666	100 yr	existing final 2-24	522.00	98.00	103.21		103.54	0.001445	5.05	158.47	67.03	0.42
Main	3532	100 yr	proposed 4c	510.00	95.13	103.11		103.17	0.000198	2.29	401.47	158.11	0.16
Main	3532	100 yr	existing final 2-24	522.00	95.13	103.35		103.40	0.000172	2.18	439.28	160.48	0.15
Main	3496	100 yr	proposed 4c	510.00	94.00	103.08		103.16	0.000254	2.58	372.21	135.35	0.18
Main	3496	100 yr	existing final 2-24	522.00	94.00	103.32		103.40	0.000225	2.49	404.76	137.02	0.17
Main	3488	100 yr	proposed 4c	510.00	93.70	102.72	97.90	103.13	0.001191	5.12	99.51	90.67	0.31
Main	3488	100 yr	existing final 2-24	522.00	93.70	102.95	97.97	103.36	0.001143	5.11	102.17	92.24	0.30
Main	3455			Culvert									
Main	3415	100 yr	proposed 4c	510.00	93.10	97.35	97.35	99.39	0.016850	11.47	44.46	10.98	1.00
Main	3415	100 yr	existing final 2-24	522.00	93.10	97.41	97.41	99.49	0.016900	11.56	45.17	10.99	1.01
Main	3400	100 yr	proposed 4c	510.00	93.00	96.69	96.69	98.04	0.010299	9.35	55.31	22.40	1.00

HEC-RAS River: Unnamed Bk Reach: Main Profile: 100 yr (Continued)

Reach	River Sta	Profile	Plan	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)	
Main	3400	100 yr	existing final 2-24	522.00	93.00	96.73	96.73	98.11	0.010277	9.43	56.21	22.55	1.00
Main	3300	100 yr	proposed 4c	510.00	90.00	92.77	92.77	93.61	0.011491	7.35	69.38	41.97	1.01
Main	3300	100 yr	existing final 2-24	522.00	90.00	92.80	92.80	93.65	0.011487	7.39	70.64	42.39	1.01

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	5350	100 yr	proposed 6da	202.00	111.00	113.92	113.92	114.98	0.013129	8.26	24.45	11.72	1.01
Main	5350	100 yr	existing final 2-24	202.00	111.00	115.11		115.50	0.003400	5.01	40.37	15.20	0.53
Main	5194.50*	100 yr	proposed 6da	202.00	109.25	112.05	112.05	112.89	0.012345	7.32	27.59	16.92	1.01
Main	5194.50*	100 yr	existing final 2-24	202.00	109.25	115.26		115.31	0.000213	1.93	154.17	93.97	0.16
Main	5039	100 yr	proposed 6da	202.00	107.50	111.27		111.40	0.001013	3.02	79.98	54.67	0.32
Main	5039	100 yr	existing final 2-24	202.00	107.50	115.29		115.29	0.000011	0.58	671.67	248.22	0.04
Main	4929	100 yr	proposed 6da	202.00	106.00	111.13		111.27	0.001356	3.19	75.44	52.84	0.29
Main	4929	100 yr	existing final 2-24	202.00	106.00	115.29		115.29	0.000005	0.32	1127.41	401.10	0.02
Main	4919	100 yr	proposed 6da	202.00	105.80	111.16	107.87	111.25	0.000773	2.50	94.10	57.53	0.20
Main	4919	100 yr	existing final 2-24	202.00	105.80	115.29	108.21	115.29	0.000005	0.31	1136.35	401.10	0.02
Main	4718			Culvert									
Main	4517	100 yr	proposed 6da	202.00	105.40	110.67		110.73	0.000420	1.94	113.41	43.96	0.16
Main	4517	100 yr	existing final 2-24	202.00	105.40	115.29		115.29	0.000003	0.25	1442.76	466.99	0.01
Main	4502	100 yr	proposed 6da	202.00	105.00	110.67		110.72	0.000361	1.90	130.24	53.10	0.15
Main	4502	100 yr	existing final 2-24	202.00	105.00	115.28		115.29	0.000005	0.34	1421.52	441.24	0.02
Main	4402.00*	100 yr	proposed 6da	202.00	104.96	110.65		110.68	0.000244	1.58	218.08	131.20	0.13
Main	4402.00*	100 yr	existing final 2-24	202.00	104.96	115.28		115.28	0.000004	0.33	1312.11	326.26	0.02
Main	4302	100 yr	proposed 6da	308.00	104.92	110.63		110.66	0.000310	1.78	292.06	113.10	0.15
Main	4302	100 yr	existing final 2-24	308.00	104.92	115.28		115.28	0.000011	0.54	1067.92	211.59	0.03
Main	4268	100 yr	proposed 6da	308.00	105.00	110.49		110.63	0.001163	3.25	121.84	38.57	0.27
Main	4268	100 yr	existing final 2-24	308.00	105.00	115.26		115.28	0.000070	1.30	346.83	62.60	0.08
Main	4260	100 yr	proposed 6da	308.00	105.00	109.97	108.09	110.57	0.003285	6.20	49.68	29.82	0.49
Main	4260	100 yr	existing final 2-24	308.00	105.10	115.25	108.93	115.28	0.000139	1.75	289.60	56.21	0.10
Main	4230			Culvert									
Main	4200	100 yr	proposed 6da	308.00	104.50	107.90	107.39	108.65	0.004947	7.10	47.57	28.08	0.72
Main	4200	100 yr	existing final 2-24	308.00	104.50	110.18		110.24	0.000294	2.51	194.99	95.17	0.19
Main	4185	100 yr	proposed 6da	308.00	104.00	108.18		108.33	0.000786	3.26	129.43	72.06	0.29
Main	4185	100 yr	existing final 2-24	308.00	104.00	110.20		110.22	0.000104	1.57	299.60	96.41	0.11
Main	4130	100 yr	proposed 6da	308.00	103.25	108.04		108.26	0.001447	4.13	103.06	63.67	0.39
Main	4130	100 yr	existing final 2-24	308.00	103.25	110.19		110.22	0.000131	1.72	290.50	105.11	0.13
Main	4122	100 yr	proposed 6da	308.00	102.70	107.59	105.79	108.21	0.001950	6.30	48.89	29.34	0.50
Main	4122	100 yr	existing final 2-24	308.00	102.70	110.17	106.17	110.21	0.000163	1.90	263.90	115.80	0.14
Main	4093.5			Culvert									
Main	4065	100 yr	proposed 6da	308.00	101.90	105.73		105.90	0.000942	3.34	106.25	48.09	0.32
Main	4065	100 yr	existing final 2-24	308.00	101.90	105.75		105.91	0.000923	3.31	107.14	48.36	0.32
Main	4050	100 yr	proposed 6da	308.00	100.50	105.74		105.86	0.000462	2.98	163.13	71.98	0.24
Main	4050	100 yr	existing final 2-24	308.00	100.50	105.76		105.88	0.000454	2.97	164.44	72.37	0.24
Main	3973	100 yr	proposed 6da	308.00	100.17	105.75		105.81	0.000384	2.49	277.21	147.21	0.21
Main	3973	100 yr	existing final 2-24	308.00	100.17	105.77		105.83	0.000375	2.47	279.97	147.35	0.20
Main	3965	100 yr	proposed 6da	308.00	99.40	105.75	104.45	105.81	0.000369	2.80	292.55	132.51	0.20
Main	3965	100 yr	existing final 2-24	308.00	99.40	105.77	104.45	105.82	0.000361	2.78	295.03	132.87	0.20
Main	3955			Culvert									
Main	3945	100 yr	proposed 6da	308.00	98.30	103.66	102.28	104.26	0.002931	6.50	80.00	106.63	0.54
Main	3945	100 yr	existing final 2-24	308.00	98.30	103.68	102.28	104.27	0.002853	6.43	82.32	109.19	0.53
Main	3930	100 yr	proposed 6da	510.00	98.38	103.65	103.65	104.19	0.003279	7.22	176.40	150.11	0.59
Main	3930	100 yr	existing final 2-24	522.00	98.38	103.64	103.64	104.22	0.003464	7.42	175.63	150.08	0.61
Main	3796	100 yr	proposed 6da	510.00	98.20	103.40		103.44	0.000305	1.72	330.68	166.28	0.18
Main	3796	100 yr	existing final 2-24	522.00	98.20	103.59		103.63	0.000252	1.64	363.14	168.49	0.17
Main	3666	100 yr	proposed 6da	510.00	98.00	102.95		103.33	0.001777	5.38	141.22	64.01	0.46
Main	3666	100 yr	existing final 2-24	522.00	98.00	103.21		103.54	0.001445	5.05	158.47	67.03	0.42
Main	3532	100 yr	proposed 6da	510.00	95.13	103.11		103.17	0.000198	2.29	401.47	158.11	0.16
Main	3532	100 yr	existing final 2-24	522.00	95.13	103.35		103.40	0.000172	2.18	439.28	160.48	0.15
Main	3496	100 yr	proposed 6da	510.00	94.00	103.08		103.16	0.000254	2.58	372.21	135.35	0.18
Main	3496	100 yr	existing final 2-24	522.00	94.00	103.32		103.40	0.000225	2.49	404.76	137.02	0.17
Main	3488	100 yr	proposed 6da	510.00	93.70	102.72	97.90	103.13	0.001191	5.12	99.51	90.67	0.31
Main	3488	100 yr	existing final 2-24	522.00	93.70	102.95	97.97	103.36	0.001143	5.11	102.17	92.24	0.30
Main	3455			Culvert									
Main	3415	100 yr	proposed 6da	510.00	93.10	97.35	97.35	99.39	0.016850	11.47	44.46	10.98	1.00
Main	3415	100 yr	existing final 2-24	522.00	93.10	97.41	97.41	99.49	0.016900	11.56	45.17	10.99	1.01
Main	3400	100 yr	proposed 6da	510.00	93.00	96.69	96.69	98.04	0.010299	9.35	55.31	22.40	1.00

Reach	River Sta	Profile	Plan	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)	
Main	3400	100 yr	existing final 2-24	522.00	93.00	96.73	96.73	98.11	0.010277	9.43	56.21	22.55	1.00
Main	3300	100 yr	proposed 6da	510.00	90.00	92.77	92.77	93.61	0.011490	7.35	69.38	41.97	1.01
Main	3300	100 yr	existing final 2-24	522.00	90.00	92.80	92.80	93.65	0.011487	7.39	70.64	42.39	1.01

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	5350	100 yr	proposed 6c 4-21	202.00	111.00	113.92	113.92	114.98	0.013129	8.26	24.45	11.72	1.01
Main	5350	100 yr	existing final 2-24	202.00	111.00	115.11		115.50	0.003400	5.01	40.37	15.20	0.53
Main	5194.50*	100 yr	proposed 6c 4-21	202.00	109.25	112.05	112.05	112.89	0.012345	7.32	27.59	16.92	1.01
Main	5194.50*	100 yr	existing final 2-24	202.00	109.25	115.26		115.31	0.000213	1.93	154.17	93.97	0.16
Main	5039	100 yr	proposed 6c 4-21	202.00	107.50	111.38		111.50	0.000864	2.86	86.29	59.06	0.30
Main	5039	100 yr	existing final 2-24	202.00	107.50	115.29		115.29	0.000011	0.58	671.67	248.22	0.04
Main	4929	100 yr	proposed 6c 4-21	202.00	106.00	111.26		111.39	0.001167	3.02	83.66	67.67	0.27
Main	4929	100 yr	existing final 2-24	202.00	106.00	115.29		115.29	0.000005	0.32	1127.41	401.10	0.02
Main	4919	100 yr	proposed 6c 4-21	202.00	105.80	111.27	107.67	111.37	0.000587	2.64	76.45	70.20	0.20
Main	4919	100 yr	existing final 2-24	202.00	105.80	115.29	108.21	115.29	0.000005	0.31	1136.35	401.10	0.02
Main	4896.5			Culvert									
Main	4870	100 yr	proposed 6c 4-21	202.00	105.60	111.01		111.02	0.000054	0.71	285.54	66.90	0.06
Main	4718.00*	100 yr	proposed 6c 4-21	202.00	105.60	110.99		111.01	0.000126	1.02	198.91	50.26	0.09
Main	4567	100 yr	proposed 6c 4-21	202.00	105.40	110.99	107.00	110.99	0.000046	0.66	314.11	132.69	0.06
Main	4541.5			Culvert									
Main	4517	100 yr	proposed 6c 4-21	202.00	105.30	110.72		110.73	0.000064	0.74	274.23	72.43	0.07
Main	4517	100 yr	existing final 2-24	202.00	105.40	115.29		115.29	0.000003	0.25	1442.76	466.99	0.01
Main	4502	100 yr	proposed 6c 4-21	202.00	105.00	110.67		110.72	0.000361	1.90	130.24	53.10	0.15
Main	4502	100 yr	existing final 2-24	202.00	105.00	115.28		115.29	0.000005	0.34	1421.52	441.24	0.02
Main	4402.00*	100 yr	proposed 6c 4-21	202.00	104.96	110.65		110.68	0.000244	1.58	218.08	131.20	0.13
Main	4402.00*	100 yr	existing final 2-24	202.00	104.96	115.28		115.28	0.000004	0.33	1312.11	326.26	0.02
Main	4302	100 yr	proposed 6c 4-21	308.00	104.92	110.63		110.66	0.000310	1.78	292.06	113.10	0.15
Main	4302	100 yr	existing final 2-24	308.00	104.92	115.28		115.28	0.000011	0.54	1067.92	211.59	0.03
Main	4268	100 yr	proposed 6c 4-21	308.00	105.00	110.49		110.63	0.001163	3.25	121.84	38.57	0.27
Main	4268	100 yr	existing final 2-24	308.00	105.00	115.26		115.28	0.000070	1.30	346.83	62.60	0.08
Main	4260	100 yr	proposed 6c 4-21	308.00	105.00	109.97	108.09	110.57	0.003285	6.20	49.68	29.82	0.49
Main	4260	100 yr	existing final 2-24	308.00	105.10	115.25	108.93	115.28	0.000139	1.75	289.60	56.21	0.10
Main	4230			Culvert									
Main	4200	100 yr	proposed 6c 4-21	308.00	104.50	107.38	107.23	108.39	0.008090	8.16	40.00	17.74	0.87
Main	4200	100 yr	existing final 2-24	308.00	104.50	110.18		110.24	0.000294	2.51	194.99	95.17	0.19
Main	4185	100 yr	proposed 6c 4-21	308.00	104.00	107.73		107.96	0.001397	4.00	98.54	64.67	0.38
Main	4185	100 yr	existing final 2-24	308.00	104.00	110.20		110.22	0.000104	1.57	299.60	96.41	0.11
Main	4130	100 yr	proposed 6c 4-21	308.00	103.25	107.34		107.81	0.003836	5.77	65.17	44.88	0.62
Main	4130	100 yr	existing final 2-24	308.00	103.25	110.19		110.22	0.000131	1.72	290.50	105.11	0.13
Main	4122	100 yr	proposed 6c 4-21	308.00	102.70	106.92	105.79	107.75	0.003178	7.29	42.23	22.99	0.63
Main	4122	100 yr	existing final 2-24	308.00	102.70	110.17	106.17	110.21	0.000163	1.90	263.90	115.80	0.14
Main	4093.5			Culvert									
Main	4065	100 yr	proposed 6c 4-21	308.00	101.90	105.73		105.90	0.000942	3.34	106.25	48.09	0.32
Main	4065	100 yr	existing final 2-24	308.00	101.90	105.75		105.91	0.000923	3.31	107.14	48.36	0.32
Main	4050	100 yr	proposed 6c 4-21	308.00	100.50	105.74		105.86	0.000462	2.98	163.13	71.98	0.24
Main	4050	100 yr	existing final 2-24	308.00	100.50	105.76		105.88	0.000454	2.97	164.44	72.37	0.24
Main	3973	100 yr	proposed 6c 4-21	308.00	100.17	105.75		105.81	0.000384	2.49	277.21	147.21	0.21
Main	3973	100 yr	existing final 2-24	308.00	100.17	105.77		105.83	0.000375	2.47	279.97	147.35	0.20
Main	3965	100 yr	proposed 6c 4-21	308.00	99.40	105.75	104.45	105.81	0.000369	2.80	292.55	132.51	0.20
Main	3965	100 yr	existing final 2-24	308.00	99.40	105.77	104.45	105.82	0.000361	2.78	295.03	132.87	0.20
Main	3955			Culvert									
Main	3945	100 yr	proposed 6c 4-21	308.00	98.30	103.66	102.28	104.26	0.002931	6.50	80.00	106.63	0.54
Main	3945	100 yr	existing final 2-24	308.00	98.30	103.68	102.28	104.27	0.002853	6.43	82.32	109.19	0.53
Main	3930	100 yr	proposed 6c 4-21	510.00	98.38	103.65	103.65	104.19	0.003279	7.22	176.40	150.11	0.59
Main	3930	100 yr	existing final 2-24	522.00	98.38	103.64	103.64	104.22	0.003464	7.42	175.63	150.08	0.61
Main	3796	100 yr	proposed 6c 4-21	510.00	98.20	103.40		103.44	0.000305	1.72	330.68	166.28	0.18
Main	3796	100 yr	existing final 2-24	522.00	98.20	103.59		103.63	0.000252	1.64	363.14	168.49	0.17
Main	3666	100 yr	proposed 6c 4-21	510.00	98.00	102.95		103.33	0.001777	5.38	141.22	64.01	0.46
Main	3666	100 yr	existing final 2-24	522.00	98.00	103.21		103.54	0.001445	5.05	158.47	67.03	0.42
Main	3532	100 yr	proposed 6c 4-21	510.00	95.13	103.11		103.17	0.000198	2.29	401.47	158.11	0.16
Main	3532	100 yr	existing final 2-24	522.00	95.13	103.35		103.40	0.000172	2.18	439.28	160.48	0.15
Main	3496	100 yr	proposed 6c 4-21	510.00	94.00	103.08		103.16	0.000254	2.58	372.21	135.35	0.18
Main	3496	100 yr	existing final 2-24	522.00	94.00	103.32		103.40	0.000225	2.49	404.76	137.02	0.17
Main	3488	100 yr	proposed 6c 4-21	510.00	93.70	102.72	97.90	103.13	0.001191	5.12	99.51	90.67	0.31

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3488	100 yr	existing final 2-24	522.00	93.70	102.95	97.97	103.36	0.001143	5.11	102.17	92.24	0.30
Main	3455			Culvert									
Main	3415	100 yr	proposed 6c 4-21	510.00	93.10	97.35	97.35	99.39	0.016850	11.47	44.46	10.98	1.00
Main	3415	100 yr	existing final 2-24	522.00	93.10	97.41	97.41	99.49	0.016900	11.56	45.17	10.99	1.01
Main	3400	100 yr	proposed 6c 4-21	510.00	93.00	96.69	96.69	98.04	0.010299	9.35	55.31	22.40	1.00
Main	3400	100 yr	existing final 2-24	522.00	93.00	96.73	96.73	98.11	0.010277	9.43	56.21	22.55	1.00
Main	3300	100 yr	proposed 6c 4-21	510.00	90.00	92.77	92.77	93.61	0.011491	7.35	69.38	41.97	1.01
Main	3300	100 yr	existing final 2-24	522.00	90.00	92.80	92.80	93.65	0.011487	7.39	70.64	42.39	1.01

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

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X          XXX XXXX      XXXXXX      XXXX
X      X  X          X          X      X      X      X      X
X      X  X          X      X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      X      XXXXX

```

PROJECT DATA

Project Title: Derby Milford brook
Project File : DerbyMilfordbrook.prj
Run Date and Time: 4/21/2022 2:54:40 PM

Project in English units

PLAN DATA

Plan Title: proposed 3E 4-21
Plan File : p:\1 ACTIVE PROJECTS\2398 Derby Milford -
Orange\H&H\4-Hydraulics\Modeling\RAS\DerbyMilfordbrook.p58

Geometry Title: proposed 3F With cross culverts dl
Geometry File : p:\1 ACTIVE PROJECTS\2398 Derby Milford -
Orange\H&H\4-Hydraulics\Modeling\RAS\DerbyMilfordbrook.g38

Flow Title : TR-55 NRCS flow (5 thru 100)
Flow File : p:\1 ACTIVE PROJECTS\2398 Derby Milford -
Orange\H&H\4-Hydraulics\Modeling\RAS\DerbyMilfordbrook.f10

Plan Summary Information:

Number of: Cross Sections	=	33	Multiple Openings	=	0
Culverts	=	5	Inline Structures	=	0
Bridges	=	0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01

Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

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

FLOW DATA

Flow Title: TR-55 NRCS flow (5 thru 100)

Flow File : p:\1 ACTIVE PROJECTS\2398 Derby Milford -
Orange\H&H\4-Hydraulics\Modeling\RAS\DerbyMilfordbrook.f10

Flow Data (cfs)

River	Reach	RS	5 yr	10 yr
25 yr	50 yr	100 yr		
Unnamed Bk	Main	5350	44	68
92	143	202		
Unnamed Bk	Main	4302	58	94
131	212	308		
Unnamed Bk	Main	3930	97	160
221	357	510		

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Unnamed Bk	Main	5 yr	Critical
Normal S = 0.05			
Unnamed Bk	Main	10 yr	Critical
Normal S = 0.05			

GEOMETRY DATA

Geometry Title: proposed 3F With cross culverts d1
 Geometry File : p:\1 ACTIVE PROJECTS\2398 Derby Milford -
 Orange\H&H\4-Hydraulics\Modeling\RAS\DerbyMilfordbrook.g38

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 5350

INPUT

Description:

Station Elevation Data		num=		20					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	121	43.6	120	66.4	119	118.6	118	157.2	117
158.9	116	160.3	115	161.7	114	162.9	113	165	111
170	111	172.5	113	173.6	114	175.1	115	177.3	116
187.4	117	195.9	118	228.7	119	245.6	120	251.6	121

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.04	160.3	.03	175.1	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	160.3	175.1		155.5	155.5		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	113.63	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.		0.030
W.S. Elev (ft)	113.05	Reach Len. (ft)	155.50	155.50
155.50				
Crit W.S. (ft)	112.88	Flow Area (sq ft)		15.07
E.G. Slope (ft/ft)	0.010287	Area (sq ft)		15.07
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	9.71	Top Width (ft)		9.71
Vel Total (ft/s)	6.10	Avg. Vel. (ft/s)		6.10
Max Chl Dpth (ft)	2.05	Hydr. Depth (ft)		1.55
Conv. Total (cfs)	907.1	Conv. (cfs)		907.1

Length Wtd. (ft)	155.50	Wetted Per. (ft)		11.25
Min Ch El (ft)	111.00	Shear (lb/sq ft)		0.86
Alpha	1.00	Stream Power (lb/ft s)		5.25
Frctn Loss (ft)	1.84	Cum Volume (acre-ft)	0.13	2.48
0.21				
C & E Loss (ft)	0.00	Cum SA (acres)	0.20	1.30
0.23				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	114.98	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.06	Wt. n-Val.		0.030
W.S. Elev (ft)	113.92	Reach Len. (ft)	155.50	155.50
155.50				
Crit W.S. (ft)	113.92	Flow Area (sq ft)		24.45
E.G. Slope (ft/ft)	0.013129	Area (sq ft)		24.45
Q Total (cfs)	202.00	Flow (cfs)		202.00
Top Width (ft)	11.72	Top Width (ft)		11.72
Vel Total (ft/s)	8.26	Avg. Vel. (ft/s)		8.26
Max Chl Dpth (ft)	2.92	Hydr. Depth (ft)		2.09
Conv. Total (cfs)	1762.9	Conv. (cfs)		1762.9
Length Wtd. (ft)	155.50	Wetted Per. (ft)		13.92
Min Ch El (ft)	111.00	Shear (lb/sq ft)		1.44
Alpha	1.00	Stream Power (lb/ft s)		11.90
Frctn Loss (ft)	1.98	Cum Volume (acre-ft)	1.08	5.27
1.36				
C & E Loss (ft)	0.07	Cum SA (acres)	0.87	1.53
1.15				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main RS: 5194.50*

INPUT

Description:

Station Elevation Data	num=	40
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 120.25 22.47 119.81 41.77 119.15 55.85 118.53 59.24 118.37		
69.22 117.84 90.22 117.02 91.14 116.99 109.18 116.37 120.25 116.29		
151.9 115.57 161.14 115.31 175.87 114.86 202.77 114.1 213.59 113.64		
215.9 113.06 217.8 112.5 219.91 111.6 220.42 111.44 222.67 110.69		
226.6 109.25 229.1 109.25 232.8 110.73 234.43 111.45 234.84 111.59		
236.65 112.5 238.17 113.22 240.19 113.75 242.16 114.06 251.45 114.85		
256.45 115.25 261.38 115.68 270.13 116.42 271.75 116.52 293.51 117.22		
306.57 117.84 322.94 118.23 342.83 118.87 350.14 119.22 359.8 120		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .04 217.8 .03 236.65 .04		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr. Expan.
217.8 236.65	155.5 155.5 155.5	.1 .3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	111.80	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.		0.030
W.S. Elev (ft)	111.20	Reach Len. (ft)	155.50	155.50
155.50				

Crit W.S. (ft)	111.20	Flow Area (sq ft)		14.86
E.G. Slope (ft/ft)	0.013691	Area (sq ft)		14.86
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	12.74	Top Width (ft)		12.74
Vel Total (ft/s)	6.19	Avg. Vel. (ft/s)		6.19
Max Chl Dpth (ft)	1.95	Hydr. Depth (ft)		1.17
Conv. Total (cfs)	786.3	Conv. (cfs)		786.3
Length Wtd. (ft)	155.50	Wetted Per. (ft)		13.46
Min Ch El (ft)	109.25	Shear (lb/sq ft)		0.94
Alpha	1.00	Stream Power (lb/ft s)		5.84
Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	0.13	2.43
0.21				
C & E Loss (ft)	0.10	Cum SA (acres)	0.20	1.26
0.23				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	112.89	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.83	Wt. n-Val.		0.030
W.S. Elev (ft)	112.05	Reach Len. (ft)	155.50	155.50

155.50			
Crit W.S. (ft)	112.05	Flow Area (sq ft)	27.59
E.G. Slope (ft/ft)	0.012345	Area (sq ft)	27.59
Q Total (cfs)	202.00	Flow (cfs)	202.00
Top Width (ft)	16.92	Top Width (ft)	16.92
Vel Total (ft/s)	7.32	Avg. Vel. (ft/s)	7.32
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)	1.63
Conv. Total (cfs)	1818.1	Conv. (cfs)	1818.1
Length Wtd. (ft)	155.50	Wetted Per. (ft)	17.99
Min Ch El (ft)	109.25	Shear (lb/sq ft)	1.18
Alpha	1.00	Stream Power (lb/ft s)	8.66
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	1.08
1.36			5.18
C & E Loss (ft)	0.21	Cum SA (acres)	0.87
1.15			1.48

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 5039

INPUT

Description:

Station Elevation Data		num=		25					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.5	28.4	119	52.8	118	70.6	117	87.5	116
115.2	115	138	114	152	114	192	113	222.3	112
256.3	111	275.3	110	278.4	109	288.2	107.5	295.8	109
298.2	110	300.3	111	305.8	112	318.6	113	332.3	114
346.6	115	376.6	116	394.6	117	444.6	118	468	119

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.04	275.3	.03	298.2	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	275.3	298.2		90	110	130	.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	109.76	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.27	Wt. n-Val.		0.030
W.S. Elev (ft)	109.49	Reach Len. (ft)	90.00	110.00
130.00				
Crit W.S. (ft)		Flow Area (sq ft)		22.23
E.G. Slope (ft/ft)	0.006276	Area (sq ft)		22.23
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	20.09	Top Width (ft)		20.09
Vel Total (ft/s)	4.14	Avg. Vel. (ft/s)		4.14
Max Chl Dpth (ft)	1.99	Hydr. Depth (ft)		1.11
Conv. Total (cfs)	1161.3	Conv. (cfs)		1161.3
Length Wtd. (ft)	110.00	Wetted Per. (ft)		20.53
Min Ch El (ft)	107.50	Shear (lb/sq ft)		0.42
Alpha	1.00	Stream Power (lb/ft s)		1.76
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	0.13	2.36
0.21				

C & E Loss (ft)	0.00	Cum SA (acres)	0.20	1.20
0.23				

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	111.42	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	111.29	Reach Len. (ft)	90.00	110.00
130.00				
Crit W.S. (ft)		Flow Area (sq ft)	16.57	62.84
1.91				
E.G. Slope (ft/ft)	0.000978	Area (sq ft)	16.57	62.84
1.91				
Q Total (cfs)	202.00	Flow (cfs)	13.24	187.41
1.36				
Top Width (ft)	55.63	Top Width (ft)	29.01	22.90
3.72				
Vel Total (ft/s)	2.48	Avg. Vel. (ft/s)	0.80	2.98
0.71				
Max Chl Dpth (ft)	3.79	Hydr. Depth (ft)	0.57	2.74
0.51				
Conv. Total (cfs)	6460.5	Conv. (cfs)	423.4	5993.7
43.4				
Length Wtd. (ft)	109.77	Wetted Per. (ft)	29.04	23.52
3.97				
Min Ch El (ft)	107.50	Shear (lb/sq ft)	0.03	0.16
0.03				
Alpha	1.34	Stream Power (lb/ft s)	0.03	0.49
0.02				
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	1.05	5.02
1.36				
C & E Loss (ft)	0.00	Cum SA (acres)	0.82	1.41
1.15				

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main RS: 4929

INPUT

Description:

Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	118.5	78	117	103	116	123.74	115	138	114.7
189.4	113.01	238.5	112	266.6	111.2	296.7	111	302.4	110.34
303.1	110	305.2	109	307.4	108	309.6	107	312.8	106
316.9	107	318.6	108	320.3	109	324.2	110	328.9	111
335.3	111.5	346.6	112.1	351.3	112.5	451.3	112.5	481.3	113.2
499.3	114.2	517.3	115.2	533.3	116.2	535	117	540	118

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	305.2	.04	320.3	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	305.2	320.3		10	10	.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.98	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.28	Wt. n-Val.		0.040
W.S. Elev (ft)	108.69	Reach Len. (ft)	10.00	10.00
10.00				
Crit W.S. (ft)		Flow Area (sq ft)		21.61
E.G. Slope (ft/ft)	0.008074	Area (sq ft)		21.61
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	13.91	Top Width (ft)		13.91
Vel Total (ft/s)	4.26	Avg. Vel. (ft/s)		4.26
Max Chl Dpth (ft)	2.69	Hydr. Depth (ft)		1.55
Conv. Total (cfs)	1023.9	Conv. (cfs)		1023.9
Length Wtd. (ft)	10.00	Wetted Per. (ft)		15.01
Min Ch El (ft)	106.00	Shear (lb/sq ft)		0.73
Alpha	1.00	Stream Power (lb/ft s)		3.09
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.13	2.30
0.21				
C & E Loss (ft)	0.06	Cum SA (acres)	0.20	1.16
0.23				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	111.30	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.040	0.040
0.040				
W.S. Elev (ft)	111.15	Reach Len. (ft)	10.00	10.00
10.00				
Crit W.S. (ft)		Flow Area (sq ft)	8.73	58.59
9.68				
E.G. Slope (ft/ft)	0.001317	Area (sq ft)	8.73	58.59
9.68				
Q Total (cfs)	202.00	Flow (cfs)	4.94	184.94
12.13				
Top Width (ft)	57.46	Top Width (ft)	31.78	15.10
10.58				
Vel Total (ft/s)	2.62	Avg. Vel. (ft/s)	0.57	3.16
1.25				
Max Chl Dpth (ft)	5.15	Hydr. Depth (ft)	0.27	3.88
0.92				
Conv. Total (cfs)	5566.1	Conv. (cfs)	136.0	5096.0
334.1				
Length Wtd. (ft)	10.00	Wetted Per. (ft)	32.12	16.35
10.82				
Min Ch El (ft)	106.00	Shear (lb/sq ft)	0.02	0.29
0.07				
Alpha	1.34	Stream Power (lb/ft s)	0.01	0.93
0.09				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	1.03	4.87
1.34				
C & E Loss (ft)	0.01	Cum SA (acres)	0.76	1.36
1.12				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 4919

INPUT

Description:

Station Elevation Data				num=	22				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	118.5	78	117	103	116	123.74	115	138	114.7
189.4	113.01	238.5	112	266.6	111.2	280	107	307.7	105.8
320	105.8	320	107	335.3	111.5	346.6	112.1	351.3	112.5
451.3	112.5	481.3	113.2	499.3	114.2	517.3	115.2	533.3	116.2
550	117.2	570	118.2						

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.04	266.6	.04	335.3	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	266.6	335.3		49	49		.1	.3

Ineffective Flow				num=	2
Sta L	Sta R	Elev	Permanent		
0	306	111.6	F		
320	570	111.6	F		

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.89	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.		0.040
W.S. Elev (ft)	108.82	Reach Len. (ft)	49.00	49.00
49.00				
Crit W.S. (ft)	106.91	Flow Area (sq ft)		42.19
E.G. Slope (ft/ft)	0.000884	Area (sq ft)		114.99
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	51.98	Top Width (ft)		51.98
Vel Total (ft/s)	2.18	Avg. Vel. (ft/s)		2.18
Max Chl Dpth (ft)	3.02	Hydr. Depth (ft)		3.01
Conv. Total (cfs)	3095.0	Conv. (cfs)		3095.0
Length Wtd. (ft)	49.00	Wetted Per. (ft)		15.20
Min Ch El (ft)	105.80	Shear (lb/sq ft)		0.15
Alpha	1.00	Stream Power (lb/ft s)		0.33

Frctn Loss (ft)	Cum Volume (acre-ft)	0.13	2.29
0.21			
C & E Loss (ft)	Cum SA (acres)	0.20	1.15
0.23			

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	111.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.		0.040
W.S. Elev (ft)	111.17	Reach Len. (ft)	49.00	49.00
49.00				
Crit W.S. (ft)	107.67	Flow Area (sq ft)		75.08
E.G. Slope (ft/ft)	0.000624	Area (sq ft)		255.32
Q Total (cfs)	202.00	Flow (cfs)		202.00
Top Width (ft)	67.47	Top Width (ft)		67.47
Vel Total (ft/s)	2.69	Avg. Vel. (ft/s)		2.69
Max Chl Dpth (ft)	5.37	Hydr. Depth (ft)		5.36
Conv. Total (cfs)	8089.4	Conv. (cfs)		8089.4
Length Wtd. (ft)	49.00	Wetted Per. (ft)		15.20
Min Ch El (ft)	105.80	Shear (lb/sq ft)		0.19
Alpha	1.00	Stream Power (lb/ft s)		0.52
Frctn Loss (ft)		Cum Volume (acre-ft)	1.03	4.83
1.34				
C & E Loss (ft)		Cum SA (acres)	0.75	1.35
1.12				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: Unnamed Bk

REACH: Main RS: 4896.5

INPUT

Description:

Distance from Upstream XS = 2

Deck/Roadway Width = 40

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 7

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
192.1	111.6				229.2	111.6				259.8	111.6			
296.7	111.6				314.7	111.6				349.7	112			
383	111.6													

Upstream Bridge Cross Section Data

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	118.5	78	117	103	116	123.74	115	138	114.7
189.4	113.01	238.5	112	266.6	111.2	280	107	307.7	105.8
320	105.8	320	107	335.3	111.5	346.6	112.1	351.3	112.5
451.3	112.5	481.3	113.2	499.3	114.2	517.3	115.2	533.3	116.2
550	117.2	570	118.2						

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	266.6	.04	335.3	.04

Bank Sta: Left Right Coeff Contr. Expan.

266.6	335.3	.1	.3
-------	-------	----	----

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	306	111.6	F
320	570	111.6	F

Downstream Deck/Roadway Coordinates

num= 7

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
192.1	111.2				229.2	111.2				259.8	111.2			
296.7	111.2				314.7	111.2				349.7	112			
383	111.6													

Downstream Bridge Cross Section Data

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	118.5	78	117	103	116	123.74	115	138	114.7
189.4	113.01	238.5	112	266.6	111.2	280	105.6	292	105.6

315	105.6	320	106	335.3	111.5	346.6	112.1	351.3	112.5
451.3	112.5	481.3	113.2	499.3	114.2	517.3	115.2	533.3	116.2
550	117.2	570	118.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	266.6	.04	335.3	.04

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	266.6	335.3		.1	.3

Upstream Embankment side slope	=	3 horiz. to 1.0 vertical
Downstream Embankment side slope	=	3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.98
Elevation at which weir flow begins	=	
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	4	12
FHWA Chart # 8 - flared wingwalls			
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.			
Solution Criteria = Highest U.S. EG			
Culvert Upstrm Dist	Length	Top n	Bottom n
Exit Loss Coef			
	2	40	.013
			.013
			0
			.2
1			

Upstream	Elevation =	105.9
	Centerline Station =	313
Downstream	Elevation =	105.8
	Centerline Station =	308

CULVERT OUTPUT Profile #25 yr Culv Group: Culvert #1

Q Culv Group (cfs)	92.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	2.68
Q Barrel (cfs)	92.00	Culv Vel DS (ft/s)	2.59
E.G. US. (ft)	108.89	Culv Inv El Up (ft)	105.90
W.S. US. (ft)	108.82	Culv Inv El Dn (ft)	105.80
E.G. DS (ft)	108.76	Culv Frctn Ls (ft)	0.01
W.S. DS (ft)	108.76	Culv Exit Loss (ft)	0.10
Delta EG (ft)	0.13	Culv Entr Loss (ft)	0.02
Delta WS (ft)	0.06	Q Weir (cfs)	
E.G. IC (ft)	107.83	Weir Sta Lft (ft)	
E.G. OC (ft)	108.89	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	108.76	Weir Max Depth (ft)	

Culv WS Outlet (ft)	108.76	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.29	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.22	Min El Weir Flow (ft)	111.61

CULVERT OUTPUT Profile #100 yr Culv Group: Culvert #1

Q Culv Group (cfs)	202.00	Culv Full Len (ft)	40.00
# Barrels	1	Culv Vel US (ft/s)	4.21
Q Barrel (cfs)	202.00	Culv Vel DS (ft/s)	4.21
E.G. US. (ft)	111.28	Culv Inv El Up (ft)	105.90
W.S. US. (ft)	111.17	Culv Inv El Dn (ft)	105.80
E.G. DS (ft)	110.93	Culv Frctn Ls (ft)	0.03
W.S. DS (ft)	110.92	Culv Exit Loss (ft)	0.27
Delta EG (ft)	0.35	Culv Entr Loss (ft)	0.06
Delta WS (ft)	0.25	Q Weir (cfs)	
E.G. IC (ft)	109.21	Weir Sta Lft (ft)	
E.G. OC (ft)	111.28	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	109.90	Weir Max Depth (ft)	
Culv WS Outlet (ft)	109.80	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.07	Min El Weir Flow (ft)	111.61

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main RS: 4870

INPUT

Description:

Station Elevation Data				num=	22				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	118.5	78	117	103	116	123.74	115	138	114.7
189.4	113.01	238.5	112	266.6	111.2	280	105.6	292	105.6
315	105.6	320	106	335.3	111.5	346.6	112.1	351.3	112.5
451.3	112.5	481.3	113.2	499.3	114.2	517.3	115.2	533.3	116.2
550	117.2	570	118.2						

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.04	266.6	.04	335.3	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	266.6	335.3		152	152	.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.76	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.		0.040
W.S. Elev (ft)	108.76	Reach Len. (ft)	152.00	152.00
152.00				
Crit W.S. (ft)		Flow Area (sq ft)		147.79
E.G. Slope (ft/ft)	0.000078	Area (sq ft)		147.79
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	55.22	Top Width (ft)		55.22
Vel Total (ft/s)	0.62	Avg. Vel. (ft/s)		0.62
Max Chl Dpth (ft)	3.16	Hydr. Depth (ft)		2.68
Conv. Total (cfs)	10440.3	Conv. (cfs)		10440.3
Length Wtd. (ft)	152.00	Wetted Per. (ft)		56.35
Min Ch El (ft)	105.60	Shear (lb/sq ft)		0.01
Alpha	1.00	Stream Power (lb/ft s)		0.01
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.13	2.25
0.21				
C & E Loss (ft)	0.00	Cum SA (acres)	0.20	1.09
0.23				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.93	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.		0.040
W.S. Elev (ft)	110.92	Reach Len. (ft)	152.00	152.00
152.00				
Crit W.S. (ft)		Flow Area (sq ft)		279.28
E.G. Slope (ft/ft)	0.000058	Area (sq ft)		279.28

Q Total (cfs)	202.00	Flow (cfs)		202.00
Top Width (ft)	66.41	Top Width (ft)		66.41
Vel Total (ft/s)	0.72	Avg. Vel. (ft/s)		0.72
Max Chl Dpth (ft)	5.32	Hydr. Depth (ft)		4.21
Conv. Total (cfs)	26515.7	Conv. (cfs)		26515.7
Length Wtd. (ft)	152.00	Wetted Per. (ft)		68.35
Min Ch El (ft)	105.60	Shear (lb/sq ft)		0.01
Alpha	1.00	Stream Power (lb/ft s)		0.01
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	1.03	4.77
1.34				
C & E Loss (ft)	0.00	Cum SA (acres)	0.75	1.28
1.12				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 4718.00*

INPUT
 Description:

Station Elevation Data				num=	47				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-20	118.25	-.83	117.57	18.34	116.9	38.66	116.21	61.53	115.54
63.59	115.46	87.66	114.78	109.33	114.08	117.41	113.92	124.24	113.75
150.91	112.93	154.69	112.57	158.67	112.6	166.62	112.51	177.96	112.25
183.52	112.16	185.49	111.96	193.89	111.67	200.95	111.73	207.57	111.89
229.28	111.53	246.28	111.18	252.96	111.11	258.65	111.04	281.44	111.03
290	107	303.45	105.6	310.55	105.6	320	105.8	332.71	111.4
344.01	111.92	348.71	112.21	350.74	112.25	356.58	112.35	368.98	112.48
401.17	112.75	432.25	113.25	448.75	113.44	476.53	114.07	478.76	114.14
496.77	114.95	505.12	115.33	514.78	115.75	530.79	116.5	537.51	116.8
547.49	117.27	567.5	118.1						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-20	.04	281.44	.04	332.71	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
281.44	332.71	151	151	151		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.74	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.		0.040
W.S. Elev (ft)	108.73	Reach Len. (ft)	151.00	151.00
151.00				
Crit W.S. (ft)		Flow Area (sq ft)		96.46
E.G. Slope (ft/ft)	0.000213	Area (sq ft)		96.46
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	40.32	Top Width (ft)		40.32
Vel Total (ft/s)	0.95	Avg. Vel. (ft/s)		0.95
Max Chl Dpth (ft)	3.13	Hydr. Depth (ft)		2.39
Conv. Total (cfs)	6297.2	Conv. (cfs)		6297.2
Length Wtd. (ft)	151.00	Wetted Per. (ft)		41.40
Min Ch El (ft)	105.60	Shear (lb/sq ft)		0.03
Alpha	1.00	Stream Power (lb/ft s)		0.03
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.13	1.82
0.21				
C & E Loss (ft)	0.00	Cum SA (acres)	0.20	0.92
0.23				

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.		0.040
W.S. Elev (ft)	110.90	Reach Len. (ft)	151.00	151.00

151.00				
Crit W.S. (ft)		Flow Area (sq ft)		194.15
E.G. Slope (ft/ft)	0.000135	Area (sq ft)		194.15
Q Total (cfs)	202.00	Flow (cfs)		202.00
Top Width (ft)	49.85	Top Width (ft)		49.85
Vel Total (ft/s)	1.04	Avg. Vel. (ft/s)		1.04
Max Chl Dpth (ft)	5.30	Hydr. Depth (ft)		3.90
Conv. Total (cfs)	17388.4	Conv. (cfs)		17388.4
Length Wtd. (ft)	151.00	Wetted Per. (ft)		51.86
Min Ch El (ft)	105.60	Shear (lb/sq ft)		0.03
Alpha	1.00	Stream Power (lb/ft s)		0.03
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	1.03	3.95
1.34				
C & E Loss (ft)	0.01	Cum SA (acres)	0.75	1.07
1.12				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 4567

INPUT

Description:

Station Elevation Data		num=		31					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-40	118	-20	117	0	116	21.2	115	47.2	114
103.35	113	138.3	112	142.24	111.39	146.4	111.58	154.69	111.66
172.32	111.41	174.38	111.05	183.14	110.64	190.5	110.91	197.41	111.36
237.8	110.83	244.76	110.86	274.48	111	280	107	299.2	105.4
313	105.4	330	106	348.15	112	354	112.2	366.4	112.46
398.6	113	429.7	114	473.99	115	502.6	116	535	117
565	118								

Manning's n Values		num=		3
Sta	n Val	Sta	n Val	Sta n Val
-40	.04	274.48	.04	348.15 .04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
274.48	348.15	50	50	50		.1	.3

Ineffective Flow		num=		2
Sta L	Sta R	Elev	Permanent	
-40	300	110.9	F	
318	565	110.9	F	

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.70	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.		0.040
W.S. Elev (ft)	108.66	Reach Len. (ft)	50.00	50.00
50.00				
Crit W.S. (ft)	106.36	Flow Area (sq ft)		58.25
E.G. Slope (ft/ft)	0.000378	Area (sq ft)		155.19
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	60.34	Top Width (ft)		60.34
Vel Total (ft/s)	1.58	Avg. Vel. (ft/s)		1.58
Max Chl Dpth (ft)	3.26	Hydr. Depth (ft)		3.24
Conv. Total (cfs)	4734.2	Conv. (cfs)		4734.2
Length Wtd. (ft)	50.00	Wetted Per. (ft)		18.00
Min Ch El (ft)	105.40	Shear (lb/sq ft)		0.08
Alpha	1.00	Stream Power (lb/ft s)		0.12
Frctn Loss (ft)		Cum Volume (acre-ft)	0.13	1.39
0.21				
C & E Loss (ft)		Cum SA (acres)	0.20	0.75
0.23				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.		0.040
W.S. Elev (ft)	110.81	Reach Len. (ft)	50.00	50.00
50.00				
Crit W.S. (ft)	107.00	Flow Area (sq ft)		96.95
E.G. Slope (ft/ft)	0.000333	Area (sq ft)	0.71	295.10
Q Total (cfs)	202.00	Flow (cfs)		202.00
Top Width (ft)	78.11	Top Width (ft)	8.30	69.81
Vel Total (ft/s)	2.08	Avg. Vel. (ft/s)		2.08
Max Chl Dpth (ft)	5.41	Hydr. Depth (ft)		5.39
Conv. Total (cfs)	11065.2	Conv. (cfs)		11065.2
Length Wtd. (ft)	50.00	Wetted Per. (ft)		18.00
Min Ch El (ft)	105.40	Shear (lb/sq ft)		0.11
Alpha	1.00	Stream Power (lb/ft s)		0.23
Frctn Loss (ft)		Cum Volume (acre-ft)	1.03	3.10
1.34				
C & E Loss (ft)		Cum SA (acres)	0.74	0.87
1.12				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: Unnamed Bk

REACH: Main RS: 4541.5

INPUT

Description:

Distance from Upstream XS = 3

Deck/Roadway Width = 40

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	11								
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
188	110.9				300.2	110.9			
407.6	112				465.1	112.5			
551.8	114				562.5	115			
591.9	117				604.2	118			

Upstream Bridge Cross Section Data

Station Elevation Data	num=	31							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-40	118	-20	117	0	116	21.2	115	47.2	114
103.35	113	138.3	112	142.24	111.39	146.4	111.58	154.69	111.66
172.32	111.41	174.38	111.05	183.14	110.64	190.5	110.91	197.41	111.36
237.8	110.83	244.76	110.86	274.48	111	280	107	299.2	105.4
313	105.4	330	106	348.15	112	354	112.2	366.4	112.46
398.6	113	429.7	114	473.99	115	502.6	116	535	117
565	118								

Manning's n Values

num=	3			
Sta	n Val	Sta	n Val	Sta
-40	.04	274.48	.04	348.15
				.04

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	274.48	348.15		.1	.3

Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent
-40	300	110.9	F
318	565	110.9	F

Downstream Deck/Roadway Coordinates

num=	11								
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
188	110.9				300.2	110.9			
407.6	112				465.1	112.5			
551.8	114				562.5	115			
591.9	117				604.2	118			

Downstream Bridge Cross Section Data

Station Elevation Data	num=	31							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-40	118	-20	117	0	116	21.2	115	47.2	114
103.35	113	138.3	112	142.24	111.39	146.4	111.58	154.69	111.66
172.32	111.41	174.38	111.05	183.14	110.64	190.5	110.91	197.41	111.36
237.8	110.83	244.76	110.86	274.48	111	280	107	298	105.3
311	105.3	330	107	348.15	112	354	112.2	366.4	112.46
398.6	113	429.7	114	473.99	115	502.6	116	535	117
565	118								

Manning's n Values

num=	3
------	---

Sta	n Val	Sta	n Val	Sta	n Val
-40	.04	274.48	.04	348.15	.04

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	274.48	348.15		.1	.3

Upstream Embankment side slope	=	3 horiz. to 1.0 vertical
Downstream Embankment side slope	=	3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.98
Elevation at which weir flow begins	=	
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	4	13

FHWA Chart # 8 - flared wingwalls
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
 Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	
Exit Loss Coef	3	45	.013	.013	0	.2

1

Upstream	Elevation = 105.6
	Centerline Station = 308
Downstream	Elevation = 105.5
	Centerline Station = 304

CULVERT OUTPUT Profile #25 yr Culv Group: Culvert #1

Q Culv Group (cfs)	92.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	2.36
Q Barrel (cfs)	92.00	Culv Vel DS (ft/s)	2.29
E.G. US. (ft)	108.70	Culv Inv El Up (ft)	105.60
W.S. US. (ft)	108.66	Culv Inv El Dn (ft)	105.50
E.G. DS (ft)	108.60	Culv Frctn Ls (ft)	0.01
W.S. DS (ft)	108.59	Culv Exit Loss (ft)	0.07
Delta EG (ft)	0.10	Culv Entr Loss (ft)	0.02
Delta WS (ft)	0.07	Q Weir (cfs)	
E.G. IC (ft)	107.43	Weir Sta Lft (ft)	
E.G. OC (ft)	108.70	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	108.60	Weir Max Depth (ft)	
Culv WS Outlet (ft)	108.59	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.27	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.16	Min El Weir Flow (ft)	110.91

CULVERT OUTPUT Profile #100 yr Culv Group: Culvert #1

Q Culv Group (cfs)	202.00	Culv Full Len (ft)	45.00
# Barrels	1	Culv Vel US (ft/s)	3.88
Q Barrel (cfs)	202.00	Culv Vel DS (ft/s)	3.88
E.G. US. (ft)	110.88	Culv Inv El Up (ft)	105.60
W.S. US. (ft)	110.81	Culv Inv El Dn (ft)	105.50
E.G. DS (ft)	110.58	Culv Frctn Ls (ft)	0.03
W.S. DS (ft)	110.57	Culv Exit Loss (ft)	0.23
Delta EG (ft)	0.30	Culv Entr Loss (ft)	0.05
Delta WS (ft)	0.24	Q Weir (cfs)	
E.G. IC (ft)	108.73	Weir Sta Lft (ft)	
E.G. OC (ft)	110.88	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	109.60	Weir Max Depth (ft)	
Culv WS Outlet (ft)	109.50	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.96	Min El Weir Flow (ft)	110.91

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main RS: 4517

INPUT

Description:

Station Elevation Data		num= 31							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-40	118	-20	117	0	116	21.2	115	47.2	114
103.35	113	138.3	112	142.24	111.39	146.4	111.58	154.69	111.66
172.32	111.41	174.38	111.05	183.14	110.64	190.5	110.91	197.41	111.36
237.8	110.83	244.76	110.86	274.48	111	280	107	298	105.3
311	105.3	330	107	348.15	112	354	112.2	366.4	112.46
398.6	113	429.7	114	473.99	115	502.6	116	535	117
565	118								

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
-40	.04	274.48	.04
		348.15	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	274.48	348.15		15	15	.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.60	Element	Left OB	Channel
Right OB				

Vel Head (ft)	0.01	Wt. n-Val.		0.040
W.S. Elev (ft)	108.59	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)		139.62
E.G. Slope (ft/ft)	0.000099	Area (sq ft)		139.62
Q Total (cfs)	92.00	Flow (cfs)		92.00
Top Width (ft)	57.99	Top Width (ft)		57.99
Vel Total (ft/s)	0.66	Avg. Vel. (ft/s)		0.66
Max Chl Dpth (ft)	3.29	Hydr. Depth (ft)		2.41
Conv. Total (cfs)	9223.5	Conv. (cfs)		9223.5
Length Wtd. (ft)	15.00	Wetted Per. (ft)		58.87
Min Ch El (ft)	105.30	Shear (lb/sq ft)		0.01
Alpha	1.00	Stream Power (lb/ft s)		0.01
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.13	1.33
0.21				
C & E Loss (ft)	0.00	Cum SA (acres)	0.20	0.68
0.23				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.		0.040
W.S. Elev (ft)	110.57	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)		263.81
E.G. Slope (ft/ft)	0.000072	Area (sq ft)		263.81
Q Total (cfs)	202.00	Flow (cfs)		202.00

Top Width (ft)	67.87	Top Width (ft)	67.87	
Vel Total (ft/s)	0.77	Avg. Vel. (ft/s)	0.77	
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)	3.89	
Conv. Total (cfs)	23808.3	Conv. (cfs)	23808.3	
Length Wtd. (ft)	15.00	Wetted Per. (ft)	69.67	
Min Ch El (ft)	105.30	Shear (lb/sq ft)	0.02	
Alpha	1.00	Stream Power (lb/ft s)	0.01	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.03	3.02
1.34				
C & E Loss (ft)	0.00	Cum SA (acres)	0.74	0.79
1.12				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 4502

INPUT

Description:

Station Elevation Data				num=	38					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
-40	118	-20	117	0	116	21.2	115	47.2	114	
103.35	113	138.3	112	142.24	111.39	146.4	111.58	154.69	111.66	
172.32	111.41	174.38	111.05	183.14	110.64	190.5	110.91	197.41	111.36	
237.8	110.83	244.76	110.86	274.48	111	282.32	110.4	288	109	
294.1	108	295.6	107	297.1	106	299.2	105	308.3	105	
309.8	106	311.2	107	314.6	108	317	109	321.2	110	
335.2	111	343.3	112	383.9	113	417.5	114	447.7	115	
478.3	116	509	117	540	118					

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
-40	.06	294.1	.04	314.6	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	294.1	314.6		100	100		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.060	0.040
0.060				
W.S. Elev (ft)	108.55	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.92	54.38
0.36				
E.G. Slope (ft/ft)	0.000620	Area (sq ft)	0.92	54.38
0.36				
Q Total (cfs)	92.00	Flow (cfs)	0.24	91.67
0.09				
Top Width (ft)	25.18	Top Width (ft)	3.36	20.50
1.32				
Vel Total (ft/s)	1.65	Avg. Vel. (ft/s)	0.26	1.69
0.25				
Max Chl Dpth (ft)	3.55	Hydr. Depth (ft)	0.28	2.65
0.28				
Conv. Total (cfs)	3694.8	Conv. (cfs)	9.6	3681.6
3.6				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	3.40	22.10
1.43				
Min Ch El (ft)	105.00	Shear (lb/sq ft)	0.01	0.10
0.01				
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.16
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.13	1.30
0.21				
C & E Loss (ft)	0.00	Cum SA (acres)	0.20	0.67
0.23				

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.060	0.040
0.060				
W.S. Elev (ft)	110.51	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	16.98	94.61
10.92				
E.G. Slope (ft/ft)	0.000409	Area (sq ft)	16.98	94.61
10.92				

Q Total (cfs)	202.00	Flow (cfs)	9.91	187.48
4.61				
Top Width (ft)	47.53	Top Width (ft)	13.25	20.50
13.78				
Vel Total (ft/s)	1.65	Avg. Vel. (ft/s)	0.58	1.98
0.42				
Max Chl Dpth (ft)	5.51	Hydr. Depth (ft)	1.28	4.62
0.79				
Conv. Total (cfs)	9984.6	Conv. (cfs)	489.6	9266.9
228.1				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	13.51	22.10
14.11				
Min Ch El (ft)	105.00	Shear (lb/sq ft)	0.03	0.11
0.02				
Alpha	1.35	Stream Power (lb/ft s)	0.02	0.22
0.01				
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	1.02	2.96
1.34				
C & E Loss (ft)	0.01	Cum SA (acres)	0.73	0.77
1.12				

CROSS SECTION

RIVER: Unnamed Bk
REACH: Main RS: 4402.00*

INPUT

Description:

Station Elevation Data			num= 63						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-20	119	-5.38	118.02	-4.8	117.98	10.39	116.97	26.5	115.93
46.25	114.76	80.9	113.19	84.41	112.55	88.21	111.51	88.92	111.48
104	110.72	115.47	110.15	118.47	109.76	121.63	109.76	127.93	109.61
129.15	109.56	141.32	111.41	142.89	111.49	144.36	111.68	149.54	111.24
155.13	111.07	160.38	111.01	191.07	109.08	196.36	108.8	197	108.77
203	109.59	218.94	109.29	224.9	108.85	229.22	108.06	233.85	107.46
236.22	106.82	237.66	106.43	238.59	106.12	240.66	105.58	241.9	104.96
246.45	104.96	248.2	105.58	248.55	105.71	249.83	106.19	251.18	106.46
252.05	106.78	253.8	107.5	255.49	108.26	257.08	108.77	258.45	109.23
263.11	110.24	265.88	110.63	268.3	110.82	274.01	111.5	274.15	111.5
302.59	112.48	303.83	112.53	326.25	113.34	336.6	113.74	347.51	114.32
353.85	114.65	365.92	115.43	369.06	115.68	374.55	116.13	383.17	116.83
390.67	117.43	391.8	117.53	412.5	118.5				

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
-20	.06	233.85	.04	253.8	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
233.85	253.8	100 100	100	.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.060	0.040
0.060				
W.S. Elev (ft)	108.48	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	3.80	50.01
1.08				
E.G. Slope (ft/ft)	0.000727	Area (sq ft)	3.80	50.01
1.08				
Q Total (cfs)	92.00	Flow (cfs)	1.69	89.90
0.41				
Top Width (ft)	29.23	Top Width (ft)	6.91	19.95
2.37				
Vel Total (ft/s)	1.68	Avg. Vel. (ft/s)	0.44	1.80
0.38				
Max Chl Dpth (ft)	3.52	Hydr. Depth (ft)	0.55	2.51
0.46				
Conv. Total (cfs)	3412.1	Conv. (cfs)	62.6	3334.3
15.1				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	6.99	20.80
2.56				
Min Ch El (ft)	104.96	Shear (lb/sq ft)	0.02	0.11
0.02				
Alpha	1.13	Stream Power (lb/ft s)	0.01	0.20
0.01				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.13	1.18
0.21				
C & E Loss (ft)	0.00	Cum SA (acres)	0.19	0.62
0.22				

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.060	0.040
0.060				
W.S. Elev (ft)	110.49	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)		Flow Area (sq ft)	94.04	90.23

13.38				
E.G. Slope (ft/ft)	0.000295	Area (sq ft)	94.04	90.23
13.38				
Q Total (cfs)	202.00	Flow (cfs)	42.67	153.06
6.27				
Top Width (ft)	123.07	Top Width (ft)	92.00	19.95
11.11				
Vel Total (ft/s)	1.02	Avg. Vel. (ft/s)	0.45	1.70
0.47				
Max Chl Dpth (ft)	5.53	Hydr. Depth (ft)	1.02	4.52
1.20				
Conv. Total (cfs)	11768.7	Conv. (cfs)	2486.1	8917.5
365.1				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	92.35	20.80
11.56				
Min Ch El (ft)	104.96	Shear (lb/sq ft)	0.02	0.08
0.02				
Alpha	2.14	Stream Power (lb/ft s)	0.01	0.14
0.01				
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.89	2.75
1.31				
C & E Loss (ft)	0.00	Cum SA (acres)	0.61	0.73
1.09				

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Unnamed Bk
REACH: Main RS: 4302

INPUT
Description:

Station Elevation Data		num=		30					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	120	10	119	69	113.2	71.4	112	74	110
84.8	109	102	107.487	112.4	112.4	148.4	106.68	152.5	108.28
173.6	106.91	178.8	106.46	182.9	105.78	184.6	104.92	187	105.2
190	105.58	191	106	193	107	194.9	108	198.4	110
200	110.5	204.8	111	222	112	241	113	251	114
258	115	263	116	268	117	273	118	285	119

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	173.6	.04	193	.06

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

173.6	193	34	34	34	.1	.3
-------	-----	----	----	----	----	----

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.43	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.060	0.040
0.060				
W.S. Elev (ft)	108.36	Reach Len. (ft)	34.00	34.00
34.00				
Crit W.S. (ft)		Flow Area (sq ft)	33.69	46.10
1.74				
E.G. Slope (ft/ft)	0.001260	Area (sq ft)	33.69	46.10
1.74				
Q Total (cfs)	131.00	Flow (cfs)	23.99	105.92
1.10				
Top Width (ft)	69.44	Top Width (ft)	47.51	19.40
2.53				
Vel Total (ft/s)	1.61	Avg. Vel. (ft/s)	0.71	2.30
0.63				
Max Chl Dpth (ft)	3.44	Hydr. Depth (ft)	0.71	2.38
0.69				
Conv. Total (cfs)	3690.6	Conv. (cfs)	675.7	2983.9
31.0				
Length Wtd. (ft)	34.00	Wetted Per. (ft)	48.22	20.04
2.87				
Min Ch El (ft)	104.92	Shear (lb/sq ft)	0.05	0.18
0.05				
Alpha	1.69	Stream Power (lb/ft s)	0.04	0.42
0.03				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.08	1.07
0.21				
C & E Loss (ft)	0.01	Cum SA (acres)	0.13	0.58
0.22				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.060	0.040
0.060				

W.S. Elev (ft)	110.46	Reach Len. (ft)	34.00	34.00
34.00				
Crit W.S. (ft)		Flow Area (sq ft)	175.68	86.89
11.08				
E.G. Slope (ft/ft)	0.000366	Area (sq ft)	175.68	86.89
11.08				
Q Total (cfs)	308.00	Flow (cfs)	137.07	164.25
6.68				
Top Width (ft)	110.16	Top Width (ft)	83.89	19.40
6.87				
Vel Total (ft/s)	1.13	Avg. Vel. (ft/s)	0.78	1.89
0.60				
Max Chl Dpth (ft)	5.54	Hydr. Depth (ft)	2.09	4.48
1.61				
Conv. Total (cfs)	16092.0	Conv. (cfs)	7161.7	8581.4
348.9				
Length Wtd. (ft)	34.00	Wetted Per. (ft)	85.47	20.04
7.72				
Min Ch El (ft)	104.92	Shear (lb/sq ft)	0.05	0.10
0.03				
Alpha	1.72	Stream Power (lb/ft s)	0.04	0.19
0.02				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.59	2.54
1.28				
C & E Loss (ft)	0.01	Cum SA (acres)	0.41	0.68
1.07				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk
REACH: Main RS: 4268

INPUT

Description:

Station Elevation Data		num=		38					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	121	20	120	40	119	66	118	78	117
84.88	117	87.5	118.5	114.2	118.5	118.2	117	121.1	116
123.3	115	124.8	114	126.3	113	127.8	112	129.3	111
131.6	110	133.1	109	135.1	108	148.89	107.51	153.13	106.51
154.72	106	156.2	105	160.39	105	163.4	106	164.4	107
165.5	108	166.7	109	168.3	110	169.8	111	171.38	112

172.88	113	174.38	114	181.38	115	196.38	116	206	117
216	118	220	119	225	120				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	148.89	.04	165.5	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	148.89	165.5		8	8		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.19	Wt. n-Val.	0.060	0.040
0.060				
W.S. Elev (ft)	108.15	Reach Len. (ft)	8.00	8.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	5.49	35.33
0.01				
E.G. Slope (ft/ft)	0.003801	Area (sq ft)	5.49	35.33
0.01				
Q Total (cfs)	131.00	Flow (cfs)	4.46	126.53
0.00				
Top Width (ft)	30.89	Top Width (ft)	14.09	16.61
0.18				
Vel Total (ft/s)	3.21	Avg. Vel. (ft/s)	0.81	3.58
0.23				
Max Chl Dpth (ft)	3.15	Hydr. Depth (ft)	0.39	2.13
0.08				
Conv. Total (cfs)	2124.7	Conv. (cfs)	72.4	2052.2
0.1				
Length Wtd. (ft)	8.00	Wetted Per. (ft)	14.14	18.07
0.24				
Min Ch El (ft)	105.00	Shear (lb/sq ft)	0.09	0.46
0.01				
Alpha	1.21	Stream Power (lb/ft s)	0.07	1.66
0.00				
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.07	1.04
0.20				
C & E Loss (ft)	0.04	Cum SA (acres)	0.10	0.56
0.21				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

E.G. Elev (ft)	110.46	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.15	Wt. n-Val.	0.060	0.040
0.060				
W.S. Elev (ft)	110.31	Reach Len. (ft)	8.00	8.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	40.18	71.19
3.54				
E.G. Slope (ft/ft)	0.001365	Area (sq ft)	40.18	71.19
3.54				
Q Total (cfs)	308.00	Flow (cfs)	61.39	243.63
2.98				
Top Width (ft)	37.88	Top Width (ft)	18.00	16.61
3.27				
Vel Total (ft/s)	2.68	Avg. Vel. (ft/s)	1.53	3.42
0.84				
Max Chl Dpth (ft)	5.31	Hydr. Depth (ft)	2.23	4.29
1.08				
Conv. Total (cfs)	8337.6	Conv. (cfs)	1661.9	6595.0
80.7				
Length Wtd. (ft)	8.00	Wetted Per. (ft)	18.62	18.07
4.01				
Min Ch El (ft)	105.00	Shear (lb/sq ft)	0.18	0.34
0.08				
Alpha	1.36	Stream Power (lb/ft s)	0.28	1.15
0.06				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.50	2.48
1.27				
C & E Loss (ft)	0.01	Cum SA (acres)	0.37	0.67
1.07				

CROSS SECTION

Station		Elevation		Data		num=		38	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	121	20	120	40	119	60	119.66	70.2	119
79.86	118	83.3	118.5	109.6	118.5	115.3	117	120.4	116
122.1	115	123.8	114	125.3	115	126.8	114	128.3	113
129.8	112	131.3	111	132	110	133	109	136.3	108
149	107	151.2	106	152.4	105.1	157.9	105.1	158.8	106
159.2	107	159.8	108	160.5	109	161.9	110	163.4	111
164.7	112	166.3	113	169.5	114	176.5	115	182	116
187	117	192	118	197	119				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	151.2	.04	159.8	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	151.2	159.8		30	30		.3	.5

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	108.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.060	0.040
W.S. Elev (ft)	107.68	Reach Len. (ft)	30.00	30.00
30.00				
Crit W.S. (ft)	107.41	Flow Area (sq ft)	5.56	19.30
E.G. Slope (ft/ft)	0.012171	Area (sq ft)	5.56	19.30
Q Total (cfs)	131.00	Flow (cfs)	9.58	121.42
Top Width (ft)	19.28	Top Width (ft)	10.87	8.41
Vel Total (ft/s)	5.27	Avg. Vel. (ft/s)	1.72	6.29
Max Chl Dpth (ft)	2.58	Hydr. Depth (ft)	0.51	2.29
Conv. Total (cfs)	1187.4	Conv. (cfs)	86.9	1100.6
Length Wtd. (ft)	30.00	Wetted Per. (ft)	11.12	10.15
Min Ch El (ft)	105.10	Shear (lb/sq ft)	0.38	1.45
Alpha	1.33	Stream Power (lb/ft s)	0.66	9.09
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.07	1.03
0.20				
C & E Loss (ft)	0.11	Cum SA (acres)	0.10	0.56
0.21				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.44	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.25	Wt. n-Val.	0.060	0.040
0.060				
W.S. Elev (ft)	110.18	Reach Len. (ft)	30.00	30.00
30.00				
Crit W.S. (ft)		Flow Area (sq ft)	48.44	40.77
2.16				
E.G. Slope (ft/ft)	0.002702	Area (sq ft)	48.44	40.77
2.16				
Q Total (cfs)	308.00	Flow (cfs)	111.56	194.33
2.11				
Top Width (ft)	30.30	Top Width (ft)	19.33	8.60
2.38				
Vel Total (ft/s)	3.37	Avg. Vel. (ft/s)	2.30	4.77
0.98				
Max Chl Dpth (ft)	5.08	Hydr. Depth (ft)	2.51	4.74
0.91				
Conv. Total (cfs)	5924.7	Conv. (cfs)	2145.9	3738.2
40.6				
Length Wtd. (ft)	30.00	Wetted Per. (ft)	20.24	10.52
3.27				
Min Ch El (ft)	105.10	Shear (lb/sq ft)	0.40	0.65
0.11				
Alpha	1.43	Stream Power (lb/ft s)	0.93	3.12
0.11				
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.49	2.47
1.27				
C & E Loss (ft)	0.01	Cum SA (acres)	0.37	0.67
1.07				

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 4230.00*

INPUT

Description:

Station Elevation Data				num= 56					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	117	13.68	116.11	17.51	115.91	35.01	115.02	35.92	115.02
52.52	114.87	54.07	114.77	61.45	114.26	69.45	113.53	69.9	113.49
72.92	113.68	93.78	113.25	95.94	113.24	100.93	112.46	105.39	111.94
106.88	111.43	108.37	110.92	109.68	111.41	110.99	110.9	112.3	110.4
112.76	110.22	113.62	109.96	114.93	109.55	115.54	109.1	116.42	108.66
119.31	108.37	121.04	108.42	128.15	108.6	130.42	108.57	131.51	108.32
131.77	106.65	132.35	106	134.55	104.8	140.95	104.8	142.11	105.61
142.63	106.26	143.4	107	143.97	107.57	145.1	108.21	146.31	108.86
147.36	109.49	147.46	109.54	148.66	110.29	149.55	110.67	151.25	111.31
152.3	111.59	156.91	112.4	158.06	112.63	161.36	113.27	164.21	113.85
165.41	114.16	168	114.82	168.27	115.85	169.45	116	170.88	116.18
173.5	115.5								

Manning's n Values				num= 3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.045	132.35	.035	143.4	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	132.35	143.4		30	30		.3	.5

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	107.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.36	Wt. n-Val.	0.045	0.035
0.050				
W.S. Elev (ft)	107.58	Reach Len. (ft)	30.00	30.00
30.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.80	26.95
0.17				
E.G. Slope (ft/ft)	0.004491	Area (sq ft)	0.80	26.95
0.17				
Q Total (cfs)	131.00	Flow (cfs)	1.02	129.87
0.12				
Top Width (ft)	12.37	Top Width (ft)	0.73	11.05
0.59				
Vel Total (ft/s)	4.69	Avg. Vel. (ft/s)	1.28	4.82
0.69				
Max Chl Dpth (ft)	2.78	Hydr. Depth (ft)	1.10	2.44
0.29				
Conv. Total (cfs)	1954.8	Conv. (cfs)	15.2	1937.9
1.7				
Length Wtd. (ft)	30.00	Wetted Per. (ft)	1.81	12.22
0.83				
Min Ch El (ft)	104.80	Shear (lb/sq ft)	0.12	0.62
0.06				
Alpha	1.05	Stream Power (lb/ft s)	0.16	2.98

0.04				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.06	1.02
0.20				
C & E Loss (ft)	0.09	Cum SA (acres)	0.10	0.55
0.21				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.37	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.28	Wt. n-Val.	0.045	0.035
0.050				
W.S. Elev (ft)	110.09	Reach Len. (ft)	30.00	30.00
30.00				
Crit W.S. (ft)		Flow Area (sq ft)	28.83	54.69
7.24				
E.G. Slope (ft/ft)	0.001592	Area (sq ft)	28.83	54.69
7.24				
Q Total (cfs)	308.00	Flow (cfs)	46.52	251.60
9.88				
Top Width (ft)	35.16	Top Width (ft)	19.17	11.05
4.94				
Vel Total (ft/s)	3.39	Avg. Vel. (ft/s)	1.61	4.60
1.37				
Max Chl Dpth (ft)	5.29	Hydr. Depth (ft)	1.50	4.95
1.46				
Conv. Total (cfs)	7718.5	Conv. (cfs)	1165.8	6305.0
247.7				
Length Wtd. (ft)	30.00	Wetted Per. (ft)	21.27	12.22
5.86				
Min Ch El (ft)	104.80	Shear (lb/sq ft)	0.13	0.44
0.12				
Alpha	1.54	Stream Power (lb/ft s)	0.22	2.05
0.17				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.47	2.44
1.27				
C & E Loss (ft)	0.11	Cum SA (acres)	0.35	0.66
1.06				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main RS: 4200

INPUT

Description:

Station Elevation Data	num=	24
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 113 11.73 112 30.8 111 46.37 110 59.56 109		
80.42 108 96.7 107.79 103.8 109 109.9 110 112.78 110.2		
113 107 113.5 106 116.7 104.5 124 104.5 127 106		
130.1 107 131.7 108 133.8 109 138.2 110 142.9 111		
145.8 112 146 114 148 114 150 112		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .03 113.5 .03 127 .04		

Bank Sta: Left Right Lengths: Left Channel Right	Coeff Contr.	Expan.
113.5 127 15 15 15	.3	.5

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	107.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.17	Wt. n-Val.	0.030	0.030
0.040				
W.S. Elev (ft)	107.61	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	0.57	37.32
3.74				
E.G. Slope (ft/ft)	0.001281	Area (sq ft)	0.57	37.32
3.74				
Q Total (cfs)	131.00	Flow (cfs)	0.48	126.07
4.45				
Top Width (ft)	18.12	Top Width (ft)	0.54	13.50
4.07				
Vel Total (ft/s)	3.15	Avg. Vel. (ft/s)	0.84	3.38
1.19				
Max Chl Dpth (ft)	3.11	Hydr. Depth (ft)	1.05	2.76
0.92				
Conv. Total (cfs)	3660.5	Conv. (cfs)	13.4	3522.8
124.3				
Length Wtd. (ft)	15.00	Wetted Per. (ft)	1.73	14.19
4.41				

Min Ch El (ft)	104.50	Shear (lb/sq ft)	0.03	0.21
0.07				
Alpha	1.11	Stream Power (lb/ft s)	0.02	0.71
0.08				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.06	0.99
0.20				
C & E Loss (ft)	0.06	Cum SA (acres)	0.09	0.54
0.21				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.24	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.030	0.030
0.040				
W.S. Elev (ft)	110.18	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	100.74	72.04
22.30				
E.G. Slope (ft/ft)	0.000293	Area (sq ft)	100.74	72.04
22.30				
Q Total (cfs)	308.00	Flow (cfs)	107.01	180.51
20.49				
Top Width (ft)	95.21	Top Width (ft)	69.66	13.50
12.05				
Vel Total (ft/s)	1.58	Avg. Vel. (ft/s)	1.06	2.51
0.92				
Max Chl Dpth (ft)	5.68	Hydr. Depth (ft)	1.45	5.34
1.85				
Conv. Total (cfs)	17984.6	Conv. (cfs)	6248.3	10540.1
1196.2				
Length Wtd. (ft)	15.00	Wetted Per. (ft)	73.50	14.19
12.85				
Min Ch El (ft)	104.50	Shear (lb/sq ft)	0.03	0.09
0.03				
Alpha	1.66	Stream Power (lb/ft s)	0.03	0.23
0.03				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.42	2.39
1.26				
C & E Loss (ft)	0.02	Cum SA (acres)	0.32	0.65
1.06				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 4185

INPUT

Description:

Station Elevation Data		num=		22					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	113	15.32	112	36.11	111	43.26	110	51.7	109
56.6	108.4	61.8	108	73	107.2	98.1	107.1	106.5	106
108.6	105.3	109.6	104	124.7	104	126.7	106	128.3	107
130.9	108	133.9	109	137.6	110	141	111	142.6	112
144.1	113	145	114						

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.04	106.5	.03	126.7	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	106.5	126.7		55	55		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	107.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	107.67	Reach Len. (ft)	55.00	55.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	23.80	67.92
2.44				
E.G. Slope (ft/ft)	0.000277	Area (sq ft)	23.80	67.92
2.44				
Q Total (cfs)	131.00	Flow (cfs)	10.39	119.47
1.13				
Top Width (ft)	63.54	Top Width (ft)	40.01	20.20
3.33				
Vel Total (ft/s)	1.39	Avg. Vel. (ft/s)	0.44	1.76
0.46				
Max Chl Dpth (ft)	3.66	Hydr. Depth (ft)	0.59	3.36
0.73				

Conv. Total (cfs)	7872.4	Conv. (cfs)	624.6	7179.7
68.1				
Length Wtd. (ft)	55.00	Wetted Per. (ft)	40.10	21.78
3.74				
Min Ch El (ft)	104.00	Shear (lb/sq ft)	0.01	0.05
0.01				
Alpha	1.47	Stream Power (lb/ft s)	0.00	0.09
0.01				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.06	0.98
0.20				
C & E Loss (ft)	0.00	Cum SA (acres)	0.09	0.54
0.21				

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	110.20	Reach Len. (ft)	55.00	55.00
55.00				
Crit W.S. (ft)		Flow Area (sq ft)	159.95	119.07
20.66				
E.G. Slope (ft/ft)	0.000104	Area (sq ft)	159.95	119.07
20.66				
Q Total (cfs)	308.00	Flow (cfs)	110.50	186.48
11.02				
Top Width (ft)	96.42	Top Width (ft)	64.65	20.20
11.57				
Vel Total (ft/s)	1.03	Avg. Vel. (ft/s)	0.69	1.57
0.53				
Max Chl Dpth (ft)	6.20	Hydr. Depth (ft)	2.47	5.89
1.79				
Conv. Total (cfs)	30225.7	Conv. (cfs)	10844.2	18300.4
1081.0				
Length Wtd. (ft)	55.00	Wetted Per. (ft)	64.87	21.78
12.37				
Min Ch El (ft)	104.00	Shear (lb/sq ft)	0.02	0.04
0.01				
Alpha	1.58	Stream Power (lb/ft s)	0.01	0.06
0.01				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.38	2.36
1.25				
C & E Loss (ft)	0.00	Cum SA (acres)	0.30	0.64
1.05				

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 4130

INPUT

Description:

Station Elevation Data	num=	24
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 113.59 6.1 113 10 112.59 14.6 112 22.59 111		
32 110 41.41 109 48.23 108.5 59.38 108 80.85 107		
93.25 106 97.37 105 98.9 104 102.83 103.25 105.52 104		
107.37 105 111.08 106 116.65 107 122 108 128.2 109		
134.5 110 139.1 111 154.9 112 171.8 113		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .04 93.25 .03 111.08 .04		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
93.25 111.08	8 8 8	.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	107.69	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	107.63	Reach Len. (ft)	8.00	8.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	18.15	53.68
7.31				
E.G. Slope (ft/ft)	0.000458	Area (sq ft)	18.15	53.68
7.31				
Q Total (cfs)	131.00	Flow (cfs)	11.39	114.57
5.04				
Top Width (ft)	52.57	Top Width (ft)	25.82	17.83
8.91				
Vel Total (ft/s)	1.66	Avg. Vel. (ft/s)	0.63	2.13
0.69				
Max Chl Dpth (ft)	4.38	Hydr. Depth (ft)	0.70	3.01
0.82				
Conv. Total (cfs)	6118.1	Conv. (cfs)	532.1	5350.6
235.4				
Length Wtd. (ft)	8.00	Wetted Per. (ft)	25.88	18.81
9.06				
Min Ch El (ft)	103.25	Shear (lb/sq ft)	0.02	0.08

0.02				
Alpha	1.47	Stream Power (lb/ft s)	0.01	0.17
0.02				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.90
0.20				
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	0.51
0.20				

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	110.19	Reach Len. (ft)	8.00	8.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	141.45	99.36
49.78				
E.G. Slope (ft/ft)	0.000131	Area (sq ft)	141.45	99.36
49.78				
Q Total (cfs)	308.00	Flow (cfs)	103.05	171.08
33.87				
Top Width (ft)	105.12	Top Width (ft)	63.01	17.83
24.28				
Vel Total (ft/s)	1.06	Avg. Vel. (ft/s)	0.73	1.72
0.68				
Max Chl Dpth (ft)	6.94	Hydr. Depth (ft)	2.24	5.57
2.05				
Conv. Total (cfs)	26878.9	Conv. (cfs)	8993.5	14929.9
2955.5				
Length Wtd. (ft)	8.00	Wetted Per. (ft)	63.17	18.81
24.64				
Min Ch El (ft)	103.25	Shear (lb/sq ft)	0.02	0.04
0.02				
Alpha	1.67	Stream Power (lb/ft s)	0.01	0.07
0.01				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.19	2.22
1.21				
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.62
1.03				

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 4122

INPUT

Description:

Station		Elevation Data		num=		23			
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	112.75	6.16	112	13.39	111	24.36	110	36.67	109
49.01	108.59	79.7	108.6	87.79	108.43	90.5	107	93.5	106
97.2	105	98.1	102.7	105.6	102.7	105.81	104	108.86	105
111.6	106	113.9	107	122.1	108	130.5	109	136.1	110
141.1	110.4	151.9	111	164.4	112				

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.04	93.5	.03	111.6	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	93.5	111.6		57	57		.3	.5

Ineffective Flow		num=		2	
Sta L	Sta R	Elev	Permanent		
0	97.2	109.2	F		
106.5	164.4	109	F		

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	107.67	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.15	Wt. n-Val.		0.030
W.S. Elev (ft)	107.53	Reach Len. (ft)	57.00	57.00
57.00				
Crit W.S. (ft)	104.76	Flow Area (sq ft)		42.76
E.G. Slope (ft/ft)	0.000704	Area (sq ft)	3.35	62.71
3.51				
Q Total (cfs)	131.00	Flow (cfs)		131.00
Top Width (ft)	28.74	Top Width (ft)	4.00	18.10
6.64				
Vel Total (ft/s)	3.06	Avg. Vel. (ft/s)		3.06
Max Chl Dpth (ft)	4.83	Hydr. Depth (ft)		4.60
Conv. Total (cfs)	4938.1	Conv. (cfs)		4938.1
Length Wtd. (ft)	57.00	Wetted Per. (ft)		12.01
Min Ch El (ft)	102.70	Shear (lb/sq ft)		0.16

Alpha	1.00	Stream Power (lb/ft s)	0.48
Frctn Loss (ft)		Cum Volume (acre-ft)	0.03
0.20			0.89
C & E Loss (ft)		Cum SA (acres)	0.04
0.20			0.51

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	110.21	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	110.17	Reach Len. (ft)	57.00	57.00
57.00				
Crit W.S. (ft)	106.17	Flow Area (sq ft)	105.03	110.58
48.40				
E.G. Slope (ft/ft)	0.000163	Area (sq ft)	105.03	110.58
48.40				
Q Total (cfs)	308.00	Flow (cfs)	64.28	209.95
33.78				
Top Width (ft)	115.82	Top Width (ft)	71.05	18.10
26.67				
Vel Total (ft/s)	1.17	Avg. Vel. (ft/s)	0.61	1.90
0.70				
Max Chl Dpth (ft)	7.47	Hydr. Depth (ft)	1.48	6.11
1.81				
Conv. Total (cfs)	24132.8	Conv. (cfs)	5036.3	16449.9
2646.6				
Length Wtd. (ft)	57.00	Wetted Per. (ft)	71.62	21.25
27.10				
Min Ch El (ft)	102.70	Shear (lb/sq ft)	0.01	0.05
0.02				
Alpha	1.90	Stream Power (lb/ft s)	0.01	0.10
0.01				
Frctn Loss (ft)		Cum Volume (acre-ft)	0.16	2.20
1.20				
C & E Loss (ft)		Cum SA (acres)	0.21	0.62
1.03				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: Unnamed Bk

REACH: Main RS: 4093.5

INPUT

Description:

Distance from Upstream XS = 10

Deck/Roadway Width = 42

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 6

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		112			6.8		112			41.8		111		
72.2		110			105.7		109			150		110		

Upstream Bridge Cross Section Data

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	112.75	6.16	112	13.39	111	24.36	110	36.67	109
49.01	108.59	79.7	108.6	87.79	108.43	90.5	107	93.5	106
97.2	105	98.1	102.7	105.6	102.7	105.81	104	108.86	105
111.6	106	113.9	107	122.1	108	130.5	109	136.1	110
141.1	110.4	151.9	111	164.4	112				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	93.5	.03	111.6	.04

Bank	Sta: Left	Right	Coeff	Contr.	Expan.
	93.5	111.6		.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	97.2	109.2	F
106.5	164.4	109	F

Downstream Deck/Roadway Coordinates

num= 6

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		112			6.8		112			41.8		111		
72.2		110			105.7		109			142		109		

Downstream Bridge Cross Section Data

Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	111.75	33	110	44.6	109	51.7	108	58.5	107
70	106	75.2	105	82.3	104	85.3	103	93	101.9
102.4	101.9	104.6	102	107.7	103	108.9	104	112.8	105

122	106	127	107	132	108	142	109	152	110
162	111								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	82.3	.03	108.9	.06

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	82.3	108.9		.3	.5

Upstream Embankment side slope	=	2 horiz. to 1.0 vertical
Downstream Embankment side slope	=	2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.98
Elevation at which weir flow begins	=	109.5
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Derby Rd	Arch	4	5.5
FHWA Chart # 41- Arch; Corrugated metal			
FHWA Scale # 1 - 90 Degree headwall			
Solution Criteria = Highest U.S. EG			
Culvert Upstrm Dist	Length	Top n	Bottom n
Exit Loss Coef		Depth Blocked	Entrance Loss Coef
	5	52	.025
			.025
			0
			.5

Upstream	Elevation = 102.8
	Centerline Station = 102
Downstream	Elevation = 102
	Centerline Station = 98

CULVERT OUTPUT Profile #25 yr Culv Group: Derby Rd

Q Culv Group (cfs)	131.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	8.41
Q Barrel (cfs)	131.00	Culv Vel DS (ft/s)	8.32
E.G. US. (ft)	107.68	Culv Inv El Up (ft)	102.80
W.S. US. (ft)	107.53	Culv Inv El Dn (ft)	102.00
E.G. DS (ft)	105.32	Culv Frctn Ls (ft)	0.77
W.S. DS (ft)	105.28	Culv Exit Loss (ft)	1.03
Delta EG (ft)	2.35	Culv Entr Loss (ft)	0.55
Delta WS (ft)	2.25	Q Weir (cfs)	
E.G. IC (ft)	107.57	Weir Sta Lft (ft)	
E.G. OC (ft)	107.68	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	106.03	Weir Max Depth (ft)	
Culv WS Outlet (ft)	105.28	Weir Avg Depth (ft)	

Culv Nml Depth (ft)	3.16	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.57	Min El Weir Flow (ft)	109.50

CULVERT OUTPUT Profile #100 yr Culv Group: Derby Rd

Q Culv Group (cfs)	189.57	Culv Full Len (ft)	38.32
# Barrels	1	Culv Vel US (ft/s)	10.97
Q Barrel (cfs)	189.57	Culv Vel DS (ft/s)	11.21
E.G. US. (ft)	110.21	Culv Inv El Up (ft)	102.80
W.S. US. (ft)	110.17	Culv Inv El Dn (ft)	102.00
E.G. DS (ft)	105.90	Culv Frctn Ls (ft)	1.60
W.S. DS (ft)	105.73	Culv Exit Loss (ft)	1.78
Delta EG (ft)	4.32	Culv Entr Loss (ft)	0.94
Delta WS (ft)	4.45	Q Weir (cfs)	118.43
E.G. IC (ft)	110.21	Weir Sta Lft (ft)	65.51
E.G. OC (ft)	110.21	Weir Sta Rgt (ft)	138.85
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	106.80	Weir Max Depth (ft)	1.22
Culv WS Outlet (ft)	105.73	Weir Avg Depth (ft)	0.70
Culv Nml Depth (ft)	4.00	Weir Flow Area (sq ft)	51.51
Culv Crt Depth (ft)	3.20	Min El Weir Flow (ft)	109.50

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main RS: 4065

INPUT

Description:

Station Elevation Data	num=	21
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 111.75 33 110 44.6 109 51.7 108 58.5 107		
70 106 75.2 105 82.3 104 85.3 103 93 101.9		
102.4 101.9 104.6 102 107.7 103 108.9 104 112.8 105		
122 106 127 107 132 108 142 109 152 110		
162 111		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .06 82.3 .03 108.9 .06		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
82.3 108.9	15 15 15	.3	.5

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	105.32	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	105.28	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	5.75	77.02
3.41				
E.G. Slope (ft/ft)	0.000284	Area (sq ft)	5.75	77.02
3.41				
Q Total (cfs)	131.00	Flow (cfs)	1.83	128.25
0.92				
Top Width (ft)	41.65	Top Width (ft)	8.56	26.60
6.49				
Vel Total (ft/s)	1.52	Avg. Vel. (ft/s)	0.32	1.67
0.27				
Max Chl Dpth (ft)	3.38	Hydr. Depth (ft)	0.67	2.90
0.53				
Conv. Total (cfs)	7768.6	Conv. (cfs)	108.5	7605.8
54.3				
Length Wtd. (ft)	15.00	Wetted Per. (ft)	8.66	27.36
6.63				
Min Ch El (ft)	101.90	Shear (lb/sq ft)	0.01	0.05
0.01				
Alpha	1.18	Stream Power (lb/ft s)	0.00	0.08
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.86
0.20				
C & E Loss (ft)	0.01	Cum SA (acres)	0.04	0.48
0.19				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	105.90	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.17	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	105.73	Reach Len. (ft)	15.00	15.00
15.00				

Crit W.S. (ft)		Flow Area (sq ft)	10.10	88.92
7.23				
E.G. Slope (ft/ft)	0.000942	Area (sq ft)	10.10	88.92
7.23				
Q Total (cfs)	308.00	Flow (cfs)	7.24	296.54
4.22				
Top Width (ft)	48.09	Top Width (ft)	10.89	26.60
10.60				
Vel Total (ft/s)	2.90	Avg. Vel. (ft/s)	0.72	3.34
0.58				
Max Chl Dpth (ft)	3.83	Hydr. Depth (ft)	0.93	3.34
0.68				
Conv. Total (cfs)	10035.7	Conv. (cfs)	236.0	9662.2
137.4				
Length Wtd. (ft)	15.00	Wetted Per. (ft)	11.03	27.36
10.77				
Min Ch El (ft)	101.90	Shear (lb/sq ft)	0.05	0.19
0.04				
Alpha	1.28	Stream Power (lb/ft s)	0.04	0.64
0.02				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.16	2.08
1.20				
C & E Loss (ft)	0.03	Cum SA (acres)	0.15	0.59
1.00				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 4050

INPUT

Description:

Station Elevation Data				num=	28				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	111.5	9.21	111	15.1	111.33	18.7	111	28.1	110
40.92	109	44.8	108.4	47.59	108	53.3	107	57.4	106
67.9	105.23	70.1	105	80	104	83.8	103	85.5	102
88.2	101.5	90.87	100.5	98.17	100.5	100.58	101	103.35	101.87
105.1	103	117.8	104	126.9	105	134.9	106	153.1	106.18
169.9	106.46	189.9	107.46	210	108				

Manning's n Values				num=	3				
Sta	n Val	Sta	n Val	Sta	n Val				

0 .06 85.5 .03 103.35 .06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	85.5	103.35		77	77		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	105.31	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	105.29	Reach Len. (ft)	77.00	77.00
77.00				
Crit W.S. (ft)		Flow Area (sq ft)	19.69	77.52
35.14				
E.G. Slope (ft/ft)	0.000127	Area (sq ft)	19.69	77.52
35.14				
Q Total (cfs)	131.00	Flow (cfs)	5.66	113.44
11.90				
Top Width (ft)	62.04	Top Width (ft)	18.36	17.85
25.83				
Vel Total (ft/s)	0.99	Avg. Vel. (ft/s)	0.29	1.46
0.34				
Max Chl Dpth (ft)	4.79	Hydr. Depth (ft)	1.07	4.34
1.36				
Conv. Total (cfs)	11624.1	Conv. (cfs)	502.5	10065.5
1056.1				
Length Wtd. (ft)	77.00	Wetted Per. (ft)	18.82	18.26
26.28				
Min Ch El (ft)	100.50	Shear (lb/sq ft)	0.01	0.03
0.01				
Alpha	1.91	Stream Power (lb/ft s)	0.00	0.05
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.03	0.83
0.19				
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	0.47
0.19				

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	105.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.12	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	105.74	Reach Len. (ft)	77.00	77.00
77.00				

Crit W.S. (ft)		Flow Area (sq ft)	29.56	85.72
47.85				
E.G. Slope (ft/ft)	0.000462	Area (sq ft)	29.56	85.72
47.85				
Q Total (cfs)	308.00	Flow (cfs)	17.54	255.70
34.76				
Top Width (ft)	71.98	Top Width (ft)	24.62	17.85
29.51				
Vel Total (ft/s)	1.89	Avg. Vel. (ft/s)	0.59	2.98
0.73				
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)	1.20	4.80
1.62				
Conv. Total (cfs)	14336.7	Conv. (cfs)	816.4	11902.1
1618.2				
Length Wtd. (ft)	77.00	Wetted Per. (ft)	25.10	18.26
29.98				
Min Ch El (ft)	100.50	Shear (lb/sq ft)	0.03	0.14
0.05				
Alpha	2.09	Stream Power (lb/ft s)	0.02	0.40
0.03				
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.16	2.05
1.19				
C & E Loss (ft)	0.02	Cum SA (acres)	0.15	0.58
1.00				

CROSS SECTION

RIVER: Unnamed Bk
REACH: Main RS: 3973

INPUT
Description:

Station Elevation Data		num=		28					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	108	9.1	107.7	9.8	108.2	10.3	108	15.8	107
18.4	106	20.6	105	22.8	104	25.1	103	27.3	102
28.2	101	29.4	100.17	35.4	100.61	36.04	101	38.2	102
40.39	103	42.44	104	68.91	104.47	72.79	104.65	80.41	104.27
92.9	104.23	105.6	104.1	108.42	104.1	143	103.6	151	104
162	105	167.5	106	176	107				

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	25.1	.03	40.39	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	25.1	40.39		8	8	8		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	105.30	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	105.28	Reach Len. (ft)	8.00	8.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	5.91	61.64
141.02				
E.G. Slope (ft/ft)	0.000136	Area (sq ft)	5.91	61.64
141.02				
Q Total (cfs)	131.00	Flow (cfs)	1.77	84.75
44.48				
Top Width (ft)	143.57	Top Width (ft)	5.12	15.29
123.16				
Vel Total (ft/s)	0.63	Avg. Vel. (ft/s)	0.30	1.37
0.32				
Max Chl Dpth (ft)	5.11	Hydr. Depth (ft)	1.15	4.03
1.15				
Conv. Total (cfs)	11236.9	Conv. (cfs)	151.4	7269.8
3815.6				
Length Wtd. (ft)	8.00	Wetted Per. (ft)	5.61	16.77
123.49				
Min Ch El (ft)	100.17	Shear (lb/sq ft)	0.01	0.03
0.01				
Alpha	3.19	Stream Power (lb/ft s)	0.00	0.04
0.00				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	0.71
0.03				
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.44
0.06				

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	105.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	105.75	Reach Len. (ft)	8.00	8.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	8.57	68.86
199.78				
E.G. Slope (ft/ft)	0.000384	Area (sq ft)	8.57	68.86
199.78				

Q Total (cfs)	308.00	Flow (cfs)	4.88	171.36
131.76				
Top Width (ft)	147.21	Top Width (ft)	6.16	15.29
125.76				
Vel Total (ft/s)	1.11	Avg. Vel. (ft/s)	0.57	2.49
0.66				
Max Chl Dpth (ft)	5.58	Hydr. Depth (ft)	1.39	4.50
1.59				
Conv. Total (cfs)	15715.3	Conv. (cfs)	248.9	8743.5
6722.9				
Length Wtd. (ft)	8.00	Wetted Per. (ft)	6.75	16.77
126.13				
Min Ch El (ft)	100.17	Shear (lb/sq ft)	0.03	0.10
0.04				
Alpha	2.95	Stream Power (lb/ft s)	0.02	0.24
0.03				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	1.92
0.97				
C & E Loss (ft)	0.00	Cum SA (acres)	0.12	0.55
0.86				

CROSS SECTION

RIVER: Unnamed Bk
REACH: Main RS: 3965

INPUT
Description:

Station Elevation Data		num=		28					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	107	11.22	106	16.79	105	19.73	104	21.82	103
24.15	104	26.97	104.2	29.64	104.34	30.74	104	31.04	103.79
31.64	103	34.64	102	34.74	101	35.84	99.7	37.74	99.5
38.74	99.4	39.84	99.5	41.24	99.7	42.04	101	43.14	101
44.24	102	74.74	103	97.64	104	134.64	105	148.54	106
153.64	107	159.14	107.69	167.64	108				

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	34.74	.03	42.04	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
34.74	42.04	20	20	20		.3	.5

Ineffective Flow		num=		2	
Sta L	Sta R	Elev	Permanent		
0	36.5	105.1	F		
41.5	167.64	105.1	F		

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	105.30	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	105.28	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	102.32	Flow Area (sq ft)	27.94	40.37
164.09				
E.G. Slope (ft/ft)	0.000116	Area (sq ft)	27.94	40.37
164.09				
Q Total (cfs)	131.00	Flow (cfs)	8.81	60.07
62.12				
Top Width (ft)	123.35	Top Width (ft)	19.52	7.30
96.53				
Vel Total (ft/s)	0.56	Avg. Vel. (ft/s)	0.32	1.49
0.38				
Max Chl Dpth (ft)	5.88	Hydr. Depth (ft)	1.43	5.53
1.70				
Conv. Total (cfs)	12167.5	Conv. (cfs)	818.2	5579.3
5770.1				
Length Wtd. (ft)	20.00	Wetted Per. (ft)	21.74	8.66
96.98				
Min Ch El (ft)	99.40	Shear (lb/sq ft)	0.01	0.03
0.01				
Alpha	3.43	Stream Power (lb/ft s)	0.00	0.05
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	0.00	0.70
0.00				
C & E Loss (ft)		Cum SA (acres)	0.01	0.44
0.04				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	105.81	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	105.75	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	104.45	Flow Area (sq ft)	37.74	43.81

211.01				
E.G. Slope (ft/ft)	0.000369	Area (sq ft)	37.74	43.81
211.01				
Q Total (cfs)	308.00	Flow (cfs)	24.00	122.72
161.28				
Top Width (ft)	132.51	Top Width (ft)	22.14	7.30
103.07				
Vel Total (ft/s)	1.05	Avg. Vel. (ft/s)	0.64	2.80
0.76				
Max Chl Dpth (ft)	6.35	Hydr. Depth (ft)	1.70	6.00
2.05				
Conv. Total (cfs)	16042.3	Conv. (cfs)	1250.0	6391.9
8400.3				
Length Wtd. (ft)	20.00	Wetted Per. (ft)	24.40	8.66
103.53				
Min Ch El (ft)	99.40	Shear (lb/sq ft)	0.04	0.12
0.05				
Alpha	3.13	Stream Power (lb/ft s)	0.02	0.33
0.04				
Frctn Loss (ft)		Cum Volume (acre-ft)	0.12	1.91
0.93				
C & E Loss (ft)		Cum SA (acres)	0.12	0.55
0.84				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: Unnamed Bk
 REACH: Main RS: 3955

INPUT

Description:
 Distance from Upstream XS = 4
 Deck/Roadway Width = 10
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates

num= 3														
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		105			22.2		105.1			150		105		

Upstream Bridge Cross Section Data

Station Elevation Data num= 28									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	107	11.22	106	16.79	105	19.73	104	21.82	103
24.15	104	26.97	104.2	29.64	104.34	30.74	104	31.04	103.79

31.64	103	34.64	102	34.74	101	35.84	99.7	37.74	99.5
38.74	99.4	39.84	99.5	41.24	99.7	42.04	101	43.14	101
44.24	102	74.74	103	97.64	104	134.64	105	148.54	106
153.64	107	159.14	107.69	167.64	108				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	34.74	.03	42.04	.06

Bank Sta: Left Right Coeff Contr. Expan.

34.74	42.04		.3	.5
-------	-------	--	----	----

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	36.5	105.1	F
41.5	167.64	105.1	F

Downstream Deck/Roadway Coordinates

num= 3

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0		105			22.2		105.2			180		105		

Downstream Bridge Cross Section Data

Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	107.93	11.5	107.24	14.6	107.65	17.3	107	22.2	106
27.3	105	27.8	104	28.3	103	28.8	102	29.3	101
29.8	100.5	32.2	100	32.3	98.5	34.3	98.4	36.2	98.3
36.8	98.4	39.3	100.1	41.2	101.1	42.9	102	45.3	103
49	103.42	56.4	103.42	72.7	103.36	98.8	103.36	174.6	104
180	105	185	106	190	107	195	108	210	109

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	29.8	.03	39.3	.06

Bank Sta: Left Right Coeff Contr. Expan.

29.8	39.3		.3	.5
------	------	--	----	----

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Driveway 596	Arch	3.5	4

FHWA Chart # 41- Arch; Corrugated metal

FHWA Scale # 1 - 90 Degree headwall

Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
---------------------	--------	-------	----------	---------------	--------------------	----------------

1

Upstream Elevation = 100.07

Centerline Station = 39

Downstream Elevation = 98.64

Centerline Station = 34.5

CULVERT OUTPUT Profile #25 yr Culv Group: Driveway 596

Q Culv Group (cfs)	101.47	Culv Full Len (ft)	18.00
# Barrels	1	Culv Vel US (ft/s)	9.23
Q Barrel (cfs)	101.47	Culv Vel DS (ft/s)	9.23
E.G. US. (ft)	105.29	Culv Inv El Up (ft)	100.07
W.S. US. (ft)	105.28	Culv Inv El Dn (ft)	98.64
E.G. DS (ft)	103.00	Culv Frctn Ls (ft)	0.75
W.S. DS (ft)	102.82	Culv Exit Loss (ft)	1.14
Delta EG (ft)	2.30	Culv Entr Loss (ft)	0.66
Delta WS (ft)	2.47	Q Weir (cfs)	29.53
E.G. IC (ft)	105.53	Weir Sta Lft (ft)	15.32
E.G. OC (ft)	105.29	Weir Sta Rgt (ft)	138.32
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	103.57	Weir Max Depth (ft)	0.25
Culv WS Outlet (ft)	102.14	Weir Avg Depth (ft)	0.20
Culv Nml Depth (ft)	1.66	Weir Flow Area (sq ft)	25.08
Culv Crt Depth (ft)	2.63	Min El Weir Flow (ft)	105.10

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet

equations are not valid and the supercritical result has been discarded.

The outlet answer will be used.

CULVERT OUTPUT Profile #100 yr Culv Group: Driveway 596

Q Culv Group (cfs)	94.24	Culv Full Len (ft)	18.00
# Barrels	1	Culv Vel US (ft/s)	8.57
Q Barrel (cfs)	94.24	Culv Vel DS (ft/s)	8.57
E.G. US. (ft)	105.80	Culv Inv El Up (ft)	100.07
W.S. US. (ft)	105.75	Culv Inv El Dn (ft)	98.64
E.G. DS (ft)	104.26	Culv Frctn Ls (ft)	0.42
W.S. DS (ft)	103.66	Culv Exit Loss (ft)	0.54
Delta EG (ft)	1.53	Culv Entr Loss (ft)	0.57
Delta WS (ft)	2.09	Q Weir (cfs)	213.76

E.G. IC (ft)	105.80	Weir Sta Lft (ft)	12.24
E.G. OC (ft)	105.80	Weir Sta Rgt (ft)	146.00
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	103.57	Weir Max Depth (ft)	0.81
Culv WS Outlet (ft)	102.14	Weir Avg Depth (ft)	0.72
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	96.01
Culv Crt Depth (ft)	2.52	Min El Weir Flow (ft)	105.10

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 3945

INPUT

Description:

Station Elevation Data				num=	30						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	107.93	11.5	107.24	14.6	107.65	17.3	107	22.2	106		
27.3	105	27.8	104	28.3	103	28.8	102	29.3	101		
29.8	100.5	32.2	100	32.3	98.5	34.3	98.4	36.2	98.3		
36.8	98.4	39.3	100.1	41.2	101.1	42.9	102	45.3	103		
49	103.42	56.4	103.42	72.7	103.36	98.8	103.36	174.6	104		
180	105	185	106	190	107	195	108	210	109		

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	29.8	.03	39.3	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	29.8	39.3		15	15		.3	.5

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	103.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.18	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	102.82	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)		Flow Area (sq ft)	1.86	35.33
7.16				
E.G. Slope (ft/ft)	0.001111	Area (sq ft)	1.86	35.33
7.16				
Q Total (cfs)	131.00	Flow (cfs)	1.18	123.30
6.51				
Top Width (ft)	16.47	Top Width (ft)	1.41	9.50
5.56				

Vel Total (ft/s)	2.95	Avg. Vel. (ft/s)	0.64	3.49
0.91				
Max Chl Dpth (ft)	4.52	Hydr. Depth (ft)	1.32	3.72
1.29				
Conv. Total (cfs)	3930.9	Conv. (cfs)	35.5	3699.9
195.5				
Length Wtd. (ft)	15.00	Wetted Per. (ft)	2.74	11.49
6.19				
Min Ch El (ft)	98.30	Shear (lb/sq ft)	0.05	0.21
0.08				
Alpha	1.32	Stream Power (lb/ft s)	0.03	0.74
0.07				
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.00	0.67
0.00				
C & E Loss (ft)	0.30	Cum SA (acres)	0.00	0.44
0.01				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	104.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.60	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	103.66	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)	102.28	Flow Area (sq ft)	3.23	43.37
33.40				
E.G. Slope (ft/ft)	0.002931	Area (sq ft)	3.23	43.37
33.40				
Q Total (cfs)	308.00	Flow (cfs)	3.96	281.88
22.16				
Top Width (ft)	106.63	Top Width (ft)	1.83	9.50
95.30				
Vel Total (ft/s)	3.85	Avg. Vel. (ft/s)	1.23	6.50
0.66				
Max Chl Dpth (ft)	5.36	Hydr. Depth (ft)	1.76	4.56
0.35				
Conv. Total (cfs)	5689.0	Conv. (cfs)	73.2	5206.5
409.3				
Length Wtd. (ft)	15.00	Wetted Per. (ft)	3.68	11.49

96.00				
Min Ch El (ft)	98.30	Shear (lb/sq ft)	0.16	0.69
0.06				
Alpha	2.61	Stream Power (lb/ft s)	0.20	4.49
0.04				
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.12	1.84
0.93				
C & E Loss (ft)	0.03	Cum SA (acres)	0.11	0.54
0.79				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 3930

INPUT
 Description:

Station Elevation Data		num=		27					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	107.93	11.5	107.24	14.6	107.65	17.3	107	22.2	106
27.3	105	27.8	104	28.3	103	28.8	102	29.3	101
29.8	100	32.4	98.45	34.3	98.38	36.8	98.61	39.3	100.1
41.2	101.1	42.9	102	45.7	102.52	59.5	102.53	100	102.75
174.6	103	180	104	185	105	195	106	200	107
205	108	215	109						

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	29.3	.03	39.3	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	29.3	39.3		168 134	100	.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	102.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.18	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	101.47	Reach Len. (ft)	168.00	134.00
100.00				
Crit W.S. (ft)	101.47	Flow Area (sq ft)	0.05	24.83

1.78				
E.G. Slope (ft/ft)	0.011187	Area (sq ft)	0.05	24.83
1.78				
Q Total (cfs)	221.00	Flow (cfs)	0.03	217.64
3.33				
Top Width (ft)	12.83	Top Width (ft)	0.23	10.00
2.59				
Vel Total (ft/s)	8.29	Avg. Vel. (ft/s)	0.58	8.77
1.87				
Max Chl Dpth (ft)	3.09	Hydr. Depth (ft)	0.23	2.48
0.68				
Conv. Total (cfs)	2089.5	Conv. (cfs)	0.3	2057.7
31.5				
Length Wtd. (ft)	133.75	Wetted Per. (ft)	0.52	11.47
2.93				
Min Ch El (ft)	98.38	Shear (lb/sq ft)	0.07	1.51
0.42				
Alpha	1.10	Stream Power (lb/ft s)	0.04	13.25
0.79				
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	0.00	0.66
0.00				
C & E Loss (ft)	0.33	Cum SA (acres)	0.00	0.43
0.01				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	104.19	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.54	Wt. n-Val.	0.060	0.030

0.060				
W.S. Elev (ft)	103.65	Reach Len. (ft)	168.00	134.00
100.00				
Crit W.S. (ft)	103.65	Flow Area (sq ft)	1.75	46.61
128.04				
E.G. Slope (ft/ft)	0.003279	Area (sq ft)	1.75	46.61
128.04				
Q Total (cfs)	510.00	Flow (cfs)	1.75	336.65
171.60				
Top Width (ft)	150.11	Top Width (ft)	1.32	10.00
138.79				
Vel Total (ft/s)	2.89	Avg. Vel. (ft/s)	1.00	7.22
1.34				
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)	1.32	4.66
0.92				
Conv. Total (cfs)	8907.0	Conv. (cfs)	30.5	5879.5
2996.9				
Length Wtd. (ft)	127.96	Wetted Per. (ft)	2.96	11.47
139.37				
Min Ch El (ft)	98.38	Shear (lb/sq ft)	0.12	0.83
0.19				
Alpha	4.19	Stream Power (lb/ft s)	0.12	6.01
0.25				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.12	1.83
0.91				
C & E Loss (ft)	0.15	Cum SA (acres)	0.11	0.54
0.75				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main RS: 3796

INPUT

Description:

Station Elevation Data				num= 19					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	106	4.31	105	6.87	104	12.88	103	17.21	102
20.94	101	25.23	100	51.92	98.2	56.1	100	72.37	101
118.7	102	123	102.5	174.6	103	180	104	185	105
195	106	200	107	205	108	215	109		

Manning's n Values				num= 3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	17.21	.03	118.7	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	17.21	118.7		130	130		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	101.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.08	Wt. n-Val.		0.030
W.S. Elev (ft)	101.50	Reach Len. (ft)	130.00	130.00
130.00				
Crit W.S. (ft)		Flow Area (sq ft)		100.59
E.G. Slope (ft/ft)	0.001375	Area (sq ft)		100.59
Q Total (cfs)	221.00	Flow (cfs)		221.00
Top Width (ft)	76.25	Top Width (ft)		76.25
Vel Total (ft/s)	2.20	Avg. Vel. (ft/s)		2.20
Max Chl Dpth (ft)	3.30	Hydr. Depth (ft)		1.32
Conv. Total (cfs)	5958.9	Conv. (cfs)		5958.9
Length Wtd. (ft)	130.00	Wetted Per. (ft)		76.90
Min Ch El (ft)	98.20	Shear (lb/sq ft)		0.11
Alpha	1.00	Stream Power (lb/ft s)		0.25
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	0.00	0.47
0.00				
C & E Loss (ft)	0.07	Cum SA (acres)	0.00	0.30
0.01				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	103.44	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	103.40	Reach Len. (ft)	130.00	130.00
130.00				
Crit W.S. (ft)		Flow Area (sq ft)	4.37	287.42
38.88				
E.G. Slope (ft/ft)	0.000305	Area (sq ft)	4.37	287.42
38.88				
Q Total (cfs)	510.00	Flow (cfs)	1.40	495.73
12.87				
Top Width (ft)	166.28	Top Width (ft)	6.73	101.49
58.06				
Vel Total (ft/s)	1.54	Avg. Vel. (ft/s)	0.32	1.72
0.33				
Max Chl Dpth (ft)	5.20	Hydr. Depth (ft)	0.65	2.83
0.67				
Conv. Total (cfs)	29178.7	Conv. (cfs)	80.1	28362.0
736.5				
Length Wtd. (ft)	130.00	Wetted Per. (ft)	6.88	102.21
58.12				
Min Ch El (ft)	98.20	Shear (lb/sq ft)	0.01	0.05
0.01				
Alpha	1.22	Stream Power (lb/ft s)	0.00	0.09
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.11	1.32
0.71				
C & E Loss (ft)	0.03	Cum SA (acres)	0.10	0.37
0.53				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 3666

INPUT

Description:

Station Elevation Data				num=	18				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	105.2	1	105	3.98	104	10.51	103	17.92	102
20	101	22.2	100	24.45	99	27	98	30	98
33	98	37.09	99	40.98	100	50.75	101	64.98	102
75.49	103	78.79	104	82.79	105				

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.06	22.2	.03	40.98	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	22.2	40.98		134	134		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	101.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.80	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	100.30	Reach Len. (ft)	134.00	134.00
134.00				
Crit W.S. (ft)	100.30	Flow Area (sq ft)	0.10	30.64
0.44				
E.G. Slope (ft/ft)	0.011511	Area (sq ft)	0.10	30.64
0.44				
Q Total (cfs)	221.00	Flow (cfs)	0.07	220.61
0.32				
Top Width (ft)	22.36	Top Width (ft)	0.66	18.78
2.92				
Vel Total (ft/s)	7.09	Avg. Vel. (ft/s)	0.70	7.20
0.75				
Max Chl Dpth (ft)	2.30	Hydr. Depth (ft)	0.15	1.63
0.15				
Conv. Total (cfs)	2059.9	Conv. (cfs)	0.6	2056.2
3.0				
Length Wtd. (ft)	134.00	Wetted Per. (ft)	0.72	19.43
2.93				
Min Ch El (ft)	98.00	Shear (lb/sq ft)	0.10	1.13
0.11				
Alpha	1.03	Stream Power (lb/ft s)	0.07	8.16
0.08				
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	0.00	0.28
0.00				

C & E Loss (ft)	0.11	Cum SA (acres)	0.00	0.16
0.00				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	103.33	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.39	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	102.95	Reach Len. (ft)	134.00	134.00
134.00				
Crit W.S. (ft)		Flow Area (sq ft)	11.70	80.35
49.17				
E.G. Slope (ft/ft)	0.001777	Area (sq ft)	11.70	80.35
49.17				
Q Total (cfs)	510.00	Flow (cfs)	12.15	432.29
65.55				
Top Width (ft)	64.01	Top Width (ft)	11.29	18.78
33.94				
Vel Total (ft/s)	3.61	Avg. Vel. (ft/s)	1.04	5.38
1.33				
Max Chl Dpth (ft)	4.95	Hydr. Depth (ft)	1.04	4.28
1.45				
Conv. Total (cfs)	12097.4	Conv. (cfs)	288.2	10254.2
1555.0				
Length Wtd. (ft)	134.00	Wetted Per. (ft)	11.80	19.43
34.07				
Min Ch El (ft)	98.00	Shear (lb/sq ft)	0.11	0.46
0.16				
Alpha	1.90	Stream Power (lb/ft s)	0.11	2.47
0.21				
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.08	0.77

0.58				
C & E Loss (ft)	0.10	Cum SA (acres)	0.07	0.19
0.39				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 3532

INPUT

Description:

Station Elevation Data				num=	24				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-10	106	-7	105	-4	104	0	103	5.8	102
11	101	13.3	100	14.5	99	15.1	98	16.3	97
17.6	96	20	95.18	23	95.13	26	95.4	28.3	96
30.9	97	35.9	98	41.7	99	48.4	100	59.8	101
153	102	157	103	163	104	166.5	105		

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
-10	.06	14.5	.03	41.7	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	14.5	41.7		36	36	.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	98.68	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.42	Wt. n-Val.		0.030
W.S. Elev (ft)	98.26	Reach Len. (ft)	36.00	36.00
36.00				
Crit W.S. (ft)		Flow Area (sq ft)		42.33
E.G. Slope (ft/ft)	0.005164	Area (sq ft)		42.33
Q Total (cfs)	221.00	Flow (cfs)		221.00
Top Width (ft)	22.45	Top Width (ft)		22.45

Vel Total (ft/s)	5.22	Avg. Vel. (ft/s)	5.22
Max Chl Dpth (ft)	3.13	Hydr. Depth (ft)	1.89
Conv. Total (cfs)	3075.5	Conv. (cfs)	3075.5
Length Wtd. (ft)	36.00	Wetted Per. (ft)	23.83
Min Ch El (ft)	95.13	Shear (lb/sq ft)	0.57
Alpha	1.00	Stream Power (lb/ft s)	2.99
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.16
C & E Loss (ft)	0.00	Cum SA (acres)	0.10

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	103.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.060	0.030
0.060				
W.S. Elev (ft)	103.11	Reach Len. (ft)	36.00	36.00
36.00				
Crit W.S. (ft)		Flow Area (sq ft)	22.29	172.59
206.60				
E.G. Slope (ft/ft)	0.000198	Area (sq ft)	22.29	172.59
206.60				
Q Total (cfs)	510.00	Flow (cfs)	9.81	394.52
105.67				
Top Width (ft)	158.11	Top Width (ft)	14.94	27.20
115.97				
Vel Total (ft/s)	1.27	Avg. Vel. (ft/s)	0.44	2.29
0.51				
Max Chl Dpth (ft)	7.98	Hydr. Depth (ft)	1.49	6.35
1.78				
Conv. Total (cfs)	36236.2	Conv. (cfs)	696.8	28031.3
7508.0				
Length Wtd. (ft)	36.00	Wetted Per. (ft)	15.71	29.06
116.22				
Min Ch El (ft)	95.13	Shear (lb/sq ft)	0.02	0.07
0.02				
Alpha	2.54	Stream Power (lb/ft s)	0.01	0.17
0.01				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.03	0.38
0.19				

C & E Loss (ft)	0.00	Cum SA (acres)	0.03	0.12
0.16				

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 3496

INPUT
Description:

Station Elevation Data		num= 29							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-10	106	-7	105	-4	104	0	103	3.5	102
10	101	13.12	100	17.45	99	21.09	98	24.53	97
26.53	96	27.94	95	29.04	94.5	32.19	94	35.14	94.5
35.91	95	36.42	96	37.06	97	38.56	98	41.76	99
43.14	100	46	101	55.17	101.35	69.1	101.06	121.79	101.17
131.79	102	134.79	103	137.79	104	140.79	105		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-10	.08	17.45	.03	41.76	.08

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	17.45	41.76		8	8	8		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	98.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.45	Wt. n-Val.		0.030
W.S. Elev (ft)	98.05	Reach Len. (ft)	8.00	8.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)		41.08
E.G. Slope (ft/ft)	0.004617	Area (sq ft)		41.08
Q Total (cfs)	221.00	Flow (cfs)		221.00
Top Width (ft)	17.82	Top Width (ft)		17.82
Vel Total (ft/s)	5.38	Avg. Vel. (ft/s)		5.38
Max Chl Dpth (ft)	4.05	Hydr. Depth (ft)		2.31

Conv. Total (cfs)	3252.5	Conv. (cfs)	3252.5
Length Wtd. (ft)	8.00	Wetted Per. (ft)	20.33
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.58
Alpha	1.00	Stream Power (lb/ft s)	3.13
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.13
C & E Loss (ft)	0.03	Cum SA (acres)	0.08

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	103.16	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.08	Wt. n-Val.	0.080	0.030
0.080				
W.S. Elev (ft)	103.08	Reach Len. (ft)	8.00	8.00
8.00				
Crit W.S. (ft)		Flow Area (sq ft)	35.86	160.25
176.10				
E.G. Slope (ft/ft)	0.000254	Area (sq ft)	35.86	160.25
176.10				
Q Total (cfs)	510.00	Flow (cfs)	16.66	414.05
79.30				
Top Width (ft)	135.35	Top Width (ft)	17.77	24.31
93.27				
Vel Total (ft/s)	1.37	Avg. Vel. (ft/s)	0.46	2.58
0.45				
Max Chl Dpth (ft)	9.08	Hydr. Depth (ft)	2.02	6.59
1.89				
Conv. Total (cfs)	31973.2	Conv. (cfs)	1044.2	25957.6
4971.5				
Length Wtd. (ft)	8.00	Wetted Per. (ft)	18.26	27.10
93.98				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.03	0.09
0.03				
Alpha	2.91	Stream Power (lb/ft s)	0.01	0.24
0.01				
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.01	0.24
0.03				
C & E Loss (ft)	0.03	Cum SA (acres)	0.02	0.10
0.07				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 3488

INPUT

Description:

Station Elevation Data		num=		30					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-10	106.5	-5	105.5	0	104.52	10	103.73	15.44	103
19.2	102	22.07	101	24.69	100	28.75	99	29.4	93.8
29.59	93.7	38.95	93.7	39.65	93.8	39.79	96	40.04	97
40.15	98	40.31	99	40.58	100	46.96	100.3	49	100.1
50.9	99.6	70.1	100	92.9	100.3	102.9	101.3	105.9	102.3
108.9	103.3	111.9	104.3	114.9	105.3	117.9	106.3	120.9	107.3

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
-10	.08	28.75	.03	40.31	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	28.75	40.31		73	73		.3	.5

Ineffective Flow		num=		2	
Sta L	Sta R	Elev	Permanent		
-10	28.95	103.5	F		
40.31	120.9	103.5	F		

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	98.44	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.		0.030
W.S. Elev (ft)	98.10	Reach Len. (ft)	73.00	73.00
73.00				
Crit W.S. (ft)	96.12	Flow Area (sq ft)		47.08
E.G. Slope (ft/ft)	0.002539	Area (sq ft)		47.11
Q Total (cfs)	221.00	Flow (cfs)		221.00
Top Width (ft)	11.30	Top Width (ft)		11.30

Vel Total (ft/s)	4.69	Avg. Vel. (ft/s)	4.69
Max Chl Dpth (ft)	4.40	Hydr. Depth (ft)	4.20
Conv. Total (cfs)	4386.1	Conv. (cfs)	4386.1
Length Wtd. (ft)	73.00	Wetted Per. (ft)	18.25
Min Ch El (ft)	93.70	Shear (lb/sq ft)	0.41
Alpha	1.00	Stream Power (lb/ft s)	1.92
Frctn Loss (ft)		Cum Volume (acre-ft)	0.12
C & E Loss (ft)		Cum SA (acres)	0.08

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	103.13	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.41	Wt. n-Val.		0.030
W.S. Elev (ft)	102.72	Reach Len. (ft)	73.00	73.00
73.00				
Crit W.S. (ft)	97.90	Flow Area (sq ft)		99.51
E.G. Slope (ft/ft)	0.001191	Area (sq ft)	23.37	100.42
164.75				
Q Total (cfs)	510.00	Flow (cfs)		510.00
Top Width (ft)	90.67	Top Width (ft)	12.26	11.56
66.85				
Vel Total (ft/s)	5.12	Avg. Vel. (ft/s)		5.12
Max Chl Dpth (ft)	9.02	Hydr. Depth (ft)		8.76
Conv. Total (cfs)	14780.9	Conv. (cfs)		14780.9
Length Wtd. (ft)	73.00	Wetted Per. (ft)		19.16
Min Ch El (ft)	93.70	Shear (lb/sq ft)		0.39
Alpha	1.00	Stream Power (lb/ft s)		1.98

Frctn Loss (ft)	Cum Volume (acre-ft)	0.00	0.22
0.00			
C & E Loss (ft)	Cum SA (acres)	0.01	0.10
0.06			

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: Unnamed Bk
 REACH: Main RS: 3455

INPUT

Description:
 Distance from Upstream XS = 16
 Deck/Roadway Width = 44
 Weir Coefficient = 2.6
 Upstream Deck/Roadway Coordinates

num= 26											
Sta	Hi	Cord	Lo Cord	Sta	Hi	Cord	Lo Cord	Sta	Hi	Cord	Lo Cord
0	103.5			10	103.5			15.44	103.5		
19.2	103.5			22.07	103.5			24.69	103.5		
28.95	103.5			29.59	103.5			29.59	103.5		
38.95	103.5			38.95	103.5			39.3	103.5		
39.79	103.5			40.04	103.5			40.15	103.5		
40.31	103.5			40.58	103.5			46.96	103.5		
49	103.5			50.9	103.5			70.1	103.5		
92.9	103.5			102.9	103.5			105.9	103.5		
108.9	103.5			111.9	103.5						

Upstream Bridge Cross Section Data

Station Elevation Data num= 30											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-10	106.5	-5	105.5	0	104.52	10	103.73	15.44	103		
19.2	102	22.07	101	24.69	100	28.75	99	29.4	93.8		
29.59	93.7	38.95	93.7	39.65	93.8	39.79	96	40.04	97		
40.15	98	40.31	99	40.58	100	46.96	100.3	49	100.1		
50.9	99.6	70.1	100	92.9	100.3	102.9	101.3	105.9	102.3		
108.9	103.3	111.9	104.3	114.9	105.3	117.9	106.3	120.9	107.3		

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
-10	.08	28.75	.03	40.31	.08

Bank Sta: Left Right Coeff Contr. Expan.

	28.75	40.31		.3	.5
Ineffective Flow			num=	2	
Sta L	Sta R	Elev	Permanent		
-10	28.95	103.5	F		
40.31	120.9	103.5	F		

Downstream Deck/Roadway Coordinates

num=	26				
Sta	Hi	Cord	Lo	Cord	
0	103.5		10	103.5	
19.2	103.5		22.07	103.5	
28.95	103.5		29.59	103.5	
38.95	103.5		38.95	103.5	
39.79	103.5		40.04	103.5	
40.31	103.5		40.58	103.5	
49	103.5		50.9	103.5	
92.9	103.5		102.9	103.5	
108.9	103.5		111.9	103.5	

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	24					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	104.52	10	103.73	15.44	103	19.2	102	22.07	101
24.69	100	28.95	99	29.49	93.1	39.59	93.1	39.69	95
39.79	96	40.04	97	40.15	98	40.31	99	40.58	100
46.96	100.3	49	100.1	50.9	99.6	70.1	100	92.9	100.3
102.9	101.3	105.9	102.3	108.9	103.3	111.9	104.3		

Manning's n Values	num=	3
Sta	n Val	Sta
0	.08	28.95
		.03
		40.31
		.08

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	28.95	40.31		.3	.5

Upstream Embankment side slope	=	2 horiz. to 1.0 vertical
Downstream Embankment side slope	=	2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.98
Elevation at which weir flow begins	=	
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
High Ridge	Box	5	10
FHWA Chart # 58- Rectangular concrete			
FHWA Scale # 1 - Side tapered; Less favorable edges			
Solution Criteria = Inlet control			

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef
Exit Loss Coef					

1	72	.013	.013	0	.5
---	----	------	------	---	----

1

Upstream Elevation = 94.03
Centerline Station = 34.4
Downstream Elevation = 93.4
Centerline Station = 34.5

CULVERT OUTPUT Profile #25 yr Culv Group: High Ridge

Q Culv Group (cfs)	221.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	8.93
Q Barrel (cfs)	221.00	Culv Vel DS (ft/s)	11.42
E.G. US. (ft)	98.44	Culv Inv El Up (ft)	94.03
W.S. US. (ft)	98.10	Culv Inv El Dn (ft)	93.40
E.G. DS (ft)	96.75	Culv Frctn Ls (ft)	0.38
W.S. DS (ft)	95.54	Culv Exit Loss (ft)	0.62
Delta EG (ft)	1.69	Culv Entr Loss (ft)	0.70
Delta WS (ft)	2.56	Q Weir (cfs)	
E.G. IC (ft)	98.44	Weir Sta Lft (ft)	
E.G. OC (ft)	98.36	Weir Sta Rgt (ft)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (ft)	96.51	Weir Max Depth (ft)	
Culv WS Outlet (ft)	95.34	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.74	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.48	Min El Weir Flow (ft)	103.51

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section

downstream of the culvert has supercritical flow.

Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100 yr Culv Group: High Ridge

Q Culv Group (cfs)	510.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	10.20
Q Barrel (cfs)	510.00	Culv Vel DS (ft/s)	18.48
E.G. US. (ft)	103.13	Culv Inv El Up (ft)	94.03
W.S. US. (ft)	102.72	Culv Inv El Dn (ft)	93.40
E.G. DS (ft)	99.39	Culv Frctn Ls (ft)	0.85
W.S. DS (ft)	97.35	Culv Exit Loss (ft)	2.08
Delta EG (ft)	3.74	Culv Entr Loss (ft)	0.81
Delta WS (ft)	5.37	Q Weir (cfs)	
E.G. IC (ft)	103.13	Weir Sta Lft (ft)	
E.G. OC (ft)	101.60	Weir Sta Rgt (ft)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (ft)	99.03	Weir Max Depth (ft)	
Culv WS Outlet (ft)	96.16	Weir Avg Depth (ft)	

Culv Nml Depth (ft)	3.09	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	4.32	Min El Weir Flow (ft)	103.51

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.

Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 3415

INPUT

Description:

Station Elevation Data num= 24									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	104.52	10	103.73	15.44	103	19.2	102	22.07	101
24.69	100	28.95	99	29.49	93.1	39.59	93.1	39.69	95
39.79	96	40.04	97	40.15	98	40.31	99	40.58	100
46.96	100.3	49	100.1	50.9	99.6	70.1	100	92.9	100.3
102.9	101.3	105.9	102.3	108.9	103.3	111.9	104.3		

Manning's n Values num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
0	.08	28.95	.03	40.31	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	28.95	40.31		15	15		.3	.5

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	96.75	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.21	Wt. n-Val.		0.030
W.S. Elev (ft)	95.54	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)	95.54	Flow Area (sq ft)		25.07
E.G. Slope (ft/ft)	0.015955	Area (sq ft)		25.07
Q Total (cfs)	221.00	Flow (cfs)		221.00
Top Width (ft)	10.48	Top Width (ft)		10.48
Vel Total (ft/s)	8.81	Avg. Vel. (ft/s)		8.81

Max Chl Dpth (ft)	2.44	Hydr. Depth (ft)	2.39
Conv. Total (cfs)	1749.6	Conv. (cfs)	1749.6
Length Wtd. (ft)	15.00	Wetted Per. (ft)	14.99
Min Ch El (ft)	93.10	Shear (lb/sq ft)	1.67
Alpha	1.00	Stream Power (lb/ft s)	14.68
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.08
C & E Loss (ft)	0.18	Cum SA (acres)	0.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	99.39	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.05	Wt. n-Val.		0.030
W.S. Elev (ft)	97.35	Reach Len. (ft)	15.00	15.00
15.00				
Crit W.S. (ft)	97.35	Flow Area (sq ft)		44.46
E.G. Slope (ft/ft)	0.016850	Area (sq ft)		44.46
Q Total (cfs)	510.00	Flow (cfs)		510.00
Top Width (ft)	10.98	Top Width (ft)		10.98
Vel Total (ft/s)	11.47	Avg. Vel. (ft/s)		11.47
Max Chl Dpth (ft)	4.25	Hydr. Depth (ft)		4.05
Conv. Total (cfs)	3928.8	Conv. (cfs)		3928.8

Length Wtd. (ft)	15.00	Wetted Per. (ft)		18.65
Min Ch El (ft)	93.10	Shear (lb/sq ft)		2.51
Alpha	1.00	Stream Power (lb/ft s)		28.76
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.00	0.16
0.00				
C & E Loss (ft)	0.34	Cum SA (acres)	0.00	0.08
0.00				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Unnamed Bk
 REACH: Main RS: 3400

INPUT
 Description:

Station Elevation Data				num=	27				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	103.23	10	100.7	11.65	100	13.83	99	16.02	98
18.34	97	20.76	96	22.82	95	26.39	94	31.08	93.13
37.13	93	38.27	94	39.45	95	40.67	96	41.88	97
42.97	98	44.83	99	50.28	99.85	53.05	100	53.83	99.5
67.89	100	86.09	100.2	96.09	101	99.09	102	102.09	103
105.09	104	108.09	105						

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.08	20.76	.03	40.67	.08

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

20.76 40.67 100 100 100 .1 .3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	96.27	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.84	Wt. n-Val.		0.030
W.S. Elev (ft)	95.43	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)	95.43	Flow Area (sq ft)		30.01
E.G. Slope (ft/ft)	0.012239	Area (sq ft)		30.01
Q Total (cfs)	221.00	Flow (cfs)		221.00
Top Width (ft)	18.05	Top Width (ft)		18.05
Vel Total (ft/s)	7.36	Avg. Vel. (ft/s)		7.36
Max Chl Dpth (ft)	2.43	Hydr. Depth (ft)		1.66
Conv. Total (cfs)	1997.7	Conv. (cfs)		1997.7
Length Wtd. (ft)	100.00	Wetted Per. (ft)		19.26
Min Ch El (ft)	93.00	Shear (lb/sq ft)		1.19
Alpha	1.00	Stream Power (lb/ft s)		8.77
Frctn Loss (ft)	1.25	Cum Volume (acre-ft)		0.07
C & E Loss (ft)	0.07	Cum SA (acres)		0.05

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	98.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.36	Wt. n-Val.	0.080	0.030
0.080				
W.S. Elev (ft)	96.69	Reach Len. (ft)	100.00	100.00
100.00				
Crit W.S. (ft)	96.69	Flow Area (sq ft)	0.57	54.46
0.29				
E.G. Slope (ft/ft)	0.010299	Area (sq ft)	0.57	54.46
0.29				
Q Total (cfs)	510.00	Flow (cfs)	0.50	509.28
0.22				
Top Width (ft)	22.40	Top Width (ft)	1.66	19.91
0.83				
Vel Total (ft/s)	9.22	Avg. Vel. (ft/s)	0.88	9.35
0.78				
Max Chl Dpth (ft)	3.69	Hydr. Depth (ft)	0.34	2.74
0.34				
Conv. Total (cfs)	5025.5	Conv. (cfs)	4.9	5018.4
2.2				
Length Wtd. (ft)	100.00	Wetted Per. (ft)	1.80	21.46
1.08				
Min Ch El (ft)	93.00	Shear (lb/sq ft)	0.20	1.63
0.17				
Alpha	1.03	Stream Power (lb/ft s)	0.18	15.26
0.13				
Frctn Loss (ft)	1.09	Cum Volume (acre-ft)	0.00	0.14
0.00				
C & E Loss (ft)	0.16	Cum SA (acres)	0.00	0.07
0.00				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Unnamed Bk

REACH: Main

RS: 3300

INPUT

Description:

Station Elevation Data				num=	25				
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	101	5.19	100	6.95	99	8.39	98	9.86	97
11.6	96	13.6	95	18	94	22.8	93	25.96	92
28.19	91	39.7	90	46.5	90	50.2	91	57.2	92
67.9	93	75.19	94	79.8	95	83.45	96	86.7	97
96.7	98	118	99	128	100	131	101	134	102

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.08	13.6	.03	79.8	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	13.6	79.8		0	0		.1	.3

CROSS SECTION OUTPUT Profile #25 yr

E.G. Elev (ft)	92.42	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.61	Wt. n-Val.		0.030
W.S. Elev (ft)	91.81	Reach Len. (ft)		
Crit W.S. (ft)	91.81	Flow Area (sq ft)		35.30
E.G. Slope (ft/ft)	0.012804	Area (sq ft)		35.30
Q Total (cfs)	221.00	Flow (cfs)		221.00
Top Width (ft)	29.50	Top Width (ft)		29.50
Vel Total (ft/s)	6.26	Avg. Vel. (ft/s)		6.26
Max Chl Dpth (ft)	1.81	Hydr. Depth (ft)		1.20
Conv. Total (cfs)	1953.1	Conv. (cfs)		1953.1
Length Wtd. (ft)		Wetted Per. (ft)		29.91
Min Ch El (ft)	90.00	Shear (lb/sq ft)		0.94

Alpha	1.00	Stream Power (lb/ft s)	5.91
Frctn Loss (ft)		Cum Volume (acre-ft)	
C & E Loss (ft)		Cum SA (acres)	

Warning: Slope too steep for slope area to converge during supercritical flow calculations (normal depth is below critical depth). Water surface set to critical depth.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	93.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.84	Wt. n-Val.		0.030
W.S. Elev (ft)	92.77	Reach Len. (ft)		
Crit W.S. (ft)	92.77	Flow Area (sq ft)		69.38
E.G. Slope (ft/ft)	0.011490	Area (sq ft)		69.38
Q Total (cfs)	510.00	Flow (cfs)		510.00
Top Width (ft)	41.97	Top Width (ft)		41.97
Vel Total (ft/s)	7.35	Avg. Vel. (ft/s)		7.35
Max Chl Dpth (ft)	2.77	Hydr. Depth (ft)		1.65
Conv. Total (cfs)	4757.8	Conv. (cfs)		4757.8
Length Wtd. (ft)		Wetted Per. (ft)		42.59
Min Ch El (ft)	90.00	Shear (lb/sq ft)		1.17
Alpha	1.00	Stream Power (lb/ft s)		8.59
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Slope too steep for slope area to converge during supercritical flow calculations (normal depth is below critical depth). Water surface set to critical depth.

SUMMARY OF MANNING'S N VALUES

River:Unnamed Bk

Reach	River Sta.	n1	n2	n3
Main	5350	.04	.03	.04
Main	5194.50*	.04	.03	.04
Main	5039	.04	.03	.04
Main	4929	.04	.04	.04
Main	4919	.04	.04	.04
Main	4896.5	Culvert		
Main	4870	.04	.04	.04
Main	4718.00*	.04	.04	.04
Main	4567	.04	.04	.04
Main	4541.5	Culvert		
Main	4517	.04	.04	.04
Main	4502	.06	.04	.06
Main	4402.00*	.06	.04	.06
Main	4302	.06	.04	.06
Main	4268	.06	.04	.06
Main	4260	.06	.04	.06
Main	4230.00*	.045	.035	.05
Main	4200	.03	.03	.04
Main	4185	.04	.03	.04
Main	4130	.04	.03	.04
Main	4122	.04	.03	.04
Main	4093.5	Culvert		
Main	4065	.06	.03	.06
Main	4050	.06	.03	.06
Main	3973	.06	.03	.06
Main	3965	.06	.03	.06
Main	3955	Culvert		
Main	3945	.06	.03	.06
Main	3930	.06	.03	.06
Main	3796	.06	.03	.06
Main	3666	.06	.03	.06
Main	3532	.06	.03	.06
Main	3496	.08	.03	.08
Main	3488	.08	.03	.08
Main	3455	Culvert		
Main	3415	.08	.03	.08
Main	3400	.08	.03	.08
Main	3300	.08	.03	.08

SUMMARY OF REACH LENGTHS

River: Unnamed Bk

Reach	River Sta.	Left	Channel	Right
Main	5350	155.5	155.5	155.5
Main	5194.50*	155.5	155.5	155.5
Main	5039	90	110	130
Main	4929	10	10	10
Main	4919	49	49	49
Main	4896.5	Culvert		
Main	4870	152	152	152
Main	4718.00*	151	151	151
Main	4567	50	50	50
Main	4541.5	Culvert		
Main	4517	15	15	15
Main	4502	100	100	100
Main	4402.00*	100	100	100
Main	4302	34	34	34
Main	4268	8	8	8
Main	4260	30	30	30
Main	4230.00*	30	30	30
Main	4200	15	15	15
Main	4185	55	55	55
Main	4130	8	8	8
Main	4122	57	57	57
Main	4093.5	Culvert		
Main	4065	15	15	15
Main	4050	77	77	77
Main	3973	8	8	8
Main	3965	20	20	20
Main	3955	Culvert		
Main	3945	15	15	15
Main	3930	168	134	100
Main	3796	130	130	130
Main	3666	134	134	134
Main	3532	36	36	36
Main	3496	8	8	8
Main	3488	73	73	73
Main	3455	Culvert		
Main	3415	15	15	15
Main	3400	100	100	100
Main	3300	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Unnamed Bk

Reach	River Sta.	Contr.	Expan.
Main	5350	.1	.3
Main	5194.50*	.1	.3
Main	5039	.1	.3
Main	4929	.1	.3
Main	4919	.1	.3
Main	4896.5 Culvert		
Main	4870	.1	.3
Main	4718.00*	.1	.3
Main	4567	.1	.3
Main	4541.5 Culvert		
Main	4517	.1	.3
Main	4502	.1	.3
Main	4402.00*	.1	.3
Main	4302	.1	.3
Main	4268	.1	.3
Main	4260	.3	.5
Main	4230.00*	.3	.5
Main	4200	.3	.5
Main	4185	.1	.3
Main	4130	.1	.3
Main	4122	.3	.5
Main	4093.5 Culvert		
Main	4065	.3	.5
Main	4050	.1	.3
Main	3973	.1	.3
Main	3965	.3	.5
Main	3955 Culvert		
Main	3945	.3	.5
Main	3930	.1	.3
Main	3796	.1	.3
Main	3666	.1	.3
Main	3532	.1	.3
Main	3496	.1	.3
Main	3488	.3	.5
Main	3455 Culvert		
Main	3415	.3	.5
Main	3400	.1	.3
Main	3300	.1	.3

APPENDIX E
SITE PHOTOGRAPHS

Derby Milford Road Flooding Report



833 Brookside Drive-Front Steps



833 Brookside Drive-Shed



827 Brookside Drive-View from front



827 Brookside Drive-Looking out of garage

Derby Milford Road Flooding Report



840 Glenbrook Rd-Garage



837 Glenbrook Rd-Garage



837 Glenbrook Rd-Pool



837 Glenbrook Rd-Pool

Derby Milford Road Flooding Report



840 Glenbrook Rd-Looking at Garage



840 Glenbrook-Looking towards 827 Brookside



827 Brookside-Rear fence



837 Glenbrook Rd-Inside house



Downstream of Railroad culvert



Area downstream of railroad culvert

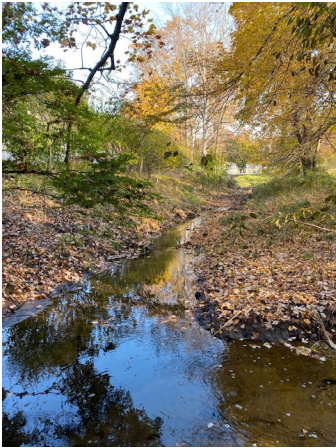
Derby Milford Road Flooding Report



Brookside/Glenbrook Culverts Upstream



Brookside/Glenbrook Culverts Downstream



Looking upstream from railroad culvert



Railroad stone culvert-Upstream



Looking upstream from railroad culvert



Looking upstream from railroad culvert

Derby Milford Road Flooding Report



Derby Milford Road Culvert Upstream



Derby Milford Culvert Downstream



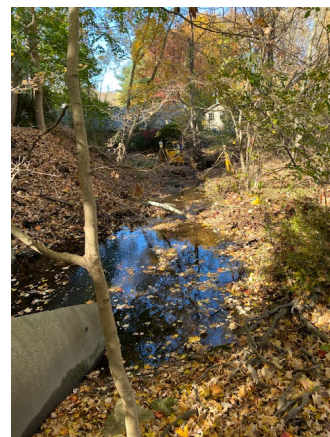
East Slope Driveway Culvert-Downstream



596 East Slope-Outdoor Structure



**Looking at 48" culvert discharge upstream
of railroad culvert**



**Looking downstream towards railroad culvert
from 48 inch culvert**

833 Brookside Dr



Image capture: Nov 2015 © 2022 Google





Google







Google



Google

APPENDIX F
COST ESTIMATES

Major and Minor Contract Items

P:\1 ACTIVE PROJECTS\2398 Derby Milford - Orange\H&H\6-Reports\Estimating\April 2022\final\Cost Estimate Form Derby Milford Replacement -10x5 box .xlsx

Orange, CT

[illegible]

B	Minor Items Subtotal	10	% of Line "A"	\$ 127,769
---	----------------------	----	---------------	------------

Other Item Allowances

Clearing and Grubbing	2	% of Line "C"	\$ 28,109
M & P of Traffic	4	% of Line "C"	\$ 56,218
Mobilization	8	% of Line "C"	\$ 112,436
Construction Staking	2	% of Line "C"	\$ 28,109

E	CONTRACT SUBTOTAL (C + D)	\$ 1,630,326
---	---------------------------	--------------

Inflation Costs (Simple Method)

Date of Estimate	May-22
Anticipated Bid Date	Jul-22
Annual Inflation	8%

G	TOTAL CONTRACT COST ESTIMATE (E + F) (Rounded to nearest \$1000)	\$ 1,656,000
----------	---	---------------------

Contract Cost Estimate (Line "G")		\$ 1,656,000
Contingencies	10%	\$ 165,600
Incidentals	10%	\$ 165,600
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	\$ 35,000
Engineering Permitting	LS	\$ 7,000
TOTAL PROJECT COST		\$ 2,029,200

Major and Minor Contract Items

A	Major Items Subtotal			\$	487,585
B	Minor Items Subtotal	10	% of Line "A"	\$	48,759
C	Major and Minor Contract Items Subtotal (A + B)			\$	536,344

Clearing and Grubbing	2	% of Line "C"	\$	10,727
M & P of Traffic	4	% of Line "C"	\$	21,454
Mobilization	8	% of Line "C"	\$	42,908
Construction Staking	2	% of Line "C"	\$	10,727

E	CONTRACT SUBTOTAL (C + D)	\$ 622,160
---	---------------------------	------------

Date of Estimate	May-22
Anticipated Bid Date	Jul-22
Annual Inflation	8%

G	TOTAL CONTRACT COST ESTIMATE (E + F) (Rounded to nearest \$1000)	\$ 632,000
----------	---	-------------------

Contract Cost Estimate (Line "G")		\$ 632,000
Contingencies	10%	\$ 63,200
Incidentals	10%	\$ 63,200
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	\$ 40,000
Engineering Permitting	LS	\$ 6,000
TOTAL PROJECT COST		\$ 804,400

Construction Cost Estimate

Replacement of Brookside Culvert to Glenbrook (10x4 box)

Orange, CT

Major and Minor Contract Items

[illegible]

A	Major Items Subtotal	\$ 1,148,585
---	----------------------	--------------

B	Minor Items Subtotal	10	% of Line "A"	\$ 114,859
---	----------------------	----	---------------	------------

C	Major and Minor Contract Items Subtotal (A + B)	\$ 1,263,444
---	---	--------------

Other Item Allowances

Clearing and Grubbing	2	% of Line "C"	\$ 25,269
M & P of Traffic	4	% of Line "C"	\$ 50,538
Mobilization	8	% of Line "C"	\$ 101,076
Construction Staking	2	% of Line "C"	\$ 25,269

D	Other Items Subtotal	\$ 202,152
---	----------------------	------------

E	CONTRACT SUBTOTAL (C + D)	\$ 1,465,596
---	---------------------------	--------------

Inflation Costs (Simple Method)

Date of Estimate	May-22
Anticipated Bid Date	Jul-22
Annual Inflation	8%

F	Inflation Subtotal	1.6% of Line "E"	\$ 23,450
---	--------------------	------------------	-----------

G	TOTAL CONTRACT COST ESTIMATE (E + F) (Rounded to nearest \$1000)	\$ 1,489,000
----------	---	---------------------

Project Costs Summary

Contract Cost Estimate (Line "G")		\$ 1,489,000
Contingencies	10%	\$ 148,900
Incidentals	10%	\$ 148,900
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	\$ 35,000
Engineering Permitting	LS	\$ 7,000
TOTAL PROJECT COST		\$ 1,828,800

Construction Cost Estimate
Removal of RR Culvert and Restore Open Channel (60 LF)
Orange, CT

Major and Minor Contract Items

Item No.	Item	Unit	Quantity	Unit \$	Total Cost
0201001	CLEARING AND GRUBBING	LS	1	*	*
0202000	EARTH EXCAVATION	CY	1000	\$ 38.00	\$ 38,000.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	0	\$ 80.00	\$ -
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	0	\$ 3,000.00	\$ -
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	80	\$ 35.00	\$ 2,800.00
0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	0	\$ 75.00	\$ -
0204151	HANDLING WATER	LS	1	\$ 35,000.00	\$ 35,000.00
0209001	FORMATION OF SUBGRADE	SY	0	\$ 3.00	\$ -
0212000	SUBBASE	CY	0	\$ 48.00	\$ -
0213100	GRANULAR FILL	CY	100	\$ 60.00	\$ 6,000.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	0	\$ 62.00	\$ -
0219001	SEDIMENTATION CONTROL SYSTEM	LF	250	\$ 8.00	\$ 2,000.00
0304002	PROCESSED AGGREGATE BASE	CY	0	\$ 50.00	\$ -
0305000	PROCESSED AGGREGATE	TON	0	\$ 45.00	\$ -
0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	0	\$ 150.00	\$ -
0503001	REMOVAL OF EXISTING CULVERT	LS	1	\$ 35,000.00	\$ 35,000.00
0601062	FOOTING CONCRETE	CY	0	\$ 750.00	\$ -
0601064	ABUTMENT AND WALL CONCRETE	CY	0	\$ 850.00	\$ -
0602030	DEFORMED STEEL BARS - GALVANIZED	LB	0	\$ 2.00	\$ -
0703011	MODIFIED RIPRAP	CY	100	\$ 85.00	\$ 8,500.00
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	0	\$ 80.00	\$ -
0708001	DAMPPROOFING	SY	0	\$ 20.00	\$ -
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	0	\$ 45.00	\$ -
0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	0	\$ 3,500.00	\$ -
0911924	R-B END ANCHORAGE TYPE II	EA	0	\$ 1,500.00	\$ -
0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	0	\$ 60.00	\$ -
0944000	FURNISHING AND PLACING TOPSOIL	SY	300	\$ 8.00	\$ 2,400.00
0950005	TURF ESTABLISHMENT	SY	300	\$ 2.00	\$ 600.00
0950036	EROSION CONTROL MATTING	SY	200	\$ 5.00	\$ 1,000.00
09500340A	WOODEN FENCE	LF	150	\$ 30.00	\$ 4,500.00
09500343A	WETLAND GRASS ESTABLISHMENT	SF	4000	\$ 1.50	\$ 6,000.00
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -

A Major Items Subtotal \$ 141,800

B Minor Items Subtotal 10 % of Line "A" \$ 14,180

C Major and Minor Contract Items Subtotal (A + B) \$ 155,980

Other Item Allowances

Clearing and Grubbing	5	% of Line "C"	\$ 7,799
M & P of Traffic	0	% of Line "C"	\$ -
Mobilization	5	% of Line "C"	\$ 7,799
Construction Staking	1	% of Line "C"	\$ 1,560

D Other Items Subtotal \$ 17,158

E CONTRACT SUBTOTAL (C + D) \$ 173,138

Inflation Costs (Simple Method)

Date of Estimate	May-22
Anticipated Bid Date	Jul-22
Annual Inflation	8%

F Inflation Subtotal 1.6% of Line "E" \$ 2,770

G TOTAL CONTRACT COST ESTIMATE (E + F) (Rounded to nearest \$1000) \$ 176,000

Project Costs Summary

Contract Cost Estimate (Line "G")		\$ 176,000
Contingencies	10%	\$ 17,600
Incidentals	10%	\$ 17,600
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	\$ 35,000
Engineering Permitting	LS	\$ 10,600
TOTAL PROJECT COST		\$ 256,800

Construction Cost Estimate
Replacement of RR Culvert (10x5 box)
Orange, CT

Major and Minor Contract Items

Item No.	Item	Unit	Quantity	Unit \$	Total Cost
0201001	CLEARING AND GRUBBING	LS	1	*	*
0202000	EARTH EXCAVATION	CY	400	\$ 27.00	\$ 10,800.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	50	\$ 80.00	\$ 4,000.00
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	\$ 3,000.00	\$ 3,000.00
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	80	\$ 35.00	\$ 2,800.00
0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	10	\$ 75.00	\$ 750.00
0204151	HANDLING WATER	LS	1	\$ 50,000.00	\$ 50,000.00
0209001	FORMATION OF SUBGRADE	SY	400	\$ 3.00	\$ 1,200.00
0212000	SUBBASE	CY	90	\$ 48.00	\$ 4,320.00
0213100	GRANULAR FILL	CY	60	\$ 60.00	\$ 3,600.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	120	\$ 62.00	\$ 7,440.00
0219001	SEDIMENTATION CONTROL SYSTEM	LF	250	\$ 8.00	\$ 2,000.00
0304002	PROCESSED AGGREGATE BASE	CY	0	\$ 50.00	\$ -
0305000	PROCESSED AGGREGATE	TON	0	\$ 45.00	\$ -
0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	0	\$ 150.00	\$ -
0503001	REMOVAL OF EXISTING CULVERT	LS	1	\$ 40,000.00	\$ 40,000.00
0601062	FOOTING CONCRETE	CY	20	\$ 750.00	\$ 15,000.00
0601064	ABUTMENT AND WALL CONCRETE	CY	10	\$ 850.00	\$ 8,500.00
0601125	10' x 5' PRECAST CONCRETE BOX CULVERT	LF	60	\$ 2,200.00	\$ 132,000.00
0602030	DEFORMED STEEL BARS - GALVANIZED	LB	10000	\$ 2.00	\$ 20,000.00
0703011	MODIFIED RIPRAP	CY	40	\$ 85.00	\$ 3,400.00
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	65	\$ 80.00	\$ 5,200.00
0708001	DAMPPROOFING	SY	55	\$ 20.00	\$ 1,100.00
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	0	\$ 45.00	\$ -
0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	2	\$ 3,500.00	\$ 7,000.00
0911924	R-B END ANCHORAGE TYPE II	EA	4	\$ 1,500.00	\$ 6,000.00
0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	0	\$ 60.00	\$ -
0944000	FURNISHING AND PLACING TOPSOIL	SY	300	\$ 8.00	\$ 2,400.00
0950005	TURF ESTABLISHMENT	SY	300	\$ 2.00	\$ 600.00
0969060	CONSTRUCTION FIELD OFFICE (SMALL)	MO	4	\$ 2,500.00	\$ 10,000.00
0970006	TRAFFICPERSON (MUNICIPAL POLICE OFFICER)	EST	0	\$ 5,000.00	\$ -
0970001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	0	*	*
0974001	REMOVAL OF EXISTING MASONRY	CY	10	\$ 400.00	\$ 4,000.00
0975004	MOBILIZATION AND PROJECT CLOSE-OUT	LS	1	*	*
0979003	CONSTRUCTION BARRICADE - TYPE III	EA	6	\$ 130.00	\$ 780.00
0980001	CONSTRUCTION STAKING	LS	1	*	*
1209007	PAINTED PAVEMENT MARKINGS - 4" YELLOW	LF	0	\$ 1.00	\$ -
1220027	CONSTRUCTION SIGNS	SF	0	\$ 25.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -

A Major Items Subtotal					\$ 345,890
B Minor Items Subtotal	10	% of Line "A"			\$ 34,589

C Major and Minor Contract Items Subtotal (A + B)					\$ 380,479
--	--	--	--	--	-------------------

Other Item Allowances

Clearing and Grubbing	2	% of Line "C"	\$ 7,610
M & P of Traffic	0	% of Line "C"	\$ -
Mobilization	8	% of Line "C"	\$ 30,438
Construction Staking	2	% of Line "C"	\$ 7,610

D Other Items Subtotal					\$ 45,658
-------------------------------	--	--	--	--	------------------

E CONTRACT SUBTOTAL (C + D)					\$ 426,137
------------------------------------	--	--	--	--	-------------------

Inflation Costs (Simple Method)

Date of Estimate	May-22	
Anticipated Bid Date	Jul-22	
Annual Inflation	8%	
Inflation Subtotal	1.6% of Line "E"	\$ 6,818

G TOTAL CONTRACT COST ESTIMATE (E + F) (Rounded to nearest \$1000)					\$ 433,000
---	--	--	--	--	-------------------

Project Costs Summary

Contract Cost Estimate (Line "G")		\$ 433,000
Contingencies	10%	\$ 43,300
Incidentals	10%	\$ 43,300
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	\$ 35,000
Engineering Permitting	LS	\$ 10,000
TOTAL PROJECT COST		\$ 564,600

Construction Cost Estimate
Replacement of East Slope with 10x5 box
Orange, CT

Major and Minor Contract Items

Item No.	Item	Unit	Quantity	Unit \$	Total Cost
0201001	CLEARING AND GRUBBING	LS	1	*	*
0202000	EARTH EXCAVATION	CY	100	\$ 27.00	\$ 2,700.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	60	\$ 80.00	\$ 4,800.00
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	1	\$ 3,000.00	\$ 3,000.00
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	80	\$ 35.00	\$ 2,800.00
0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	10	\$ 75.00	\$ 750.00
0204151	HANDLING WATER	LS	1	\$ 55,000.00	\$ 55,000.00
0209001	FORMATION OF SUBGRADE	SY	200	\$ 3.00	\$ 600.00
0212000	SUBBASE	CY	90	\$ 48.00	\$ 4,320.00
0213100	GRANULAR FILL	CY	60	\$ 60.00	\$ 3,600.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	120	\$ 62.00	\$ 7,440.00
0219001	SEDIMENTATION CONTROL SYSTEM	LF	100	\$ 8.00	\$ 800.00
0304002	PROCESSED AGGREGATE BASE	CY	20	\$ 50.00	\$ 1,000.00
0305000	PROCESSED AGGREGATE	TON	15	\$ 45.00	\$ 675.00
0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	15	\$ 150.00	\$ 2,250.00
0503001	REMOVAL OF EXISTING CULVERT	LS	1	\$ 35,000.00	\$ 35,000.00
0601062	FOOTING CONCRETE	CY	20	\$ 750.00	\$ 15,000.00
0601064	ABUTMENT AND WALL CONCRETE	CY	10	\$ 850.00	\$ 8,500.00
0601125	10' x 5' PRECAST CONCRETE BOX CULVERT	LF	20	\$ 2,200.00	\$ 44,000.00
0602030	DEFORMED STEEL BARS - GALVANIZED	LB	8000	\$ 2.00	\$ 16,000.00
0703011	MODIFIED RIPRAP	CY	40	\$ 85.00	\$ 3,400.00
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	65	\$ 80.00	\$ 5,200.00
0708001	DAMPPROOFING	SY	55	\$ 20.00	\$ 1,100.00
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	40	\$ 45.00	\$ 1,800.00
0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	2	\$ 3,500.00	\$ 7,000.00
0911924	R-B END ANCHORAGE TYPE II	EA	4	\$ 1,500.00	\$ 6,000.00
0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	62	\$ 60.00	\$ 3,720.00
0944000	FURNISHING AND PLACING TOPSOIL	SY	300	\$ 8.00	\$ 2,400.00
0950005	TURF ESTABLISHMENT	SY	300	\$ 2.00	\$ 600.00
0969060	CONSTRUCTION FIELD OFFICE (SMALL)	MO	0	\$ 2,500.00	\$ -
0970006	TRAFFICPERSON (MUNICIPAL POLICE OFFICER)	EST	1	\$ 5,000.00	\$ 5,000.00
0970001	MAINTENANCE AND PROTECTION OF TRAFFIC	LS	1	*	*
0974001	REMOVAL OF EXISTING MASONRY	CY	60	\$ 400.00	\$ 24,000.00
0975004	MOBILIZATION AND PROJECT CLOSE-OUT	LS	1	*	*
0979003	CONSTRUCTION BARRICADE - TYPE III	EA	6	\$ 130.00	\$ 780.00
0980001	CONSTRUCTION STAKING	LS	1	*	*
1209007	PAINTED PAVEMENT MARKINGS - 4" YELLOW	LF	0	\$ 1.00	\$ -
1220027	CONSTRUCTION SIGNS	SF	0	\$ 25.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -

A Major Items Subtotal					\$ 269,235
B Minor Items Subtotal	10	% of Line "A"			\$ 26,924

C Major and Minor Contract Items Subtotal (A + B)					\$ 296,159
--	--	--	--	--	-------------------

Other Item Allowances

Clearing and Grubbing	2	% of Line "C"	\$ 5,923
M & P of Traffic	1	% of Line "C"	\$ 2,962
Mobilization	8	% of Line "C"	\$ 23,693
Construction Staking	2	% of Line "C"	\$ 5,923

D Other Items Subtotal					\$ 38,501
-------------------------------	--	--	--	--	------------------

E CONTRACT SUBTOTAL (C + D)					\$ 334,660
------------------------------------	--	--	--	--	-------------------

Inflation Costs (Simple Method)

Date of Estimate	May-22	
Anticipated Bid Date	Jul-22	
Annual Inflation	8%	
Inflation Subtotal	1.6% of Line "E"	\$ 5,355

G TOTAL CONTRACT COST ESTIMATE (E + F) (Rounded to nearest \$1000)					\$ 340,000
---	--	--	--	--	-------------------

Project Costs Summary

Contract Cost Estimate (Line "G")		\$ 340,000
Contingencies	10%	\$ 34,000
Incidentals	10%	\$ 34,000
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	\$ 24,000
Engineering Permitting	LS	\$ 6,000
TOTAL PROJECT COST		\$ 438,000

Construction Cost Estimate
Removal of RR Culvert and Restore Open Channel (60 LF)
Orange, CT

Major and Minor Contract Items

Item No.	Item	Unit	Quantity	Unit \$	Total Cost
0201001	CLEARING AND GRUBBING	LS	1	*	*
0202000	EARTH EXCAVATION	CY	1000	\$ 38.00	\$ 38,000.00
0202216A	EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL	CY	0	\$ 80.00	\$ -
0202217A	SUPPLEMENTAL STREAMBED CHANNEL MATERIAL	EST	0	\$ 3,000.00	\$ -
0203000	STRUCTURE EXCAVATION - EARTH (COMPLETE)	CY	80	\$ 35.00	\$ 2,800.00
0203100	STRUCTURE EXCAVATION - ROCK (COMPLETE)	CY	0	\$ 75.00	\$ -
0204151	HANDLING WATER	LS	1	\$ 35,000.00	\$ 35,000.00
0209001	FORMATION OF SUBGRADE	SY	0	\$ 3.00	\$ -
0212000	SUBBASE	CY	0	\$ 48.00	\$ -
0213100	GRANULAR FILL	CY	100	\$ 60.00	\$ 6,000.00
0216000	PERVIOUS STRUCTURE BACKFILL	CY	0	\$ 62.00	\$ -
0219001	SEDIMENTATION CONTROL SYSTEM	LF	250	\$ 8.00	\$ 2,000.00
0304002	PROCESSED AGGREGATE BASE	CY	0	\$ 50.00	\$ -
0305000	PROCESSED AGGREGATE	TON	0	\$ 45.00	\$ -
0406010-2	BITUMINOUS CONCRETE CLASS 2	TON	0	\$ 150.00	\$ -
0503001	REMOVAL OF EXISTING CULVERT	LS	1	\$ 35,000.00	\$ 35,000.00
0601062	FOOTING CONCRETE	CY	0	\$ 750.00	\$ -
0601064	ABUTMENT AND WALL CONCRETE	CY	0	\$ 850.00	\$ -
0602030	DEFORMED STEEL BARS - GALVANIZED	LB	0	\$ 2.00	\$ -
0703011	MODIFIED RIPRAP	CY	100	\$ 85.00	\$ 8,500.00
0707009	MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)	SY	0	\$ 80.00	\$ -
0708001	DAMPPROOFING	SY	0	\$ 20.00	\$ -
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	LF	0	\$ 45.00	\$ -
0910184	METAL BEAM RAIL R-B 350 (TYPE II) SECTION	EA	0	\$ 3,500.00	\$ -
0911924	R-B END ANCHORAGE TYPE II	EA	0	\$ 1,500.00	\$ -
0913003	4' POLYVINYL CHLORIDE CHAIN LINK FENCE	LF	0	\$ 60.00	\$ -
0944000	FURNISHING AND PLACING TOPSOIL	SY	300	\$ 8.00	\$ 2,400.00
0950005	TURF ESTABLISHMENT	SY	300	\$ 2.00	\$ 600.00
0950036	EROSION CONTROL MATTING	SY	200	\$ 5.00	\$ 1,000.00
09500340A	WOODEN FENCE	LF	150	\$ 30.00	\$ 4,500.00
09500343A	WETLAND GRASS ESTABLISHMENT	SF	4000	\$ 1.50	\$ 6,000.00
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -
				\$ 1.00	\$ -

A Major Items Subtotal \$ **141,800**

B Minor Items Subtotal 10 % of Line "A" \$ **14,180**

C Major and Minor Contract Items Subtotal (A + B) \$ **155,980**

Other Item Allowances

Clearing and Grubbing	5	% of Line "C"	\$ 7,799
M & P of Traffic	0	% of Line "C"	\$ -
Mobilization	5	% of Line "C"	\$ 7,799
Construction Staking	1	% of Line "C"	\$ 1,560

D Other Items Subtotal \$ **17,158**

E CONTRACT SUBTOTAL (C + D) \$ **173,138**

Inflation Costs (Simple Method)

Date of Estimate	Apr-22
Anticipated Bid Date	Jul-22
Annual Inflation	4%

F Inflation Subtotal 1.2% of Line "E" \$ **2,078**

G TOTAL CONTRACT COST ESTIMATE (E + F) (Rounded to nearest \$1000) \$ **175,000**

LOTICIP Project Costs Summary

Contract Cost Estimate (Line "G")		\$ 175,000
Contingencies	10%	\$ 17,500
Incidentals	10%	\$ 17,500
ROW	LS	N/A
Utilities	LS	N/A
Engineering Design	LS	\$ 35,000
Engineering Permitting	LS	\$ 10,600
TOTAL PROJECT COST		\$ 255,600