



Hunt River - Randolph, Massachusetts

RANDOLPH FLOODPLAIN ANALYSIS

RANDOLPH, MA

JUNE 13, 2022

PREPARED FOR:

Mr. Art Campbell
Core Investments Development, LLC
800 Boylston Street, 30th Floor
Boston, MA 02199

PREPARED BY:

The Vertex Companies, Inc.
400 Libbey Parkway
Weymouth, MA 02189
PHONE 781.952.6000

CORE INVESTMENTS PROJECT ID: 20066-00CDEV
VERTEX PROJECT NO: 78000



June 13, 2022

Mr. Art Campbell
Core Investments Development, LLC
800 Boylston Street, 30th Floor
Boston, MA 02199

Re: Randolph Project Floodplain Analysis Report
VERTEX Project 78000

Mr. Campbell:

The Vertex Companies, Inc. (VERTEX) is pleased to submit this Floodplain Analysis report for the potential development on the Randolph, Massachusetts properties (the Site). The report presents an analysis of the unstudied floodplain along Hunt River which bisects the development area.

This report steps through the process of our analysis, our determinations, and recommended considerations.

Please do not hesitate to contact us at your convenience should you have any questions or comments regarding this analysis.

Sincerely,

The Vertex Companies, Inc.

A handwritten signature in blue ink, appearing to read "Omeed Mollaian", with a long horizontal line extending to the right.

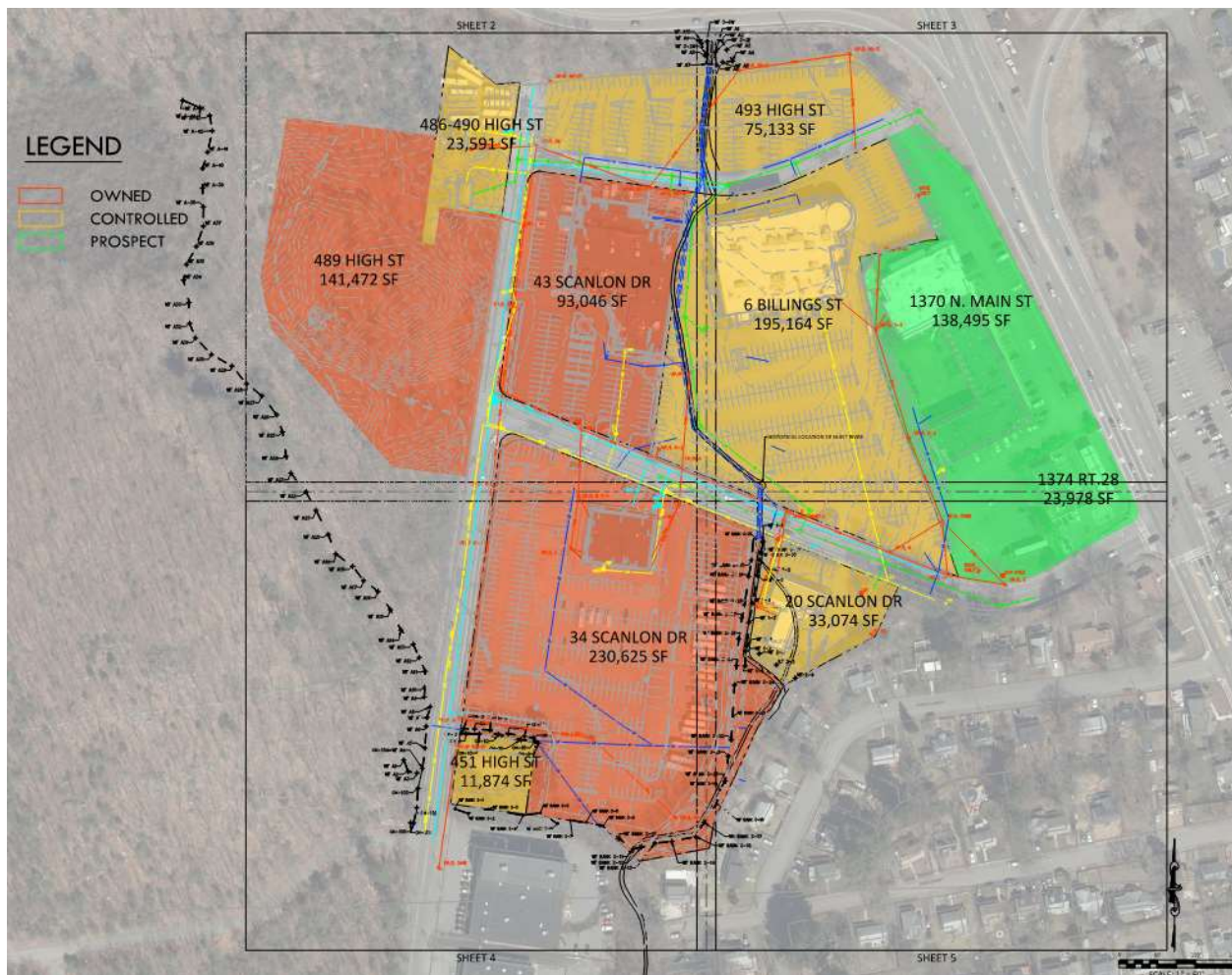
Omeed Mollaian
Vice President – Civil Engineering

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STUDY AREA DESCRIPTION

The Vertex Companies, Inc. (VERTEX) was retained by Core Investments Development, LLC (Core) to conduct a floodplain analysis of development area located at: 34 Scanlon Drive, 43 Scanlon Drive, 489 High Street, 486-490 High Street, 451 High Street, 493 High Street, 6 Billings Street, and 20 Scanlon Drive in Randolph, Massachusetts. The location of the project limits and separation of sites is shown below.

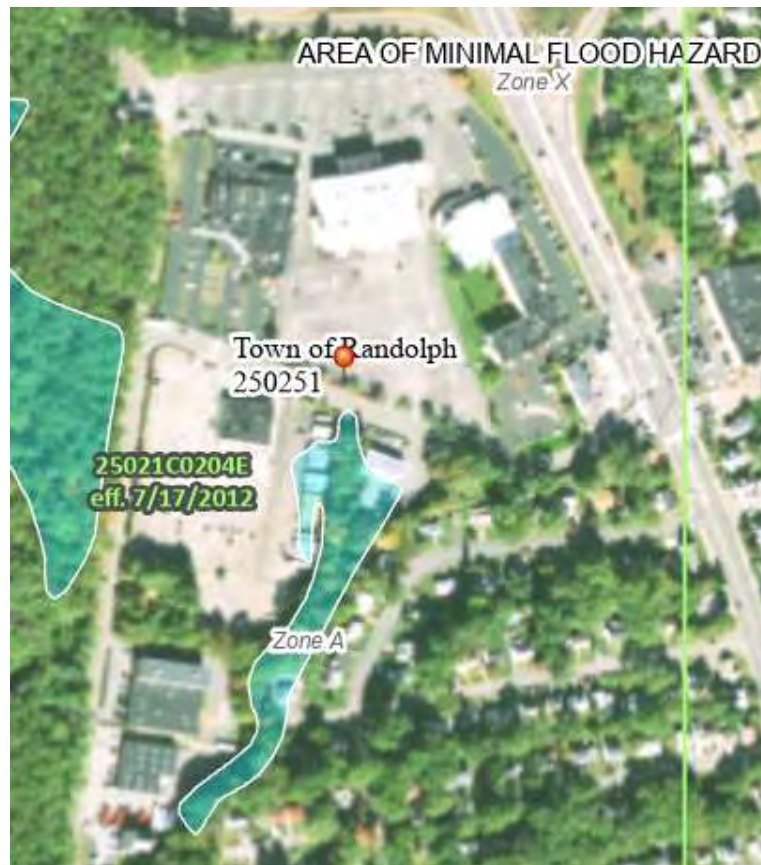


The project site consists of 16 parcels totaling approximately 17.8 acres, improved with several commercial buildings and paved parking lots occupying most of the land.

The purpose of this report is to present the findings of a hydraulic analysis of the Hunt River channel and associated culvert relative to floodplain mapping of the project area.

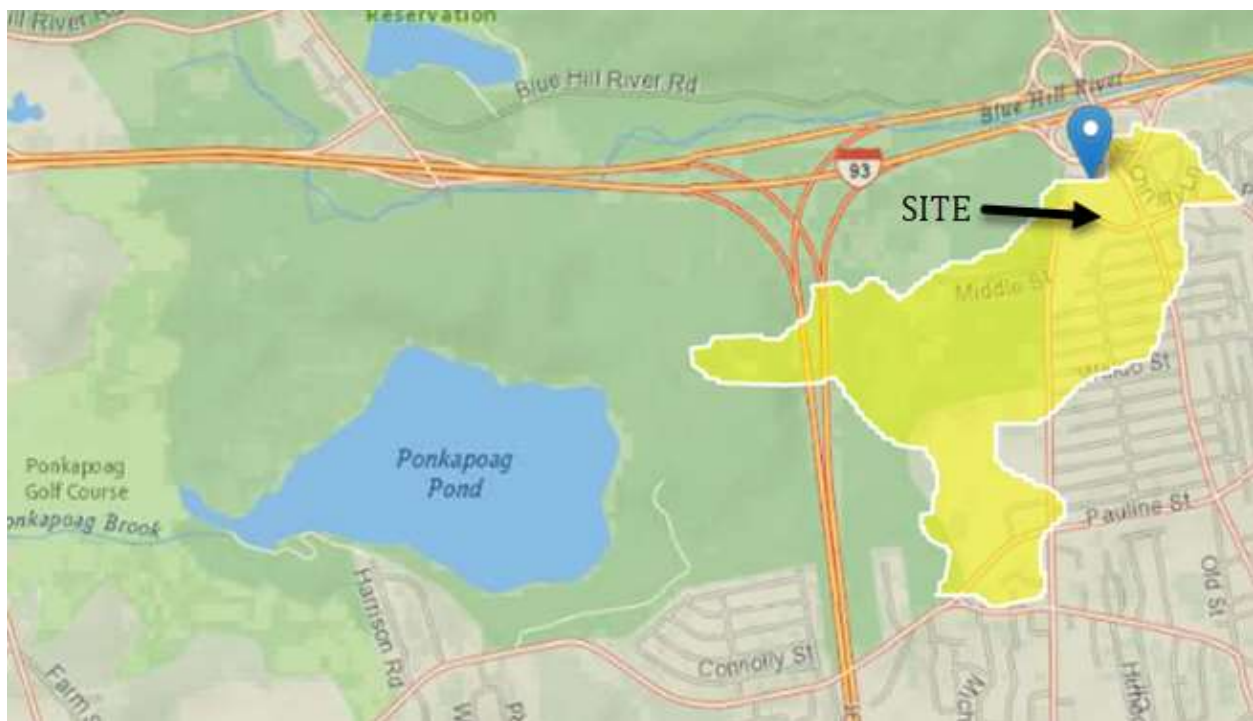
EFFECTIVE FLOODPLAIN

The effective floodplain for the project area is shown of FEMA FIRM map 25021C0204E below dated July 17, 2012. There is a section of floodplain adjacent to a portion of the southern project area as shown below. The shaded area below is noted as Zone A:



HYDROLOGY

Stormwater flows in the area generally flow from the south to north and are fed by a hydrologic basin as shown on the map below in the yellow shaded region. Stormwater in this area is conveyed down to the Hunt River which flows north across the development area. The tributary basin is relatively small covering 0.52 sq miles with a mean elevation of 187 feet.

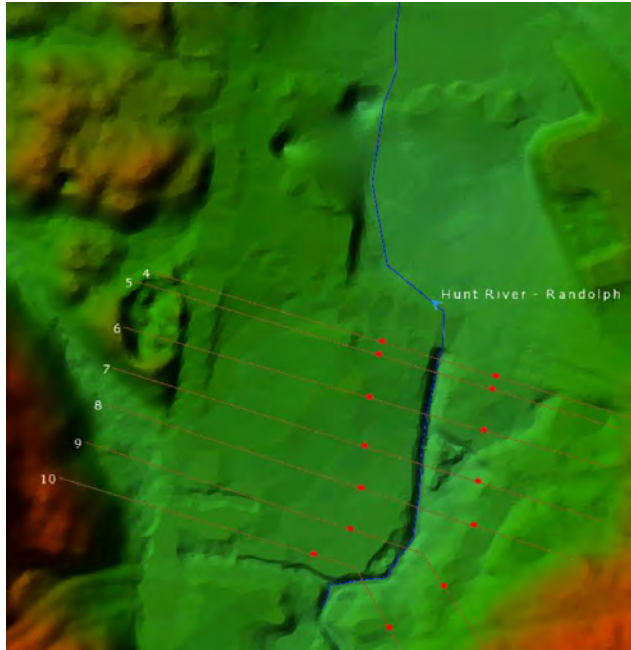


When flows from this basin cross the project area, they have the following return totals:

5 Year	41.6 CFS
10 Year	55.2 CFS
25 Year	75.1 CFS
100 Year	109 CFS

Floodplain analysis and Flood Insurance Rate Maps (FIRM) focus predominately on the 100-year storm event. The associated 109 CFS flow rate was used for our analysis.

HYDRAULICS



The Hunt River travels across the site via an open channel along the east side of the 34 Scanlon Dr parcel, transitioning into an existing box culvert at south side of Scanlon Dr. Survey for the site was used to construct a topographic model of the channel and surrounding area. Using this data, a hydraulic study was conducted to determine the water surface elevation (WSEL) and floodplain boundary surrounding Hunt River for the 100-year storm interval. At Scanlon Dr the channel flows into a 6x5 foot box culvert (W x H) which

conveys flow across the 6 Billings St and 493 High St parcels. A separate analysis was performed to evaluate the culvert capacity for this section. The image below shows the cross sections and flow path that were used.

FINDINGS

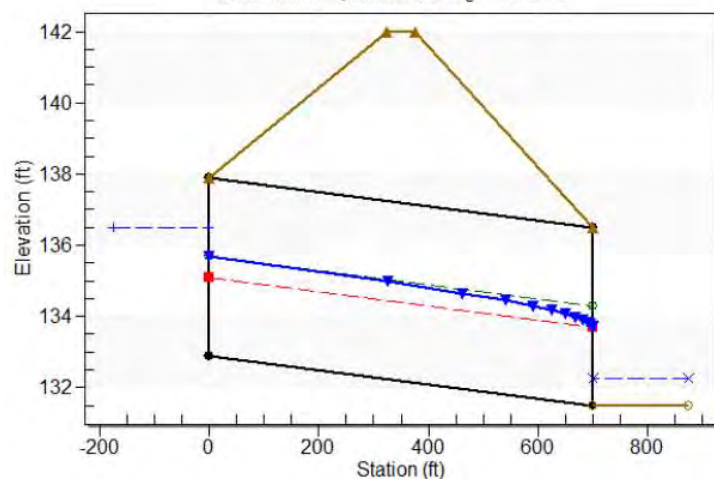
A full-sized set of diagrams and cross sections from our analysis can be found at the end of the report. Based on our analysis, the surveyed channel has capacity to hold a majority of the 100-year storm event. As shown in the image below, based on the available information, a small portion of the 20 Scanlon Dr parcel would be within the floodplain where low lying areas allow some inundation, but a majority is held within the wooded channel area. The approximate base

flood elevation for these sections is 139.1 feet and shown in more detail in the cross sections found in the appendix.



The box culvert that conveys flow north past Scanlon Dr was modeled as well. There is a discrepancy between the design drawings for the culvert showing an invert at 132.9 feet and the survey showing the channel bottom at 136.9 feet. It is possible that survey data is mapping the water surface versus bottom of channel, or sediment buildup has occurred over the years. We have modeled the condition conservatively based on this inconsistency but may be able to reduce the BFE with additional information. There are catch basins across the paved areas that convey surface flows into the box culvert, and this total flow condition was considered. Based on the culvert size, slope, and 100-year storm event flow rates, the culvert flow will be within the design capacity.

Crossing - Crossing 1, Design Discharge - 109.0 cfs
Culvert - Culvert 1, Culvert Discharge - 109.0 cfs



CONSIDERATIONS AND RECOMMENDATIONS

1. The entrance to the culvert should be inspected prior to any development activities. This area needs to be a clear opening and free of any debris. Any buildup of silt/debris would reduce the capacity of the culvert and could raise the BFE.
2. A conditional analysis of the culvert entrance / exit should be conducted to evaluate the condition of the wingwalls, apron and headwall. Particular attention should be taken to any scouring effects behind the wingwalls or under the concrete apron.
3. Based on potential development activities the existing culvert location may conflict with building foundations and require location. The cost of this should be factored into development considerations.
4. Should the existing culvert remain and continue to be used, a CCTV camera should run the full length of the culvert, if not done already, to evaluate the integrity and condition.
5. Generally, if a mortgage is taken out on a parcel with floodplain touching it, it triggers potential flood insurance for any built structures. Based on our evaluation, a FEMA Letter of Map Amendment (LOMA) could be filed to remove this requirement as long as the footprint of the building remains out of the floodplain.
6. The discrepancy between design drawings and survey should not impact our determinations and floodplain mapping. Investigating this further could reduce the BFE that has been calculated.

APPENDIX

Parcel Map

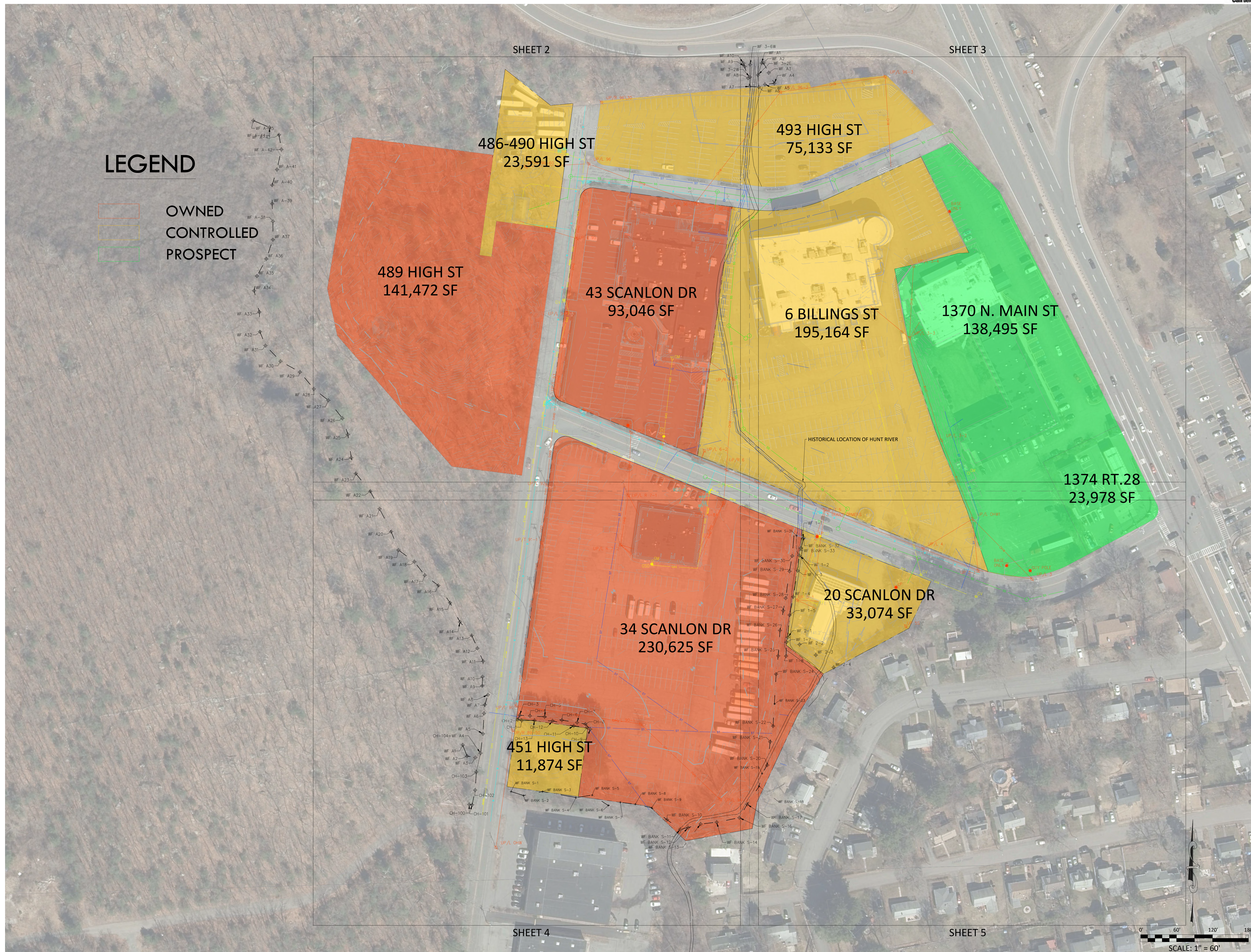


VERTeX[®]
100 North Washington Street, Suite 302 | Boston, MA 02114
Main: 617.275.5407 | VERTEXENG.COM

COMBINED PARCELAGE
SITE: SCANLON DRIVE, BILLINGS STREET AND HIGH STREET
RANDOLPH, MA 02368
FOR: CORE INVESTMENTS, INC.
800 BOYLSTON STREET, 30TH FLOOR
BOSTON, MA 02199

NO.	REVISIONS
1	REVISION 1
2	
3	
4	
5	
6	
7	
8	
9	
10	

DATE: 03/29/2022
DRAWN BY: JL
CHECKED BY: AS
JOB #: 78000



FEMA FIRM Map

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIRM was derived from digital orthophotography. Base map files were provided in digital format by Massachusetts Geographic Information Systems (MassGIS). Ortho imagery was produced at a scale of 1:5,000. Aerial photography is dated April 2005.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

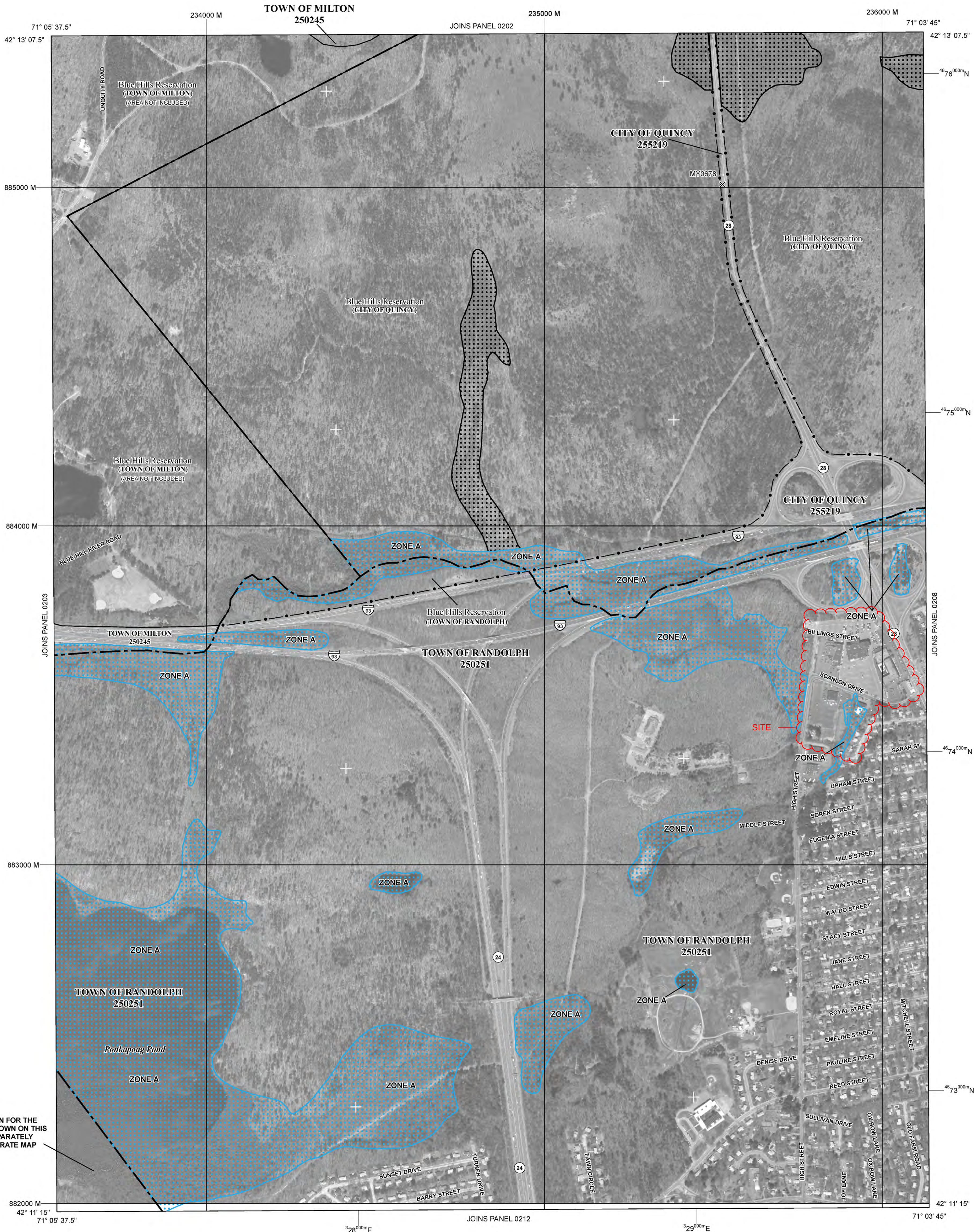
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.

FLOOD HAZARD INFORMATION FOR THE TOWN OF CANTON IS NOT SHOWN ON THIS MAP. PLEASE REFER TO SEPARATELY PRINTED FLOOD INSURANCE RATE MAP FOR THE TOWN OF CANTON.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently derelictified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- Culvert
- Bridge
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 4989000 M
- 1000-meter ticks: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection
- 1000-meter Universal Transverse Mercator grid values, zone 19N
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- River Mile
- MAP REPOSITORIES
- Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
- July 17, 2012
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 500'
250 0 500 1000
150 0 150 300
FEET
METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0204E
FIRM
FLOOD INSURANCE RATE MAP
NORFOLK COUNTY,
MASSACHUSETTS
(ALL JURISDICTIONS)
PANEL 204 OF 430
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MILTON, TOWN OF	250245	0204	E
QUINCY, CITY OF	255219	0204	E
RANDOLPH, TOWN OF	250251	0204	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25021C0204E
EFFECTIVE DATE
JULY 17, 2012
Federal Emergency Management Agency

FEMA Firmette

National Flood Hazard Layer FIRMMette



71°4'13"W 42°12'18"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000 71°3'36"W 42°11'51"N
Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



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

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

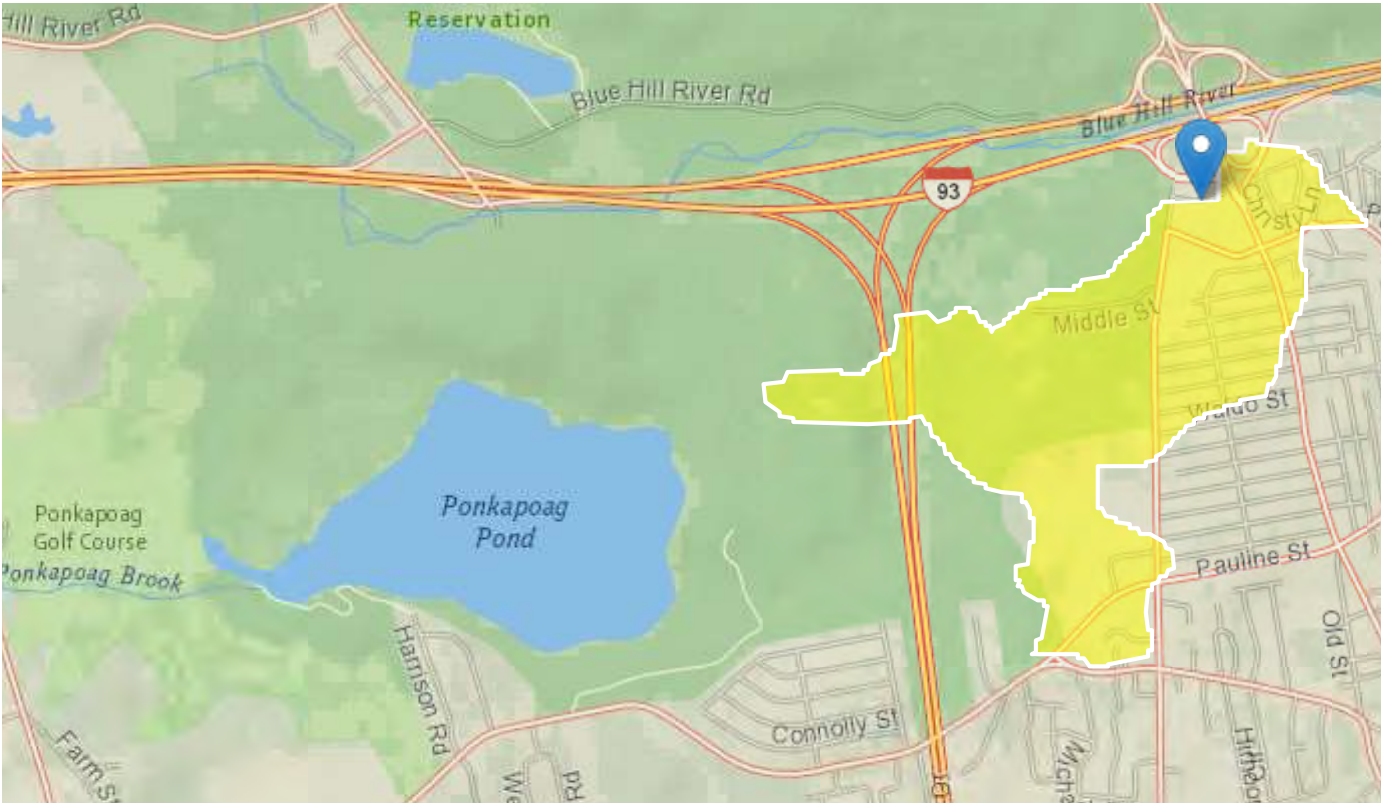
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/9/2022 at 7:17 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Hydrology - Stream Stats Report

StreamStats Report

Region ID: MA
Workspace ID: MA20220607164531827000
Clicked Point (Latitude, Longitude): 42.20257, -71.06521
Time: 2022-06-07 10:45:52 -0600



 Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.52	square miles
ELEV	Mean Basin Elevation	187	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	3.9	percent

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.52	square miles	0.16	512
ELEV	Mean Basin Elevation	187	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	3.9	percent	0	32.3

Peak-Flow Statistics Flow Report [Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	ASEp
50-percent AEP flood	24.7	ft ³ /s	12.5	48.9	42.3
20-percent AEP flood	41.6	ft ³ /s	20.7	83.7	43.4
10-percent AEP flood	55.2	ft ³ /s	26.8	114	44.7
4-percent AEP flood	75.1	ft ³ /s	35.1	161	47.1
2-percent AEP flood	91.6	ft ³ /s	41.5	202	49.4
1-percent AEP flood	109	ft ³ /s	47.8	249	51.8
0.5-percent AEP flood	129	ft ³ /s	54.8	304	54.1
0.2-percent AEP flood	157	ft ³ /s	63.6	388	57.6

Peak-Flow Statistics Citations

Zarriello, P.J., 2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 99 p. (<https://dx.doi.org/10.3133/sir20165156>)

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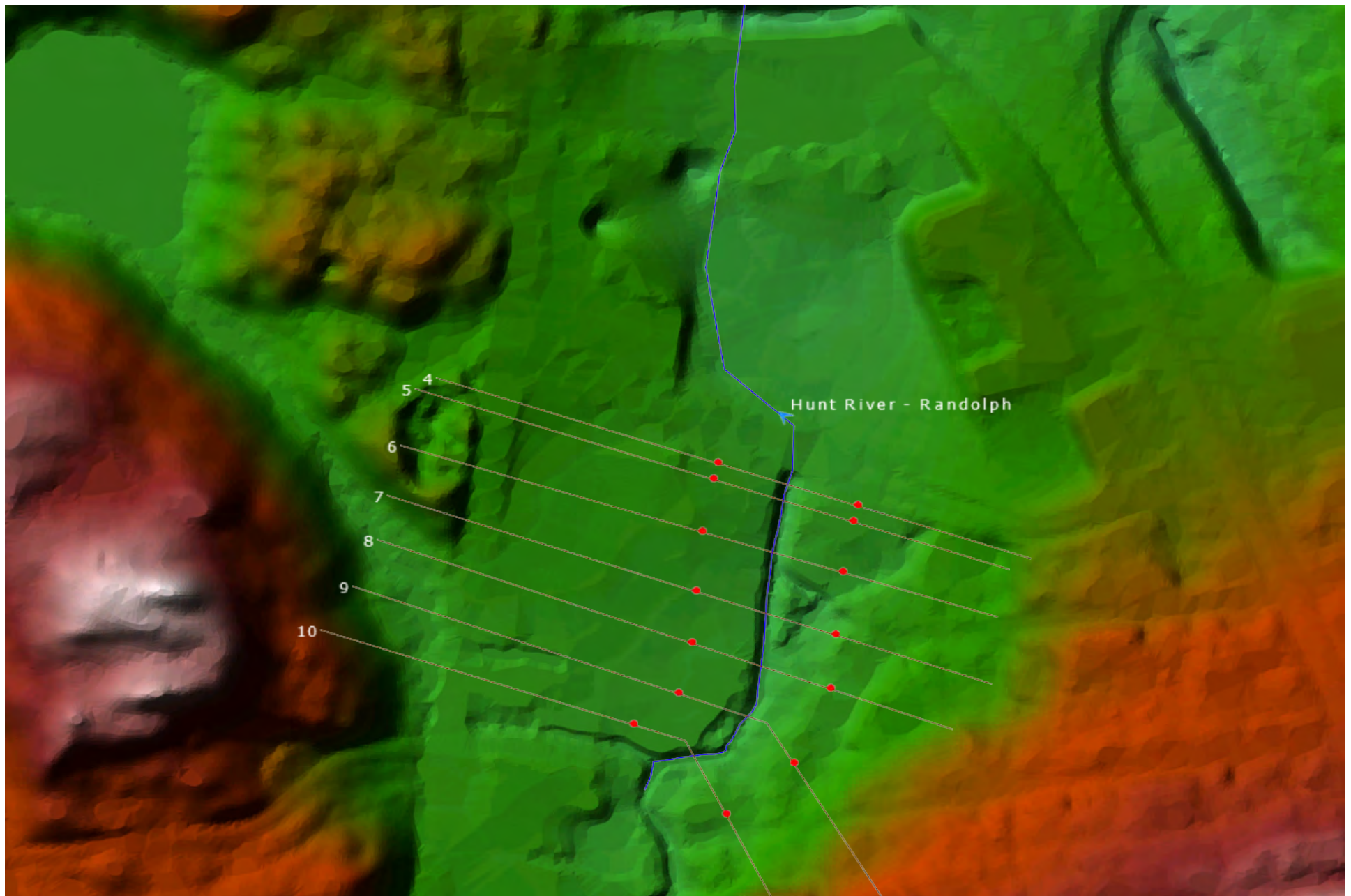
Application Version: 4.9.0

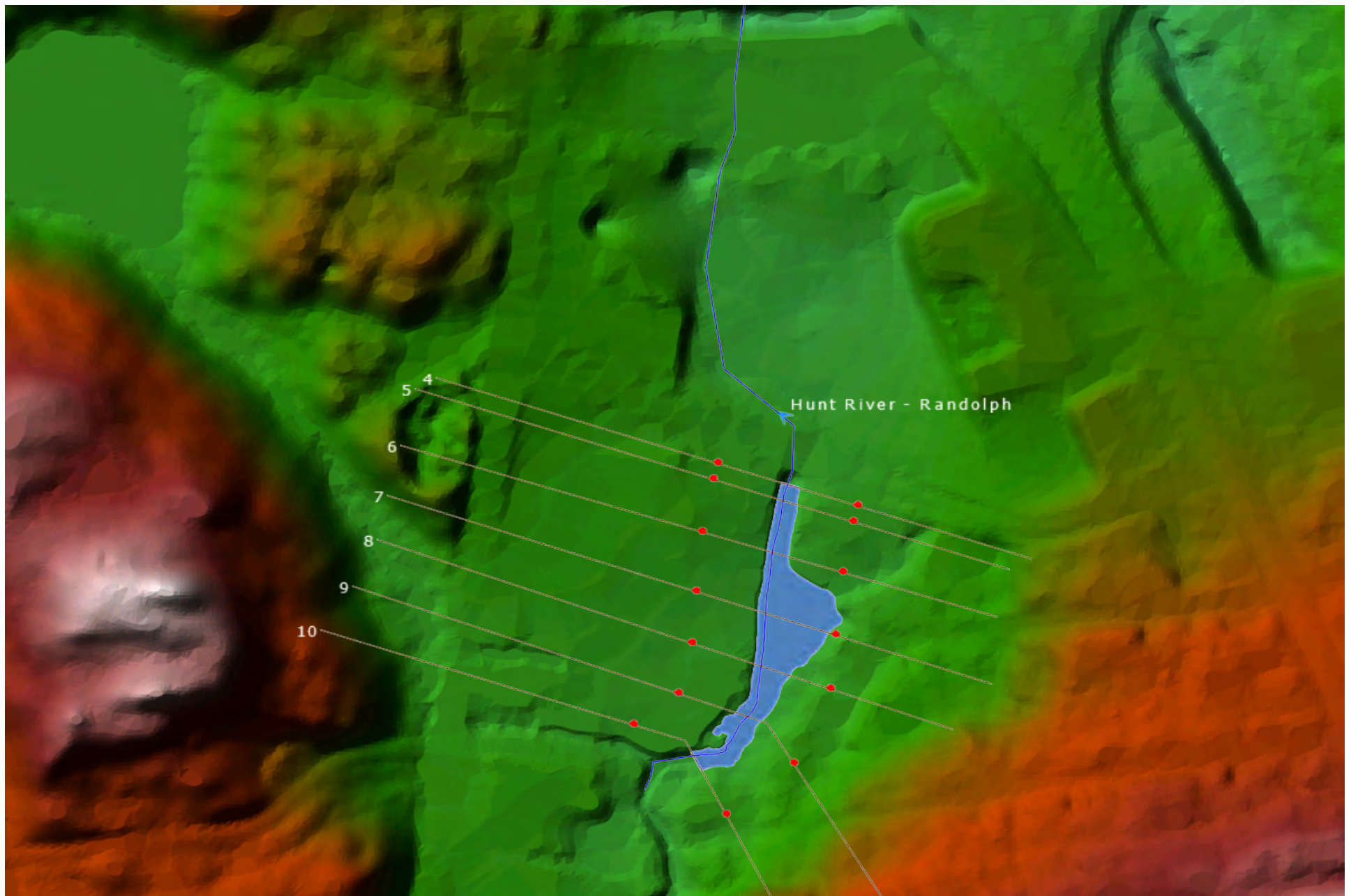
StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.0

Hydraulics - Modeling Maps





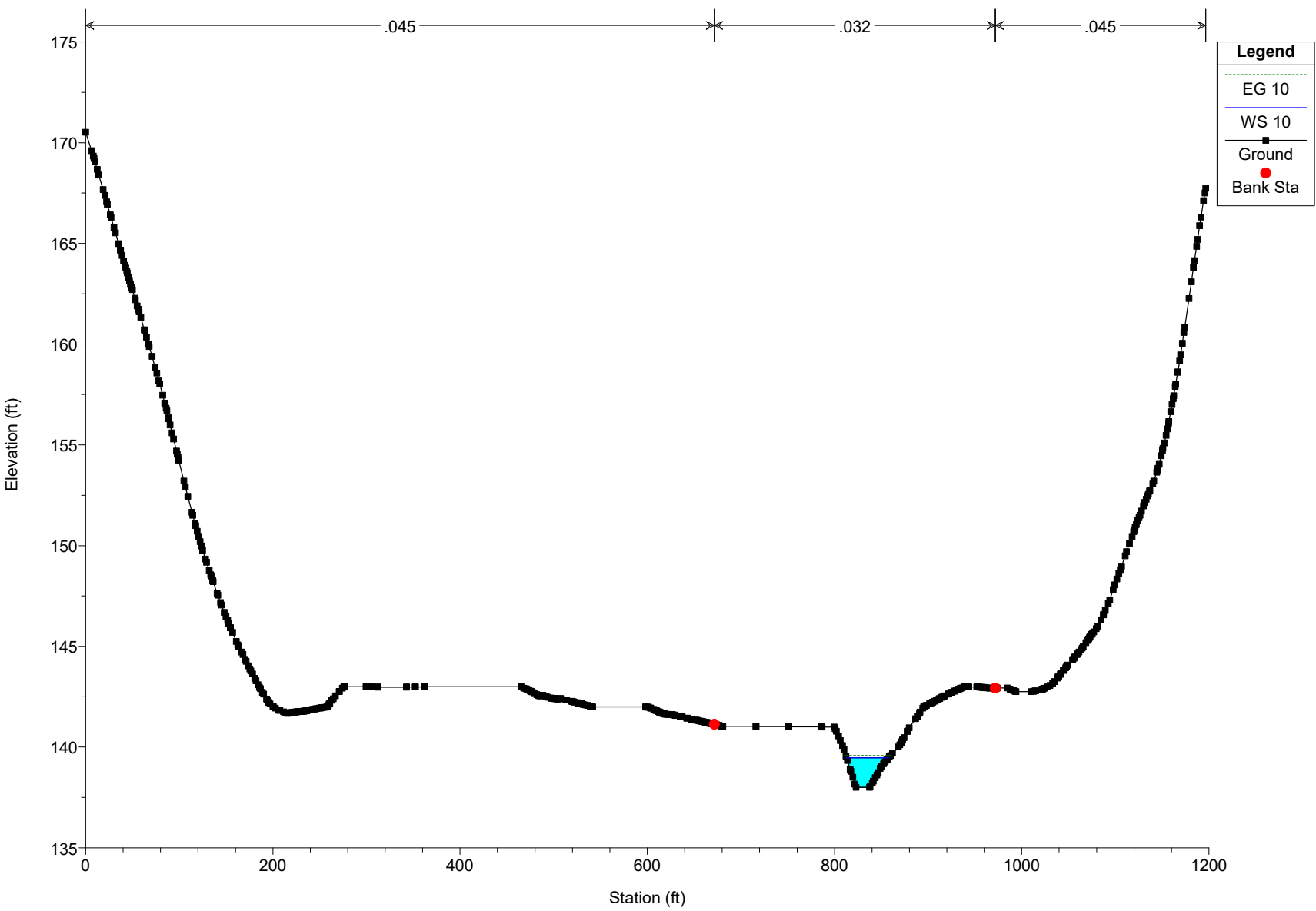


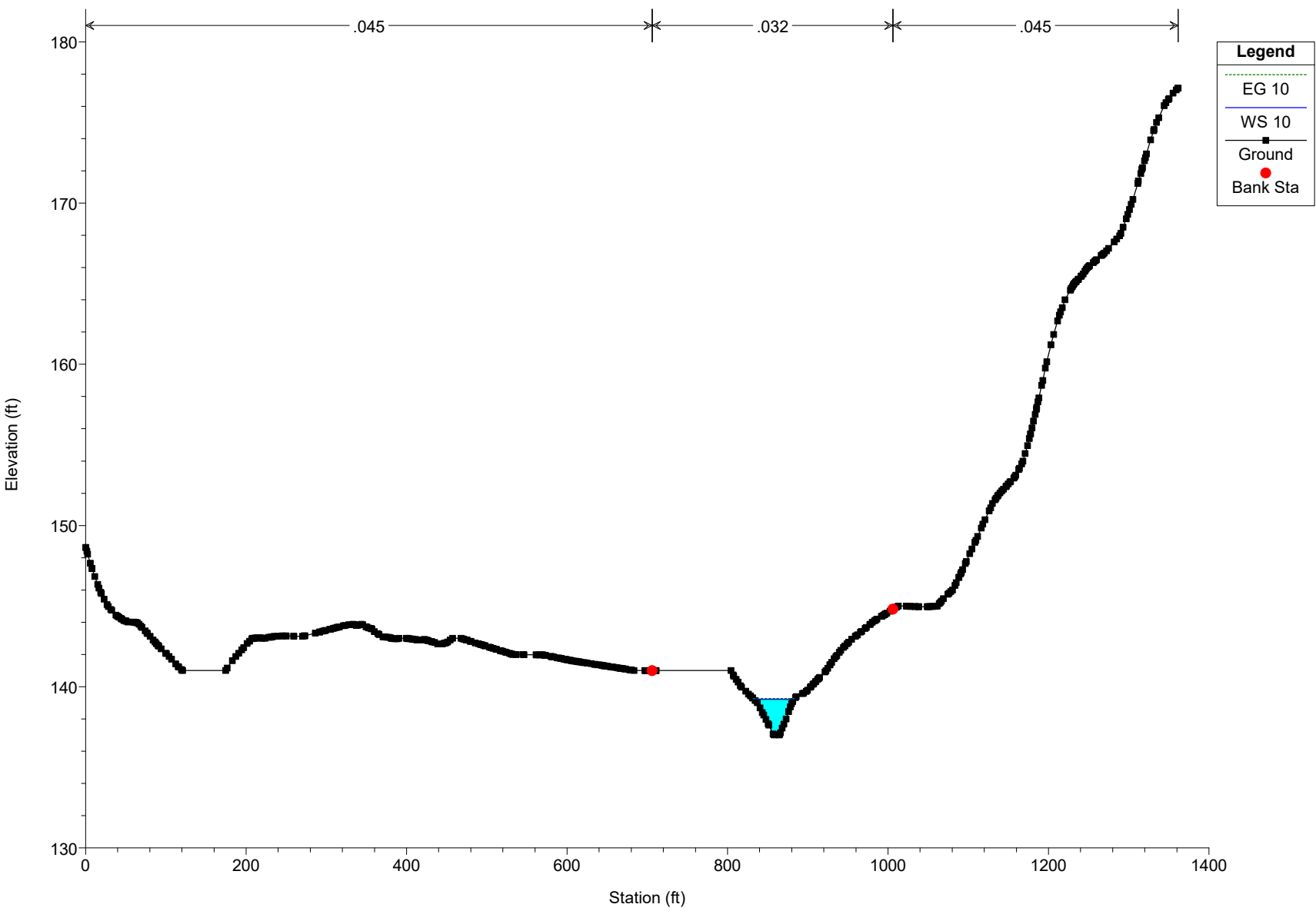


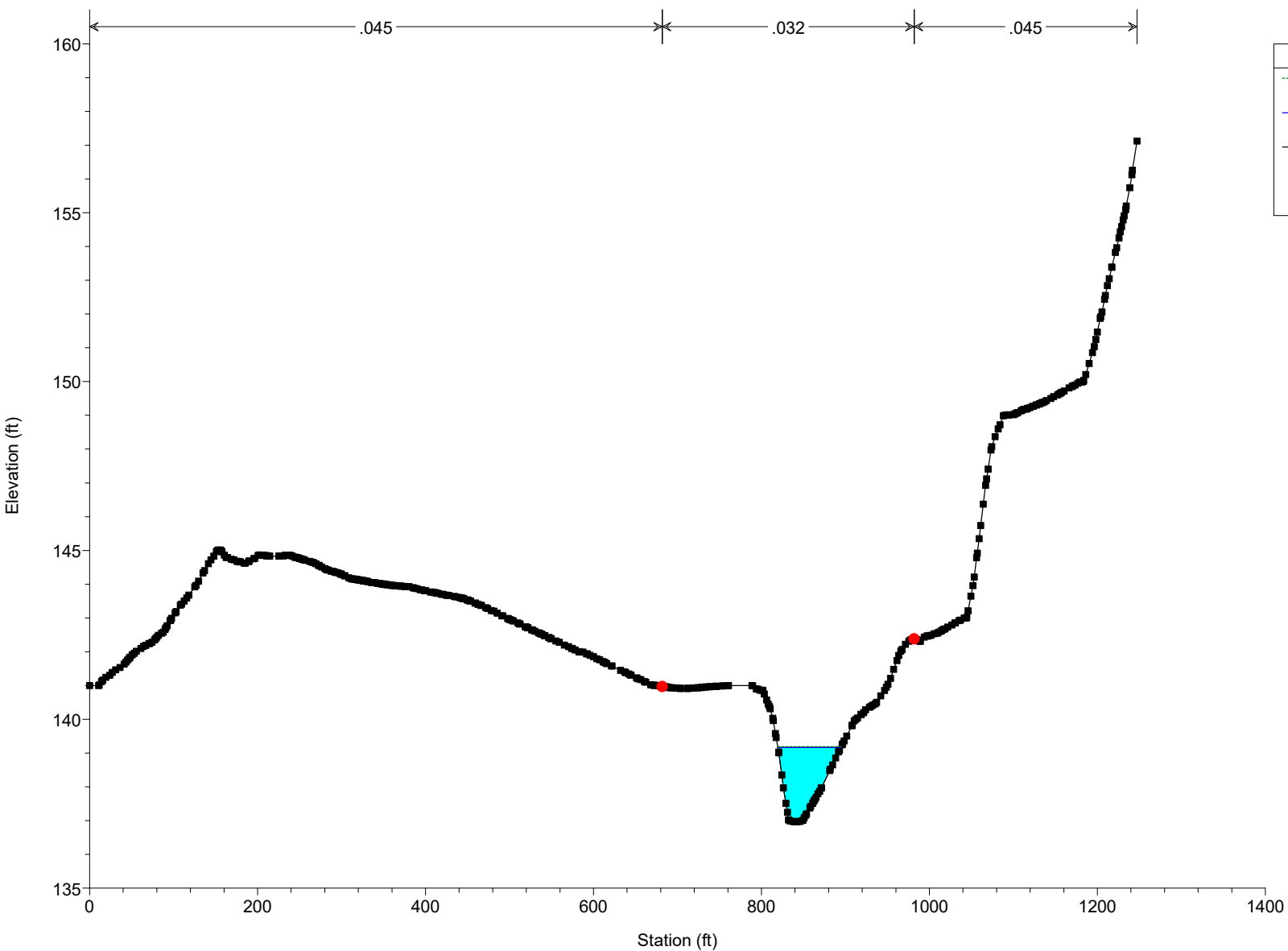
Hydraulics – Cross Sections

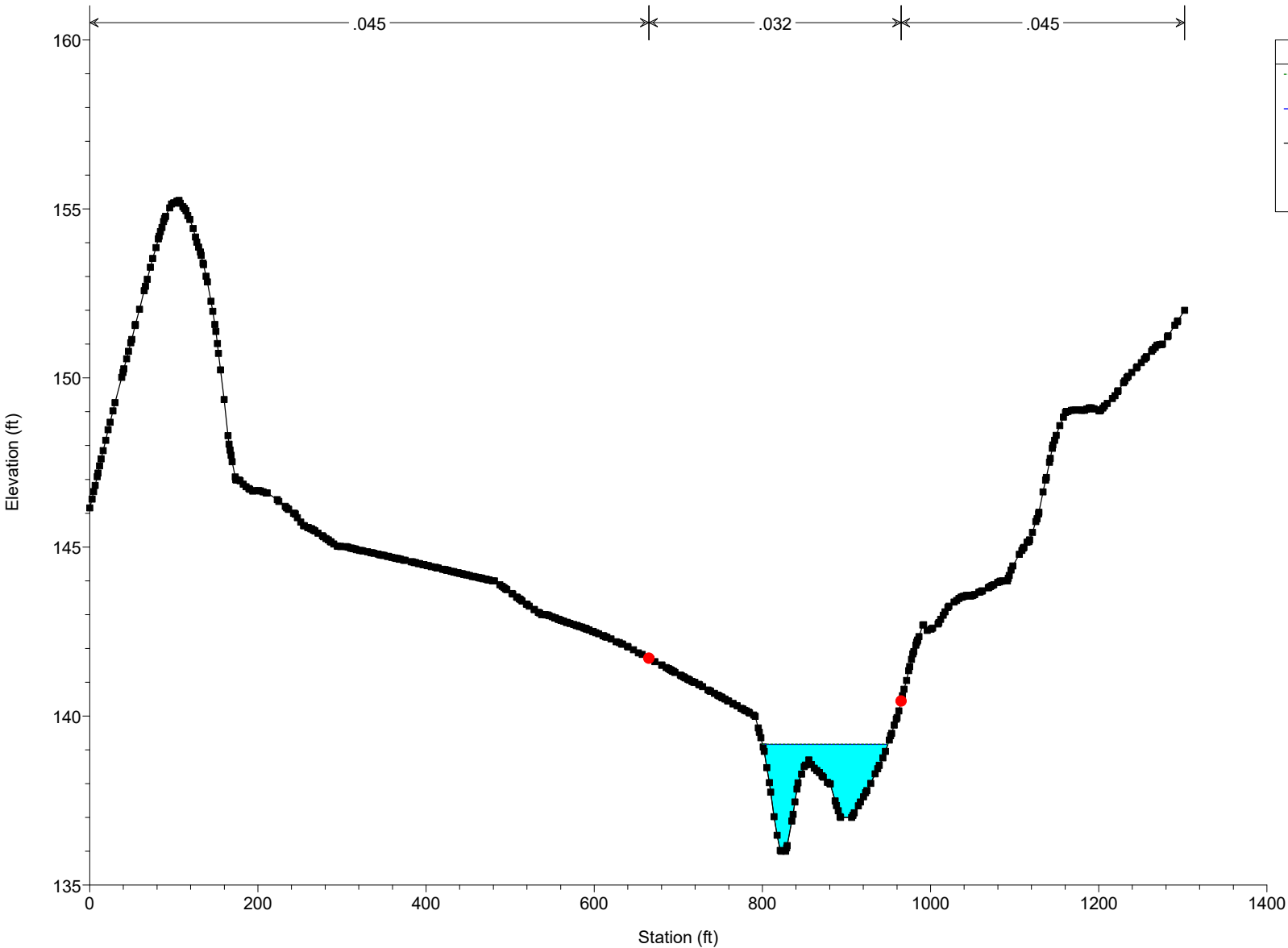
HEC-RAS Plan: Default Scenario River: Hunt River Reach: Randolph Profile: 10

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
Randolph	10	10	109.00	138.00	139.47		139.58	0.003248	2.55	42.67	44.84	0.46
Randolph	9	10	109.00	137.00	139.22		139.27	0.001189	1.80	60.41	50.26	0.29
Randolph	8	10	109.00	136.96	139.17		139.19	0.000349	1.06	102.41	75.12	0.16
Randolph	7	10	109.00	136.00	139.16		139.17	0.000071	0.50	217.25	148.94	0.07
Randolph	6	10	109.00	136.00	139.11		139.14	0.000432	1.42	76.67	42.35	0.19
Randolph	5	10	109.00	136.00	139.06		139.09	0.000446	1.48	73.63	39.09	0.19
Randolph	4	10	109.00	136.90	138.98	138.05	139.06	0.001458	2.19	49.66	35.73	0.33

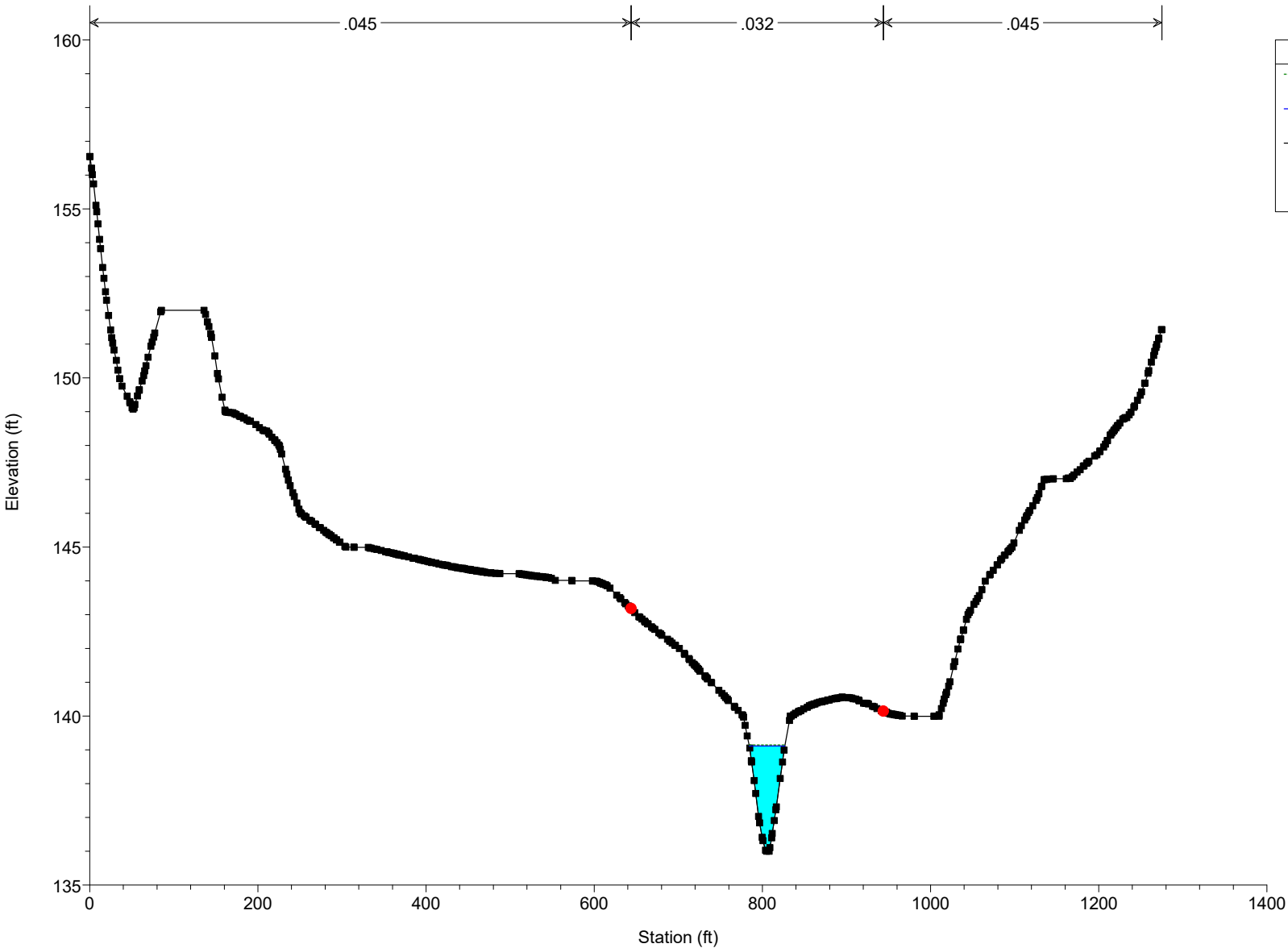






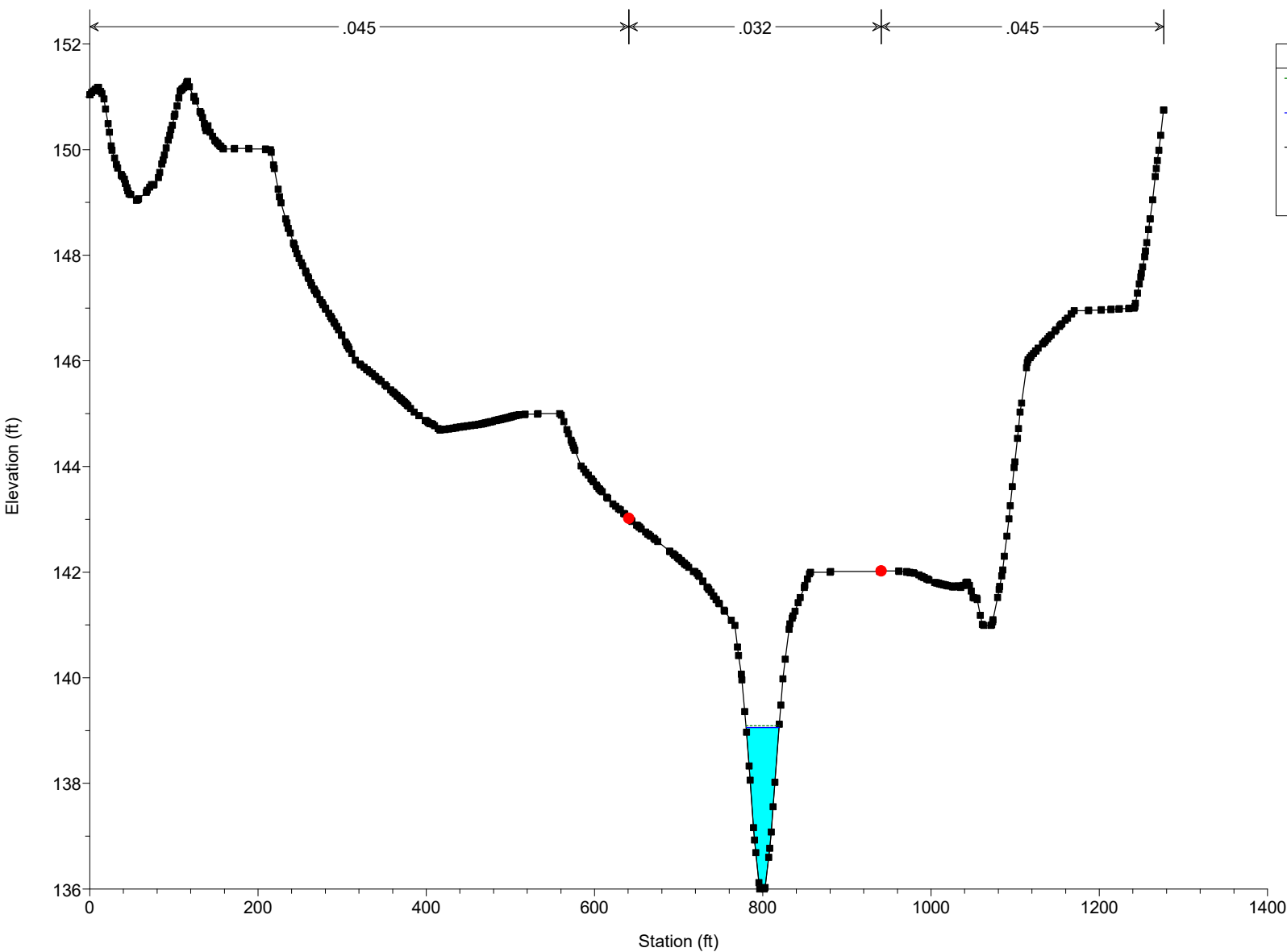


- Legend**
- EG 10
 - WS 10
 - Ground
 - Bank Sta

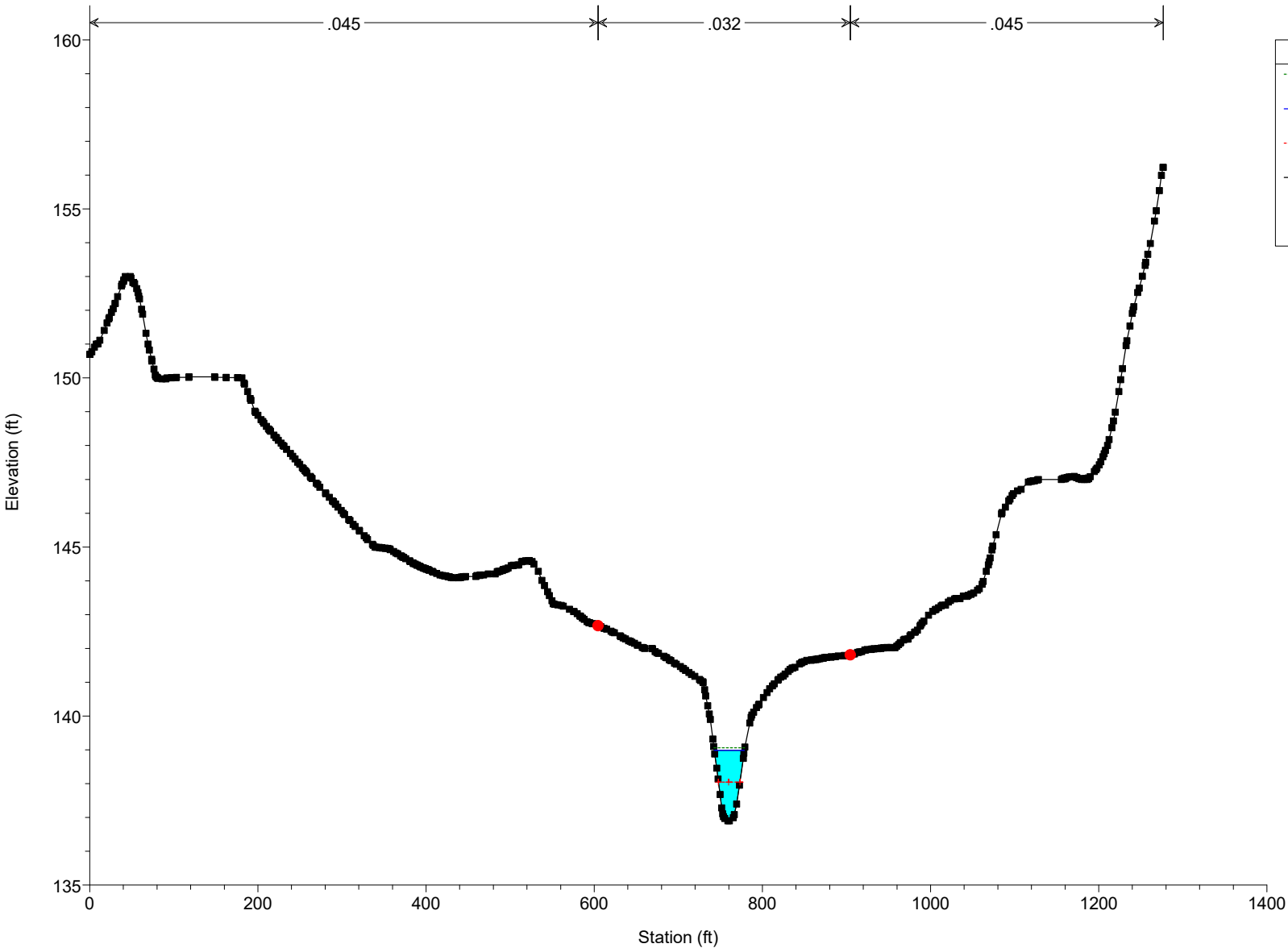


Legend

- EG 10
- WS 10
- Ground
- Bank Sta



Legend	
EG 10	
WS 10	
Ground	
Bank Sta	



Legend

- EG 10
- WS 10
- Crit 10
- Ground
- Bank Sta

Hydraulics – Culvert Analysis

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 109 cfs

Design Flow: 109 cfs

Maximum Flow: 109 cfs

Table 1 - Summary of Culvert Flows at Crossing: Crossing 1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
136.47	109.00	109.00	0.00	1
142.00	308.89	308.89	0.00	Overtopping

Rating Curve Plot for Crossing: Crossing 1

Total Rating Curve

Crossing: Crossing 1

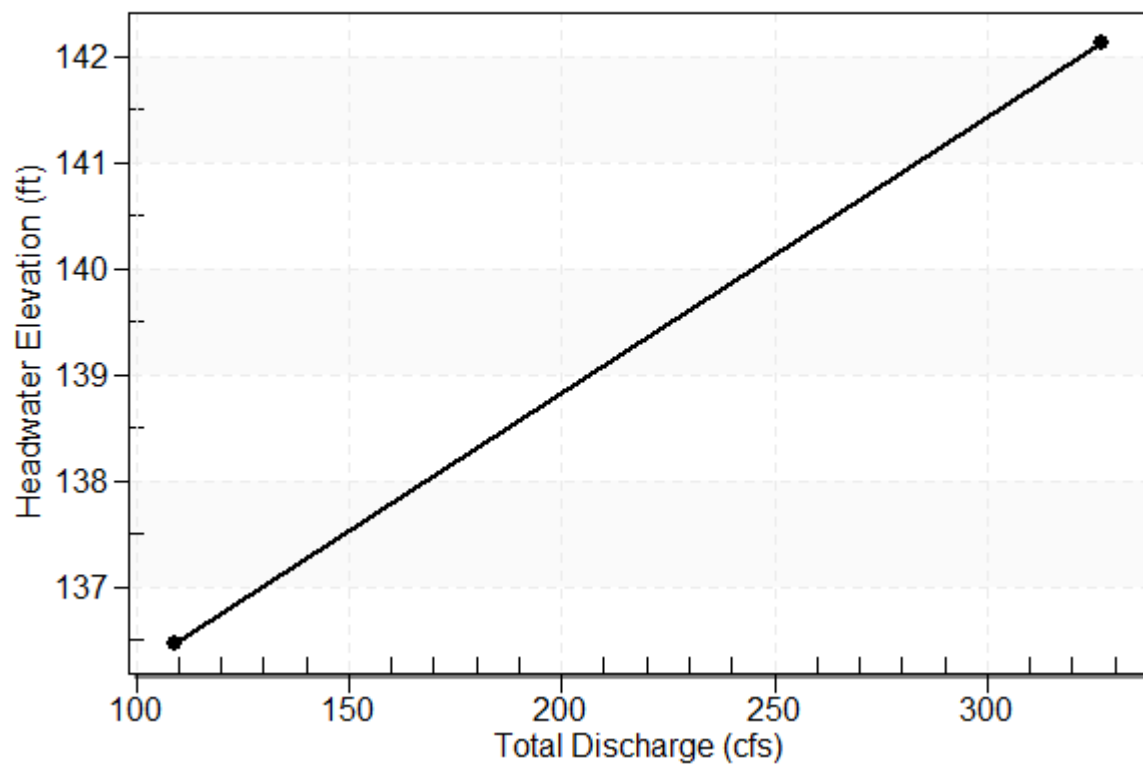


Table 2 - Culvert Summary Table: Culvert 1

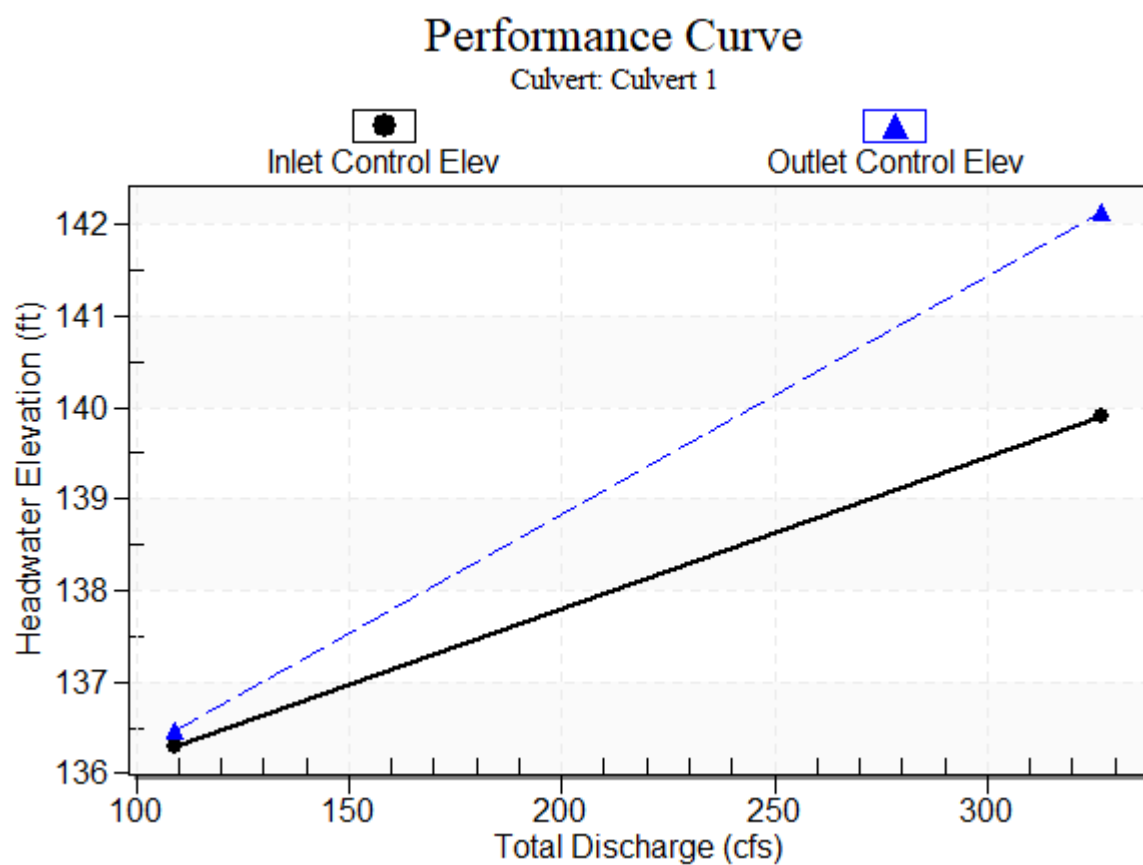
[illegible]

Straight Culvert

Inlet Elevation (invert): 132.90 ft, Outlet Elevation (invert): 131.50 ft

Culvert Length: 700.00 ft, Culvert Slope: 0.0020

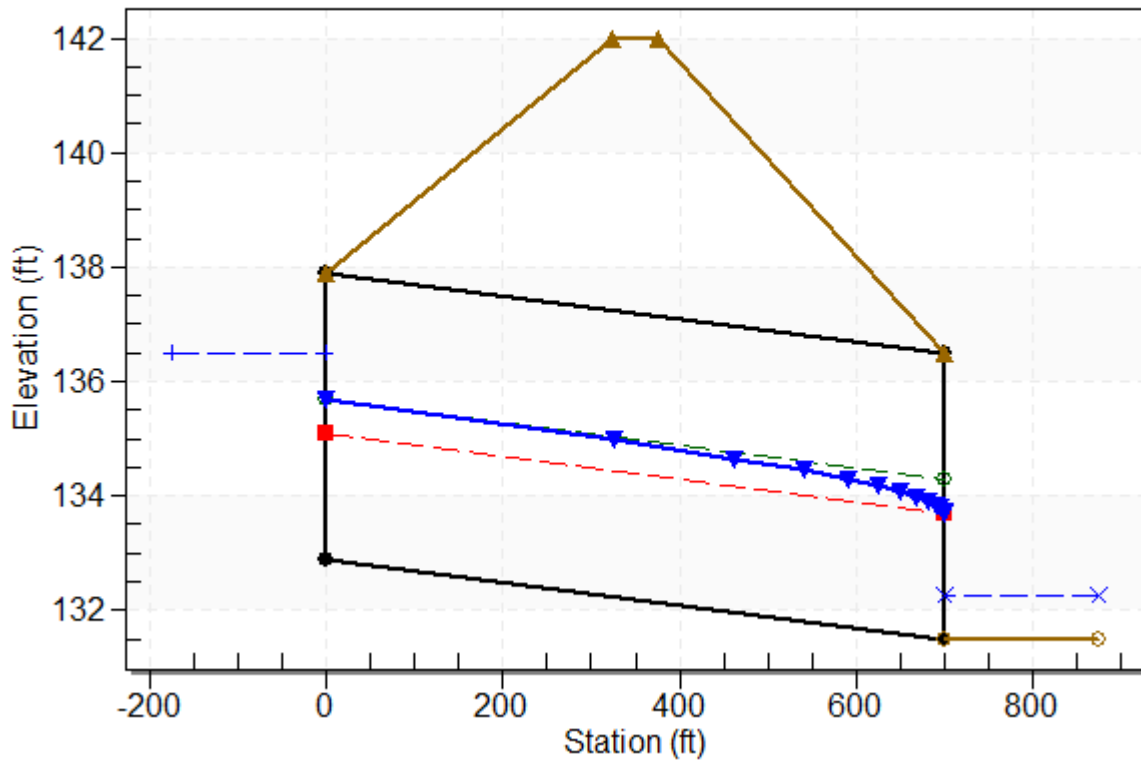
Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1

Crossing - Crossing 1, Design Discharge - 109.0 cfs

Culvert - Culvert 1, Culvert Discharge - 109.0 cfs



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 132.90 ft

Outlet Station: 700.00 ft

Outlet Elevation: 131.50 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: 1.5:1 Bevel (90°) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Crossing 1)

[illegible]

Tailwater Channel Data - Crossing 1

Tailwater Channel Option: Rectangular Channel

Bottom Width: 50.00 ft

Channel Slope: 0.0050

Channel Manning's n: 0.0300

Channel Invert Elevation: 131.50 ft

Roadway Data for Crossing: Crossing 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1.00 ft

Crest Elevation: 142.00 ft

Roadway Surface: Paved

Roadway Top Width: 50.00 ft

Hydraulics – HEC-RAS Report

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

```
X X XXXXXX XXXX XXXX XX XXXX
X X X X X X X X X
X X X X X X X X X
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: HEC-RAS Model
Project File : Randolph Floodplain Analysis.prj
Run Date and Time: 6/9/2022 3:10:55 PM

Project in English units

Project Description:

CRS Info=<SpatialReference> <CoordinateSystem WKT="PROJCS["WGS 84 / World
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HORITY["EPSG","6326"]],PRIMEM["Greenwich",0,AUTHOR
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H]]" AcadCode="" /> <Registration OffsetX="0" OffsetY="0" OffsetZ="0"
ScaleX="1" ScaleY="1" ScaleZ="1" /></SpatialReference>

PLAN DATA

Plan Title: Default Scenario

Plan File : Z:\Shared\Projects\78000-78999\78000-78099\78000.Randolph - Site Development -
MA\05-Engineering\Vertex Models\Floodplain Analysis\Randolph Floodplain Analysis.p01

Geometry Title: Default Geometry

Geometry File : Z:\Shared\Projects\78000-78999\78000-78099\78000.Randolph - Site Development -
MA\05-Engineering\Vertex Models\Floodplain Analysis\Randolph Floodplain Analysis.g01

Flow Title : Default Steady Flow

Flow File : Z:\Shared\Projects\78000-78999\78000-78099\78000.Randolph - Site Development -
MA\05-Engineering\Vertex Models\Floodplain Analysis\Randolph Floodplain Analysis.f01

Plan Description:
Default Scenario

Plan Summary Information:

Number of: Cross Sections = 7 Multiple Openings = 0
Culverts = 0 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 = 0.33
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: Default Steady Flow

Flow File : Z:\Shared\Projects\78000-78999\78000-78099\78000.Randolph - Site Development -
MA\05-Engineering\Vertex Models\Floodplain Analysis\Randolph Floodplain Analysis.f01

Flow Data (cfs)

River	Reach	RS	10
Hunt River	Randolph	10	109

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Hunt River	Randolph	10		Normal S = 0.001458

GEOMETRY DATA

Geometry Title: Default Geometry

Geometry File : Z:\Shared\Projects\78000-78999\78000-78099\78000.Randolph - Site Development -
MA\05-Engineering\Vertex Models\Floodplain Analysis\Randolph Floodplain Analysis.g01

CROSS SECTION

RIVER: Hunt River
REACH: Randolph RS: 10

INPUT

Description:

Station Elevation Data num= 491

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	170.52	6.19	169.6	8.12	169.33	8.9	169.21	10.11	169.04
12.38	168.68	14.05	168.4	18.57	167.67	20.39	167.38	22.29	167.06
23.08	166.94	26.23	166.42	27.02	166.3	30.17	165.78	31.74	165.53
35.18	164.99	37.14	164.67	37.26	164.66	38.83	164.4	40.59	164.12
41.98	163.91	42.77	163.78	43.8	163.63	44.34	163.54	45.92	163.3
46.71	163.17	47.86	163	49.07	162.81	49.86	162.7	52.61	162.28
53.01	162.21	55.02	161.9	56.16	161.73	56.94	161.6	58.8	161.32
62.65	160.72	63.04	160.65	64.99	160.35	67.18	160	67.93	159.89
71.07	159.39	74.27	158.83	75.88	158.57	78.21	158.17	79.09	158.03
82.29	157.47	84.51	157.07	84.84	157.02	85.89	156.82	86.65	156.69
88.45	156.34	88.71	156.3	90.31	155.99	92.39	155.6	93.96	155.29
97.11	154.7	97.9	154.54	98.69	154.4	99.47	154.24	104.99	153.2
106.56	152.91	109.13	152.45	113.65	151.65	114.37	151.51	116.8	151.11
117.58	150.99	119.16	150.71	120.69	150.46	122.39	150.2	123.78	149.98
124.98	149.78	128.15	149.33	129.21	149.17	132.02	148.77	133.62	148.55
134.13	148.49	135.7	148.28	136.16	148.21	140.43	147.64	141.22	147.54
144	147.17	144.85	147.05	148.06	146.69	149.88	146.49	151.63	146.28
152.87	146.12	153.03	146.11	154.56	145.93	154.73	145.92	156.97	145.69
160.89	145.24	162.48	145.07	163.01	145	166.42	144.72	167.99	144.6
170.41	144.35	171.47	144.25	173.58	144.03	175.33	143.88	176.39	143.78
178.23	143.63	180.59	143.41	182.03	143.29	184.14	143.09	185.67	142.96
186.56	142.9	188.77	142.72	190.05	142.63	193.2	142.39	193.98	142.34
195.56	142.22	196.82	142.14	199.99	142.01	200.28	142.01	202.65	141.93
205.81	141.85	206.33	141.83	207.41	141.82	211.31	141.75	213.72	141.7
215.25	141.68	216.04	141.68	218.4	141.72	220.24	141.72	220.76	141.73
222.34	141.73	222.81	141.74	224.29	141.74	224.7	141.75	226.4	141.75
226.66	141.76	228.64	141.76	229	141.77	230.63	141.77	231	141.78
232.74	141.78	233.07	141.79	234.85	141.79	234.94	141.8	236.28	141.8
238.28	141.84	238.87	141.84	242.03	141.88	244.39	141.89	244.47	141.9
246.75	141.91	249.64	141.94	250.72	141.94	252.26	141.96	254.63	141.97
257.04	141.99	258.09	142.01	259.15	142.07	260.14	142.14	260.93	142.18
263.04	142.32	264.43	142.4	266.76	142.55	270.77	142.75	271.17	142.76
274.32	142.92	275.89	142.99	276.38	143	299.52	143	300.17	142.99
305.82	142.99	306.36	142.98	311.97	142.98	312.12	142.97	342.61	142.97
342.83	142.98	352.12	142.98	352.29	142.99	361.63	142.99	361.74	143
465.16	143	468.06	142.93	470.47	142.9	471.5	142.88	472.78	142.84
473.47	142.83	475.15	142.78	475.93	142.77	476.89	142.74	479.09	142.69
482.06	142.61	484.17	142.56	484.91	142.55	486.17	142.55	486.29	142.56
487.75	142.56	488.54	142.57	492.03	142.51	494.05	142.47	496.85	142.44
497.74	142.42	498.96	142.42	499.35	142.41	500.95	142.41	501.08	142.4
502.71	142.4	503.19	142.39	505.08	142.39	505.3	142.4	506.65	142.4
507.51	142.41	512.95	142.34	513.74	142.34	518.6	142.28	519.88	142.26
521.15	142.25	522.21	142.23	525.37	142.2	526.34	142.18	527.13	142.18
528.22	142.16	529.6	142.15	531.43	142.12	533.83	142.1	536.24	142.07
538.94	142.03	539.45	142.03	541.55	142	598.27	142	598.8	141.99
600.4	141.99	601.44	141.98	603.44	141.94	603.61	141.93	606.82	141.87
608.42	141.83	609.82	141.81	611.4	141.77	612.72	141.75	613.24	141.73
614.12	141.72	616.23	141.67	618.05	141.65	619.27	141.63	621.26	141.63
621.51	141.62	626.07	141.62	627.15	141.6	628.91	141.59	629.96	141.57
635.24	141.52	636.6	141.5	637.39	141.5	642.11	141.44	642.9	141.44
646.84	141.39	647.63	141.39	651.56	141.34	652.35	141.34	654.26	141.32
655.32	141.3	657.08	141.29	658.15	141.27	659.75	141.26	661.8	141.23
662.71	141.23	663.77	141.21	664.57	141.21	666.53	141.18	667.32	141.18
668.42	141.16	670.11	141.15	671.25	141.13	671.74	141.13	672.04	141.13

674.19 141.1 676.77 141.08 679 141.05 679.62 141.05 680.61 141.03
 715.89 141.03 716.15 141.02 750.8 141.02 751.18 141.01 786.23 141.01
 786.71 141 799.59 141 800.71 140.91 801.82 140.79 804.19 140.55
 806.17 140.32 808.44 140.08 809.98 139.88 812.22 139.55 813.71 139.34
 816.7 138.9 817.45 138.8 819.49 138.5 821.68 138.16 822.98 138
 837.46 138 837.96 138.03 840.23 138.21 841.35 138.31 843.54 138.48
 845.26 138.62 846.59 138.74 848.6 138.94 849.71 139.03 850.33 139.06
 852.28 139.18 853.86 139.26 855.28 139.35 856.31 139.4 858.4 139.52
 859.74 139.58 861.96 139.7 868.26 140.01 869.77 140.12 871.25 140.24
 872.02 140.29 872.75 140.36 874.14 140.47 877.56 140.77 877.98 140.8
 879.78 140.96 886.47 141.41 888.44 141.53 890.68 141.68 891.43 141.74
 894.26 141.94 895.38 142.01 896.49 142.03 897.41 142.06 898.15 142.07
 901.54 142.16 903.17 142.19 904.13 142.22 904.88 142.23 906.93 142.28
 908.74 142.33 909.86 142.35 911.6 142.4 912.35 142.41 914.59 142.47
 915.34 142.48 916.83 142.52 917.86 142.54 921.32 142.63 922.06 142.64
 925.05 142.72 925.45 142.72 927.68 142.78 928.04 142.78 929.9 142.83
 931.78 142.86 932.53 142.88 934.02 142.9 934.77 142.92 936.26 142.94
 938.5 142.99 939.25 143 942.99 143 943.27 142.99 951.95 142.99
 952.18 142.98 954.41 142.98 954.94 142.97 957.21 142.97 957.75 142.96
 960.17 142.96 960.58 142.95 962.2 142.94 965.54 142.94 965.95 142.93
 971.74 142.93 973.34 142.93 973.63 142.94 984.45 142.94 987.64 142.87
 988.9 142.85 991.13 142.8 993.08 142.77 993.83 142.75 1010.29 142.75
 1012.53 142.77 1014.03 142.79 1014.77 142.79 1021.51 142.88 1022.25 142.88
 1023 142.9 1024.55 142.92 1027.49 142.98 1030.04 143.06 1033.07 143.17
 1034.97 143.26 1037.97 143.43 1038.72 143.48 1039.56 143.52 1041.16 143.61
 1041.71 143.65 1044.49 143.8 1044.7 143.82 1046.95 143.94 1047.69 143.99
 1049.19 144.07 1054.28 144.33 1054.5 144.35 1055.92 144.42 1056.72 144.47
 1059.03 144.6 1060.06 144.65 1061.19 144.72 1063.35 144.84 1064.5 144.91
 1065.72 144.97 1068.64 145.18 1070.3 145.29 1071.17 145.36 1071.63 145.38
 1072.38 145.44 1073.13 145.48 1074.63 145.58 1075.38 145.62 1076.87 145.72
 1079.45 145.88 1081.36 145.99 1084.52 146.32 1087.15 146.56 1087.35 146.59
 1089.31 146.78 1092.58 147.13 1094.08 147.31 1097.75 147.82 1099.32 148.05
 1101.56 148.35 1103.81 148.62 1105.3 148.81 1106.75 148.98 1110.54 149.49
 1112.04 149.7 1115.03 150.1 1117.87 150.46 1119.59 150.69 1120.27 150.77
 1121.2 150.9 1122.32 151.04 1124.01 151.24 1125.2 151.39 1126.25 151.51
 1127.88 151.71 1130.1 151.97 1131.49 152.14 1132.98 152.3 1134.35 152.47
 1135.23 152.55 1136.63 152.71 1136.9 152.73 1140.1 153.06 1141.22 153.2
 1144.21 153.64 1144.95 153.76 1145.55 153.84 1146.78 154.03 1149 154.46
 1150.36 154.71 1150.94 154.83 1152.44 155.1 1154.2 155.48 1155.67 155.79
 1156.93 156.08 1157.22 156.16 1159.17 156.65 1160.67 157 1161.8 157.29
 1162.34 157.44 1164.08 157.9 1164.56 158.02 1166.65 158.6 1166.79 158.63
 1168.66 159.16 1169.64 159.47 1171.51 160.04 1173.23 160.58 1174.13 160.85
 1178.62 162.27 1181.24 163.09 1183.46 163.82 1184.49 164.15 1186.8 164.85
 1187.91 165.2 1190.14 165.88 1191.53 166.31 1194.33 167.13 1195.69 167.5
 1196.61 167.73

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .045 671.74 .032 971.74 .045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 671.74 971.74 158.82 158.82 158.82 .1 .3

CROSS SECTION OUTPUT Profile #10

E.G. Elev (ft)	139.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.	0.032		
W.S. Elev (ft)	139.47	Reach Len. (ft)	158.82	158.82	158.82

Crit W.S. (ft)	Flow Area (sq ft)	42.67
E.G. Slope (ft/ft)	0.003248 Area (sq ft)	42.67
Q Total (cfs)	109.00 Flow (cfs)	109.00
Top Width (ft)	44.84 Top Width (ft)	44.84
Vel Total (ft/s)	2.55 Avg. Vel. (ft/s)	2.55
Max Chl Dpth (ft)	1.47 Hydr. Depth (ft)	0.95
Conv. Total (cfs)	1912.5 Conv. (cfs)	1912.5
Length Wtd. (ft)	158.82 Wetted Per. (ft)	45.01
Min Ch El (ft)	138.00 Shear (lb/sq ft)	0.19
Alpha	1.00 Stream Power (lb/ft s)	0.49
Frctn Loss (ft)	0.29 Cum Volume (acre-ft)	1.59
C & E Loss (ft)	0.02 Cum SA (acres)	1.11

Warning: The conveyance ratio (upstream 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: Hunt River

REACH: Randolph RS: 9

INPUT

Description:

Station Elevation Data num= 492

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	148.63	.18	148.63	1.54	148.4	2.51	148.22	5.8	147.66
7.89	147.34	8.02	147.33	11.28	146.83	14.96	146.35	16.64	146.12
18.85	145.86	19.76	145.78	23.15	145.43	26.63	145.09	28.24	144.97
31.4	144.79	32.47	144.74	37.8	144.44	39.63	144.37	41.4	144.32
43.74	144.24	45.2	144.2	47.63	144.11	49.96	144.08	50.28	144.06
52.73	144.01	59.74	144.01	60.07	144	62.32	144	63.18	143.97
64.46	143.96	66.59	143.87	68.72	143.75	70.18	143.68	74.11	143.46
76.4	143.34	76.99	143.3	80.45	143.12	84.18	142.9	86.52	142.77
88.07	142.67	90.05	142.56	90.98	142.52	94.23	142.35	99.74	142.08
100.52	142.05	103.91	141.87	107.11	141.71	112.18	141.42	115.29	141.25
116.07	141.22	119.18	141.06	119.8	141.02	120.98	141	174.41	141
176.43	141.15	182.96	141.61	187.09	141.87	190.74	142.07	194.41	142.29
196.96	142.43	201.19	142.68	204.16	142.82	207.07	142.97	207.98	143
209.18	143.01	210.96	143.01	211.37	143.02	213.29	143.02	213.76	143.03
217.18	143.03	217.8	143.02	220.15	143.02	220.29	143.01	223.55	143.01
228.32	143.06	230.02	143.07	231.88	143.1	232.74	143.1	235.04	143.13
238.96	143.13	239.35	143.14	244.68	143.14	245.18	143.15	249.41	143.15
249.85	143.14	259.18	143.14	259.61	143.13	270.28	143.13	272.4	143.16
273.18	143.16	286.27	143.33	291.6	143.39	291.85	143.4	295.39	143.44
297.85	143.48	299.07	143.49	304.01	143.56	305.47	143.57	308.67	143.62
310.8	143.64	313.11	143.67	314	143.69	316.13	143.71	321.26	143.78
323.28	143.79	327.86	143.84	331.52	143.85	333.19	143.87	335.33	143.86
337.46	143.8	339.59	143.81	343.63	143.87	345.32	143.84	349.41	143.72
350.41	143.7	352.39	143.64	355.63	143.61	356.65	143.58	359.85	143.42
363.98	143.3	365.67	143.24	370.41	143.1	371.19	143.09	372.98	143.09
375.07	143.07	377.98	143.06	380.12	143.03	381.3	142.99	384.41	142.97
386.74	142.97	388.65	142.98	390.63	143	399.58	143	400.74	142.99
401.72	143	402.3	142.98	404.67	142.98	406.96	142.95	407.47	142.96
409.76	142.93	411.63	142.92	413.15	142.9	420.19	142.9	421.63	142.93
422.77	142.92	425.02	142.88	425.63	142.88	427.04	142.85	431.07	142.8

431.85 142.78 434.96 142.74 438.58 142.66 444.83 142.66 447.06 142.7
447.7 142.7 449.43 142.73 451.3 142.78 454.41 142.89 457.24 143
467.82 143 469.69 142.97 471.52 142.95 474.19 142.9 475.41 142.89
479.28 142.82 480.36 142.81 485.69 142.72 489.45 142.67 492.09 142.62
493.3 142.61 495.29 142.57 497.19 142.55 497.93 142.53 503.02 142.46
504.96 142.42 508.11 142.38 511.5 142.32 511.96 142.32 516.58 142.24
517.68 142.23 519.82 142.19 523.01 142.15 524.41 142.12 528.17 142.07
530.15 142.03 531.41 142.02 532.19 142 536.08 142 536.79 141.99
545.41 141.99 546.19 141.98 561.41 141.98 561.74 141.97 565.76 141.97
566.41 141.98 568.87 141.98 570.3 141.97 572.54 141.94 573.41 141.94
579.63 141.87 580.6 141.87 581.67 141.85 583.52 141.84 587.8 141.79
589.74 141.78 592.08 141.75 592.85 141.75 595.97 141.71 597.97 141.7
599.08 141.68 600.01 141.68 602.19 141.65 604.06 141.64 605.13 141.62
606.08 141.62 608.33 141.59 610.74 141.58 612.3 141.56 614.63 141.55
614.73 141.54 617.25 141.53 620.02 141.5 622.41 141.49 625.1 141.46
630.19 141.43 634.08 141.39 635.28 141.39 637.97 141.36 640.37 141.35
643.12 141.32 644.19 141.32 645.65 141.3 646.72 141.3 648.08 141.28
650.41 141.27 650.54 141.26 654.18 141.24 654.3 141.23 656.63 141.22
658.19 141.2 661.65 141.18 664.1 141.16 665.8 141.14 666.74 141.14
668.05 141.12 669.19 141.12 671.86 141.09 672.97 141.09 677.67 141.05
679.36 141.03 680.48 141.03 683.35 141 697.08 141 697.72 140.99
706.1 140.99 710.7 140.99 711.08 141 804.41 141 806.92 140.73
807.75 140.66 810.63 140.46 813.32 140.28 816.08 140.06 817.34 139.97
822.68 139.72 826.19 139.54 828.58 139.43 830.86 139.31 831.21 139.3
834.41 139.14 837.08 139 840.45 138.68 843.3 138.4 845.07 138.24
847.97 137.96 850.62 137.69 851.47 137.61 856.8 137.06 857.87 137
864.3 137 865.08 137.05 865.86 137.14 868.19 137.44 870.14 137.68
872.86 138 876.06 138.46 878.13 138.75 879.86 138.95 881.33 139.08
884.51 139.32 885.59 139.38 893.13 139.57 894.71 139.6 898.13 139.71
899.62 139.78 903 139.97 903.93 140.01 906.51 140.15 907.24 140.18
909.43 140.3 910.16 140.33 912.35 140.45 913.67 140.51 914.85 140.58
921.32 140.91 922.75 140.99 924.72 141.14 927.69 141.35 927.71 141.36
929.88 141.51 932.92 141.73 935 141.86 936.14 141.94 939.38 142.14
941.03 142.25 944.57 142.44 946.44 142.53 949.15 142.67 951.07 142.76
954.72 142.95 959.11 143.13 960.27 143.16 961.9 143.22 965.68 143.38
967.04 143.43 971.53 143.62 972.99 143.67 977.37 143.86 978.04 143.88
980.46 144 983.22 144.09 984.68 144.13 986.26 144.19 991.86 144.36
992.71 144.38 994.37 144.44 995.64 144.47 996.69 144.51 998.56 144.56
1002.49 144.69 1004.4 144.74 1006.1 144.8 1006.37 144.81 1007.66 144.84
1010.25 144.92 1010.61 144.94 1012.93 145 1022.67 145 1023.23 144.99
1027.41 144.99 1027.78 144.98 1033.33 144.98 1033.63 144.97 1038.01 144.97
1038.44 144.96 1048.97 144.96 1049.13 144.97 1051.89 144.97 1052.35 144.98
1055.83 144.98 1056.27 144.99 1059.75 144.99 1061.39 145 1063.95 145.15
1064.93 145.22 1066.5 145.31 1068.88 145.46 1074.54 145.73 1076 145.79
1078.19 145.9 1080.38 146 1083.3 146.29 1085.03 146.45 1088.3 146.77
1088.42 146.79 1090.6 147 1091.34 147.09 1092.94 147.26 1096.42 147.65
1097.58 147.77 1101.89 148.25 1104.7 148.55 1108.37 148.96 1109.61 149.08
1111.8 149.32 1116.18 149.84 1118.24 150.08 1120.77 150.36 1126.14 150.91
1127.87 151.1 1130.09 151.36 1133.52 151.6 1134.68 151.69 1136.64 151.82
1137.37 151.88 1139.56 152.03 1141.75 152.14 1143.91 152.26 1146.86 152.41
1147.44 152.45 1149.84 152.57 1151.98 152.69 1152.71 152.72 1156.71 152.94
1158.07 153.01 1159.28 153.12 1162.94 153.47 1163.66 153.55 1166.5 153.82
1168.05 153.99 1170.97 154.47 1173.9 154.96 1176.09 155.39 1177.48 155.68
1177.59 155.69 1179.46 156.06 1181.43 156.48 1183.41 156.89 1184.85 157.21
1185.38 157.34 1186.86 157.67 1188.02 157.91 1191.5 158.7 1192.89 159
1196.14 159.76 1198 160.16 1203.02 161.21 1206.58 161.85 1211.45 162.69
1213.53 163.04 1215 163.25 1217.06 163.52 1220.65 164.01 1227.23 164.6
1228.3 164.7 1229.77 164.82 1230.93 164.93 1232.34 165.03 1233.8 165.11

1234.75 165.15 1236.72 165.26 1237.46 165.29 1240.38 165.45 1241.11 165.48
 1243.3 165.61 1245.49 165.77 1246.95 165.89 1248.57 166.01 1249.88 166.06
 1251.34 166.13 1255.72 166.31 1257.6 166.4 1259.2 166.46 1259.92 166.5
 1265.72 166.75 1266.88 166.79 1268.03 166.85 1269.6 166.91 1272.27 167.04
 1274.99 167.2 1281.95 167.59 1284.94 167.77 1288.6 167.97 1290.1 168.13
 1292.98 168.51 1297.02 169.03 1298.82 169.3 1301.02 169.61 1303.21 169.93
 1305.14 170.23 1311.24 171.23 1312.1 171.38 1314.9 171.84 1316.36 172.09
 1317.09 172.2 1319.66 172.63 1320.74 172.82 1322.2 173.06 1327.17 173.93
 1330.97 174.49 1331.51 174.56 1334.62 175.01 1337.43 175.3 1344.12 176.04
 1346.31 176.23 1349.28 176.43 1350.37 176.49 1355.21 176.82 1359.15 177.02
 1361.13 177.13 1361.59 177.13

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .045 706.1 .032 1006.1 .045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 706.1 1006.1 121.2 121.2 121.2 .1 .3

CROSS SECTION OUTPUT Profile #10

E.G. Elev (ft)	139.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.032		
W.S. Elev (ft)	139.22	Reach Len. (ft)	121.20	121.20	121.20
Crit W.S. (ft)		Flow Area (sq ft)	60.41		
E.G. Slope (ft/ft)	0.001189	Area (sq ft)	60.41		
Q Total (cfs)	109.00	Flow (cfs)	109.00		
Top Width (ft)	50.26	Top Width (ft)	50.26		
Vel Total (ft/s)	1.80	Avg. Vel. (ft/s)	1.80		
Max Chl Dpth (ft)	2.22	Hydr. Depth (ft)	1.20		
Conv. Total (cfs)	3161.6	Conv. (cfs)	3161.6		
Length Wtd. (ft)	121.20	Wetted Per. (ft)	50.50		
Min Ch El (ft)	137.00	Shear (lb/sq ft)	0.09		
Alpha	1.00	Stream Power (lb/ft s)	0.16		
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	1.40		
C & E Loss (ft)	0.01	Cum SA (acres)	0.94		

Warning: The conveyance ratio (upstream 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: Hunt River
 REACH: Randolph RS: 8

INPUT

Description:

Station Elevation Data num= 492

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	141	10.65	141	11.26	141.01	14.04	141.11	15.73	141.16
19.32	141.24	23.8	141.3	27.1	141.39	30.99	141.46	36.07	141.53
41.15	141.63	43.25	141.69	44.99	141.75	47.32	141.81	48.1	141.84
50.71	141.91	53.02	141.95	55.43	142.01	61.18	142.1	64.06	142.16
66.93	142.19	70.66	142.24	71.44	142.24	74.17	142.28	77.37	142.35
78.44	142.39	79.99	142.43	81.83	142.49	85.44	142.55	87.77	142.58

89.94 142.66 90.88 142.71 92.44 142.77 95.69 142.92 96.56 142.94
97.63 142.99 101.77 143.15 102.96 143.19 108 143.38 109.36 143.41
112.66 143.5 115.72 143.59 118.11 143.68 125.11 143.92 126.67 143.97
129.62 144.09 134.95 144.33 136.78 144.4 141.45 144.61 144.58 144.72
147.92 144.83 150.95 144.97 152.01 145 153 145.01 155.45 145.01
156.39 145 157.78 144.96 160.54 144.86 162.68 144.79 164 144.79
168.67 144.74 171.78 144.72 175.47 144.68 176.73 144.68 178.42 144.66
179.56 144.66 184 144.62 185.2 144.62 189.33 144.67 190.28 144.69
195.37 144.75 196.68 144.77 200.57 144.85 202.1 144.87 203.2 144.86
206.79 144.86 207.23 144.85 209.9 144.85 210.62 144.84 214.01 144.84
214.57 144.83 225.46 144.83 225.59 144.84 230.96 144.84 233.05 144.86
238.38 144.86 238.68 144.85 241.01 144.84 244.13 144.8 245.24 144.8
246.91 144.78 248.11 144.78 249.57 144.76 251.91 144.75 253.31 144.73
254.68 144.73 256.38 144.71 262.02 144.68 264.85 144.65 266.54 144.64
269.31 144.61 272.51 144.56 273.69 144.55 276.02 144.51 280.1 144.46
281.8 144.43 284.23 144.42 287.43 144.39 288.57 144.39 291.25 144.37
292.76 144.35 295.35 144.34 298.1 144.31 299.16 144.31 300.13 144.29
303.25 144.25 304.02 144.25 308.5 144.19 311.38 144.16 313.36 144.16
313.99 144.15 316.22 144.15 316.47 144.14 318.8 144.14 319.08 144.13
321.14 144.13 321.56 144.12 323.47 144.12 323.69 144.11 325.82 144.11
325.86 144.1 327.95 144.1 328.14 144.09 330.09 144.09 331.51 144.07
335.14 144.05 337.55 144.05 337.72 144.04 340.14 144.04 342.8 144.02
345.25 144.02 345.89 144.01 348.36 144.01 348.77 144 351.28 144
351.41 143.99 353.81 143.99 354.52 143.98 357.7 143.98 357.81 143.97
361.01 143.97 361.44 143.96 364.21 143.96 364.7 143.95 369.92 143.95
370.14 143.94 375 143.94 375.59 143.93 380.4 143.93 384.92 143.9
386.6 143.88 389.8 143.87 393.48 143.84 395.04 143.84 398.73 143.81
400.42 143.81 405.93 143.77 407.48 143.77 409.82 143.75 411.37 143.75
413.26 143.73 414.91 143.73 419.06 143.7 420.76 143.7 424.99 143.68
425.37 143.67 427.54 143.67 433.93 143.64 436.26 143.62 440.15 143.61
442.05 143.59 443.11 143.59 444.48 143.57 445.6 143.57 449.42 143.53
450.58 143.53 451.82 143.51 453.78 143.5 458.82 143.44 459.6 143.44
462.71 143.4 465.82 143.37 466.6 143.37 471.9 143.3 474.04 143.28
478.18 143.22 481.38 143.2 485.27 143.14 490.72 143.07 491.93 143.06
497.72 142.98 498.56 142.98 500.41 142.95 502.1 142.94 503.89 142.91
504.72 142.91 509.81 142.85 511.72 142.82 512.5 142.82 518.72 142.74
519.5 142.74 521.32 142.71 522.02 142.71 526.5 142.65 527.28 142.65
529.94 142.61 534.3 142.56 535.99 142.55 536.95 142.53 538.57 142.52
541.28 142.48 542.06 142.48 546.55 142.42 547.2 142.42 549.06 142.39
549.83 142.39 555.08 142.32 559.34 142.28 565.39 142.2 570.21 142.15
573.95 142.1 574.73 142.1 578.36 142.05 582.51 142 583.87 141.99
587.46 141.99 591.84 141.94 592.62 141.94 596.09 141.89 599.86 141.85
604.13 141.79 607.33 141.76 611.29 141.71 612.25 141.69 613.72 141.68
615.64 141.65 621.4 141.58 622.18 141.58 632.29 141.45 637.18 141.4
638.25 141.38 642.1 141.34 643.96 141.31 644.74 141.31 651.23 141.23
653.18 141.2 656.4 141.17 660.64 141.11 662.23 141.1 668.07 141.02
669.63 141.01 672.37 141.01 672.74 141 677.41 141 679.49 140.98
681.73 140.97 681.95 140.97 684.41 140.97 686.74 140.96 686.82 140.95
689.07 140.95 689.43 140.94 692.63 140.94 692.96 140.93 697.96 140.93
698.41 140.92 703.29 140.92 703.76 140.91 712.24 140.91 712.41 140.92
719.41 140.92 719.75 140.93 724.1 140.93 724.62 140.94 728.88 140.94
729.18 140.95 733.41 140.95 734.13 140.96 738.48 140.96 738.86 140.97
745.95 140.97 746.13 140.98 753.64 140.98 754.26 140.99 760.01 140.99
760.64 141 788.77 141 789.66 140.99 793.93 140.9 795.64 140.89
798.19 140.86 800.36 140.86 801.87 140.85 803.42 140.75 806.02 140.57
808.09 140.45 809.65 140.37 810.42 140.31 813.54 140.03 814.19 139.96
816.65 139.58 817.53 139.46 820.4 139.03 820.59 139.01 824.08 138.35
826.16 137.97 829.17 137.51 830.86 137.24 832.32 137.02 833.76 136.99

836.87 136.98 839.21 136.96 842.32 136.96 844.42 136.98 846.29 136.98
 849.5 137.01 850.87 137.08 852.89 137.16 853.64 137.2 857.79 137.37
 858.65 137.42 860.99 137.51 862.17 137.57 863.54 137.62 864.88 137.69
 867.21 137.79 869.29 137.87 871.1 137.96 871.53 137.97 881.37 138.48
 881.99 138.52 884.56 138.65 888.21 138.85 891.87 139.04 892.88 139.08
 895.99 139.24 896.77 139.27 898.43 139.36 901.44 139.5 907.66 139.81
 908.02 139.82 910.51 139.95 912.21 140 914.42 140.04 918.55 140.14
 918.98 140.14 921.66 140.2 924.07 140.28 928.66 140.36 930.42 140.38
 932.54 140.42 935.44 140.46 937.22 140.5 942.15 140.69 946.55 140.85
 948.89 140.95 950.68 141.04 953.55 141.21 957.44 141.48 961.32 141.74
 963.47 141.89 966 142.02 967.56 142.07 971.45 142.22 975.34 142.31
 977.33 142.35 979.99 142.37 981.95 142.38 982.67 142.38 983.89 142.36
 984.8 142.36 985.86 142.34 987 142.34 988.46 142.31 989.34 142.31
 994 142.43 996.94 142.46 997.89 142.46 999.45 142.48 1001.86 142.49
 1005.67 142.53 1009.32 142.55 1011.12 142.58 1013.88 142.61 1014.65 142.63
 1016.79 142.66 1018.84 142.68 1021.71 142.73 1026.68 142.79 1030.34 142.85
 1030.83 142.85 1035.23 142.92 1037.05 142.94 1041.31 143 1043.79 143
 1044.57 143.02 1046.08 143.21 1049.47 143.65 1051.97 143.96 1053.35 144.21
 1056.25 144.78 1057.01 144.92 1059.1 145.35 1060.9 145.74 1064.01 146.37
 1066.9 146.93 1067.97 147.12 1069.81 147.41 1073.2 147.97 1074.37 148.07
 1078.28 148.37 1081.91 148.6 1083.96 148.72 1088.13 148.99 1090.46 149.01
 1094.35 149.01 1094.63 149.02 1099.96 149.02 1102.01 149.04 1102.09 149.05
 1104.46 149.08 1105.24 149.08 1109.13 149.13 1110.86 149.16 1112.75 149.18
 1115.56 149.19 1116.91 149.21 1120.02 149.23 1123.13 149.27 1124.04 149.27
 1127.02 149.31 1127.8 149.31 1130.88 149.35 1131.69 149.35 1133.87 149.38
 1134.8 149.38 1136.75 149.4 1139.29 149.44 1144.37 149.5 1147.76 149.55
 1152.85 149.61 1154.54 149.64 1156.58 149.66 1157.36 149.68 1160.47 149.72
 1166.4 149.81 1169.81 149.85 1170.58 149.87 1173.18 149.9 1176.81 149.95
 1179.14 149.99 1181.65 149.99 1183.13 150 1183.81 150.03 1186.14 150.21
 1190.13 150.54 1194.26 150.86 1196.25 151.03 1198.06 151.25 1200.01 151.47
 1203.39 151.87 1204.03 151.92 1205.38 152.06 1208.64 152.44 1209.48 152.55
 1211.92 152.84 1214.05 153.05 1217.24 153.38 1217.27 153.39 1221.52 153.83
 1223.02 153.96 1225.72 154.25 1227.41 154.44 1228.93 154.59 1230.8 154.79
 1232.04 154.91 1233.59 155.09 1234.37 155.2 1238.58 155.74 1240.97 156.12
 1241.78 156.26 1247.18 157.12

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .045 681.95 .032 981.95 .045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 681.95 981.95 120.9 120.9 120.9 .1 .3

CROSS SECTION OUTPUT Profile #10

E.G. Elev (ft)	139.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.032		
W.S. Elev (ft)	139.17	Reach Len. (ft)	120.90	120.90	120.90
Crit W.S. (ft)		Flow Area (sq ft)	102.41		
E.G. Slope (ft/ft)	0.000349	Area (sq ft)	102.41		
Q Total (cfs)	109.00	Flow (cfs)	109.00		
Top Width (ft)	75.12	Top Width (ft)	75.12		
Vel Total (ft/s)	1.06	Avg. Vel. (ft/s)	1.06		
Max Chl Dpth (ft)	2.21	Hydr. Depth (ft)	1.36		
Conv. Total (cfs)	5834.2	Conv. (cfs)	5834.2		
Length Wtd. (ft)	120.90	Wetted Per. (ft)	75.36		
Min Ch El (ft)	136.96	Shear (lb/sq ft)	0.03		
Alpha	1.00	Stream Power (lb/ft s)	0.03		

Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	1.18
C & E Loss (ft)	0.00	Cum SA (acres)	0.76

Warning: The conveyance ratio (upstream 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: Hunt River

REACH: Randolph RS: 7

INPUT

Description:

Station Elevation Data num= 492

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	146.16	2.61	146.42	4.64	146.64	6.45	146.82	8.89	147.08
9.79	147.19	11.75	147.4	13.59	147.61	16.07	147.85	19.08	148.16
21.87	148.47	24.23	148.69	27.71	149.03	30.06	149.27	37.91	150.02
39.48	150.16	40.55	150.27	43.81	150.57	46.04	150.79	48.71	151.04
49.89	151.14	54.13	151.55	54.38	151.58	59.09	152.03	64.72	152.58
66.15	152.71	68.29	152.92	72.14	153.28	74.82	153.54	78.7	153.86
81.68	154.12	82.62	154.19	84.19	154.33	85.76	154.45	87.87	154.63
89.09	154.72	90.15	154.78	95.17	155.03	97.39	155.15	99.69	155.18
100.41	155.18	103.8	155.23	106.15	155.25	107.72	155.17	110.72	155.07
112.49	155.02	114.52	154.95	116.64	154.8	118.88	154.69	123	154.42
125.76	154.17	127.33	154.02	129.35	153.87	131.47	153.73	132.53	153.63
134.65	153.4	135.2	153.35	138.46	153.01	139.95	152.84	144.19	152.27
146.31	151.97	148.74	151.58	149.89	151.38	151.76	151.02	153.15	150.73
155.57	150.24	159.68	149.36	164.57	148.29	165.76	148.04	166.86	147.87
168.12	147.71	169.47	147.52	172.9	147.07	173.61	147	174.37	146.98
177.53	146.98	178.94	146.96	182.53	146.86	185.79	146.78	189.29	146.73
190.08	146.71	193.95	146.65	196.1	146.67	200.48	146.67	201.06	146.66
203.11	146.66	206.13	146.63	209.88	146.6	210.94	146.6	223.02	146.4
224.96	146.35	232.43	146.2	234	146.16	236.33	146.12	236.38	146.11
242.38	146	243.42	146	244.54	145.97	246.96	145.87	251.07	145.74
254.33	145.63	255.18	145.63	259.1	145.58	259.89	145.58	263.03	145.54
263.91	145.54	266.03	145.5	267.73	145.48	271.33	145.41	276.63	145.33
277.93	145.3	280.86	145.25	283.71	145.21	286.16	145.16	287.22	145.15
290.23	145.09	294.4	145.03	294.64	145.02	297.82	145.02	298.32	145.01
304.92	145.01	306.95	145	310.09	144.97	311.45	144.97	313.08	144.95
315.58	144.94	317.15	144.92	320.91	144.9	322.87	144.9	324.99	144.88
330.48	144.86	334.3	144.83	336.01	144.83	338.08	144.81	343.03	144.79
345.08	144.77	346.55	144.77	348.52	144.75	350.09	144.75	353.88	144.72
355.58	144.72	359.27	144.69	362.64	144.68	364.56	144.66	366.22	144.66
368.13	144.64	369.7	144.64	373.46	144.61	375.16	144.61	382.25	144.56
383.82	144.56	385.76	144.54	387.36	144.54	390.88	144.51	392.45	144.51
396.31	144.48	397.41	144.48	401.08	144.45	402.64	144.45	406.1	144.42
411	144.4	412.84	144.38	414.41	144.38	419.66	144.34	422.84	144.33
424.61	144.31	426.18	144.31	429.65	144.28	432.67	144.27	433.24	144.26
436.37	144.24	437.94	144.24	439.79	144.22	442.97	144.21	444.75	144.19
448.14	144.18	448.27	144.17	451.45	144.16	455.06	144.13	456.84	144.13
458.86	144.11	462.26	144.1	464.16	144.08	465.9	144.08	467.75	144.06
471.38	144.05	473.24	144.03	474.96	144.03	478.73	144	481.17	144
487.7	143.88	490.5	143.84	492.77	143.8	494.42	143.76	495.99	143.74
502.15	143.62	503.05	143.61	507.6	143.52	508.66	143.51	510.89	143.46

512.46 143.44 514.23 143.4 519.25 143.31 520.31 143.3 522.65 143.25
528.5 143.15 528.93 143.15 533.39 143.07 535.02 143.05 537.56 143
541.55 143 542.26 142.99 544.82 142.99 546.45 142.97 550.11 142.94
553.16 142.9 554.03 142.9 557.17 142.86 557.95 142.86 560.31 142.83
563.44 142.81 566.93 142.77 567.99 142.77 571.29 142.74 575.41 142.71
578.59 142.68 579.65 142.68 582.27 142.65 585.41 142.63 587.76 142.6
589.74 142.59 590.9 142.57 593.77 142.55 597.96 142.5 598.8 142.5
601.82 142.46 605.2 142.43 610.37 142.37 611.29 142.37 613.36 142.34
614.99 142.33 619.92 142.28 626.19 142.2 629.68 142.17 632.62 142.13
633.68 142.13 639.53 142.06 640.31 142.04 646.59 141.96 652.52 141.87
656.99 141.82 663.06 141.74 664.97 141.71 665.41 141.7 667.59 141.68
672.11 141.61 680.27 141.51 680.36 141.5 685.6 141.43 688.43 141.4
690.06 141.37 691.3 141.36 693.01 141.33 694.43 141.32 696 141.29
702.55 141.21 703.61 141.19 706.38 141.16 708.01 141.13 710.91 141.1
711.69 141.08 713.14 141.07 716.17 141.02 718.44 141 719.63 141
724.24 140.94 725.02 140.92 728.95 140.87 735.39 140.77 737.57 140.75
738.36 140.73 742.81 140.67 746.99 140.62 748.56 140.59 751.29 140.56
752.07 140.54 755.62 140.5 758.6 140.45 759.76 140.44 764.94 140.37
765.13 140.36 770.02 140.3 774.6 140.23 776.55 140.21 778.83 140.17
780.95 140.15 783.85 140.11 784.64 140.09 789.61 140.03 791.55 139.99
795.14 139.65 796.4 139.52 798.16 139.36 801.03 139.08 802.14 138.95
805.32 138.47 808.17 138.03 809.74 137.75 813.66 137.02 817.58 136.47
821.21 136.02 822.25 136 827.57 136 828.77 136.1 829.35 136.17
834.99 136.89 836.41 137.09 838.76 137.46 841.11 137.84 842.41 138.02
846.49 138.28 849.74 138.5 851.31 138.55 855.12 138.7 858.3 138.56
861.59 138.46 864.61 138.39 867.64 138.33 870.92 138.23 872.49 138.19
877.19 138.04 880.33 138 880.55 137.99 886.61 137.49 888.18 137.35
890.08 137.2 892.2 137.02 892.88 137 906.22 137 907.79 137.06
909.35 137.14 914.06 137.34 916.57 137.46 920.16 137.61 922.69 137.73
924.26 137.79 928.96 138.01 934.09 138.29 937.11 138.44 938.82 138.54
943.15 138.76 946.17 138.95 950.93 139.29 952.59 139.42 953.65 139.49
956.83 139.73 959.33 139.91 960.01 139.95 962.13 140.15 964.97 140.44
965.31 140.48 966.61 140.6 968.49 140.79 971.32 141.05 974.02 141.34
975.24 141.46 977.28 141.68 978.91 141.84 979.95 141.91 982.42 142.1
983.32 142.18 984.38 142.22 984.65 142.25 986.22 142.35 990.93 142.69
991.8 142.7 996.03 142.53 1000.54 142.57 1002.39 142.6 1008.75 142.72
1009.92 142.76 1012.11 142.86 1015.11 142.98 1017.22 143.08 1020.4 143.21
1021.68 143.25 1027.82 143.37 1031 143.42 1033.77 143.48 1036.3 143.52
1037.36 143.52 1038.78 143.54 1039.81 143.54 1042.56 143.57 1045.05 143.57
1047.4 143.55 1049.76 143.56 1050.72 143.58 1052.35 143.59 1057.49 143.66
1058.88 143.67 1060.74 143.7 1061.52 143.7 1068.58 143.79 1069.37 143.81
1071.26 143.83 1073.03 143.86 1075.2 143.88 1079.74 143.95 1081.92 143.97
1082.7 143.99 1085.12 143.99 1085.84 144 1091.39 144 1092.45 144.07
1093.51 144.16 1095.63 144.32 1097.75 144.44 1105.45 144.78 1108.59 144.9
1110.16 144.97 1110.94 144.99 1114.7 145.14 1116.82 145.16 1117.88 145.21
1121.06 145.43 1125.29 145.75 1126.63 145.84 1128.47 145.98 1128.98 146.03
1133.77 146.63 1136.82 146.98 1137.61 147.06 1141.53 147.51 1142.31 147.62
1144.67 147.92 1145.53 148.02 1147.54 148.16 1149.37 148.3 1153.53 148.59
1158 148.84 1160.36 148.98 1161.69 149.01 1163.44 149.01 1167.41 149.04
1169.69 149.05 1172.12 149.05 1172.71 149.06 1175.73 149.06 1176.04 149.05
1179.33 149.05 1179.64 149.04 1183.1 149.04 1185.46 149.08 1188.59 149.12
1190.98 149.12 1193.3 149.09 1194.33 149.09 1200.36 149.03 1201.58 149.03
1202.49 149.06 1204.76 149.11 1206.88 149.17 1210.06 149.25 1216.41 149.39
1219.18 149.48 1222.32 149.6 1223.11 149.62 1229.38 149.86 1230.95 149.91
1233.5 150.01 1234.87 150.05 1239.17 150.16 1244.92 150.3 1245.85 150.33
1250.56 150.45 1254.27 150.56 1256.05 150.6 1256.83 150.63 1263.03 150.79
1264.5 150.84 1267.03 150.9 1269.37 150.97 1272.39 150.99 1274.69 150.99
1275.75 151 1281.45 151.22 1282.45 151.25 1290.52 151.56 1293.54 151.67

1293.88 151.69 1302.15 152

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
0 .045 664.97 .032 964.97 .045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
664.97 964.97 140.37 140.37 140.37 .1 .3

CROSS SECTION OUTPUT Profile #10

E.G. Elev (ft)	139.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.032		
W.S. Elev (ft)	139.16	Reach Len. (ft)	140.37	140.37	140.37
Crit W.S. (ft)		Flow Area (sq ft)	217.25		
E.G. Slope (ft/ft)	0.000071	Area (sq ft)	217.25		
Q Total (cfs)	109.00	Flow (cfs)	109.00		
Top Width (ft)	148.94	Top Width (ft)	148.94		
Vel Total (ft/s)	0.50	Avg. Vel. (ft/s)	0.50		
Max Chl Dpth (ft)	3.16	Hydr. Depth (ft)	1.46		
Conv. Total (cfs)	12945.4	Conv. (cfs)	12945.4		
Length Wtd. (ft)	140.37	Wetted Per. (ft)	149.45		
Min Ch El (ft)	136.00	Shear (lb/sq ft)	0.01		
Alpha	1.00	Stream Power (lb/ft s)	0.00		
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.73		
C & E Loss (ft)	0.00	Cum SA (acres)	0.45		

Warning: The conveyance ratio (upstream 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: Hunt River
REACH: Randolph RS: 6

INPUT

Description:

Station Elevation Data num= 492

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	156.55	.24	156.55	2.02	156.21	3.08	156.02	4.47	155.74
7.28	155.11	8.18	154.92	9.77	154.56	11.73	154.1	12.94	153.83
15.33	153.27	16.74	152.95	18.84	152.55	20.09	152.3	22.47	151.85
24.85	151.42	26.19	151.19	27.22	151.03	28.82	150.83	31.45	150.52
33.55	150.23	35.65	149.98	38.35	149.76	44.34	149.46	47.44	149.3
47.88	149.26	50.26	149.12	51.41	149.08	52.65	149.12	53.65	149.22
56.76	149.47	58.77	149.64	59	149.65	62.17	149.91	64.02	150.07
65.35	150.21	66.94	150.36	69.46	150.61	72.71	150.94	74.08	151.06
75.96	151.21	77.26	151.33	84.41	151.96	85.2	152	136.02	152
137.71	151.88	139.99	151.66	141.58	151.52	143.72	151.31	144.93	151.2
148.72	150.65	151.9	150.13	153.03	149.97	157.46	149.43	160.63	149.05
161.43	149	162.79	148.99	164.89	148.99	165.4	148.98	167.78	148.97
170.21	148.97	172.25	148.94	174.35	148.92	177.88	148.87	179.43	148.86
182.86	148.81	183.66	148.81	187.2	148.76	189.7	148.73	191.16	148.72
197.46	148.62	201.92	148.53	205.83	148.46	207.38	148.44	210.49	148.43
212.45	148.38	213.6	148.34	216.7	148.25	219.81	148.17	220.18	148.15

222.56 148.09 224.95 148.02 225.74 147.98 226.54 147.89 228.12 147.75
232.89 147.3 234.48 147.16 236.34 146.98 238.44 146.81 241.55 146.61
243.21 146.49 246.2 146.3 248.77 146.12 250.36 146.02 251.45 145.98
251.94 145.98 255.12 145.92 256.31 145.89 257.36 145.88 261.73 145.79
263.85 145.76 267.7 145.68 268.62 145.67 273.12 145.58 274.16 145.57
278.37 145.49 280.7 145.44 282.12 145.42 284.5 145.37 285.03 145.37
287.2 145.33 289.93 145.27 290.45 145.27 293.23 145.21 293.7 145.21
296.95 145.14 297.45 145.14 303.44 145.02 304.64 145 314.1 145
314.53 144.99 331.35 144.99 333.16 144.97 334.72 144.97 338.26 144.94
341.42 144.93 346.67 144.9 351.92 144.86 353.58 144.86 355.44 144.84
358.69 144.83 360.72 144.81 361.94 144.81 363.9 144.79 365.58 144.79
367.33 144.77 368.88 144.77 370.84 144.75 373.99 144.74 374.22 144.73
379.24 144.71 384.5 144.67 386.13 144.67 391.19 144.64 393.28 144.62
396.06 144.61 398.16 144.59 401.49 144.58 403.41 144.56 406.56 144.55
406.78 144.54 411.54 144.52 415.46 144.49 419.48 144.48 421.68 144.46
423.68 144.46 425.83 144.45 430.18 144.42 432.19 144.42 434.57 144.4
436.68 144.39 438.76 144.39 441.24 144.37 443.34 144.37 443.41 144.36
445.68 144.36 448.59 144.34 450.45 144.34 450.7 144.33 452.8 144.33
452.83 144.32 454.9 144.32 455.21 144.31 457.59 144.31 458.05 144.3
459.98 144.3 460.15 144.29 462.68 144.29 463.15 144.28 465.15 144.28
465.41 144.27 467.51 144.27 467.92 144.26 469.81 144.26 472.43 144.24
476.96 144.24 477.44 144.23 482.24 144.23 483 144.22 487.47 144.22
487.77 144.21 510.59 144.21 510.79 144.2 513.74 144.2 513.97 144.19
516.4 144.19 516.89 144.18 518.99 144.18 519.5 144.17 522.15 144.17
522.61 144.16 525.3 144.16 525.72 144.15 528.45 144.15 528.82 144.14
531.6 144.14 531.93 144.13 535.41 144.13 535.81 144.12 538.58 144.12
538.96 144.11 542.11 144.11 542.55 144.1 545.73 144.1 549.01 144.07
553.67 144.01 573.17 144.01 573.52 144 597.8 144 598.14 143.99
602 143.99 603.69 143.98 606.46 143.95 607.66 143.93 609.57 143.92
610.84 143.9 613.56 143.88 615.42 143.85 618.67 143.78 626.72 143.58
630.37 143.5 631.67 143.46 636.25 143.36 637.52 143.32 640.63 143.26
643.39 143.19 644 143.18 644.19 143.18 648.16 143.06 653.05 142.94
654.42 142.92 656.64 142.87 659.79 142.81 660.81 142.78 663.24 142.73
664.16 142.72 668.01 142.64 669.6 142.6 671.98 142.56 676.61 142.46
678.71 142.43 680.41 142.39 687.21 142.27 689.45 142.22 690.32 142.21
692.62 142.16 695.8 142.1 696.66 142.09 701.36 142 706.92 141.85
707.71 141.82 712.47 141.7 713.27 141.67 716.71 141.58 718.83 141.53
719.62 141.5 721.37 141.46 722.93 141.41 724.38 141.38 725.91 141.33
731.53 141.19 732.41 141.16 733.91 141.13 734.71 141.1 738.91 141
739.47 140.98 748.06 140.76 751.91 140.67 754.56 140.6 756.14 140.55
758.41 140.5 759.62 140.46 766.47 140.29 767.26 140.26 771.06 140.17
775.72 140.04 776.79 140.02 777.58 139.97 779.58 139.72 781.93 139.41
784.83 139.05 786.94 138.68 787.11 138.64 790.09 138.09 791.88 137.71
795.34 137.03 796.64 136.84 799.82 136.41 800.65 136.31 803.67 136.03
804.8 136 807.95 136 809 136.11 810.93 136.4 811.73 136.53
814.25 136.91 816.1 137.23 816.49 137.31 821.25 138.15 823.86 138.64
825.81 138.99 832.12 139.87 833.15 140 834.22 140 837.13 140.04
839.39 140.08 842.69 140.12 843.49 140.14 845.6 140.16 848.93 140.21
853.36 140.26 855.9 140.3 858.39 140.33 860.16 140.34 861.54 140.36
862.59 140.36 864.92 140.39 867.84 140.41 871 140.42 871.28 140.43
874.15 140.44 877.63 140.47 879.4 140.47 882.55 140.5 885.97 140.51
886.36 140.52 888.4 140.52 888.75 140.53 890.63 140.53 892.72 140.54
894.9 140.56 896.21 140.55 901.47 140.55 901.5 140.54 903.83 140.54
906.21 140.53 907.89 140.51 911.14 140.5 914.39 140.47 915.13 140.45
920.38 140.38 922.48 140.38 922.89 140.37 924.79 140.37 926.06 140.36
930.89 140.29 932.99 140.27 936.14 140.22 941.4 140.16 942.74 140.16
944 140.14 946.71 140.11 947.5 140.11 949.64 140.08 951.9 140.06
953.85 140.06 954 140.05 956.24 140.05 956.64 140.04 958.62 140.04

958.96 140.03 961 140.03 961.36 140.02 963.62 140.02 966.39 140
 980.27 140 980.7 139.99 1003.99 139.99 1004.44 140 1009.69 140
 1010.2 140.04 1010.23 140 1012.85 140.22 1014.99 140.38 1016.41 140.5
 1018.17 140.63 1018.96 140.7 1021.35 140.88 1022.93 141.01 1027.28 141.46
 1028.83 141.61 1032.46 141.98 1035.64 142.26 1035.96 142.28 1038.81 142.53
 1039.12 142.55 1042.78 142.86 1044.36 143 1045.96 143.07 1047.63 143.13
 1051.52 143.3 1053.9 143.39 1055.93 143.48 1058.03 143.56 1061.05 143.74
 1065.02 143.99 1070.38 144.17 1070.76 144.19 1074.55 144.31 1079.04 144.47
 1079.31 144.47 1083.18 144.61 1084.74 144.65 1087.84 144.75 1088.5 144.76
 1092.01 144.86 1093.13 144.9 1095.19 144.95 1096.78 145 1099.01 145.12
 1105.51 145.49 1108.03 145.63 1111.86 145.8 1113.72 145.89 1114.77 145.93
 1116.63 146.02 1118.22 146.08 1121.39 146.22 1125.36 146.38 1126.95 146.46
 1128.88 146.58 1131.71 146.78 1132.13 146.8 1134.89 146.99 1135.68 147
 1138.07 147 1138.63 147.01 1145.3 147.01 1146.01 147.02 1161.37 147.02
 1163.93 147.04 1166.26 147.03 1168.59 147.08 1170.46 147.13 1174.37 147.22
 1177.77 147.29 1181.74 147.39 1182.57 147.4 1185.67 147.48 1186.5 147.49
 1188.32 147.54 1195.24 147.69 1197.78 147.73 1201.2 147.82 1201.59 147.84
 1205.86 147.96 1207.94 148.04 1210.12 148.15 1210.32 148.15 1213.62 148.31
 1214.29 148.32 1215.88 148.38 1217.74 148.43 1218.79 148.47 1220.64 148.52
 1222.23 148.58 1223.12 148.6 1225.1 148.67 1228.58 148.78 1230.17 148.8
 1231.4 148.83 1233.5 148.83 1236.12 148.91 1238.47 148.99 1241.57 149.13
 1242.62 149.17 1246.05 149.34 1249.34 149.49 1250.89 149.59 1254.52 149.84
 1254.79 149.85 1258.65 150.14 1259.55 150.22 1262.73 150.47 1265.36 150.67
 1266.7 150.79 1268.18 150.9 1269.08 150.99 1271.08 151.15 1271.33 151.18
 1274.64 151.43 1275.1 151.43

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .045 644 .032 944 .045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 644 944 119.99 119.99 119.99 .1 .3

CROSS SECTION OUTPUT Profile #10

E.G. Elev (ft)	139.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.032		
W.S. Elev (ft)	139.11	Reach Len. (ft)	119.99	119.99	119.99
Crit W.S. (ft)		Flow Area (sq ft)	76.67		
E.G. Slope (ft/ft)	0.000432	Area (sq ft)	76.67		
Q Total (cfs)	109.00	Flow (cfs)	109.00		
Top Width (ft)	42.35	Top Width (ft)	42.35		
Vel Total (ft/s)	1.42	Avg. Vel. (ft/s)	1.42		
Max Chl Dpth (ft)	3.11	Hydr. Depth (ft)	1.81		
Conv. Total (cfs)	5246.0	Conv. (cfs)	5246.0		
Length Wtd. (ft)	119.99	Wetted Per. (ft)	42.87		
Min Ch El (ft)	136.00	Shear (lb/sq ft)	0.05		
Alpha	1.00	Stream Power (lb/ft s)	0.07		
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.26		
C & E Loss (ft)	0.00	Cum SA (acres)	0.14		

CROSS SECTION

RIVER: Hunt River
 REACH: Randolph RS: 5

INPUT

Description:

Station Elevation Data num= 491

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	151.04	.4	151.04	2.26	151.08	4.89	151.11
6.49	151.14	7.16	151.14	9.06	151.18	10.33	151.18
12.91	151.1	14.52	151.06	16.94	150.96	18.78	150.77
21.66	150.49	23.24	150.33	25.6	150.07	26.39	149.99
29.35	149.84	31.46	149.72	33.18	149.65	37.41	149.53
37.8	149.51	38.98	149.49	40.97	149.44	42.45	149.36
44.14	149.28	45.2	149.22	46.62	149.16	48.63	149.15
55.52	149.04	57.1	149.05	57.9	149.07	67.18	149.19
68.44	149.23	71.27	149.29	73.36	149.34	75.84	149.33
76.45	149.34	81.51	149.47	83.23	149.57	85.73	149.73
87.02	149.8	88.52	149.9	90.95	150.03	93.32	150.18
95	150.27	96.47	150.38	98.09	150.46	100.4	150.63
101.2	150.67	103.55	150.83	105.92	150.98	107.49	151.11
109.07	151.13	109.85	151.15	111.76	151.17	113.55	151.2
114.58	151.23	115.36	151.27	116.15	151.29	118.51	151.19
123.68	150.99	124.03	151.01	125.91	150.92	131.11	150.72
132.09	150.69	133.95	150.61	136.06	150.49	137.12	150.42
138.27	150.36	138.99	150.37	140.56	150.45	142.93	150.33
146.15	150.25	148.44	150.18	149.36	150.16	151.59	150.13
152.37	150.11	154.74	150.07	155.78	150.06	157.89	150.02
158.99	150.01	171.83	150.01	171.99	150.02	188.89	150.02
189.38	150.01	208.76	150.01	208.97	150	214.58	150
215.55	149.95	218.39	149.71	219.31	149.64	224.03	149.25
225.61	149.11	227.18	148.99	232.69	148.69	234.32	148.61
236.04	148.51	238.2	148.42	242.14	148.23	242.93	148.2
244.5	148.12	246.47	148.03	248.89	147.94	251.59	147.86
253.17	147.8	256.32	147.7	256.91	147.67	259.46	147.59
260.12	147.56	262.61	147.48	263.91	147.43	266.55	147.36
267.34	147.33	269.19	147.28	270.25	147.26	273.64	147.16
276.18	147.1	277.38	147.06	279.94	147	280.47	146.98
283.98	146.9	286.24	146.84	286.65	146.84	287.81	146.8
290.17	146.74	290.96	146.71	293.49	146.65	295.69	146.59
299.02	146.49	299.62	146.48	303.56	146.36	305.2	146.32
305.92	146.29	307.23	146.26	308.28	146.22	311.38	146.14
315.68	146.01	321.12	145.94	322.02	145.92	325.94	145.88
329.15	145.83	329.93	145.83	332.59	145.79	335.76	145.76
338.78	145.71	339.98	145.7	343.6	145.65	343.72	145.64
346.32	145.61	350.81	145.55	352.66	145.52	357.75	145.45
360.06	145.41	361.26	145.4	362.86	145.37	364.98	145.35
365.77	145.33	368.51	145.3	369.28	145.28	370.62	145.27
371.28	145.25	373.2	145.23	374.1	145.21	375.91	145.19
377.31	145.16	378.37	145.15	381.19	145.1	385.57	145.03
390.97	144.96	391.75	144.96	398.84	144.87	399.63	144.87
401.39	144.85	402.32	144.83	404.35	144.81	406.2	144.81
407.6	144.8	409.86	144.77	414.23	144.72	416.16	144.69
418.17	144.7	422.26	144.7	422.4	144.71	426.62	144.71
427.07	144.72	431.12	144.72	431.89	144.73	435.1	144.73
435.85	144.74	439.91	144.74	440.36	144.75	444.3	144.75
444.51	144.76	448.45	144.76	448.81	144.77	453.17	144.77
453.57	144.78	457.57	144.78	457.9	144.79	461.83	144.79
462.39	144.8	465.77	144.8	465.94	144.81	468.13	144.81
468.81	144.82	470.5	144.82	471	144.83	473.11	144.83
473.63	144.84	476.01	144.84	476.28	144.85	478.44	144.85
481.39	144.87	483.26	144.87	483.68	144.88	485.79	144.88
486.25	144.89	488.61	144.89	488.96	144.9	491.07	144.9
491.28	144.91	493.76	144.91	494.12	144.92	496.36	144.92
496.48	144.93	498.84	144.93	499.31	144.94	501.21	144.94
501.64	144.95	503.75	144.95	504.13	144.96	506.72	144.96
506.92	144.97	509.87	144.97	510.55	144.98	516.97	144.98
517.49	144.99	532.28	144.99	532.7	145	558.71	145
560.31	144.97	563.41	144.85	567.15	144.7	568.93	144.62
572.08	144.5	572.86	144.46	574.54	144.4	575.6	144.35
576.8	144.31	584.05	144.01	587.04	143.95	589.58	143.89
592.55	143.84	595.63	143.77	596.49	143.76	598.06	143.72
598.86	143.71	602.05	143.65	603.07	143.62	605.26	143.58
606.24	143.57	607.51	143.54	609.08	143.52	614.31	143.42
615.75	143.4	621.68	143.29	625.26	143.25	628.43	143.2
630.54	143.18	634.77	143.11				

635.76 143.1 639.79 143.03 640.76 143.02 643.73 142.98 644.52 142.96
 650.03 142.89 651.41 142.88 653.18 142.85 653.79 142.85 655.54 142.82
 660.68 142.76 663.3 142.72 664.65 142.71 666.57 142.68 670.69 142.64
 671.75 142.62 675.23 142.58 689.4 142.4 689.71 142.39 693.55 142.35
 695.15 142.32 695.7 142.32 698.36 142.28 699.64 142.27 700.43 142.25
 703.18 142.22 703.96 142.2 706.73 142.17 707.51 142.15 709.6 142.13
 711.9 142.09 717.63 142.01 719.32 142.01 721.69 141.98 723.26 141.94
 724.58 141.92 728.8 141.83 728.86 141.82 733.68 141.72 734.87 141.7
 735.86 141.67 738.5 141.62 741.37 141.55 741.71 141.55 744.52 141.48
 744.92 141.48 747.67 141.41 748.46 141.4 753.97 141.28 754.55 141.26
 762.57 141.09 766.84 140.99 770.01 140.58 771.3 140.42 774.44 140.07
 775.29 139.96 778.63 139.36 780.74 138.97 783.89 138.33 785.05 138.06
 789.03 137.16 790.19 136.93 791.77 136.69 795.37 136.12 796.42 136
 801.71 136 802.87 136.03 806.99 136.6 808.3 136.77 810.16 137.08
 812.34 137.56 814.39 138.02 819.67 139.12 821.42 139.48 823.9 139.98
 826.79 140.35 831.29 140.92 832.35 141.02 835.08 141.13 835.86 141.17
 838.23 141.26 842.16 141.42 844.44 141.52 849.24 141.71 850.04 141.75
 853.19 141.87 855.42 141.97 856.65 142 880.15 142 880.75 142.01
 939.06 142.01 939.16 142.02 940.76 142.02 961.63 142.02 961.85 142.01
 971.26 142.01 971.3 142 974.99 142 975.24 141.99 979.29 141.99
 979.96 141.98 985.55 141.95 988.34 141.92 989.41 141.92 990.99 141.9
 992.13 141.9 994.93 141.87 996.12 141.87 997.62 141.85 1004.37 141.8
 1006.58 141.8 1006.68 141.79 1009.1 141.79 1009.79 141.78 1011.97 141.78
 1012.25 141.77 1014.61 141.77 1015.14 141.76 1017.25 141.76 1017.76 141.75
 1019.42 141.75 1020.12 141.74 1022.63 141.74 1025.44 141.72 1027.45 141.72
 1029.57 141.74 1031.93 141.74 1032.04 141.73 1035.21 141.71 1037.8 141.75
 1038.38 141.75 1041.55 141.8 1042.61 141.81 1043.66 141.8 1045.78 141.75
 1047.89 141.64 1049.92 141.52 1051.52 141.51 1054.23 141.51 1054.77 141.48
 1058.71 141.18 1061.07 141.01 1062.64 140.99 1071.31 140.99 1072.19 141
 1073.25 141.06 1073.67 141.1 1079.18 141.52 1081.08 141.67 1081.7 141.73
 1084.17 141.93 1085.24 142.04 1087.26 142.3 1090.05 142.68 1092.57 143.01
 1094.14 143.26 1096.54 143.62 1098.87 143.98 1099.68 144.09 1102.72 144.53
 1103.89 144.72 1105.95 145.03 1107.53 145.2 1113.4 145.87 1114.46 145.97
 1115.4 146.02 1117.34 146.06 1117.76 146.06 1119.34 146.1 1121.85 146.14
 1124.36 146.19 1124.85 146.19 1127.45 146.24 1132.42 146.32 1134.53 146.35
 1135.88 146.38 1138.76 146.42 1140.6 146.46 1142.9 146.49 1147.21 146.56
 1148.47 146.59 1152.66 146.65 1153.99 146.68 1155.66 146.7 1159.5 146.77
 1162.29 146.81 1166.59 146.89 1167.1 146.89 1170.31 146.95 1187.06 146.95
 1187.36 146.96 1202.15 146.96 1202.42 146.97 1213.83 146.97 1214 146.98
 1223.28 146.98 1224.07 146.99 1235.09 146.99 1235.64 147 1241.39 147
 1242.3 147.03 1242.97 147.09 1245.47 147.28 1247.58 147.46 1249.27 147.59
 1250.05 147.66 1251.63 147.78 1253.92 147.97 1254.98 148.08 1256.35 148.24
 1258.6 148.49 1260.29 148.69 1260.37 148.69 1263.46 149.05 1266.55 149.49
 1267.66 149.64 1268.95 149.79 1270.83 149.99 1273.05 150.27 1276.26 150.75
 1276.72 150.75

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .045 640.76 .032 940.76 .045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 640.76 940.76 37.76 37.76 37.76 .1 .3

CROSS SECTION OUTPUT Profile #10

E.G. Elev (ft)	139.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.032		
W.S. Elev (ft)	139.06	Reach Len. (ft)	37.76	37.76	37.76

Crit W.S. (ft)	Flow Area (sq ft)	73.63
E.G. Slope (ft/ft)	0.000446 Area (sq ft)	73.63
Q Total (cfs)	109.00 Flow (cfs)	109.00
Top Width (ft)	39.09 Top Width (ft)	39.09
Vel Total (ft/s)	1.48 Avg. Vel. (ft/s)	1.48
Max Chl Dpth (ft)	3.06 Hydr. Depth (ft)	1.88
Conv. Total (cfs)	5164.0 Conv. (cfs)	5164.0
Length Wtd. (ft)	37.76 Wetted Per. (ft)	39.67
Min Ch El (ft)	136.00 Shear (lb/sq ft)	0.05
Alpha	1.00 Stream Power (lb/ft s)	0.08
Frctn Loss (ft)	0.03 Cum Volume (acre-ft)	0.05
C & E Loss (ft)	0.00 Cum SA (acres)	0.03

Warning: The conveyance ratio (upstream 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: Hunt River

REACH: Randolph RS: 4

INPUT

Description:

Station Elevation Data num= 492

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	150.7	.43	150.7	2.55	150.77	5.47	150.91	7.81	151
9.94	151.01	12.06	151.12	17.13	151.41	20.65	151.63	22.8	151.75
23.32	151.79	25.79	151.94	27.9	152.05	30.02	152.2	30.29	152.21
33.03	152.41	37.76	152.72	38.31	152.77	40.12	152.86	40.58	152.9
42.48	153	48.05	153	49.04	152.96	51.14	152.83	52.21	152.83
53.51	152.79	55.97	152.64	57.32	152.53	58.23	152.42	59.18	152.34
61.71	152.03	62.77	151.89	66.89	151.32	69.26	151	70.83	150.83
73.63	150.55	73.98	150.5	76.34	150.26	77.92	150.09	78.62	150.04
80.05	150	80.28	150.02	81.07	149.99	85.79	149.97	90.52	149.97
92.09	150	96.82	150	97.5	150.01	102.52	150.01	102.92	150.02
117.71	150.02	118.08	150.03	148.35	150.03	148.79	150.02	162.17	150.02
162.42	150.01	175.83	150.01	176.35	150	181.11	150	183.43	149.85
184.06	149.82	187.6	149.6	190.81	149.39	191.67	149.34	196.42	149.02
197.23	148.98	199.97	148.9	203.66	148.77	205.69	148.71	207.06	148.66
210.21	148.57	212.57	148.49	213.86	148.46	214.89	148.42	219.15	148.31
221.31	148.24	222.02	148.23	224.24	148.16	227.74	148.07	229.89	148
230.95	147.98	233.94	147.89	238.55	147.77	241.33	147.68	244.07	147.61
247.22	147.51	249.58	147.45	252.73	147.35	254.01	147.32	255.88	147.26
257.18	147.23	258.24	147.19	262.18	147.09	262.96	147.06	264.43	147.03
269.26	146.89	271.08	146.85	273.7	146.77	280.29	146.6	280.71	146.58
285.01	146.47	288.74	146.36	289.74	146.34	291.95	146.27	292.25	146.27
295.16	146.18	299.19	146.08	301.58	146	303.18	145.96	308	145.81
309.42	145.78	313.18	145.67	315.72	145.61	320.45	145.49	320.84	145.47
326.25	145.33	328.87	145.27	330.47	145.22	336.2	145.08	336.98	145.05
339.35	145	340.65	144.99	344.07	144.99	344.8	144.98	347.22	144.98
347.89	144.97	351.34	144.97	351.94	144.96	354.55	144.96	356.67	144.94
357.46	144.92	361.39	144.87	364.18	144.82	366.12	144.8	369.53	144.74
370.84	144.73	372.21	144.7	373.41	144.69	375.71	144.65	380.24	144.59
381.08	144.57	384.23	144.53	384.98	144.51	387.14	144.49	388.95	144.46
389.74	144.46	392.42	144.43	393.48	144.41	396.29	144.39	397.35	144.37

399.19 144.36 400.44 144.34 402.34 144.33 403.53 144.31 407.22 144.28
408.27 144.26 412.58 144.22 416.51 144.17 419.66 144.16 421.97 144.14
423.6 144.14 425.96 144.12 427.54 144.12 429.9 144.1 432.26 144.09
438.56 144.09 438.91 144.1 441.24 144.1 441.71 144.11 443.71 144.11
444.07 144.12 446.44 144.12 446.81 144.13 459.17 144.13 460.5 144.16
463.76 144.16 464.27 144.17 468.53 144.17 473.78 144.2 482.23 144.2
484.58 144.27 485.02 144.26 486.18 144.28 487.79 144.28 490.69 144.3
491.74 144.33 492.8 144.33 494.21 144.35 495.26 144.35 497.62 144.38
501.25 144.45 503.37 144.45 503.84 144.46 508.66 144.46 510.22 144.47
513.37 144.56 514.81 144.58 518.16 144.58 518.29 144.59 521.24 144.59
522.82 144.6 525.97 144.57 528.33 144.49 533.36 144.28 537.78 144.01
540.76 143.86 544.57 143.68 546.69 143.56 549.59 143.41 551.16 143.32
553.02 143.3 556.68 143.29 560.61 143.27 563.24 143.25 570.45 143.16
575.57 143.09 576.08 143.09 579.73 143.03 582.82 142.96 583.67 142.95
585.91 142.9 588.17 142.86 591.32 142.79 593.69 142.76 594.47 142.76
597.4 142.73 598.55 142.73 603.92 142.68 604.45 142.67 606.91 142.64
607.86 142.64 611.8 142.59 614.61 142.57 619.91 142.51 621.7 142.48
623.82 142.46 630.66 142.37 631.48 142.35 634.38 142.31 637.08 142.28
640.72 142.23 642.83 142.21 644.64 142.18 647.73 142.15 651.17 142.1
651.96 142.1 657 142.03 658.68 142.02 659.74 142 668.49 142
669.37 141.99 672.46 141.91 674.53 141.87 676.37 141.85 682.67 141.77
684.82 141.73 686.15 141.72 689.32 141.66 691.01 141.64 695.26 141.56
697.63 141.53 702.35 141.46 705.17 141.41 706.23 141.4 708.65 141.35
712.65 141.29 715.74 141.23 719.67 141.17 725.01 141.08 726.3 141.05
729.12 141.01 729.47 140.99 731.19 140.78 732.64 140.59 735 140.3
736.87 140.06 737.93 139.9 741.1 139.32 742.15 139.1 743.3 138.88
745.66 138.46 747.23 138.14 749.55 137.68 751.66 137.28 752.66 137.11
753.53 137.02 755.11 136.97 759.01 136.9 760.62 136.9 765.4 136.99
766.45 137.08 769.28 137.4 772.79 137.95 777.16 138.75 777.94 138.9
779.13 139.08 785.03 139.79 786.37 139.96 787.39 140.03 789.58 140.11
793.02 140.25 795.27 140.33 796.11 140.35 801.32 140.55 805.38 140.69
808.72 140.81 812.06 140.89 814 140.95 818.48 141.06 818.89 141.08
821.69 141.15 824.9 141.18 827.02 141.24 830.7 141.32 832.92 141.38
835.13 141.42 836.29 141.42 838.58 141.44 844.09 141.54 846.45 141.57
847.24 141.59 849.6 141.61 852.75 141.65 857.93 141.65 858.26 141.66
860.62 141.66 861.02 141.67 863.42 141.67 863.66 141.68 865.77 141.68
866.14 141.69 868.5 141.69 870.86 141.71 872.44 141.71 874.01 141.73
876.37 141.73 876.48 141.74 881.62 141.74 881.89 141.75 886.9 141.75
890.07 141.78 897.13 141.78 897.47 141.79 902.75 141.79 904.45 141.81
908.37 141.84 909.45 141.84 913.19 141.88 914.38 141.88 915.75 141.9
918 141.91 921.77 141.95 922.84 141.95 924.41 141.97 929.24 141.97
929.92 141.98 932.45 141.98 933.07 141.99 937.01 141.99 937.27 142
940.94 142 941.39 142.01 944.09 142.01 944.48 142.02 947.57 142.02
948.03 142.03 952.75 142.03 953.32 142.02 957.69 142.02 959.74 142.07
961.92 142.11 963.78 142.16 964.57 142.17 967.77 142.25 969.21 142.27
972.44 142.27 973.23 142.28 975.59 142.37 976.71 142.4 980.94 142.48
982 142.49 984.25 142.54 987.28 142.66 988.34 142.69 989.76 142.75
992.13 142.81 997.64 142.98 1002.36 143.1 1005.51 143.14 1006.29 143.16
1009.4 143.2 1012.71 143.26 1014.17 143.28 1017.92 143.28 1021.26 143.37
1023.62 143.42 1028.49 143.46 1029.92 143.48 1034.65 143.48 1034.83 143.47
1039.05 143.55 1041.16 143.55 1043.4 143.54 1044.82 143.57 1048.03 143.61
1048.03 143.6 1051.18 143.64 1055.76 143.72 1058.07 143.77 1061.42 143.9
1062.48 143.98 1066.14 144.28 1068.64 144.47 1069.69 144.56 1070.87 144.68
1072.86 144.91 1074.02 145.03 1077.96 145.36 1084.48 145.98 1085.04 146.02
1088.98 146.18 1092.98 146.36 1094.58 146.42 1096.85 146.52 1098.43 146.58
1103.5 146.66 1107.73 146.71 1116.18 146.92 1118.66 146.94 1120.27 146.94
1122.05 146.96 1123.63 146.96 1126.86 146.98 1128.29 147 1155.58 147
1156.7 147.02 1158.79 147.01 1159.06 147.04 1160.4 147.02 1162.21 147.06

1164.78 147.07 1167.05 147.07 1167.72 147.08 1170.14 147.08 1170.87 147.09
 1173.23 147.06 1174.02 147.06 1176.32 147.02 1178.75 147.02 1179.41 147
 1181.9 147.02 1182.87 147 1184.26 147.03 1186.08 147 1187.41 147.04
 1188.03 147.02 1189.77 147.08 1194.87 147.23 1196.48 147.29 1197.96 147.33
 1200.53 147.43 1202.37 147.52 1204.93 147.67 1206.31 147.76 1208.1 147.86
 1210.32 148 1212.33 148.18 1215.76 148.53 1217.61 148.73 1219.6 148.99
 1223.95 149.6 1225.99 149.95 1228.18 150.28 1232.41 150.96 1233.46 151.1
 1237.02 151.54 1239.8 151.91 1240.66 152.01 1241.74 152.11 1246.47 152.53
 1248.04 152.66 1251.98 153.01 1255.13 153.33 1255.92 153.42 1258.32 153.66
 1261.43 153.98 1266.15 154.64 1268.33 154.95 1272.15 155.54 1274.67 155.99
 1276.39 156.23 1276.72 156.23

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .045 604.45 .032 904.45 .045

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 604.45 904.45 73.77 73.77 73.77 .1 .3

CROSS SECTION OUTPUT Profile #10

E.G. Elev (ft)	139.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.032		
W.S. Elev (ft)	138.98	Reach Len. (ft)			
Crit W.S. (ft)	138.05	Flow Area (sq ft)	49.66		
E.G. Slope (ft/ft)	0.001458	Area (sq ft)	49.66		
Q Total (cfs)	109.00	Flow (cfs)	109.00		
Top Width (ft)	35.73	Top Width (ft)	35.73		
Vel Total (ft/s)	2.19	Avg. Vel. (ft/s)	2.19		
Max Chl Dpth (ft)	2.08	Hydr. Depth (ft)	1.39		
Conv. Total (cfs)	2854.3	Conv. (cfs)	2854.3		
Length Wtd. (ft)		Wetted Per. (ft)	36.07		
Min Ch El (ft)	136.90	Shear (lb/sq ft)	0.13		
Alpha	1.00	Stream Power (lb/ft s)	0.28		
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Hunt River

Reach	River Sta.	n1	n2	n3
Randolph	10	.045	.032	.045
Randolph	9	.045	.032	.045
Randolph	8	.045	.032	.045
Randolph	7	.045	.032	.045
Randolph	6	.045	.032	.045
Randolph	5	.045	.032	.045
Randolph	4	.045	.032	.045

SUMMARY OF REACH LENGTHS

River: Hunt River

Reach	River Sta.	Left	Channel	Right
Randolph	10	158.82	158.82	158.82
Randolph	9	121.2	121.2	121.2
Randolph	8	120.9	120.9	120.9
Randolph	7	140.37	140.37	140.37
Randolph	6	119.99	119.99	119.99
Randolph	5	37.76	37.76	37.76
Randolph	4	73.77	73.77	73.77

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Hunt River

Reach	River Sta.	Contr.	Expan.
Randolph	10	.1	.3
Randolph	9	.1	.3
Randolph	8	.1	.3
Randolph	7	.1	.3
Randolph	6	.1	.3
Randolph	5	.1	.3
Randolph	4	.1	.3