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RESILIENT NEW YORK FLOOD MITIGATION INITIATIVE

IRONDEQUOIT CREEK, NEW YORK

Prepared for:

NEW YORK STATE OF OPPORTUNITY. Office of General Services

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

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HIGHLAND PLANNING

IN NOVEMBER 2018, NEW YORK STATE GOVERNOR ANDREW CUOMO COMMITTED FUNDING TO UNDERTAKE ADVANCED MODELING TECHNIQUES AND FIELD ASSESSMENTS OF 48 FLOOD-PRONE STREAMS TO IDENTIFY PRIORITY PROJECTS AND ACTIONS TO REDUCE COMMUNITY FLOOD AND ICE JAM RISKS, WHILE IMPROVING HABITAT. THE OVERALL GOAL OF THE PROGRAM IS TO MAKE NEW YORK STATE MORE RESILIENT TO FUTURE FLOODING.

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LIST OF ABBREVIATIONS

1-D	one-dimensional
2-D	two-dimensional
ACE	annual chance flood event
BFE	base flood elevation
BIN	Bridge Identification Number
BRIC	Building Resilient Infrastructure and Communities
CDBG	Community Development Block Grants
CFA	Consolidated Funding Applications
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIN	Culvert Identification Number
CRRA	Community Risk and Resiliency Act
CRS	Community Rating System
CSC	Climate Smart Communities
DEM	Digital Elevation Model
EWP	Emergency Watershed Protection
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
ft	feet
GIS	Geographic Information Systems
GLS	Generalized Least-Squares
GSE	Gomez and Sullivan Engineers, D.P.C.
H&H	Hydrologic and Hydraulic
HEC	Hydrologic Engineering Center
HEC-RAS	Hydrologic Engineering Center's River Analysis System
Highland Planning	Highland Planning, LLC
HMGP	Hazard Mitigation Grant Program
IPaC	Information for Planning and Consultation
LiDAR	Light Detection and Ranging
LOMR	Letter of Map Revision
mi^2	square miles
MSC	Map Service Center
NAVD88	North American Vertical Datum of 1988
NCEI	National Centers for Environmental Information
NFIP	National Flood Insurance Program
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NYSDEC	New York State Department of Environmental Conservation
NYSDHSES	New York State Division of Homeland Security and Emergency Services
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Energy Research and Development Authority
NYSGOSR	New York State Governors Office of Storm Recovery

NYSOEM	New York State Office of Emergency Management
NYSOGS	New York State Office of General Services
NYSOPRHP	New York State Office of Parks, Recreation, and Historic Places
PDM	Pre-Disaster Mitigation
RCP	Representative Concentration Pathways
Ramboll	Ramboll Americas Engineering Solutions, Inc.
R_c	Circularity Ratio
R_E	Elongation Ratio
R_F	Form Factor
RF	Radio Frequency
RL	Repetitive Loss
ROM	Rough Order of Magnitude
SFHA	Special Flood Hazard Area
SRL	Severe Repetitive Loss
USACE	United States Army Corps of Engineers
USDHS	United States Department of Homeland Security
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WQIP	Water Quality Improvement Project

Introduction

Historical Initiatives

Flood mitigation has historically been an initiative in western New York and in the Irondequoit Creek watershed. Some natural features such as ponds, lakes, and swamps offer some retention of storm runoff to decrease the discharge. Land control measures which aim to retain the water retention benefits of these areas are used to minimize flood damage and to protect the pubic health, safety, and general welfare of citizens within the watershed. Retaining park land, such as Ellison Park is one example of such land control measures, while the property buyout efforts within the Town of Perinton is another example. Additionally, some towns within the watershed flood forecasting by the National Weather Service has been used to provide flood warnings to the community. While structural flood control measures have not been common, some small projects have proceeded. A wall of boulders was placed in 1998 to protect the 100-foot tall sand cliffs along Irondequoit Creek within Linear park (also known as Channing H. Philbrick Park). Similarly, the New York State Department of Transportation (NYSDOT) has performed maintenance activities to maintain hydraulic capacity through structures, such as periodic sediment removal at the Interstate 490 culverts. The Town of Penfield has also worked to take down trees and remove blockages in Ellison Park. Flood buyouts have also been implemented within this watershed, as six townhouses on Penn Lane in the Town of Penfield were purchased and demolished due to significant recurring flooding. The Town of Penfield is also working to reduce backwater surges from catch basins in this area.

A report by the United States Army Corps of Engineers (USACE) identified areas of flood hazard within the watershed. In addition to discussing general watershed scale flood mitigation alternatives, it specifically reviewed potential mitigation alteranatives in the vicinity of Panorama Plaza, including channelization, diversion channels, berms, levees, and floodwalls. The report's final recommendation included a combination of levees and floodwalls designed to protect the area up to the 0.2% annual chance exceedance (ACE) event. The USACE did not receive a Letter of Intent to provide non-Federal project assurances from the non-Federal local sponsor. Therefore, the nonstructural plan was selected for implementation. The non-Federal sponsor provided a letter dated May 18, 1982 concurring with the recommendation of the study to implement a nonstructural plan without USACE participation, due to the lack of support from the Penfield Town Board for the levee and floodwall alternative (USACE, 1982). The non-structural plan included discussion regarding flood warning systems, floodproofing, permanent evacuation, flood insurance, and flood plain regulations.

A flood mitigation analysis was recently completed for Allen Creek which evaluated ways to improve the resiliency of the Oak Hill Country Club under drought and flood conditions. With regards to flood conditions, the analysis recommends replacing the three-pipe culvert at the main access road with a single box culvert to address debris clogging issues. This recommendation tried to balance the existing floodplain storage benefits provided by the course during a large flood event with the desire to reduce the time it takes to drain the course after a flood event. Permitting for this mitigation alternative is underway, and additional measures are being researched relative to contingency plans for major Professional Golf Association events.

Monroe County considers hydraulic capacity and freeboard when evaluating a bridge replacement, and attempts to achieve NYSDOT freeboard guidance. In some cases these freeboard guidelines cannot be attained without impacting nearby properties; in which case Monroe County attempts to maximize the freeboard while balancing out the surrounding property impact. A 2005 bridge replacement at Old Penfield Road by Monroe County increased the bridge clear span width by 17 feet and raised the low

chord by approximately 7.5 feet, which has anecdotally decreased flooding in the area. During the May 2014 flooding event, the areas near Brook Hill Lane and Penn Lane were impacted by bank overflow downstream of the bridge, as opposed to backwater from the bridge which was estimated to have approximately two feet of freeboard during the event. The Monroe County Capital Improvement program includes planned replacements for the Taylor Road bridge in 2025 and the Mile Square Road bridge in 2026. These bridge replacements will include a hydraulic analysis as part of the design (Cox, 2022).

Floodplain Development

General recommendations for high risk floodplain development follow four basic strategies:

1. Remove the flood prone facilities from the floodplain
2. Adapt the facilities to be flood resilient under repetitive inundation scenarios
3. Develop nature-based mitigation measures (e.g., floodplain benches, constructed wetlands, etc.) to lower flood stages in effected areas
4. Up-size bridges and culverts to be more resilient to ice jams, high flow events, and projected future flood flows due to climate change in effected areas

In order to effectively mitigate flooding along substantial lengths of a watercourse corridor, floodplain management should restrict the encroachment on natural floodplain areas. Floodplains act to convey floodwaters downstream, mitigate damaging velocities, and provide areas for sediment to accumulate safely. The reduction in floodplain width of one reach of a stream, often leads to the increase in flooding upstream or downstream. During a flood event, a finite amount of water with an unchanging volume must be conveyed and, as certain conveyance areas are encroached upon, floodwaters will often expand into other sensitive areas.

A critical evaluation of existing floodplain law and policies should be undertaken to evaluate the effectiveness of current practices and requirements within this watershed. Local floodplain regulations should be consistent with the National Flood Insurance Program (NFIP) and Federal Emergency Management Agency (FEMA) regulations since the Towns of Penfield, Perinton, and Mendon are participating communities in the NFIP and should involve a floodplain coordinator and a site plan review process for all proposed developments. This review should be in accordance with local regulations and the NFIP requirements, which require the community to determine if any future proposed development could adversely impact the floodplain or floodway resulting in higher flood stages and sequentially greater economic losses to the community.

Resilient NY Initiative

In November of 2018, New York State Governor Andrew Cuomo announced the Resilient NY program in response to devastating flooding in communities across the State in the preceding years. A total of 48 high-priority flood prone watersheds across New York State are being addressed through the Resilient NY program. Flood mitigation studies were commissioned using advanced modeling techniques and field assessments to identify priority projects in these 48 flood-prone watersheds, develop state-of-the-art studies to reduce flooding and ice jams, and improve ecological habitats in the watersheds (NYSGPO, 2018). The Irondequoit Creek watershed was chosen as a study site for this initiative.

The New York State Department of Environmental Conservation (NYSDEC) is responsible for implementing the Resilient NY program with contractual assistance from the New York State Office of General Services (NYSOGS). High-priority watersheds were selected based on several factors, such as frequency and

severity of flooding and ice jams, extent of previous flood damage, and susceptibility to future flooding and ice-jam formations (NYSGPO, 2018).

The Resilient NY flood studies will identify the causes of flooding within each watershed and develop effective and ecologically sustainable flood and ice-jam hazard mitigation projects. Potential flood mitigation measures will be evaluated using hydrologic and hydraulic (H&H) modeling to quantitatively determine flood mitigation strategies that would result in the greatest flood reduction benefits. In addition, the flood mitigation studies incorporate the latest climate change forecasts and assess open water and ice-jam hazards where future flood risks have been identified.

This report is not intended to address detailed design considerations for individual flood mitigation alternatives. The mitigation alternatives discussed are conceptual projects that have been initially developed and evaluated to determine their flood mitigation benefits. A more in-depth engineering design study would still be required for any mitigation alternative chosen to further define the engineering project details. However, the information contained within this study can inform such in-depth engineering design studies and be used in the application for state and federal funding and/or grant programs.

The goals of the Resilient NY Program are to:

1. Perform comprehensive flood and ice jam studies to identify known and potential flood risks in flood-prone watersheds
2. Incorporate climate change predictions into future flood models
3. Develop and evaluate flood hazard mitigation alternatives for each flood-prone stream area, with a focus on ice-jam hazards

The overarching purpose of the initiative is to evaluate a suite of flood and ice-jam mitigation projects that local municipalities can undertake to make their community more resilient to future floods. The projects should be affordable, attainable through grant funding programs, able to be implemented either individually or in combination in phases over the course of several years, achieve measurable improvement at the completion of each phase, and fit with the community way of life. The information developed under this initiative is intended to provide the community with a basis for assessing and selecting flood mitigation strategies to pursue; no recommendations are made as to which strategies the community should pursue.

The flood mitigation and resiliency study for Irondequoit Creek began in January of 2022 and a final flood study report was issued in September of 2022.

Data Collection

Initial Data Collection

Hydrological and meteorological data were obtained from readily available state and federal government databases, including ortho-imagery, flood zone maps, streamflow, precipitation, flooding and ice jam reports. Historical flood reports, newspaper articles, social media posts, community engagement meeting notes, and geographic information system (GIS) mapping were used to identify stakeholder concerns, produce watershed maps, and identify current high-risk areas. New York State Community Risk and Resiliency Act (NYSDEC, 2020) guidelines, NYSDOT bridge and culvert standards, and United States Geologic Service (USGS) *FutureFlow Explorer* v1.5 (USGS, 2016) and *StreamStats* v4.4.0 (USGS, 2020) software were used to develop current and future potential discharges and bankfull widths and depths at various points along the stream channel. H&H modeling was performed previously, as part of the FEMA Flood Insurance Studies (FIS) for the Towns of Penfield, Perinton, and Mendon.

Updated H&H modeling was performed in this study using the USACE Hydrologic Engineering Center's River Analysis System (HEC-RAS) v6.2 (USACE, 2022a) software to compute water stage at current and potential future levels for high risk areas and to evaluate the effectiveness of potential flood mitigation strategies. These studies and data were obtained and used, all or in part, as part of this effort. Appendix A is a summary listing of data and reports collected for this study.

Public Outreach

An initial virtual project kickoff meeting was held on January 20, 2022, with representatives of the NYSDEC, NYSOGS, Ramboll Americas Engineering Solutions, Inc. (Ramboll), Gomez & Sullivan Engineers, D.P.C. (GSE), Highland Planning, USACE, Monroe County, the Towns of Penfield, Perinton, Mendon, Victor, Henrietta, and Brighton, and the Oak Hill Country Club (Appendix B). At the project kickoff meeting, project specifics including background, purpose, funding, roles, and timelines were discussed. Discussions included a variety of topics, including:

- Firsthand accounts of past flooding events
- Identification of specific areas that flooded in each community, and the extent and severity of flood damage
- Information on post-flood mitigation efforts, such as temporary floodwalls

This outreach effort assisted in the identification of current high-risk areas to focus on during the future flood risk assessments.

Field Assessment

Following the initial data gathering and agency meetings, field staff from GSE undertook field data collection efforts with special attention given to high risk areas in the Towns of Penfield, Perinton, and Mendon, as identified in the initial data collection process. Initial field assessments of Irondequoit Creek were conducted in May 2022. Information collected during field investigations included the following:

- Rapid "windshield" river corridor inspection
- Photo documentation of inspected areas
- Measurement and rapid hydraulic assessment of bridges, culverts, and dams

- Geomorphic classification and assessment, including measurement of bankfull channel widths and depths at key cross sections
- Field identification of potential flood storage areas
- Wolman pebble counts
- Characterization of key stream bank failures, head cuts, bed erosion, aggradation areas, and other unstable stream channel features
- Preliminary identification of potential flood hazard mitigation alternatives, including those requiring further analysis

Included in Appendix C is a copy of the Stream Channel Classification Form, Field Observation Form for the inspection of bridges and culverts, and Wolman Pebble Count Form. Appendix D is a photo log of select locations within the river corridor. The collected field data was categorized, summarized, indexed, and geographically located within a GIS database. This GIS database will be made available to the NYSDEC and NYSOGS upon completion of the project.

All references to “right bank” and “left bank” in this report refer to "river right" and "river left," meaning the orientation assumes that the reader is standing in the river looking downstream.

Watershed Characteristics

Study Area

The Irondequoit Creek watershed includes portions of Monroe, Ontario, and Wayne Counties covering the entirety of the Villages of East Rochester, Pittsford, and Fairport, as well as portions of the Towns of Penfield, Perinton, Mendon, Pittsford, Victor, Brighton, West Bloomfield, Henrietta, Macedon, and Irondequoit, in addition to part of the City of Rochester. The creek has a total drainage area of approximately 139 square miles at its confluence with Irondequoit Bay on Lake Ontario. The headwaters of Irondequoit Creek lie approximately 11 miles West-NorthWest of Canandaigua, NY and the creek generally flows North through a gorge about 150-feet to 200-feet wide between steep hils on its way to Lake Ontario. The primary tributaries are Allen Creek and Thomas Creek, with minor tributaries including Trout Brook, White Brook, and Buckland Creek (USACE, 1982).

Figure 1 depicts the location of the Irondequoit Creek watershed. Within the watershed, the Towns of Penfield, Perinton, and Mendon were chosen as the target study area due to the history of flooding in and along the creek and the amount of development along the creek. Figure 2 depicts the stationing of the creek for the watershed and identifies the study area, as well as the locations where field data was collected for this study.

Figure 1. Irondequoit Creek Watershed, Monroe County, NY

Figure 2. Irondequoit Creek Stationing, Monroe County, NY

Environmental Conditions

An overview of the environmental and cultural resources within the Irondequoit Creek study area was compiled using the following online tools:

- Environmental Resource Mapper: The Environmental Resource Mapper is a tool used to identify mapped federal and state wetlands, state designated significant natural communities, and plants and animals identified as endangered or threatened by the NYSDEC (NYSDEC, 2022) (https://gisservices.dec.ny.gov/gis/erm/)
- National Wetlands Inventory (NWI): The NWI is a digital map database available on the Environmental Resource Mapper that provides information on the "status, extent, characteristics and functions of wetlands, riparian, and deep-water habitats" (NYSDEC, 2022)
- Information for Planning and Consultation (IPaC): The IPaC database provides information about endangered/threatened species and migratory birds regulated by the United States Fish and Wildlife Service (USFWS, 2022) (https://ecos.fws.gov/ipac/)
- National Register of Historic Places: The National Register of Historic Places lists historic places worthy of preservation, as authorized by the National Historic Preservation Act of 1966 (NPS, 2014) (https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466)

Wetlands

The State-Regulated Freshwater Wetlands database shows the approximate location of wetlands regulated by New York State. According to the Environmental Resource Mapper, about 84 state-regulated wetlands overlap with the study area (NYSDEC, 2022).

The NWI was reviewed to identify national wetlands and surface waters (Figure 3). The Irondequoit Creek study area includes about 1,375 wetlands, including freshwater emergent wetlands, freshwater forested/shrub wetlands, ponds, lakes, and rivers (NYSDEC, 2022).

Sensitive Natural Resources

Areas designated as significant natural communities by the NYSDEC were mapped in the Irondequoit Creek study area (Figure 4). The natural communities identified included oak openings at Powder Mills Kettle and Kame, rich fern shrub at Bentley Woods, and a rich graminoid fen called Quaker Pond Fen, as mapped by the Environmental Resource Mapper (NYSDEC, 2022).

Endangered or Threatened Species

The Environmental Resource Mapper shows that the study area has several rare or threatened species records (Figure 4). The NYSDEC Regional Office should be contacted to determine the potential presence of the species identified (NYSDEC, 2022).

The USFWS Information for Planning and Consultation (IPaC) results for the study area does not list any endangered or threatened species as potentially occurring within the study area. Monarch butterfly (*Danaus plexipuss*), a candidate species under the Endangered Species Act, is listed as potentially present within the study area. No critical habitat has been designated for the species within the study area (USFWS, 2022).

The migratory bird species listed in Table 1 are listed in the IPaC review of the study area.

Table 1. USFWS IPaC Listed Migratory Bird Species

Common Name	Scientific Name	Level of Concern	Breeding Season
American Golden-plover	*Pluvialis dominica*	Bird of Conservation Concern (BCC) Rangewide	Breeds elsewhere
Bald Eagle	*Haliaeetus leucocephalus*	Non-BCC, Vulnerable	Dec 1 – Aug 31
Black-billed Cuckoo	*Coccyzus erythrophalmus*	BCC Rangewide	May 15 – Oct 10
Blue-winged Warbler	*Vermivora pinus*	BCC Bird Conservation Regions (BCR)	May 1 – Jun 30
Bobolink	*Dolichonyx oryzivorus*	BCC Rangewide	May 20 – Jul 31
Canada Warbler	*Cardellina canadensis*	BCC Rangewide	May 20 – Aug 10
Cerulean Warbler	*Dendroica cerulea*	BCC Rangewide	Apr 20 – Jul 20
Eastern Whip-poor-will	*Antrostomus vociferus*	BCC Rangewide	May 1 – Aug 20
Evening Grosbeak	*Coccothraustes vespertinus*	BCC Rangewide	May 15 – Aug 10
Golden Eagle	*Aquila chrysaetos*	Non-BCC, Vulnerable	Jan 1 – Aug 31
Golden-winged Warbler	*Vermivora chrysoptera*	BCC Rangewide	May 1 – Jul 20
Lesser Yellowlegs	*Tringa flavipes*	BCC Rangewide	Breeds elsewhere
Red-headed Woodpecker	*Melanerpes erythrocephalus*	BCC Rangewide	May 10 – Sep 10
Ruddy Turnstone	*Arenaria interpres morinella*	BCC -BCR	Breeds elsewhere
Short-billed Dowitcher	*Limnodromus griseus*	BCC Rangewide	Breeds elsewhere
Wood Thrush	*Hylocichla mustelina*	BCC Rangewide	May 10 – Aug 31

Source: (USFWS, 2022)

Cultural Resources

According to the National Register of Historic Places, there are 17 registered historic places within the Irondequoit Creek study area (Figure 5).

Consultation with New York State Office of Parks, Recreation, and Historic Places (NYSOPRHP) should be performed to identify the potential presence of archeological resources and the subsequent need to perform a cultural resources investigation (NPS, 2014).

Figure 3. Irondequoit Creek Study Area Wetlands and Hydrography, Monroe County, NY

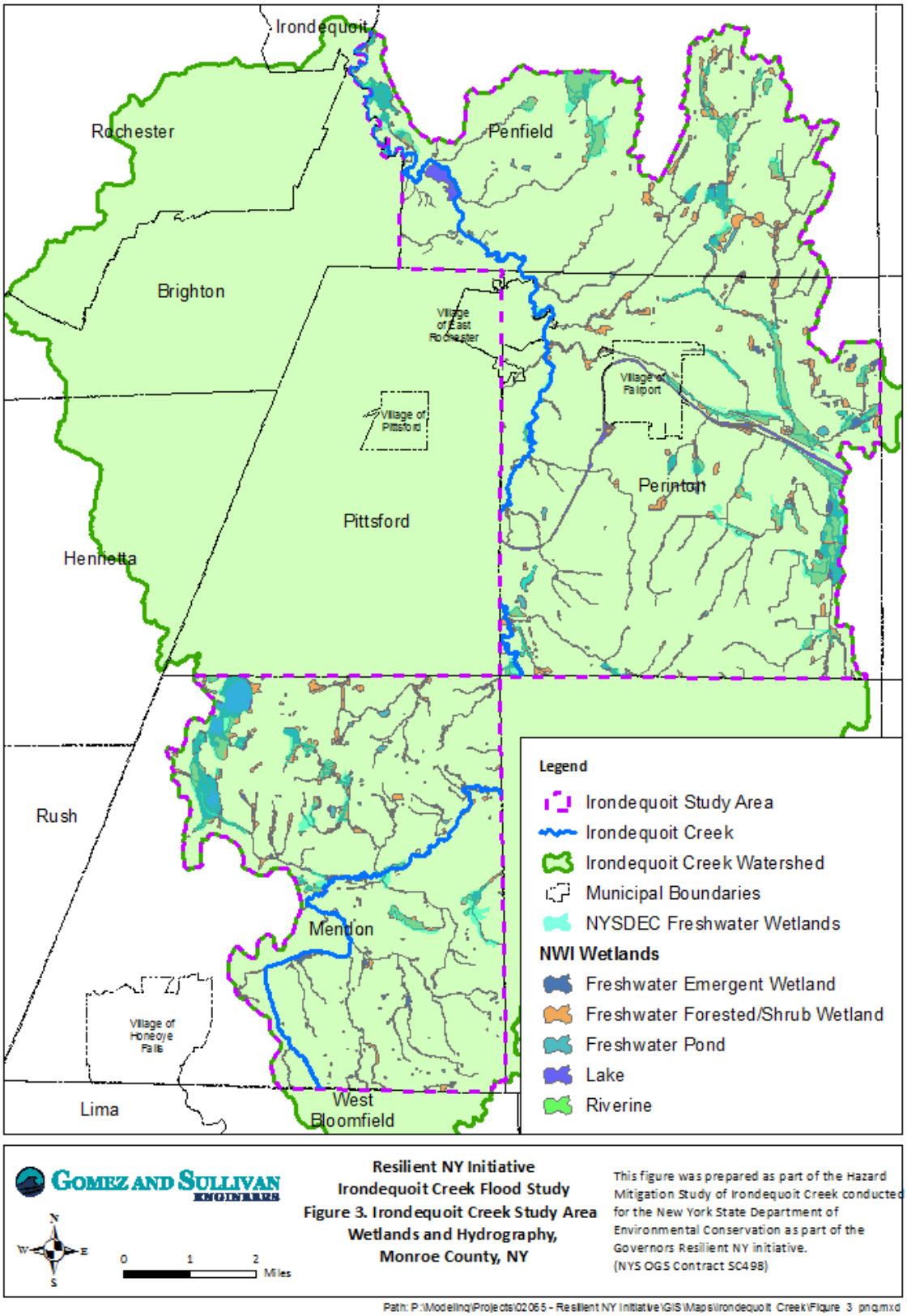


Figure 4. Significant Natural Communities and Rare Plants or Animals, Irondequoit Creek Study Area, Monroe County, NY

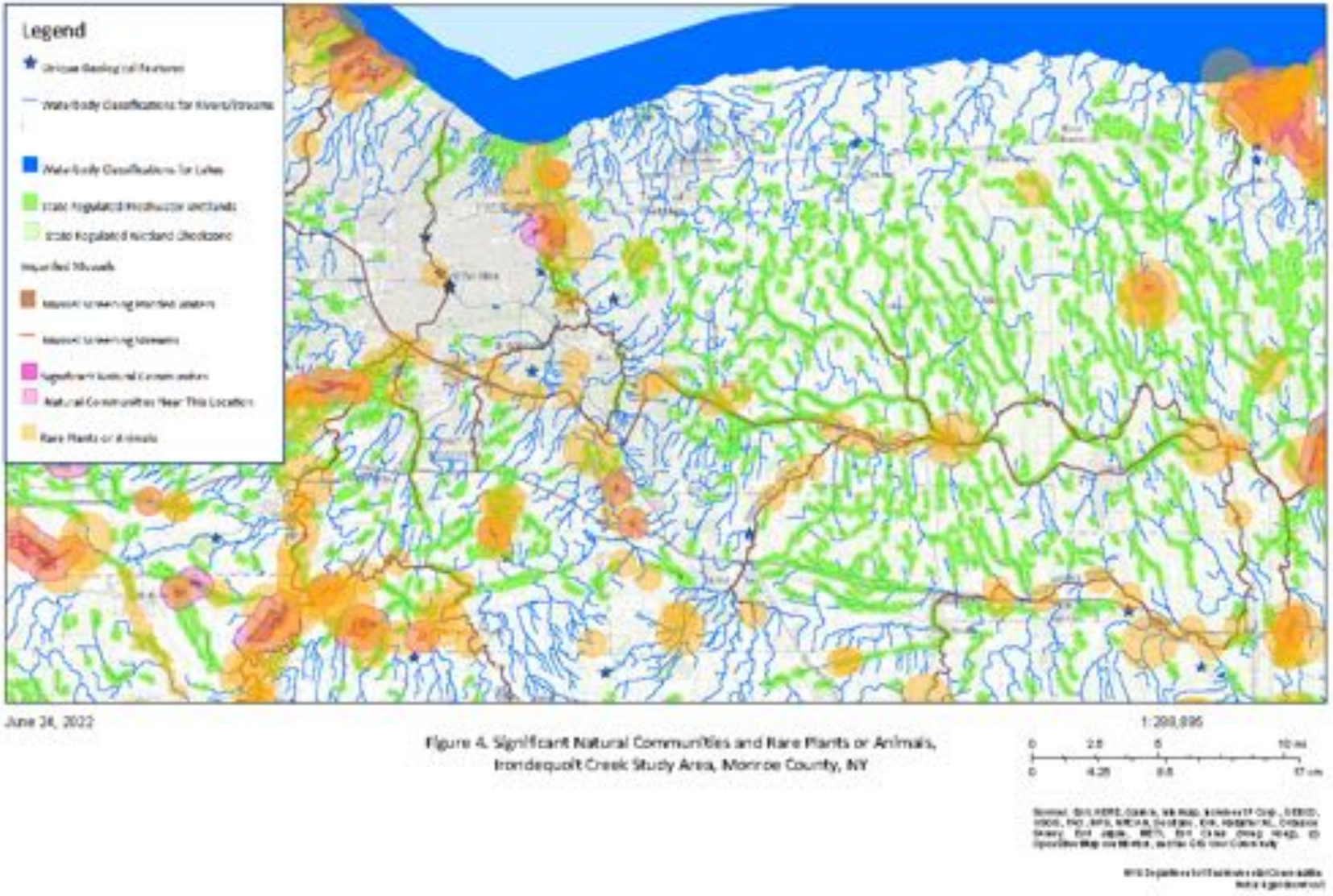


Figure 5. National Register of Historic Places, Irondequoit Creek Study Area, Monroe County, NY

Floodplain Location

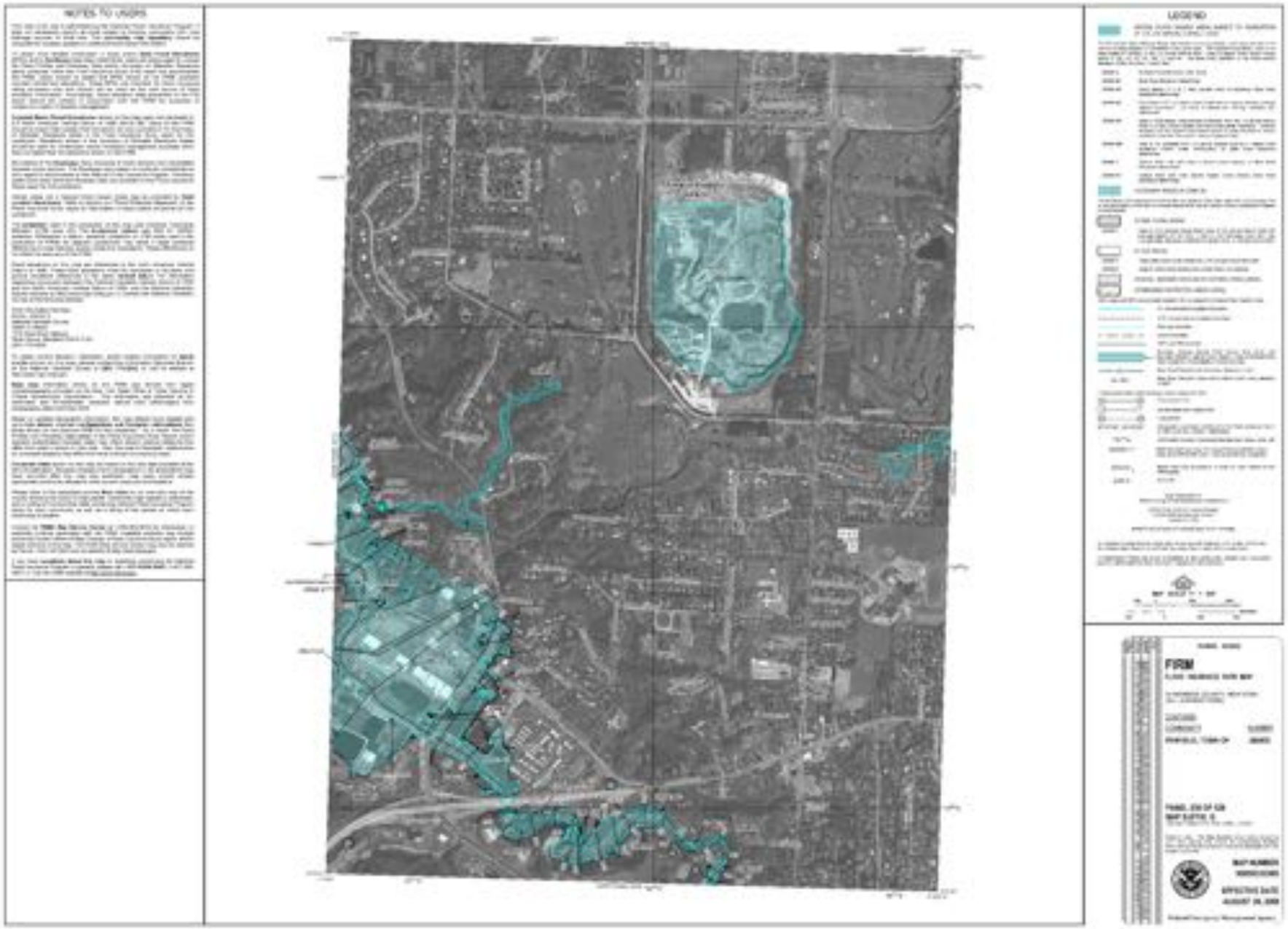
The FEMA Flood Map Service Center (MSC) (https://msc.fema.gov/portal/home) is a database that contains FEMA Flood Insurance Rate Maps (FIRMs) for areas that have had FEMA flood insurance studies completed throughout the United States. For the Towns of Penfield, Perinton, and Mendon, the current effective FEMA FIS was completed on August 28, 2008. According to the FIS, the hydrologic and hydraulic analyses completed included redelineation of the original FEMA H&H studies and updated new detailed studies from the original H&H studies. The FEMA FIS included Irondequoit Creek as a redelineation study (FEMA, 2008a).

Redelineation is the method of updating effective flood hazard boundaries to match current topographic data based on the computed water surface elevations from FEMA effective models. The results of a redelineation update are more accurate floodplain boundaries when compared to current ground conditions. Redelineation of floodplain boundaries can be applied to both riverine and coastal studies. No new engineering analyses are performed as part of the redelineation methodology; however, redelineation can be paired with new engineering studies as part of a larger update. For riverine studies, effective flood profiles and data tables from the Flood Insurance Study (FIS) report, Base Flood Elevations (BFEs) from the Flood Insurance Rate Maps (FIRMs), and supporting hydrologic and hydraulic analyses are used in conjunction with the updated topographic data to formulate new floodplain boundaries. The coastal redelineation method also typically involves no new analyses. This method combines effective information from the FIRM and FIS Report and the supporting analyses with new, more detailed, or more up to-date topographic data to redelineate coastal high hazard areas (FEMA, 2015a).

The FIRM for Irondequoit Creek indicates Special Flood Hazard Areas (SFHAs), which are land areas covered by floodwaters during the 1% ACE, along the banks of the creek, for almost the entire length of the creek (FEMA, 2008b). Irondequoit Creek is a Regulatory Floodway, which is defined as the watercourse channel and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than 1-foot over the 1% annual chance flood hazard water surface elevation, referred to as the Base Flood Elevation (BFE). In the regulatory floodway, communities must regulate encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway and demonstrate through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not increase flood levels within the community during the occurrence of the base flood. Development in the portions of the floodplain beyond the floodway, referred to as the floodway fringe, is allowed as long as it does not increase the BFE more than 1.0 foot (FEMA, 2000).

For watercourses where FEMA has provided BFEs, but no floodway has been designated, or where FEMA has not provided BFEs, the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur or identify the need to adopt a floodway if adequate information is available. The flood zones indicated in the Irondequoit Creek study area are Zone AE where mandatory flood insurance purchase requirements apply. AE Zones are areas that have a 1% annual chance of flooding where BFEs are provided by FEMA. Figure 6 is a FIRM that includes a portion of Irondequoit Creek in the Town of Penfield, NY (FEMA, 2008b).

Figure 6. FEMA FIRM, Irondequoit Creek, Town of Penfield, Monroe County, NY



Study Area Land Use

The National Land Cover Database (MRLC, 2019) shows that, within the study area, the Developed, Open Space land use cover type makes up 20.95% of the study area. All developed land cover types total 38.08% of the study area and all agriculture cover types total 27.06%. Further details of the distribution of land cover within the watershed are shown in Table 2. The developed land land use cover types are located mostly in the towns of Penfield and Perinton. Agriculture is more dominant throughout the town of Mendon.

Table 2. Land Use Cover Types in the Irondequoit Creek Study Area

Land Use Cover Type	Acres	Percentage
Developed, Open Space	10,210.07	20.95%
Deciduous Forest	8,537.18	17.52%
Pasture/Hay	8,197.69	16.82%
Developed, Low Intensity	5,903.69	12.11%
Cultivated Crops	4,988.57	10.24%
Woody Wetlands	3,905.55	8.01%
Mixed Forest	2,857.10	5.86%
Developed, Medium Intensity	1,965.90	4.03%
Emergent Herbaceous Wetlands	535.19	1.10%
Developed High Intensity	477.36	0.98%
Open Water	416.20	0.85%
Evergreen Forest	240.03	0.49%
Barren Land (Rock/Sand/Clay)	190.42	0.39%
Grassland/Herbaceous	157.39	0.32%
Shrub/Scrub	153.38	0.31%
Total	48,735.72	**100%**

Source: (MRLC, 2019)

Geomorphology

The Irondequoit Creek resides in the Erie-Ontario Lowland physiographic province, whose watershed consists of the Ontario Lake Plain and the Southern Ontario Plain which are separated by the west-trending Niagara Escarpment in the vicinity of Allen Creek. The south central portion of the watershed is marked by the Onondaga Escarpment through the Villages of Pittsford and Fairport. The most striking physiographic feature in the watershed is the Irondequoit valley which exhibits more than 150 feet of relief in parts. The headwater of Irondequoit are in the northwest corner of Ontario County beginning at an elevation of about 780 feet above mean sea level and flows northerly through a freshwater marshland and empties into Irondequoit Bay. Its major tributaries are Thomas Creek to the east and Allen Creek to the west.

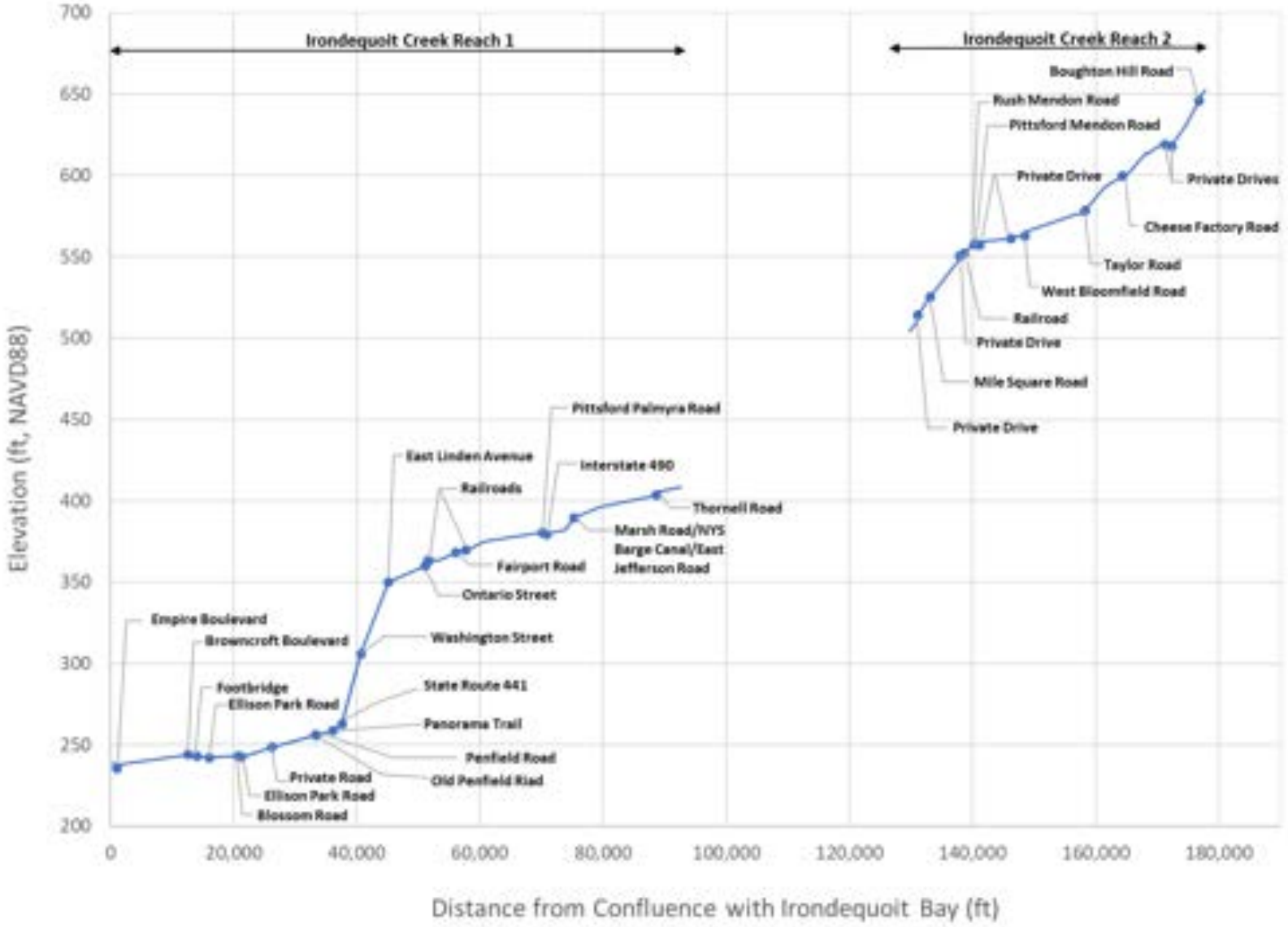
Bedrock underlying the area consists of limestones, shales, and sandstones of the middle Silurian Clinton group and dolomite of the Lockport group. These units form a homocline which dips gently towards the south. The surficial deposits overlying the bedrock consists of glacial, lacustrine, and fluvial deposits. Till covers much of the upland and consists of a mixture of sand, silt, clay, and boulders. Thick, sorted sand

silt and gravel deposits border the Irondequoit Valley. These were deposited by the ancestral Genesee River into glacial Lake Iroquois, a predecessor to Lake Ontario.

Irondequoit Creek flows in a meandering course through a hilly and steep-sided valley. Figure 7 is a general profile of the stream bed elevation and channel distance within the study area based on elevations at selected locations in the current effective FEMA FIS. The figure includes the location of all stream crossings included within the FIS. In its headwaters the Irondequoit Creek falls approximately 15 feet per mile between Boughton Hill Road and Mile Square Road. The slope of the creek is generally less in its downstream reaches where it is 6 feet per mile between Thornell Road and East Linden Avenue and 4 feet per mile between State Route 441 and Empire Boulevard. However, the slope is approximately 61 feet per mile between East Linden Avenue and State Route 441 as it travels down the Niagara Escarpment.

There are numerous locations where sediment depositional aggradation is occurring within the channel of Irondequoit Creek. Aggradation is a natural fluvial process where sediment and other materials are deposited in a stream channel when the supply of sediment is greater than the amount of material that the system is able to transport. Over time, aggradation can lead to the development of sand and sediment bars within the stream channel. These sand and sediment bars may restrict flow by reducing the in-channel flow area and may act as catchpoints for ice pieces during ice breakup events, potentially increasing open water flood risks and ice jam formations (Mugade UR, Sapkale JB, 2015). Gravel bars are noted to be found in the steeper portion of the creek, while finer overbank deposits are noted to be found in the lower portion of the stream (USACE, 1982).

Figure 7. Irondequoit Creek Study Area Profile of Stream Bed Elevation and Channel Distance



Hydrology

The main stem of Irondequoit Creek is approximately 32.0 miles long and its watershed covers approximately 139 square miles (88,960 acres) of drainage area (USACE, 1982), which does not include the approximately 8.5 square miles that drains directly into the New York State Barge Canal that runs east and west through the watershed (USACE, 1982). The Creek originates in Ontario County and generally flows north, discharging into Irondequoit Bay, part of Lake Ontario. Thomas Creek and Allen Creek are the two major tributaries of the Irondequoit Creek. Allen Creek drains an area of about 27.8 square miles and Thomas Creek drains an area of about 27.4 square miles. Together, these two tributaries account for approximately 40% of the total Irondequoit Creek drainage area.

Table 3 is a summary of the basin characteristic formulas and calculated values for the Irondequoit Creek watershed, where A is the drainage area of the basin in square miles (mi^2), B_L is the basin length in miles, and B_P is the basin perimeter in miles (USGS, 1978).

Table 3. Irondequoit Creek Basin Characteristics Factors

Factor	Formula	Value
Form Factor (R_F)	A/B_L^2	0.14
Circularity Ratio (R_C)	$4\pi A/B_P^2$	0.10
Elongation Ratio (R_E)	$2(A/\pi)^{0.5}/B_L$	0.42

Form Factor (R_F) describes the shape of the basin (e.g., circular or elongated) and the intensity of peak discharges over a given duration of time. Circularity Ratio (R_C) gives an indication of topography where the higher the circularity ratio, the lower the relief and less disturbance to drainage systems by structures within the channel. Elongation Ratio (R_E) gives an indication of ground slope where values less than 0.7 correlate to steeper ground slopes and elongated basin shapes. Based on the basin characteristic factors, the Irondequoit Creek basin would be categorized as a more elongated basin being more susceptible to erosion, and for which peak discharges would be expected to be lower than less elongated basins; subsequently high flow events would be expected to occur with a longer duration (Parveen, Kumar, & Singh, 2012). The drainage system within the basin would be expected to have appreciable structural controls and have high relief topography (Waikar & Nilawar, 2014).

There are two (2) active USGS stream gaging stations on Irondequoit Creek within the watershed. The most upstream gage is located at Railroad Mills near Fishers, NY (USGS 04232034) with a drainage area of 39.2 square miles. This gage has records dating back to 1991 with its highest recorded peak flow being 1,000 cubic feet per second (cfs) on January 08, 1998. The second gage is located above Blossom Road near Rochester, NY (USGS 0423205010) with a contributing drainage area of just over 134 square miles. This gage has records dating back to 1980 with its highest recorded peak flow being 3,300 cfs on January 08, 1998.

An effective FEMA Flood Insurance Study (FIS) for Monroe County was issued on August 28, 2008, which included a redelineation study for Irondequoit Creek and included drainage area and discharge information for the portions of Irondequoit Creek included in this study. Table 4 summarizes the FEMA FIS drainage area and peak discharges for Irondequoit Creek within the study area (FEMA, 2008a).

Table 4. Irondequoit Creek FEMA FIS Peak Discharges

Flooding Source and Location	Drainage Area (mi^2)	River Station (ft)	Peak Discharge (cfs)			
			10%	2%	1%	0.2%
IRONDEQUOIT CREEK REACH 1 At Mouth	139.0	2+30	5,146	8,276	9,525	11,198
IRONDEQUOIT CREEK REACH 1 Below confluence with Allen Creek	123.0	334+08	4,593	7,386	8,501	9,994
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with Allen Creek	95.2	341+86	3,619	5,820	6,699	7,875
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence of Thomas Creek	87.4	522+84	3,343	7,375	6,187	7,274
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence of Thomas Creek	60	526+82	2,356	3,789	4,361	5,127
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence with the New York State Barge Canal	50.3	738+25	1,999	3,214	3,703	4,353
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with the New York State Barge Canal	50.3	743+93	2,040	4,120	5,620	10,099
IRONDEQUOIT CREEK REACH 1 Downstream of confluence of Mill Creek	49.9	809+42	2,028	4,096	5,587	10,041
IRONDEQUOIT CREEK REACH 1 Upstream of confluence of Mill Creek	42.3	810+89	1,798	3,630	4,952	8,900
IRONDEQUOIT CREEK REACH 1 At the Town of Pittsford/Town of Perinton corporate limits	41.5	916+45	1,773	3,580	4,884	8778
IRONDEQUOIT CREEK REACH 1 At the Monroe County/Ontario County line	23.6	1,296+90	1,800	2,520	2,800	3,600
IRONDEQUOIT CREEK REACH 2 At West Bloomfield-Pittsford Road	16.6	1,488+16	1,350	1,890	2,130	2,680
IRONDEQUOIT CREEK REACH 2 At confluence with Tributary A	11.5	1,561+67	960	1,340	1,520	1,900

Source: (FEMA, 2008a)

According to the effective FEMA FIS, flows were estimated from a log-Pearson Type III analysis of two gages on Irondequoit Creek. These flows were prorated by drainage area and further adjusted by using depth discharge and depth storage relationships to complete hydrologic flood routing in the vicinity of the New York State Barge Canal. This was done because the canal embankment acts as a dam, resulting in reduced flows downstream of the New York State Barge Canal. The resulting 1% ACE flow was found to agree with those published by the USACE in February 1975. General limitations of the FEMA FIS methodology are the age of the effective FIS H&H analysis and the age of the methodology. The H&H analysis for Irondequoit Creek was completed in the 1977 using the gage frequency analysis, proration, and hydrologyic routing methodology.

Due to the study having been performed almost 50 years ago, several items in the hydrologic analysis are outdated. The log-Pearson Type III gage analysis was performed with only eight (8) years of data. Current guidelines state that flood frequency computations are not reliable with records composed of less than 10 annual flood observations (USGS, 2019), particularly for less frequent events (<10% ACE). Not only is more data available at one of these gages, additional gages have been installed on Irondequoit Creek since the time of the original study. Additionally, currently guidelines use generalized least-squares (GLS) regional-regression equations to improve streamflow-gaging-station estimates, and more detailed guidance on how these flows should be prorated to ungagged locations.

StreamStats v4.8.1 software (https://streamstats.usgs.gov/ss/) is a map-based web application that provides an assortment of analytical tools that are useful for water-resources planning and management, and engineering purposes. Developed by the USGS, the primary purpose of *StreamStats* is to provide estimates of streamflow statistics for user selected ungaged sites on streams and for USGS stream gages, which are locations where streamflow data are collected [(USGS, 2017); (USGS, 2017b)].

Methods for computing a peak discharge estimate for a selected recurrence interval at a specific site depend on whether the site is gaged or ungaged, and whether the drainage area lies within a single hydrologic region or crosses into an adjacent hydrologic region or State. Hydrologic regions refer to areas in which streamflow-gaging stations indicate a similarity of peak-discharge response that differs from the peak-discharge response in adjacent regions. These similarities and differences are defined by the regression residuals, which are the differences between the peak discharges calculated from station records and the values computed through the regression equation. There are currently six hydrologic regions in New York State [(USGS, 1991); (USGS, 2006)].

For ungaged sites, *StreamStats* relies on regional regression equations that were developed by statistically relating the streamflow statistics to the basin characteristics for a group of stream gages within a region. Estimates of streamflow statistics for an ungaged site can then be obtained by measuring its basin characteristics and inserting them into the regression equations (USGS, 2017). For example, the equation for estimating the 100-year flood for ungaged sites within Irondequoit Creek's hydrologic region in New York is:

$$Q_{100} = 46.0 * (A)^{0.823} * (ST+0.5)^{-0.177} * (RUNF)^{0.505} * (EL12+1)^{0.166} * (SR)^{0.318}$$

Where,

A is the drainage area in square miles;

ST is the basin storage ;

RUNF is the mean annual runoff in inches;

EL12 is the percentage of drainage basin at or greater than 1,200 feet above sea level;

SR is the slope ratio (USGS, 2006).

StreamStats delineates the drainage basin boundary for a selected site by use of an evenly spaced grid of land-surface elevations, known as a Digital Elevation Model (DEM), and a digital representation of the stream network. Using this data, the application calculates multiple basin characteristics, including drainage area, basin storage, mean annual runoff, percent of basin at or greater than 1,200 feet above sea level, and the slope ratio. By using these characteristics in the calculation, the peak discharge values have increased accuracy and decreased standard errors by approximately 20% for a 1% annual chance interval (100-year recurrence) discharge when compared to the drainage-area only regression equation (USGS, 2017).

However, when one or more of the basin characteristics for an ungaged site are outside the given ranges, then the estimates are extrapolated. *StreamStats* provides warnings when extrapolation occurs. Although *StreamStats* does provide estimates of streamflow statistics in these circumstances, no error indicators are provided with them, as the errors associated with these estimates are unknown and may be very large (USGS, 2017).

In addition, estimates of streamflow statistics that are obtained from regression equations are based on the assumption of natural flow conditions at the ungaged site unless the reports that document the equations state otherwise. If human activities such as dam regulation and water withdrawals substantially affect the timing, magnitude, or duration of flows at a selected site, the regression-equation estimates provided by *StreamStats* should be adjusted by the user to account for those activities (USGS, 2017).

StreamStats was used to calculate the current peak discharges for Irondequoit Creek and compared with the effective FIS peak discharges. Table 5 is the summary output of peak discharges calculated by the USGS *StreamStats* software for Irondequoit Creek at the same locations as the FEMA FIS peak discharges.

Table 5. USGS *StreamStats* Peak Discharge for Irondequoit Creek at the FEMA FIS Locations

Flooding Source and Location	Drainage Area (mi^2)	River Station (ft)	Peak Discharge (cfs)			
			10%	2%	1%	0.2%
IRONDEQUOIT CREEK REACH 1 At Mouth	150	2+30	2,170	2,880	3,170	3,870
IRONDEQUOIT CREEK REACH 1 Below confluence with Allen Creek	135	334+08	1,980	2,600	2,850	3,450
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with Allen Creek	103	341+86	1,530	2,010	2,200	2,650
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence of Thomas Creek	94.4	522+84	1,420	1,870	2,050	2,470
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence of Thomas Creek	64.6	526+82	1,080	1,410	1,540	1,850
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence with the New York State Barge Canal	52.4	738+25	920	1,210	1,330	1,600
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with the New York State Barge Canal	52.3	743+93	920	1,210	1,330	1,600
IRONDEQUOIT CREEK REACH 1 Downstream of confluence of Mill Creek	51.8	809+42	913	1,200	1,320	1,590
IRONDEQUOIT CREEK REACH 1 Upstream of confluence of Mill Creek	44.5	810+89	789	1,040	1,140	1,370
IRONDEQUOIT CREEK REACH 1 At the Town of Pittsford/Town of Perinton corporate limits	43.9	916+45	800	1,060	1,160	1,400
IRONDEQUOIT CREEK REACH 1 At the Monroe County/Ontario County line	24.1	1,296+90	517	700	774	948
IRONDEQUOIT CREEK REACH 2 At West Bloomfield-Pittsford Road	16.3	1,488+16	399	549	611	757
IRONDEQUOIT CREEK REACH 2 At confluence with Tributary A	11.6	1,561+67	471	616	672	800

Source: (USGS, 2020)

As the table shows, there are two locations for which the regional regression equation estimates of the peak flows provide irregular results. As the locations move upstream and the drainage areas decrease,

the regional regression equations calculate increased peak discharges for the same annual chance flood event. This is due to significant changes in the slope ratio or basin storge for each location. Since these parameters had significant changes with a small change in drainage area and no changes to the other parameters, it resulted in the flow irregularity.

Using the standard error calculations from the regression equation analysis in *StreamStats*, an acceptable range at the 95% confidence interval for peak discharge values at the 10%, 2%, 1%, and 0.2% annual chance flood hazards was determined. Standard error gives an indication of how accurate the calculated peak discharges are when compared to the actual peak discharges since approximately two-thirds (68.3%) of the calculated peak discharges would be within one standard error of the actual peak discharge, 95.4% would be within two standard errors, and almost all (99.7%) would be within three standard errors (McDonald, 2014). Table 6 is a summary table of the USGS *StreamStats* standard errors at each percent annual chance flood hazard for Region 6 in New York State.

Table 6. USGS *StreamStats* Standard Errors for Full Regression Equations

Parameter	Annual Chance of Exceedance (%)			
	10%	2%	1%	0.2%
Standard Error of Peak Discharge (%)	32.9	35.8	37.2	41.4

Source: (USGS, 2006)

FEMA FIS peak discharges are greater than *StreamStats* peak discharges. As a result, the FEMA FIS peak discharge values were used in the hydraulic model simulations for this study to maintain consistency between the modeling outputs and the FEMA models.

In addition to peak discharges, the *StreamStats* software also calculates bankfull statistics by using stream survey data and discharge records from 281 cross-sections at 82 streamflow-gaging stations in a linear regression analysis to relate drainage area to bankfull discharge and bankfull-channel width, depth, and cross-sectional area for streams across New York State. These equations are intended to serve as a guide for streams in areas of the same hydrologic region, which contain similar hydrologic, climatic, and physiographic conditions (USGS, 2009).

Bankfull discharge is defined as the flow that reaches the transition between the channel and its flood plain. Bankfull discharge is considered to be the most effective flow for moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphological characteristics of channels (USGS, 2009). The bankfull width and depth of Irondequoit Creek is important in understanding the distribution of available energy within the stream channel and the ability of various discharges occurring within the channel to erode, deposit, and move sediment (Rosgen & Silvey, 1996). Table 7 lists the estimated drainage area, bankfull discharge, width, and depth at select locations along Irondequoit Creek as derived from the USGS *StreamStats* program.

Table 7. USGS *StreamStats* Estimated Drainage Area, Bankfull Discharge, Width, and Depth

Flooding Source and Location	Drainage Area (mi^2)	River Station (ft)	Bankfull Depth (ft)	Bankfull Width (ft)	Bankfull Streamflow (cfs)
IRONDEQUOIT CREEK REACH 1 At mouth	150	2+30	3.98	107	1710
IRONDEQUOIT CREEK REACH 1 Below confluence with Allen Creek	135	334+08	3.9	102	1580
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with Allen Creek	103	341+86	3.7	90.2	1290
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence of Thomas Creek	94.4	522+84	3.63	86.7	1200
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence of Thomas Creek	64.6	526+82	3.37	72.9	900
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence with the New York State Barge Canal	52.4	738+25	3.23	66.2	767
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with the New York State Barge Canal	52.4	743+93	3.23	66.2	767
IRONDEQUOIT CREEK REACH 1 Downstream of confluence of Mill Creek	51.8	809+42	3.22	65.9	760
IRONDEQUOIT CREEK REACH 1 Upstream of confluence of Mill Creek	44.5	810+89	3.13	61.4	677
IRONDEQUOIT CREEK REACH 1 At the Town of Pittsford/Town of Perinton corporate limits	43.9	916+45	3.12	61	670
IRONDEQUOIT CREEK REACH 1 At the Monroe County/Ontario County line	24.1	1,296+90	2.77	46.4	423
IRONDEQUOIT CREEK REACH 2 At West Bloomfield-Pittsford Road	16.3	1,488+16	2.56	38.8	314
IRONDEQUOIT CREEK REACH 2 At confluence with Tributary A	11.6	1,561+67	2.39	33.2	242

Source: (USGS, 2020)

Infrastructure

There are no dams located on Irondequoit Creek within the study area. Table 8 summarizes pertinent information about the ten (10) NYSDOT owned bridges and culverts crossing Irondquoit Creek within the study area. In addition to the NYSDOT infrastructure, Irondequoit Creek is crossed by 33 structures within the study area, which are owned and maintained by Monroe County, local municipalities, and private owners as summarized in Table 9. Bridge dimensions were not readily available for some some structures (primarily privately owned or railroad bridges), and these structures were not included in the survey plan for the study. Hydraulic capacity is the measure of the amount of water that can pass through a structure or watercourse. Hydraulic design is an essential function of structures in watersheds. Exceeding the capacity can result in damages or flooding to surrounding areas and infrastructure (USDOT, 2012). In assessing hydraulic capacity of the culverts and bridges along Irondequoit Creek, the FEMA FIS profile of Irondequoit Creek was used to determine the lowest annual chance flood elevation to flow under the low chord of a bridge, without causing an appreciable backwater condition upstream (Table 8, Table 9). Figure 8 depicts the location of the infrastructure crossing Irondequoit Creek within the study area.

Table 8. NYSDOT Bridges/Culverts Crossing Irondequoit Creek within Study Area

Roadway Carried (NY/US Route)	NYSDOT BIN/CIN	River Station (ft)	Bridge Length (ft)	Surface Width[1] (ft)	Hydraulic Capacity (% Annual Chance)
NY 404 (Empire Boulevard)	1051310	4+69	79	60.3	10%
NY 286 (Browncroft Boulevard) [Left Channel]	1044511/ 1044512	121+76	87	37.8 & 41.1	10%
NY 286 (Browncroft Boulevard) [Right Channel]	1044521/ 1044522	133+63	73	35.8 & 35.8	Not on FIS Profile
NY 941V (Blossom Road)	1042760	205+56	102	32	< 10%
NY 441	1063939	366+59	148	88.7	> 0.2%
NY 31F (Fairport Road)	1022120	555+96	45	48.6	> 0.2%
NY 31 (Pittsford Palmyra Road)	1021700	689+35	50	69	< 0.2%
Interstate 490	1048960	696+35	55	55.5	0.2%
NY 251 (Victor Mendon Road)	1028900	1,407+18	38	33.1	2%
NY 64 (Mendon Ionia Road)	1043400	1,410+26	58	32	1%

Notes:

1. Surface Width is measured parallel to creek flow and refers to the curb-to-curb width, which is the minimum distance between the curbs or the bridge railings (if there are no curbs), to the nearest 30 mm or tenth of a foot (NYSDOT, 2006).

Source: (NYSDOT, 2019); (FEMA, 2008a)

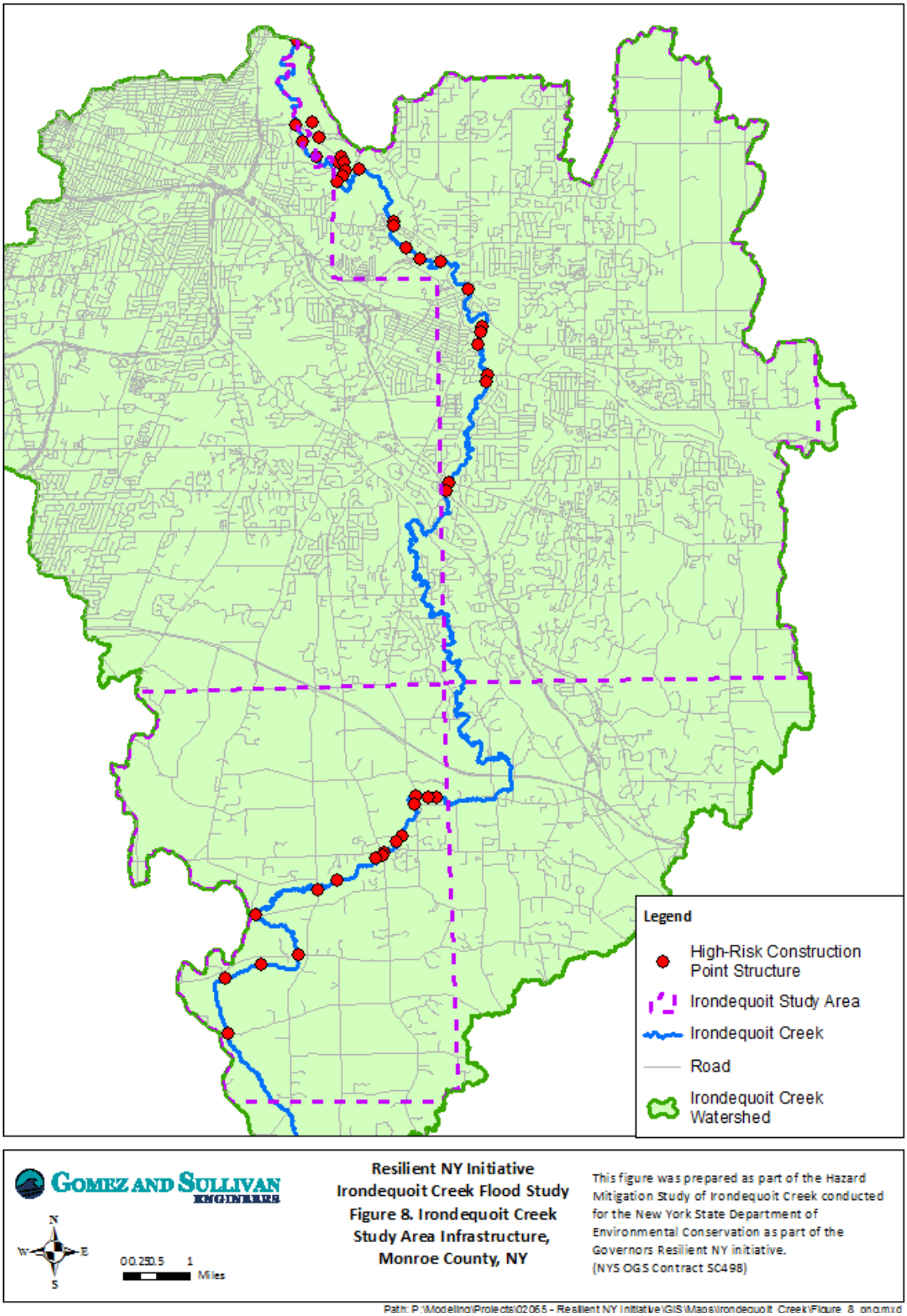
Table 9. Non-NYSDOT Bridges/Culverts Crossing Irondequoit Creek within Study Area

Roadway Carried	BIN/CIN	River Station (ft)	Owner	Bridge Length (ft)	Surface Width (ft)	Hydraulic Capacity (% Annual Chance)
Steel Pipe Support	N/A	5+28	Unknown	Not Available	Not Available	10%
Old Browncroft Boulevard [Right Channel]	2211200	119+34	Town of Penfield	59	33.5	Not on FIS Profile
Service Road [Left Channel]	N/A	135+79	Private	Not Available	Not Available	< 10%
Service Road [Left Channel]	3317930	156+74	Monroe County	58	7.5	Not on FIS Profile
Footbridge [Left Channel]	N/A	188+09	Monroe County	Not Available	Not Available	Not on FIS Profile
Ellison Park Road [Left Channel]	3369080	194+32	Monroe County	56	24	< 10%
Hazelwood Shelter Road [Right Channel]	2268620	195+34	Monroe County	33	34	Not on FIS Profile
Private Drive [Right Channel]	N/A	198+79	Private	Not Available	Not Available	Not on FIS Profile
South Lodge Road	3361570	210+40	Monroe County	61	22	< 10%
Footbridge	N/A	224+57	Private	Not Available	Not Available	Not on FIS Profile
Private Drive	N/A	260+63	Private	Not Available	Not Available	10%
Old Penfield Road	3317240	324+33	Monroe County	95	38	< 10%
Penfield Road	1048530	327+21	Monroe County	83.5	42	> 0.2%
Panorama Trail	1095720	352+53	Monroe County	89	49.25	< 0.2%
Washington Street	1063890	398+14	Town of Penfield	85	18.9	2%
East Linden Avenue	1043470	444+38	Monroe County	148	50	> 0.2%
Ontario Street	2257920	504+41	Village of East Rochester	53	13.6	< 10%
Railroad	N/A	509+13	CSX	Not Available	Not Available	> 0.2%
Forest Hills Park Road	N/A	519+64	Private	Not Available	Not Available	Not on FIS Profile
Railroad	N/A	562+58	CSX	Not Available	Not Available	> 0.2%
Private Drive	N/A	1,307+94	Private	Not Available	Not Available	< 10%
Footbridge	N/A	1,316+46	Private	Not Available	Not Available	Not on FIS Profile
Miles Square Road	3317130	1,333+58	Monroe County	28	24.2	10%
Private Drive	N/A	1,350+98	Private	Not Available	Not Available	Not on FIS Profile
Private Drive	N/A	1,383+29	Private	Not Available	Not Available	1%
Lehigh Valley Trail	N/A	1,389+98	Monroe County	Not Available	Not Available	> 0.2%
Private Drive	N/A	1,417+39	Private	36	14	< 10%
Private Drive	N/A	1,463+36	Private	Not Available	Not Available	< 10%
West Bloomfield Road	09066332[1]	1,488+16	Monroe County	18.42	30.33	< 10%
Taylor Road	3317720	1,595+08	Monroe County	37	26.5	0.2%
Cheese Factory Road	3369600	1,658+19	Monroe County	20	50	10%
Private Drive	N/A	1,697+63	Private	Not Available	Not Available	< 10%
Private Drive	N/A	1,728+66	Private	Not Available	Not Available	< 10%
Boughton Hill Road	09053109[1]	1,781+90	Monroe County	14	60	< 10%

Notes:
1. This is a Monroe County Structure Identification Number (SIN), as opposed to a BIN or CIN from the NYSDOT.

Source: (NYSDOT, 2019); (Monroe County, 2019); (FEMA, 2008a)

Figure 8. Irondequoit Creek Study Area Infrastructure, Monroe County, NY



In New York State, hydraulic and hydrologic regulations for bridges were developed by the NYSDOT. The NYSDOT guidelines require a factor of safety for bridges that cross waterways, known as freeboard. Freeboard is the additional capacity, usually expressed as a distance in feet, in a waterway above the calculated capacity required for a specified flood level, usually the base flood elevation. Freeboard compensates for the many unknown factors that could contribute to flood heights being greater than calculated, such as wave action, minor silt and debris deposits, the hydrological effect of urbanization of the watershed, etc. However, freeboard is not intended to compensate for higher floods expected under future climatic conditions, such as those due to sea-level rise or more extreme precipitation events (NYSDEC, 2020).

The term "bridge" shall apply to any structure whether single or multiple span construction with a clear span in excess of 20 feet when measurement is made horizontally along the center line of roadway from face to face of abutments or sidewalls immediately below the copings or fillets; or, if there are no copings or fillets, at 6 inches below the bridge seats or immediately under the top slab, in the case of frame structures. In the case of arches, the span shall be measured from spring line to spring line. All measurements shall include the widths of intervening piers or division walls, as well as the width of copings or fillets (NYSDOT, 2020).

According to the NYSDOT bridge manual (2021) for Region 4, which includes Monroe, Ontario, Livingston, Orleans, Genesee, Wyoming and Wayne Counties, new and replacement bridges are required to meet certain standards, which include (NYSDOT, 2021):

- The structure will not raise the water surface elevations anywhere when compared to the existing conditions for both the 2 and 1% ACE (50- and 100-year flood) flows.
- The proposed low chord shall not be lower than the existing low chord.
- A minimum of 2'-0" of freeboard for the projected 2% ACE (50-year flood) is required for the proposed structure. The freeboard shall be measured at the lowest point of the superstructure between the two edges of the bottom angle for all structures.
- The current 1% ACE (100-year flood), based on peak streamflow from the USGS *StreamStats* plus a 10% increase in flow, shall pass below the proposed low chord without touching it.
- The maximum skew of the pier to the flow shall not exceed 10 degrees.

In addition, current peak flows shall be increased to account for future projected peak flows based on the USGS *StreamStats* tool where current 2% ACE peak flows shall be increased by 10% in Region 4. For critical bridges, the minimum hydraulic design criteria is 3-feet of freeboard over the 2% annual chance flood elevation. A critical bridge is considered to be vital infrastructure that the incapacity or destruction of such would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters [(NYSDOT, 2021); (USDHS, 2010)].

In an effort to improve flood resiliency of infrastructure in light of future climate change, New York State passed the Community Risk and Resiliency Act (CRRA) in 2014. In accordance with the guidelines of the CRRA, the NYSDEC released the *New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act* (2018) report. In the report, the NYSDEC outlined infrastructure guidelines, most notably that the new freeboard recommendation for normal bridges is 2-feet of freeboard over the elevation of a flood with a 1% chance of being equaled or exceeded in a given year (i.e. base flood elevation) and 3-feet for a critical structure (NYSDEC, 2020). When compared to current guidelines, the new CRRA climate change recommended freeboard is based on the 1% ACE water surface elevation, while the previous guidelines were based on the 2% ACE. This is a higher standard for freeboard.

Table 10 displays the 2% and 1% annual chance flood levels and their calculated difference at FEMA FIS infrastructure locations within the study area using the FIS profile for Irondequoit Creek.

Table 10. FEMA FIS Profile 2 and 1% Annual Chance Flood Hazard Levels with Differences at Infrastructure Locations

Bridge Crossing	River Station (ft)	2% Water Surface Elevation (ft NAVD88)	1% Water Surface Elevation (ft NAVD88)	Difference in Water Surface Elevations (ft NAVD88)
Steel Pipe Support	5+28	254.2	255.0	0.80
NY 404 (Empire Boulevard)	4+69	254.2	255.0	0.80
NY 286 (Browncroft Boulevard)	121+76	256.0	257.0	1.00
Service Road	135+79	259.0	260.0	1.00
Ellison Park Road	194+32	259.5	260.5	1.00
NY 941V (Blossom Road)	205+56	260.0	261.0	1.00
South Lodge Road	210+40	260.0	261.1	1.10
Private Road	260+63	260.8	261.9	1.10
Old Penfield Road	324+33	271.0	271.4	0.40
Penfield Road	327+21	271.0	271.5	0.50
Panorama Trail	352+53	272.9	273.2	0.30
NY 441	366+59	273.8	274.2	0.40
Washington Street	398+14	318.0	320.1	2.10
East Linden Avenue	444+38	358	358.5	0.50
Ontario Street	504+41	374.5	375.3	0.80
Railroad	509+13	375.8	376.3	0.50
Railroad	562+58	376.0	376.6	0.60
NY 31F (Fairport Road)	555+96	379.0	380.0	1.00
Railroad	562+58	380.3	381.3	1.00
NY 31 (Pittsford Palmyra Road)	689+35	391.9	392.2	0.30
Interstate 490	696+35	393.0	394.0	1.00
Private Drive	1,307+94	519.7	520.0	0.30
Mile Square Road	1,333+58	536.0	536.5	0.50
Private Drive	1,383+29	555.3	555.8	0.50
Railroad	1,389+98	558.0	559.5	1.50
NY 251 (Victor Mendon Road)	1,407+18	565.2	565.3	0.10
NY 64 (Mendon Ionia Road)	1,410+26	567.0	568.0	1.00
Private Drive	1,417+39	569.0	569.5	0.50
Private Drive	1,463+36	570.1	570.5	0.40
West Bloomfield Road	1,488+16	574.0	574.7	0.70
Taylor Road	1,595+08	583.0	583.5	0.50
Cheese Factory Road	1,658+19	605.5	606.4	0.90
Private Drive	1,728+66	624.8	624.9	0.10
Private Drive	1,738+10	627.2	627.3	0.10
Boughton Hill Road	1,781+90	654.5	654.7	0.20

Source: (FEMA, 2008a)

In assessing hydraulic capacity of the bridges located in the identified high-risk areas along Irondequoit Creek, the FEMA FIS profile was used to determine the lowest annual chance flood elevation to flow under the low chord of a bridge, without causing a significant backwater condition upstream (Table 8, Table 9). According to the FEMA FIS profiles, six structures within the identified high-risk areas do not meet the NYSDOT guidelines for 2-feet of freeboard for bridges: Old Penfield Road, Panorama Trail, NY 31 (Pittsford Palmyra Road), NY 251 (Victor Mendon Road), NY 64 (Mendon Ionia Road) and a Private Drive. In addition, these structures do not meet the new CRRA climate change infrastructure guidelines as described above. Their low chord elevations are generally below the 0.2% ACE, with the low chord elevations of Old Penfield Road and the Private Drive below the 10% ACE, and they do not provide the recommended hydraulic capacity (FEMA, 2008a). Even though these structures may have hydraulic capacity restraints, the NYSDOT has to balance both physical constraints along with cost versus benefit of replacing existing bridges to meet the new CRRA guidelines.

The Old Penfield Road bridge was replaced in 2005, and designed to be able to pass the 2% ACE with approximately 2 feet of freeboard. This design was based on coordination with the USACE and the understanding that additional improvements proposed by USACE would be implemented within the service life of the bridge (Cox, 2022). The Private Drive was likely designed as a low water structure that was intended to be overtopped during significant events. Raising these structures with embankments would likely lead to increase flooding upstream of these bridges due to reduce overbank flow capacity, and may require reconfiguring nearby intersections. NY 251 (Victor Mendon Road) and NY 64 (Mendon Ionia Road) are located within a heavily developed area. Raising these bridges would likely have severe impacts on access to nearby homes and businesses. Panorma Trail and NY 31 (Pittsford Palmyra Road) already have a significant embankment. These embankments could potentially be raised in height to meet the new CRRA climate change infrastructure guidelines, provided it doesn't significantly impact nearby intersections.

In addition to comparing the annual chance flood elevations and low chords for bridges that cross Irondequoit Creek, the structure width and bankfull width were compared for each of these structures. The USGS *StreamStats* tool was used to calculate the bankfull widths and discharge for each structure along Irondequoit Creek. The structures with bankfull widths that are wider than or close to the structures width indicate that water velocities have to slow and contract in order to pass through the structures, which can cause sediment depositional aggradation and the accumulation of sediment and debris. Aggradation can lead to the development of sediment and sand bars, which can cause upstream water surfaces to rise, increasing the potential for overtopping banks or backwater flooding. Table 11 compares bankfull widths estimates to structure widths at those structures for which information was available. This table indicates that within the study area, there are 21 bridges within the study area that cross Irondequoit Creek that have bridge openings that are smaller than the bankfull widths. In addition, there two (2) bridges that have openings very close (within 5 feet) of bankfull width. Therefore, structures with widths less than or within five feet of the bankfull width are considered high-risk constriction point structures, as depicted in Figure 8. Of the bridges listed in Table 11, six are within the identified high risk areas: Old Penfield Road, Penfield Road, Panorama Trail, NY 31 (Pittsford Palmyra Road), Intestate 490, and NY 251 (Victor Mendon Road). Two of the high-risk constriction point structures located outside of the identified high risk areas have planned replacements as part of the Monroe County Capital Improvement program: Taylor Road (replacement scheduled for 2025) and Mile Square Road (replacement scheduled for 2026) (Cox, 2022).

Table 11. Hydraulic Capacity of Potential Constriction Point Bridges Crossing Irondequoit Creek within Study Area

Roadway Carried	Structure Type	River Station (ft)	Structure Width (ft)	Bankfull Width (ft)	Bankfull Discharge (cfs)	ACE Equivalent[1]
NY 404 (Empire Boulevard)	Bridge	4+69	79	107	1,710	> 20%
Steel Pipe Support	N/A	5+28	Not Available	107	1,710	> 20%
Old Browncroft Boulevard [Right Channel]	Bridge	119+34	59	107	1,710	> 20%
NY 286 (Browncroft Boulevard) [Left Channel]	Bridge	121+76	87	107	1,710	> 20%
NY 286 (Browncroft Boulevard) [Right Channel]	Bridge	133+63	73	107	1,710	> 20%
Service Road [Left Channel]	Bridge	135+79	Not Available	107	1,710	> 20%
Service Road [Left Channel]	Bridge	156+74	58	107	1,710	> 20%
Footbridge	Bridge	188+09	Not Available	107	1,710	> 20%
Ellison Park Road [Left Channel]	Bridge	194+32	56	107	1,710	> 20%
Hazelwood Shelter Road [Right Channel]	Bridge	195+34	33	107	1,710	> 20%
Private Drive [Right Channel]	Bridge	198+79	Not Available	107	1,710	> 20%
NY 941V (Blossom Road)	Bridge	205+56	102	107	1,710	> 20%
South Lodge Road	Bridge	210+40	61	107	1,710	> 20%
Footbridge	Bridge	224+57	Not Available	107	1,710	> 20%
Private Drive	Bridge	260+63	Not Available	107	1,710	> 20%
Old Penfield Road	Bridge	324+33	95	107	1,710	> 20%
Penfield Road	Bridge	327+21	83.5	107	1,710	> 20%
Panorama Trail	Bridge	352+53	89	90.2	1,290	> 20%
State Route 441	Bridge	366+59	148	90.2	1,290	> 20%
Washington Street	Bridge	398+14	85	90.2	1,290	> 20%
East Linden Avenue	Bridge	444+38	148	90.2	1,290	> 20%
Ontario Street	Bridge	504+41	53	90.2	1,290	> 20%
Railroad	Bridge	509+13	Not Available	90.2	1,290	> 20%
Forest Hills Park Road	Bridge	519+64	Not Available	90.2	1,290	> 20%
NY 31F (Fairport Road)	Bridge	555+96	45	72.9	900	> 20%
Railroad	Culvert	562+58	Not Available	72.9	900	> 20%
NY 31 (Pittsford Palmyra Road)	Culvert/Bridge	689+35	50	72.9	900	> 20%
Insterstate 490	Culvert/Bridge	696+35	55	72.9	900	> 20%
Private Drive	Bridge	1,307+94	Not Available	46.4	423	> 20%
Footbridge	Bridge	1,316+46	Not Available	46.4	423	> 20%
Miles Square Road	Bridge	1,333+58	28	46.4	423	> 20%
Private Drive	Bridge	1,350+98	Not Available	46.4	423	> 20%
Private Drive	Bridge	1,383+29	Not Available	46.4	423	> 20%
Lehigh Valley Trail	Bridge	1,389+98	Not Available	46.4	423	> 20%
NY 251 (Victor Mendon Road)	Bridge	1,407+18	38	46.4	423	> 20%
NY 64 (Mendon Ionia Road)	Bridge	1,410+26	58	46.4	423	> 20%
Private Drive	Bridge	1,417+39	36	46.4	423	> 20%
Private Drive	Bridge	1,463+36	Not Available	46.4	423	> 20%
West Bloomfield Road	Culvert	1,488+16	18.42	38.8	314	> 20%
Taylor Road	Bridge	1,595+08	27	33.2	242	> 66.7%
Cheese Factory Road	Bridge	1,658+19	20	33.2	242	> 66.7%
Private Drive	Bridge	1,697+63	Not Available	33.2	242	> 66.7%
Private Drive	Bridge	1,728+66	Not Available	33.2	242	> 66.7%
Boughton Hill Road	Bridge	1,781+90	14	33.2	242	> 66.7%

Notes:
1. ACE Equivalent describes the equivalent ACE for the given bankfull discharge as calculated by the USGS *StreamStats* application. The 50% ACE is equal to a 2-year recurrence interval.

Source: (NYSDOT, 2019); (USGS, 2020); (FEMA, 2008a)

Climate Change Implications

Future Projected Stream Flow in Irondequoit Creek

In New York State, climate change is expected to exacerbate flooding due to projected increases of 1-8% in total annual precipitation coupled with increases in the frequency, intensity, and duration of extreme precipitation events (events with more than 1, 2, or 4 inches of rainfall) (NYSERDA, 2011). In response to these projected changes in climate, New York State passed the Community Risk and Resiliency Act (CRRA) in 2014. In accordance with the guidelines of the CRRA, the NYSDEC released the New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act (2020) report. In the report, two methods for estimating projected future discharges were discussed: an end of design life multiplier and the USGS *FutureFlow Explorer* map-based web application (NYSDEC, 2020).

USGS *FutureFlow Explorer* v1.5 (https://ny.water.usgs.gov/maps/floodfreq-climate/) is discussed as a potential tool to project peak flows under various climate scenarios into the future. *FutureFlow* Explorer was developed by the USGS in partnership with the NYSDOT. This application is an extension for the USGS *StreamStats* map-based web application and projects future stream flows in New York State. The USGS team examined 33 global climate models and selected five that best predicted past precipitation trends in the region. The results were then downscaled to apply to all six hydrologic regions of New York State. Three time periods can be examined: 2024-2049, 2050-2074 and 2075-2099, as well as two Intergovernmental Panel on Climate Change (IPCC) greenhouse gas emission scenarios: RCP 4.5 and RCP 8.5. RCP 4.5 is considered a midrange-emissions scenario, and RCP 8.5 is a high-emissions scenario [(Taylor, Stouffer, & Meehi, 2011); (NYSDEC, 2020)].

In general, climate models are better at forecasting temperature than precipitation and contain some level of uncertainty with their calculations and results. The USGS recommends using *FutureFlow* projections as qualitative guidance to see likely trends within any watershed and as an exploratory tool to inform selection of appropriate design flow. Current future flood projection models will not provide accurate results for basins that extend across more than one hydrologic region in New York (NYSDEC, 2020).

Based on the current future flood projection models, flood magnitudes are expected to increase in nearly all cases in New York State, but the magnitudes vary among regions. While the *FutureFlow* application is still being upgraded, it can be used with appropriate caution. Climate model forecasts are expected to improve and as they do, the existing regression approach will be tested and refined further (NYSDEC, 2020).

The NYSDEC recommends that future peak flow conditions should be adjusted by multiplying relevant peak flow parameters by a factor specific to the expected service life of the structure and geographic location of the project. For Western New York, the recommended design-flow multiplier is 10% increased flow for an end of design life of 2025-2100 (NYSDEC, 2020). Table 12 provides a summary of the projected future peak stream flows using the FEMA FIS peak discharges and 10% CRRA design multiplier.

Table 12. Irondequoit Creek Projected Peak Discharges

Flooding Source and Location	Drainage Area (mi^2)	River Station (ft)	Peak Discharge (cfs)			
			10%	2%	1%	0.2%
IRONDEQUOIT CREEK REACH 1 At Mouth	139.0	2+30	5,661	9,104	10,478	12,318
IRONDEQUOIT CREEK REACH 1 Below confluence with Allen Creek	123.0	334+08	5,052	8,125	9,351	10,993
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with Allen Creek	95.2	341+86	3,981	6,402	7,369	8,663
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence of Thomas Creek	87.4	522+84	3,677	8,113	6,806	8,001
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence of Thomas Creek	60	526+82	2,592	4,168	4,797	5,640
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence with the New York State Barge Canal	50.3	738+25	2,199	3,535	4,073	4,788
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with the New York State Barge Canal	50.3	743+93	2,244	4,532	6,182	11,109
IRONDEQUOIT CREEK REACH 1 Downstream of confluence of Mill Creek	49.9	809+42	2,231	4,506	6,146	11,045
IRONDEQUOIT CREEK REACH 1 Upstream of confluence of Mill Creek	42.3	810+89	1,978	3,993	5,447	9,790
IRONDEQUOIT CREEK REACH 1 At the Town of Pittsford/Town of Perinton corporate limits	41.5	916+45	1,950	3,938	5,372	9,656
IRONDEQUOIT CREEK REACH 1 At the Monroe County/Ontario County line	23.6	1,296+90	1,980	2,772	3,080	3,960
IRONDEQUOIT CREEK REACH 2 At West Bloomfield-Pittsford Road	16.6	1,488+16	1,485	2,079	2,343	2,948
IRONDEQUOIT CREEK REACH 2 At confluence with Tributary A	11.5	1,561+67	1,056	1,474	1,672	2,090

Source: (NYSDEC, 2020)

Appendix E contains the HEC-RAS simulation summary sheets for the current and projected future flow simulations. The HEC-RAS model simulation results for the future condition model parameters using the future projected discharge values are similar to the base-condition model output with the only difference being future projected water surface elevations are up to 2.6-foot higher at specific locations, generally upstream of bridges due to backwater, as a result of the increased discharges.

Table 13 provides a comparison of HEC-RAS base condition modeled water surface elevations at the FIS discharge locations within the modeled risk areas, using the effective FEMA FIS flows, and future condition, using the 10% CRRA design multiplier flows. There were no FIS discharge locations within Risk Area 3, therefore results are provided at a representative location.

Table 13. HEC-RAS Current and Projected Future Flow Water Surface Elevation Comparison

Flooding Source and Location	Drainage Area (mi^2)	River Station (ft)	Water Surface Elevation Change (ft)[1]			
			10%	2%	1%	0.2%
IRONDEQUOIT CREEK REACH 1 Below confluence with Allen Creek	123.0	334+08	0.35	0.42	0.41	0.33
IRONDEQUOIT CREEK REACH 1 Upstream of the confluence with Allen Creek	95.2	341+86	0.35	0.38	0.39	0.33
IRONDEQUOIT CREEK REACH 1 Downstream of the confluence with the New York State Barge Canal	50.3	738+25	0.28	0.21	0.28	0.32
IRONDEQUOIT CREEK REACH 2 Between NY 251 (Victor Mendon Road) and NY 64 (Mendon Ionia Road)	22.5	1,409+37	0.52	0.65	0.78	2.63

Notes:
1. Positive changes in water surface elevation indicate the future conditions water surface elevation is higher than the base condition.

Source: : (FEMA, 2008a); (NYSDEC, 2020); (USACE, 2022a)

Flooding Characteristics

Flooding History

Floods in the Irondeqouit Creek watershed can occur any time of the year, but significant floods are primarily due to spring rainfall coupled with snowmelt or summer thunderstorms. The larget recorded flood on Irondeqouit Creek was in 1864, with other documented flood events occurring in 1912, 1934, 1960, 1974, 1976, 2013, 2014, 2017, 2020, and 2021. Areas subject to frequent flooding from Irondeqouit Creek include Ellison Park; residences and business in the vicinity of Panorama Plaza and Panorama Trail; Linear Park; Spring Lake Park; the Island Valley Golf Course; the residential neighborhoods of Brook Hollow, Little Brook Drive, and Hidden Creek Circle; as well as residences and businesses near the intersection of NY 251 (Victor Mendon Road) and NY 64 (Mendon Ionia Road). It has been noted that a second larger flood peak occurs 8 to 12 hours after the first in the vicinity of Brook Hollow. This is presumed to be a result of differing runoff times from various tributaries in the watershed. No history of ice jams was found for Irondeqouit Creek during background research, thus ice jams were not further investigated.

Other areas of flooding concern within the watershed include Irondequoit Creek near Fishers Road in the Town of Victor and the Bushnell Basin area in the Town of Pittsford; Allen Creek in the Towns of Pittsford, Henrietta, and Brighton; Thomas Creek in the Town of Perinton; and other minor tributaries where development has occurred.

FEMA FIRMs are available for Irondequoit Creek, depicting the extent of the expected floodplain. Figure 9, Figure 10, and Figure 11 display the floodway and 1% and 0.2% ACE boundaries for Irondequoit Creek as determined by FEMA for the Towns of Penfield, Perinton, and Mendon (FEMA, 2008b).

Figure 9. Irondequoit Creek FEMA Flood Zones, Town of Penfield, Monroe County, NY

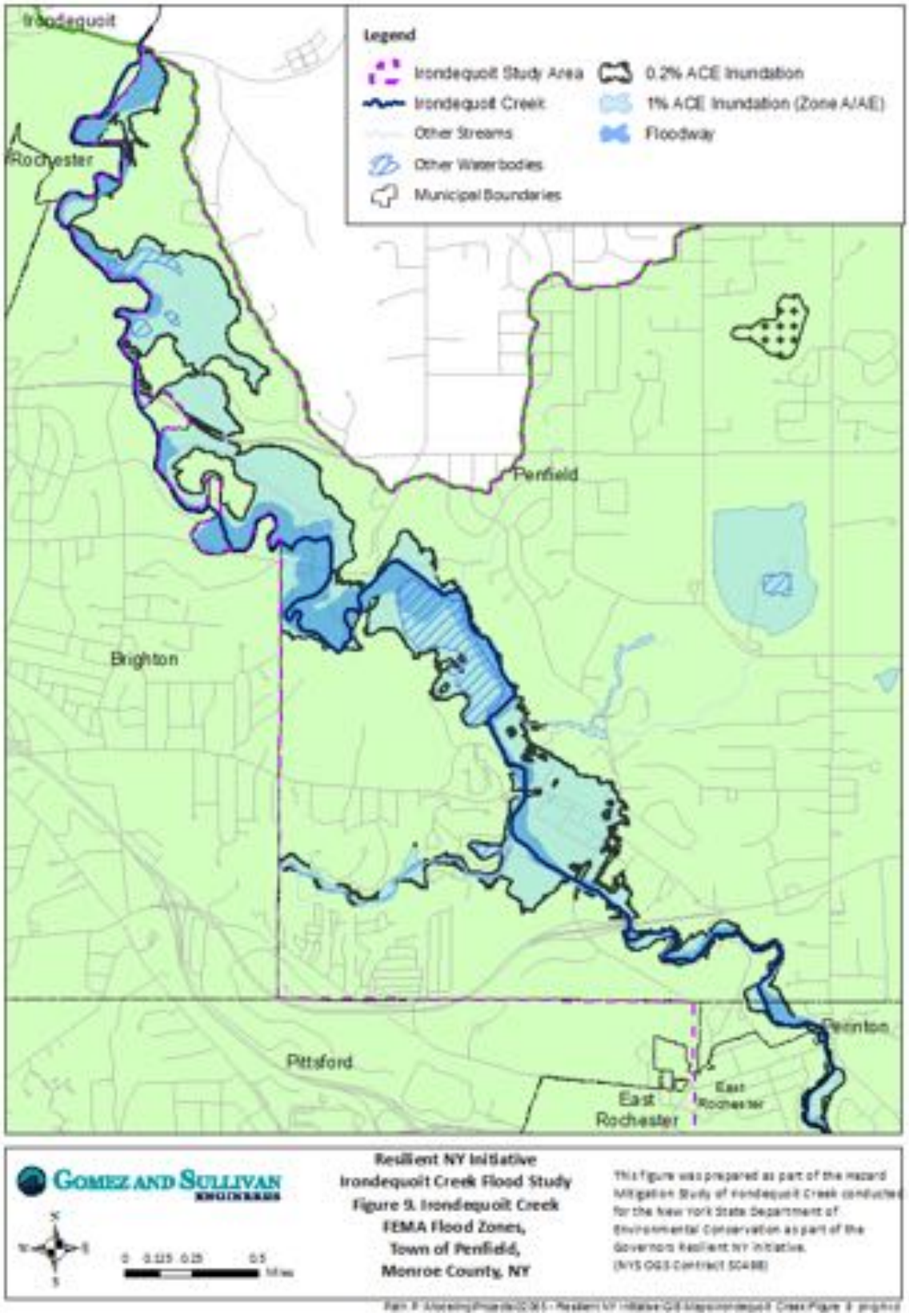
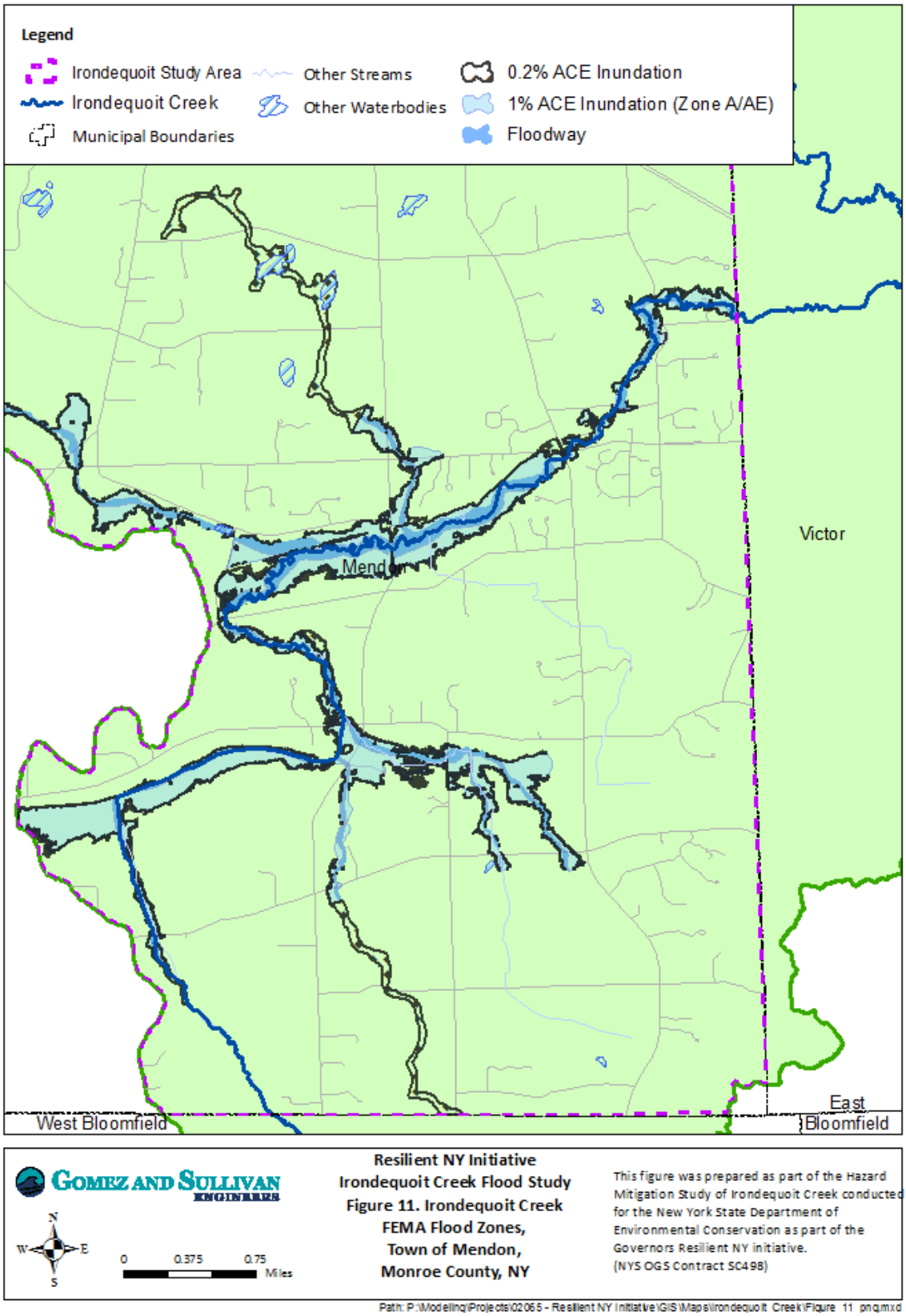


Figure 10. Irondequoit Creek FEMA Flood Zones, Town of Perinton, Monroe County, NY

Figure 11. Irondequoit Creek FEMA Flood Zones, Town of Mendon, Monroe County, NY



Flood Risk Assessment

Flood Mitigation Analysis

For this study of Irondequoit Creek, standard hydrologic and hydraulic study methods were used to determine and evaluate flood hazard data. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10%, 2%, 1%, and 0.2% chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of the effective FIS (FEMA, 2008a).

Hydraulic analysis of Irondequoit Creek was conducted using the HEC-RAS v6.2 program (USACE, 2022a). The HEC-RAS computer program was written by the USACE Hydrologic Engineering Center (HEC) and is considered to be the industry standard for riverine flood analysis. The model is used to compute water surface profiles for one- and two-Dimensional (2-D), steady-state, or time-varied (unsteady) flow. In one-dimensional (1-D) solutions, the water surface profiles are computed from one cross section to the next by solving the 1D St. Venant equations with an iterative procedure (i.e. standard step backwater method). Energy losses are evaluated by friction (Manning's Equation) and the contraction / expansion of flow through the channel. The momentum equation is used in situations where the water surface profile is rapidly varied, such as hydraulic jumps, mixed-flow regime calculations, hydraulics of dams and bridges, and evaluating profiles at a river confluence (USACE, 2022b).

Hydraulic and Hydrologic modeling of Irondequoit Creek in the Towns of Penfield, Perinton, and Mendon was completed by FEMA in the late 1970's and early 1980's. Due to the age and format of the FIS study, an updated 1-D HEC-RAS model was developed using the following data and software:

- New York State Digital Ortho-imagery Program imagery for Monroe County (NYSOITS, 2020)
- Monroe County LiDAR data (Monroe County, 2017)
- National Land Cover Database (NLCD) data (MRLC, 2019)
- FIS Channel Profile (FEMA, 2008a) and survey information collected during this project
- RAS Mapper extension in HEC-RAS software (USACE, 2022a)
- FEMA FIS peak discharge data (FEMA, 2008a)

A separate hydraulic model was developed for each of the risk areas identified for Irondequoit Creek. However, these models utilize the same stationing which begins at Irondequoit Bay approximately 450 feet downstream of NY 404 (Empire Boulevard) [river station 0+00] and extending upstream to a point approximately 1,050 feet upstream of Boughton Hill Road [river station 1792+00].

Methodology of HEC-RAS Model Development

Using the orthoimagery, LiDAR data, land cover data, available bathymetric data, and the RAS Mapper extension in the HEC-RAS software, a base condition hydraulic model was developed from the effective FEMA hydraulic model using the following methodology:

- Main channel, bank lines, flow paths, and cross-sections, which were drawn along the main channel at stream meanders, contraction / expansion points, and at structures, were digitized in RAS Mapper
- A digital elevation model (DEM) with a three foot horizontal resolution was developed using the ground classified LiDAR points
- Using the DEM and NLCD land cover data, terrain elevation profiles, downstream reach lengths, and Manning's n values were assigned to each cross-section
- The overland topographic data was combined with the channel bathymetry from the effective FEMA profile and survey information and a 1-D steady flow simulation was performed using the FEMA FIS peak discharges

The base condition model water surface elevation results were then compared to the FEMA FIS water surface profiles, and the effective FEMA FIS streambed elevation profiles to validate the model. The base condition water surface elevations differed by as much as 1.0 ft at FIS lettered cross sections within the modeled risk areas. In addition to floodplain development since the original FIS studies (circa 1970's and 1980's), these differences are likely also influenced by the use of LiDAR based cross section geometry and newer modeling software. After the base condition model was verified, it was then used to develop alternative condition models to simulate potential flood mitigation strategies. Generic renderings of various potential flood mitigation strategies are provided in Appendix F. The simulation results of the alternative conditions were evaluated based on their reduction in water surface elevations. As the potential flood mitigation strategies are, at this point, preliminary, inundation mapping was not developed from the computed water surface profiles for each potential mitigation alternative. Inundation shown on figures within this report reflects that of the effective FEMA FIS for the Towns of Penfield, Perinton, and Mendon. The effectiveness of each potential mitigation strategy was evaluated based on reduction in water surface elevations. In addition to reduced water surface elevations at the inundated structures, some structures may be removed from the inundation area for a given ACE event by implementing the mitigation strategies.

The flood mitigation strategies that were modeled were:

- Create Flood Bench Upstream of Quarry
- Modify Penfield Road Crossing
- Create Flood Bench near Hidden Creek Circle
- Modify NY 31 (Pittsford Palmyra Road) Crossing
- Modify Interstate 490 Crossing
- Modify NY 251 (Victor Mendon Road) Crossing
- Install High Flow Culverts under NY 251 (Victor Mendon Road)
- Modify NY 64 (Mendon Ionia Road) Crossing

Stationing references for the flood mitigation measures are based on the digitized channel centerline for Irondequoit Creek, which differs from the FEMA FIS stationing values.

Cost Estimate Analysis

Rough order of magnitude (ROM) cost estimates were prepared for each mitigation alternative. In order to reflect current construction market conditions, a semi-analogous cost estimating procedure was used by considering costs of a recently completed, similar scope construction project performed in Upstate

New York. Phase I of the Sauquoit Creek Channel and Floodplain Restoration Project in Whitestown, NY contained many elements similar to those found in the potential mitigation alternatives.

Where recent construction cost data was not readily available, RSMeans CostWorks 2019 was used to determine accurate and timely information (Gordian, Inc., 2019). Costs were adjusted for inflation and verified against current market conditions and trends.

For mitigation alternatives where increases in bridge sizes were evaluated, bridge size increases were initially analyzed based on 2-feet freeboard over the base flood elevation for a 1% ACE. Once these optimal sizes were determined, further analysis was completed including site constraints and constructability. Due to these additional constraints, for some mitigation measures the size necessary to meet the freeboard requirement was not feasible. Cost estimates were only performed for projects determined to be constructible and practical.

Infrastructure and hydrologic modifications will require permits and applications to the New York State and / or FEMA, including construction and environmental permits from the State and accreditation, Letter of Map Revision (LOMR), etc. applications to FEMA. Application and permit costs were not incorporated in the ROM costs estimates.

High Risk Areas

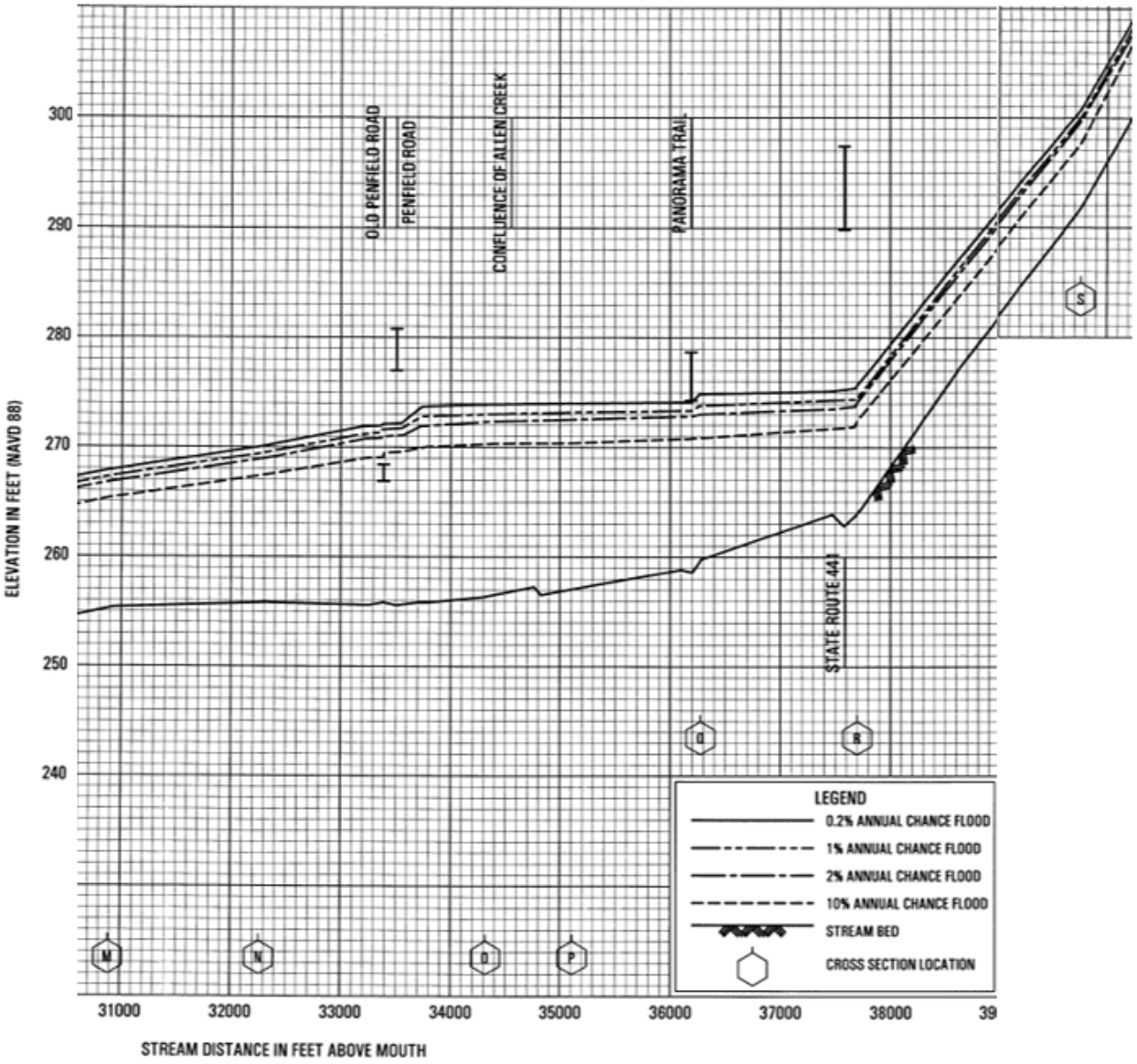
Based on the FEMA FIS, NCEI storm events database, historical flood reports, and stakeholder input from engagement meetings, three areas along Irondequoit Creek were identified as high-risk flood areas in the Towns of Penfield, Perinton, and Mendon.

High Risk Area #1: Vicinity of Panorama Plaza (Station 299+00 to 372+00)

This risk area comprises 1.7 miles of Irondequoit Creek from approximately 2,500 feet downstream of Old Penfield Road to 2,300 feet upstream of State Route 441, and contains approximately 45 residential structures and 20 commerical structures within the 1% annual chance flood hazard zone. Approximately 23 of these residences are FEMA Repetitive Loss (RL) properties. There are four bridge crossings within this area with Monroe County owning the Old Penfield Road [BIN 3317240], Penfield Road [BIN 1048530], and Panorama Trail [BIN 1095720] crossings and the NYSDOT owning the State Route 441 [BIN 1063939] crossing. This area was identified by stakeholders as being prone to flooding during the initial engagement meeting, and was selected due to the number of residences and businesses impacted by flooding. While flood mitigation measures has been previously evaluated by the USACE, this study tried to identify alternatives not previously considered. The former quarry just downstream of Panorama Plaza is primarily fed by pristine groundwater. The site is now owned by the Rochester Institute of Technology, which uses it for water quality studies. Therefore, mitigation alternatives that consider allowing sediment laden flood waters to more easily access this water body may not be desirable. A wolman pebble count downstream of Old Penfield Road resulted in about 40 percent of the material being classified as silt/clay, with the classification of all other material ranged from very coarse gravel to very large boulders. The high presence of silt/clay suggests that backwater conditions may occur in this area due to hydraulic constrictions located downstream of Old Penfield Road. According to the Monroe County Department of Transportation this sedimentation has reportedly occurred since the bridge was built and has been unexpected (Cox, 2022). Figure 12 depicts the extent of flooding within the risk area, while Figure 13 shows the water surface profiles within the risk area.

Figure 12. High Risk Area #1: Vicinity of Panorama Plaza

Figure 13. FEMA FIS Profile for Irondequoit Creek in the Vicinity of High Risk Area #1

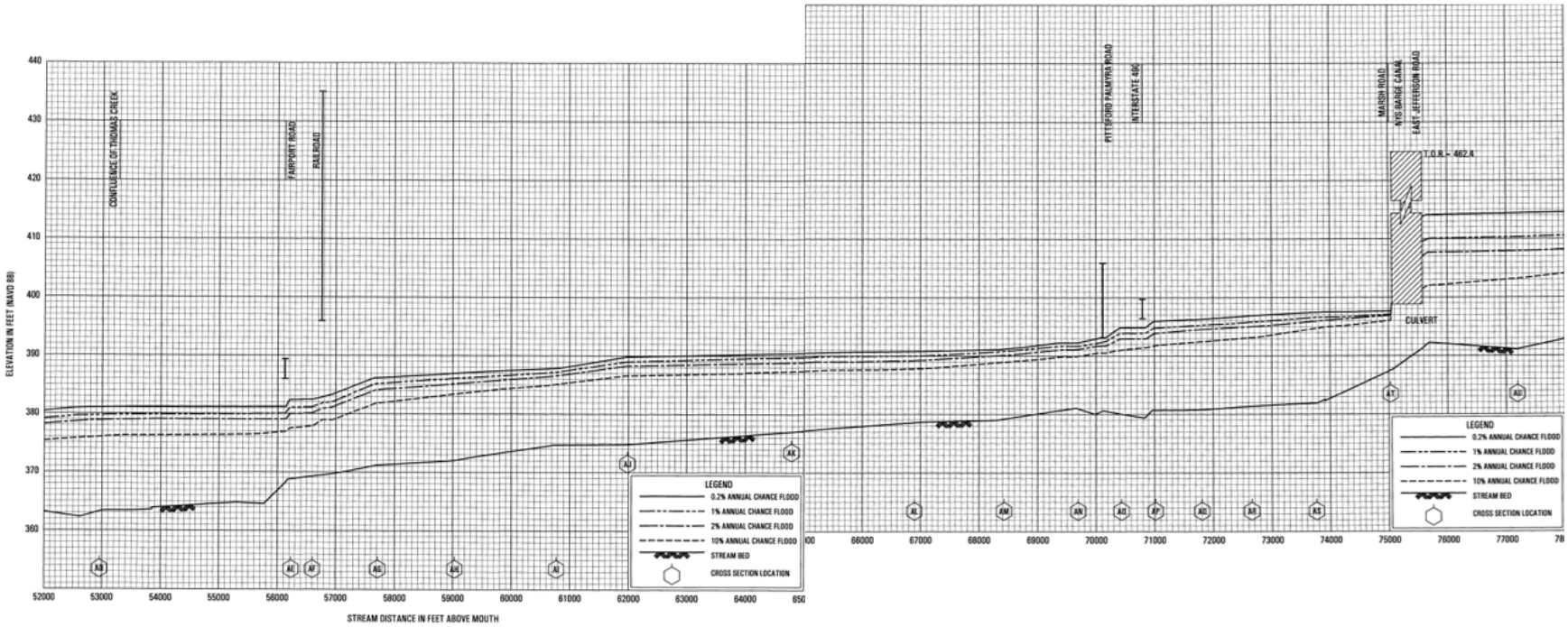


High Risk Area #2: Residential Area between NY 31F (Fairport Road) and New York State Barge Canal (Station 572+00 to 739+00)

This risk area comprises 3.1 miles of Irondequoit Creek from approximately 1,600 feet upstream of NY 31F (Fairport Road) to 300 feet downstream of the New York State Barge Canal, and contains approximately 41 residential structures within the 1% annual chance flood hazard zone. Four of these residences are FEMA Repetitive Loss (RL) properties. There are two bridge crossings within this area with the NYSDOT owning both the NY 31 (Pittsford Palmyra Road) [BIN 1021700]the Interstate 490 [BIN 1048960] crossings. This area, specifically Brook Hollow Road, Little Brook Drive, and Hidden Creek Circle, was identified by stakeholders as being prone to flooding during the initial engagement meeting, and was selected due to the number of residences impacted by flooding. The NYSDOT has periodically removed sediment buildup at the Interstate 490 crossing. Additionally, the Town of Perinton has been actively working to obtain funding for property buyouts for properties on Brook Hollow Road. This study attempts to identify additional mitigation alternatives for the risk area. A wolman pebble count upstream of NY 31 (Pittsford Palmyra Road) resulted in about 60 percent of the material being classified as silt/clay, with all other material being classified as very fine sand or fine sand. The prevalence of fine materials suggests that this area is highly susceptible to siltation, which could be caused by inadequate hydraulic capacity though the NY 31 (Pittsford Palmyra Road) crossing. Figure 14 depicts the extent of flooding within the risk area, while Figure 15 shows the water surface profiles within the risk area.

Figure 14. High Risk Area #2: Residential Area between NY 31F (Fairport Road) and New York State Barge Canal

Figure 15. FEMA FIS Profile for Irondequoit Creek in the Vicinity of High Risk Area #2

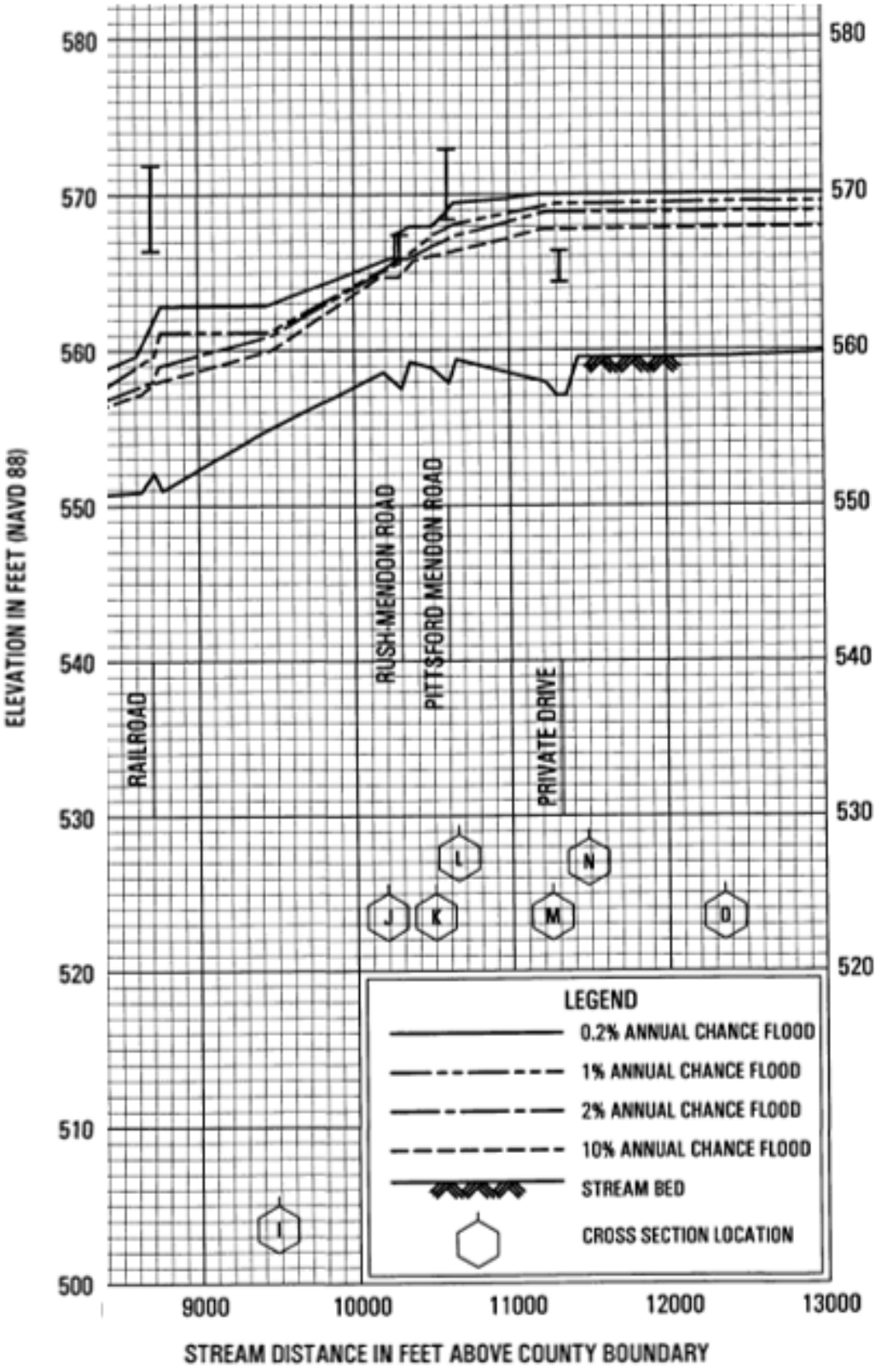


High Risk Area #3: Near Intersection of NY 251 (Victor Mendon Road) and NY 64 (Mendon Ionia Road) (Station 1,390+00 to 1,440+00)

This risk area comprises 0.8 miles of Irondequoit Creek from just upstream of the Lehigh Valley Trail (referred to as Railroad in the FIS profile) to 2,000 feet upstream of NY 64 (Mendon Ionia Road, referred to as Pittsford Mendon Road on the FIS Profile), and contains approximately 13 residential and commercial structures. One of these residences is a FEMA Repetitive Loss (RL) property. There are three bridge crossings within this area with the NYSDOT owning the NY 251 (Victor Mendon Road, referred to as Rush Mendon Road on the FIS Profile) [BIN 1028900] and NY 64 (Mendon Ionia Road, referred to as Pittsford Mendon Road on the FIS Profile) [BIN 1043400] crossings and a private bridge whose owner is unknown. This area was identified by stakeholders as being prone to flooding during the initial engagement meeting, and was selected due to the number of residences and businesses impacted by flooding. A wolman pebble count downstream of NY 251 (Victor Mendon Road) provided materials generally categorized and gravels and cobbles, with nearly 70% of the material being small or large cobbles, and less than 5% of the material being classified as silt/clay or very fine sand. Many macroinvertebrates were also noted at this location suggesting a healthy stream and properly functioning stream. As such it is anticipated that any hydraulic constrictions downstream of NY 251 (Victor Mendon Road) do not impact flooding at this crossing. Figure 16 depicts the extent of flooding within the risk area, while Figure 17 shows the water surface profiles within the risk area.

Figure 16. High Risk Area #3: Near Intersection of NY 251 (Victor Mendon Road) and NY 64 (Mendon Ionia Road)

Figure 17. FEMA FIS Profile for Irondequoit Creek in the Vicinity of High Risk Area #3



Mitigation Alternatives

The following flood mitigation alternatives that have the potential to reduce water surface elevations were evaluated for the identified high-risk areas along Irondequoit Creek. These alternatives could potentially reduce flood related damages in areas adjacent to the creek. The Towns of Penfield, Perinton, and Mendon should evaluate each alternative and consider the potential effects to the community and the level of community buy-in for each before pursuing them further.

High Risk Area #1: Vicinity of Panorama Plaza (Station 299+00 to 372+00)

Alternative #1-1: Create Flood Bench Upstream of Quarry (Station 310+00 to 318+50)

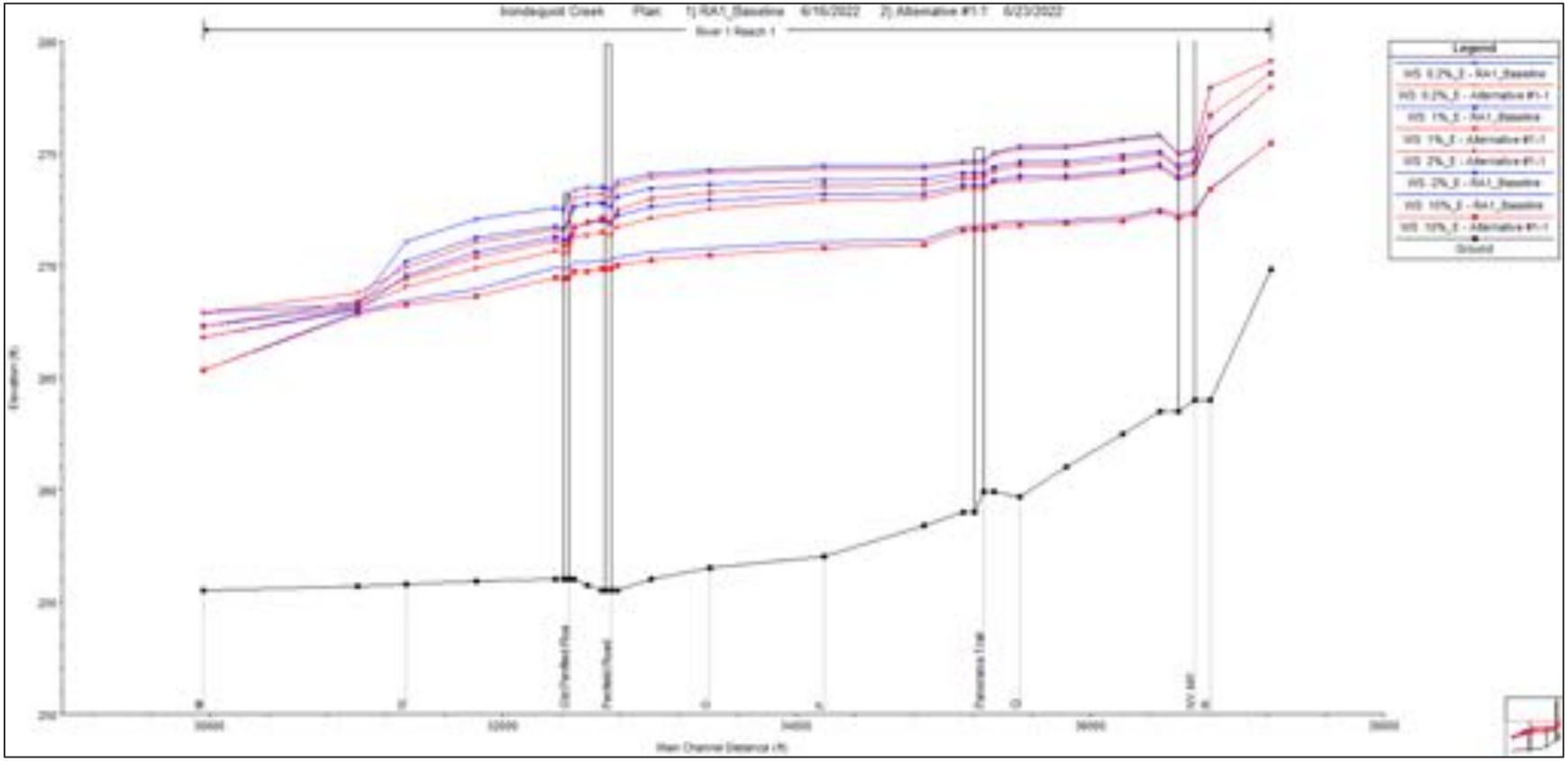
The inundation extents for the effective FEMA FIRM indicate extensive residential and commercial flooding. The channel has been straightened and berms built up to allow for quarry operations. These activities have likely decreased the overall channel capacity during significant flood events, and field observations suggest sedimentation is occurring near Old Penfield Road. This potential flood mitigation alternative is intended to provide additional flow area in the overbank through construction of a 200-foot-wide by 850-foot-long flood bench, and removal of berms within the floodplain. The existing topography was lowered by approximately 1.5 feet within flood bench for this alternative to an elevation of 264.5 feet which is between the approximate bankfull and 10% annual chance water surface elevations. The existing topography was lowered by approximately 8.5 feet within the area of the berms for this alternative to an elevation of 267 feet which is between the approximate bankfull and 10% annual chance water surface elevations. These topographic changes result in the removal of approximately 20,500 cubic yards of material. Figure 18 depicts the conceptual extents of this alternative.

Figure 19 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #1-1 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending approximately 1 mile upstream of the floodplain bench to just upstream of State Route 441. Water surface elevation reductions under current discharges are computed to be as much as 0.5 ft for the 10% ACE discharge, 0.7 ft for the 2% ACE discharge, 0.9 ft for the 1% ACE discharge, and 1.2 ft for the 0.2% ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.5 ft for the 10% ACE discharge, 0.8 ft for the 2% ACE discharge, 1.0 ft for the 1% ACE discharge, and 1.4 ft for the 0.2% ACE discharge. It should be noted that this alternative raised water surface elevation at the downstream extent of the floodplain bench by 0.1 ft for the current 2% ACE discharge, 0.2 feet for the projected future 2% ACE discharge, 0.2 ft for the current 1% ACE discharge, 0.4 feet for the projected future 1% ACE discharge, 0.5 ft for the current 0.2% ACE discharge, and 0.8 feet for the projected future 0.2% ACE discharge. The water levels at the downstream extent of the flood bench are unusually low under the base condition due to the berms and narrow channel constricting the floodplan, which causes higher water levels upstream of this location. Once this constriction is relieved under the Alternative #1-1 topography, water levels at the downstream extent of the floodplain bench rise, and allow for lower water levels upstream of this location.

The Rough Order Magnitude cost $3.1 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination.

Figure 18. Location Map for Alternative #1-1

Figure 19. HEC-RAS Model Simulation Output Results for Alternative #1-1



Alternative #1-2: Modify Penfield Road Crossing (Station 327+21)

The water surface profiles for the effective FEMA FIS indicate the Penfield Road bridge causes an increase in water surface elevations upstream of the road for discharges equaling or exceeding the 2% ACE event. The hydraulic width of the bridge is less than the bankfull width according to Streamstats. This potential flood mitigation alternative is intended to provide additional flow area through the bridge by widening the bridge's hydraulic opening from 80 feet to 120 feet, which is approximately 13 feet wider than the bankfull width according to StreamStats. Figure 20 depicts the conceptual extents of this alternative.

Figure 21 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #1-2 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending approximately 0.8 miles upstream of the Penfield Road Crossing to just upstream of State Route 441. Water surface elevation reductions under current discharges are computed to be as much as 0.1 ft for the 10% ACE discharge, 0.2 ft for the 2% and 0.2% ACE discharges, and 0.3 ft for the 1 % ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.1 ft for the 10% ACE discharge, 0.2 ft for the 1% and 0.2% ACE discharges, and 0.3 ft for the 2% ACE discharge. It should be noted that hydraulic studies performed in support of a 2012 superstructure replacement of this bridge, indicated that widening this bridge would have negative impacts to the area just downstream of this structure (Cox, 2022). While such results were not seen in this study, the difference in conclusions is likely due to differences in the analysis methods and objectives between this study and the 2012 superstructure replacement project.

The Rough Order Magnitude cost $6.6 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination.

Figure 20. Location Map for Alternative #1-2

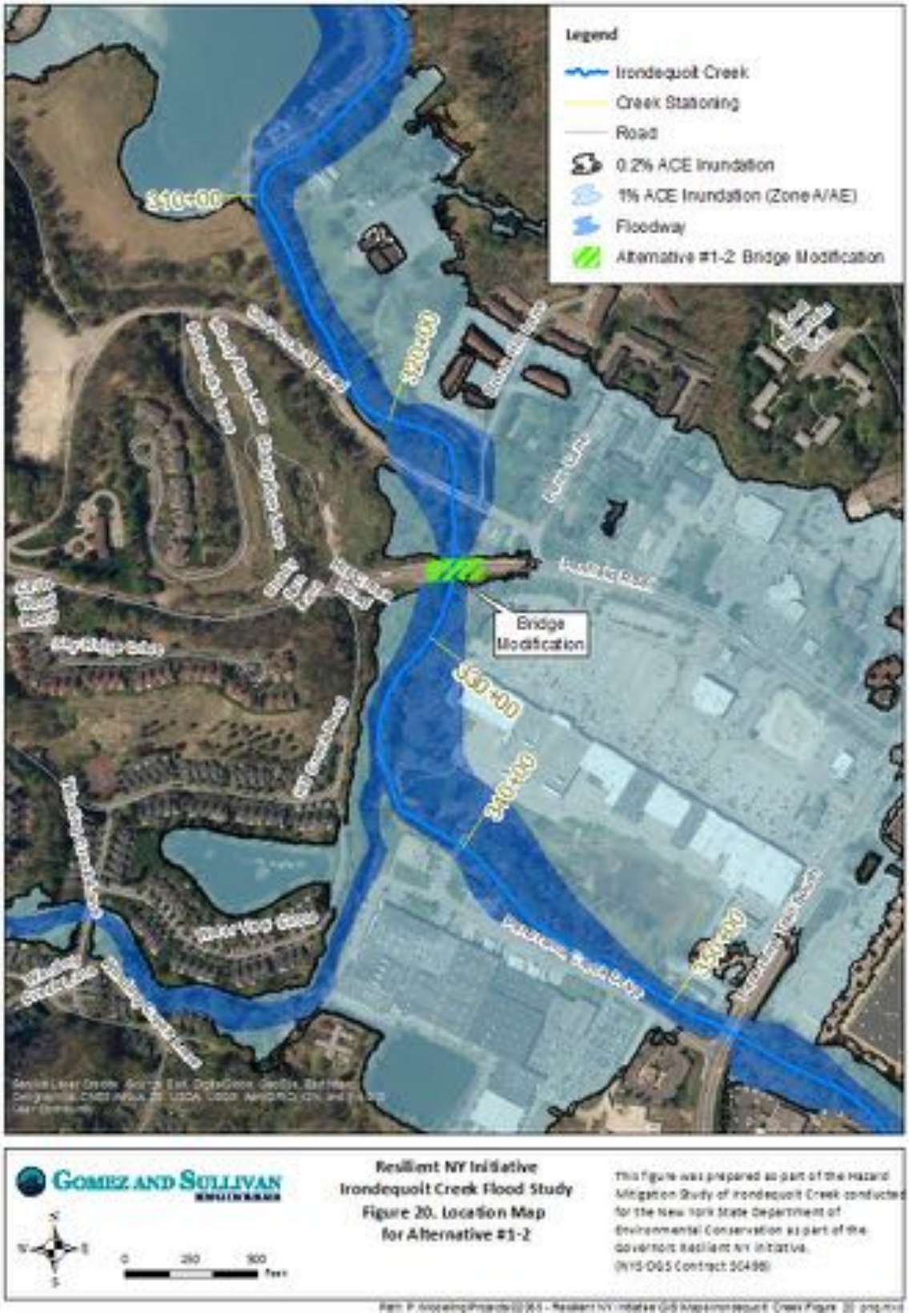
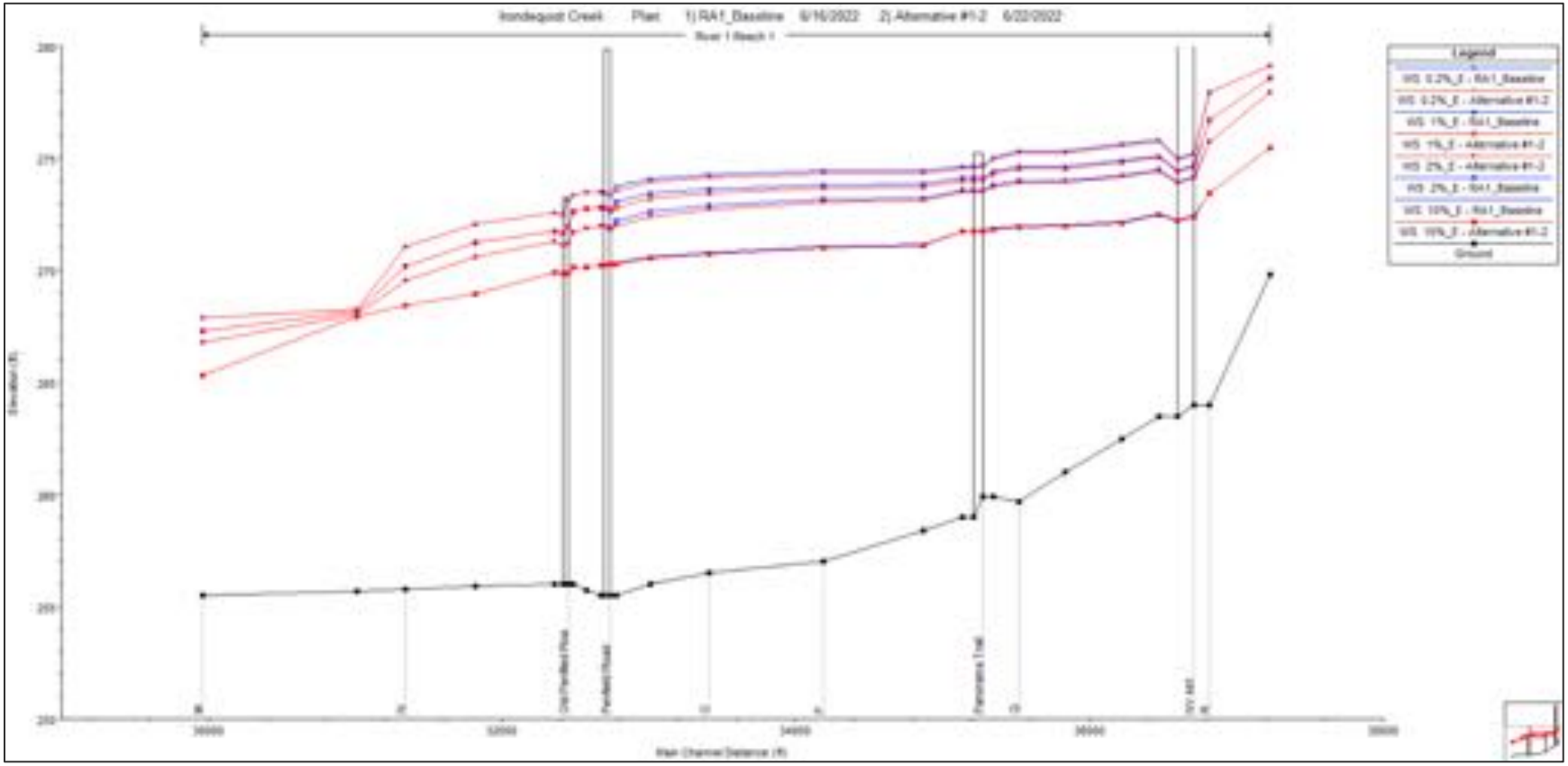


Figure 21. HEC-RAS Model Simulation Output Results for Alternative #1-2



Alternative #1-3: Remove Berms Upstream of Quarry (Station 310+00 to 311+70)

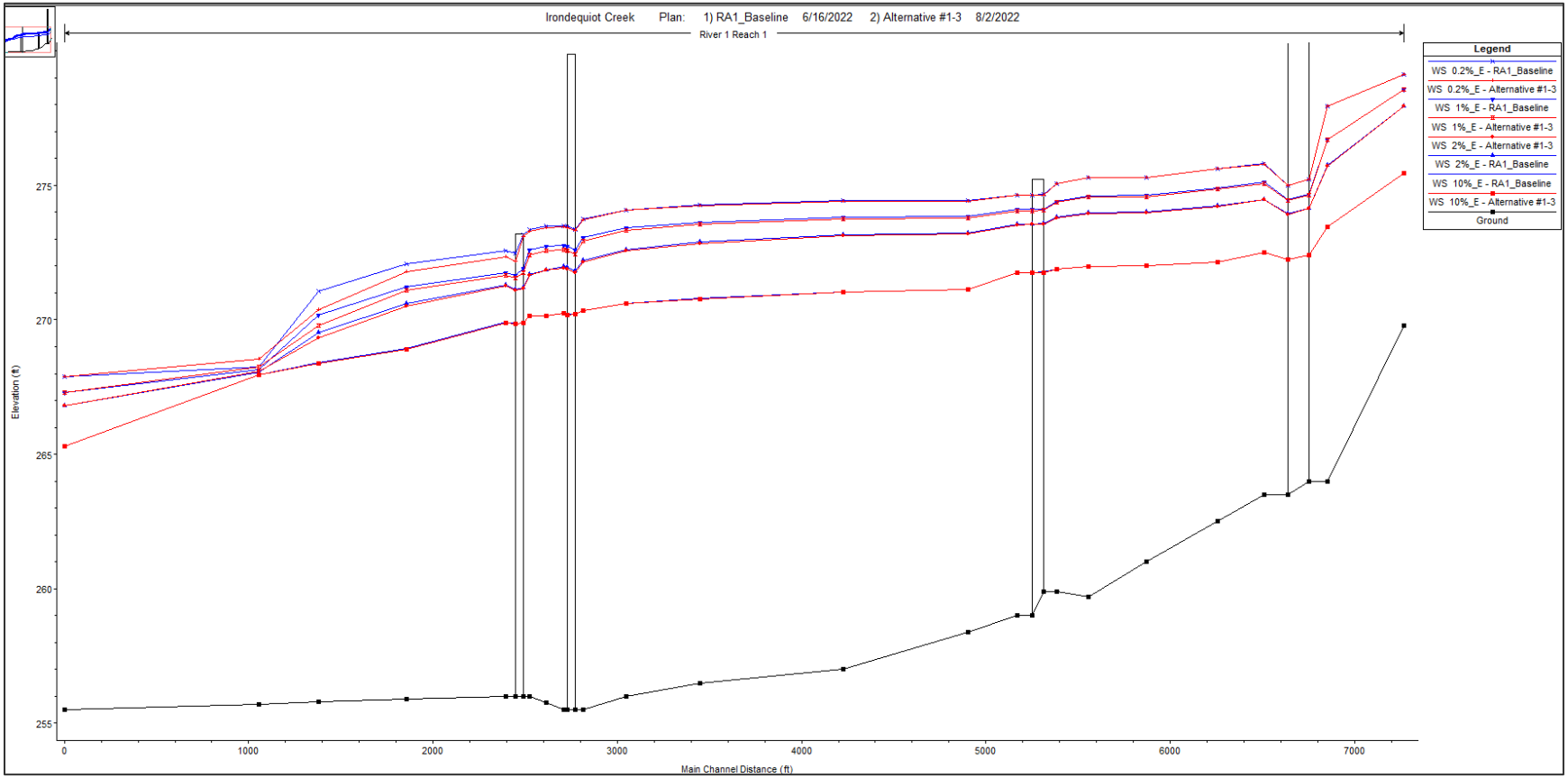
Water level reductions due to the creation of the floodplain bench may be due more to the removal of the berms. This potential flood mitigation alternative is intended to provide additional flow area in the overbank area through the removal of berms within the floodplain. The existing topography was lowered by approximately 8.5 feet within the area of the berms for this alternative to an elevation of 267 feet which is between the approximate bankfull and 10% annual chance water surface elevations. These topographic changes result in the removal of approximately 11,700 cubic yards of material. Figure 22 depicts the conceptual extents of this alternative.

Figure 23 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #1-3 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending approximately 1 mile upstream of the berm removal to just downstream of State Route 441. Water surface elevation reductions under current discharges are computed to be as much as 0.0 ft for the 10% ACE discharge, 0.2 ft for the 2% ACE discharge, 0.4 ft for the 1% ACE discharge, and 0.7 ft for the 0.2% ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.1 ft for the 10% ACE discharge, 0.2 ft for the 2% ACE discharge, 0.5 ft for the 1% ACE discharge, and 1.0 ft for the 0.2% ACE discharge. It should be noted that this alternative raised water surface elevation at the berm removal location by 0.0 ft for the current 2% ACE discharge, 0.1 feet for the projected future 2% ACE discharge and current 1% ACE discharge, 0.2 feet for the projected future 1% ACE discharge, 0.3 ft for the current 0.2% ACE discharge, and 0.6 feet for the projected future 0.2% ACE discharge. The water levels at the berm removal location are unusually low under the base condition due to the berms constricting the floodplan, which causes higher water levels upstream of this location. Once this constriction is relieved under the Alternative #1-3 topography, water levels at the downstream extent of the floodplain bench rise, and allow for lower water levels upstream of this location.

The Rough Order Magnitude cost $1.6 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination.

Figure 22. Location Map for Alternative #1-3

Figure 23. HEC-RAS Model Simulation Output Results for Alternative #1-3



Alternative #1-4: Create Flood Bench and Modify Penfield Road (Station 310+00 to 327+21)

Water level reductions may be greater when mitigation alternatives are evaluated in combination with each other depending on their relative proximity. This potential flood mitigation alternative is intended to provide additional flow area in the overbank and through the bridge by combining the modifications described in Alternatives #1-1 and #1-2. Figure 24 depicts the conceptual extents of this alternative.

Figure 25 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #1-4 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending approximately 1 mile upstream of the floodplain bench to just upstream of State Route 441. Water surface elevation reductions under current discharges are computed to be as much as 0.5 ft for the 10% ACE discharge, 0.7 ft for the 2% ACE discharge, 1.0 ft for the 1% ACE discharge, and 1.2 ft for the 0.2% ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.5 ft for the 10% ACE discharge, 0.8 ft for the 2% ACE discharge, 1.0 ft for the 1% ACE discharge, and 1.4 ft for the 0.2% ACE discharge. It should be noted that this alternative raised water surface elevation at the downstream extent of the floodplain bench by 0.1 ft for the current 2% ACE discharge, 0.2 feet for the projected future 2% ACE discharge and current 1% ACE discharge, 0.4 feet for the projected future 1% ACE discharge, 0.5 ft for the current 0.2% ACE discharge, and 0.8 feet for the projected future 0.2% ACE discharge. The water levels at the downstream extent of the flood bench are unusually low under the base condition due to the berms constricting the floodplan, which causes higher water levels upstream of this location. Once this constriction is relieved under the Alternative #1-4 topography, water levels at the downstream extent of the floodplain bench rise, and allow for lower water levels upstream of this location. The alternative provided water levels upstream of Penfield road which were lower than either Alternative #1-1 or Alternative #1-2 by as much as 0.1 ft for the current and projected future 10% ACE discharges, 0.2 ft for the current 0.2% ACE discharge, 0.3 ft for the current 0.2% ACE and projected future 2% and 0.2% ACE discharges, and 0.4 ft for the current and projected future 1% ACE discharges.

The Rough Order Magnitude cost $9.7 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination.

Figure 24. Location Map for Alternative #1-4

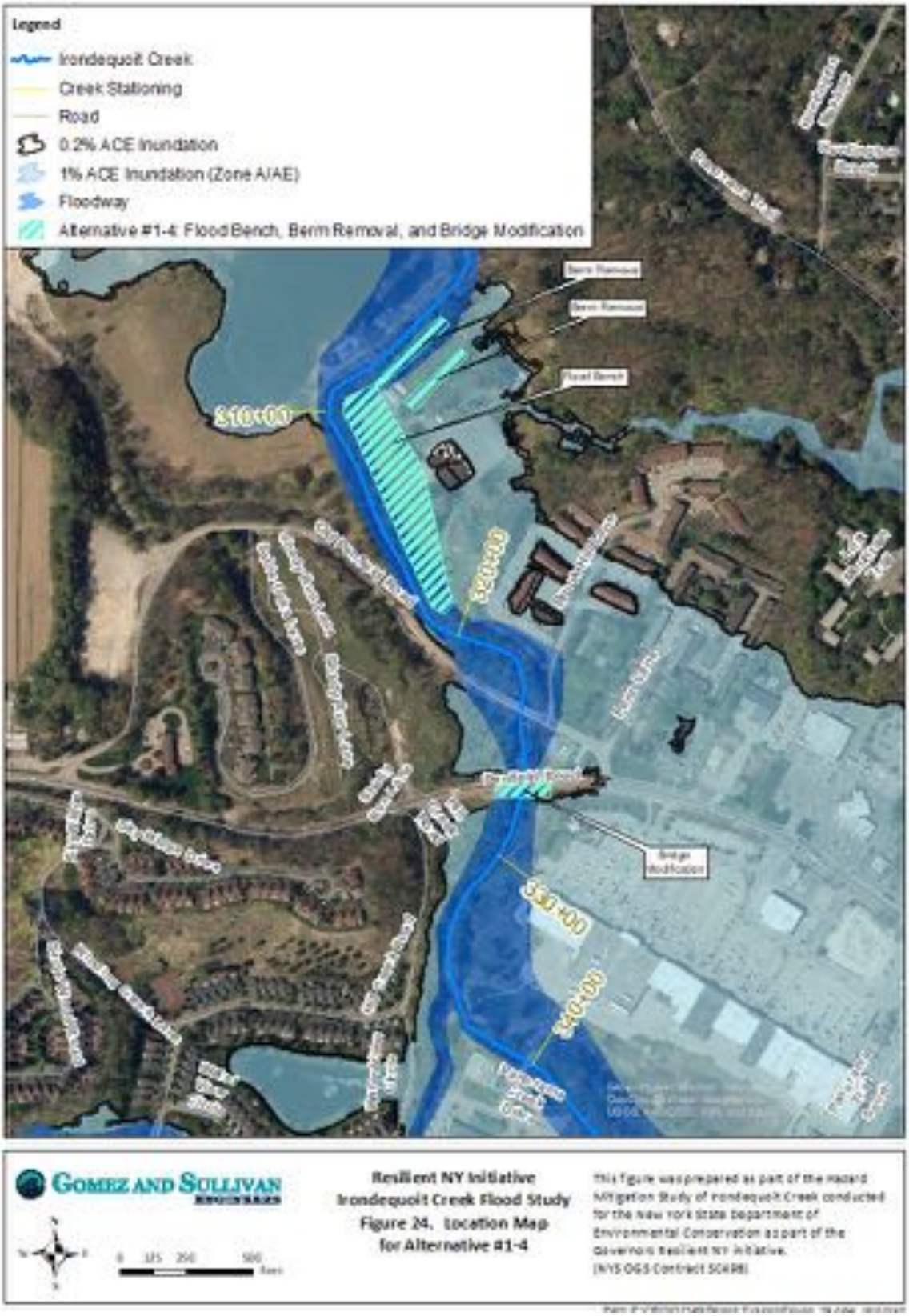
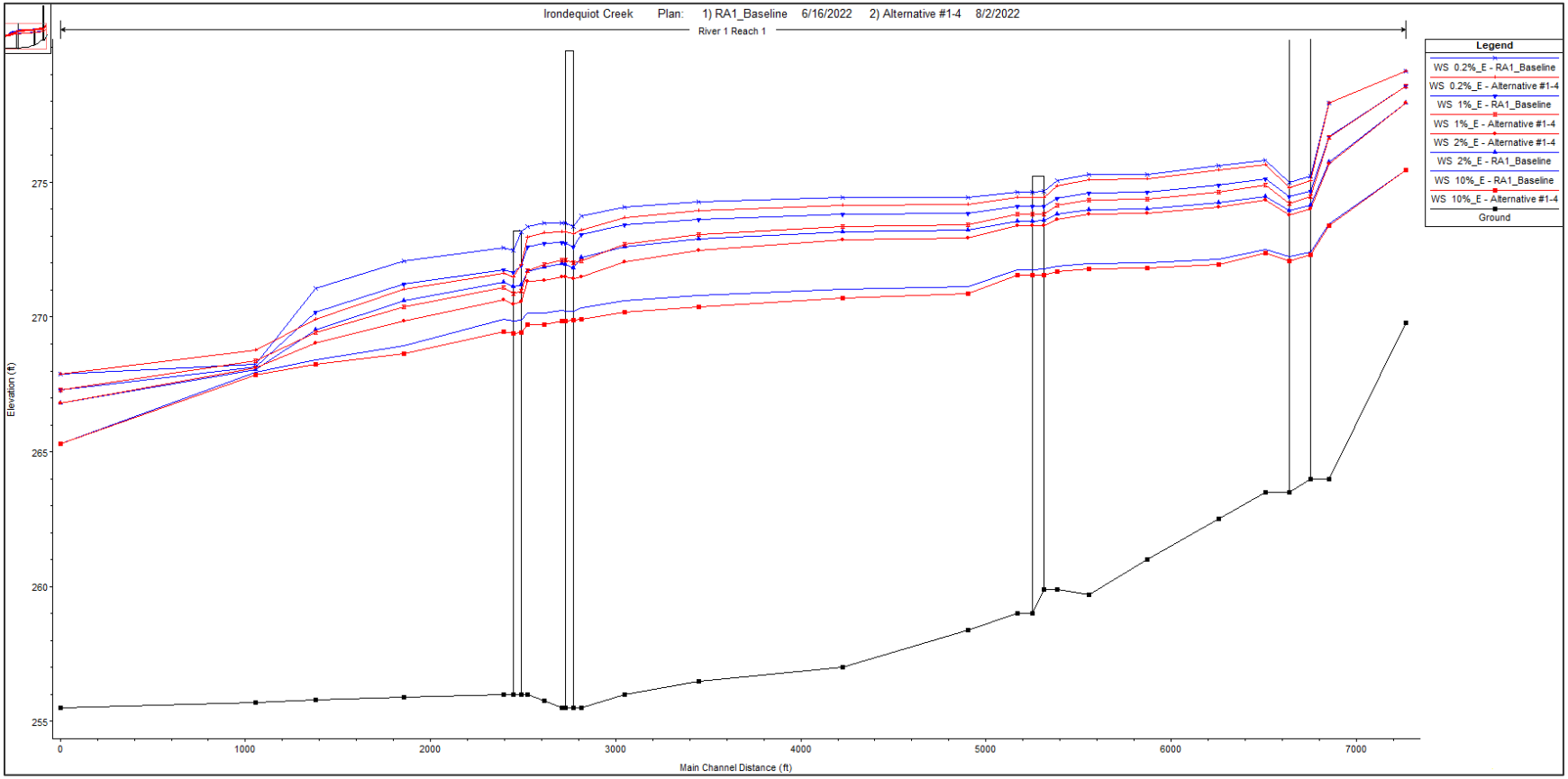


Figure 25. HEC-RAS Model Simulation Output Results for Alternative #1-4



High Risk Area #2: Residential Area between NY 31F (Fairport Road) and New York State Barge Canal (Station 572+00 to 739+00)

Alternative #2-1: Create Flood Bench near Hidden Creek Circle (Station 594+50 to 601+00)

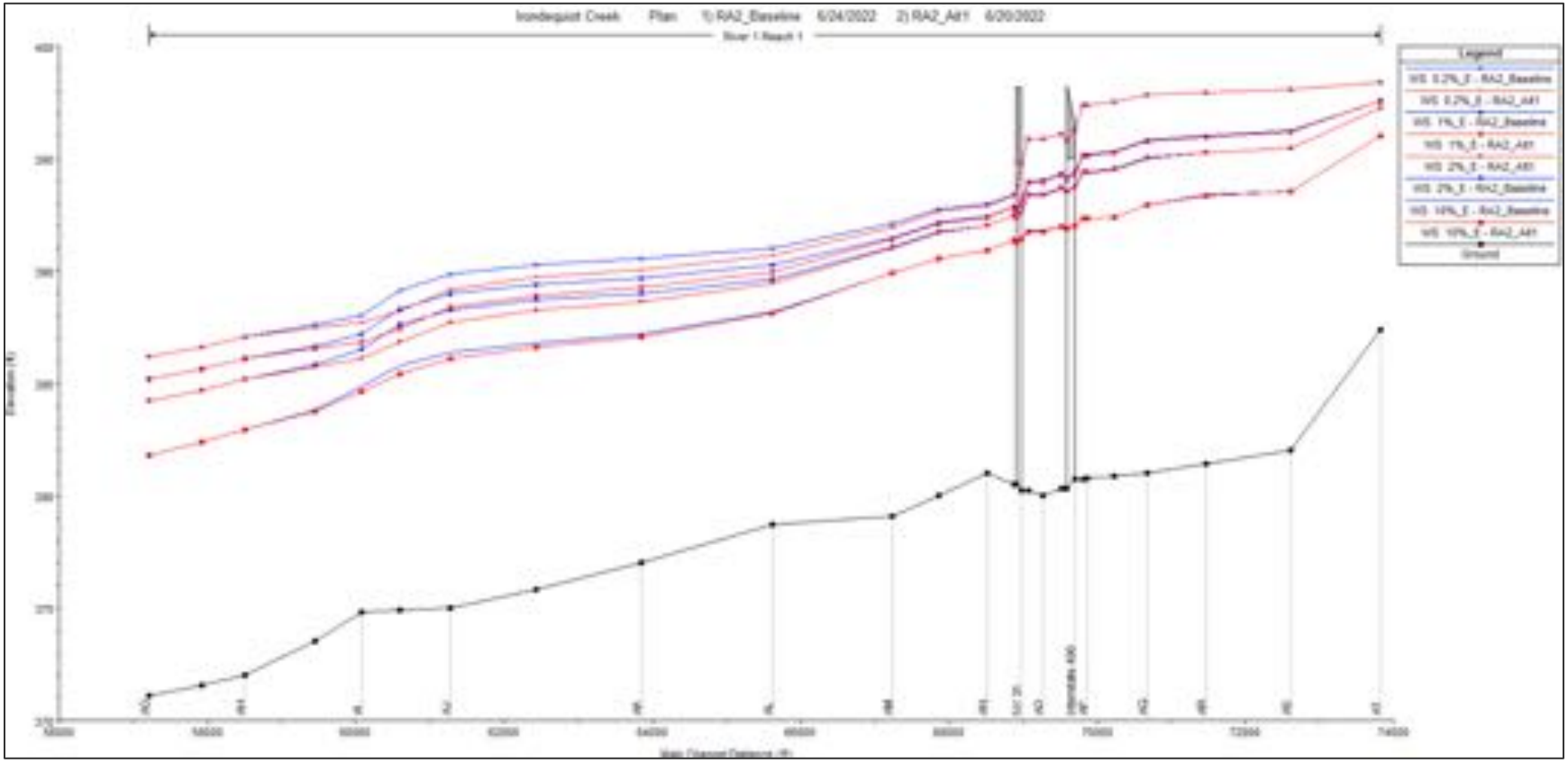
The inundation extents for the effective FEMA FIRM indicate extensive residential flooding along Irondequoit Creek between Hidden Creek Circle and the New York State Barge Canal. The terrain shows that the floodplain narrows for approximately 500 feet along Irondequoit Creek just downstream of Hidden Circle. This potential flood mitigation alternative is intended to provide additional flow area in the overbank through the construction of a 200-foot wide by 650-foot-long flood bench. The existing topography was lowered by approximately 30 feet for this alternative to an elevation of 383 feet which is between the approximate bankfull and 10% annual chance water surface elevations, resulting in the removal of approximately 128,300 cubic yards of material. Figure 26 depicts the conceptual extents of this alternative.

Figure 27 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #2-1 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending approximately 2.4 miles upstream of the flood bench nearly to the New York State Barge Canal. Water surface elevation reductions under current discharges are computed to be as much as 0.4 ft for the 10% ACE discharge, 0.8 ft for the 2% and 1% ACE discharges, and 0.9 ft for the 0.2% ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.5 ft for the 10% ACE discharge, 0.8 ft for the 2% ACE discharge, and 0.9 ft for the 1% and 0.2% ACE discharges. This alternative results in water level decreases in excess of 0.5 feet for the existing and projected future 1% ACE discharges at approximately 12 residences, with approximatley 29 additional residential structures seeing water level reductions of less than 0.1 feet.

The Rough Order Magnitude cost $9.4 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination.

Figure 26. Location Map for Alternative #2-1

Figure 27. HEC-RAS Model Simulation Output Results for Alternative #2-1



Alternative #2-2: Modify NY 31 (Pittsford Palmyra Road) Crossing (Station 689+35)

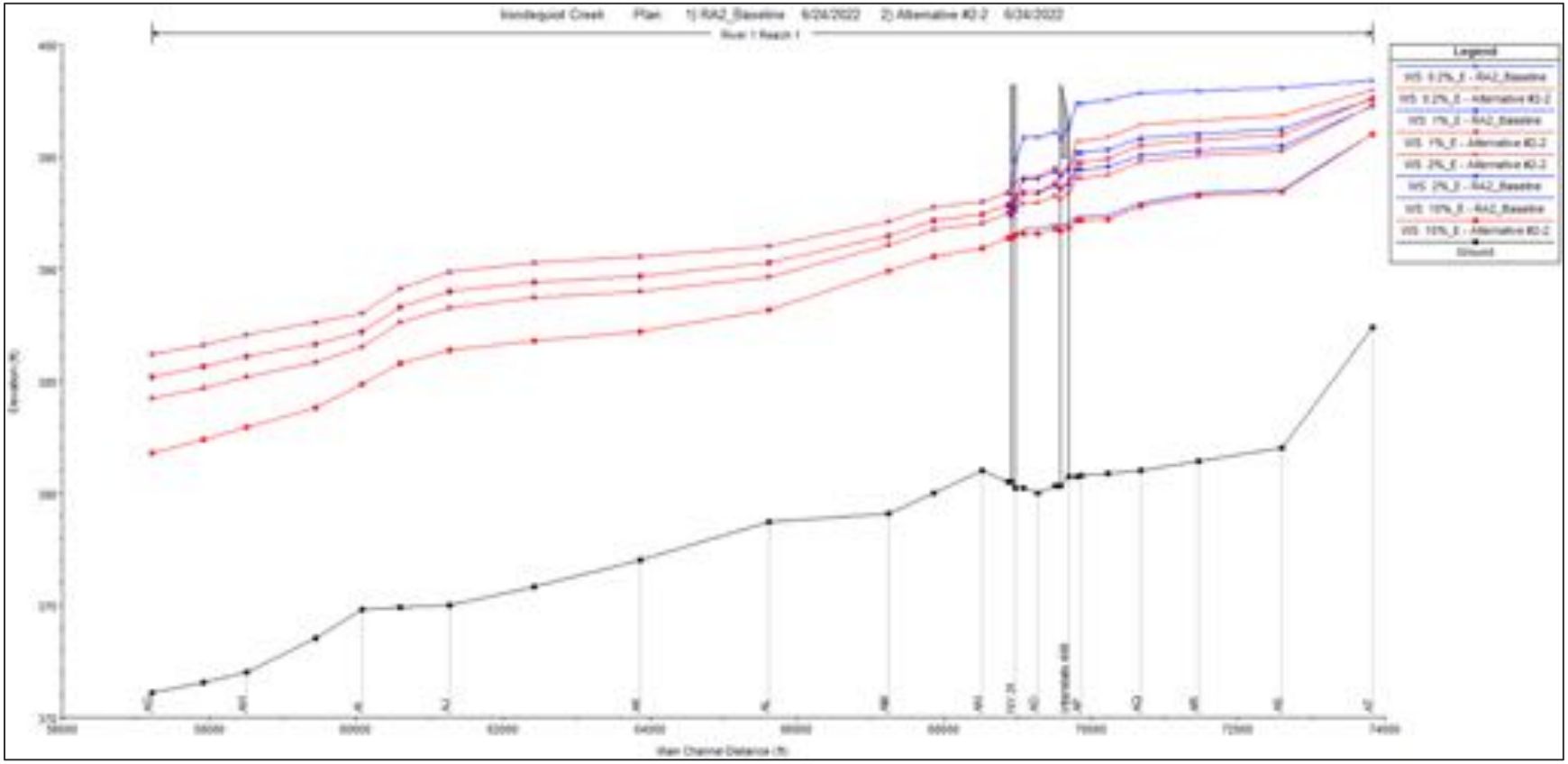
The water surface profiles for the effective FEMA FIS indicate the NY 31 (Pittsford Palmyra Road) bridge causes an increase in water surface elevations upstream of the road for discharges equaling or exceeding the 2% ACE event. The hydraulic width of the bridge is less than the bankfull width according to Streamstats, and field observations suggest sedimentation is occurring upstream of the NY 31 (Pittsford Palmyra Road) crossing. This potential flood mitigation alternative is intended to provide additional flow area through the bridge by widening the bridge's hydraulic opening from 45 feet to 85 feet, which is approximately 12 feet wider than the bankfull width according to StreamStats, and raising the low chord approximately 0.7 feet to meet CRRA guidelines. Figure 28 depicts the conceptual extents of this alternative.

Figure 29 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #2-2 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending approximately 0.9 miles upstream of the bridge to the New York State Barge Canal. Water surface elevation reductions under current discharges are computed to be as much as 0.2 ft for the 10 % ACE discharge, 0.5 ft for the 2% ACE discharge, 0.6 ft for the 1% ACE discharge, and 1.8 ft for the 0.2% ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.3 ft for the 10% ACE discharge, 0.6 ft for the 2% discharge, 0.7 ft for the 1% ACE discharge, and 1.6 ft for the 0.2% ACE discharge.

The Rough Order Magnitude cost $6.5 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination.

Figure 28. Location Map for Alternative #2-2

Figure 29. HEC-RAS Model Simulation Output Results for Alternative #2-2



Alternative #2-3: Modify Interstate 490 Crossing (Station 696+35)

The water surface profiles for the effective FEMA FIS indicate the Interstate 490 bridge causes an increase in water surface elevations upstream of the road for discharges equaling or exceeding the 2% ACE event. The hydraulic width of the bridge is less than the bankfull width according to Streamstats, and sediment removal operations at this structure are periodically required. This potential flood mitigation alternative is intended to provide additional flow area through the bridge by widening the bridge's hydraulic opening from 45 feet to 85 feet, which is approximately 12 feet wider than the bankfull width according to StreamStats. Figure 30 depicts the conceptual extents of this alternative.

Figure 31 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #2-3 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending approximately 0.9 miles upstream of the bridge to the New York State Barge Canal. Water surface elevation reductions under current discharges are computed to be as much as 0.3 ft for the 10 % ACE discharge, 0.6 ft for the 2% ACE discharge, 0.7 ft for the 1% ACE discharge, and 0.9 ft for the 0.2% ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.4 ft for the 10% ACE discharge, 0.7 ft for the 2% discharge, 0.8 ft for the 1% ACE discharge, and 1.2 ft for the 0.2% ACE discharge.

The Rough Order Magnitude cost $8.5 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination.

Figure 30. Location Map for Alternative #2-3

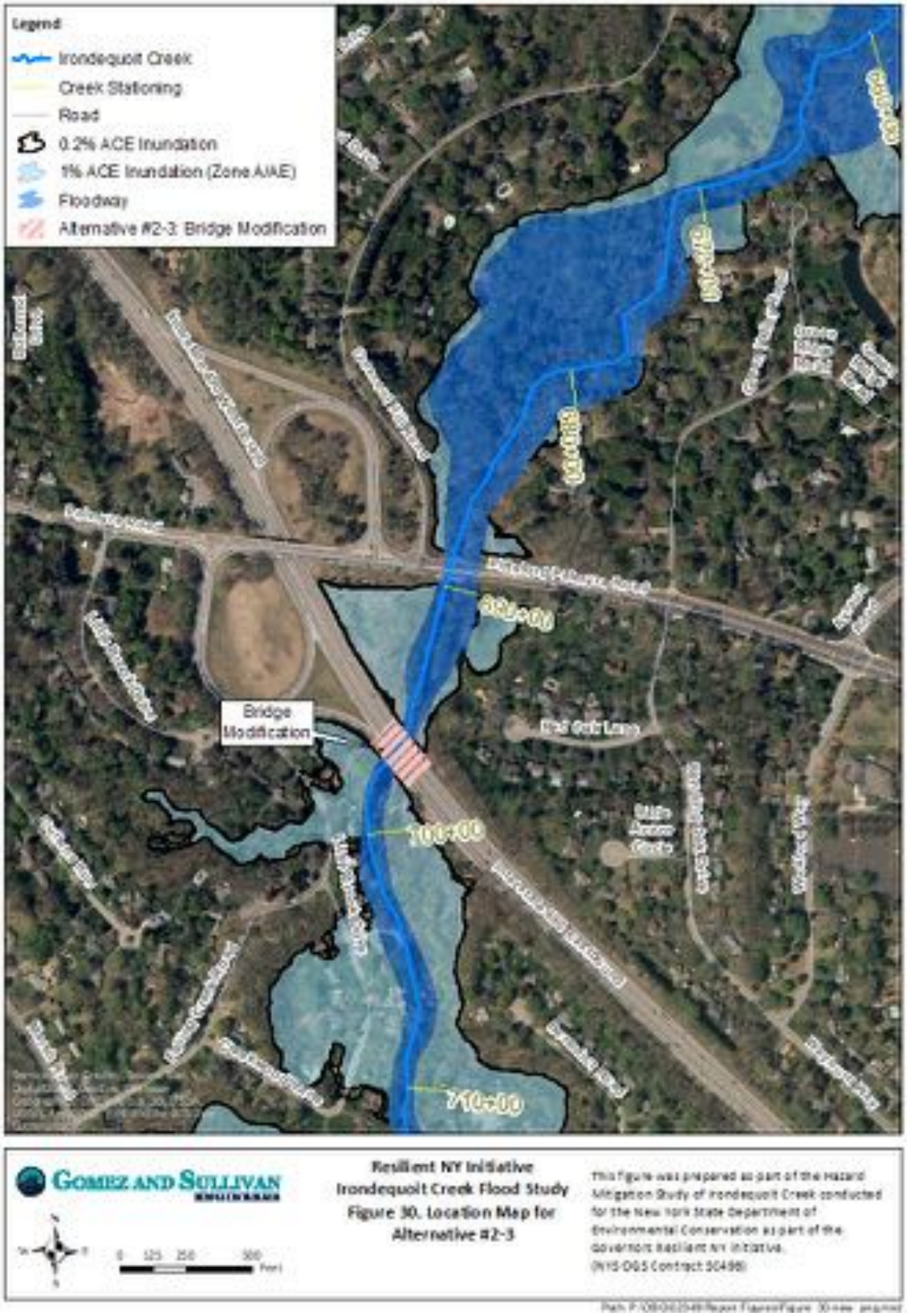
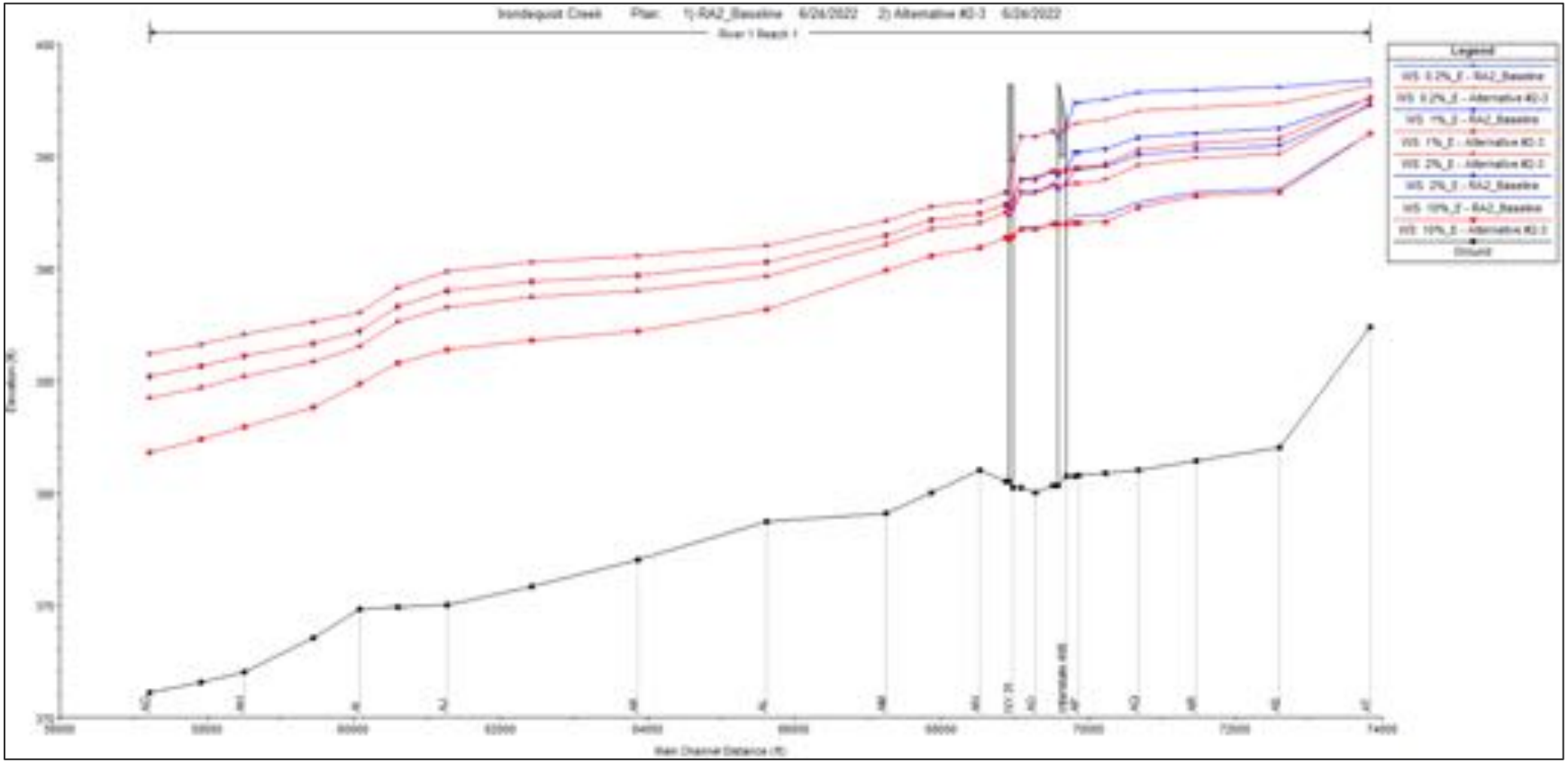


Figure 31. HEC-RAS Model Simulation Output Results for Alternative #2-3



Alternative #2-4: Modify NY 31 (Pittsford Palmyra Road) Crossing (Station 689+35) and Interstate 490 Crossing (Station 696+35)

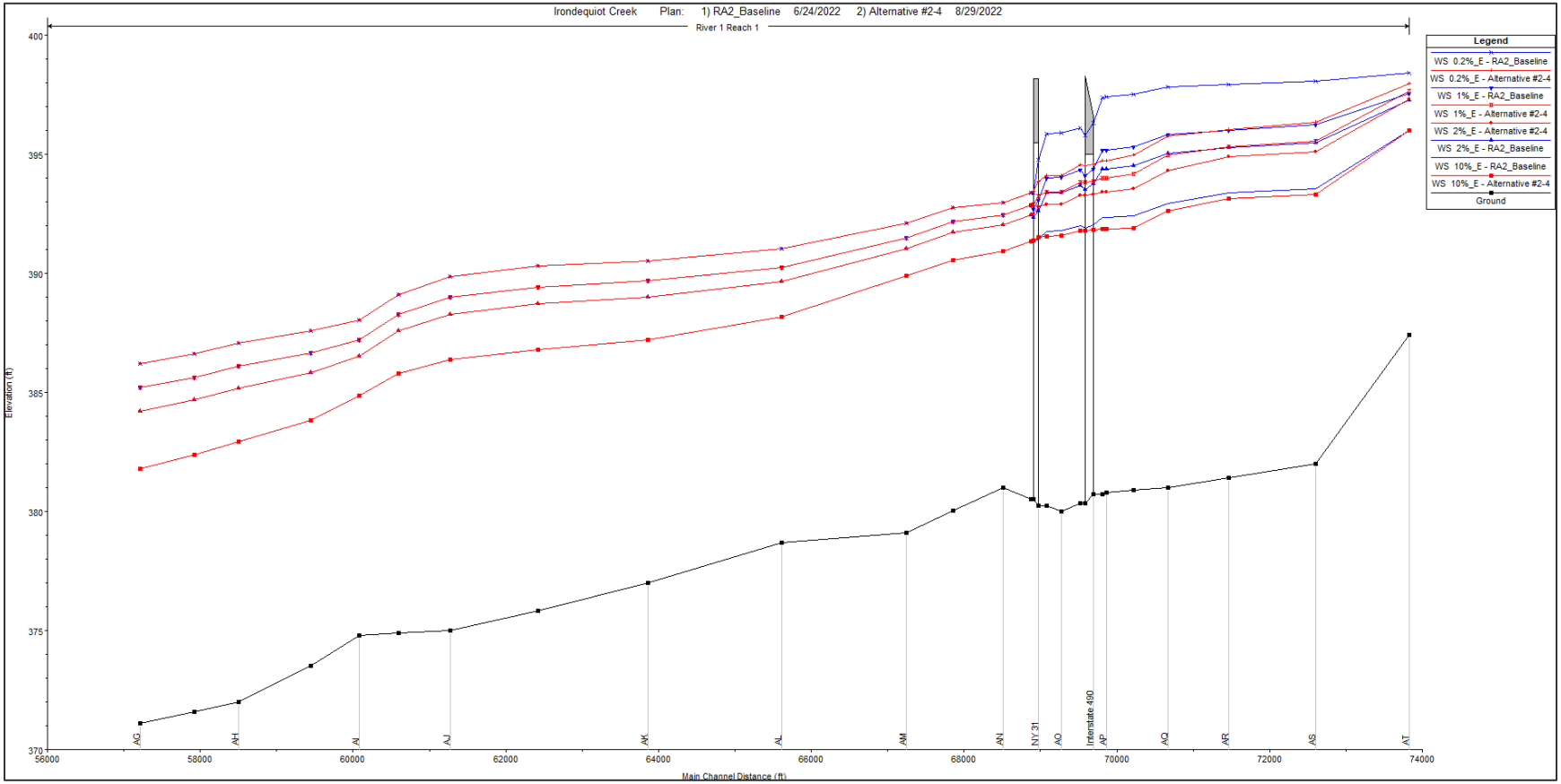
The water surface profiles for the effective FEMA FIS indicate the NY 31 (Pittsford Palmyra Road) and Interstate 490 bridges cause an increase in water surface elevations upstream of these roads for discharges equaling or exceeding the 2% ACE event. The hydraulic width of these bridges are less than the bankfull width according to Streamstats. Additionally, field observations suggest sedimentation is occurring upstream of the NY 31 (Pittsford Palmyra Road) crossing and sediment removal operations at are periodically required at the Interstate 490 crossing. This potential flood mitigation alternative is intended to provide additional flow area through the NY 31 bridges by widening its hydraulic opening from 45 feet to 85 feet, which is approximately 12 feet wider than the bankfull width according to StreamStats, and raising the low chord approximately 0.7 feet to meet CRRA guidelines. This potential flood mitigation alternative is also intended to provide additional flow area through the Interstate 490 bridge by widening the its hydraulic opening from 45 feet to 85 feet, which is approximately 12 feet wider than the bankfull width according to StreamStats. Figure 32 depicts the conceptual extents of this alternative.

Figure 33 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #2-4 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending approximately 0.9 miles upstream of these bridges to the New York State Barge Canal. Water surface elevation reductions under current discharges are computed to be as much as 0.5 ft for the 10 % ACE discharge, 1.0 ft for the 2% ACE discharge, 1.2 ft for the 1% ACE discharge, and 2.7 ft for the 0.2% ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.6 ft for the 10% ACE discharge, 1.1 ft for the 2% discharge, 1.4 ft for the 1% ACE discharge, and 2.7 ft for the 0.2% ACE discharge.

The Rough Order Magnitude cost $15 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination.

Figure 32. Location Map for Alternative #2-4

Figure 33. HEC-RAS Model Simulation Output Results for Alternative #2-4



High Risk Area #3: Near Intersection of NY 251 (Victor Mendon Road) and NY 64 (Mendon Ionia Road) (Station 1,390+00 to 1,440+00)

Alternative #3-1: Modify NY 251 (Victor Mendon Road) Crossing (Station 1,407+18)

The water surface profiles for the effective FEMA FIS indicate the NY 251 (Victor Mendon Road) bridge causes an increase in water surface elevations upstream of the road for all the modeled discharges. The hydraulic width of the bridge is less than the bankfull width, according to *StreamStats*. This potential flood mitigation alternative is intended to provide additional flow area through bridge by widening the bridge and raising the low chord to meet CRRA guidelines. Raising this bridge may require the redesign of the nearby intersection and NY 64 (Mendon Ionia Road) crossing, and would significantly impact the ability to access residential and commercial properties within this area. Additionally, widening of this bridge is not considered feasible due to the proximity of residential and commercial structures on either side of the bridge. As such, further modeling and cost estimates were not performed for this alternative.

Alternative #3-2: Install High Flow Culverts under NY 251 (Victor Mendon Road) (Station 1,407+18)

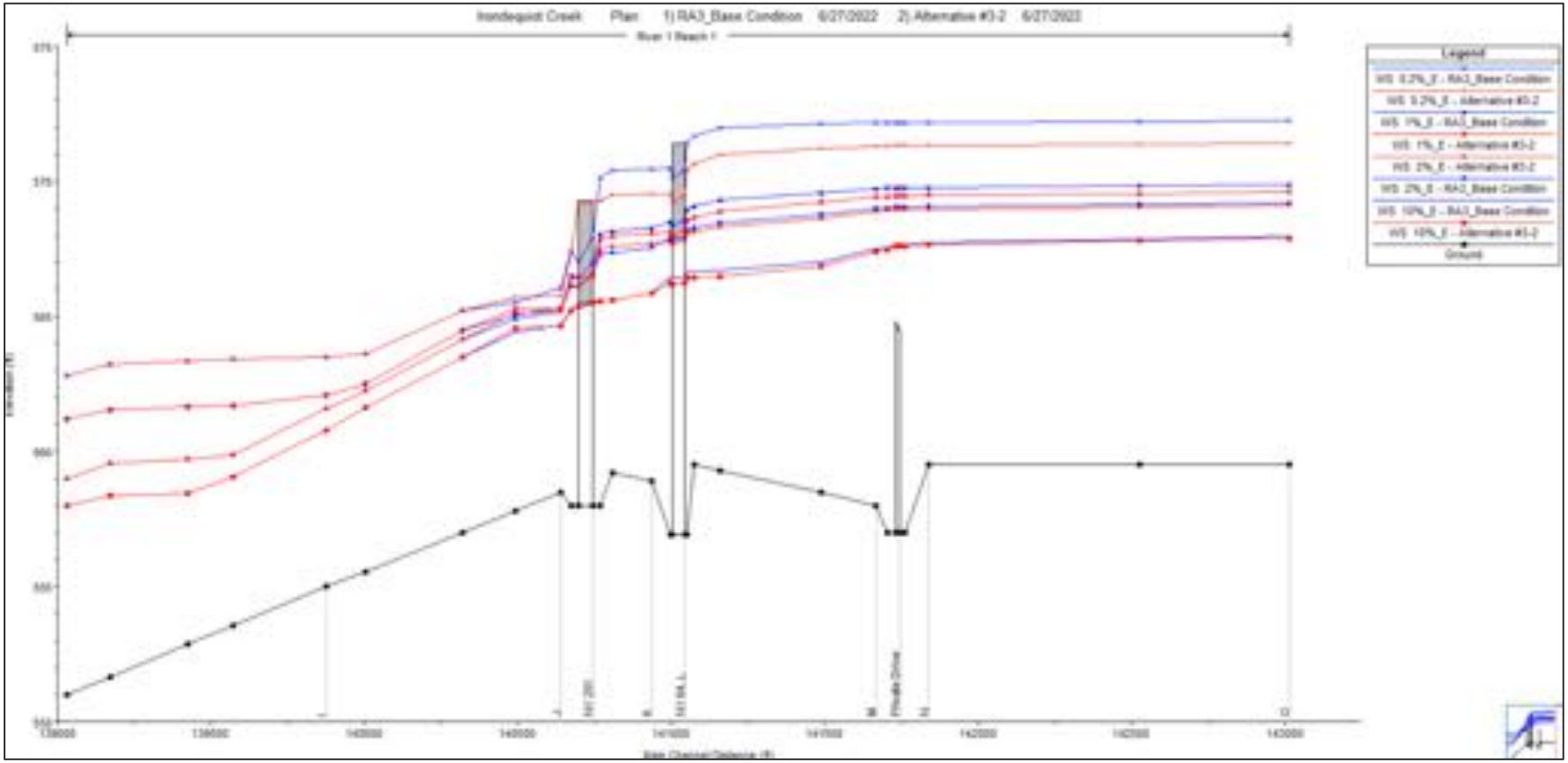
The water surface profiles for the effective FEMA FIS indicate the NY 251 (Victor Mendon Road) bridge causes an increase in water surface elevations upstream of the road for all the modeled discharges. The hydraulic width of the bridge is less than the bankfull width, according to *StreamStats*. This potential flood mitigation alternative is intended to provide additional flow area through bridge by constructing high flow culverts under NY 251 (Victor Mendon Road) in the overbank area approximately 200 ft east of Irondequoit Creek. A 20-foot-wide by 3-feet-high concrete box culvert, with an invert elevation of 563.5 feet, was constructed in the right overbank, and a channel was constructed to the direct the culvert discharge in the downstream floodplain toward the main river channel. This alternative potentially has the additional benefit of addressing standing water in the vicinity of the culverts upstream of NY 251 which collects from local runoff (Highland Planning, 2022). Figure 32 depicts the conceptual extents of this alternative.

Figure 33 depicts the difference in modeled water surface elevations for existing flood conditions under the base condition and Alternative #3-2 conditions in the vicinity of this alternative. The hydraulic analysis shows that this alternative results in water surface elevation reductions extending more than 0.4 miles upstream of the NY 251 (Victor Mendon Road) Crossing beyond the extents of the modeled risk area. Note that the model was not extended further upstream due to the limited number of structures affected further upstream. Water surface elevation reductions under current discharges are computed to be as much as 0.2 ft for the 10% and 2% ACE discharges, 0.4 ft for the 1% ACE discharge, and 1.0 ft for the 0.2% ACE discharge. Similar results, relative to the extent and magnitude of water surface elevation reductions, were found under this alternative for the projected future discharges. Reductions under projected future discharges are computed to be as much as 0.3 ft for the 10% ACE discharge, 0.4 ft for the 2% ACE discharge, 0.8 for the 1% ACE discharge, and 3.1 ft for the 0.2% ACE discharge. The water levels approximately 200 feet downstream of the NY 251 (Victor Mendon Road) Crossing are unusually low under the base condition due to ineffective areas constricting the floodplain. Removing part of this ineffective area due to the introduction of discharge in the right overbank from the culvert causes a water level rise of 0.1 feet to 0.2 feet in this area under all flows evaluated. Additionally, the model suggests in increase in water levels of approximately 0.2 feet for the current 2% ACE discharge for the area between NY 251 (Victor Mendon Road) and NY 64 (Mendon Ionia Road). Due to the complicated hydraulics of split flow in this area, the potential for increased water levels should be further evaluated with a two-dimensional hydraulic model to determine whether this alternative is appropriate.

The Rough Order Magnitude cost $1.1 million, which does not include land acquisition costs other than survey, appraisal, and engineering coordination. An additional challenge not included in this cost estimate is the presence of a raised bed septic area in the vicinity of the proposed culverts (Highland Planning, 2022).

Figure 34. Location Map for Alternative #3-2

Figure 35. HEC-RAS Model Simulation Output Results for Alternative #3-2



Alternative #3-3: Modify NY 64 (Mendon Ionia Road) Crossing (Station 1,410+26)

The water surface profiles for the effective FEMA FIS indicate the NY 64 (Mendon Ionia Road) bridge causes an increase in water surface elevations upstream of the road for discharges equaling or exceeding the 0.2% ACE event. This potential flood mitigation alternative is intended to provide additional flow area through bridge by widening the bridge and raising the low chord to meet CRRA guidelines. Raising this bridge may require the redesign of the nearby intersection and the NY 251 (Victor Mendon Road) crossing, and would significantly impact the ability to access residential and commercial properties within this area. Additionally, widening of this bridge is not considered feasible due to the proximity of residential and commercial structures on either side of the bridge. As such, further modeling and cost estimates were not performed for this alternative.

Basin-wide Mitigation Alternatives

Non-structural measures attempt to avoid flood damages by modifying or removing properties currently located within flood-prone areas. These measures do not affect the frequency or level of flooding within the floodplain; rather, they affect floodplain activities. In considering the range of non-structural measures, the community needs to assess the type of flooding which occurs (depth of water, velocity, duration) prior to determining which measure best suits its needs (USACE, 2016).

Alternative #4-1: Early Warning Flood Detection System

Early warning flood detection systems can be implemented, which can provide communities with more advanced warning of potential flood conditions. Early forecast and warning involve the identification of imminent flooding, implementation of a plan to warn the public, and assistance in evacuating persons and some personal property. A typical low-cost early warning flood detection system consists of commercially available off-the-shelf-components. The major components of an early warning flood detection system are a sensor connected to a data acquisition device with built-in power supply or backup, some type of notification or warning equipment, and a means of communication.

The system can be powered from an alternating current source via landline or by batteries that are recharged by solar panels. The notification process can incorporate standard telephone or cellular telephone. Transfer of data from the system can be achieved using standard or cellular telephone, radio frequency (RF) telemetry, wireless internet, or satellite transceivers. Emergency management notification techniques can be implemented through the use of radio, siren, individual notification, or a reverse 911 system. More elaborate means include remote sensors that detect water levels and automatically warn residents. These measures normally serve to reduce flood hazards to life, and damage to portable personal property (USACE, 2016).

The Rough Order Magnitude cost for this strategy is approximately $150,000, not including annual maintenance and operational costs.

Alternative #4-2: Debris Maintenance around Bridges/Culverts

Debris, such as trees, branches and stumps, are an important feature of natural and healthy stream systems. In a healthy stream network, woody debris helps to stabilize the stream and its banks, reduce sediment erosion, and slow storm-induced high streamflow events. Fallen trees and brush also form the basis for the entire aquatic ecosystem by providing food, shelter, and other benefits to fish and wildlife. In the headwaters of many streams, woody debris influences flooding events by increasing channel roughness, dissipating energy, and slowing floodwaters, which can potentially reduce flood damages in the downstream reaches. Any woody debris that does not pose a hazard to infrastructure or property should be left in place and undisturbed, thereby saving time and money for more critical work at other locations (NYSDEC, 2013).

However, in some instances, significant sediment and debris can impact flows by blocking bridge and culvert openings and accumulating along the stream path at meanders, contraction / expansion points, etc., which can divert stream flow and cause backwater and bank erosion. When debris poses a risk to infrastructure, such as bridges or homes, it should be removed. Provided fallen trees, limbs, debris and trash can be pulled, cabled or otherwise removed from a stream or stream bank without significant disruption of the stream bed and banks, a permit from the NYSDEC is not required. Woody debris and trash can be removed from a stream without the need for a permit under the following guidelines:

- Fallen trees and debris may be pulled from the stream by vehicles and motorized equipment operating from the top of the streambanks using winches, chains and or cables.
- Hand-held tools, such as chainsaws, axes, handsaws, etc., may be used to cut up the debris into manageable sized pieces.
- Downed trees that are still attached to the banks should be cut off near the stump. Do not grub (pull out) tree stumps from the bank; stumps hold the bank from eroding.
- All trees, brush, and trash that is removed from the channel should not be left on the floodplain. Trash should be properly disposed of at a waste management facility. Trees and brush can be utilized as firewood. To prevent the spread of invasive species, such as Emerald Ash Borer, firewood cannot be moved more than 50 miles from its point of origin.
- Equipment may not be operated in the water, and any increase in stream turbidity from the removal must be avoided (NYSDEC 2013).

Any work that will disturb the bed or banks of a protected stream (gravel removal, stream restoration, bank stabilization, installation, repair, replacements of culverts or bridges, objects embedded in the stream that require digging out, etc.) will require an Article 15 permit from the NYSDEC. Projects that will require disturbance of the stream bed or banks, such as excavating sand and gravel, digging embedded debris from the streambed or the use of motorized, vehicular equipment, such as a tractor, backhoe, bulldozer, log skidder, four-wheel drive truck, etc. (any heavy equipment), in the stream channel, or anywhere below the top of banks, will require either a Protection of Waters or Excavation or Fill in Navigable Waters Permit (NYSDEC, 2013).

In addition, sediment control basins along Irondequoit Creek could be established to reduce watercourse and gully erosion, trap sediment, reduce and manage runoff near and downstream of the basin, and to improve downstream water quality. A sediment control basin is an earth embankment, or a combination ridge and channel, generally constructed across the slope of minor watercourses to form a sediment trap and water detention basin. The basin should be configured to enhance sediment deposition by using flow deflectors, inlet and outlet selection, or by adjusting the length to width ratio of the creek channel. Additional hydrologic and hydraulic studies should be performed to identify the optimal locations for the sediment control basins. Operation and maintenance costs to maintain the embankment, design capacity, vegetative cover, and outlet of the basin should be considered (NRCS, 2002).

Consultation with the NYSDEC can help determine if, when and how sediment and debris should be managed and whether a permit will be required.

The Rough Order Magnitude cost for this strategy is up to $25,000, not including annual maintenance and operational costs.

Alternative #4-3: Flood Buyout Programs

Buyouts allow state and municipal agencies the ability to purchase developed properties within areas vulnerable to flooding from willing owners. Buyouts are effective management tools in response to natural disasters to reduce or eliminate future losses of vulnerable or repetitive loss properties. Buyout programs include the acquisition of private property, demolition of existing structures, and conversion of land into public space or natural buffers. The land is maintained in an undeveloped state for public use in perpetuity. Buyout programs not only assist individual homeowners, but are also intended to improve the resiliency of the entire community in the following ways (Siders, 2013):

- Reduce exposure by limiting the people and infrastructure located in vulnerable areas

- Reduce future disaster response costs and flood insurance payments
- Restore natural buffers such as wetlands in order to reduce future flooding levels
- Reduce or eliminate the need to maintain and repair flood control structures
- Reduce or eliminate the need for public expenditures on emergency response, garbage collection and other municipal services in the area
- Provide open space for the community

Resilience achieved through buyouts can have real economic consequences in addition to improved social resilience. According to FEMA, voluntary buyouts cost $1 for every $2 saved in future insurance claims, an estimate which does not include money saved on flood recovery and response actions, such as local flood fighting, evacuation, and rescue, and recovery expenses that will not be incurred in the future. In order to achieve these goals, buyouts need to acquire a continuous swath of land, rather than individual homes in isolated areas, or only some of the homes within flood-prone areas (Siders, 2013).

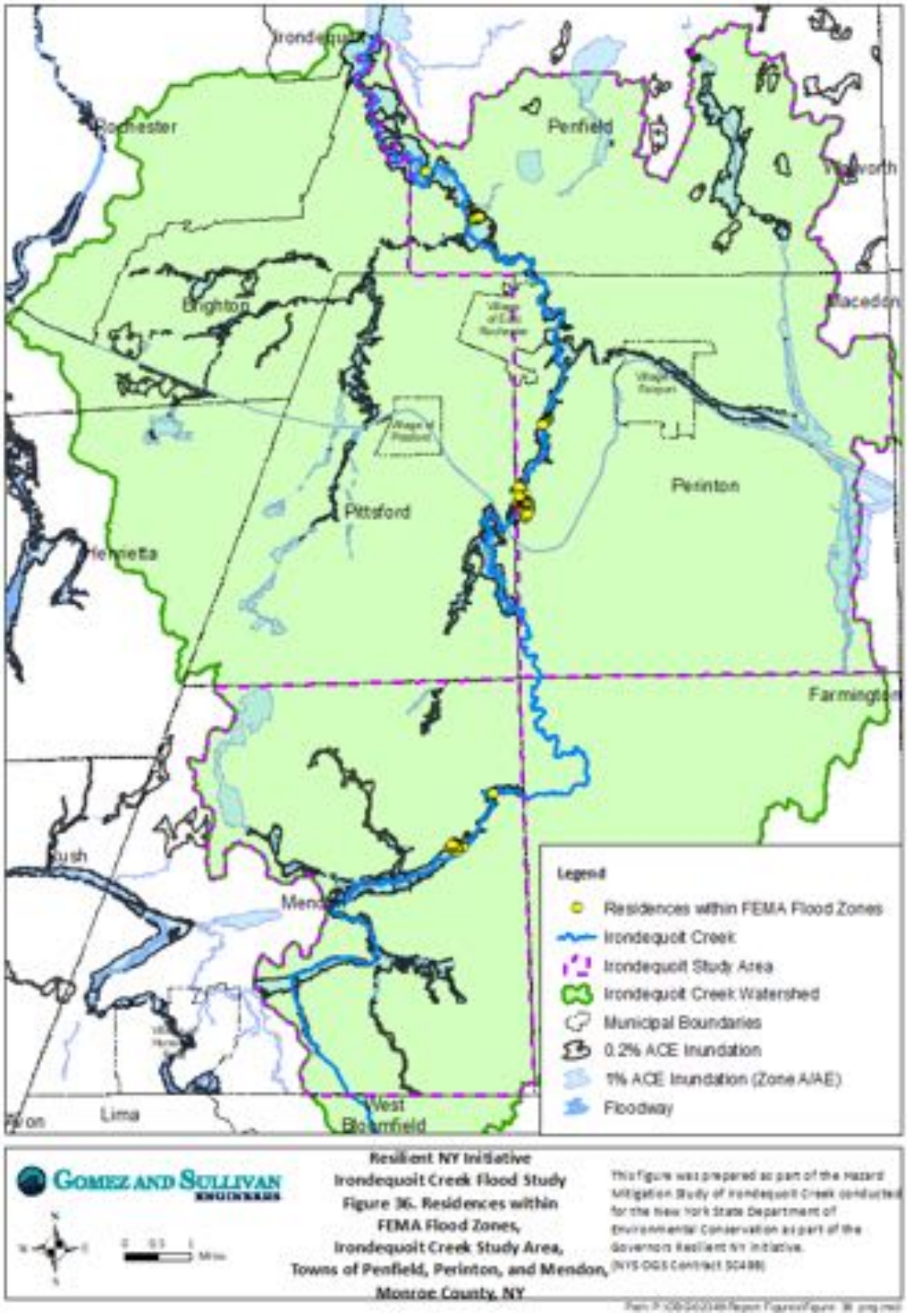
Buyout programs can be funded through a combination of federal, state or local funds, and are generally made available following a nationally recognized disaster. FEMA administers programs to help with buyouts under the Stafford Disaster Act, and the Department of Housing and Urban Development (HUD) administers another program through Community Development Block Grants (CDBG) [(FEMA, 2020), (NYSGOSR, 2019)]. These funding sources can reduce the economic burden on the local community. However, these funds also come with guidelines and regulations that may constrain policy makers' options on whether to pursue a buyout strategy and how to shape their programs. FEMA funds may be used to cover 75% of the expenses, but the remaining 25% must come from another non-federal source. In most cases, the buyout must be a cost-effective measure that will substantially reduce the risk of future flooding damage (Siders, 2013).

For homes in the special flood hazard area (SFHA), FEMA has developed precalculated benefits for property acquisition and structure elevation of buildings. Based on a national analysis that derived the average benefits for acquisition and elevation projects, FEMA has determined that acquisition projects that cost $276,000 or less, or elevation projects that costs $175,000 or less, and which are located in the 1% ACE (i.e. 100 year recurrence interval) floodplain are considered cost-effective and do not require a separate benefit-cost analysis. For projects that contain multiple structures, the average cost of all structures in the project must meet the stated criteria. If the cost to acquire or elevate a structure exceeds the amount of benefits listed above, then a traditional FEMA approved benefits-cost analysis must be completed (FEMA, 2015b).

In the Irondequoit Creek study area, there are approximately 120 residential structures within the FEMA 1% and 0.2% annual chance flood hazard zones for Irondequoit Creek (Figure 34). In addition, 28 of these structures are FEMA Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties.

Due to the variable nature of buyout programs, no ROM cost estimate was produced for this study. It is recommended that any buyout program begin with a cost-benefit analysis for each property. After a substantial benefit has been established, a buyout strategy study should be developed that focuses on properties closest to Irondequoit Creek in the highest-risk flood areas and progresses outwards from there to maximize flood damage reductions. In addition, structures located adjacent to flood prone infrastructure (i.e. bridges, culverts, etc.) should also be considered high-risk and prioritized in any buyout program strategy. A potential negative consequence of buyout programs is the permanent removal of properties from the floodplain, and resulting tax revenue, which would have long-term implications for local governments, and should be considered prior to implementing a buyout program.

Figure 36. Residences within FEMA Flood Zones, Irondequoit Creek Study Area, Towns of Penfield, Perinton, and Mendon, Monroe County, NY



Alternative #4-4: Floodproofing

Floodproofing is defined as any combination of structural or nonstructural adjustments, changes, or actions that reduce or eliminate flood damage to a building, contents, and attendant utilities and equipment (FEMA, 2000). Floodproofing can prevent damage to existing buildings and can be used to meet compliance requirements for new construction of residential and non-residential buildings.

The most effective flood mitigation methods are relocation (i.e. moving a home to higher ground outside of a high-risk flood area) and elevation (i.e. raising the entire structure above BFE). The relationship between the BFE and a structure's elevation is one of many factors in determining the flood insurance premium. Buildings that are situated at or above the level of the BFE have lower flood risk than buildings below BFE and tend to have lower insurance premiums than buildings situated below the BFE (FEMA, 2015c).

In some communities, where non-structural flood mitigation alternatives are not feasible, structural alternatives such as flood proofing may be a viable alternative. The NFIP has specific rules related to flood proofing for residential and non-residential structures. These can be found in the Code of Federal Regulations (CFR) 44 CFR 60.3 (FEMA, 2000).

For existing residential structures, structures should be raised above the BFE or above the freeboard required by local regulations. Floodproofing is allowed for non-residential structures, with design guidelines outlined in FEMA P-936 – Floodproofing Non-Residential Structures [(FEMA, 2000); (FEMA, 2013)]. The local floodplain administrator should carefully review local ordinances, the CFR and available design guidelines before issuing a permit for structural flood proofing. Floodproofing strategies include:

Interior Modification/Retrofit Measures

Interior modification and retrofitting involve making changes to an existing building to protect it from flood damage. When the mitigation is properly completed in accordance with NFIP floodplain management requirements, interior modification / retrofit measures could achieve somewhat similar results as elevating a home above the BFE. Keep in mind, in areas where expected base flood depths are high, the flood protection techniques below may not provide protection on their own to the BFE or, where applicable, the locally required freeboard elevation (FEMA, 2015c).

Examples include:

- *Basement Infill*: This measure involves filling a basement located below the BFE to grade (ground level)
- *Abandon Lowest Floor*: This measure involves abandoning the lowest floor of a two or more story slab-on-grade residential building
- *Elevate Lowest Interior Floor*: This measure involves elevating the lowest interior floor within a residential building with high ceilings

Dry floodproofing

A combination of measures that results in a structure, including the attendant utilities and equipment, being watertight with all elements substantially impermeable to the entrance of floodwater and with structural components having the capacity to resist flood loads (FEMA, 2015c).

Although NFIP regulations require non-residential buildings to be watertight and protected only to the BFE for floodplain management purposes (to meet NFIP regulations), protection to a higher level is necessary for dry floodproofing measures to be considered for NFIP flood insurance rating purposes. Because of the additional risk associated with dry floodproofed buildings, to receive an insurance rating based on 1% annual chance (100-year) flood protection, a building must be dry floodproofed to an elevation at least 1-foot above the BFE (FEMA, 2013).

In New York State, only non-residential buildings are allowed to be dry floodproofed and the building must be dry floodproofed to an elevation of at least 2 feet above the BFE. New York State has higher freeboard standards than federal regulations at 44 CFR Part 60.3. Care must be taken to check the New York State Building Code for more stringent guidelines.

Examples include:

- *Passive Dry Floodproofing System*: This measure involves installing a passive (works automatically without human assistance) dry floodproofing system around a home to protect the building from flood damage.
- *Elevation*: This measure involves raising an entire residential or non-residential building structure above the BFE or above the freeboard required by local regulations.

Wet floodproofing

The use of flood-damage-resistant materials and construction techniques to minimize flood damage to areas below the flood protection level of a structure, which is intentionally allowed to flood (FEMA, 2015c).

Examples include:

- *Flood Openings*: This measure involves installing openings in foundation and enclosure walls located below the BFE that allow automatic entry and exit of floodwaters to prevent collapse from the pressures of standing water.
- *Elevate Building Utilities*: This measure involves elevating all building utility systems and associated equipment (e.g., furnaces, septic tanks, and electric and gas meters) to protect utilities from damage or loss of function from flooding.
- *Floodproof Building Utilities*: This measure involves floodproofing all building utility systems and associated equipment to protect it from damage or loss of function from flooding.
- *Flood Damage-Resistant Materials*: This measure involves the use of flood damage-resistant materials such as non-paper-faced gypsum board and terrazzo tile flooring for building materials and furnishings located below the BFE to reduce structural and nonstructural damage and post-flood event cleanup.

Barrier Measures

Barriers, such as floodwalls and levees, can be built around single or multiple residential and non-residential buildings to contain or control floodwaters (FEMA, 2015c). Although floodwalls or levees can be used to keep floodwaters away from buildings, implementing these measures will not affect a building's flood insurance rating unless the flood control structure is accredited in accordance with NFIP requirements (44 CFR §65.10) and provides protection from at least the 1% annual chance (100-year) flood. Furthermore, floodwalls or levees as a retrofit measure will not bring the building into compliance with NFIP requirements for Substantial Improvement/Damage (FEMA, 2013). Barrier measures require

ongoing maintenance (i.e. mowing, etc.) which should be factored into any cost analysis. In addition, barrier measures tend to create a false sense of security for the property owners and residents that are protected by them. If a barrier structure is not properly constructed or maintained and fails, catastrophic damages to surrounding areas can occur.

- *Floodwall with Gates and Floodwall without Gates*: These two measures involve installing a reinforced concrete floodwall, which works automatically without human assistance, constructed to a maximum of four feet above grade (ground level). The floodwall with gates is built with passive flood gates that are designed to open or close automatically due to the hydrostatic pressure caused by the floodwater. The floodwall without gates is built using vehicle ramps or pedestrian stairs to avoid the need for passive flood gates.
- *Levee with Gates and Levee without Gates*: These two measures involve installing an earthen levee around a home, which works automatically without human assistance, with a clay or concrete core constructed to a maximum of six feet above grade (ground level). The levee with gates is built with passive flood gates that are designed to open or close automatically due to hydrostatic pressure caused by the floodwater. The levee without gates is built using vehicle access ramps to avoid the need for passive flood gates.

Modifying a residential or non-residential building to protect it from flood damage requires extreme care, will require permits, and may also require complex engineered designs. Therefore, the following process is recommended to ensure proper and timely completion of any floodproofing project (FEMA, 2015c):

- Consult a registered design professional (i.e. architect or engineer) who is qualified to deal with the specifics of a flood mitigation project
- Check your community's floodplain management ordinances
- Contact your insurance agent to find out how your flood insurance premium may be affected
- Check what financial assistance might be available
- Hire a qualified contractor
- Contact the local building department to learn about development and permit requirements and to obtain a building permit
- Determine whether the mitigation project will trigger a Substantial Improvement declaration
- See the project through to completion
- Obtain an elevation certificate and an engineering certificate (if necessary)

No cost estimates were prepared for this alternative due to the variable and case-by-case nature of the flood mitigation strategy. Local municipal leaders should contact residential and non-residential building owners that are currently at a high flood risk to inform them about floodproofing measures, the recommended process to complete a floodproofing project, and the associated costs and benefits.

Alternative #4-5: Area Preservation / Floodplain Ordinances

This alternative proposes that municipalities within the Irondequoit Creek watershed consider watershed and floodplain management practices such as preservation and/or conservation of areas along with land use ordinances that could minimize future development of sensitive areas such as wetlands, forests, riparian areas, and other open spaces. It could also include areas in the floodplain that are currently free from development and are providing floodplain storage.

A watershed approach to planning and management is an important part of water protection and restoration efforts. New York State's watersheds are the basis for management, monitoring, and assessment activities. The New York State Open Space Conservation Plan, NYSDEC's Smart Growth initiative and the Climate Smart Communities Program address land use within a watershed (NYSDEC, Date Unknown).

Natural floodplains provide flood risk reduction benefits by slowing runoff and storing flood water. They also provide other benefits of considerable economic, social, and environmental value that should be considered in local land-use decisions. Floodplains frequently contain wetlands and other important ecological areas which directly affect the quality of the local environment. Floodplain management is the operation of a community program of preventive and corrective measures to reduce the risk of current and future flooding, resulting in a more resilient community. These measures take a variety of forms, are carried out by multiple stakeholders with a vested interest in responsible floodplain management and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances. While FEMA has minimum floodplain management standards for communities participating in the NFIP, best practices demonstrate that the adoption of higher standards will lead to safer, stronger, and more resilient communities (FEMA, 2006).

For floodplain ordinances, the NYSDEC has a sample of regulatory requirements for floodplain management that a community can adopt within their local flood damage prevention ordinance. If a community is interested in updating their local law to include regulatory language promoting floodplain management, it is recommended that they reach out to the NYSDEC through floodplain@dec.ny.gov or (518) 402-8185 for more information.

In addition, the Community Rating System (CRS) program through FEMA is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Participating communities are able to get discounted rates on the flood insurance premiums for residents in the community. Adopting these enhanced requirements and preserving open space for floodplain storage earns points in the CRS program, which can lead to discounted flood insurance premiums.

Further hydrology and hydraulic model scenarios could be performed to illustrate how future watershed and floodplain management techniques could benefit the communities within the Irondequoit Creek watershed**.**

Next Steps

Before selecting a flood mitigation strategy, securing funding or commencing an engineering design phase, Gomez and Sullivan recommends that additional modeling simulations and wetland investigations be performed.

Additional Data Modeling

Additional data collection and modeling would be necessary to more precisely model water surface elevations and the extent of potential flooding in overbank areas and the floodplain. 2-D unsteady flow modeling using the HEC-RAS program, would incorporate additional spatial information in model simulations producing more robust results with a higher degree of confidence than the currently modeled 1-D steady flow simulations.

State/Federal Wetlands Investigation

Any flood mitigation strategy that proposes using wetlands in any capacity, needs to be evaluated based on federal and state wetland criteria before that mitigation strategy can be pursued for consideration.

Example Funding Sources

There are numerous potential funding programs and grants for flood mitigation projects that may be used to offset municipal financing, including:

- New York State Division of Homeland Security and Emergency Services (NYSDHSES)
- Regional Economic Development Councils/Consolidated Funding Applications (CFA)
- Natural Resources Conservation Services (NRCS) Emergency Watershed Protection (EWP) Program
- FEMA Hazard Mitigation Grant Program (HMGP)

New York State Division of Homeland Security and Emergency Services (NYSDHSES)

The New York State Office of Emergency Management (NYSOEM), which is a part of the NYSDHSES, in conjunction with the United States Department of Homeland Security (USDHS) and FEMA, offers several funding opportunities through federal grant programs. Two primary programs are available through FEMA's Hazard Mitigation Grant Program (HMGP): Public Assistance, which includes post-disaster recovery grants enabled by Presidential declaration to reimburse for the emergency protective measures and the repair of eligible public facilities and infrastructure; and Hazard Mitigation, which includes pre-disaster project grants to eligible government sub-applicants to avoid or reduce the loss of life and property in future events. The NYSOEM would be the primary point of contact for all aspects of these programs.

Regional Economic Development Councils/Consolidated Funding Applications (CFA)

The CFA is a single application for state economic development resources from numerous state agencies. The ninth round of the CFA was offered in 2019.

Water Quality Improvement Project (WQIP) Program

The WQIP Program, administered through the NYSDEC, is a statewide reimbursement grant program to address documented water quality impairments. Eligible parties include local governments and not-for-profit corporations. Funding is available for construction/implementation projects; projects exclusively

for planning are not eligible. Match for WQIP is a percentage of the award amount, not the total project cost. Deadlines are in accordance with the CFA application cycle.

Climate Smart Communities (CSC) Grant Program

The CSC Grant Program is a 50/50 matching grant program for municipalities under the New York State Environmental Protection Fund, offered through the CFA by the New York State Office of Climate Change. The purpose of the program is to fund climate change adaptation and mitigation projects and includes support for projects that are part of a strategy to become a Certified Climate Smart Community. The eligible project types that may be relevant include the following:

- The construction of natural resiliency measures, conservation or restoration of riparian areas and tidal marsh migration areas
- Nature-based solutions such as wetland protections to address physical climate risk due to water level rise, and/or storm surges and/or flooding
- Relocation or retrofit of facilities to address physical climate risk due to water level rise, and/or storm surges and/or flooding
- Flood risk reduction
- Climate change adaptation planning and supporting studies

Eligible projects include implementation and certification projects. Deadlines are in accordance with the CFA cycle.

NRCS Emergency Watershed Protection (EWP) Program

Through the EWP Program, the United States Department of Agriculture's (USDA) NRCS can assist communities in addressing watershed impairments that pose imminent threats to lives and property. Most EWP projects involve the protection of threatened infrastructure from continued stream erosion. Projects must have a project sponsor, defined as a legal subdivision of the State, such as a city, county, general improvement district, or conservation district, or an Indian Tribe or Tribal organization. Sponsors are responsible for providing land rights to do repair work, securing the necessary permits, furnishing the local cost share (25%), and performing any necessary operation and maintenance for a ten-year period. Through EWP, the NRCS may pay up to 75% of the construction costs of emergency measures, with up to 90% paid for projects in limited-resource areas. The remaining costs must come from local services. Eligible projects include, but are not limited to, debris-clogged stream channels, undermined and unstable streambanks, and jeopardized water control structures and public infrastructures.

FEMA Hazard Mitigation Grant Program (HMGP)

The HMGP, offered by FEMA and administered by the NYSDHSES, provides funding for creating/updating hazard mitigation plans and implementing hazard mitigation projects. The HMGP program consolidates the application process for FEMA's annual mitigation grant programs not tied to a State's Presidential disaster declaration. Funds are available under the Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) Programs.

For flood mitigation measures that are being considered for funding through FEMA grant programs, a benefit-to-cost analysis will be required. In order to qualify for FEMA grants and/or funding, the benefit to cost ratio must be greater than one.

Building Resilient Infrastructure and Communities (BRIC) Program

Beginning in 2020, the BRIC grant program, which was created as part of Disaster Recovery Reform Act of 2018 (DRRA), replaced the existing Pre-Disaster Mitigation (PDM) program and is funded by a 6% set-aside from federal post-disaster grant expenditures. BRIC will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. BRIC aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. Through BRIC, FEMA will invest in a wide variety of mitigation activities, including community-wide public infrastructure projects. Moreover, FEMA anticipates BRIC will fund projects that demonstrate innovative approaches to partnerships, such as shared funding mechanisms and/or project design.

Flood Mitigation Assistance (FMA) Program

The FMA Program provides resources to reduce or eliminate long-term risk of flood damage to structures insured under the NFIP. The FMA project funding categories include Community Flood Mitigation – Advance Assistance (up to $200,000 total federal share funding) and Community Flood Mitigation Projects (up to $10 million total). Federal funding is available for up to 75% of the eligible activity costs. FEMA may contribute up to 100% federal cost share for severe repetitive loss properties, and up to 90% cost share for repetitive loss properties. Eligible project activities include the following:

- Infrastructure protective measures
- Floodwater storage and diversion
- Utility protective measures
- Stormwater management
- Wetland restoration/creation
- Aquifer storage and recovery
- Localized flood control to protect critical facility
- Floodplain and stream restoration
- Water and sanitary sewer system protective measures

Summary

The Towns of Penfield, Perinton, and Mendon have had a history of flooding events along Irondequoit Creek. Flooding in the Towns of Penfield, Perinton, and Mendon primarily occur during the summer and winter months due to heavy rains by convective systems and snowmelt. In response to persistent flooding, the State of New York in conjunction with the Towns of Penfield, Perinton, and Mendon, and Monroe County, are studying and evaluating potential flood mitigation projects for Irondequoit Creek as part of the Resilient NY Initiative.

This study analyzed the historical and present day causes of flooding in the Irondequoit Creek watershed. Hydraulic and hydrologic data was used to model potential flood mitigation measures. The model simulation results indicated that there are flood mitigation measures that have the potential to reduce water surface elevations along high-risk areas of Irondequoit Creek, which could potentially reduce flood related damages in areas adjacent to the creek. Constructing multiple flood mitigation measures would increase the overall flood reduction potential along Irondequoit Creek by combining the reduction potential of the mitigation measures being constructed.

Based on the flood mitigation analyses performed in this report, the mitigation measures that provided the greatest reductions in water surface elevations were creating a flood bench within the Town of Penfield, modifying both NY 31 (Pittsford Palmyra Road) and Interstate 490 within the Town of Perinton, and the installing a high flow culvert under NY 251 (Victor Mendon Road) within the Town of Mendon. There would be an overall greater effect in water surface elevations if multiple alternatives were built along Irondequoit Creek in different phases, rather than a single mitigation project. For example, building multiple flood benches along a single reach would compound the flood mitigation benefits of each bench. While the maximum water level reductions are not increased by modifying the Penfield Road bridge in conjunction with creating a floodplain bench, there are greater water surface elevation reductions in some of the risk area by combining these mitigation alternatives.

Based on the analysis of the bridge widening simulations, the Penfileld Road, NY 31 (Pittsford Palmyra Road), and Interstate 490 bridge crossings benefited from increased bridge openings. However, the bridge widening measures may be more costly than other alternatives. The benefits of the measures in their respective reaches should be balanced with the associated costs of each bridge widening measure to determine if it would be feasible to move a bridge widening measure forward. In addition, other complications, such as traffic re-routing, should be taken into account when considering any of the bridge widening measures.

The debris maintenance alternatives around culverts / bridges would maintain the flow channel area in Irondequoit Creek. As sediment and debris build up at the openings of bridges and culverts, the channel flow area is reduced. This can lead to potential backwater and flooding due to the inability of the creek channel to pass stream flows of the same annual chance event.

For flood mitigation measures that are being considered for funding through FEMA grant programs, a benefit-to-cost analysis will be required. In order to qualify for FEMA grants and / or funding, the benefit to cost ratio must be greater than one. Flood buyouts / property acquisitions can qualify for FEMA grant programs with a 75% match of funds. The remaining 25% of funds is the responsibility of state, county, and local governments. The case-by-case nature of buyouts and acquisitions requires widespread property owner participation to maximize flood risk reductions. An unintended consequence of buyout programs is the permanent removal of properties from the floodplain, including tax revenue, which would

have long-term implications for local governments and should be considered prior to implementing a buyout program.

Floodproofing is an effective mitigation measure but requires a large financial investment in individual residential and non-residential buildings. Floodproofing can reduce the future risk and flood damage potential but leaves buildings in flood risk areas so that the potential for future flood damages remain. A benefit to floodproofing versus buyouts is that properties remain in the community and the tax base for the local municipality remains intact. Table 14 is a summary of the potential flood mitigation measures, including modeled water surface elevation reductions and estimated ROM costs.

Table 14. Summary of Flood Mitigation Measures

Alternative No.	Description	Change in Water Surface Elevation (ft)		ROM cost ($U.S. dollars)
		Current Flows	Projected Flows	
1-1	Create Flood Bench Upstream of Quarry	0.5 – 1.2	0.5 – 1.4	$3.1 million
1-2	Modify Penfield Road Crossing	0.1 – 0.3	0.1 – 0.3	$6.6 million
1-3	Remove Berms Upstream of Quarry	0.0 – 0.7	0.1 – 1.0	$1.6 million
1-4	Create Flood Bench and Modify Penfield Road	0.5 – 1.2	0.5 – 1.4	$9.7 million
2-1	Create Flood Bench near Hidden Creek Circle	0.4 – 0.9	0.5 – 0.9	$9.4 million
2-2	Modify NY 31 (Pittsford Palmyra Road) Crossing	0.2 – 1.8	0.3 – 1.6	$6.5 million
2-3	Modify Interstate 490 Crossing	0.3 – 0.9	0.4 – 1.2	$8.5 million
2-4	Modify NY 31 (Pittsford Palmyra Road) Crossing and Interstate 490 Crossing	0.5 – 2.7	0.6 – 2.7	$15.0 million
3-1	Modify NY 251 (Victor Mendon Road) Crossing	Not Modeled		
3-2	Install High Flow Culverts under NY 251 (Victor Mendon Road)	0.2 – 1.0	0.3 – 3.1	$1.1 million
3-3	Modify NY 64 (Mendon Ionia Road) Crossing	Not Modeled		
4-1	Early Flood Warning Detection System	N/A	N/A	$150,000 (not including annual operational costs)
4-2	Debris Maintenance Around Bridges/Culverts	N/A	N/A	$25,000 (not including annual operational costs)
4-3	Flood Buyouts Program	N/A	N/A	Variable (case-by-case)
4-4	Floodproofing	N/A	N/A	Variable (case-by-case)
4-5	Area Preservation/Floodplain Ordinances	N/A	N/A	Variable (case-by-case)

Conclusion

Municipalities affected by flooding along Irondequoit Creek can use this report to support flood mitigation initiatives within their communities. This report is intended to be a high-level overview of potential flood mitigation strategies, their impacts on water surface elevations, and the associated ROM cost for each mitigation strategy. The research and analysis that went into each potential strategy should be considered preliminary, and additional research, field observations, and modeling are recommended before final mitigation strategies are chosen.

In order to implement the flood mitigation strategies presented in this report, communities should engage in a process that follows the following steps:

1. Obtain stakeholder and public input to assess the feasibility and public support of each mitigation strategy presented in this report.
2. Complete additional data collection and modeling efforts to assess the effectiveness of the potential flood mitigation strategies.
3. Develop a list of final flood mitigation strategies based on the additional data collection and modeling results.
4. Select a final flood mitigation strategy or series of strategies to be completed for Irondequoit Creek based on feasibility, permitting, effectiveness, and available funding.
5. Develop a preliminary engineering design report and cost estimate for each selected mitigation strategy.
6. Assess funding sources for the selected flood mitigation strategy.

Once funding has been secured and the engineering design has been completed for the final mitigation strategy, construction and / or implementation of the measure should begin.

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Appendix A. Summary of Data and Reports Collected

Year	Type	Document Title	Author	Publisher
1978	Report	National Handbook of Recommended Methods for Water-Data Acquisition	Office of Water Data Coordination	USGS
1980	Report	Flood Insurance Study: Town of Penfield, NY		FEMA
1981	Report	Flood Insurance Study: Town of Mendon, NY		FEMA
1982	Report	Irondequoit Creek Watershed New York Final Feasibility Report and Environmental Impact Statement	Buffalo Creek	USACE
1989	Report	Glacial History and Geohydrology of the Irondequoit Creek Valley, Monroe County, New York		USGS
1991	Report	Regionalization of Flood Discharges for Rural, Unregulated Streams in New York, Excluding Long Island	Richard Lumia	USGS
1992	Report	Flood Insurance Study: Town of Perinton, NY		FEMA
1995	Article	Numerical Simulation of River Ice Processes	H. T. Shen, D. S. Wang, and L. A. Wasantha,	Journal of Cold Region Engineering
1996	Book	Applied River Morphology, 2nd Edition	D. L. Rosgen and H. L. Silvey	Wildland Hydrology Books
1997	Report	Water Resources of Monroe County, New York, Water Years 1989-93, with Emphasis on Water Quality in the Irondequoit Creek Basin	Donald A. Sherwood	USGS
1999	Report	Town of Penfield and Monroe County Win Environmental Award for Linear Park Erosion Control Project		Monroe County

Year	Type	Document Title	Author	Publisher
2000	Code	Title 44: Emergency Management and Assistance, Chapter 1		FEMA
2000	Report	Effects of a Cattail Wetland on Water Quality of Irondequoit Creek near Rochester, New York	William F. Coon, John M. Bernard, and Franz K. Seischab	USGS
2000	Report	Water Resources of Monroe County, New York, Water Years 1994-96, with Emphasis on Water Quality in the Irondequoit Creek Basin	Donald A. Sherwood	USGS
2000	Report	Irondequoit Creek Watershed Gets a Model		Monroe County
2002	Standard	National Conservation Practice Standard No. 638: Water and Sediment Control Basin		NRCS
2002	Report	Engineering Manual 1110-2-1612: Engineering and Design – Ice Engineering		USACE
2004	Report	Irondequoit Creek Watershed Stormwater Management Report Requirements: Packet for Developers		Irondequoit Creek Watershed Collaborative
2005	Software	Comprehensive River Ice Simulation System Project		CEATI
2006	Report	Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials		FEMA
2006	Report	Bridge Inventory Manual		NYSDOT
2006	Report	Magnitude and Frequency of Floods in New York	Richard Lumia, Douglas A. Freehafer, and Martyn J. Smith	USGS
2007	Book	Elevation Data for Floodplain Mapping		NRC

Year	Type	Document Title	Author	Publisher
2008	Report	Flood Insurance Study: Monroe County, NY		FEMA
2008	Report	Hydrologic Evidence of Climate Change in Monroe County, New York	William F. Coon	USGS
2009	Report	Bankfull Discharge and Channel Characteristics of Streams in New York State	Christiane I. Mulvihill, Barry P. Baldigo, Sarah J. Miller, Douglas DeKoskie, and Joel DuBois	USGS
2010	Report	DHS Risk Lexicon		USDHS
2011	Report	Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation in New York State, Final Report		NYSERDA
2011	Article	A Unified Degree-Day Method for River Ice Cover Thickness Simulation	H. T. Shen and P. Yapa	Canadian Journal of Civil Engineering
2011	Article	An Overview of CMIP5 and the Experiment Design	K. E. Taylor, R. J. Stouffer, and G. A. Meehi	Bulletin of the American Meteorological Society
2012	Report	Hydraulic Design of Safe Bridges	L. W. Zevenbergen, L. A. Arneson, J.H. Hunt, and A.C. Miller	USDOT
2012	Article	Geomorphic Characterization of Upper South Koel Basin, Jharkhand: A Remove Sensing and GIS Approach	R. Parveen, U. Kumar, and V. K. Singh	Journal of Water Resource and Protection, 1042-1050
2013	Report	Floodproofing Non-Residential Buildings		FEMA
2013	Report	Removal of Woody Debris and Trash from Rivers and Streams		NYSDEC
2013	Article	Anatomy of a Buyout Program – New York Post-Superstorm Sandy	A. R. Siders	Vermont Law School

Year	Type	Document Title	Author	Publisher
2014	Book	Handbook of Biological Statistics, 3rd Edition	J. H. McDonald	Sparky House Publishing
2014	Report	National Register of Historical Places and National Historic Landmarks Program Records for New York State		NPS
2014	Article	Morphometric Analysis of a Drainage Basin Using Geographical Information System: A Case Study	M. L. Waikar and A. P. Nilawar	International Journal of Multidisciplinary and Current Research
2014	Article	Spring Flooding	Dick Halsey	https://rochistory.com/
2014	Article	Flood surges plague Perinton cul-de-sac	Steve Orr	Democrat & Chonicle
2015	Report	Guidance for Flood Risk Analysis and Mapping: Redelineation Guidance		FEMA
2015	Report	Hazard Mitigation Assistance Program Digest, September 2015		FEMA
2015	Report	Reducing Flood Risk to Residential Buildings That Cannot Be Elevated		FEMA
2015	Article	Influence of Aggradation and Degradation on River Channels: A Review	U. R. Mugade and J. B. Sapkale	International Journal of Engineering and Technical Research
2015	Report	Development of Flood Regressions and Climate Change Scenarios to Explore Estimates of Future Peak Flows	Douglas A. Burns, Martyn J. Smith, and Douglas A. Freehafer	USGS
2016	Report	Lexington Greene – Section 2015 of the 1948 Flood Control Act – Flood Risk Management	Buffalo District	USACE

Year	Type	Document Title	Author	Publisher
2016	Software	Application of Flood Regressions and Climate Change Scenarios to Explore Estimates of Future Peak Flows, Version 1.5 Web Application		USGS
2017	Data	New York State Digital Ortho-Imagery Program	GIS Program Office	NYSOITS
2017	Report	Fact Sheet 2017-3046: *StreamStats*, Version 4	Kernell G. Ries III, Jeremy K. Newsom, Martyn J. Smith, John D. Guthrie, Peter A. Steeves, Tiana L Haluska, Katharine R. Kolb, Ryan F. Thompson, Richard D. Santoro, and Hans W. Vraga	USGS
2017	Software	Streamstats		USGS
2017	Report	Disaster Mitigation Act of 2000 Hazard Mitigation Plan – Monroe County, New York	Tetra Tech	Monroe County
2017	Article	Relentless rain causes flooding on Irondequoit Creek	Sean Lahman	Democrat & Chronicle
2018	Report	DRAFT New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act		NYSDEC
2018	Report	Highway Design Manual	Engineering Division, Office of Design	NYSDOT
2018	Article	Governor Cuomo Announces $3 Million for Studies to Reduce Community Flood Risk		NYSGPO
2019	Software	ArcGIS for Desktop 10		ESRI
2019	Data	2016 Land Cover: Conterminous United States	NLCD	MRLC

Year	Type	Document Title	Author	Publisher
2019	Data	Bridge Point Locations and Select Attributes	Structures Division	NYSDOT
2019	Data	CostsWorks 2019	RS Means Data Online	Gordian, Inc.
2019	Report	Policy Manual: NY Rising Buyout and Acquisition Program, Version 7.0		NYSGOSR
2019	Report	Monroe County Bridge Inventory, 5th Edition	Department of Transportation	Monroe County
2020	Report	New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act		NYSDEC
2020	Data	Storm Events Database	NCEI	NOAA
2020	Software	Environmental Resource Mapper Web Application		NYSDEC
2020	Data	Inventory of Dams – New York State		NYSDEC
2020	Standard	Standard Specifications (US Customary Units), Volume 1	Engineering Division	NYSDOT
2020	Data	Ice Jam Database	Cold Regions Research and Engineering Laboratory	USACE
2020	Software	Information for Planning and Consultation Web Application	ECOS	USFWS
2020	Software	*StreamStats*, Version 4.4.0 Web Application		USGS
2020	Website	Hazard Mitigation Grant Program (HMGP)		FEMA
2020	Article	Two men swept underwater during Penfield flooding		Rochester First
2020	Article	Flooding causes issues in Monroe County		WHEC

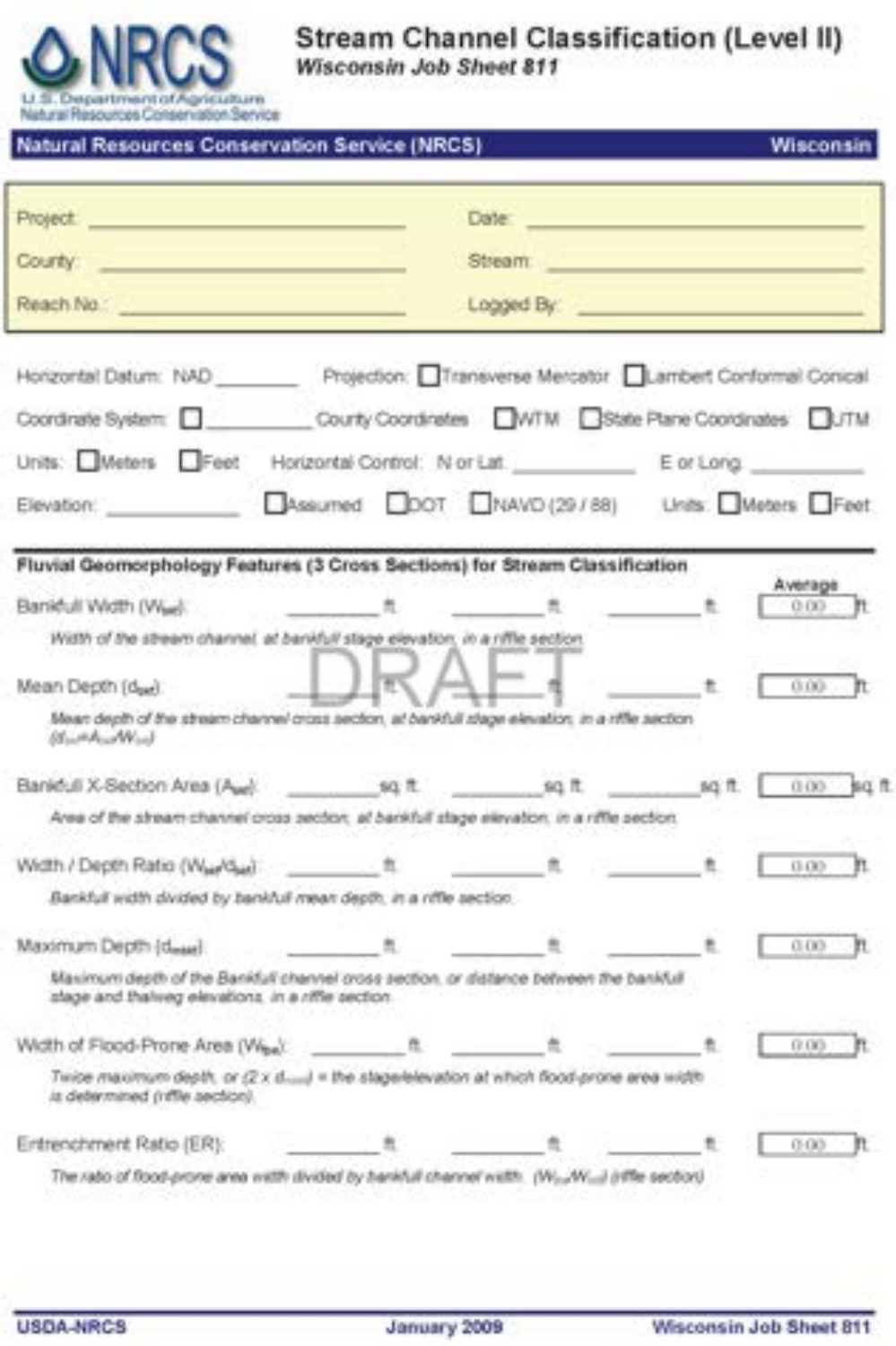
Year	Type	Document Title	Author	Publisher
2020	Article	Flood Warning		Weather USA
2021	Report	Bridge Manual		NYSDOT
2021	Article	Parks Dept: 2-3 days needed for flood waters to subside, before cleanup can start	Emily Putnam	WHEC
2021	Article	Heavy rains flood much of region		WHAM
2021	Article	Cleanup continues after record-setting rain	Randy Gorbman	WXXI
2022	Software	Hydrologic Engineering Center's River Analysis System, Version 6.2	HEC	USACE
2022	Report	HEC-RAS: River Analysis System User's Manual, Version 6.2	HEC	USACE
2022	Letter	August 22, 2022 Memorandum: Resilient NY Flood Mitigation Initiative Interim Final Report	Karen F. Cox, Chief of Highway & Bridge Engineering	Monroe County Department of Transportation
Unk	Article	Watershed Management		NYSDEC

Appendix B. Agency and Stakeholder Meeting Attendees List

Initial Project Kickoff Meeting: January 20, 2022

Attendees	Affiliation
Kevin Miller	Gomez & Sullivan
Susan Charland	Highland Planning
Tyra Jones	Highland Planning
Jen Topa	Highland Planning
Andy Sansone	Monroe County
James Sroka	Monroe County
Thomas Haley	NYSDEC
Goeffrey Golick	NYSDEC Albany
Tara Blum	NYSDEC Avon
Robert Call	NYSDEC Avon
Karis Manning	NYSDEC Avon
John Russel	NYSDEC Avon
Luke Scannell	NYSDEC Avon
David Clarke	NYSDEC Buffalo
Noel Kurth	NYSDOT Region 4
Eric Baurle	NYSOGS
Jeff Corcoran	Oak Hill Country Club
Shaun Gannon	Ramboll
Keith Manor	Sternwater
Evert Garcia	Town of Brighton
Steve Zimmer	Town of Brighton
Mike Catalano	Town of Henrietta
Craig Eckertt	Town of Henrietta
John Moffitt	Town of Mendon
Mike Graves	Town of Mendon resident
Catherine DuBreck	Town of Penfield
Kerry Ivers	Town of Penfield
Mike O'Connor	Town of Penfield
Mark Valentine	Town of Penfield
Rob Kozarits	Town of Perinton
Eric Williams	Town of Perinton
Alan Benedict	Town of Victor
Adam Ryczek	Town of Victor
Steve Metivier	USACE Buffalo
Laura Ortiz	USACE Buffalo

Appendix C. Field Data Collection Forms



NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service

Stream Channel Classification (Level II)
Wisconsin Job Sheet 811

Natural Resources Conservation Service (NRCS) **Wisconsin**

Project: _____ Date: _____

County: _____ Stream: _____

Reach No.: _____ Logged By: _____

Horizontal Datum: NAD _____ Projection: ☐ Transverse Mercator ☐ Lambert Conformal Conical

Coordinate System: ☐ _____ County Coordinates ☐ WTM ☐ State Plane Coordinates ☐ UTM

Units: ☐ Meters ☐ Feet Horizontal Control: N or Lat _____ E or Long _____

Elevation: _____ ☐ Assumed ☐ DOT ☐ NAVD (29 / 88) Units: ☐ Meters ☐ Feet

Fluvial Geomorphology Features (3 Cross Sections) for Stream Classification

				Average
Bankfull Width (W_{bkf}): *Width of the stream channel, at bankfull stage elevation, in a riffle section.*	_____ ft.	_____ ft.	_____ ft.	0.00 ft.
Mean Depth (d_{bkf}): *Mean depth of the stream channel cross section, at bankfull stage elevation, in a riffle section. ($d_{bkf}=A_{bkf}/W_{bkf}$)*	_____ ft.	_____ ft.	_____ ft.	0.00 ft.
Bankfull X-Section Area (A_{bkf}): *Area of the stream channel cross section, at bankfull stage elevation, in a riffle section.*	_____ sq. ft.	_____ sq. ft.	_____ sq. ft.	0.00 sq. ft.
Width / Depth Ratio (W_{bkf}/d_{bkf}): *Bankfull width divided by bankfull mean depth, in a riffle section.*	_____ ft.	_____ ft.	_____ ft.	0.00 ft.
Maximum Depth (d_{max}): *Maximum depth of the Bankfull channel cross section, or distance between the bankfull stage and thalweg elevations, in a riffle section.*	_____ ft.	_____ ft.	_____ ft.	0.00 ft.
Width of Flood-Prone Area (W_{fpa}): *Twice maximum depth, or (2 x d_{max}) = the stage/elevation at which flood-prone area width is determined (riffle section).*	_____ ft.	_____ ft.	_____ ft.	0.00 ft.
Entrenchment Ratio (ER): *The ratio of flood-prone area width divided by bankfull channel width. (W_{fpa}/W_{bkf}) (riffle section)*	_____ ft.	_____ ft.	_____ ft.	0.00 ft.

DRAFT

USDA-NRCS **January 2009** **Wisconsin Job Sheet 811**

Reach Characteristics

Channel Materials (Particle Size Index) D50: _____ mm

The D50 particle size index represents the median diameter of channel materials, as sampled from the channel surface, between the bankfull stage and thalweg elevations.

Water Surface Slope (S): _____ ft./ft.

Channel slope = "rise" over "run" for a reach approximately 20-30 bankfull channel widths in length, with the "riffle to riffle" water surface slope representing the gradient at bankfull stage.

Channel Sinuosity (K): _____.

Sinuosity is an index of channel pattern, determined from a ratio of stream length divided by valley length (SL/VL); or estimated from a ratio of valley slope divided by channel slope (VS/S).

Distance to Up-Stream Structures: _____.

Stream Type: _____ (For reference, note Stream Type Chart and Classification Key)

Dominant Channel Soils at an Eroding Bank Location

Bed Material: _____ Left Bank: _____ Right Bank: _____

Description of Soil Profiles (from base of bank to top):

Left: _____

_____

Right: _____

_____

Riparian Vegetation at an Eroding Bank Location

Left Bank: _____ Right Bank: _____

Percent Total Area (Mass): Left: _____ Right: _____

Percent Total Height with Roots: Left: _____ Right: _____

Other Bank Features at an Eroding Bank Location

Actual Bank Height: _____ Bankfull Height: _____

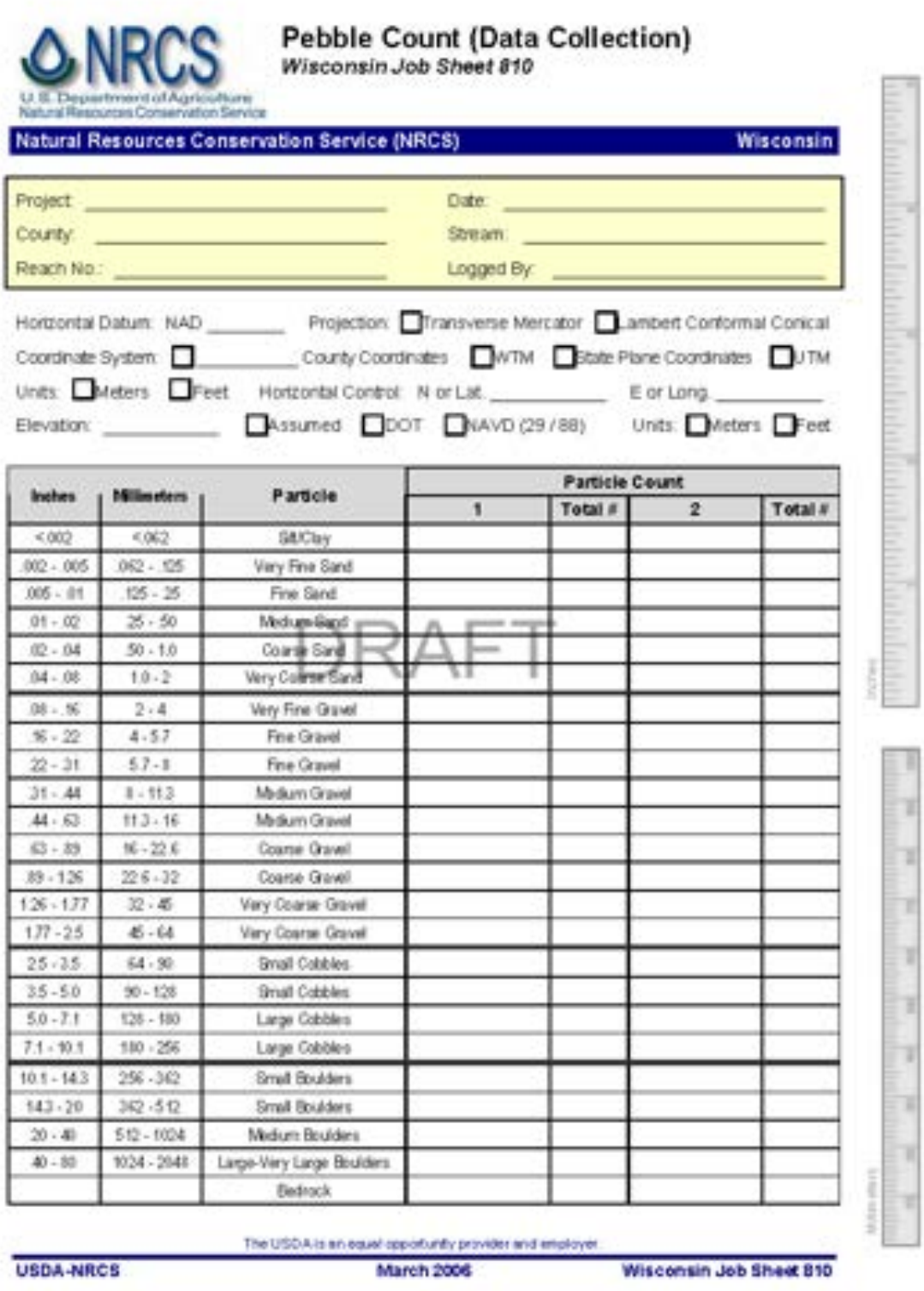
Bank Slope (Horizontal to Vertical):

Left:	Right:
☐ 0-20° (flat)	☐ 0-20° (flat)
☐ 21-60° (moderate)	☐ 21-60° (moderate)
☐ 61-80° (steep)	☐ 61-80° (steep)
☐ 81-90° (vertical)	☐ 81-90° (vertical)
☐ 90°+ (undercut)	☐ 90°+ (undercut)

Visible Seepage in Bank? ☐ Yes ☐ No Where? _____

Thalweg Location: ☐ Near 1/3 ☐ Mid 1/3 ☐ Far 1/3

USDA-NRCS **January 2009** **Wisconsin Job Sheet 811**



NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service

Pebble Count (Data Collection)

Wisconsin Job Sheet 810

Natural Resources Conservation Service (NRCS) **Wisconsin**

Project: _____ Date: _____

County: _____ Stream: _____

Reach No.: _____ Logged By: _____

Horizontal Datum: NAD _____ Projection: ☐ Transverse Mercator ☐ Lambert Conformal Conical

Coordinate System: ☐ _____ County Coordinates ☐ WTM ☐ State Plane Coordinates ☐ UTM

Units: ☐ Meters ☐ Feet Horizontal Control: N or Lat. _____ E or Long. _____

Elevation: _____ ☐ Assumed ☐ DOT ☐ NAVD (29 / 88) Units: ☐ Meters ☐ Feet

Inches	Millimeters	Particle	Particle Count			
			1	Total #	2	Total #
<.002	<.062	Silt/Clay				
.002 - .005	.062 - .125	Very Fine Sand				
.005 - .01	.125 - .25	Fine Sand				
.01 - .02	.25 - .50	Medium Sand				
.02 - .04	.50 - 1.0	Coarse Sand				
.04 - .08	1.0 - 2	Very Coarse Sand				
.08 - .16	2 - 4	Very Fine Gravel				
.16 - .22	4 - 5.7	Fine Gravel				
.22 - .31	5.7 - 8	Fine Gravel				
.31 - .44	8 - 11.3	Medium Gravel				
.44 - .63	11.3 - 16	Medium Gravel				
.63 - .89	16 - 22.6	Coarse Gravel				
.89 - 1.26	22.6 - 32	Coarse Gravel				
1.26 - 1.77	32 - 45	Very Coarse Gravel				
1.77 - 2.5	45 - 64	Very Coarse Gravel				
2.5 - 3.5	64 - 90	Small Cobbles				
3.5 - 5.0	90 - 128	Small Cobbles				
5.0 - 7.1	128 - 180	Large Cobbles				
7.1 - 10.1	180 - 256	Large Cobbles				
10.1 - 14.3	256 - 362	Small Boulders				
14.3 - 20	362 - 512	Small Boulders				
20 - 40	512 - 1024	Medium Boulders				
40 - 80	1024 - 2048	Large-Very Large Boulders				
		Bedrock				

DRAFT

The USDA is an equal opportunity provider and employer

USDA-NRCS **March 2006** **Wisconsin Job Sheet 810**

GOMEZ AND SULLIVAN ENGINEERS

Resilient New York

Date:

Field crew:

Stream:

Road crossing:

Structure data: ☐ Bridge

Height at edge[1]: _____ Width at top of opening: _____

Height at deepest point: _____ Bank slope: Rise: _____ Run: _____

Piers _____ Pier shape: round triangle square

Span between piers: _____ Width of piers: _____

☐ Culvert (see data below)

Length in direction of flow:

Manning value: Top: Bottom:

Deck thickness:

Height of rail:

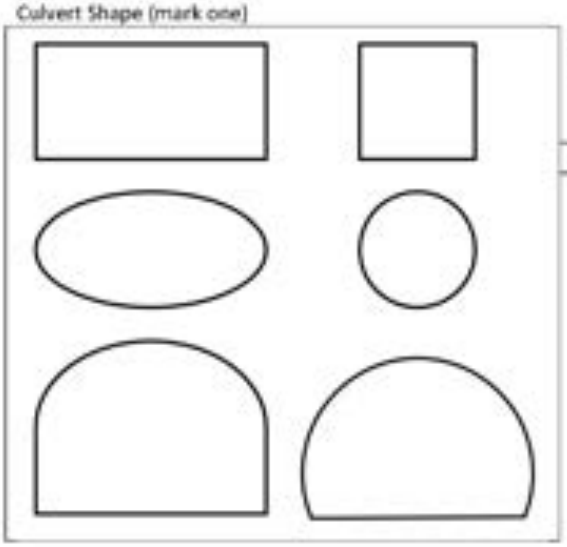
Type of rail:

Structure material:

Bottom substrate:

Description:

Culvert Shape (mark one)



Depth from top of opening to bottom of stream

at edge: _____

at deepest location: _____

Opening width: _____

[1] All measurements should be taken to 0.1 feet

P:\2065 - Resilient NY Initiative\Field Data Collection\Field_Template.docx

Appendix D. Photo Log

List of Additional Field Photos

Photo D-1. Downstream Face of Old Penfield Road
Photo D-2. Upstream Face of Penfield Road
Photo D-3. Confluence of Allen Creek
Photo D-4. Upstream Face of Panorma Trail
Photo D-5. Upstream Face of NY 441
Photo D-6. Downstream Face of NY 31 (Pittsford Palmyra Road)
Photo D-7. Upstream Face of Interstate 490
Photo D-8. Downstream Face of NY 251 (Victor Mendon Road)
Photo D-9. Downstream Face of NY 64 (Mendon Ionia Road)
Photo D-10. Upstream Face of Private Drive approximately 700 feet upstream of NY 64 (Mendon Ionia Road)

Photo D-1. *Downstream Face of Old Penfield Road*

Photo D-2. *Upstream Face of Penfield Road*

Photo D-3. *Confluence of Allen Creek*

Photo D-4. *Upstream Face of Panorma Trail*

Photo D-5. *Upstream Face of NY 441*

Photo D-6. *Downstream Face of NY 31 (Pittsford Palmyra Road)*

Photo D-7. *Upstream Face of Interstate 490*

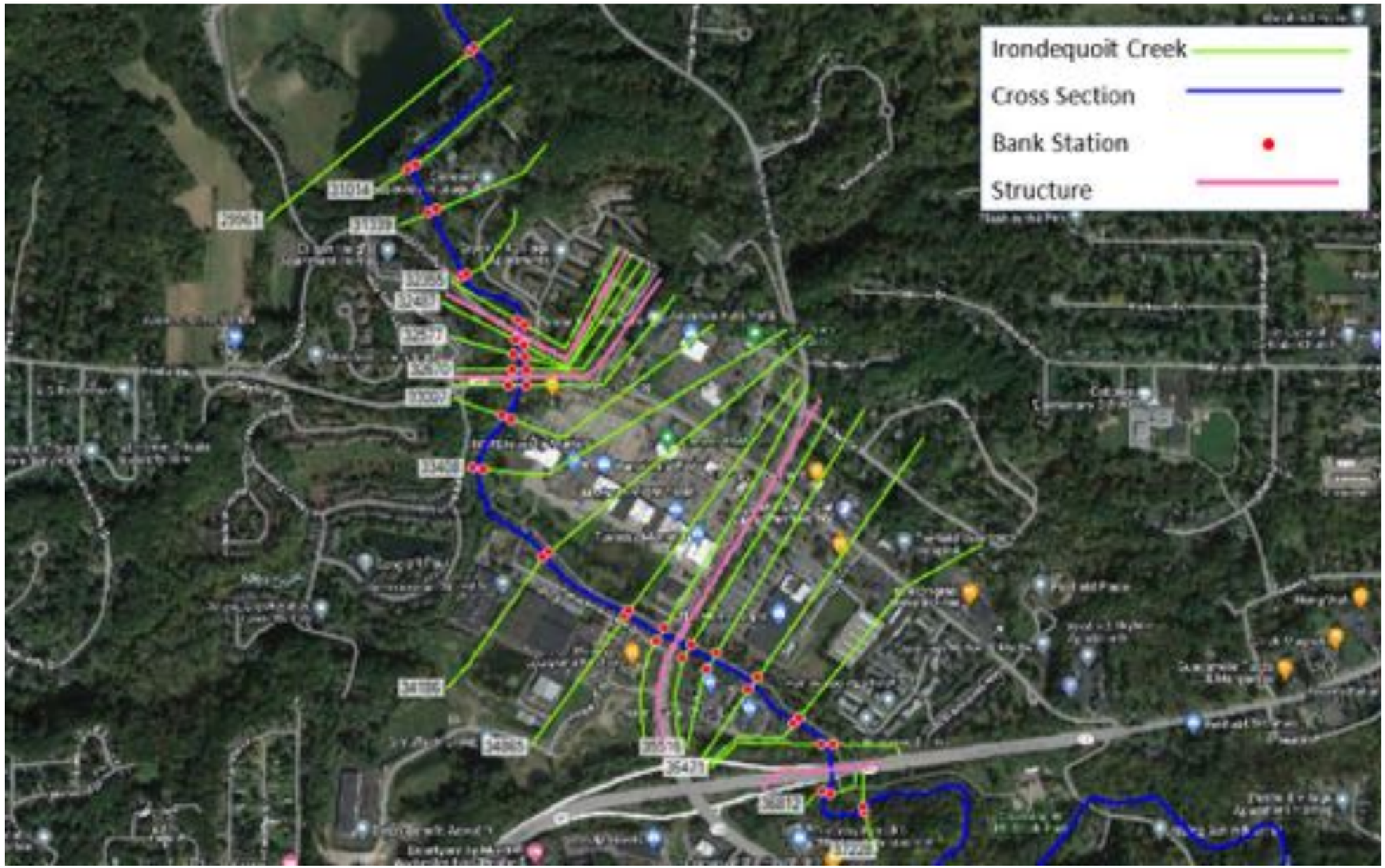
Photo D-8. *Downstream Face of NY 251 (Victor Mendon Road)*

Photo D-9. *Downstream Face of NY 64 (Mendon Ionia Road)*

Photo D-10. *Upstream Face of Private Drive approximately 700 feet upstream of NY 64 (Mendon Ionia Road)*

Appendix E. HEC-RAS Simulation Output

Risk Area #1



Plan: Base Condition (Risk Area #1) Flows: Current

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
Reach 1	37228	10%_E	3619.00	269.80	275.47	275.47	277.80	0.010906	13.84	352.68	80.15	1.03
Reach 1	37228	2%_E	5820.00	269.80	277.94	277.94	280.02	0.006627	13.77	715.86	270.72	0.85
Reach 1	37228	1%_E	6699.00	269.80	278.58	278.58	280.59	0.006065	13.86	854.07	341.53	0.83
Reach 1	37228	0.2%_E	7875.00	269.80	279.11	279.11	281.25	0.006193	14.57	973.13	354.41	0.84
Reach 1	36812	10%_E	3619.00	264.00	273.46	269.92	274.17	0.001534	7.09	605.00	151.23	0.42
Reach 1	36812	2%_E	5820.00	264.00	275.73	271.74	276.86	0.001823	8.99	854.05	189.81	0.47
Reach 1	36812	1%_E	6699.00	264.00	276.70	272.39	277.84	0.001692	9.16	999.76	212.28	0.46
Reach 1	36812	0.2%_E	7875.00	264.00	277.94	273.10	279.07	0.001544	9.33	1184.99	288.38	0.45
Reach 1	36700		Bridge									
Reach 1	36471	10%_E	3619.00	263.50	272.52		272.89	0.000898	5.08	848.01	263.37	0.31
Reach 1	36471	2%_E	5820.00	263.50	274.48		275.02	0.001005	6.20	1162.27	317.03	0.34
Reach 1	36471	1%_E	6699.00	263.50	275.11		275.71	0.001054	6.62	1263.27	328.21	0.36
Reach 1	36471	0.2%_E	7875.00	263.50	275.81		276.51	0.001145	7.19	1374.18	340.36	0.38
Reach 1	36217	10%_E	3619.00	262.50	272.15		272.61	0.001307	6.21	933.78	428.87	0.37
Reach 1	36217	2%_E	5820.00	262.50	274.23		274.72	0.001198	6.86	1508.72	465.69	0.37
Reach 1	36217	1%_E	6699.00	262.50	274.90		275.40	0.001160	7.03	1700.06	470.84	0.37
Reach 1	36217	0.2%_E	7875.00	262.50	275.63		276.15	0.001171	7.37	1909.45	490.09	0.37
Reach 1	35831	10%_E	3619.00	261.00	272.02		272.25	0.000476	3.88	973.59	208.46	0.23
Reach 1	35831	2%_E	5820.00	261.00	274.00		274.37	0.000593	4.95	1339.09	300.68	0.26
Reach 1	35831	1%_E	6699.00	261.00	274.63		275.05	0.000634	5.31	1464.95	335.88	0.28
Reach 1	35831	0.2%_E	7875.00	261.00	275.30		275.80	0.000704	5.81	1600.60	431.97	0.29
Reach 1	35516	10%_E	3619.00	259.70	271.98		272.07	0.000449	2.52	1621.38	241.56	0.14
Reach 1	35516	2%_E	5820.00	259.70	273.98		274.12	0.000563	3.19	2091.68	982.83	0.16
Reach 1	35516	1%_E	6699.00	259.70	274.62		274.78	0.000606	3.42	2244.76	1073.08	0.17
Reach 1	35516	0.2%_E	7875.00	259.70	275.30		275.49	0.000682	3.76	2410.90	1209.52	0.18
Reach 1	35344	10%_E	3619.00	259.90	271.88	264.05	272.00	0.000216	2.93	1402.47	511.29	0.16
Reach 1	35344	2%_E	5820.00	259.90	273.81	265.57	274.03	0.000297	3.85	1757.09	1038.66	0.19
Reach 1	35344	1%_E	6699.00	259.90	274.42	266.08	274.67	0.000329	4.19	1868.53	1284.21	0.20
Reach 1	35344	0.2%_E	7875.00	259.90	275.06	266.74	275.37	0.000381	4.65	1985.39	1706.91	0.22
Reach 1	35300		Bridge									
Reach 1	35133	10%_E	3619.00	259.00	271.75		271.90	0.000226	3.12	1202.41	1081.03	0.16
Reach 1	35133	2%_E	5820.00	259.00	273.56		273.84	0.000347	4.27	1473.52	1822.07	0.21
Reach 1	35133	1%_E	6699.00	259.00	274.11		274.44	0.000397	4.69	1556.49	1967.77	0.22
Reach 1	35133	0.2%_E	7875.00	259.00	274.64		275.06	0.000478	5.28	1637.07	2005.14	0.25

Reach 1	34865	10%_E	3619.00	258.40	271.13	265.50	271.67	0.001026	6.25	938.03	1584.18	0.33
Reach 1	34865	2%_E	5820.00	258.40	273.21	267.82	273.65	0.000854	6.38	1823.74	2292.24	0.31
Reach 1	34865	1%_E	6699.00	258.40	273.84	268.98	274.27	0.000832	6.49	2090.60	2379.59	0.31
Reach 1	34865	0.2%_E	7875.00	258.40	274.44	271.82	274.88	0.000874	6.84	2343.06	2396.98	0.31
Reach 1	34186	10%_E	3619.00	257.00	271.05		271.17	0.000353	3.58	2204.41	2378.57	0.20
Reach 1	34186	2%_E	5820.00	257.00	273.17		273.26	0.000256	3.46	4185.30	2904.00	0.17
Reach 1	34186	1%_E	6699.00	257.00	273.82		273.90	0.000227	3.37	4982.46	2917.17	0.16
Reach 1	34186	0.2%_E	7875.00	257.00	274.43		274.51	0.000222	3.43	5731.64	2956.75	0.16
Reach 1	33408	10%_E	4593.00	256.50	270.79		270.93	0.000302	3.65	2636.13	1938.05	0.19
Reach 1	33408	2%_E	7386.00	256.50	272.89		273.05	0.000315	4.16	5408.92	2124.59	0.20
Reach 1	33408	1%_E	8501.00	256.50	273.63		273.73	0.000239	3.75	6964.50	2133.07	0.17
Reach 1	33408	0.2%_E	9994.00	256.50	274.27		274.35	0.000213	3.64	8334.07	2140.09	0.16
Reach 1	33007	10%_E	4593.00	256.00	270.61		270.79	0.000393	4.10	1980.02	1469.15	0.21
Reach 1	33007	2%_E	7386.00	256.00	272.62		272.88	0.000502	5.15	3596.14	1798.24	0.25
Reach 1	33007	1%_E	8501.00	256.00	273.42		273.61	0.000387	4.69	5052.03	1831.96	0.22
Reach 1	33007	0.2%_E	9994.00	256.00	274.09		274.25	0.000341	4.54	6285.71	1835.84	0.21
Reach 1	32776	10%_E	4593.00	255.50	270.36	262.61	270.65	0.000609	4.32	1063.17	1038.06	0.25
Reach 1	32776	2%_E	7386.00	255.50	272.21	264.89	272.68	0.000791	5.56	1839.50	1271.91	0.30
Reach 1	32776	1%_E	8501.00	255.50	273.05	265.66	273.43	0.000654	5.32	2885.36	1289.12	0.28
Reach 1	32776	0.2%_E	9994.00	255.50	273.74	266.57	274.09	0.000605	5.31	3749.44	1306.07	0.27
Reach 1	32700		Bridge									
Reach 1	32670	10%_E	4593.00	255.50	270.24		270.51	0.000490	4.23	1326.05	1047.93	0.23
Reach 1	32670	2%_E	7386.00	255.50	271.99		272.29	0.000537	4.92	2792.90	1251.95	0.25
Reach 1	32670	1%_E	8501.00	255.50	272.78		273.05	0.000470	4.81	3626.45	1326.54	0.24
Reach 1	32670	0.2%_E	9994.00	255.50	273.50		273.75	0.000440	4.82	4410.74	1331.07	0.23
Reach 1	32577	10%_E	4593.00	255.75	270.16		270.45	0.000590	4.70	1527.00	1123.85	0.26
Reach 1	32577	2%_E	7386.00	255.75	271.86		272.22	0.000676	5.58	2885.47	1269.85	0.28
Reach 1	32577	1%_E	8501.00	255.75	272.74		273.00	0.000511	5.09	3935.76	1277.82	0.25
Reach 1	32577	0.2%_E	9994.00	255.75	273.47		273.70	0.000457	4.99	4820.06	1284.30	0.24
Reach 1	32487	10%_E	4593.00	256.00	270.15	263.00	270.37	0.000390	4.28	1795.74	1349.13	0.21
Reach 1	32487	2%_E	7386.00	256.00	271.70	265.24	272.13	0.000665	6.05	2590.81	1374.07	0.28
Reach 1	32487	1%_E	8501.00	256.00	272.61	266.13	272.93	0.000525	5.60	3582.66	1395.19	0.25
Reach 1	32487	0.2%_E	9994.00	256.00	273.35	266.96	273.64	0.000490	5.58	4410.14	1405.53	0.25
Reach 1	32480		Bridge									
Reach 1	32355	10%_E	4593.00	256.00	269.90		270.16	0.000448	4.53	1638.14	1309.84	0.23
Reach 1	32355	2%_E	7386.00	256.00	271.30		271.69	0.000654	5.88	2128.70	1320.68	0.28

Reach 1	32355	1%_E	8501.00	256.00	271.76		272.37	0.000912	7.10	2381.99	1325.34	0.33
Reach 1	32355	0.2%_E	9994.00	256.00	272.58		273.11	0.000821	6.99	3134.73	1335.24	0.32
Reach 1	31818	10%_E	4593.00	255.90	268.94		269.63	0.001421	8.20	1394.25	506.13	0.42
Reach 1	31818	2%_E	7386.00	255.90	270.59		271.16	0.001270	8.47	2237.44	515.99	0.41
Reach 1	31818	1%_E	8501.00	255.90	271.24		271.77	0.001193	8.48	2576.28	530.57	0.40
Reach 1	31818	0.2%_E	9994.00	255.90	272.09		272.58	0.001111	8.51	3041.64	564.06	0.39
Reach 1	31339	10%_E	4593.00	255.80	268.42		269.01	0.001117	6.95	1140.10	292.68	0.41
Reach 1	31339	2%_E	7386.00	255.80	269.53		270.45	0.001627	9.05	1496.39	470.63	0.50
Reach 1	31339	1%_E	8501.00	255.80	270.17		271.09	0.001570	9.26	1747.18	483.22	0.50
Reach 1	31339	0.2%_E	9994.00	255.80	271.07	268.86	271.95	0.001440	9.35	2096.34	552.85	0.48
Reach 1	31014	10%_E	4593.00	255.70	267.95		268.50	0.000884	6.45	1117.69	258.76	0.37
Reach 1	31014	2%_E	7386.00	255.70	268.04		269.40	0.002198	10.22	1139.33	259.48	0.58
Reach 1	31014	1%_E	8501.00	255.70	268.14		269.88	0.002767	11.56	1167.63	260.43	0.65
Reach 1	31014	0.2%_E	9994.00	255.70	268.25	267.94	270.55	0.003639	13.35	1195.64	261.55	0.75
Reach 1	29961	10%_E	4593.00	255.50	265.30	263.50	266.81	0.003667	10.60	861.88	1135.36	0.64
Reach 1	29961	2%_E	7386.00	255.50	266.80	266.47	267.40	0.001888	8.47	2213.07	1196.41	0.47
Reach 1	29961	1%_E	8501.00	255.50	267.30	266.67	267.77	0.001569	7.97	2673.58	1197.80	0.43
Reach 1	29961	0.2%_E	9994.00	255.50	267.90	266.89	268.28	0.001316	7.57	3226.57	1199.59	0.40

Plan: Base Condition (Risk Area #1) Flows: Projected Future

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
Reach 1	37228	10%_P	3981.00	269.80	275.77	275.77	278.26	0.010928	14.35	377.13	83.86	1.04
Reach 1	37228	2%_P	6402.00	269.80	278.43	278.43	280.41	0.006057	13.69	820.44	333.20	0.82
Reach 1	37228	1%_P	7369.00	269.80	278.91	278.91	280.97	0.006090	14.23	926.52	350.60	0.83
Reach 1	37228	0.2%_P	8663.00	269.80	279.43	279.43	281.66	0.006325	15.06	1044.12	359.03	0.86
Reach 1	36812	10%_P	3981.00	264.00	273.88	270.26	274.65	0.001571	7.40	641.51	157.06	0.43
Reach 1	36812	2%_P	6402.00	264.00	276.37	272.18	277.50	0.001740	9.12	949.84	203.08	0.47
Reach 1	36812	1%_P	7369.00	264.00	277.41	272.83	278.54	0.001607	9.26	1105.70	262.84	0.46
Reach 1	36812	0.2%_P	8663.00	264.00	278.74	273.63	279.87	0.001456	9.42	1305.74	298.49	0.44
Reach 1	36700		Bridge									
Reach 1	36471	10%_P	3981.00	263.50	272.87		273.28	0.000921	5.29	904.92	265.93	0.32
Reach 1	36471	2%_P	6402.00	263.50	274.87		275.46	0.001050	6.51	1224.92	323.42	0.35
Reach 1	36471	1%_P	7369.00	263.50	275.53		276.18	0.001102	6.94	1329.49	336.03	0.37
Reach 1	36471	0.2%_P	8663.00	263.50	276.26		277.02	0.001193	7.53	1446.80	382.99	0.39
Reach 1	36217	10%_P	3981.00	262.50	272.53		272.99	0.001283	6.33	1032.28	435.62	0.37
Reach 1	36217	2%_P	6402.00	262.50	274.64		275.14	0.001192	7.02	1626.16	468.64	0.37

Reach 1	36217	1%_P	7369.00	262.50	275.34		275.85	0.001160	7.21	1825.09	481.18	0.37
Reach 1	36217	0.2%_P	8663.00	262.50	276.11		276.65	0.001170	7.56	2048.27	580.89	0.38
Reach 1	35831	10%_P	3981.00	261.00	272.38		272.64	0.000501	4.08	1034.55	225.41	0.24
Reach 1	35831	2%_P	6402.00	261.00	274.38		274.79	0.000629	5.21	1415.42	320.94	0.27
Reach 1	35831	1%_P	7369.00	261.00	275.04		275.50	0.000672	5.59	1546.41	383.13	0.29
Reach 1	35831	0.2%_P	8663.00	261.00	275.75		276.29	0.000742	6.11	1691.45	833.11	0.30
Reach 1	35516	10%_P	3981.00	259.70	272.34		272.44	0.000472	2.65	1705.03	246.80	0.14
Reach 1	35516	2%_P	6402.00	259.70	274.37		274.52	0.000600	3.36	2184.40	1023.59	0.17
Reach 1	35516	1%_P	7369.00	259.70	275.03		275.20	0.000647	3.61	2344.11	1131.29	0.18
Reach 1	35516	0.2%_P	8663.00	259.70	275.75		275.96	0.000727	3.96	2534.69	1327.61	0.19
Reach 1	35344	10%_P	3981.00	259.90	272.23	264.33	272.37	0.000231	3.10	1467.03	615.74	0.17
Reach 1	35344	2%_P	6402.00	259.90	274.18	265.92	274.42	0.000323	4.09	1824.12	1174.63	0.20
Reach 1	35344	1%_P	7369.00	259.90	274.81	266.48	275.09	0.000358	4.45	1939.23	1462.79	0.21
Reach 1	35344	0.2%_P	8663.00	259.90	275.49	267.12	275.83	0.000412	4.93	2063.27	1848.79	0.23
Reach 1	35300		Bridge									
Reach 1	35133	10%_P	3981.00	259.00	272.09		272.26	0.000247	3.33	1252.08	1339.99	0.17
Reach 1	35133	2%_P	6402.00	259.00	273.89		274.20	0.000385	4.56	1522.62	1901.37	0.22
Reach 1	35133	1%_P	7369.00	259.00	274.44		274.82	0.000440	5.02	1607.23	1982.76	0.24
Reach 1	35133	0.2%_P	8663.00	259.00	274.93		275.42	0.000538	5.67	1681.94	2014.62	0.26
Reach 1	34865	10%_P	3981.00	258.40	271.50	265.93	272.03	0.001012	6.34	1093.09	1797.92	0.33
Reach 1	34865	2%_P	6402.00	258.40	273.58	268.49	274.02	0.000864	6.53	1977.39	2339.46	0.31
Reach 1	34865	1%_P	7369.00	258.40	274.22	271.60	274.65	0.000844	6.66	2250.75	2394.20	0.31
Reach 1	34865	0.2%_P	8663.00	258.40	274.76	272.13	275.23	0.000919	7.12	2479.03	2401.03	0.32
Reach 1	34186	10%_P	3981.00	257.00	271.40		271.52	0.000361	3.71	2428.58	2685.39	0.20
Reach 1	34186	2%_P	6402.00	257.00	273.55		273.63	0.000245	3.45	4643.84	2910.17	0.17
Reach 1	34186	1%_P	7369.00	257.00	274.21		274.28	0.000220	3.38	5458.02	2948.91	0.16
Reach 1	34186	0.2%_P	8663.00	257.00	274.76		274.84	0.000225	3.51	6135.25	2969.30	0.17
Reach 1	33408	10%_P	5052.00	256.50	271.14		271.28	0.000302	3.72	2887.08	2021.71	0.19
Reach 1	33408	2%_P	8125.00	256.50	273.31		273.44	0.000275	3.96	6299.39	2129.02	0.18
Reach 1	33408	1%_P	9351.00	256.50	274.04		274.13	0.000217	3.64	7843.77	2137.37	0.17
Reach 1	33408	0.2%_P	10993.00	256.50	274.60		274.69	0.000208	3.65	9055.66	2146.90	0.16
Reach 1	33007	10%_P	5052.00	256.00	270.95		271.14	0.000407	4.25	2108.09	1512.69	0.22
Reach 1	33007	2%_P	8125.00	256.00	273.07		273.30	0.000444	4.95	4419.29	1820.08	0.23
Reach 1	33007	1%_P	9351.00	256.00	273.86		274.02	0.000348	4.54	5854.14	1834.51	0.21
Reach 1	33007	0.2%_P	10993.00	256.00	274.44		274.58	0.000332	4.55	6917.85	1837.79	0.20
Reach 1	32776	10%_P	5052.00	255.50	270.66	263.00	270.98	0.000667	4.60	1099.42	1177.97	0.27
Reach 1	32776	2%_P	8125.00	255.50	272.66	265.41	273.10	0.000751	5.57	2390.68	1280.87	0.29

Reach 1	32776	1%_P	9351.00	255.50	273.51	266.20	273.86	0.000606	5.25	3457.60	1300.01	0.27
Reach 1	32776	0.2%_P	10993.00	255.50	274.08	267.15	274.42	0.000602	5.40	4180.17	1314.21	0.27
Reach 1	32700		Bridge									
Reach 1	32670	10%_P	5052.00	255.50	270.52		270.81	0.000518	4.43	1553.92	1066.65	0.24
Reach 1	32670	2%_P	8125.00	255.50	272.36		272.66	0.000534	5.01	3173.75	1292.42	0.25
Reach 1	32670	1%_P	9351.00	255.50	273.26		273.51	0.000437	4.75	4152.30	1329.42	0.23
Reach 1	32670	0.2%_P	10993.00	255.50	273.86		274.11	0.000443	4.92	4800.84	1333.55	0.23
Reach 1	32577	10%_P	5052.00	255.75	270.44		270.75	0.000618	4.90	1643.45	1151.44	0.27
Reach 1	32577	2%_P	8125.00	255.75	272.28		272.61	0.000623	5.48	3387.34	1273.76	0.27
Reach 1	32577	1%_P	9351.00	255.75	273.23		273.46	0.000459	4.94	4530.51	1282.18	0.24
Reach 1	32577	0.2%_P	10993.00	255.75	273.84		274.05	0.000452	5.05	5256.76	1287.43	0.24
Reach 1	32487	10%_P	5052.00	256.00	270.43	263.62	270.67	0.000418	4.50	1901.78	1353.45	0.22
Reach 1	32487	2%_P	8125.00	256.00	272.13	265.88	272.53	0.000629	6.00	3057.54	1383.19	0.28
Reach 1	32487	1%_P	9351.00	256.00	273.11	266.60	273.40	0.000488	5.52	4139.15	1402.16	0.25
Reach 1	32487	0.2%_P	10993.00	256.00	273.71	267.34	273.99	0.000490	5.67	4820.38	1411.16	0.25
Reach 1	32480		Bridge									
Reach 1	32355	10%_P	5052.00	256.00	270.13		270.42	0.000490	4.80	1719.76	1311.23	0.24
Reach 1	32355	2%_P	8125.00	256.00	271.55		271.99	0.000717	6.23	2218.61	1323.54	0.29
Reach 1	32355	1%_P	9351.00	256.00	272.23		272.80	0.000862	7.05	2812.47	1329.92	0.33
Reach 1	32355	0.2%_P	10993.00	256.00	273.12		273.61	0.000767	6.92	3659.15	1351.82	0.31
Reach 1	31818	10%_P	5052.00	255.90	269.17		269.87	0.001465	8.44	1508.93	507.20	0.43
Reach 1	31818	2%_P	8125.00	255.90	271.03		271.57	0.001210	8.45	2464.25	522.36	0.40
Reach 1	31818	1%_P	9351.00	255.90	271.72		272.23	0.001165	8.57	2835.00	557.28	0.40
Reach 1	31818	0.2%_P	10993.00	255.90	272.66		273.11	0.001025	8.38	3366.90	570.77	0.38
Reach 1	31339	10%_P	5052.00	255.80	268.55		269.22	0.001261	7.45	1175.55	293.39	0.43
Reach 1	31339	2%_P	8125.00	255.80	269.95		270.88	0.001596	9.21	1661.43	479.82	0.50
Reach 1	31339	1%_P	9351.00	255.80	270.68	268.64	271.58	0.001500	9.33	1944.38	513.68	0.49
Reach 1	31339	0.2%_P	10993.00	255.80	271.68	269.32	272.53	0.001340	9.33	2337.36	612.07	0.47
Reach 1	31014	10%_P	5052.00	255.70	267.97		268.63	0.001058	7.06	1123.62	258.96	0.40
Reach 1	31014	2%_P	8125.00	255.70	268.11		269.71	0.002566	11.10	1159.24	260.15	0.63
Reach 1	31014	1%_P	9351.00	255.70	268.22	267.68	270.25	0.003238	12.56	1186.45	261.13	0.71
Reach 1	31014	0.2%_P	10993.00	255.70	268.30	268.30	271.03	0.004310	14.58	1207.91	262.11	0.82
Reach 1	29961	10%_P	5052.00	255.50	265.55	264.03	266.87	0.003373	10.36	1075.09	1141.42	0.61
Reach 1	29961	2%_P	8125.00	255.50	267.13	266.59	267.64	0.001668	8.13	2518.26	1197.34	0.44
Reach 1	29961	1%_P	9351.00	255.50	267.64	266.79	268.06	0.001418	7.74	2988.35	1198.82	0.41
Reach 1	29961	0.2%_P	10993.00	255.50	268.30	267.04	268.64	0.001180	7.34	3592.87	1200.79	0.38

Plan: Alternative #1-1

Flows: Current and Projected Future

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
Reach 1	37228	10%_E	3619.00	269.80	275.47	275.47	277.80	0.010906	13.84	352.68	80.15	1.03
Reach 1	37228	2%_E	5820.00	269.80	277.94	277.94	280.02	0.006627	13.77	715.86	270.72	0.85
Reach 1	37228	1%_E	6699.00	269.80	278.58	278.58	280.59	0.006065	13.86	854.07	341.53	0.83
Reach 1	37228	0.2%_E	7875.00	269.80	279.11	279.11	281.25	0.006193	14.57	973.13	354.41	0.84
Reach 1	37228	10%_P	3981.00	269.80	275.77	275.77	278.26	0.010928	14.35	377.13	83.86	1.04
Reach 1	37228	2%_P	6402.00	269.80	278.43	278.43	280.41	0.006057	13.69	820.44	333.20	0.82
Reach 1	37228	1%_P	7369.00	269.80	278.91	278.91	280.97	0.006090	14.23	926.52	350.60	0.83
Reach 1	37228	0.2%_P	8663.00	269.80	279.43	279.43	281.66	0.006325	15.06	1044.12	359.03	0.86
Reach 1	36812	10%_E	3619.00	264.00	273.40	269.92	274.12	0.001568	7.14	600.26	150.36	0.42
Reach 1	36812	2%_E	5820.00	264.00	275.69	271.74	276.83	0.001851	9.04	848.02	188.96	0.48
Reach 1	36812	1%_E	6699.00	264.00	276.68	272.39	277.82	0.001709	9.19	995.50	211.49	0.47
Reach 1	36812	0.2%_E	7875.00	264.00	277.94	273.10	279.07	0.001544	9.33	1184.95	288.38	0.45
Reach 1	36812	10%_P	3981.00	264.00	273.83	270.26	274.61	0.001600	7.44	637.42	156.47	0.43
Reach 1	36812	2%_P	6402.00	264.00	276.35	272.18	277.49	0.001756	9.14	946.12	202.47	0.47
Reach 1	36812	1%_P	7369.00	264.00	277.40	272.83	278.53	0.001614	9.28	1103.74	262.70	0.46
Reach 1	36812	0.2%_P	8663.00	264.00	278.75	273.63	279.88	0.001451	9.41	1307.26	298.57	0.44
Reach 1	36700		Bridge									
Reach 1	36471	10%_E	3619.00	263.50	272.40		272.79	0.000949	5.17	829.49	262.52	0.32
Reach 1	36471	2%_E	5820.00	263.50	274.36		274.91	0.001052	6.30	1143.19	315.64	0.35
Reach 1	36471	1%_E	6699.00	263.50	274.97		275.59	0.001109	6.73	1240.80	325.14	0.36
Reach 1	36471	0.2%_E	7875.00	263.50	275.73		276.44	0.001175	7.25	1361.82	339.16	0.38
Reach 1	36471	10%_P	3981.00	263.50	272.77		273.19	0.000966	5.37	888.22	265.16	0.33
Reach 1	36471	2%_P	6402.00	263.50	274.77		275.37	0.001090	6.59	1208.56	321.79	0.36
Reach 1	36471	1%_P	7369.00	263.50	275.40		276.07	0.001152	7.04	1309.09	334.07	0.37
Reach 1	36471	0.2%_P	8663.00	263.50	276.18		276.96	0.001225	7.60	1433.88	372.36	0.39
Reach 1	36217	10%_E	3619.00	262.50	271.99		272.48	0.001431	6.42	893.27	426.33	0.39
Reach 1	36217	2%_E	5820.00	262.50	274.08		274.61	0.001287	7.05	1467.13	464.67	0.38
Reach 1	36217	1%_E	6699.00	262.50	274.73		275.26	0.001251	7.23	1652.38	469.34	0.38
Reach 1	36217	0.2%_E	7875.00	262.50	275.54		276.08	0.001216	7.47	1883.68	487.17	0.38
Reach 1	36217	10%_P	3981.00	262.50	272.39		272.88	0.001384	6.51	995.68	432.67	0.38
Reach 1	36217	2%_P	6402.00	262.50	274.52		275.05	0.001262	7.17	1591.16	467.70	0.38
Reach 1	36217	1%_P	7369.00	262.50	275.19		275.73	0.001237	7.38	1782.24	473.65	0.38
Reach 1	36217	0.2%_P	8663.00	262.50	276.02		276.58	0.001212	7.65	2021.70	546.62	0.38
Reach 1	35831	10%_E	3619.00	261.00	271.86		272.10	0.000507	3.95	947.13	187.62	0.24
Reach 1	35831	2%_E	5820.00	261.00	273.85		274.23	0.000625	5.03	1308.78	294.04	0.27
Reach 1	35831	1%_E	6699.00	261.00	274.45		274.89	0.000673	5.41	1429.41	325.08	0.28
Reach 1	35831	0.2%_E	7875.00	261.00	275.21		275.71	0.000726	5.87	1580.98	418.93	0.30
Reach 1	35831	10%_P	3981.00	261.00	272.24		272.50	0.000530	4.15	1009.64	218.58	0.24

Reach 1	35831	2%_P	6402.00	261.00	274.25		274.67	0.000658	5.29	1389.31	313.95	0.28
Reach 1	35831	1%_P	7369.00	261.00	274.88		275.35	0.000708	5.69	1514.06	358.09	0.29
Reach 1	35831	0.2%_P	8663.00	261.00	275.65		276.21	0.000764	6.17	1671.30	749.86	0.31
Reach 1	35516	10%_E	3619.00	259.70	271.81		271.90	0.000480	2.58	1582.77	238.77	0.14
Reach 1	35516	2%_E	5820.00	259.70	273.82		273.97	0.000593	3.24	2054.16	846.15	0.16
Reach 1	35516	1%_E	6699.00	259.70	274.44		274.60	0.000642	3.49	2201.15	1031.40	0.17
Reach 1	35516	0.2%_E	7875.00	259.70	275.20		275.40	0.000702	3.79	2386.38	1175.61	0.18
Reach 1	35516	10%_P	3981.00	259.70	272.19		272.29	0.000500	2.70	1670.30	244.63	0.15
Reach 1	35516	2%_P	6402.00	259.70	274.23		274.39	0.000626	3.41	2152.35	1006.15	0.17
Reach 1	35516	1%_P	7369.00	259.70	274.86		275.05	0.000680	3.67	2304.36	1106.78	0.18
Reach 1	35516	0.2%_P	8663.00	259.70	275.65		275.87	0.000747	4.00	2506.20	1290.05	0.19
Reach 1	35344	10%_E	3619.00	259.90	271.70	264.05	271.83	0.000230	2.99	1370.65	461.85	0.16
Reach 1	35344	2%_E	5820.00	259.90	273.65	265.57	273.87	0.000312	3.91	1727.19	1013.29	0.20
Reach 1	35344	1%_E	6699.00	259.90	274.23	266.08	274.49	0.000348	4.26	1833.93	1203.02	0.21
Reach 1	35344	0.2%_E	7875.00	259.90	274.96	266.74	275.27	0.000392	4.69	1966.39	1608.88	0.23
Reach 1	35344	10%_P	3981.00	259.90	272.07	264.33	272.22	0.000244	3.15	1438.65	560.62	0.17
Reach 1	35344	2%_P	6402.00	259.90	274.04	265.92	274.29	0.000336	4.14	1798.64	1116.72	0.21
Reach 1	35344	1%_P	7369.00	259.90	274.64	266.48	274.93	0.000375	4.52	1907.79	1394.21	0.22
Reach 1	35344	0.2%_P	8663.00	259.90	275.38	267.12	275.73	0.000423	4.98	2043.83	1822.19	0.24
Reach 1	35300		Bridge									
Reach 1	35133	10%_E	3619.00	259.00	271.57		271.73	0.000239	3.18	1176.04	928.71	0.17
Reach 1	35133	2%_E	5820.00	259.00	273.39		273.68	0.000363	4.33	1447.91	1762.69	0.21
Reach 1	35133	1%_E	6699.00	259.00	273.91		274.26	0.000418	4.77	1526.44	1905.60	0.23
Reach 1	35133	0.2%_E	7875.00	259.00	274.54		274.97	0.000490	5.32	1622.30	1997.06	0.25
Reach 1	35133	10%_P	3981.00	259.00	271.93		272.10	0.000260	3.38	1228.43	1228.57	0.18
Reach 1	35133	2%_P	6402.00	259.00	273.74		274.07	0.000400	4.62	1500.59	1884.24	0.22
Reach 1	35133	1%_P	7369.00	259.00	274.26		274.66	0.000462	5.09	1579.68	1973.29	0.24
Reach 1	35133	0.2%_P	8663.00	259.00	274.84		275.33	0.000551	5.72	1667.62	2011.53	0.26
Reach 1	34865	10%_E	3619.00	258.40	270.90	265.50	271.48	0.001124	6.45	852.46	1477.43	0.34
Reach 1	34865	2%_E	5820.00	258.40	272.97	267.82	273.46	0.000970	6.72	1718.07	2259.06	0.33
Reach 1	34865	1%_E	6699.00	258.40	273.57	268.98	274.05	0.000950	6.85	1973.84	2336.89	0.32
Reach 1	34865	0.2%_E	7875.00	258.40	274.31	271.82	274.78	0.000926	7.00	2288.26	2395.33	0.32
Reach 1	34865	10%_P	3981.00	258.40	271.21	265.93	271.84	0.001187	6.76	972.25	1623.45	0.35
Reach 1	34865	2%_P	6402.00	258.40	273.37	268.49	273.86	0.000957	6.81	1889.41	2319.34	0.33
Reach 1	34865	1%_P	7369.00	258.40	273.97	271.60	274.46	0.000946	6.97	2146.65	2391.05	0.33
Reach 1	34865	0.2%_P	8663.00	258.40	274.65	272.13	275.14	0.000964	7.25	2432.65	2399.67	0.33
Reach 1	34186	10%_E	3619.00	257.00	270.77		270.91	0.000422	3.85	2033.02	2207.85	0.21
Reach 1	34186	2%_E	5820.00	257.00	272.90		273.01	0.000304	3.72	3858.20	2898.04	0.19
Reach 1	34186	1%_E	6699.00	257.00	273.53		273.62	0.000271	3.62	4628.77	2909.96	0.18
Reach 1	34186	0.2%_E	7875.00	257.00	274.30		274.38	0.000239	3.54	5568.41	2951.96	0.17
Reach 1	34186	10%_P	3981.00	257.00	271.11		271.25	0.000410	3.88	2245.08	2412.69	0.21

Reach 1	34186	2%_P	6402.00	257.00	273.33		273.42	0.000281	3.65	4375.01	2906.43	0.18
Reach 1	34186	1%_P	7369.00	257.00	273.96		274.04	0.000254	3.59	5145.88	2934.75	0.17
Reach 1	34186	0.2%_P	8663.00	257.00	274.65		274.73	0.000238	3.60	5997.83	2965.47	0.17
Reach 1	33408	10%_E	4593.00	256.50	270.45		270.62	0.000364	3.93	2404.54	1809.27	0.20
Reach 1	33408	2%_E	7386.00	256.50	272.51		272.73	0.000433	4.78	4590.32	2121.06	0.23
Reach 1	33408	1%_E	8501.00	256.50	273.27		273.41	0.000312	4.21	6205.39	2128.36	0.20
Reach 1	33408	0.2%_E	9994.00	256.50	274.11		274.21	0.000236	3.80	8006.75	2138.28	0.17
Reach 1	33408	10%_P	5052.00	256.50	270.80		270.97	0.000363	4.00	2645.10	1943.76	0.21
Reach 1	33408	2%_P	8125.00	256.50	273.03		273.19	0.000343	4.36	5694.55	2125.82	0.21
Reach 1	33408	1%_P	9351.00	256.50	273.74		273.85	0.000267	3.98	7203.90	2133.88	0.18
Reach 1	33408	0.2%_P	10993.00	256.50	274.48		274.57	0.000225	3.78	8783.62	2144.12	0.17
Reach 1	33007	10%_E	4593.00	256.00	270.25		270.46	0.000465	4.37	1844.91	1437.45	0.23
Reach 1	33007	2%_E	7386.00	256.00	272.11		272.50	0.000700	5.93	2702.89	1732.25	0.29
Reach 1	33007	1%_E	8501.00	256.00	272.99		273.25	0.000516	5.31	4260.98	1815.22	0.25
Reach 1	33007	0.2%_E	9994.00	256.00	273.91		274.09	0.000383	4.77	5960.85	1834.84	0.22
Reach 1	33007	10%_P	5052.00	256.00	270.58		270.80	0.000482	4.53	1968.91	1463.43	0.23
Reach 1	33007	2%_P	8125.00	256.00	272.71		273.01	0.000570	5.51	3764.29	1801.72	0.26
Reach 1	33007	1%_P	9351.00	256.00	273.50		273.71	0.000442	5.04	5202.05	1832.49	0.23
Reach 1	33007	0.2%_P	10993.00	256.00	274.29		274.45	0.000363	4.73	6652.68	1836.98	0.21
Reach 1	32776	10%_E	4593.00	255.50	269.98	262.61	270.30	0.000691	4.51	1018.45	934.48	0.27
Reach 1	32776	2%_E	7386.00	255.50	271.69	264.89	272.26	0.000996	6.04	1231.70	1261.60	0.33
Reach 1	32776	1%_E	8501.00	255.50	272.47	265.66	273.01	0.000912	6.07	2161.68	1277.16	0.32
Reach 1	32776	0.2%_E	9994.00	255.50	273.51	266.57	273.91	0.000691	5.61	3459.48	1300.05	0.28
Reach 1	32776	10%_P	5052.00	255.50	270.27	263.00	270.63	0.000760	4.80	1052.20	1009.21	0.28
Reach 1	32776	2%_P	8125.00	255.50	272.19	265.41	272.76	0.000968	6.15	1812.03	1271.47	0.33
Reach 1	32776	1%_P	9351.00	255.50	273.04	266.20	273.50	0.000798	5.87	2866.01	1288.78	0.30
Reach 1	32776	0.2%_P	10993.00	255.50	273.90	267.15	274.28	0.000669	5.64	3945.19	1310.26	0.28
Reach 1	32700		Bridge									
Reach 1	32670	10%_E	4593.00	255.50	269.85		270.15	0.000571	4.45	1115.52	1018.90	0.25
Reach 1	32670	2%_E	7386.00	255.50	271.49		271.87	0.000673	5.36	2349.45	1221.59	0.28
Reach 1	32670	1%_E	8501.00	255.50	272.10		272.48	0.000669	5.53	2908.02	1258.54	0.28
Reach 1	32670	0.2%_E	9994.00	255.50	273.18		273.47	0.000523	5.17	4057.65	1328.82	0.25
Reach 1	32670	10%_P	5052.00	255.50	270.11		270.45	0.000626	4.74	1226.25	1040.25	0.26
Reach 1	32670	2%_P	8125.00	255.50	271.90		272.27	0.000656	5.42	2704.03	1247.26	0.28
Reach 1	32670	1%_P	9351.00	255.50	272.60		272.95	0.000622	5.48	3429.32	1316.51	0.27
Reach 1	32670	0.2%_P	10993.00	255.50	273.60		273.89	0.000505	5.19	4520.93	1331.77	0.25
Reach 1	32577	10%_E	4593.00	255.75	269.71		270.07	0.000742	5.12	1346.04	1111.67	0.29
Reach 1	32577	2%_E	7386.00	255.75	271.34		271.78	0.000843	6.05	2269.39	1239.53	0.32
Reach 1	32577	1%_E	8501.00	255.75	271.94		272.39	0.000850	6.28	2981.52	1270.60	0.32
Reach 1	32577	0.2%_E	9994.00	255.75	273.14		273.41	0.000555	5.41	4415.91	1281.34	0.26
Reach 1	32577	10%_P	5052.00	255.75	269.99		270.37	0.000776	5.34	1459.68	1118.75	0.30

Reach 1	32577	2%_P	8125.00	255.75	271.79		272.20	0.000796	6.03	2791.62	1266.02	0.31
Reach 1	32577	1%_P	9351.00	255.75	272.53		272.89	0.000705	5.91	3684.37	1275.97	0.29
Reach 1	32577	0.2%_P	10993.00	255.75	273.57		273.83	0.000523	5.36	4938.03	1285.15	0.26
Reach 1	32487	10%_E	4593.00	256.00	269.71	263.00	269.97	0.000475	4.61	1629.42	1342.46	0.23
Reach 1	32487	2%_E	7386.00	256.00	271.32	265.24	271.68	0.000622	5.74	2234.43	1368.01	0.27
Reach 1	32487	1%_E	8501.00	256.00	271.72	266.13	272.29	0.000871	6.93	2612.66	1374.50	0.33
Reach 1	32487	0.2%_E	9994.00	256.00	272.98	266.96	273.34	0.000599	6.08	3990.51	1400.31	0.27
Reach 1	32487	10%_P	5052.00	256.00	269.98	263.62	270.27	0.000508	4.84	1733.52	1346.63	0.24
Reach 1	32487	2%_P	8125.00	256.00	271.44	265.88	272.06	0.000935	7.08	2306.93	1369.88	0.34
Reach 1	32487	1%_P	9351.00	256.00	272.33	266.60	272.80	0.000743	6.58	3277.16	1389.53	0.30
Reach 1	32487	0.2%_P	10993.00	256.00	273.42	267.34	273.76	0.000570	6.04	4492.14	1406.55	0.27
Reach 1	32480		Bridge									
Reach 1	32355	10%_E	4593.00	256.00	269.44		269.75	0.000547	4.88	1476.84	1307.08	0.25
Reach 1	32355	2%_E	7386.00	256.00	270.65		271.14	0.000846	6.47	1900.42	1315.43	0.32
Reach 1	32355	1%_E	8501.00	256.00	271.09		271.65	0.000939	6.97	2056.03	1319.08	0.33
Reach 1	32355	0.2%_E	9994.00	256.00	271.63	266.94	272.54	0.001351	8.58	2259.53	1324.21	0.40
Reach 1	32355	10%_P	5052.00	256.00	269.66		270.00	0.000601	5.18	1554.00	1308.40	0.26
Reach 1	32355	2%_P	8125.00	256.00	270.94		271.48	0.000908	6.81	2004.77	1317.95	0.33
Reach 1	32355	1%_P	9351.00	256.00	271.41		272.01	0.001003	7.32	2168.51	1321.96	0.35
Reach 1	32355	0.2%_P	10993.00	256.00	272.02		272.91	0.001326	8.66	2625.38	1327.72	0.40
Reach 1	31818	10%_E	4593.00	255.90	268.64		269.23	0.001355	7.76	1342.75	504.73	0.41
Reach 1	31818	2%_E	7386.00	255.90	269.86		270.50	0.001565	8.93	1958.10	510.75	0.45
Reach 1	31818	1%_E	8501.00	255.90	270.39		271.00	0.001516	9.04	2229.15	514.12	0.44
Reach 1	31818	0.2%_E	9994.00	255.90	271.02		271.62	0.001488	9.24	2557.41	522.15	0.44
Reach 1	31818	10%_P	5052.00	255.90	268.84		269.45	0.001429	8.06	1440.68	505.65	0.42
Reach 1	31818	2%_P	8125.00	255.90	270.21		270.83	0.001529	9.00	2140.95	512.76	0.44
Reach 1	31818	1%_P	9351.00	255.90	270.76		271.36	0.001496	9.15	2419.77	518.13	0.44
Reach 1	31818	0.2%_P	10993.00	255.90	271.40		272.01	0.001498	9.45	2760.42	547.20	0.45
Reach 1	31339	10%_E	4593.00	255.80	268.26		268.67	0.000879	6.09	1221.70	291.79	0.36
Reach 1	31339	2%_E	7386.00	255.80	269.02		269.76	0.001505	8.41	1437.12	358.76	0.48
Reach 1	31339	1%_E	8501.00	255.80	269.41		270.24	0.001635	9.00	1577.11	467.96	0.50
Reach 1	31339	0.2%_E	9994.00	255.80	269.91		270.83	0.001763	9.66	1770.96	479.20	0.52
Reach 1	31339	10%_P	5052.00	255.80	268.38		268.85	0.000992	6.53	1255.98	292.48	0.38
Reach 1	31339	2%_P	8125.00	255.80	269.28		270.08	0.001596	8.82	1527.00	464.84	0.49
Reach 1	31339	1%_P	9351.00	255.80	269.70		270.58	0.001713	9.39	1688.45	474.77	0.51
Reach 1	31339	0.2%_P	10993.00	255.80	270.23		271.21	0.001829	10.03	1896.01	484.28	0.54
Reach 1	31014	10%_E	4593.00	255.70	267.86		268.19	0.000636	5.43	1660.78	644.30	0.31
Reach 1	31014	2%_E	7386.00	255.70	268.11		268.82	0.001388	8.17	1821.35	645.16	0.46
Reach 1	31014	1%_E	8501.00	255.70	268.38		269.17	0.001538	8.75	1995.93	646.05	0.49
Reach 1	31014	0.2%_E	9994.00	255.70	268.77		269.62	0.001656	9.32	2249.00	647.21	0.51
Reach 1	31014	10%_P	5052.00	255.70	267.91		268.29	0.000742	5.89	1694.64	644.48	0.34

Reach 1	31014	2%_P	8125.00	255.70	268.28		269.05	0.001494	8.57	1935.28	645.77	0.48
Reach 1	31014	1%_P	9351.00	255.70	268.60		269.43	0.001616	9.10	2137.31	646.70	0.50
Reach 1	31014	0.2%_P	10993.00	255.70	269.05		269.92	0.001689	9.58	2430.21	648.03	0.52
Reach 1	29961	10%_E	4593.00	255.50	265.30	263.50	266.81	0.003667	10.60	861.88	1135.36	0.64
Reach 1	29961	2%_E	7386.00	255.50	266.80	266.47	267.40	0.001888	8.47	2213.07	1196.41	0.47
Reach 1	29961	1%_E	8501.00	255.50	267.30	266.67	267.77	0.001569	7.97	2673.58	1197.80	0.43
Reach 1	29961	0.2%_E	9994.00	255.50	267.90	266.89	268.28	0.001316	7.57	3226.57	1199.59	0.40
Reach 1	29961	10%_P	5052.00	255.50	265.55	264.03	266.87	0.003373	10.36	1075.09	1141.42	0.61
Reach 1	29961	2%_P	8125.00	255.50	267.13	266.59	267.64	0.001668	8.13	2518.26	1197.34	0.44
Reach 1	29961	1%_P	9351.00	255.50	267.64	266.79	268.06	0.001418	7.74	2988.35	1198.82	0.41
Reach 1	29961	0.2%_P	10993.00	255.50	268.30	267.04	268.64	0.001180	7.34	3592.87	1200.79	0.38

Plan: Alternative #1-2

Flows: Current and Projected Future

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
Reach 1	37228	10%_E	3619.00	269.80	275.47	275.47	277.80	0.010906	13.84	352.68	80.15	1.03
Reach 1	37228	2%_E	5820.00	269.80	277.94	277.94	280.02	0.006627	13.77	715.86	270.72	0.85
Reach 1	37228	1%_E	6699.00	269.80	278.58	278.58	280.59	0.006065	13.86	854.07	341.53	0.83
Reach 1	37228	0.2%_E	7875.00	269.80	279.11	279.11	281.25	0.006193	14.57	973.13	354.41	0.84
Reach 1	37228	10%_P	3981.00	269.80	275.77	275.77	278.26	0.010928	14.35	377.13	83.86	1.04
Reach 1	37228	2%_P	6402.00	269.80	278.43	278.43	280.41	0.006057	13.69	820.44	333.20	0.82
Reach 1	37228	1%_P	7369.00	269.80	278.91	278.91	280.97	0.006090	14.23	926.52	350.60	0.83
Reach 1	37228	0.2%_P	8663.00	269.80	279.43	279.43	281.66	0.006325	15.06	1044.12	359.03	0.86
Reach 1	36812	10%_E	3619.00	264.00	273.45	269.92	274.16	0.001539	7.09	604.18	151.08	0.42
Reach 1	36812	2%_E	5820.00	264.00	275.71	271.74	276.85	0.001837	9.01	850.97	189.40	0.48
Reach 1	36812	1%_E	6699.00	264.00	276.69	272.39	277.82	0.001701	9.17	997.47	211.83	0.46
Reach 1	36812	0.2%_E	7875.00	264.00	277.94	273.10	279.07	0.001544	9.33	1184.93	288.37	0.45
Reach 1	36812	10%_P	3981.00	264.00	273.87	270.26	274.64	0.001579	7.41	640.45	156.90	0.43
Reach 1	36812	2%_P	6402.00	264.00	276.35	272.18	277.49	0.001751	9.14	947.23	202.65	0.47
Reach 1	36812	1%_P	7369.00	264.00	277.40	272.83	278.54	0.001611	9.27	1104.58	262.76	0.46
Reach 1	36812	0.2%_P	8663.00	264.00	278.75	273.63	279.88	0.001451	9.41	1307.22	298.57	0.44
Reach 1	36700		Bridge									
Reach 1	36471	10%_E	3619.00	263.50	272.50		272.87	0.000907	5.09	844.90	263.23	0.32
Reach 1	36471	2%_E	5820.00	263.50	274.42		274.97	0.001027	6.25	1153.08	316.36	0.35
Reach 1	36471	1%_E	6699.00	263.50	275.04		275.65	0.001081	6.67	1252.06	326.57	0.36
Reach 1	36471	0.2%_E	7875.00	263.50	275.74		276.45	0.001172	7.25	1362.96	339.27	0.38
Reach 1	36471	10%_P	3981.00	263.50	272.85		273.25	0.000932	5.31	900.72	265.74	0.32
Reach 1	36471	2%_P	6402.00	263.50	274.80		275.40	0.001077	6.56	1213.81	322.31	0.36
Reach 1	36471	1%_P	7369.00	263.50	275.46		276.13	0.001127	6.99	1319.25	335.04	0.37
Reach 1	36471	0.2%_P	8663.00	263.50	276.18		276.96	0.001224	7.60	1434.16	372.98	0.39

Reach 1	36217	10%_E	3619.00	262.50	272.12		272.59	0.001327	6.25	926.98	428.45	0.37
Reach 1	36217	2%_E	5820.00	262.50	274.16		274.67	0.001240	6.95	1488.66	465.20	0.38
Reach 1	36217	1%_E	6699.00	262.50	274.82		275.33	0.001204	7.13	1676.39	470.02	0.37
Reach 1	36217	0.2%_E	7875.00	262.50	275.55		276.09	0.001211	7.46	1886.05	487.45	0.38
Reach 1	36217	10%_P	3981.00	262.50	272.49		272.97	0.001306	6.37	1023.24	434.75	0.37
Reach 1	36217	2%_P	6402.00	262.50	274.56		275.08	0.001239	7.12	1602.45	468.00	0.38
Reach 1	36217	1%_P	7369.00	262.50	275.26		275.79	0.001198	7.30	1803.66	474.38	0.38
Reach 1	36217	0.2%_P	8663.00	262.50	276.02		276.58	0.001211	7.65	2022.30	547.85	0.38
Reach 1	35831	10%_E	3619.00	261.00	271.99		272.23	0.000481	3.89	969.13	207.15	0.23
Reach 1	35831	2%_E	5820.00	261.00	273.93		274.30	0.000608	4.99	1324.44	297.44	0.27
Reach 1	35831	1%_E	6699.00	261.00	274.54		274.97	0.000653	5.36	1447.41	330.55	0.28
Reach 1	35831	0.2%_E	7875.00	261.00	275.22		275.72	0.000724	5.86	1582.78	420.12	0.30
Reach 1	35831	10%_P	3981.00	261.00	272.35		272.60	0.000508	4.10	1028.42	223.73	0.24
Reach 1	35831	2%_P	6402.00	261.00	274.29		274.71	0.000649	5.26	1397.73	316.18	0.28
Reach 1	35831	1%_P	7369.00	261.00	274.96		275.42	0.000689	5.64	1530.25	370.26	0.29
Reach 1	35831	0.2%_P	8663.00	261.00	275.66		276.21	0.000764	6.17	1671.76	751.27	0.31
Reach 1	35516	10%_E	3619.00	259.70	271.95		272.04	0.000454	2.53	1614.99	241.11	0.14
Reach 1	35516	2%_E	5820.00	259.70	273.90		274.04	0.000577	3.21	2073.60	936.97	0.16
Reach 1	35516	1%_E	6699.00	259.70	274.53		274.69	0.000624	3.45	2223.24	1055.34	0.17
Reach 1	35516	0.2%_E	7875.00	259.70	275.21		275.40	0.000700	3.79	2388.59	1177.31	0.18
Reach 1	35516	10%_P	3981.00	259.70	272.30		272.40	0.000478	2.66	1696.53	246.27	0.14
Reach 1	35516	2%_P	6402.00	259.70	274.28		274.43	0.000618	3.39	2162.69	1011.49	0.17
Reach 1	35516	1%_P	7369.00	259.70	274.95		275.13	0.000663	3.64	2324.24	1118.59	0.18
Reach 1	35516	0.2%_P	8663.00	259.70	275.66		275.87	0.000747	4.00	2506.85	1291.61	0.19
Reach 1	35344	10%_E	3619.00	259.90	271.85	264.05	271.97	0.000218	2.94	1397.22	505.11	0.16
Reach 1	35344	2%_E	5820.00	259.90	273.73	265.57	273.95	0.000304	3.88	1742.69	1026.72	0.20
Reach 1	35344	1%_E	6699.00	259.90	274.33	266.08	274.58	0.000338	4.22	1851.48	1246.57	0.21
Reach 1	35344	0.2%_E	7875.00	259.90	274.97	266.74	275.28	0.000391	4.69	1968.14	1618.82	0.22
Reach 1	35344	10%_P	3981.00	259.90	272.19	264.33	272.33	0.000234	3.11	1460.10	605.05	0.17
Reach 1	35344	2%_P	6402.00	259.90	274.08	265.92	274.33	0.000332	4.13	1806.87	1134.75	0.20
Reach 1	35344	1%_P	7369.00	259.90	274.72	266.48	275.01	0.000366	4.48	1923.54	1425.47	0.22
Reach 1	35344	0.2%_P	8663.00	259.90	275.38	267.12	275.73	0.000423	4.98	2044.29	1823.37	0.24
Reach 1	35300		Bridge									
Reach 1	35133	10%_E	3619.00	259.00	271.72		271.87	0.000228	3.13	1198.06	1055.64	0.16
Reach 1	35133	2%_E	5820.00	259.00	273.48		273.76	0.000355	4.30	1461.19	1799.52	0.21
Reach 1	35133	1%_E	6699.00	259.00	274.01		274.35	0.000407	4.73	1541.69	1936.32	0.23
Reach 1	35133	0.2%_E	7875.00	259.00	274.55		274.98	0.000489	5.32	1623.75	1998.58	0.25
Reach 1	35133	10%_P	3981.00	259.00	272.05		272.22	0.000250	3.34	1246.30	1311.64	0.17
Reach 1	35133	2%_P	6402.00	259.00	273.79		274.11	0.000395	4.60	1507.70	1888.92	0.22
Reach 1	35133	1%_P	7369.00	259.00	274.35		274.74	0.000451	5.06	1593.49	1977.53	0.24
Reach 1	35133	0.2%_P	8663.00	259.00	274.84		275.33	0.000550	5.71	1667.95	2011.60	0.26

Reach 1	34865	10%_E	3619.00	258.40	271.08	265.50	271.64	0.001054	6.32	916.92	1557.05	0.33
Reach 1	34865	2%_E	5820.00	258.40	273.10	267.82	273.56	0.000907	6.54	1773.92	2276.11	0.32
Reach 1	34865	1%_E	6699.00	258.40	273.71	268.98	274.16	0.000886	6.66	2034.18	2360.65	0.31
Reach 1	34865	0.2%_E	7875.00	258.40	274.32	271.82	274.79	0.000921	6.99	2293.73	2395.49	0.32
Reach 1	34865	10%_P	3981.00	258.40	271.43	265.93	271.98	0.001051	6.44	1064.98	1772.40	0.33
Reach 1	34865	2%_P	6402.00	258.40	273.44	268.49	273.91	0.000925	6.72	1918.42	2325.64	0.32
Reach 1	34865	1%_P	7369.00	258.40	274.10	271.60	274.55	0.000892	6.81	2199.65	2392.66	0.32
Reach 1	34865	0.2%_P	8663.00	258.40	274.65	272.13	275.14	0.000963	7.25	2433.89	2399.71	0.33
Reach 1	34186	10%_E	3619.00	257.00	270.99		271.12	0.000365	3.63	2171.14	2349.42	0.20
Reach 1	34186	2%_E	5820.00	257.00	273.05		273.14	0.000277	3.58	4031.90	2902.12	0.18
Reach 1	34186	1%_E	6699.00	257.00	273.68		273.77	0.000247	3.49	4812.23	2912.70	0.17
Reach 1	34186	0.2%_E	7875.00	257.00	274.31		274.39	0.000237	3.53	5584.75	2952.41	0.17
Reach 1	34186	10%_P	3981.00	257.00	271.33		271.46	0.000372	3.75	2383.69	2584.25	0.20
Reach 1	34186	2%_P	6402.00	257.00	273.40		273.49	0.000269	3.58	4464.04	2907.67	0.18
Reach 1	34186	1%_P	7369.00	257.00	274.09		274.16	0.000236	3.48	5305.18	2941.95	0.17
Reach 1	34186	0.2%_P	8663.00	257.00	274.65		274.73	0.000238	3.59	6001.45	2965.59	0.17
Reach 1	33408	10%_E	4593.00	256.50	270.73		270.87	0.000313	3.70	2591.87	1918.25	0.19
Reach 1	33408	2%_E	7386.00	256.50	272.72		272.90	0.000363	4.42	5042.60	2123.01	0.21
Reach 1	33408	1%_E	8501.00	256.50	273.46		273.58	0.000271	3.95	6606.60	2131.17	0.18
Reach 1	33408	0.2%_E	9994.00	256.50	274.13		274.22	0.000233	3.78	8039.77	2138.46	0.17
Reach 1	33408	10%_P	5052.00	256.50	271.07		271.21	0.000315	3.78	2831.39	2010.59	0.19
Reach 1	33408	2%_P	8125.00	256.50	273.13		273.27	0.000318	4.22	5900.76	2126.71	0.20
Reach 1	33408	1%_P	9351.00	256.50	273.89		273.99	0.000240	3.80	7534.27	2135.65	0.17
Reach 1	33408	0.2%_P	10993.00	256.50	274.48		274.57	0.000225	3.77	8790.89	2144.16	0.17
Reach 1	33007	10%_E	4593.00	256.00	270.54		270.73	0.000405	4.14	1954.54	1460.75	0.21
Reach 1	33007	2%_E	7386.00	256.00	272.40		272.71	0.000583	5.49	3200.63	1782.22	0.26
Reach 1	33007	1%_E	8501.00	256.00	273.22		273.44	0.000439	4.95	4690.04	1826.66	0.23
Reach 1	33007	0.2%_E	9994.00	256.00	273.93		274.11	0.000378	4.75	5994.00	1834.94	0.22
Reach 1	33007	10%_P	5052.00	256.00	270.87		271.07	0.000423	4.31	2076.45	1500.78	0.22
Reach 1	33007	2%_P	8125.00	256.00	272.84		273.11	0.000522	5.31	3993.15	1806.78	0.25
Reach 1	33007	1%_P	9351.00	256.00	273.69		273.87	0.000390	4.77	5543.67	1833.55	0.22
Reach 1	33007	0.2%_P	10993.00	256.00	274.30		274.46	0.000362	4.72	6659.86	1837.00	0.21
Reach 1	32776	10%_E	4593.00	255.50	270.29	262.61	270.58	0.000623	4.36	1054.66	1017.28	0.26
Reach 1	32776	2%_E	7386.00	255.50	271.97	264.89	272.49	0.000894	5.82	1529.94	1266.94	0.32
Reach 1	32776	1%_E	8501.00	255.50	272.79	265.66	273.24	0.000761	5.65	2557.83	1283.58	0.30
Reach 1	32776	0.2%_E	9994.00	255.50	273.53	266.57	273.93	0.000682	5.58	3489.69	1300.66	0.28
Reach 1	32776	10%_P	5052.00	255.50	270.57	263.00	270.90	0.000688	4.64	1088.59	1117.16	0.27
Reach 1	32776	2%_P	8125.00	255.50	272.35	265.41	272.87	0.000891	5.95	2007.65	1274.66	0.32
Reach 1	32776	1%_P	9351.00	255.50	273.29	266.20	273.69	0.000688	5.53	3182.88	1294.49	0.28
Reach 1	32776	0.2%_P	10993.00	255.50	273.90	267.15	274.28	0.000667	5.63	3951.73	1310.39	0.28
Reach 1	32700		Bridge									

Reach 1	32670	10%_E	4593.00	255.50	270.24		270.51	0.000490	4.23	1326.05	1047.93	0.23
Reach 1	32670	2%_E	7386.00	255.50	271.99		272.29	0.000537	4.92	2792.90	1251.95	0.25
Reach 1	32670	1%_E	8501.00	255.50	272.78		273.05	0.000470	4.81	3626.45	1326.54	0.24
Reach 1	32670	0.2%_E	9994.00	255.50	273.50		273.75	0.000440	4.82	4410.74	1331.07	0.23
Reach 1	32670	10%_P	5052.00	255.50	270.52		270.81	0.000518	4.43	1553.92	1066.65	0.24
Reach 1	32670	2%_P	8125.00	255.50	272.36		272.66	0.000534	5.01	3173.75	1292.42	0.25
Reach 1	32670	1%_P	9351.00	255.50	273.26		273.51	0.000437	4.75	4152.30	1329.42	0.23
Reach 1	32670	0.2%_P	10993.00	255.50	273.86		274.11	0.000443	4.92	4800.84	1333.55	0.23
Reach 1	32577	10%_E	4593.00	255.75	270.16		270.45	0.000590	4.70	1527.00	1123.85	0.26
Reach 1	32577	2%_E	7386.00	255.75	271.86		272.22	0.000676	5.58	2885.47	1269.85	0.28
Reach 1	32577	1%_E	8501.00	255.75	272.74		273.00	0.000511	5.09	3935.76	1277.82	0.25
Reach 1	32577	0.2%_E	9994.00	255.75	273.47		273.70	0.000457	4.99	4820.06	1284.30	0.24
Reach 1	32577	10%_P	5052.00	255.75	270.44		270.75	0.000618	4.90	1643.45	1151.44	0.27
Reach 1	32577	2%_P	8125.00	255.75	272.28		272.61	0.000623	5.48	3387.34	1273.76	0.27
Reach 1	32577	1%_P	9351.00	255.75	273.23		273.46	0.000459	4.94	4530.51	1282.18	0.24
Reach 1	32577	0.2%_P	10993.00	255.75	273.84		274.05	0.000452	5.05	5256.76	1287.43	0.24
Reach 1	32487	10%_E	4593.00	256.00	270.15	263.00	270.37	0.000390	4.28	1795.74	1349.13	0.21
Reach 1	32487	2%_E	7386.00	256.00	271.70	265.24	272.13	0.000665	6.05	2590.81	1374.07	0.28
Reach 1	32487	1%_E	8501.00	256.00	272.61	266.13	272.93	0.000525	5.60	3582.66	1395.19	0.25
Reach 1	32487	0.2%_E	9994.00	256.00	273.35	266.96	273.64	0.000490	5.58	4410.14	1405.53	0.25
Reach 1	32487	10%_P	5052.00	256.00	270.43	263.62	270.67	0.000418	4.50	1901.78	1353.45	0.22
Reach 1	32487	2%_P	8125.00	256.00	272.13	265.88	272.53	0.000629	6.00	3057.54	1383.19	0.28
Reach 1	32487	1%_P	9351.00	256.00	273.11	266.60	273.40	0.000488	5.52	4139.15	1402.16	0.25
Reach 1	32487	0.2%_P	10993.00	256.00	273.71	267.34	273.99	0.000490	5.67	4820.38	1411.16	0.25
Reach 1	32480		Bridge									
Reach 1	32355	10%_E	4593.00	256.00	269.90		270.16	0.000448	4.53	1638.14	1309.84	0.23
Reach 1	32355	2%_E	7386.00	256.00	271.30		271.69	0.000654	5.88	2128.70	1320.68	0.28
Reach 1	32355	1%_E	8501.00	256.00	271.76		272.37	0.000912	7.10	2381.99	1325.34	0.33
Reach 1	32355	0.2%_E	9994.00	256.00	272.58		273.11	0.000821	6.99	3134.73	1335.24	0.32
Reach 1	32355	10%_P	5052.00	256.00	270.13		270.42	0.000490	4.80	1719.76	1311.23	0.24
Reach 1	32355	2%_P	8125.00	256.00	271.55		271.99	0.000717	6.23	2218.61	1323.54	0.29
Reach 1	32355	1%_P	9351.00	256.00	272.23		272.80	0.000862	7.05	2812.47	1329.92	0.33
Reach 1	32355	0.2%_P	10993.00	256.00	273.12		273.61	0.000767	6.92	3659.15	1351.82	0.31
Reach 1	31818	10%_E	4593.00	255.90	268.94		269.63	0.001421	8.20	1394.25	506.13	0.42
Reach 1	31818	2%_E	7386.00	255.90	270.59		271.16	0.001270	8.47	2237.44	515.99	0.41
Reach 1	31818	1%_E	8501.00	255.90	271.24		271.77	0.001193	8.48	2576.28	530.57	0.40
Reach 1	31818	0.2%_E	9994.00	255.90	272.09		272.58	0.001111	8.51	3041.64	564.06	0.39
Reach 1	31818	10%_P	5052.00	255.90	269.17		269.87	0.001465	8.44	1508.93	507.20	0.43
Reach 1	31818	2%_P	8125.00	255.90	271.03		271.57	0.001210	8.45	2464.25	522.36	0.40
Reach 1	31818	1%_P	9351.00	255.90	271.72		272.23	0.001165	8.57	2835.00	557.28	0.40
Reach 1	31818	0.2%_P	10993.00	255.90	272.66		273.11	0.001025	8.38	3366.90	570.77	0.38

Reach 1	31339	10%_E	4593.00	255.80	268.42		269.01	0.001117	6.95	1140.10	292.68	0.41
Reach 1	31339	2%_E	7386.00	255.80	269.53		270.45	0.001627	9.05	1496.39	470.63	0.50
Reach 1	31339	1%_E	8501.00	255.80	270.17		271.09	0.001570	9.26	1747.18	483.22	0.50
Reach 1	31339	0.2%_E	9994.00	255.80	271.07	268.86	271.95	0.001440	9.35	2096.34	552.85	0.48
Reach 1	31339	10%_P	5052.00	255.80	268.55		269.22	0.001261	7.45	1175.55	293.39	0.43
Reach 1	31339	2%_P	8125.00	255.80	269.95		270.88	0.001596	9.21	1661.43	479.82	0.50
Reach 1	31339	1%_P	9351.00	255.80	270.68	268.64	271.58	0.001500	9.33	1944.38	513.68	0.49
Reach 1	31339	0.2%_P	10993.00	255.80	271.68	269.32	272.53	0.001340	9.33	2337.36	612.07	0.47
Reach 1	31014	10%_E	4593.00	255.70	267.95		268.50	0.000884	6.45	1117.69	258.76	0.37
Reach 1	31014	2%_E	7386.00	255.70	268.04		269.40	0.002198	10.22	1139.33	259.48	0.58
Reach 1	31014	1%_E	8501.00	255.70	268.14		269.88	0.002767	11.56	1167.63	260.43	0.65
Reach 1	31014	0.2%_E	9994.00	255.70	268.25	267.94	270.55	0.003639	13.35	1195.64	261.55	0.75
Reach 1	31014	10%_P	5052.00	255.70	267.97		268.63	0.001058	7.06	1123.62	258.96	0.40
Reach 1	31014	2%_P	8125.00	255.70	268.11		269.71	0.002566	11.10	1159.24	260.15	0.63
Reach 1	31014	1%_P	9351.00	255.70	268.22	267.68	270.25	0.003238	12.56	1186.45	261.13	0.71
Reach 1	31014	0.2%_P	10993.00	255.70	268.30	268.30	271.03	0.004310	14.58	1207.91	262.11	0.82
Reach 1	29961	10%_E	4593.00	255.50	265.30	263.50	266.81	0.003667	10.60	861.88	1135.36	0.64
Reach 1	29961	2%_E	7386.00	255.50	266.80	266.47	267.40	0.001888	8.47	2213.07	1196.41	0.47
Reach 1	29961	1%_E	8501.00	255.50	267.30	266.67	267.77	0.001569	7.97	2673.58	1197.80	0.43
Reach 1	29961	0.2%_E	9994.00	255.50	267.90	266.89	268.28	0.001316	7.57	3226.57	1199.59	0.40
Reach 1	29961	10%_P	5052.00	255.50	265.55	264.03	266.87	0.003373	10.36	1075.09	1141.42	0.61
Reach 1	29961	2%_P	8125.00	255.50	267.13	266.59	267.64	0.001668	8.13	2518.26	1197.34	0.44
Reach 1	29961	1%_P	9351.00	255.50	267.64	266.79	268.06	0.001418	7.74	2988.35	1198.82	0.41
Reach 1	29961	0.2%_P	10993.00	255.50	268.30	267.04	268.64	0.001180	7.34	3592.87	1200.79	0.38

Plan: Alternative #1-3

Flows: Current and Projected Future

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
Reach 1	37228	Bankfull	1290.00	269.80	273.02	273.02	274.27	0.011695	9.77	169.38	69.82	0.97
Reach 1	37228	10%_E	3619.00	269.80	275.47	275.47	277.80	0.010906	13.84	352.68	80.15	1.03
Reach 1	37228	2%_E	5820.00	269.80	277.94	277.94	280.02	0.006627	13.77	715.86	270.72	0.85
Reach 1	37228	1%_E	6699.00	269.80	278.58	278.58	280.59	0.006065	13.86	854.07	341.53	0.83
Reach 1	37228	0.2%_E	7875.00	269.80	279.11	279.11	281.25	0.006193	14.57	973.13	354.41	0.84
Reach 1	37228	10%_P	3981.00	269.80	275.77	275.77	278.26	0.010928	14.35	377.13	83.86	1.04
Reach 1	37228	2%_P	6402.00	269.80	278.43	278.43	280.41	0.006057	13.69	820.44	333.20	0.82
Reach 1	37228	1%_P	7369.00	269.80	278.91	278.91	280.97	0.006090	14.23	926.52	350.60	0.83
Reach 1	37228	0.2%_P	8663.00	269.80	279.43	279.43	281.66	0.006325	15.06	1044.12	359.03	0.86
Reach 1	36812	Bankfull	1290.00	264.00	269.47	267.26	269.83	0.001629	4.92	287.68	79.50	0.39
Reach 1	36812	10%_E	3619.00	264.00	273.46	269.92	274.17	0.001534	7.09	604.94	151.22	0.42
Reach 1	36812	2%_E	5820.00	264.00	275.73	271.74	276.86	0.001827	9.00	853.13	189.68	0.47
Reach 1	36812	1%_E	6699.00	264.00	276.70	272.39	277.83	0.001697	9.16	998.55	212.01	0.46
Reach 1	36812	0.2%_E	7875.00	264.00	277.94	273.10	279.07	0.001544	9.33	1184.96	288.38	0.45

Reach 1	36812	10%_P	3981.00	264.00	273.88	270.26	274.65	0.001572	7.40	641.45	157.05	0.43
Reach 1	36812	2%_P	6402.00	264.00	276.37	272.18	277.51	0.001739	9.11	950.13	203.13	0.47
Reach 1	36812	1%_P	7369.00	264.00	277.41	272.83	278.54	0.001610	9.27	1104.91	262.79	0.46
Reach 1	36812	0.2%_P	8663.00	264.00	278.75	273.63	279.87	0.001454	9.41	1306.39	298.52	0.44
Reach 1	36700		Bridge									
Reach 1	36471	Bankfull	1290.00	263.50	268.65		268.87	0.001136	3.71	348.51	84.09	0.32
Reach 1	36471	10%_E	3619.00	263.50	272.52		272.89	0.000899	5.08	847.80	263.36	0.31
Reach 1	36471	2%_E	5820.00	263.50	274.46		275.00	0.001012	6.22	1159.58	316.83	0.35
Reach 1	36471	1%_E	6699.00	263.50	275.08		275.68	0.001067	6.64	1257.56	327.27	0.36
Reach 1	36471	0.2%_E	7875.00	263.50	275.79		276.50	0.001149	7.20	1372.43	340.19	0.38
Reach 1	36471	10%_P	3981.00	263.50	272.87		273.27	0.000922	5.29	904.69	265.92	0.32
Reach 1	36471	2%_P	6402.00	263.50	274.88		275.46	0.001047	6.50	1226.10	323.54	0.35
Reach 1	36471	1%_P	7369.00	263.50	275.48		276.15	0.001119	6.97	1322.55	335.35	0.37
Reach 1	36471	0.2%_P	8663.00	263.50	276.22		276.99	0.001208	7.56	1440.70	379.30	0.39
Reach 1	36217	Bankfull	1290.00	262.50	267.86		268.40	0.002874	5.89	218.92	233.27	0.49
Reach 1	36217	10%_E	3619.00	262.50	272.15		272.61	0.001309	6.21	933.31	428.84	0.37
Reach 1	36217	2%_E	5820.00	262.50	274.21		274.71	0.001209	6.89	1502.93	465.55	0.37
Reach 1	36217	1%_E	6699.00	262.50	274.86		275.36	0.001182	7.08	1688.03	470.42	0.37
Reach 1	36217	0.2%_E	7875.00	262.50	275.62		276.14	0.001177	7.38	1905.83	489.79	0.37
Reach 1	36217	10%_P	3981.00	262.50	272.53		272.99	0.001284	6.33	1031.79	435.57	0.37
Reach 1	36217	2%_P	6402.00	262.50	274.65		275.15	0.001187	7.01	1628.68	468.70	0.37
Reach 1	36217	1%_P	7369.00	262.50	275.28		275.81	0.001185	7.27	1810.59	474.62	0.37
Reach 1	36217	0.2%_P	8663.00	262.50	276.07		276.61	0.001190	7.60	2035.75	555.89	0.38
Reach 1	35831	Bankfull	1290.00	261.00	267.87		267.97	0.000353	2.50	516.79	90.40	0.18
Reach 1	35831	10%_E	3619.00	261.00	272.02		272.25	0.000477	3.88	973.29	208.37	0.23
Reach 1	35831	2%_E	5820.00	261.00	273.98		274.35	0.000597	4.96	1334.87	299.69	0.27
Reach 1	35831	1%_E	6699.00	261.00	274.59		275.01	0.000644	5.34	1455.95	333.15	0.28
Reach 1	35831	0.2%_E	7875.00	261.00	275.29		275.79	0.000707	5.82	1597.85	430.14	0.29
Reach 1	35831	10%_P	3981.00	261.00	272.38		272.64	0.000501	4.08	1034.21	225.31	0.24
Reach 1	35831	2%_P	6402.00	261.00	274.39		274.80	0.000627	5.21	1417.29	321.44	0.27
Reach 1	35831	1%_P	7369.00	261.00	274.98		275.45	0.000684	5.62	1535.47	374.36	0.29
Reach 1	35831	0.2%_P	8663.00	261.00	275.71		276.25	0.000752	6.14	1682.12	788.42	0.31
Reach 1	35516	Bankfull	1290.00	259.70	267.79		267.83	0.000418	1.71	773.52	157.53	0.12
Reach 1	35516	10%_E	3619.00	259.70	271.97		272.06	0.000449	2.52	1620.95	241.54	0.14
Reach 1	35516	2%_E	5820.00	259.70	273.96		274.10	0.000567	3.19	2086.47	965.82	0.16
Reach 1	35516	1%_E	6699.00	259.70	274.57		274.73	0.000615	3.44	2233.72	1068.54	0.17
Reach 1	35516	0.2%_E	7875.00	259.70	275.29		275.48	0.000685	3.76	2407.35	1205.20	0.18
Reach 1	35516	10%_P	3981.00	259.70	272.34		272.44	0.000472	2.65	1704.56	246.77	0.14
Reach 1	35516	2%_P	6402.00	259.70	274.38		274.53	0.000598	3.36	2186.70	1024.74	0.17
Reach 1	35516	1%_P	7369.00	259.70	274.97		275.15	0.000658	3.63	2330.66	1122.65	0.18
Reach 1	35516	0.2%_P	8663.00	259.70	275.71		275.92	0.000736	3.98	2521.43	1315.74	0.19

Reach 1	35344	Bankfull	1290.00	259.90	267.74	262.04	267.79	0.000165	1.83	711.35	128.66	0.13
Reach 1	35344	10%_E	3619.00	259.90	271.87	264.05	272.00	0.000216	2.93	1402.11	510.86	0.16
Reach 1	35344	2%_E	5820.00	259.90	273.79	265.57	274.01	0.000299	3.86	1752.94	1035.13	0.19
Reach 1	35344	1%_E	6699.00	259.90	274.37	266.08	274.63	0.000334	4.20	1859.78	1264.88	0.21
Reach 1	35344	0.2%_E	7875.00	259.90	275.05	266.74	275.35	0.000383	4.66	1982.73	1692.76	0.22
Reach 1	35344	10%_P	3981.00	259.90	272.23	264.33	272.37	0.000231	3.10	1466.66	615.16	0.17
Reach 1	35344	2%_P	6402.00	259.90	274.19	265.92	274.43	0.000322	4.09	1825.95	1178.88	0.20
Reach 1	35344	1%_P	7369.00	259.90	274.75	266.48	275.04	0.000363	4.47	1928.61	1437.33	0.22
Reach 1	35344	0.2%_P	8663.00	259.90	275.44	267.12	275.78	0.000417	4.95	2054.28	1839.01	0.23
Reach 1	35300		Bridge									
Reach 1	35133	Bankfull	1290.00	259.00	267.70		267.75	0.000123	1.74	743.24	100.01	0.11
Reach 1	35133	10%_E	3619.00	259.00	271.75		271.90	0.000226	3.12	1202.11	1079.07	0.16
Reach 1	35133	2%_E	5820.00	259.00	273.54		273.82	0.000349	4.27	1469.97	1814.43	0.21
Reach 1	35133	1%_E	6699.00	259.00	274.06		274.40	0.000402	4.71	1548.89	1965.88	0.22
Reach 1	35133	0.2%_E	7875.00	259.00	274.63		275.05	0.000480	5.28	1635.03	2004.79	0.25
Reach 1	35133	10%_P	3981.00	259.00	272.08		272.25	0.000248	3.33	1251.76	1338.45	0.17
Reach 1	35133	2%_P	6402.00	259.00	273.90		274.21	0.000383	4.56	1524.20	1903.13	0.22
Reach 1	35133	1%_P	7369.00	259.00	274.38		274.77	0.000447	5.04	1597.93	1979.22	0.24
Reach 1	35133	0.2%_P	8663.00	259.00	274.89		275.38	0.000544	5.69	1675.34	2013.19	0.26
Reach 1	34865	Bankfull	1290.00	258.40	267.42	262.11	267.64	0.000612	3.71	349.16	298.62	0.24
Reach 1	34865	10%_E	3619.00	258.40	271.13	265.50	271.67	0.001027	6.26	936.63	1582.28	0.33
Reach 1	34865	2%_E	5820.00	258.40	273.18	267.82	273.63	0.000869	6.43	1809.59	2287.36	0.31
Reach 1	34865	1%_E	6699.00	258.40	273.77	268.98	274.21	0.000859	6.58	2061.87	2369.19	0.31
Reach 1	34865	0.2%_E	7875.00	258.40	274.42	271.82	274.87	0.000881	6.86	2335.59	2396.75	0.32
Reach 1	34865	10%_P	3981.00	258.40	271.49	265.93	272.03	0.001015	6.35	1091.58	1796.54	0.33
Reach 1	34865	2%_P	6402.00	258.40	273.59	268.49	274.03	0.000858	6.52	1983.54	2343.88	0.31
Reach 1	34865	1%_P	7369.00	258.40	274.14	271.60	274.59	0.000876	6.76	2216.30	2393.16	0.31
Reach 1	34865	0.2%_P	8663.00	258.40	274.71	272.13	275.19	0.000939	7.18	2458.01	2400.44	0.33
Reach 1	34186	Bankfull	1290.00	257.00	266.96		267.18	0.000741	3.72	353.26	132.37	0.26
Reach 1	34186	10%_E	3619.00	257.00	271.04		271.16	0.000353	3.59	2202.19	2376.88	0.20
Reach 1	34186	2%_E	5820.00	257.00	273.14		273.22	0.000262	3.49	4141.88	2903.47	0.17
Reach 1	34186	1%_E	6699.00	257.00	273.75		273.83	0.000237	3.43	4895.89	2914.90	0.17
Reach 1	34186	0.2%_E	7875.00	257.00	274.41		274.49	0.000224	3.45	5709.47	2956.02	0.16
Reach 1	34186	10%_P	3981.00	257.00	271.39		271.52	0.000362	3.71	2425.88	2678.93	0.20
Reach 1	34186	2%_P	6402.00	257.00	273.56		273.64	0.000243	3.44	4662.47	2910.43	0.17
Reach 1	34186	1%_P	7369.00	257.00	274.13		274.20	0.000230	3.45	5355.07	2946.06	0.17
Reach 1	34186	0.2%_P	8663.00	257.00	274.71		274.79	0.000231	3.55	6072.99	2967.81	0.17
Reach 1	33408	Bankfull	1580.00	256.50	266.66		266.79	0.000348	2.93	566.44	123.01	0.19
Reach 1	33408	10%_E	4593.00	256.50	270.79		270.93	0.000303	3.65	2633.19	1936.17	0.19
Reach 1	33408	2%_E	7386.00	256.50	272.85		273.01	0.000328	4.23	5307.59	2124.15	0.20
Reach 1	33408	1%_E	8501.00	256.50	273.54		273.65	0.000254	3.85	6783.82	2132.41	0.18
Reach 1	33408	0.2%_E	9994.00	256.50	274.25		274.33	0.000216	3.66	8289.99	2139.85	0.17

Reach 1	33408	10%_P	5052.00	256.50	271.14		271.28	0.000303	3.72	2883.83	2021.08	0.19
Reach 1	33408	2%_P	8125.00	256.50	273.33		273.45	0.000271	3.94	6339.54	2129.30	0.18
Reach 1	33408	1%_P	9351.00	256.50	273.94		274.04	0.000232	3.74	7636.01	2136.22	0.17
Reach 1	33408	0.2%_P	10993.00	256.50	274.55		274.63	0.000216	3.71	8932.71	2144.88	0.17
Reach 1	33007	Bankfull	1580.00	256.00	266.49		266.64	0.000400	3.10	638.05	267.59	0.20
Reach 1	33007	10%_E	4593.00	256.00	270.60		270.79	0.000393	4.10	1978.35	1467.97	0.21
Reach 1	33007	2%_E	7386.00	256.00	272.56		272.84	0.000524	5.24	3487.58	1794.99	0.25
Reach 1	33007	1%_E	8501.00	256.00	273.32		273.52	0.000415	4.84	4865.61	1831.29	0.22
Reach 1	33007	0.2%_E	9994.00	256.00	274.07		274.23	0.000346	4.57	6242.41	1835.71	0.21
Reach 1	33007	10%_P	5052.00	256.00	270.95		271.14	0.000408	4.26	2106.25	1512.23	0.22
Reach 1	33007	2%_P	8125.00	256.00	273.10		273.32	0.000437	4.91	4461.41	1821.13	0.23
Reach 1	33007	1%_P	9351.00	256.00	273.74		273.92	0.000375	4.69	5646.64	1833.87	0.21
Reach 1	33007	0.2%_P	10993.00	256.00	274.37		274.52	0.000346	4.63	6798.62	1837.43	0.21
Reach 1	32776	Bankfull	1580.00	255.50	266.44	259.20	266.54	0.000272	2.44	647.42	281.90	0.16
Reach 1	32776	10%_E	4593.00	255.50	270.35	262.61	270.64	0.000610	4.32	1062.61	1036.63	0.25
Reach 1	32776	2%_E	7386.00	255.50	272.14	264.89	272.63	0.000820	5.64	1752.41	1270.49	0.30
Reach 1	32776	1%_E	8501.00	255.50	272.92	265.66	273.34	0.000705	5.48	2721.91	1286.33	0.29
Reach 1	32776	0.2%_E	9994.00	255.50	273.71	266.57	274.06	0.000615	5.35	3711.61	1305.29	0.27
Reach 1	32776	10%_P	5052.00	255.50	270.65	263.00	270.98	0.000668	4.60	1098.78	1176.12	0.27
Reach 1	32776	2%_P	8125.00	255.50	272.69	265.41	273.12	0.000738	5.53	2427.98	1281.48	0.29
Reach 1	32776	1%_P	9351.00	255.50	273.36	266.20	273.74	0.000659	5.43	3275.22	1296.35	0.28
Reach 1	32776	0.2%_P	10993.00	255.50	274.00	267.15	274.36	0.000631	5.50	4075.73	1312.47	0.27
Reach 1	32700		Bridge									
Reach 1	32670	Bankfull	1580.00	255.50	266.41		266.51	0.000295	2.42	653.52	152.40	0.17
Reach 1	32670	10%_E	4593.00	255.50	270.23		270.50	0.000491	4.24	1322.21	1047.65	0.23
Reach 1	32670	2%_E	7386.00	255.50	271.92		272.24	0.000558	5.00	2724.70	1248.34	0.26
Reach 1	32670	1%_E	8501.00	255.50	272.61		272.91	0.000509	4.96	3448.34	1318.06	0.25
Reach 1	32670	0.2%_E	9994.00	255.50	273.46		273.71	0.000449	4.87	4366.24	1330.79	0.23
Reach 1	32670	10%_P	5052.00	255.50	270.52		270.81	0.000520	4.44	1549.55	1066.35	0.24
Reach 1	32670	2%_P	8125.00	255.50	272.39		272.69	0.000524	4.97	3210.09	1295.11	0.25
Reach 1	32670	1%_P	9351.00	255.50	273.07		273.35	0.000484	4.95	3944.10	1328.18	0.24
Reach 1	32670	0.2%_P	10993.00	255.50	273.75		274.01	0.000469	5.04	4678.60	1332.78	0.24
Reach 1	32577	Bankfull	1580.00	255.75	266.31		266.46	0.000460	3.05	520.99	285.93	0.21
Reach 1	32577	10%_E	4593.00	255.75	270.15		270.44	0.000591	4.71	1524.87	1123.69	0.26
Reach 1	32577	2%_E	7386.00	255.75	271.86		272.18	0.000629	5.38	2879.99	1269.80	0.27
Reach 1	32577	1%_E	8501.00	255.75	272.57		272.86	0.000570	5.32	3726.05	1276.27	0.26
Reach 1	32577	0.2%_E	9994.00	255.75	273.43		273.66	0.000468	5.04	4769.35	1283.93	0.24
Reach 1	32577	10%_P	5052.00	255.75	270.43		270.75	0.000620	4.91	1641.11	1150.65	0.27
Reach 1	32577	2%_P	8125.00	255.75	272.32		272.64	0.000608	5.42	3434.09	1274.13	0.27
Reach 1	32577	1%_P	9351.00	255.75	273.04		273.29	0.000517	5.19	4292.11	1280.43	0.25
Reach 1	32577	0.2%_P	10993.00	255.75	273.72		273.95	0.000481	5.18	5117.83	1286.43	0.25

Reach 1	32487	Bankfull	1580.00	256.00	266.30	259.65	266.40	0.000243	2.65	698.68	778.35	0.16
Reach 1	32487	10%_E	4593.00	256.00	270.14	263.00	270.37	0.000391	4.29	1793.78	1349.05	0.21
Reach 1	32487	2%_E	7386.00	256.00	271.65	265.24	272.10	0.000684	6.12	2537.52	1373.15	0.29
Reach 1	32487	1%_E	8501.00	256.00	272.42	266.13	272.78	0.000584	5.85	3374.84	1391.91	0.27
Reach 1	32487	0.2%_E	9994.00	256.00	273.30	266.96	273.60	0.000502	5.64	4358.26	1404.89	0.25
Reach 1	32487	10%_P	5052.00	256.00	270.43	263.62	270.67	0.000419	4.51	1899.63	1353.36	0.22
Reach 1	32487	2%_P	8125.00	256.00	272.17	265.88	272.56	0.000614	5.94	3104.37	1384.14	0.27
Reach 1	32487	1%_P	9351.00	256.00	272.89	266.60	273.22	0.000550	5.80	3893.26	1399.10	0.26
Reach 1	32487	0.2%_P	10993.00	256.00	273.58	267.34	273.89	0.000523	5.83	4678.27	1409.08	0.26
Reach 1	32480		Bridge									
Reach 1	32355	Bankfull	1580.00	256.00	266.26		266.36	0.000248	2.67	687.09	611.22	0.16
Reach 1	32355	10%_E	4593.00	256.00	269.90		270.15	0.000449	4.53	1636.23	1309.80	0.23
Reach 1	32355	2%_E	7386.00	256.00	271.25		271.65	0.000665	5.91	2113.73	1320.35	0.28
Reach 1	32355	1%_E	8501.00	256.00	271.64		272.30	0.000969	7.28	2274.64	1324.35	0.34
Reach 1	32355	0.2%_E	9994.00	256.00	272.34		272.95	0.000929	7.36	2915.71	1331.13	0.34
Reach 1	32355	10%_P	5052.00	256.00	270.13		270.41	0.000491	4.80	1717.65	1311.19	0.24
Reach 1	32355	2%_P	8125.00	256.00	271.59		272.02	0.000706	6.20	2233.02	1323.93	0.29
Reach 1	32355	1%_P	9351.00	256.00	272.05		272.68	0.000945	7.32	2651.73	1328.03	0.34
Reach 1	32355	0.2%_P	10993.00	256.00	272.74		273.35	0.000930	7.49	3290.65	1339.82	0.34
Reach 1	31818	Bankfull	1580.00	255.90	265.34		265.95	0.001371	6.29	260.41	285.67	0.39
Reach 1	31818	10%_E	4593.00	255.90	268.91		269.62	0.001453	8.28	1378.76	505.99	0.43
Reach 1	31818	2%_E	7386.00	255.90	270.50		271.10	0.001338	8.66	2190.39	515.04	0.42
Reach 1	31818	1%_E	8501.00	255.90	271.09		271.66	0.001285	8.73	2494.96	523.47	0.41
Reach 1	31818	0.2%_E	9994.00	255.90	271.77		272.35	0.001296	9.06	2864.62	558.37	0.42
Reach 1	31818	10%_P	5052.00	255.90	269.14		269.85	0.001499	8.52	1492.73	507.05	0.44
Reach 1	31818	2%_P	8125.00	255.90	270.90		271.47	0.001299	8.70	2395.52	520.32	0.42
Reach 1	31818	1%_P	9351.00	255.90	271.49		272.06	0.001302	8.96	2706.91	549.07	0.42
Reach 1	31818	0.2%_P	10993.00	255.90	272.17		272.75	0.001289	9.20	3091.23	565.30	0.42
Reach 1	31339	Bankfull	1580.00	255.80	264.90		265.29	0.001127	5.03	328.05	93.69	0.38
Reach 1	31339	10%_E	4593.00	255.80	268.38		268.98	0.001142	7.00	1129.04	292.46	0.41
Reach 1	31339	2%_E	7386.00	255.80	269.31		270.33	0.001815	9.42	1413.30	465.63	0.53
Reach 1	31339	1%_E	8501.00	255.80	269.80		270.88	0.001886	9.91	1600.63	477.28	0.54
Reach 1	31339	0.2%_E	9994.00	255.80	270.38	268.86	271.54	0.001966	10.50	1828.46	486.97	0.56
Reach 1	31339	10%_P	5052.00	255.80	268.50		269.19	0.001293	7.51	1163.01	293.14	0.44
Reach 1	31339	2%_P	8125.00	255.80	269.64		270.70	0.001866	9.76	1538.07	473.17	0.54
Reach 1	31339	1%_P	9351.00	255.80	270.14		271.27	0.001928	10.24	1735.53	482.72	0.55
Reach 1	31339	0.2%_P	10993.00	255.80	270.67	269.32	271.92	0.002080	10.99	1941.47	513.02	0.58
Reach 1	31014	Bankfull	1580.00	255.70	264.76		264.98	0.000539	3.84	464.08	98.57	0.27
Reach 1	31014	10%_E	4593.00	255.70	267.95		268.45	0.000846	6.30	1483.32	644.60	0.36
Reach 1	31014	2%_E	7386.00	255.70	268.07	266.50	269.27	0.002009	9.80	1564.14	645.03	0.56
Reach 1	31014	1%_E	8501.00	255.70	268.25	268.19	269.65	0.002352	10.74	1682.37	645.67	0.60
Reach 1	31014	0.2%_E	9994.00	255.70	268.55	266.80	270.13	0.002673	11.67	1874.17	646.56	0.65

Reach 1	31014	10%_P	5052.00	255.70	267.97	264.29	268.57	0.001004	6.88	1502.01	644.70	0.39
Reach 1	31014	2%_P	8125.00	255.70	268.19	266.58	269.53	0.002244	10.44	1640.88	645.45	0.59
Reach 1	31014	1%_P	9351.00	255.70	268.41	266.57	269.93	0.002561	11.32	1785.28	646.16	0.63
Reach 1	31014	0.2%_P	10993.00	255.70	268.85	268.85	270.42	0.002671	11.90	2067.69	647.45	0.65
Reach 1	29961	Bankfull	1580.00	255.50	263.80	259.43	264.20	0.001010	5.09	310.56	1117.74	0.33
Reach 1	29961	10%_E	4593.00	255.50	265.30	263.50	266.81	0.003667	10.60	861.88	1135.36	0.64
Reach 1	29961	2%_E	7386.00	255.50	266.80	266.47	267.40	0.001888	8.47	2213.07	1196.41	0.47
Reach 1	29961	1%_E	8501.00	255.50	267.30	266.67	267.77	0.001569	7.97	2673.58	1197.80	0.43
Reach 1	29961	0.2%_E	9994.00	255.50	267.90	266.89	268.28	0.001316	7.57	3226.57	1199.59	0.40
Reach 1	29961	10%_P	5052.00	255.50	265.55	264.03	266.87	0.003373	10.36	1075.09	1141.42	0.61
Reach 1	29961	2%_P	8125.00	255.50	267.13	266.59	267.64	0.001668	8.13	2518.26	1197.34	0.44
Reach 1	29961	1%_P	9351.00	255.50	267.64	266.79	268.06	0.001418	7.74	2988.35	1198.82	0.41
Reach 1	29961	0.2%_P	10993.00	255.50	268.30	267.04	268.64	0.001180	7.34	3592.87	1200.79	0.38

Plan: Alternative #1-4

Flows: Current and Projected Future

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
Reach 1	37228	Bankfull	1290.00	269.80	273.02	273.02	274.27	0.011695	9.77	169.38	69.82	0.97
Reach 1	37228	10%_E	3619.00	269.80	275.47	275.47	277.80	0.010906	13.84	352.68	80.15	1.03
Reach 1	37228	2%_E	5820.00	269.80	277.94	277.94	280.02	0.006627	13.77	715.86	270.72	0.85
Reach 1	37228	1%_E	6699.00	269.80	278.58	278.58	280.59	0.006065	13.86	854.07	341.53	0.83
Reach 1	37228	0.2%_E	7875.00	269.80	279.11	279.11	281.25	0.006193	14.57	973.13	354.41	0.84
Reach 1	37228	10%_P	3981.00	269.80	275.77	275.77	278.26	0.010928	14.35	377.13	83.86	1.04
Reach 1	37228	2%_P	6402.00	269.80	278.43	278.43	280.41	0.006057	13.69	820.44	333.20	0.82
Reach 1	37228	1%_P	7369.00	269.80	278.91	278.91	280.97	0.006090	14.23	926.52	350.60	0.83
Reach 1	37228	0.2%_P	8663.00	269.80	279.43	279.43	281.66	0.006325	15.06	1044.12	359.03	0.86
Reach 1	36812	Bankfull	1290.00	264.00	269.46	267.26	269.83	0.001639	4.93	287.02	79.40	0.39
Reach 1	36812	10%_E	3619.00	264.00	273.39	269.92	274.11	0.001573	7.14	599.59	150.24	0.42
Reach 1	36812	2%_E	5820.00	264.00	275.69	271.74	276.83	0.001853	9.04	847.53	188.88	0.48
Reach 1	36812	1%_E	6699.00	264.00	276.67	272.39	277.81	0.001715	9.20	993.90	211.21	0.47
Reach 1	36812	0.2%_E	7875.00	264.00	277.94	273.10	279.07	0.001543	9.33	1185.35	288.41	0.45
Reach 1	36812	10%_P	3981.00	264.00	273.82	270.26	274.61	0.001605	7.45	636.71	156.36	0.43
Reach 1	36812	2%_P	6402.00	264.00	276.33	272.18	277.48	0.001764	9.16	944.27	202.16	0.47
Reach 1	36812	1%_P	7369.00	264.00	277.40	272.83	278.54	0.001612	9.28	1104.13	262.73	0.46
Reach 1	36812	0.2%_P	8663.00	264.00	278.77	273.63	279.89	0.001445	9.40	1309.29	298.68	0.44
Reach 1	36700		Bridge									
Reach 1	36471	Bankfull	1290.00	263.50	268.63		268.85	0.001155	3.73	346.76	84.02	0.32
Reach 1	36471	10%_E	3619.00	263.50	272.38		272.78	0.000957	5.18	826.77	262.40	0.32
Reach 1	36471	2%_E	5820.00	263.50	274.35		274.90	0.001057	6.31	1141.53	315.52	0.35
Reach 1	36471	1%_E	6699.00	263.50	274.90		275.53	0.001138	6.78	1229.45	323.87	0.37
Reach 1	36471	0.2%_E	7875.00	263.50	275.66		276.38	0.001204	7.31	1350.16	338.03	0.38

Reach 1	36471	10%_P	3981.00	263.50	272.75		273.17	0.000975	5.39	885.19	265.02	0.33
Reach 1	36471	2%_P	6402.00	263.50	274.71		275.32	0.001115	6.64	1198.83	320.82	0.36
Reach 1	36471	1%_P	7369.00	263.50	275.31		276.00	0.001187	7.11	1295.59	332.78	0.38
Reach 1	36471	0.2%_P	8663.00	263.50	276.10		276.89	0.001257	7.66	1421.14	359.86	0.40
Reach 1	36217	Bankfull	1290.00	262.50	267.83		268.37	0.002943	5.94	217.10	232.63	0.50
Reach 1	36217	10%_E	3619.00	262.50	271.96		272.47	0.001451	6.45	888.18	425.95	0.39
Reach 1	36217	2%_E	5820.00	262.50	274.07		274.60	0.001295	7.07	1463.45	464.58	0.38
Reach 1	36217	1%_E	6699.00	262.50	274.65		275.20	0.001301	7.34	1627.93	468.68	0.39
Reach 1	36217	0.2%_E	7875.00	262.50	275.45		276.01	0.001260	7.57	1859.16	484.27	0.39
Reach 1	36217	10%_P	3981.00	262.50	272.36		272.86	0.001404	6.54	988.83	432.25	0.39
Reach 1	36217	2%_P	6402.00	262.50	274.44		274.99	0.001307	7.27	1570.03	467.19	0.39
Reach 1	36217	1%_P	7369.00	262.50	275.09		275.65	0.001292	7.50	1753.50	472.67	0.39
Reach 1	36217	0.2%_P	8663.00	262.50	275.93		276.50	0.001256	7.75	1995.34	531.75	0.39
Reach 1	35831	Bankfull	1290.00	261.00	267.83		267.93	0.000360	2.51	513.39	90.23	0.19
Reach 1	35831	10%_E	3619.00	261.00	271.83		272.08	0.000512	3.96	943.38	185.62	0.24
Reach 1	35831	2%_E	5820.00	261.00	273.83		274.22	0.000628	5.04	1306.11	293.45	0.27
Reach 1	35831	1%_E	6699.00	261.00	274.36		274.81	0.000694	5.47	1411.04	319.76	0.29
Reach 1	35831	0.2%_E	7875.00	261.00	275.11		275.63	0.000748	5.93	1562.27	398.95	0.30
Reach 1	35831	10%_P	3981.00	261.00	272.21		272.48	0.000535	4.17	1005.05	217.38	0.24
Reach 1	35831	2%_P	6402.00	261.00	274.17		274.60	0.000676	5.34	1373.54	309.78	0.28
Reach 1	35831	1%_P	7369.00	261.00	274.77		275.26	0.000733	5.75	1492.31	344.85	0.30
Reach 1	35831	0.2%_P	8663.00	261.00	275.55		276.12	0.000788	6.23	1650.90	591.83	0.31
Reach 1	35516	Bankfull	1290.00	259.70	267.75		267.79	0.000428	1.72	767.26	156.64	0.12
Reach 1	35516	10%_E	3619.00	259.70	271.78		271.88	0.000485	2.59	1576.97	238.34	0.14
Reach 1	35516	2%_E	5820.00	259.70	273.81		273.95	0.000596	3.25	2050.84	836.01	0.17
Reach 1	35516	1%_E	6699.00	259.70	274.34		274.51	0.000662	3.52	2178.59	1020.35	0.18
Reach 1	35516	0.2%_E	7875.00	259.70	275.11		275.30	0.000722	3.83	2363.32	1153.37	0.19
Reach 1	35516	10%_P	3981.00	259.70	272.16		272.26	0.000505	2.71	1663.84	244.23	0.15
Reach 1	35516	2%_P	6402.00	259.70	274.15		274.31	0.000643	3.44	2132.98	998.99	0.17
Reach 1	35516	1%_P	7369.00	259.70	274.75		274.94	0.000703	3.71	2277.66	1089.75	0.18
Reach 1	35516	0.2%_P	8663.00	259.70	275.55		275.77	0.000769	4.04	2477.92	1267.29	0.19
Reach 1	35344	Bankfull	1290.00	259.90	267.70	262.04	267.75	0.000168	1.84	706.13	127.28	0.13
Reach 1	35344	10%_E	3619.00	259.90	271.67	264.05	271.81	0.000232	3.00	1365.84	452.37	0.17
Reach 1	35344	2%_E	5820.00	259.90	273.63	265.57	273.86	0.000313	3.92	1724.53	1010.87	0.20
Reach 1	35344	1%_E	6699.00	259.90	274.13	266.08	274.40	0.000358	4.30	1815.95	1156.33	0.21
Reach 1	35344	0.2%_E	7875.00	259.90	274.86	266.74	275.18	0.000403	4.73	1948.18	1493.06	0.23
Reach 1	35344	10%_P	3981.00	259.90	272.04	264.33	272.19	0.000246	3.16	1433.35	556.21	0.17
Reach 1	35344	2%_P	6402.00	259.90	273.96	265.92	274.21	0.000344	4.18	1783.19	1087.77	0.21
Reach 1	35344	1%_P	7369.00	259.90	274.52	266.48	274.82	0.000388	4.56	1886.55	1331.60	0.22
Reach 1	35344	0.2%_P	8663.00	259.90	275.27	267.12	275.63	0.000436	5.02	2024.06	1791.03	0.24
Reach 1	35300		Bridge									

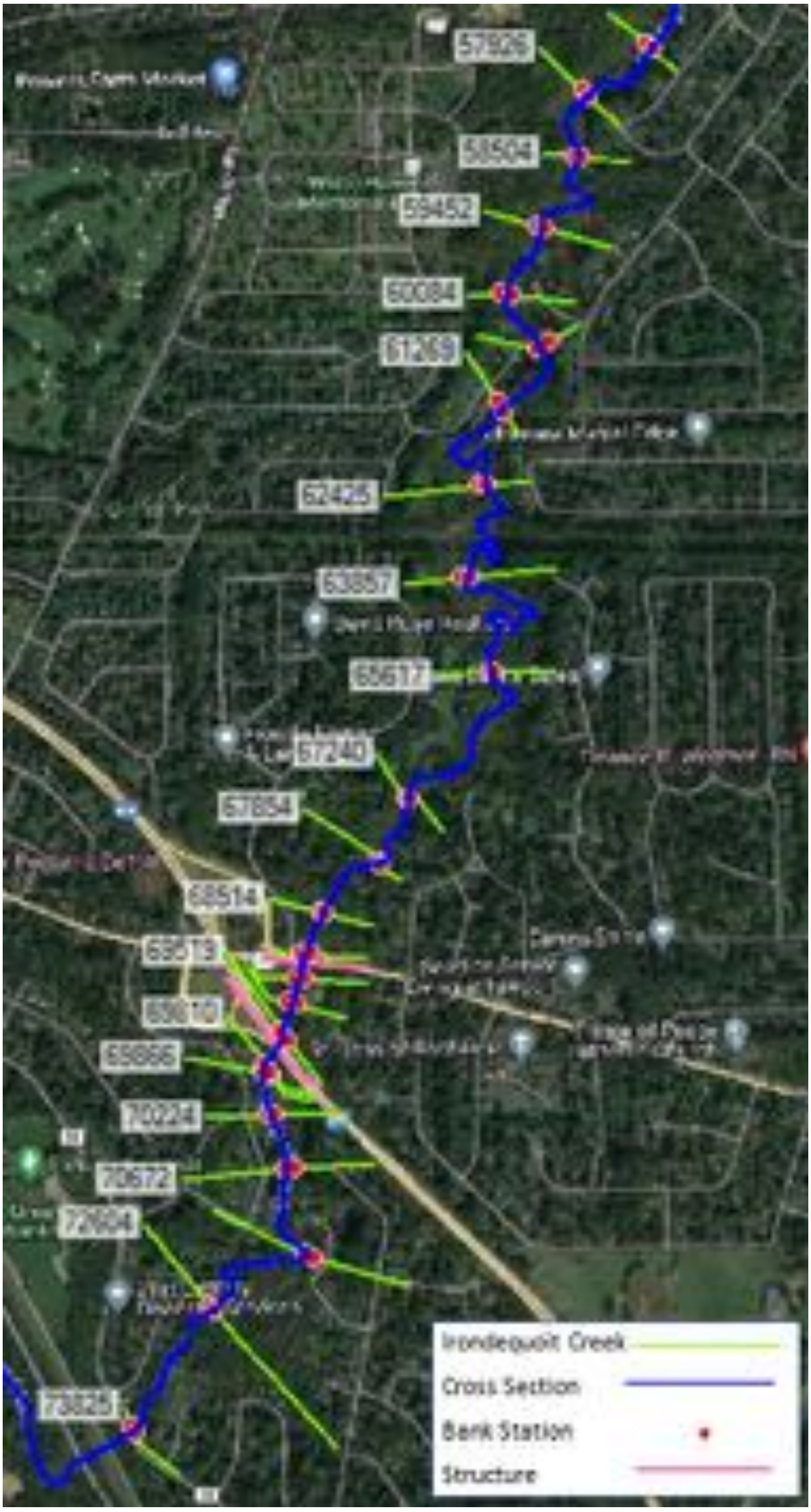
Reach 1	35133	Bankfull	1290.00	259.00	267.66		267.71	0.000125	1.75	739.12	99.89	0.11
Reach 1	35133	10%_E	3619.00	259.00	271.55		271.70	0.000241	3.18	1172.07	911.40	0.17
Reach 1	35133	2%_E	5820.00	259.00	273.38		273.66	0.000365	4.33	1445.63	1757.57	0.21
Reach 1	35133	1%_E	6699.00	259.00	273.81		274.16	0.000430	4.81	1510.83	1890.98	0.23
Reach 1	35133	0.2%_E	7875.00	259.00	274.44		274.87	0.000504	5.37	1606.14	1982.35	0.25
Reach 1	35133	10%_P	3981.00	259.00	271.90		272.07	0.000262	3.39	1224.01	1194.52	0.18
Reach 1	35133	2%_P	6402.00	259.00	273.65		273.98	0.000409	4.66	1487.23	1875.43	0.23
Reach 1	35133	1%_P	7369.00	259.00	274.14		274.54	0.000477	5.14	1561.03	1968.85	0.24
Reach 1	35133	0.2%_P	8663.00	259.00	274.74		275.24	0.000564	5.76	1652.91	2008.40	0.27
Reach 1	34865	Bankfull	1290.00	258.40	267.38	262.11	267.59	0.000624	3.73	346.95	296.88	0.24
Reach 1	34865	10%_E	3619.00	258.40	270.85	265.50	271.45	0.001149	6.51	839.68	1456.72	0.34
Reach 1	34865	2%_E	5820.00	258.40	272.94	267.82	273.45	0.000982	6.75	1708.22	2255.51	0.33
Reach 1	34865	1%_E	6699.00	258.40	273.42	268.98	273.94	0.001024	7.06	1909.15	2323.89	0.34
Reach 1	34865	0.2%_E	7875.00	258.40	274.16	271.82	274.67	0.000990	7.19	2226.25	2393.46	0.33
Reach 1	34865	10%_P	3981.00	258.40	271.15	265.93	271.80	0.001225	6.84	948.01	1597.77	0.36
Reach 1	34865	2%_P	6402.00	258.40	273.24	268.49	273.76	0.001022	6.99	1832.99	2295.43	0.34
Reach 1	34865	1%_P	7369.00	258.40	273.80	271.60	274.32	0.001028	7.20	2072.02	2372.78	0.34
Reach 1	34865	0.2%_P	8663.00	258.40	274.52	272.13	275.04	0.001021	7.42	2377.05	2398.00	0.34
Reach 1	34186	Bankfull	1290.00	257.00	266.91		267.13	0.000763	3.76	346.26	105.53	0.27
Reach 1	34186	10%_E	3619.00	257.00	270.72		270.86	0.000436	3.90	2002.19	2163.91	0.22
Reach 1	34186	2%_E	5820.00	257.00	272.88		272.98	0.000309	3.74	3827.31	2894.55	0.19
Reach 1	34186	1%_E	6699.00	257.00	273.37		273.47	0.000299	3.78	4429.94	2907.20	0.19
Reach 1	34186	0.2%_E	7875.00	257.00	274.15		274.24	0.000260	3.66	5382.56	2946.82	0.18
Reach 1	34186	10%_P	3981.00	257.00	271.05		271.20	0.000426	3.94	2206.27	2379.98	0.22
Reach 1	34186	2%_P	6402.00	257.00	273.18		273.29	0.000307	3.79	4200.37	2904.18	0.19
Reach 1	34186	1%_P	7369.00	257.00	273.77		273.87	0.000284	3.76	4919.64	2915.52	0.18
Reach 1	34186	0.2%_P	8663.00	257.00	274.52		274.60	0.000256	3.71	5832.35	2960.05	0.18
Reach 1	33408	Bankfull	1580.00	256.50	266.59		266.72	0.000359	2.96	559.44	114.72	0.19
Reach 1	33408	10%_E	4593.00	256.50	270.39		270.57	0.000377	3.98	2361.85	1790.66	0.21
Reach 1	33408	2%_E	7386.00	256.50	272.47		272.70	0.000448	4.86	4504.04	2120.68	0.23
Reach 1	33408	1%_E	8501.00	256.50	273.05		273.22	0.000369	4.53	5743.92	2126.03	0.21
Reach 1	33408	0.2%_E	9994.00	256.50	273.93		274.05	0.000266	4.01	7625.19	2136.16	0.18
Reach 1	33408	10%_P	5052.00	256.50	270.73		270.90	0.000379	4.07	2591.66	1918.15	0.21
Reach 1	33408	2%_P	8125.00	256.50	272.83		273.02	0.000403	4.68	5266.75	2123.98	0.22
Reach 1	33408	1%_P	9351.00	256.50	273.51		273.65	0.000315	4.28	6715.76	2131.93	0.20
Reach 1	33408	0.2%_P	10993.00	256.50	274.32		274.42	0.000249	3.94	8450.83	2141.95	0.18
Reach 1	33007	Bankfull	1580.00	256.00	266.42		266.57	0.000417	3.14	617.93	261.04	0.20
Reach 1	33007	10%_E	4593.00	256.00	270.18		270.40	0.000481	4.42	1819.49	1428.81	0.23
Reach 1	33007	2%_E	7386.00	256.00	272.06		272.46	0.000724	6.01	2610.05	1723.27	0.29
Reach 1	33007	1%_E	8501.00	256.00	272.70		273.03	0.000630	5.79	3739.06	1801.23	0.27
Reach 1	33007	0.2%_E	9994.00	256.00	273.70		273.91	0.000441	5.07	5570.31	1833.63	0.23
Reach 1	33007	10%_P	5052.00	256.00	270.50		270.73	0.000501	4.60	1937.52	1457.57	0.24
Reach 1	33007	2%_P	8125.00	256.00	272.44		272.81	0.000688	5.97	3269.87	1785.64	0.29

Reach 1	33007	1%_P	9351.00	256.00	273.22		273.48	0.000532	5.45	4685.30	1826.51	0.25
Reach 1	33007	0.2%_P	10993.00	256.00	274.11		274.30	0.000407	4.97	6321.23	1835.95	0.22
Reach 1	32776	Bankfull	1580.00	255.50	266.37	259.20	266.46	0.000280	2.47	640.28	268.73	0.16
Reach 1	32776	10%_E	4593.00	255.50	269.91	262.61	270.23	0.000708	4.55	1010.15	910.49	0.27
Reach 1	32776	2%_E	7386.00	255.50	271.48	264.89	272.07	0.001068	6.17	1204.28	1258.17	0.34
Reach 1	32776	1%_E	8501.00	255.50	272.08	265.66	272.74	0.001119	6.56	1677.65	1269.35	0.35
Reach 1	32776	0.2%_E	9994.00	255.50	273.21	266.57	273.69	0.000822	6.02	3087.66	1292.76	0.31
Reach 1	32776	10%_P	5052.00	255.50	270.18	263.00	270.54	0.000782	4.85	1041.67	980.26	0.29
Reach 1	32776	2%_P	8125.00	255.50	271.87	265.41	272.52	0.001126	6.50	1416.89	1264.89	0.35
Reach 1	32776	1%_P	9351.00	255.50	272.62	266.20	273.21	0.001019	6.47	2338.15	1280.02	0.34
Reach 1	32776	0.2%_P	10993.00	255.50	273.65	267.15	274.09	0.000771	5.97	3635.31	1303.62	0.30
Reach 1	32700		Bridge									
Reach 1	32670	Bankfull	1580.00	255.50	266.34		266.43	0.000305	2.45	645.56	147.43	0.17
Reach 1	32670	10%_E	4593.00	255.50	269.85		270.15	0.000571	4.45	1115.52	1018.90	0.25
Reach 1	32670	2%_E	7386.00	255.50	271.49		271.87	0.000673	5.36	2349.40	1221.59	0.28
Reach 1	32670	1%_E	8501.00	255.50	272.10		272.48	0.000669	5.53	2907.96	1258.53	0.28
Reach 1	32670	0.2%_E	9994.00	255.50	273.18		273.47	0.000523	5.17	4057.65	1328.82	0.25
Reach 1	32670	10%_P	5052.00	255.50	270.11		270.45	0.000626	4.74	1226.25	1040.25	0.26
Reach 1	32670	2%_P	8125.00	255.50	271.90		272.27	0.000656	5.42	2704.03	1247.26	0.28
Reach 1	32670	1%_P	9351.00	255.50	272.60		272.95	0.000622	5.48	3429.32	1316.51	0.27
Reach 1	32670	0.2%_P	10993.00	255.50	273.60		273.89	0.000505	5.19	4520.93	1331.77	0.25
Reach 1	32577	Bankfull	1580.00	255.75	266.23		266.38	0.000473	3.09	512.86	281.26	0.21
Reach 1	32577	10%_E	4593.00	255.75	269.71		270.07	0.000742	5.12	1346.03	1111.66	0.29
Reach 1	32577	2%_E	7386.00	255.75	271.34		271.78	0.000843	6.05	2269.43	1239.53	0.32
Reach 1	32577	1%_E	8501.00	255.75	271.94		272.39	0.000850	6.28	2981.41	1270.60	0.32
Reach 1	32577	0.2%_E	9994.00	255.75	273.14		273.41	0.000555	5.41	4415.91	1281.34	0.26
Reach 1	32577	10%_P	5052.00	255.75	269.99		270.37	0.000776	5.34	1459.68	1118.75	0.30
Reach 1	32577	2%_P	8125.00	255.75	271.79		272.20	0.000796	6.03	2791.62	1266.02	0.31
Reach 1	32577	1%_P	9351.00	255.75	272.53		272.89	0.000705	5.91	3684.37	1275.97	0.29
Reach 1	32577	0.2%_P	10993.00	255.75	273.57		273.83	0.000523	5.36	4938.03	1285.15	0.26
Reach 1	32487	Bankfull	1580.00	256.00	266.22	259.65	266.33	0.000252	2.68	688.37	744.87	0.16
Reach 1	32487	10%_E	4593.00	256.00	269.71	263.00	269.97	0.000475	4.61	1629.41	1342.46	0.23
Reach 1	32487	2%_E	7386.00	256.00	271.32	265.24	271.68	0.000622	5.74	2234.44	1368.01	0.27
Reach 1	32487	1%_E	8501.00	256.00	271.72	266.13	272.29	0.000872	6.93	2612.49	1374.50	0.33
Reach 1	32487	0.2%_E	9994.00	256.00	272.98	266.96	273.34	0.000599	6.08	3990.51	1400.31	0.27
Reach 1	32487	10%_P	5052.00	256.00	269.98	263.62	270.27	0.000508	4.84	1733.52	1346.63	0.24
Reach 1	32487	2%_P	8125.00	256.00	271.44	265.88	272.06	0.000935	7.08	2306.93	1369.88	0.34
Reach 1	32487	1%_P	9351.00	256.00	272.33	266.60	272.80	0.000743	6.58	3277.16	1389.53	0.30
Reach 1	32487	0.2%_P	10993.00	256.00	273.42	267.34	273.76	0.000570	6.04	4492.14	1406.55	0.27
Reach 1	32480		Bridge									

Reach 1	32355	Bankfull	1580.00	256.00	266.18		266.28	0.000258	2.70	676.98	607.97	0.16
Reach 1	32355	10%_E	4593.00	256.00	269.44		269.75	0.000547	4.88	1476.83	1307.08	0.25
Reach 1	32355	2%_E	7386.00	256.00	270.65		271.14	0.000846	6.47	1900.44	1315.43	0.32
Reach 1	32355	1%_E	8501.00	256.00	271.09		271.65	0.000939	6.97	2056.01	1319.08	0.33
Reach 1	32355	0.2%_E	9994.00	256.00	271.63	266.94	272.54	0.001351	8.58	2259.50	1324.21	0.40
Reach 1	32355	10%_P	5052.00	256.00	269.66		270.00	0.000601	5.18	1554.00	1308.40	0.26
Reach 1	32355	2%_P	8125.00	256.00	270.94		271.48	0.000908	6.81	2004.77	1317.95	0.33
Reach 1	32355	1%_P	9351.00	256.00	271.41		272.01	0.001003	7.32	2168.51	1321.96	0.35
Reach 1	32355	0.2%_P	10993.00	256.00	272.02		272.91	0.001326	8.66	2625.41	1327.72	0.40
Reach 1	31818	Bankfull	1580.00	255.90	265.35		265.89	0.001288	6.01	322.89	363.94	0.38
Reach 1	31818	10%_E	4593.00	255.90	268.64		269.23	0.001355	7.76	1342.74	504.73	0.41
Reach 1	31818	2%_E	7386.00	255.90	269.86		270.50	0.001565	8.93	1958.09	510.75	0.45
Reach 1	31818	1%_E	8501.00	255.90	270.39		271.00	0.001516	9.04	2229.12	514.12	0.44
Reach 1	31818	0.2%_E	9994.00	255.90	271.02		271.62	0.001488	9.24	2557.40	522.15	0.44
Reach 1	31818	10%_P	5052.00	255.90	268.84		269.45	0.001429	8.06	1440.67	505.65	0.42
Reach 1	31818	2%_P	8125.00	255.90	270.21		270.83	0.001529	9.00	2140.95	512.76	0.44
Reach 1	31818	1%_P	9351.00	255.90	270.76		271.36	0.001496	9.15	2419.76	518.13	0.44
Reach 1	31818	0.2%_P	10993.00	255.90	271.40		272.01	0.001498	9.45	2760.42	547.20	0.45
Reach 1	31339	Bankfull	1580.00	255.80	264.91		265.28	0.001072	4.91	378.92	217.83	0.37
Reach 1	31339	10%_E	4593.00	255.80	268.26		268.67	0.000879	6.09	1221.70	291.79	0.36
Reach 1	31339	2%_E	7386.00	255.80	269.02		269.76	0.001505	8.41	1437.12	358.76	0.48
Reach 1	31339	1%_E	8501.00	255.80	269.41		270.24	0.001635	9.00	1577.11	467.96	0.50
Reach 1	31339	0.2%_E	9994.00	255.80	269.91		270.83	0.001763	9.66	1770.96	479.20	0.52
Reach 1	31339	10%_P	5052.00	255.80	268.38		268.85	0.000992	6.53	1255.98	292.48	0.38
Reach 1	31339	2%_P	8125.00	255.80	269.28		270.08	0.001596	8.82	1527.00	464.84	0.49
Reach 1	31339	1%_P	9351.00	255.80	269.70		270.58	0.001713	9.39	1688.44	474.77	0.51
Reach 1	31339	0.2%_P	10993.00	255.80	270.23		271.21	0.001829	10.03	1896.01	484.28	0.54
Reach 1	31014	Bankfull	1580.00	255.70	264.76		264.97	0.000531	3.81	503.41	249.77	0.27
Reach 1	31014	10%_E	4593.00	255.70	267.86		268.19	0.000636	5.43	1660.78	644.30	0.31
Reach 1	31014	2%_E	7386.00	255.70	268.11		268.82	0.001388	8.17	1821.35	645.16	0.46
Reach 1	31014	1%_E	8501.00	255.70	268.38		269.17	0.001538	8.75	1995.93	646.05	0.49
Reach 1	31014	0.2%_E	9994.00	255.70	268.77		269.62	0.001656	9.32	2249.00	647.21	0.51
Reach 1	31014	10%_P	5052.00	255.70	267.91		268.29	0.000742	5.89	1694.64	644.48	0.34
Reach 1	31014	2%_P	8125.00	255.70	268.28		269.05	0.001494	8.57	1935.28	645.77	0.48
Reach 1	31014	1%_P	9351.00	255.70	268.60		269.43	0.001616	9.10	2137.31	646.70	0.50
Reach 1	31014	0.2%_P	10993.00	255.70	269.05		269.92	0.001689	9.58	2430.21	648.03	0.52
Reach 1	29961	Bankfull	1580.00	255.50	263.80	259.43	264.20	0.001010	5.09	310.56	1117.74	0.33
Reach 1	29961	10%_E	4593.00	255.50	265.30	263.50	266.81	0.003667	10.60	861.88	1135.36	0.64
Reach 1	29961	2%_E	7386.00	255.50	266.80	266.47	267.40	0.001888	8.47	2213.07	1196.41	0.47
Reach 1	29961	1%_E	8501.00	255.50	267.30	266.67	267.77	0.001569	7.97	2673.58	1197.80	0.43
Reach 1	29961	0.2%_E	9994.00	255.50	267.90	266.89	268.28	0.001316	7.57	3226.57	1199.59	0.40
Reach 1	29961	10%_P	5052.00	255.50	265.55	264.03	266.87	0.003373	10.36	1075.09	1141.42	0.61
Reach 1	29961	2%_P	8125.00	255.50	267.13	266.59	267.64	0.001668	8.13	2518.26	1197.34	0.44

Reach 1	29961	1%_P	9351.00	255.50	267.64	266.79	268.06	0.001418	7.74	2988.35	1198.82	0.41
Reach 1	29961	0.2%_P	10993.00	255.50	268.30	267.04	268.64	0.001180	7.34	3592.87	1200.79	0.38

Risk Area #2


57926
51564
59452
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62465
63857
65617
67240
67854
68514
69019
70924
72672
72924
73825
Irondequoit Creek
Cross Section
Bank Station
Structure

Plan: Base Condition (Risk Area #2) Flows: Current

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
Reach 1	73825	10%_E	2356.00	387.40	396.01	392.60	396.46	0.001317	5.43	441.43	70.86	0.37
Reach 1	73825	2%_E	3789.00	387.40	397.26	393.98	398.08	0.001899	7.30	575.68	130.37	0.45
Reach 1	73825	1%_E	4361.00	387.40	397.56	394.46	398.55	0.002211	8.06	614.09	132.85	0.49
Reach 1	73825	0.2%_E	5127.00	387.40	398.40	395.04	399.47	0.002142	8.46	729.65	141.54	0.49
Reach 1	72604	10%_E	2356.00	382.00	393.54	391.01	394.28	0.002492	7.12	486.21	525.13	0.48
Reach 1	72604	2%_E	3789.00	382.00	395.47		395.92	0.001506	6.51	1554.86	1035.20	0.38
Reach 1	72604	1%_E	4361.00	382.00	396.23		396.54	0.001068	5.79	2242.52	1277.91	0.33
Reach 1	72604	0.2%_E	5127.00	382.00	398.07		398.19	0.000431	4.13	4566.41	1645.93	0.21
Reach 1	71465	10%_E	2356.00	381.40	393.38		393.47	0.000239	2.72	1812.52	688.13	0.16
Reach 1	71465	2%_E	3789.00	381.40	395.28		395.36	0.000198	2.82	3174.19	736.47	0.15
Reach 1	71465	1%_E	4361.00	381.40	396.02		396.09	0.000179	2.81	3720.70	746.98	0.15
Reach 1	71465	0.2%_E	5127.00	381.40	397.93		397.97	0.000107	2.41	5177.50	773.79	0.12
Reach 1	70672	10%_E	2356.00	381.00	392.93	387.79	393.17	0.000602	4.11	850.54	530.33	0.25
Reach 1	70672	2%_E	3789.00	381.00	395.05	389.48	395.17	0.000324	3.52	2742.15	742.03	0.19
Reach 1	70672	1%_E	4361.00	381.00	395.82	390.03	395.92	0.000274	3.39	3317.59	744.40	0.18
Reach 1	70672	0.2%_E	5127.00	381.00	397.83	391.04	397.88	0.000143	2.74	4816.70	750.30	0.13
Reach 1	70224	10%_E	2356.00	380.89	392.40	388.84	392.79	0.001220	5.52	734.30	290.57	0.35
Reach 1	70224	2%_E	3789.00	380.89	394.52	391.22	394.91	0.001024	5.92	1216.44	400.04	0.33
Reach 1	70224	1%_E	4361.00	380.89	395.32	391.65	395.69	0.000936	5.96	1426.58	419.97	0.32
Reach 1	70224	0.2%_E	5127.00	380.89	397.51	392.32	397.75	0.000541	5.12	2019.78	465.54	0.25
Reach 1	69866	10%_E	2356.00	380.80	392.35	385.44	392.51	0.000337	3.25	769.68	315.83	0.19
Reach 1	69866	2%_E	3789.00	380.80	394.39	386.95	394.65	0.000414	4.13	1140.49	481.82	0.22
Reach 1	69866	1%_E	4361.00	380.80	395.18	387.47	395.45	0.000413	4.33	1359.39	601.46	0.22
Reach 1	69866	0.2%_E	5127.00	380.80	397.40	388.11	397.61	0.000268	3.91	2027.79	654.90	0.18
Reach 1	69810	10%_E	2356.00	380.74	392.35	384.79	392.48	0.000239	2.94	907.90	557.85	0.16
Reach 1	69810	2%_E	3789.00	380.74	394.39	386.18	394.60	0.000309	3.79	1214.36	630.62	0.19
Reach 1	69810	1%_E	4361.00	380.74	395.18	386.66	395.41	0.000323	4.04	1331.66	637.22	0.20
Reach 1	69810	0.2%_E	5127.00	380.74	397.38	387.29	397.59	0.000247	3.92	1661.78	673.34	0.18
Reach 1	69662		Bridge									
Reach 1	69519	10%_E	2356.00	380.34	391.99	384.35	392.10	0.000228	2.77	985.68	568.93	0.16
Reach 1	69519	2%_E	3789.00	380.34	393.70	385.74	393.89	0.000311	3.62	1322.92	595.17	0.19
Reach 1	69519	1%_E	4361.00	380.34	394.35	386.22	394.56	0.000331	3.88	1450.10	603.69	0.20
Reach 1	69519	0.2%_E	5127.00	380.34	396.10	386.82	396.30	0.000267	3.82	1795.52	638.85	0.18
Reach 1	69271	10%_E	2356.00	380.00	391.78	385.44	392.00	0.000454	3.75	744.83	519.45	0.22

Reach 1	69271	2%_E	3789.00	380.00	393.39	387.11	393.74	0.000626	4.92	1037.38	613.28	0.27
Reach 1	69271	1%_E	4361.00	380.00	394.02	387.67	394.40	0.000647	5.20	1209.49	634.23	0.27
Reach 1	69271	0.2%_E	5127.00	380.00	395.88	388.38	396.19	0.000455	4.84	1735.27	719.80	0.24
Reach 1	69076	10%_E	2356.00	380.24	391.77	384.26	391.89	0.000227	2.80	1025.73	449.73	0.16
Reach 1	69076	2%_E	3789.00	380.24	393.38	385.63	393.57	0.000319	3.68	1368.42	661.21	0.19
Reach 1	69076	1%_E	4361.00	380.24	394.01	386.12	394.23	0.000341	3.94	1509.10	686.15	0.20
Reach 1	69076	0.2%_E	5127.00	380.24	395.87	386.73	396.07	0.000262	3.81	1954.64	735.49	0.18
Reach 1	68969		Bridge									
Reach 1	68872	10%_E	2356.00	380.52	391.35		391.58	0.000487	3.82	617.08	68.24	0.22
Reach 1	68872	2%_E	3789.00	380.52	392.46		392.93	0.000865	5.49	696.48	77.87	0.30
Reach 1	68872	1%_E	4361.00	380.52	392.86		393.44	0.001010	6.08	728.15	80.73	0.33
Reach 1	68872	0.2%_E	5127.00	380.52	393.39		394.11	0.001188	6.81	771.45	83.32	0.36
Reach 1	68514	10%_E	2356.00	381.00	390.94		391.28	0.001250	5.22	794.92	269.54	0.35
Reach 1	68514	2%_E	3789.00	381.00	392.03		392.52	0.001594	6.50	1126.77	330.07	0.41
Reach 1	68514	1%_E	4361.00	381.00	392.44		392.95	0.001648	6.84	1262.08	337.48	0.42
Reach 1	68514	0.2%_E	5127.00	381.00	392.97		393.52	0.001678	7.19	1448.80	360.54	0.43
Reach 1	67854	10%_E	2356.00	380.02	390.56		390.66	0.000596	3.53	1913.70	783.66	0.24
Reach 1	67854	2%_E	3789.00	380.02	391.74		391.83	0.000543	3.75	2847.02	799.89	0.23
Reach 1	67854	1%_E	4361.00	380.02	392.18		392.27	0.000519	3.80	3199.55	805.46	0.23
Reach 1	67854	0.2%_E	5127.00	380.02	392.76		392.85	0.000485	3.84	3671.16	812.98	0.23
Reach 1	67240	10%_E	2356.00	379.10	389.90		390.16	0.001184	5.12	1087.98	405.46	0.33
Reach 1	67240	2%_E	3789.00	379.10	391.03		391.34	0.001314	5.93	1553.62	414.59	0.36
Reach 1	67240	1%_E	4361.00	379.10	391.48		391.79	0.001299	6.10	1740.55	417.65	0.36
Reach 1	67240	0.2%_E	5127.00	379.10	392.09		392.39	0.001247	6.24	1995.98	421.24	0.35
Reach 1	65617	10%_E	2356.00	378.70	388.16		388.34	0.001242	4.64	1306.04	600.16	0.34
Reach 1	65617	2%_E	3789.00	378.70	389.65		389.79	0.000844	4.44	2228.31	633.54	0.29
Reach 1	65617	1%_E	4361.00	378.70	390.26		390.38	0.000725	4.34	2613.22	645.16	0.27
Reach 1	65617	0.2%_E	5127.00	378.70	391.03		391.14	0.000614	4.25	3117.41	661.70	0.25
Reach 1	63857	10%_E	2356.00	377.00	387.19		387.28	0.000474	2.87	1951.66	676.17	0.19
Reach 1	63857	2%_E	3789.00	377.00	389.00		389.07	0.000368	2.93	3186.38	689.98	0.17
Reach 1	63857	1%_E	4361.00	377.00	389.69		389.75	0.000336	2.93	3661.02	694.79	0.16
Reach 1	63857	0.2%_E	5127.00	377.00	390.53		390.60	0.000307	2.96	4251.92	702.20	0.16
Reach 1	62425	10%_E	2356.00	375.83	386.80		386.86	0.000280	2.48	2605.49	733.25	0.15
Reach 1	62425	2%_E	3789.00	375.83	388.71		388.76	0.000233	2.57	4011.70	741.68	0.14
Reach 1	62425	1%_E	4361.00	375.83	389.43		389.47	0.000217	2.59	4541.60	744.28	0.13
Reach 1	62425	0.2%_E	5127.00	375.83	390.30		390.34	0.000204	2.63	5190.47	747.23	0.13
Reach 1	61269	10%_E	2356.00	375.00	386.38	382.25	386.47	0.000522	2.83	1273.62	317.72	0.19

Reach 1	61269	2%_E	3789.00	375.00	388.28	383.32	388.41	0.000537	3.39	1762.13	361.58	0.20
Reach 1	61269	1%_E	4361.00	375.00	388.99	383.68	389.13	0.000532	3.55	1952.53	421.43	0.20
Reach 1	61269	0.2%_E	5127.00	375.00	389.85	384.16	390.01	0.000536	3.78	2191.88	489.96	0.21
Reach 1	60600	10%_E	2356.00	374.89	385.80		386.00	0.000900	3.60	707.87	132.44	0.25
Reach 1	60600	2%_E	3789.00	374.89	387.59		387.89	0.000994	4.46	954.27	210.18	0.27
Reach 1	60600	1%_E	4361.00	374.89	388.29		388.62	0.000995	4.71	1053.92	221.95	0.28
Reach 1	60600	0.2%_E	5127.00	374.89	389.11		389.48	0.001012	5.03	1176.14	249.17	0.28
Reach 1	60084	10%_E	2356.00	374.80	384.86		385.25	0.002545	5.01	488.53	104.15	0.38
Reach 1	60084	2%_E	3789.00	374.80	386.50		387.08	0.002654	6.11	668.05	116.03	0.41
Reach 1	60084	1%_E	4361.00	374.80	387.19		387.81	0.002544	6.36	770.38	193.80	0.40
Reach 1	60084	0.2%_E	5127.00	374.80	388.02		388.68	0.002423	6.65	959.10	249.35	0.40
Reach 1	59452	10%_E	2356.00	373.52	383.81		384.02	0.001354	4.18	1230.98	482.07	0.29
Reach 1	59452	2%_E	3789.00	373.52	385.83		385.99	0.000901	4.07	2226.09	499.99	0.24
Reach 1	59452	1%_E	4361.00	373.52	386.66		386.80	0.000762	3.98	2643.36	503.56	0.23
Reach 1	59452	0.2%_E	5127.00	373.52	387.60		387.73	0.000674	3.98	3115.55	507.36	0.22
Reach 1	58504	10%_E	2356.00	372.00	382.94		383.10	0.000809	3.73	1374.38	417.66	0.23
Reach 1	58504	2%_E	3789.00	372.00	385.19		385.34	0.000656	3.93	2215.16	438.12	0.21
Reach 1	58504	1%_E	4361.00	372.00	386.10		386.24	0.000592	3.95	2562.55	445.48	0.20
Reach 1	58504	0.2%_E	5127.00	372.00	387.07		387.22	0.000565	4.07	2937.45	452.72	0.20
Reach 1	57926	10%_E	2356.00	371.58	382.38		382.59	0.000931	4.01	1014.75	270.01	0.25
Reach 1	57926	2%_E	3789.00	371.58	384.68		384.91	0.000822	4.44	1663.11	297.24	0.24
Reach 1	57926	1%_E	4361.00	371.58	385.62		385.85	0.000759	4.51	1951.88	317.49	0.23
Reach 1	57926	0.2%_E	5127.00	371.58	386.60		386.84	0.000732	4.68	2270.43	328.92	0.23
Reach 1	57217	10%_E	2356.00	371.10	381.80	377.17	381.97	0.000813	3.63	1109.66	283.91	0.23
Reach 1	57217	2%_E	3789.00	371.10	384.20	378.77	384.38	0.000669	3.95	1865.99	338.40	0.22
Reach 1	57217	1%_E	4361.00	371.10	385.20	379.22	385.37	0.000590	3.95	2209.90	349.07	0.21
Reach 1	57217	0.2%_E	5127.00	371.10	386.20	379.97	386.38	0.000570	4.10	2573.76	370.66	0.21

Plan: Base Condition (Risk Area #2) Flows: Projected Future

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
Reach 1	73825	10%_P	2592.00	387.40	396.29	392.83	396.80	0.001389	5.73	461.91	75.29	0.38
Reach 1	73825	2%_P	4168.00	387.40	397.47	394.30	398.40	0.002095	7.80	602.92	132.11	0.48
Reach 1	73825	1%_P	4797.00	387.40	397.84	394.79	398.94	0.002370	8.53	651.74	135.72	0.51
Reach 1	73825	0.2%_P	5640.00	387.40	398.72	395.46	399.91	0.002279	8.93	775.60	145.02	0.51
Reach 1	72604	10%_P	2592.00	382.00	393.88	391.36	394.61	0.002382	7.18	619.75	629.69	0.47
Reach 1	72604	2%_P	4168.00	382.00	395.98		396.33	0.001212	6.06	1990.52	1185.02	0.35
Reach 1	72604	1%_P	4797.00	382.00	396.79		397.03	0.000881	5.46	2859.90	1437.03	0.30

Reach 1	72604	0.2%_P	5640.00	382.00	398.66		398.74	0.000328	3.73	5530.48	1666.94	0.19
Reach 1	71465	10%_P	2592.00	381.40	393.74		393.83	0.000229	2.73	2067.61	705.47	0.16
Reach 1	71465	2%_P	4168.00	381.40	395.77		395.84	0.000186	2.82	3534.28	744.17	0.15
Reach 1	71465	1%_P	4797.00	381.40	396.58		396.65	0.000166	2.80	4140.85	757.08	0.14
Reach 1	71465	0.2%_P	5640.00	381.40	398.51		398.56	0.000103	2.43	5629.99	778.14	0.12
Reach 1	70672	10%_P	2592.00	381.00	393.29	388.10	393.54	0.000602	4.24	957.65	563.22	0.26
Reach 1	70672	2%_P	4168.00	381.00	395.56	389.86	395.67	0.000290	3.44	3122.80	743.60	0.18
Reach 1	70672	1%_P	4797.00	381.00	396.40	390.44	396.50	0.000244	3.31	3751.33	746.18	0.17
Reach 1	70672	0.2%_P	5640.00	381.00	398.42	391.59	398.47	0.000136	2.75	5258.73	752.01	0.13
Reach 1	70224	10%_P	2592.00	380.89	392.77	389.30	393.16	0.001185	5.61	811.67	300.35	0.34
Reach 1	70224	2%_P	4168.00	380.89	395.05	391.51	395.43	0.000967	5.95	1354.87	415.14	0.32
Reach 1	70224	1%_P	4797.00	380.89	395.92	392.12	396.28	0.000874	5.97	1587.17	449.13	0.31
Reach 1	70224	0.2%_P	5640.00	380.89	398.09	392.61	398.34	0.000534	5.24	2186.11	491.76	0.25
Reach 1	69866	10%_P	2592.00	380.80	392.71	385.71	392.89	0.000356	3.43	817.59	341.56	0.20
Reach 1	69866	2%_P	4168.00	380.80	394.91	387.29	395.18	0.000414	4.27	1282.32	512.92	0.22
Reach 1	69866	1%_P	4797.00	380.80	395.78	387.84	396.06	0.000404	4.42	1539.16	626.07	0.22
Reach 1	69866	0.2%_P	5640.00	380.80	397.99	388.51	398.20	0.000271	4.04	2202.44	664.21	0.19
Reach 1	69810	10%_P	2592.00	380.74	392.71	385.04	392.85	0.000254	3.11	961.46	570.91	0.17
Reach 1	69810	2%_P	4168.00	380.74	394.91	386.51	395.14	0.000319	3.96	1291.90	634.97	0.20
Reach 1	69810	1%_P	4797.00	380.74	395.77	387.02	396.02	0.000330	4.21	1420.65	642.72	0.20
Reach 1	69810	0.2%_P	5640.00	380.74	397.94	387.66	398.18	0.000260	4.13	1746.57	688.57	0.18
Reach 1	69662		Bridge									
Reach 1	69519	10%_P	2592.00	380.34	392.29	384.60	392.42	0.000244	2.94	1045.85	573.52	0.17
Reach 1	69519	2%_P	4168.00	380.34	394.13	386.06	394.33	0.000325	3.80	1406.87	600.79	0.20
Reach 1	69519	1%_P	4797.00	380.34	394.84	386.57	395.07	0.000342	4.05	1546.70	610.78	0.20
Reach 1	69519	0.2%_P	5640.00	380.34	396.39	387.20	396.62	0.000298	4.10	1851.91	643.43	0.19
Reach 1	69271	10%_P	2592.00	380.00	392.07	385.75	392.31	0.000488	3.97	787.72	531.75	0.23
Reach 1	69271	2%_P	4168.00	380.00	393.80	387.48	394.17	0.000643	5.12	1150.20	626.99	0.27
Reach 1	69271	1%_P	4797.00	380.00	394.51	388.08	394.91	0.000649	5.36	1344.19	650.81	0.28
Reach 1	69271	0.2%_P	5640.00	380.00	396.15	388.85	396.49	0.000502	5.15	1812.80	725.16	0.25
Reach 1	69076	10%_P	2592.00	380.24	392.06	384.50	392.19	0.000245	2.97	1085.25	456.37	0.17
Reach 1	69076	2%_P	4168.00	380.24	393.79	385.96	394.01	0.000335	3.86	1460.21	677.66	0.20
Reach 1	69076	1%_P	4797.00	380.24	394.50	386.46	394.74	0.000351	4.11	1620.92	697.86	0.21
Reach 1	69076	0.2%_P	5640.00	380.24	396.14	387.10	396.36	0.000293	4.09	2019.99	738.22	0.19
Reach 1	68969		Bridge									
Reach 1	68872	10%_P	2592.00	380.52	391.57		391.83	0.000547	4.11	631.88	69.01	0.23

Reach 1	68872	2%_P	4168.00	380.52	392.73		393.26	0.000963	5.89	717.12	79.83	0.32
Reach 1	68872	1%_P	4797.00	380.52	393.16		393.82	0.001113	6.50	752.80	82.22	0.34
Reach 1	68872	0.2%_P	5640.00	380.52	393.73		394.55	0.001299	7.26	804.02	102.60	0.37
Reach 1	68514	10%_P	2592.00	381.00	391.13		391.51	0.001331	5.48	848.85	280.49	0.37
Reach 1	68514	2%_P	4168.00	381.00	392.30		392.81	0.001634	6.73	1216.21	335.09	0.42
Reach 1	68514	1%_P	4797.00	381.00	392.74		393.28	0.001671	7.05	1367.17	348.15	0.42
Reach 1	68514	0.2%_P	5640.00	381.00	393.34		393.90	0.001665	7.36	1581.00	367.98	0.43
Reach 1	67854	10%_P	2592.00	380.02	390.77		390.87	0.000586	3.57	2078.86	787.37	0.24
Reach 1	67854	2%_P	4168.00	380.02	392.03		392.12	0.000528	3.79	3080.46	803.47	0.23
Reach 1	67854	1%_P	4797.00	380.02	392.51		392.60	0.000500	3.83	3467.20	809.71	0.23
Reach 1	67854	0.2%_P	5640.00	380.02	393.15		393.24	0.000462	3.85	3989.54	818.02	0.22
Reach 1	67240	10%_P	2592.00	379.10	390.10		390.37	0.001222	5.29	1167.95	406.96	0.34
Reach 1	67240	2%_P	4168.00	379.10	391.33		391.64	0.001308	6.05	1676.71	416.72	0.36
Reach 1	67240	1%_P	4797.00	379.10	391.83		392.13	0.001273	6.19	1884.86	419.75	0.36
Reach 1	67240	0.2%_P	5640.00	379.10	392.50		392.80	0.001201	6.30	2169.95	423.60	0.35
Reach 1	65617	10%_P	2592.00	378.70	388.41		388.58	0.001166	4.62	1455.92	605.12	0.33
Reach 1	65617	2%_P	4168.00	378.70	390.05		390.18	0.000763	4.38	2482.07	641.32	0.28
Reach 1	65617	1%_P	4797.00	378.70	390.70		390.81	0.000657	4.28	2899.73	654.20	0.26
Reach 1	65617	0.2%_P	5640.00	378.70	391.53		391.63	0.000557	4.20	3452.45	672.49	0.24
Reach 1	63857	10%_P	2592.00	377.00	387.51		387.59	0.000453	2.88	2164.92	678.86	0.18
Reach 1	63857	2%_P	4168.00	377.00	389.46		389.53	0.000346	2.93	3501.24	693.11	0.17
Reach 1	63857	1%_P	4797.00	377.00	390.17		390.24	0.000319	2.95	3999.85	698.62	0.16
Reach 1	63857	0.2%_P	5640.00	377.00	391.07		391.14	0.000292	2.99	4632.71	707.04	0.16
Reach 1	62425	10%_P	2592.00	375.83	387.14		387.19	0.000270	2.49	2852.88	734.63	0.14
Reach 1	62425	2%_P	4168.00	375.83	389.19		389.23	0.000222	2.58	4363.79	743.45	0.13
Reach 1	62425	1%_P	4797.00	375.83	389.93		389.97	0.000209	2.61	4914.68	746.04	0.13
Reach 1	62425	0.2%_P	5640.00	375.83	390.85		390.89	0.000197	2.66	5603.85	748.81	0.13
Reach 1	61269	10%_P	2592.00	375.00	386.71	382.44	386.82	0.000528	2.94	1358.12	325.14	0.19
Reach 1	61269	2%_P	4168.00	375.00	388.75	383.57	388.89	0.000534	3.50	1888.15	402.18	0.20
Reach 1	61269	1%_P	4797.00	375.00	389.49	383.96	389.64	0.000532	3.68	2088.48	456.51	0.21
Reach 1	61269	0.2%_P	5640.00	375.00	390.40	384.47	390.57	0.000536	3.91	2363.06	541.82	0.21
Reach 1	60600	10%_P	2592.00	374.89	386.11		386.33	0.000924	3.77	749.68	134.24	0.26
Reach 1	60600	2%_P	4168.00	374.89	388.05		388.37	0.000996	4.63	1020.04	218.38	0.28
Reach 1	60600	1%_P	4797.00	374.89	388.76		389.12	0.001005	4.90	1123.94	230.13	0.28
Reach 1	60600	0.2%_P	5640.00	374.89	389.63		390.03	0.001021	5.24	1256.19	305.21	0.29
Reach 1	60084	10%_P	2592.00	374.80	385.14		385.56	0.002595	5.23	517.78	105.79	0.39
Reach 1	60084	2%_P	4168.00	374.80	386.96		387.56	0.002592	6.29	727.05	162.23	0.41
Reach 1	60084	1%_P	4797.00	374.80	387.67		388.31	0.002485	6.54	873.26	231.31	0.40

Reach 1	60084	0.2%_P	5640.00	374.80	388.57		389.25	0.002315	6.77	1104.31	277.40	0.40
Reach 1	59452	10%_P	2592.00	373.52	384.15		384.35	0.001265	4.18	1395.54	488.28	0.28
Reach 1	59452	2%_P	4168.00	373.52	386.38		386.53	0.000806	4.01	2501.08	502.38	0.23
Reach 1	59452	1%_P	4797.00	373.52	387.20		387.34	0.000708	3.98	2913.81	505.69	0.22
Reach 1	59452	0.2%_P	5640.00	373.52	388.20		388.33	0.000628	3.99	3422.06	509.90	0.21
Reach 1	58504	10%_P	2592.00	372.00	383.32		383.48	0.000783	3.78	1516.14	421.04	0.22
Reach 1	58504	2%_P	4168.00	372.00	385.79		385.93	0.000613	3.95	2444.49	443.28	0.21
Reach 1	58504	1%_P	4797.00	372.00	386.66		386.80	0.000576	4.02	2777.32	449.71	0.20
Reach 1	58504	0.2%_P	5640.00	372.00	387.69		387.84	0.000549	4.14	3180.35	456.94	0.20
Reach 1	57926	10%_P	2592.00	371.58	382.77		382.99	0.000921	4.11	1119.91	274.16	0.25
Reach 1	57926	2%_P	4168.00	371.58	385.30		385.53	0.000779	4.49	1851.85	309.41	0.24
Reach 1	57926	1%_P	4797.00	371.58	386.18		386.42	0.000746	4.62	2133.05	325.50	0.23
Reach 1	57926	0.2%_P	5640.00	371.58	387.24		387.48	0.000712	4.77	2479.93	334.31	0.23
Reach 1	57217	10%_P	2592.00	371.10	382.20	377.43	382.37	0.000801	3.73	1224.94	298.84	0.23
Reach 1	57217	2%_P	4168.00	371.10	384.86	379.12	385.04	0.000616	3.95	2092.67	345.73	0.21
Reach 1	57217	1%_P	4797.00	371.10	385.77	379.59	385.95	0.000584	4.06	2414.92	366.74	0.21
Reach 1	57217	0.2%_P	5640.00	371.10	386.85	380.28	387.03	0.000551	4.18	2815.51	377.48	0.21

Plan: Alternative #2-1

Flows: Current and Projected Future

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
Reach 1	73825	10%_E	2356.00	387.40	396.01	392.60	396.46	0.001317	5.43	441.47	70.86	0.37
Reach 1	73825	2%_E	3789.00	387.40	397.27	393.98	398.08	0.001895	7.30	576.26	130.41	0.45
Reach 1	73825	1%_E	4361.00	387.40	397.56	394.46	398.55	0.002208	8.06	614.48	132.88	0.49
Reach 1	73825	0.2%_E	5127.00	387.40	398.40	395.04	399.47	0.002141	8.46	729.75	141.55	0.49
Reach 1	73825	10%_P	2592.00	387.40	396.29	392.83	396.80	0.001388	5.73	462.03	75.41	0.38
Reach 1	73825	2%_P	4168.00	387.40	397.48	394.30	398.40	0.002091	7.79	603.53	132.15	0.48
Reach 1	73825	1%_P	4797.00	387.40	397.84	394.79	398.94	0.002369	8.53	651.84	135.72	0.51
Reach 1	73825	0.2%_P	5640.00	387.40	398.72	395.46	399.91	0.002278	8.93	775.79	145.04	0.51
Reach 1	72604	10%_E	2356.00	382.00	393.53	391.01	394.28	0.002505	7.13	483.42	521.32	0.48
Reach 1	72604	2%_E	3789.00	382.00	395.45		395.91	0.001537	6.57	1536.19	1030.07	0.39
Reach 1	72604	1%_E	4361.00	382.00	396.20		396.51	0.001100	5.86	2206.76	1269.32	0.33
Reach 1	72604	0.2%_E	5127.00	382.00	398.08		398.19	0.000430	4.13	4569.46	1645.96	0.21
Reach 1	72604	10%_P	2592.00	382.00	393.87	391.36	394.60	0.002400	7.20	615.32	627.92	0.47
Reach 1	72604	2%_P	4168.00	382.00	395.94		396.31	0.001245	6.13	1961.06	1174.65	0.35
Reach 1	72604	1%_P	4797.00	382.00	396.74		397.00	0.000914	5.55	2807.37	1430.80	0.31
Reach 1	72604	0.2%_P	5640.00	382.00	398.66		398.74	0.000328	3.73	5534.17	1667.01	0.19
Reach 1	71465	10%_E	2356.00	381.40	393.37		393.46	0.000241	2.72	1805.47	687.31	0.16
Reach 1	71465	2%_E	3789.00	381.40	395.25		395.33	0.000200	2.84	3154.76	735.60	0.15

Reach 1	71465	1%_E	4361.00	381.40	395.98		396.05	0.000183	2.83	3692.42	746.57	0.15
Reach 1	71465	0.2%_E	5127.00	381.40	397.93		397.98	0.000107	2.41	5178.85	773.81	0.12
Reach 1	71465	10%_P	2592.00	381.40	393.73		393.82	0.000230	2.74	2059.10	705.11	0.16
Reach 1	71465	2%_P	4168.00	381.40	395.73		395.81	0.000189	2.84	3509.29	743.47	0.15
Reach 1	71465	1%_P	4797.00	381.40	396.53		396.60	0.000170	2.82	4104.37	756.22	0.15
Reach 1	71465	0.2%_P	5640.00	381.40	398.51		398.56	0.000103	2.43	5631.69	778.15	0.12
Reach 1	70672	10%_E	2356.00	381.00	392.92	387.79	393.16	0.000606	4.12	846.93	529.20	0.25
Reach 1	70672	2%_E	3789.00	381.00	395.02	389.48	395.14	0.000330	3.54	2719.41	741.93	0.19
Reach 1	70672	1%_E	4361.00	381.00	395.78	390.03	395.88	0.000280	3.42	3286.05	744.27	0.18
Reach 1	70672	0.2%_E	5127.00	381.00	397.83	391.04	397.89	0.000143	2.74	4818.20	750.31	0.13
Reach 1	70672	10%_P	2592.00	381.00	393.28	388.11	393.53	0.000607	4.25	952.95	562.06	0.26
Reach 1	70672	2%_P	4168.00	381.00	395.52	389.86	395.63	0.000296	3.46	3094.55	743.48	0.19
Reach 1	70672	1%_P	4797.00	381.00	396.35	390.55	396.45	0.000250	3.35	3711.93	746.02	0.17
Reach 1	70672	0.2%_P	5640.00	381.00	398.42	391.58	398.47	0.000136	2.75	5260.60	752.02	0.13
Reach 1	70224	10%_E	2356.00	380.89	392.38	388.84	392.77	0.001234	5.54	730.43	290.20	0.35
Reach 1	70224	2%_E	3789.00	380.89	394.48	391.22	394.87	0.001043	5.96	1206.24	398.58	0.33
Reach 1	70224	1%_E	4361.00	380.89	395.27	391.65	395.65	0.000959	6.01	1412.56	419.08	0.32
Reach 1	70224	0.2%_E	5127.00	380.89	397.51	392.32	397.76	0.000541	5.12	2020.40	465.56	0.25
Reach 1	70224	10%_P	2592.00	380.89	392.75	389.30	393.14	0.001200	5.64	807.21	299.75	0.35
Reach 1	70224	2%_P	4168.00	380.89	395.00	391.51	395.38	0.000988	6.00	1342.21	414.22	0.33
Reach 1	70224	1%_P	4797.00	380.89	395.86	392.12	396.23	0.000898	6.03	1569.89	448.14	0.31
Reach 1	70224	0.2%_P	5640.00	380.89	398.09	392.61	398.35	0.000533	5.24	2186.93	491.88	0.25
Reach 1	69866	10%_E	2356.00	380.80	392.33	385.45	392.50	0.000339	3.26	767.39	315.19	0.19
Reach 1	69866	2%_E	3789.00	380.80	394.35	386.94	394.61	0.000418	4.15	1130.41	457.67	0.22
Reach 1	69866	1%_E	4361.00	380.80	395.12	387.46	395.40	0.000422	4.36	1342.88	593.37	0.22
Reach 1	69866	0.2%_E	5127.00	380.80	397.41	388.11	397.61	0.000268	3.91	2028.62	654.94	0.18
Reach 1	69866	10%_P	2592.00	380.80	392.68	385.72	392.87	0.000359	3.44	814.62	339.80	0.20
Reach 1	69866	2%_P	4168.00	380.80	394.86	387.29	395.13	0.000422	4.29	1268.61	508.94	0.22
Reach 1	69866	1%_P	4797.00	380.80	395.71	387.83	395.99	0.000414	4.46	1518.99	625.07	0.22
Reach 1	69866	0.2%_P	5640.00	380.80	397.99	388.52	398.20	0.000271	4.04	2203.34	664.25	0.19
Reach 1	69810	10%_E	2356.00	380.74	392.33	384.78	392.46	0.000241	2.95	905.09	556.79	0.16
Reach 1	69810	2%_E	3789.00	380.74	394.35	386.18	394.57	0.000313	3.80	1208.40	630.28	0.19
Reach 1	69810	1%_E	4361.00	380.74	395.12	386.67	395.36	0.000329	4.06	1323.39	636.74	0.20
Reach 1	69810	0.2%_E	5127.00	380.74	397.38	387.27	397.60	0.000247	3.92	1662.10	673.41	0.18
Reach 1	69810	10%_P	2592.00	380.74	392.69	385.03	392.83	0.000256	3.11	958.24	569.86	0.17
Reach 1	69810	2%_P	4168.00	380.74	394.86	386.49	395.09	0.000324	3.98	1284.41	634.58	0.20
Reach 1	69810	1%_P	4797.00	380.74	395.70	387.03	395.96	0.000336	4.23	1410.56	642.05	0.20
Reach 1	69810	0.2%_P	5640.00	380.74	397.94	387.68	398.18	0.000260	4.13	1746.94	688.63	0.18
Reach 1	69662		Bridge									
Reach 1	69519	10%_E	2356.00	380.34	391.97	384.35	392.08	0.000229	2.78	981.74	568.32	0.16
Reach 1	69519	2%_E	3789.00	380.34	393.65	385.74	393.85	0.000316	3.64	1314.03	594.57	0.19

Reach 1	69519	1%_E	4361.00	380.34	394.28	386.22	394.50	0.000338	3.91	1437.48	602.84	0.20
Reach 1	69519	0.2%_E	5127.00	380.34	396.10	386.82	396.31	0.000267	3.82	1796.01	638.89	0.18
Reach 1	69519	10%_P	2592.00	380.34	392.27	384.60	392.40	0.000246	2.94	1041.30	573.20	0.17
Reach 1	69519	2%_P	4168.00	380.34	394.07	386.06	394.28	0.000331	3.82	1395.52	600.03	0.20
Reach 1	69519	1%_P	4797.00	380.34	394.76	386.57	395.00	0.000350	4.09	1531.06	609.40	0.21
Reach 1	69519	0.2%_P	5640.00	380.34	396.39	387.20	396.62	0.000298	4.10	1852.45	643.48	0.19
Reach 1	69271	10%_E	2356.00	380.00	391.76	385.44	391.98	0.000458	3.76	741.65	518.42	0.22
Reach 1	69271	2%_E	3789.00	380.00	393.33	387.11	393.69	0.000639	4.95	1023.48	611.70	0.27
Reach 1	69271	1%_E	4361.00	380.00	393.94	387.67	394.34	0.000666	5.25	1189.27	631.81	0.28
Reach 1	69271	0.2%_E	5127.00	380.00	395.89	388.38	396.19	0.000455	4.83	1736.06	719.86	0.24
Reach 1	69271	10%_P	2592.00	380.00	392.05	385.75	392.28	0.000493	3.99	783.92	530.85	0.23
Reach 1	69271	2%_P	4168.00	380.00	393.74	387.48	394.12	0.000660	5.16	1132.08	624.77	0.28
Reach 1	69271	1%_P	4797.00	380.00	394.42	388.08	394.83	0.000672	5.43	1318.93	648.02	0.28
Reach 1	69271	0.2%_P	5640.00	380.00	396.15	388.85	396.50	0.000501	5.15	1813.70	725.22	0.25
Reach 1	69076	10%_E	2356.00	380.24	391.75	384.26	391.87	0.000229	2.81	1021.22	449.26	0.16
Reach 1	69076	2%_E	3789.00	380.24	393.33	385.63	393.52	0.000325	3.70	1357.15	659.63	0.20
Reach 1	69076	1%_E	4361.00	380.24	393.94	386.12	394.16	0.000349	3.98	1492.34	684.31	0.20
Reach 1	69076	0.2%_E	5127.00	380.24	395.87	386.73	396.07	0.000262	3.81	1955.30	735.52	0.18
Reach 1	69076	10%_P	2592.00	380.24	392.03	384.51	392.16	0.000247	2.98	1079.92	455.96	0.17
Reach 1	69076	2%_P	4168.00	380.24	393.73	385.96	393.94	0.000343	3.89	1445.27	675.37	0.20
Reach 1	69076	1%_P	4797.00	380.24	394.41	386.47	394.65	0.000361	4.15	1599.80	695.33	0.21
Reach 1	69076	0.2%_P	5640.00	380.24	396.14	387.10	396.36	0.000293	4.08	2020.73	738.25	0.19
Reach 1	68969		Bridge									
Reach 1	68872	10%_E	2356.00	380.52	391.35		391.58	0.000487	3.82	617.12	68.24	0.22
Reach 1	68872	2%_E	3789.00	380.52	392.45		392.92	0.000868	5.49	695.80	77.80	0.30
Reach 1	68872	1%_E	4361.00	380.52	392.84		393.41	0.001018	6.09	726.07	80.60	0.33
Reach 1	68872	0.2%_E	5127.00	380.52	393.34		394.06	0.001207	6.84	766.95	83.06	0.36
Reach 1	68872	10%_P	2592.00	380.52	391.57		391.83	0.000546	4.11	631.91	69.01	0.23
Reach 1	68872	2%_P	4168.00	380.52	392.71		393.25	0.000969	5.90	715.52	79.68	0.32
Reach 1	68872	1%_P	4797.00	380.52	393.12		393.79	0.001127	6.53	749.50	82.02	0.35
Reach 1	68872	0.2%_P	5640.00	380.52	393.66		394.48	0.001328	7.31	796.42	100.25	0.38
Reach 1	68514	10%_E	2356.00	381.00	390.94		391.28	0.001250	5.21	795.14	269.59	0.35
Reach 1	68514	2%_E	3789.00	381.00	392.01		392.50	0.001609	6.53	1121.69	329.56	0.41
Reach 1	68514	1%_E	4361.00	381.00	392.40		392.93	0.001684	6.89	1250.14	336.70	0.42
Reach 1	68514	0.2%_E	5127.00	381.00	392.90		393.47	0.001745	7.30	1422.77	353.19	0.43
Reach 1	68514	10%_P	2592.00	381.00	391.13		391.51	0.001331	5.48	848.99	280.51	0.37
Reach 1	68514	2%_P	4168.00	381.00	392.27		392.79	0.001662	6.77	1206.99	334.64	0.42
Reach 1	68514	1%_P	4797.00	381.00	392.69		393.24	0.001725	7.14	1347.85	346.86	0.43
Reach 1	68514	0.2%_P	5640.00	381.00	393.23		393.82	0.001760	7.51	1543.07	365.86	0.44
Reach 1	67854	10%_E	2356.00	380.02	390.56		390.66	0.000595	3.53	1914.77	783.68	0.24
Reach 1	67854	2%_E	3789.00	380.02	391.72		391.81	0.000552	3.77	2829.59	799.67	0.24

Reach 1	67854	1%_E	4361.00	380.02	392.13	392.22	0.000537	3.85	3161.56	804.81	0.23
Reach 1	67854	0.2%_E	5127.00	380.02	392.67	392.76	0.000515	3.93	3596.25	811.75	0.23
Reach 1	67854	10%_P	2592.00	380.02	390.77	390.87	0.000586	3.57	2079.56	787.38	0.24
Reach 1	67854	2%_P	4168.00	380.02	391.99	392.09	0.000542	3.83	3050.45	803.00	0.24
Reach 1	67854	1%_P	4797.00	380.02	392.44	392.53	0.000525	3.90	3409.33	808.79	0.23
Reach 1	67854	0.2%_P	5640.00	380.02	393.03	393.12	0.000498	3.97	3887.50	816.61	0.23
Reach 1	67240	10%_E	2356.00	379.10	389.90	390.16	0.001181	5.12	1089.09	405.48	0.33
Reach 1	67240	2%_E	3789.00	379.10	391.00	391.31	0.001348	5.99	1537.81	414.30	0.36
Reach 1	67240	1%_E	4361.00	379.10	391.40	391.72	0.001365	6.22	1707.76	417.17	0.37
Reach 1	67240	0.2%_E	5127.00	379.10	391.95	392.27	0.001355	6.44	1935.58	420.44	0.37
Reach 1	67240	10%_P	2592.00	379.10	390.10	390.37	0.001220	5.29	1168.63	406.97	0.34
Reach 1	67240	2%_P	4168.00	379.10	391.27	391.58	0.001362	6.15	1650.39	416.27	0.37
Reach 1	67240	1%_P	4797.00	379.10	391.71	392.04	0.001364	6.36	1836.84	419.06	0.37
Reach 1	67240	0.2%_P	5640.00	379.10	392.32	392.64	0.001329	6.55	2091.15	422.50	0.37
Reach 1	65617	10%_E	2356.00	378.70	388.11	388.31	0.001299	4.72	1280.49	599.17	0.34
Reach 1	65617	2%_E	3789.00	378.70	389.44	389.60	0.000991	4.73	2096.66	627.81	0.31
Reach 1	65617	1%_E	4361.00	378.70	389.97	390.12	0.000881	4.67	2433.28	639.72	0.30
Reach 1	65617	0.2%_E	5127.00	378.70	390.67	390.80	0.000764	4.61	2882.12	653.63	0.28
Reach 1	65617	10%_P	2592.00	378.70	388.34	388.53	0.001244	4.74	1416.69	603.84	0.34
Reach 1	65617	2%_P	4168.00	378.70	389.79	389.94	0.000918	4.69	2318.20	636.20	0.30
Reach 1	65617	1%_P	4797.00	378.70	390.37	390.51	0.000811	4.64	2687.77	647.34	0.29
Reach 1	65617	0.2%_P	5640.00	378.70	391.13	391.26	0.000697	4.56	3187.73	663.42	0.27
Reach 1	63857	10%_E	2356.00	377.00	387.05	387.14	0.000530	3.00	1854.44	674.56	0.20
Reach 1	63857	2%_E	3789.00	377.00	388.64	388.73	0.000456	3.17	2936.66	687.57	0.19
Reach 1	63857	1%_E	4361.00	377.00	389.26	389.34	0.000422	3.19	3363.02	691.74	0.18
Reach 1	63857	0.2%_E	5127.00	377.00	390.04	390.12	0.000389	3.23	3905.96	697.56	0.18
Reach 1	63857	10%_P	2592.00	377.00	387.32	387.42	0.000519	3.04	2040.07	677.31	0.20
Reach 1	63857	2%_P	4168.00	377.00	389.05	389.13	0.000434	3.19	3218.37	690.30	0.18
Reach 1	63857	1%_P	4797.00	377.00	389.70	389.79	0.000403	3.21	3673.34	694.93	0.18
Reach 1	63857	0.2%_P	5640.00	377.00	390.55	390.63	0.000369	3.25	4264.65	702.39	0.17
Reach 1	62425	10%_E	2356.00	375.83	386.60	386.66	0.000323	2.62	2455.52	732.10	0.16
Reach 1	62425	2%_E	3789.00	375.83	388.27	388.33	0.000294	2.81	3684.24	739.61	0.15
Reach 1	62425	1%_E	4361.00	375.83	388.92	388.97	0.000277	2.84	4165.60	742.51	0.15
Reach 1	62425	0.2%_E	5127.00	375.83	389.73	389.79	0.000261	2.88	4769.79	745.36	0.15
Reach 1	62425	10%_P	2592.00	375.83	386.89	386.95	0.000320	2.66	2667.35	733.59	0.16
Reach 1	62425	2%_P	4168.00	375.83	388.70	388.75	0.000283	2.83	4002.45	741.62	0.15
Reach 1	62425	1%_P	4797.00	375.83	389.39	389.44	0.000268	2.86	4511.72	744.14	0.15
Reach 1	62425	0.2%_P	5640.00	375.83	390.26	390.31	0.000251	2.91	5165.31	747.14	0.15
Reach 1	61269	10%_E	2356.00	375.00	386.11	382.25	386.21	0.000609	2.98	1206.25	311.03	0.21
Reach 1	61269	2%_E	3789.00	375.00	387.73	383.32	387.88	0.000685	3.66	1618.47	345.45	0.23
Reach 1	61269	1%_E	4361.00	375.00	388.37	383.69	388.55	0.000682	3.85	1788.32	371.72	0.23
Reach 1	61269	0.2%_E	5127.00	375.00	389.18	384.15	389.37	0.000682	4.08	2004.35	436.29	0.23

Reach 1	61269	10%_P	2592.00	375.00	386.38	382.44	386.50	0.000630	3.11	1275.18	317.87	0.21
Reach 1	61269	2%_P	4168.00	375.00	388.15	383.56	388.32	0.000685	3.79	1730.24	353.62	0.23
Reach 1	61269	1%_P	4797.00	375.00	388.84	383.96	389.02	0.000683	3.98	1911.24	412.26	0.23
Reach 1	61269	0.2%_P	5640.00	375.00	389.71	384.47	389.91	0.000680	4.22	2149.95	471.98	0.23
Reach 1	60600	10%_E	2356.00	374.89	385.42		385.65	0.001109	3.84	658.26	130.25	0.28
Reach 1	60600	2%_E	3789.00	374.89	386.83		387.20	0.001393	4.95	847.39	152.61	0.32
Reach 1	60600	1%_E	4361.00	374.89	387.45		387.86	0.001401	5.23	933.37	206.69	0.32
Reach 1	60600	0.2%_E	5127.00	374.89	388.20		388.67	0.001419	5.59	1041.98	220.69	0.33
Reach 1	60600	10%_P	2592.00	374.89	385.65		385.90	0.001181	4.06	688.29	131.61	0.29
Reach 1	60600	2%_P	4168.00	374.89	387.23		387.63	0.001405	5.14	903.39	199.46	0.32
Reach 1	60600	1%_P	4797.00	374.89	387.88		388.32	0.001416	5.44	994.84	215.47	0.33
Reach 1	60600	0.2%_P	5640.00	374.89	388.71		389.21	0.001417	5.79	1115.97	229.14	0.33
Reach 1	60084	10%_E	2356.00	374.80	384.64	381.34	384.89	0.002010	4.33	679.06	232.19	0.34
Reach 1	60084	2%_E	3789.00	374.80	386.12	383.84	386.38	0.001658	4.65	1028.25	240.50	0.32
Reach 1	60084	1%_E	4361.00	374.80	386.83	384.14	387.09	0.001398	4.57	1204.02	261.91	0.30
Reach 1	60084	0.2%_E	5127.00	374.80	387.69	384.46	387.93	0.001191	4.54	1482.75	359.86	0.28
Reach 1	60084	10%_P	2592.00	374.80	384.86	381.68	385.12	0.002005	4.44	730.72	233.43	0.34
Reach 1	60084	2%_P	4168.00	374.80	386.58	384.04	386.84	0.001486	4.60	1141.16	246.71	0.30
Reach 1	60084	1%_P	4797.00	374.80	387.32	384.33	387.57	0.001278	4.56	1353.11	339.47	0.29
Reach 1	60084	0.2%_P	5640.00	374.80	388.25	384.65	388.49	0.001072	4.50	1695.17	391.22	0.27
Reach 1	59452	10%_E	2356.00	373.52	383.76	380.30	383.92	0.001114	3.77	1483.81	784.10	0.26
Reach 1	59452	2%_E	3789.00	373.52	385.73	381.84	385.79	0.000466	2.91	3046.87	802.67	0.18
Reach 1	59452	1%_E	4361.00	373.52	386.56	383.38	386.61	0.000346	2.66	3714.07	806.96	0.15
Reach 1	59452	0.2%_E	5127.00	373.52	387.48	383.64	387.53	0.000274	2.52	4465.06	811.73	0.14
Reach 1	59452	10%_P	2592.00	373.52	384.09	380.62	384.22	0.000948	3.60	1740.54	789.73	0.24
Reach 1	59452	2%_P	4168.00	373.52	386.27	383.30	386.33	0.000381	2.74	3486.04	805.52	0.16
Reach 1	59452	1%_P	4797.00	373.52	387.09	383.55	387.14	0.000301	2.58	4143.78	809.67	0.14
Reach 1	59452	0.2%_P	5640.00	373.52	388.09	383.79	388.13	0.000241	2.46	4954.18	814.93	0.13
Reach 1	58504	10%_E	2356.00	372.00	382.94		383.10	0.000809	3.73	1374.35	417.66	0.23
Reach 1	58504	2%_E	3789.00	372.00	385.19		385.34	0.000656	3.93	2215.12	438.12	0.21
Reach 1	58504	1%_E	4361.00	372.00	386.10		386.24	0.000592	3.95	2562.52	445.48	0.20
Reach 1	58504	0.2%_E	5127.00	372.00	387.07		387.22	0.000565	4.07	2937.44	452.72	0.20
Reach 1	58504	10%_P	2592.00	372.00	383.32		383.48	0.000783	3.78	1516.10	421.04	0.22
Reach 1	58504	2%_P	4168.00	372.00	385.79		385.93	0.000613	3.95	2444.46	443.28	0.21
Reach 1	58504	1%_P	4797.00	372.00	386.66		386.80	0.000576	4.02	2777.32	449.71	0.20
Reach 1	58504	0.2%_P	5640.00	372.00	387.69		387.84	0.000549	4.14	3180.35	456.94	0.20
Reach 1	57926	10%_E	2356.00	371.58	382.38		382.59	0.000931	4.01	1014.73	270.00	0.25
Reach 1	57926	2%_E	3789.00	371.58	384.68		384.91	0.000822	4.44	1663.09	297.24	0.24
Reach 1	57926	1%_E	4361.00	371.58	385.62		385.85	0.000759	4.51	1951.88	317.49	0.23
Reach 1	57926	0.2%_E	5127.00	371.58	386.60		386.84	0.000732	4.68	2270.43	328.92	0.23
Reach 1	57926	10%_P	2592.00	371.58	382.77		382.99	0.000921	4.11	1119.90	274.16	0.25
Reach 1	57926	2%_P	4168.00	371.58	385.30		385.53	0.000779	4.49	1851.84	309.40	0.24

Reach 1	57926	1%_P	4797.00	371.58	386.18		386.42	0.000746	4.62	2133.06	325.50	0.23
Reach 1	57926	0.2%_P	5640.00	371.58	387.24		387.48	0.000712	4.77	2479.93	334.31	0.23
Reach 1	57217	10%_E	2356.00	371.10	381.80	377.17	381.97	0.000812	3.63	1109.73	283.91	0.23
Reach 1	57217	2%_E	3789.00	371.10	384.20	378.77	384.38	0.000669	3.95	1866.06	338.40	0.22
Reach 1	57217	1%_E	4361.00	371.10	385.20	379.22	385.37	0.000590	3.95	2209.97	349.07	0.21
Reach 1	57217	0.2%_E	5127.00	371.10	386.20	379.97	386.38	0.000569	4.10	2573.83	370.66	0.21
Reach 1	57217	10%_P	2592.00	371.10	382.20	377.43	382.37	0.000801	3.73	1225.01	298.84	0.23
Reach 1	57217	2%_P	4168.00	371.10	384.86	379.12	385.04	0.000616	3.95	2092.74	345.73	0.21
Reach 1	57217	1%_P	4797.00	371.10	385.77	379.59	385.95	0.000583	4.06	2414.99	366.74	0.21
Reach 1	57217	0.2%_P	5640.00	371.10	386.85	380.29	387.03	0.000551	4.18	2815.59	377.48	0.21

Plan: Alternative #2-2

Flows: Current and Projected Future

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
Reach 1	73825	10%_E	2356.00	387.40	396.01	392.60	396.47	0.001315	5.43	441.72	70.87	0.37
Reach 1	73825	2%_E	3789.00	387.40	397.31	393.98	398.12	0.001858	7.25	582.02	130.76	0.45
Reach 1	73825	1%_E	4361.00	387.40	397.59	394.46	398.57	0.002174	8.02	619.13	133.18	0.49
Reach 1	73825	0.2%_E	5127.00	387.40	397.97	395.04	399.19	0.002555	8.96	670.34	137.28	0.53
Reach 1	73825	10%_P	2592.00	387.40	396.31	392.83	396.81	0.001380	5.72	462.94	76.07	0.38
Reach 1	73825	2%_P	4168.00	387.40	397.52	394.30	398.43	0.002055	7.75	608.79	132.50	0.47
Reach 1	73825	1%_P	4797.00	387.40	397.76	394.79	398.89	0.002444	8.62	641.92	134.88	0.52
Reach 1	73825	0.2%_P	5640.00	387.40	398.26	395.46	399.61	0.002742	9.48	710.30	140.18	0.55
Reach 1	72604	10%_E	2356.00	382.00	393.44	391.01	394.22	0.002661	7.28	453.71	443.45	0.49
Reach 1	72604	2%_E	3789.00	382.00	395.25		395.81	0.001827	7.05	1382.85	957.68	0.42
Reach 1	72604	1%_E	4361.00	382.00	395.96		396.36	0.001340	6.37	1979.15	1180.07	0.37
Reach 1	72604	0.2%_E	5127.00	382.00	396.85		397.12	0.000954	5.71	2937.13	1446.14	0.31
Reach 1	72604	10%_P	2592.00	382.00	393.79	391.36	394.56	0.002547	7.36	579.82	605.25	0.48
Reach 1	72604	2%_P	4168.00	382.00	395.72		396.17	0.001501	6.62	1766.05	1096.10	0.39
Reach 1	72604	1%_P	4797.00	382.00	396.48		396.78	0.001056	5.86	2509.43	1370.88	0.33
Reach 1	72604	0.2%_P	5640.00	382.00	397.52		397.71	0.000738	5.23	3784.70	1625.89	0.28
Reach 1	71465	10%_E	2356.00	381.40	393.28		393.37	0.000247	2.74	1745.30	681.63	0.17
Reach 1	71465	2%_E	3789.00	381.40	395.05		395.14	0.000223	2.95	3007.05	729.45	0.16
Reach 1	71465	1%_E	4361.00	381.40	395.73		395.81	0.000207	2.97	3506.23	743.39	0.16
Reach 1	71465	0.2%_E	5127.00	381.40	396.61		396.69	0.000187	2.97	4167.87	757.72	0.15
Reach 1	71465	10%_P	2592.00	381.40	393.63		393.72	0.000246	2.81	1987.51	701.53	0.17
Reach 1	71465	2%_P	4168.00	381.40	395.50		395.59	0.000212	2.97	3338.47	739.35	0.16
Reach 1	71465	1%_P	4797.00	381.40	396.23		396.31	0.000195	2.97	3883.35	749.63	0.15
Reach 1	71465	0.2%_P	5640.00	381.40	397.29		397.36	0.000168	2.92	4683.66	767.41	0.15
Reach 1	70672	10%_E	2356.00	381.00	392.81	387.79	393.06	0.000643	4.21	816.24	519.52	0.26
Reach 1	70672	2%_E	3789.00	381.00	394.78	389.48	394.92	0.000384	3.76	2541.19	741.14	0.21
Reach 1	70672	1%_E	4361.00	381.00	395.50	390.03	395.62	0.000329	3.65	3074.13	743.40	0.20

Reach 1	70672	0.2%_E	5127.00	381.00	396.42	391.04	396.52	0.000276	3.53	3761.04	746.22	0.18
Reach 1	70672	10%_P	2592.00	381.00	393.15	388.11	393.41	0.000650	4.35	913.29	548.63	0.26
Reach 1	70672	2%_P	4168.00	381.00	395.26	389.86	395.38	0.000346	3.68	2896.71	742.67	0.20
Reach 1	70672	1%_P	4797.00	381.00	396.02	390.55	396.13	0.000297	3.58	3467.92	745.02	0.19
Reach 1	70672	0.2%_P	5640.00	381.00	397.12	391.58	397.21	0.000238	3.40	4287.22	748.26	0.17
Reach 1	70224	10%_E	2356.00	380.89	392.21	388.84	392.64	0.001367	5.75	695.98	286.93	0.36
Reach 1	70224	2%_E	3789.00	380.89	394.16	391.22	394.61	0.001218	6.30	1125.04	386.76	0.36
Reach 1	70224	1%_E	4361.00	380.89	394.90	391.65	395.34	0.001133	6.39	1315.94	412.24	0.35
Reach 1	70224	0.2%_E	5127.00	380.89	395.85	392.32	396.28	0.001028	6.45	1568.77	448.07	0.34
Reach 1	70224	10%_P	2592.00	380.89	392.56	389.30	392.99	0.001341	5.87	767.61	295.14	0.36
Reach 1	70224	2%_P	4168.00	380.89	394.65	391.51	395.10	0.001162	6.37	1251.22	404.67	0.35
Reach 1	70224	1%_P	4797.00	380.89	395.45	392.12	395.88	0.001071	6.42	1460.42	425.05	0.34
Reach 1	70224	0.2%_P	5640.00	380.89	396.60	392.61	397.00	0.000919	6.36	1770.29	456.81	0.32
Reach 1	69866	10%_E	2356.00	380.80	392.17	385.45	392.34	0.000362	3.32	746.61	301.42	0.20
Reach 1	69866	2%_E	3789.00	380.80	394.02	386.94	394.30	0.000470	4.31	1058.07	425.53	0.23
Reach 1	69866	1%_E	4361.00	380.80	394.74	387.46	395.05	0.000482	4.56	1235.66	499.42	0.24
Reach 1	69866	0.2%_E	5127.00	380.80	395.68	388.11	396.01	0.000477	4.78	1510.44	624.69	0.24
Reach 1	69866	10%_P	2592.00	380.80	392.50	385.72	392.69	0.000385	3.52	788.79	322.06	0.21
Reach 1	69866	2%_P	4168.00	380.80	394.50	387.29	394.80	0.000481	4.49	1169.90	484.79	0.24
Reach 1	69866	1%_P	4797.00	380.80	395.28	387.83	395.60	0.000482	4.70	1389.59	607.95	0.24
Reach 1	69866	0.2%_P	5640.00	380.80	396.43	388.52	396.75	0.000446	4.81	1735.96	637.68	0.24
Reach 1	69810	10%_E	2356.00	380.74	392.17	384.78	392.31	0.000256	3.01	880.47	548.87	0.17
Reach 1	69810	2%_E	3789.00	380.74	394.03	386.18	394.26	0.000347	3.93	1159.42	627.62	0.20
Reach 1	69810	1%_E	4361.00	380.74	394.74	386.67	395.00	0.000368	4.21	1266.59	633.58	0.21
Reach 1	69810	0.2%_E	5127.00	380.74	395.67	387.27	395.97	0.000387	4.54	1406.19	641.75	0.22
Reach 1	69810	10%_P	2592.00	380.74	392.50	385.03	392.65	0.000274	3.18	929.91	562.41	0.18
Reach 1	69810	2%_P	4168.00	380.74	394.50	386.49	394.75	0.000362	4.12	1230.67	631.54	0.21
Reach 1	69810	1%_P	4797.00	380.74	395.27	387.03	395.56	0.000380	4.40	1346.48	638.08	0.22
Reach 1	69810	0.2%_P	5640.00	380.74	396.41	387.68	396.73	0.000383	4.67	1517.51	649.44	0.22
Reach 1	69662		Bridge									
Reach 1	69519	10%_E	2356.00	380.34	391.79	384.35	391.91	0.000247	2.85	946.61	563.56	0.17
Reach 1	69519	2%_E	3789.00	380.34	393.28	385.74	393.49	0.000361	3.80	1239.66	589.15	0.20
Reach 1	69519	1%_E	4361.00	380.34	393.83	386.22	394.08	0.000393	4.11	1349.15	596.92	0.22
Reach 1	69519	0.2%_E	5127.00	380.34	394.55	386.82	394.83	0.000429	4.47	1489.27	606.31	0.23
Reach 1	69519	10%_P	2592.00	380.34	392.06	384.60	392.20	0.000267	3.02	1000.46	570.07	0.17
Reach 1	69519	2%_P	4168.00	380.34	393.65	386.06	393.88	0.000383	4.01	1312.60	594.47	0.21
Reach 1	69519	1%_P	4797.00	380.34	394.24	386.57	394.51	0.000414	4.32	1429.65	602.32	0.22
Reach 1	69519	0.2%_P	5640.00	380.34	395.00	387.20	395.32	0.000448	4.68	1579.68	614.24	0.23
Reach 1	69271	10%_E	2356.00	380.00	391.57	385.44	391.80	0.000497	3.86	713.57	509.06	0.23
Reach 1	69271	2%_E	3789.00	380.00	392.91	387.11	393.31	0.000746	5.21	919.50	590.94	0.29
Reach 1	69271	1%_E	4361.00	380.00	393.42	387.67	393.88	0.000819	5.64	1045.89	614.24	0.31

Reach 1	69271	0.2%_E	5127.00	380.00	394.10	388.38	394.62	0.000867	6.05	1231.72	637.14	0.32
Reach 1	69271	10%_P	2592.00	380.00	391.82	385.75	392.07	0.000542	4.11	749.94	521.10	0.24
Reach 1	69271	2%_P	4168.00	380.00	393.24	387.48	393.69	0.000801	5.52	998.75	608.60	0.30
Reach 1	69271	1%_P	4797.00	380.00	393.81	388.08	394.30	0.000850	5.88	1151.63	627.17	0.31
Reach 1	69271	0.2%_P	5640.00	380.00	394.55	388.85	395.09	0.000884	6.27	1355.69	652.20	0.32
Reach 1	69076	10%_E	2356.00	380.24	391.55	384.26	391.68	0.000248	2.88	981.29	444.54	0.17
Reach 1	69076	2%_E	3789.00	380.24	392.90	385.63	393.12	0.000380	3.90	1264.48	615.26	0.21
Reach 1	69076	1%_E	4361.00	380.24	393.41	386.12	393.66	0.000419	4.22	1374.82	662.35	0.22
Reach 1	69076	0.2%_E	5127.00	380.24	394.09	386.73	394.39	0.000459	4.60	1526.83	688.08	0.24
Reach 1	69076	10%_P	2592.00	380.24	391.80	384.51	391.94	0.000271	3.07	1032.32	450.42	0.17
Reach 1	69076	2%_P	4168.00	380.24	393.23	385.96	393.48	0.000407	4.12	1336.79	656.47	0.22
Reach 1	69076	1%_P	4797.00	380.24	393.80	386.47	394.08	0.000443	4.44	1460.83	677.75	0.23
Reach 1	69076	0.2%_P	5640.00	380.24	394.54	387.10	394.86	0.000479	4.82	1629.65	699.05	0.24
Reach 1	68969		Bridge									
Reach 1	68872	10%_E	2356.00	380.52	391.35		391.58	0.000487	3.82	617.08	68.24	0.22
Reach 1	68872	2%_E	3789.00	380.52	392.46		392.93	0.000865	5.49	696.48	77.87	0.30
Reach 1	68872	1%_E	4361.00	380.52	392.86		393.44	0.001010	6.08	728.15	80.73	0.33
Reach 1	68872	0.2%_E	5127.00	380.52	393.39		394.11	0.001188	6.81	771.45	83.32	0.36
Reach 1	68872	10%_P	2592.00	380.52	391.57		391.83	0.000547	4.11	631.88	69.01	0.23
Reach 1	68872	2%_P	4168.00	380.52	392.73		393.26	0.000963	5.89	717.12	79.83	0.32
Reach 1	68872	1%_P	4797.00	380.52	393.16		393.82	0.001113	6.50	752.81	82.22	0.34
Reach 1	68872	0.2%_P	5640.00	380.52	393.73		394.55	0.001299	7.26	804.03	102.63	0.37
Reach 1	68514	10%_E	2356.00	381.00	390.94		391.28	0.001250	5.21	794.91	269.54	0.35
Reach 1	68514	2%_E	3789.00	381.00	392.03		392.52	0.001594	6.50	1126.77	330.07	0.41
Reach 1	68514	1%_E	4361.00	381.00	392.44		392.95	0.001648	6.84	1262.09	337.48	0.42
Reach 1	68514	0.2%_E	5127.00	381.00	392.97		393.52	0.001678	7.19	1448.80	360.54	0.43
Reach 1	68514	10%_P	2592.00	381.00	391.13		391.51	0.001331	5.48	848.85	280.49	0.37
Reach 1	68514	2%_P	4168.00	381.00	392.30		392.81	0.001634	6.73	1216.20	335.09	0.42
Reach 1	68514	1%_P	4797.00	381.00	392.74		393.28	0.001671	7.05	1367.18	348.15	0.42
Reach 1	68514	0.2%_P	5640.00	381.00	393.34		393.90	0.001665	7.36	1581.00	367.98	0.43
Reach 1	67854	10%_E	2356.00	380.02	390.56		390.66	0.000596	3.53	1913.70	783.66	0.24
Reach 1	67854	2%_E	3789.00	380.02	391.74		391.83	0.000543	3.75	2847.02	799.89	0.23
Reach 1	67854	1%_E	4361.00	380.02	392.18		392.27	0.000519	3.80	3199.55	805.46	0.23
Reach 1	67854	0.2%_E	5127.00	380.02	392.76		392.85	0.000485	3.84	3671.16	812.98	0.23
Reach 1	67854	10%_P	2592.00	380.02	390.77		390.87	0.000586	3.57	2078.86	787.37	0.24
Reach 1	67854	2%_P	4168.00	380.02	392.03		392.12	0.000528	3.79	3080.46	803.47	0.23
Reach 1	67854	1%_P	4797.00	380.02	392.51		392.60	0.000500	3.83	3467.20	809.71	0.23
Reach 1	67854	0.2%_P	5640.00	380.02	393.15		393.24	0.000462	3.85	3989.54	818.02	0.22
Reach 1	67240	10%_E	2356.00	379.10	389.90		390.16	0.001184	5.12	1087.98	405.46	0.33
Reach 1	67240	2%_E	3789.00	379.10	391.03		391.34	0.001314	5.93	1553.62	414.59	0.36
Reach 1	67240	1%_E	4361.00	379.10	391.48		391.79	0.001299	6.10	1740.55	417.65	0.36

Reach 1	67240	0.2%_E	5127.00	379.10	392.09	392.39	0.001247	6.24	1995.98	421.24	0.35
Reach 1	67240	10%_P	2592.00	379.10	390.10	390.37	0.001222	5.29	1167.95	406.96	0.34
Reach 1	67240	2%_P	4168.00	379.10	391.33	391.64	0.001308	6.05	1676.71	416.72	0.36
Reach 1	67240	1%_P	4797.00	379.10	391.83	392.13	0.001273	6.19	1884.86	419.75	0.36
Reach 1	67240	0.2%_P	5640.00	379.10	392.50	392.80	0.001201	6.30	2169.95	423.60	0.35
Reach 1	65617	10%_E	2356.00	378.70	388.16	388.34	0.001242	4.64	1306.04	600.16	0.34
Reach 1	65617	2%_E	3789.00	378.70	389.65	389.79	0.000844	4.44	2228.31	633.54	0.29
Reach 1	65617	1%_E	4361.00	378.70	390.26	390.38	0.000725	4.34	2613.22	645.16	0.27
Reach 1	65617	0.2%_E	5127.00	378.70	391.03	391.14	0.000614	4.25	3117.41	661.70	0.25
Reach 1	65617	10%_P	2592.00	378.70	388.41	388.58	0.001166	4.62	1455.90	605.12	0.33
Reach 1	65617	2%_P	4168.00	378.70	390.05	390.18	0.000763	4.38	2482.07	641.32	0.28
Reach 1	65617	1%_P	4797.00	378.70	390.70	390.81	0.000657	4.28	2899.73	654.20	0.26
Reach 1	65617	0.2%_P	5640.00	378.70	391.53	391.63	0.000557	4.20	3452.45	672.49	0.24
Reach 1	63857	10%_E	2356.00	377.00	387.19	387.28	0.000474	2.87	1951.66	676.17	0.19
Reach 1	63857	2%_E	3789.00	377.00	389.00	389.07	0.000368	2.93	3186.38	689.98	0.17
Reach 1	63857	1%_E	4361.00	377.00	389.69	389.75	0.000336	2.93	3661.02	694.79	0.16
Reach 1	63857	0.2%_E	5127.00	377.00	390.53	390.60	0.000307	2.96	4251.92	702.20	0.16
Reach 1	63857	10%_P	2592.00	377.00	387.51	387.59	0.000453	2.88	2164.90	678.86	0.18
Reach 1	63857	2%_P	4168.00	377.00	389.46	389.53	0.000346	2.93	3501.24	693.11	0.17
Reach 1	63857	1%_P	4797.00	377.00	390.17	390.24	0.000319	2.95	3999.85	698.62	0.16
Reach 1	63857	0.2%_P	5640.00	377.00	391.07	391.14	0.000292	2.99	4632.71	707.04	0.16
Reach 1	62425	10%_E	2356.00	375.83	386.81	386.86	0.000280	2.48	2605.51	733.25	0.15
Reach 1	62425	2%_E	3789.00	375.83	388.71	388.76	0.000233	2.57	4011.70	741.68	0.14
Reach 1	62425	1%_E	4361.00	375.83	389.43	389.47	0.000217	2.59	4541.60	744.28	0.13
Reach 1	62425	0.2%_E	5127.00	375.83	390.30	390.34	0.000204	2.63	5190.47	747.23	0.13
Reach 1	62425	10%_P	2592.00	375.83	387.14	387.19	0.000270	2.49	2852.85	734.63	0.14
Reach 1	62425	2%_P	4168.00	375.83	389.19	389.23	0.000222	2.58	4363.79	743.45	0.13
Reach 1	62425	1%_P	4797.00	375.83	389.93	389.97	0.000209	2.61	4914.68	746.04	0.13
Reach 1	62425	0.2%_P	5640.00	375.83	390.85	390.89	0.000197	2.66	5603.85	748.81	0.13
Reach 1	61269	10%_E	2356.00	375.00	386.38	382.25	386.47	0.000522	2.83	1273.63	317.73	0.19
Reach 1	61269	2%_E	3789.00	375.00	388.28	383.32	388.41	0.000537	3.39	1762.13	361.58	0.20
Reach 1	61269	1%_E	4361.00	375.00	388.99	383.69	389.13	0.000532	3.55	1952.53	421.43	0.20
Reach 1	61269	0.2%_E	5127.00	375.00	389.85	384.15	390.01	0.000536	3.78	2191.88	489.96	0.21
Reach 1	61269	10%_P	2592.00	375.00	386.71	382.44	386.82	0.000528	2.94	1358.11	325.14	0.19
Reach 1	61269	2%_P	4168.00	375.00	388.75	383.56	388.89	0.000534	3.50	1888.15	402.18	0.20
Reach 1	61269	1%_P	4797.00	375.00	389.49	383.96	389.64	0.000532	3.68	2088.48	456.51	0.21
Reach 1	61269	0.2%_P	5640.00	375.00	390.40	384.47	390.57	0.000536	3.91	2363.06	541.82	0.21
Reach 1	60600	10%_E	2356.00	374.89	385.80		386.00	0.000900	3.60	707.88	132.44	0.25
Reach 1	60600	2%_E	3789.00	374.89	387.59		387.89	0.000994	4.46	954.27	210.18	0.27
Reach 1	60600	1%_E	4361.00	374.89	388.29		388.62	0.000995	4.71	1053.92	221.95	0.28
Reach 1	60600	0.2%_E	5127.00	374.89	389.11		389.48	0.001012	5.03	1176.14	249.17	0.28
Reach 1	60600	10%_P	2592.00	374.89	386.11		386.33	0.000924	3.77	749.68	134.24	0.26

Reach 1	60600	2%_P	4168.00	374.89	388.05		388.37	0.000996	4.63	1020.05	218.38	0.28
Reach 1	60600	1%_P	4797.00	374.89	388.76		389.12	0.001005	4.90	1123.95	230.13	0.28
Reach 1	60600	0.2%_P	5640.00	374.89	389.63		390.03	0.001021	5.24	1256.19	305.22	0.29
Reach 1	60084	10%_E	2356.00	374.80	384.86		385.25	0.002545	5.01	488.52	104.15	0.38
Reach 1	60084	2%_E	3789.00	374.80	386.50		387.08	0.002655	6.11	668.03	116.03	0.41
Reach 1	60084	1%_E	4361.00	374.80	387.19		387.81	0.002545	6.36	770.37	193.80	0.40
Reach 1	60084	0.2%_E	5127.00	374.80	388.02		388.68	0.002423	6.65	959.08	249.35	0.40
Reach 1	60084	10%_P	2592.00	374.80	385.14		385.56	0.002595	5.23	517.76	105.79	0.39
Reach 1	60084	2%_P	4168.00	374.80	386.96		387.56	0.002592	6.29	727.04	162.23	0.41
Reach 1	60084	1%_P	4797.00	374.80	387.67		388.31	0.002485	6.54	873.24	231.31	0.40
Reach 1	60084	0.2%_P	5640.00	374.80	388.57		389.25	0.002315	6.77	1104.30	277.40	0.40
Reach 1	59452	10%_E	2356.00	373.52	383.81		384.02	0.001354	4.18	1230.95	482.07	0.29
Reach 1	59452	2%_E	3789.00	373.52	385.83		385.99	0.000901	4.07	2226.06	499.99	0.24
Reach 1	59452	1%_E	4361.00	373.52	386.66		386.80	0.000762	3.98	2643.32	503.56	0.23
Reach 1	59452	0.2%_E	5127.00	373.52	387.60		387.73	0.000674	3.98	3115.53	507.36	0.22
Reach 1	59452	10%_P	2592.00	373.52	384.15		384.35	0.001265	4.18	1395.57	488.28	0.28
Reach 1	59452	2%_P	4168.00	373.52	386.38		386.53	0.000806	4.01	2501.06	502.38	0.23
Reach 1	59452	1%_P	4797.00	373.52	387.20		387.34	0.000708	3.98	2913.79	505.69	0.22
Reach 1	59452	0.2%_P	5640.00	373.52	388.20		388.33	0.000628	3.99	3422.06	509.90	0.21
Reach 1	58504	10%_E	2356.00	372.00	382.94		383.10	0.000809	3.73	1374.35	417.66	0.23
Reach 1	58504	2%_E	3789.00	372.00	385.19		385.34	0.000656	3.93	2215.12	438.12	0.21
Reach 1	58504	1%_E	4361.00	372.00	386.10		386.24	0.000592	3.95	2562.52	445.48	0.20
Reach 1	58504	0.2%_E	5127.00	372.00	387.07		387.22	0.000565	4.07	2937.44	452.72	0.20
Reach 1	58504	10%_P	2592.00	372.00	383.32		383.48	0.000783	3.78	1516.17	421.04	0.22
Reach 1	58504	2%_P	4168.00	372.00	385.79		385.93	0.000613	3.95	2444.46	443.28	0.21
Reach 1	58504	1%_P	4797.00	372.00	386.66		386.80	0.000576	4.02	2777.31	449.71	0.20
Reach 1	58504	0.2%_P	5640.00	372.00	387.69		387.84	0.000549	4.14	3180.35	456.94	0.20
Reach 1	57926	10%_E	2356.00	371.58	382.38		382.59	0.000931	4.01	1014.73	270.00	0.25
Reach 1	57926	2%_E	3789.00	371.58	384.68		384.91	0.000822	4.44	1663.09	297.24	0.24
Reach 1	57926	1%_E	4361.00	371.58	385.62		385.85	0.000759	4.51	1951.88	317.49	0.23
Reach 1	57926	0.2%_E	5127.00	371.58	386.60		386.84	0.000732	4.68	2270.43	328.92	0.23
Reach 1	57926	10%_P	2592.00	371.58	382.77		382.99	0.000921	4.11	1119.96	274.16	0.25
Reach 1	57926	2%_P	4168.00	371.58	385.30		385.53	0.000779	4.49	1851.84	309.40	0.24
Reach 1	57926	1%_P	4797.00	371.58	386.18		386.42	0.000746	4.62	2133.05	325.50	0.23
Reach 1	57926	0.2%_P	5640.00	371.58	387.24		387.48	0.000712	4.77	2479.93	334.31	0.23
Reach 1	57217	10%_E	2356.00	371.10	381.80	377.17	381.97	0.000812	3.63	1109.73	283.91	0.23
Reach 1	57217	2%_E	3789.00	371.10	384.20	378.77	384.38	0.000669	3.95	1866.06	338.40	0.22
Reach 1	57217	1%_E	4361.00	371.10	385.20	379.22	385.37	0.000590	3.95	2209.97	349.07	0.21
Reach 1	57217	0.2%_E	5127.00	371.10	386.20	379.97	386.38	0.000569	4.10	2573.83	370.66	0.21
Reach 1	57217	10%_P	2592.00	371.10	382.20	377.43	382.37	0.000801	3.73	1225.01	298.84	0.23
Reach 1	57217	2%_P	4168.00	371.10	384.86	379.12	385.04	0.000616	3.95	2092.74	345.73	0.21
Reach 1	57217	1%_P	4797.00	371.10	385.77	379.59	385.95	0.000583	4.06	2414.99	366.74	0.21

Reach 1	57217	0.2%_P	5640.00	371.10	386.85	380.29	387.03	0.000551	4.18	2815.59	377.48	0.21

Plan: Alternative #2-3

Flows: Current and Projected Future

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
Reach 1	73825	10%_E	2356.00	387.40	396.01	392.60	396.47	0.001313	5.43	441.90	70.88	0.37
Reach 1	73825	2%_E	3789.00	387.40	397.35	393.98	398.15	0.001827	7.21	586.91	131.06	0.44
Reach 1	73825	1%_E	4361.00	387.40	397.63	394.46	398.60	0.002137	7.98	624.45	133.53	0.48
Reach 1	73825	0.2%_E	5127.00	387.40	398.10	395.04	399.27	0.002424	8.81	687.62	138.55	0.52
Reach 1	73825	10%_P	2592.00	387.40	396.31	392.83	396.82	0.001375	5.72	463.51	76.38	0.38
Reach 1	73825	2%_P	4168.00	387.40	397.52	394.30	398.44	0.002049	7.74	609.68	132.56	0.47
Reach 1	73825	1%_P	4797.00	387.40	397.79	394.79	398.91	0.002419	8.59	645.18	135.16	0.52
Reach 1	73825	0.2%_P	5640.00	387.40	398.29	395.46	399.63	0.002714	9.45	713.76	140.42	0.55
Reach 1	72604	10%_E	2356.00	382.00	393.39	391.01	394.19	0.002752	7.37	438.97	420.76	0.50
Reach 1	72604	2%_E	3789.00	382.00	395.11		395.75	0.002052	7.40	1286.89	934.22	0.45
Reach 1	72604	1%_E	4361.00	382.00	395.79		396.25	0.001553	6.77	1823.78	1113.17	0.39
Reach 1	72604	0.2%_E	5127.00	382.00	397.36		397.55	0.000693	5.02	3571.18	1621.73	0.27
Reach 1	72604	10%_P	2592.00	382.00	393.73	391.36	394.53	0.002653	7.47	555.93	582.71	0.49
Reach 1	72604	2%_P	4168.00	382.00	395.57		396.07	0.001672	6.91	1636.88	1059.17	0.41
Reach 1	72604	1%_P	4797.00	382.00	396.29		396.64	0.001234	6.25	2300.25	1311.52	0.35
Reach 1	72604	0.2%_P	5640.00	382.00	397.78		397.94	0.000592	4.76	4146.77	1631.95	0.25
Reach 1	71465	10%_E	2356.00	381.40	393.21		393.31	0.000258	2.79	1700.97	673.39	0.17
Reach 1	71465	2%_E	3789.00	381.40	394.91		395.01	0.000241	3.04	2905.76	726.00	0.17
Reach 1	71465	1%_E	4361.00	381.40	395.55		395.64	0.000227	3.08	3370.95	739.92	0.17
Reach 1	71465	0.2%_E	5127.00	381.40	397.16		397.23	0.000147	2.71	4588.12	766.06	0.14
Reach 1	71465	10%_P	2592.00	381.40	393.55		393.65	0.000258	2.86	1934.63	698.79	0.17
Reach 1	71465	2%_P	4168.00	381.40	395.33		395.43	0.000232	3.07	3212.91	737.16	0.17
Reach 1	71465	1%_P	4797.00	381.40	396.02		396.11	0.000216	3.09	3724.38	747.04	0.16
Reach 1	71465	0.2%_P	5640.00	381.40	397.58		397.64	0.000149	2.79	4905.34	770.55	0.14
Reach 1	70672	10%_E	2356.00	381.00	392.72	387.79	392.99	0.000673	4.28	793.35	512.67	0.27
Reach 1	70672	2%_E	3789.00	381.00	394.61	389.48	394.76	0.000428	3.93	2414.40	740.55	0.22
Reach 1	70672	1%_E	4361.00	381.00	395.28	390.03	395.42	0.000373	3.83	2915.28	742.74	0.21
Reach 1	70672	0.2%_E	5127.00	381.00	397.02	391.04	397.10	0.000206	3.15	4210.31	747.96	0.16
Reach 1	70672	10%_P	2592.00	381.00	393.05	388.11	393.32	0.000685	4.43	884.08	541.95	0.27
Reach 1	70672	2%_P	4168.00	381.00	395.05	389.86	395.20	0.000391	3.86	2746.58	742.05	0.21
Reach 1	70672	1%_P	4797.00	381.00	395.78	390.55	395.91	0.000339	3.77	3287.46	744.28	0.20
Reach 1	70672	0.2%_P	5640.00	381.00	397.43	391.58	397.51	0.000206	3.22	4519.66	749.16	0.16
Reach 1	70224	10%_E	2356.00	380.89	392.08	388.84	392.54	0.001487	5.93	668.12	282.42	0.38
Reach 1	70224	2%_E	3789.00	380.89	393.92	391.22	394.42	0.001373	6.58	1066.38	378.79	0.38
Reach 1	70224	1%_E	4361.00	380.89	394.61	391.65	395.10	0.001299	6.71	1239.98	403.87	0.37
Reach 1	70224	0.2%_E	5127.00	380.89	396.58	392.32	396.91	0.000764	5.79	1766.09	456.67	0.29

Reach 1	70224	10%_P	2592.00	380.89	392.41	389.30	392.87	0.001469	6.06	735.94	290.84	0.38
Reach 1	70224	2%_P	4168.00	380.89	394.38	391.51	394.87	0.001327	6.68	1179.64	396.68	0.37
Reach 1	70224	1%_P	4797.00	380.89	395.13	392.12	395.61	0.001235	6.76	1375.84	416.66	0.37
Reach 1	70224	0.2%_P	5640.00	380.89	396.97	392.61	397.32	0.000797	6.04	1871.86	460.21	0.30
Reach 1	69866	10%_E	2356.00	380.80	392.04	385.45	392.21	0.000382	3.38	730.19	295.28	0.20
Reach 1	69866	2%_E	3789.00	380.80	393.78	386.94	394.08	0.000514	4.43	1006.47	418.66	0.24
Reach 1	69866	1%_E	4361.00	380.80	394.44	387.46	394.77	0.000538	4.73	1153.19	483.24	0.25
Reach 1	69866	0.2%_E	5127.00	380.80	396.45	388.11	396.71	0.000366	4.36	1740.69	637.92	0.21
Reach 1	69866	10%_P	2592.00	380.80	392.35	385.72	392.54	0.000408	3.58	769.24	315.69	0.21
Reach 1	69866	2%_P	4168.00	380.80	394.21	387.29	394.54	0.000530	4.63	1099.08	430.80	0.25
Reach 1	69866	1%_P	4797.00	380.80	394.94	387.83	395.29	0.000542	4.89	1291.12	516.31	0.25
Reach 1	69866	0.2%_P	5640.00	380.80	396.82	388.52	397.11	0.000391	4.60	1853.18	644.47	0.22
Reach 1	69810	10%_E	2356.00	380.74	392.04	384.78	392.18	0.000269	3.05	860.62	543.99	0.17
Reach 1	69810	2%_E	3789.00	380.74	393.78	386.18	394.02	0.000376	4.03	1122.64	625.43	0.21
Reach 1	69810	1%_E	4361.00	380.74	394.44	386.67	394.72	0.000403	4.34	1221.53	631.02	0.22
Reach 1	69810	0.2%_E	5127.00	380.74	396.43	387.27	396.69	0.000315	4.24	1520.32	649.64	0.20
Reach 1	69810	10%_P	2592.00	380.74	392.35	385.03	392.51	0.000290	3.24	907.27	557.63	0.18
Reach 1	69810	2%_P	4168.00	380.74	394.22	386.49	394.48	0.000395	4.24	1187.96	629.14	0.22
Reach 1	69810	1%_P	4797.00	380.74	394.94	387.03	395.24	0.000419	4.54	1296.54	635.21	0.23
Reach 1	69810	0.2%_P	5640.00	380.74	396.80	387.68	397.09	0.000346	4.52	1575.59	656.72	0.21
Reach 1	69662		Bridge									
Reach 1	69519	10%_E	2356.00	380.34	391.97	384.35	392.08	0.000230	2.78	981.65	568.30	0.16
Reach 1	69519	2%_E	3789.00	380.34	393.66	385.74	393.85	0.000315	3.64	1315.31	594.65	0.19
Reach 1	69519	1%_E	4361.00	380.34	394.30	386.22	394.52	0.000336	3.90	1441.01	603.08	0.20
Reach 1	69519	0.2%_E	5127.00	380.34	396.10	386.82	396.30	0.000267	3.82	1795.52	638.85	0.18
Reach 1	69519	10%_P	2592.00	380.34	392.27	384.60	392.40	0.000246	2.94	1041.24	573.20	0.17
Reach 1	69519	2%_P	4168.00	380.34	394.08	386.06	394.29	0.000330	3.82	1398.31	600.22	0.20
Reach 1	69519	1%_P	4797.00	380.34	394.78	386.57	395.02	0.000347	4.08	1536.37	609.87	0.21
Reach 1	69519	0.2%_P	5640.00	380.34	396.39	387.20	396.62	0.000298	4.10	1851.91	643.43	0.19
Reach 1	69271	10%_E	2356.00	380.00	391.76	385.44	391.98	0.000458	3.76	741.58	518.40	0.22
Reach 1	69271	2%_E	3789.00	380.00	393.34	387.11	393.70	0.000637	4.95	1025.47	611.93	0.27
Reach 1	69271	1%_E	4361.00	380.00	393.97	387.67	394.35	0.000661	5.24	1194.90	632.48	0.28
Reach 1	69271	0.2%_E	5127.00	380.00	395.88	388.38	396.19	0.000455	4.84	1735.27	719.80	0.24
Reach 1	69271	10%_P	2592.00	380.00	392.04	385.75	392.28	0.000493	3.99	783.86	530.84	0.23
Reach 1	69271	2%_P	4168.00	380.00	393.75	387.48	394.13	0.000656	5.15	1136.51	625.31	0.28
Reach 1	69271	1%_P	4797.00	380.00	394.45	388.08	394.85	0.000664	5.40	1327.48	648.93	0.28
Reach 1	69271	0.2%_P	5640.00	380.00	396.15	388.85	396.49	0.000502	5.15	1812.80	725.16	0.25
Reach 1	69076	10%_E	2356.00	380.24	391.75	384.26	391.87	0.000229	2.81	1021.12	449.25	0.16
Reach 1	69076	2%_E	3789.00	380.24	393.34	385.63	393.53	0.000324	3.70	1358.76	659.88	0.20
Reach 1	69076	1%_E	4361.00	380.24	393.96	386.12	394.18	0.000347	3.97	1496.99	684.83	0.20
Reach 1	69076	0.2%_E	5127.00	380.24	395.87	386.73	396.07	0.000262	3.81	1954.63	735.49	0.18

Reach 1	69076	10%_P	2592.00	380.24	392.03	384.51	392.16	0.000248	2.98	1079.85	455.96	0.17
Reach 1	69076	2%_P	4168.00	380.24	393.74	385.96	393.96	0.000341	3.89	1448.92	675.97	0.20
Reach 1	69076	1%_P	4797.00	380.24	394.44	386.47	394.68	0.000358	4.14	1606.94	696.08	0.21
Reach 1	69076	0.2%_P	5640.00	380.24	396.14	387.10	396.36	0.000293	4.09	2019.97	738.22	0.19
Reach 1	68969		Bridge									
Reach 1	68872	10%_E	2356.00	380.52	391.35		391.58	0.000487	3.82	617.08	68.24	0.22
Reach 1	68872	2%_E	3789.00	380.52	392.46		392.93	0.000865	5.49	696.48	77.87	0.30
Reach 1	68872	1%_E	4361.00	380.52	392.86		393.44	0.001010	6.08	728.15	80.73	0.33
Reach 1	68872	0.2%_E	5127.00	380.52	393.39		394.11	0.001188	6.81	771.45	83.32	0.36
Reach 1	68872	10%_P	2592.00	380.52	391.57		391.83	0.000547	4.11	631.88	69.01	0.23
Reach 1	68872	2%_P	4168.00	380.52	392.73		393.26	0.000963	5.89	717.12	79.83	0.32
Reach 1	68872	1%_P	4797.00	380.52	393.16		393.82	0.001113	6.50	752.81	82.22	0.34
Reach 1	68872	0.2%_P	5640.00	380.52	393.73		394.55	0.001299	7.26	804.03	102.63	0.37
Reach 1	68514	10%_E	2356.00	381.00	390.94		391.28	0.001250	5.21	794.91	269.54	0.35
Reach 1	68514	2%_E	3789.00	381.00	392.03		392.52	0.001594	6.50	1126.77	330.07	0.41
Reach 1	68514	1%_E	4361.00	381.00	392.44		392.95	0.001648	6.84	1262.09	337.48	0.42
Reach 1	68514	0.2%_E	5127.00	381.00	392.97		393.52	0.001678	7.19	1448.80	360.54	0.43
Reach 1	68514	10%_P	2592.00	381.00	391.13		391.51	0.001331	5.48	848.85	280.49	0.37
Reach 1	68514	2%_P	4168.00	381.00	392.30		392.81	0.001634	6.73	1216.20	335.09	0.42
Reach 1	68514	1%_P	4797.00	381.00	392.74		393.28	0.001671	7.05	1367.18	348.15	0.42
Reach 1	68514	0.2%_P	5640.00	381.00	393.34		393.90	0.001665	7.36	1581.00	367.98	0.43
Reach 1	67854	10%_E	2356.00	380.02	390.56		390.66	0.000596	3.53	1913.70	783.66	0.24
Reach 1	67854	2%_E	3789.00	380.02	391.74		391.83	0.000543	3.75	2847.02	799.89	0.23
Reach 1	67854	1%_E	4361.00	380.02	392.18		392.27	0.000519	3.80	3199.55	805.46	0.23
Reach 1	67854	0.2%_E	5127.00	380.02	392.76		392.85	0.000485	3.84	3671.16	812.98	0.23
Reach 1	67854	10%_P	2592.00	380.02	390.77		390.87	0.000586	3.57	2078.86	787.37	0.24
Reach 1	67854	2%_P	4168.00	380.02	392.03		392.12	0.000528	3.79	3080.46	803.47	0.23
Reach 1	67854	1%_P	4797.00	380.02	392.51		392.60	0.000500	3.83	3467.20	809.71	0.23
Reach 1	67854	0.2%_P	5640.00	380.02	393.15		393.24	0.000462	3.85	3989.54	818.02	0.22
Reach 1	67240	10%_E	2356.00	379.10	389.90		390.16	0.001184	5.12	1087.98	405.46	0.33
Reach 1	67240	2%_E	3789.00	379.10	391.03		391.34	0.001314	5.93	1553.62	414.59	0.36
Reach 1	67240	1%_E	4361.00	379.10	391.48		391.79	0.001299	6.10	1740.55	417.65	0.36
Reach 1	67240	0.2%_E	5127.00	379.10	392.09		392.39	0.001247	6.24	1995.98	421.24	0.35
Reach 1	67240	10%_P	2592.00	379.10	390.10		390.37	0.001222	5.29	1167.95	406.96	0.34
Reach 1	67240	2%_P	4168.00	379.10	391.33		391.64	0.001308	6.05	1676.71	416.72	0.36
Reach 1	67240	1%_P	4797.00	379.10	391.83		392.13	0.001273	6.19	1884.86	419.75	0.36
Reach 1	67240	0.2%_P	5640.00	379.10	392.50		392.80	0.001201	6.30	2169.95	423.60	0.35
Reach 1	65617	10%_E	2356.00	378.70	388.16		388.34	0.001242	4.64	1306.04	600.16	0.34
Reach 1	65617	2%_E	3789.00	378.70	389.65		389.79	0.000844	4.44	2228.31	633.54	0.29
Reach 1	65617	1%_E	4361.00	378.70	390.26		390.38	0.000725	4.34	2613.22	645.16	0.27
Reach 1	65617	0.2%_E	5127.00	378.70	391.03		391.14	0.000614	4.25	3117.41	661.70	0.25

Reach 1	65617	10%_P	2592.00	378.70	388.41		388.58	0.001166	4.62	1455.90	605.12	0.33
Reach 1	65617	2%_P	4168.00	378.70	390.05		390.18	0.000763	4.38	2482.07	641.32	0.28
Reach 1	65617	1%_P	4797.00	378.70	390.70		390.81	0.000657	4.28	2899.73	654.20	0.26
Reach 1	65617	0.2%_P	5640.00	378.70	391.53		391.63	0.000557	4.20	3452.45	672.49	0.24
Reach 1	63857	10%_E	2356.00	377.00	387.19		387.28	0.000474	2.87	1951.66	676.17	0.19
Reach 1	63857	2%_E	3789.00	377.00	389.00		389.07	0.000368	2.93	3186.38	689.98	0.17
Reach 1	63857	1%_E	4361.00	377.00	389.69		389.75	0.000336	2.93	3661.02	694.79	0.16
Reach 1	63857	0.2%_E	5127.00	377.00	390.53		390.60	0.000307	2.96	4251.92	702.20	0.16
Reach 1	63857	10%_P	2592.00	377.00	387.51		387.59	0.000453	2.88	2164.90	678.86	0.18
Reach 1	63857	2%_P	4168.00	377.00	389.46		389.53	0.000346	2.93	3501.24	693.11	0.17
Reach 1	63857	1%_P	4797.00	377.00	390.17		390.24	0.000319	2.95	3999.85	698.62	0.16
Reach 1	63857	0.2%_P	5640.00	377.00	391.07		391.14	0.000292	2.99	4632.71	707.04	0.16
Reach 1	62425	10%_E	2356.00	375.83	386.81		386.86	0.000280	2.48	2605.51	733.25	0.15
Reach 1	62425	2%_E	3789.00	375.83	388.71		388.76	0.000233	2.57	4011.70	741.68	0.14
Reach 1	62425	1%_E	4361.00	375.83	389.43		389.47	0.000217	2.59	4541.60	744.28	0.13
Reach 1	62425	0.2%_E	5127.00	375.83	390.30		390.34	0.000204	2.63	5190.47	747.23	0.13
Reach 1	62425	10%_P	2592.00	375.83	387.14		387.19	0.000270	2.49	2852.85	734.63	0.14
Reach 1	62425	2%_P	4168.00	375.83	389.19		389.23	0.000222	2.58	4363.79	743.45	0.13
Reach 1	62425	1%_P	4797.00	375.83	389.93		389.97	0.000209	2.61	4914.68	746.04	0.13
Reach 1	62425	0.2%_P	5640.00	375.83	390.85		390.89	0.000197	2.66	5603.85	748.81	0.13
Reach 1	61269	10%_E	2356.00	375.00	386.38	382.25	386.47	0.000522	2.83	1273.63	317.73	0.19
Reach 1	61269	2%_E	3789.00	375.00	388.28	383.32	388.41	0.000537	3.39	1762.13	361.58	0.20
Reach 1	61269	1%_E	4361.00	375.00	388.99	383.69	389.13	0.000532	3.55	1952.53	421.43	0.20
Reach 1	61269	0.2%_E	5127.00	375.00	389.85	384.15	390.01	0.000536	3.78	2191.88	489.96	0.21
Reach 1	61269	10%_P	2592.00	375.00	386.71	382.44	386.82	0.000528	2.94	1358.11	325.14	0.19
Reach 1	61269	2%_P	4168.00	375.00	388.75	383.56	388.89	0.000534	3.50	1888.15	402.18	0.20
Reach 1	61269	1%_P	4797.00	375.00	389.49	383.96	389.64	0.000532	3.68	2088.48	456.51	0.21
Reach 1	61269	0.2%_P	5640.00	375.00	390.40	384.47	390.57	0.000536	3.91	2363.06	541.82	0.21
Reach 1	60600	10%_E	2356.00	374.89	385.80		386.00	0.000900	3.60	707.88	132.44	0.25
Reach 1	60600	2%_E	3789.00	374.89	387.59		387.89	0.000994	4.46	954.27	210.18	0.27
Reach 1	60600	1%_E	4361.00	374.89	388.29		388.62	0.000995	4.71	1053.92	221.95	0.28
Reach 1	60600	0.2%_E	5127.00	374.89	389.11		389.48	0.001012	5.03	1176.14	249.17	0.28
Reach 1	60600	10%_P	2592.00	374.89	386.11		386.33	0.000924	3.77	749.68	134.24	0.26
Reach 1	60600	2%_P	4168.00	374.89	388.05		388.37	0.000996	4.63	1020.05	218.38	0.28
Reach 1	60600	1%_P	4797.00	374.89	388.76		389.12	0.001005	4.90	1123.95	230.13	0.28
Reach 1	60600	0.2%_P	5640.00	374.89	389.63		390.03	0.001021	5.24	1256.19	305.22	0.29
Reach 1	60084	10%_E	2356.00	374.80	384.86		385.25	0.002545	5.01	488.52	104.15	0.38
Reach 1	60084	2%_E	3789.00	374.80	386.50		387.08	0.002655	6.11	668.03	116.03	0.41
Reach 1	60084	1%_E	4361.00	374.80	387.19		387.81	0.002545	6.36	770.37	193.80	0.40
Reach 1	60084	0.2%_E	5127.00	374.80	388.02		388.68	0.002423	6.65	959.08	249.35	0.40
Reach 1	60084	10%_P	2592.00	374.80	385.14		385.56	0.002595	5.23	517.76	105.79	0.39
Reach 1	60084	2%_P	4168.00	374.80	386.96		387.56	0.002592	6.29	727.04	162.23	0.41

Reach 1	60084	1%_P	4797.00	374.80	387.67	388.31	0.002485	6.54	873.24	231.31	0.40
Reach 1	60084	0.2%_P	5640.00	374.80	388.57	389.25	0.002315	6.77	1104.30	277.40	0.40
Reach 1	59452	10%_E	2356.00	373.52	383.81	384.02	0.001354	4.18	1230.95	482.07	0.29
Reach 1	59452	2%_E	3789.00	373.52	385.83	385.99	0.000901	4.07	2226.06	499.99	0.24
Reach 1	59452	1%_E	4361.00	373.52	386.66	386.80	0.000762	3.98	2643.32	503.56	0.23
Reach 1	59452	0.2%_E	5127.00	373.52	387.60	387.73	0.000674	3.98	3115.53	507.36	0.22
Reach 1	59452	10%_P	2592.00	373.52	384.15	384.35	0.001265	4.18	1395.57	488.28	0.28
Reach 1	59452	2%_P	4168.00	373.52	386.38	386.53	0.000806	4.01	2501.06	502.38	0.23
Reach 1	59452	1%_P	4797.00	373.52	387.20	387.34	0.000708	3.98	2913.79	505.69	0.22
Reach 1	59452	0.2%_P	5640.00	373.52	388.20	388.33	0.000628	3.99	3422.06	509.90	0.21
Reach 1	58504	10%_E	2356.00	372.00	382.94	383.10	0.000809	3.73	1374.35	417.66	0.23
Reach 1	58504	2%_E	3789.00	372.00	385.19	385.34	0.000656	3.93	2215.12	438.12	0.21
Reach 1	58504	1%_E	4361.00	372.00	386.10	386.24	0.000592	3.95	2562.52	445.48	0.20
Reach 1	58504	0.2%_E	5127.00	372.00	387.07	387.22	0.000565	4.07	2937.44	452.72	0.20
Reach 1	58504	10%_P	2592.00	372.00	383.32	383.48	0.000783	3.78	1516.17	421.04	0.22
Reach 1	58504	2%_P	4168.00	372.00	385.79	385.93	0.000613	3.95	2444.46	443.28	0.21
Reach 1	58504	1%_P	4797.00	372.00	386.66	386.80	0.000576	4.02	2777.31	449.71	0.20
Reach 1	58504	0.2%_P	5640.00	372.00	387.69	387.84	0.000549	4.14	3180.35	456.94	0.20
Reach 1	57926	10%_E	2356.00	371.58	382.38	382.59	0.000931	4.01	1014.73	270.00	0.25
Reach 1	57926	2%_E	3789.00	371.58	384.68	384.91	0.000822	4.44	1663.09	297.24	0.24
Reach 1	57926	1%_E	4361.00	371.58	385.62	385.85	0.000759	4.51	1951.88	317.49	0.23
Reach 1	57926	0.2%_E	5127.00	371.58	386.60	386.84	0.000732	4.68	2270.44	328.92	0.23
Reach 1	57926	10%_P	2592.00	371.58	382.77	382.99	0.000921	4.11	1119.96	274.16	0.25
Reach 1	57926	2%_P	4168.00	371.58	385.30	385.53	0.000779	4.49	1851.84	309.40	0.24
Reach 1	57926	1%_P	4797.00	371.58	386.18	386.42	0.000746	4.62	2133.05	325.50	0.23
Reach 1	57926	0.2%_P	5640.00	371.58	387.24	387.48	0.000712	4.77	2479.93	334.31	0.23
Reach 1	57217	10%_E	2356.00	371.10	381.80	377.17	381.97	0.000812	3.63	1109.73	283.91	0.23
Reach 1	57217	2%_E	3789.00	371.10	384.20	378.77	384.38	0.000669	3.95	1866.06	338.40	0.22
Reach 1	57217	1%_E	4361.00	371.10	385.20	379.22	385.37	0.000590	3.95	2209.97	349.07	0.21
Reach 1	57217	0.2%_E	5127.00	371.10	386.20	379.97	386.38	0.000569	4.10	2573.83	370.66	0.21
Reach 1	57217	10%_P	2592.00	371.10	382.20	377.43	382.37	0.000801	3.73	1225.01	298.84	0.23
Reach 1	57217	2%_P	4168.00	371.10	384.86	379.12	385.04	0.000616	3.95	2092.74	345.73	0.21
Reach 1	57217	1%_P	4797.00	371.10	385.77	379.59	385.95	0.000583	4.06	2414.99	366.74	0.21
Reach 1	57217	0.2%_P	5640.00	371.10	386.85	380.29	387.03	0.000551	4.18	2815.59	377.48	0.21

Plan: Alternative #2-4

Flows: Current and Projected Future

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
Reach 1	73825	10%_E	2356.00	387.40	396.01	392.60	396.47	0.001313	5.43	441.87	70.88	0.37
Reach 1	73825	2%_E	3789.00	387.40	397.32	393.98	398.12	0.001853	7.24	582.90	130.81	0.45
Reach 1	73825	1%_E	4361.00	387.40	397.67	394.46	398.63	0.002107	7.94	628.71	133.81	0.48

Reach 1	73825	0.2%_E	5127.00	387.40	397.96	395.04	399.18	0.002570	8.97	668.38	137.11	0.53
Reach 1	73825	10%_P	2592.00	387.40	396.32	392.83	396.83	0.001368	5.71	464.38	76.84	0.38
Reach 1	73825	2%_P	4168.00	387.40	397.59	394.30	398.49	0.001991	7.67	618.30	133.13	0.47
Reach 1	73825	1%_P	4797.00	387.40	397.86	394.79	398.95	0.002351	8.51	654.26	135.93	0.51
Reach 1	73825	0.2%_P	5640.00	387.40	398.20	395.46	399.57	0.002816	9.56	701.22	139.53	0.56
Reach 1	72604	10%_E	2356.00	382.00	393.33	391.01	394.16	0.002870	7.48	421.17	379.33	0.51
Reach 1	72604	2%_E	3789.00	382.00	395.09		395.71	0.002029	7.34	1273.85	929.73	0.44
Reach 1	72604	1%_E	4361.00	382.00	395.57		396.12	0.001834	7.24	1634.82	1058.52	0.43
Reach 1	72604	0.2%_E	5127.00	382.00	396.34		396.72	0.001349	6.56	2358.57	1323.51	0.37
Reach 1	72604	10%_P	2592.00	382.00	393.65	391.36	394.49	0.002793	7.62	527.72	564.48	0.50
Reach 1	72604	2%_P	4168.00	382.00	395.36		395.97	0.002011	7.46	1465.14	999.62	0.44
Reach 1	72604	1%_P	4797.00	382.00	396.02		396.47	0.001549	6.87	2029.62	1199.76	0.39
Reach 1	72604	0.2%_P	5640.00	382.00	396.85		397.18	0.001154	6.27	2937.74	1446.21	0.34
Reach 1	71465	10%_E	2356.00	381.40	393.13		393.23	0.000272	2.84	1644.23	667.83	0.17
Reach 1	71465	2%_E	3789.00	381.40	394.88		394.98	0.000245	3.06	2883.55	725.24	0.17
Reach 1	71465	1%_E	4361.00	381.40	395.30		395.40	0.000259	3.23	3188.35	736.73	0.18
Reach 1	71465	0.2%_E	5127.00	381.40	396.03		396.14	0.000245	3.29	3734.32	747.19	0.17
Reach 1	71465	10%_P	2592.00	381.40	393.46		393.56	0.000275	2.93	1869.40	696.26	0.18
Reach 1	71465	2%_P	4168.00	381.40	395.11		395.21	0.000262	3.21	3047.81	730.84	0.18
Reach 1	71465	1%_P	4797.00	381.40	395.72		395.83	0.000251	3.27	3502.01	743.27	0.17
Reach 1	71465	0.2%_P	5640.00	381.40	396.55		396.65	0.000233	3.30	4121.68	756.63	0.17
Reach 1	70672	10%_E	2356.00	381.00	392.61	387.79	392.89	0.000715	4.37	763.95	506.11	0.27
Reach 1	70672	2%_E	3789.00	381.00	394.30	389.48	394.65	0.000774	5.17	1317.29	719.77	0.29
Reach 1	70672	1%_E	4361.00	381.00	394.98	390.03	395.15	0.000448	4.12	2692.26	741.82	0.23
Reach 1	70672	0.2%_E	5127.00	381.00	395.76	391.04	395.90	0.000392	4.05	3269.63	744.20	0.21
Reach 1	70672	10%_P	2592.00	381.00	392.93	388.11	393.22	0.000731	4.53	848.53	529.70	0.28
Reach 1	70672	2%_P	4168.00	381.00	394.78	389.86	394.95	0.000465	4.14	2540.72	741.14	0.23
Reach 1	70672	1%_P	4797.00	381.00	395.43	390.55	395.58	0.000414	4.07	3026.01	743.20	0.22
Reach 1	70672	0.2%_P	5640.00	381.00	396.30	391.58	396.43	0.000355	3.97	3674.57	745.87	0.21
Reach 1	70224	10%_E	2356.00	380.89	391.90	388.84	392.40	0.001648	6.14	632.53	266.83	0.40
Reach 1	70224	2%_E	3789.00	380.89	393.56	391.22	394.14	0.001655	7.04	980.19	346.61	0.41
Reach 1	70224	1%_E	4361.00	380.89	394.18	391.65	394.76	0.001603	7.24	1128.25	387.63	0.41
Reach 1	70224	0.2%_E	5127.00	380.89	394.96	392.32	395.55	0.001522	7.43	1332.10	413.49	0.40
Reach 1	70224	10%_P	2592.00	380.89	392.20	389.30	392.72	0.001667	6.34	693.35	286.58	0.40
Reach 1	70224	2%_P	4168.00	380.89	393.97	391.51	394.56	0.001622	7.18	1077.93	380.20	0.41
Reach 1	70224	1%_P	4797.00	380.89	394.63	392.12	395.22	0.001558	7.36	1244.64	404.20	0.41
Reach 1	70224	0.2%_P	5640.00	380.89	395.54	392.61	396.11	0.001424	7.45	1483.90	431.60	0.39
Reach 1	69866	10%_E	2356.00	380.80	391.86	385.45	392.05	0.000409	3.45	709.04	288.59	0.21
Reach 1	69866	2%_E	3789.00	380.80	393.40	386.94	393.73	0.000587	4.62	931.15	401.51	0.26
Reach 1	69866	1%_E	4361.00	380.80	393.98	387.46	394.36	0.000631	4.98	1049.81	424.15	0.27
Reach 1	69866	0.2%_E	5127.00	380.80	394.73	388.11	395.16	0.000668	5.36	1233.74	498.76	0.28
Reach 1	69866	10%_P	2592.00	380.80	392.14	385.72	392.35	0.000442	3.67	743.67	300.18	0.22

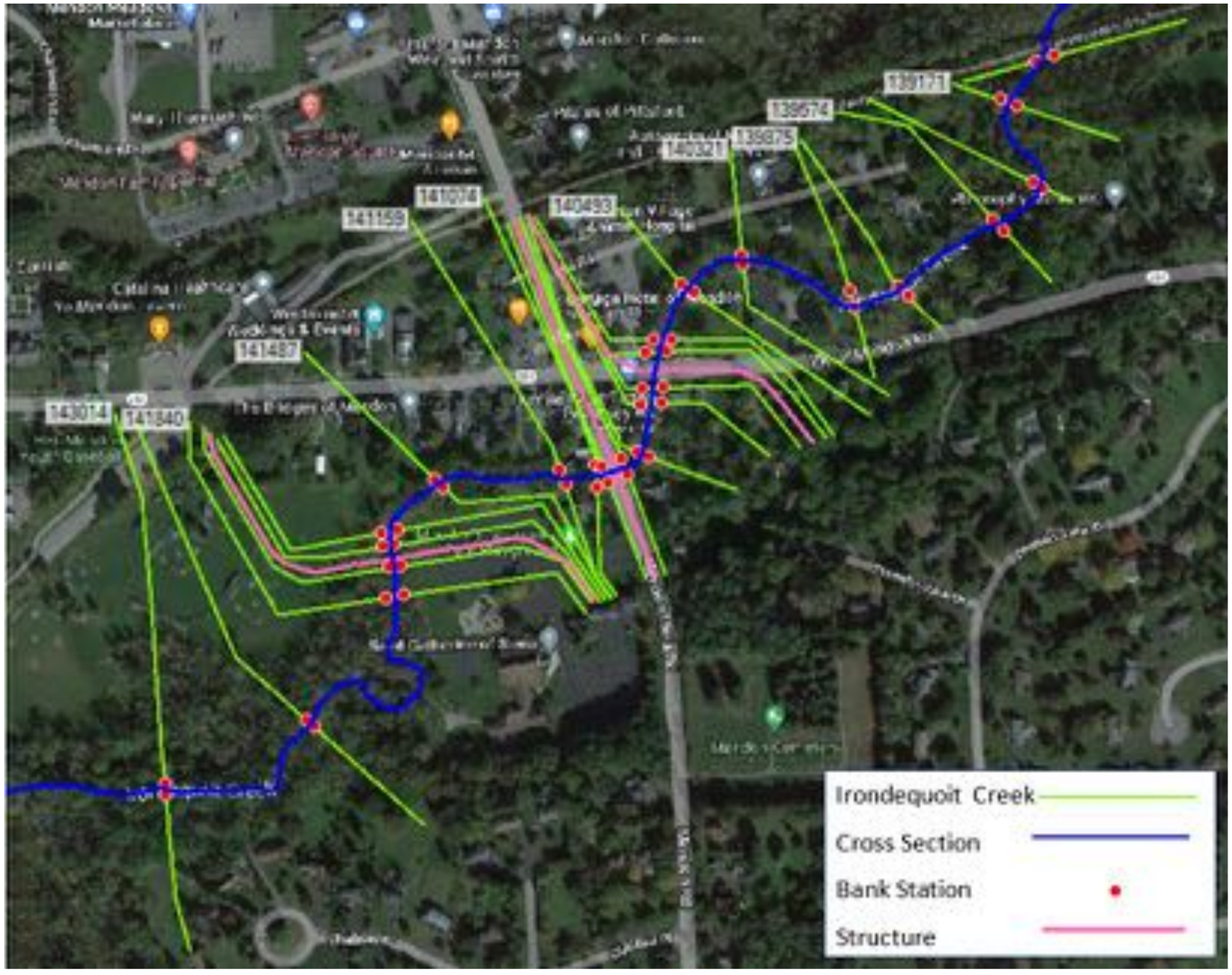
Reach 1	69866	2%_P	4168.00	380.80	393.79	387.29	394.15	0.000619	4.87	1009.11	418.98	0.27
Reach 1	69866	1%_P	4797.00	380.80	394.41	387.83	394.82	0.000657	5.22	1146.54	482.49	0.28
Reach 1	69866	0.2%_P	5640.00	380.80	395.29	388.52	395.74	0.000663	5.52	1394.63	610.41	0.28
Reach 1	69810	10%_E	2356.00	380.74	391.86	384.78	392.01	0.000288	3.12	834.51	535.70	0.18
Reach 1	69810	2%_E	3789.00	380.74	393.41	386.18	393.67	0.000426	4.20	1066.71	617.78	0.22
Reach 1	69810	1%_E	4361.00	380.74	393.99	386.67	394.29	0.000465	4.54	1153.80	627.28	0.24
Reach 1	69810	0.2%_E	5127.00	380.74	394.74	387.27	395.09	0.000510	4.96	1265.64	633.53	0.25
Reach 1	69810	10%_P	2592.00	380.74	392.14	385.03	392.31	0.000313	3.32	876.92	548.13	0.19
Reach 1	69810	2%_P	4168.00	380.74	393.80	386.49	394.09	0.000453	4.43	1124.69	625.54	0.23
Reach 1	69810	1%_P	4797.00	380.74	394.42	387.03	394.75	0.000492	4.78	1218.00	630.82	0.24
Reach 1	69810	0.2%_P	5640.00	380.74	395.29	387.68	395.68	0.000523	5.17	1348.81	638.22	0.25
Reach 1	69662		Bridge									
Reach 1	69519	10%_E	2356.00	380.34	391.79	384.35	391.91	0.000247	2.85	946.61	563.56	0.17
Reach 1	69519	2%_E	3789.00	380.34	393.28	385.74	393.49	0.000361	3.80	1239.66	589.15	0.20
Reach 1	69519	1%_E	4361.00	380.34	393.83	386.22	394.08	0.000393	4.11	1349.15	596.92	0.22
Reach 1	69519	0.2%_E	5127.00	380.34	394.55	386.82	394.83	0.000429	4.47	1489.27	606.31	0.23
Reach 1	69519	10%_P	2592.00	380.34	392.06	384.60	392.20	0.000267	3.02	1000.46	570.07	0.17
Reach 1	69519	2%_P	4168.00	380.34	393.65	386.06	393.88	0.000383	4.01	1312.60	594.47	0.21
Reach 1	69519	1%_P	4797.00	380.34	394.24	386.57	394.51	0.000414	4.32	1429.65	602.32	0.22
Reach 1	69519	0.2%_P	5640.00	380.34	395.00	387.20	395.32	0.000448	4.68	1579.68	614.24	0.23
Reach 1	69271	10%_E	2356.00	380.00	391.57	385.44	391.80	0.000497	3.86	713.57	509.06	0.23
Reach 1	69271	2%_E	3789.00	380.00	392.91	387.11	393.31	0.000746	5.21	919.50	590.94	0.29
Reach 1	69271	1%_E	4361.00	380.00	393.42	387.67	393.88	0.000819	5.64	1045.89	614.24	0.31
Reach 1	69271	0.2%_E	5127.00	380.00	394.10	388.38	394.62	0.000867	6.05	1231.72	637.14	0.32
Reach 1	69271	10%_P	2592.00	380.00	391.82	385.75	392.07	0.000542	4.11	749.94	521.10	0.24
Reach 1	69271	2%_P	4168.00	380.00	393.24	387.48	393.69	0.000801	5.52	998.75	608.60	0.30
Reach 1	69271	1%_P	4797.00	380.00	393.81	388.08	394.30	0.000850	5.88	1151.63	627.17	0.31
Reach 1	69271	0.2%_P	5640.00	380.00	394.55	388.85	395.09	0.000884	6.27	1355.69	652.20	0.32
Reach 1	69076	10%_E	2356.00	380.24	391.55	384.26	391.68	0.000248	2.88	981.29	444.54	0.17
Reach 1	69076	2%_E	3789.00	380.24	392.90	385.63	393.12	0.000380	3.90	1264.48	615.26	0.21
Reach 1	69076	1%_E	4361.00	380.24	393.41	386.12	393.66	0.000419	4.22	1374.82	662.35	0.22
Reach 1	69076	0.2%_E	5127.00	380.24	394.09	386.73	394.39	0.000459	4.60	1526.83	688.08	0.24
Reach 1	69076	10%_P	2592.00	380.24	391.80	384.51	391.94	0.000271	3.07	1032.32	450.42	0.17
Reach 1	69076	2%_P	4168.00	380.24	393.23	385.96	393.48	0.000407	4.12	1336.79	656.47	0.22
Reach 1	69076	1%_P	4797.00	380.24	393.80	386.47	394.08	0.000443	4.44	1460.83	677.75	0.23
Reach 1	69076	0.2%_P	5640.00	380.24	394.54	387.10	394.86	0.000479	4.82	1629.65	699.05	0.24
Reach 1	68969		Bridge									
Reach 1	68872	10%_E	2356.00	380.52	391.35		391.58	0.000487	3.82	617.08	68.24	0.22
Reach 1	68872	2%_E	3789.00	380.52	392.46		392.93	0.000865	5.49	696.48	77.87	0.30
Reach 1	68872	1%_E	4361.00	380.52	392.86		393.44	0.001010	6.08	728.15	80.73	0.33

Reach 1	68872	0.2%_E	5127.00	380.52	393.39	394.11	0.001188	6.81	771.45	83.32	0.36
Reach 1	68872	10%_P	2592.00	380.52	391.57	391.83	0.000547	4.11	631.88	69.01	0.23
Reach 1	68872	2%_P	4168.00	380.52	392.73	393.26	0.000963	5.89	717.12	79.83	0.32
Reach 1	68872	1%_P	4797.00	380.52	393.16	393.82	0.001113	6.50	752.81	82.22	0.34
Reach 1	68872	0.2%_P	5640.00	380.52	393.73	394.55	0.001299	7.26	804.03	102.63	0.37
Reach 1	68514	10%_E	2356.00	381.00	390.94	391.28	0.001250	5.21	794.91	269.54	0.35
Reach 1	68514	2%_E	3789.00	381.00	392.03	392.52	0.001594	6.50	1126.77	330.07	0.41
Reach 1	68514	1%_E	4361.00	381.00	392.44	392.95	0.001648	6.84	1262.09	337.48	0.42
Reach 1	68514	0.2%_E	5127.00	381.00	392.97	393.52	0.001678	7.19	1448.80	360.54	0.43
Reach 1	68514	10%_P	2592.00	381.00	391.13	391.51	0.001331	5.48	848.85	280.49	0.37
Reach 1	68514	2%_P	4168.00	381.00	392.30	392.81	0.001634	6.73	1216.20	335.09	0.42
Reach 1	68514	1%_P	4797.00	381.00	392.74	393.28	0.001671	7.05	1367.19	348.15	0.42
Reach 1	68514	0.2%_P	5640.00	381.00	393.34	393.90	0.001665	7.36	1581.00	367.98	0.43
Reach 1	67854	10%_E	2356.00	380.02	390.56	390.66	0.000596	3.53	1913.70	783.66	0.24
Reach 1	67854	2%_E	3789.00	380.02	391.74	391.83	0.000543	3.75	2847.02	799.89	0.23
Reach 1	67854	1%_E	4361.00	380.02	392.18	392.27	0.000519	3.80	3199.55	805.46	0.23
Reach 1	67854	0.2%_E	5127.00	380.02	392.76	392.85	0.000485	3.84	3671.16	812.98	0.23
Reach 1	67854	10%_P	2592.00	380.02	390.77	390.87	0.000586	3.57	2078.86	787.37	0.24
Reach 1	67854	2%_P	4168.00	380.02	392.03	392.12	0.000528	3.79	3080.46	803.47	0.23
Reach 1	67854	1%_P	4797.00	380.02	392.51	392.60	0.000500	3.83	3467.22	809.71	0.23
Reach 1	67854	0.2%_P	5640.00	380.02	393.15	393.24	0.000462	3.85	3989.54	818.02	0.22
Reach 1	67240	10%_E	2356.00	379.10	389.90	390.16	0.001184	5.12	1087.98	405.46	0.33
Reach 1	67240	2%_E	3789.00	379.10	391.03	391.34	0.001314	5.93	1553.62	414.59	0.36
Reach 1	67240	1%_E	4361.00	379.10	391.48	391.79	0.001299	6.10	1740.55	417.65	0.36
Reach 1	67240	0.2%_E	5127.00	379.10	392.09	392.39	0.001247	6.24	1995.98	421.24	0.35
Reach 1	67240	10%_P	2592.00	379.10	390.10	390.37	0.001222	5.29	1167.95	406.96	0.34
Reach 1	67240	2%_P	4168.00	379.10	391.33	391.64	0.001308	6.05	1676.71	416.72	0.36
Reach 1	67240	1%_P	4797.00	379.10	391.83	392.13	0.001273	6.19	1884.87	419.76	0.36
Reach 1	67240	0.2%_P	5640.00	379.10	392.50	392.80	0.001201	6.30	2169.95	423.60	0.35
Reach 1	65617	10%_E	2356.00	378.70	388.16	388.34	0.001242	4.64	1306.04	600.16	0.34
Reach 1	65617	2%_E	3789.00	378.70	389.65	389.79	0.000844	4.44	2228.33	633.54	0.29
Reach 1	65617	1%_E	4361.00	378.70	390.26	390.38	0.000725	4.34	2613.22	645.16	0.27
Reach 1	65617	0.2%_E	5127.00	378.70	391.03	391.14	0.000614	4.25	3117.41	661.70	0.25
Reach 1	65617	10%_P	2592.00	378.70	388.41	388.58	0.001166	4.62	1455.92	605.12	0.33
Reach 1	65617	2%_P	4168.00	378.70	390.05	390.18	0.000763	4.38	2482.07	641.32	0.28
Reach 1	65617	1%_P	4797.00	378.70	390.70	390.81	0.000657	4.28	2899.75	654.20	0.26
Reach 1	65617	0.2%_P	5640.00	378.70	391.53	391.63	0.000557	4.20	3452.45	672.49	0.24
Reach 1	63857	10%_E	2356.00	377.00	387.19	387.28	0.000474	2.87	1951.66	676.17	0.19
Reach 1	63857	2%_E	3789.00	377.00	389.00	389.07	0.000368	2.93	3186.40	689.98	0.17
Reach 1	63857	1%_E	4361.00	377.00	389.69	389.75	0.000336	2.93	3661.02	694.79	0.16
Reach 1	63857	0.2%_E	5127.00	377.00	390.53	390.60	0.000307	2.96	4251.92	702.20	0.16
Reach 1	63857	10%_P	2592.00	377.00	387.51	387.59	0.000453	2.88	2164.92	678.86	0.18

Reach 1	63857	2%_P	4168.00	377.00	389.46		389.53	0.000346	2.93	3501.24	693.11	0.17
Reach 1	63857	1%_P	4797.00	377.00	390.17		390.24	0.000319	2.95	3999.87	698.62	0.16
Reach 1	63857	0.2%_P	5640.00	377.00	391.07		391.14	0.000292	2.99	4632.71	707.04	0.16
Reach 1	62425	10%_E	2356.00	375.83	386.81		386.86	0.000280	2.48	2605.51	733.25	0.15
Reach 1	62425	2%_E	3789.00	375.83	388.71		388.76	0.000233	2.57	4011.73	741.68	0.14
Reach 1	62425	1%_E	4361.00	375.83	389.43		389.47	0.000217	2.59	4541.60	744.28	0.13
Reach 1	62425	0.2%_E	5127.00	375.83	390.30		390.34	0.000204	2.63	5190.47	747.23	0.13
Reach 1	62425	10%_P	2592.00	375.83	387.14		387.19	0.000270	2.49	2852.88	734.63	0.14
Reach 1	62425	2%_P	4168.00	375.83	389.19		389.23	0.000222	2.58	4363.79	743.45	0.13
Reach 1	62425	1%_P	4797.00	375.83	389.93		389.97	0.000209	2.61	4914.70	746.04	0.13
Reach 1	62425	0.2%_P	5640.00	375.83	390.85		390.89	0.000197	2.66	5603.85	748.81	0.13
Reach 1	61269	10%_E	2356.00	375.00	386.38	382.25	386.47	0.000522	2.83	1273.63	317.73	0.19
Reach 1	61269	2%_E	3789.00	375.00	388.28	383.32	388.41	0.000537	3.39	1762.14	361.58	0.20
Reach 1	61269	1%_E	4361.00	375.00	388.99	383.69	389.13	0.000532	3.55	1952.53	421.43	0.20
Reach 1	61269	0.2%_E	5127.00	375.00	389.85	384.15	390.01	0.000536	3.78	2191.88	489.96	0.21
Reach 1	61269	10%_P	2592.00	375.00	386.71	382.44	386.82	0.000528	2.94	1358.12	325.14	0.19
Reach 1	61269	2%_P	4168.00	375.00	388.75	383.56	388.89	0.000534	3.50	1888.15	402.18	0.20
Reach 1	61269	1%_P	4797.00	375.00	389.49	383.96	389.64	0.000532	3.68	2088.49	456.51	0.21
Reach 1	61269	0.2%_P	5640.00	375.00	390.40	384.47	390.57	0.000536	3.91	2363.06	541.82	0.21
Reach 1	60600	10%_E	2356.00	374.89	385.80		386.00	0.000900	3.60	707.88	132.44	0.25
Reach 1	60600	2%_E	3789.00	374.89	387.59		387.89	0.000994	4.46	954.27	210.18	0.27
Reach 1	60600	1%_E	4361.00	374.89	388.29		388.62	0.000995	4.71	1053.92	221.95	0.28
Reach 1	60600	0.2%_E	5127.00	374.89	389.11		389.48	0.001012	5.03	1176.14	249.17	0.28
Reach 1	60600	10%_P	2592.00	374.89	386.11		386.33	0.000924	3.77	749.69	134.24	0.26
Reach 1	60600	2%_P	4168.00	374.89	388.05		388.37	0.000996	4.63	1020.05	218.38	0.28
Reach 1	60600	1%_P	4797.00	374.89	388.76		389.12	0.001005	4.90	1123.95	230.13	0.28
Reach 1	60600	0.2%_P	5640.00	374.89	389.63		390.03	0.001021	5.24	1256.19	305.22	0.29
Reach 1	60084	10%_E	2356.00	374.80	384.86		385.25	0.002545	5.01	488.52	104.15	0.38
Reach 1	60084	2%_E	3789.00	374.80	386.50		387.08	0.002655	6.11	668.03	116.03	0.41
Reach 1	60084	1%_E	4361.00	374.80	387.19		387.81	0.002545	6.36	770.37	193.80	0.40
Reach 1	60084	0.2%_E	5127.00	374.80	388.02		388.68	0.002423	6.65	959.08	249.35	0.40
Reach 1	60084	10%_P	2592.00	374.80	385.14		385.56	0.002595	5.23	517.77	105.79	0.39
Reach 1	60084	2%_P	4168.00	374.80	386.96		387.56	0.002592	6.29	727.04	162.23	0.41
Reach 1	60084	1%_P	4797.00	374.80	387.67		388.31	0.002485	6.54	873.25	231.31	0.40
Reach 1	60084	0.2%_P	5640.00	374.80	388.57		389.25	0.002315	6.77	1104.30	277.40	0.40
Reach 1	59452	10%_E	2356.00	373.52	383.81		384.02	0.001354	4.18	1230.95	482.07	0.29
Reach 1	59452	2%_E	3789.00	373.52	385.83		385.99	0.000901	4.07	2226.07	499.99	0.24
Reach 1	59452	1%_E	4361.00	373.52	386.66		386.80	0.000762	3.98	2643.32	503.56	0.23
Reach 1	59452	0.2%_E	5127.00	373.52	387.60		387.73	0.000674	3.98	3115.53	507.36	0.22
Reach 1	59452	10%_P	2592.00	373.52	384.15		384.35	0.001265	4.18	1395.60	488.28	0.28
Reach 1	59452	2%_P	4168.00	373.52	386.38		386.53	0.000806	4.01	2501.06	502.38	0.23
Reach 1	59452	1%_P	4797.00	373.52	387.20		387.34	0.000708	3.98	2913.81	505.69	0.22

Reach 1	59452	0.2%_P	5640.00	373.52	388.20		388.33	0.000628	3.99	3422.05	509.90	0.21
Reach 1	58504	10%_E	2356.00	372.00	382.94		383.10	0.000809	3.73	1374.35	417.66	0.23
Reach 1	58504	2%_E	3789.00	372.00	385.19		385.34	0.000656	3.93	2215.13	438.12	0.21
Reach 1	58504	1%_E	4361.00	372.00	386.10		386.24	0.000592	3.95	2562.52	445.48	0.20
Reach 1	58504	0.2%_E	5127.00	372.00	387.07		387.22	0.000565	4.07	2937.44	452.72	0.20
Reach 1	58504	10%_P	2592.00	372.00	383.32		383.48	0.000783	3.78	1516.20	421.04	0.22
Reach 1	58504	2%_P	4168.00	372.00	385.79		385.93	0.000613	3.95	2444.46	443.28	0.21
Reach 1	58504	1%_P	4797.00	372.00	386.66		386.80	0.000576	4.02	2777.32	449.71	0.20
Reach 1	58504	0.2%_P	5640.00	372.00	387.69		387.84	0.000549	4.14	3180.34	456.94	0.20
Reach 1	57926	10%_E	2356.00	371.58	382.38		382.59	0.000931	4.01	1014.73	270.00	0.25
Reach 1	57926	2%_E	3789.00	371.58	384.68		384.91	0.000822	4.44	1663.10	297.24	0.24
Reach 1	57926	1%_E	4361.00	371.58	385.62		385.85	0.000759	4.51	1951.88	317.49	0.23
Reach 1	57926	0.2%_E	5127.00	371.58	386.60		386.84	0.000732	4.68	2270.44	328.92	0.23
Reach 1	57926	10%_P	2592.00	371.58	382.77		382.99	0.000921	4.11	1120.00	274.16	0.25
Reach 1	57926	2%_P	4168.00	371.58	385.30		385.53	0.000779	4.49	1851.84	309.40	0.24
Reach 1	57926	1%_P	4797.00	371.58	386.18		386.42	0.000746	4.62	2133.06	325.50	0.23
Reach 1	57926	0.2%_P	5640.00	371.58	387.24		387.48	0.000712	4.77	2479.92	334.31	0.23
Reach 1	57217	10%_E	2356.00	371.10	381.80	377.17	381.97	0.000812	3.63	1109.73	283.91	0.23
Reach 1	57217	2%_E	3789.00	371.10	384.20	378.77	384.38	0.000669	3.95	1866.06	338.40	0.22
Reach 1	57217	1%_E	4361.00	371.10	385.20	379.22	385.37	0.000590	3.95	2209.97	349.07	0.21
Reach 1	57217	0.2%_E	5127.00	371.10	386.20	379.97	386.38	0.000569	4.10	2573.83	370.66	0.21
Reach 1	57217	10%_P	2592.00	371.10	382.20	377.43	382.37	0.000801	3.73	1225.01	298.84	0.23
Reach 1	57217	2%_P	4168.00	371.10	384.86	379.12	385.04	0.000616	3.95	2092.74	345.73	0.21
Reach 1	57217	1%_P	4797.00	371.10	385.77	379.59	385.95	0.000583	4.06	2414.99	366.74	0.21
Reach 1	57217	0.2%_P	5640.00	371.10	386.85	380.29	387.03	0.000551	4.18	2815.59	377.48	0.21

Risk Area #3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138875
140321
141074
141559
140498
141487
140014
141840
Irondequoit Creek
Cross Section
Bank Station
Structure

Plan: Base Condition (Risk Area #3) Flows: Current

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
Reach 1	143014 O	10%_E	1800.00	559.50	567.96	565.44	567.99	0.000187	2.18	2812.66	853.13	0.15
Reach 1	143014 O	2%_E	2520.00	559.50	569.20	565.74	569.22	0.000138	2.11	3913.14	914.81	0.14
Reach 1	143014 O	1%_E	2800.00	559.50	569.88	565.92	569.90	0.000108	1.98	4544.66	939.55	0.12
Reach 1	143014 O	0.2%_E	3600.00	559.50	572.23	566.20	572.24	0.000052	1.62	6845.47	1034.32	0.09
Reach 1	142528	10%_E	1800.00	559.50	567.87		567.90	0.000239	2.59	2298.80	769.25	0.17
Reach 1	142528	2%_E	2520.00	559.50	569.13		569.16	0.000160	2.36	3304.19	814.96	0.14
Reach 1	142528	1%_E	2800.00	559.50	569.83		569.85	0.000119	2.15	3876.70	823.52	0.13
Reach 1	142528	0.2%_E	3600.00	559.50	572.21		572.22	0.000054	1.70	5907.84	920.11	0.09
Reach 1	141840 N	10%_E	1800.00	559.50	567.74	564.46	567.79	0.000212	2.55	2218.01	956.46	0.17
Reach 1	141840 N	2%_E	2520.00	559.50	569.06	565.04	569.09	0.000126	2.21	3556.49	1110.36	0.14
Reach 1	141840 N	1%_E	2800.00	559.50	569.78	565.26	569.80	0.000090	1.98	4298.27	1172.45	0.12
Reach 1	141840 N	0.2%_E	3600.00	559.50	572.19	565.82	572.20	0.000036	1.48	6807.19	1238.48	0.08
Reach 1	141762	10%_E	1800.00	557.00	567.67	563.74	567.76	0.000279	3.31	1821.66	978.28	0.20
Reach 1	141762	2%_E	2520.00	557.00	569.04	566.57	569.08	0.000142	2.59	3093.10	1072.53	0.14
Reach 1	141762	1%_E	2800.00	557.00	569.77	566.78	569.79	0.000098	2.26	3777.41	1101.92	0.12
Reach 1	141762	0.2%_E	3600.00	557.00	572.18	567.12	572.20	0.000039	1.63	6076.21	1192.63	0.08
Reach 1	141750 Private Drive				Bridge							
Reach 1	141706.	10%_E	1800.00	557.00	567.56	563.80	567.67	0.000343	3.61	1575.51	958.33	0.22
Reach 1	141706.	2%_E	2520.00	557.00	569.01	566.83	569.05	0.000147	2.62	2918.03	1073.33	0.15
Reach 1	141706.	1%_E	2800.00	557.00	569.75	566.96	569.77	0.000099	2.25	3613.98	1094.63	0.12
Reach 1	141706.	0.2%_E	3600.00	557.00	572.18	567.28	572.19	0.000037	1.58	5919.71	1187.79	0.08
Reach 1	141668 M	10%_E	1800.00	558.00	567.51	564.64	567.65	0.000500	3.80	1305.43	919.68	0.26
Reach 1	141668 M	2%_E	2520.00	558.00	568.99	566.74	569.04	0.000187	2.65	2724.97	1069.62	0.16
Reach 1	141668 M	1%_E	2800.00	558.00	569.74	566.89	569.77	0.000121	2.26	3461.86	1137.43	0.13
Reach 1	141668 M	0.2%_E	3600.00	558.00	572.18	567.32	572.19	0.000041	1.55	5918.42	1249.09	0.08
Reach 1	141487	10%_E	1800.00	558.50	567.02	564.99	567.48	0.001372	6.46	604.25	299.76	0.43
Reach 1	141487	2%_E	2520.00	558.50	568.76	566.60	568.97	0.000641	5.11	1321.61	581.42	0.30
Reach 1	141487	1%_E	2800.00	558.50	569.59	566.89	569.73	0.000425	4.41	1697.69	728.66	0.25
Reach 1	141487	0.2%_E	3600.00	558.50	572.12	567.84	572.17	0.000156	3.13	2979.43	1026.04	0.16
Reach 1	141159	10%_E	1800.00	559.30	566.71	563.53	567.08	0.000979	5.24	524.07	248.28	0.35
Reach 1	141159	2%_E	2520.00	559.30	568.45	564.92	568.75	0.000684	5.08	892.20	434.89	0.30
Reach 1	141159	1%_E	2800.00	559.30	569.32	565.57	569.57	0.000528	4.76	1125.56	602.33	0.27
Reach 1	141159	0.2%_E	3600.00	559.30	571.97	566.38	572.10	0.000243	3.79	1957.45	966.38	0.19
Reach 1	141074 L	10%_E	1800.00	559.50	566.67	562.72	566.99	0.000813	4.52	397.92	55.99	0.30

Reach 1	141074	L	2%_E	2520.00	559.50	568.26	563.52	568.67	0.000857	5.18	487.05	87.37	0.31
Reach 1	141074	L	1%_E	2800.00	559.50	569.07	563.81	569.49	0.000781	5.24	554.67	536.70	0.30
Reach 1	141074	L	0.2%_E	3600.00	559.50	571.68	564.61	572.05	0.000518	5.02	841.94	932.79	0.25
Reach 1	141049		10%_E	1800.00	556.90	566.65	561.56	566.97	0.000472	4.55	398.68	46.66	0.27
Reach 1	141049		2%_E	2520.00	556.90	568.19	562.47	568.64	0.000540	5.42	469.59	115.76	0.30
Reach 1	141049		1%_E	2800.00	556.90	568.97	562.81	569.46	0.000522	5.60	505.92	424.70	0.30
Reach 1	141049		0.2%_E	3600.00	556.90	571.45	563.71	571.99	0.000440	5.88	625.67	807.14	0.28
Reach 1	141040	NY 64, L			Bridge								
Reach 1	140996		10%_E	1800.00	556.90	566.46	561.55	566.79	0.000502	4.63	403.13	50.68	0.28
Reach 1	140996		2%_E	2520.00	556.90	567.89	562.48	568.36	0.000586	5.54	477.01	53.54	0.31
Reach 1	140996		1%_E	2800.00	556.90	568.51	562.82	569.03	0.000590	5.79	511.34	169.16	0.31
Reach 1	140996		0.2%_E	3600.00	556.90	570.49	563.71	571.08	0.000543	6.22	654.06	674.62	0.31
Reach 1	140937	K	10%_E	1800.00	558.90	565.86	564.75	566.61	0.002611	7.77	340.19	164.97	0.58
Reach 1	140937	K	2%_E	2520.00	558.90	567.55	565.52	568.24	0.001795	7.69	492.69	195.68	0.51
Reach 1	140937	K	1%_E	2800.00	558.90	568.27	565.78	568.93	0.001527	7.57	560.27	316.21	0.47
Reach 1	140937	K	0.2%_E	3600.00	558.90	570.44	566.48	571.03	0.001023	7.28	777.19	868.71	0.40
Reach 1	140810		10%_E	1800.00	559.20	565.58	563.67	566.27	0.002414	6.64	271.93	257.33	0.54
Reach 1	140810		2%_E	2520.00	559.20	567.36	564.69	568.01	0.001551	6.58	440.03	428.84	0.45
Reach 1	140810		1%_E	2800.00	559.20	568.14	565.05	568.73	0.001238	6.34	534.20	652.08	0.41
Reach 1	140810		0.2%_E	3600.00	559.20	570.42	565.86	570.88	0.000712	5.77	807.85	888.46	0.33
Reach 1	140768		10%_E	1800.00	558.00	565.56	563.21	566.13	0.001636	6.06	300.77	150.54	0.46
Reach 1	140768		2%_E	2520.00	558.00	567.31	564.13	567.94	0.001254	6.38	406.01	308.09	0.42
Reach 1	140768		1%_E	2800.00	558.00	568.04	564.44	568.67	0.001121	6.43	449.39	552.37	0.40
Reach 1	140768		0.2%_E	3600.00	558.00	570.15	565.28	570.79	0.000834	6.49	576.14	796.22	0.36
Reach 1	140700	NY 251			Bridge								
Reach 1	140675		10%_E	1800.00	558.00	565.24	563.21	565.92	0.002214	6.60	272.57	63.94	0.52
Reach 1	140675		2%_E	2520.00	558.00	566.15	564.16	567.10	0.002504	7.83	323.95	116.18	0.57
Reach 1	140675		1%_E	2800.00	558.00	566.52	564.49	567.56	0.002522	8.18	346.88	157.69	0.57
Reach 1	140675		0.2%_E	3600.00	558.00	567.43	565.37	568.72	0.002641	9.15	409.00	343.82	0.60
Reach 1	140641	J	10%_E	1800.00	558.50	564.69	563.62	565.72	0.003829	8.16	228.54	124.33	0.68
Reach 1	140641	J	2%_E	2520.00	558.50	565.18	564.64	566.79	0.005239	10.23	263.07	167.24	0.81
Reach 1	140641	J	1%_E	2800.00	558.50	565.33	564.96	567.19	0.005857	11.02	274.11	176.98	0.86
Reach 1	140641	J	0.2%_E	3600.00	558.50	566.07	566.07	568.31	0.005989	12.18	340.30	251.65	0.88
Reach 1	140493		10%_E	1800.00	557.80	564.42	563.59	565.17	0.002625	7.56	349.88	259.30	0.58
Reach 1	140493		2%_E	2520.00	557.80	564.92	564.33	566.01	0.003515	9.28	407.55	308.85	0.68
Reach 1	140493		1%_E	2800.00	557.80	565.06	564.58	566.31	0.003904	9.95	424.71	330.71	0.72
Reach 1	140493		0.2%_E	3600.00	557.80	565.53	565.23	567.15	0.004694	11.48	479.96	393.27	0.80

Reach 1	140321	10%_E	1800.00	557.00	563.51	563.51	564.58	0.004368	9.59	352.78	180.47	0.74
Reach 1	140321	2%_E	2520.00	557.00	564.16	564.16	565.34	0.004529	10.57	476.61	199.87	0.77
Reach 1	140321	1%_E	2800.00	557.00	564.47	564.37	565.59	0.004208	10.55	540.41	207.36	0.75
Reach 1	140321	0.2%_E	3600.00	557.00	565.21	564.88	566.28	0.003791	10.80	698.54	264.28	0.73
Reach 1	140004	10%_E	1800.00	555.55	561.61	561.22	562.74	0.004555	8.88	266.71	113.32	0.73
Reach 1	140004	2%_E	2520.00	555.55	562.23	562.04	563.75	0.005386	10.50	342.97	136.03	0.81
Reach 1	140004	1%_E	2800.00	555.55	562.51	562.46	564.08	0.005312	10.80	382.22	142.59	0.81
Reach 1	140004	0.2%_E	3600.00	555.55	563.62	563.07	565.04	0.004031	10.64	560.29	183.18	0.73
Reach 1	139875 I	10%_E	1800.00	555.00	560.80	560.71	562.04	0.006628	9.34	256.54	124.00	0.77
Reach 1	139875 I	2%_E	2520.00	555.00	561.60	561.50	562.96	0.006373	10.19	359.54	133.39	0.77
Reach 1	139875 I	1%_E	2800.00	555.00	562.06	561.76	563.31	0.005420	9.94	422.97	138.35	0.72
Reach 1	139875 I	0.2%_E	3600.00	555.00	563.49		564.44	0.003384	9.08	634.80	156.47	0.59
Reach 1	139574	10%_E	1800.00	553.55	559.07	558.70	560.13	0.005756	8.57	265.62	122.97	0.72
Reach 1	139574	2%_E	2520.00	553.55	559.87	559.51	561.11	0.005697	9.53	360.42	159.67	0.73
Reach 1	139574	1%_E	2800.00	553.55	561.71	559.75	562.21	0.001816	6.56	717.43	254.00	0.43
Reach 1	139574	0.2%_E	3600.00	553.55	563.40	560.83	563.73	0.001043	5.74	1082.47	313.72	0.34
Reach 1	139424	10%_E	1800.00	552.85	558.44	558.23	559.26	0.004864	8.51	371.68	207.31	0.66
Reach 1	139424	2%_E	2520.00	552.85	559.72	558.79	560.30	0.003008	7.76	584.22	236.26	0.54
Reach 1	139424	1%_E	2800.00	552.85	561.67	558.97	561.93	0.001043	5.45	922.96	289.64	0.33
Reach 1	139424	0.2%_E	3600.00	552.85	563.35	559.46	563.57	0.000739	5.18	1224.76	304.91	0.29
Reach 1	139171	10%_E	1800.00	551.65	558.38	555.65	558.61	0.001021	4.46	587.11	211.17	0.32
Reach 1	139171	2%_E	2520.00	551.65	559.54	556.44	559.82	0.001019	5.01	744.21	221.93	0.33
Reach 1	139171	1%_E	2800.00	551.65	561.56	556.65	561.74	0.000483	4.06	1042.67	238.69	0.24
Reach 1	139171	0.2%_E	3600.00	551.65	563.24	557.21	563.42	0.000429	4.28	1303.48	256.46	0.23
Reach 1	139029	10%_E	1800.00	551.00	558.00	554.85	558.42	0.001285	5.29	368.91	66.15	0.36
Reach 1	139029	2%_E	2520.00	551.00	559.00	555.74	559.61	0.001542	6.37	436.20	68.49	0.41
Reach 1	139029	1%_E	2800.00	551.00	561.20	556.05	561.63	0.000784	5.38	593.51	207.66	0.30
Reach 1	139029	0.2%_E	3600.00	551.00	562.80	556.90	563.31	0.000776	5.92	724.32	342.44	0.31

Plan: Base Condition (Risk Area #3)

Flows: Projected Future

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
Reach 1	143014 O	10%_P	1980.00	559.50	568.25	565.56	568.27	0.000176	2.18	3055.84	860.02	0.15
Reach 1	143014 O	2%_P	2772.00	559.50	569.81	565.90	569.82	0.000111	1.99	4476.11	937.08	0.12
Reach 1	143014 O	1%_P	3080.00	559.50	570.67	566.03	570.69	0.000082	1.83	5299.37	965.30	0.11
Reach 1	143014 O	0.2%_P	3960.00	559.50	574.06	566.29	574.07	0.000029	1.34	8870.09	1215.59	0.07
Reach 1	142528	10%_P	1980.00	559.50	568.16		568.19	0.000218	2.54	2524.44	771.71	0.17

Reach 1	142528		2%_P	2772.00	559.50	569.76		569.78	0.000123	2.17	3815.37	822.57	0.13
Reach 1	142528		1%_P	3080.00	559.50	570.64		570.65	0.000087	1.95	4544.17	835.08	0.11
Reach 1	142528		0.2%_P	3960.00	559.50	574.05		574.06	0.000033	1.47	7746.59	1081.76	0.07
Reach 1	141840	N	10%_P	1980.00	559.50	568.04	564.50	568.09	0.000191	2.49	2521.90	1010.20	0.16
Reach 1	141840	N	2%_P	2772.00	559.50	569.71	565.16	569.73	0.000093	2.00	4219.28	1163.41	0.12
Reach 1	141840	N	1%_P	3080.00	559.50	570.60	565.52	570.62	0.000063	1.76	5148.46	1210.46	0.10
Reach 1	141840	N	0.2%_P	3960.00	559.50	574.04	566.13	574.04	0.000021	1.24	8853.86	1373.66	0.06
Reach 1	141762		10%_P	1980.00	557.00	568.00	564.07	568.06	0.000238	3.13	2120.36	1019.14	0.18
Reach 1	141762		2%_P	2772.00	557.00	569.69	566.76	569.72	0.000102	2.30	3704.87	1098.69	0.12
Reach 1	141762		1%_P	3080.00	557.00	570.59	566.92	570.61	0.000068	1.98	4556.08	1161.17	0.10
Reach 1	141762		0.2%_P	3960.00	557.00	574.04	567.26	574.04	0.000021	1.31	7930.07	1267.09	0.06
Reach 1	141750	Private Drive			Bridge								
Reach 1	141706.		10%_P	1980.00	557.00	567.92	564.14	568.00	0.000274	3.31	1902.06	1006.43	0.20
Reach 1	141706.		2%_P	2772.00	557.00	569.67	566.93	569.70	0.000103	2.28	3540.56	1092.48	0.12
Reach 1	141706.		1%_P	3080.00	557.00	570.58	567.09	570.60	0.000067	1.95	4399.41	1142.33	0.10
Reach 1	141706.		0.2%_P	3960.00	557.00	574.03	567.39	574.04	0.000020	1.27	7766.61	1247.43	0.06
Reach 1	141668	M	10%_P	1980.00	558.00	567.88	564.89	567.98	0.000383	3.44	1654.99	950.96	0.23
Reach 1	141668	M	2%_P	2772.00	558.00	569.66	566.89	569.69	0.000126	2.29	3383.77	1133.21	0.14
Reach 1	141668	M	1%_P	3080.00	558.00	570.58	567.06	570.60	0.000079	1.93	4297.44	1180.57	0.11
Reach 1	141668	M	0.2%_P	3960.00	558.00	574.03	567.45	574.04	0.000021	1.23	7824.61	1269.20	0.06
Reach 1	141487		10%_P	1980.00	558.50	567.45	564.99	567.85	0.001168	6.20	760.07	404.89	0.40
Reach 1	141487		2%_P	2772.00	558.50	569.50	566.85	569.65	0.000442	4.48	1658.44	716.75	0.25
Reach 1	141487		1%_P	3080.00	558.50	570.47	567.30	570.57	0.000294	3.89	2123.80	931.79	0.21
Reach 1	141487		0.2%_P	3960.00	558.50	574.00	568.01	574.03	0.000081	2.47	3958.22	1074.10	0.12
Reach 1	141159		10%_P	1980.00	559.30	567.17	563.77	567.52	0.000886	5.20	604.71	282.83	0.34
Reach 1	141159		2%_P	2772.00	559.30	569.23	565.29	569.48	0.000543	4.79	1100.51	567.24	0.27
Reach 1	141159		1%_P	3080.00	559.30	570.24	565.91	570.45	0.000414	4.48	1394.79	822.54	0.24
Reach 1	141159		0.2%_P	3960.00	559.30	573.91	566.69	573.99	0.000135	3.12	2588.44	1036.66	0.15
Reach 1	141074	L	10%_P	1980.00	559.50	567.10	562.93	567.44	0.000823	4.69	421.86	56.05	0.30
Reach 1	141074	L	2%_P	2772.00	559.50	568.98	563.79	569.41	0.000791	5.24	545.27	512.18	0.30
Reach 1	141074	L	1%_P	3080.00	559.50	569.97	564.10	570.38	0.000677	5.19	654.14	758.51	0.28
Reach 1	141074	L	0.2%_P	3960.00	559.50	573.66	564.94	573.95	0.000348	4.55	1059.86	1016.00	0.21
Reach 1	141049		10%_P	1980.00	556.90	567.07	561.80	567.42	0.000489	4.78	417.82	46.76	0.28
Reach 1	141049		2%_P	2772.00	556.90	568.89	562.78	569.37	0.000524	5.59	502.12	378.03	0.30
Reach 1	141049		1%_P	3080.00	556.90	569.83	563.14	570.34	0.000492	5.72	545.81	602.87	0.29
Reach 1	141049		0.2%_P	3960.00	556.90	573.40	564.11	573.89	0.000338	5.64	732.56	885.96	0.25
Reach 1	141040	NY 64, L			Bridge								

Reach 1	140996		10%_P	1980.00	556.90	566.86	561.80	567.22	0.000522	4.86	423.30	51.20	0.29
Reach 1	140996		2%_P	2772.00	556.90	568.45	562.77	568.96	0.000590	5.77	507.59	135.76	0.31
Reach 1	140996		1%_P	3080.00	556.90	569.21	563.15	569.76	0.000576	5.97	552.86	538.96	0.31
Reach 1	140996		0.2%_P	3960.00	556.90	572.74	564.10	572.85	0.000129	3.39	3341.07	860.24	0.15
Reach 1	140937	K	10%_P	1980.00	558.90	566.35	564.96	567.06	0.002249	7.63	384.34	172.19	0.55
Reach 1	140937	K	2%_P	2772.00	558.90	568.20	565.77	568.86	0.001554	7.58	553.04	250.39	0.48
Reach 1	140937	K	1%_P	3080.00	558.90	569.07	566.04	569.69	0.001282	7.39	635.46	757.86	0.44
Reach 1	140937	K	0.2%_P	3960.00	558.90	572.78	566.81	572.81	0.000088	2.45	4704.61	924.16	0.12
Reach 1	140810		10%_P	1980.00	559.20	566.10	563.93	566.78	0.002059	6.58	305.13	267.96	0.51
Reach 1	140810		2%_P	2772.00	559.20	568.06	564.98	568.66	0.001268	6.37	524.26	631.76	0.42
Reach 1	140810		1%_P	3080.00	559.20	568.99	565.35	569.52	0.000977	6.06	635.93	722.26	0.37
Reach 1	140810		0.2%_P	3960.00	559.20	572.78	566.20	572.79	0.000051	1.80	5517.44	956.16	0.09
Reach 1	140768		10%_P	1980.00	558.00	566.08	563.45	566.65	0.001456	6.08	332.11	217.61	0.44
Reach 1	140768		2%_P	2772.00	558.00	567.96	564.42	568.60	0.001134	6.43	444.93	502.05	0.40
Reach 1	140768		1%_P	3080.00	558.00	568.81	564.74	569.44	0.000990	6.43	495.81	614.43	0.38
Reach 1	140768		0.2%_P	3960.00	558.00	572.76	565.60	572.79	0.000069	2.18	4941.96	966.94	0.11
Reach 1	140700	NY 251			Bridge								
Reach 1	140675		10%_P	1980.00	558.00	565.47	563.46	566.22	0.002320	6.95	284.92	71.64	0.53
Reach 1	140675		2%_P	2772.00	558.00	566.48	564.46	567.51	0.002522	8.15	344.51	150.89	0.57
Reach 1	140675		1%_P	3080.00	558.00	566.91	564.80	568.02	0.002497	8.47	372.74	237.14	0.58
Reach 1	140675		0.2%_P	3960.00	558.00	567.68	565.71	569.13	0.002835	9.70	426.85	385.25	0.63
Reach 1	140641	J	10%_P	1980.00	558.50	564.82	563.91	565.99	0.004185	8.70	237.62	150.74	0.71
Reach 1	140641	J	2%_P	2772.00	558.50	565.31	564.94	567.15	0.005799	10.94	272.95	176.15	0.85
Reach 1	140641	J	1%_P	3080.00	558.50	565.46	565.28	567.59	0.006473	11.78	284.88	184.19	0.90
Reach 1	140641	J	0.2%_P	3960.00	558.50	566.43	566.43	568.74	0.005773	12.45	376.56	258.28	0.88
Reach 1	140493		10%_P	1980.00	557.80	564.55	563.79	565.39	0.002868	8.03	364.72	274.03	0.61
Reach 1	140493		2%_P	2772.00	557.80	565.05	564.54	566.28	0.003874	9.89	422.67	327.66	0.72
Reach 1	140493		1%_P	3080.00	557.80	565.23	564.81	566.61	0.004195	10.51	444.67	352.99	0.75
Reach 1	140493		0.2%_P	3960.00	557.80	565.72	565.46	567.50	0.005041	12.12	502.10	408.37	0.83
Reach 1	140321		10%_P	1980.00	557.00	563.70	563.70	564.78	0.004309	9.77	389.12	185.04	0.74
Reach 1	140321		2%_P	2772.00	557.00	564.46	564.35	565.57	0.004187	10.50	536.95	207.07	0.75
Reach 1	140321		1%_P	3080.00	557.00	564.73	564.57	565.84	0.004075	10.67	594.09	212.20	0.74
Reach 1	140321		0.2%_P	3960.00	557.00	565.58	565.03	566.58	0.003433	10.64	781.78	290.53	0.70
Reach 1	140004		10%_P	1980.00	555.55	561.76	561.43	563.01	0.004856	9.36	283.90	118.04	0.76
Reach 1	140004		2%_P	2772.00	555.55	562.46	562.44	564.05	0.005391	10.82	375.93	141.68	0.82
Reach 1	140004		1%_P	3080.00	555.55	562.85	562.71	564.40	0.004956	10.86	432.20	150.81	0.79
Reach 1	140004		0.2%_P	3960.00	555.55	564.26	563.49	565.51	0.003290	10.22	685.13	214.42	0.67

Reach 1	139875 I	10%_P	1980.00	555.00	561.02	560.94	562.29	0.006504	9.55	284.76	127.20	0.77
Reach 1	139875 I	2%_P	2772.00	555.00	561.95	561.73	563.26	0.005800	10.14	407.36	137.21	0.75
Reach 1	139875 I	1%_P	3080.00	555.00	562.52		563.68	0.004712	9.74	487.40	145.18	0.68
Reach 1	139875 I	0.2%_P	3960.00	555.00	564.18		565.01	0.002745	8.69	745.91	172.13	0.54
Reach 1	139574	10%_P	1980.00	553.55	559.24	558.92	560.38	0.005943	8.94	285.44	127.00	0.73
Reach 1	139574	2%_P	2772.00	553.55	561.50	559.74	562.06	0.002066	6.86	673.24	252.30	0.46
Reach 1	139574	1%_P	3080.00	553.55	562.30	559.64	562.73	0.001468	6.22	844.91	266.00	0.40
Reach 1	139574	0.2%_P	3960.00	553.55	564.13	561.05	564.42	0.000865	5.51	1240.86	336.97	0.31
Reach 1	139424	10%_P	1980.00	552.85	558.78	558.37	559.51	0.004183	8.24	427.72	222.98	0.62
Reach 1	139424	2%_P	2772.00	552.85	561.47	558.96	561.74	0.001149	5.63	886.79	287.24	0.35
Reach 1	139424	1%_P	3080.00	552.85	562.26	559.16	562.50	0.000918	5.35	1027.87	295.82	0.31
Reach 1	139424	0.2%_P	3960.00	552.85	564.07	559.67	564.28	0.000655	5.11	1356.18	311.38	0.27
Reach 1	139171	10%_P	1980.00	551.65	558.67	555.65	558.91	0.001029	4.62	625.97	213.66	0.32
Reach 1	139171	2%_P	2772.00	551.65	561.35	556.63	561.54	0.000517	4.14	1011.30	237.46	0.24
Reach 1	139171	1%_P	3080.00	551.65	562.15	556.85	562.33	0.000460	4.13	1131.70	242.43	0.23
Reach 1	139171	0.2%_P	3960.00	551.65	563.96	557.43	564.16	0.000414	4.39	1428.14	269.94	0.23
Reach 1	139029	10%_P	1980.00	551.00	558.25	555.08	558.72	0.001366	5.59	385.52	66.72	0.38
Reach 1	139029	2%_P	2772.00	551.00	560.98	556.02	561.42	0.000832	5.46	577.11	200.20	0.31
Reach 1	139029	1%_P	3080.00	551.00	561.76	556.37	562.21	0.000781	5.57	635.92	245.71	0.31
Reach 1	139029	0.2%_P	3960.00	551.00	563.52	557.25	564.05	0.000743	6.04	792.72	423.14	0.31

Plan: Alternative #3-2

Flows: Current and Projected Future

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
Reach 1	143014 O	10%_E	1800.00	559.50	567.90	565.44	567.92	0.000198	2.23	2758.97	851.56	0.16
Reach 1	143014 O	2%_E	2520.00	559.50	569.12	565.74	569.13	0.000147	2.16	3836.91	913.81	0.14
Reach 1	143014 O	1%_E	2800.00	559.50	569.60	565.92	569.62	0.000129	2.12	4285.26	927.59	0.13
Reach 1	143014 O	0.2%_E	3600.00	559.50	571.39	566.20	571.40	0.000076	1.86	5999.07	985.08	0.11
Reach 1	143014 O	10%_P	1980.00	559.50	568.17	565.56	568.19	0.000188	2.23	2988.68	857.97	0.15
Reach 1	143014 O	2%_P	2772.00	559.50	569.55	565.90	569.57	0.000131	2.12	4240.56	926.32	0.13
Reach 1	143014 O	1%_P	3080.00	559.50	570.08	566.03	570.10	0.000115	2.08	4737.12	946.38	0.13
Reach 1	143014 O	0.2%_P	3960.00	559.50	572.09	566.29	572.10	0.000067	1.82	6696.03	1023.60	0.10
Reach 1	142528	10%_E	1800.00	559.50	567.79		567.83	0.000257	2.66	2244.88	768.59	0.18
Reach 1	142528	2%_E	2520.00	559.50	569.04		569.07	0.000171	2.43	3232.45	814.14	0.15
Reach 1	142528	1%_E	2800.00	559.50	569.54		569.57	0.000146	2.33	3639.53	819.90	0.14
Reach 1	142528	0.2%_E	3600.00	559.50	571.36		571.37	0.000080	1.96	5150.76	850.73	0.11
Reach 1	142528	10%_P	1980.00	559.50	568.07		568.11	0.000237	2.62	2458.34	771.01	0.17
Reach 1	142528	2%_P	2772.00	559.50	569.49		569.52	0.000148	2.34	3599.32	819.21	0.14
Reach 1	142528	1%_P	3080.00	559.50	570.03		570.05	0.000126	2.25	4042.74	826.19	0.13

Reach 1	142528		0.2%_P	3960.00	559.50	572.06		572.07	0.000071	1.92	5768.32	916.81	0.10
Reach 1	141840	N	10%_E	1800.00	559.50	567.66	564.46	567.71	0.000229	2.63	2141.54	938.80	0.18
Reach 1	141840	N	2%_E	2520.00	559.50	568.97	565.04	569.00	0.000136	2.28	3460.09	1096.21	0.14
Reach 1	141840	N	1%_E	2800.00	559.50	569.48	565.26	569.51	0.000112	2.16	3987.19	1142.98	0.13
Reach 1	141840	N	0.2%_E	3600.00	559.50	571.33	565.82	571.34	0.000057	1.75	5903.80	1222.26	0.10
Reach 1	141840	N	10%_P	1980.00	559.50	567.95	564.50	568.00	0.000210	2.59	2423.52	1005.66	0.17
Reach 1	141840	N	2%_P	2772.00	559.50	569.43	565.16	569.46	0.000114	2.17	3935.35	1141.11	0.13
Reach 1	141840	N	1%_P	3080.00	559.50	569.98	565.52	570.00	0.000095	2.06	4503.90	1193.30	0.12
Reach 1	141840	N	0.2%_P	3960.00	559.50	572.03	566.13	572.04	0.000048	1.67	6641.25	1234.46	0.09
Reach 1	141762		10%_E	1800.00	557.00	567.58	563.74	567.68	0.000309	3.46	1739.41	968.33	0.21
Reach 1	141762		2%_E	2520.00	557.00	568.94	566.57	568.98	0.000154	2.69	3003.15	1069.50	0.15
Reach 1	141762		1%_E	2800.00	557.00	569.46	566.78	569.49	0.000124	2.49	3489.97	1089.99	0.14
Reach 1	141762		0.2%_E	3600.00	557.00	571.32	567.12	571.34	0.000061	1.94	5245.90	1171.63	0.10
Reach 1	141762		10%_P	1980.00	557.00	567.89	564.07	567.97	0.000267	3.29	2021.72	1011.07	0.19
Reach 1	141762		2%_P	2772.00	557.00	569.41	566.76	569.44	0.000126	2.51	3442.24	1088.04	0.14
Reach 1	141762		1%_P	3080.00	557.00	569.97	566.92	569.99	0.000103	2.35	3964.42	1109.58	0.12
Reach 1	141762		0.2%_P	3960.00	557.00	572.03	567.26	572.04	0.000051	1.85	5922.29	1188.24	0.09
Reach 1	141750	Private Drive			Bridge								
Reach 1	141706.		10%_E	1800.00	557.00	567.45	563.80	567.58	0.000393	3.83	1474.79	939.43	0.23
Reach 1	141706.		2%_E	2520.00	557.00	568.91	566.83	568.95	0.000161	2.72	2824.39	1070.02	0.15
Reach 1	141706.		1%_E	2800.00	557.00	569.44	566.96	569.47	0.000126	2.49	3320.87	1085.36	0.14
Reach 1	141706.		0.2%_E	3600.00	557.00	571.31	567.28	571.33	0.000059	1.90	5090.09	1172.24	0.10
Reach 1	141706.		10%_P	1980.00	557.00	567.80	564.14	567.89	0.000316	3.53	1788.77	996.36	0.21
Reach 1	141706.		2%_P	2772.00	557.00	569.39	566.93	569.42	0.000129	2.51	3272.26	1083.74	0.14
Reach 1	141706.		1%_P	3080.00	557.00	569.95	567.09	569.97	0.000103	2.33	3800.50	1100.72	0.12
Reach 1	141706.		0.2%_P	3960.00	557.00	572.02	567.39	572.03	0.000049	1.80	5764.94	1184.51	0.09
Reach 1	141668	M	10%_E	1800.00	558.00	567.39	564.64	567.55	0.000584	4.05	1192.37	875.86	0.28
Reach 1	141668	M	2%_E	2520.00	558.00	568.89	566.74	568.94	0.000206	2.76	2626.02	1056.58	0.17
Reach 1	141668	M	1%_E	2800.00	558.00	569.43	566.89	569.46	0.000157	2.51	3149.72	1116.41	0.15
Reach 1	141668	M	0.2%_E	3600.00	558.00	571.31	567.32	571.32	0.000068	1.88	5033.11	1238.41	0.10
Reach 1	141668	M	10%_P	1980.00	558.00	567.75	564.89	567.87	0.000449	3.68	1531.72	948.91	0.25
Reach 1	141668	M	2%_P	2772.00	558.00	569.37	566.89	569.41	0.000161	2.53	3098.17	1112.09	0.15
Reach 1	141668	M	1%_P	3080.00	558.00	569.94	567.06	569.97	0.000125	2.33	3659.19	1150.89	0.14
Reach 1	141668	M	0.2%_P	3960.00	558.00	572.01	567.45	572.03	0.000055	1.76	5753.34	1247.55	0.09
Reach 1	141487		10%_E	1800.00	558.50	566.84	564.99	567.36	0.001548	6.75	555.27	259.24	0.45
Reach 1	141487		2%_E	2520.00	558.50	568.63	566.60	568.87	0.000712	5.33	1264.62	552.19	0.32
Reach 1	141487		1%_E	2800.00	558.50	569.23	566.89	569.41	0.000553	4.91	1531.35	671.82	0.28
Reach 1	141487		0.2%_E	3600.00	558.50	571.21	567.84	571.30	0.000256	3.80	2508.52	988.27	0.20
Reach 1	141487		10%_P	1980.00	558.50	567.22	564.99	567.71	0.001421	6.70	673.14	358.17	0.44
Reach 1	141487		2%_P	2772.00	558.50	569.17	566.85	569.35	0.000565	4.94	1505.59	656.92	0.29
Reach 1	141487		1%_P	3080.00	558.50	569.78	567.30	569.92	0.000452	4.61	1785.05	778.98	0.26

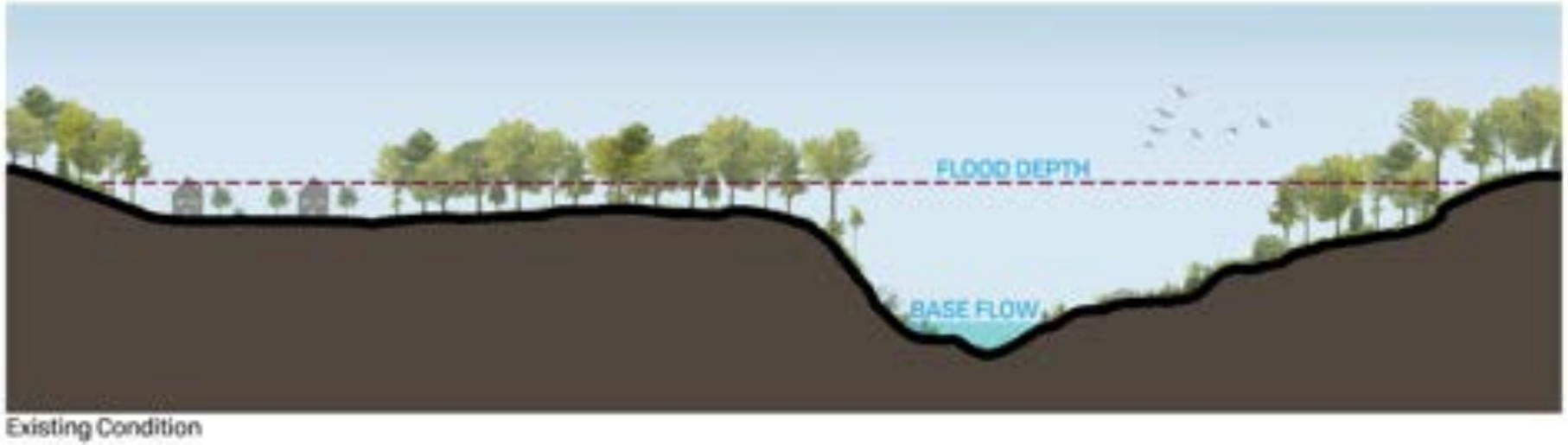
Reach 1	141487		0.2%_P	3960.00	558.50	571.94	568.01	572.01	0.000208	3.57	2885.43	1023.06	0.18
Reach 1	141159		10%_E	1800.00	559.30	566.48	563.53	566.90	0.001143	5.54	484.45	227.04	0.38
Reach 1	141159		2%_E	2520.00	559.30	568.30	564.92	568.62	0.000742	5.23	854.82	416.31	0.31
Reach 1	141159		1%_E	2800.00	559.30	568.90	565.57	569.20	0.000660	5.16	1011.14	514.17	0.30
Reach 1	141159		0.2%_E	3600.00	559.30	570.99	566.38	571.19	0.000387	4.53	1637.35	903.11	0.24
Reach 1	141159		10%_P	1980.00	559.30	566.88	563.77	567.29	0.001059	5.54	554.27	264.15	0.36
Reach 1	141159		2%_P	2772.00	559.30	568.84	565.29	569.15	0.000668	5.17	995.56	505.69	0.30
Reach 1	141159		1%_P	3080.00	559.30	569.47	565.91	569.75	0.000591	5.08	1167.48	640.25	0.29
Reach 1	141159		0.2%_P	3960.00	559.30	571.74	566.69	571.92	0.000326	4.34	1882.89	950.71	0.22
Reach 1	141074	L	10%_E	1800.00	559.50	566.45	562.72	566.79	0.000895	4.67	385.63	55.96	0.31
Reach 1	141074	L	2%_E	2520.00	559.50	568.11	563.52	568.54	0.000904	5.26	478.91	57.63	0.32
Reach 1	141074	L	1%_E	2800.00	559.50	568.65	563.81	569.12	0.000913	5.50	513.66	265.59	0.32
Reach 1	141074	L	0.2%_E	3600.00	559.50	570.64	564.61	571.12	0.000731	5.62	727.86	872.40	0.30
Reach 1	141074	L	10%_P	1980.00	559.50	566.83	562.93	567.19	0.000920	4.87	406.66	56.01	0.32
Reach 1	141074	L	2%_P	2772.00	559.50	568.60	563.79	569.06	0.000913	5.48	509.51	247.09	0.32
Reach 1	141074	L	1%_P	3080.00	559.50	569.16	564.10	569.66	0.000914	5.70	564.70	568.07	0.33
Reach 1	141074	L	0.2%_P	3960.00	559.50	571.36	564.94	571.85	0.000694	5.71	807.23	907.62	0.29
Reach 1	141049		10%_E	1800.00	556.90	566.43	561.56	566.77	0.000513	4.67	388.76	46.61	0.28
Reach 1	141049		2%_E	2520.00	556.90	568.04	562.47	568.51	0.000566	5.50	463.00	81.88	0.30
Reach 1	141049		1%_E	2800.00	556.90	568.56	562.81	569.08	0.000592	5.82	486.79	182.95	0.31
Reach 1	141049		0.2%_E	3600.00	556.90	570.43	563.71	571.05	0.000572	6.37	573.45	682.32	0.32
Reach 1	141049		10%_P	1980.00	556.90	566.80	561.80	567.17	0.000540	4.93	405.51	46.69	0.29
Reach 1	141049		2%_P	2772.00	556.90	568.51	562.78	569.03	0.000589	5.79	484.51	171.18	0.31
Reach 1	141049		1%_P	3080.00	556.90	569.04	563.14	569.62	0.000619	6.12	508.96	449.37	0.32
Reach 1	141049		0.2%_P	3960.00	556.90	571.08	564.11	571.77	0.000584	6.65	605.33	788.74	0.32
Reach 1	141040	NY 64			Bridge								
Reach 1	140996		10%_E	1800.00	556.90	566.23	561.55	566.58	0.000550	4.76	391.53	50.38	0.29
Reach 1	140996		2%_E	2520.00	556.90	567.76	562.48	568.25	0.000612	5.61	470.32	53.01	0.31
Reach 1	140996		1%_E	2800.00	556.90	568.13	562.82	568.68	0.000668	6.01	490.04	54.54	0.33
Reach 1	140996		0.2%_E	3600.00	556.90	569.52	563.71	570.22	0.000720	6.79	573.54	566.38	0.35
Reach 1	140996		10%_P	1980.00	556.90	566.57	561.80	566.96	0.000582	5.03	408.70	50.83	0.30
Reach 1	140996		2%_P	2772.00	556.90	568.09	562.77	568.64	0.000663	5.97	488.05	54.39	0.33
Reach 1	140996		1%_P	3080.00	556.90	568.47	563.15	569.10	0.000723	6.39	508.97	140.01	0.35
Reach 1	140996		0.2%_P	3960.00	556.90	569.92	564.10	570.72	0.000774	7.20	604.25	614.64	0.37
Reach 1	140937	K	10%_E	1800.00	558.90	565.86	564.67	566.45	0.002218	7.16	399.30	164.93	0.54
Reach 1	140937	K	2%_E	2520.00	558.90	567.71	565.36	568.19	0.001339	6.74	603.83	200.50	0.44
Reach 1	140937	K	1%_E	2800.00	558.90	568.09	565.61	568.61	0.001351	7.00	647.01	235.14	0.44
Reach 1	140937	K	0.2%_E	3600.00	558.90	569.54	566.24	570.08	0.001145	7.23	814.23	802.90	0.42
Reach 1	140937	K	10%_P	1980.00	558.90	566.28	564.86	566.85	0.001982	7.10	445.11	170.72	0.51
Reach 1	140937	K	2%_P	2772.00	558.90	568.05	565.59	568.57	0.001350	6.98	642.68	224.76	0.44
Reach 1	140937	K	1%_P	3080.00	558.90	568.45	565.83	569.00	0.001366	7.26	687.79	502.36	0.45

Reach 1	140937	K		0.2%_P	3960.00	558.90	569.96	566.49	570.55	0.001186	7.59	866.52	844.52	0.43
Reach 1	140810		10%_E	1800.00	559.20	565.61		566.12	0.001962	6.01	387.50	257.80	0.49	
Reach 1	140810		2%_E	2520.00	559.20	567.58		567.99	0.001068	5.58	678.56	479.54	0.38	
Reach 1	140810		1%_E	2800.00	559.20	567.97		568.40	0.001047	5.74	745.60	583.23	0.38	
Reach 1	140810		0.2%_E	3600.00	559.20	569.50		569.90	0.000792	5.68	1004.91	770.89	0.34	
Reach 1	140810		10%_P	1980.00	559.20	566.06		566.56	0.001703	5.95	438.80	266.74	0.46	
Reach 1	140810		2%_P	2772.00	559.20	567.93		568.36	0.001049	5.73	738.75	567.19	0.38	
Reach 1	140810		1%_P	3080.00	559.20	568.34		568.79	0.001032	5.89	808.58	686.11	0.38	
Reach 1	140810		0.2%_P	3960.00	559.20	569.94		570.35	0.000787	5.85	1079.56	864.79	0.34	
Reach 1	140768		10%_E	1800.00	558.00	565.55	563.22	566.03	0.001449	5.70	355.69	150.37	0.43	
Reach 1	140768		2%_E	2520.00	558.00	567.49	564.26	567.94	0.000945	5.63	518.12	359.35	0.36	
Reach 1	140768		1%_E	2800.00	558.00	567.84	564.53	568.34	0.000984	5.93	547.84	474.90	0.38	
Reach 1	140768		0.2%_E	3600.00	558.00	569.26	565.30	569.81	0.000887	6.29	667.12	650.31	0.37	
Reach 1	140768		10%_P	1980.00	558.00	566.00	563.58	566.48	0.001314	5.72	393.48	209.81	0.41	
Reach 1	140768		2%_P	2772.00	558.00	567.80	564.50	568.30	0.000981	5.90	544.79	458.39	0.37	
Reach 1	140768		1%_P	3080.00	558.00	568.17	564.82	568.71	0.001025	6.22	575.49	582.34	0.39	
Reach 1	140768		0.2%_P	3960.00	558.00	569.65	565.57	570.26	0.000924	6.60	700.01	712.16	0.38	
Reach 1	140700	NY 251			Bridge									
Reach 1	140675		10%_E	1800.00	558.00	565.21	563.21	565.83	0.002101	6.42	314.21	93.91	0.50	
Reach 1	140675		2%_E	2520.00	558.00	566.11	564.31	566.92	0.002281	7.44	391.48	145.19	0.54	
Reach 1	140675		1%_E	2800.00	558.00	566.45	564.64	567.32	0.002293	7.74	422.68	157.99	0.55	
Reach 1	140675		0.2%_E	3600.00	558.00	567.36	565.48	568.41	0.002326	8.54	512.12	324.51	0.56	
Reach 1	140675		10%_P	1980.00	558.00	565.44	563.46	566.11	0.002171	6.70	333.71	103.23	0.52	
Reach 1	140675		2%_P	2772.00	558.00	566.41	564.60	567.28	0.002293	7.71	419.49	156.32	0.55	
Reach 1	140675		1%_P	3080.00	558.00	566.81	564.95	567.73	0.002254	7.97	457.60	213.44	0.55	
Reach 1	140675		0.2%_P	3960.00	558.00	567.48	565.80	568.69	0.002648	9.21	523.89	352.39	0.60	
Reach 1	140641	J	10%_E	1800.00	558.50	564.65	563.75	565.63	0.003777	8.05	252.80	149.65	0.67	
Reach 1	140641	J	2%_E	2520.00	558.50	565.18	564.73	566.62	0.004872	9.86	305.41	169.58	0.78	
Reach 1	140641	J	1%_E	2800.00	558.50	565.30	565.08	566.97	0.005486	10.63	318.48	175.65	0.83	
Reach 1	140641	J	0.2%_E	3600.00	558.50	565.76	565.76	567.94	0.006519	12.27	371.32	206.82	0.91	
Reach 1	140641	J	10%_P	1980.00	558.50	564.79	564.03	565.89	0.004080	8.54	266.15	158.42	0.70	
Reach 1	140641	J	2%_P	2772.00	558.50	565.29	565.04	566.94	0.005432	10.56	317.01	174.90	0.82	
Reach 1	140641	J	1%_P	3080.00	558.50	565.42	565.39	567.32	0.006118	11.39	330.58	181.72	0.88	
Reach 1	140641	J	0.2%_P	3960.00	558.50	566.35	566.35	568.34	0.005338	11.87	446.40	257.04	0.84	
Reach 1	140493		10%_E	1800.00	557.80	564.55	563.42	565.11	0.002059	6.80	408.89	273.75	0.52	
Reach 1	140493		2%_E	2520.00	557.80	565.15	564.11	565.94	0.002591	8.18	482.86	344.56	0.59	
Reach 1	140493		1%_E	2800.00	557.80	565.28	564.34	566.19	0.002907	8.79	500.21	360.43	0.63	
Reach 1	140493		0.2%_E	3600.00	557.80	565.73	564.95	566.93	0.003594	10.25	556.17	408.81	0.70	
Reach 1	140493		10%_P	1980.00	557.80	564.70	563.61	565.33	0.002211	7.18	427.85	292.86	0.54	
Reach 1	140493		2%_P	2772.00	557.80	565.27	564.31	566.17	0.002880	8.74	498.20	357.04	0.62	
Reach 1	140493		1%_P	3080.00	557.80	565.42	564.55	566.44	0.003215	9.38	516.94	385.35	0.66	

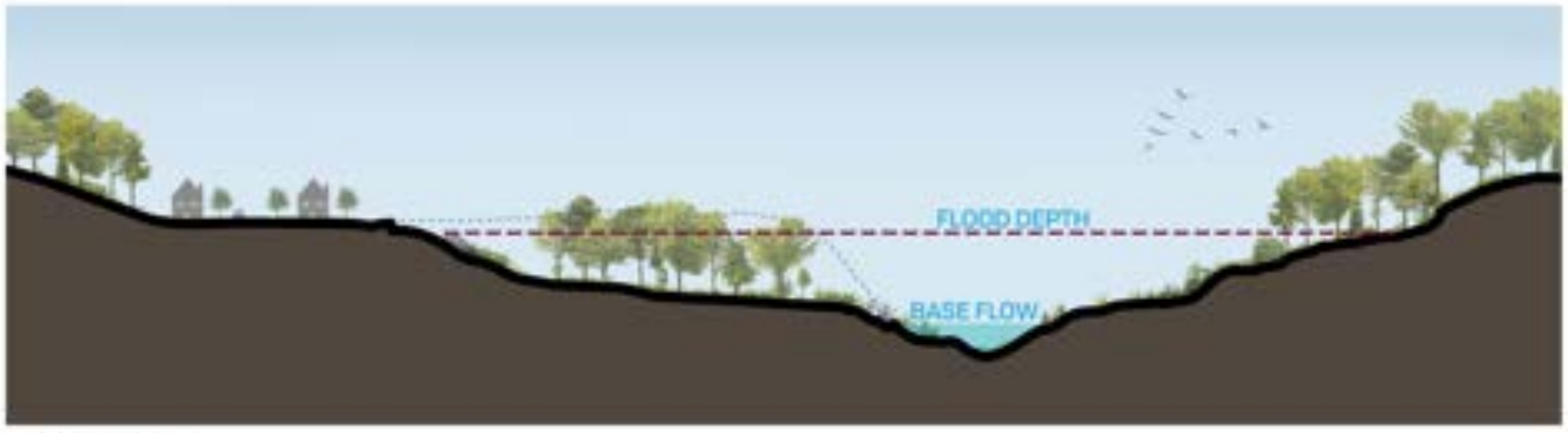
Reach 1	140493		0.2%_P	3960.00	557.80	565.96	565.20	567.27	0.003769	10.73	585.35	421.66	0.73
Reach 1	140321		10%_E	1800.00	557.00	563.51	563.51	564.58	0.004368	9.59	352.78	180.47	0.74
Reach 1	140321		2%_E	2520.00	557.00	564.16	564.16	565.34	0.004529	10.57	476.61	199.87	0.77
Reach 1	140321		1%_E	2800.00	557.00	564.47	564.37	565.59	0.004208	10.55	540.41	207.36	0.75
Reach 1	140321		0.2%_E	3600.00	557.00	565.21	564.88	566.28	0.003791	10.80	698.54	264.28	0.73
Reach 1	140321		10%_P	1980.00	557.00	563.70	563.70	564.78	0.004309	9.77	389.12	185.04	0.74
Reach 1	140321		2%_P	2772.00	557.00	564.46	564.35	565.57	0.004187	10.50	536.95	207.07	0.75
Reach 1	140321		1%_P	3080.00	557.00	564.73	564.57	565.84	0.004075	10.67	594.09	212.20	0.74
Reach 1	140321		0.2%_P	3960.00	557.00	565.58	565.03	566.58	0.003433	10.64	781.78	290.53	0.70
Reach 1	140004		10%_E	1800.00	555.55	561.61	561.22	562.74	0.004555	8.88	266.71	113.32	0.73
Reach 1	140004		2%_E	2520.00	555.55	562.23	562.04	563.75	0.005386	10.50	342.97	136.03	0.81
Reach 1	140004		1%_E	2800.00	555.55	562.51	562.46	564.08	0.005312	10.80	382.22	142.59	0.81
Reach 1	140004		0.2%_E	3600.00	555.55	563.62	563.07	565.04	0.004031	10.64	560.29	183.18	0.73
Reach 1	140004		10%_P	1980.00	555.55	561.76	561.43	563.01	0.004856	9.36	283.90	118.04	0.76
Reach 1	140004		2%_P	2772.00	555.55	562.46	562.44	564.05	0.005391	10.82	375.93	141.68	0.82
Reach 1	140004		1%_P	3080.00	555.55	562.85	562.71	564.40	0.004956	10.86	432.20	150.81	0.79
Reach 1	140004		0.2%_P	3960.00	555.55	564.26	563.49	565.51	0.003290	10.22	685.13	214.42	0.67
Reach 1	139875	I	10%_E	1800.00	555.00	560.80	560.71	562.04	0.006628	9.34	256.54	124.00	0.77
Reach 1	139875	I	2%_E	2520.00	555.00	561.60	561.50	562.96	0.006373	10.19	359.54	133.39	0.77
Reach 1	139875	I	1%_E	2800.00	555.00	562.06	561.76	563.31	0.005420	9.94	422.97	138.35	0.72
Reach 1	139875	I	0.2%_E	3600.00	555.00	563.49		564.44	0.003384	9.08	634.80	156.47	0.59
Reach 1	139875	I	10%_P	1980.00	555.00	561.02	560.94	562.29	0.006504	9.55	284.76	127.20	0.77
Reach 1	139875	I	2%_P	2772.00	555.00	561.95	561.73	563.26	0.005800	10.14	407.36	137.21	0.75
Reach 1	139875	I	1%_P	3080.00	555.00	562.52		563.68	0.004712	9.74	487.40	145.18	0.68
Reach 1	139875	I	0.2%_P	3960.00	555.00	564.18		565.01	0.002745	8.69	745.91	172.13	0.54
Reach 1	139574		10%_E	1800.00	553.55	559.07	558.70	560.13	0.005756	8.57	265.62	122.97	0.72
Reach 1	139574		2%_E	2520.00	553.55	559.87	559.51	561.11	0.005697	9.53	360.42	159.67	0.73
Reach 1	139574		1%_E	2800.00	553.55	561.71	559.75	562.21	0.001816	6.56	717.43	254.00	0.43
Reach 1	139574		0.2%_E	3600.00	553.55	563.40	560.83	563.73	0.001043	5.74	1082.47	313.72	0.34
Reach 1	139574		10%_P	1980.00	553.55	559.24	558.92	560.38	0.005943	8.94	285.44	127.00	0.73
Reach 1	139574		2%_P	2772.00	553.55	561.50	559.74	562.06	0.002066	6.86	673.24	252.30	0.46
Reach 1	139574		1%_P	3080.00	553.55	562.30	559.64	562.73	0.001468	6.22	844.91	266.00	0.40
Reach 1	139574		0.2%_P	3960.00	553.55	564.13	561.05	564.42	0.000865	5.51	1240.86	336.97	0.31
Reach 1	139424		10%_E	1800.00	552.85	558.44	558.23	559.26	0.004864	8.51	371.68	207.31	0.66
Reach 1	139424		2%_E	2520.00	552.85	559.72	558.79	560.30	0.003008	7.76	584.22	236.26	0.54
Reach 1	139424		1%_E	2800.00	552.85	561.67	558.97	561.93	0.001043	5.45	922.96	289.64	0.33
Reach 1	139424		0.2%_E	3600.00	552.85	563.35	559.46	563.57	0.000739	5.18	1224.76	304.91	0.29
Reach 1	139424		10%_P	1980.00	552.85	558.78	558.37	559.51	0.004183	8.24	427.72	222.98	0.62
Reach 1	139424		2%_P	2772.00	552.85	561.47	558.96	561.74	0.001149	5.63	886.79	287.24	0.35
Reach 1	139424		1%_P	3080.00	552.85	562.26	559.16	562.50	0.000918	5.35	1027.87	295.82	0.31
Reach 1	139424		0.2%_P	3960.00	552.85	564.07	559.67	564.28	0.000655	5.11	1356.18	311.38	0.27

Reach 1	139171	10%_E	1800.00	551.65	558.38	555.65	558.61	0.001021	4.46	587.11	211.17	0.32
Reach 1	139171	2%_E	2520.00	551.65	559.54	556.44	559.82	0.001019	5.01	744.21	221.93	0.33
Reach 1	139171	1%_E	2800.00	551.65	561.56	556.65	561.74	0.000483	4.06	1042.67	238.69	0.24
Reach 1	139171	0.2%_E	3600.00	551.65	563.24	557.21	563.42	0.000429	4.28	1303.48	256.46	0.23
Reach 1	139171	10%_P	1980.00	551.65	558.67	555.65	558.91	0.001029	4.62	625.97	213.66	0.32
Reach 1	139171	2%_P	2772.00	551.65	561.35	556.63	561.54	0.000517	4.14	1011.30	237.46	0.24
Reach 1	139171	1%_P	3080.00	551.65	562.15	556.85	562.33	0.000460	4.13	1131.70	242.43	0.23
Reach 1	139171	0.2%_P	3960.00	551.65	563.96	557.43	564.16	0.000414	4.39	1428.14	269.94	0.23
Reach 1	139029	10%_E	1800.00	551.00	558.00	554.85	558.42	0.001285	5.29	368.91	66.15	0.36
Reach 1	139029	2%_E	2520.00	551.00	559.00	555.74	559.61	0.001542	6.37	436.20	68.49	0.41
Reach 1	139029	1%_E	2800.00	551.00	561.20	556.05	561.63	0.000784	5.38	593.51	207.66	0.30
Reach 1	139029	0.2%_E	3600.00	551.00	562.80	556.90	563.31	0.000776	5.92	724.32	342.44	0.31
Reach 1	139029	10%_P	1980.00	551.00	558.25	555.08	558.72	0.001366	5.59	385.52	66.72	0.38
Reach 1	139029	2%_P	2772.00	551.00	560.98	556.02	561.42	0.000832	5.46	577.11	200.20	0.31
Reach 1	139029	1%_P	3080.00	551.00	561.76	556.37	562.21	0.000781	5.57	635.92	245.71	0.31
Reach 1	139029	0.2%_P	3960.00	551.00	563.52	557.25	564.05	0.000743	6.04	792.72	423.14	0.31

Appendix F. Mitigation Renderings

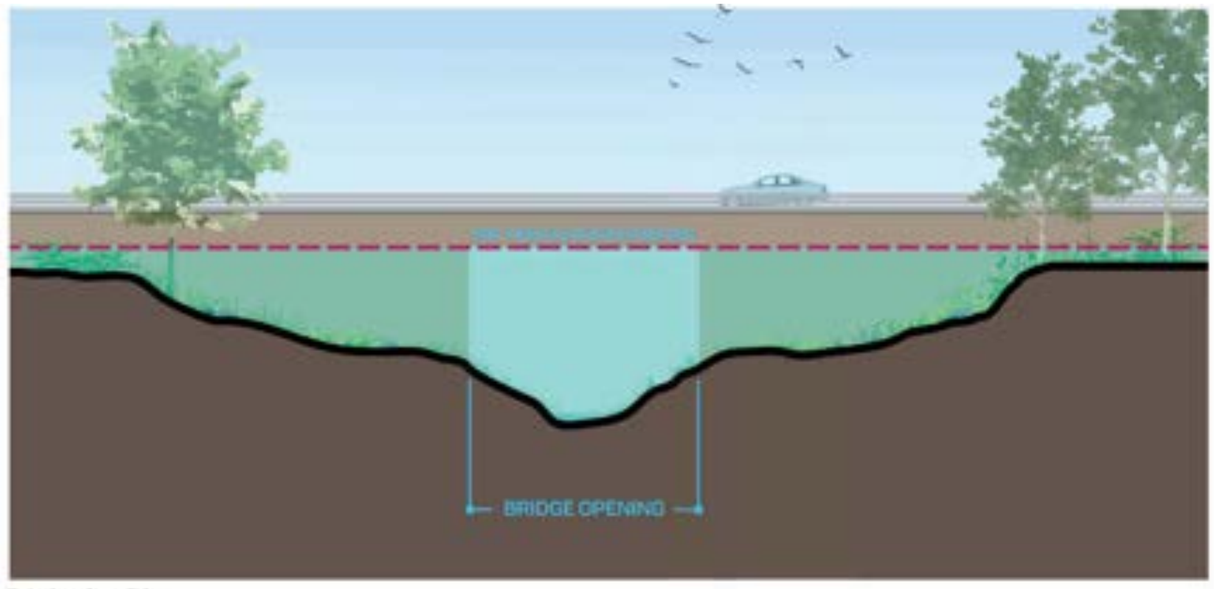


Existing Condition

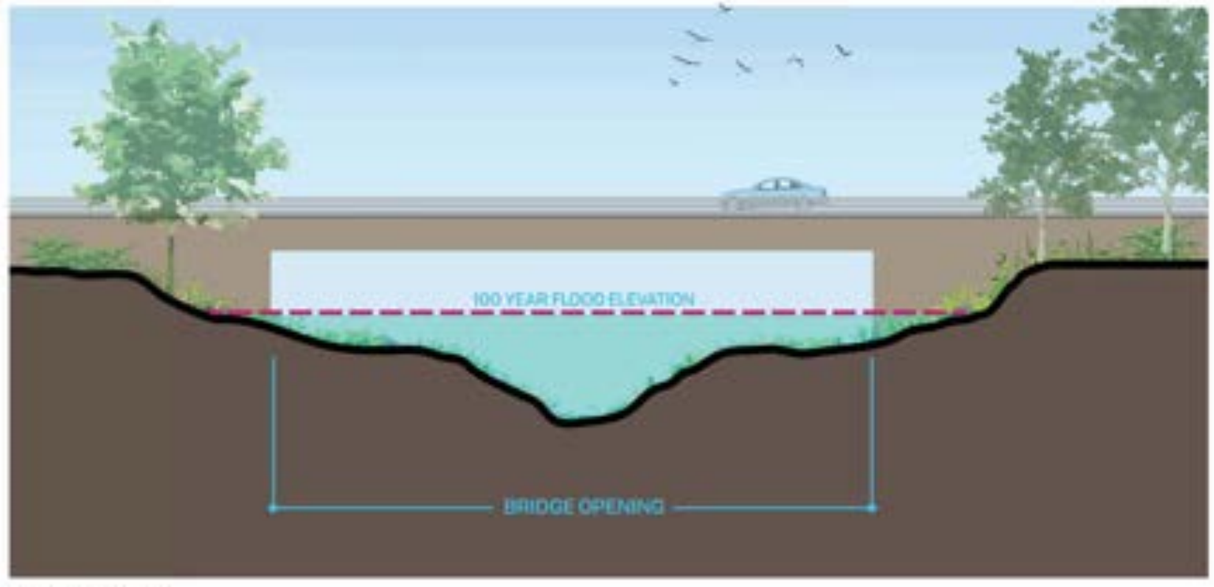


Future Condition

FLOODPLAIN BENCH

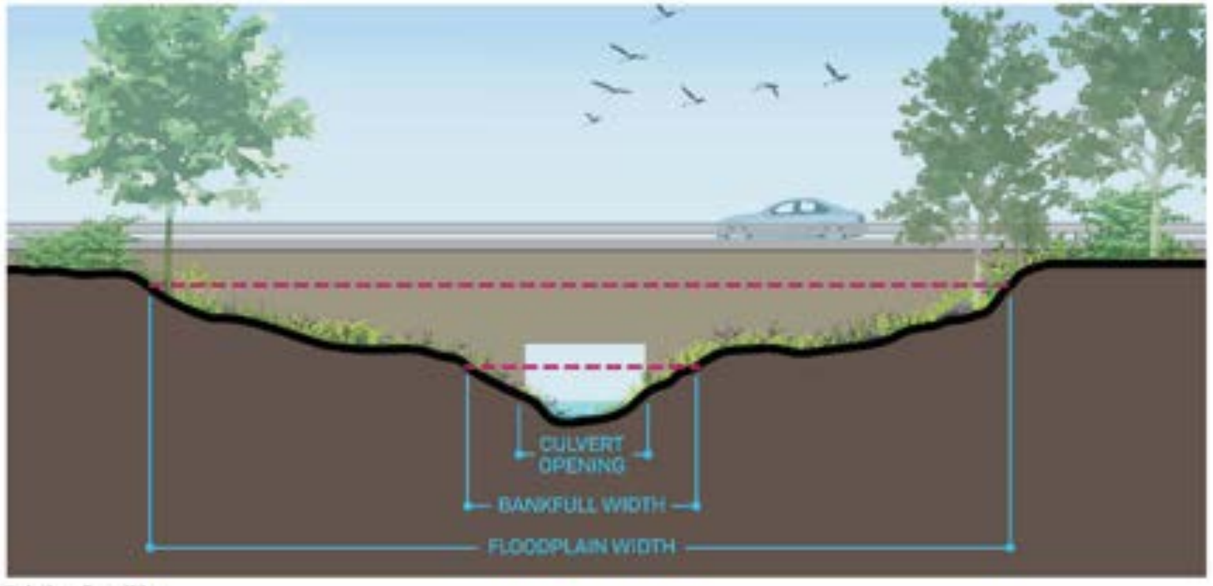


Existing Condition

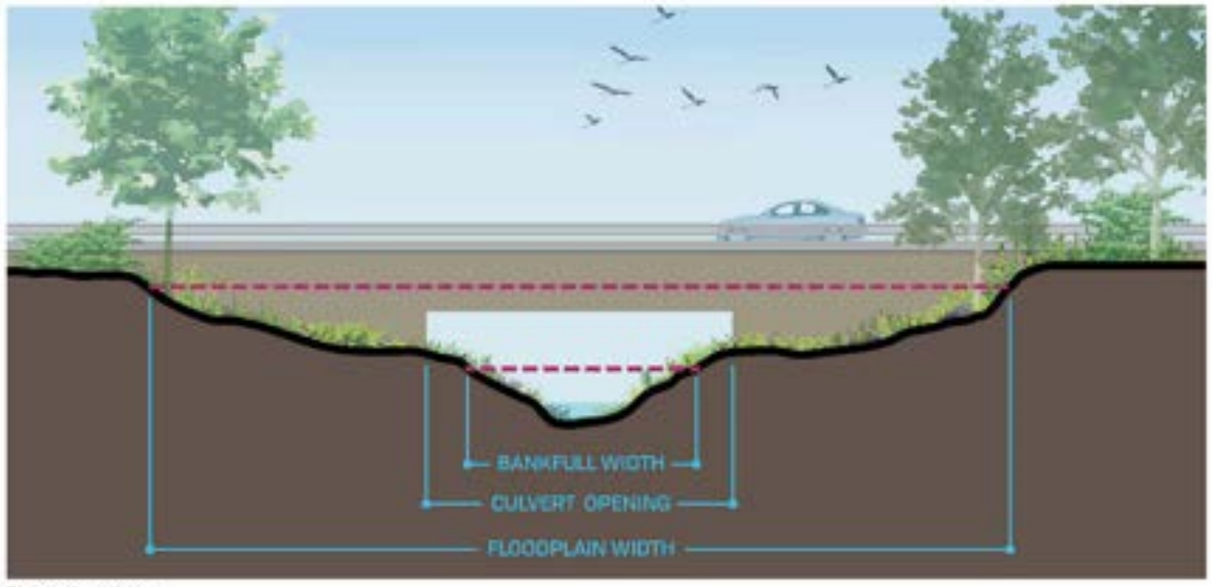


Future Condition

EXPANDED BRIDGE OPENING



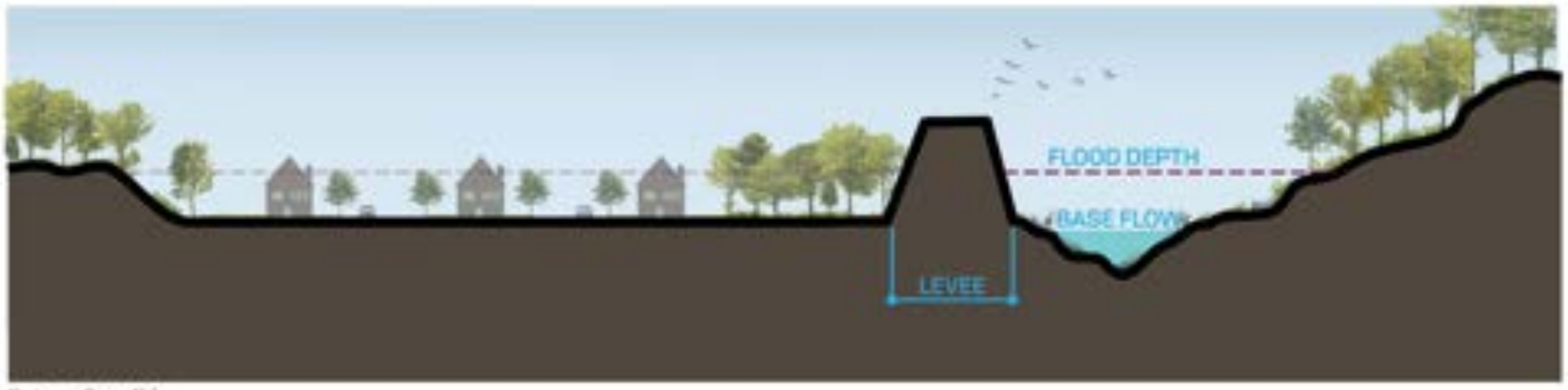
Existing Condition



Future Condition

EXPANDED CULVERT OPENING

Existing Condition



Future Condition

PROTECTIVE LEVEE