Fuller Brook Park Preservation Project – Phase 3
Final Design & Permitting
Wellesley, MA

Prepared for:

TOWN OF WELLESLEY
FULLER BROOK PARK COORDINATING COMMITTEE

Hydraulic Analysis Report (HA)

Prepared by:

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and

Horsley Witten Group

August 23, 2012

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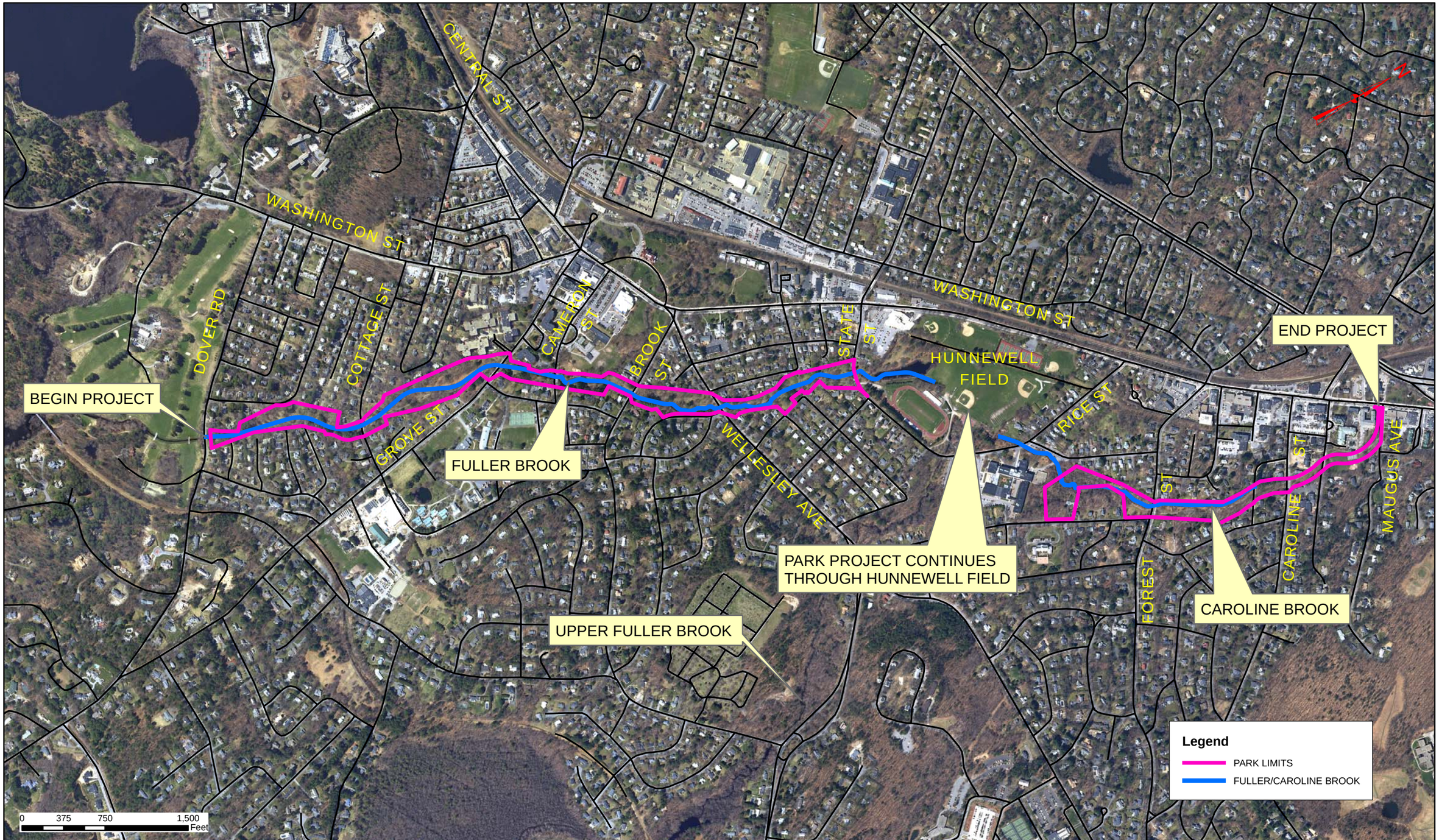

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FULLER BROOK PARK PRESERVATION PROJECT

WELLESLEY, MA

Project Locus Map

Project Location

The Fuller Brook Park Preservation Project extends from Dover Road to Hunnewell Field following Fuller Brook and from Hunnewell Field to Washington Street at Maugus Avenue following Caroline Brook. The hydraulic analysis was completed for the sections of the brooks within the park limit (see Project Locus Map).

Purpose

The purpose of this hydraulic analysis is to understand the characteristics of the brooks including capacity, flow rates, velocities, scour, and flooding for various storm events. It is developed to predict existing and proposed water surface elevations and flood depths, as well as to aid in the selection of the types of bank stabilization measures that should be used to address any existing erosion problems.

Methodology

A hydraulic (HEC-RAS) model of the brooks was created from available data and field observation to identify stream velocities and elevation levels at various locations along the brooks. Hydrologic data was taken from the XPSWMM model developed for the 2004 Stormwater Master Plan Update utilizing the following rainfall depths.

Table 1 XPSWMM Hydrologic Input Data – Rainfall Depths

	Storm Event (Year)				
	1	2	10	25	100
Depth (inches)	2.50	3.12	5.04	5.52	6.96

Summary of Data:

- Field Observations January - May, 2012
- Video Survey December 27, 2011
- USGS Maps
- Town of Wellesley GIS
- Survey for Fuller Brook Park
- 2004 Stormwater Master Plan Update (SWMPU)
- Miscellaneous Drainage Plans from Town
- Plans from Town Indicating Locations of Flooding Issues
- FEMA Flood Map (1982)
- FEMA Flood Insurance Study (1981)
- NRCS Soils Maps
- Watershed Maps
- Hydrologic Model - XPSWMM
- Hydraulic Model - HEC-RAS
- CRWA Gage Flow Data from 2002 to 2010

Summary of Observations

Caroline Brook

Caroline Brook is 2,815± feet long from the headwall at Caroline Street to the culvert inlet at Hunnewell Field.

- It conveys runoff from a 294-acre watershed of predominately developed commercial and residential areas.
- The upper section, from Caroline Brook to Forest Street, is intermittent, drying up during extended periods without rain. It is also flat; this 900-foot section drops 0.7 feet, a grade of 0.08, causing low flow velocities and sedimentation (see Sedimentation Investigation Report).
- The high elevation of the Forest Street culvert causes a very flat stream condition up-gradient and a steep condition just down gradient.
- Poor culvert alignment and elevated shear stresses at Forest Street has contributed to severe bank erosion, exposing sewer pipe and manhole. (see further discussion of sheer stress in the following section on Stream Bank Erosion)
- Approximately 200 feet from Forest Street, the brook widens, becoming shallower and flatter in the swamp area south of Paine Street. An 80± feet long boardwalk/bridge section was installed to cross the brook/swamp area.
- The swamp, along with the 42-inch CMP culvert crossing the driveway off Paine Street, acts as a detention system, regulating the flow through the lower portion of Caroline Brook.
- The high invert of the culvert at Hunnewell Field has caused an approximate 775 foot long reach just upstream of the culvert to be virtually flat, creating a sedimentation-prone condition.

Fuller Brook

Fuller Brook, within the park area, is 7,140± feet long from the Hunnewell Field culvert outlet to Dover Street.

- The confluence of the Caroline Brook and upper Fuller Brook, a 1,153-acre watershed, flows through the culvert below Hunnewell Field.
- The first 890± feet section, which includes the State Street Pond (aka Skating Pond) to the State Street culvert, is flat. The State Street Pond inlet and outlet culvert inverts are at the same elevation. The low gradient change across the pond decreases brook velocities and causes significant sediment deposition in the State Street Pond.
- The brook then flows through a narrow 4-foot wide stone block culvert/channel at the footbridge at the outlet to State Street Pond. Both the hydraulic model and the 2004 SWMPU indicate that this overtops for most storms of 2-year frequency and above.

- Just above State Street is the confluence with Abbott Brook, conveying flows from a 175-acre watershed.
- From State Street to Brook Street (2,160± feet), the Brook has a fairly consistent grade (0.07%) as it meanders through the park.
- The confluence of Cold Stream Brook, a 467-acre watershed, and Fuller Brook occurs between Brook Street and Cameron Street. Some bank erosion occurs throughout this section, most notably when the brook changes direction or shape. Just upstream of Cold Spring Brook, erosion of the bank has exposed sewer pipe. Cold Spring Brook appears to have a high concentration of iron-oxides, resulting in a rust-brown stream color.
- The Cameron Street culvert is the smallest at 4 feet by 8 feet, creating a flow constriction and causing some surcharging of the brook. Both the hydraulic model and the 2004 SWMPU indicate flooding in this area; water not does flow over the road for the 100-year storm event.

  From Brook Street to Dover Road (4,065± feet), the Brook straightens out and the grade increases to an average of 0.29%, increasing the flow velocity. This portion of the brook was engineered in the 1950s to provide a deeper, straighter channel to accommodate the flows. Over 4,500 linear feet of concrete liners and the Grove Street Flume were installed as an attempt to protect the banks and stream bed from erosion caused by high velocities. Due to development and increased impervious area, this reinforced channel has become undersized. Significant erosion behind the liners has occurred, resulting in over-widening of the channel.

Stream Capacity

The hydraulic model was evaluated to identify capacity issues within the project limits. It was found that the bank full capacity for Caroline Brook and Fuller Brook is generally between the 1- and 2-year storm event with overbank flow remaining within the park for larger events (see Hydraulic Data in Appendix C).

The hydraulic model shows that Caroline Brook may have capacity issues; however, Town records do not indicate any known storm event flow or capacity problems.. Difficulties in in estimating runoff or storage capacity in the watershed may account for this discrepancy (see Hydrologic Data in Appendix A for more explanation). Upland storage capacity was modeled using available GIS topographic data; data which may not accurately depict topography in the heavily wooded, wetland areas. The capacity discrepancy was most apparent in the Caroline Brook portion of the watershed.

Town reports do indicate that, under some flow conditions, flooding is a concern between State Street and Cameron Street. The issues were specifically observed when a significant rainfall event occurred during late winter with frozen ground and a heavy snow cover. This type of event cannot easily be predicted in a hydraulic model due to the unusual circumstances. This observed event should be considered an anomaly for the purpose of this analysis.

Culvert/Bridge Capacity

Caroline Brook has six culverts of various sizes and materials. The 60-inch dia. reinforced concrete pipe (RCP) culverts crossing roadways at Forest Street and Rice Street have sufficient capacity to convey flow for the 100-year storm events. Three smaller (42”-48”) culverts crossing driveways and footpaths are overtopped during larger storm events. The hydraulic model indicates that the arch culvert under the High School field also does not have capacity to accommodate the larger storm events.

Within the project limits, Fuller Brook has seven culverts and four footbridges. The first of these is a narrow 4-foot wide stone block culvert/channel at the footbridge at the outlet to State Street Pond. Both the hydraulic model and 2004 SWMPU indicate that this overtops for most storms of 10-year frequency and above.

The State Street culvert is a concrete arch with mortared stone headwalls. Wellesley Avenue and Cameron Street culverts are concrete box culverts with mortared stone headwalls and arch openings. The Brook Street culvert is a pair of 72-inch RCPs with stone block headwall and wing walls. The Cameron Street culvert is the smallest at 4 feet by 8 feet causing some surcharging of the brook. Both the hydraulic model and reports to the Town indicate flooding in this area; water however does not flow over the road for the 100-year storm event. The three lower reach culverts, Dover Rd., Cottage St. & Grove St. were constructed along with stream improvements in the 1950s. They are oversized concrete box culverts with wing walls of sufficient size to accommodate the 100-year storm event. They have utilities passing through them, but they are high enough not to be affected by flows in the Brook.

All culverts including headwalls and wingwalls are generally in good condition, except the 48-inch diameter RCP culvert for the footpath off Smith Street, which is deteriorated and steel reinforcing is exposed (see Summary of Culverts in Appendix D). It should be noted that the bottom of the culverts on the lower portion of Caroline Brook were not observed due to being submerged and partially filled with sediment.

Stream Bank Erosion

Stream bank erosion for upper Caroline Brook from Caroline Street to Forest Street is due primarily to the lack of vegetation on the banks and lack of natural sinuosity[1] in the brook; the brook is severely channelized across this reach. Abutting owners have installed railroad ties and stone as an attempt to prevent additional property loss.

[1] Sinuosity relates to the bending or curving shape of a river or stream. Streams attempt to maintain a balance between slope, sediment loads, and energy by naturally adjusting their sinuosity. When bank erosion is observed in a straightened segment of stream, it suggests that the system is attempting to arrive at the natural balance by forming a more sinuous condition. In the case of Caroline Brook at the straightened segments, abutters have attempted to stop bank erosion and property loss through the use of railroad ties and stone for stabilization.

The most severe signs of stream bank erosion are observed downstream of the Forest Street culvert. Poor culvert alignment, steep gradients, and elevated shear stresses[2] have contributed to the exposure of the adjacent active sewer infrastructure. The risk of sewer line failure at this location is high given the current conditions. A second section of abandoned sewer pipe is also exposed just up-gradient of the confluence of Cold Spring Brook.

Due to attempts over the years to straighten, lower, and generally increase the capacity of Fuller Brook, most of the natural banks and stream bottom have been impacted. The disturbance and straightening of the brook, in addition to increased development within the watershed, causes velocities and flows to increase which in turn, contributes to erosion and changes in brook shape. This can be seen throughout the section of Fuller Brook to varying degrees, most significantly around locations of drainage outfalls and concrete liners.

Drainage Outfalls

The brooks are a significant part of the overall stormwater management system for the Town of Wellesley. Outlets from street drainage systems are routed directly to the brooks. The majority of these drainage systems were constructed before the effects of stormwater discharges were fully understood and before treatment was deemed necessary or required. Many of the outfalls are failing due to erosion of the banks or from excessive aggradation (see Summary of Drainage Outfalls in Appendix E). Two outfalls from Marvin Road drainage systems were observed below the mud line indicating that the elevation of the bottom of the brook has raised since these systems were installed. It is likely that much of the existing drainage infrastructure is undersized for the current level of development. Some potential drainage improvement recommendations to address stormwater treatment are described in more detail in the Sedimentation Investigation Report. Details for improvements to the individual outfalls within the project limits will be included as part of the design improvements.

[2] Shear stress is a force acting on stream banks; it can be used to identify areas prone to scour and/or sediment deposition. Shear stress increases when stream depth and/or bed slope increases. High shear stresses generally yield conditions for increased scour, which transports sediment. Stream velocity and shear stress can also be related, but both should always be evaluated individually when making determinations about erosion potential. A good example of this in regards to the Fuller Brook HEC-RAS analysis can be observed in the results for Station 13+48. At this location, shear stress is very high relative to the rest of the project reaches. Conversely, velocity increases only moderately. The steep gradient (i.e., slope) change at this location produces the elevated shear stress results, and as a result, this area will likely be prone to significant erosion. If only velocity were considered in the analysis, erosion potential could be easily underestimated.

Conclusions and Recommendations

The analysis indicates that the Caroline Brook and Fuller Brook within the study area have sufficient capacity to accommodate flows for up to the 100-year storm event within the park. Roadway culverts can also accommodate the 100-year storm. Some footpaths are overtopped during larger storm events.

The following are recommendations for consideration as part of the Fuller Brook Park Preservation Project or future projects within the watershed.

- Dredge stream bed to remove accumulated sediments from Caroline Brook to Forest Street, including two tributary swales.
- Remove remnants of existing railroad tie walls and vegetate / stabilize banks as necessary.
- Consider installing BMPs to treat runoff from street system such as:
  - Vegetated treatment swale or constructed wetlands up-gradient of Caroline Street to capture sediments and allow for regular maintenance (sediment removal) without requiring permits.
  - Outlet sediment traps at pipe outfalls
  - Rain gardens at end of streets abutting park
  - Provide off-line deep sump catchbasin and/or water quality structures
- Reinstall/upgrade street drainage pipe from Forest Street and install outlet sediment trap/energy dissipater.
- Relocate and reinforce the bank of stream to protect sewer southwest of Forest Street.
- In the forested swamp area south of Paine Street, replace 8-inch cross culverts with swales bridged by boardwalk/pedestrian bridges to reconnect wetland areas, equalize water elevations and reduce inundation from flooding. Balance fill with excavation in flood plain.
- Dredge stream bed and culverts to remove accumulated sediments from the driveway off Paine Street to Hunnewell Field, including two tributary swales.
- Repair/replace or remove footpath culvert off Smith Street to Hunnewell Field
- Any future upgrades to the Hunnewell Field culvert should include lowering inlet to improve the hydraulic function of the lower Caroline Brook section. This was also noted in the 2004 SWMPU.
- Dredge stream bed and State Street Pond to remove accumulated sediments from the Hunnewell Field culvert to the confluence with Abbott Brook.
- Evaluate opportunities to re-use concrete liners within the project, possibly for energy dissipation at drainage outfalls and/or to create riffle-pool sequences within the stream channel.
- Provide improvements to drainage outfalls to repair and protect against erosion
- Install new, higher outlets for Marvin Road drainage system.

- General maintenance/repairs to repoint mortar stone and block walls for culvert/bridges
- Install stream bank stabilization measures for the eroding stream sections described below and shown on the Special Studies Recommendations Plans. Both hard and soft stabilization measures are recommended based on the results of the hydraulic analysis. Hard stabilization techniques include concrete, riprap, gabions or other engineered hard structures. Soft stabilization techniques include vegetation, coir logs, coir blankets, or other natural practices.

  Hard stabilization necessary at: (bank sides refer to side looking downstream)

  - Caroline Brook – Left bank station 121+15 to 119+38
  - Caroline Brook - Both banks at culvert inlet station 121+90 to 121+80
  - Fuller Brook – Both banks station 74+95 to 73+79
  - Fuller Brook – Both banks at culvert outlet station 43+97 to 43+87
  - Fuller Brook – Slight improvements to existing hard stabilization (flume) station 41+06 to 39+61 and
  - Fuller Brook – Slight improvements to existing hard stabilization station 18+26 to 18+11
  - Fuller Brook – Both banks station 12+71 to 11+27, and
  - Fuller Brook – Both banks station 10+80 and 10+68

  A combination of soft and hard stabilization techniques at:

  - Fuller Brook – Between Stations 18+26 and 37+75 along both banks due to the disturbance associated with the removal of the concrete liners in this area. Hard stabilization will be necessary at culverts, bridges, and outfalls. Hard stabilization also necessary along left bank below wall from Stations 23+00 to 24+30, and a combination of hard/soft stabilization will be used elsewhere as needed.
  - Fuller Brook – Between Stations 12+71 and 18+11 along both banks due to the disturbance associated with the removal of the concrete liners. Hard stabilization will be necessary at culverts, bridges, and outfalls. A combination of hard/soft stabilization will be used elsewhere when practicable.

Soft stabilization at:

- Caroline Brook – Both banks station 130+78 to 121+80 in dredge areas.
- Caroline Brook – Right bank station 123+00 to 121+80.
- Caroline Brook – Both banks station 119+38 to 101+40, in dredge areas
- Caroline Brook – Both banks station 108+38 to 107+06
- Fuller Brook – Both banks station 74+95 and 81+97, in dredge areas.
- Fuller Brook – Left bank station 62+00 to 60+50
- Fuller Brook – Right bank station 59+79 to 58+60
- Fuller Brook – Left bank station 56+50 to 55+12
- Fuller Brook – Both banks station 45+50 to 44+43
- Fuller Brook – The currently hard stabilized area station 39+61 to 37+75 could be converted to soft stabilization at some point, but we recommend not disturbing the banks at this time.
- Fuller Brook – Both banks station 11+27 to 10+80

APPENDIX A

HYDROLOGIC DATA

Hydrologic Model

The hydrologic information was taken from the XPSWMM model completed for the 2004 Stormwater Master Plan Update (SWMPU).

The following observations were made concerning the model. Although a thorough review of the XPSWMM model was not completed, the watershed areas directly tributary the brooks were checked and some modifications were made to better represent existing flow conditions.

The model in general does not break down the watershed flows to each individual outlet to the brook. Most often, for any particular reach, the combined flow to the brook for each section (between road crossings) is introduced at the upstream end of the reach. For the analysis the HEC-RAS model interjects the flows in the similar location.

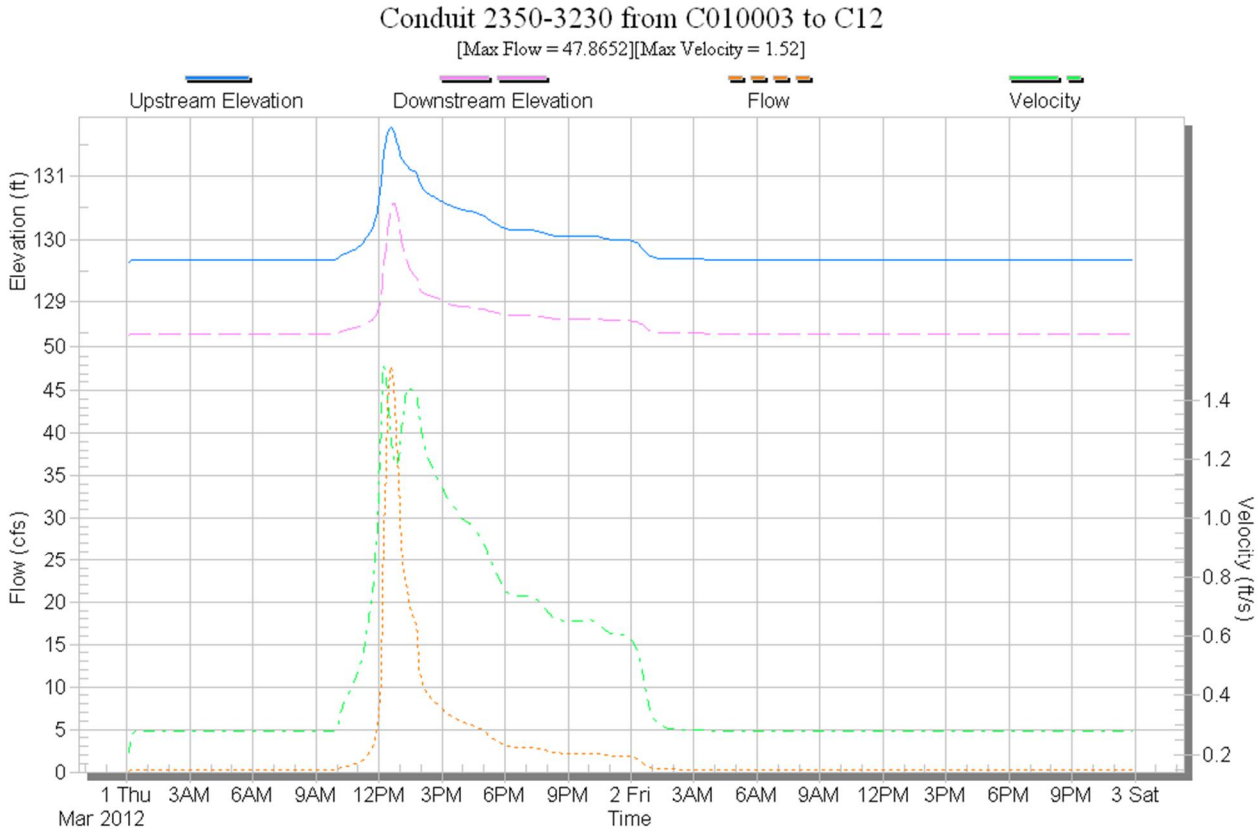
Summary of Hydrologic Flow Data from XPSWMM Model

	Stream	Storm Event (Year)				
Brook Name	Station	1	2	10	25	100
Abbot Brook		9.2	18.3	29.3	36.3	48.7
Upper Fuller Brook		21	24.3	36.7	44.7	62.8
Cold Spring Brook		74.9	100	153.7	161.9	182.1
Caroline Brook	130+78	47.9	61.8	98.8	105.8	125.8
	121+80	66.2	94.3	147.4	154.6	172.9
	12100	72.5	107.8	185.4	202.1	245
	111+46	77.3	122.8	188	184.4	208.9
	109+86	35.2	43.1	96.2	125.8	168.1
	106+20	35.3	42.9	79.6	92.7	126.3
Lower Fuller Brook	81+97	42.3	63.1	102	115.8	135.9
	74+31	42.8	64.3	121.2	132.2	157.6
	73+07	44.1	66.4	125.5	135.1	164.8
	59+89	45.6	70.3	133.5	144.1	179.6
	51+33	46.9	75.9	141.3	154.7	186.2
	48+29	94.8	147.1	238.8	252.3	321.8
	43+97	115	169.5	267.2	279.4	346.5
	38+72	118	174.4	274.1	288.1	357.8
	24+86	119	180	304.7	333.5	421.4

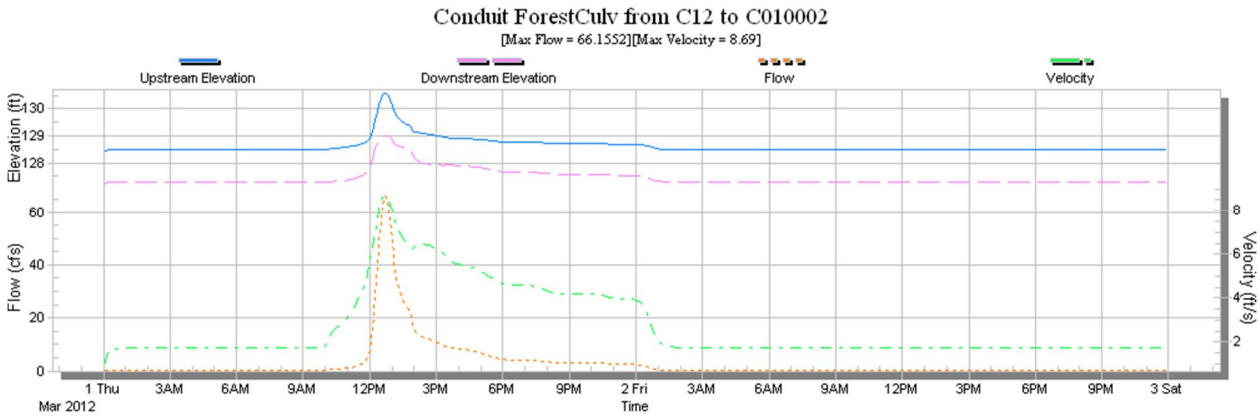
Flows in cubic feet per second (cfs)

Appendix A – XPSWMM Flow Data

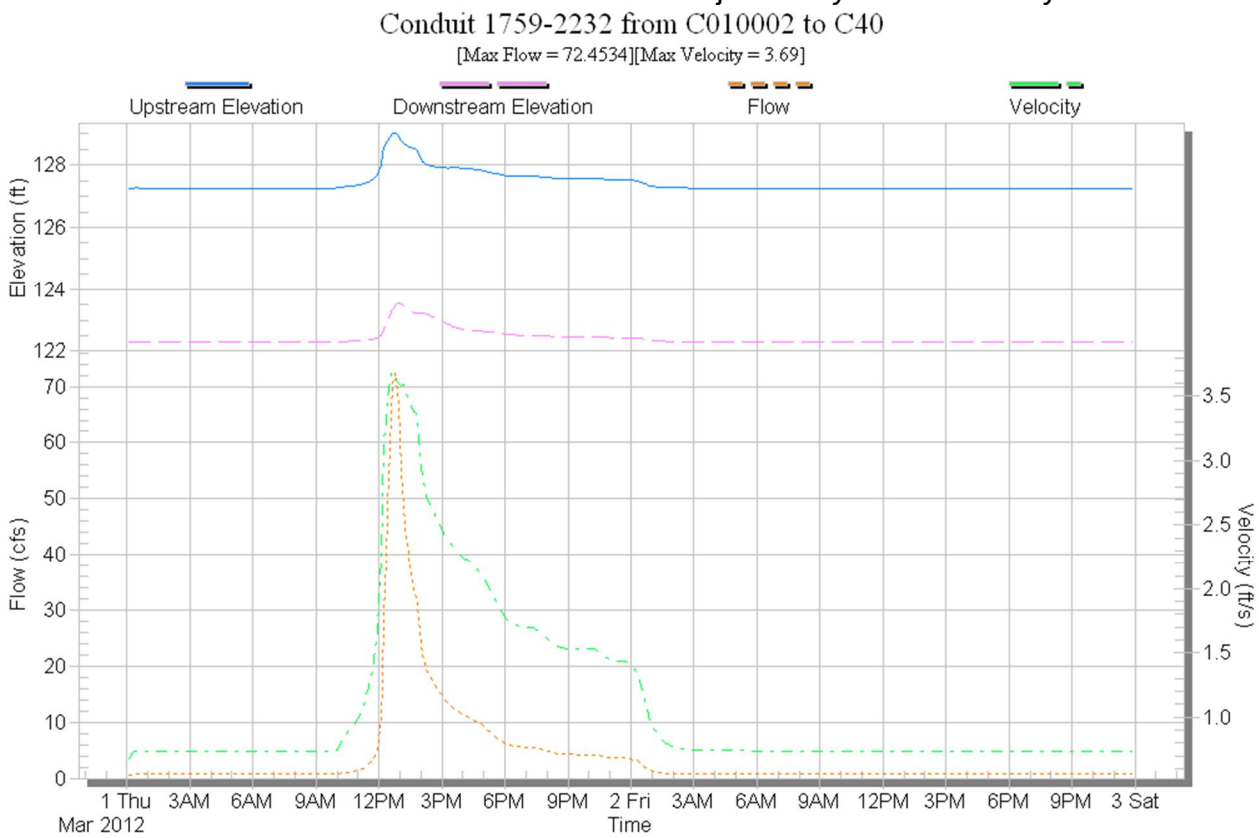
One Year Storm (2.50 inches)



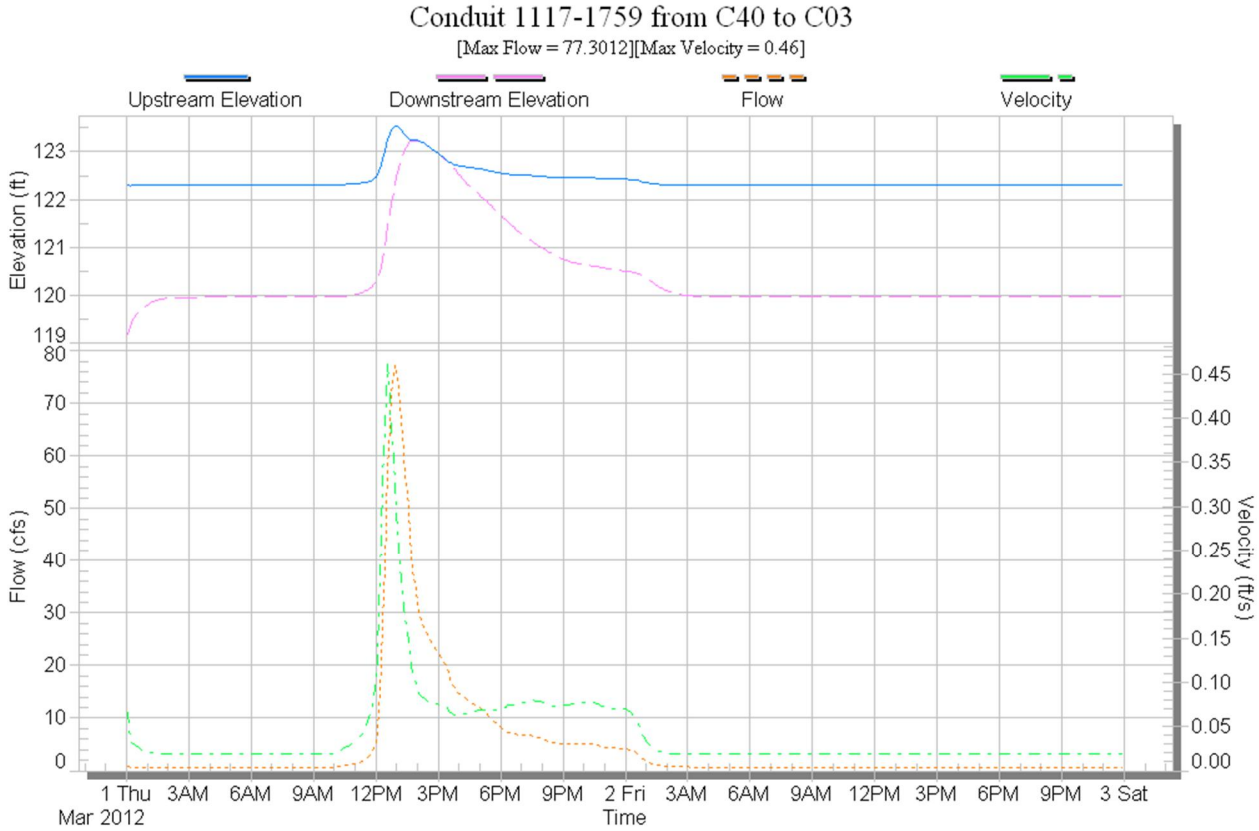
Caroline St. (HW1 – Station 130+78)



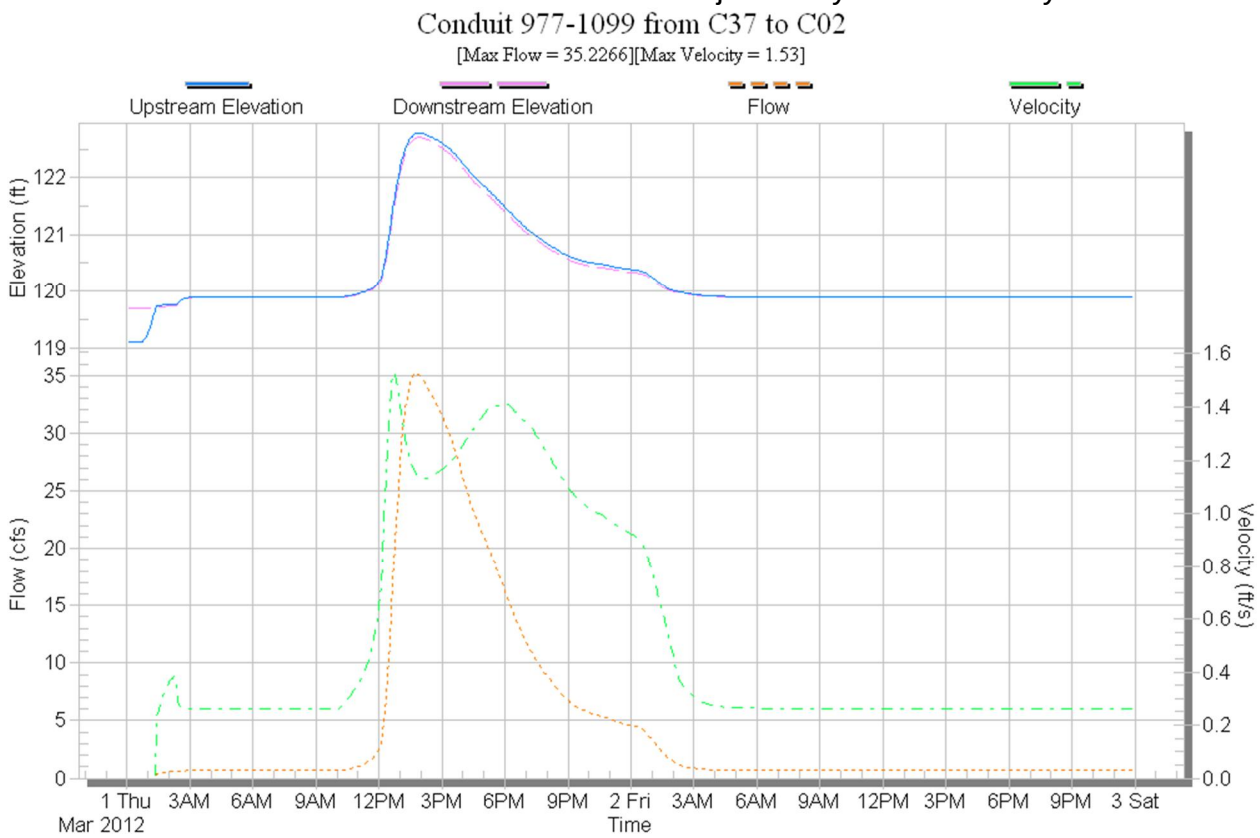
Forest St Culvert (CO7 – Station 121+80)



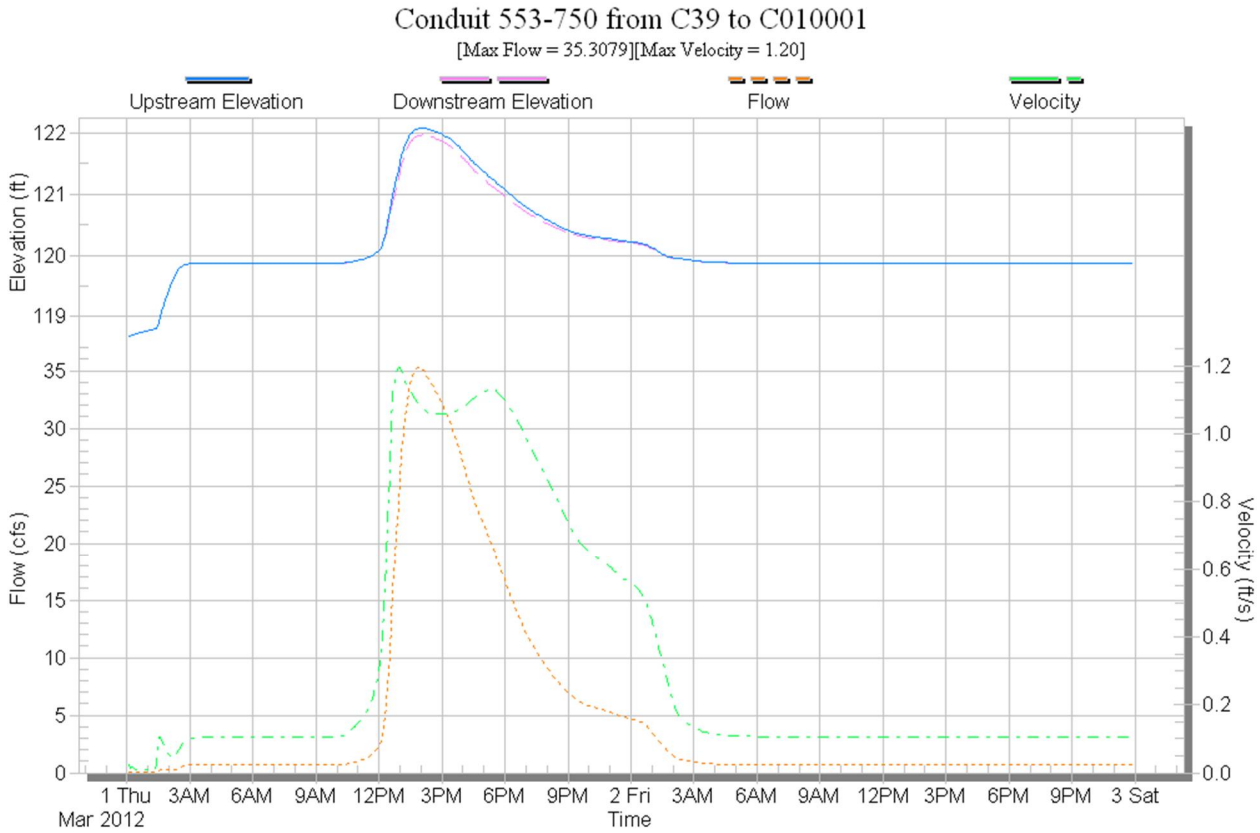
Forest St (Station 121+00)



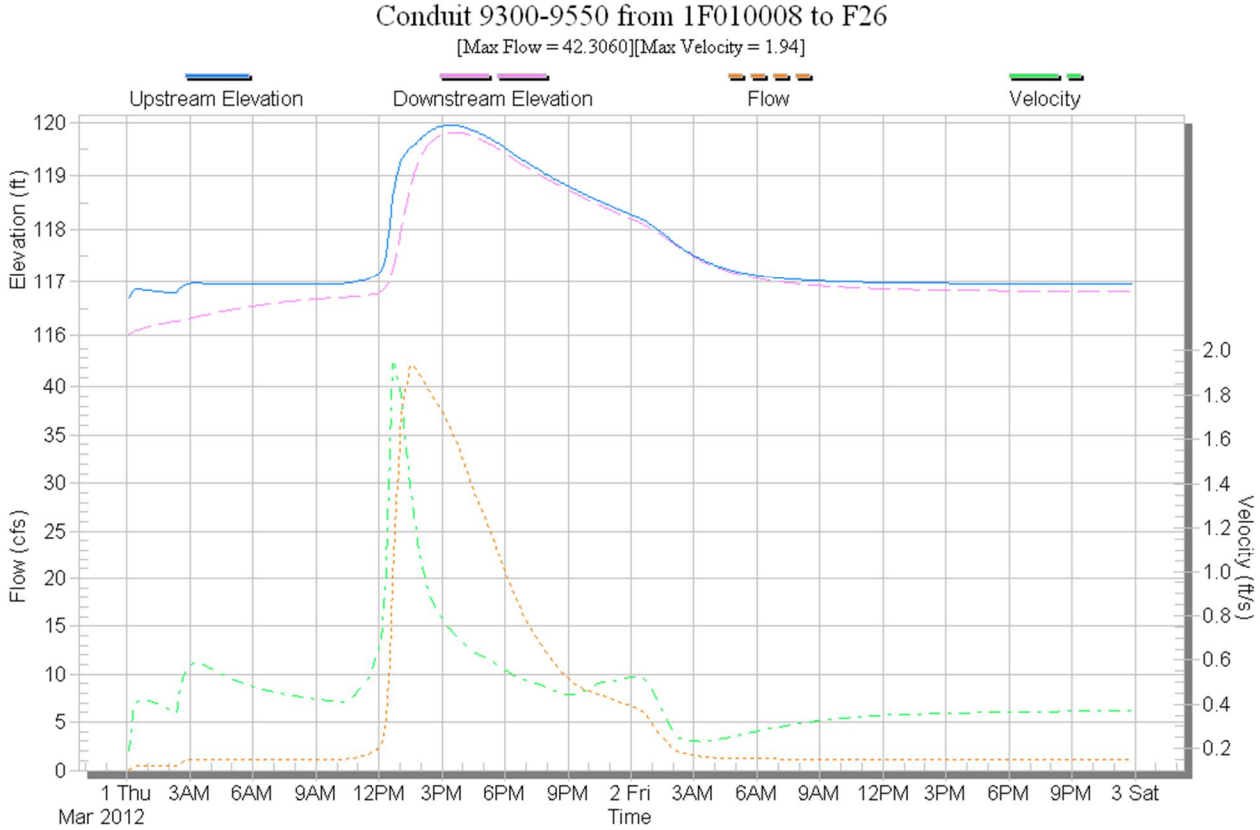
Wetland at Paine St. (C08 – Station 111+46)



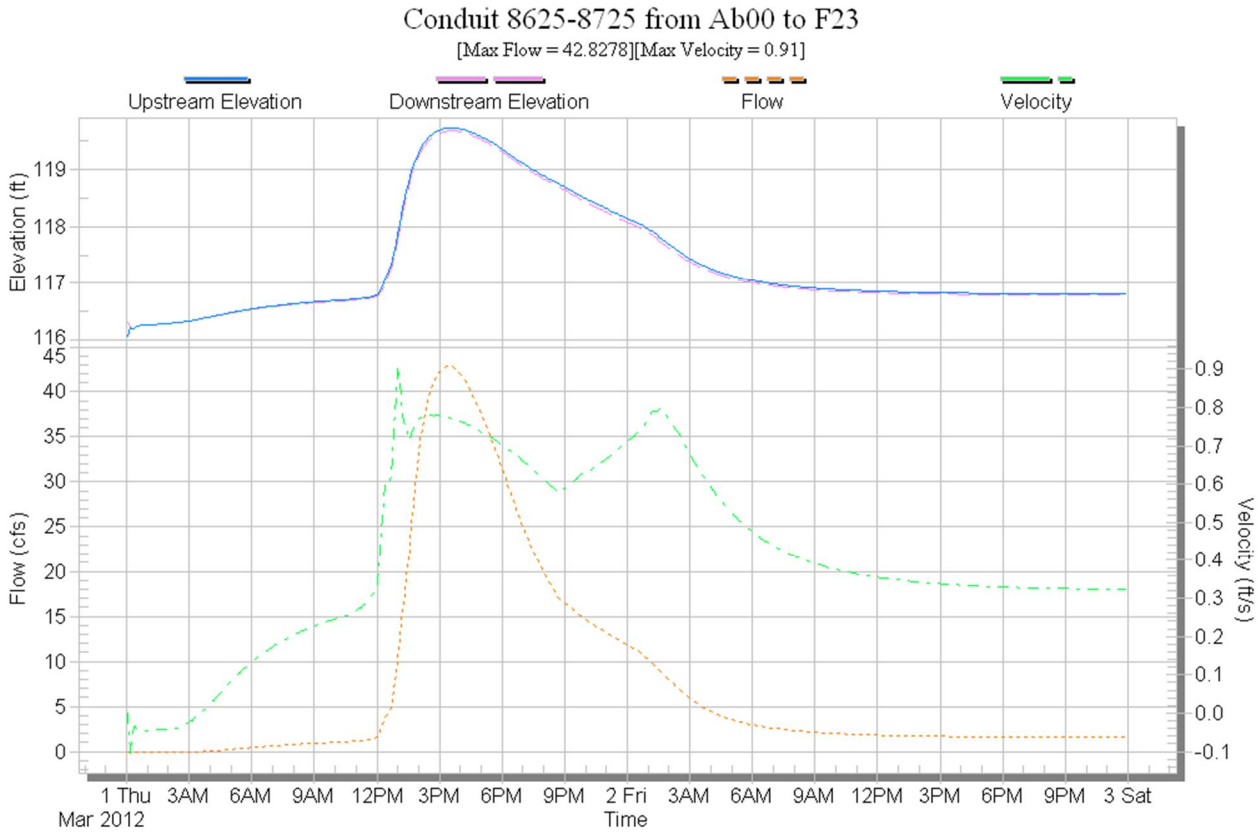
Paine St. (Station 109+86)



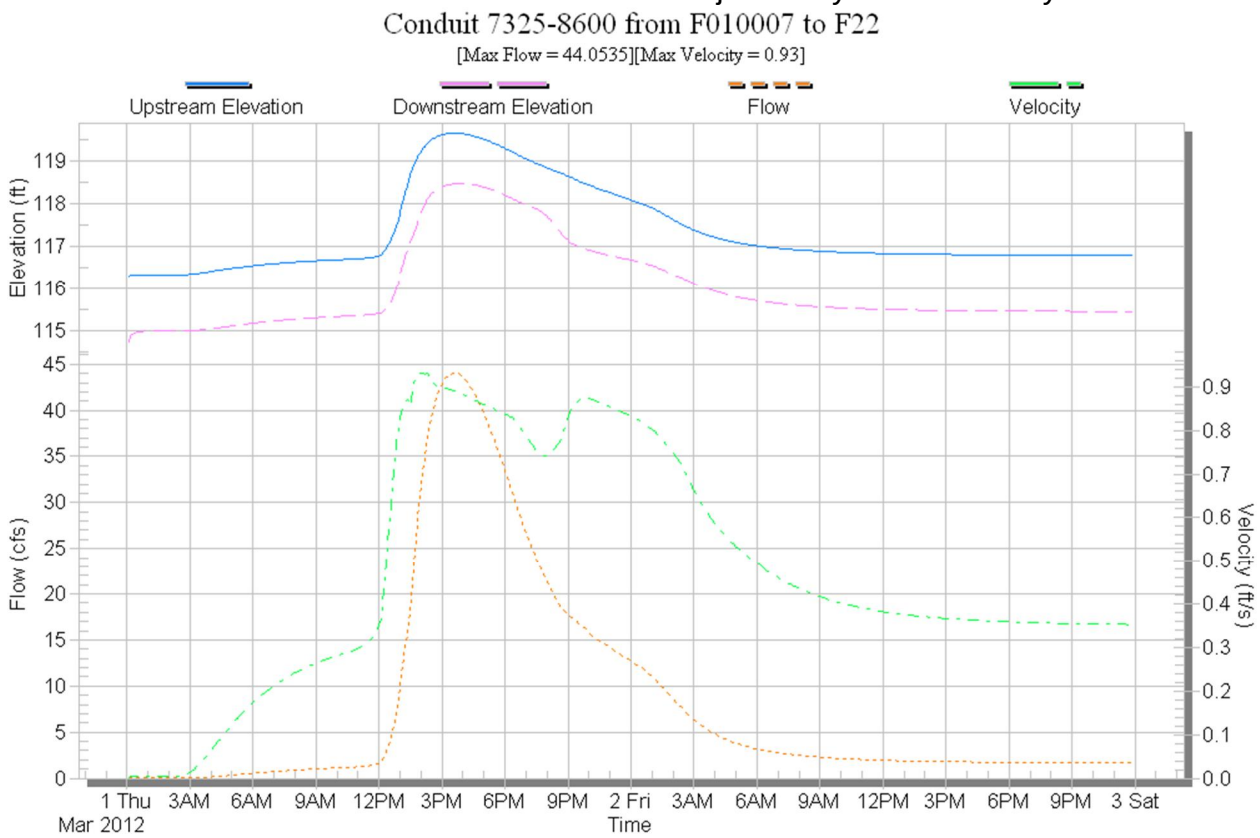
Rice St. (Station 106+20)



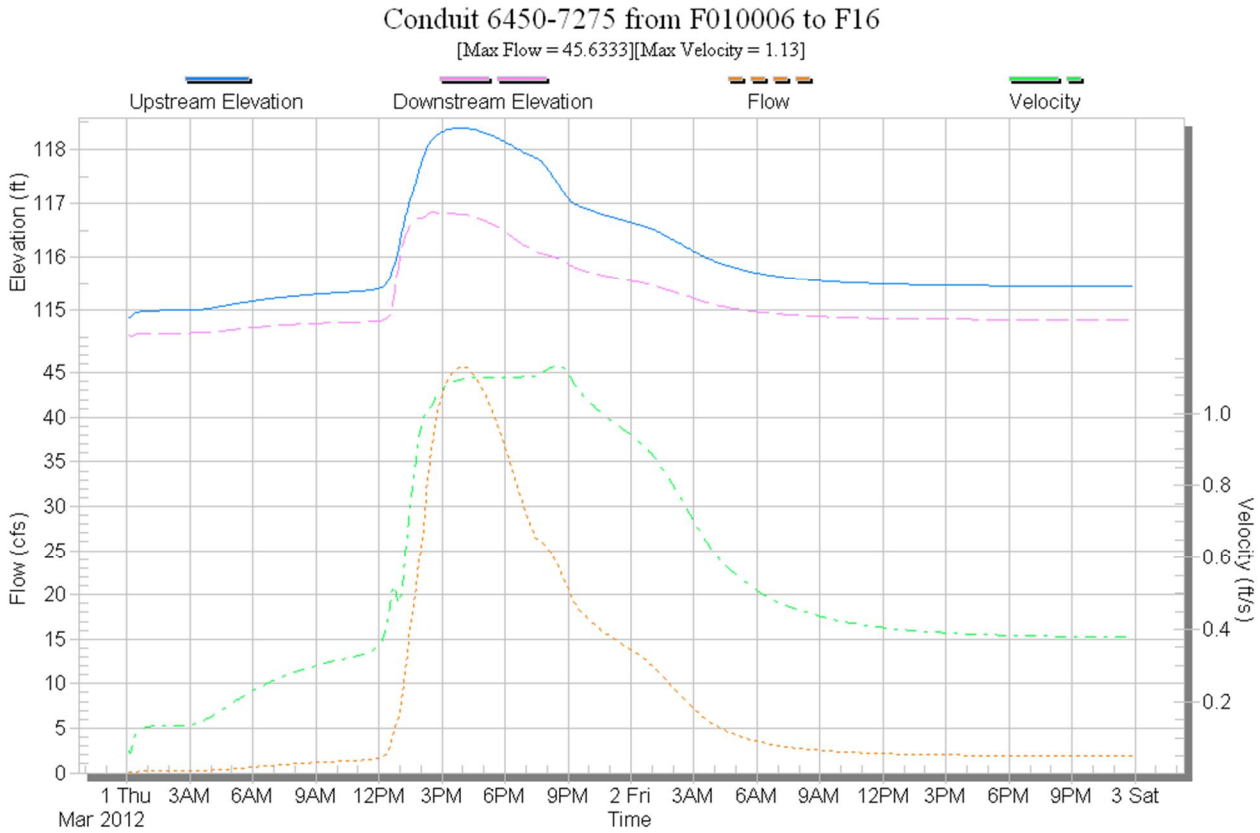
High School Culvert (Station 81+97)



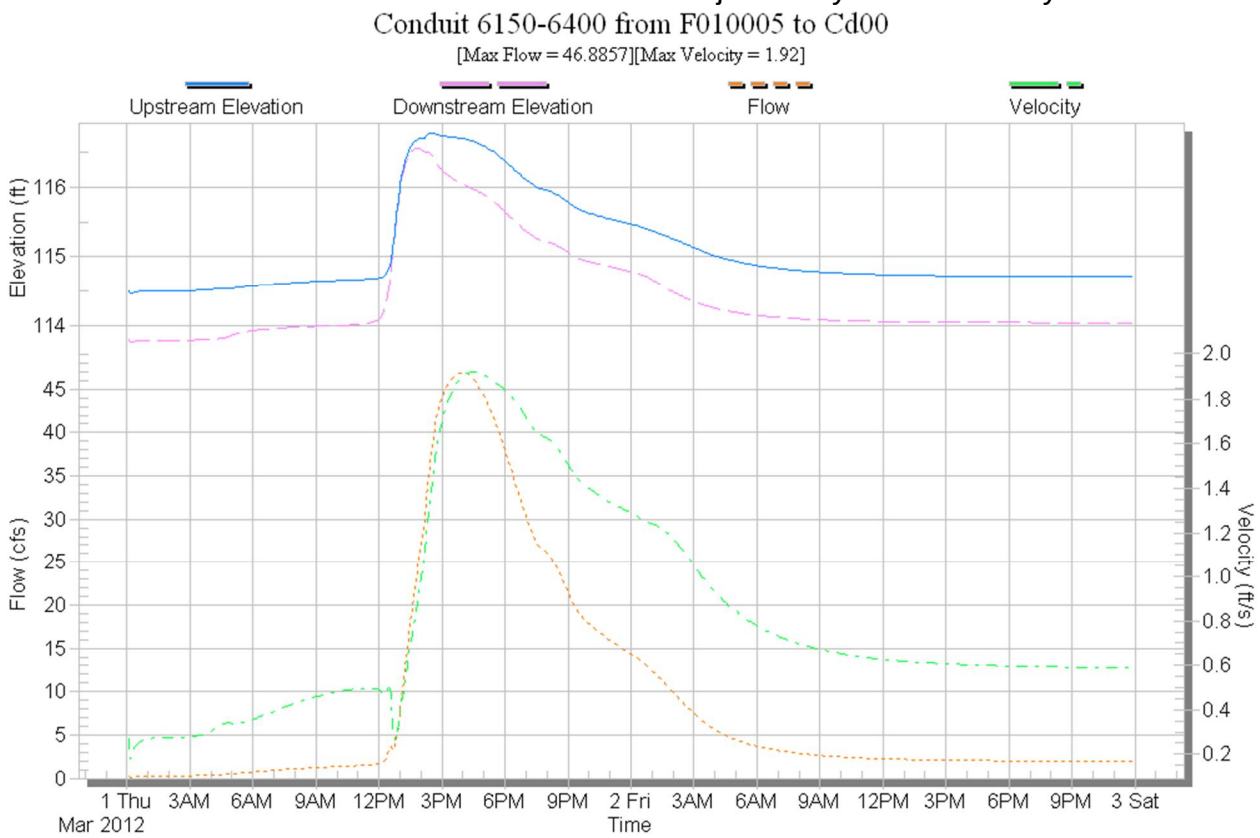
Abbot Brook (Station 74+31)



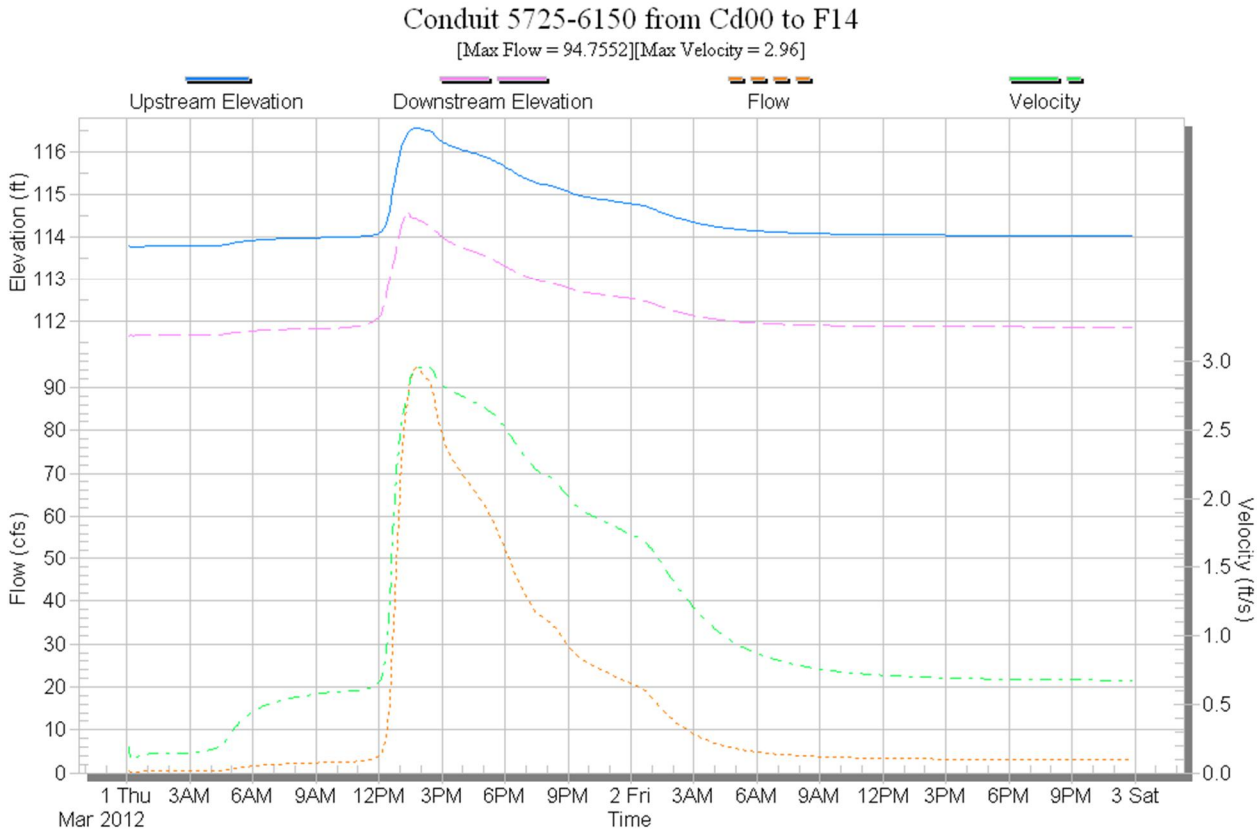
State Street (Station 73+04)



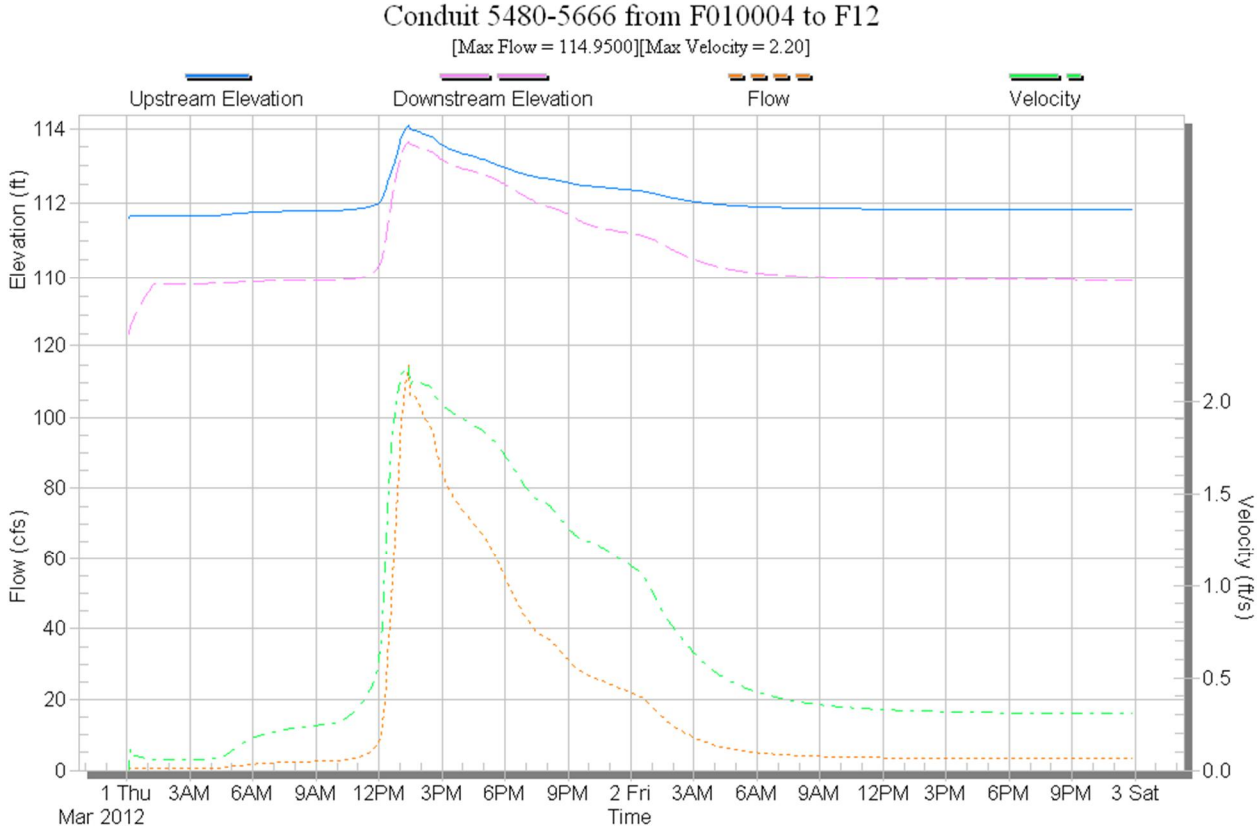
Wellesley Avenue (Station 59+89)



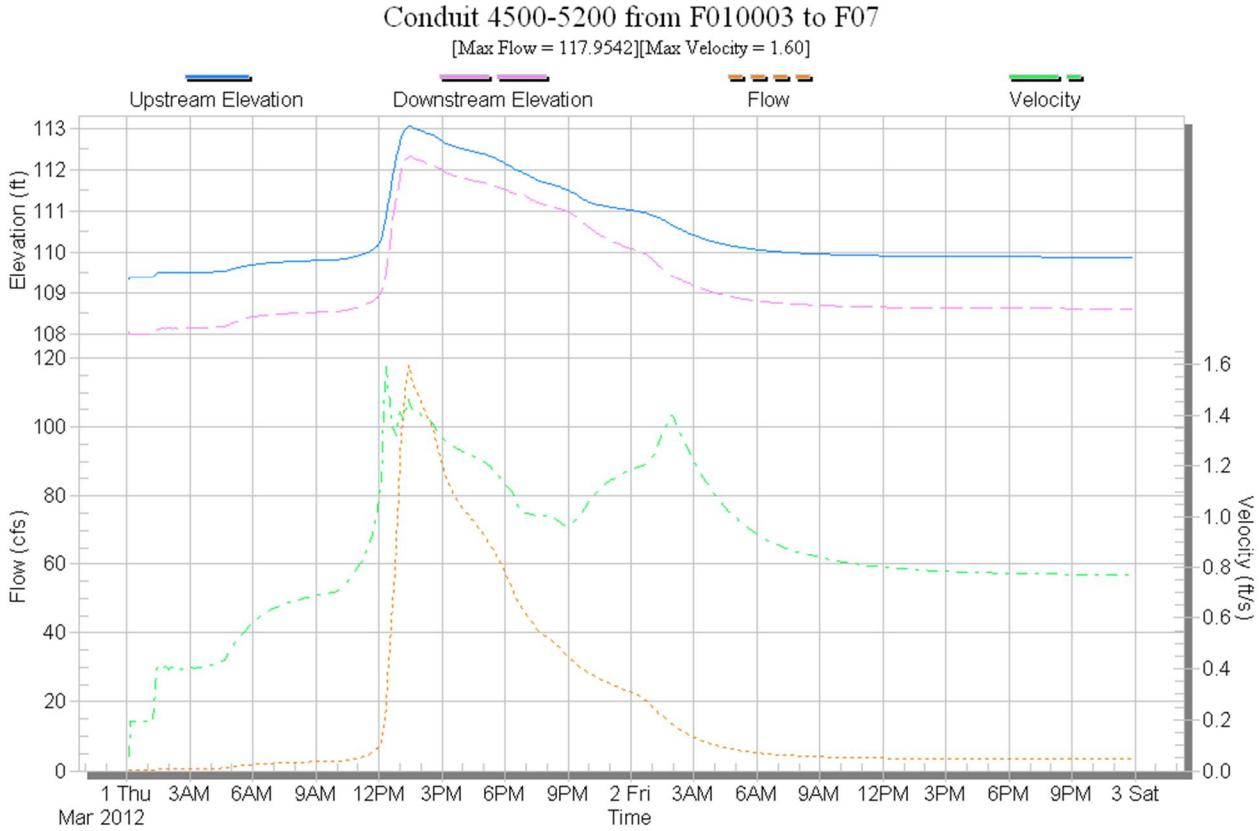
Brook Street (Station 51+33)



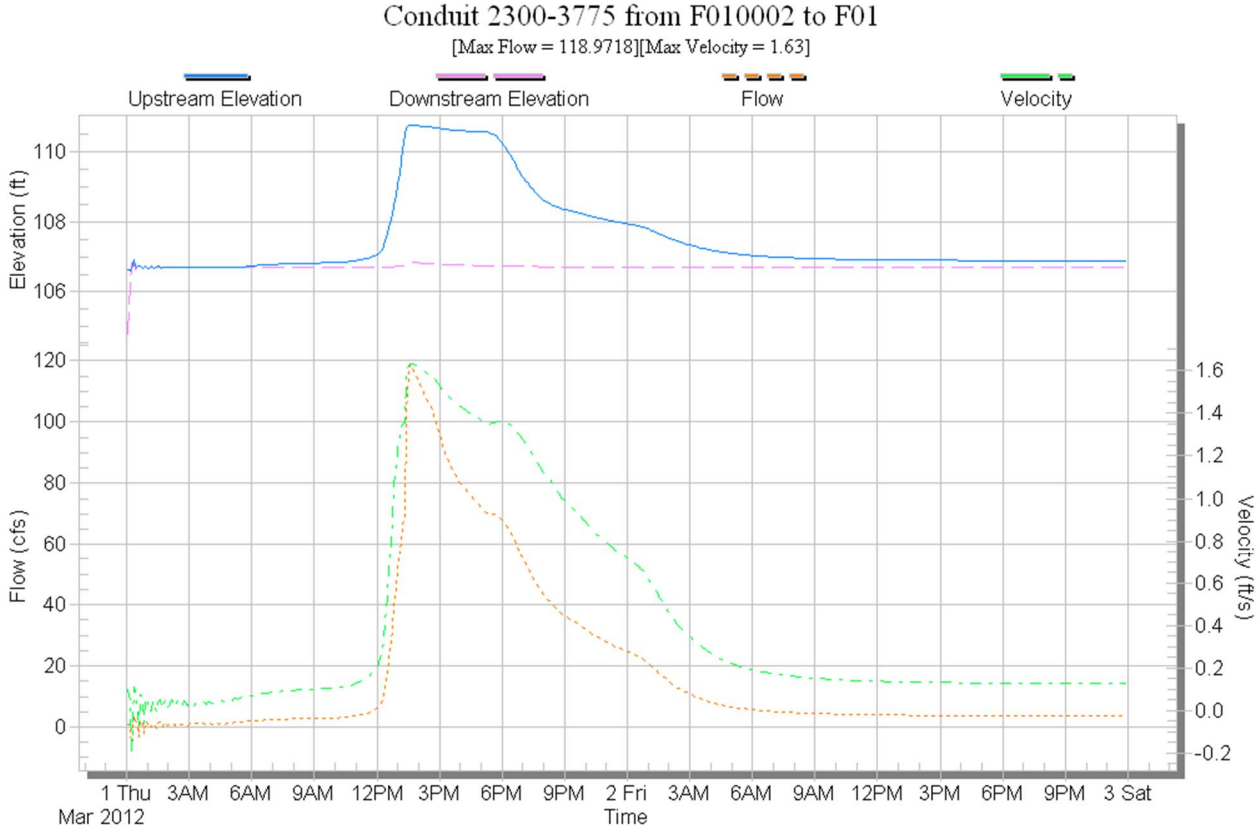
Cold Stream Brook (Station 48+29)



Cameron Street (Station 43+97)

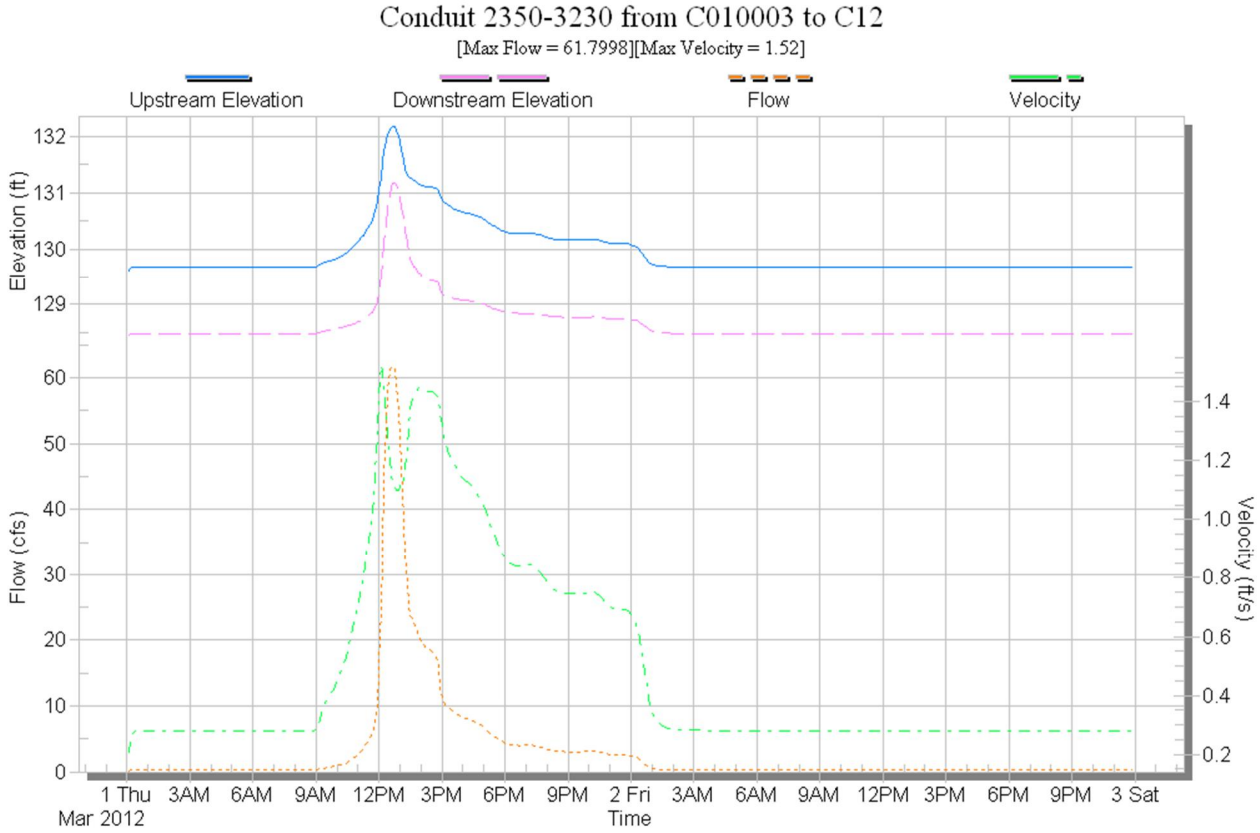


Grove Street (Station 38+73)

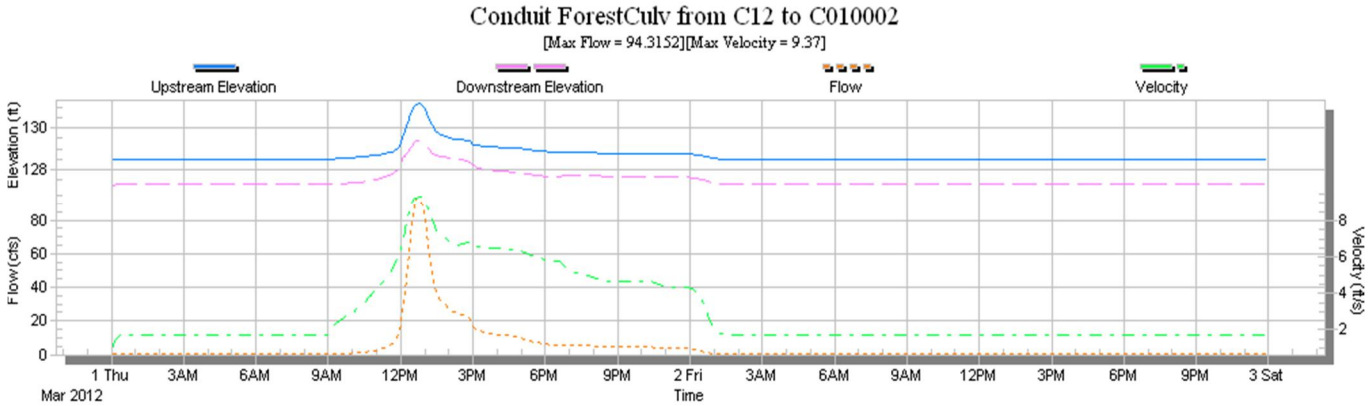


Cottage Street (Station 24+86)

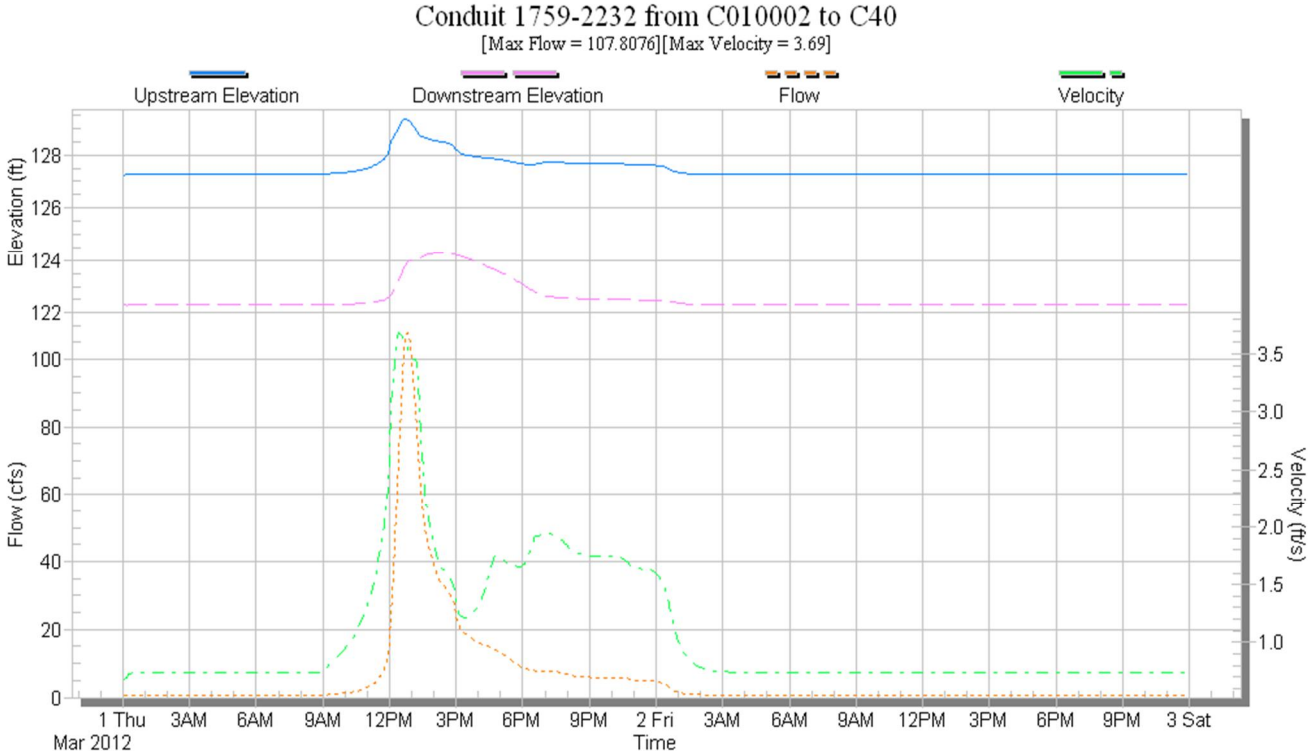
Two Year Storm (3.12 inches)



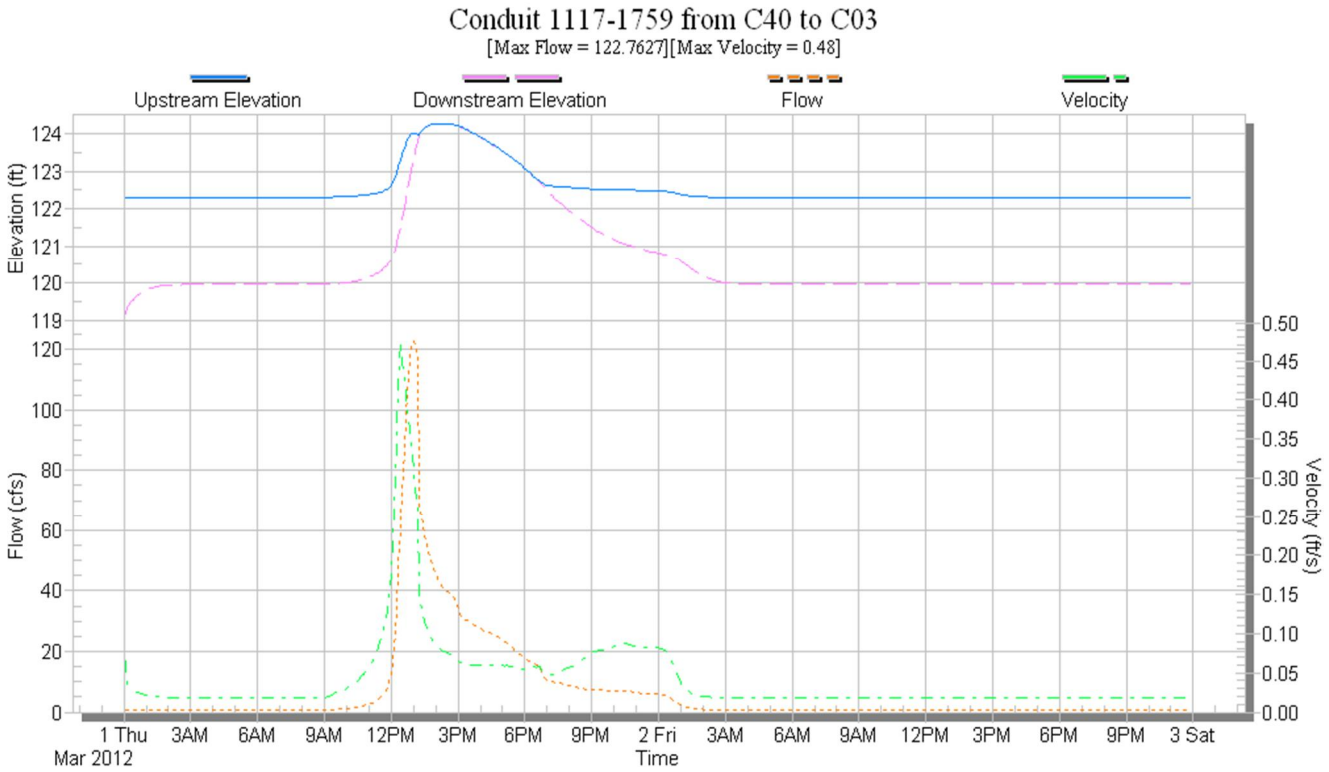
Caroline St. (HW1 – Station 130+78)



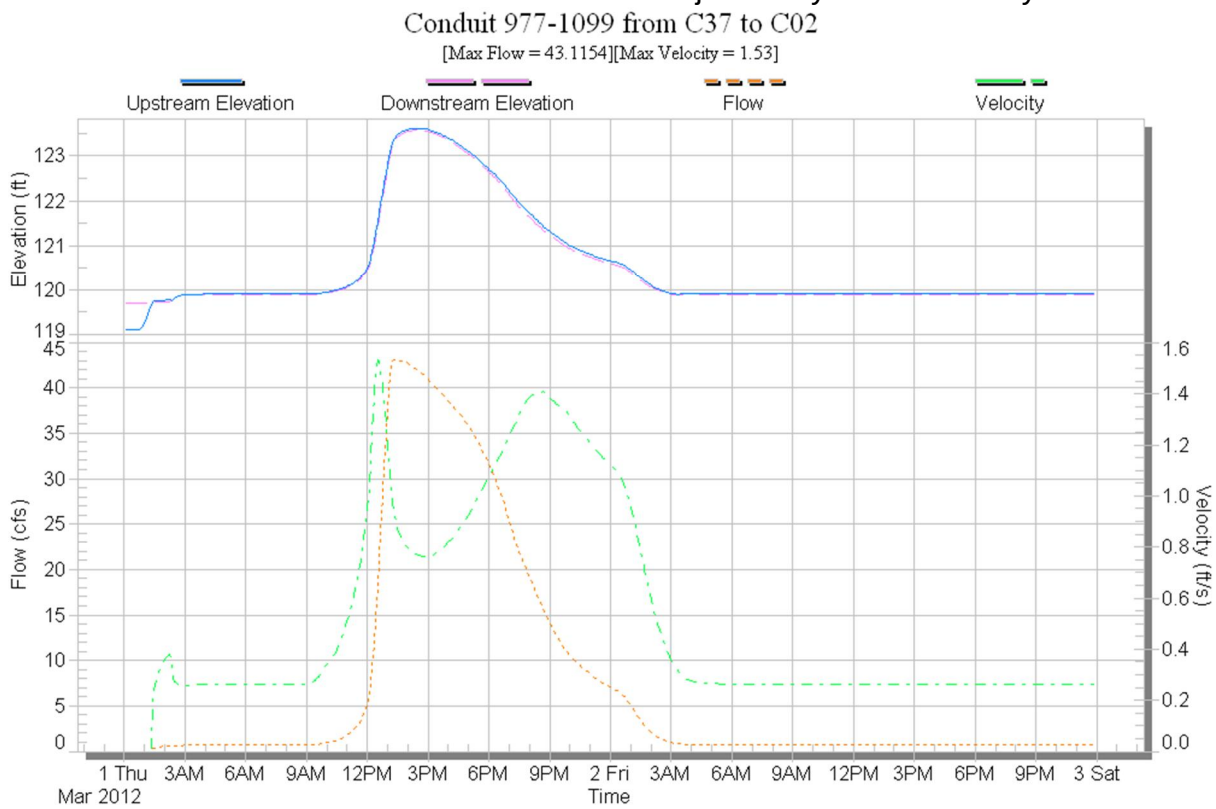
Forest St Culvert (CO7 – Station 121+80)



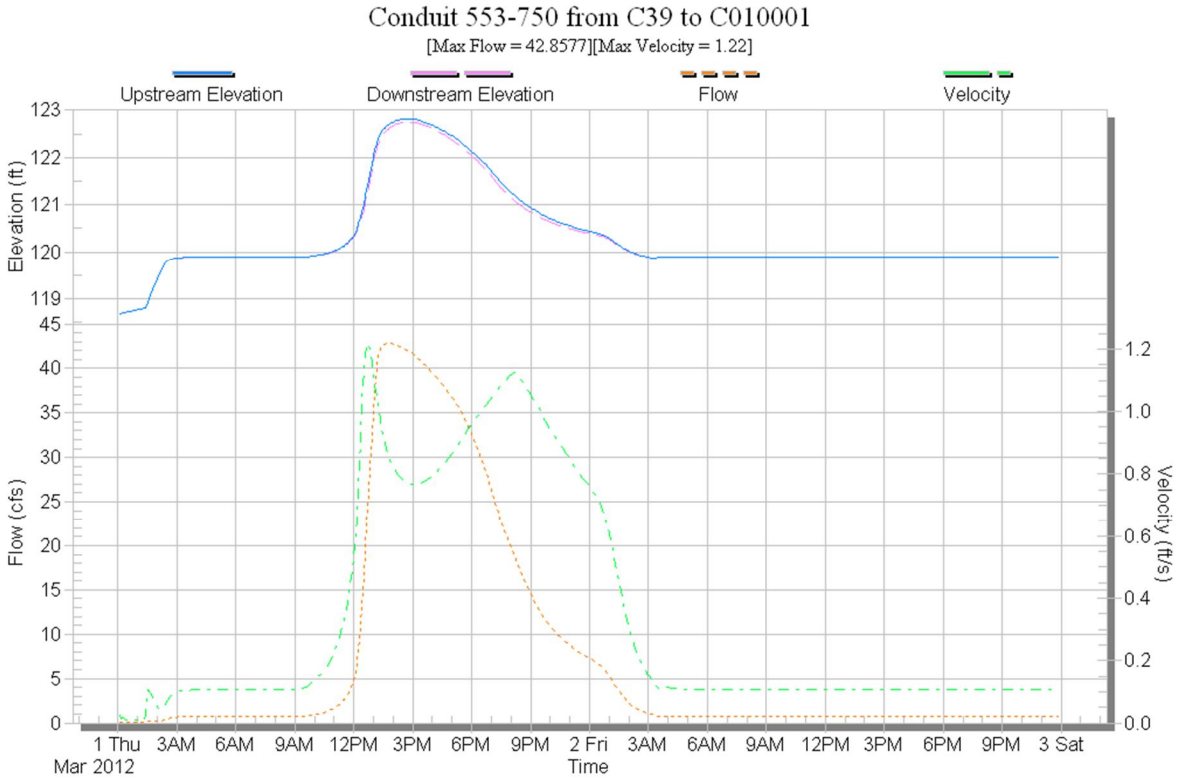
Forest St (Station 121+00)



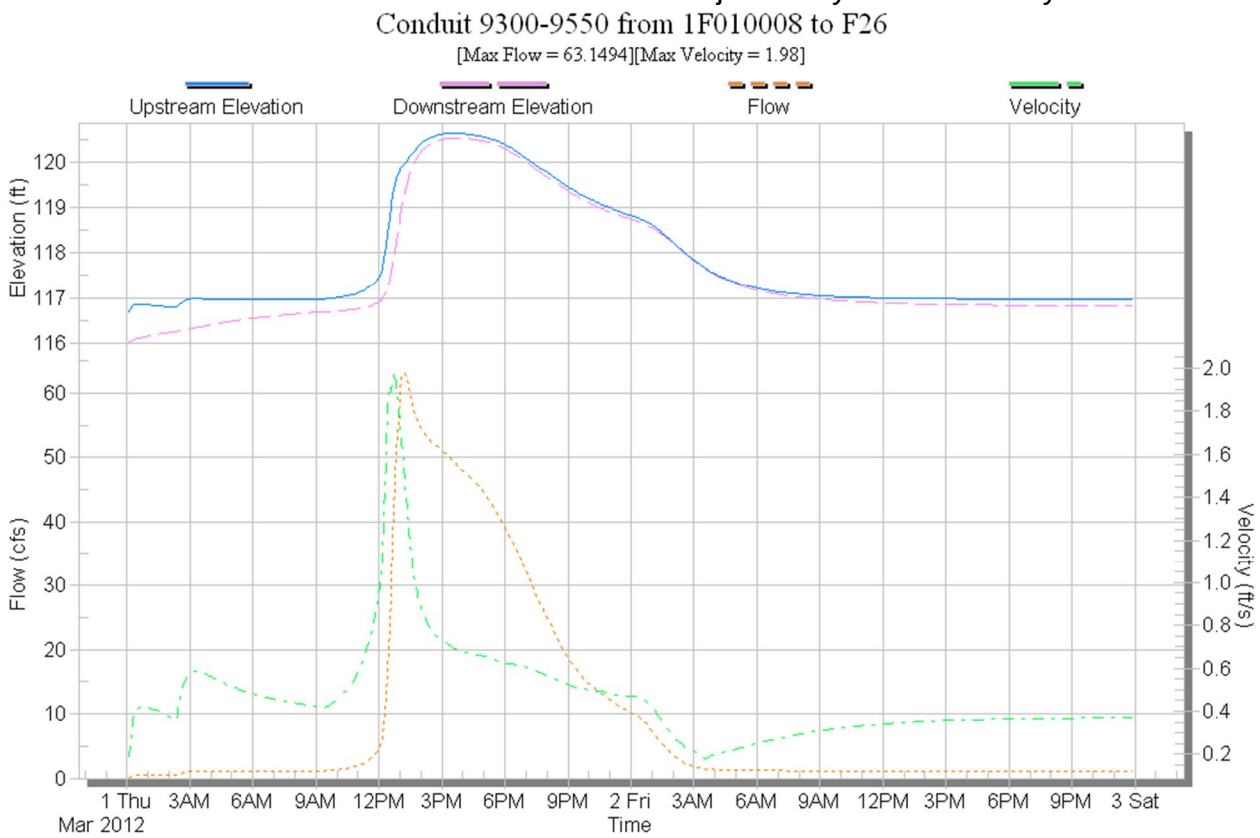
Wetland at Paine St. (C08 – Station 111+46)



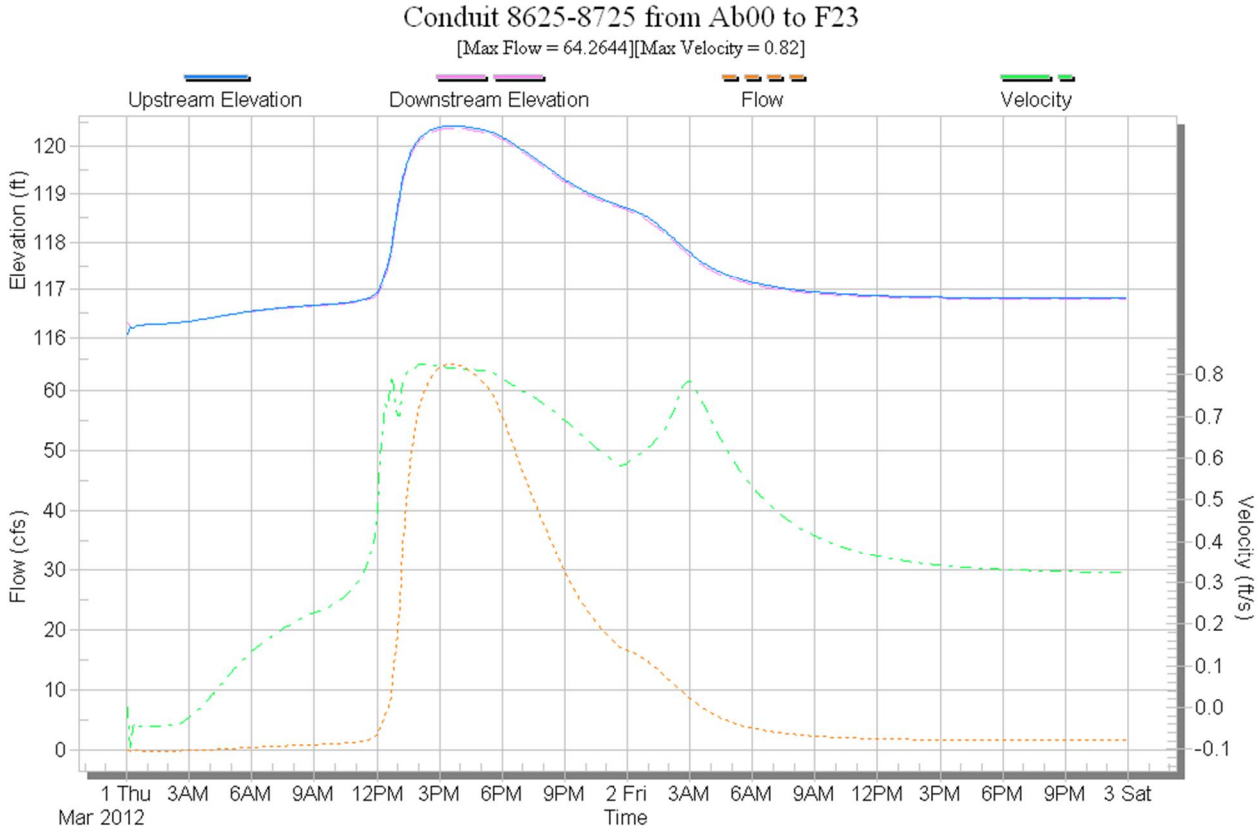
Paine St. (Station 109+86)



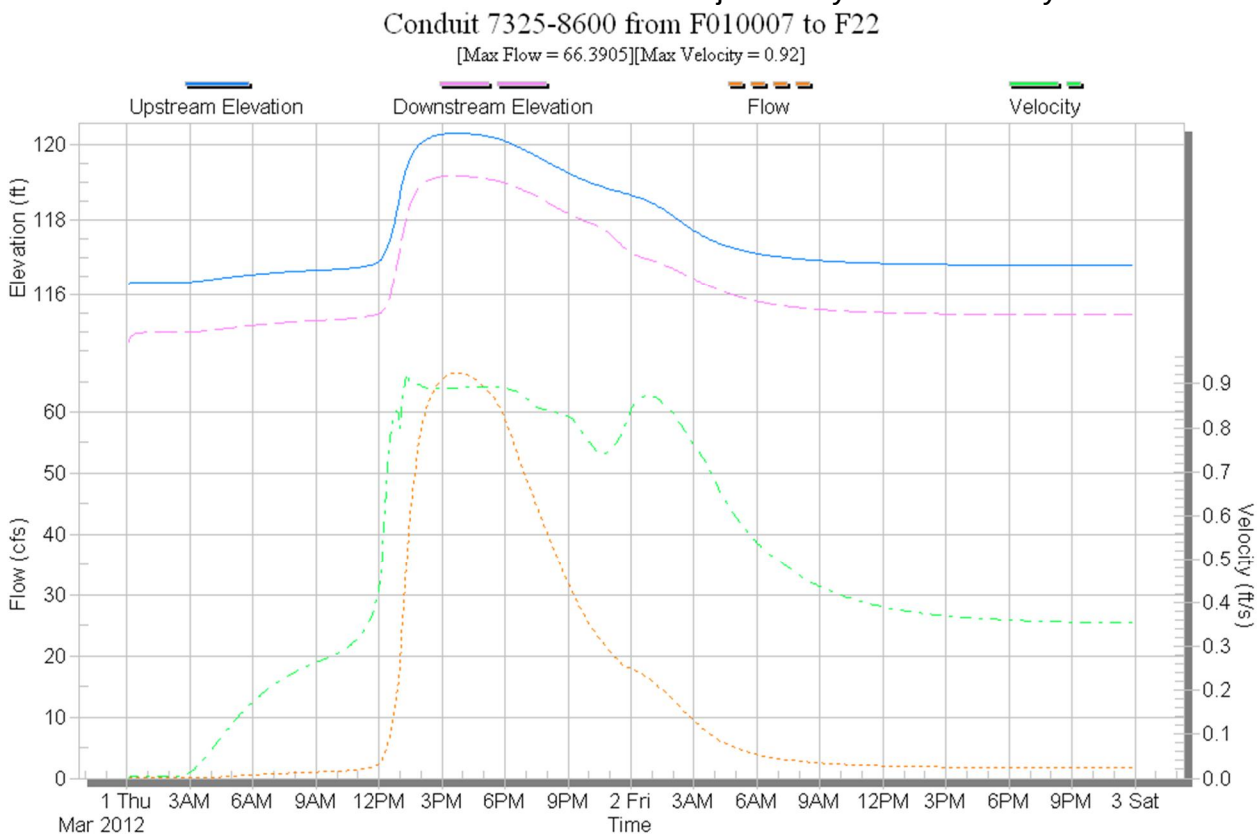
Rice St. (Station 106+20)



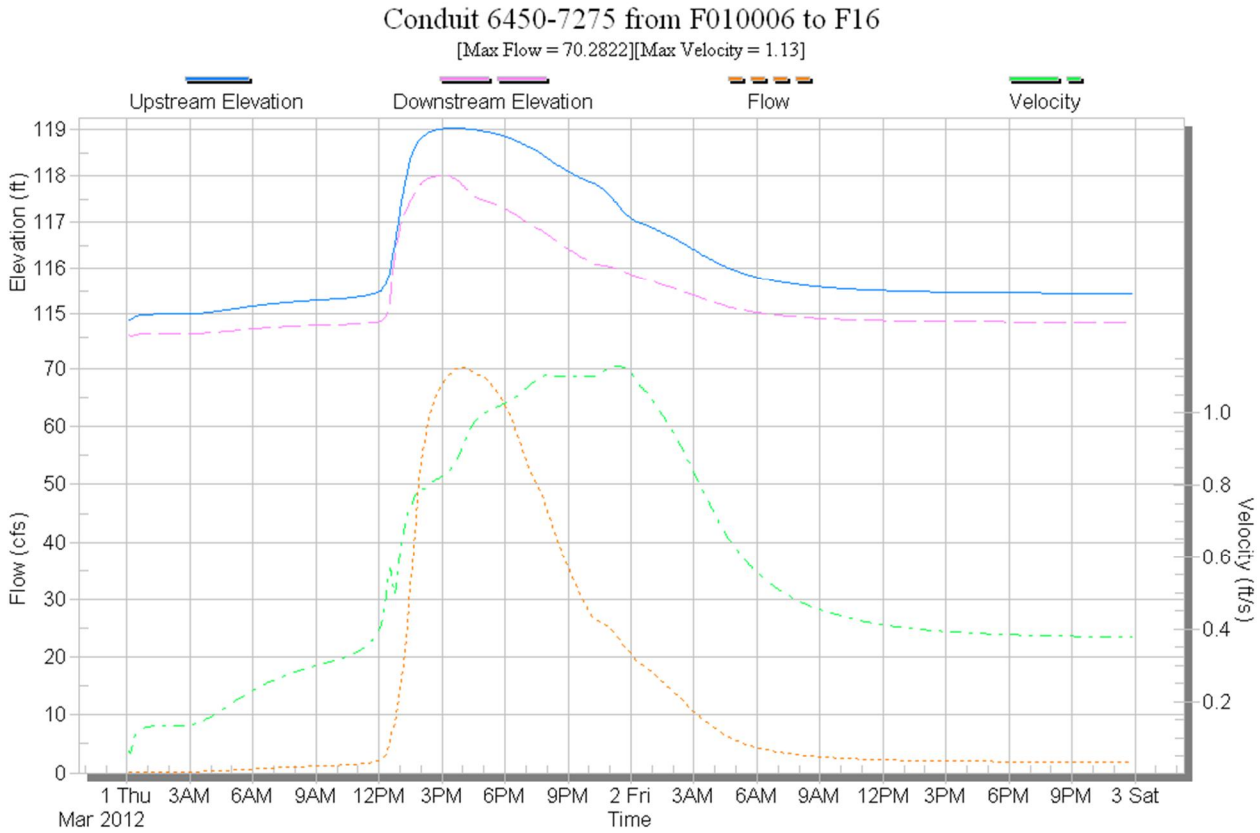
High School Culvert (Station 81+97)



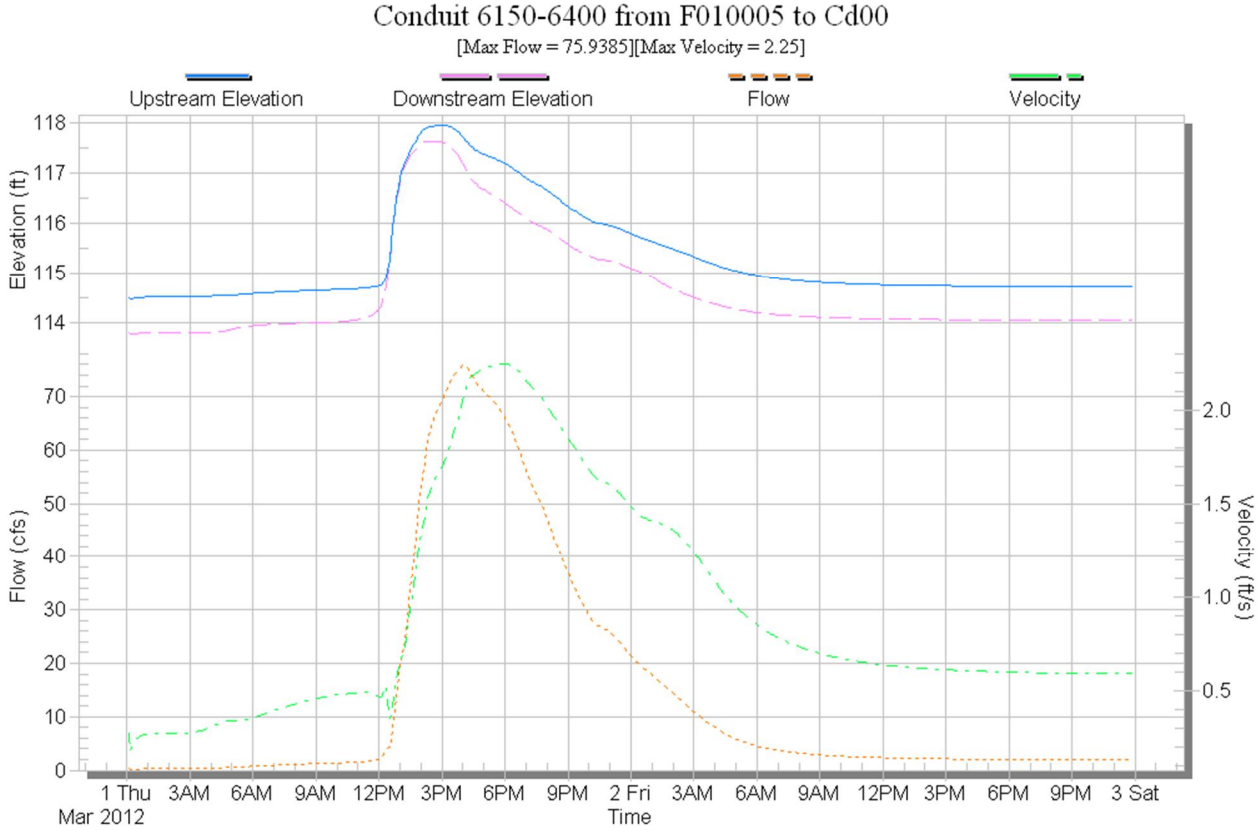
Abbot Brook (Station 74+31)



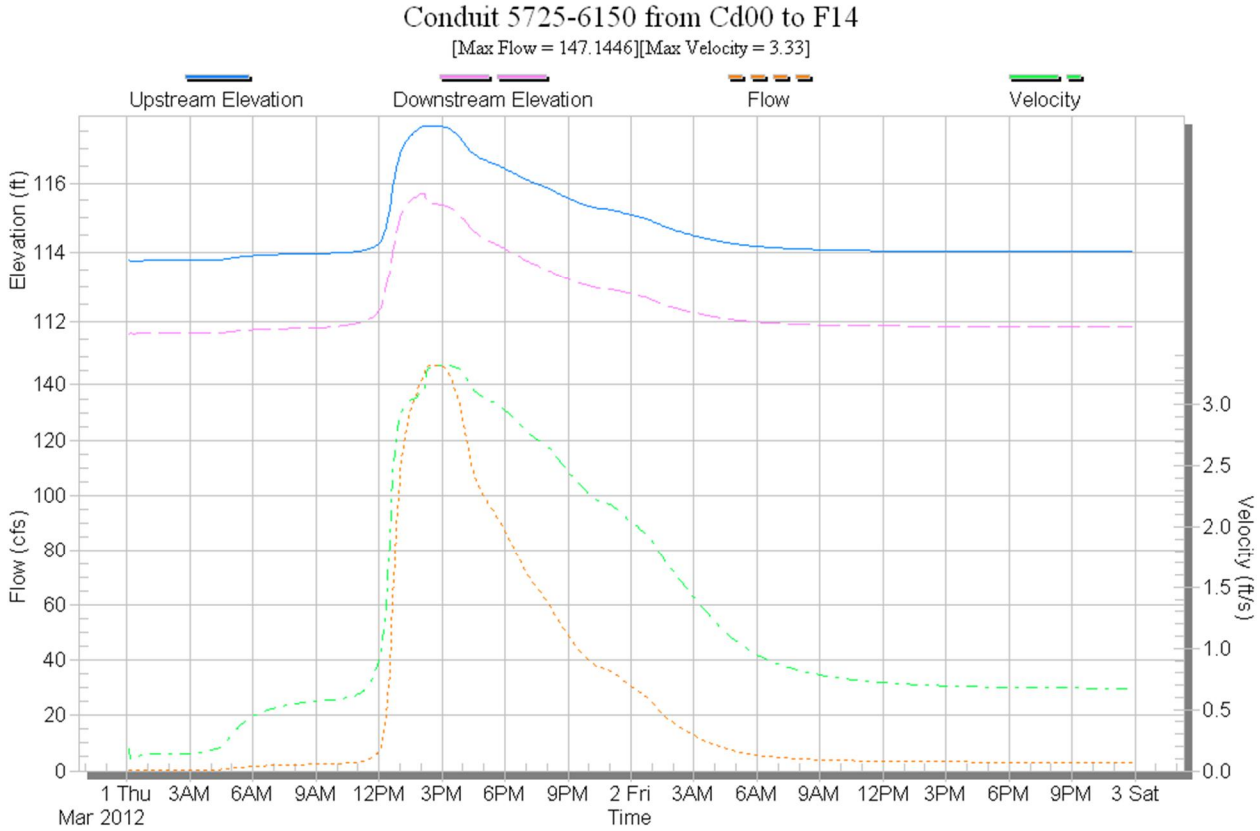
State Street (Station 73+04)



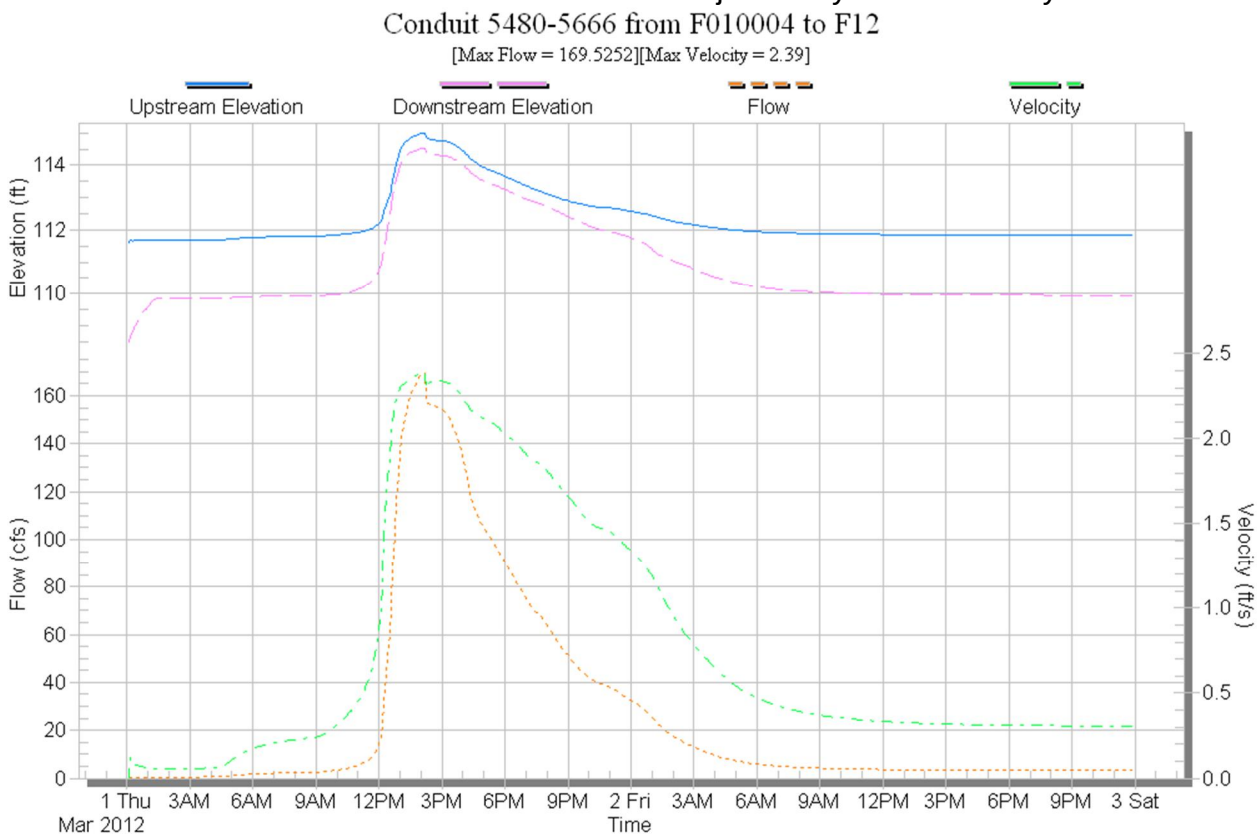
Wellesley Avenue (Station 59+89)



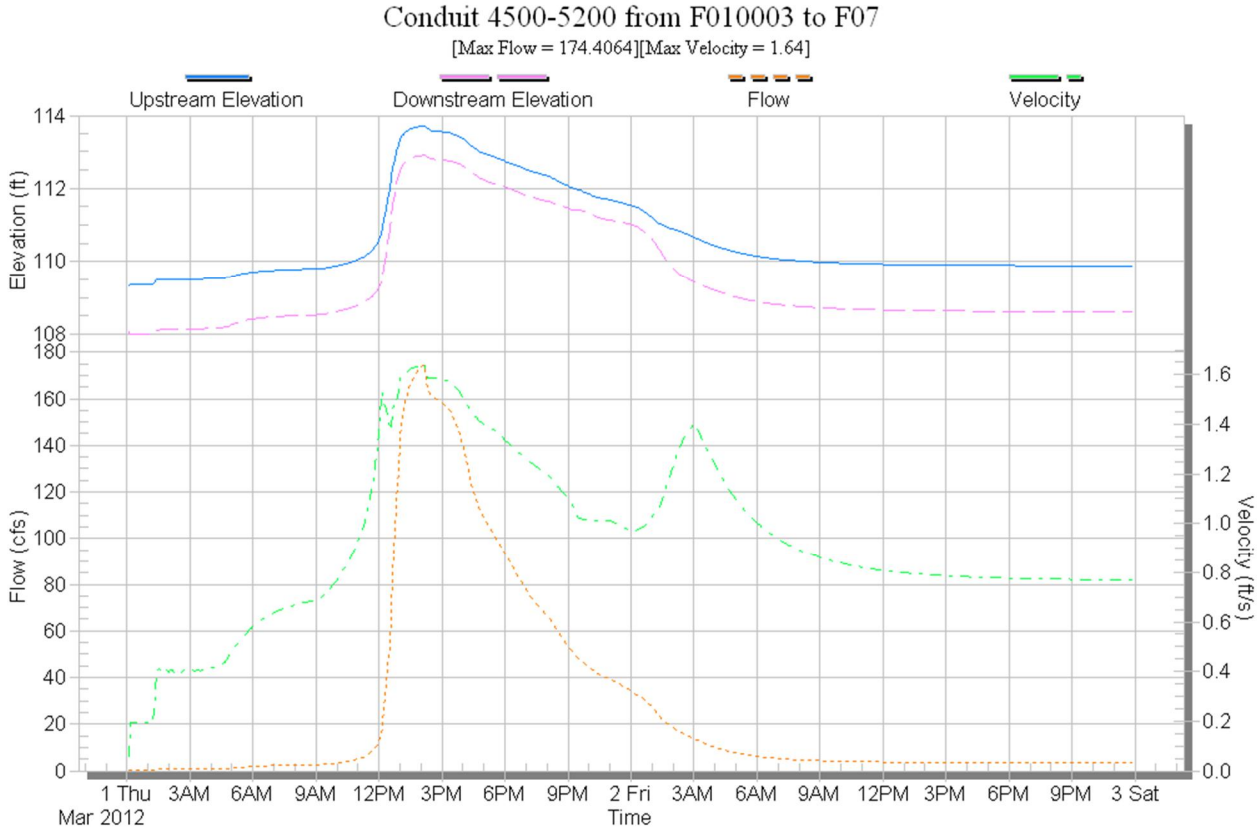
Brook Street (Station 51+33)



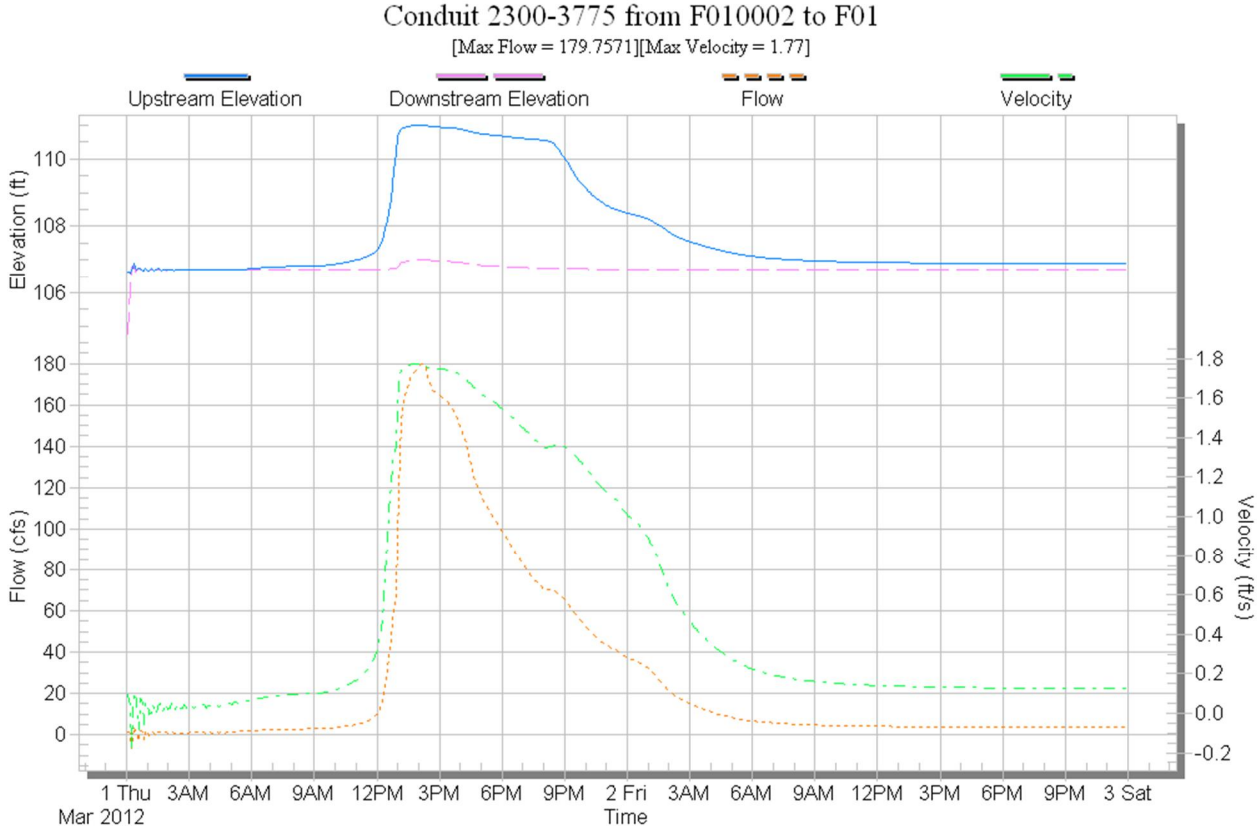
Cold Stream Brook (Station 48+29)



Cameron Street (Station 43+97)

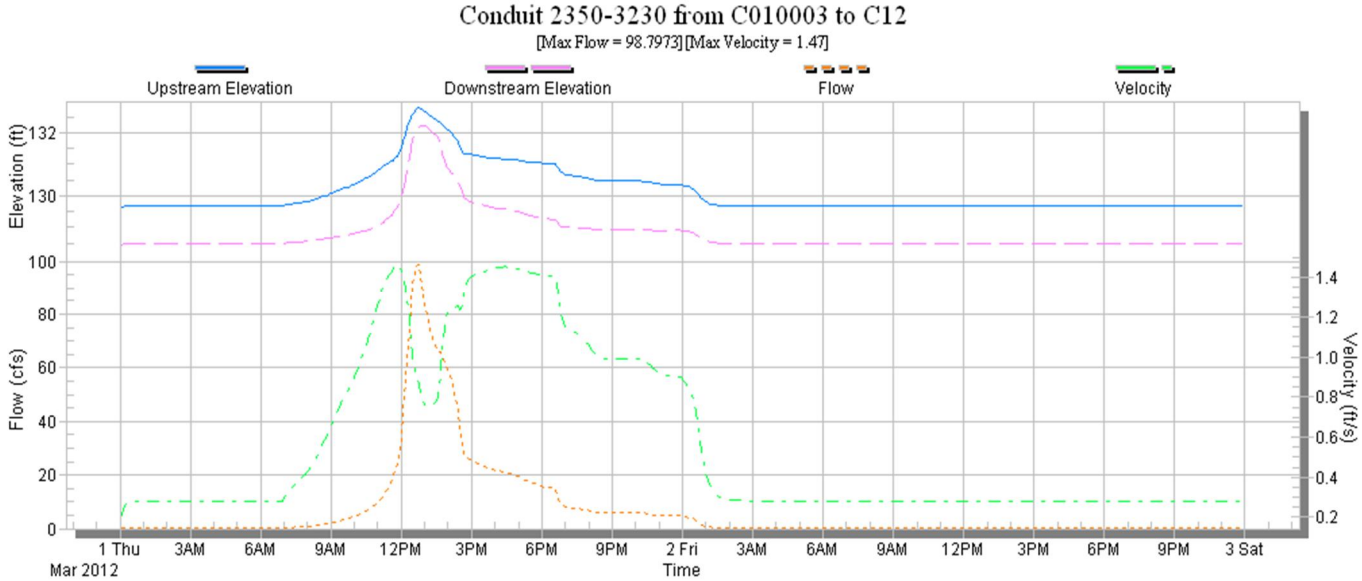


Grove Street (Station 38+73)

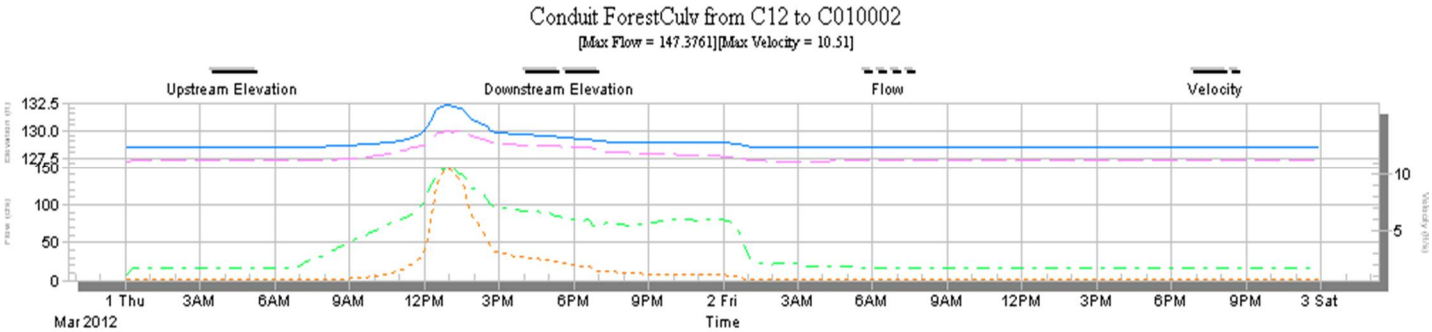


Cottage Street (Station 24+86)

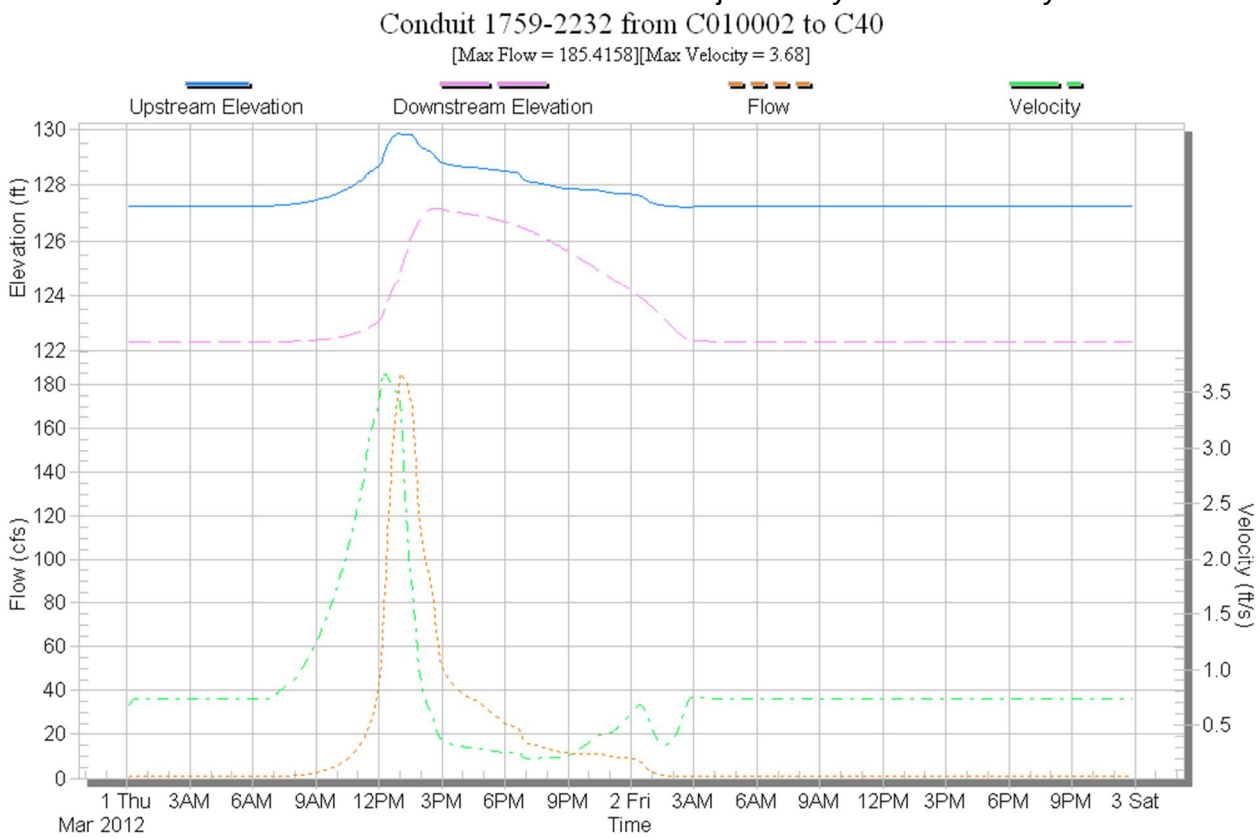
Ten Year Storm (5.04 inches)



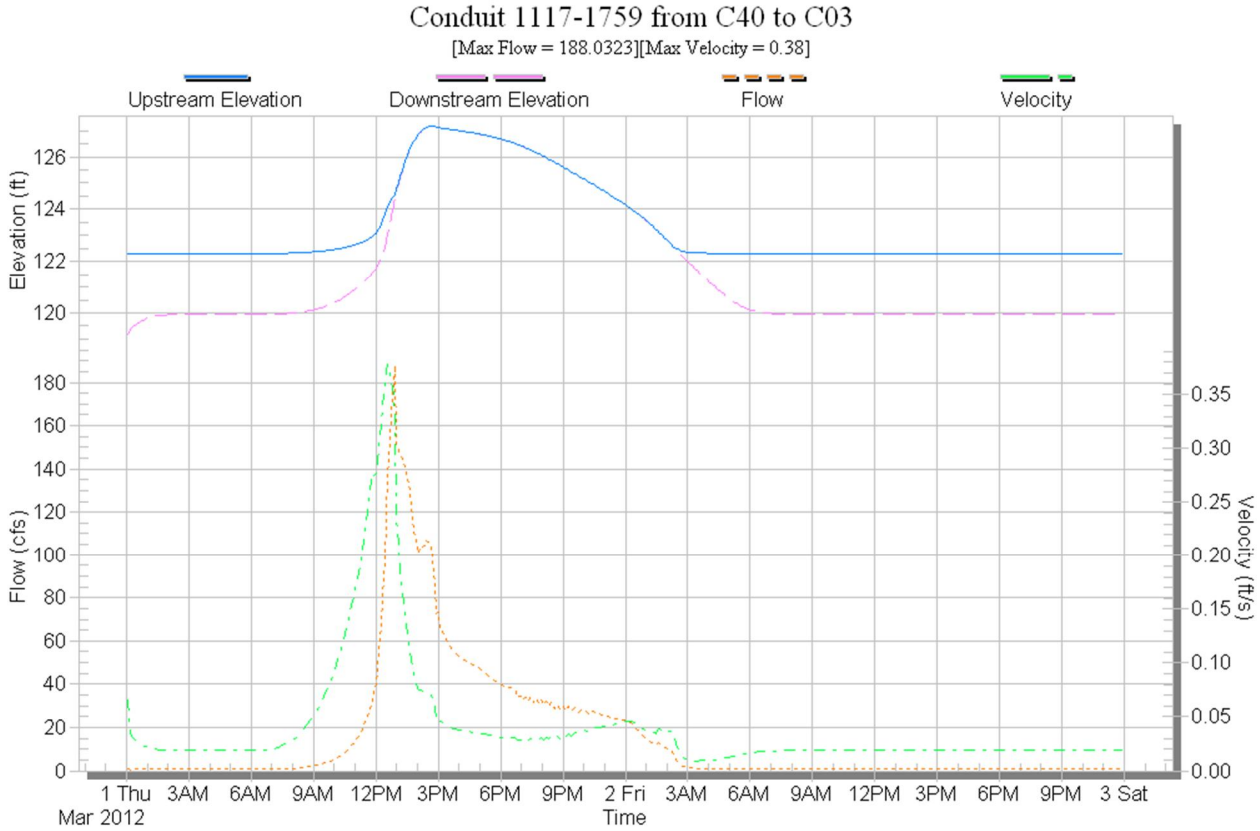
Caroline St. (HW1 – Station 130+78)



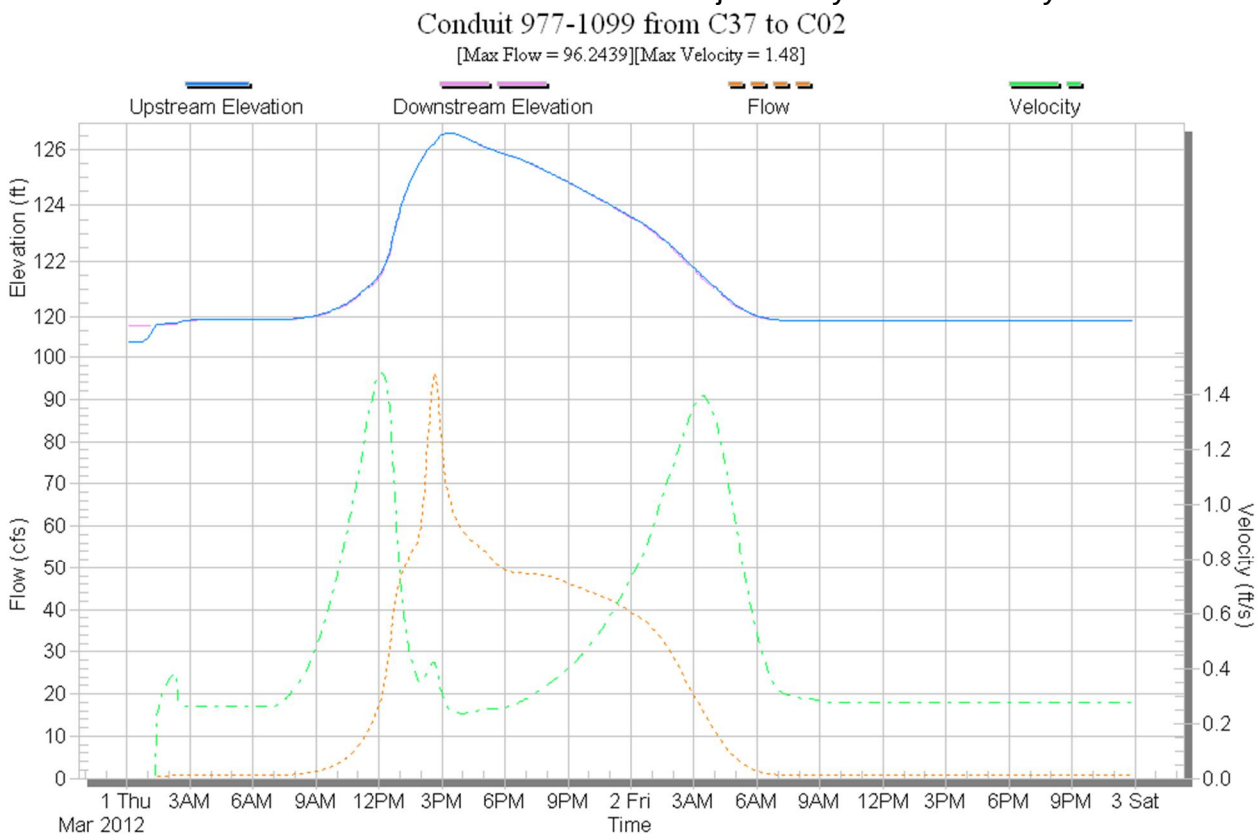
Forest St Culvert (CO7 – Station 121+80)



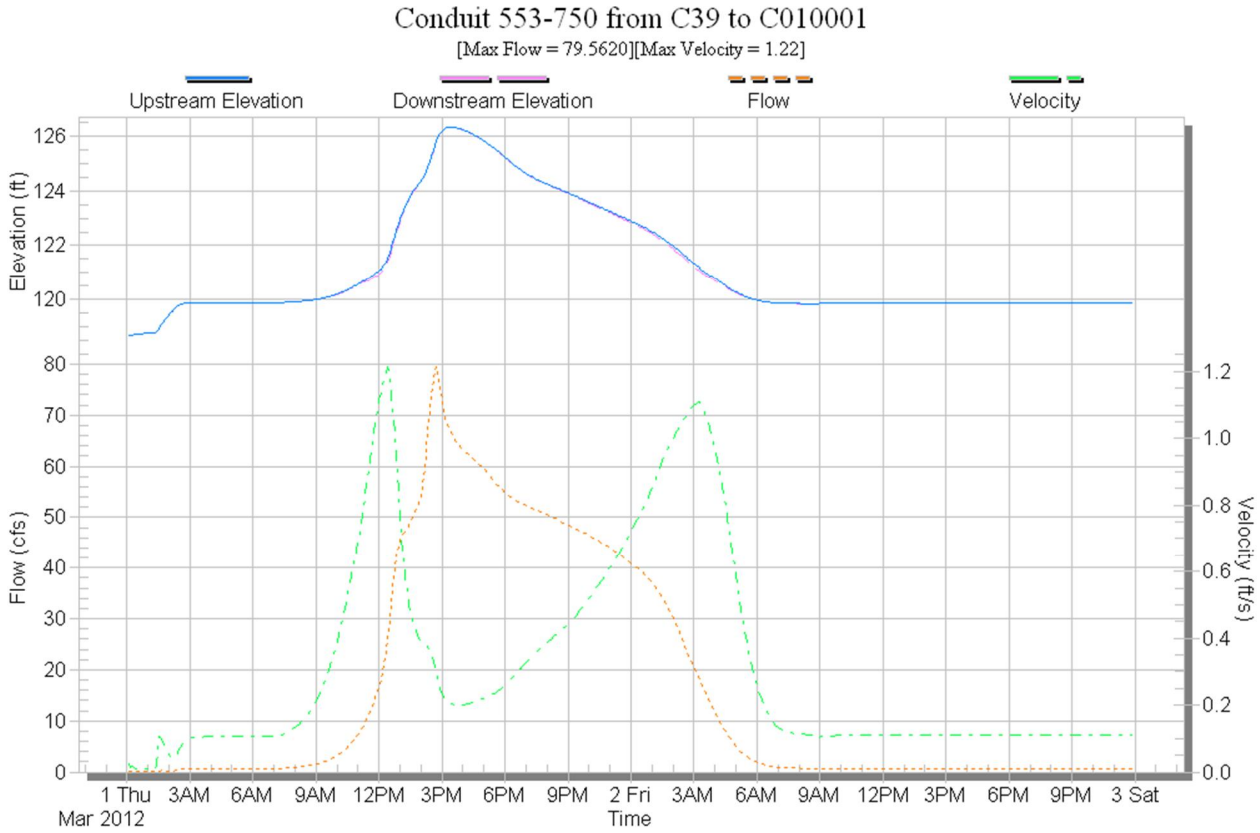
Forest St (Station 121+00)



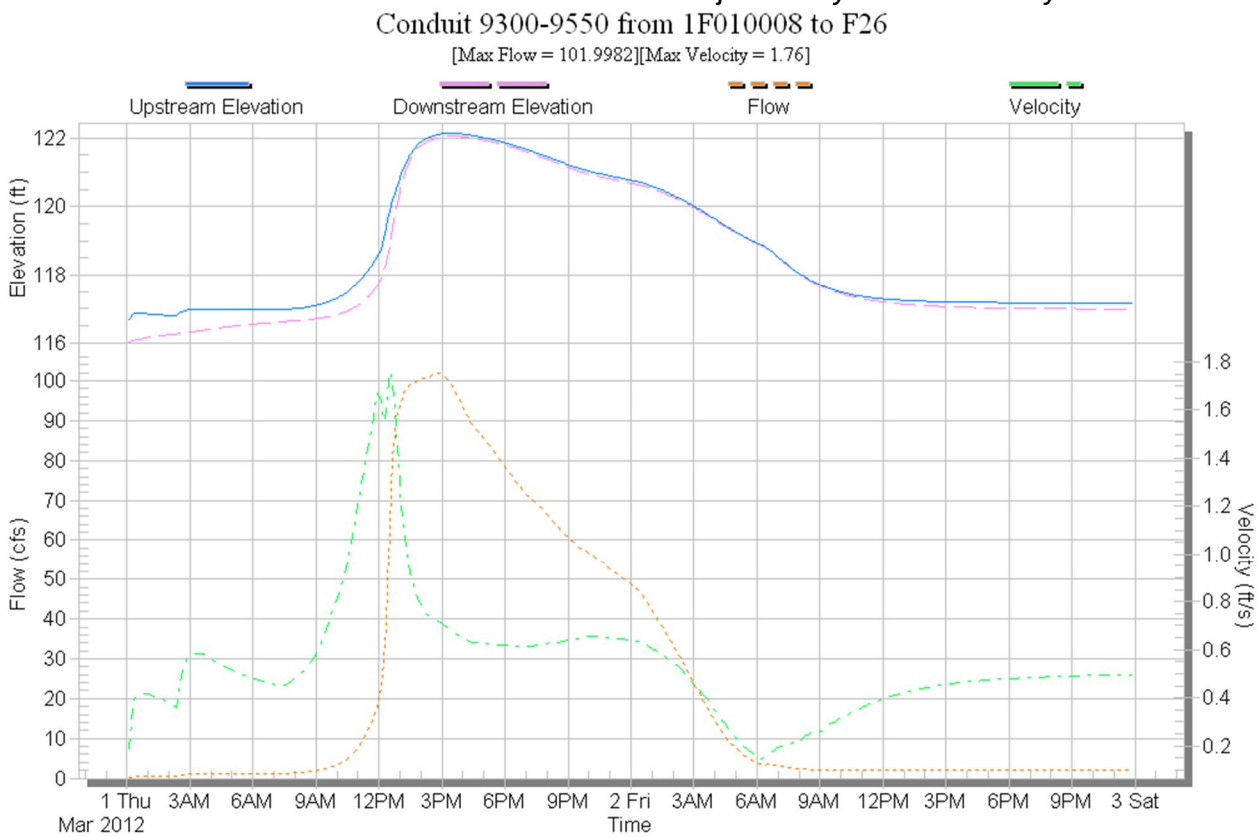
Wetland at Paine St. (C08 – Station 111+46)



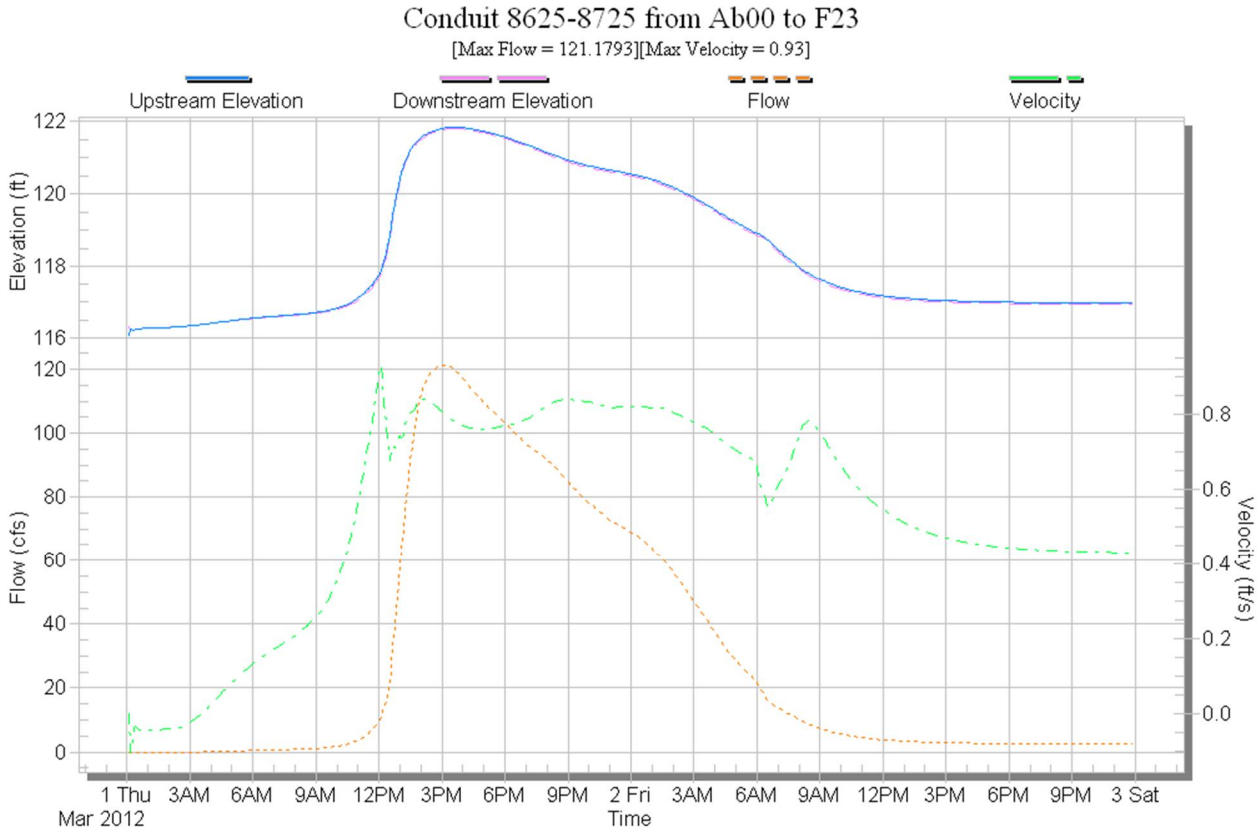
Paine St. (Station 109+86)



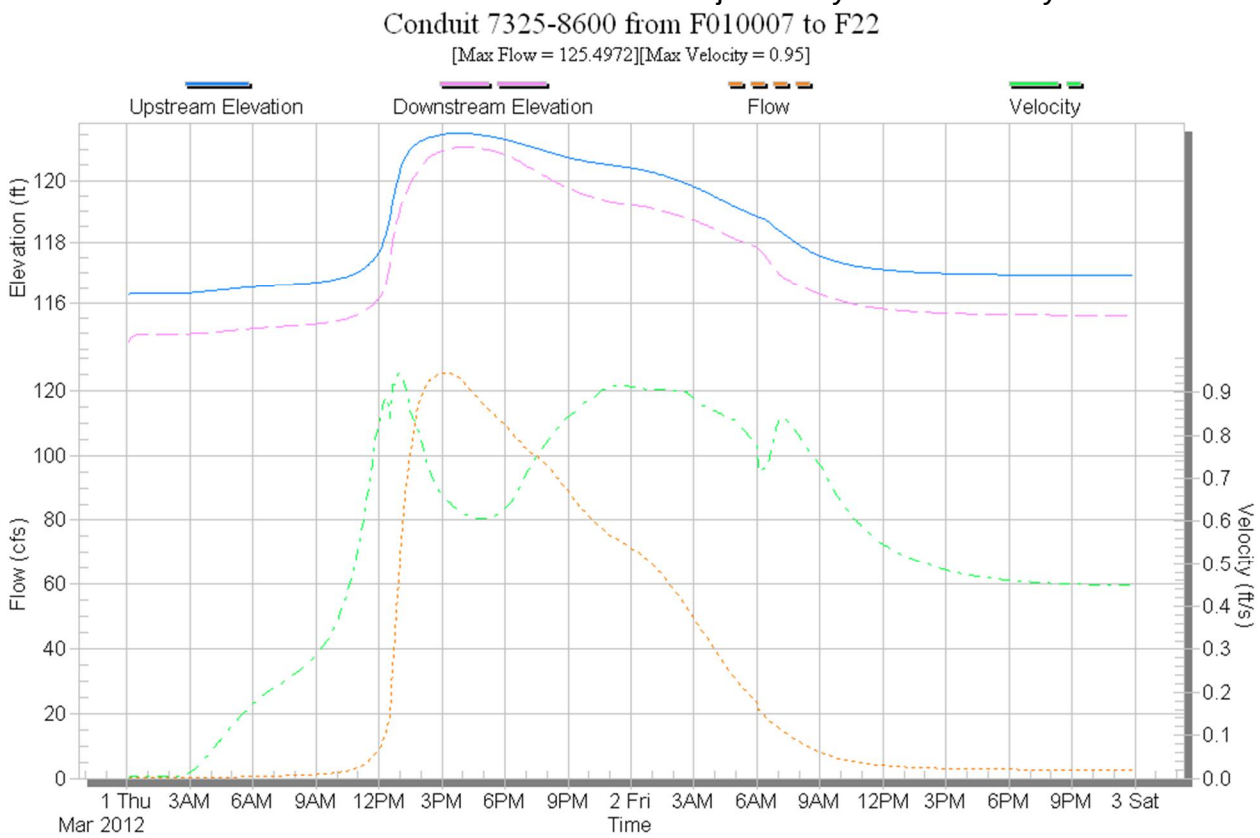
Rice St. (Station 106+20)



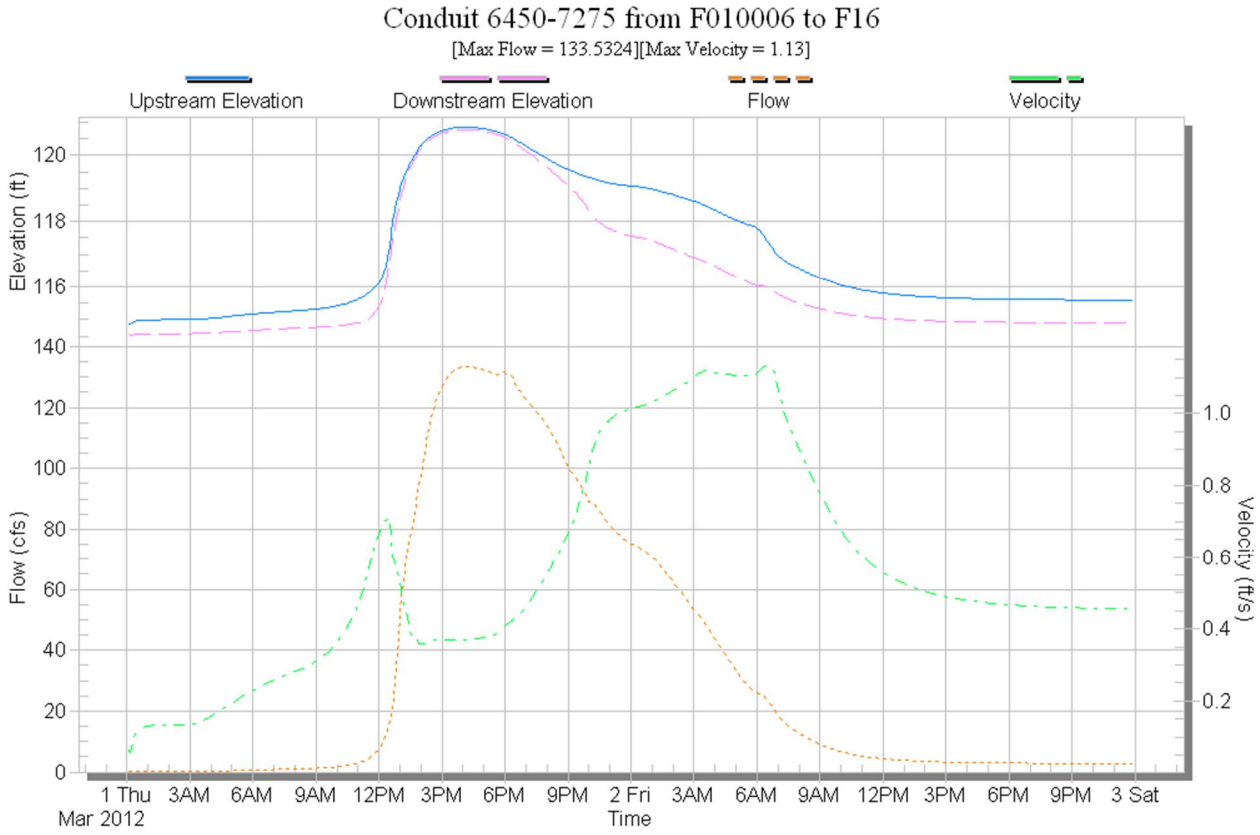
High School Culvert (Station 81+97)



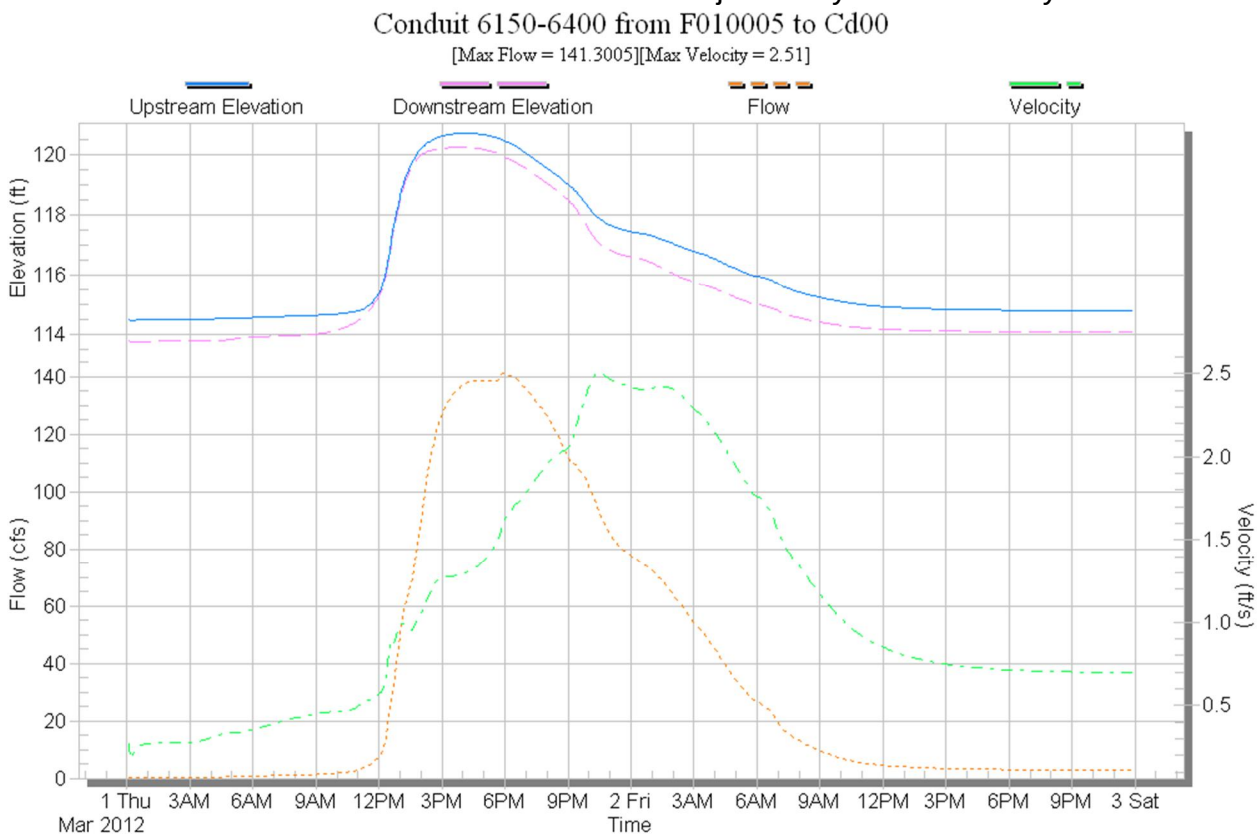
Abbot Brook (Station 74+31)



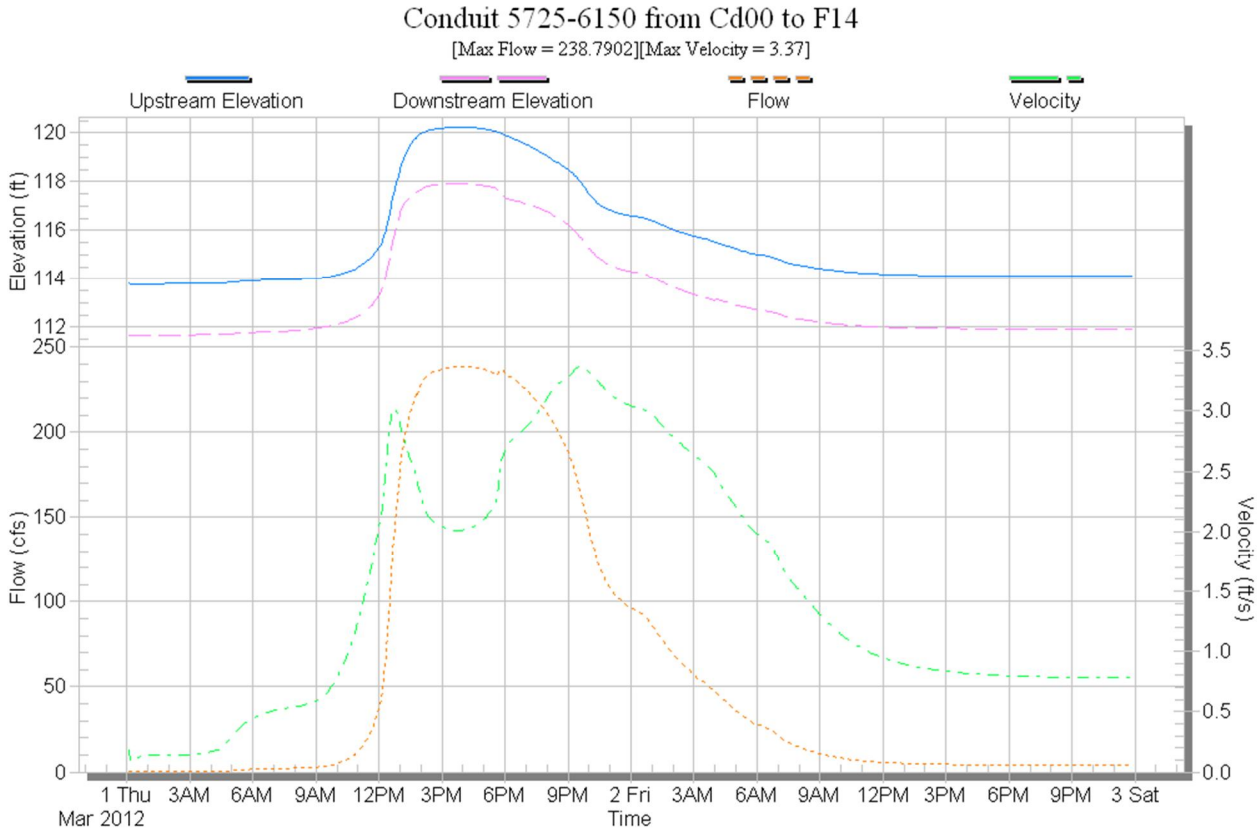
State Street (Station 73+04)



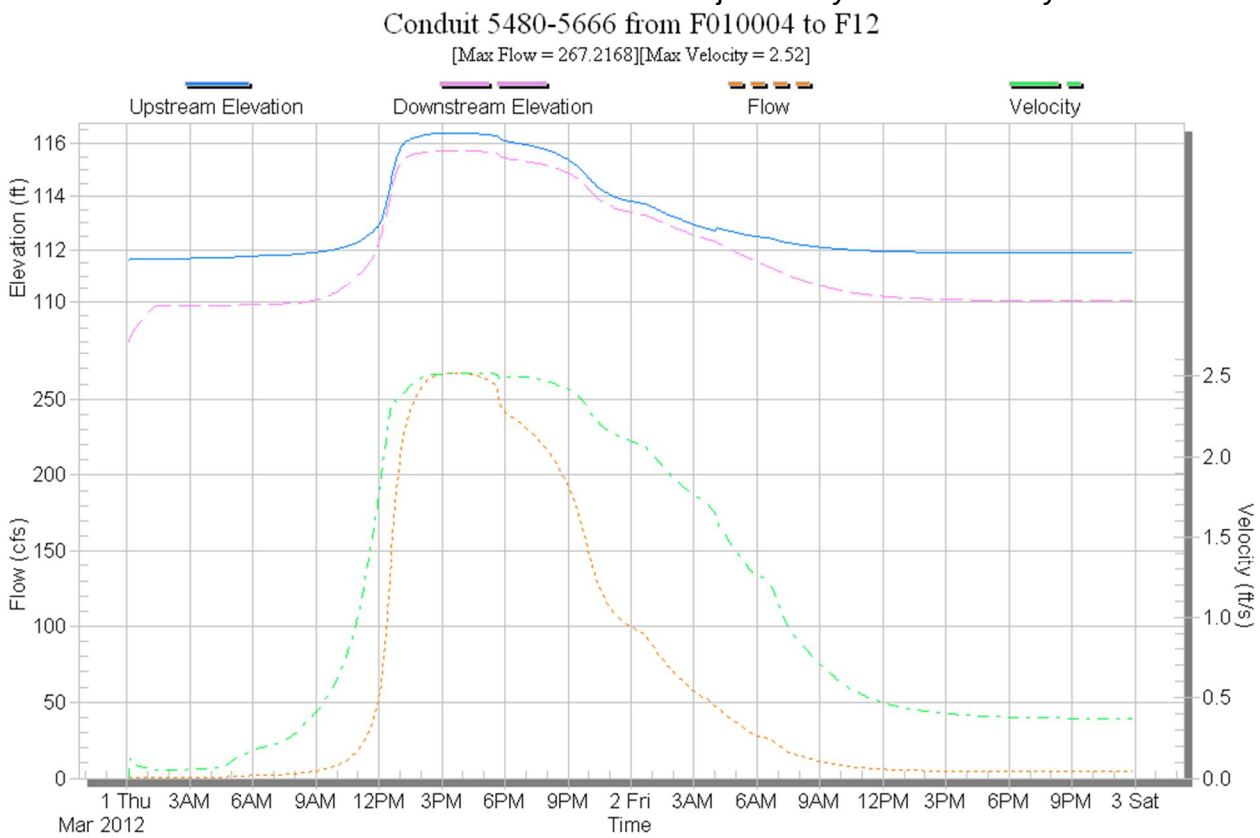
Wellesley Avenue (Station 59+89)



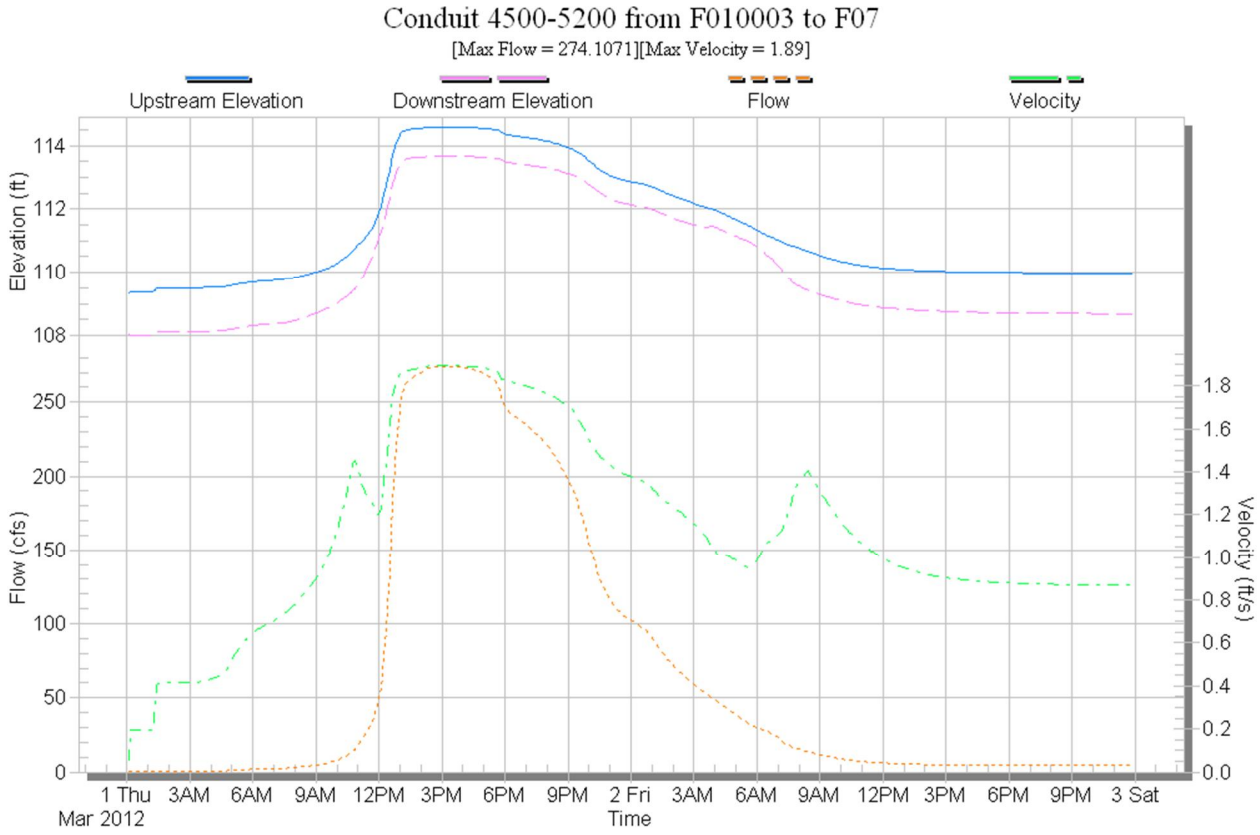
Brook Street (Station 51+33)



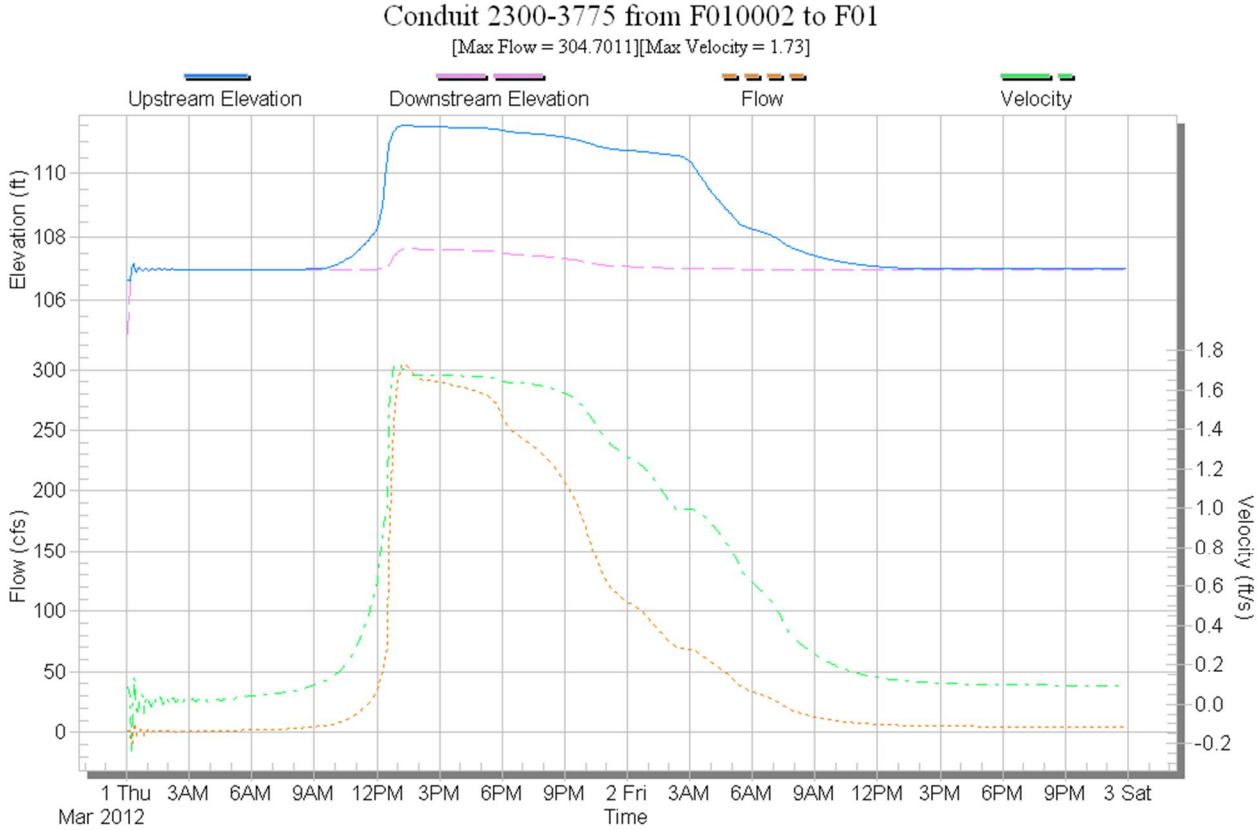
Cold Stream Brook (Station 48+29)



Cameron Street (Station 43+97)

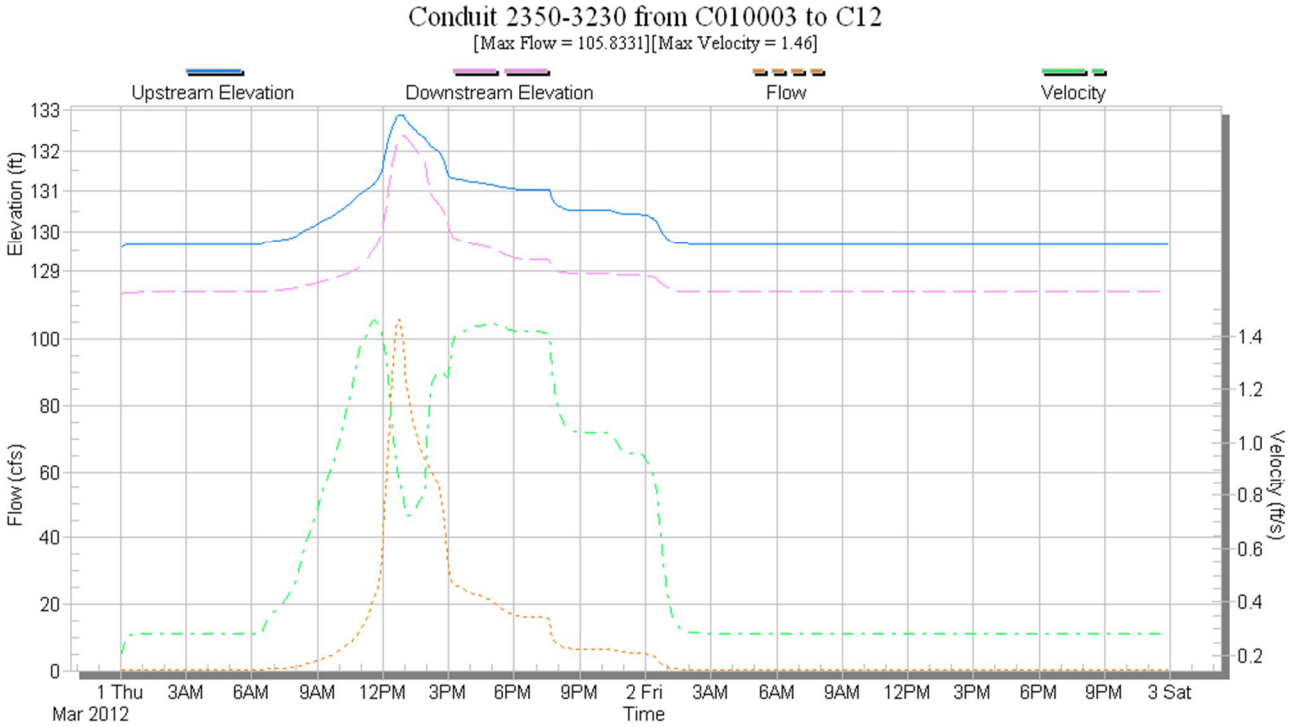


Grove Street (Station 38+73)

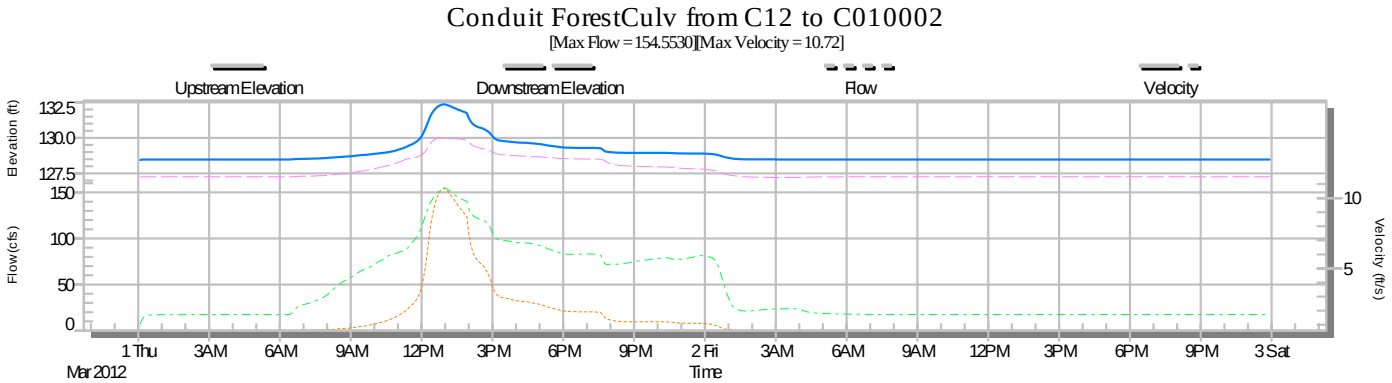


Cottage Street (Station 24+86)

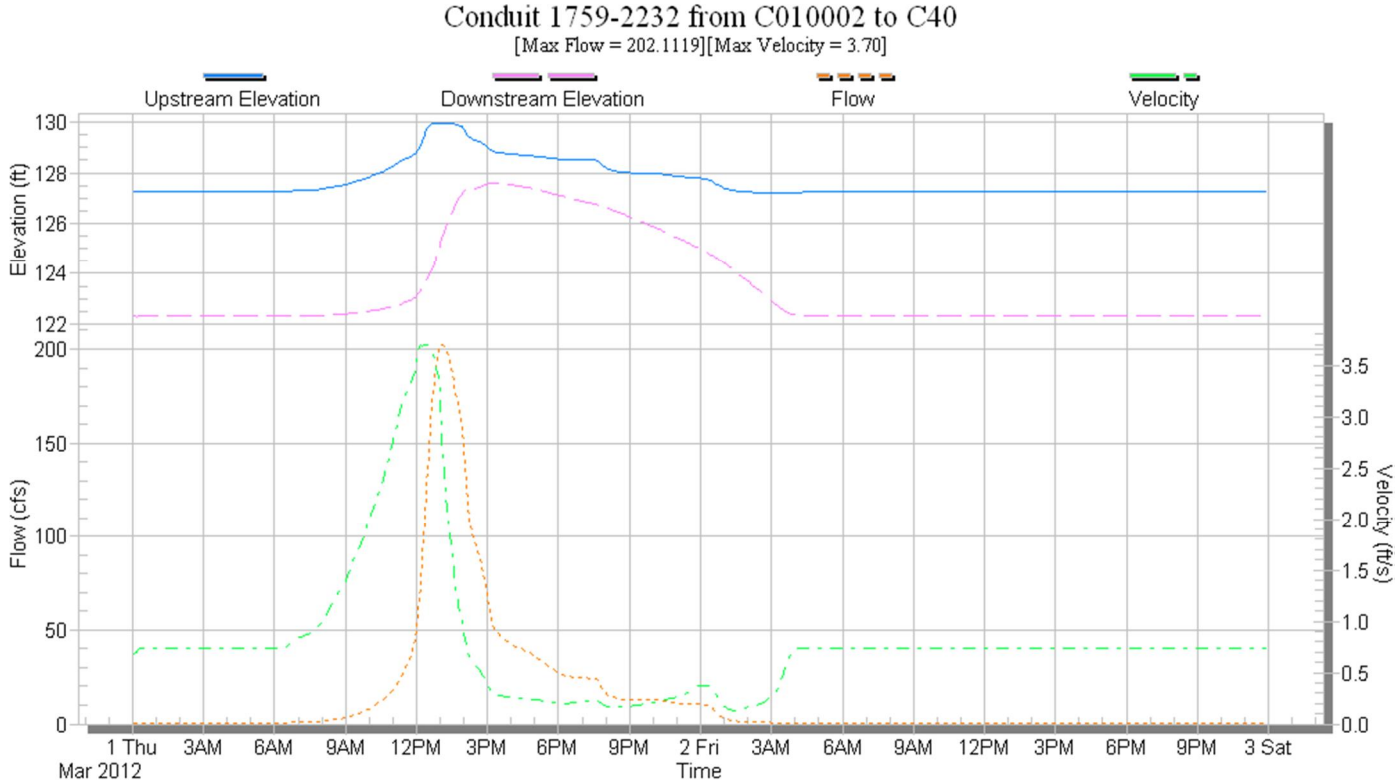
Twenty Five Year Storm (5.52 inches)



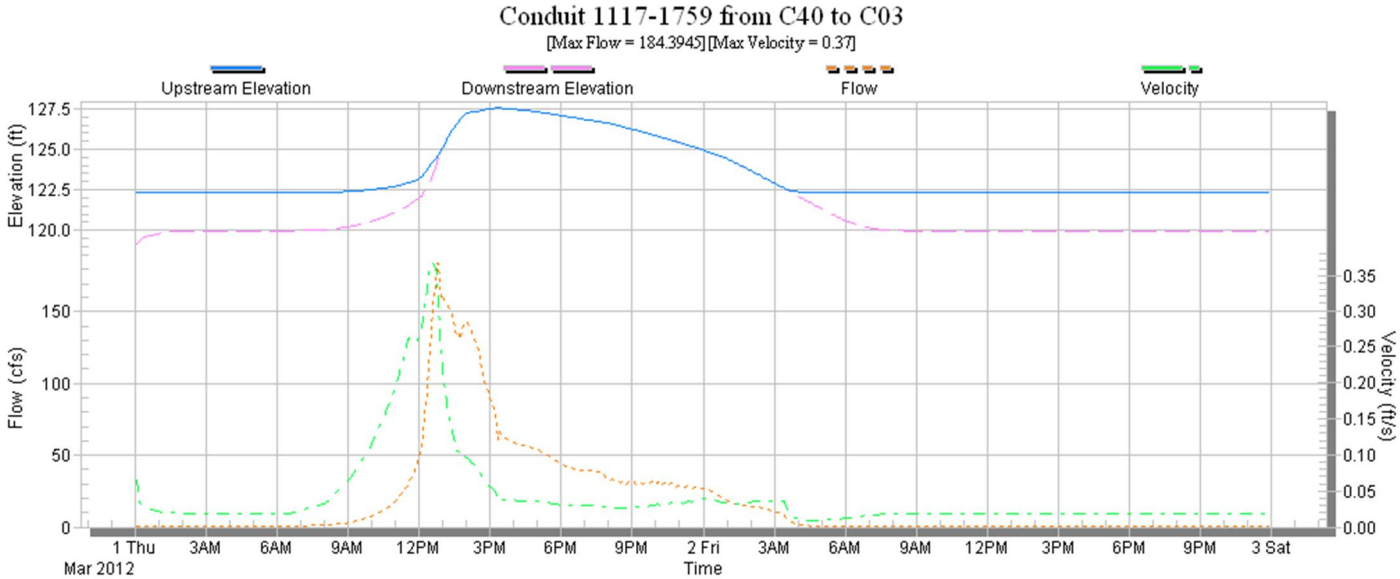
Caroline St. (HW1 – Station 130+78)



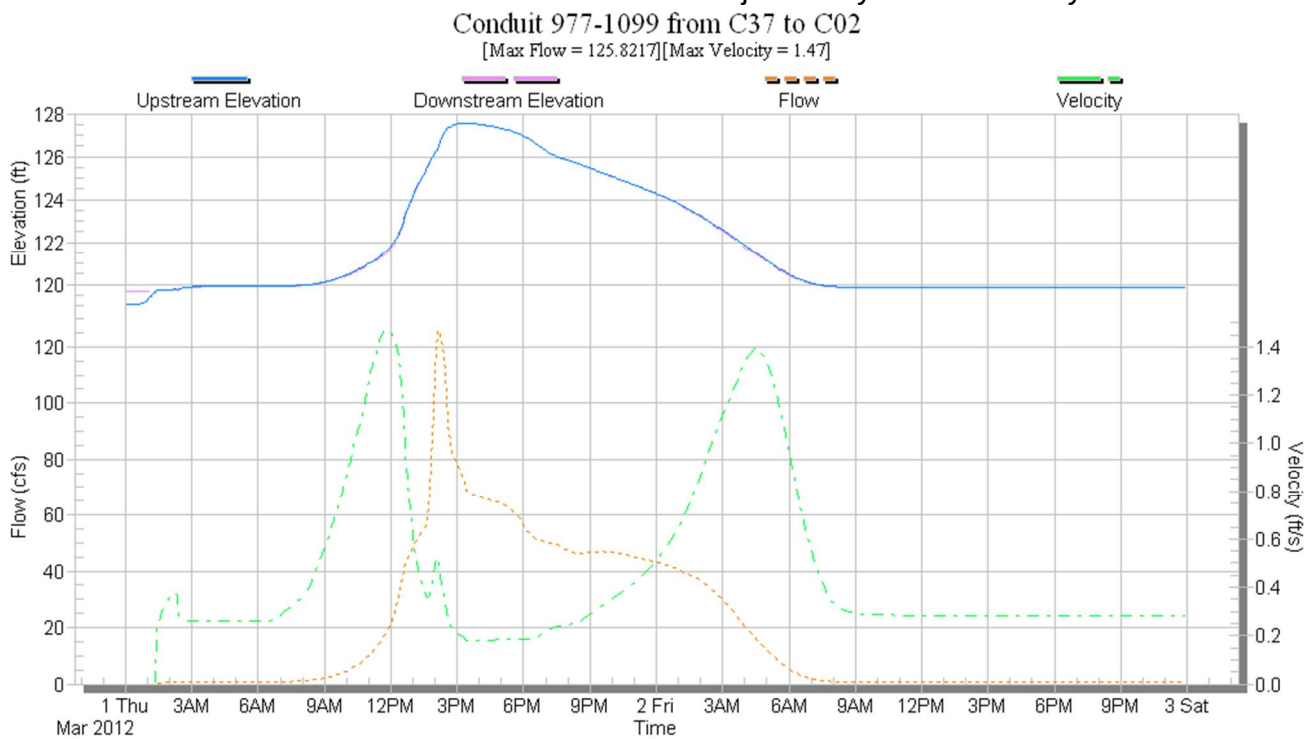
Forest St Culvert (CO7 – Station 121+80)



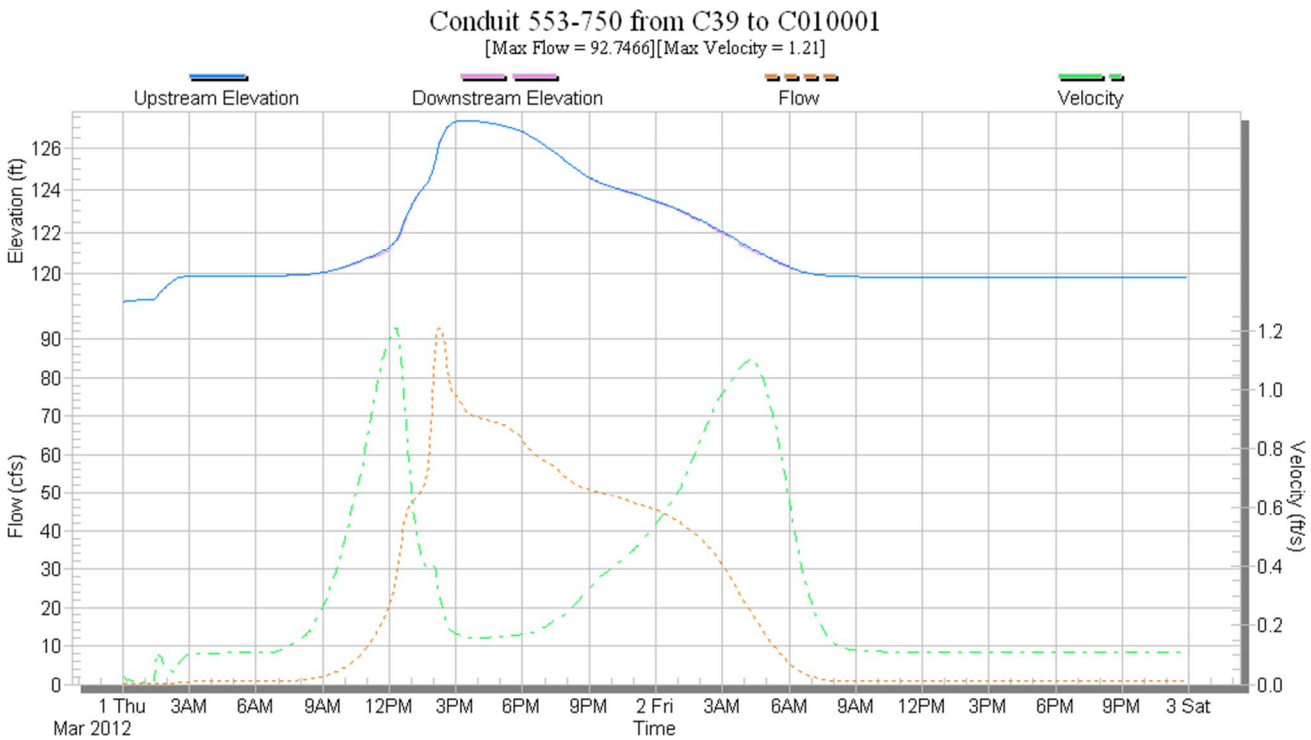
Forest St (Station 121+00)



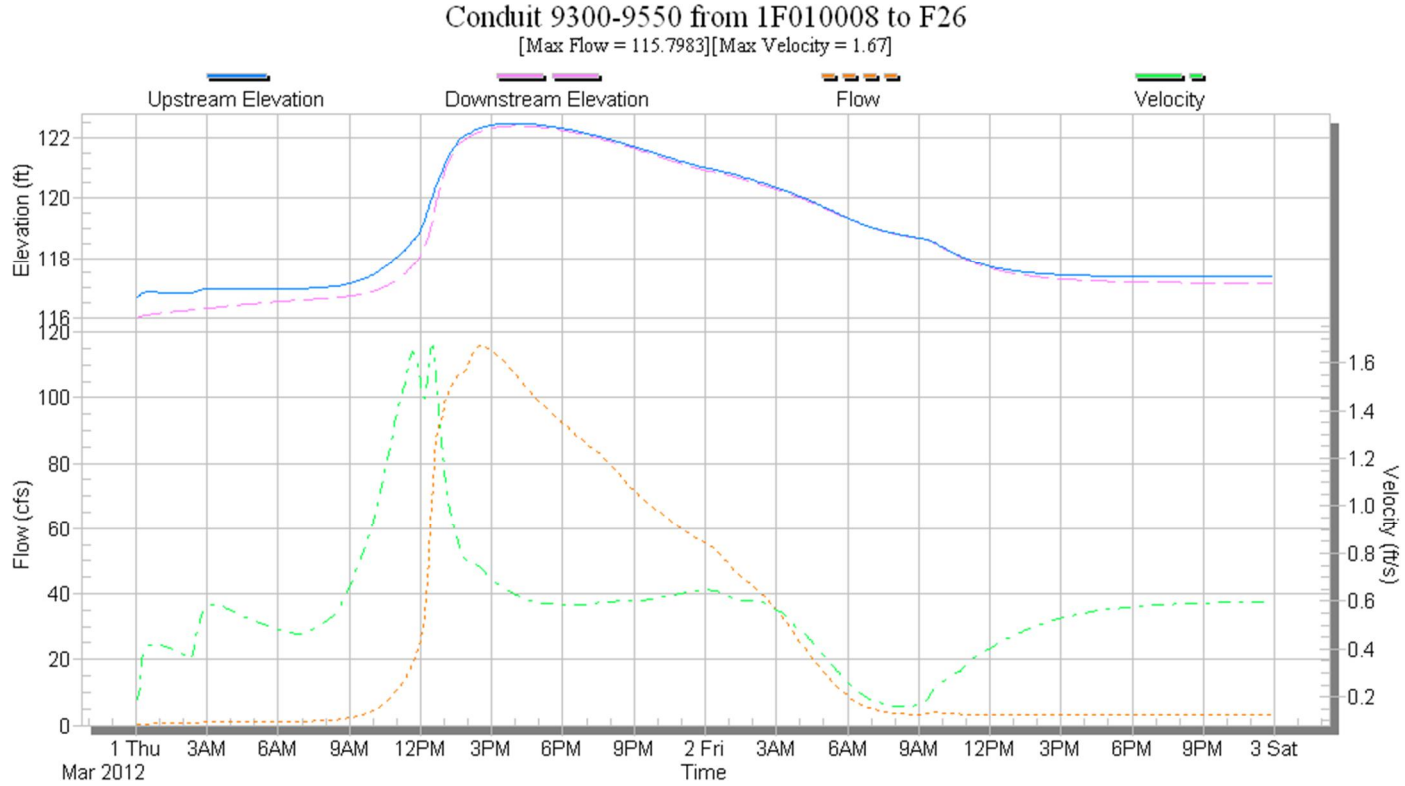
Wetland at Paine St. (C08 – Station 111+46)



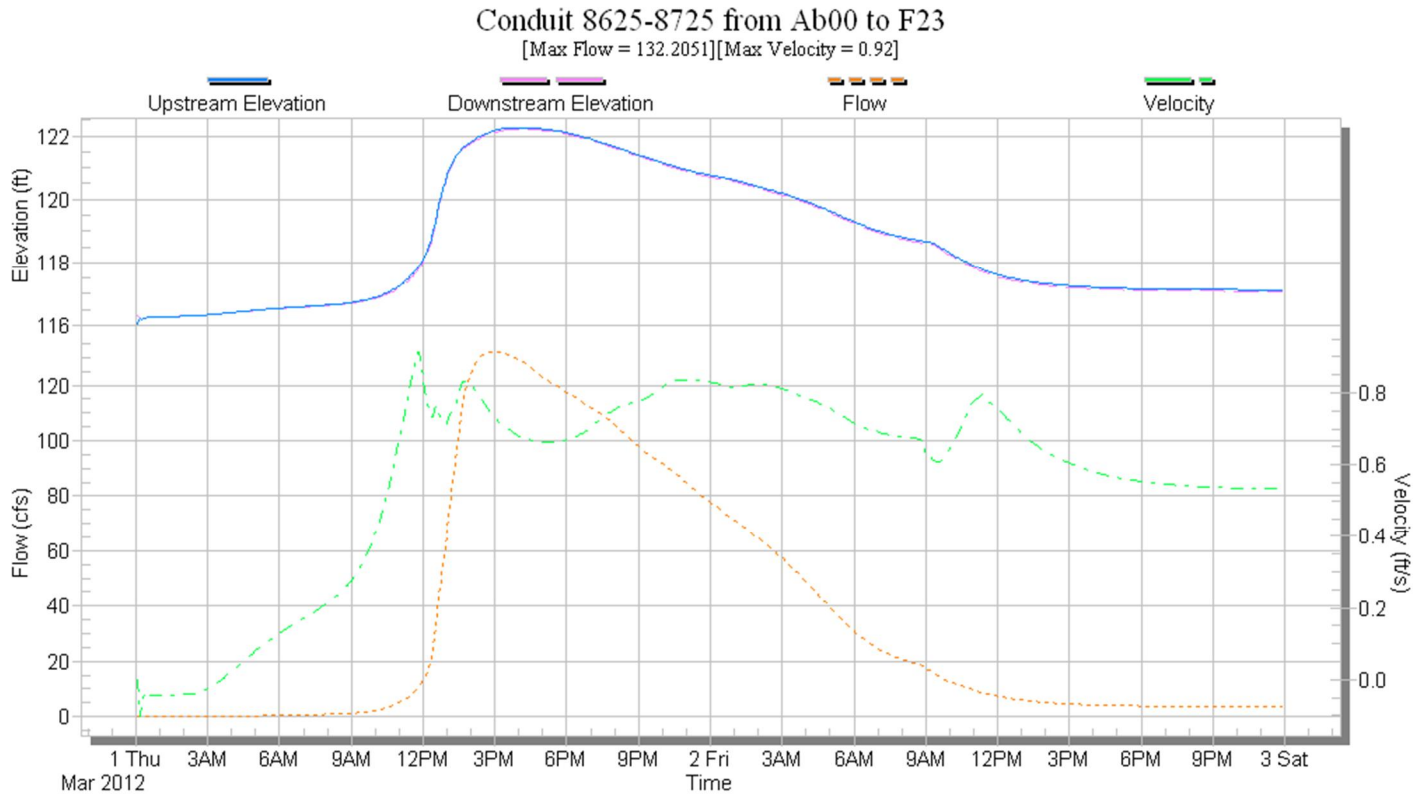
Paine St. (Station 109+86)



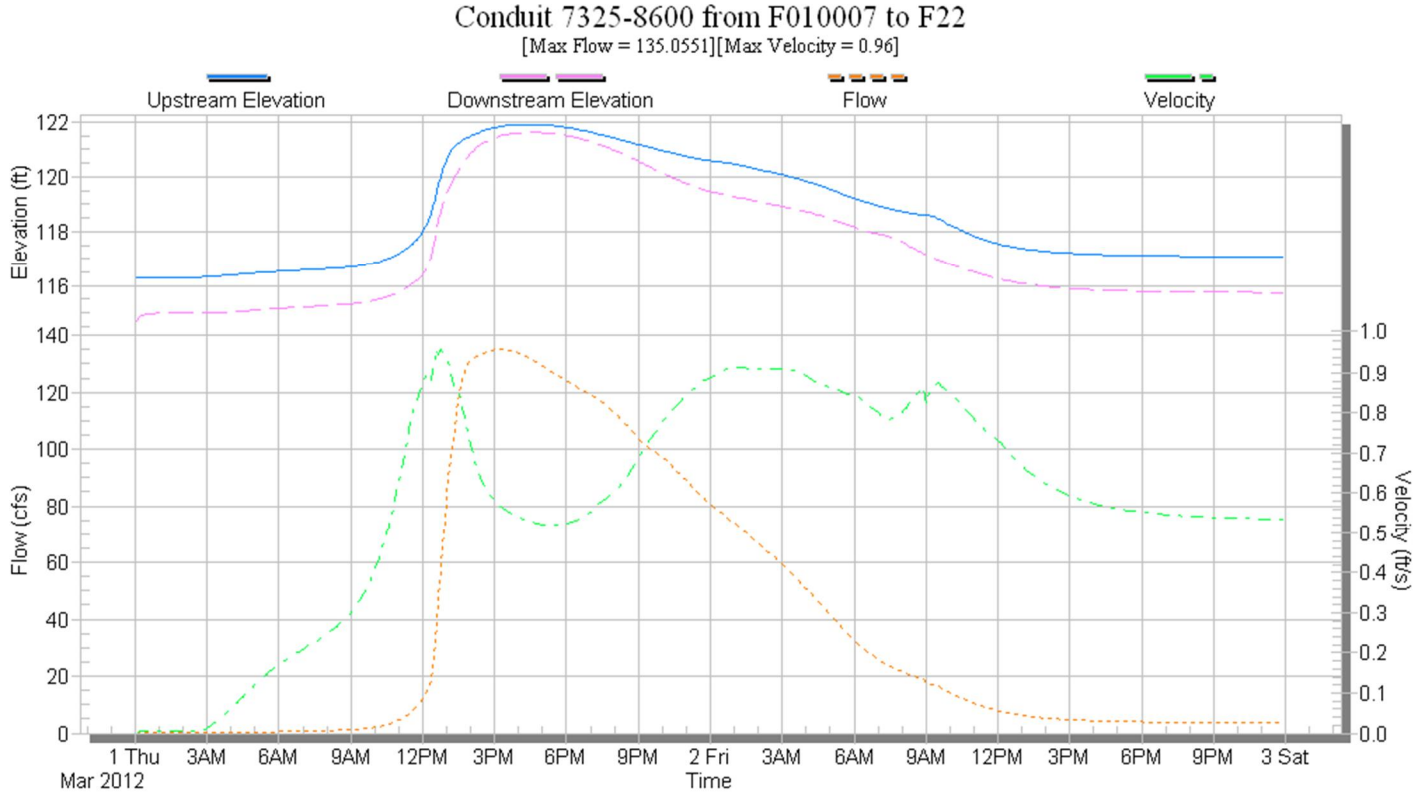
Rice St. (Station 106+20)



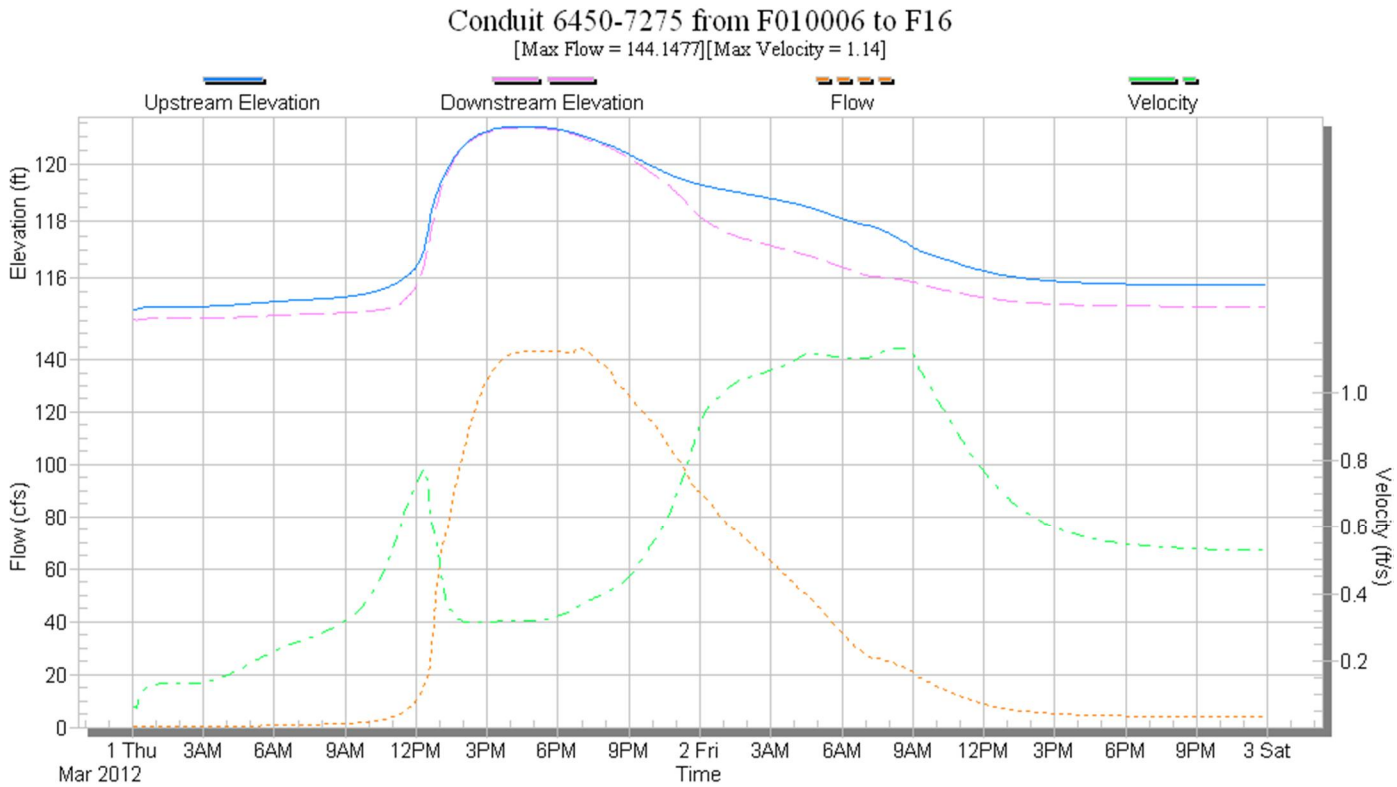
High School Culvert (Station 81+97)



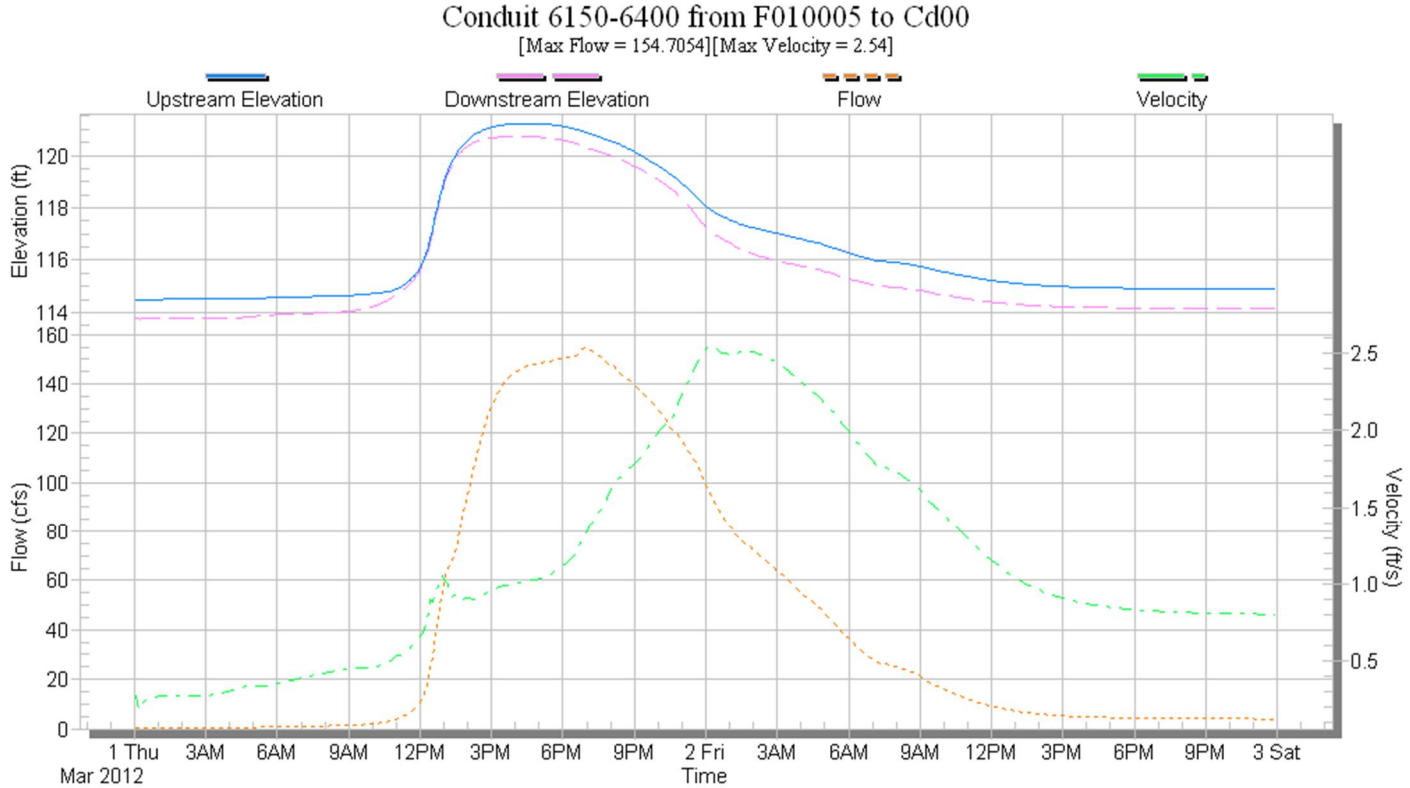
Abbot Brook (Station 74+31)



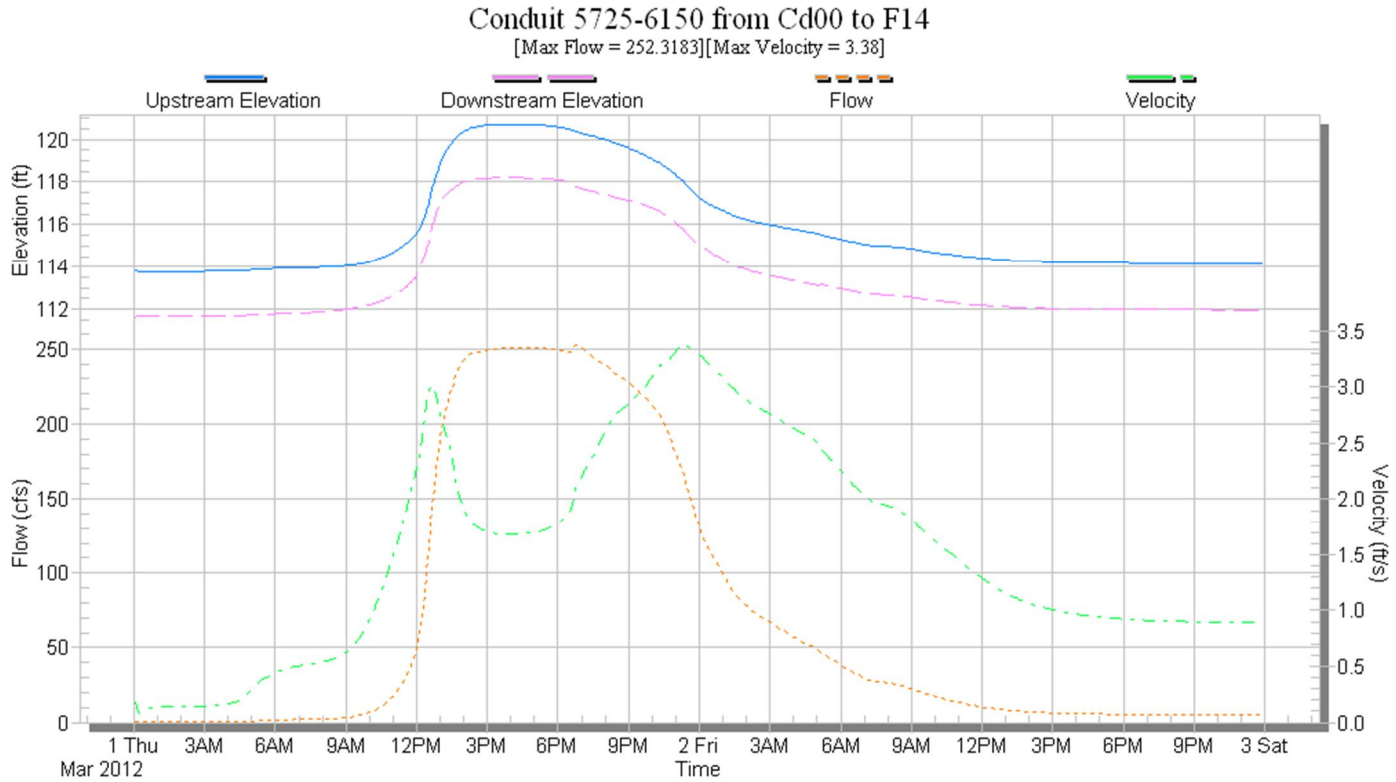
State Street (Station 73+04)



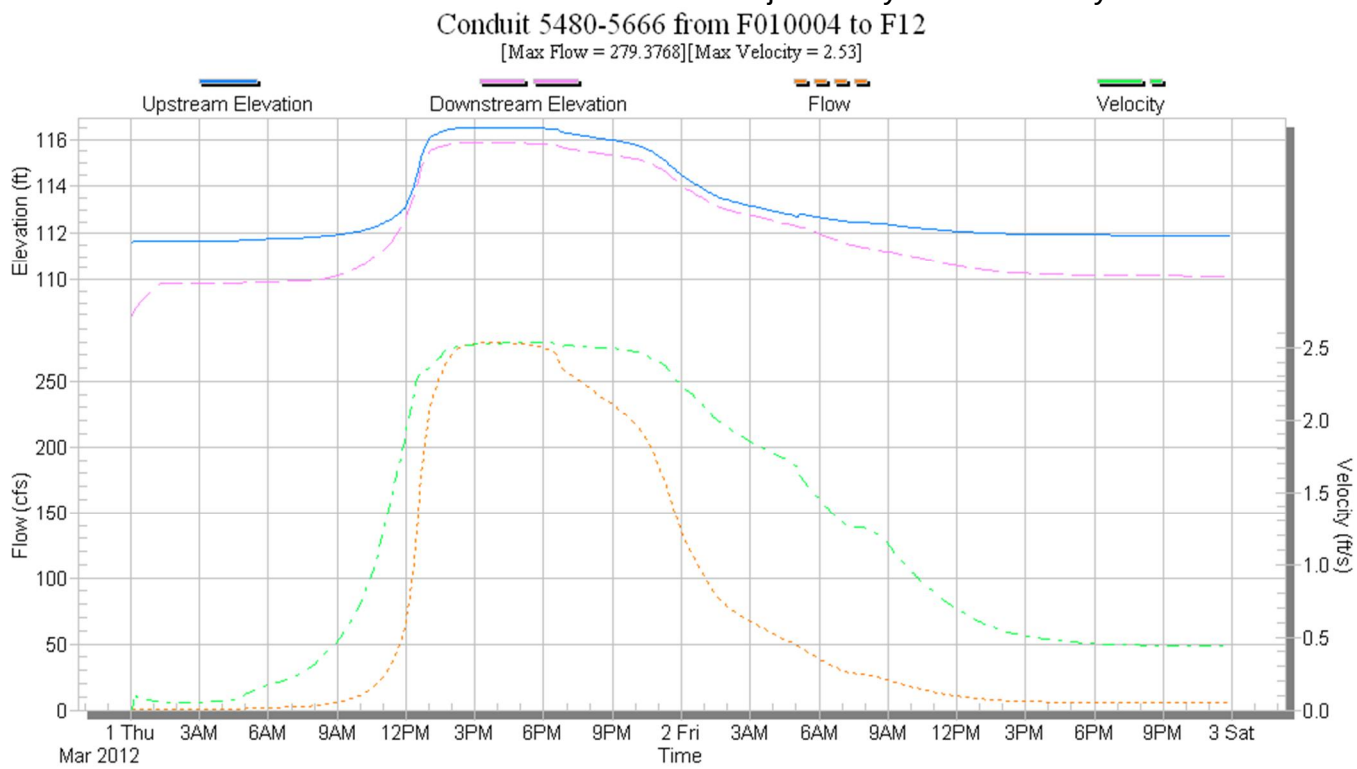
Wellesley Avenue (Station 59+89)



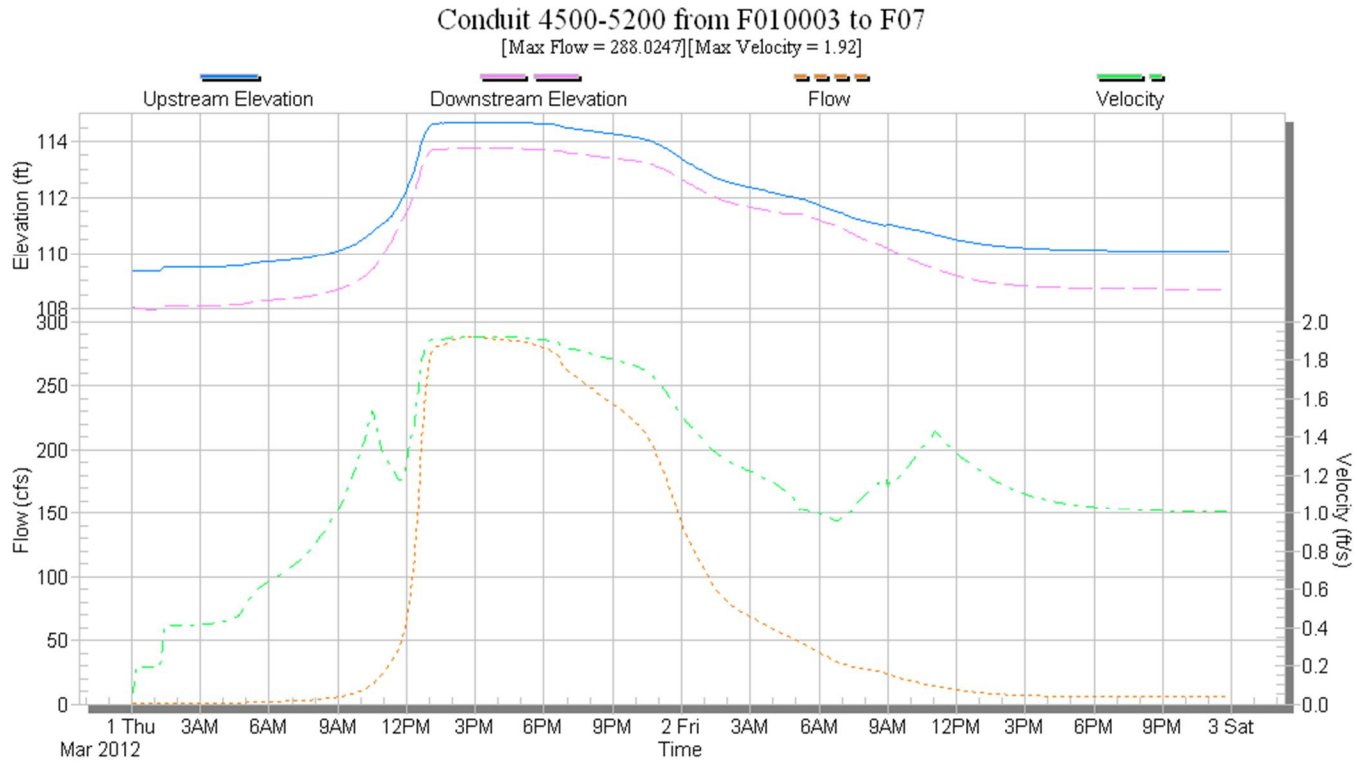
Brook Street (Station 51+33)



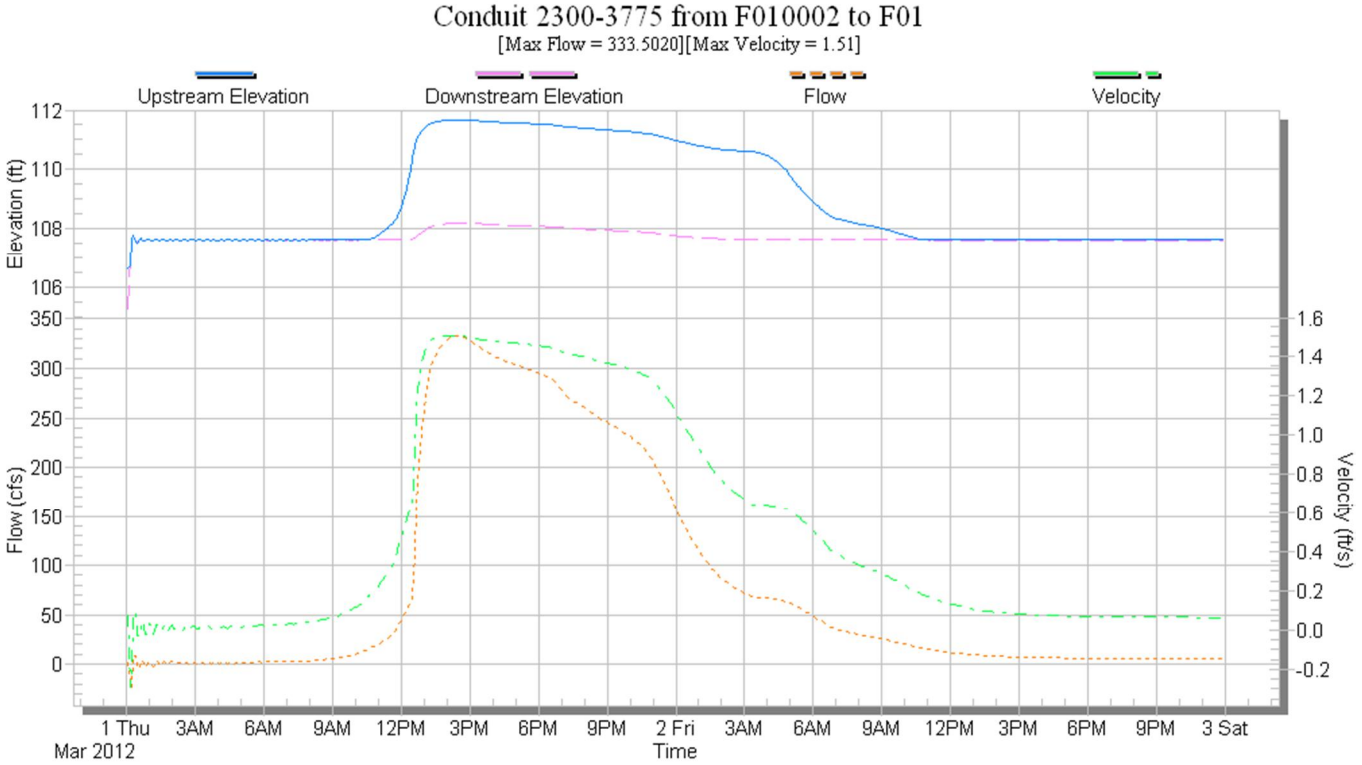
Cold Stream Brook (Station 48+29)



Cameron Street (Station 43+97)

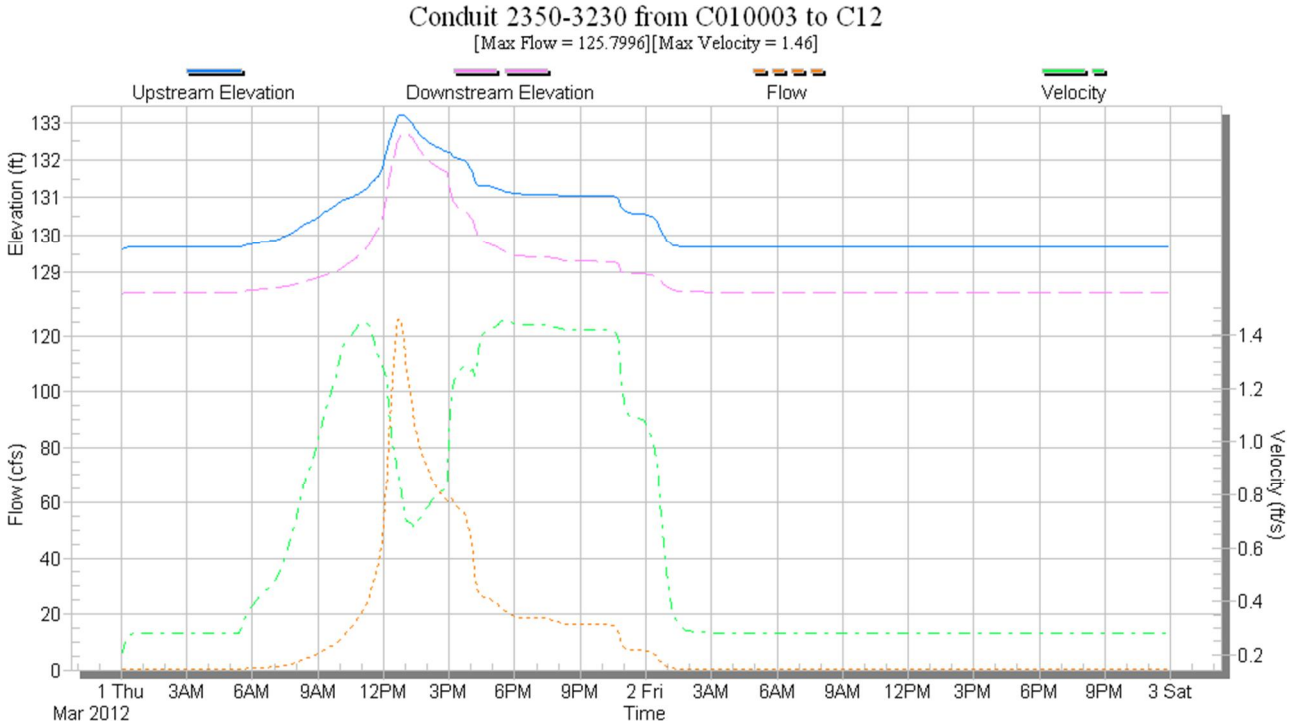


Grove Street (Station 38+73)

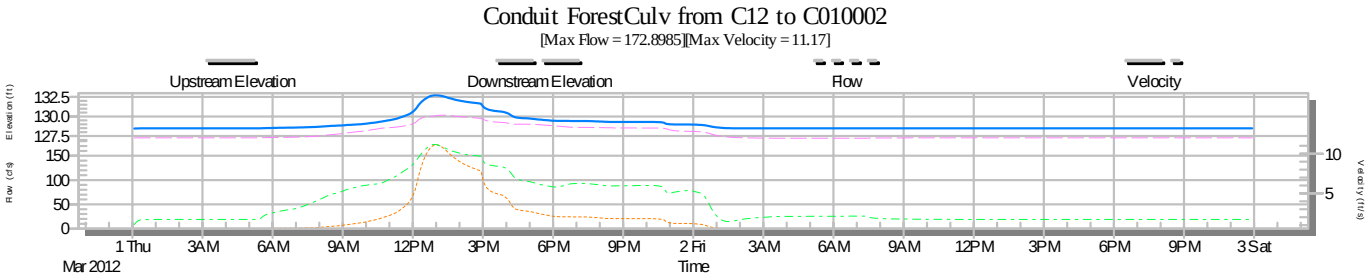


Cottage Street (Station 24+86)

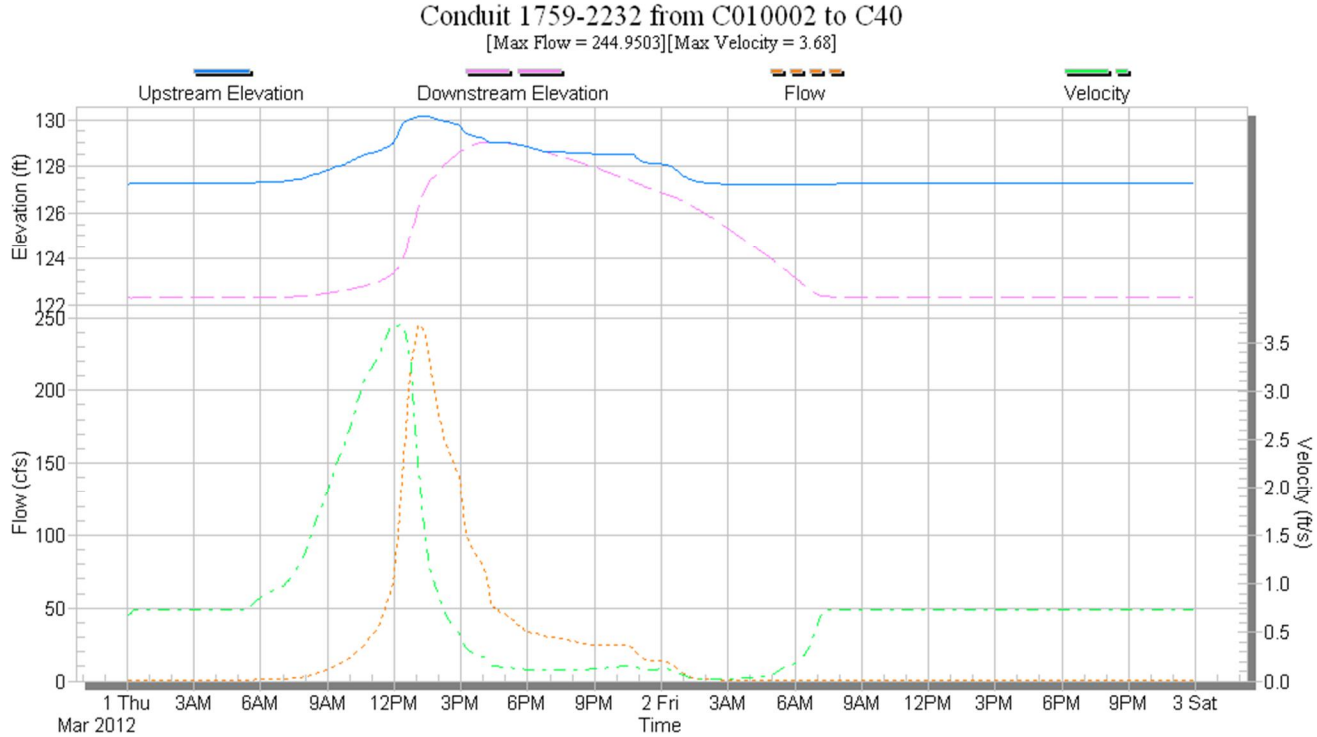
One Hundred Year Storm (6.96 inches)



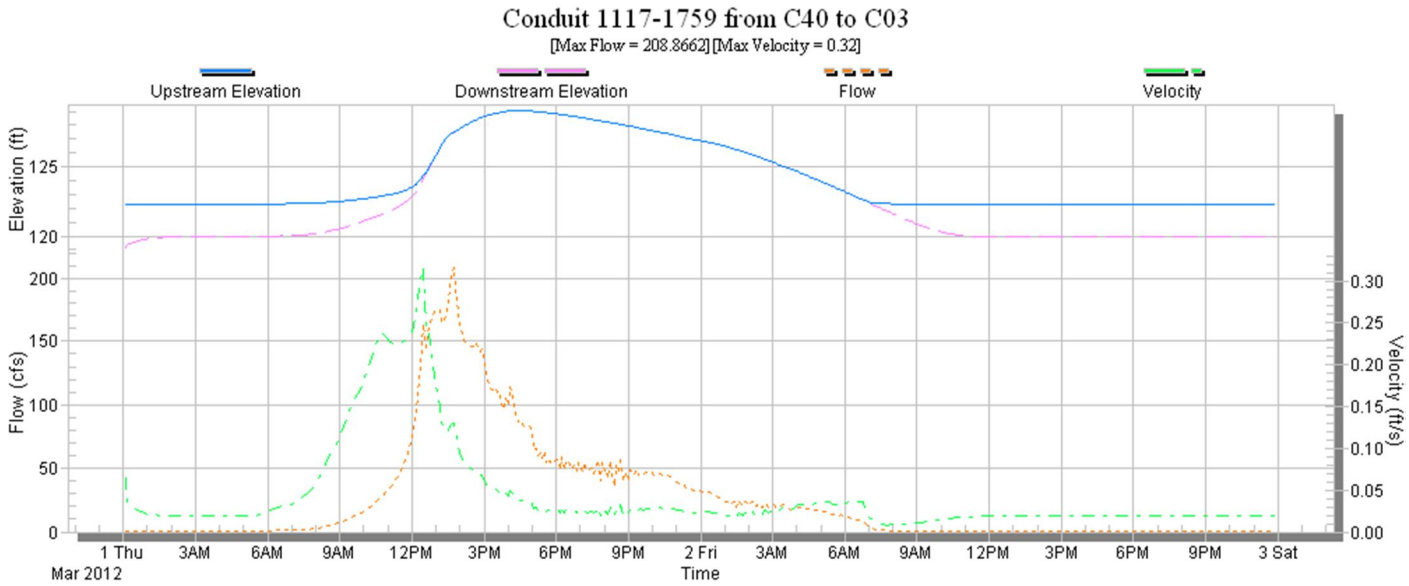
Caroline St. (HW1 – Station 130+78)



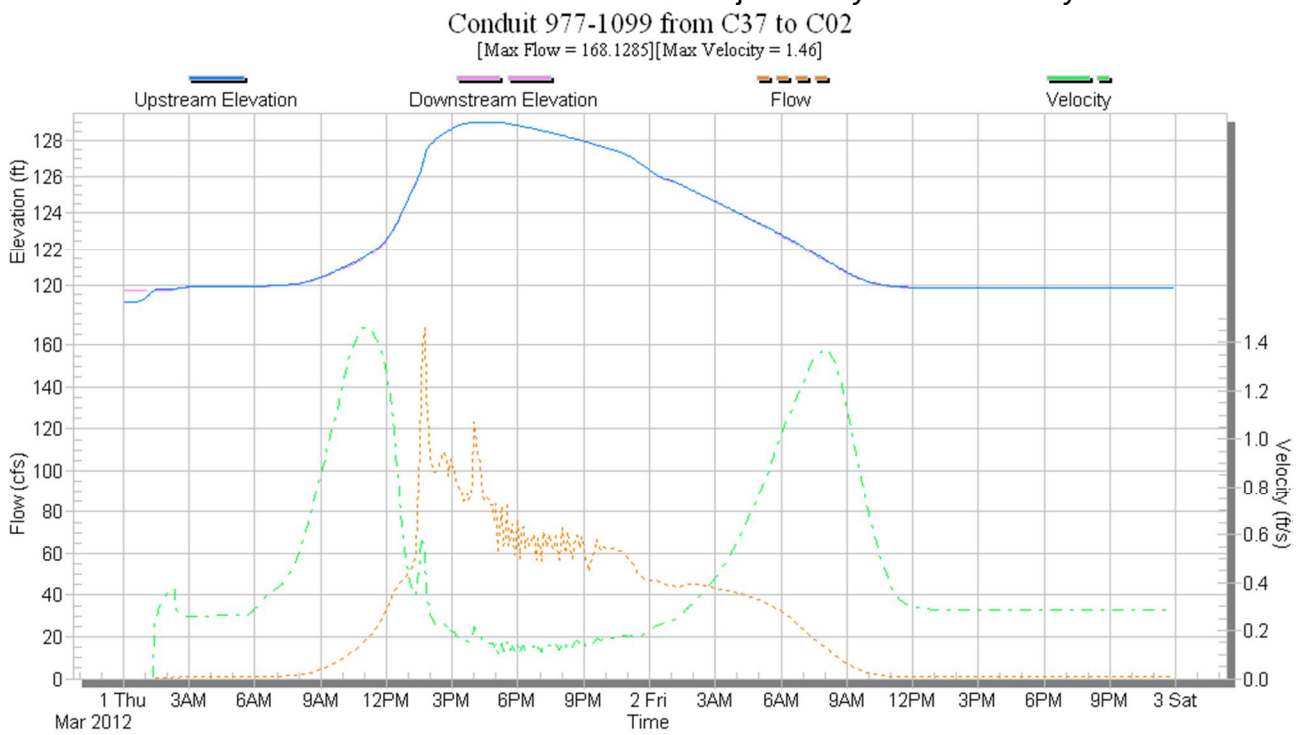
Forest St Culvert (CO7 – Station 121+80)



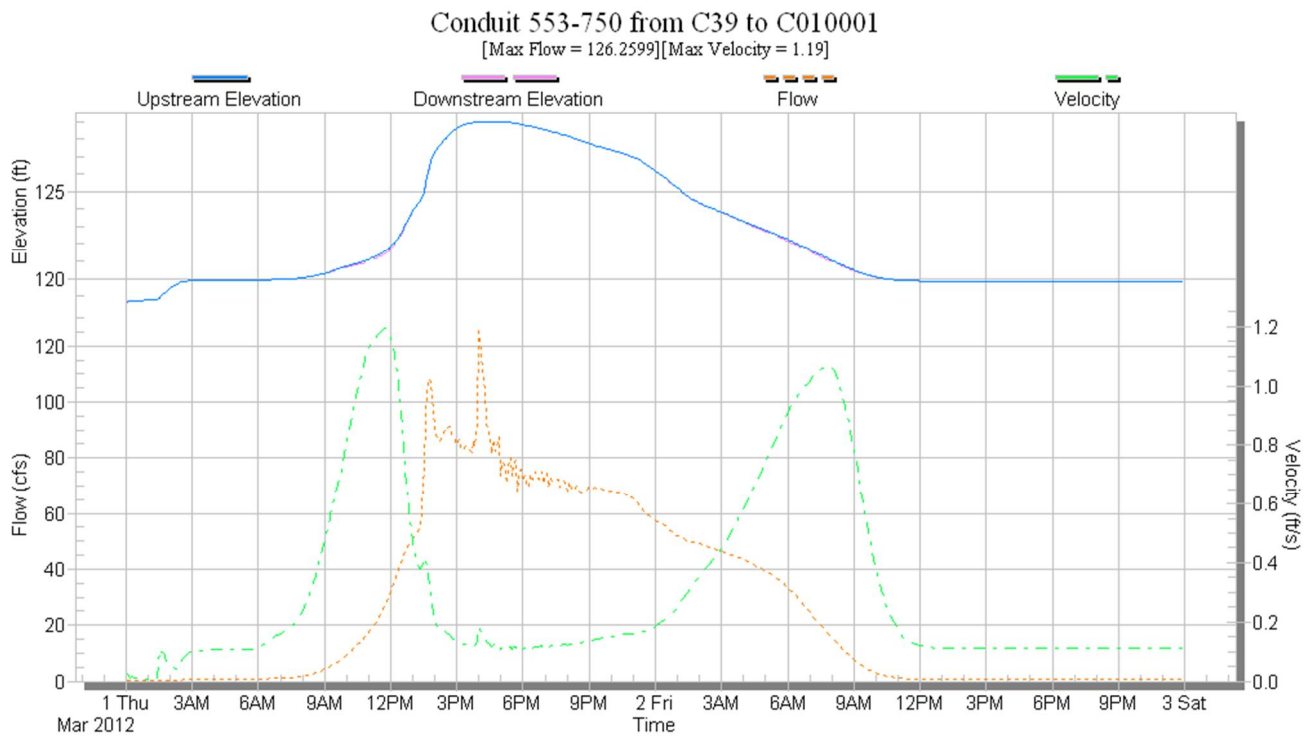
Forest St (Station 121+00)



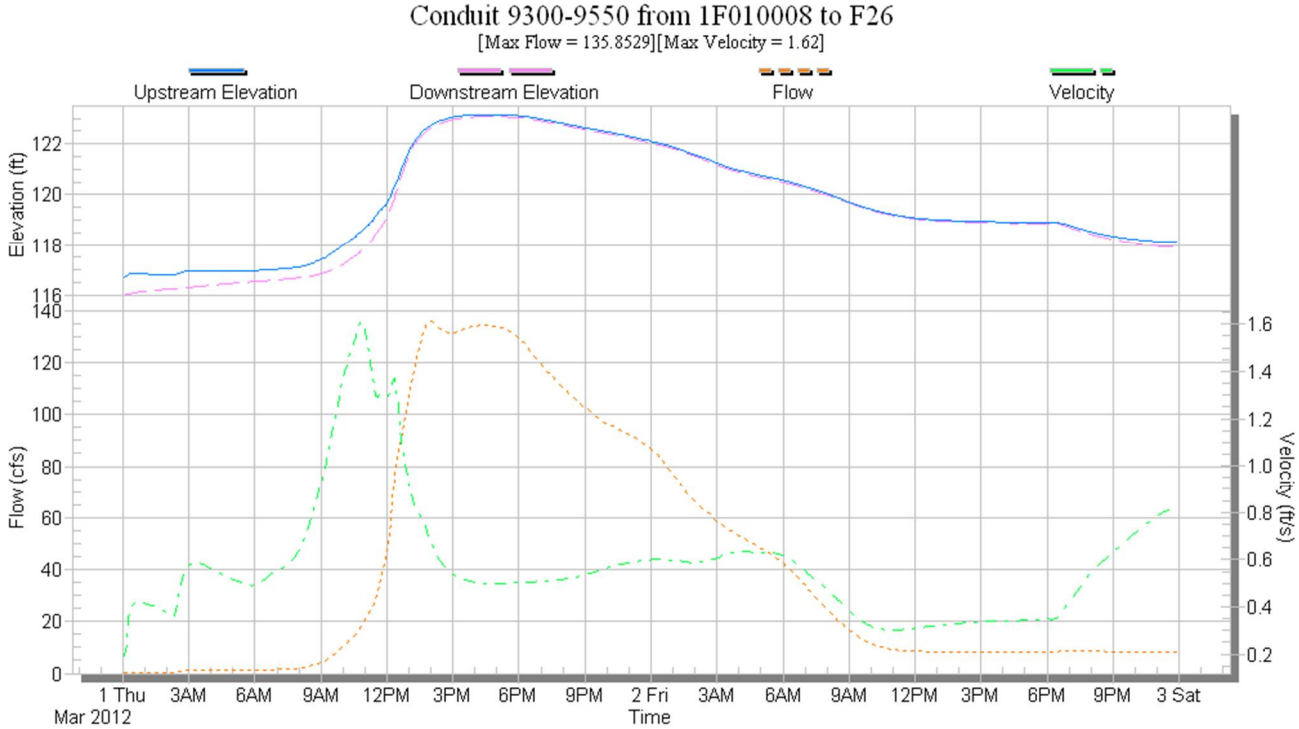
Wetland at Paine St. (C08 – Station 111+46)



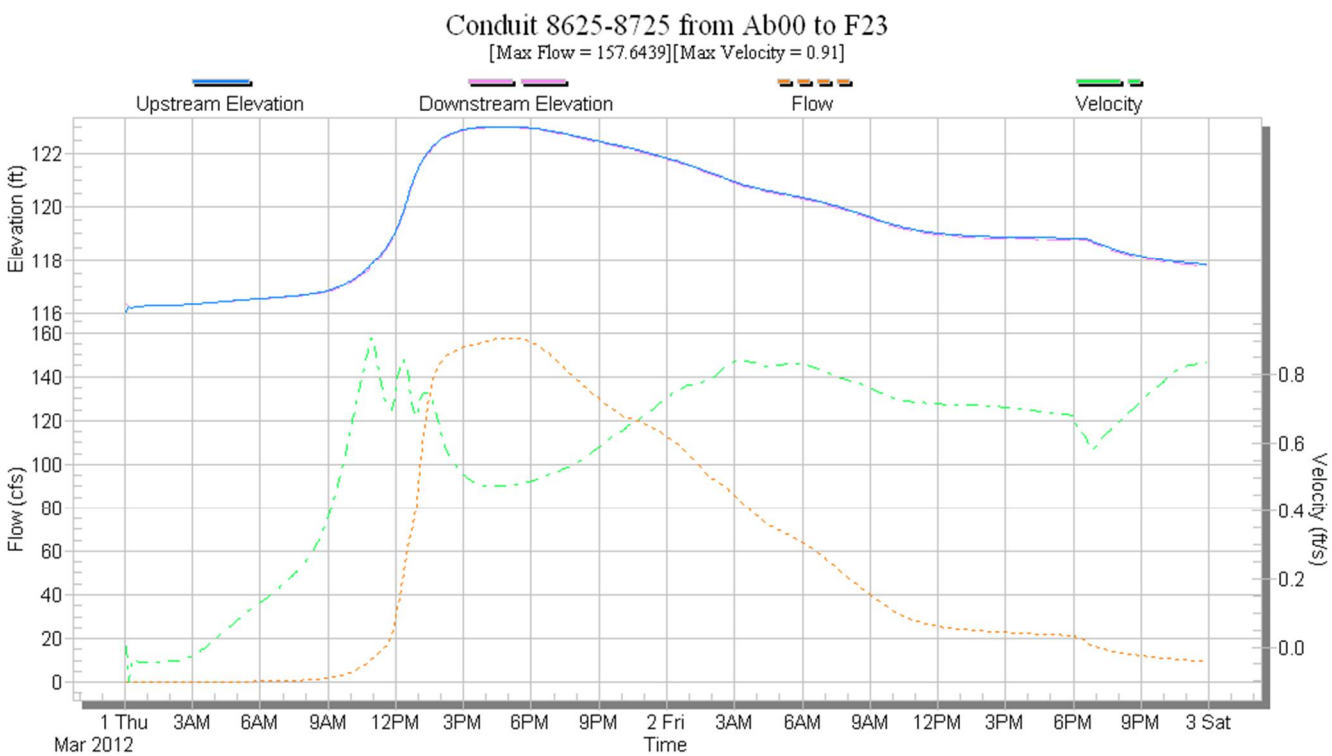
Paine St. (Station 109+86)



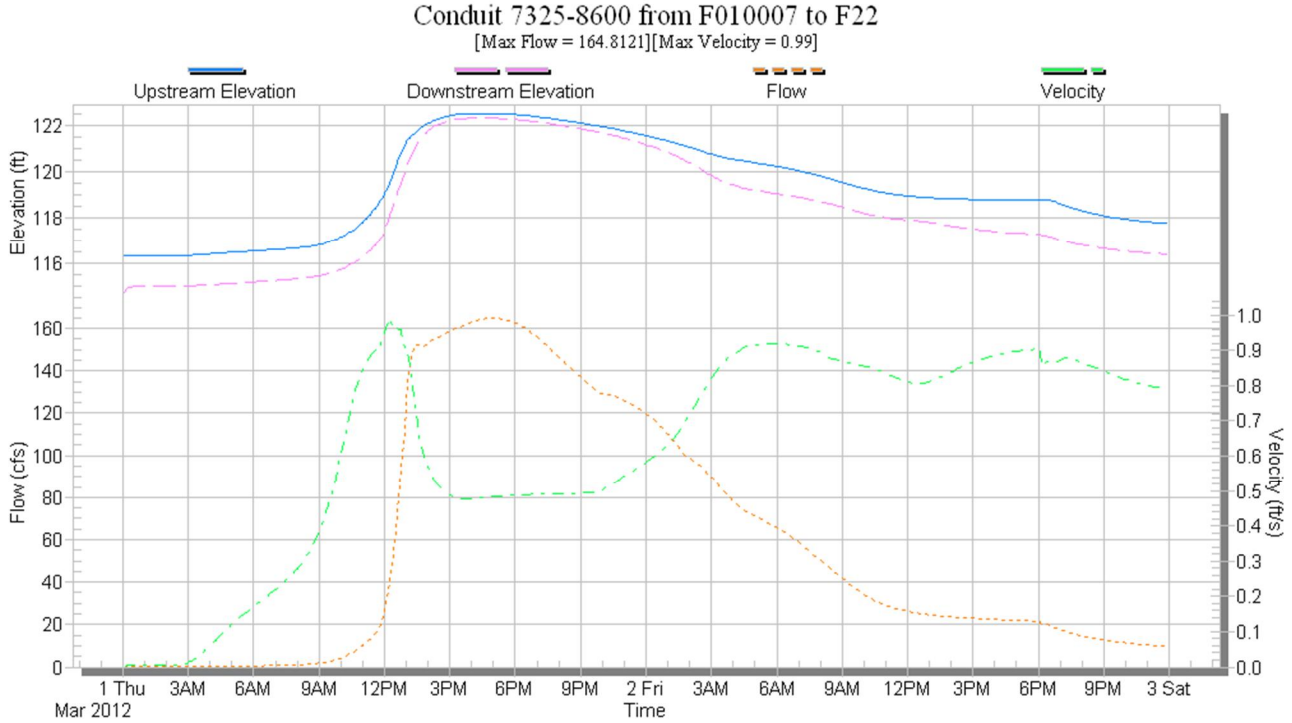
Rice St. (Station 106+20)



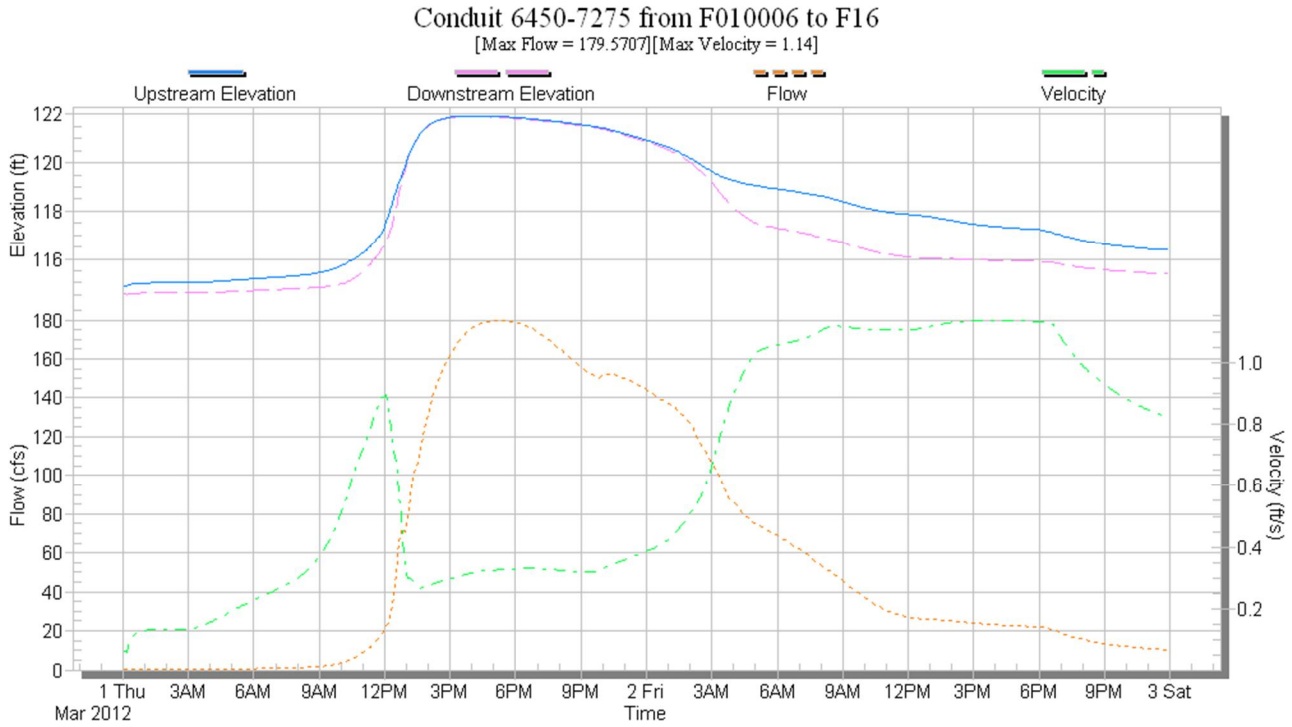
High School Culvert (Station 81+97)



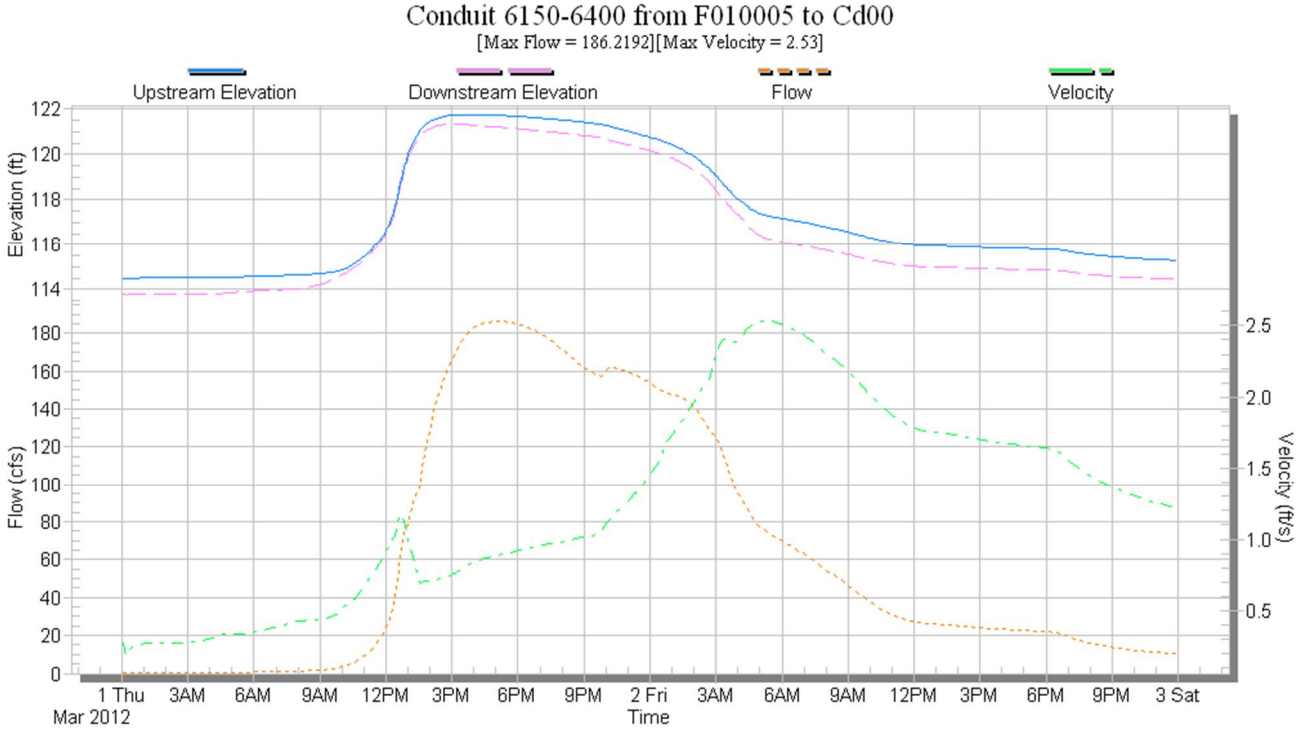
Abbot Brook (Station 74+31)



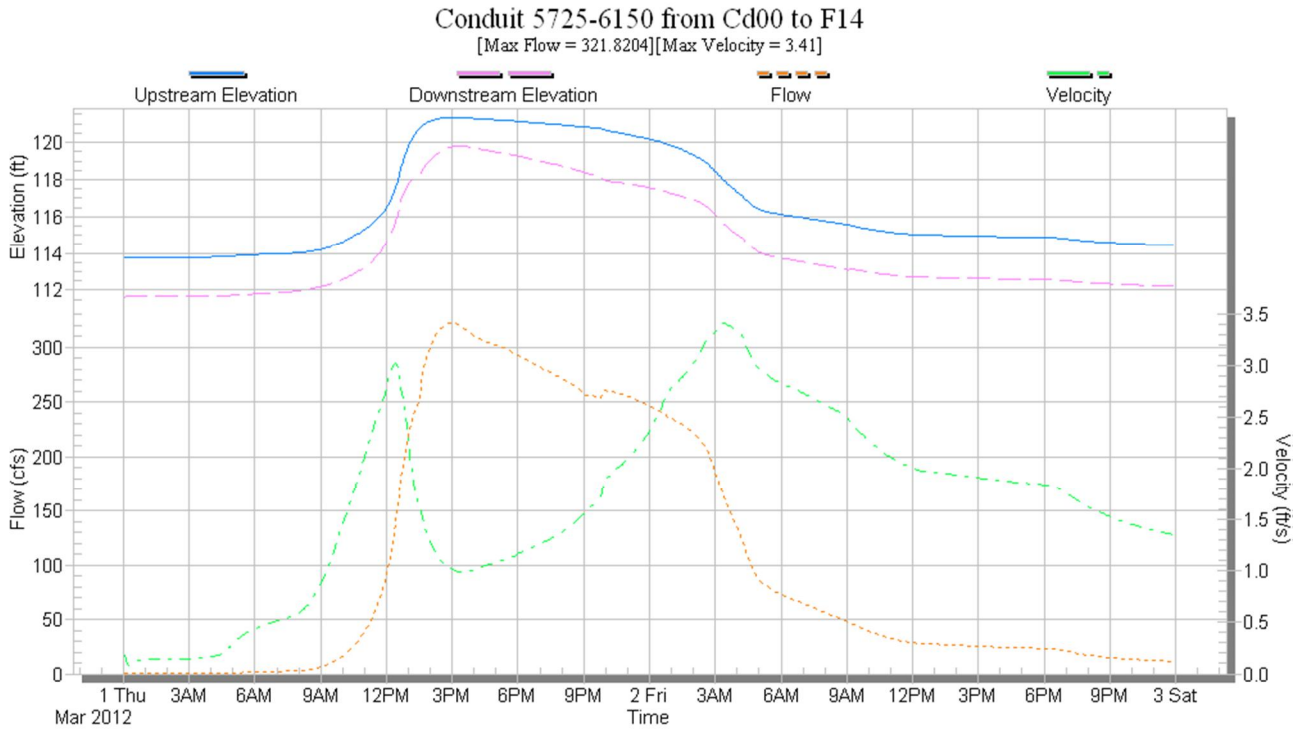
State Street (Station 73+04)



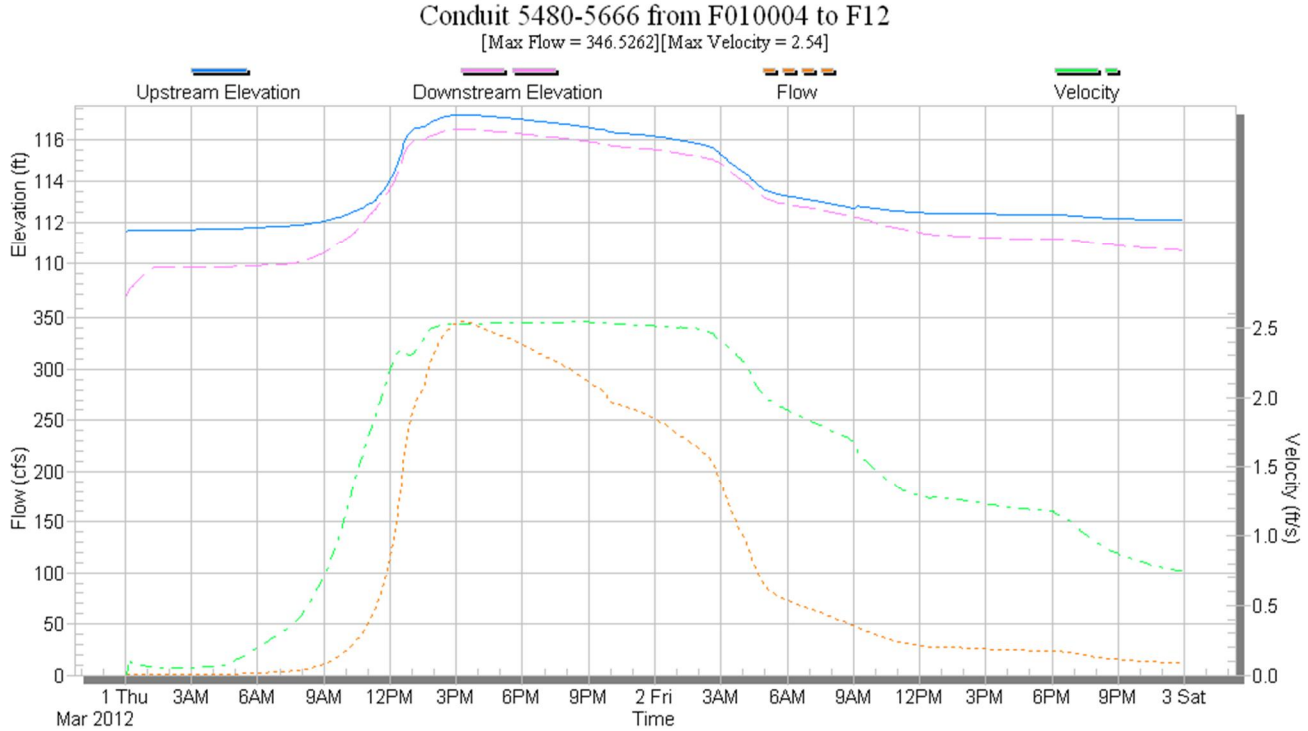
Wellesley Avenue (Station 59+89)



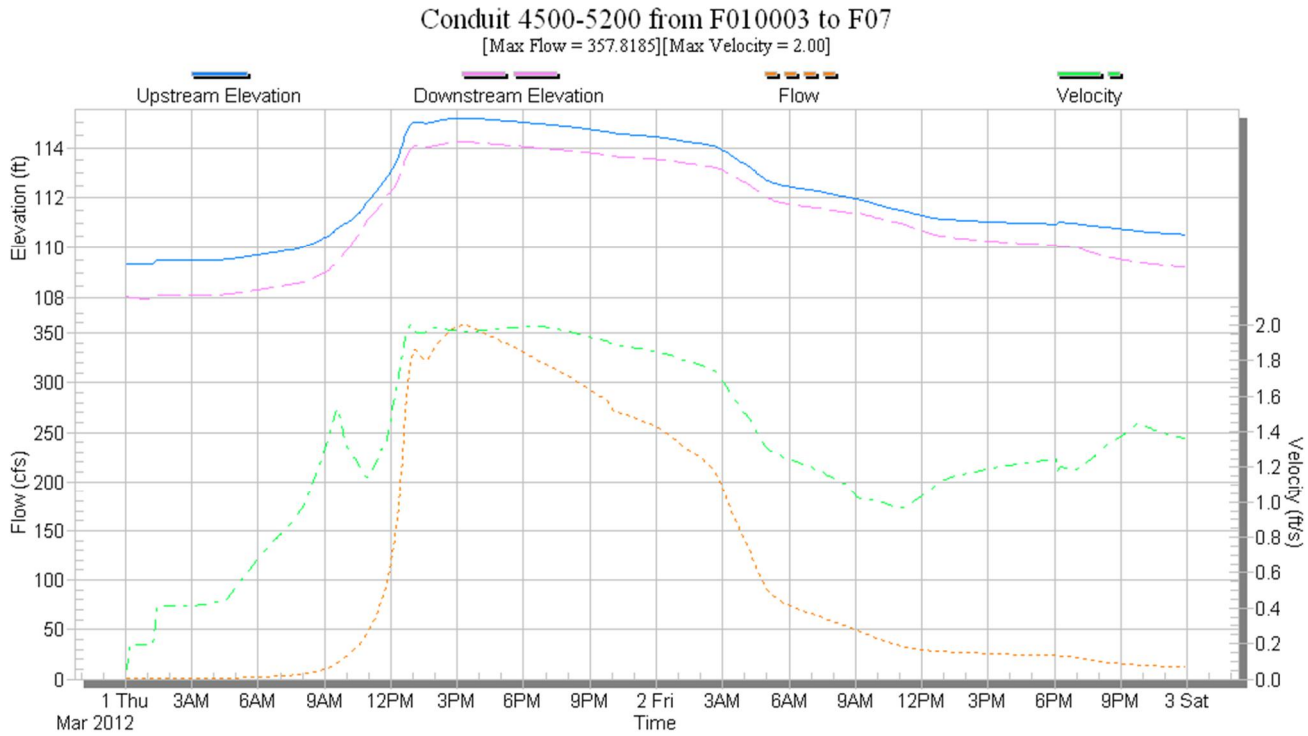
Brook Street (Station 51+33)



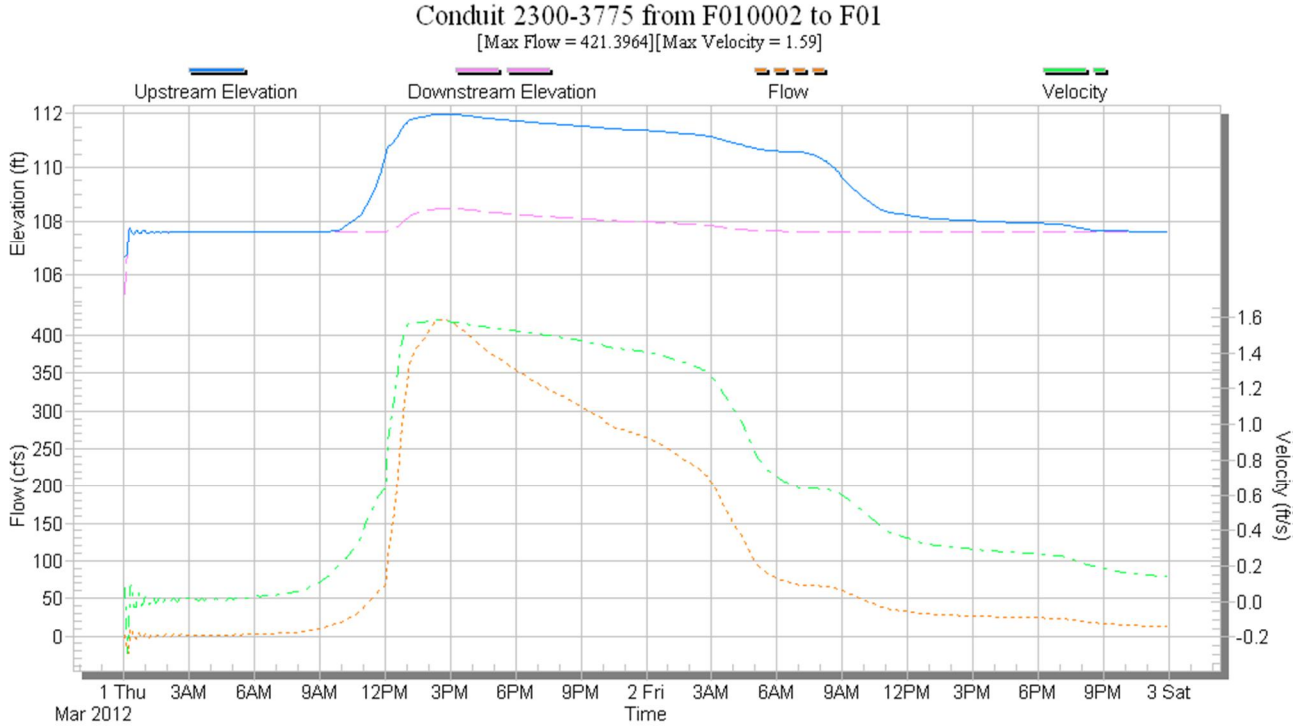
Cold Stream Brook (Station 48+29)



Cameron Street (Station 43+97)



Grove Street (Station 38+73)



Cottage Street (Station 24+86)

APPENDIX B

TOWN REPORTS OF STORMWATER ISSUES

ENGINEERING SUCCESS TOGETHER

MEMORANDUM

Date: May 1, 2012

To: File

From: Philip Paradis, Jr., PE

BETA Project #: 4196

Subject: Fuller Brook
Town Observed Drainage Issues

BETA received GIS plans from the Wellesley Engineering Department noting where the known stormwater runoff problems are within the watershed. Below is a list of areas identified within proximity of the Fuller Brook Park Preservation Project.

1. In Washington St. between Maugus Ave. and Seaward Rd: "prone to flooding in heavy rains, will crest the curb occasionally"
2. In park between Seaward Rd. & Abbott Rd. (the brook is not in this section of the park only drainage pipes): "prone to flooding"
3. Caroline Brook between Caroline St. & Forest St.: "brook needs to be dredged on a schedule b/c sand/sediment builds up & area is very flat"
4. Skating Pond: "Skating Pond frequently floods, the sediment has built up extensively in the pond"
5. Fuller Brook Footbridge just up-gradient of Abbott Brook: "ponding covers footbridge almost to parking lot" & "footbridge @ skating pond 'covers' in heavy rain"
6. Fuller Brook adjacent to Wilson Street: "ponding over banks"
7. Fuller Brook east of Cameron Street: "more bank overtopping this section"
8. Fuller Brook outlet from Denton Street: "can't find structure, prone to flooding"
9. Fuller Brook west of Dover Road: "footbridges overtop in most significant events"

Ref: Summary of Reports of Flooding to Town.docx

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APPENDIX C

HYDRAULIC DATA HEC-RAS MODEL

Hydraulic Model

The brook hydraulics was modeled using the Hydrologic Engineering Centers River Analysis System (HEC- RAS) 4.1 a program provided by the Army Corp of Engineers. Sections were cut from an Auto CAD CIVIL3D surface created from combining the field survey and town GIS data (6.29 feet added to match Town datum) with supplemental information from the 2004 SWMPU (5.75 feet added to match Town datum)

Calibration of the Hydraulic Model

Initial run of the HEC-RAS model showed that the driveway to the Wellesley High School over tops for the one year storm event. The Town indicated that, to their knowledge, this has not happened. There is a combination of possible reasons for this:

1. Storm events usually do not follow the pattern of the SCS unit hydrograph model universally accepted as a method for determining runoff from rainfall events and design systems to accommodate certain storm events. Variations in rainfall will provide different results. The rainfall pattern for storms in March of 2010 did not match the typical SCS unit hydrograph. These storms provided almost a continuous rainfall with few peaks. Sizing or designing stormwater systems, to accommodate all storm events is not practical.
2. The hydrologic data for this section may be too conservative, and not as much runoff reaches the brook. The watershed areas developed for the XPSWMM model (from the SWMPU) are large and do not accommodate a variety of conditions. Variations in surface conditions, soils, time of concentration, and local storage (depressions) all effect the rates and volume of runoff. Updating or providing a detailed hydrologic model for this 294 acre watershed may not be practical.
3. The topography taken from the Town GIS may not accurately depict the amount of flood storage available in the swamp area just up-gradient of the culvert. Due to the thick vegetation, a detailed survey of this area would be difficult and may not be practical.

The project team was able to obtain gage flow data taken at the Dove Street form the Charles River Watershed Association (CRWA). This data indicated that, for more frequent storm events (1 & 2 year), the model provided realist results. Therefore for the purposes of this project, primarily to provide stream bank stabilization which utilizes the 1 & 2 year storm event results, the model is adequate.

Water Elevations From HEC-RAS Model

Location	Hydraulic Opening Dimensions	Invert Elevations (ft)		Top Road Elevation (feet)	Water Elevations Year Storm Event				
		Up	Down		1	2	10	25	100
FULLER BROOK									
Dover Road*	16.2' x 9.9' box	108.15	108.15	119.65	111.06	111.53	112.32	112.49	112.99
Cottage Street*	15.8' x 9.2' box	112.25	112.15	123.05	115.02	115.71	116.82	117.05	117.67
Grove Street*	16' x 9.2' box	115.55	115.05	126.65	117.76	118.82	119.31	119.43	119.96
Cameron Street*	8' x 4' box	117.05	117.35	126.25	120.38	121.29	123.04	123.34	125.05
Brook Street	2 x 72" dia.	119.61	119.92	128.05	121.68	122.23	123.62	123.86	125.32
Wellesley Avenue*	7' x 6.1' box	120.25	120.55	129.05	122.54	123.11	124.4	124.61	125.74
State Street*	12' x 4.1' arch	121.55	122.05	128.85	123.7	124.27	125.56	125.78	126.76
Skating Pond*	4.8' x 4' box	121.45	121.85	126.05	124.65	125.44	**126.41**	**126.57**	**126.93**
HS Field D/S Structure*	8.3' x 4.1' box	--	122.35	128.65	124.79	125.35	126.43	126.57	126.89
CAROLINE BROOK									
Culvert from HS Field*	4.5' x 3.1' arch	125.45	--	128.55	127.56	127.97	**129.11**	**129.25**	**129.48**
Footpath off Smith St	48" dia.	123.55	123.55	128.4	127.91	128.43	**129.16**	**129.3**	**129.55**
Rice Street	60" dia.	124.72	123.94	133.24	128.29	128.78	130.47	**131.59**	**133.2**
Path off Paine Street	42" dia.	124.36	124.86	130.7	129.23	130.14	**131.58**	**131.86**	**133.22**
Paine Street Driveway**	42" dia.	125.63	124.93	132.5	132.28	**133.01**	**133.26**	**133.27**	**133.37**
Forest Street	60" dia.	133.46	132.24	140.2	136.81	137.59	139.04	139.25	139.85

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FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 1 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
Headwall at Caroline Street													
13078	47.9	134.48	137.47	135.48	137.5	0.00044	1.44	33.25	12.64			0.06	0.06
13061	47.9	134.6	137.41		137.48	0.00096	2.14	23.35	11.58	0.02	0.02	0.12	0.1
13000	47.9	135.1	137.3		137.4	0.00164	2.61	19.59	12.57	0.04	0.04	0.19	0.14
12900	47.9	134.82	137.13		137.23	0.00181	2.49	19.49	11.55	0.01	0.02	0.18	0.16
12800	47.9	134.65	137		137.07	0.00128	2.12	23.16	14.27	0.03	0.01	0.13	0.11
12750	47.9	134.39	136.97		137.02	0.00071	1.87	27.12	14.63	0.02	0.02	0.09	0.07
12700	47.9	134.27	136.93		136.98	0.00079	1.87	27.23	14.98		0.04	0.1	0.08
12600	47.9	134.23	136.9		136.92	0.00035	1.42	46.96	42.84	0.02	0.01	0.05	0.02
12500	47.9	133.98	136.9		136.9	9.1E-05	0.71	86.37	53.5	0	0.01	0.01	0.01
12400	47.9	133.93	136.89		136.89	7.4E-05	0.63	97.36	62.39	0	0.01	0.01	0.01
12300	47.9	133.89	136.84		136.88	0.0004	1.5	39.85	36.36	0.01	0.01	0.06	0.03
12216	47.9	133.7	136.82		136.84	0.00029	1.24	42.92	24.91	0.01	0.01	0.04	0.03
12190	47.9	133.53	136.81		136.84	0.00027	1.22	40.09	16.43		0.01	0.04	0.04
12180	66.2	133.23	136.61	135.21	136.81	0.00399	3.61	18.36	6.94			0.39	0.39
12147	Culvert			Foster Street									
12115	66.2	131.64	133.56	133.56	134.33	0.0247	7.05	9.39	6.2			1.67	1.67
12100	72.5	132.19	133.93	133.1	134	0.00215	2.06	35.2	26.28			0.18	0.18
12068	72.5	132.12	133.44		133.82	0.01598	4.92	14.73	12.82			1.07	1.07
12029	72.5	131.15	133.22		133.42	0.00571	3.6	20.15	12.45			0.52	0.52
11938	72.5	130.67	132.24		132.61	0.01512	4.88	14.87	12.6		0.05	1.04	1
11865	72.5	130.22	132.33		132.35	0.00077	1.39	69.2	71.48	0.01	0.03	0.07	0.05
11818	72.5	129.98	132.31		132.32	0.00046	0.98	94.31	90.94	0.01	0.03	0.04	0.03
11777	72.5	129.88	132.29		132.3	0.00032	1.05	114.57	100.57	0.01	0.02	0.04	0.02
11737	72.5	129.37	132.29		132.3	0.00011	0.64	183.03	151.64	0.01	0.01	0.01	0.01
11684	72.5	129.03	132.28		132.29	0.00019	0.87	156.85	140.73	0.01	0.01	0.03	0.01
11596	72.5	129.05	132.28		132.28	3.8E-05	0.52	272.12	164.83	0	0	0.01	0
11500	72.5	129.11	132.28		132.28	5E-06	0.2	620.66	267.14	0	0	0	0
11374	72.5	127.43	132.28		132.28	2E-06	0.13	821.44	277.21	0	0	0	0
11242	72.5	127.35	132.28		132.28	0	0.08	1601.91	470.77	0	0	0	0
11146	77.3	126.19	132.28		132.28	1E-06	0.14	1060.49	285.96	0	0	0	0
11073	77.3	125.96	132.28		132.28	2E-06	0.15	765.39	205.33	0	0	0	0
11038	77.3	125.9	132.28		132.28	8E-06	0.34	360.78	143.36	0	0	0	0
11028	77.3	125.69	132.27	127.27	132.28	4.7E-05	0.67	182.31	129.15	0	0	0.01	0
11007	Culvert		Driveway off Paine Steet										
10986	35.2	125.54	129.23		129.25	0.00013	0.99	40.98	17.14	0.01	0.01	0.02	0.02
10976	35.2	125.53	129.23		129.24	0.00013	0.9	40.03	14.19	0		0.02	0.02
10948	35.2	125.51	129.23		129.24	7.3E-05	0.76	81.87	55.91	0.01	0	0.01	0.01

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FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 1 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
10905	35.2	125.6	129.23		129.24	8.6E-05	0.77	74.77	56.07	0	0.01	0.01	0.01
10869	35.2	125.81	129.23		129.23	6.2E-05	0.71	77.74	45.09	0.01	0	0.01	0.01
10859	35.2	125.74	129.19	126.99	129.23	0.00068	1.63	21.65	8.12			0.08	0.08
10848	Culvert			Footpath off Paine Steet									
10838	35.2	125.7	128.27		128.38	0.00248	2.63	13.37	6.8			0.21	0.21
10828	35.2	125.68	128.32		128.34	0.00027	1.2	35.12	25.34	0.01	0.01	0.04	0.02
10775	35.2	125.29	128.31		128.33	0.0003	1.23	39.5	29.26	0	0.02	0.04	0.02
10714	35.2	125.33	128.3		128.32	0.00012	0.91	48.06	26.7	0.01	0.01	0.02	0.01
10706	35.2	125.39	128.29	126.48	128.31	0.00032	1.3	30.42	19.02	0.01	0.01	0.04	0.03
10662	Culvert			Rice Steet									
10620	35.3	125.38	127.93		127.99	0.00123	1.99	17.8	10.73	0.01		0.12	0.11
10611	35.3	125.42	127.94		127.97	0.0006	1.56	23.04	13.76	0.01	0.01	0.07	0.06
10580	35.3	125.36	127.92		127.96	0.00045	1.41	25.85	19.33	0.01	0.01	0.05	0.04
10500	35.3	125.34	127.91		127.92	0.00027	1.11	46.35	48.95	0.01	0.01	0.03	0.02
10428	35.3	125.05	127.91		127.91	5.7E-05	0.58	102.95	98.11	0	0	0.01	0
10413	35.3	125.16	127.9	126.2	127.91	0.00013	0.79	79.33	85.19	0.01	0.01	0.02	0.01
10407	Culvert			Footpath off Smith Steet									
10393	35.3	125.15	127.58		127.64	0.00108	2.02	17.75	8.24		0.01	0.12	0.1
10383	35.3	125.2	127.6		127.62	0.00042	1.31	35.67	46	0.01	0.02	0.05	0.02
10337	35.3	124.92	127.6		127.61	0.00016	0.91	55.99	42.13	0.01	0.01	0.02	0.01
10273	35.3	125.15	127.57		127.59	0.00032	1.13	34.61	23.7	0	0.02	0.04	0.03
10263	35.3	125.2	127.56	126.04	127.59	0.00052	1.25	28.89	20.55	0.01		0.05	0.04
10133	Culvert			High School Field									
10000	35.3	123.6	124.82	124.57	125.08	0.01	4.05	8.71	8.29			0.58	0.58

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FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 2 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft) LOB	ROB	Chan	Total
				Headwall at Caroline Street									
13078	61.8	134.48	137.98	135.63	138.01	0.00043	1.55	40.38	16.09		0	0.06	0.05
13061	61.8	134.6	137.92		138	0.00081	2.24	29.83	13.82	0.02	0.03	0.13	0.09
13000	61.8	135.1	137.85		137.94	0.00113	2.53	28.43	21.13	0.04	0.03	0.17	0.09
12900	61.8	134.82	137.74		137.83	0.00117	2.4	27.28	14.32	0.03	0.03	0.16	0.12
12800	61.8	134.65	137.66		137.72	0.00075	1.98	34.21	19.07	0.03	0.02	0.1	0.07
12750	61.8	134.39	137.64		137.69	0.00048	1.82	38.25	18.53	0.02	0.02	0.08	0.06
12700	61.8	134.27	137.63		137.66	0.00042	1.57	47.54	43.36		0.01	0.06	0.03
12600	61.8	134.23	137.62		137.63	0.00015	1.11	82.31	55.54	0.01	0.01	0.03	0.01
12500	61.8	133.98	137.62		137.62	4.8E-05	0.61	127.71	61.47	0	0.01	0.01	0.01
12400	61.8	133.93	137.62		137.62	3.7E-05	0.53	145.99	77.18	0	0	0.01	0
12300	61.8	133.89	137.6		137.61	0.00016	1.1	107.12	108.27	0.01	0.01	0.03	0.01
12216	61.8	133.7	137.58		137.6	0.00017	1.13	66.24	36.66	0.01	0.01	0.03	0.02
12190	61.8	133.53	137.57		137.59	0.00021	1.2	53.34	18.67		0.01	0.04	0.03
12180	94.3	133.23	137.31	135.64	137.56	0.00432	4.03	23.42	7.43			0.47	0.47
12147	Culvert			Foster Street									
12115	94.3	131.64	133.97	133.97	134.94	0.02535	7.89	11.95	6.28			2	2
12100	107.8	132.19	134.37	133.31	134.45	0.00197	2.29	47	27.68			0.2	0.2
12068	107.8	132.12	133.78		134.27	0.01597	5.61	19.2	13.48			1.3	1.3
12029	107.8	131.15	133.44		133.78	0.00871	4.7	22.92	12.88			0.86	0.86
11938	107.8	130.67	132.99		133.16	0.00477	3.61	41.17	48.83		0.14	0.5	0.24
11865	107.8	130.22	133.03		133.05	0.00033	1.16	125.97	88.21	0.01	0.03	0.05	0.03
11818	107.8	129.98	133.03		133.04	0.00019	0.84	172.54	124.76	0.01	0.02	0.02	0.02
11777	107.8	129.88	133.02		133.03	0.00016	0.91	196.12	122.92	0.01	0.02	0.03	0.02
11737	107.8	129.37	133.02		133.02	5.6E-05	0.56	308.01	183.73	0	0.01	0.01	0.01
11684	107.8	129.03	133.02		133.02	9.4E-05	0.68	282.37	189.95	0.01	0.01	0.02	0.01
11596	107.8	129.05	133.01		133.01	2.6E-05	0.5	398.87	184.62	0	0	0.01	0
11500	107.8	129.11	133.01		133.01	5E-06	0.22	821.04	278.21	0	0	0	0
11374	107.8	127.43	133.01		133.01	2E-06	0.16	1037.31	314	0	0	0	0
11242	107.8	127.35	133.01		133.01	0	0.09	1954.49	491.79	0	0	0	0
11146	122.8	126.19	133.01		133.01	2E-06	0.18	1276.06	300.79	0	0	0	0
11073	122.8	125.96	133.01		133.01	2E-06	0.2	921.15	229.04	0	0	0	0
11038	122.8	125.9	133.01		133.01	9E-06	0.39	476.43	172.74	0	0	0	0
11028	122.8	125.69	133.01	127.77	133.01	3.4E-05	0.62	293.73	172.9	0	0	0.01	0
11007	Culvert			Driveway off Paine Steet									
10986	43.1	125.54	130.14		130.15	7.8E-05	0.92	59.49	28.32	0	0	0.02	0.01
10976	43.1	125.53	130.14		130.15	8.4E-05	0.83	57	28.27	0	0	0.02	0.01
10948	43.1	125.51	130.14		130.15	3.1E-05	0.57	141.6	75.35	0	0	0.01	0

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FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 2 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
10905	43.1	125.6	130.14		130.15	3.3E-05	0.56	133.8	73.24	0	0	0.01	0
10869	43.1	125.81	130.14		130.14	3.1E-05	0.59	124.61	62.05	0	0	0.01	0
10859	43.1	125.74	130.12	127.14	130.14	0.00034	1.28	38.63	31.31	0	0.01	0.04	0.02
10848	Culvert			Footpath off Paine Steet									
10838	43.1	125.7	128.75		128.86	0.00198	2.56	16.81	7.44	0.01		0.2	0.19
10828	43.1	125.68	128.81		128.83	0.00018	1.09	48.37	28.67	0.01	0.01	0.03	0.02
10775	43.1	125.29	128.8		128.82	0.0002	1.13	55.91	37.65	0.01	0.02	0.03	0.02
10714	43.1	125.33	128.8		128.81	0.00009	0.89	62.42	31.69	0.01	0.01	0.02	0.01
10706	43.1	125.39	128.78	126.61	128.8	0.00023	1.24	40.67	22.4	0.01	0.01	0.04	0.02
10662	Culvert			Rice Steet									
10620	42.9	125.38	128.43		128.48	0.00083	1.85	23.74	12.99	0.02		0.1	0.08
10611	42.9	125.42	128.44		128.47	0.00038	1.45	30.41	15.65	0.01	0.01	0.05	0.04
10580	42.9	125.36	128.43		128.46	0.00024	1.17	37.1	25.14	0.01	0.01	0.04	0.02
10500	42.9	125.34	128.43		128.44	0.00014	0.92	77.07	73.2	0.01	0	0.02	0.01
10428	42.9	125.05	128.43		128.43	0.00003	0.48	165.96	132.58	0	0	0.01	0
10413	42.9	125.16	128.43	126.34	128.43	5.4E-05	0.59	128	99.09	0	0	0.01	0
10407	Culvert			Footpath off Smith Steet									
10393	42.9	125.15	127.95		128.01	0.00119	2.09	21.78	29.01	0	0.02	0.14	0.05
10383	42.9	125.2	127.97		127.99	0.00028	1.2	57.39	67.13	0.01	0.01	0.04	0.01
10337	42.9	124.92	127.97		127.98	0.00013	0.9	73.37	50.54	0.01	0.01	0.02	0.01
10273	42.9	125.15	127.95		127.97	0.00024	1.11	45.31	33.02	0	0.01	0.03	0.02
10263	42.9	125.2	127.94	126.15	127.97	0.00037	1.2	37.27	23.3	0.01		0.04	0.03
10133	Culvert			High School Field									
10000	42.9	123.6	124.97	124.7	125.26	0.01	4.31	9.96	8.57			0.64	0.64

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 10 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
Headwall at Caroline Street													
13078	98.8	134.48	139.24	135.98	139.27	0.0003	1.58	78.04	50.11	0	0.01	0.06	0.03
13061	98.8	134.6	139.18		139.26	0.00054	2.35	53.01	24.09	0.03	0.03	0.12	0.07
13000	98.8	135.1	139.18		139.22	0.00036	1.89	70.95	42.89	0.01	0.03	0.08	0.04
12900	98.8	134.82	139.1		139.18	0.00059	2.27	51.96	24.06	0.04	0.03	0.12	0.07
12800	98.8	134.65	139.07		139.12	0.00037	1.87	68.21	29.2	0.03	0.03	0.08	0.05
12750	98.8	134.39	139.06		139.11	0.00028	1.82	70.65	27.21	0.02	0.02	0.07	0.04
12700	98.8	134.27	139.08		139.09	9.6E-05	0.97	130.63	68.7	0	0.01	0.02	0.01
12600	98.8	134.23	139.07		139.08	0.00004	0.72	220.94	141.51	0	0.01	0.01	0
12500	98.8	133.98	139.07		139.08	0.00002	0.51	267.8	144.41	0	0	0.01	0
12400	98.8	133.93	139.07		139.07	1.2E-05	0.38	417.98	241.39	0	0	0	0
12300	98.8	133.89	139.07		139.07	0.00003	0.61	315.04	188.93	0	0	0.01	0
12216	98.8	133.7	139.06		139.07	7.3E-05	0.97	137.26	59.56	0.01	0.01	0.02	0.01
12190	98.8	133.53	139.04		139.06	0.00018	1.24	83.98	23.02		0.01	0.04	0.03
12180	147.4	133.23	138.74	136.34	139.03	0.00383	4.3	34.28	7.73			0.5	0.5
12147	Culvert			Foster Street									
12115	147.4	131.64	134.64	134.64	135.93	0.0269	9.11	16.19	6.38			2.51	2.51
12100	185.4	132.19	135.17	133.73	135.27	0.00177	2.64	70.22	30.58			0.24	0.24
12068	185.4	132.12	134.42		135.09	0.01534	6.58	28.16	14.71			1.64	1.64
12029	185.4	131.15	133.9		134.53	0.01299	6.38	29.07	13.65			1.5	1.5
11938	185.4	130.67	133.24		133.52	0.00787	4.89	55.92	62.8		0.28	0.89	0.42
11865	185.4	130.22	133.31		133.34	0.0006	1.69	151.13	96	0.02	0.06	0.09	0.06
11818	185.4	129.98	133.3		133.31	0.00035	1.22	207.49	133.97	0.02	0.03	0.05	0.03
11777	185.4	129.88	133.29		133.3	0.00031	1.33	229.61	130.55	0.02	0.03	0.06	0.03
11737	185.4	129.37	133.28		133.29	0.00011	0.82	356.97	187.03	0.01	0.01	0.02	0.01
11684	185.4	129.03	133.28		133.28	0.00017	0.96	333.4	200.89	0.02	0.02	0.03	0.02
11596	185.4	129.05	133.27		133.27	5.6E-05	0.76	447.96	196.99	0.01	0.01	0.01	0.01
11500	185.4	129.11	133.27		133.27	1.1E-05	0.35	893.07	282.09	0	0	0	0
11374	185.4	127.43	133.27		133.27	4E-06	0.25	1119.5	325.24	0	0	0	0
11242	185.4	127.35	133.27		133.27	1E-06	0.15	2082.17	503.01	0	0	0	0
11146	188	126.19	133.27		133.27	4E-06	0.25	1353.89	305.97	0	0	0	0
11073	188	125.96	133.27		133.27	5E-06	0.28	982.07	245.93	0	0	0	0
11038	188	125.9	133.27		133.27	1.5E-05	0.53	521.81	182.98	0	0	0.01	0
11028	188	125.69	133.26	128.38	133.27	5.2E-05	0.78	339.17	184.96	0.01	0	0.01	0.01
11007	Culvert		Driveway off Paine Steet										
10986	96.2	125.54	131.57		131.59	0.0001	1.28	124.86	75.96	0	0.01	0.03	0.01
10976	96.2	125.53	131.57		131.58	8.9E-05	1.05	147.25	80.03	0.01	0.01	0.02	0.01
10948	96.2	125.51	131.58		131.58	2.9E-05	0.68	263.2	94.69	0	0	0.01	0.01

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 10 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
10905	96.2	125.6	131.58		131.58	2.9E-05	0.65	253.14	101.79	0	0	0.01	0
10869	96.2	125.81	131.57		131.58	3.1E-05	0.72	234.52	86.97	0	0	0.01	0.01
10859	96.2	125.74	131.57	127.98	131.58	0.00011	0.92	137.11	83.09	0.01	0.01	0.02	0.01
10848	Culvert			Footpath off Paine Steet									
10838	96.2	125.7	130.44		130.53	0.00107	2.61	48.14	45.03	0.03	0.02	0.17	0.07
10828	96.2	125.68	130.49		130.51	0.0001	1.14	118.24	61.14	0.01	0.01	0.03	0.01
10775	96.2	125.29	130.49		130.5	9.4E-05	1.04	154.94	82.79	0.01	0.01	0.02	0.01
10714	96.2	125.33	130.48		130.5	7.3E-05	1.05	130.31	48.8	0.01	0.01	0.02	0.01
10706	96.2	125.39	130.47	127.28	130.49	0.00016	1.41	91.25	38.94	0.02	0.01	0.04	0.02
10662	Culvert			Rice Steet									
10620	79.6	125.38	129.13		129.22	0.00105	2.49	34.01	16.44	0.05	0.01	0.16	0.12
10611	79.6	125.42	129.14		129.2	0.00048	1.92	42.43	18.43	0.03	0.02	0.09	0.06
10580	79.6	125.36	129.15		129.19	0.00022	1.33	61.7	42.73	0.01	0.01	0.04	0.02
10500	79.6	125.34	129.16		129.17	0.00012	1.01	144.76	104.82	0.01	0.01	0.02	0.01
10428	79.6	125.05	129.16		129.16	3.2E-05	0.57	273.14	161.11	0	0	0.01	0
10413	79.6	125.16	129.16	126.96	129.16	4.9E-05	0.65	209.94	130.24	0.01	0	0.01	0
10407	Culvert			Footpath off Smith Steet									
10393	79.6	125.15	129.13		129.15	0.00027	1.32	110.15	92.95	0.02	0.01	0.05	0.02
10383	79.6	125.2	129.13		129.14	0.00012	1.02	150.21	92.26	0.01	0.01	0.02	0.01
10337	79.6	124.92	129.13		129.14	8.7E-05	0.92	144.59	72.2	0.01	0.01	0.02	0.01
10273	79.6	125.15	129.12		129.13	0.00013	1.08	100.79	59.76	0.01	0.01	0.03	0.01
10263	79.6	125.2	129.11	126.58	129.13	0.0002	1.2	79.64	51.82	0.01	0.01	0.04	0.02
10133	Culvert			High School Field									
10000	79.6	123.6	125.57	125.21	125.98	0.01001	5.16	15.41	9.67			0.84	0.84

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 25 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
Headwall at Caroline Street													
13078	105.8	134.48	139.44	136.04	139.47	0.00027	1.55	89.15	60.52	0	0.01	0.06	0.02
13061	105.8	134.6	139.38		139.46	0.00052	2.37	57.97	25.92	0.03	0.03	0.12	0.06
13000	105.8	135.1	139.38		139.42	0.00036	1.94	80.62	56.07	0.02	0.02	0.08	0.03
12900	105.8	134.82	139.31		139.38	0.00055	2.27	57.23	30.65	0.04	0.02	0.12	0.06
12800	105.8	134.65	139.28		139.33	0.00035	1.87	74.38	30.82	0.03	0.03	0.08	0.05
12750	105.8	134.39	139.26		139.31	0.00027	1.84	76.74	34.33	0.02	0.02	0.07	0.04
12700	105.8	134.27	139.28		139.29	8.3E-05	0.93	145.16	71.29	0	0.01	0.02	0.01
12600	105.8	134.23	139.28		139.29	3.3E-05	0.68	250.69	144.23	0	0	0.01	0
12500	105.8	133.98	139.28		139.28	1.8E-05	0.49	298.49	149.63	0	0	0.01	0
12400	105.8	133.93	139.28		139.28	0.00001	0.37	468.8	246.07	0	0	0	0
12300	105.8	133.89	139.28		139.28	2.4E-05	0.57	354.82	191.57	0	0	0.01	0
12216	105.8	133.7	139.27		139.28	6.7E-05	0.95	150.09	62.82	0.01	0.01	0.02	0.01
12190	105.8	133.53	139.25		139.27	0.00018	1.26	90.25	37.48	0	0.02	0.04	0.02
12180	154.6	133.23	138.95	136.42	139.24	0.00374	4.31	35.89	7.77			0.5	0.5
12147	Culvert			Foster Street									
12115	154.6	131.64	134.72	134.72	136.05	0.02711	9.25	16.72	6.39			2.57	2.57
12100	202.1	132.19	135.32	133.8	135.43	0.00174	2.7	74.91	31.12			0.25	0.25
12068	202.1	132.12	134.54		135.25	0.01514	6.73	30.03	14.95			1.69	1.69
12029	202.1	131.15	134.01	133.63	134.69	0.01337	6.61	30.58	13.84			1.59	1.59
11938	202.1	130.67	133.24	133.01	133.58	0.0094	5.35	55.79	62.77		0.34	1.06	0.5
11865	202.1	130.22	133.32		133.36	0.0007	1.83	152.32	96.38	0.03	0.06	0.11	0.07
11818	202.1	129.98	133.31		133.33	0.00041	1.32	208.92	134.29	0.02	0.04	0.06	0.04
11777	202.1	129.88	133.29		133.31	0.00036	1.44	230.74	130.8	0.03	0.04	0.07	0.04
11737	202.1	129.37	133.29		133.3	0.00012	0.89	358.56	187.14	0.01	0.02	0.02	0.01
11684	202.1	129.03	133.28		133.29	0.0002	1.04	334.83	201.09	0.02	0.02	0.03	0.02
11596	202.1	129.05	133.28		133.28	6.6E-05	0.83	449.15	197.28	0.01	0.01	0.02	0.01
11500	202.1	129.11	133.28		133.28	1.3E-05	0.38	894.75	282.18	0	0	0	0
11374	202.1	127.43	133.28		133.28	5E-06	0.28	1121.41	325.47	0	0	0	0
11242	202.1	127.35	133.28		133.28	1E-06	0.16	2085.1	503.19	0	0	0	0
11146	184.4	126.19	133.27		133.28	4E-06	0.25	1355.68	306.09	0	0	0	0
11073	184.4	125.96	133.27		133.27	4E-06	0.28	983.52	246.15	0	0	0	0
11038	184.4	125.9	133.27		133.27	1.5E-05	0.52	522.9	183.22	0	0	0.01	0
11028	184.4	125.69	133.27	128.35	133.27	4.9E-05	0.77	340.31	185.24	0.01	0	0.01	0.01
11007	Culvert		Driveway off Paine Steet										
10986	125.8	125.54	131.85		131.87	0.00013	1.48	147.42	87.32	0.01	0.01	0.04	0.01
10976	125.8	125.53	131.85		131.87	0.00011	1.22	170.62	92.15	0.01	0.01	0.03	0.01
10948	125.8	125.51	131.86		131.86	3.8E-05	0.8	291.01	103.53	0.01	0	0.01	0.01

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 25 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
10905	125.8	125.6	131.86		131.86	3.8E-05	0.76	284.92	122.51	0.01	0	0.01	0.01
10869	125.8	125.81	131.85		131.86	4.1E-05	0.85	259.27	90.17	0.01	0.01	0.01	0.01
10859	125.8	125.74	131.85	128.36	131.86	0.00011	1	160.75	86.31	0.01	0.01	0.02	0.01
10848	Culvert			Footpath off Paine Steet									
10838	125.8	125.7	131.58		131.6	0.00027	1.55	111.69	79.45	0.02	0.01	0.06	0.02
10828	125.8	125.68	131.59		131.6	4.7E-05	0.89	204.6	96.6	0.01	0	0.02	0.01
10775	125.8	125.29	131.59		131.59	0.00004	0.79	253.58	97.92	0	0.01	0.01	0.01
10714	125.8	125.33	131.58		131.59	5.6E-05	1.06	193.23	72.78	0.01	0.01	0.02	0.01
10706	125.8	125.39	131.57	127.59	131.59	0.00011	1.34	141.07	58.03	0.01	0.01	0.04	0.02
10662	Culvert			Rice Steet									
10620	92.7	125.38	129.26		129.37	0.0012	2.74	36.23	17.11	0.06	0.02	0.19	0.14
10611	92.7	125.42	129.28		129.35	0.00055	2.11	44.96	18.99	0.03	0.03	0.11	0.07
10580	92.7	125.36	129.29		129.33	0.00024	1.41	67.87	45.72	0.02	0.01	0.05	0.02
10500	92.7	125.34	129.3		129.31	0.00013	1.07	159.89	108.55	0.01	0.01	0.03	0.01
10428	92.7	125.05	129.3		129.3	3.6E-05	0.62	296.32	166.03	0	0	0.01	0
10413	92.7	125.16	129.3	127.05	129.3	5.4E-05	0.69	229.11	140.35	0.01	0	0.01	0.01
10407	Culvert			Footpath off Smith Steet									
10393	92.7	125.15	129.28		129.29	0.00028	1.36	123.84	97.31	0.02	0.01	0.05	0.02
10383	92.7	125.2	129.28		129.29	0.00013	1.09	163.64	95.27	0.01	0.01	0.03	0.01
10337	92.7	124.92	129.27		129.28	9.9E-05	1	155.06	74.81	0.01	0.01	0.02	0.01
10273	92.7	125.15	129.26		129.27	0.00015	1.17	109.3	60.99	0.01	0.01	0.03	0.02
10263	92.7	125.2	129.25	126.82	129.27	0.00022	1.29	87.1	53.94	0.01	0.01	0.04	0.02
10133	Culvert			High School Field									
10000	92.7	123.6	125.75	125.36	126.2	0.01	5.39	17.2	10			0.89	0.89

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 100 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
				Headwall at Caroline Street									
13078	125.8	134.48	140.01	136.22	140.03	0.00014	1.2	168.66	181.09	0	0.01	0.03	0.01
13061	125.8	134.6	139.95		140.02	0.00041	2.28	86.53	109.51	0.01	0.01	0.11	0.02
13000	125.8	135.1	139.96		139.98	0.00024	1.72	131.64	113.94	0.01	0.01	0.06	0.02
12900	125.8	134.82	139.9		139.95	0.00039	2.09	89.07	72.36	0.03	0.01	0.1	0.03
12800	125.8	134.65	139.87		139.92	0.00029	1.85	95.25	41.93	0.03	0.02	0.07	0.04
12750	125.8	134.39	139.86		139.9	0.00022	1.8	101.83	47.98	0.02	0.01	0.07	0.03
12700	125.8	134.27	139.88		139.89	5.7E-05	0.84	190.56	89.84	0	0.01	0.02	0.01
12600	125.8	134.23	139.88		139.88	0.00002	0.58	339.25	152.03	0	0	0.01	0
12500	125.8	133.98	139.88		139.88	1.3E-05	0.45	391.83	162.46	0	0	0	0
12400	125.8	133.93	139.88		139.88	7E-06	0.33	620.06	259.52	0	0	0	0
12300	125.8	133.89	139.88		139.88	1.5E-05	0.48	471.91	199.13	0	0	0	0
12216	125.8	133.7	139.87		139.88	5.2E-05	0.9	190.29	70.74	0.01	0.01	0.02	0.01
12190	125.8	133.53	139.85		139.87	0.00017	1.24	121.29	62.46	0.01	0.02	0.04	0.02
12180	172.9	133.23	139.56	136.64	139.84	0.0034	4.25	40.66	7.97			0.48	0.48
12147	Culvert			Foster Street									
12115	172.9	131.64	134.93	134.93	136.36	0.02759	9.58	18.05	6.42			2.73	2.73
12100	245	132.19	135.69	133.98	135.81	0.00167	2.83	86.62	32.44			0.27	0.27
12068	245	132.12	134.88	134.57	135.63	0.01384	6.93	35.68	18.22		0.12	1.72	1.52
12029	245	131.15	134.15	133.92	135.03	0.01636	7.51	32.61	14.09			2.03	2.03
11938	245	130.67	133.37		133.73	0.01005	5.67	64.03	64.63		0.43	1.18	0.6
11865	245	130.22	133.44		133.48	0.00084	2.07	163.95	100.34	0.04	0.08	0.14	0.08
11818	245	129.98	133.42		133.45	0.00049	1.5	224.79	137.87	0.03	0.05	0.08	0.05
11777	245	129.88	133.41		133.43	0.00044	1.63	245.81	134.19	0.04	0.05	0.08	0.05
11737	245	129.37	133.41		133.41	0.00015	1.01	379.93	188.56	0.02	0.02	0.03	0.02
11684	245	129.03	133.4		133.4	0.00025	1.17	357.46	203.63	0.03	0.02	0.04	0.03
11596	245	129.05	133.39		133.39	8.4E-05	0.95	471.11	202.53	0.01	0.01	0.02	0.01
11500	245	129.11	133.39		133.39	1.7E-05	0.45	925.81	283.83	0	0	0	0
11374	245	127.43	133.38		133.39	7E-06	0.32	1157.27	329.64	0	0	0	0
11242	245	127.35	133.38		133.38	2E-06	0.19	2140.39	506.65	0	0	0	0
11146	208.9	126.19	133.38		133.38	4E-06	0.27	1389.3	308.3	0	0	0	0
11073	208.9	125.96	133.38		133.38	5E-06	0.31	1010.64	249.25	0	0	0	0
11038	208.9	125.9	133.38		133.38	1.7E-05	0.56	543.11	187.68	0	0	0.01	0
11028	208.9	125.69	133.38	128.57	133.38	5.3E-05	0.81	360.73	191.02	0.01	0	0.01	0.01
11007	Culvert			Driveway off Paine Steet									
10986	168.1	125.54	133.22		133.23	4.2E-05	0.97	330.43	155.82	0	0	0.02	0.01
10976	168.1	125.53	133.22		133.23	3.6E-05	0.8	336.86	148.72	0	0	0.01	0
10948	168.1	125.51	133.22		133.23	0.00002	0.65	466.3	155.94	0	0	0.01	0

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Caroline Brook - 100 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
10905	168.1	125.6	133.22		133.23	1.6E-05	0.58	492.77	174.97	0	0	0.01	0
10869	168.1	125.81	133.22		133.22	0.00002	0.68	445.33	176.23	0	0	0.01	0
10859	168.1	125.74	133.22	128.85	133.22	3.6E-05	0.67	337.86	174.24	0	0	0.01	0
10848	Culvert			Footpath off Paine Steet									
10838	168.1	125.7	133.19		133.2	4.3E-05	0.75	310.83	159.15	0.01	0	0.01	0.01
10828	168.1	125.68	133.2		133.2	1.6E-05	0.62	400.45	157.74	0	0	0.01	0
10775	168.1	125.29	133.19		133.2	1.6E-05	0.58	431.5	132.03	0	0	0.01	0
10714	168.1	125.33	133.19		133.2	2.4E-05	0.8	338.99	102.02	0	0	0.01	0
10706	168.1	125.39	133.18	127.96	133.2	0.00005	1.07	262.39	99.36	0.01	0.01	0.02	0.01
10662	Culvert			Rice Steet									
10620	126.3	125.38	129.48		129.65	0.0017	3.41	40.06	18.21	0.09	0.04	0.29	0.21
10611	126.3	125.42	129.51		129.62	0.00076	2.6	49.4	19.94	0.05	0.04	0.16	0.11
10580	126.3	125.36	129.53		129.59	0.0003	1.65	79.51	50.88	0.02	0.01	0.06	0.03
10500	126.3	125.34	129.55		129.56	0.00016	1.25	187.56	115.06	0.02	0.01	0.04	0.02
10428	126.3	125.05	129.55		129.55	4.7E-05	0.74	338.44	173.59	0.01	0	0.01	0.01
10413	126.3	125.16	129.54	127.21	129.55	6.9E-05	0.82	265.32	151.95	0.01	0.01	0.02	0.01
10407	Culvert			Footpath off Smith Steet									
10393	126.3	125.15	129.52		129.54	0.00032	1.52	148.78	104.8	0.03	0.02	0.06	0.03
10383	126.3	125.2	129.52		129.54	0.00017	1.3	187.67	100.43	0.02	0.02	0.04	0.02
10337	126.3	124.92	129.52		129.53	0.00014	1.22	173.81	79.27	0.02	0.01	0.03	0.02
10273	126.3	125.15	129.5		129.52	0.0002	1.41	124.08	63.08	0.01	0.02	0.04	0.02
10263	126.3	125.2	129.49	127.11	129.52	0.00029	1.54	100.02	55.79	0.02	0.01	0.06	0.03
10133	Culvert			High School Field									
10000	126.3	123.6	126.17	125.72	126.7	0.01	5.87	21.53	10.76			1.01	1.01

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Fuller Brook - 1 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
				Culvert at High School Field									
8197	42.3	122.35	124.79	123.49	124.87	0.00164	2.26	18.76	8.5			0.15	0.15
8020	42.3	120.77	124.75		124.76	0.00022	0.82	56.32	36.63	0.01	0	0.04	0.02
7940	42.3	120.34	124.76		124.76	1E-06	0.09	515.99	186.03	0	0	0	0
7790	42.3	120.64	124.76		124.76	2E-06	0.14	301.93	121.73	0	0	0	0
7656	42.3	120.47	124.76		124.76	6E-06	0.16	268.5	109.44	0	0	0	0
7527	42.3	121.85	124.68		124.75	0.00243	2.15	19.66	17.53			0.16	0.16
7505	42.3	121.4	124.65		124.71	0.00112	1.96	22.04	12.43	0.02		0.12	0.11
7495	42.3	121.38	124.56	122.75	124.69	0.00286	2.8	15.11	4.8			0.24	0.24
7489	Culvert			Footpath at Skating Pond									
7481	42.3	121.77	124.45		124.63	0.0045	3.34	12.68	4.8			0.36	0.36
7474	42.3	121.95	124.24		124.56	0.01011	4.52	9.35	4.16			0.69	0.69
7431	42.8	122.06	124.28		124.34	0.00172	1.94	22.3	21.13		0.01	0.12	0.11
7379	42.8	122.09	123.55	123.55	124.07	0.0209	5.79	7.41	7.47		0.08	1.19	1.16
7354	42.8	121.3	123.7	122.02	123.73	0.00038	1.24	34.55	16.52			0.04	0.04
7329	Culvert			State Street									
7307	44.1	121.82	123.58		123.62	0.00079	1.5	29.44	20.32		0	0.07	0.07
7290	44.1	121.68	123.56		123.6	0.00098	1.69	26.06	17.02			0.09	0.09
7190	44.1	121.19	123.51		123.53	0.00042	1.28	36.33	26.31	0.01	0.01	0.05	0.04
7133	44.1	121.18	123.46		123.5	0.00079	1.54	29.94	24.01	0.01	0.01	0.07	0.06
7081	44.1	120.97	123.44		123.46	0.00056	1.33	33.09	20.32			0.05	0.05
7015	44.1	120.78	123.41		123.43	0.00039	1.31	36.87	29.41	0.01	0.01	0.05	0.03
6941	44.1	120.29	123.38		123.41	0.00031	1.19	42.11	33.81	0.01	0	0.04	0.02
6879	44.1	120.49	123.38		123.39	0.00018	0.87	50.65	26.28	0	0	0.02	0.02
6837	44.1	121.17	123.3		123.37	0.00105	2.12	20.75	10.24			0.1	0.1
6810	44.1	121.13	122.98	122.06	123.08	0.00297	2.58	17.32	10.32		0.05	0.27	0.25
6805	Bridge			Footbridge to Morton Street									
6800	44.1	121.12	122.94		123.05	0.00367	2.65	16.67	10.84			0.29	0.29
6767	44.1	120.7	122.89		122.92	0.0009	1.5	29.99	21.19	0	0.01	0.09	0.08
6681	44.1	120.47	122.84		122.87	0.00041	1.31	34.25	25.15		0	0.04	0.03
6593	44.1	120.53	122.81		122.84	0.00037	1.26	35.03	21.88			0.03	0.03
6496	44.1	120.18	122.77		122.8	0.00039	1.28	34.76	24.15		0	0.04	0.03
6457	44.1	120.26	122.75		122.78	0.00053	1.51	29.67	21.97		0	0.05	0.04
6400	44.1	119.85	122.73		122.75	0.00036	1.33	33.88	22.13	0	0	0.04	0.03
6346	44.1	120.43	122.71		122.73	0.00032	1.21	37.68	30.53	0	0	0.03	0.02
6304	44.1	120.04	122.68		122.72	0.00053	1.59	28.29	19.19		0.01	0.05	0.04
6254	44.1	120.21	122.67		122.69	0.00031	1.07	41.18	28.36			0.03	0.03
6217	44.1	119.99	122.65		122.68	0.00032	1.26	36.12	24.63		0.01	0.03	0.03

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Fuller Brook - 1 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
6188	44.1	119.87	122.63		122.67	0.00044	1.46	30.96	21.56	0	0	0.05	0.04
6144	44.1	120.34	122.62		122.65	0.00035	1.32	33.44	18.15			0.04	0.04
6106	44.1	120.37	122.6		122.63	0.00037	1.35	32.57	17.48			0.04	0.04
6062	44.1	119.87	122.58		122.62	0.0003	1.59	27.84	14.05		0	0.03	0.03
6044	44.1	119.96	122.51		122.6	0.00127	2.39	18.41	8.94			0.13	0.13
6039	44.1	119.97	122.54	121.01	122.58	0.00056	1.7	25.89	11.74			0.06	0.06
6017	Culvert			Wellesley Avenue									
5989	45.6	119.98	122.27		122.34	0.00111	2.18	20.95	10.97			0.11	0.11
5979	45.6	119.96	122.26		122.33	0.00107	2.06	22.11	13.98			0.1	0.1
5941	45.6	119.92	122.25		122.29	0.00054	1.54	29.7	18.41			0.05	0.05
5911	45.6	120.48	122.21		122.27	0.00116	1.92	23.79	18.78		0	0.09	0.09
5892	45.6	120.37	122.19		122.24	0.001	1.84	24.78	18.54			0.08	0.08
5860	45.6	119.56	122.18		122.22	0.00061	1.61	28.39	17.01			0.06	0.06
5838	45.6	119.99	122.16		122.2	0.00067	1.67	27.34	17.16			0.06	0.06
5803	45.6	120.19	122.14		122.18	0.00063	1.47	30.95	23.3			0.05	0.05
5773	45.6	120.04	122.1		122.15	0.00091	1.91	23.92	15.24			0.08	0.08
5744	45.6	119.38	122.09		122.12	0.00065	1.54	29.58	21.21		0	0.05	0.05
5689	45.6	120.13	122.03		122.08	0.00086	1.8	25.35	17.37			0.07	0.07
5634	45.6	120.24	121.98		122.03	0.00095	1.81	25.2	18.14			0.08	0.08
5593	45.6	120.01	121.95		122	0.00071	1.65	27.62	18.17			0.06	0.06
5554	45.6	120.07	121.9		121.96	0.00121	1.96	23.27	18.09			0.09	0.09
5537	45.6	119.71	121.9		121.94	0.00056	1.56	29.29	17.69			0.05	0.05
5512	45.6	119.38	121.88		121.92	0.0006	1.65	28.03	17.42		0.01	0.06	0.06
5476	45.6	119.31	121.87		121.9	0.00034	1.36	33.41	16.63			0.04	0.04
5419	45.6	120.06	121.84		121.88	0.0007	1.6	28.56	20.17			0.06	0.06
5320	45.6	119.89	121.79		121.82	0.00043	1.39	33.29	22.16	0.01	0	0.04	0.04
5220	45.6	119.71	121.75		121.78	0.00041	1.35	36.15	27.09	0	0.01	0.04	0.03
5194	45.6	120.02	121.68		121.75	0.00143	2.14	21.36	17.13	0.01		0.11	0.11
5185	45.6	119.74	121.68	120.56	121.74	0.00116	1.85	24.63	13.66			0.11	0.11
5161	Culvert			Brook Street									
5133	46.9	119.57	121.37		121.42	0.0009	1.89	24.78	15.07			0.08	0.08
5116	46.9	120.04	121.33		121.4	0.00195	2.08	22.56	23.6			0.11	0.11
5015	46.9	119.59	121.08		121.18	0.00237	2.56	18.29	15.63			0.16	0.16
4915	46.9	119.32	120.95		121.01	0.00112	1.93	24.61	20.62		0.01	0.09	0.08
4878	46.9	119.28	120.91		120.94	0.00065	1.47	34.82	31.12		0.03	0.05	0.04
4829	94.8	118.65	120.72		120.86	0.00219	3.08	30.8	18.87			0.21	0.21
4729	94.8	118.41	120.55		120.67	0.00159	2.78	34.06	18.31			0.17	0.17
4698	94.8	116.33	120.61		120.63	0.00016	1.2	78.83	26.74			0.03	0.03

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Fuller Brook - 1 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
4670	94.8	116.31	120.56		120.62	0.00045	1.95	48.56	14.92			0.07	0.07
4642	94.8	118.39	120.49		120.59	0.00133	2.53	37.45	21.06	0.01		0.14	0.14
4598	94.8	118.02	120.47		120.54	0.00083	2.21	42.84	19.29			0.1	0.1
4538	94.8	118.31	120.38		120.48	0.00137	2.52	37.59	21.31			0.14	0.14
4511	94.8	116.1	120.43		120.44	0.00012	1.11	85.7	25.27			0.02	0.02
4485	94.8	117.25	120.38		120.43	0.00058	1.92	49.97	25.11		0.01	0.07	0.07
4463	94.8	117.74	120.37		120.42	0.00054	1.76	53.87	26.85			0.06	0.06
4443	94.8	116.8	120.38	117.93	120.41	0.0002	1.35	70.38	23.79			0.03	0.03
4418	Culvert			Cameron Street									
4397	115	117.19	119.83		120.09	0.0034	4.13	27.86	14.43			0.36	0.36
4365	115	115.42	119.99		120.01	0.00011	1.11	105.06	32.91		0	0.02	0.02
4310	115	118.1	119.85		119.98	0.00217	2.89	39.81	25.95			0.19	0.19
4260	115	116.88	119.78		119.9	0.00126	2.68	42.87	20.19			0.15	0.15
4208	115	116.48	119.77		119.84	0.00062	2.16	53.29	20.55			0.09	0.09
4106	115	117.21	119.6		119.74	0.00166	2.99	38.51	18.4			0.19	0.19
4070	115	117.01	119.51		119.67	0.00185	3.26	35.41	17.35	0.03		0.22	0.21
4060	115	117.12	119.28		119.63	0.00259	4.75	24.2	14.3			0.23	0.23
4018	115	116.66	118.54	118.54	119.41	0.00697	7.48	15.38	8.96			0.58	0.58
4011	115	114.27	117.73	116.18	117.95	0.00105	3.82	30.07	10.03			0.13	0.13
3961	115	115.01	117.75		117.87	0.00091	2.8	41.1	16.44			0.11	0.11
3941	115	115.14	117.76	116.31	117.84	0.00082	2.25	51.13	21.19			0.1	0.1
3905	Culvert			Grove Street									
3872	118	114.73	117.7		117.76	0.00061	2.09	56.43	21.93			0.09	0.09
3851	118	114.57	117.67		117.75	0.00112	2.16	54.51	25.54			0.14	0.14
3775	118	114.04	117.42		117.61	0.00249	3.53	33.44	16.76			0.27	0.27
3696	118	113.63	117.18		117.4	0.00281	3.78	31.28	15.3	0.02		0.3	0.29
3595	118	113.34	116.92		117.13	0.00253	3.71	32.21	16.21	0.03	0.03	0.29	0.25
3495	118	113.23	116.83		116.94	0.00105	2.69	48.02	23.55	0.03	0.05	0.14	0.11
3404	118	113.18	116.44		116.73	0.00693	4.29	27.53	13.29			0.72	0.72
3315	118	113.64	116.27		116.41	0.00169	3.01	39.48	21.26		0.01	0.19	0.17
3208	118	112.47	116.17		116.27	0.00093	2.52	50.27	23.95	0.04	0.04	0.13	0.1
3094	118	112.39	115.99		116.14	0.0014	3.07	39.58	16.46	0.05		0.19	0.17
3021	118	112.18	115.85		116.02	0.00181	3.27	37.22	17.9		0.05	0.22	0.19
2923	118	112.1	115.58		115.79	0.00279	3.79	32.42	18.71	0.03	0.09	0.3	0.24
2832	118	111.9	115.42		115.57	0.00193	3.11	38.48	21.11	0.04	0.01	0.21	0.19
2732	118	111.64	115.19		115.36	0.00222	3.27	36.98	20.79		0.05	0.23	0.21
2632	118	111.33	115.07		115.19	0.00113	2.76	46.47	22.67	0.04	0.06	0.15	0.12
2584	118	111.27	115.02		115.13	0.00107	2.75	43.89	19.72	0.02	0.02	0.15	0.13

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FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Fuller Brook - 1 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
2539	118	111.91	115.02		115.09	0.00052	2	59.49	24.61	0.01		0.08	0.07
2522	118	111.97	114.98	113.21	115.07	0.00088	2.47	47.69	16.32			0.12	0.12
2505	Culvert			Cottage Street									
2486	119	112.01	114.94		115.03	0.00083	2.53	46.95	16.23			0.11	0.11
2467	119	111.21	114.95		115.01	0.00058	1.99	60.09	25.82		0.01	0.08	0.08
2392	119	110.97	114.83		114.94	0.00126	2.64	45.05	20.98		0.01	0.15	0.14
2332	119	110.97	114.75		114.86	0.00135	2.74	43.66	20.71		0.01	0.15	0.14
2281	119	110.92	114.68		114.79	0.00145	2.64	45.12	23.49			0.15	0.15
2223	119	110.63	114.59		114.7	0.00154	2.77	43.15	22.55		0.02	0.16	0.16
2175	119	110.37	114.52		114.63	0.00148	2.72	43.91	22.2		0.02	0.16	0.15
2096	119	111.55	114.41		114.5	0.00169	2.38	50.31	25.03	0.03		0.21	0.2
2068	119	111.34	114.25	113.05	114.36	0.00139	2.62	45.4	21.71			0.16	0.16
2063	Bridge		Footbridge to Appleby Road										
2057	119	111.14	114.18		114.34	0.00301	3.2	37.55	16.97	0.05		0.37	0.34
2023	119	110.29	114.04		114.14	0.00259	2.58	46.17	24.32	0.02		0.26	0.25
1937	119	110.04	113.94		114.02	0.0008	2.21	53.81	25.45		0	0.1	0.1
1849	119	111.05	113.84		113.92	0.00147	2.35	51.14	24.11		0.03	0.19	0.18
1826	119	111.39	113.53	112.68	113.73	0.00465	3.63	32.78	16.74			0.5	0.5
1821	Bridge		Footbridge to Leighton Road										
1816	119	110.75	113.41		113.67	0.0056	4.14	28.76	12.06			0.63	0.63
1811	119	110.68	113.44		113.62	0.00426	3.37	35.29	19.68	0.02		0.44	0.43
1764	119	109.4	113.52		113.55	0.0002	1.49	90.41	34.63	0.01	0.01	0.04	0.03
1685	119	109.72	113.46		113.53	0.00051	2.02	59.35	24.07	0.01	0.01	0.08	0.07
1609	119	110.59	113.41		113.48	0.00079	2.09	58.23	27.09	0.02	0.01	0.11	0.1
1520	119	110.12	113.34		113.41	0.00083	2.09	56.91	22.81			0.12	0.12
1448	119	109.4	113.25		113.34	0.00111	2.3	51.75	21.17			0.14	0.14
1348	119	109.77	112.89		112.97	0.11075	2.27	52.38	24.05		0.42	14.1	13.63
1271	119	108.7	111.73		111.94	0.00491	3.68	32.35	19.7			0.42	0.42
1218	119	108.45	111.56		111.72	0.00302	3.24	36.72	19.22		0.01	0.31	0.3
1127	119	108.42	111.05		111.31	0.00711	4.09	29.08	17.91			0.54	0.54
1068	119	108.46	111.06		111.14	0.00089	2.29	52.04	25.51			0.11	0.11
1057	119	108.73	110.86	110.16	111.1	0.0034	3.96	30.07	16.42			0.34	0.34
1036	Culvert			Dover Road									
1024	119	107.9	110.92		111.04	0.00114	2.73	43.53	16.09			0.15	0.15
1000	119	109.46	110.47	110.47	110.93	0.01424	5.45	21.83	23.9			0.79	0.79

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FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Fuller Brook - 2 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
				Culvert at High School Field									
8197	63.1	122.35	125.35	123.77	125.46	0.00192	2.68	23.57	8.5			0.21	0.21
8020	63.1	120.77	125.35		125.36	0.00019	0.84	96.41	80.05	0.01	0.01	0.03	0.01
7940	63.1	120.34	125.35		125.35	1E-06	0.11	629.36	195.4	0	0	0	0
7790	63.1	120.64	125.35		125.35	2E-06	0.18	380.4	135.19	0	0	0	0
7656	63.1	120.47	125.35		125.35	6E-06	0.2	335.35	114.56	0	0	0	0
7527	63.1	121.85	125.28		125.34	0.00145	1.98	32.64	30.29		0.01	0.12	0.09
7505	63.1	121.4	125.24		125.32	0.00107	2.2	29.97	14.33	0.04		0.14	0.12
7495	63.1	121.38	125.09	123.16	125.28	0.0043	3.58	17.62	4.8			0.39	0.39
7489	Culvert			Footpath at Skating Pond									
7481	63.1	121.77	124.92		125.19	0.00658	4.23	14.9	4.8			0.56	0.56
7474	63.1	121.95	124.54		125.09	0.01629	5.96	10.58	4.16			1.17	1.17
7431	64.3	122.06	124.69		124.76	0.00147	2.13	33.37	32.23		0.03	0.14	0.09
7379	64.3	122.09	123.94	123.94	124.52	0.01879	6.16	10.65	9.65		0.27	1.28	1.17
7354	64.3	121.3	124.28	122.24	124.31	0.00041	1.45	44.26	17.44			0.06	0.06
7329	Culvert			State Street									
7307	66.4	121.82	124.13		124.17	0.00064	1.64	40.93	22.06	0	0.01	0.08	0.07
7290	66.4	121.68	124.1		124.15	0.00089	1.85	35.8	18.82			0.1	0.1
7190	66.4	121.19	124.06		124.09	0.00036	1.42	53.44	35.4	0.01	0.01	0.05	0.03
7133	66.4	121.18	124.02		124.07	0.0006	1.65	45.26	30.65	0.01	0.02	0.07	0.05
7081	66.4	120.97	124		124.04	0.00049	1.47	45.86	25.41	0	0.01	0.06	0.05
7015	66.4	120.78	123.98		124.01	0.00033	1.42	57.76	43.58	0.01	0.01	0.05	0.03
6941	66.4	120.29	123.96		123.98	0.00028	1.31	65.18	45.22	0.01	0.01	0.04	0.02
6879	66.4	120.49	123.95		123.97	0.00017	1.02	68.24	34.85	0	0	0.03	0.02
6837	66.4	121.17	123.85		123.94	0.00118	2.51	26.43	10.47			0.13	0.13
6810	66.4	121.13	123.5	122.34	123.63	0.00299	2.99	22.8	10.78		0.09	0.33	0.3
6805	Bridge			Footbridge to Morton Street									
6800	66.4	121.12	123.46		123.6	0.00329	2.95	22.57	11.56		0.03	0.34	0.32
6767	66.4	120.7	123.45		123.49	0.00072	1.62	44.35	29.61	0.01	0.02	0.09	0.06
6681	66.4	120.47	123.42		123.45	0.00034	1.4	50.58	32.06		0.01	0.04	0.03
6593	66.4	120.53	123.39		123.42	0.00032	1.38	48.07	23.81	0		0.04	0.04
6496	66.4	120.18	123.35		123.38	0.00035	1.36	50.53	30.49		0.01	0.04	0.04
6457	66.4	120.26	123.33		123.37	0.00044	1.62	45.19	31.59		0.01	0.05	0.04
6400	66.4	119.85	123.31		123.34	0.00031	1.49	48.23	27.02	0.01	0.01	0.04	0.03
6346	66.4	120.43	123.3		123.33	0.00024	1.3	60.26	45.03	0.01	0.01	0.03	0.02
6304	66.4	120.04	123.26		123.31	0.00049	1.76	42.19	28.48		0.01	0.06	0.04
6254	66.4	120.21	123.27		123.29	0.00025	1.11	60.17	38.4		0	0.03	0.02
6217	66.4	119.99	123.25		123.28	0.00027	1.4	52.77	32.76	0	0.01	0.04	0.03

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FULLER BROOK PARK PRESERVATION PROJECT
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Fuller Brook - 2 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
6188	66.4	119.87	123.23		123.27	0.00037	1.61	46.46	30.72	0.01	0.01	0.05	0.03
6144	66.4	120.34	123.21		123.25	0.00036	1.48	44.94	20.74			0.04	0.04
6106	66.4	120.37	123.2		123.23	0.00036	1.52	44.62	23.89		0	0.05	0.04
6062	66.4	119.87	123.16		123.22	0.0003	1.84	36.62	16.5		0	0.04	0.04
6044	66.4	119.96	123.08		123.2	0.00144	2.82	23.55	9.3			0.17	0.17
6039	66.4	119.97	123.11	121.27	123.18	0.00065	2.02	32.81	12.36			0.08	0.08
6017	Culvert			Wellesley Avenue									
5989	70.3	119.98	122.77		122.88	0.00135	2.64	26.66	11.79			0.15	0.15
5979	70.3	119.96	122.77		122.86	0.0011	2.38	29.49	15.03			0.12	0.12
5941	70.3	119.92	122.77		122.82	0.00056	1.75	40.49	23.56		0.01	0.06	0.06
5911	70.3	120.48	122.73		122.79	0.00096	2.05	35.31	26.53	0	0.02	0.09	0.08
5892	70.3	120.37	122.71		122.78	0.0009	1.99	35.25	21.51			0.09	0.09
5860	70.3	119.56	122.7		122.75	0.00062	1.87	38.02	20.03	0.01		0.07	0.07
5838	70.3	119.99	122.68		122.74	0.00067	1.94	36.72	21.09	0.01		0.08	0.07
5803	70.3	120.19	122.67		122.71	0.00054	1.57	45.09	29.72		0.01	0.05	0.05
5773	70.3	120.04	122.61		122.68	0.001	2.19	32.03	17.35			0.1	0.1
5744	70.3	119.38	122.61		122.65	0.00054	1.72	42.09	26.85	0.01	0.01	0.06	0.05
5689	70.3	120.13	122.55		122.62	0.00081	1.99	35.52	21.41		0.01	0.08	0.08
5634	70.3	120.24	122.51		122.57	0.00083	2.01	34.89	18.74			0.09	0.09
5593	70.3	120.01	122.48		122.54	0.00071	1.87	37.63	20.6			0.07	0.07
5554	70.3	120.07	122.44		122.5	0.00096	2.09	33.74	20.92		0.01	0.1	0.09
5537	70.3	119.71	122.44		122.49	0.00056	1.81	38.91	18.28			0.07	0.07
5512	70.3	119.38	122.42		122.47	0.0006	1.92	37.73	18.96		0.02	0.07	0.07
5476	70.3	119.31	122.41		122.45	0.0004	1.65	42.57	17.64			0.05	0.05
5419	70.3	120.06	122.37		122.42	0.00062	1.77	39.67	21.69			0.07	0.07
5320	70.3	119.89	122.33		122.37	0.00039	1.59	45.94	24.55	0.01	0.01	0.05	0.04
5220	70.3	119.71	122.3		122.33	0.00035	1.51	52.93	34.01	0.01	0.02	0.05	0.03
5194	70.3	120.02	122.23		122.31	0.00116	2.27	31.62	20.63	0.03		0.11	0.1
5185	70.3	119.74	122.23	120.8	122.3	0.00137	2.19	32.04	13.72			0.16	0.16
5161	Culvert			Brook Street									
5133	75.9	119.57	121.95		122.03	0.00092	2.25	33.68	15.14			0.11	0.11
5116	75.9	120.04	121.95		122.01	0.00103	2.01	37.78	25.39			0.09	0.09
5015	75.9	119.59	121.79		121.89	0.00132	2.55	30.09	17.4		0.03	0.14	0.13
4915	75.9	119.32	121.74		121.79	0.00063	1.84	43.32	27.27	0	0.02	0.07	0.06
4878	75.9	119.28	121.72		121.75	0.00033	1.31	61.31	34.23		0.03	0.04	0.03
4829	147.1	118.65	121.55		121.69	0.00149	3.09	47.54	21.48	0		0.19	0.19
4729	147.1	118.41	121.43		121.56	0.00116	2.89	50.83	19.86			0.16	0.16
4698	147.1	116.33	121.49		121.52	0.00017	1.43	103.15	28.48			0.03	0.03

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FULLER BROOK PARK PRESERVATION PROJECT
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Fuller Brook - 2 Year Storm Event

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										LOB	ROB	Chan	Total
4670	147.1	116.31	121.42		121.5	0.00057	2.38	61.76	16.15			0.1	0.1
4642	147.1	118.39	121.38		121.48	0.00089	2.61	57.38	23.9	0.03		0.13	0.12
4598	147.1	118.02	121.35		121.44	0.00075	2.44	60.34	20.51			0.12	0.12
4538	147.1	118.31	121.3		121.39	0.00085	2.53	59.24	25.89		0.02	0.12	0.11
4511	147.1	116.1	121.34		121.37	0.00014	1.32	111.59	31.16		0	0.03	0.03
4485	147.1	117.25	121.29		121.36	0.00045	2.06	75.83	31.57		0.02	0.08	0.06
4463	147.1	117.74	121.29		121.34	0.00039	1.85	79.38	28.7	0		0.06	0.06
4443	147.1	116.8	121.29	118.25	121.33	0.00022	1.58	92.86	25.37			0.04	0.04
4418	Culvert			Cameron Street									
4397	169.5	117.19	120.51		120.81	0.00309	4.41	38.42	16.72			0.39	0.39
4365	169.5	115.42	120.69		120.72	0.00013	1.35	128.78	35.11		0.01	0.03	0.03
4310	169.5	118.1	120.56		120.69	0.00142	2.9	58.41	26.83			0.17	0.17
4260	169.5	116.88	120.49		120.62	0.00128	2.85	59.53	27.89		0.01	0.16	0.15
4208	169.5	116.48	120.47		120.56	0.00066	2.49	68.06	21.61			0.11	0.11
4106	169.5	117.21	120.29		120.46	0.00147	3.29	51.49	19.08		0.01	0.21	0.21
4070	169.5	117.01	120.21		120.4	0.00162	3.56	48.16	18.96	0.05		0.24	0.23
4060	169.5	117.12	120.04		120.37	0.0018	4.64	36.67	18.08		0.02	0.2	0.19
4018	169.5	116.66	119.07	119.07	120.16	0.00693	8.41	20.16	9.3			0.69	0.69
4011	169.5	114.27	118.34	116.7	118.68	0.00135	4.66	36.38	10.4			0.19	0.19
3961	169.5	115.01	118.41		118.56	0.00134	3.06	55.51	27.02		0.01	0.15	0.15
3941	169.5	115.14	118.42	116.6	118.52	0.00086	2.61	64.95	21.28			0.13	0.13
3905	Culvert			Grove Street									
3872	174.4	114.73	118.32		118.42	0.00069	2.48	70.46	22.75			0.11	0.11
3851	174.4	114.57	118.31		118.4	0.00116	2.45	71.11	26.92		0	0.18	0.17
3775	174.4	114.04	118.02		118.26	0.0023	3.98	44.32	19.75	0.03	0.03	0.31	0.28
3696	174.4	113.63	117.77		118.06	0.00267	4.34	41.54	19.48	0.06	0.04	0.37	0.3
3595	174.4	113.34	117.52		117.8	0.0025	4.3	43.09	19.94	0.07	0.07	0.36	0.28
3495	174.4	113.23	117.46		117.6	0.00109	3.15	64.03	27.89	0.06	0.07	0.18	0.13
3404	174.4	113.18	117.04		117.38	0.00696	4.68	38.25	24.2	0.08	0.07	0.81	0.6
3315	174.4	113.64	116.91		117.09	0.00148	3.35	54.95	29.94	0.01	0.04	0.21	0.15
3208	174.4	112.47	116.82		116.95	0.00092	2.93	66.53	26.2	0.06	0.05	0.16	0.12
3094	174.4	112.39	116.6		116.8	0.00172	3.64	49.95	18.65	0.09		0.25	0.23
3021	174.4	112.18	116.45		116.67	0.00192	3.82	49.11	22.19	0.03	0.09	0.28	0.22
2923	174.4	112.1	116.17		116.44	0.00265	4.3	44.61	22.61	0.09	0.13	0.36	0.27
2832	174.4	111.9	116.04		116.23	0.00167	3.46	53.04	26.3	0.07	0.03	0.23	0.18
2732	174.4	111.64	115.85		116.05	0.00184	3.59	52.19	25.09	0.04	0.09	0.25	0.2
2632	174.4	111.33	115.75		115.9	0.00108	3.16	63.15	26.64	0.06	0.06	0.18	0.14
2584	174.4	111.27	115.69		115.84	0.00108	3.21	58.47	23.83	0.04	0.04	0.19	0.14

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										LOB	ROB	Chan	Total
2539	174.4	111.91	115.71		115.79	0.00051	2.32	77.09	26.98	0.02	0.01	0.1	0.08
2522	174.4	111.97	115.63	113.56	115.77	0.00106	2.98	58.45	16.38			0.17	0.17
2505	Culvert			Cottage Street									
2486	180	112.01	115.57		115.73	0.00103	3.14	57.34	16.25			0.16	0.16
2467	180	111.21	115.61		115.69	0.00059	2.35	78.29	29.44	0.01	0.02	0.1	0.09
2392	180	110.97	115.48		115.62	0.00122	3.08	59.3	23.36	0	0.03	0.18	0.16
2332	180	110.97	115.39		115.54	0.00145	3.2	57.57	22.86		0.04	0.2	0.18
2281	180	110.92	115.33		115.47	0.00127	2.97	61.33	26.42	0.01	0.03	0.17	0.16
2223	180	110.63	115.24		115.39	0.00136	3.13	59.02	25.62	0.03	0.04	0.19	0.17
2175	180	110.37	115.18		115.32	0.00136	3.06	59.98	25.83	0.02	0.04	0.18	0.17
2096	180	111.55	115.09		115.2	0.00159	2.69	68.26	27.82	0.06		0.24	0.22
2068	180	111.34	114.92	113.39	115.06	0.00151	2.97	60.66	24.8		0	0.2	0.2
2063	Bridge		Footbridge to Appleby Road										
2057	180	111.14	114.82		115.04	0.00314	3.76	48.55	17.95	0.06		0.48	0.42
2023	180	110.29	114.71		114.84	0.00216	2.86	64.08	28.87	0.04	0.03	0.29	0.25
1937	180	110.04	114.63		114.73	0.00074	2.53	72.89	30.02	0.01	0.02	0.12	0.1
1849	180	111.05	114.53		114.64	0.00148	2.68	69.06	27.81		0.06	0.24	0.21
1826	180	111.39	114.19	113.07	114.45	0.00439	4.08	44.09	17.52			0.59	0.59
1821	Bridge		Footbridge to Leighton Road										
1816	180	110.75	113.98		114.38	0.00683	5.04	35.72	12.19			0.9	0.9
1811	180	110.68	114.08		114.3	0.00381	3.73	48.63	22.27	0.08		0.49	0.47
1764	180	109.4	114.17		114.22	0.00024	1.86	113.77	37.57	0.02	0.02	0.06	0.04
1685	180	109.72	114.09		114.19	0.00058	2.48	75.61	27.72	0.02	0.02	0.11	0.09
1609	180	110.59	114.04		114.13	0.00083	2.49	76.56	31.11	0.04	0.02	0.15	0.12
1520	180	110.12	113.96		114.05	0.00096	2.51	72.47	28.16	0.02	0.01	0.16	0.14
1448	180	109.4	113.85		113.97	0.00135	2.78	64.85	23.15			0.2	0.2
1348	180	109.77	113.37		113.52	0.11911	2.66	65.25	29.72	1.45	2.21	18.16	15.02
1271	180	108.7	112.25		112.52	0.00464	4.17	43.2	21.36	0.02	0.02	0.5	0.49
1218	180	108.45	112.08		112.31	0.00322	3.85	47.04	20.41		0.06	0.41	0.39
1127	180	108.42	111.51		111.85	0.00814	4.73	38.06	21.65			0.7	0.7
1068	180	108.46	111.53		111.65	0.0011	2.79	64.45	27.48			0.15	0.15
1057	180	108.73	111.2	110.56	111.6	0.00463	5.03	35.77	16.9			0.53	0.53
1036	Culvert			Dover Road									
1024	180	107.9	111.28		111.49	0.0018	3.65	49.34	16.18			0.26	0.26
1000	180	109.46	110.79	110.79	111.36	0.01328	6.07	29.66	26.24			0.91	0.91

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Fuller Brook - 10 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
				Culvert at High School Field									
8197	102	122.35	126.43	124.22	126.58	0.00204	3.12	32.72	8.5			0.26	0.26
8020	102	120.77	126.5		126.5	7.3E-05	0.63	202.07	104.5	0.01	0.01	0.02	0.01
7940	102	120.34	126.5		126.5	1E-06	0.13	870.2	223.93	0	0	0	0
7790	102	120.64	126.5		126.5	2E-06	0.21	541.62	147.22	0	0	0	0
7656	102	120.47	126.5		126.5	6E-06	0.22	474.37	129.7	0	0	0	0
7527	102	121.85	126.47		126.49	0.00038	1.43	98.79	155.39	0	0.01	0.05	0.01
7505	102	121.4	126.41		126.48	0.00068	2.22	62.28	123.71	0.05	0.01	0.13	0.02
7495	102	121.38	126.12	123.82	126.44	0.00605	4.51	22.76	9.62		0.01	0.6	0.45
7489	Culvert			Footpath at Skating Pond									
7481	102	121.77	125.89		126.31	0.00862	5.21	19.71	7.82		0.02	0.82	0.67
7474	102	121.95	126.15		126.17	0.00103	1.81	94.51	138.46	0.01	0.04	0.1	0.04
7431	121.2	122.06	125.75		125.81	0.00075	2.08	84.92	67.4	0.01	0.04	0.11	0.06
7379	121.2	122.09	125.42		125.71	0.00447	4.38	30.27	16.47		0.25	0.54	0.46
7354	121.2	121.3	125.56	122.71	125.61	0.00043	1.78	68.05	19.51			0.08	0.08
7329	Culvert			State Street									
7307	125.5	121.82	125.3		125.36	0.00046	1.9	69.88	27.13	0.02	0.02	0.09	0.07
7290	125.5	121.68	125.28		125.35	0.00065	2.09	61.6	26.11	0.02	0.01	0.11	0.09
7190	125.5	121.19	125.27		125.3	0.00023	1.48	108.27	56.75	0.02	0.01	0.05	0.03
7133	125.5	121.18	125.24		125.28	0.00036	1.73	96.32	67.85	0.02	0.01	0.07	0.03
7081	125.5	120.97	125.23		125.26	0.00033	1.63	89.78	47.04	0.01	0.02	0.06	0.04
7015	125.5	120.78	125.22		125.24	0.00018	1.36	136.6	92.28	0.01	0.01	0.04	0.02
6941	125.5	120.29	125.21		125.23	0.00017	1.3	147.3	89.87	0.02	0.01	0.04	0.02
6879	125.5	120.49	125.2		125.22	0.00014	1.2	127.39	68.7	0.01	0.01	0.03	0.02
6837	125.5	121.17	125.03		125.19	0.0014	3.21	39.15	10.98			0.2	0.2
6810	125.5	121.13	124.64	122.95	124.85	0.003	3.69	35.73	11.8		0.16	0.46	0.4
6805	Bridge			Footbridge to Morton Street									
6800	125.5	121.12	124.62		124.81	0.00283	3.51	36.87	13.13		0.11	0.42	0.37
6767	125.5	120.7	124.68		124.71	0.00039	1.62	93.77	52.83	0.02	0.02	0.08	0.04
6681	125.5	120.47	124.66		124.69	0.00021	1.51	100.82	51.19	0	0.01	0.04	0.03
6593	125.5	120.53	124.63		124.67	0.00023	1.59	85.54	41.38	0.01	0	0.04	0.03
6496	125.5	120.18	124.62		124.65	0.00019	1.42	109.84	90.24	0.01	0	0.04	0.01
6457	125.5	120.26	124.61		124.64	0.00019	1.47	129	127.01	0.01	0.01	0.04	0.01
6400	125.5	119.85	124.59		124.62	0.00021	1.63	110.93	105.31	0.01	0.01	0.05	0.01
6346	125.5	120.43	124.59		124.61	0.00011	1.21	163.01	124.61	0	0.01	0.02	0.01
6304	125.5	120.04	124.58		124.6	0.00019	1.39	142.94	128.15	0.01	0.01	0.03	0.01
6254	125.5	120.21	124.58		124.6	0.00012	1.08	130.17	65.56	0	0.01	0.02	0.01
6217	125.5	119.99	124.56		124.59	0.00016	1.46	123	77.28	0.01	0.01	0.04	0.02

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Fuller Brook - 10 Year Storm Event

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										LOB	ROB	Chan	Total
6188	125.5	119.87	124.54		124.58	0.00024	1.72	104.9	70.99	0.01	0.01	0.05	0.02
6144	125.5	120.34	124.53		124.57	0.00024	1.64	89.65	65.91	0.01	0.01	0.05	0.02
6106	125.5	120.37	124.52		124.56	0.00027	1.66	91.46	52.45	0	0.01	0.05	0.03
6062	125.5	119.87	124.47		124.55	0.00026	2.2	64.79	28.76		0.01	0.05	0.03
6044	125.5	119.96	124.35		124.53	0.00144	3.43	38.31	15.28		0.04	0.22	0.17
6039	125.5	119.97	124.4	121.83	124.5	0.00073	2.53	49.56	13.73			0.12	0.12
6017	Culvert			Wellesley Avenue									
5989	133.5	119.98	123.9		124.07	0.00148	3.26	40.92	13.22			0.21	0.21
5979	133.5	119.96	123.92		124.04	0.00097	2.77	48.21	17.67	0.01		0.15	0.14
5941	133.5	119.92	123.94		124	0.00041	2	74.94	34.75	0	0.02	0.07	0.05
5911	133.5	120.48	123.93		123.99	0.00048	2.09	79.96	44.73	0.03	0.03	0.08	0.05
5892	133.5	120.37	123.92		123.98	0.00054	1.95	74.97	47.9	0.01	0.01	0.07	0.05
5860	133.5	119.56	123.91		123.96	0.0004	2	87.38	55.66	0.02	0.01	0.07	0.04
5838	133.5	119.99	123.9		123.95	0.00041	1.98	87.35	52.88	0.02	0.02	0.07	0.04
5803	133.5	120.19	123.9		123.94	0.00028	1.61	99.33	58.76	0.01	0.01	0.05	0.03
5773	133.5	120.04	123.85		123.92	0.00062	2.19	71.72	53.68	0.02	0	0.09	0.05
5744	133.5	119.38	123.85		123.9	0.00033	1.87	91.44	72.22	0.02	0.01	0.06	0.03
5689	133.5	120.13	123.83		123.88	0.0004	1.9	107.03	98.61		0.01	0.07	0.03
5634	133.5	120.24	123.79		123.86	0.00049	2.08	81.08	77.47	0.01	0.01	0.08	0.03
5593	133.5	120.01	123.78		123.84	0.0004	1.98	87.42	89.98	0.01	0.01	0.07	0.02
5554	133.5	120.07	123.75		123.82	0.0005	2.18	70.64	39.19	0.01	0.02	0.09	0.05
5537	133.5	119.71	123.74		123.81	0.00047	2.07	66.78	33.3	0.01	0	0.08	0.05
5512	133.5	119.38	123.73		123.8	0.00044	2.16	68.05	28.81	0.01	0.03	0.08	0.06
5476	133.5	119.31	123.72		123.78	0.00032	1.94	86.82	76.51	0.01	0.01	0.06	0.02
5419	133.5	120.06	123.72		123.76	0.00028	1.68	114.05	106.14	0.01	0.01	0.05	0.02
5320	133.5	119.89	123.68		123.73	0.00026	1.8	85.48	45.36	0.01	0.01	0.06	0.03
5220	133.5	119.71	123.67		123.7	0.00021	1.62	110.12	50.19	0.01	0.02	0.04	0.03
5194	133.5	120.02	123.62		123.69	0.0005	2.21	69.86	36.52	0.02	0.02	0.09	0.06
5185	133.5	119.74	123.57	121.31	123.68	0.00155	2.63	50.67	14.02			0.24	0.24
5161	Culvert			Brook Street									
5133	141.3	119.57	123.35		123.46	0.00075	2.57	54.98	15.28			0.12	0.12
5116	141.3	120.04	123.38		123.43	0.00037	1.83	82.13	37.49	0.01	0.01	0.06	0.05
5015	141.3	119.59	123.3		123.38	0.00061	2.37	66.71	38.54	0.01	0.02	0.1	0.06
4915	141.3	119.32	123.3		123.33	0.00022	1.6	120.12	93.15	0.01	0.01	0.05	0.02
4878	141.3	119.28	123.3		123.31	0.00014	1.13	186.42	139.92	0.01	0.01	0.02	0.01
4829	238.8	118.65	123.18		123.29	0.00059	2.69	109.83	90.33	0.01	0.01	0.12	0.04
4729	238.8	118.41	123.12		123.23	0.00058	2.62	109.38	89.09	0.02	0.01	0.12	0.04
4698	238.8	116.33	123.17		123.2	0.00013	1.51	174.78	85.01		0	0.04	0.02

BETA

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										LOB	ROB	Chan	Total
4670	238.8	116.31	123.11		123.19	0.00039	2.4	127.67	89.12	0.01	0.01	0.09	0.03
4642	238.8	118.39	123.09		123.18	0.00043	2.35	114.09	76.16	0.03	0	0.09	0.04
4598	238.8	118.02	123.08		123.15	0.00059	2.27	119.09	74.63		0.01	0.12	0.06
4538	238.8	118.31	123.05		123.13	0.00037	2.24	115.47	70.52		0.01	0.08	0.04
4511	238.8	116.1	123.08		123.11	0.00011	1.42	190.24	103.47		0	0.03	0.01
4485	238.8	117.25	123.05		123.1	0.00024	1.96	152.61	101.11	0	0.01	0.06	0.02
4463	238.8	117.74	123.04		123.1	0.0002	1.82	143.71	66.18	0.01	0	0.05	0.03
4443	238.8	116.8	123.04	118.71	123.09	0.00018	1.71	139.91	28.39			0.05	0.05
4418	Culvert			Cameron Street									
4397	267.2	117.19	121.56		121.89	0.00256	4.62	57.84	20.26			0.4	0.4
4365	267.2	115.42	121.75		121.79	0.00014	1.65	179	53.69	0	0.01	0.04	0.03
4310	267.2	118.1	121.62		121.76	0.00104	3	90.29	36.93	0.02	0.01	0.17	0.14
4260	267.2	116.88	121.58		121.71	0.00088	2.97	95.93	37.8		0.04	0.16	0.13
4208	267.2	116.48	121.54		121.67	0.00069	2.9	92.17	23.25			0.14	0.14
4106	267.2	117.21	121.37		121.57	0.00123	3.65	75.97	25.84		0.05	0.23	0.19
4070	267.2	117.01	121.29		121.53	0.00127	3.9	72.1	29.61	0.04	0.01	0.26	0.17
4060	267.2	117.12	121.18		121.5	0.00111	4.61	59.53	21.84		0.05	0.18	0.16
4018	267.2	116.66	119.86	119.86	121.3	0.00698	9.62	27.79	9.82			0.84	0.84
4011	267.2	114.27	116.18	117.5	120.88	0.03836	17.41	15.35	9			3.13	3.13
3961	267.2	115.01	119.33	117.25	119.5	0.00105	3.32	82.91	33.19	0.02	0.04	0.17	0.14
3941	267.2	115.14	119.31	117.04	119.47	0.00098	3.18	84.13	21.39			0.18	0.18
3905	Culvert			Grove Street									
3872	274.1	114.73	119.18		119.32	0.00079	3.05	89.97	23		0	0.16	0.16
3851	274.1	114.57	119.17		119.3	0.00113	2.9	95.06	28.64	0.03	0	0.23	0.21
3775	274.1	114.04	118.82		119.16	0.00221	4.69	62.06	24.5	0.07	0.08	0.4	0.31
3696	274.1	113.63	118.55		118.96	0.0027	5.17	59.17	25.45	0.12	0.11	0.48	0.34
3595	274.1	113.34	118.28		118.69	0.00269	5.21	60.42	25.53	0.13	0.14	0.49	0.34
3495	274.1	113.23	118.25		118.46	0.00119	3.82	88.08	32.85	0.09	0.09	0.25	0.17
3404	274.1	113.18	117.97		118.26	0.00421	4.58	66.73	35	0.17	0.22	0.69	0.45
3315	274.1	113.64	117.85		118.05	0.00123	3.72	88.61	42.13	0.05	0.07	0.24	0.15
3208	274.1	112.47	117.75		117.93	0.00093	3.48	93.15	31.58	0.06	0.08	0.2	0.15
3094	274.1	112.39	117.5		117.78	0.00167	4.29	70.42	27.03	0.1	0.05	0.32	0.23
3021	274.1	112.18	117.37		117.65	0.0018	4.42	72.43	28.47	0.07	0.13	0.34	0.25
2923	274.1	112.1	117.15		117.46	0.0021	4.67	70.31	29.43	0.14	0.16	0.39	0.27
2832	274.1	111.9	117.09		117.29	0.00118	3.63	85.48	33.51	0.08	0.07	0.23	0.17
2732	274.1	111.64	116.94		117.16	0.00135	3.86	83.22	32.13	0.07	0.11	0.26	0.19
2632	274.1	111.33	116.86		117.04	0.00091	3.54	95.59	31.94	0.08	0.08	0.21	0.15
2584	274.1	111.27	116.79		116.99	0.00095	3.65	88.54	30.6	0.07	0.06	0.22	0.15

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										LOB	ROB	Chan	Total
2539	274.1	111.91	116.83		116.93	0.00045	2.67	109.71	31.78	0.03	0.02	0.11	0.09
2522	274.1	111.97	116.71	114.1	116.91	0.00122	3.6	76.16	16.49			0.23	0.23
2505	Culvert			Cottage Street									
2486	304.7	112.01	116.6		116.86	0.00137	4.12	73.95	16.28			0.25	0.25
2467	304.7	111.21	116.67		116.8	0.0006	2.9	112.11	33.65	0.04	0.03	0.14	0.11
2392	304.7	110.97	116.51		116.73	0.00121	3.78	85.47	27.19	0	0.07	0.25	0.2
2332	304.7	110.97	116.42		116.65	0.00157	3.91	82.88	26.4	0.01	0.09	0.29	0.24
2281	304.7	110.92	116.38		116.57	0.00111	3.5	91.43	31.04	0.04	0.06	0.21	0.18
2223	304.7	110.63	116.29		116.5	0.00123	3.73	88.14	30.09	0.06	0.08	0.24	0.2
2175	304.7	110.37	116.24		116.44	0.00121	3.62	89.83	30.73	0.05	0.07	0.23	0.19
2096	304.7	111.55	116.16		116.32	0.00144	3.17	100.36	31.82	0.09	0.03	0.3	0.26
2068	304.7	111.34	116	113.96	116.19	0.00138	3.48	89.54	27.74		0.06	0.26	0.23
2063	Bridge		Footbridge to Appleby Road										
2057	304.7	111.14	115.83		116.16	0.0034	4.63	68.46	21.64	0.11	0.01	0.66	0.51
2023	304.7	110.29	115.79		115.95	0.00182	3.31	99.09	36.42	0.1	0.08	0.34	0.27
1937	304.7	110.04	115.71		115.85	0.0007	3.05	109.26	37.21	0.03	0.04	0.15	0.12
1849	304.7	111.05	115.62		115.77	0.00135	3.18	102.49	33.67	0.04	0.1	0.3	0.24
1826	304.7	111.39	115.24	113.75	115.58	0.00441	4.69	66.16	23.42		0.14	0.72	0.66
1821	Bridge		Footbridge to Leighton Road										
1816	304.7	110.75	114.82		115.48	0.01137	6.54	47.09	17.84		0.19	1.51	1.38
1811	304.7	110.68	115.05		115.34	0.0034	4.36	72.03	26.19	0.16	0.05	0.61	0.53
1764	304.7	109.4	115.16		115.24	0.00031	2.44	152.68	40.38	0.04	0.02	0.09	0.07
1685	304.7	109.72	115.04		115.2	0.00069	3.21	104.66	33.4	0.04	0.04	0.17	0.12
1609	304.7	110.59	114.99		115.14	0.00091	3.12	110.39	41.53	0.05	0.05	0.22	0.14
1520	304.7	110.12	114.89		115.05	0.00106	3.17	102.97	38.23	0.05	0.03	0.23	0.16
1448	304.7	109.4	114.76		114.95	0.00163	3.49	87.88	29.07		0.02	0.3	0.27
1348	304.7	109.77	113.97		114.4	0.1143	2.98	86.18	41.48	3.49	3.27	21.3	13.92
1271	304.7	108.7	113.03		113.43	0.00453	5.1	60.82	24.36	0.09	0.11	0.67	0.59
1218	304.7	108.45	112.83		113.21	0.00386	4.93	63.01	22.12		0.15	0.62	0.57
1127	304.7	108.42	112.28		112.74	0.00687	5.46	57.1	27.76	0.14	0.14	0.83	0.72
1068	304.7	108.46	112.32		112.51	0.00124	3.49	87.75	30.85	0.01	0.02	0.22	0.21
1057	304.7	108.73	111.69	111.24	112.43	0.00716	6.91	44.09	17.58			0.95	0.95
1036	Culvert			Dover Road									
1024	304.7	107.9	111.77		112.21	0.00333	5.31	57.34	16.48			0.53	0.53
1000	304.7	109.46	111.3	111.3	112.04	0.01213	6.9	44.16	30.09			1.08	1.08

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Fuller Brook - 25 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
				Culvert at High School Field									
8197	115.8	122.35	126.57	124.37	126.75	0.0024	3.42	33.88	8.5			0.32	0.32
8020	115.8	120.77	126.65		126.66	7.6E-05	0.66	218.56	108.36	0.01	0.01	0.02	0.01
7940	115.8	120.34	126.65		126.65	1E-06	0.14	905.23	227.92	0	0	0	0
7790	115.8	120.64	126.65		126.65	3E-06	0.23	564.57	149.07	0	0	0	0
7656	115.8	120.47	126.65		126.65	7E-06	0.25	494.63	131.98	0	0	0	0
7527	115.8	121.85	126.62		126.65	0.00033	1.37	123.81	158.99	0	0.01	0.05	0.02
7505	115.8	121.4	126.57		126.63	0.00062	2.2	85.33	151.05	0.05	0.01	0.12	0.02
7495	115.8	121.38	126.19	124.03	126.59	0.00749	5.04	23.66	16.26		0.03	0.75	0.43
7489	Culvert			Footpath at Skating Pond									
7481	115.8	121.77	125.98	124.43	126.5	0.01046	5.77	20.49	9.59		0.06	1	0.75
7474	115.8	121.95	126.32		126.33	0.00075	1.58	118.77	156.09	0.01	0.03	0.07	0.03
7431	132.2	122.06	125.96		126.01	0.00064	2.02	99.64	73.77	0.01	0.04	0.1	0.05
7379	132.2	122.09	125.64		125.92	0.00404	4.34	36.42	33.3		0.09	0.51	0.26
7354	132.2	121.3	125.78	122.79	125.83	0.00043	1.83	72.25	19.85			0.08	0.08
7329	Culvert			State Street									
7307	135.1	121.82	125.48		125.54	0.00044	1.92	74.84	27.9	0.02	0.03	0.09	0.07
7290	135.1	121.68	125.46		125.53	0.00061	2.11	66.45	27.64	0.02	0.01	0.11	0.09
7190	135.1	121.19	125.45		125.48	0.00022	1.49	119.7	67.45	0.02	0.01	0.05	0.02
7133	135.1	121.18	125.43		125.47	0.00032	1.69	110.38	80.49	0.02	0.01	0.07	0.03
7081	135.1	120.97	125.41		125.45	0.0003	1.63	98.98	52.04	0.01	0.02	0.06	0.03
7015	135.1	120.78	125.41		125.43	0.00016	1.31	154.9	101.77	0.01	0.01	0.04	0.01
6941	135.1	120.29	125.4		125.42	0.00015	1.26	165.23	97.97	0.01	0.01	0.04	0.02
6879	135.1	120.49	125.39		125.41	0.00013	1.2	141.24	76.55	0.01	0.01	0.03	0.02
6837	135.1	121.17	125.21		125.38	0.00141	3.28	41.16	11.05			0.21	0.21
6810	135.1	121.13	124.82	123.04	125.04	0.00295	3.76	37.91	11.96		0.17	0.47	0.4
6805	Bridge			Footbridge to Morton Street									
6800	135.1	121.12	124.81		125	0.00274	3.55	39.33	13.38		0.12	0.42	0.37
6767	135.1	120.7	124.87		124.91	0.00035	1.58	104.48	56.95	0.02	0.02	0.08	0.04
6681	135.1	120.47	124.85		124.88	0.0002	1.52	111.18	54.83	0.01	0.01	0.04	0.02
6593	135.1	120.53	124.83		124.86	0.00022	1.6	94.17	46.62	0.01	0.01	0.04	0.03
6496	135.1	120.18	124.82		124.84	0.00017	1.38	129.69	107.08	0.01	0.01	0.03	0.01
6457	135.1	120.26	124.81		124.84	0.00016	1.4	157.41	149.27	0.01	0.01	0.03	0.01
6400	135.1	119.85	124.79		124.82	0.00018	1.56	133.57	115.08	0.01	0.01	0.04	0.01
6346	135.1	120.43	124.8		124.81	9.6E-05	1.15	190.23	143.8	0	0.01	0.02	0.01
6304	135.1	120.04	124.79		124.81	0.00016	1.32	172.4	149.83	0.01	0.01	0.03	0.01
6254	135.1	120.21	124.78		124.8	0.00011	1.06	145.4	83.87	0	0.01	0.02	0.01
6217	135.1	119.99	124.77		124.79	0.00015	1.43	140.47	91.85	0.01	0.01	0.03	0.01

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Fuller Brook - 25 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
6188	135.1	119.87	124.75		124.79	0.00021	1.68	120.95	81.23	0.01	0.01	0.05	0.02
6144	135.1	120.34	124.74		124.78	0.00021	1.6	103.96	70.96	0.01	0.01	0.04	0.02
6106	135.1	120.37	124.73		124.77	0.00024	1.63	103.14	57.99	0	0.01	0.05	0.03
6062	135.1	119.87	124.68		124.76	0.00024	2.22	71.13	31.89		0.01	0.05	0.03
6044	135.1	119.96	124.56		124.74	0.00137	3.44	41.64	16.22		0.05	0.22	0.17
6039	135.1	119.97	124.61	121.91	124.71	0.00073	2.58	52.44	13.95			0.12	0.12
6017	Culvert			Wellesley Avenue									
5989	144.1	119.98	124.1		124.27	0.00144	3.31	43.53	13.46			0.21	0.21
5979	144.1	119.96	124.12		124.24	0.00091	2.79	51.77	18.23	0.01		0.15	0.14
5941	144.1	119.92	124.14		124.2	0.00038	2.01	82.04	35.84	0.01	0.02	0.07	0.05
5911	144.1	120.48	124.13		124.19	0.00043	2.07	90.08	51.7	0.02	0.03	0.08	0.05
5892	144.1	120.37	124.13		124.18	0.00046	1.9	85.13	50.4	0.02	0.02	0.07	0.05
5860	144.1	119.56	124.11		124.17	0.00036	1.97	99.32	58.9	0.02	0.01	0.07	0.04
5838	144.1	119.99	124.11		124.16	0.00036	1.95	98.72	55.91	0.02	0.02	0.07	0.04
5803	144.1	120.19	124.11		124.14	0.00025	1.59	111.86	61.03	0.01	0.01	0.05	0.03
5773	144.1	120.04	124.07		124.13	0.00053	2.11	85.02	66.57	0.03	0.01	0.08	0.04
5744	144.1	119.38	124.07		124.12	0.00029	1.83	109.9	97.01	0.02	0.01	0.06	0.02
5689	144.1	120.13	124.05		124.1	0.00033	1.81	132.02	128.64	0	0.01	0.06	0.02
5634	144.1	120.24	124.02		124.08	0.00041	2.01	101.45	106.15	0.01	0.01	0.07	0.02
5593	144.1	120.01	124.01		124.06	0.00033	1.89	113.83	128.41	0.01	0.01	0.06	0.02
5554	144.1	120.07	123.97		124.04	0.00044	2.16	82.17	81.38	0.02	0.01	0.08	0.03
5537	144.1	119.71	123.97		124.03	0.00042	2.07	75.83	55.31	0.01	0	0.08	0.03
5512	144.1	119.38	123.95		124.02	0.00039	2.15	83.12	110.07	0.01	0	0.08	0.02
5476	144.1	119.31	123.95		124.01	0.00028	1.9	107.71	104.76	0.01	0.01	0.06	0.02
5419	144.1	120.06	123.95		123.99	0.00023	1.58	140.2	116.01	0.01	0.01	0.04	0.02
5320	144.1	119.89	123.91		123.96	0.00024	1.8	101.87	83.17	0.01	0.01	0.05	0.02
5220	144.1	119.71	123.9		123.94	0.00019	1.61	122.3	53.26	0.01	0.02	0.04	0.03
5194	144.1	120.02	123.86		123.93	0.00043	2.17	78.98	39.55	0.02	0.02	0.08	0.05
5185	144.1	119.74	123.8	121.38	123.92	0.00154	2.67	53.94	14.1			0.25	0.25
5161	Culvert			Brook Street									
5133	154.7	119.57	123.59		123.7	0.00075	2.64	58.58	15.29			0.13	0.13
5116	154.7	120.04	123.62		123.67	0.00033	1.83	91.44	39.92	0.01	0.01	0.06	0.05
5015	154.7	119.59	123.55		123.63	0.00052	2.3	77.5	47.69	0.01	0.02	0.09	0.05
4915	154.7	119.32	123.56		123.59	0.00018	1.53	145.97	107.3	0.01	0.01	0.04	0.02
4878	154.7	119.28	123.56		123.57	0.00012	1.06	224.97	162.06	0.01	0.01	0.02	0.01
4829	252.3	118.65	123.45		123.55	0.00047	2.54	137.2	110.66	0.02	0.01	0.11	0.04
4729	252.3	118.41	123.41		123.5	0.00046	2.45	137.86	108.16	0.02	0.01	0.1	0.04
4698	252.3	116.33	123.45		123.48	0.00011	1.46	199.96	94.56		0	0.03	0.01

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										LOB	ROB	Chan	Total
4670	252.3	116.31	123.4		123.47	0.00032	2.23	155.82	100.94	0.01	0.01	0.08	0.03
4642	252.3	118.39	123.39		123.46	0.00034	2.19	142.34	108.21	0.03	0.01	0.08	0.03
4598	252.3	118.02	123.38		123.44	0.0005	2.11	142.96	87.59		0.02	0.11	0.05
4538	252.3	118.31	123.35		123.42	0.00031	2.12	142.92	121.81		0.01	0.07	0.02
4511	252.3	116.1	123.37		123.4	9.6E-05	1.38	225.22	135.64		0	0.03	0.01
4485	252.3	117.25	123.35		123.4	0.0002	1.84	185.28	117.79	0	0.01	0.05	0.02
4463	252.3	117.74	123.35		123.39	0.00017	1.77	166.14	84.14	0.01	0.01	0.05	0.02
4443	252.3	116.8	123.34	118.78	123.39	0.00017	1.7	148.47	28.93		0	0.05	0.04
4418	Culvert			Cameron Street									
4397	279.4	117.19	121.68		122.01	0.0025	4.63	60.31	20.67			0.4	0.4
4365	279.4	115.42	121.87		121.91	0.00014	1.68	185.53	54.32	0	0.01	0.04	0.03
4310	279.4	118.1	121.75		121.89	0.00099	3	94.92	38.93	0.02	0.01	0.17	0.14
4260	279.4	116.88	121.7		121.84	0.00085	2.98	100.67	38.72		0.04	0.16	0.13
4208	279.4	116.48	121.67		121.8	0.00069	2.94	95.03	23.43			0.15	0.15
4106	279.4	117.21	121.5		121.7	0.00121	3.68	79.23	26.43		0.05	0.24	0.19
4070	279.4	117.01	121.42		121.65	0.00123	3.93	76.11	33.82	0.05	0.01	0.26	0.16
4060	279.4	117.12	121.31		121.63	0.00107	4.61	62.37	22.22		0.05	0.17	0.16
4018	279.4	116.66	119.96	119.96	121.43	0.00695	9.72	28.74	9.89			0.85	0.85
4011	279.4	114.27	116.24	117.6	121.01	0.03762	17.54	15.93	9.04			3.15	3.15
3961	279.4	115.01	119.45	117.31	119.62	0.001	3.33	86.91	34.07	0.02	0.04	0.16	0.14
3941	279.4	115.14	119.43	117.1	119.59	0.00099	3.23	86.62	21.41			0.18	0.18
3905	Culvert			Grove Street									
3872	288.1	114.73	119.29		119.44	0.0008	3.12	92.54	23.03		0	0.17	0.16
3851	288.1	114.57	119.28		119.41	0.00112	2.96	98.29	28.76	0.03	0.01	0.23	0.21
3775	288.1	114.04	118.93		119.28	0.00219	4.77	64.74	25.15	0.08	0.09	0.4	0.31
3696	288.1	113.63	118.66		119.08	0.00267	5.24	62.02	26.28	0.13	0.12	0.49	0.34
3595	288.1	113.34	118.4		118.81	0.00265	5.29	63.36	26.37	0.14	0.15	0.49	0.34
3495	288.1	113.23	118.37		118.58	0.00118	3.87	92.03	33.59	0.1	0.1	0.25	0.18
3404	288.1	113.18	118.11		118.4	0.00381	4.5	71.97	36.18	0.17	0.22	0.65	0.43
3315	288.1	113.64	118		118.2	0.00116	3.72	95.13	44.1	0.06	0.07	0.24	0.15
3208	288.1	112.47	117.91		118.08	0.0009	3.51	98.06	32.62	0.06	0.08	0.2	0.15
3094	288.1	112.39	117.66		117.94	0.0016	4.31	74.86	28.58	0.1	0.05	0.32	0.22
3021	288.1	112.18	117.54		117.82	0.00169	4.42	77.36	29.63	0.08	0.14	0.34	0.24
2923	288.1	112.1	117.35		117.64	0.00191	4.59	76.21	30.78	0.14	0.15	0.37	0.25
2832	288.1	111.9	117.3		117.48	0.00105	3.57	92.53	34.75	0.08	0.08	0.22	0.16
2732	288.1	111.64	117.16		117.37	0.00122	3.8	90.44	33.74	0.07	0.11	0.25	0.18
2632	288.1	111.33	117.08		117.26	0.00083	3.5	102.96	33.02	0.08	0.08	0.2	0.14
2584	288.1	111.27	117.02		117.21	0.00087	3.61	95.77	32.01	0.07	0.06	0.21	0.14

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										LOB	ROB	Chan	Total
2539	288.1	111.91	117.06		117.16	0.00042	2.66	117.16	32.95	0.03	0.02	0.11	0.08
2522	288.1	111.97	116.94	114.17	117.14	0.00117	3.6	79.94	16.51			0.23	0.23
2505	Culvert			Cottage Street									
2486	333.5	112.01	116.8		117.09	0.00144	4.32	77.28	16.29			0.27	0.27
2467	333.5	111.21	116.89		117.03	0.00061	3.01	119.44	34.41	0.04	0.04	0.15	0.12
2392	333.5	110.97	116.72		116.95	0.00121	3.91	91.23	27.96	0.01	0.07	0.26	0.2
2332	333.5	110.97	116.62		116.87	0.00157	4.04	88.46	27.13	0.01	0.1	0.3	0.25
2281	333.5	110.92	116.59		116.79	0.00109	3.6	98.13	31.97	0.05	0.06	0.22	0.18
2223	333.5	110.63	116.5		116.72	0.00122	3.84	94.6	30.99	0.07	0.08	0.25	0.2
2175	333.5	110.37	116.45		116.66	0.00119	3.73	96.48	31.72	0.06	0.08	0.24	0.19
2096	333.5	111.55	116.38		116.54	0.00142	3.27	107.34	32.62	0.1	0.04	0.32	0.27
2068	333.5	111.34	116.22	114.08	116.42	0.00137	3.59	95.56	28.08		0.07	0.27	0.24
2063	Bridge		Footbridge to Appleby Road										
2057	333.5	111.14	116.04		116.39	0.00345	4.8	73.01	23.42	0.12	0.03	0.7	0.51
2023	333.5	110.29	116		116.17	0.00177	3.4	107.05	38.03	0.1	0.09	0.35	0.27
1937	333.5	110.04	115.93		116.08	0.00069	3.15	117.39	38.63	0.04	0.05	0.16	0.12
1849	333.5	111.05	115.83		115.99	0.00133	3.28	109.85	34.76	0.05	0.11	0.31	0.25
1826	333.5	111.39	115.45	113.89	115.8	0.00473	4.78	71.33	27.44	0.03	0.19	0.76	0.66
1821	Bridge		Footbridge to Leighton Road										
1816	333.5	110.75	115		115.69	0.0126	6.7	50.58	20.35		0.3	1.6	1.47
1811	333.5	110.68	115.24		115.55	0.00333	4.49	77.15	27.13	0.17	0.07	0.63	0.53
1764	333.5	109.4	115.35		115.45	0.00032	2.55	160.73	40.92	0.04	0.02	0.1	0.07
1685	333.5	109.72	115.23		115.4	0.00071	3.35	111.21	35.52	0.04	0.04	0.18	0.13
1609	333.5	110.59	115.18		115.34	0.00091	3.23	118.57	44.23	0.05	0.05	0.23	0.14
1520	333.5	110.12	115.08		115.25	0.00107	3.29	110.49	41.44	0.06	0.03	0.24	0.17
1448	333.5	109.4	114.95		115.15	0.00165	3.61	93.48	31.38		0.03	0.31	0.27
1348	333.5	109.77	114.08		114.59	0.10889	2.97	90.88	44.08	3.69	3.39	20.97	13.2
1271	333.5	108.7	113.19		113.62	0.00453	5.28	64.62	25.21	0.1	0.13	0.71	0.61
1218	333.5	108.45	112.98		113.38	0.00399	5.15	66.27	22.45		0.17	0.66	0.61
1127	333.5	108.42	112.44		112.92	0.00659	5.58	61.7	29.14	0.16	0.16	0.85	0.72
1068	333.5	108.46	112.49		112.69	0.00124	3.62	92.94	31.44	0.01	0.03	0.23	0.21
1057	333.5	108.73	111.76	111.39	112.6	0.00784	7.34	45.47	17.69			1.06	1.06
1036	Culvert			Dover Road									
1024	333.5	107.9	111.85		112.35	0.00374	5.69	58.63	16.52			0.6	0.6
1000	333.5	109.46	111.41	111.41	112.18	0.0119	7.04	47.38	30.89			1.1	1.1

BETA

FULLER BROOK PARK PRESERVATION PROJECT
SUMMARY OF HYDRAULIC (HEC-RAS) DATA

Fuller Brook - 100 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
				Culvert at High School Field									
8197	135.9	122.35	126.89	124.57	127.1	0.00268	3.71	36.64	8.5			0.37	0.37
8020	135.9	120.77	127		127.01	6.6E-05	0.64	258.19	117.14	0.01	0.01	0.02	0.01
7940	135.9	120.34	127		127	1E-06	0.15	986.89	237.02	0	0	0	0
7790	135.9	120.64	127		127	3E-06	0.25	617.62	153.01	0	0	0	0
7656	135.9	120.47	127		127	7E-06	0.26	541.9	137.58	0	0	0	0
7527	135.9	121.85	126.99		127	0.00018	1.12	182.9	167.03	0	0.01	0.03	0.01
7505	135.9	121.4	126.96		126.99	0.00033	1.71	146.34	159.99	0.02	0.01	0.07	0.02
7495	135.9	121.38	126.93	124.33	126.98	0.00159	2.51	109.78	157.69	0.04	0.05	0.18	0.06
7489	Culvert			Footpath at Skating Pond									
7481	135.9	121.77	126.95		126.98	0.0011	2.06	124.26	161.61	0.02	0.04	0.12	0.05
7474	135.9	121.95	126.96		126.97	0.00017	0.83	223.52	169.8	0.01	0.01	0.02	0.01
7431	157.6	122.06	126.82		126.85	0.00026	1.54	174.42	96.27	0.01	0.02	0.06	0.03
7379	157.6	122.09	126.77		126.82	0.00076	2.26	103.72	83.96	0	0.04	0.13	0.06
7354	157.6	121.3	126.76	122.96	126.81	0.00031	1.7	92.81	22.31			0.07	0.07
7329	Culvert			State Street									
7307	164.8	121.82	126.36		126.41	0.00028	1.8	101.03	31.69	0.02	0.02	0.07	0.05
7290	164.8	121.68	126.35		126.4	0.00037	1.95	94.27	35.17	0.02	0.02	0.09	0.06
7190	164.8	121.19	126.36		126.37	0.0001	1.19	200.99	106.86	0.01	0.01	0.03	0.01
7133	164.8	121.18	126.35		126.37	0.00012	1.22	204.5	118.92	0.01	0.01	0.03	0.01
7081	164.8	120.97	126.34		126.36	0.00014	1.31	177.82	123.59	0.01	0.01	0.04	0.01
7015	164.8	120.78	126.34		126.35	0.00006	0.92	272.9	143.08	0.01	0.01	0.02	0.01
6941	164.8	120.29	126.34		126.34	6.1E-05	0.93	284.41	148.91	0.01	0.01	0.02	0.01
6879	164.8	120.49	126.33		126.34	6.6E-05	0.96	234.96	120.11	0	0.01	0.02	0.01
6837	164.8	121.17	126.16		126.32	0.00112	3.18	51.99	17.09		0	0.19	0.14
6810	164.8	121.13	125.89	123.3	126.06	0.00199	3.46	51.12	13.08		0.16	0.37	0.32
6805	Bridge			Footbridge to Morton Street									
6800	164.8	121.12	125.82		125.98	0.00176	3.25	53.63	14.76		0.12	0.33	0.29
6767	164.8	120.7	125.9		125.92	0.00015	1.2	174.2	79.02	0.01	0.01	0.04	0.02
6681	164.8	120.47	125.89		125.91	9.8E-05	1.28	182.53	96.72	0.01	0.01	0.03	0.01
6593	164.8	120.53	125.87		125.9	0.00011	1.38	159.53	78.8	0.01	0.01	0.03	0.01
6496	164.8	120.18	125.88		125.89	4.6E-05	0.88	302.97	191.18	0	0	0.01	0
6457	164.8	120.26	125.88		125.88	3.9E-05	0.82	336.99	188.63	0	0	0.01	0
6400	164.8	119.85	125.87		125.88	5.3E-05	1	294.01	184.84	0	0	0.02	0.01
6346	164.8	120.43	125.87		125.88	0.00003	0.75	372.99	181.94	0	0	0.01	0
6304	164.8	120.04	125.87		125.88	3.9E-05	0.78	356.03	179.13	0	0	0.01	0
6254	164.8	120.21	125.87		125.87	3.8E-05	0.76	305.9	172.82	0	0	0.01	0
6217	164.8	119.99	125.86		125.87	5.5E-05	1.04	261.48	129.65	0.01	0.01	0.02	0.01

Fuller Brook - 100 Year Storm Event

River STA	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)	Shear Stresses (lb/sq ft)			
										LOB	ROB	Chan	Total
6188	164.8	119.87	125.85		125.87	7.8E-05	1.21	222.34	105.19	0.01	0.01	0.02	0.01
6144	164.8	120.34	125.85		125.87	7.8E-05	1.16	199.57	98.49	0	0.01	0.02	0.01
6106	164.8	120.37	125.84		125.86	9.7E-05	1.25	179.09	74.83	0	0.01	0.02	0.01
6062	164.8	119.87	125.8		125.85	0.00014	1.95	116.13	48.62		0.01	0.03	0.02
6044	164.8	119.96	125.73		125.84	0.00075	2.89	63.42	21		0.06	0.15	0.11
6039	164.8	119.97	125.74	122.14	125.83	0.00049	2.39	69	15.51		0	0.1	0.09
6017	Culvert			Wellesley Avenue									
5989	179.6	119.98	125.35		125.48	0.00079	2.94	61.43	15.16	0.01	0.01	0.15	0.14
5979	179.6	119.96	125.37		125.46	0.00047	2.42	76.82	21.75	0.02		0.1	0.09
5941	179.6	119.92	125.4		125.44	0.00018	1.71	132.76	45.26	0.01	0.02	0.05	0.03
5911	179.6	120.48	125.4		125.43	0.00017	1.62	164.07	66.62	0.02	0.01	0.04	0.02
5892	179.6	120.37	125.4		125.43	0.00014	1.37	163.2	73.58	0.01	0.01	0.03	0.02
5860	179.6	119.56	125.4		125.42	0.00012	1.39	207.15	110.24	0.02	0.01	0.03	0.01
5838	179.6	119.99	125.4		125.42	0.00012	1.4	200.39	104.62	0.01	0.01	0.03	0.01
5803	179.6	120.19	125.4		125.41	8.7E-05	1.2	210.67	94.16	0.01	0.01	0.02	0.01
5773	179.6	120.04	125.39		125.41	0.00011	1.26	203.85	108.5	0.01	0.01	0.03	0.01
5744	179.6	119.38	125.39		125.41	6.4E-05	1.08	287.14	157.08	0.01	0.01	0.02	0.01
5689	179.6	120.13	125.39		125.4	6.5E-05	1.02	325.62	160.27	0	0.01	0.02	0.01
5634	179.6	120.24	125.39		125.4	7.3E-05	1.08	306.81	170.57	0.01	0.01	0.02	0.01
5593	179.6	120.01	125.39		125.4	5.8E-05	1	328.01	175.8	0	0.01	0.02	0.01
5554	179.6	120.07	125.38		125.39	0.00009	1.24	286.29	172.07	0.01	0.01	0.02	0.01
5537	179.6	119.71	125.37		125.39	9.7E-05	1.25	254.65	161.45	0.01	0.01	0.02	0.01
5512	179.6	119.38	125.37		125.39	8.5E-05	1.25	290.24	181.37	0	0.01	0.02	0.01
5476	179.6	119.31	125.37		125.38	6.5E-05	1.13	334.18	187.77	0	0.01	0.02	0.01
5419	179.6	120.06	125.37		125.38	4.7E-05	0.91	352.61	168.38	0	0.01	0.01	0.01
5320	179.6	119.89	125.35		125.37	8.3E-05	1.32	254.9	143.67	0.01	0.01	0.03	0.01
5220	179.6	119.71	125.34		125.36	7.7E-05	1.29	212.57	73.88	0.01	0.01	0.02	0.01
5194	179.6	120.02	125.32		125.36	0.00015	1.63	146.75	53.35	0.01	0.01	0.04	0.02
5185	179.6	119.74	125.26	121.62	125.35	0.00108	2.4	74.83	14.58			0.22	0.22
5161	Culvert			Brook Street									
5133	186.2	119.57	125.1		125.18	0.00043	2.28	81.72	15.48			0.09	0.09
5116	186.2	120.04	125.13		125.16	0.00011	1.4	163.18	58.6	0.01	0.01	0.03	0.02
5015	186.2	119.59	125.13		125.15	8.6E-05	1.23	204.47	119.2	0	0.01	0.02	0.01
4915	186.2	119.32	125.13		125.14	2.9E-05	0.78	425.56	249	0	0	0.01	0
4878	186.2	119.28	125.13		125.13	2.4E-05	0.63	526.03	228.66	0	0	0.01	0
4829	321.8	118.65	125.11		125.13	0.00011	1.53	392.56	203.57	0.01	0.01	0.03	0.01
4729	321.8	118.41	125.1		125.12	0.0001	1.46	376.29	177.52	0.01	0.01	0.03	0.01
4698	321.8	116.33	125.1		125.11	4.4E-05	1.08	388.76	142.11	0	0	0.02	0.01

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										LOB	ROB	Chan	Total
4670	321.8	116.31	125.09		125.11	8.5E-05	1.39	367.65	156.17	0.01	0.01	0.03	0.01
4642	321.8	118.39	125.09		125.11	6.4E-05	1.21	392.27	173.43	0.01	0.01	0.02	0.01
4598	321.8	118.02	125.09		125.1	0.00013	1.2	406.16	184.58	0	0.01	0.04	0.02
4538	321.8	118.31	125.09		125.1	5.6E-05	1.09	453.73	219.99		0.01	0.02	0.01
4511	321.8	116.1	125.09		125.1	0.00003	0.89	543.42	224.43		0	0.01	0
4485	321.8	117.25	125.09		125.1	4.2E-05	1.04	497.54	223.29	0	0	0.02	0.01
4463	321.8	117.74	125.07		125.09	6.1E-05	1.29	341.43	108.32	0	0.01	0.02	0.01
4443	321.8	116.8	125.05	119.08	125.09	0.00011	1.62	203.88	50.24	0	0	0.04	0.02
4418	Culvert			Cameron Street									
4397	346.5	117.19	122.31		122.65	0.00222	4.68	74.02	22.79			0.39	0.39
4365	346.5	115.42	122.5		122.55	0.00015	1.83	221.72	61.32	0	0.01	0.05	0.03
4310	346.5	118.1	122.38		122.53	0.00078	3.04	123.11	49.65	0.03	0.03	0.16	0.11
4260	346.5	116.88	122.35		122.49	0.0007	3.04	126.97	43.81	0.01	0.05	0.15	0.12
4208	346.5	116.48	122.3		122.45	0.00069	3.15	110.68	29.98	0		0.16	0.14
4106	346.5	117.21	122.15		122.36	0.00109	3.74	100.26	38.8	0.02	0.07	0.24	0.16
4070	346.5	117.01	122.1		122.32	0.00097	3.89	109.32	62.9	0.05	0.03	0.24	0.1
4060	346.5	117.12	121.97		122.3	0.00089	4.65	78.4	43.03		0.01	0.17	0.09
4018	346.5	116.66	120.46	120.46	122.09	0.00689	10.24	33.83	10.51			0.92	0.92
4011	346.5	114.27	116.6	118.07	121.66	0.03376	18.06	19.19	9.26			3.21	3.21
3961	346.5	115.01	119.99	117.62	120.17	0.00088	3.47	106.77	39.19	0.04	0.04	0.17	0.13
3941	346.5	115.14	119.96	117.37	120.15	0.00106	3.54	97.87	21.47			0.22	0.22
3905	Culvert			Grove Street									
3872	357.8	114.73	119.78		119.96	0.00086	3.45	103.91	23.17		0.01	0.2	0.19
3851	357.8	114.57	119.78		119.94	0.00112	3.22	113.24	32.89	0.04	0.01	0.27	0.21
3775	357.8	114.04	119.4		119.8	0.00216	5.15	77.15	28	0.1	0.12	0.45	0.33
3696	357.8	113.63	119.13		119.6	0.00263	5.65	75.07	29.77	0.16	0.15	0.54	0.37
3595	357.8	113.34	118.86		119.33	0.00266	5.71	76.42	29.83	0.17	0.19	0.56	0.37
3495	357.8	113.23	118.85		119.09	0.00119	4.19	109.01	36.53	0.12	0.11	0.29	0.2
3404	357.8	113.18	118.67		118.93	0.00296	4.4	93.67	41.74	0.18	0.23	0.59	0.38
3315	357.8	113.64	118.56		118.77	0.00104	3.86	121.74	50.37	0.07	0.09	0.24	0.15
3208	357.8	112.47	118.46		118.67	0.00088	3.78	117.03	35.16	0.07	0.1	0.23	0.16
3094	357.8	112.39	118.21		118.53	0.00153	4.61	92.1	34.76	0.11	0.07	0.35	0.22
3021	357.8	112.18	118.1		118.41	0.00161	4.69	95.13	33.74	0.1	0.15	0.36	0.25
2923	357.8	112.1	117.94		118.24	0.00168	4.73	95.72	34.88	0.15	0.16	0.37	0.25
2832	357.8	111.9	117.91		118.1	0.00092	3.68	114.94	39.12	0.08	0.09	0.22	0.15
2732	357.8	111.64	117.77		118	0.00111	3.99	112.5	38.49	0.08	0.11	0.26	0.18
2632	357.8	111.33	117.7		117.89	0.00081	3.75	124.28	36.76	0.09	0.09	0.22	0.15
2584	357.8	111.27	117.64		117.85	0.00085	3.87	116.58	35.95	0.08	0.08	0.23	0.15

BETA

FULLER BROOK PARK PRESERVATION PROJECT
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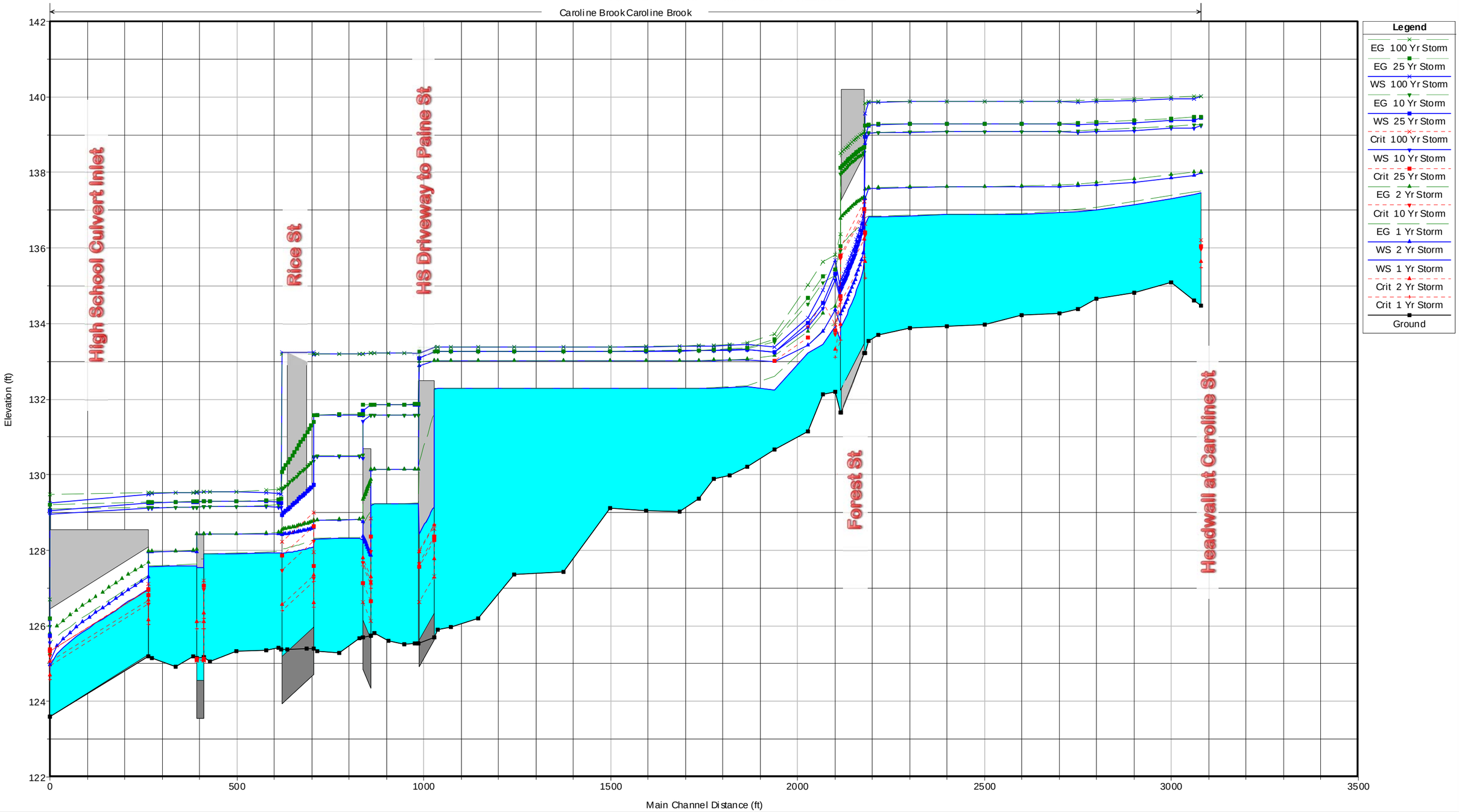
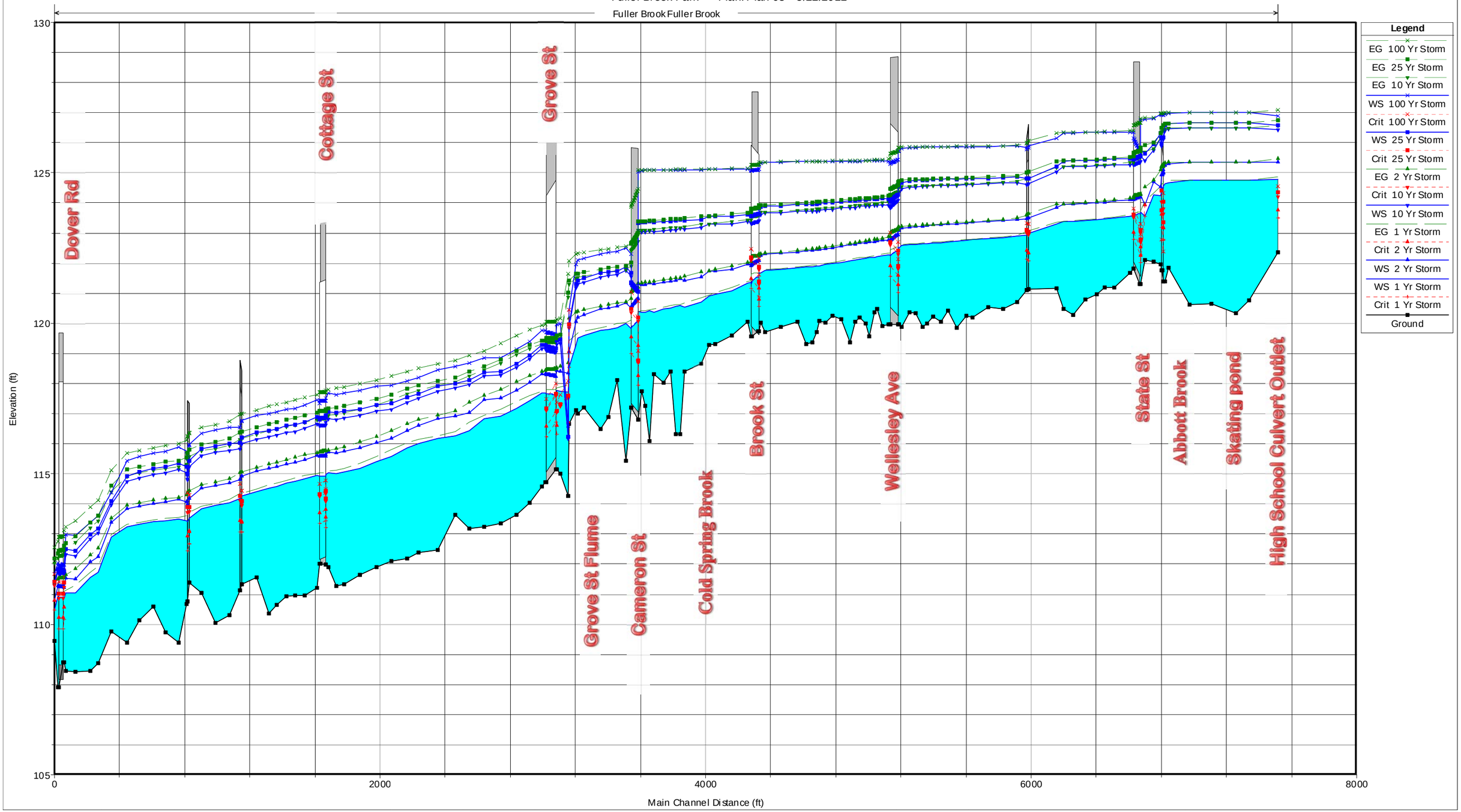
										LOB	ROB	Chan	Total
2539	357.8	111.91	117.67		117.8	0.00041	2.88	138.47	36.08	0.04	0.03	0.12	0.09
2522	357.8	111.97	117.53	114.5	117.77	0.00131	3.99	89.62	16.56			0.27	0.27
2505	Culvert			Cottage Street									
2486	421.4	112.01	117.34		117.71	0.00168	4.9	86.04	16.31			0.34	0.34
2467	421.4	111.21	117.46		117.63	0.00063	3.33	139.79	36.83	0.05	0.05	0.17	0.13
2392	421.4	110.97	117.27		117.55	0.00124	4.3	107.24	30	0.01	0.1	0.3	0.23
2332	421.4	110.97	117.17		117.47	0.00164	4.45	103.84	29.06	0.02	0.13	0.36	0.29
2281	421.4	110.92	117.15		117.38	0.00107	3.9	116.71	34.44	0.07	0.08	0.25	0.2
2223	421.4	110.63	117.05		117.31	0.00122	4.21	112.42	34.61	0.09	0.09	0.29	0.22
2175	421.4	110.37	117		117.25	0.00119	4.08	114.7	34.61	0.08	0.09	0.28	0.21
2096	421.4	111.55	116.94		117.13	0.00141	3.57	126.39	37.55	0.09	0.05	0.36	0.27
2068	421.4	111.34	116.76	114.45	117	0.00143	3.93	111.99	33.01	0.02	0.1	0.31	0.25
2063	Bridge		Footbridge to Appleby Road										
2057	421.4	111.14	116.55		116.97	0.00371	5.29	86.1	27.79	0.16	0.09	0.83	0.55
2023	421.4	110.29	116.54		116.74	0.00175	3.69	128.56	42.07	0.13	0.11	0.4	0.29
1937	421.4	110.04	116.46		116.64	0.00072	3.47	139.23	48.47	0.05	0.04	0.19	0.12
1849	421.4	111.05	116.36		116.55	0.00137	3.61	128.92	37.45	0.07	0.13	0.36	0.28
1826	421.4	111.39	115.98	114.28	116.37	0.00426	5.06	88.71	35.42	0.11	0.24	0.8	0.59
1821	Bridge		Footbridge to Leighton Road										
1816	421.4	110.75	115.54		116.25	0.01309	6.8	64.4	32	0.12	0.59	1.65	1.33
1811	421.4	110.68	115.75		116.11	0.00324	4.87	91.85	30.19	0.2	0.11	0.71	0.56
1764	421.4	109.4	115.89		116	0.00036	2.87	183.78	46.3	0.06	0.02	0.12	0.08
1685	421.4	109.72	115.74		115.95	0.00077	3.73	131.15	43.57	0.05	0.05	0.21	0.13
1609	421.4	110.59	115.7		115.88	0.00094	3.54	144.82	59.14	0.06	0.05	0.26	0.14
1520	421.4	110.12	115.59		115.79	0.00111	3.62	133.71	50.03	0.08	0.05	0.28	0.17
1448	421.4	109.4	115.45		115.69	0.00166	3.94	110.93	38.4	0.02	0.05	0.36	0.27
1348	421.4	109.77	114.38		115.12	0.09181	2.88	104.9	51.07	3.94	3.56	19.21	11.17
1271	421.4	108.7	113.62		114.13	0.00449	5.76	76.16	27.64	0.15	0.18	0.81	0.66
1218	421.4	108.45	113.39		113.89	0.0043	5.74	75.83	24.78	0.02	0.23	0.8	0.69
1127	421.4	108.42	112.94		113.45	0.00562	5.79	77.41	33.48	0.21	0.22	0.86	0.68
1068	421.4	108.46	112.99		113.23	0.00121	3.93	109.31	33.25	0.03	0.05	0.26	0.23
1057	421.4	108.73	111.99	111.79	113.12	0.00976	8.51	49.54	18.01			1.4	1.4
1036	Culvert			Dover Road									
1024	421.4	107.9	112.03		112.76	0.00517	6.84	61.64	16.63			0.86	0.86
1000	421.4	109.46	111.67	111.67	112.56	0.01163	7.57	55.66	31.76			1.23	1.23

Fuller Brook Park Plan: Plan 03 5/22/2012



Fuller Brook Park Plan: Plan 03 5/22/2012



APPENDIX D

SUMMARY OF CULVERTS

FULLER BROOK PARK PRESERVATION PROJECT
HYDRAULIC ANALYSIS

Summary of Culverts

Location	Size	Type	Condition	Comment/Recommendation	Photos
CAROLINE BROOK					
Forest Street	60" dia.	RCP	Stone Block HW & Pipe Good	None	1, 2, 3
Paine Street Driveway	42" dia.	CMP	Stone HW & Pipe Good*	Grout around pipe at HW	4, 5, 6
Path off Paine Street	42" dia.	CMP	Stone HW & Pipe Good*	Grout around pipe at HW	7, 8, 9
Rice Street	60" dia.	RCP	HW & Pipe Good	None	10, 11, 12
Footpath off Smith St	48" dia.	RCP	Pipe reinforcing exposed	Consider Replacing	13, 14, 15
Culvert from HS Field	4.5' x 3.1'	CMP arch	Steel flared end section dislocated	Reattach/Replace FES	16, 17
FULLER BROOK					
HS Field D/S Structure	8.3' x 4.1'	Conc. Box	HW & Box Culvert Good	None	18
Skating Pond	4.8' x 4'	Stone Box	Partial Calapse of End of Wall	Consider Enlarging/Repair Wall	19, 20
State Street	12' x 4.1'	Conc. Box	HW & Pipe Good	Check/repair mortar as needed	21, 22
Wellesley Avenue	7' x 6.1'	Conc. Box	HW & Pipe Good	Check/repair mortar as needed	23, 24
Brook Street	2 x 72" dia.	RCP	HW & Pipe Good	Check/repair mortar as needed	25, 26
Cameron Street	8' x 4'	Conc. Box	Small Culvert Good	Check/repair mortar as needed	27, 28
Grove Street	16' x 9.2'	Conc. Box	HW & Box Walls Good, Utilities Cross	None	29, 30
Cottage Street	15.8' x 9.2'	Conc. Box	HW & Box Walls Good, Utilities Cross	None	31, 32
Dover Road	16.2' x 9.9'	Conc. Box	HW & Box Walls Good, Utilities Cross	None	33, 34

*Note: Pipe observed only above water elevation

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Fuller Brook Park Preservation Project

Caroline Brook Culvert Photos

Photo 1: Forest Street – Upstream

Photo 2: Forest Street - Downstream

Photo 3: Forest Street – Inside 60 in. dia. RCP

Photo 4: Driveway off Paine Street – Upstream

Photo 5: Driveway off Paine Street – Downstream

Photo 6: Driveway off Paine Street – Inside 42” CMP

Photo 7: Path off Paine Street – Upstream

Photo 8: Path off Paine Street – Downstream

Photo 9: Path off Paine Street – Inside 42" CMP

Photo 10: Rice Street – Upstream

Photo 11: Rice Street – Downstream

Photo 12: Rice Street – Inside 60" RCP

Photo 13: Path off Smith Street – Upstream

Photo 14: Path off Smith Street – Downstream

Photo 15: Path off Smith Street – Inside 48” RCP

Photo 16: High School Culvert – Upstream

Photo 17: High School Culvert – Inside 58” x 32” CMP Arch

Fuller Brook Park Preservation Project

Fuller Brook Culvert Photos

Photo 18: High School Culvert – Downstream

Photo 19: Skating Pond Path - Upstream

Photo 20: Skating Pond Path – Downstream

Photo 21: State Street – Upstream

Photo 22: State Street – Downstream

Photo 23: Wellesley Ave – Upstream

Photo 24: Wellesley Ave – Downstream

Photo 25: Brook Street – Upstream

Photo 26: Brook Street – Downstream

Photo 27: Cameron Street – Upstream

Photo 28: Cameron Street – Downstream

Photo 29: Grove Street – Upstream

Photo 30: Grove Street – Downstream

Photo 31: Cottage Street – Upstream

Photo 32: Cottage Street – Downstream

Photo 33: Dover Road – Upstream

Photo 34: Dover Road – Downstream

APPENDIX E

SUMMARY OF DRAINAGE OUTFALLS

Fuller Brook Park Preservation Project

Summary of Drainage Outfalls

Location Station		Size (in.)	Type	Condition	Comment/Recommendation	Photos
Fuller Brook						
11+90	R	12	RCP	High outlet - Last section detached	Reset section/restore bank	1
12+68	R	6	CI	Outlet near top of bank-broken end	Clean cut pipe/erosion protection	2
12+88	R	10	CP	Outlet near top of bank-broken end	Clean cut pipe/erosion protection	2
14+99	R	10	PVC	Outlet near top of bank	Erosion protection	3
16+56	L	10	CP	End section detached	Reset section/restore bank	4
16+57	L	12	RCP	End section detached	Repair	4
18+38	R	10	CP	End section exposed	Erosion protection/restore bank	5
19+50	R	10	CP	Last 2 sections dislocated/erosion	Reset sections/restore bank	6
20+75	L	12	ACP	Concrete sluce deteriorating	Provide new erosion protection	7
23+05	R	12	RCP	Out of wall - good	Existing to remain	8
24+62	R	18	HDPE	FES dislocated	Reset FES/erosion protection	9
24+77	L	10	CP	Pipe thru trees/bit sluce	remove trees/erosion protection	10
24+80	L	12	RCP	Pipe thru trees/bit sluce	remove trees/erosion protection	10
28+34	R	10	CP	Last 2 sections dislocated/erosion	Remove sections/erosion protection	11
29+93	L	12	RCP	HW undermined & sediment accum.	Remove sediment/erosion protection	12
31+23	R	30	RCP	HW deteriorating/erosion	Repair HW/erosion protection	13
31+27	R	18	RCP	HW deteriorating/erosion	Repair HW/erosion protection	13
36+80	R	10	DI	Fair condition	Existing to remain/erosion protection	14
36+85	L	15	CMP	Roots/tree impact HW	Remove tree & Roots/repair HW	15
37+33	L	10	CP	Abandoned?	Remove if abandoned	16
37+80	L	10	CP	Abandoned?	Remove if abandoned	17
38+03	R	10	CP	Fair condition	Touch up erosion protection	18
38+48	L	8	CMP	HW undermined/tree & roots problem	Remove tree & erosion protection	19
38+51	L	10	CP	Pipe end supported by trees	Rem trees intall HW & erosion protection	19
39+70	L	10	CP	Abandoned	Remove/abandon	20
41+02	L	18	CLAY	Fair condition	Review erosion protection	21
42+08	L	24	RCP	Fair condition	Check HW & erosion protection	22
43+70	L	12	DI	Partially burried	Open end - possible sediment trap/swale	23
43+83	R	12	RCP	Fair condition	Check erosion protection	24
44+30	L	24	RCP	Direct Connect to culvert		
46+60	L	6	CP	Outlet near top of bank	Erosion protection	25
51+30	R	12	RCP	Fair condition out HW	Check erosion protection	26
54+09	L	12	RCP	Pipe extends over water	Cut pipe back to bank/erosion protection	27
54+67	R	8	CLAY	Pipe below mud line	Private street?	28
54+69	L	8	ACP	Pipe extends over water	Cut pipe back to bank/erosion protection	29
54+98	R	10	CLAY	Last 2 sections dislocated/erosion	Remove sections/erosion protection	30
56+18	R	8	CLAY	Pipe below mud line	Install new drain pipe at higher elevation	31
56+78	L	8	CLAY	Under path	Upgrade to accommodate path	
58+42	R	8	CLAY	Last 4 sections dislocated/erosion	Remove sections/erosion protection	32
59+58	L	12	ACP	Pipe extends over water	Cut pipe back to bank/erosion protection	33
59+65	R	18	RCP	Fair condition	Check erosion protection	34

BETA

Fuller Brook Park Preservation Project

Summary of Drainage Outfalls

Location Station		Size (in.)	Type	Condition	Comment/Recommendation	Photos
60+26	L			Direct Connect to culvert		
60+89	R	8	CLAY	End broken/abandoned?	This pipe appears to be abandoned	35
61+28	R	6	CLAY	Pipe extends over water	Cut pipe back to bank/erosion protection	36
62+86	R	6	ACP	Under path	Upgrade to accommodate path	
64+43	R	6	CI	Pipe extends over water	Cut pipe back to bank/erosion protection	37
66+47	L	8	DI	Fair condition	Check erosion protection	38
67+85	R	14	ACP	Pipe extends over water	Cut pipe back to bank/erosion protection	39
68+05	L	14?	ACP	Under footbridge		40
72+60	R	4	PVC	Sump pump outlet?		41
72+70	L	12	RCP	End section exposed	Erosion protection/restore bank	42
73+03	R	15	RCP	HW broken/missing	Erosion protection/restore bank	43
Caroline Brook						
105+75	R	12	RCP	Outlet at mudline	To be field verified	44
106+20	L	12	RCP	In HW - adequate		45
106+81	R	12	RCP	Direct Connect to culvert	Cut pipe back to prevent blockage	46
107+04	L	8	DI	Outlet at HW		47
107+92	R	8	PVC	New/fair condition		48
108+61	L	8	ST	Thiobacillus bacteria observed		49
109+16	L	12	RCP	Pipe extends over water	Cut pipe back to bank/erosion protection	50
110+05				Direct Connect to culvert	Relocate to provide treatment BMP	
110+43	L	12	HDPE	New/fair condition		51
113+18	L	8	CLAY	Under path	Upgrade to accommodate path	52
115+07	L	8	CLAY	Under path	Upgrade to accommodate path	
115+44	L	8	CLAY	Under path	Upgrade to accommodate path	53
121+05	L	12	RCP	Pipe undermined	Provide erosion protection below pipe	54
121+05	R	8	CLAY	Massive erosion several section	Reconstruct pipe/consider increasing size	55
121+35				CB Direct to Culvert		
121+60				CB Direct to Culvert		
123+25	R	24	RCP	Pipe outlet above stream bed	Provide erosion protection below pipe	56
124+81	L	4	PVC	Adequate Condtion		57
126+84	R	18	CLAY	Only 6" above mudline	Dredge swale & upstream end	58
127+77	L	8	CI	Outlet near top of bank	Erosion protection	59
129+37	L	10	ACP	Pipe extends over water	Cut pipe back to bank/erosion protection	60
129+68	L	10	CP	Broken end	Clean cut pipe/erosion protection	61
130+78	L	22	CLAY	Adequate Condtion		62
130+78		18	RCP	Adequate Condtion		62
130+78	R	24	ST	Adequate Condtion		62

BETA

Fuller Brook Park Preservation Project

Fuller Brook Drainage Outfalls

Photo 1: 11+90R (12” RCP)

Photo 2: 12+68R (6” CI) & 12+88R (10” CP)

Photo 3: 14+99R (10” PVC)

Photo 4: 16+56L (10”CP)& 16+57 (12”RCP)

Photo 5: 18+38R (10” CP)

Photo 6: 19+50R (10”CP)

Photo 7: 20+75L (12”ACP)

Photo 8: 23+05R (12”RCP)

Photo 9: 24+62R (18”HDPE)

Photo 10: 24+77L(10”CP) & 24+80L(12”RCP)

Photo 11: 28+34R (10”CP)

Photo 12: 29+93L (12”RCP)

Photo 13: 31+23R(30”RCP) & 31+27R(18”RCP)

Photo 14: 36+80R (10”DI)

Photo 15: 36+85L (15”CMP)

Photo 16: 37+33L(10” CP)

Photo 17: 37+80L(10” CP)

Photo 18: 38+03R (10”CP)

Photo 19: 38+48L(18”CMP)&38+51L(10” CP)

Photo 20: 39+70L(10” CP)

Photo 21: 41+02R (18”CLAY)

Fuller Brook Park Preservation Project

Fuller Brook Drainage Outfalls (cont)

Photo 22: 42+08L (24" RCP)

Photo 23: 43+70L (12" DI)

Photo 24: 43+83R (12"RCP)

Photo 25: 46+60L (6" CP)

Photo 26: 51+30R (12" DI)

Photo 27: 54+09L (12"RCP)

Photo 28: 54+67R (8" CLAY)

Photo 29: 54+69L (8" ACP)

Photo 30: 54+98R (10" CLAY)

Photo 31: 56+18R (12" CLAY)

Photo 32: 58+42R (8" CLAY)

Photo 33: 59+58 (12" ACP)

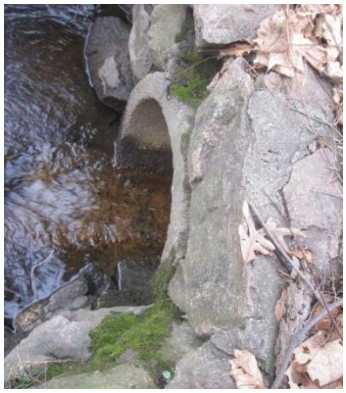


Photo 34: 59+65R (18” RCP)

Photo 35: 60+89R (8” CLAY)

Photo 36: 61+28R (6” CLAY)

Photo 37: 64+43R (6” CI)

Photo 38: 66+47L (6” CI)

Photo 39: 67+85R (14” ACP)

Photo 40: 68+05L (14” ACP)

Photo 41: 72+60R (4” PVC)

Photo 42: 72+70L (12” RCP)

Photo 43: 73+03R (15” RCP)

Fuller Brook Park Preservation Project

Caroline Brook Drainage Outfalls

Photo 44: 105+75R (12" RCP)

Photo 45: 106+20L (12" RCP)

Photo 46: 106+81R (12"RCP)

Photo 47: 107+04L (8" DI)

Photo 48: 107+92R (8"PVC)

Photo 49: 108+61L (8" IP)

Photo 50: 109+16L (12" RCP)

Photo 51: 110+43L (12"HDPE)

Photo 52: 113+18L (8" CLAY)

Photo 53: 115+44L (8" CLAY)

Photo 54: 121+05L (12"RCP)

Photo 55: 121+05R (8" CLAY)

Photo 56: 123+25R (24" RCP)

Photo 57: 124+81L (4"PVC)

Photo 58: 126+84R (18" CLAY)

Photo 59: 127+77L (8" CLAY)

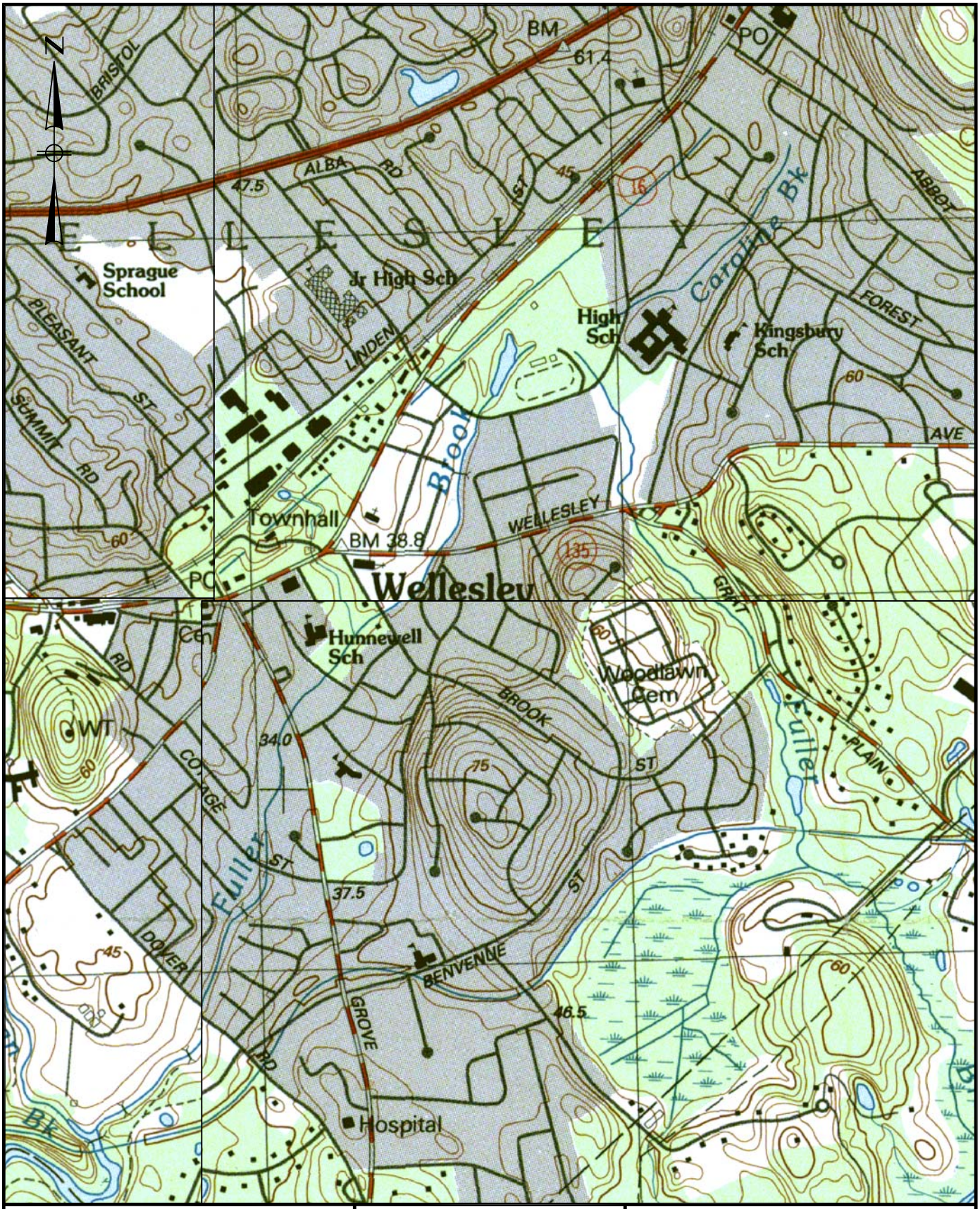
Photo 60: 129+37L (10"ACP)

Photo 61: 129+68L (10" RCP)

Photo 62: 130+78 (22"CLAY – 18" RCP – 24" ACP)

APPENDIX F

BACKUP DATA



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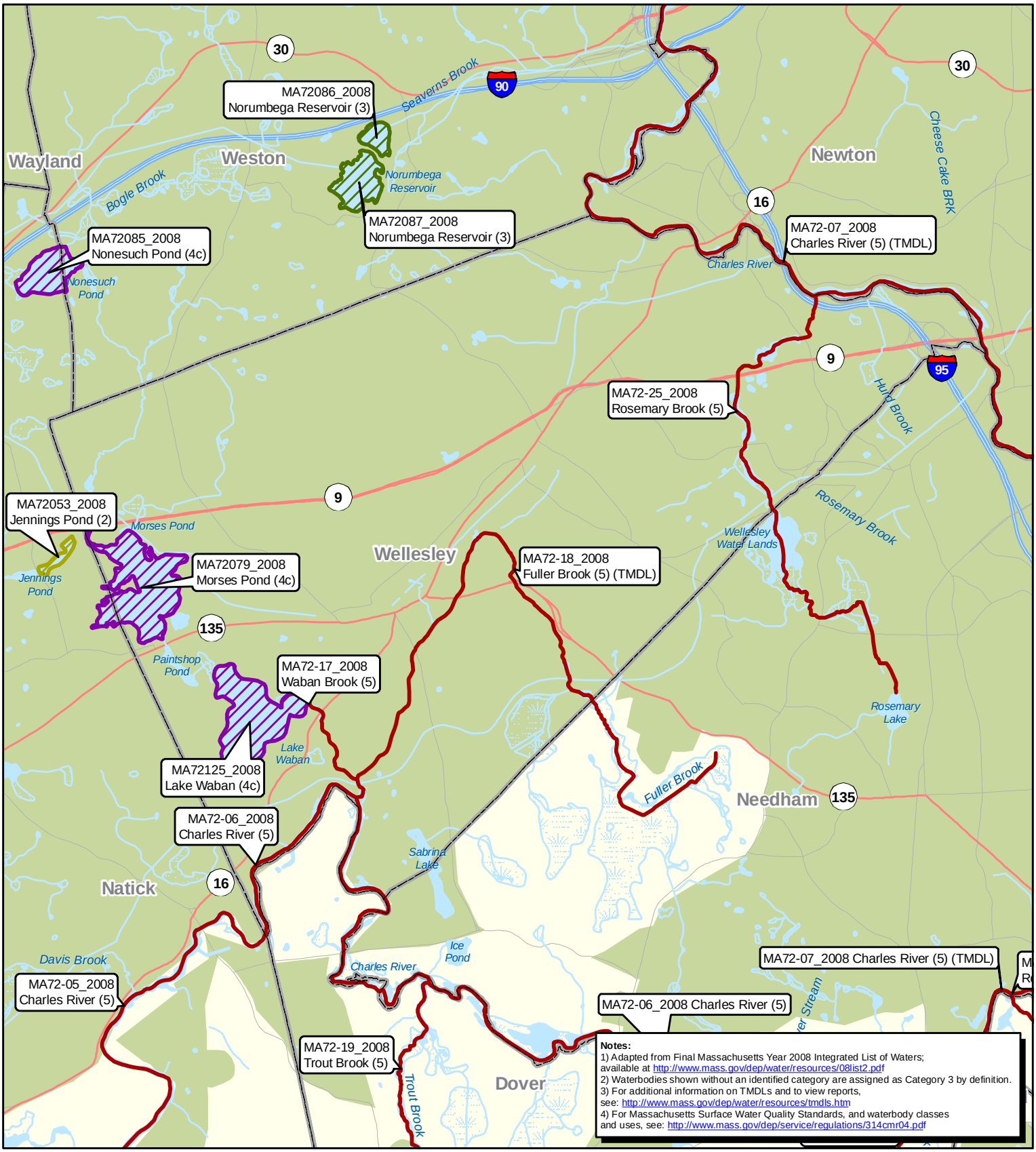
email: BETA@BETA-inc.com

FULLER BROOK PARK PRESERVATION PROJECT

WELLESLEY
Massachusetts

PROJECT LOCUS
Scale: 1" = 1200'±

O:\3300s\3364 – Wellesley DPW On-Call\Task 1 – Wales Street Bridge\AutoCadDrawings\3364 Project Locus.dwg Jul 08,2011 5:00pm



Waterbody Assessment and TMDL Status
Wellesley, MA

N

0 0.5 Miles

EPA

Map produced by EPA Region I GIS Center
Map Tracker ID 6678, February 25, 2010
Data Sources: TeleAtlas, Census Bureau, USGS, MassDEP

Waterbody Label

State ID,
Waterbody Name (Category)
(TMDL(s) approved for this waterbody)

See companion table for a listing of pollutants, non-pollutants, and TMDLs for each waterbody

Assessment of Waterbody Segment

- Category 2: Attaining some uses; other uses not assessed
- Category 3: Insufficient information to make assessments for any use.
- Category 4a: TMDL is completed and approved for one or more pollutants
- Category 4c: Impairment not caused by a pollutant.
- Category 5: Impaired or threatened for one or more uses and requiring a TMDL.

- Waterbodies
- Swamp/Marsh
- MS4 Urbanized Areas (2000 Census)
- Municipal Boundaries

Summary of Waterbody Assessment and TMDL Status in Massachusetts

Wellesley, MA

ID	Waterbody Name	Watershed Name	Category	Acres (In Town - Total)	Miles (In Town - Total)	Cause Non-Pollutant(s)*/Pollutant(s	TMDL
MA72-06_2008	Charles River	Charles	5	2.0	8.4		
						Bioassessments	
						Exotic species*	
						Flow alteration*	
						Noxious aquatic plants	
						Nutrients	
						PCBs	
						Pesticides	
MA72-07_2008	Charles River	Charles	5	0.0	24.8		
						Bioassessments	
						Exotic species*	
						Flow alteration*	
						Noxious aquatic plants	
						Nutrients	
						Other habitat alterations*	
						Pathogens	CN 156.0
						PCBs	
						Pesticides	
MA72-17_2008	Waban Brook	Charles	5	0.7	0.7		
						Thermal modifications	

1) Adapted from Final Massachusetts Year 2008 Integrated List of Waters (CN 281.1, 12/2008); available at http://www.mass.gov/dep/water/resources/08list2.pdf
2) For additional information on TMDLs and to view reports, see: http://www.mass.gov/dep/water/resources/tmdls.htm
3) For Massachusetts Surface Water Quality Standards, and waterbody classes and uses, see: http://www.mass.gov/dep/service/regulations/314cmr04.pdf

Assessment of Waterbody Segment

Category 2 - Attaining some uses; other uses not assessed
Category 3 - Insufficient information to make assessments for any use
Category 4a - TMDL is completed
Category 4c - Impairment not caused by a pollutant
Category 5 - Impaired or threatened for one or more uses and requiring a TMDL

Note: The accuracy of mileage and acreage estimates is limited for waterbodies that serve as or span municipal boundaries

Summary of Waterbody Assessment and TMDL Status in Massachusetts

Wellesley, MA

ID	Waterbody Name	Watershed Name	Category	Acres (In Town - Total)		Miles (In Town - Total)		Cause Non-Pollutant(s)*/Pollutant(s	TMDL
MA72-18_2008	Fuller Brook	Charles	5			2.9	4.3		
								Cause Unknown	
								Organic enrichment/Low DO	
								Other habitat alterations*	
								Pathogens	CN156.0
								Siltation	
MA72-25_2008	Rosemary Brook	Charles	5			1.6	3.3		
								Nutrients	
								Organic enrichment/Low DO	
MA72079_2008	Morses Pond	Charles	4c	102.77	111.82				
								Exotic species*	
MA72125_2008	Lake Waban	Charles	4c	109	109				

1) Adapted from Final Massachusetts Year 2008 Integrated List of Waters (CN 281.1, 12/2008); available at http://www.mass.gov/dep/water/resources/08list2.pdf
2) For additional information on TMDLs and to view reports, see: http://www.mass.gov/dep/water/resources/tmdls.htm
3) For Massachusetts Surface Water Quality Standards, and waterbody classes and uses, see: http://www.mass.gov/dep/service/regulations/314cmr04.pdf

Assessment of Waterbody Segment

Category 2 - Attaining some uses; other uses not assessed
Category 3 - Insufficient information to make assessments for any use
Category 4a - TMDL is completed
Category 4c - Impairment not caused by a pollutant
Category 5 - Impaired or threatened for one or more uses and requiring a TMDL

Note: The accuracy of mileage and acreage estimates is limited for waterbodies that serve as or span municipal boundaries

SECLECTIVE DATA FROM 2004 STORMWATER MASTERPLAN UPDATE

Table 7-11. Peak Runoff Flows by Subcatchment – Fuller Brook

		5-YR	10-YR	25-YR	50-YR	100-YR
Subcatchment	**Model Load Point**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**
F010001	Dover Rd. D/S side	3.4	6.3	8.6	11.2	17.2
F010002	Cottage St. D/S side	22.6	33.4	41.2	49.5	67.0
F010003	Grove St. D/S side	35.4	47.6	56.1	64.8	83.0
F010004	Cameron St. D/S side	5.4	9.0	11.7	14.6	20.8
F010005	Brook St. D/S side	23.1	32.3	38.8	45.4	59.2
F010006	Wellesley Ave D/S side	11.4	16.3	19.8	23.4	31.0
F010007	State St. D/S side	21.8	30.7	37.2	43.9	57.9
1F010008	HS Field culvert D/S side	2.2	3.7	4.9	6.2	9.1
2F010008	HS Field North	2.1	3.6	4.8	6.1	8.9
F010009	Smith St. D/S side	3.9	5.7	7.0	8.4	11.3
F010010	Wellesley Ave. D/S side	16.6	24.4	30.0	35.8	48.0
1F010011	Brook St. D/S side	15.0	22.9	28.7	35.0	48.2
2F010011	Sta. 126+00	8.3	12.5	15.6	18.8	25.8
1F010012	Aqueduct D/S side	26.4	34.5	40.0	45.6	57.0
2F010012	Sta. 142+00	7.7	10.0	11.6	13.2	16.5
F010013	Incinerator Rd. U/S side	190.2	267.7	323.2	381.3	503.8
F010014	Trib. Washington St. D/S side	2.2	3.4	4.3	5.2	7.2
F030015	Grove St. closed system	1.1	2.9	4.5	6.3	10.7
F030015SUB	Grove St. closed system	0.0	0.0	0.1	0.1	0.2
F030016	Cameron St. closed system	3.4	4.3	4.9	5.5	6.8

Table 7-11 cont'd.

		5-YR	10-YR	25-YR	50-YR	100-YR
Subcatchment	**Model Load Point**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**
F030017	Cameron St. closed system	84.6	104.6	118.0	131.4	158.2
1F030018	Southgate Rd. closed system	15.9	23.6	29.3	35.3	47.9
2F030018	Wellesley Ave. closed system	5.9	8.7	10.8	12.9	17.4
1F030019	Smith St. closed system	5.4	7.2	8.5	9.7	12.4
2F030019	Smith St. closed system	3.0	4.0	4.6	5.3	6.7
F030020	Wellesley Ave. closed system	9.1	13.3	16.5	19.7	26.6
F030021	Fuller Brook Rd. closed system	16.0	24.5	30.8	37.4	51.5
F030022	Eisenhower Cir. closed system	1.4	2.7	3.8	4.9	7.4
1F030023	Kenilworth Cir. closed system	3.5	5.6	7.1	8.7	12.2
2F030023	Kenilworth Rd. closed system	2.8	4.4	5.6	6.9	9.6
F030023SUB	Kenilworth Cir. closed system	1.6	3.0	4.2	5.6	8.8
F030024	Linden St. closed system	38.0	51.2	60.3	69.7	89.1
F030024SUB	Linden St. closed system	2.7	4.1	5.2	6.2	8.5
F030025	Grove St. closed system	4.6	7.9	10.5	13.3	19.6
F030026	Recycling Center closed system	16.6	20.0	22.3	24.6	29.1

Table 7-12. Peak Runoff Flows by Subcatchment – Caroline Brook

		5-YR	10-YR	25-YR	50-YR	100-YR
Subcatchment	**Model Load Point**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**
C010001	Rice St. D/S side	4.2	6.1	7.5	9.0	12.1
C010002	Forest St. D/S side	34.1	44.2	51.1	58.1	72.3
C010003	Caroline St. D/S side	34.4	46.0	54.1	62.4	79.4
C030004	Laurel Ave. closed system	1.2	1.9	2.5	3.1	4.4
C030004sub	Laurel Ave. closed system	0.6	1.0	1.3	1.5	2.1
1C030005A	Seward Rd. closed system	59.7	75.3	85.8	96.4	117.7
1C030005B	Washington St. closed system	40.9	49.8	55.6	61.5	73.2
2C030005A	Abbott Rd. closed system	20.6	25.9	29.5	33.1	40.3
2C030005B	Abbott Rd. closed system	16.7	20.3	22.7	25.2	30.1
3C030005A	Caroline St. closed system	5.5	6.9	7.8	8.7	10.5
C07	Forest St. closed system	72.3	94.3	109.3	124.6	155.8
C08	Seaver St. closed system	51.0	67.8	79.4	91.3	115.6

Table 7-13. Peak Runoff Flows by Subcatchment – Abbott Brook

		5-YR	10-YR	25-YR	50-YR	100-YR
Subcatchment	**Model Load Point**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**
Ab010001	Aqueduct D/S side	6.7	8.4	9.6	10.8	13.1
Ab010002	Linden St. D/S side	6.6	9.6	11.7	13.8	18.4
Ab010003	Abbott Pond	12.5	17.3	20.6	24.1	31.3
Ab030004	Railroad U/S side	12.9	16.0	18.0	20.1	24.3
Ab030005	Kingsbury St. closed system	6.3	8.9	10.8	12.7	16.8
1Ab030006	Audubon Rd. closed system	6.6	9.7	12.0	14.4	19.4
2Ab030006	Route 9 closed system	3.3	5.0	6.1	7.4	10.0
3Ab030006	Audubon Rd. closed system	6.0	8.8	11.0	13.2	17.8
4Ab030006	Alba Rd. closed system	4.1	6.2	7.6	9.2	12.4
5Ab030006	Alba Rd. closed system	7.3	10.9	13.5	16.2	22.0
1Ab030007	Fox Hill Rd. closed system	3.7	4.7	5.4	6.2	7.6
2Ab030007	Sagamore Rd. closed system	37.5	49.0	56.9	64.9	81.2
Ab24	Route 9 closed system	24.0	30.7	35.3	39.9	49.2

Table 7-14. Peak Runoff Flows by Subcatchment – Cold Spring Brook

		5-YR	10-YR	25-YR	50-YR	100-YR
Subcatchment	**Model Load Point**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**
Cd010001	Washington St. D/S side	2.0	3.6	4.8	6.2	9.3
Cd010002	Aqueduct D/S side	0.2	0.4	0.8	1.2	2.4
Cd010003	Railroad D/S side	4.4	6.9	8.8	10.9	15.2
Cd010004	Oak St. D/S side	30.8	39.4	45.2	51.1	63.1
Cd010005	Roberts Rd. D/S side	2.5	3.8	4.7	5.7	7.8
Cd010006	Lowell Rd. D/S side	1.1	1.9	2.5	3.1	4.5
Cd010007	Bristol Rd. D/S side	3.1	4.2	5.0	5.7	7.3
1Cd030008	Bristol Rd. closed system	24.7	33.2	39.2	45.4	58.0
2Cd030008	Bristol Rd. closed system	21.1	28.3	33.4	38.5	49.1
3Cd030008	Linden St. closed system	8.2	11.0	13.0	15.1	19.3
4Cd030008	Oak St. closed system	19.7	26.5	31.3	36.1	46.0
5Cd030008	Donizetti St. closed system	28.8	38.9	46.0	53.2	68.0
6Cd030008	Oak St. closed system	21.6	28.9	34.0	39.2	49.7
7Cd030008	Donizetti St. closed system	27.9	37.4	44.0	50.8	64.8
8Cd030008	Route 9 U/S side	16.7	22.4	26.4	30.5	38.8
9Cd030008	Oakridge Rd. closed system	11.6	15.7	18.5	21.3	27.2
Cd030009	Pinewood Rd. closed system	6.6	9.1	10.8	12.6	16.3
Cd030010	Roberts Rd. U/S side	3.0	4.2	5.1	6.0	7.8
1Cd030011A	Lowell Rd. closed system	3.8	4.9	5.6	6.4	7.9
2Cd030011A	Lowell Rd. closed system	27.3	35.6	41.3	47.2	59.2
Cd030011B	Lowell Rd. closed system	25.3	32.1	36.8	41.4	50.9

Table 7-14 cont'd.

		5-YR	10-YR	25-YR	50-YR	100-YR
Subcatchment	**Model Load Point**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**
Cd030012	Bristol Rd. closed system	82.1	105.0	120.6	136.4	168.2
Cd22	Linden St. closed system	34.7	43.2	48.9	54.6	66.1
Cd25	Linden St. closed system	19.4	23.7	26.6	29.5	35.3
Cd57	Route 9 closed system	17.1	22.3	25.9	29.5	36.9
Cd63	Westgate Rd. closed system	22.4	28.5	32.7	36.9	45.3
Cd80	Sprague Rd. closed system	1.4	2.0	2.6	3.1	4.2

7.4.5 Pollock Brook Basin

The peak runoff flows from each subcatchment within the Pollock Brook basin are presented in Table 7-15 for each storm event frequency. Although subcatchment P010002, which drains areas both inside and outside of the Town of Wellesley, is almost 10 times larger than subcatchment P010001, located entirely inside the Town, the peak flows are almost equal.

Table 7-15. Peak Runoff Flows by Subcatchment – Pollock Brook

		5-YR	10-YR	25-YR	50-YR	100-YR
Subatchment	**Model Load Point**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**	**Peak Flow, cfs**
P010001	Washington St. D/S side	2.9	4.8	6.4	8.1	12.0
P010002	Town Boundary	2.2	4.2	5.7	7.5	11.6

Table 8-4. Physical Data for Structures – Fuller, Cold Spring, & Caroline Brooks

Location	Hydraulic Opening Dimensions	Invert Elevations (ft)		Top of Road Elevation (ft)
	(circular unless noted)	Upstream	Downstream	
FULLER BROOK				
Dover Road	16.2' x 9.9' box	102.4	102.4	113.9
Cottage Street	15.8' x 9.2' box	106.5	106.4	117.3
Grove Street	16' x 9.2' box	109.8	109.3	120.9
Cameron Street	8' x 4' box	111.3	111.6	120.5
Brook Street	2 - 72"	114.5	114.4	122.3
Wellesley Avenue	7' x 6.1' box	114.5	114.8	123.3
State Street	12' x 4.1' arch	115.8	116.3	123.1
Skating Pond	4.8' x 4' box	115.7	116.1	121.1
High School Field D/S Structure	8.3' x 4.1' box	--	116.6	122.9
High School Field U/S Structure	8.3' x 4.1' box	118.0	--	123.5
Culvert from Smith St. to HS Field	60"	117.4	117.8	123.5
Smith Street	8' x 5.1' oval	118.9	118.6	123.5
Footbridge 155	2-36"	119.3	119.3	123.0
Wellesley Avenue	7' x 4.2' box	122.7	122.1	130.5
Brook Street	8.5' x 4.2' arch	128.2	128.8	135.0
Sudbury River Aqueduct	5.4' x 4' box	127.2	126.9	145.2
Incinerator Road	5 - 36"	128.3	128.3	136.2
COLD SPRING BROOK				
Washington Street	13' x 4.8' box	116.9	116.5	127.0
Town Hall Drive	8' x 5' arch	117.3	117.3	125.1
Duck Pond Dam	13.8' span	120.3	117.4	120.3*
Cochituate Aqueduct	5.6' x 4.5' box	116.8	117	135.9
CAROLINE BROOK				
Culvert on High School Field	4.5' x 3.1' arch	119.7	--	123.5
Footpath off Smith Street	48"	118.6	118.6	123.2
Rice Street	60"	119.0	118.5	127.7
Path off Paine Street	42"	118.9	119.1	125.3
Paine Street	42"	119.7	119.2	126.5
Forest Street	60"	128.4	127.1	135.1

All elevations shown are above Mean Sea Level.
All box and oval culvert dimensions are shown as Width x Height.
*Spillway crest elevation.

Table 8-5. Physical Data for Structures – Hurd Brook

Location	Hydraulic Opening Dimensions	Invert Elevations (ft)		Top of Road Elevation (ft)
	(circular unless noted)	Upstream	Downstream	
HURD BROOK				
Route 9 / Route 128 interchange	2 - 60"	61.6	59.0	70.0

All elevations shown are above Mean Sea Level.

Table 8-21. Computed Peak Flows (cfs) – Fuller, Cold Spring, and Caroline Brooks

Location	Storm Frequency (year)				
	5	10	25	50	100
FULLER BROOK					
Dover Road	263	299	325	340	395
Cottage Street	238	264	282	289	336
Grove Street	230	255	273	279	323
Cameron Street	228	252	271	276	320
Brook Street	110	126	140	147	157
Wellesley Avenue	96	112	118	128	141
State Street	92	107	117	123	133
Skating Pond Footpath	74	88	104	123	156
High School Field D/S Structure	86	93	98	100	111
High School Field U/S Structure	32	36	39	41	47
Culvert from Smith St. to HS Field	33	40	46	50	58
Smith Street	27	33	37	42	53
Footbridge 155	29	37	43	48	76
Wellesley Avenue	15	20	26	29	39
Brook Street	10	13	16	21	29
Sudbury River Aqueduct	11	14	17	19	25
Incinerator Road	11	15	17	20	26
COLD SPRING BROOK					
Washington Street	136	148	153	154	158
Town Hall Drive	136	148	153	154	158
Duck Pond Dam	136	148	153	154	158
Cochituate Aqueduct	145	152	156	156	160
CAROLINE BROOK					
Culvert on High School Field	41	44	47	47	53
Footpath off Smith Street	41	51	65	69	85
Rice Street	40	43	45	46	52
Path off Paine Street	40	43	45	46	66
Paine Street	40	43	45	46	54
Forest Street	74	85	91	95	103

Table 8-22. Computed Water Surface Elevations (ft) – Fuller, Cold Spring, and Caroline Brooks

Location	Top of Road Elevation (ft)	Storm Frequency (year)				
		5	10	25	50	100
FULLER BROOK						
Dover Road	113.9	107.4	107.7	108.2	108.9	110.3
Cottage Street	117.3	111.5	111.7	111.8	111.9	112.2
Grove Street	120.9	114.5	114.7	114.9	114.9	115.3
Cameron Street	120.5	117.1	117.6	118.1	118.3	119.3
Brook Street	122.3	119.6	120.4	121.1	121.3	121.6
Wellesley Avenue	123.3	120.0	120.7	121.3	121.5	121.9
State Street	123.1	121.1	121.5	121.9	122.1	122.5
Skating Pond Footpath	121.1	121.3	121.8	122.1	122.2	122.6
High School Field D/S Structure	122.9	121.4	121.9	122.1	122.3	122.7
High School Field U/S Structure	123.5	121.5	122.0	122.3	122.5	122.9
Culvert from Smith St. to HS Field	123.5	121.6	122.1	122.4	122.6	123.0
Smith Street	123.5	121.6	122.1	122.4	122.6	123.0
Footbridge 155	123.0	121.7	122.2	122.5	122.7	123.1
Wellesley Avenue	130.5	124.1	124.4	124.5	124.6	124.8
Brook Street	135.0	129.8	129.9	130.0	130.2	130.4
Sudbury River Aqueduct	145.2	129.8	129.9	130.1	130.2	130.4
Incinerator Road	136.2	129.8	130.0	130.1	130.2	130.5
COLD SPRING BROOK						
Washington Street	127.0	119.9	120.4	121.0	121.2	121.5
Town Hall Drive	125.1	120.9	121.3	121.6	121.8	122.1
Duck Pond Dam	120.3*	122.6	122.8	122.9	122.9	123.0
Cochituate Aqueduct	135.9	123.6	123.9	124.0	124.1	124.2
CAROLINE BROOK						
Culvert on High School Field	123.5	123.0	123.6	124.2	124.4	125.4
Footpath off Smith Street	123.2	123.3	123.9	124.3	124.5	125.4
Rice Street	127.7	123.4	124.0	124.4	124.6	125.5
Path off Paine Street	125.3	124.0	124.7	125.1	125.3	125.9
Paine Street	126.5	124.7	125.4	125.9	126.1	126.8
Forest Street	135.1	130.7	131.0	131.1	131.2	131.4

All elevations shown are in feet above Mean Sea Level.
Overtopping of roads indicated by shading.
*Dam spillway elevation.

Table 3-1 Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
A. *Natural Streams*			
1. **Main Channels**			
a. Clean, straight, full, no rifts or deep pools	0.025	0.030	0.033
b. Same as above, but more stones and weeds	0.030	0.035	0.040
c. Clean, winding, some pools and shoals	0.033	0.040	0.045
d. Same as above, but some weeds and stones	0.035	0.045	0.050
e. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
f. Same as "d" but more stones	0.045	0.050	0.060
g. Sluggish reaches, weedy. deep pools	0.050	0.070	0.080
h. Very weedy reaches, deep pools, or floodways with heavy stands of timber and brush	0.070	0.100	0.150
2. **Flood Plains**			
a. Pasture no brush			
1. Short grass LAWN	0.025	0.030	0.035
2. High grass	0.030	0.035	0.050
b. Cultivated areas			
1. No crop	0.020	0.030	0.040
2. Mature row crops	0.025	0.035	0.045
3. Mature field crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds WETLAND	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer VEGETATED	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050
2. Same as above, but heavy sprouts	0.050	0.060	0.080
3. Heavy stand of timber, few down trees, little undergrowth, flow below branches	0.080	0.100	0.120
4. Same as above, but with flow into branches	0.100	0.120	0.160
5. Dense willows, summer, straight	0.110	0.150	0.200
3. **Mountain Streams, no vegetation in channel, banks usually steep, with trees and brush on banks submerged**			
a. Bottom: gravels, cobbles, and few boulders	0.030	0.040	0.050
b. Bottom: cobbles with large boulders	0.040	0.050	0.070

Table 3-1 (Continued) Manning's 'n' Values

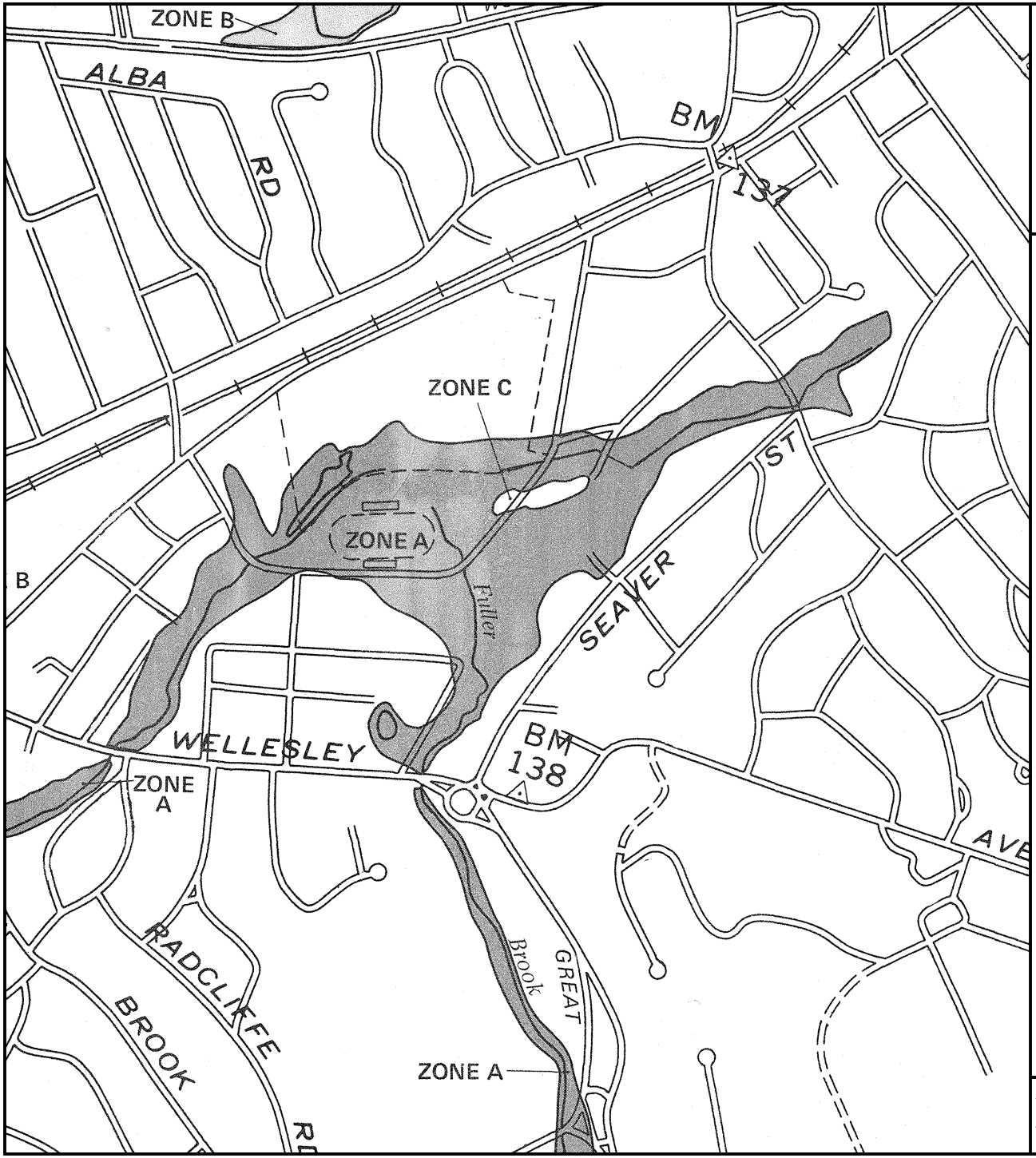
Type of Channel and Description	Minimum	Normal	Maximum
B. *Lined or Built-Up Channels*			
1. **Concrete**			
a. Trowel finish PAVEMENTS	0.011	0.013	0.015
b. Float Finish	0.013	0.015	0.016
c. Finished, with gravel bottom	0.015	0.017	0.020
d. Unfinished	0.014	0.017	0.020
e. Gunite, good section	0.016	0.019	0.023
f. Gunite, wavy section	0.018	0.022	0.025
g. On good excavated rock	0.017	0.020	
h. On irregular excavated rock	0.022	0.027	
2. **Concrete bottom float finished with sides of:**			
a. Dressed stone in mortar	0.015	0.017	0.020
b. Random stone in mortar	0.017	0.020	0.024
c. Cement rubble masonry, plastered	0.016	0.020	0.024
d. Cement rubble masonry	0.020	0.025	0.030
e. Dry rubble on riprap	0.020	0.030	0.035
3. **Gravel bottom with sides of:**			
a. Formed concrete	0.017	0.020	0.025
b. Random stone in mortar	0.020	0.023	0.026
c. Dry rubble or riprap	0.023	0.033	0.036
4. **Brick**			
a. Glazed	0.011	0.013	0.015
b. In cement mortar	0.012	0.015	0.018
5. **Metal**			
a. Smooth steel surfaces	0.011	0.012	0.014
b. Corrugated metal	0.021	0.025	0.030
6. **Asphalt**			
a. Smooth	0.013	0.013	
b. Rough	0.016	0.016	
7. **Vegetal lining**	0.030		0.500

Table 3-1 (Continued) Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
C. *Excavated or Dredged Channels*			
1. **Earth, straight and uniform**			
a. Clean, recently completed	0.016	0.018	0.020
b. Clean, after weathering NON PAVED PATH	0.018 .020	0.022	0.025
c. Gravel, uniform section, clean	0.022	0.025	0.030
d. With short grass, few weeds	0.022	0.027	0.033
2. **Earth, winding and sluggish**			
a. No vegetation	0.023	0.025	0.030
b. Grass, some weeds	0.025	0.030	0.033
c. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
d. Earth bottom and rubble side	0.028	0.030	0.035
e. Stony bottom and weedy banks	0.025	0.035	0.040
f. Cobble bottom and clean sides	0.030	0.040	0.050
3. **Dragline-excavated or dredged**			
a. No vegetation	0.025	0.028	0.033
b. Light brush on banks	0.035	0.050	0.060
4. **Rock cuts**			
a. Smooth and uniform	0.025	0.035	0.040
b. Jagged and irregular	0.035	0.040	0.050
5. **Channels not maintained, weeds and brush**			
a. Clean bottom, brush on sides	0.040	0.050	0.080
b. Same as above, highest stage of flow	0.045	0.070	0.110
c. Dense weeds, high as flow depth	0.050	0.080	0.120
d. Dense brush, high stage	0.080	0.100	0.140

Other sources that include pictures of selected streams as a guide to n value determination are available (Fasken, 1963; Barnes, 1967; and Hicks and Mason, 1991). In general, these references provide color photos with tables of calibrated n values for a range of flows.

Although there are many factors that affect the selection of the n value for the channel, some of the most important factors are the type and size of materials that compose the bed and banks of a channel, and the shape of the channel. Cowan (1956) developed a procedure for estimating the effects of these factors to determine the value of Manning's n of a channel. In Cowan's procedure, the value of n is computed by the following equation:



APPROXIMATE SCALE

800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF
WELLESLEY
MASSACHUSETTS
NORFOLK COUNTY

PANEL 5 OF 10
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
250255 0005 B

EFFECTIVE DATE:
SEPTEMBER 5, 1979

U.S. DEPARTMENT OF HOUSING
AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

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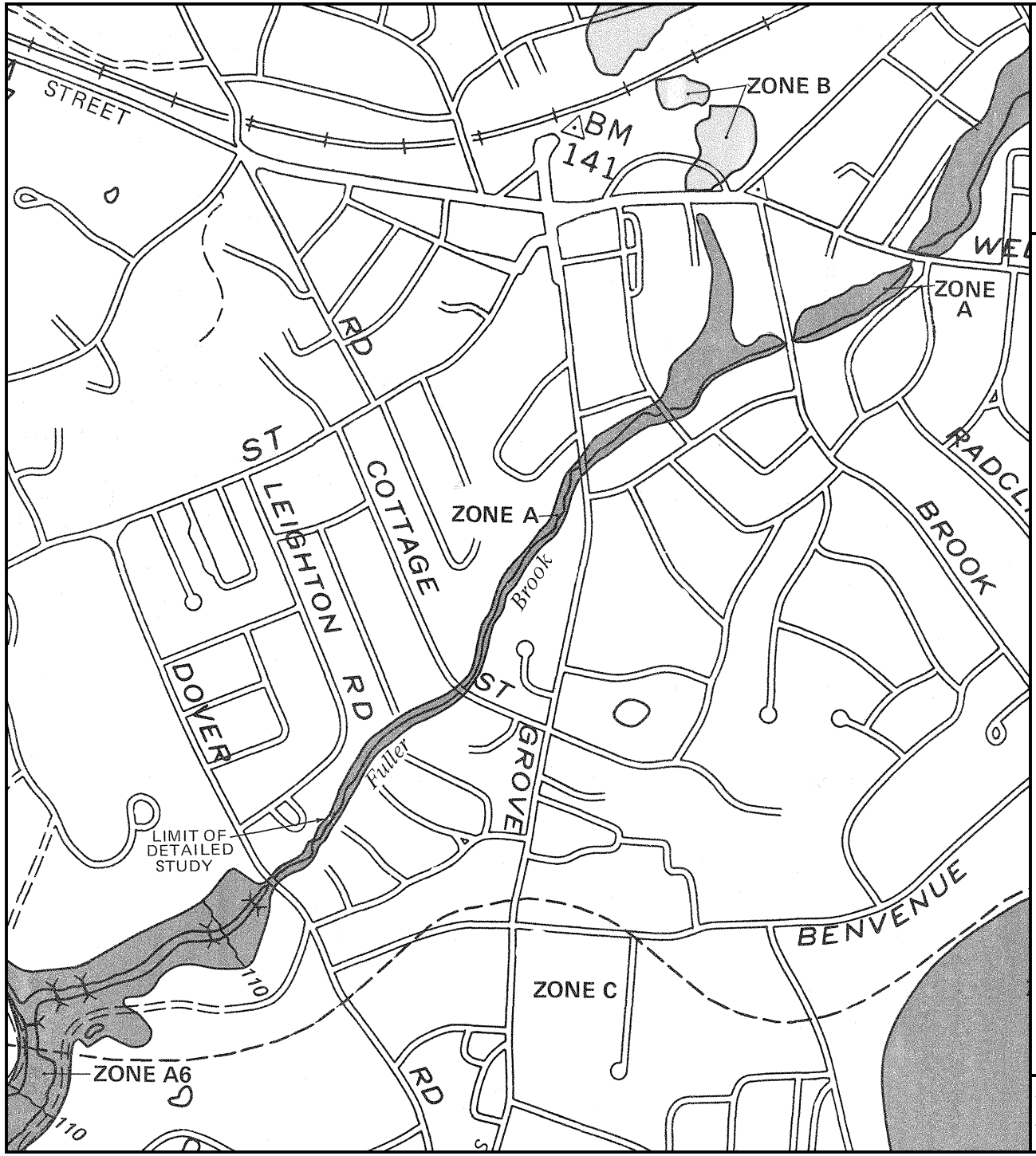

APPROXIMATE SCALE

800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF
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BETA Group, Inc.
Engineers • Scientists • Planners

JOB	FULLER BROOK WELLESLEY	NO.	4196
CALC	PFP	DATE	02/20/12
CHKD		DATE	
DESC	TIME OF CONCENTRATION	SHEET	1 OF 1

Time of concentration to **F010002** T_t = **39.4 min**

Sheet Flow

$T_t=(K_u/I^{0.4})(nL/(S)^{0.5})^{0.6}$

K_u =	0.933		coef. (0.933 eng, 6.92 metric)
n =	**0.8**	woods	Manning's roughness coefficient
L =	**100**	ft	flow length
I =	3.56	in/hr	rainfall intensity
S =	**0.07**	ft/ft	slope

T_t = **17.3 min**

Shallow Concentrated Flow

K_u = 3.28 — coef. (3.28 eng, 1.0 metric)

Segment 1

T_t=L/(60V)

k =	**0.076**	**Forest**		Intercept coeffient
S_p =	**7**		%	slope
$V = K_u(k)S_p^{0.5}$ =	0.660		ft/s	Velocity
L =	**520**	ft		flow length

T_t = **13.1 min**

Segment 2

T_t=L/(60V)

k =	**0.619**	**gutter**		Intercept coeffient
S_p =	**2**		%	slope
$V = K_u(k)S_p^{0.5}$ =	2.871		ft/s	Velocity
L =	**1550**	ft		flow length

T_t = **9.0 min**

Segment 2

T_t=L/(60V)

k =	**0.619**	**Pavement**		Intercept coeffient
S_p =	**1.5**		%	slope
$V = K_u(k)S_p^{0.5}$ =	2.487		ft/s	Velocity
L =	**0**	ft		flow length

T_t = **0.0 min**

T_t = **22.1 min**

Open Channel Flow

T_t=L/(60V)

K_u =	1.49			coef. (1.49 eng, 1.0 metric)
n =	**0.013**	RCP		Manning's roughness coefficient
S =	**0.02**	ft/ft		slope
R =	**0.25**	ft		Hydraulic Radius (A/P)
$V = (K_u/n)R^{0.67}S^{0.5}$ =	6.43		ft/s	Velocity
L =	**0**	ft		flow length

T_t = **0.0 min**

Total T_t = **39.4 min**

Calculations based on HEC-22 - August 2001

BETA Group, Inc.
Engineers • Scientists • Planners

JOB	FULLER BROOK WELLESLEY	NO.	4196
CALC	PFP	DATE	02/20/12
CHKD		DATE	
DESC	TIME OF CONCENTRATION	SHEET	1 OF 1

Time of concentration to **F030025** T_t = **34.9 min**

Sheet Flow

$T_t=(K_u/I^{0.4})(nL/(S)^{0.5})^{0.6}$

K_u =	0.933		coef. (0.933 eng, 6.92 metric)
n =	**0.8**	woods	Manning's roughness coefficient
L =	**100**	ft	flow length
I =	3.56	in/hr	rainfall intensity
S =	**0.02**	ft/ft	slope

T_t = **25.2 min**

Shallow Concentrated Flow

K_u = 3.28 — coef. (3.28 eng, 1.0 metric)

Segment 1

T_t=L/(60V)

k =	**0.213**	**lawn**		Intercept coeffient
S_p =	**1**		%	slope
$V = K_u(k)S_p^{0.5}$ =	0.699		ft/s	Velocity
L =	**200**	ft		flow length

T_t = **4.8 min**

Segment 2

T_t=L/(60V)

k =	**0.619**	**gutter**		Intercept coeffient
S_p =	**1**		%	slope
$V = K_u(k)S_p^{0.5}$ =	2.030		ft/s	Velocity
L =	**600**	ft		flow length

T_t = **4.9 min**

Segment 2

T_t=L/(60V)

k =	**0.619**	**Pavement**		Intercept coeffient
S_p =	**1.5**		%	slope
$V = K_u(k)S_p^{0.5}$ =	2.487		ft/s	Velocity
L =	**0**	ft		flow length

T_t = **0.0 min**

T_t = **9.7 min**

Open Channel Flow

T_t=L/(60V)

K_u =	1.49			coef. (1.49 eng, 1.0 metric)
n =	**0.013**	RCP		Manning's roughness coefficient
S =	**0.02**	ft/ft		slope
R =	**0.25**	ft		Hydraulic Radius (A/P)
$V = (K_u/n)R^{0.67}S^{0.5}$ =	6.43		ft/s	Velocity
L =	**0**	ft		flow length

T_t = **0.0 min**

Total T_t = **34.9 min**

Calculations based on HEC-22 - August 2001

Fuller Brook Park Preservation Project
Concrete Channel Liners

Station Start		Station End		Length (ft)
11+26	LT	15+21	LT	395
11+26	RT	15+21	RT	395
16+85	LT	17+68	LT	83
16+85	RT	17+63	RT	78
18+52	RT	24+64	RT	612
18+90	LT	24+67	LT	577
25+40	RT	38+49	RT	1309
25+44	LT	38+68	LT	1324
		Total	=	**4,773** ft

Generally liners are **3.0 ft x 2.0 ft x 6.0 in = 3.0 ft/ea**

Volume = 4,773 ft / 3.0 ft x **3.0 ft/ea =** 4773 **cu.ft.**

176.8 **cu.yd.**

MassDEP - Bureau of Waste Site Cleanup

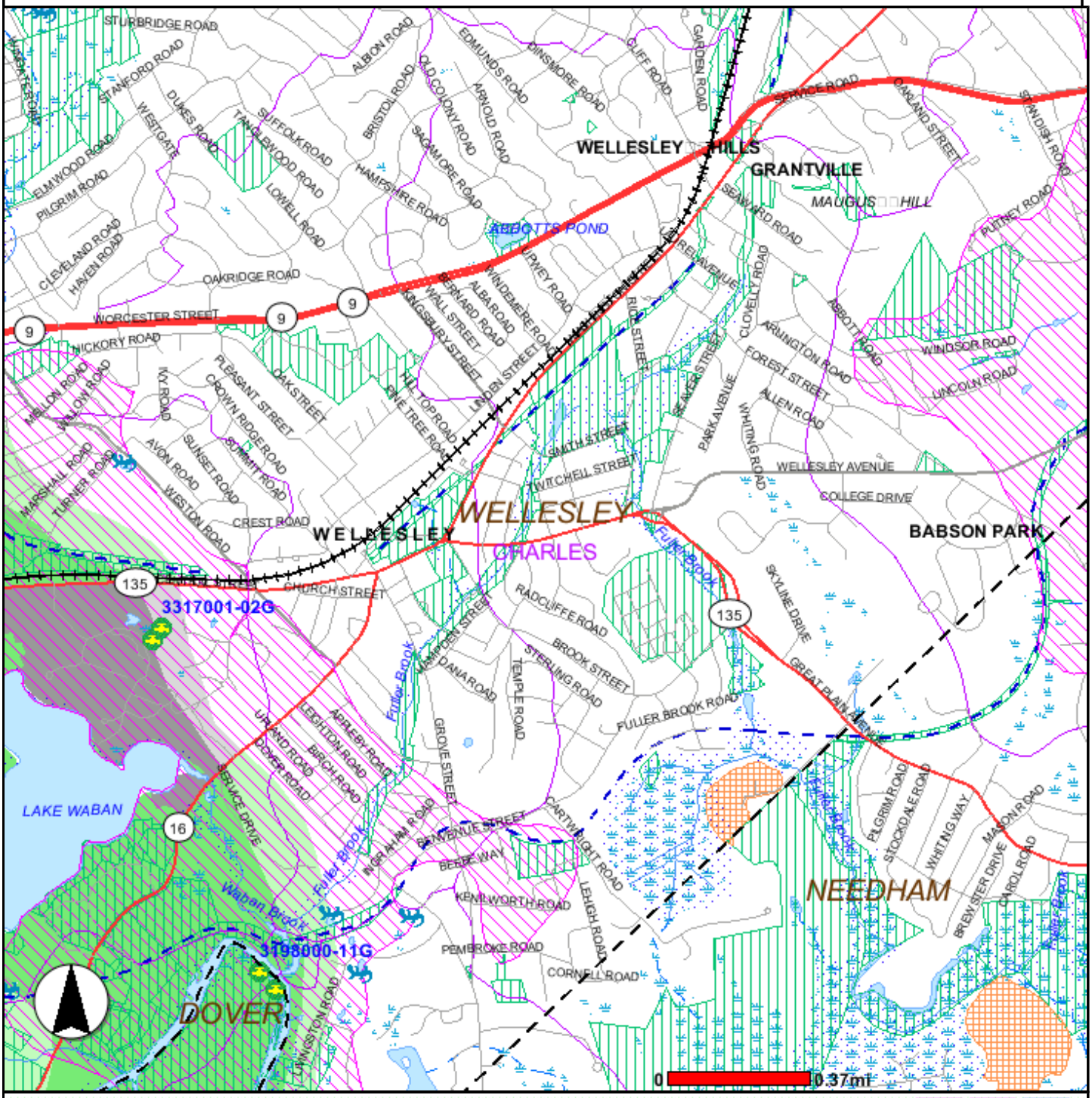
MCP Numerical Ranking System Map: 500 feet & 0.5 Mile Radii

Site Name:
Fuller Brook
Wellesley, MA
RTN:
NAD83 MA Coordinates:
0mE, 0mN

July 8, 2011

The information shown on this map is the best available at the date of printing. For more information please refer to www.mass.gov/mgis/massgis.htm

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail
Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct
Basins: Major, Sub; Streams: Perennial, Intermittent, Man Made Shore, Dam
Aquifers: Medium Yield, High Yield, EPA Sole Source
Non Potential Drinking Water Source Area: Medium, High (Yield)
PWS Protection Areas: Zone II, IWPA, Zone A
Hydrography: Open Water, PWS Reservoir, Tidal Flat
Wetlands: Freshwater, Saltwater, Cranberry Bog
FEMA 100yr Floodplain; Protected Open Space; ACEC
NHESP: Est Rare Weland Habitat, Certified Vernal Pool
DEP Permitted Solid Waste Landfill