



**Toronto and Region Conservation  
Authority Summary Report for  
Digital Floodplain Mapping in the  
Upper Humber River in the Vicinity  
of Bolton SPA**

*Prepared By:*

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R.J. Burnside & Associates Limited  
128 Wellington Street West Suite 301 Barrie ON L4N 8J6

*Prepared for:*

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Toronto and Region Conservation Authority (TRCA)

June 10, 2011

File No: MTG17401

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- A Background Information
- B Hydraulic Structure Inventory Sheets (TRCA)
- C HEC-RAS Summary Output
- D Floodplain Mapping

## 1.0 Project Overview

This report summarizes the analysis carried out to define the backwater flood elevations and develop updated digital floodline mapping for the upper Humber River and Cold Creek in the vicinity of the Bolton Special Policy Area (SPA). This report will provide the overall methodology used in the hydraulic modelling and provide commentary outlining key components of the modelling including data received from the TRCA, floodline mapping, selection of cross sections, modelling coefficients, etc.

The purpose of the study is to develop an updated hydraulic model (HEC-RAS 4.1.0) and provide updated regional floodplain mapping for the following watercourses:

- Humber River in the vicinity of the Bolton SPA.
- Cold Creek, a tributary of the Humber River, located just downstream of Bolton.

### 1.1 Project Area

The geographic location of the Humber River Mapping update is generally located within the Town of Bolton. More specifically the limits are bound to the west by Duffy's Lane to, through the Bolton SPA, east of the Caledon King Townline. The Cold Creek project area extends 1.5km north of the Humber River and is located in the vicinity of the Caledon King Townline, north of King St.

### 1.2 Background Information

The following key information and data was provided by the TRCA to initiate the project:

- Digital base mapping covering the study areas from aerial photography.
- Existing HEC-RAS models for Humber River and Cold Creek watersheds.
- Detailed design as-built drawings of hydraulic structures, where available.
- Hydrology peak flows for 2- to 100-year and Regional storm events.
- Table of Standard Manning's Roughness Coefficients for TRCA Watershed Hydraulic modeling assisted in selection of Manning's 'n' values (**Appendix A**) and;
- Requirements for coding cross-sections and hydraulic structures (**Appendix A**).

Specific references have been identified through the report where appropriate and outlined in **Appendix A**.

### 1.3 Field Work

Field visits were conducted by R.J. Burnside & Associates Limited to review data received from the TRCA and to verify information obtained from other sources. The field work has been completed to obtain an understanding of;

- Vegetation characteristics,
- Verify hydraulic structure dimensions and orientation within the floodplain,
- Shape and surface characteristics of the drainage courses;
- General watercourse hydraulics;
- Degree of maintenance applied to the drainage courses and the terrestrial cover of the drainage course floodplain area and;
- Confirm low flow geometry and channel forms.

Specific site investigations and field surveys were undertaken by Tim Lozon, Project Engineer. Bridge and culvert inventory sheets were completed and have been included in **Appendix B**.

### 2.0 Project Approach

The general approach to the project has consisted of two main components. The first approach involved reviewing the existing information provided by the TRCA as outlined in **Section 1.2** above. Secondly, using this existing information in conjunction with newly acquired field data, a geo-referenced U.S. Army Corps of Engineer's HEC-RAS model (version 4.1.0) and associated floodplain mapping was constructed to accurately represent a series of flow scenarios throughout the project area.

Burnside has developed the hydraulic HEC-RAS model with the aid of using BOSS RiverCAD (RiverCAD) to produce floodlines for the subject areas. The RiverCAD program provides interface modules that link AutoCAD with HEC-RAS 4.1.0 environment. RiverCAD has permitted the integration of the newly generated Digital Terrain Model (DTM) and facilitates generation of geo-referenced cross-sections and floodlines. The seamless transfer of the cross-sectional information into the HEC-RAS environment through RiverCAD software from the DTM has avoided errors associated with traditional approaches that rely on manual input.

### 2.1 Tasks

The following tasks have been performed in the construction of the new HEC-RAS hydraulic model:

- All hydraulic structures were checked or verified based upon information to be provided by the TRCA and survey information (e.g., as-built and design drawings, and field survey).
- Cross-sections have been cut using available mapping provided by the TRCA. Low flow channel details were referenced/derived from existing information where and field measurements where available. All cross-sections, as well as the centerline of the river was geo-referenced (using –degree UTM Projection in NAD 83) and input into the HEC-RAS models.
- Hydraulic structures have been coded from a combination of sources including existing TRCA modeling, as-constructed drawings and field measurements.
- Flows were coded in accordance existing modeling provided by the TRCA. Flow change locations were reviewed and additional flow change locations were added as required such that the maximum flow change between cross sections was less than 10%.
- Manning's 'n' values at all cross-sections were coded to represent ultimate re-vegetation potential as per the TRCA's standards for watershed hydraulic modeling. Note that overbank areas characterized by several 'n' values were input separately (i.e., not weighted).
- Detailed comments were provided in the HEC-RAS model for all hydraulic structures and cross sections as required outlining any assumptions made with respect to the modeling approach.
- Flood elevations were calculated using the HEC-RAS Version 4.1.0 computer model. Flood levels were generated for the 2-, 5-, 10-, 25-, 50-, 100-year and Regional storm events for both the Humber River and Cold Creek. HEC-RAS summary tables have been included in **Appendix C**.
- Geo-referenced digital floodlines were provided for the Regulatory Storm for Humber River and Cold Creek (the greater of the 100-year or Regional storm). The coordinate system of the floodlines matches that of the digital base mapping provided by the TRCA.
- An inline weir has been coded using cross sectional geometry editor at Cross Section 9.12 as directed by the TRCA. The geometry of the inline weir has been referenced from the existing TRCA HEC-RAS model HRC9\_R3.prj at cross section 9.13.

### 3.0 The HEC-RAS Hydraulic Model

The HEC-RAS version 4.1.0 computer model developed by the U.S. Army Corps of Engineers has been utilized as requested by the TRCA. This model estimates the change in water surface elevation between selected valley cross-sections and routines to account for local increases in water levels due to bridges and/or other flow obstructions. The model is intended for utilization in the analysis of water surface profiles of steady state, gradually varied, one-dimensional flow in natural and man-made channels.

A number of considerations are required in the selection of data and variables to be used in the application of the HEC-RAS model to the floodplains of the study area and these are as follows:

- Cross-sections
- Hydraulic Structures and Computational Routines
- Hydraulic Parameters
- Boundary Conditions

#### 3.1 Cross Sections

Floodplain boundaries and the lateral extension of flows along a natural stream are controlled by the topographic relief within which the stream flows. This relief is quantified in terms of ground surface elevations and/or contours. For utilization in the HEC-RAS program, it was necessary to convert this topographic relief into its geometric configuration represented by cross-sections of the valley taken perpendicular to the direction of flow. Furthermore, it was necessary to represent the linear topographic relief and variability by drawing repetitive cross-sections at various intervals throughout the length of the valley systems. The distance between the cross-sections required to represent the valley system is referred to as the reach length.

For the selection of digitized cross-sections which are representative of the Humber River Miller and Cold Creek watercourses and floodplains, the following criteria were used:

##### 3.1.1 Location and Orientation of Cross-Sections

The digitized cross-sections were initially taken from the topographic maps looking from left to right upstream direction for the Humber River to match into existing HEC-RAS modelling as per the TRCA's request and left to right looking downstream for Cold Creek as per the standard convention associated with HEC-RAS. Cross sections have been intentionally cut at key locations described below:

- Changes in channel and/or valley cross-sectional shape.
- Rapid changes in channel or valley slope.
- Significant changes in channel or valley roughness.
- Upstream and downstream of bridges.
- At all defined control points and.
- Upstream and downstream of all channel confluences.

### **3.1.2 Cross-Sections Spacing and Alignment**

Following the initial evaluation of the cross-sections selections as noted above, additional sections were added to the model when calculations indicated any of the following conditions:

- Where energy slope decreased or increased significantly;
- When significant changes in the conveyance of adjacent sections were observed and;
- Where topographic representation of flow between cross-sections indicated unrealistic transition.

These sections were reviewed and edited where needed in the HEC-RAS software. HEC-RAS input geometry files were re-cut from the topographic mapping and iterated through a visual examination of plotted cross-sections and model-generated warnings until the correct number and location of sections provided no warnings.

### **3.1.3 Determination of Reach Length**

For the determination of reach lengths, the topographic maps were measured between cross-sections parallel to the estimated direction of flow along the low flow channel and along the centroid of water mass moving through the floodplain using the BOSS RiverCAD software. For each reach, a minimum of three lengths was measured defining the channel and right and left overbank flow paths. For the selection of the direction of the reach length measurement, the topographic relief was analyzed to interpret the direction of flow in the particular reach of the watercourse.

## **3.2 Hydraulic Structures and Computation Routines**

The hydraulic structure information was supplemented with data acquired during the field surveys and investigation. This data included the location, orientation, elevation, width and height, composition, inlet/outlet characteristics, and overflow profile of all hydraulic structures within the study area, including bridges, dams, culverts and weirs.

Each hydraulic structure includes notes in the HEC-RAS comment/description area as per the TRCA standards noted in **Section 2.1** and are included as **Appendix B**.

Hydraulic structures such as bridges, culverts and roadways have the greatest potential to change the flood elevation for a given reach assuming a constant flow. Each structure within the study area limits was coded into the hydraulic model based on information (i.e. drawings) provided by the TRCA or field survey information. A visual field review by Burnside confirmed the general size, shape, length, type and location of each modeled structure. The following additional checks were performed to ensure these structures were modeled correctly, with additional notes for unique areas:

- Each structure was reviewed and adjusted to use the weir/pressure flow modeling approach or the energy equation. If the structure is highly submerged, such as a pedestrian crossing (i.e., park or golf course), or experiencing a low flow condition (below the obvert), then the energy equation is used; for high flow, the weir/pressure flow modeling approach was used. Expansion and contraction coefficients were checked and inserted if missing and;
- Where engineering drawings were available from other sources, elevations noted on the drawings were checked or cross referenced for consistency.

### 3.3 Hydraulic Parameters

Coefficients used in the model to evaluate head losses are as follows:

- Manning's 'n' values are used to compute flow friction losses and have been supplied by the TRCA depending on the terrestrial features (included in **Appendix A**).
- Expansion and contraction coefficients for the study area floodplains have been set at 0.1 and 0.3, respectively, for all areas due to the relative uniformity of cross-sectional transitions. For bridge sections, expansion and contraction coefficients have been estimated at 0.3 and 0.5, respectively and.
- Bridge loss coefficients relate head losses to weir shape, pier configuration and pressure flow. Conduit shapes have been determined from approved/as constructed drawings or field survey/visits and appropriate loss coefficients referenced from the HEC-RAS user manual.

### 3.4 Boundary Conditions

The downstream boundary conditions or the HEC-RAS hydraulic model directly influence water surface profiles of the individual reaches of study area(s). The Known Water Surface Elevation for each water surface profile was used for the Humber River

HEC-RAS model. These known water surface elevations have been referenced from the existing Humber River HEC-RAS model and used as directed by the TRCA.

## 4.0 Building Obstructions

The regional floodplain, located within the valley of the Bolton SPA, contains a number residential homes and commercial buildings. Accordingly, all buildings within the floodplain have been coded into the HEC-RAS hydraulic model using the blocked obstruction option. Horizontal distances have been CAD measured to each side of each building and an arbitrary elevation, indicating the vertical limit of the structure, exceeding the anticipated regional flood elevation has been selected.

To account for the decreased roughness in the floodplain associated with the coding of the blocked obstructions, the manning's 'n' roughness coefficient has been set to 0.05 as directed by the TRCA.

## 5.0 Assumptions

The following assumptions have been made during the updated HEC-RAS modeling of the Humber River and Cold Creek Watersheds;

- As-constructed drawings for the Caledon King Townline Bridge, located on the Humber River have been referenced in the coding of the hydraulic structures. It has been observed that there is a  $\pm 0.75\text{m}$  elevation difference at the centerline of road profile on the as-constructed drawings vs. the elevations illustrated on the mapping provided by the TRCA. To determine the impacts of adjusting these elevations, iterations were completed, adjusting the elevations of the high chord geometry within the  $\pm 0.75\text{m}$  difference as noted above. It has been observed that increasing or decreasing the high chord elevations has a negligible impact on water surface elevations upstream of the Caledon King Townline for the 100-year and Regional peak flows due to the downstream water surface elevations used as a boundary conditions. Water surface elevation fluctuations have been noted to be more sensitive for flow return intervals less than the 100-year event. Accordingly, an average between the as-constructed high chord geometry and the high chord geometry obtained from mapping provided by the TRCA has been used.
- The section of Humber River bound by James St to the west, Albert St to the south, John St to the east and King St to the north has not been coded directly into the HEC-RAS model. This short section of reach has been observed to be relatively flat and it has been assumed to be in a backwater condition associated with the main reach of the Humber River, located to the north of King St. Accordingly, cross sections have been orientated to reflect major system flow scenarios.

## 6.0 Analysis of HEC-RAS Hydraulic Model and Flood Plain Mapping

Output from the HEC-RAS hydraulic model is calculated in an upstream direction with a printout of critical factors determining flow parameters for each cross-section. HEC-RAS output tables have been included in **Appendix C** of this report.

Reviewing the HEC-RAS summary output tables and associated floodline mapping, the regional flood plain is contained within the valley of the Humber River Floodplain. Regional flood elevations have been observed to be approximately 222.80m at the westerly limits of the project area to 211.60m located at the eastern limits of the project area.

The following major roadways and corresponding bridge/culvert crossings are overtopped in the Regional Event;

<u>Humber River</u>	<u>Cold Creek</u>
Hickman St	Caledon King Townline STA 3+020.86
Queen St	Caledon King Townline STA 2+926.59
Humber Lea Road	Caledon King Townline STA 2+393.52
King St E	
Sneath Road	
Caledon King Townline	

It has been observed that a number of residential homes and commercial buildings are inundated during the regional event. Please refer to **Appendix D** for floodplain mapping details. Regional flood depths have been noted to be 0-3m within floodplain areas where buildings are present.

## 7.0 Conclusions and Recommendations

The results of the steady state modelling and flood line mapping for the project area outlined in this report have been included within **Appendices A-D**. Digital modelling files have been provided on a CD and included at the back of this report.

The hydraulic methodology, commentary and results outlined in this report have been based on available information, correspondence and key assumptions made during the course of the project. The modeling, analysis and presentation of the inundation mapping have been prepared using the best available information at the time of writing of this report.

Summary Report for Digital Humber River Floodplain Mapping  
June 10, 2011

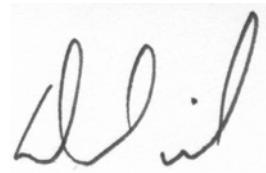
If you have any questions, or require further information, please do not hesitate to contact the undersigned.

Prepared by:

**R.J. Burnside & Associates Limited**



Tim Lozon, P.Eng.  
Water Resources Engineer  
TL:js



Daniel R. Miller, P.Eng.  
Senior Water Resource Engineer

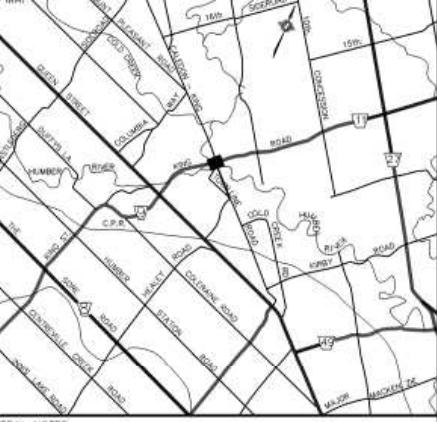
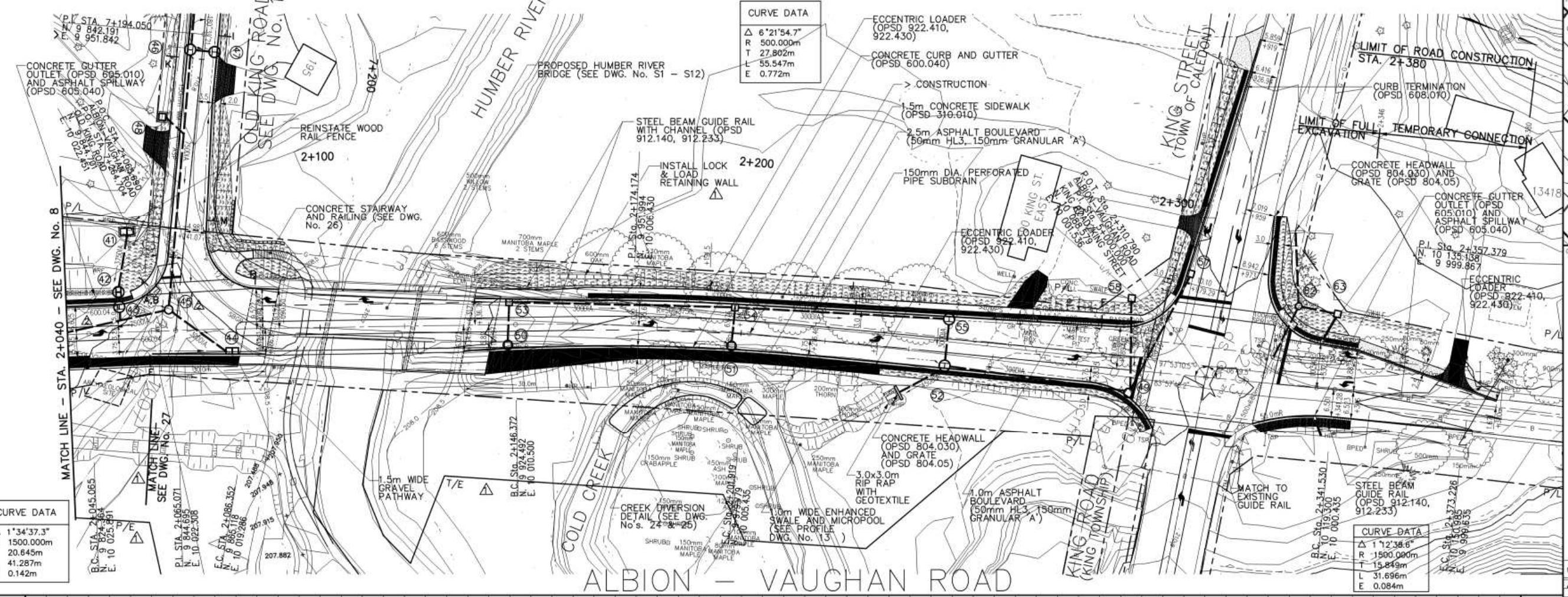
110525 Digital Floodplain Mapping in the Upper Humber River  
10/06/2011



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## **Appendix A**

### **Background Information**



**CONSTRUCTION RECORD DRAWING**

**CONTRACTOR** FERNAR PAVING LIMITED

**WORK COMMENCED** JULY 2002

**WORK COMPLETED** JULY 2004

These record drawings have been prepared based on information furnished by others. While the information is believed to be reliable, the designer is not responsible for its accuracy or for errors or omissions that may have been incorporated into this document as a result.

THESE DESIGN DOCUMENTS ARE PREPARED SOLELY FOR THE USE BY THE PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS ENTERED INTO A CONTRACT AND THERE ARE NO REPRESENTATIONS OF ANY KIND MADE BY THE DESIGN PROFESSIONAL TO ANY PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS NOT ENTERED INTO A CONTRACT.

THE LOCATION OF UTILITIES IS APPROXIMATE ONLY AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.

**NO. BY DATE REVISION CONS CHECKED TOWN APPRO**

△ R.I.R. JUNE/02 REVISED EASEMENT AND ENHANCED SWALE, R.I.R. MICROPOOL AND WALL

△ R.I.R. AUG/02 REVISED ENHANCED SWALE, STORM SEWER PLAN, PROFILE

3 R.I.R. MAR/2005 CONSTRUCTION RECORD DRAWINGS R.I.R.

**APPROVED FOR CONSTRUCTION**

THIS APPROVAL CONSTITUTES A GENERAL REVIEW AND DOES NOT CERTIFY DIMENSIONAL ACCURACY.

THIS APPROVAL IS SUBJECT TO THE FURTHER CERTIFICATION OF THE "AS CONSTRUCTED" WORKS BY A REGISTERED PROFESSIONAL ENGINEER OF THE PROVINCE OF ONTARIO.

DATE : APPROVED BY: H. MUNTZ, P.ENG. Town Engineer

BENCH MARK:

Designed by:

PROJECT NAME: ALBION - VAUGHAN ROAD CONSTRUCTION

CONSULTANT: MRC

McCORMICK RANKIN CORPORATION

IN THE REGION OF PEEL

THE CORPORATION OF THE TOWN OF CALEDON

ALBION - VAUGHAN ROAD

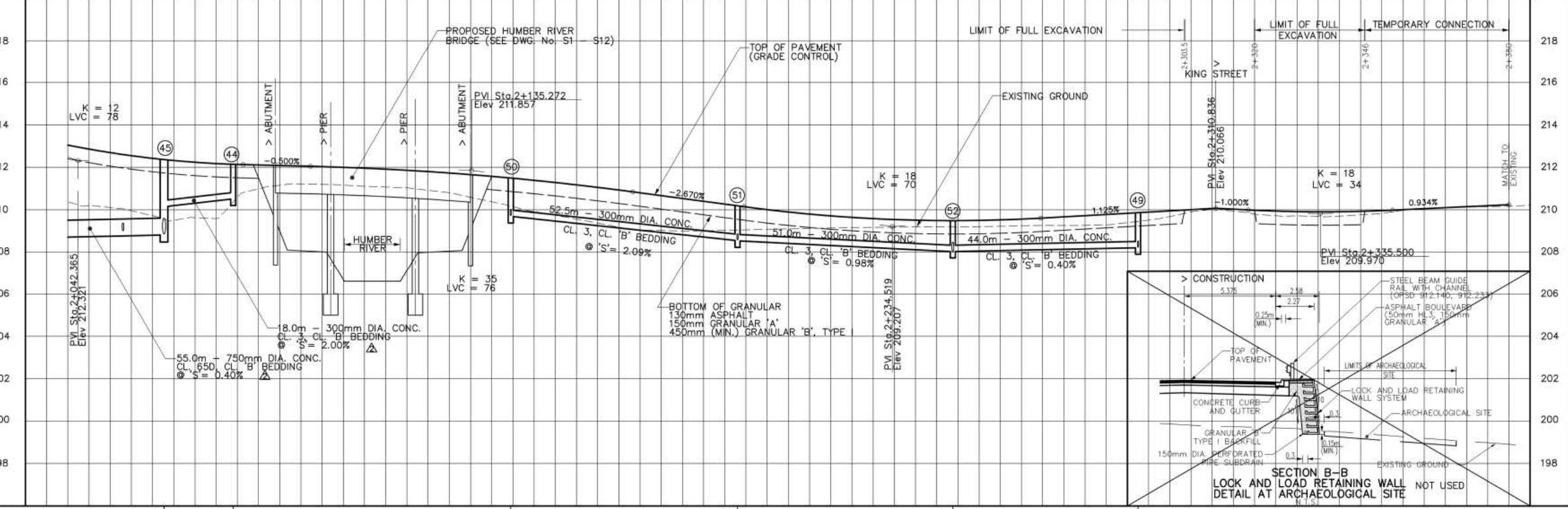
GRADING, PAVEMENT AND DRAINAGE

STA. 2+040 TO STA. 2+370

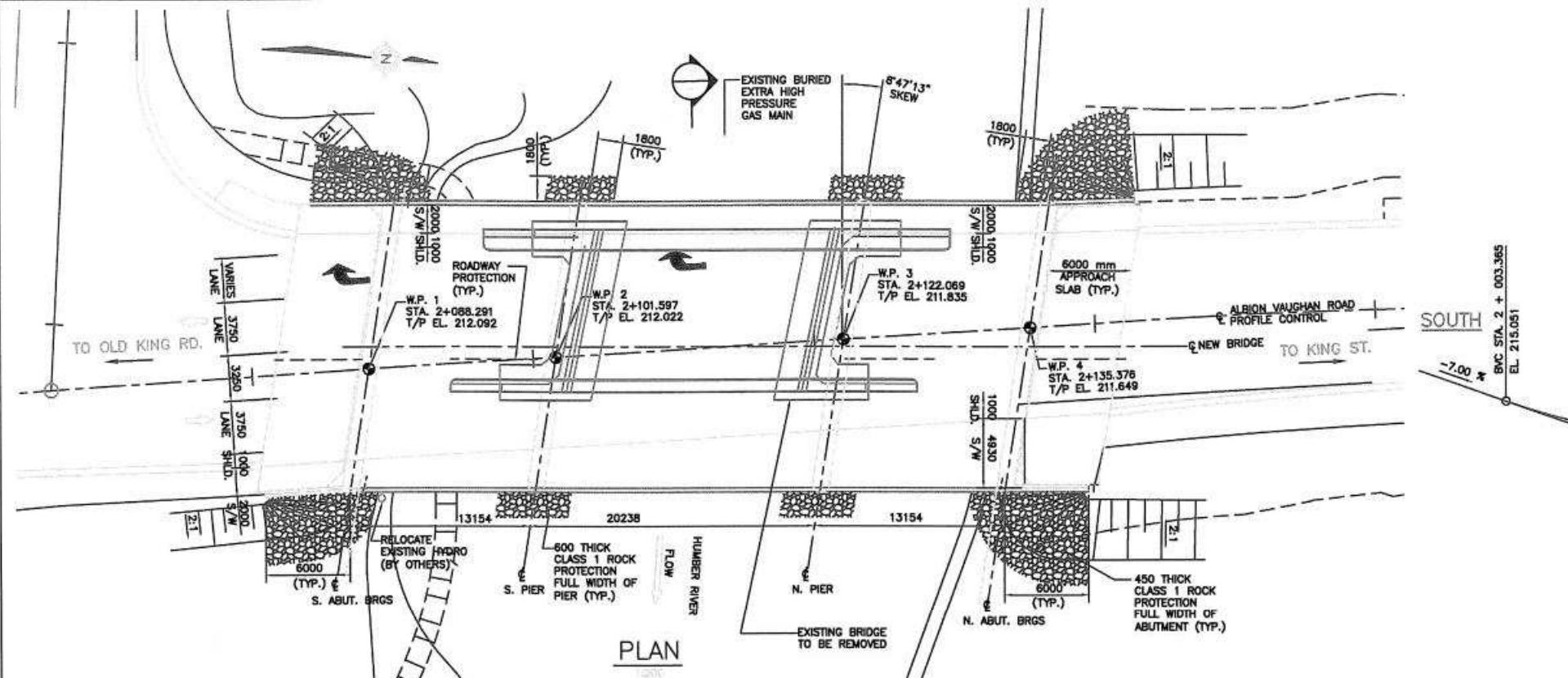
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DESIGNED BY S.T. DRAWN BY K.S. DRAWING No.

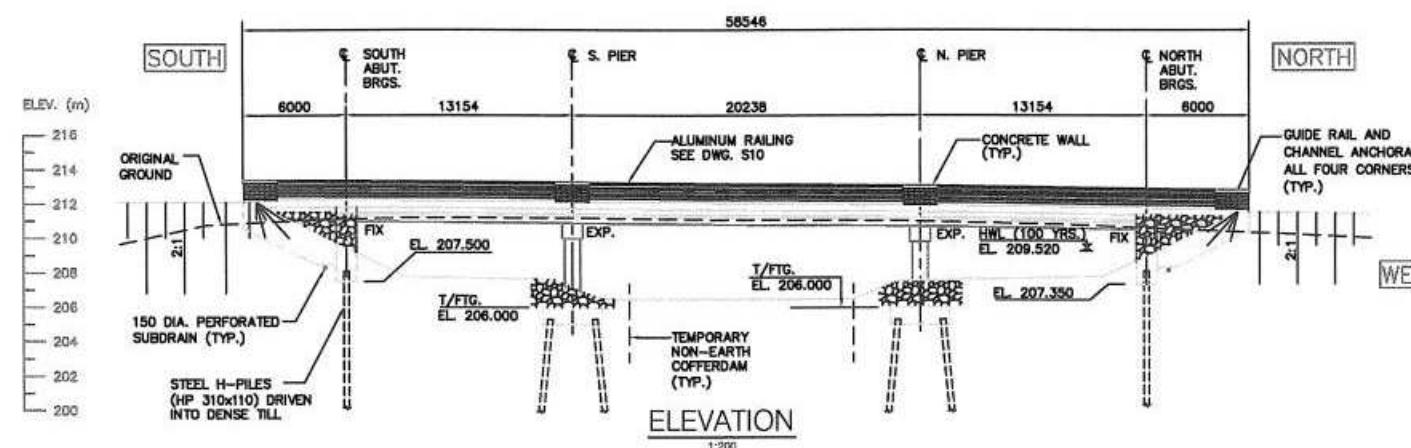
CHECKED BY R.R. DATE: MAY, 2002 9 of 27



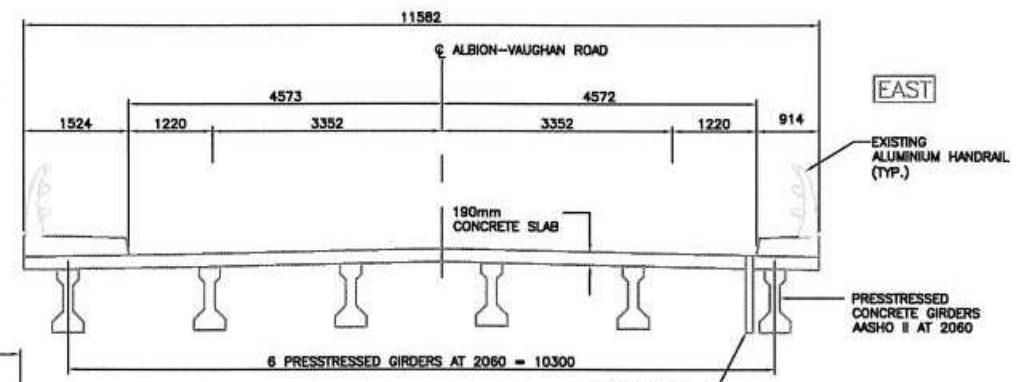
STORM INVERT	PROPOSED LC ROAD GRADES	EXISTING LC ROAD GRADES	CHAINAGE
	213.046	212.423	2+040 209.71
	212.154	210.59	2+060 209.71
			2+080 211.03
			2+100 211.20
			2+120 211.03
			2+140 210.37
			2+160 209.55
			2+180 209.02
			2+200 209.05
			2+220 209.14
			2+240 209.19
			2+260 209.22
			2+280 209.26
			2+300 209.68
			2+320 209.80
			2+340 209.70
			2+360 210.05
			2+380 210.30



## PROFILE - ALBION - VAUGHAN ROAD



## SECTION - EXISTING



SECTION - NEW

## LIST OF DRAWINGS

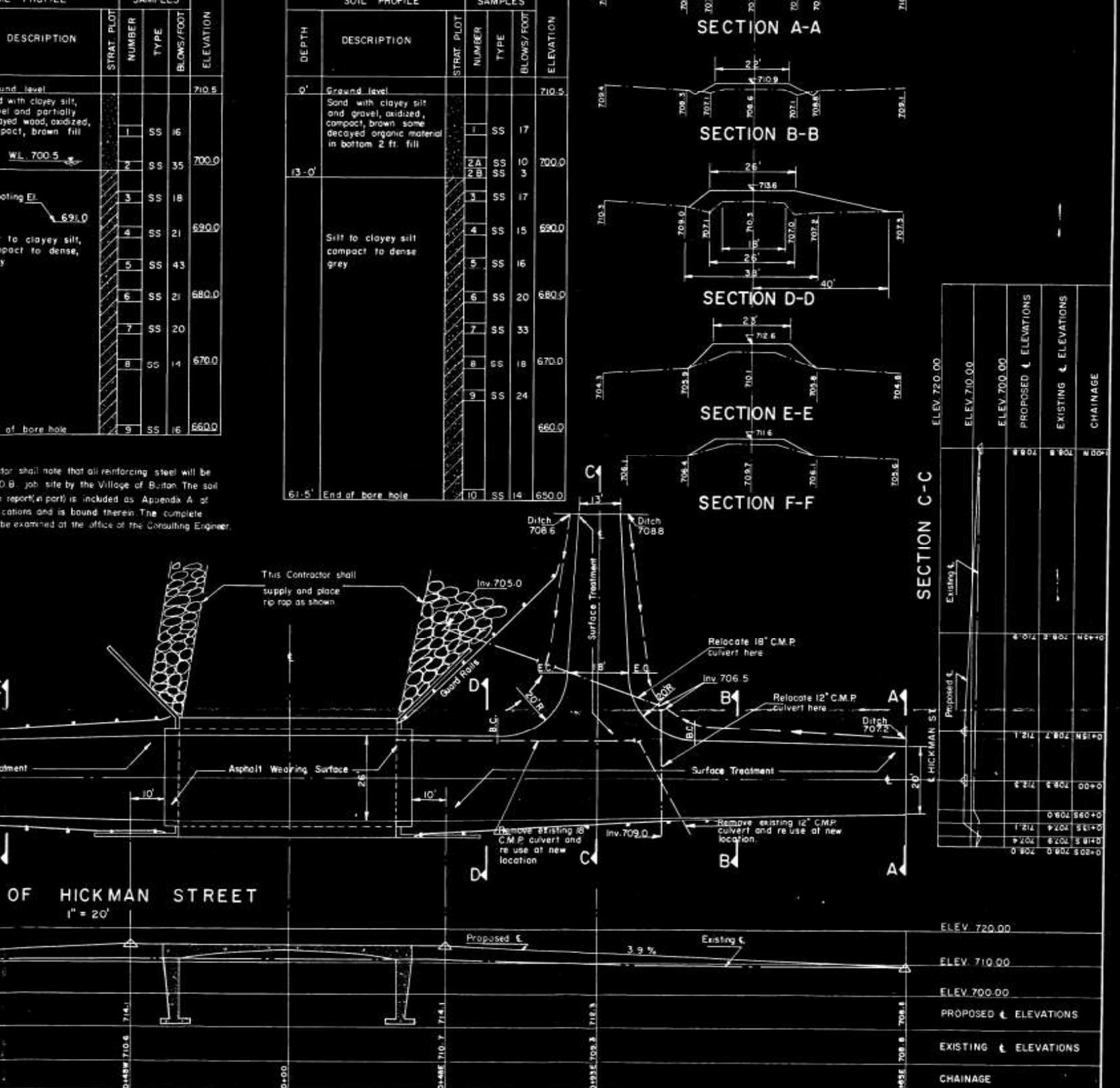
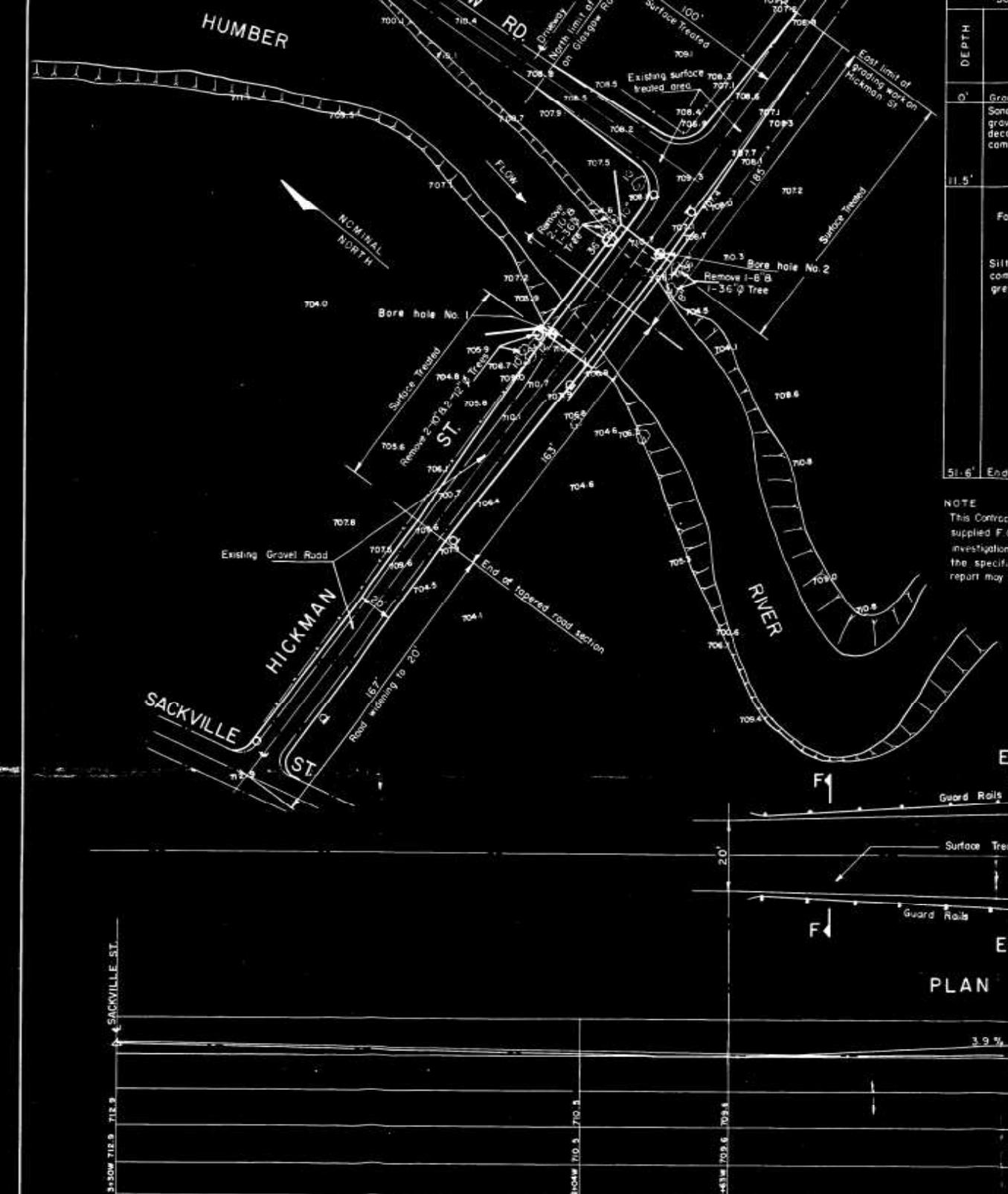
S1. GENERAL ARRANGEMENT  
S2. CONSTRUCTION STAGING  
S3. FOOTING LAYOUT AND PIPE L  
S4. NORTH ABUTMENT LAYOUT A  
S5. SOUTH ABUTMENT LAYOUT A  
S6. WINGWALL DETAILS  
S7. PIERS DETAILS  
S8. BOX GIRDERS DETAILS  
S9. DECK LAYOUT AND REINFORC  
S10. ALUMINUM RAIL DETAILS  
S11. 6000mm APPROACH SLAB  
S12. PILE DRIVING - STEAM AND  
S13. ELECTRICAL EMBEDDED WORK

## **REGION OF PEEL**

---

#### GENERAL ARRANGEMENT

AS SHOWN		CONTRACT No.
BY: S.D.L.	DRAWN BY: A.M.	02-07
BY: L.Y.	DATE: MARCH, 2002	DRAWING No. S1



This map illustrates the proposed New Hickman's St. Bridge, which would connect the townships of Albion and Weston. The bridge is shown as a dashed line crossing the Humber River. Key locations marked include Town of Weston, Orillia, County of Simcoe, and the City of Barrie. The map also shows the existing bridge at Weston Station and the route to Toronto. A scale bar indicates distances up to 10 miles.

FOLLOW SEPARATE INSTRUCTIONS FOR PREPARATION OF BRIDGE SITE PLAN WHEN MAKING BRIDGE SURVEY.

DATA

1. SPECIAL FEATURES: WATERFALLS, DAMS, EXCEPTIONAL FLOODS, ICE, DRIFTWOOD, SLIDING BANKS, ETC. MAXIMUM ELEVATION OF WATER LEVEL OCCURRED WITH "HAZEL" ELEV. 711.00. ICE PROBLEMS DOWNSTREAM FROM BRIDGE AT BEND. STORAGE DAMS TO BE BUILT UPSTREAM IN FUTURE.

2. (A) UPSTREAM & DOWNSTREAM BRIDGES (GIVE LOCATION, LENGTH, HEIGHT ABOVE N.H.W.L., NET CROSS-SECTIONAL AREA AT HIGH WATER & ESTIMATED AGE). UPSTREAM-TIMBER AND STEEL "OLD". DOWNSTREAM-D.H.O. TO CONSTRUCT NEW HWY.50 BRIDGE IN BOLTON (962-63-1000) DOWNSTREAM FROM HICKMAN ST. BRIDGE. WIDTH 65' HEIGHT OF OPENING 13'.

(B) REASONS WHY THESE BRIDGES ARE, OR ARE NOT, FAIR INDICATIONS OF SIZE OF PROPOSED BRIDGE D.H.O. BRIDGE MUST TAKE ALL FLOW THROUGH STRUCTURE NOT WARRANTED WITH HICKMAN ST WHERE APPROACHES CAN BE UTILIZED.

3. REASONS FOR CHANGES IN HEIGHT OR LENGTH FROM THAT OF OLD BRIDGE: SPAN ESSENTIALLY THE SAME. OPENING HEIGHT INCREASED AS PER D.H.O. INSTRUCTIONS.

DATA (cont'd.)	
IS DITCH, STREAM, OR RIVER GRADIENT LIABLE TO BE LOWERED? NO	
NAVIGATION CLEARANCES REQUIRED, IF ANY NONE	
RAILWAY CLEARANCE REQUIRED, IF ANY NONE	
IF STRUCTURE IS OVER OR UNDER A RAILWAY HAS APPROVAL BEEN OBTAINED?	
(A) FROM RAILWAY CO. NOT REQUIRED	
(B) FROM BOARD OF TRANSPORT COMMISSIONERS NOT REQUIRED	
HAS APPROVAL BEEN OBTAINED UNDER NAVIGABLE WATERS PROTECTION ACT?	
NOT REQUIRED	
IS A TEMPORARY DETOUR REQUIRED? NO	
WHO WILL BUILD IT? —	
WHO WILL MAINTAIN IT? —	
INFORMATION AND EVIDENCE OF EXTREME FLOODING WAS OBTAINED FROM M.T.R.C.A.	
AND REFLECTS HIGHEST WATER ELEVATION IN THE AREA OF THIS	
CONSTRUCTION TO BE 711.00 AND THE LOWEST WATER ELEVATION TO	
BE 700.00	
ROAD DESIGN INFORMATION	
ESTIMATED A.O.T.	50
DESIGN SPEED	30 M.P.H.

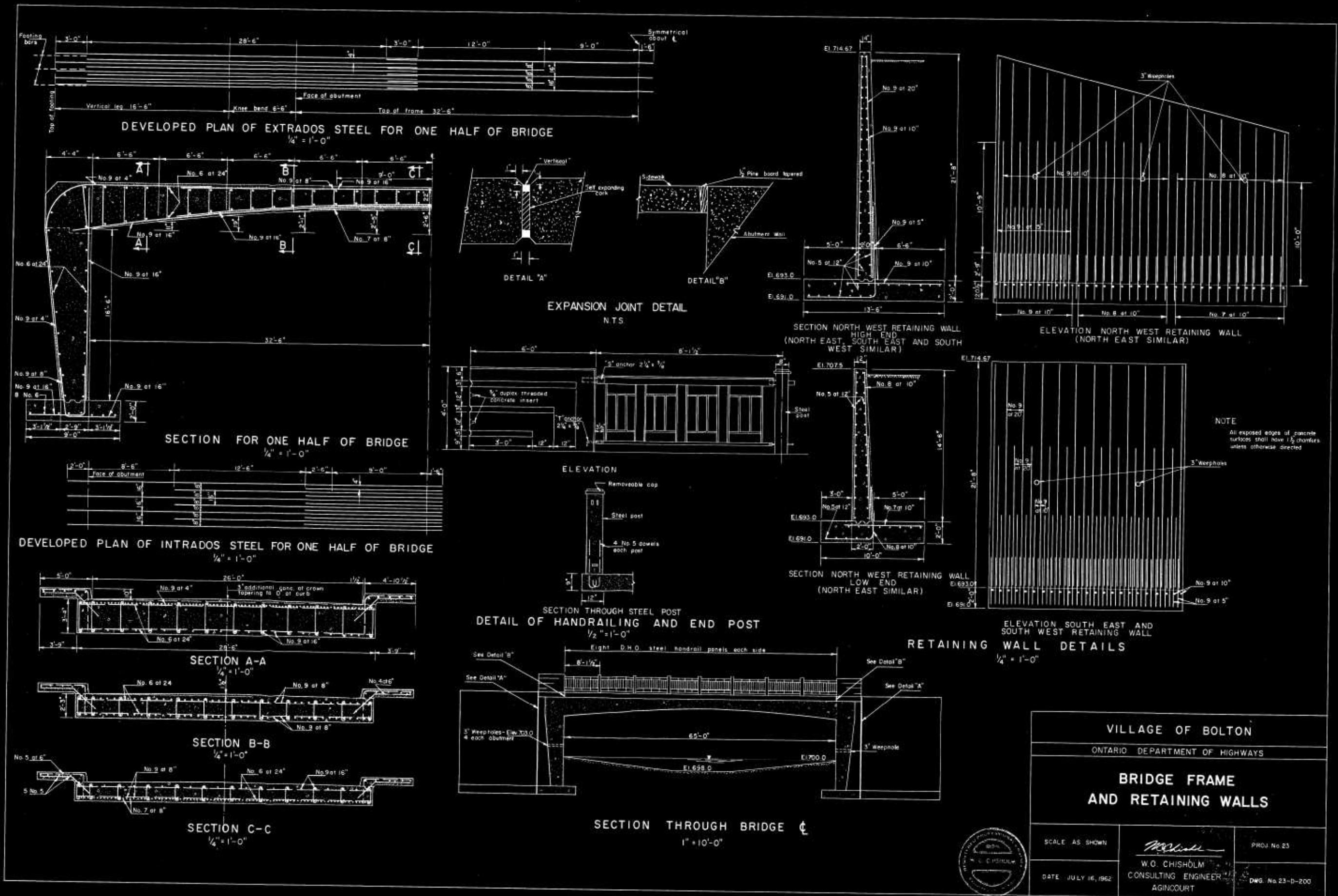
<b>STRUCTURE DATA</b>	
NET SPAN LENGTH AND TYPE OF BRIDGE: <u>65'</u>	
<b>RIGID FRAME</b>	
ROADWAY WIDTH OF BRIDGE	<u>26'</u>
NUMBER & WIDTH OF SIDEWALKS:	<u>2-5'</u>
SKEW ANGLE: <u>NONE</u>	
TOTAL LENGTH & TYPE OF PILING: <u>NONE</u>	
APPROX. VOLUME OF CONCRETE <u>650 cu. yds.</u>	
APPROX. WEIGHT OF STR. STEEL <u>NIL TONS</u>	
APPROX. WEIGHT OF REINFORCEMENT <u>40 TONS</u>	
APPROX. VOLUME OF APPROACH FILL <u>100 EACH SIDE OF STRUCTURE cu. YDS.</u>	
DRAINAGE AREA <u>75 SQ. MI.</u>	
OLD INVESTIGATION MADE <u>JUNE 27 1962</u>	
<i>B. R. G. Fleming</i> SURVEY ENGINEER	

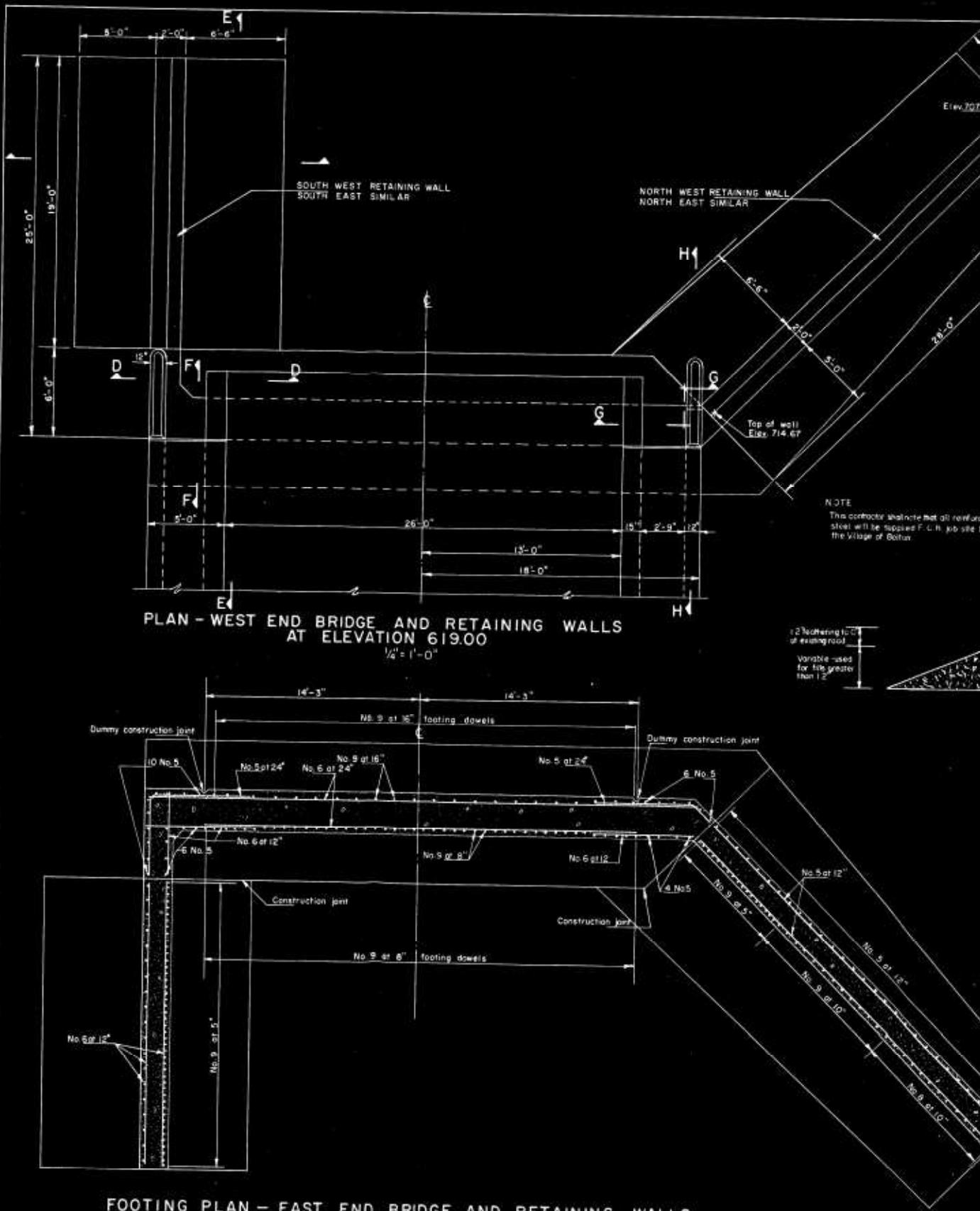
W.O. CHISHOLM  
CONSULTING ENGINEER  
GINCOURT HICKMAN STREET BRIDGE ONTARIO

OWNER VILLAGE OF BOLTON MUNICIPAL DIST. No. 6  
Ca PEEL ROAD No.  
WP. ALBION LOT 9 CON. VI

**— SITE PLAN —**

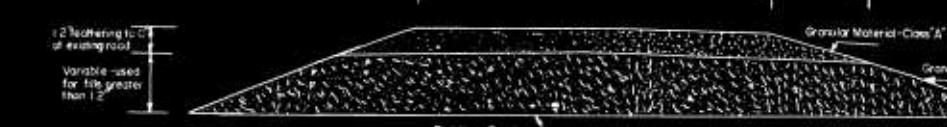
	August 1, 1962	R.W. <i>Elmer</i> DESIGN ENGINEER
	DATE:	
BRIDGE NAME:		HICKMAN STREET
LOADING:	BRIDGE NO.	SPAN NO.



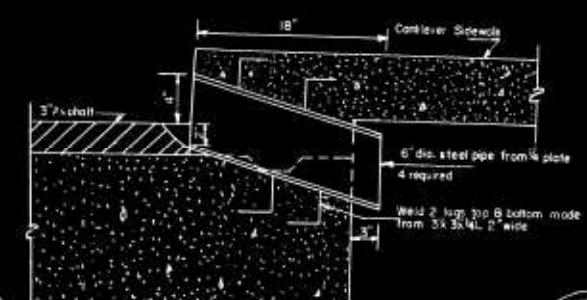


**FOOTING PLAN - EAST END BRIDGE AND RETAINING WALLS**

END BRIDGE



ROAD CROSS SECTION  
N.T.S.



DECK DRA  
1/2 = 1'



MINIMUM CLEAR COVER

MEMBER	CLEAR COVER		
	WATER	EARTH	AIR
Footings, retaining walls and breast walls	3"	3"	3"
Deck	—	—	2"
Sidewalk and posts	—	—	2"

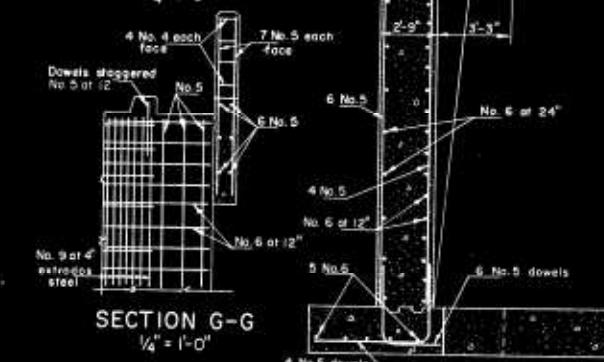
SECTION E-E

"• I-0"



SECTION E-

1



SECTION G-1

4

VILLAGE OF BOLTON

ONTARIO DEPARTMENT OF HIGHWAYS

## PLANS AND SECTIONS

GRADE 10 EXAMINATION

1000

10 of 10

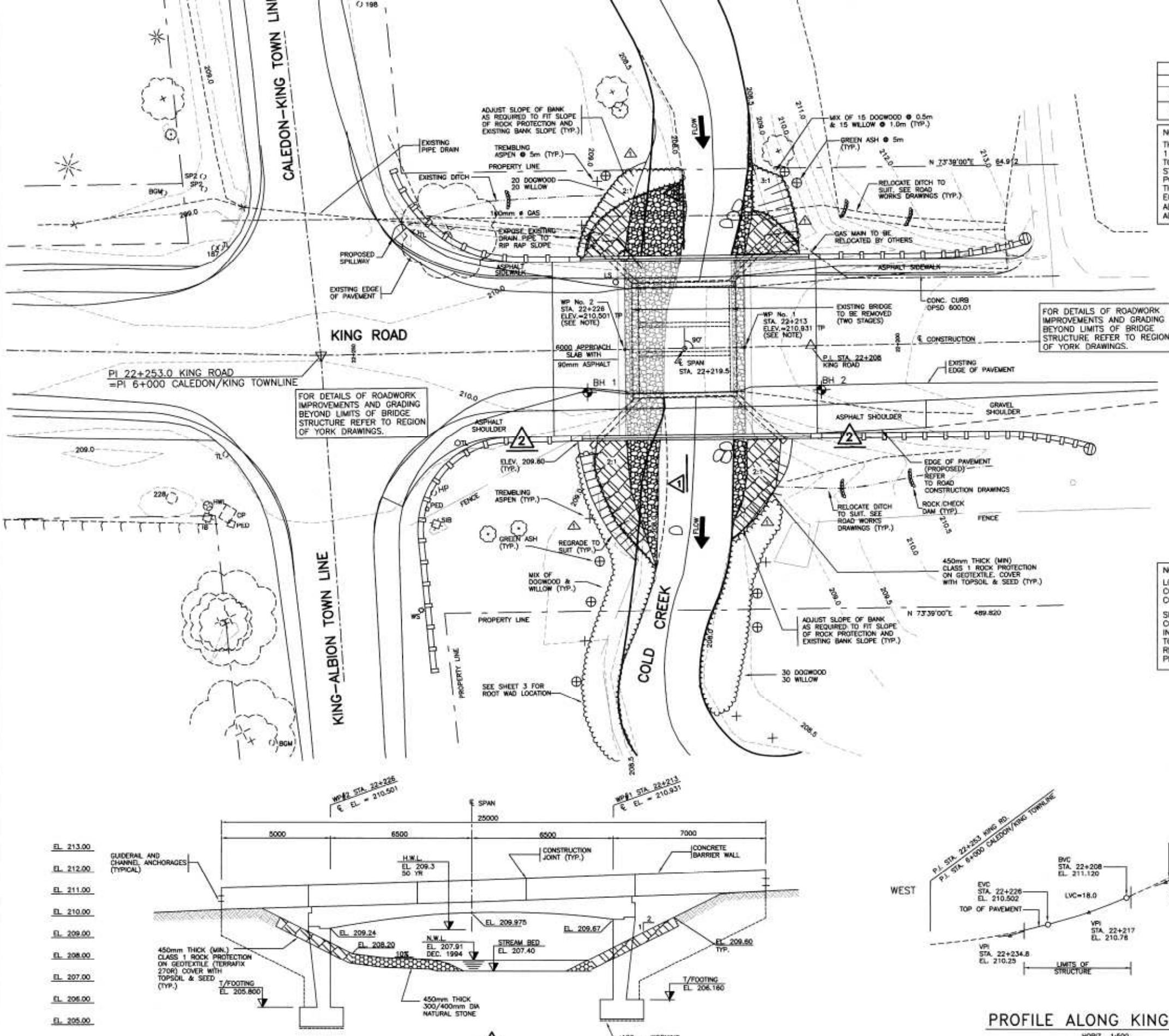
DATE JUN 16 1965

W. J. CRISWELL  
CONSULTING ENGINEER

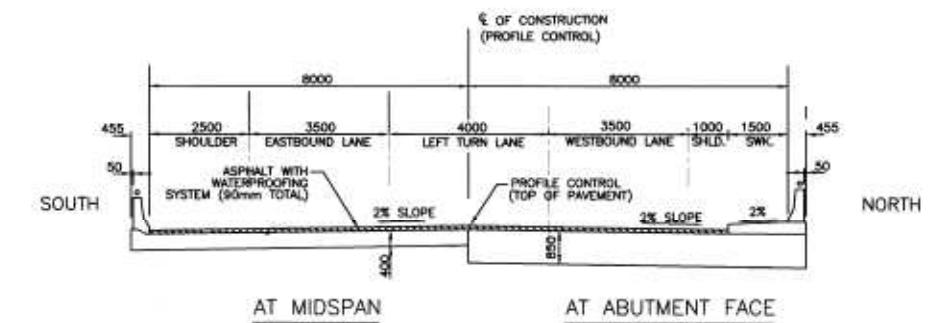
DATE JULY 16, 1962

**CONSULTING ENGINEER**

ORG. NO. 23-E



**KEY PLAN**  
N.T.S.



**DECK SECTION**  
1:100

**GENERAL NOTES:**

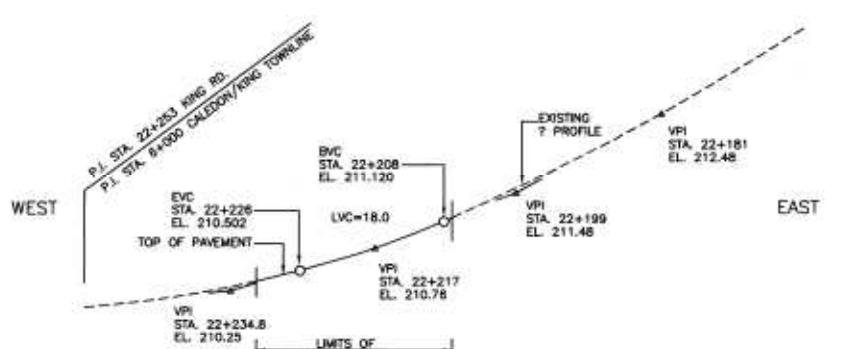
**NOTE:**  
LOCATION OF TREES AND SHRUBS SHALL BE CONFIRMED BY REGION OF YORK'S FOREST CO-ORDINATOR BEFORE PLANTING.  
SILT FENCE AND CHECK DAMS SHOWN ARE CONSIDERED MINIMUM ONLY. ADDITIONAL INSTALLATION AS DIRECTED BY THE COMMISSIONER TO SATISFY THE SITE CONDITIONS AND/OR AS REQUESTED BY REGULATORY AGENCIES SHALL BE PLACED WITHOUT DELAY.

- CLASS OF CONCRETE 30 MPa
- CLEAR COVER TO REINFORCING STEEL
- FOOTINGS ABUTMENTS, WINGWALLS AND RETAINING WALLS  
DECK (TOP) 100±25  
DECK (BOTTOM) 70±20  
REMAINDER (UNLESS OTHERWISE NOTED) 50±10  
70±20
- REINFORCING STEEL  
REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BAR MARKS WITH SUFFIX C DENOTE COATED BARS.
- CONSTRUCTION NOTES  
BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.  
BACKFILL SHALL NOT BE PLACED UNTIL ABUTMENT CONCRETE HAS REACHED 75% OF DESIGN STRENGTH.
- DESIGN IN ACCORDANCE WITH O.H.B.O.C. 1991

- LIST OF DRAWINGS**
- GENERAL ARRANGEMENT
  - FOOTING LAYOUT AND REINFORCEMENT
  - RIGID FRAME AND REINFORCEMENT
  - ABUTMENT AND WINGWALL REINFORCEMENT
  - DECK SECTIONS AND SCREED ELEVATIONS
  - BARRIER WALL
  - BARRIER WALL ON SIDEWALK
  - RAILING FOR BARRIER WALL
  - 500mm APPROACH SLAB
  - STANDARD DETAILS

**LEGEND**

- BORDELINE NUMBER AND APPROXIMATE LOCATION SHAHEEN AND PEAKER REPORT No. SP935, DATED JUNE 19, 1995
- T/ TOP
- WP WORKING POINT
- TP TOP OF PAVEMENT
- % CENTRELINE



**PROFILE ALONG KING ROAD**

HORIZ. 1:500  
VERT. 1:50

BENCHMARK: 67-100 (R.M.Y.) ELEVATION: 211.19  
Concrete structure carrying King/Albion Townline Road over Number River, 183 metres south of King Road (Y.R. 11).  
Tablet set vertically in top of concrete curb at east side, 30.4 cm south of north end of structure.

**ELEVATION**

1:100

No.	DATE	REVISIONS	BY
1	18/04/96	STREAM BANK PROTECTION WORK	LKN
2	18/06/97	BRIDGE LENGTHENED	AHH



**PARAGON**  
ENGINEERING



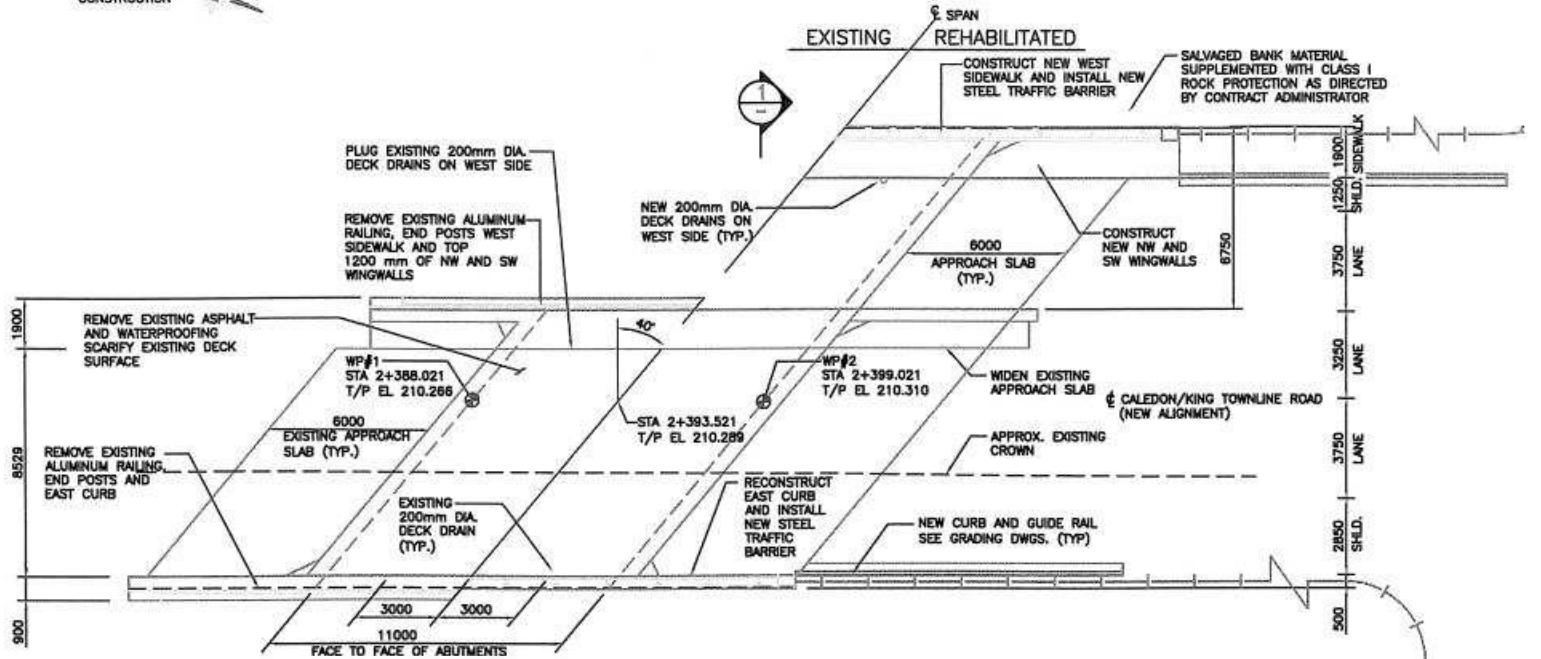
DESIGN	REVIEW
DRAWN	REVIEWED

KING ROAD BRIDGE REPLACEMENT  
OVER COLD CREEK  
TOWNLNE OF KING

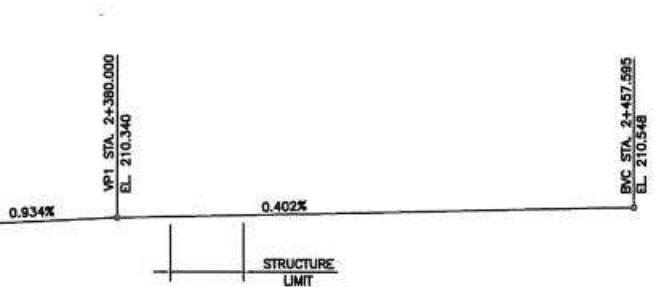
DWG. NO.  
S-205-18  
CONT. NO.

NOTE:  
THE LOCATION OF UTILITIES IS APPROXIMATE ONLY, AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED.

NORTH FOR  
CONSTRUCTION



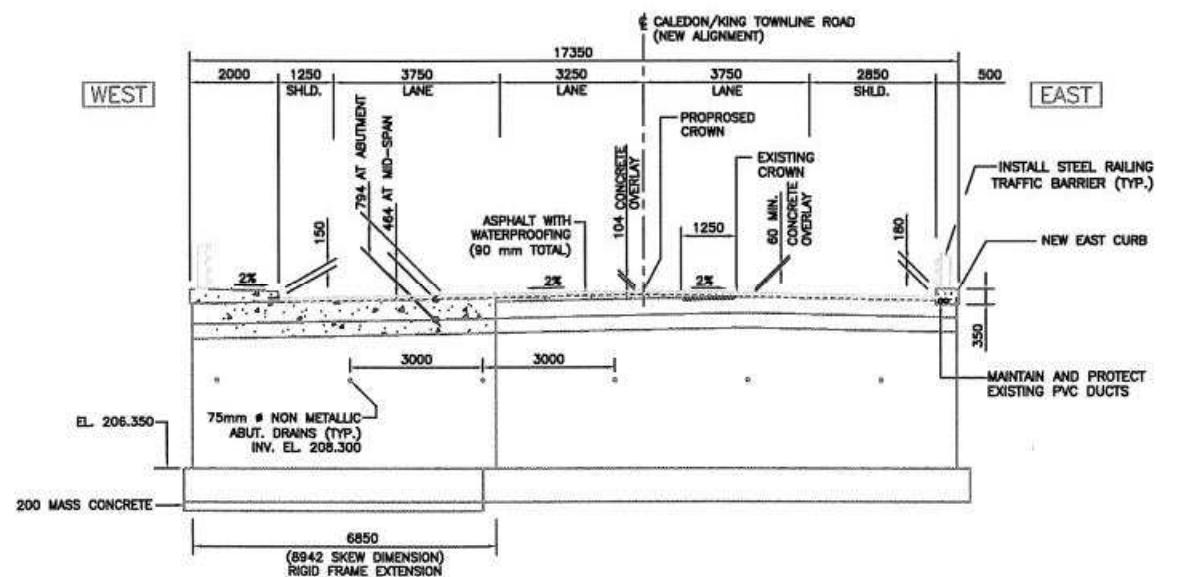
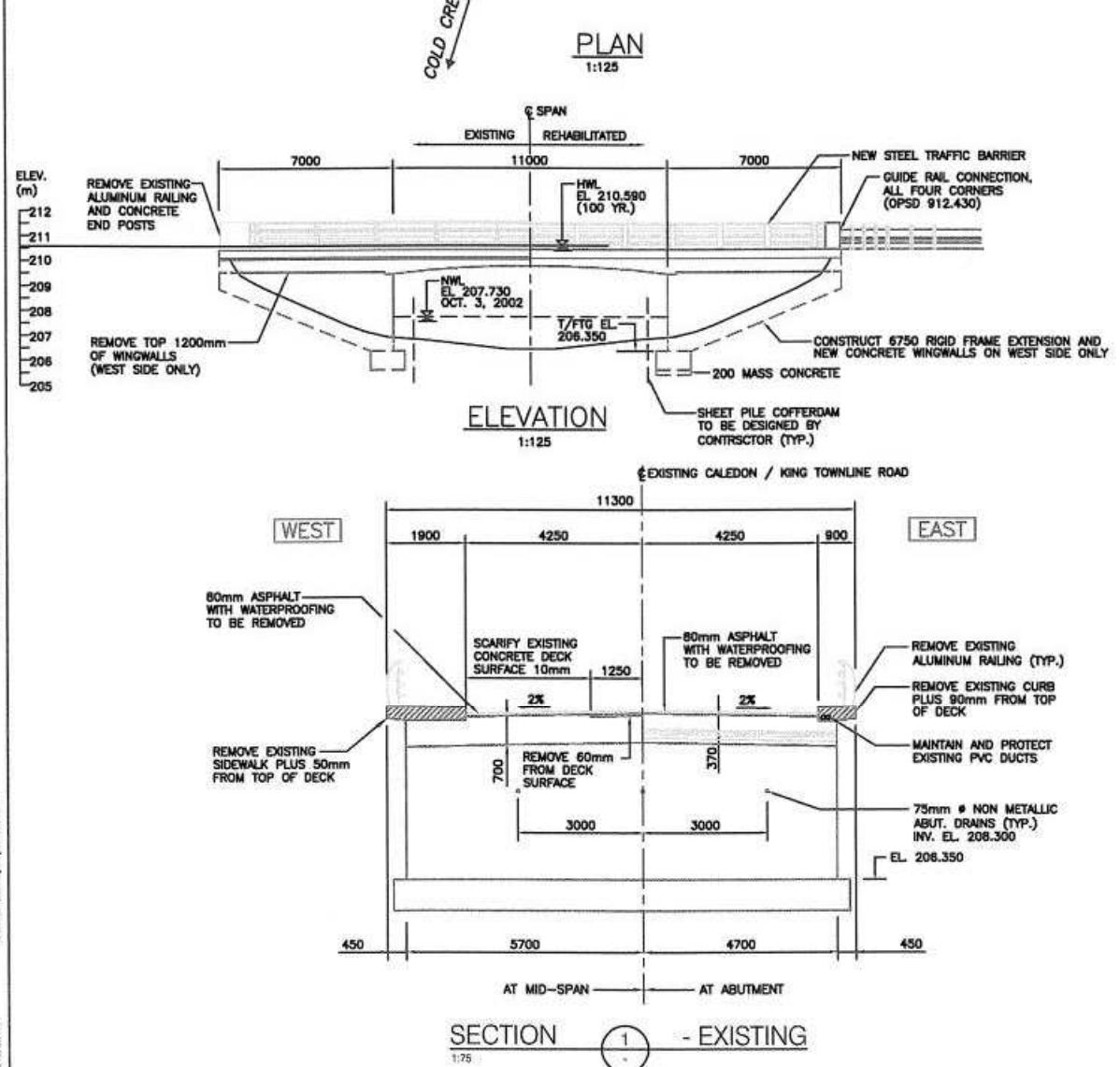
**PROFILE CALEDON-KING TOWNLINE ROAD  
(NEW ALIGNMENT)**



- GENERAL NOTES:**
- ALL WORK SHALL BE UNDERTAKEN IN ACCORDANCE WITH ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND THE SPECIAL PROVISIONS OF THE CONTRACT.
  - CLASS OF - CONCRETE: 30 MPa  
- MASS CONCRETE: 20 MPa
  - REINFORCING STEEL SHALL BE GRADE 400.  
BARS MARKED WITH PREFIX 'C' DENOTE COATED BARS.
  - CLEAR COVER TO REINFORCING STEEL 70 ± 20 mm
  - DECK - TOP 70 ± 10 mm
  - BOTTOM 100 ± 25 mm
  - REMAINDER UNLESS NOTED OTHERWISE 70 ± 20 mm
  - THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS OF THE EXISTING WORK AND ALL DETAILS ON SITE AND REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO PROCEEDING WITH THE WORK.
  - DESIGN CODE AND LOADING CHDCC-2000, CLASS A.  
TRAFFIC RAILING MEETS PERFORMANCE LEVEL 1 CRITERIA.
  - UNLESS SHOWN OTHERWISE, TENSION LAP LENGTHS SHALL BE CLASS B.
  - BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STRAPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS. ALL HOOKS SHALL BE IN ACCORDANCE WITH THE STRUCTURAL STANDARD DRAWINGS SS12-1 AND 12-2, UNLESS INDICATED OTHERWISE.
  - SACUTS AT LIMITS OF REMOVAL SHALL BE 25mm DEEP OR TO THE FIRST LAYER OF REINFORCING STEEL, WHICHEVER IS LESS (UNLESS OTHERWISE NOTED).
  - EPoxy grout for dowels shall be from the MTO's designated sources manual and installed in accordance with the manufacturer's instructions.
  - CALEDON-KING TOWNLINE ROAD TO BE CLOSED DURING CONSTRUCTION.
  - No backfill shall be placed behind abutment until deck concrete has reach 25MPa strength.
  - Backfill shall be placed simultaneously behind both abutments keeping the height of backfill approximately the same. At no time shall the difference in elevation be greater than 0.5m.

**LIST OF DRAWINGS:**

- SS-1 GENERAL ARRANGEMENT
- SS-2 REMOVALS
- SS-3 FOUNDATIONS
- SS-4 NEW CONSTRUCTION DETAILS
- SS-5 WINGWALLS
- SS-6 BACKFILL DETAILS
- SS-7 RAILING ON SIDEWALK
- SS-8 8000 mm APPROACH SLAB



**SECTION 1 - PROPOSED**

NO.	BY	DATE	REVISION	CODE CHECKED	TECH APPROVED
A	RBC	10/27/04	BACKFILL IN FRONT OF RET. WALL		

**APPROVED FOR CONSTRUCTION**  
THIS APPROVAL CONSTITUTES A GENERAL APPROVAL WHICH  
INCLUDES THE DESIGN AND CONSTRUCTION OF THE PROJECT.  
THE CONTRACTOR MAY USE AN ASSOCIATED PROFESSIONAL  
ENGINEER IN THE PROCESS OF DESIGN.

APPROVED BY: \_\_\_\_\_  
TODAY: \_\_\_\_\_

BENCH MARK: \_\_\_\_\_



PROJECT NAME: CALEDON-KING TOWNLINE SOUTH RECONSTRUCTION  
BRIDGE WIDENING AT STA. 2+393.521

CONSULTANT: MRC McCormick Rankin Corporation

**REGION OF PEEL**



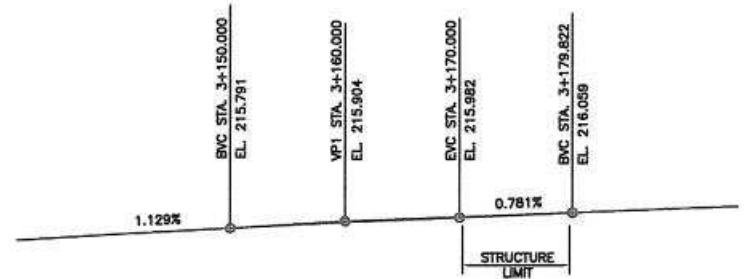
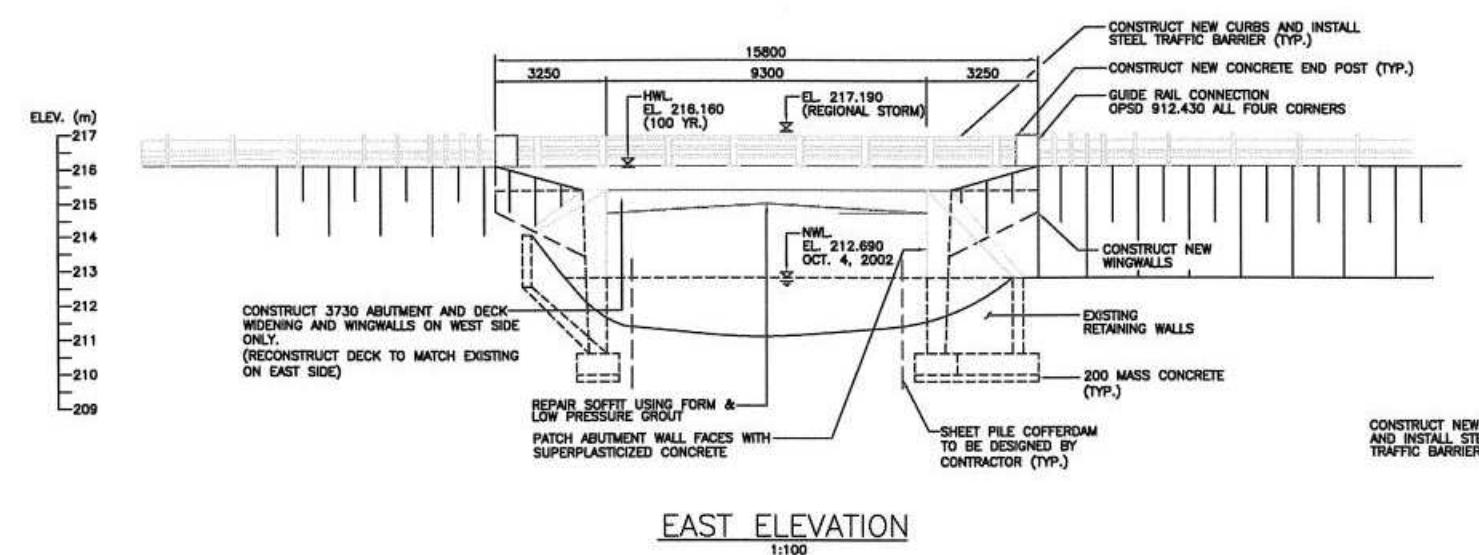
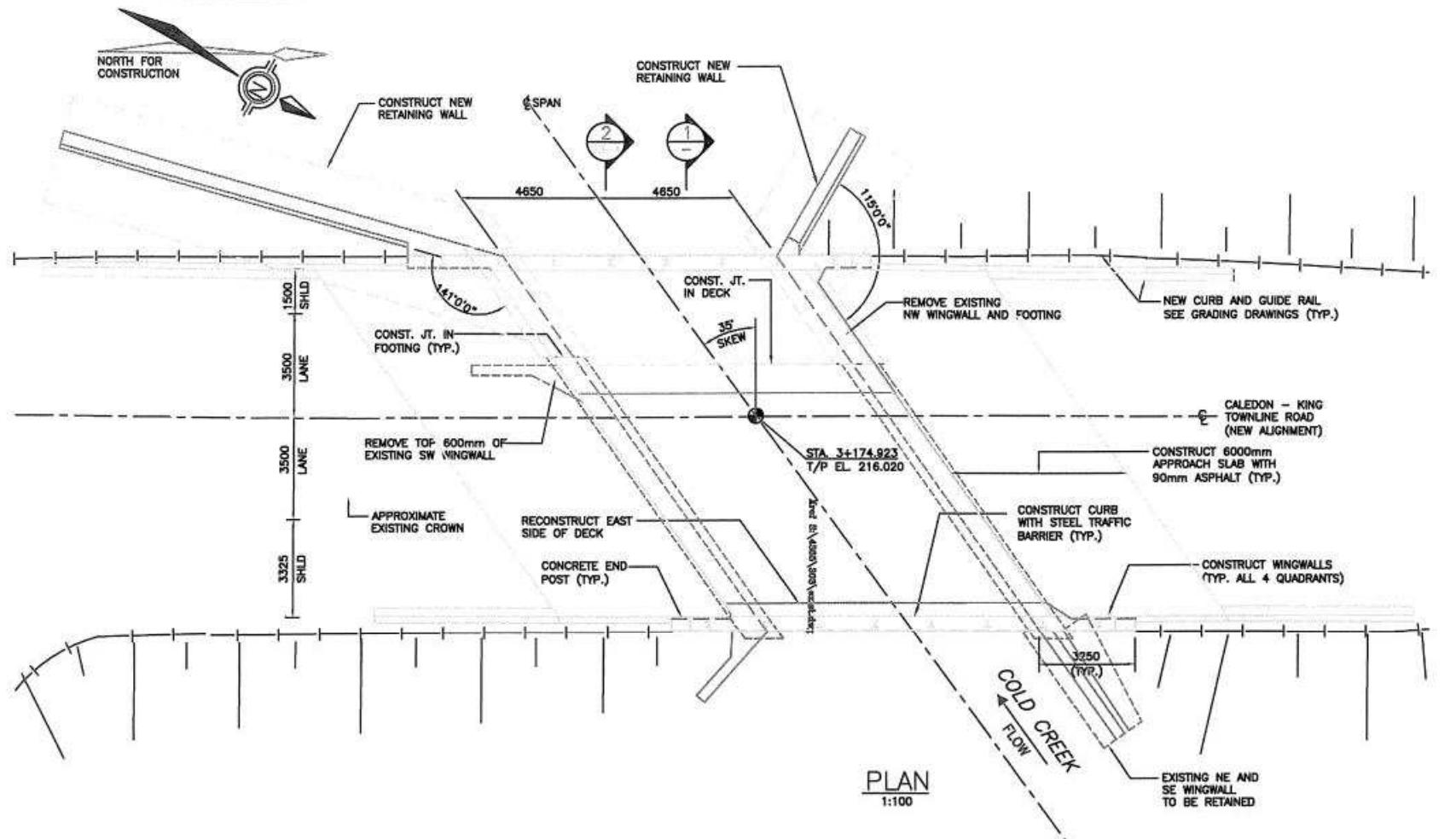
**TOWN OF CALEDON**

**GENERAL ARRANGEMENT**

SCALE	AS SHOWN	PROJECT No.
1:75	04-01	
DESIGNED BY: SL	DRAWN BY: PRJ	
CHECKED BY: KA	DATE: APRIL, 2004	DRAWING No. 56-1







PROFILE - CALEDON-KING TOWNSHIP ROAD  
(NEW ALIGNMENT)

**GENERAL NOTES:**

1. ALL WORK SHALL BE UNDERTAKEN IN ACCORDANCE WITH ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND THE SPECIAL PROVISIONS OF THE CONTRACT.
2. CLASS OF - CONCRETE : 30 MPa  
- MASS CONCRETE : 20 MPa.
3. REINFORCING STEEL SHALL BE GRADE 400.  
BARS MARKED WITH PREFIX 'C' DENOTE COATED BARS.
4. CLEAR COVER TO REINFORCING STEEL

DECK - TOP.....	70 $\pm$ 20 mm
- BOTTOM.....	50 $\pm$ 10 mm
BOTTOM OF FOOTING.....	100 $\pm$ 25 mm
REMAINDER UNLESS NOTED OTHERWISE.....	70 $\pm$ 20 mm

5. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS OF THE EXISTING WORK AND ALL DETAILS ON SITE AND REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO PROCEEDING WITH THE WORK.
6. DESIGN CODE AND LOADING CHDC-2000, CLASS A, TRAFFIC RAILING MEETS PERFORMANCE LEVEL 1 CRITERIA.
7. UNLESS SHOWN OTHERWISE, TENSION LAP LENGTHS SHALL BE CLASS B.
8. BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STRIRUPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS. ALL HOOKS SHALL BE IN ACCORDANCE WITH THE STRUCTURAL STANDARD DRAWINGS SS12-1 AND SS12-2, UNLESS INDICATED OTHERWISE. SEE CONTRACT DOCUMENTS.
9. SAWCUTS AT LIMITS OF REMOVAL SHALL BE 25MM DEEP OR TO THE FIRST LAYER OF REINFORCING STEEL, WHICHEVER IS LESS (UNLESS OTHERWISE NOTED).
10. EPOXY GROUT FOR DOWELS SHALL BE FROM THE MTO'S DESIGNATED SOURCES MANUAL AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
11. CALEDON-KING TOWLINE ROAD TO BE CLOSED DURING CONSTRUCTION.
12. NO BACKFILL SHALL BE PLACED BEHIND ABUTMENT UNTIL DECK CONCRETE HAS REACH 25MPa STRENGTH.
13. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS WHERE THE ABUTMENT HEIGHT APPROXIMATELY THE SAME, OR IN ONE STEP, THE DIFFERENCE IN ELEVATION BE DEPLETED, THAN 0.5 M.

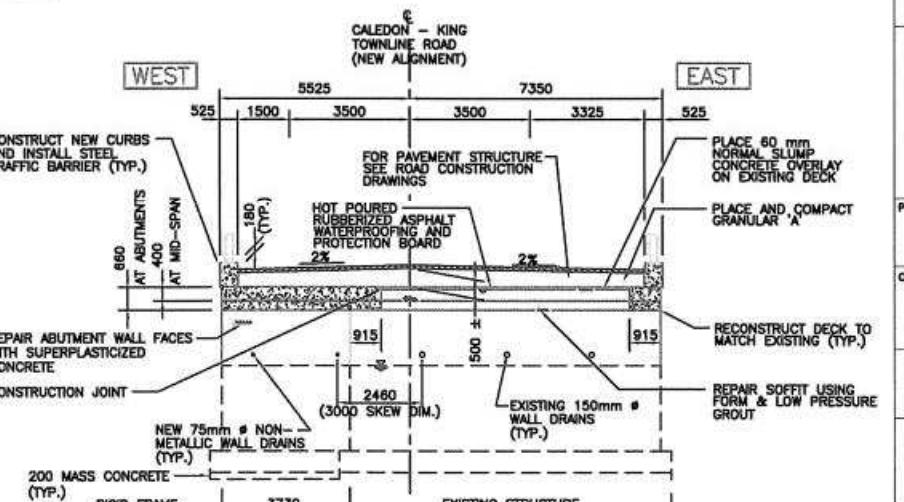
**APPLICABLE STANDARD DRAWINGS:**

LIST OF DRAWINGS:			
BY	DATE	REVISION	GENL CHECKED
3-1		GENERAL ARRANGEMENT	
3-2		REMOVALS	
3-3		FOUNDATIONS AND RETAINING WALLS	
3-4		NEW CONSTRUCTION DETAILS 1	
3-5		NEW CONSTRUCTION DETAILS 2	
3-6		EAST WALLS	
3-7		RAILING DETAILS	
3-8		900mm APPROACH SLAB	

**APPROVED FOR CONSTRUCTION**

THIS APPROVAL IS SUBJECT TO THE FURNISHING CERTIFICATION BY THE CONSTRUCTED WORK BY A REGISTERED PROFESSIONAL.

Then Engrossed



SECTION 1 — PROPOSED



## TOWN OF CALEDON

REGION OF PEEL

 THE COMPAGNIE ADP

## THE TOWN OF CALEDON

## GENERAL ARRANGEMENT

E AS SHOWN		CONTRACT No.
SIGNED BY: S.D.L.	DRAWN BY: P.R.J.	04-0
CHECKED BY: K.A.	DATE: APRIL, 2004	DRAWING No.
		S3-1



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**Appendix B**  
**Hydraulic Structures Inventory Sheets**  
**(TRCA)**

## CROSSING # H1 - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information	Structure Configuration and Dimensions		Current Flow Information
Date (mm/dd/yy): 10/26/2009	Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N): Y
Field Crew: T.L. and O.D.	Number of Cells: 1	Open Footing (Yes/No): Y	Approx. Depth (mm):
Watershed Name: Upper Humber / Bolton SPA	Material (Concrete/Steel): Concrete (confirm)		Approx. Velocity (m/s):
Subcatchment Area No:	Height (m) x Width (m) or Diameter (m): 2.1 x 15.2		Upstream Erosion (Y/N):
Tributary Name: Humber River	Length (m): 4.7		Downstream Erosion (Y/N):
Floodplain Map Sheet No.: (HUM-80-1R)	U/S Invert Elev. (m): 215.80	U/S Obvert Elev. (m): 217.80	Additional Flow Information:    
Cross-Section Range: 9.222-9.221 (Structure - 9.2215)	D/S Invert Elev. (m): 215.80	D/S Obvert Elev. (m): 217.80	
Municipality: Bolton	Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall		
Location (Road Name/Intersection): Glasgow Rd./Deer Valley Dr.	Skew Angle of Crossing (Degrees): 0 Height from Obvert to Top of Road (m): 2.1 Depth of Siltation (mm):		
<b>Site Photograph and Additional Field Notes</b>			
Site Sketch:			
	<p>Description of Photograph: Downstream view of bridge.</p>		

## CROSSING # H2 - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information		Structure Configuration and Dimensions		Current Flow Information	
Date (mm/dd/yy): 10/26/2009		Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N):	
Field Crew: T.L. and O.D.		Number of Cells: 1	Open Footing (Yes/No): Y	Approx. Depth (mm):	
Watershed Name: Upper Humber / Bolton SPA		Material (Concrete/Steel):		Approx. Velocity (m/s):	
Subcatchment Area No:		Height (m) x Width (m) or Diameter (m): 3.3 x 19.8		Upstream Erosion (Y/N):	
Tributary Name: Humber River		Length (m): 10.8		Downstream Erosion (Y/N):	
Floodplain Map Sheet No.: (HUM-79-5R)		U/S Invert Elev. (m): 213.70	U/S Obvert Elev. (m): 217.0	Additional Flow Information:	
Cross-Section Range: 9.182-9.181 (Structure - 9.1815)		D/S Invert Elev. (m): 213.70	D/S Obvert Elev. (m): 217.0		
Municipality: Bolton		Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall			
Location (Road Name/Intersection): Hickman St (near the intersection of Hickman and Glasgow St)		Skew Angle of Crossing (Degrees): 0 Height from Obvert to Top of Road (m): 1.0 Depth of Siltation (mm):			
Site Photograph and Additional Field Notes					
Site Sketch:					
Description of Photograph: Upstream view of bridge.					

## CROSSING # H3 - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information		Structure Configuration and Dimensions		Current Flow Information	
Date (mm/dd/yy): 10/26/2009		Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N):	
Field Crew: T.L. and O.D.		Number of Cells: 1	Open Footing (Yes/No): Y	Approx. Depth (mm):	
Watershed Name: Upper Humber / Bolton SPA		Material (Concrete/Steel):		Approx. Velocity (m/s):	
Subcatchment Area No:		Height (m) x Width (m) or Diameter (m): 3.5 x 19.7		Upstream Erosion (Y/N):	
Tributary Name: Humber River		Length (m): 17.7		Downstream Erosion (Y/N):	
Floodplain Map Sheet No.: (HUM-79-4R)		U/S Invert Elev. (m): 213.20	U/S Obvert Elev. (m): 216.67	Additional Flow Information:	
Cross-Section Range: 9.172-9.171 (Structure - 9.1715)		D/S Invert Elev. (m): 213.20	D/S Obvert Elev. (m): 216.67		
Municipality: Bolton		Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall			
Location (Road Name/Intersection): Highway 50 (Queen St. N.)/Hickman St.		Skew Angle of Crossing (Degrees): 0 Height from Obvert to Top of Road (m): 1.2 Depth of Siltation (mm):			
Site Photograph and Additional Field Notes					
Site Sketch:					
Description of Photograph: Upstream view of bridge.					

## CROSSING # H4 - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information		Structure Configuration and Dimensions		Current Flow Information	
Date (mm/dd/yy): 10/26/2009		Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N):	
Field Crew: T.L. and O.D.		Number of Cells: 1	Open Footing (Yes/No): Y	Approx. Depth (mm):	
Watershed Name: Upper Humber / Bolton SPA		Material (Concrete/Steel):		Approx. Velocity (m/s):	
Subcatchment Area No:		Height (m) x Width (m) or Diameter (m): 2.7-3.3 (sloped) x 15.0		Upstream Erosion (Y/N):	
Tributary Name: Humber River		Length (m): 14.7		Downstream Erosion (Y/N):	
Floodplain Map Sheet No.: (HUM-79-3R)		U/S Invert Elev. (m): 211.00	U/S Obvert Elev. (m): 213.44-214.49	Additional Flow Information:	
Cross-Section Range: 9.112-9.111 (Structure - 9.1115)		D/S Invert Elev. (m): 211.00	D/S Obvert Elev. (m): 213.44-214.49		
Municipality: Bolton		Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall			
Location (Road Name/Intersection): King St. E./Humber Lea Rd.		Skew Angle of Crossing (Degrees): 0 Height from Obvert to Top of Road (m): 1.0-1.5 Depth of Siltation (mm):			
Site Photograph and Additional Field Notes					
Site Sketch:					
Description of Photograph: Upstream view of bridge.					

## CROSSING # H5 - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information	Structure Configuration and Dimensions		Current Flow Information
Date (mm/dd/yy): 10/26/2009	Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N):
Field Crew: T.L. and O.D.	Number of Cells: 2	Open Footing (Yes/No): Y	Approx. Depth (mm):
Watershed Name: Upper Humber / Bolton SPA	Material (Concrete/Steel):		Approx. Velocity (m/s):
Subcatchment Area No:	Height (m) x Width (m) or Diameter (m): 2.6 x 14.7		Upstream Erosion (Y/N):
Tributary Name: Humber River	Length (m): 12.6		Downstream Erosion (Y/N):
Floodplain Map Sheet No.: (HUM-79-6A)	U/S Invert Elev. (m): 209.70	U/S Obvert Elev. (m): 212.32	Additional Flow Information:
Cross-Section Range: 9.092-9.091 (Structure - 9.0915)	D/S Invert Elev. (m): 209.70	D/S Obvert Elev. (m): 212.32	
Municipality: Bolton	Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall		
Location (Road Name/Intersection): King St. E./Old King Rd.	Skew Angle of Crossing (Degrees): 0 Height from Obvert to Top of Road (m): 0.9 Depth of Siltation (mm):		
Site Photograph and Additional Field Notes			
Site Sketch:			
	Description of Photograph: Downstream view of bridge.		

## CROSSING # H6 - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information	Structure Configuration and Dimensions		Current Flow Information
Date (mm/dd/yy): 10/26/2009	Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N):
Field Crew: T.L. and O.D.	Number of Cells: 1	Open Footing (Yes/No): Y	Approx. Depth (mm):
Watershed Name: Upper Humber / Bolton SPA	Material (Concrete/Steel):		Approx. Velocity (m/s):
Subcatchment Area No:	Height (m) x Width (m) or Diameter (m): 2.4 x 16.8		Upstream Erosion (Y/N):
Tributary Name: Humber River	Length (m): 3.7		Downstream Erosion (Y/N):
Floodplain Map Sheet No.: (HUM-78-1R)	U/S Invert Elev. (m): 207.40	U/S Obvert Elev. (m): 209.80	Additional Flow Information:
Cross-Section Range: 9.032-9.031 (Structure - 9.0315)	D/S Invert Elev. (m): 207.40	D/S Obvert Elev. (m): 209.80	
Municipality: Bolton	Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall		
Location (Road Name/Intersection): Old King Rd./Sneath Rd.	Skew Angle of Crossing (Degrees): 0 Height from Obvert to Top of Road (m): 0.8 Depth of Siltation (mm):		
Site Photograph and Additional Field Notes			
Site Sketch:			
	Description of Photograph: Upstream view of bridge.		

## CROSSING # H7 - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information		Structure Configuration and Dimensions		Current Flow Information	
Date (mm/dd/yy): 10/26/2009		Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N):	
Field Crew: T.L. and O.D.		Number of Cells: 3	Open Footing (Yes/No): Y	Approx. Depth (mm):	
Watershed Name: Upper Humber / Bolton SPA		Material (Concrete/Steel):		Approx. Velocity (m/s):	
Subcatchment Area No:		Height (m) x Width (m) or Diameter (m): (L-R) 2.9x11.6, 4.1x18.7, 2.6x11.6		Upstream Erosion (Y/N):	
Tributary Name: Humber River		Length (m): 21.0		Downstream Erosion (Y/N):	
Floodplain Map Sheet No.: (HUM-78-2R)		U/S Invert Elev. (m): 208.00	U/S Obvert Elev. (m): 210.80	Additional Flow Information:	
Cross-Section Range: 9.005-9.001 (Structure - 9.0015)		D/S Invert Elev. (m): 208.00	D/S Obvert Elev. (m): 210.80		
Municipality: Bolton		Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall			
Location (Road Name/Intersection): Old King Rd./Caledon King Town Line S.		Skew Angle of Crossing (Degrees): 0 Height from Obvert to Top of Road (m): 1.3 Depth of Siltation (mm):			
Site Photograph and Additional Field Notes					
Site Sketch:		 A photograph showing a concrete bridge with a metal railing spanning a river. The bridge is elevated above the water level. The surrounding area includes some trees and bushes in the foreground.			
Description of Photograph: Upstream view of bridge.					

## CROSSING # - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information	Structure Configuration and Dimensions		Current Flow Information
Date (mm/dd/yy): 10/26/2009	Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N):
Field Crew: T.L. and O.D.	Number of Cells: 1	Open Footing (Yes/No): Y	Approx. Depth (mm):
Watershed Name: Upper Humber / Bolton SPA	Material (Concrete/Steel): Concrete		Approx. Velocity (m/s):
Subcatchment Area No:	Height (m) x Width (m) or Diameter (m):		Upstream Erosion (Y/N):
Tributary Name: Humber River	Length (m):		Downstream Erosion (Y/N):
Floodplain Map Sheet No.:	U/S Invert Elev. (m):	U/S Obvert Elev. (m):	Additional Flow Information:
Cross-Section Range:	D/S Invert Elev. (m):	D/S Obvert Elev. (m):	
Municipality: Bolton	Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall		
Location (Road Name/Intersection): Caledon King Town Line S./King St. E	Skew Angle of Crossing (Degrees):		
	Height from Obvert to Top of Road (m):		
	Depth of Siltation (mm):		
Site Photograph and Additional Field Notes			
Site Sketch:			
	Description of Photograph: Upstream view of bridge.		

## CROSSING # - HYDRAULIC STRUCTURE INVENTORY SHEET

Watershed and Location Information	Structure Configuration and Dimensions		Current Flow Information
Date (mm/dd/yy): 10/26/2009	Structure Type (Culvert/Bridge): Bridge		Flow Present (Y/N):
Field Crew: T.L. and O.D.	Number of Cells: 1	Open Footing (Yes/No): Y	Approx. Depth (mm):
Watershed Name: Upper Humber / Bolton SPA	Material (Concrete/Steel): Concrete		Approx. Velocity (m/s):
Subcatchment Area No:	Height (m) x Width (m) or Diameter (m):		Upstream Erosion (Y/N):
Tributary Name: Humber River	Length (m):		Downstream Erosion (Y/N):
Floodplain Map Sheet No.:	U/S Invert Elev. (m):	U/S Obvert Elev. (m):	Additional Flow Information:
Cross-Section Range:	D/S Invert Elev. (m):	D/S Obvert Elev. (m):	
Municipality: Bolton	Inlet Type (Projecting/Mitered/Headwall): Square edge with headwall		
Location (Road Name/Intersection): Caledon King Town Line S. <i>(620m North of King Rd. W intersection)</i>	Skew Angle of Crossing (Degrees): Height from Obvert to Top of Road (m): Depth of Siltation (mm):		
<b>Site Photograph and Additional Field Notes</b>			
Site Sketch:			
<p>Description of Photograph: Upstream view of bridge.</p>			



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## **Appendix C**

### **HEC-RAS Summary Outputs**

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Cold Creek  
**Reach:** East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
EAST BRANCH	10.76	2-year	5.33	225.6	226.1	226.1	226.2	0.009477	1.62	6.36	32.49	0.73
EAST BRANCH	10.76	5-year	8.72	225.6	226.19	226.19	226.32	0.01081	1.94	9.36	34.72	0.8
EAST BRANCH	10.76	10-year	11.49	225.6	226.24	226.24	226.39	0.012063	2.17	11.26	36.06	0.86
EAST BRANCH	10.76	25-year	15.03	225.6	226.31	226.31	226.48	0.012502	2.36	13.77	37.76	0.89
EAST BRANCH	10.76	50-year	18.11	225.6	226.38	226.35	226.55	0.011354	2.4	16.55	39.56	0.86
EAST BRANCH	10.76	100-year	21.21	225.6	226.46	226.4	226.61	0.010164	2.41	19.51	41.39	0.83
EAST BRANCH	10.76	Regional	167.56	225.6	228		228.25	0.006256	3.75	108.83	71.61	0.77
EAST BRANCH	10.75	2-year	5.33	223.62	224.33		224.4	0.003607	1.27	5.99	13.34	0.48
EAST BRANCH	10.75	5-year	8.72	223.62	224.45		224.61	0.004185	1.58	8.42	15.04	0.54
EAST BRANCH	10.75	10-year	11.49	223.62	224.61		224.74	0.004592	1.79	10.13	16.14	0.57
EAST BRANCH	10.75	25-year	15.03	223.62	224.73		224.89	0.005078	2.03	12.08	17.31	0.61
EAST BRANCH	10.75	50-year	18.11	223.62	224.82		225.01	0.005428	2.2	13.67	18.2	0.64
EAST BRANCH	10.75	100-year	21.21	223.62	224.91		225.12	0.005641	2.35	15.29	19.07	0.66
EAST BRANCH	10.75	Regional	167.56	223.62	226.25	226.25	226.82	0.009965	5.04	89.61	76.2	0.99
EAST BRANCH	10.74	2-year	5.33	222.87	223.54		223.62	0.004437	1.35	6.31	20.83	0.53
EAST BRANCH	10.74	5-year	8.72	222.87	223.73		223.81	0.003994	1.51	10.92	28.61	0.52
EAST BRANCH	10.74	10-year	11.49	222.87	223.86		223.94	0.003593	1.57	15	34.04	0.51
EAST BRANCH	10.74	25-year	15.03	222.87	223.99		224.08	0.003383	1.66	19.84	39.52	0.5
EAST BRANCH	10.74	50-year	18.11	222.87	224.09		224.18	0.003323	1.74	24.21	46.77	0.5
EAST BRANCH	10.74	100-year	21.21	222.87	224.18		224.27	0.003298	1.82	28.51	53.21	0.51
EAST BRANCH	10.74	Regional	167.56	222.87	225.7		225.8	0.002437	2.62	180.03	119.9	0.5
EAST BRANCH	10.73	2-year	5.33	222.2	222.87		222.93	0.002786	1.09	5.76	12.89	0.43
EAST BRANCH	10.73	5-year	8.72	222.2	223.06		223.15	0.002943	1.33	8.68	18.54	0.46
EAST BRANCH	10.73	10-year	11.49	222.2	223.18		223.28	0.003195	1.51	11.13	24.78	0.49
EAST BRANCH	10.73	25-year	15.03	222.2	223.3		223.42	0.003328	1.67	14.67	31.67	0.51
EAST BRANCH	10.73	50-year	18.11	222.2	223.4		223.53	0.003405	1.78	17.83	36.75	0.52
EAST BRANCH	10.73	100-year	21.21	222.2	223.48		223.62	0.003403	1.86	21.23	41.52	0.52
EAST BRANCH	10.73	Regional	167.56	222.2	224.93		225.2	0.004274	3.45	130.32	102.54	0.67
EAST BRANCH	10.72	2-year	5.33	221.49	222.19		222.27	0.004241	1.36	5.7	16.3	0.52
EAST BRANCH	10.72	5-year	8.72	221.49	222.36		222.47	0.004451	1.61	9.03	21.44	0.55
EAST BRANCH	10.72	10-year	11.49	221.49	222.49	222.29	222.61	0.004373	1.75	11.88	25.01	0.56
EAST BRANCH	10.72	25-year	15.03	221.49	222.61	222.41	222.74	0.004446	1.9	15.19	28.61	0.57
EAST BRANCH	10.72	50-year	18.11	221.49	222.7	222.49	222.85	0.004524	2.02	17.93	31.27	0.59
EAST BRANCH	10.72	100-year	21.21	221.49	222.77		222.93	0.004751	2.16	20.27	33.39	0.61
EAST BRANCH	10.72	Regional	167.56	221.49	224.22		224.51	0.00583	3.95	128.68	114.47	0.76
EAST BRANCH	10.71	2-year	5.33	220.59	221.24	221.1	221.33	0.005511	1.47	5.36	18.11	0.58
EAST BRANCH	10.71	5-year	8.72	220.59	221.39	221.28	221.52	0.006024	1.76	8.55	24.24	0.63
EAST BRANCH	10.71	10-year	11.49	220.59	221.47	221.39	221.63	0.006542	1.97	10.84	27.82	0.67
EAST BRANCH	10.71	25-year	15.03	220.59	221.57	221.49	221.75	0.006944	2.17	13.71	31.75	0.7
EAST BRANCH	10.71	50-year	18.11	220.59	221.64	221.57	221.83	0.007229	2.33	16.09	34.68	0.72
EAST BRANCH	10.71	100-year	21.21	220.59	221.72	221.64	221.91	0.007223	2.43	18.7	37.62	0.73
EAST BRANCH	10.71	Regional	167.56	220.59	223.25		223.56	0.00656	4.11	136.35	148.05	0.8
EAST BRANCH	10.7	2-year	5.33	218.89	219.39	219.39	219.61	0.01613	2.11	2.72	7.43	0.95
EAST BRANCH	10.7	5-year	8.72	218.89	219.58	219.58	219.86	0.013547	2.4	4.41	10.66	0.92
EAST BRANCH	10.7	10-year	11.49	218.89	219.72	219.72	220.02	0.011726	2.53	6.13	13.78	0.89
EAST BRANCH	10.7	25-year	15.03	218.89	219.86	219.86	220.19	0.010785	2.69	8.3	16.92	0.87
EAST BRANCH	10.7	50-year	18.11	218.89	219.97	219.97	220.31	0.010227	2.81	10.22	19.29	0.86
EAST BRANCH	10.7	100-year	21.21	218.89	220.06	220.06	220.42	0.010079	2.94	12.03	21.42	0.87
EAST BRANCH	10.7	Regional	167.56	218.89	221.72	221.72	222.38	0.009644	5.2	81.07	59.45	0.99
EAST BRANCH	10.69	2-year	5.33	217.88	218.45		218.47	0.001031	0.62	8.99	18.16	0.26
EAST BRANCH	10.69	5-year	8.72	217.88	218.63		218.66	0.001091	0.76	12.43	20.39	0.28
EAST BRANCH	10.69	10-year	11.49	217.88	218.75		218.79	0.001137	0.85	14.95	21.88	0.29
EAST BRANCH	10.69	25-year	15.03	217.88	218.88		218.93	0.001191	0.96	17.93	23.52	0.31
EAST BRANCH	10.69	50-year	18.11	217.88	218.98		219.04	0.001225	1.04	20.42	24.81	0.32
EAST BRANCH	10.69	100-year	21.21	217.88	219.07		219.13	0.001299	1.12	22.54	26.16	0.33
EAST BRANCH	10.69	Regional	167.56	217.88	220.44		220.97	0.004653	3.55	74.47	49.9	0.71
EAST BRANCH	10.68	2-year	5.33	217.2	217.86	217.86	218.04	0.011682	2.1	4.48	15.64	0.82
EAST BRANCH	10.68	5-year	8.72	217.2	218.03	218.03	218.23	0.010973	2.37	7.52	20.9	0.83
EAST BRANCH	10.68	10-year	11.49	217.2	218.12	218.12	218.34	0.011444	2.59	9.56	23.64	0.86
EAST BRANCH	10.68	25-year	15.03	217.2	218.23	218.23	218.46	0.011465	2.79	12.21	26.8	0.88
EAST BRANCH	10.68	50-year	18.11	217.2	218.3	218.3	218.55	0.011893	2.97	14.19	28.93	0.9
EAST BRANCH	10.68	100-year	21.21	217.2	218.36	218.36	218.64	0.012097	3.12	16.2	30.95	0.92
EAST BRANCH	10.68	Regional	167.56	217.2	220.04		220.17	0.004413	3.29	148.33	105.74	0.62

Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: Main Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnt (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chf
MAIN BRANCH	10.28	2-year	11.86	216.37	217.3	217.4	0.004367	1.67	15.46	44.65	0.55	
MAIN BRANCH	10.28	5-year	19.54	216.37	216.32	217.61	0.003707	1.83	23.51	59.89	0.55	
MAIN BRANCH	10.28	10-year	25.44	216.37	217.64	217.78	0.003843	1.93	35.02	71.85	0.55	
MAIN BRANCH	10.28	25-year	33.47	216.37	217.78	217.88	0.003712	2.03	45.81	83.12	0.55	
MAIN BRANCH	10.28	50-year	39.75	216.37	217.87	217.97	0.003626	2.09	54.01	90.77	0.55	
MAIN BRANCH	10.28	100-year	46.22	216.37	217.96	218.06	0.003548	2.15	62.31	97.89	0.54	
MAIN BRANCH	10.28	Regional	296.27	216.37	219.91	220.01	0.001962	2.74	322.15	189.85	0.46	
MAIN BRANCH	10.27	2-year	11.86	216.2	217.22	217.26	0.001682	1.11	23.36	47.85	0.35	
MAIN BRANCH	10.27	5-year	19.54	216.2	217.44	217.48	0.001733	1.29	34.53	54.61	0.37	
MAIN BRANCH	10.27	10-year	25.44	216.2	217.58	217.61	0.001886	1.43	41.16	58.25	0.39	
MAIN BRANCH	10.27	25-year	33.47	216.2	217.69	217.82	0.002021	1.5	49.28	62.28	0.41	
MAIN BRANCH	10.27	50-year	39.75	216.2	217.77	217.84	0.002247	1.72	54.58	65	0.44	
MAIN BRANCH	10.27	100-year	46.22	216.2	217.86	217.93	0.002339	1.83	59.97	67.52	0.46	
MAIN BRANCH	10.27	Regional	296.27	216.2	219.77	219.92	0.00249	3.12	244.2	113.9	0.53	
MAIN BRANCH	10.26	2-year	11.86	216.03	216.95	216.89	0.007024	2.05	12.84	34.5	0.68	
MAIN BRANCH	10.26	5-year	19.54	216.03	217.18	217.32	0.006346	2.26	22.9	56.22	0.67	
MAIN BRANCH	10.26	10-year	25.44	216.03	217.33	217.45	0.005288	2.24	32.71	72.67	0.63	
MAIN BRANCH	10.26	25-year	33.47	216.03	217.49	217.6	0.004457	2.23	46.08	90.38	0.59	
MAIN BRANCH	10.26	50-year	39.75	216.03	217.58	217.7	0.004062	2.23	56.29	101.85	0.57	
MAIN BRANCH	10.26	100-year	46.22	216.03	217.77	217.79	0.003503	2.22	65.53	112.57	0.55	
MAIN BRANCH	10.26	Regional	296.27	216.03	219.77	219.82	0.001145	2.11	376.57	162.44	0.35	
MAIN BRANCH	10.25	2-year	11.86	215.7	216.59	216.7	0.004506	1.66	13.2	31.72	0.56	
MAIN BRANCH	10.25	5-year	19.54	215.7	216.9	216.99	0.003658	1.7	24.5	44.55	0.5	
MAIN BRANCH	10.25	10-year	25.44	215.7	217.08	217.17	0.003084	1.77	32.06	55.55	0.48	
MAIN BRANCH	10.25	25-year	33.47	215.7	217.25	217.34	0.002681	1.83	44.12	67.23	0.47	
MAIN BRANCH	10.25	50-year	39.75	215.7	217.36	217.46	0.002513	1.89	52.38	75.78	0.47	
MAIN BRANCH	10.25	100-year	46.22	215.7	217.47	217.56	0.002424	1.93	60.99	83.77	0.46	
MAIN BRANCH	10.25	Regional	296.27	215.7	219.67	219.74	0.001115	2.28	359.74	161.35	0.37	
MAIN BRANCH	10.24	2-year	11.86	215.15	216.5	216.56	0.001356	1.2	17.49	33.36	0.33	
MAIN BRANCH	10.24	5-year	19.54	215.15	216.81	216.88	0.001368	1.39	30.01	47.32	0.34	
MAIN BRANCH	10.24	10-year	25.44	215.15	216.98	217.05	0.001042	1.51	38.62	54.9	0.36	
MAIN BRANCH	10.24	25-year	33.47	215.15	217.16	217.24	0.001073	1.64	49.35	61.74	0.37	
MAIN BRANCH	10.24	50-year	39.75	215.15	217.27	217.33	0.001055	1.74	54.45	67.75	0.38	
MAIN BRANCH	10.24	100-year	46.22	215.15	217.37	217.47	0.001629	1.84	63.36	69.43	0.39	
MAIN BRANCH	10.24	Regional	296.27	215.15	219.51	219.67	0.001874	3.1	265.14	117.26	0.47	
MAIN BRANCH	10.23	2-year	11.86	215	216.26	216.42	0.004072	1.84	11.12	26.19	0.55	
MAIN BRANCH	10.23	5-year	19.54	215	216.62	216.75	0.003067	1.99	23.69	44.92	0.5	
MAIN BRANCH	10.23	10-year	25.44	215	216.81	216.93	0.002076	2.03	33.15	55.3	0.48	
MAIN BRANCH	10.23	25-year	33.47	215	217.01	217.12	0.002533	2.08	45.4	66.11	0.47	
MAIN BRANCH	10.23	50-year	39.75	215	217.13	217.24	0.002355	2.09	53.99	68.09	0.46	
MAIN BRANCH	10.23	100-year	46.22	215	217.24	217.35	0.002292	2.14	61.58	69.8	0.46	
MAIN BRANCH	10.23	Regional	296.27	215	219.37	219.54	0.002357	3.38	240.71	106.18	0.52	
MAIN BRANCH	10.22	2-year	11.86	214.67	215.96	215.55	0.003079	1.71	11.26	13.69	0.48	
MAIN BRANCH	10.22	5-year	19.54	214.67	215.25	216.44	0.004008	2.23	16.92	26.49	0.57	
MAIN BRANCH	10.22	10-year	25.44	214.67	215.61	216.9	0.003011	2.5	21.98	32.32	0.61	
MAIN BRANCH	10.22	25-year	33.47	214.67	216.52	216.38	0.005579	2.93	26	40.12	69	
MAIN BRANCH	10.22	50-year	39.75	214.67	216.62	216.94	0.006038	3.16	30.14	44.98	0.72	
MAIN BRANCH	10.22	100-year	46.22	214.67	216.73	216.65	0.006092	3.29	35.33	50.43	0.73	
MAIN BRANCH	10.22	Regional	296.27	214.67	219.3	219.42	0.001814	3.08	307.7	151.55	0.46	
MAIN BRANCH	10.21	2-year	11.86	214.37	215.22	215.22	0.013115	2.44	5.89	13.42	0.93	
MAIN BRANCH	10.21	5-year	19.54	214.37	215.48	215.82	0.010949	2.74	10.12	19.25	0.89	
MAIN BRANCH	10.21	10-year	25.44	214.37	215.64	215.63	0.010009	2.91	13.53	22.89	0.88	
MAIN BRANCH	10.21	25-year	33.47	214.37	215.92	215.81	0.009686	2.81	20.74	29.13	0.76	
MAIN BRANCH	10.21	50-year	39.75	214.37	216.27	216.27	0.00971	2.76	26.68	35.04	0.7	
MAIN BRANCH	10.21	100-year	46.22	214.37	216.27	216.55	0.004973	2.76	32.38	36.17	0.66	
MAIN BRANCH	10.21	Regional	296.27	214.37	219.84	219.23	0.002656	3.74	233.55	114.63	0.57	
MAIN BRANCH	10.2	2-year	11.86	214.27	215.23	215.26	0.007075	0.74	18.91	28.89	0.54	
MAIN BRANCH	10.2	5-year	19.54	214.27	215.59	215.62	0.006333	0.94	31.06	39.62	0.23	
MAIN BRANCH	10.2	10-year	25.44	214.27	215.81	215.84	0.005996	0.91	40.46	46.19	0.23	
MAIN BRANCH	10.2	25-year	33.47	214.27	216.06	216.1	0.005654	0.98	53.05	52.65	0.23	
MAIN BRANCH	10.2	50-year	39.75	214.27	216.23	216.27	0.005048	1.02	62.13	54.51	0.23	
MAIN BRANCH	10.2	100-year	46.22	214.27	216.39	216.43	0.005059	1.07	70.8	56.24	0.23	
MAIN BRANCH	10.2	Regional	296.27	214.27	218.97	219.15	0.000891	2.33	248.34	83.11	0.34	
MAIN BRANCH	10.19	2-year	11.86	214	214.79	214.74	0.010972	2.4	5.76	10.19	0.86	
MAIN BRANCH	10.19	5-year	19.54	214	214.99	214.99	0.013026	3.04	8.01	11.93	0.98	
MAIN BRANCH	10.19	10-year	25.44	214	215.21	215.21	0.00741	3.15	10.25	15.43	0.92	
MAIN BRANCH	10.19	25-year	33.47	214	215.43	215.43	0.003009	3.56	14.7	20.02	0.8	
MAIN BRANCH	10.19	50-year	39.75	214	215.57	215.67	0.009322	3.5	17.7	21.47	0.89	
MAIN BRANCH	10.19	100-year	46.22	214	215.71	215.71	0.008928	3.63	20.84	23.76	0.88	
MAIN BRANCH	10.19	Regional	296.27	214	218.36	218.56	0.001682	3.11	242.97	103.48	0.46	
MAIN BRANCH	10.18	2-year	11.86	213.73	214.66	214.75	0.003118	1.45	11.84	20.35	0.48	
MAIN BRANCH	10.18	5-year	19.54	213.73	214.81	214.98	0.004665	1.96	15.2	22.91	0.6	
MAIN BRANCH	10.18	10-year	25.44	213.73	214.95	215.15	0.004936	2.19	18.55	25.21	0.63	
MAIN BRANCH	10.18	25-year	33.47	213.73	215.19	215.39	0.004248	2.29	25.27	32.57	0.6	
MAIN BRANCH	10.18	50-year	39.75	213.73	215.37	215.53	0.004162	2.4	28.85	36.16	0.61	
MAIN BRANCH	10.18	100-year	46.22	213.73	215.49	215.7	0.003053	2.4	31.17	43.2	0.58	
MAIN BRANCH	10.18	Regional	296.27	213.73	218.36	218.57	0.001682	3.11	249.27	103.48	0.46	
MAIN BRANCH	10.17	2-year	11.86	213.08	214.06	214.14	0.002338	1.31	10.19	13.41	0.42	
MAIN BRANCH	10.17	5-year	19.54	213.08	214.42	214.53	0.002053	1.51	15.75	16.39	0.42	
MAIN BRANCH	10.17	10-year	25.44	213.08	214.64	214.8	0.001681	1.61	20.1	18.43	0.41	
MAIN BRANCH	10.17	25-year	33.47	213.08	214.71	214.76	0.000876	1.21	36.2	33.43	0.3	
MAIN BRANCH	10.17	50-year	39.75	213.08	215.14	215.3	0.000735	1.25	48.67	38.4	0.28	
MAIN BRANCH	10.17	100-year	46.22	213.08	215.31	215.49	0.000847	1.37	53.86	40.29	0.3	
MAIN BRANCH	10.17	Regional	296.27	213.08	218.24	218.43	0.001164	2.79	289.06	126.83	0.39	
MAIN BRANCH	10.16	2-year	11.86	212.38	214.06	214.1	0.001176	1.02	17.47	24.11	0.32	
MAIN BRANCH	10.16	5-year	19.54	212.38	214.42	214.49	0.001684	1.16	27.49	30.51	0.3	
MAIN BRANCH	10.16	10-year	25.44	212.38	214.7	214.76	0.000895	1.22	35.69	33.3	0.3	

Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: Main Branch

#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnt (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chf
MAIN BRANCH	10.13	2-year	11.86	212.93	213.91		214.05	0.003875	1.66	8.09	10.58	0.54
MAIN BRANCH	10.13	5-year	19.54	212.93	214.58		214.65	0.003677	1.56	11.15	13.51	0.54
MAIN BRANCH	10.13	10-year	25.44	212.93	214.84		214.71	0.003306	2.11	15.41	14.06	0.54
MAIN BRANCH	10.13	25-year	33.47	212.93	214.93		215.07	0.0028105	2.21	20.49	16.07	0.51
MAIN BRANCH	10.13	50-year	39.75	212.93	214.91		215.2	0.003487	2.52	21.6	16.48	0.57
MAIN BRANCH	10.13	100-year	46.22	212.93	215.05		215.38	0.003734	2.73	23.91	18.23	0.6
MAIN BRANCH	10.13	Regional	296.27	212.93	217.33	217.33	218.28	0.005688	5.56	120.8	56	0.85
MAIN BRANCH	10.12	2-year	11.86	212.66	213.82		213.89	0.001616	1.21	11.45	12.98	0.36
MAIN BRANCH	10.12	5-year	19.54	212.66	214.18		214.29	0.001715	1.49	16.84	18.76	0.39
MAIN BRANCH	10.12	10-year	25.44	212.66	214.4		214.56	0.001638	1.61	22.62	25.54	0.38
MAIN BRANCH	10.12	25-year	33.47	212.66	214.62		214.83	0.001293	1.83	33.95	35.26	0.35
MAIN BRANCH	10.12	50-year	39.75	212.66	214.88		215.03	0.001589	1.85	36.4	37	0.4
MAIN BRANCH	10.12	100-year	46.22	212.66	215.05		215.2	0.001576	1.93	42.67	40.46	0.4
MAIN BRANCH	10.12	Regional	296.27	212.66	217.13		217.65	0.003431	4.33	187.26	122	0.65
MAIN BRANCH	9.31	2-year	11.86	212.43	213.78	213.09	213.82	0.000997	0.94	13.22	16.37	0.28
MAIN BRANCH	9.31	5-year	19.54	212.43	214.15	213.32	214.21	0.000978	1.13	20.73	25.29	0.3
MAIN BRANCH	9.31	10-year	25.44	212.43	214.42	213.46	214.49	0.000978	1.2	28.78	33.97	0.29
MAIN BRANCH	9.31	25-year	33.47	212.43	214.81	213.64	214.87	0.000671	1.2	43.65	42.06	0.26
MAIN BRANCH	9.31	50-year	39.75	212.43	214.87	213.78	214.95	0.000834	1.36	46.44	43.24	0.29
MAIN BRANCH	9.31	100-year	46.22	212.43	215.03	213.9	215.12	0.001027	1.44	52.65	50.09	0.3
MAIN BRANCH	9.31	Regional	296.27	212.43	217.36		217.45	0.000705	2.07	375.91	146.8	0.3
MAIN BRANCH	9.3	2-year	12.69	212.43	213.69	213.02	213.75	0.001059	1.04	12.15	15.51	0.3
MAIN BRANCH	9.3	5-year	20.86	212.43	214.68	213.33	214.2	0.000931	1.11	21.6	26.96	0.29
MAIN BRANCH	9.3	10-year	27.11	212.43	214.15	213.48	214.23	0.001463	1.35	36.5	68.68	0.36
MAIN BRANCH	9.3	25-year	35.6	212.43	214.41	213.67	214.5	0.001292	1.43	35.93	74.07	0.35
MAIN BRANCH	9.3	50-year	42.24	212.43	214.61	213.8	214.7	0.001165	1.46	43.31	80.69	0.34
MAIN BRANCH	9.3	100-year	49.04	212.43	214.99	213.93	214.88	0.001111	1.52	49.96	88.06	0.34
MAIN BRANCH	9.3	Regional	319.93	212.43	217.32		215.93	0.000709	2.07	401.45	159.16	0.3
MAIN BRANCH	9.295	Bridge										
MAIN BRANCH	9.29	2-year	12.69	212.43	213.58	213.1	213.67	0.001954	1.28	9.91	46.44	0.4
MAIN BRANCH	9.29	5-year	20.86	212.43	214.68	213.33	214.2	0.002297	1.63	12.75	80.15	0.45
MAIN BRANCH	9.29	10-year	27.11	212.43	214.15	213.48	214.23	0.001463	1.35	36.5	68.68	0.36
MAIN BRANCH	9.29	25-year	35.6	212.43	214.41	213.67	214.5	0.001292	1.43	35.93	74.07	0.35
MAIN BRANCH	9.29	50-year	42.24	212.43	214.61	213.8	214.7	0.001165	1.46	43.31	80.69	0.34
MAIN BRANCH	9.29	100-year	49.04	212.43	214.78	213.93	214.88	0.001111	1.52	49.96	88.06	0.34
MAIN BRANCH	9.29	Regional	319.93	212.43	217.25		215.85	0.000728	2.07	395.79	156.09	0.31
MAIN BRANCH	9.28	2-year	12.69	212.43	213.43	213.15	213.58	0.0004832	1.68	7.57	9.19	0.59
MAIN BRANCH	9.28	5-year	20.85	212.43	213.68	213.41	213.9	0.0005962	2.09	9.96	10.06	0.67
MAIN BRANCH	9.28	10-year	27.1	212.43	213.83	213.58	214.11	0.0006799	2.37	11.46	10.58	0.73
MAIN BRANCH	9.28	25-year	35.6	212.43	214.41	213.67	214.5	0.001294	2.35	12.12	12.62	0.65
MAIN BRANCH	9.28	50-year	42.24	212.43	214.61	213.8	214.51	0.01021	3.19	12.33	11.16	0.94
MAIN BRANCH	9.28	100-year	49.04	212.43	214.13	214.13	214.41	0.010197	3.3	16.02	30.44	0.92
MAIN BRANCH	9.28	Regional	319.93	212.43	217.24		215.64	0.000709	2.06	368.48	128.6	0.31
MAIN BRANCH	9.27	2-year	12.69	212.43	213.12	213.12	213.39	0.0015053	2.32	5.46	9.9	1
MAIN BRANCH	9.27	5-year	20.85	212.43	213.36	213.36	213.7	0.013836	2.62	7.97	11.3	0.99
MAIN BRANCH	9.27	10-year	27.1	212.43	213.15	213.5	213.9	0.013538	2.8	9.68	12.22	1
MAIN BRANCH	9.27	25-year	35.6	212.43	213.71	213.71	214.13	0.010347	2.87	13.88	27.4	0.91
MAIN BRANCH	9.27	50-year	42.24	212.43	213.87	213.87	214.27	0.008833	2.84	19.23	38.92	0.84
MAIN BRANCH	9.27	100-year	49.04	212.43	214.13	214.13	214.41	0.004899	2.48	30.97	49.87	0.85
MAIN BRANCH	9.27	Regional	319.93	212.43	217.16		215.62	0.001015	2.42	312.58	115.76	0.37
MAIN BRANCH	9.26	2-year	12.69	212.43	212.89	212.62	213.02	0.0004817	1.59	7.96	10.52	0.58
MAIN BRANCH	9.26	5-year	20.85	212.43	213.18	212.97	213.38	0.0004548	1.87	11.45	14.8	0.6
MAIN BRANCH	9.26	10-year	27.1	212.43	213.21	213.01	213.51	0.002571	1.71	15.89	24.67	0.47
MAIN BRANCH	9.26	25-year	35.6	212.43	213.34	213.21	213.66	0.003512	2.11	20.51	25.17	0.56
MAIN BRANCH	9.26	50-year	42.24	212.43	213.84	213.35	214.26	0.003012	2.13	25.24	30.59	0.53
MAIN BRANCH	9.26	100-year	49.04	212.43	214.04	213.49	214.27	0.002444	2.09	33.93	36.13	0.48
MAIN BRANCH	9.26	Regional	319.93	212.43	217.06		215.66	0.001241	2.8	276.15	109.6	0.4
MAIN BRANCH	9.25	2-year	12.69	212.41	212.85	212.55	212.96	0.0003912	1.46	8.68	11.33	0.53
MAIN BRANCH	9.25	5-year	20.85	212.41	213.14	212.77	213.36	0.003697	1.72	12.14	13.86	0.54
MAIN BRANCH	9.25	10-year	27.1	212.41	213.24	212.92	213.34	0.003437	1.87	14.54	16.48	0.54
MAIN BRANCH	9.25	25-year	35.6	212.41	213.01	213.19	213.81	0.003599	2.03	17.57	19.97	0.53
MAIN BRANCH	9.25	50-year	42.24	212.41	213.58	213.21	213.94	0.003031	2.15	17.72	20.62	0.53
MAIN BRANCH	9.25	100-year	49.04	212.41	213.96	213.32	214.21	0.002891	2.25	21.88	25.29	0.53
MAIN BRANCH	9.25	Regional	319.93	212.41	217.04		215.73	0.000998	2.54	314.2	127.48	0.37
MAIN BRANCH	9.245	Bridge										
MAIN BRANCH	9.24	2-year	12.69	212.4	212.35	211.92	212.44	0.00257	1.28	9.88	11.36	0.44
MAIN BRANCH	9.24	5-year	20.85	212.4	212.67	212.16	212.79	0.002529	1.53	13.64	18.01	0.46
MAIN BRANCH	9.24	10-year	27.1	212.4	212.81	212.31	212.91	0.002571	1.71	15.89	24.67	0.47
MAIN BRANCH	9.24	25-year	35.6	212.4	213.34	213.01	213.51	0.00304	1.83	18.44	30.48	0.5
MAIN BRANCH	9.24	50-year	42.24	212.4	213.84	213.22	213.61	0.002815	2.09	21.14	31.59	0.51
MAIN BRANCH	9.24	100-year	49.04	212.4	214.13	213.72	213.81	0.002037	2.25	21.81	33.67	0.53
MAIN BRANCH	9.24	Regional	319.93	212.4	215.01		214.94	0.005735	5.07	133.36	75.88	0.84
MAIN BRANCH	9.22	2-year	12.69	212.15	212.06	212.24	212.24	0.007255	1.86	6.81	9.8	0.71
MAIN BRANCH	9.22	5-year	20.85	212.15	212.38	212.59	212.79	0.000349	2.05	10.19	11.39	0.69
MAIN BRANCH	9.22	10-year	27.1	212.15	212.55	212.02	212.8	0.003801	2.22	12.21	16.09	0.7
MAIN BRANCH	9.22	25-year	35.6	212.15	212.73	213.04	213.16	0.006192	2.46	14.99	17.11	0.72
MAIN BRANCH	9.22	50-year	42.24	212.15	212.86	212.31	212.88	0.006137	2.62	17.36	19.92	0.73
MAIN BRANCH	9.22	100-year	49.04	212.15	212.98	212.15	213.36	0.006097	2.77	18.98	22.54	0.74
MAIN BRANCH	9.22	Regional	319.93	212.15	215.03		214.42	0.004814	4.43	162.7	94.74	0.76
MAIN BRANCH	9.21	2-year	12.69	212.54	211.83	211.91	212.26	0.002245	1.25	10.16	10.88	0.41
MAIN BRANCH	9.21	5-year	20.85	212.54	212.15	212.45	212.26	0.002409	1.5	14.02	13.96	0.44
MAIN BRANCH	9.21	10-year	27.1	212.54	212.81	212.22	212.4	0.002671	1.72	16.35	16.2	0.48
MAIN BRANCH	9.21	25-year	35.6	212.54	213.21	212.6	212.88	0.003118	2	18.51	18.51	0.48
MAIN BRANCH	9.21	50-year	42.24	212.54	213.17							

Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: Main Branch

#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnt (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chf
MAIN BRANCH	9.16	2-year	12.69	209.16	210.28	209.73	210.33	0.001693	1.05	12.08	13.73	0.36
MAIN BRANCH	9.16	5-year	20.85	209.16	210.43	209.96	210.42	0.002023	1.32	16.35	15.8	0.42
MAIN BRANCH	9.16	10-year	27.1	209.16	210.68	210.1	210.8	0.002621	1.48	18.34	17.4	0.46
MAIN BRANCH	9.16	25-year	35.6	209.16	210.84	210.28	210.99	0.003131	1.68	21.24	19.11	0.51
MAIN BRANCH	9.16	50-year	42.24	209.16	210.94	210.41	211.11	0.003568	1.83	23.1	20.12	0.54
MAIN BRANCH	9.16	100-year	49.04	209.16	211	210.53	211.21	0.004179	2.01	24.4	22.18	0.59
MAIN BRANCH	9.16	Regional	319.93	209.16	212.81	213.39	0.004514	3.89	172.83	162.15	0.72	
MAIN BRANCH	9.15	2-year	12.69	209.16	210.22	209.76	210.28	0.002267	1.08	11.77	16.3	0.4
MAIN BRANCH	9.15	5-year	20.85	209.16	210.47	209.97	210.71	0.002746	1.28	16.31	20.26	0.45
MAIN BRANCH	9.15	10-year	27.1	209.16	210.61	210.12	210.74	0.002886	1.4	19.41	26.27	0.47
MAIN BRANCH	9.15	25-year	35.6	209.16	210.77	210.29	210.99	0.003439	1.56	20.59	20	0.5
MAIN BRANCH	9.15	50-year	42.24	209.16	210.85	210.42	211	0.003495	1.69	24.94	30.54	0.53
MAIN BRANCH	9.15	100-year	49.04	209.16	210.9	210.51	211.08	0.004158	1.88	26.09	31.37	0.59
MAIN BRANCH	9.15	Regional	319.93	209.16	212.39	213.17	0.001619	2.41	307.12	217.57	0.44	
MAIN BRANCH	9.14	2-year	12.69	209.17	209.85	209.84	210.07	0.014428	2.07	6.13	17.13	0.96
MAIN BRANCH	9.14	5-year	20.85	209.17	210.17	210.05	210.35	0.008999	1.9	19.99	30.73	0.79
MAIN BRANCH	9.14	10-year	27.1	209.17	210.36	210.18	210.71	0.007175	1.81	14.98	39.08	0.72
MAIN BRANCH	9.14	25-year	35.6	209.17	210.58	210.33	210.72	0.005156	1.72	24.05	98.37	0.62
MAIN BRANCH	9.14	50-year	42.24	209.17	210.68	210.42	210.84	0.003881	1.63	35.61	104.98	0.54
MAIN BRANCH	9.14	100-year	49.04	209.17	210.77	210.53	210.97	0.003068	2.02	31.44	104.98	0.59
MAIN BRANCH	9.14	Regional	319.93	209.17	213.03	213.09	0.000568	1.48	465.93	195.58	0.26	
MAIN BRANCH	9.13	2-year	12.69	208.49	209.63	209.26	209.74	0.003394	1.42	8.93	24.64	0.5
MAIN BRANCH	9.13	5-year	20.85	208.49	209.62	209.51	210.07	0.002035	1.69	12.32	28.63	0.55
MAIN BRANCH	9.13	10-year	27.1	208.49	210.11	209.67	210.42	0.002075	1.54	14.72	26.72	0.55
MAIN BRANCH	9.13	25-year	35.6	208.49	210.27	209.86	210.49	0.004085	2.1	17.92	63.3	0.59
MAIN BRANCH	9.13	50-year	42.24	208.49	210.36	209.99	210.63	0.004507	2.31	20	70.47	0.63
MAIN BRANCH	9.13	100-year	49.04	208.49	210.56	210.12	210.86	0.002172	1.75	62.47	126.33	0.44
MAIN BRANCH	9.13	Regional	319.93	208.49	213.01	211.38	0.000532	1.62	487.12	181.93	0.26	
MAIN BRANCH	9.12	2-year	12.69	208.33	209.53	209.61	209.81	0.002289	1.26	11.79	17.84	0.42
MAIN BRANCH	9.12	5-year	20.85	208.33	209.83	209.93	210.33	0.002236	1.49	19.75	36.02	0.43
MAIN BRANCH	9.12	10-year	27.1	208.33	210.01	209.48	210.14	0.002369	1.69	27.69	84.47	0.45
MAIN BRANCH	9.12	25-year	35.6	208.33	210.15	209.86	210.45	0.003692	1.58	45.3	83.43	0.53
MAIN BRANCH	9.12	50-year	42.24	208.33	210.28	209.83	210.47	0.001512	1.55	61.88	26.36	0.38
MAIN BRANCH	9.12	100-year	49.04	208.33	210.52	210.12	210.86	0.001348	1.56	75.23	103.06	0.36
MAIN BRANCH	9.12	Regional	319.93	208.33	212.98	213.03	0.000793	2.07	397.55	156.28	0.32	
MAIN BRANCH	9.11	2-year	12.69	208.33	209.14	209.04	209.35	0.008913	2.05	6.34	11.38	0.79
MAIN BRANCH	9.11	5-year	20.85	208.33	209.34	209.28	209.67	0.009719	2.55	0.01	14.77	0.86
MAIN BRANCH	9.11	10-year	27.1	208.33	209.57	209.45	209.89	0.00727	2.57	12.88	20.76	0.78
MAIN BRANCH	9.11	25-year	35.6	208.33	209.93	209.66	210.18	0.004224	2.36	23.44	38.11	0.82
MAIN BRANCH	9.11	50-year	42.24	208.33	209.89	209.82	210.28	0.006615	2.9	22.06	36.31	0.77
MAIN BRANCH	9.11	100-year	49.04	208.33	209.98	209.98	210.41	0.008845	3.08	25.65	40.81	0.8
MAIN BRANCH	9.11	Regional	319.93	208.33	211.81	211.81	0.000473	5.79	112.89	53.42	1.01	
MAIN BRANCH	9.1	2-year	12.69	207.94	208.96	208.98	209.85	0.000753	0.67	24.41	51.82	0.24
MAIN BRANCH	9.1	5-year	20.85	207.94	209.34	209.39	209.97	0.002002	0.65	50.93	75.96	0.19
MAIN BRANCH	9.1	10-year	27.1	207.94	210.04	209.54	210.2	0.002417	0.67	71.38	16.17	0.17
MAIN BRANCH	9.1	25-year	35.6	207.94	210.01	209.62	210.2	0.001686	0.59	128.01	144.63	0.14
MAIN BRANCH	9.1	50-year	42.24	207.94	210.03	209.65	210.25	0.000205	0.68	130.66	145.99	0.16
MAIN BRANCH	9.1	100-year	49.04	207.94	210.04	209.66	210.26	0.00033	0.79	131.93	146.64	0.18
MAIN BRANCH	9.1	Regional	319.93	207.94	212.1	212.15	0.000414	1.45	505.75	190.52	0.23	
MAIN BRANCH	9.09	2-year	12.69	206.82	208.97	207.32	208.98	0.000027	0.21	115.68	188.56	0.05
MAIN BRANCH	9.09	5-year	20.85	206.82	209.38	207.48	209.38	0.000022	0.23	195.84	206.13	0.05
MAIN BRANCH	9.09	10-year	27.1	206.82	209.65	207.6	209.65	0.000018	0.21	349.24	382.65	0.04
MAIN BRANCH	9.09	25-year	35.6	206.82	210.02	207.73	210.02	0.000013	0.21	500.08	500.93	0.04
MAIN BRANCH	9.09	50-year	42.24	206.82	210.04	207.92	210.04	0.000008	0.21	504.98	437.31	0.05
MAIN BRANCH	9.09	100-year	49.04	206.82	210.05	207.91	210.05	0.000024	0.28	514.11	437.53	0.05
MAIN BRANCH	9.09	Regional	319.93	206.82	212.13	209.35	0.000005	0.58	1491.14	506.83	0.08	
MAIN BRANCH	9.075	Bridge										
MAIN BRANCH	9.07	2-year	12.69	207.75	208.75	208.42	208.84	0.002843	1.3	9.9	36.31	0.46
MAIN BRANCH	9.07	5-year	20.85	207.75	209.15	208.62	209.25	0.002005	1.43	15.09	100.55	0.42
MAIN BRANCH	9.07	10-year	27.1	207.75	209.38	208.76	209.5	0.001843	1.54	18.21	108.15	0.41
MAIN BRANCH	9.07	25-year	35.6	207.75	209.65	208.92	209.79	0.001803	1.71	21.69	164.93	0.42
MAIN BRANCH	9.07	50-year	42.24	207.75	209.81	209.03	209.98	0.001872	1.85	23.81	406.85	0.43
MAIN BRANCH	9.07	100-year	49.04	207.75	210.05	209.14	210.05	0.000023	0.22	514.15	437.52	0.05
MAIN BRANCH	9.07	Regional	319.93	207.75	212.12	209.9	0.000055	0.54	1490.96	506.81	0.08	



Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: West Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
WEST BRANCH	10.67	2-year	6.32	227.58	228.32		228.42	0.004947	1.52	5.88	14.67	0.57
WEST BRANCH	10.67	5-year	10.53	227.58	228.53		228.67	0.00488	1.79	9.52	19.19	0.59
WEST BRANCH	10.67	10-year	13.71	227.58	228.67		228.82	0.00475	1.93	12.3	22.02	0.59
WEST BRANCH	10.67	25-year	17.99	227.58	228.82		228.99	0.004586	2.08	16.02	25.32	0.59
WEST BRANCH	10.67	50-year	21.33	227.58	228.93		229.1	0.004617	2.17	18.81	27.53	0.6
WEST BRANCH	10.67	100-year	24.84	227.58	229.03		229.21	0.004572	2.29	21.61	30.54	0.61
WEST BRANCH	10.67	Regional	132.8	227.58	230.55		230.72	0.002666	2.93	125.01	88.28	0.54
WEST BRANCH	10.66	2-year	6.32	227.35	228.14		228.18	0.001866	1	9.13	20.36	0.36
WEST BRANCH	10.66	5-year	10.53	227.35	228.38		228.43	0.00179	1.17	14.48	24.42	0.37
WEST BRANCH	10.66	10-year	13.71	227.35	228.52		228.59	0.001773	1.27	18.2	26.89	0.37
WEST BRANCH	10.66	25-year	17.99	227.35	228.69		228.76	0.001782	1.39	22.86	29.68	0.38
WEST BRANCH	10.66	50-year	21.33	227.35	228.79		228.87	0.001826	1.48	26.11	31.49	0.39
WEST BRANCH	10.66	100-year	24.84	227.35	228.89		228.98	0.001886	1.57	29.27	33.15	0.4
WEST BRANCH	10.66	Regional	132.8	227.35	230.37		230.55	0.002367	2.75	125.26	87.83	0.5
WEST BRANCH	10.65	2-year	6.32	227.12	227.98		228.03	0.001997	1.08	8.35	17.52	0.37
WEST BRANCH	10.65	5-year	10.53	227.12	228.2		228.28	0.002169	1.32	13	23.52	0.4
WEST BRANCH	10.65	10-year	13.71	227.12	228.35		228.43	0.002188	1.44	16.65	27.38	0.41
WEST BRANCH	10.65	25-year	17.99	227.12	228.51		228.6	0.002195	1.57	21.49	31.8	0.42
WEST BRANCH	10.65	50-year	21.33	227.12	228.61		228.71	0.002262	1.67	24.85	34.54	0.44
WEST BRANCH	10.65	100-year	24.84	227.12	228.7		228.81	0.002354	1.77	28.1	36.99	0.45
WEST BRANCH	10.65	Regional	132.8	227.12	230.09		230.33	0.003304	3.18	108.81	78.81	0.59
WEST BRANCH	10.64	2-year	6.32	226.87	227.67		227.78	0.005784	1.78	7.05	17.08	0.65
WEST BRANCH	10.64	5-year	10.53	226.87	227.91		228.03	0.004997	1.98	11.7	22.06	0.63
WEST BRANCH	10.64	10-year	13.71	226.87	228.05		228.18	0.004686	2.13	15.11	26.74	0.63
WEST BRANCH	10.64	25-year	17.99	226.87	228.22		228.33	0.004761	2.2	20.29	35.71	0.64
WEST BRANCH	10.64	50-year	21.33	226.87	228.33		228.47	0.004421	2.35	24.78	41.95	0.63
WEST BRANCH	10.64	100-year	24.84	226.87	228.44		228.58	0.004448	2.39	29.61	47.76	0.61
WEST BRANCH	10.64	Regional	132.8	226.87	230		230.09	0.002011	2.65	147.47	87.02	0.48
WEST BRANCH	10.63	2-year	6.32	226.61	227.46		227.51	0.002025	1.08	8.19	15.89	0.37
WEST BRANCH	10.63	5-year	10.53	226.61	227.69		227.76	0.00224	1.33	12.18	19.29	0.41
WEST BRANCH	10.63	10-year	13.71	226.61	227.82		227.91	0.002368	1.48	14.93	21.33	0.43
WEST BRANCH	10.63	25-year	17.99	226.61	227.98		228.09	0.002474	1.65	18.53	23.72	0.45
WEST BRANCH	10.63	50-year	21.33	226.61	228.08		228.2	0.002658	1.79	21	26.41	0.47
WEST BRANCH	10.63	100-year	24.84	226.61	228.17		228.31	0.002846	1.92	23.51	29.12	0.49
WEST BRANCH	10.63	Regional	132.8	226.61	229.42	229.22		0.005266	3.87	81.48	58.19	0.74
WEST BRANCH	10.62	2-year	6.32	226.35	227.15	227	227.27	0.005486	1.66	6.01	15.65	0.59
WEST BRANCH	10.62	5-year	10.53	226.35	227.31	227.22	227.49	0.006823	2.1	8.94	19.94	0.68
WEST BRANCH	10.62	10-year	13.71	226.35	227.39	227.33	227.62	0.008165	2.42	10.58	21.99	0.76
WEST BRANCH	10.62	25-year	17.99	226.35	227.47	227.47	227.77	0.010229	2.84	12.32	23.97	0.86
WEST BRANCH	10.62	50-year	21.33	226.35	227.55	227.55	227.87	0.010312	2.99	14.42	26.15	0.87
WEST BRANCH	10.62	100-year	24.84	226.35	227.63	227.63	227.97	0.010288	3.12	16.65	28.28	0.88
WEST BRANCH	10.62	Regional	132.8	226.35	228.81	228.78	229.39	0.011621	5.11	61.85	44.34	1.04
WEST BRANCH	10.61	2-year	6.32	226.13	226.76	226.7	226.86	0.006851	1.59	7.45	31.05	0.64
WEST BRANCH	10.61	5-year	10.53	226.13	226.89	226.85	227.02	0.007474	1.9	12.03	41.07	0.7
WEST BRANCH	10.61	10-year	13.71	226.13	226.98		227.11	0.008688	1.98	16.28	48.56	0.68
WEST BRANCH	10.61	25-year	17.99	226.13	227.47		227.21	0.005498	1.93	22.42	50.69	0.62
WEST BRANCH	10.61	50-year	21.33	226.13	227.18		227.28	0.004981	1.94	26.48	51.23	0.6
WEST BRANCH	10.61	100-year	24.84	226.13	227.26		227.36	0.004561	1.95	30.59	51.76	0.58
WEST BRANCH	10.61	Regional	132.8	226.13	228.89		229	0.002323	2.46	123.49	62.59	0.47
WEST BRANCH	10.6	2-year	6.32	225.75	226.48		226.52	0.002831	1.14	13.69	44.35	0.43
WEST BRANCH	10.6	5-year	10.53	225.75	226.71		226.74	0.001948	1.13	25.34	60.95	0.37
WEST BRANCH	10.6	10-year	13.71	225.75	226.84		226.87	0.001611	1.12	34.38	71.21	0.34
WEST BRANCH	10.6	25-year	17.99	225.75	226.99		227.01	0.001404	1.14	45.69	82.22	0.33
WEST BRANCH	10.6	50-year	21.33	225.75	227.09		227.11	0.001257	1.14	53.77	84.7	0.31
WEST BRANCH	10.6	100-year	24.84	225.75	227.18		227.2	0.001159	1.14	61.59	86.5	0.3
WEST BRANCH	10.6	Regional	132.8	225.75	228.88		228.91	0.00067	1.46	234.41	113.8	0.26
WEST BRANCH	10.59	2-year	6.32	225.41	226.24		226.32	0.003301	1.34	6.85	16.48	0.47
WEST BRANCH	10.59	5-year	10.53	225.41	226.47		226.57	0.003294	1.58	11.39	22.72	0.49
WEST BRANCH	10.59	10-year	13.71	225.41	226.62		226.73	0.003199	1.7	14.93	26.61	0.49
WEST BRANCH	10.59	25-year	17.99	225.41	226.75		226.88	0.003427	1.88	18.74	30.22	0.52
WEST BRANCH	10.59	50-year	21.33	225.41	226.84		226.98	0.003611	2.02	21.46	32.57	0.54
WEST BRANCH	10.59	100-year	24.84	225.41	226.92		227.07	0.003802	2.15	24.15	34.72	0.56
WEST BRANCH	10.59	Regional	132.8	225.41	228.69		228.83	0.002163	2.72	131.5	80.66	0.48
WEST BRANCH	10.58	2-year	6.32	225	225.81	225.96	225.96	0.007148	1.94	5.75	13.76	0.69
WEST BRANCH	10.58	5-year	10.53	225	225.82	225.93	226.21	0.007538	2.31	8.97	17.89	0.73
WEST BRANCH	10.58	10-year	13.71	225	225.87	226.04	226.38	0.007231	2.48	12.11	24.16	0.73
WEST BRANCH	10.58	25-year	17.99	225	225.95	226.36	226.55	0.005989	2.5	17.58	32.3	0.68
WEST BRANCH	10.58	50-year	21.33	225	226.49	226.67	226.77	0.005338	2.51	21.98	37.59	0.66
WEST BRANCH	10.58	100-year	24.84	225	226.55	226.77	226.84	0.004803	2.5	26.75	42.58	0.63
WEST BRANCH	10.58	Regional	132.8	225	228.63		228.7	0.001405	2.33	150.47	68.76	0.39
WEST BRANCH	10.57	2-year	6.32	224.77	225.56		225.62	0.004685	1.41	6.86	18.79	0.51
WEST BRANCH	10.57	5-year	10.53	224.77	225.96		225.91	0.002447	1.47	15.28	23.01	0.45
WEST BRANCH	10.57	10-year	13.71	224.77	226.06		226.1	0.002611	1.55	19.62	26.72	0.44
WEST BRANCH	10.57	25-year	17.99	224.77	226.23		226.28	0.002665	1.7	25.86	36.24	0.45
WEST BRANCH	10.57	50-year	21.33	224.77	226.37		226.44	0.002439	1.75	31.15	42.67	0.44
WEST BRANCH	10.57	100-year	24.84	224.77	226.5		226.57	0.002294	1.79	36.97	48.79	0.44
WEST BRANCH	10.57	Regional	132.8	224.77	228.66		228.71	0.000832	1.83	200.45	92.85	0.3
WEST BRANCH	10.56	2-year	6.32	224.4	225.51		225.52	0.000484	0.67	16.86	19.79	0.2
WEST BRANCH	10.56	5-year	10.53	224.4	225.8		225.82	0.000572	0.86	23.03	22.2	0.23
WEST BRANCH	10.56	10-year	13.71	224.4	225.97		226	0.000631	0.97	27	23.62	0.25
WEST BRANCH	10.56	25-year	17.99	224.4	226.17		226.2	0.000707	1.11	31.7	25.21	0.27
WEST BRANCH	10.56	50-year	21.33	224.4	226.29		226.34	0.000764	1.21	34.69	26.26	0.26
WEST BRANCH	10.56	100-year	24.84	224.4	226.41		226.46	0.000621	1.31	38.22	27.25	0.29
WEST BRANCH	10.56	Regional	132.8	224.4	228.22		228.51	0.002628	3.55			

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Cold Creek  
**Reach:** West Branch

#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
WEST BRANCH	10.53	2-year	6.32	224.36	225.41		225.49	0.004671	1.69	7.88	15.71	0.53
WEST BRANCH	10.53	5-year	10.53	224.36	225.71		225.79	0.003748	1.79	13.26	19.93	0.49
WEST BRANCH	10.53	10-year	13.71	224.36	225.88		225.97	0.003485	1.88	16.98	22.38	0.48
WEST BRANCH	10.53	25-year	17.99	224.36	226.08		226.17	0.003279	1.97	21.61	24.64	0.48
WEST BRANCH	10.53	50-year	21.33	224.36	226.21		226.3	0.003183	2.04	24.88	25.68	0.48
WEST BRANCH	10.53	100-year	24.84	224.36	226.33		226.42	0.003135	2.11	28.06	26.85	0.48
WEST BRANCH	10.53	Regional	132.8	224.36	228.18		228.39	0.003976	3.7	94.47	47.51	0.6
WEST BRANCH	10.52	2-year	6.32	224	224.94		225.06	0.003755	1.54	5.26	8.6	0.5
WEST BRANCH	10.52	5-year	10.53	224	225.2		225.37	0.004241	1.92	7.99	13.06	0.56
WEST BRANCH	10.52	10-year	13.71	224	225.38		225.57	0.004114	2.07	10.63	16.62	0.56
WEST BRANCH	10.52	25-year	17.99	224	225.56		225.77	0.004194	2.27	13.94	20.21	0.58
WEST BRANCH	10.52	50-year	21.33	224	225.68		225.9	0.004299	2.41	16.39	22.5	0.59
WEST BRANCH	10.52	100-year	24.84	224	225.78		226.02	0.004427	2.54	18.84	24.59	0.61
WEST BRANCH	10.52	Regional	132.8	224	227.06	227	227.75	0.008861	5.16	61.51	40.95	0.94
WEST BRANCH	10.51	2-year	6.32	223.69	224.75		224.8	0.002308	1.26	8.91	13.24	0.39
WEST BRANCH	10.51	5-year	10.53	223.69	224.99		225.07	0.002797	1.59	12.28	14.92	0.45
WEST BRANCH	10.51	10-year	13.71	223.69	225.13		225.24	0.003486	1.9	14.65	19.69	0.51
WEST BRANCH	10.51	25-year	17.99	223.69	225.27		225.42	0.004196	2.22	17.81	24.92	0.56
WEST BRANCH	10.51	50-year	21.33	223.69	225.36		225.54	0.004662	2.42	20.24	28.31	0.6
WEST BRANCH	10.51	100-year	24.84	223.69	225.45		225.64	0.004945	2.59	22.87	31.55	0.62
WEST BRANCH	10.51	Regional	132.8	223.69	227		227.2	0.003966	3.54	113.08	82.45	0.62
WEST BRANCH	10.5	2-year	6.32	223.49	224.53		224.59	0.003734	1.5	9.93	22.13	0.47
WEST BRANCH	10.5	5-year	10.53	223.49	224.79		224.85	0.003082	1.59	16.72	28.8	0.44
WEST BRANCH	10.5	10-year	13.71	223.49	224.93		224.99	0.003064	1.69	20.91	32.23	0.45
WEST BRANCH	10.5	25-year	17.99	223.49	225.06		225.14	0.003024	1.8	25.01	34.54	0.45
WEST BRANCH	10.5	50-year	21.33	223.49	225.18		225.24	0.002997	1.86	29.36	35.24	0.46
WEST BRANCH	10.5	100-year	24.84	223.49	225.27		225.33	0.003021	1.93	32.61	35.88	0.46
WEST BRANCH	10.5	Regional	132.8	223.49	226.7		226.89	0.005253	3.78	95.77	59.18	0.67
WEST BRANCH	10.49	2-year	6.32	223.32	224.37		224.41	0.001448	1.04	9.53	20.35	0.32
WEST BRANCH	10.49	5-year	10.53	223.32	224.63		224.69	0.001474	1.22	16.12	28.68	0.34
WEST BRANCH	10.49	10-year	13.71	223.32	224.75		224.82	0.001703	1.39	19.57	32.19	0.37
WEST BRANCH	10.49	25-year	17.99	223.32	224.86		224.95	0.002023	1.59	23.52	35.79	0.41
WEST BRANCH	10.49	50-year	21.33	223.32	224.94		225.04	0.002254	1.74	26.34	38.16	0.44
WEST BRANCH	10.49	100-year	24.84	223.32	225.01		225.13	0.002489	1.88	29.05	40.13	0.46
WEST BRANCH	10.49	Regional	132.8	223.32	226.05		226.46	0.006335	4.12	78.39	55.3	0.8
WEST BRANCH	10.48	2-year	6.32	223.1	223.87	223.87	224.14	0.013166	2.44	3.59	8.48	0.89
WEST BRANCH	10.48	5-year	10.53	223.1	224.21	224.21	224.46	0.008388	2.48	8.51	25.33	0.75
WEST BRANCH	10.48	10-year	13.71	223.1	224.35	224.35	224.58	0.007422	2.53	12.86	35.72	0.72
WEST BRANCH	10.48	25-year	17.99	223.1	224.48	224.48	224.7	0.007189	2.66	17.95	44.94	0.72
WEST BRANCH	10.48	50-year	21.33	223.1	224.54	224.54	224.78	0.007537	2.81	21.26	29.83	0.54
WEST BRANCH	10.48	100-year	24.84	223.1	224.61	224.61	224.85	0.007662	2.92	24.51	54.56	0.76
WEST BRANCH	10.48	Regional	132.8	223.1	226.07		226.15	0.00238	2.55	153.6	107.46	0.47
WEST BRANCH	10.47	2-year	6.32	222.64	223.62	223.62	223.67	0.002198	1.2	8.81	15.43	0.38
WEST BRANCH	10.47	5-year	10.53	222.64	223.88	223.93	224.08	0.002516	1.48	12.73	19.22	0.43
WEST BRANCH	10.47	10-year	13.71	222.64	223.98	223.98	224.08	0.002778	1.67	15.23	19.8	0.46
WEST BRANCH	10.47	25-year	17.99	222.64	224.13	224.26	224.38	0.00362	1.97	18.45	25.47	0.51
WEST BRANCH	10.47	50-year	21.33	222.64	224.23	224.38	224.49	0.003636	2.14	21.26	29.83	0.54
WEST BRANCH	10.47	100-year	24.84	222.64	224.33	224.49	224.61	0.003804	2.27	24.38	34.04	0.56
WEST BRANCH	10.47	Regional	132.8	222.64	225.82		226.01	0.00305	3.24	113.19	74.06	0.58
WEST BRANCH	10.46	2-year	6.32	222.32	223.26	223.11	223.41	0.005977	1.87	5.67	15.44	0.62
WEST BRANCH	10.46	5-year	10.53	222.32	223.53		223.67	0.004848	2	11.12	24.46	0.58
WEST BRANCH	10.46	10-year	13.71	222.32	223.7		223.83	0.004198	2.03	15.66	29.96	0.55
WEST BRANCH	10.46	25-year	17.99	222.32	223.88		224.04	0.004771	2.08	21.73	36.03	0.53
WEST BRANCH	10.46	50-year	21.33	222.32	224.2		224.12	0.003413	2.09	26.36	40.06	0.51
WEST BRANCH	10.46	100-year	24.84	222.32	224.12		224.23	0.003288	2.13	31.19	44.84	0.51
WEST BRANCH	10.46	Regional	132.8	222.32	225.72		225.81	0.00202	2.57	151.95	97.82	0.45
WEST BRANCH	10.45	2-year	6.32	222	222.94		223.04	0.003606	1.5	5.78	10.38	0.49
WEST BRANCH	10.45	5-year	10.53	222	223.15		223.31	0.004689	1.95	8.31	14.63	0.58
WEST BRANCH	10.45	10-year	13.71	222	223.26		223.47	0.005308	2.22	10.23	17.61	0.63
WEST BRANCH	10.45	25-year	17.99	222	223.39	223.23	223.65	0.006007	2.53	12.65	20.77	0.68
WEST BRANCH	10.45	50-year	21.33	222	223.48	223.36	223.77	0.006489	2.72	14.58	22.97	0.71
WEST BRANCH	10.45	100-year	24.84	222	223.56	223.47	223.88	0.006832	2.9	16.61	25.08	0.74
WEST BRANCH	10.45	Regional	132.8	222	225.27		225.6	0.004649	3.91	94.18	66.72	0.69
WEST BRANCH	10.44	2-year	6.32	222.46	222.52		222.53	0.004247	0.18	11.58	21.47	0.33
WEST BRANCH	10.44	5-year	10.53	222.46	222.79		222.8	0.003042	0.65	18.38	29.01	0.4
WEST BRANCH	10.44	10-year	13.71	222.46	222.94		222.96	0.002757	0.83	23.03	33.19	0.41
WEST BRANCH	10.44	25-year	17.99	222.46	223.1		223.13	0.002541	1	28.93	36.96	0.42
WEST BRANCH	10.44	50-year	21.33	222.46	223.22		223.24	0.002444	1.11	33.22	39.1	0.42
WEST BRANCH	10.44	100-year	24.84	222.46	223.32		223.35	0.002364	1.2	37.58	41.16	0.43
WEST BRANCH	10.44	Regional	132.8	222.46	225.19		225.26	0.001704	2.27	142.53	68.72	0.44
WEST BRANCH	10.43	2-year	6.32	221	221.15		222.15	0.005834	1.78	4.19	6.98	0.62
WEST BRANCH	10.43	5-year	10.53	220.83	222.04	222.07	221.15	0.002769	1.58	8.87	11.95	0.46
WEST BRANCH	10.43	10-year	13.71	220.83	222.21	222.25	222.26	0.003003	2.25	10.02	19.32	0.63
WEST BRANCH	10.43	25-year	17.99	220.83	222.42	222.45	222.86	0.004793	2.35	14.35	24.82	0.61
WEST BRANCH	10.43	50-year	21.33	220.83	222.77		222.99	0.004426	2.39	17.99	28.64	0.6
WEST BRANCH	10.43	100-year	24.84	220.83	222.91		223.12	0.003999	2.4	22.23	32.52	0.58
WEST BRANCH	10.43	Regional	132.8	220.83	224.99		225.13	0.001847	2.74	128.99	65.86	0.45
WEST BRANCH	10.42	2-year	6.32	220.83	221.75		221.83	0.002635	1.29	5.94	9.29	0.43
WEST BRANCH	10.42	5-year	10.53	220.83	222.04		222.15	0.002769	1.58	8.87	11.95	0.46
WEST BRANCH	10.42	10-year	13.71	220.83	222.21		222.35	0.002864	1.76	11.32	16.51	0.48
WEST BRANCH	10.42	25-year	17.99	220.83	222.42		222.57	0.002769	1.9	15.39	22.1	0.48
WEST BRANCH	10.42	50-year	21.33	220.83	222.57		222.73	0.002633	1.97	19.02	26.09	0.48
WEST BRANCH	10.42	100-year	24.84	220.83	222.73		222.89	0.002424	1.99	23.54	30.34	0.46
WEST BRANCH	10.42	Regional	132.8	220.83	224.85		225.02	0.001709	2.77	131.63	78.1	0.44
WEST BRANCH	10.41	2-year	6.32	220.83	221.7							

Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: West Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
WEST BRANCH	10.4	2-year	6.32	220.83	221.6		221.69	0.004008	1.32	4.8	6.21	0.48
WEST BRANCH	10.4	5-year	10.53	220.83	221.84		221.98	0.004949	1.68	6.27	6.22	0.53
WEST BRANCH	10.4	10-year	13.71	220.83	221.97		222.16	0.005816	1.93	7.09	6.22	0.58
WEST BRANCH	10.4	25-year	17.99	220.83	222.1		222.36	0.007094	2.28	7.97	7.98	0.65
WEST BRANCH	10.4	50-year	21.33	220.83	222.18		222.5	0.008153	2.54	8.64	9.36	0.7
WEST BRANCH	10.4	100-year	24.84	220.83	222.27	222	222.65	0.008786	2.76	9.57	10.99	0.74
WEST BRANCH	10.4	Regional	132.8	220.83	224.02	224.02	224.78	0.009418	4.6	56.1	42.14	0.82
WEST BRANCH	10.39	2-year	6.32	220.59	221.33		221.58	0.01347	2.4	3.92	9.43	0.89
WEST BRANCH	10.39	5-year	10.53	220.59	221.55		221.85	0.012823	2.78	6.26	11.75	0.91
WEST BRANCH	10.39	10-year	13.71	220.59	221.68		222.02	0.01258	3.01	7.93	13.16	0.92
WEST BRANCH	10.39	25-year	17.99	220.59	221.84		222.22	0.012371	3.26	10.09	14.78	0.93
WEST BRANCH	10.39	50-year	21.33	220.59	221.95		222.35	0.011882	3.39	11.87	16	0.93
WEST BRANCH	10.39	100-year	24.84	220.59	222		222.48	0.013986	3.76	12.61	16.48	1.01
WEST BRANCH	10.39	Regional	132.8	220.59	223.64	223.64	224.27	0.010322	5.41	68.22	55.41	0.99
WEST BRANCH	10.38	2-year	6.32	221.7	220.84		220.84	0.001655		17.67	29.2	0
WEST BRANCH	10.38	5-year	10.53	221.7	221.07		221.08	0.001765		25.22	34.78	0
WEST BRANCH	10.38	10-year	13.71	221.7	221.21		221.22	0.001824		30.39	38.32	0
WEST BRANCH	10.38	25-year	17.99	221.7	221.38		221.39	0.001866		36.97	42.4	0
WEST BRANCH	10.38	50-year	21.33	221.7	221.49		221.5	0.00188		41.9	45.21	0
WEST BRANCH	10.38	100-year	24.84	221.7	221.59		221.61	0.001894		46.85	47.87	0
WEST BRANCH	10.38	Regional	132.8	221.7	223.15		223.19	0.002003	1.49	154.98	90.15	0.43
WEST BRANCH	10.37	2-year	6.32	219.74	220.61		220.64	0.001685	1	11.57	23.92	0.34
WEST BRANCH	10.37	5-year	10.53	219.74	220.81		220.86	0.001869	1.21	17.06	28.72	0.37
WEST BRANCH	10.37	10-year	13.71	219.74	220.94		221	0.001973	1.34	20.83	31.6	0.39
WEST BRANCH	10.37	25-year	17.99	219.74	221.06		221.15	0.002096	1.49	25.63	35.07	0.41
WEST BRANCH	10.37	50-year	21.33	219.74	221.19		221.26	0.002141	1.58	29.39	37.66	0.42
WEST BRANCH	10.37	100-year	24.84	219.74	221.29		221.36	0.002176	1.67	33.22	40.13	0.43
WEST BRANCH	10.37	Regional	132.8	219.74	222.7		222.89	0.003146	3.09	115.86	78.86	0.57
WEST BRANCH	10.36	2-year	6.32	219.47	220.43		220.49	0.003092	1.47	10.43	24.3	0.48
WEST BRANCH	10.36	5-year	10.53	219.47	220.64		220.7	0.003056	1.66	16.06	29.72	0.49
WEST BRANCH	10.36	10-year	13.71	219.47	220.77		220.83	0.003036	1.77	19.97	32.96	0.5
WEST BRANCH	10.36	25-year	17.99	219.47	220.91		220.98	0.003078	1.88	25.03	36.74	0.5
WEST BRANCH	10.36	50-year	21.33	219.47	221.02		221.09	0.003706	1.95	29.02	39.73	0.5
WEST BRANCH	10.36	100-year	24.84	219.47	221.12		221.19	0.003695	2.03	33.11	43.85	0.51
WEST BRANCH	10.36	Regional	132.8	219.47	222.59		222.67	0.002712	2.67	141.37	98.17	0.48
WEST BRANCH	10.35	2-year	6.32	219.09	219.74		219.96	0.012512	2.19	4.02	12.06	0.87
WEST BRANCH	10.35	5-year	10.53	219.09	219.95		220.21	0.011113	2.48	7.01	16.82	0.85
WEST BRANCH	10.35	10-year	13.71	219.09	220.07		220.34	0.010709	2.65	9.16	19.21	0.86
WEST BRANCH	10.35	25-year	17.99	219.09	220.2		220.5	0.010579	2.86	11.79	21.54	0.87
WEST BRANCH	10.35	50-year	21.33	219.09	220.28		220.6	0.010813	3.04	13.6	22.99	0.89
WEST BRANCH	10.35	100-year	24.84	219.09	220.36		220.71	0.010867	3.18	15.52	24.45	0.9
WEST BRANCH	10.35	Regional	132.8	219.09	221.76		222.28	0.009374	4.86	77.94	76.53	0.95
WEST BRANCH	10.34	2-year	6.32	218.61	219.29		218.33	0.003511	1.21	11.72	33.01	0.47
WEST BRANCH	10.34	5-year	10.53	218.61	219.5		219.54	0.00254	1.24	19.24	38.08	0.42
WEST BRANCH	10.34	10-year	13.71	218.61	219.65		219.69	0.002125	1.25	24.81	38.18	0.39
WEST BRANCH	10.34	25-year	17.99	218.61	219.83		219.87	0.001815	1.3	31.67	40.6	0.37
WEST BRANCH	10.34	50-year	21.33	218.61	219.94		219.98	0.001783	1.35	36.25	42.15	0.37
WEST BRANCH	10.34	100-year	24.84	218.61	220.04		220.09	0.001754	1.41	40.76	44.06	0.38
WEST BRANCH	10.34	Regional	132.8	218.61	221.71		221.8	0.001754	2.35	147.63	84.09	0.43
WEST BRANCH	10.33	2-year	6.32	218.1	218.76		218.93	0.008575	1.85	3.92	8.57	0.73
WEST BRANCH	10.33	5-year	10.53	218.1	218.96		219.2	0.009071	2.28	5.84	10.57	0.78
WEST BRANCH	10.33	10-year	13.71	218.1	219.08		219.38	0.009495	2.54	7.25	13.35	0.82
WEST BRANCH	10.33	25-year	17.99	218.1	219.22		219.57	0.009861	2.81	9.48	17.02	0.85
WEST BRANCH	10.33	50-year	21.33	218.1	219.34		219.32	0.009676	2.91	11.7	21.09	0.83
WEST BRANCH	10.33	100-year	24.84	218.1	219.46		219.82	0.008157	2.94	14.55	24.82	0.8
WEST BRANCH	10.33	Regional	132.8	218.1	221.48		221.66	0.00235	2.89	129.97	89.69	0.5
WEST BRANCH	10.32	2-year	6.32	217.63	218.56		218.61	0.002166	1.16	10.13	20.1	0.38
WEST BRANCH	10.32	5-year	10.53	217.63	218.83		218.88	0.002025	1.32	16.08	24.86	0.39
WEST BRANCH	10.32	10-year	13.71	217.63	218.99		219.05	0.001913	1.4	20.55	27.91	0.38
WEST BRANCH	10.32	25-year	17.99	217.63	219.19		219.25	0.001748	1.47	26.23	29.54	0.37
WEST BRANCH	10.32	50-year	21.33	217.63	219.33		219.39	0.001668	1.51	30.37	30.64	0.37
WEST BRANCH	10.32	100-year	24.84	217.63	219.46		219.53	0.001608	1.56	34.52	31.71	0.37
WEST BRANCH	10.32	Regional	132.8	217.63	221.36		221.52	0.00203	2.87	124.83	68.66	0.47
WEST BRANCH	10.31	2-year	6.32	217.19	217.95		218.23	0.013602	2.46	3.55	8.44	0.9
WEST BRANCH	10.31	5-year	10.53	217.19	218.2		218.52	0.011943	2.79	5.89	10.21	0.88
WEST BRANCH	10.31	10-year	13.71	217.19	218.34		218.7	0.011994	3.04	7.34	11.03	0.91
WEST BRANCH	10.31	25-year	17.99	217.19	218.5		218.92	0.012141	3.33	9.15	11.97	0.93
WEST BRANCH	10.31	50-year	21.33	217.19	218.61		219.06	0.011997	3.5	10.58	12.66	0.94
WEST BRANCH	10.31	100-year	24.84	217.19	218.72		219.21	0.012094	3.69	11.94	13.3	0.95
WEST BRANCH	10.31	Regional	132.8	217.19	220.52		221.17	0.009012	5.36	66.89	47.24	0.94
WEST BRANCH	10.29	2-year	6.32	216.59	217.57		217.74	0.002463	1.19	10.61	23.25	0.42
WEST BRANCH	10.29	5-year	10.53	216.59	217.78		217.8	0.001207	0.99	23.7	31.61	0.29
WEST BRANCH	10.29	10-year	13.71	216.59	217.91		217.93	0.001321	1.1	27.69	32.97	0.31
WEST BRANCH	10.29	25-year	17.99	216.59	218.05		218.08	0.001482	1.25	32.4	34.91	0.33
WEST BRANCH	10.29	50-year	21.33	216.59	218.14		218.18	0.001622	1.36	35.77	36.79	0.35
WEST BRANCH	10.29	100-year	24.84	216.59	218.22		218.27	0.00177	1.48	38.98	38.5	0.37
WEST BRANCH	10.29	Regional	132.8	216.59	220.07		220.15	0.001557	2.29	166.14	112	0.39

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Cold Creek  
**Reach:** East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	9.64	2-year	26.12	231	232.5		232.58	0.001765	1.32	19.91	17.43	0.38
Bolton Reach	9.64	5-year	43.32	231	232.89		233.03	0.001971	1.64	27.51	20.88	0.42
Bolton Reach	9.64	10-year	56.5	231	233.14		233.31	0.002084	1.83	32.99	23.06	0.44
Bolton Reach	9.64	25-year	74.39	231	233.43		233.64	0.002214	2.04	40.03	25.58	0.46
Bolton Reach	9.64	50-year	88.9	231	233.64		233.87	0.002257	2.2	46.37	37.41	0.47
Bolton Reach	9.64	100-year	104.04	231	233.83		234.1	0.002263	2.33	54.93	49.77	0.48
Bolton Reach	9.64	Regional	479.46	231	236.94		237.14	0.000946	2.61	419.47	148.49	0.35
Bolton Reach	9.635	2-year	26.12	230.5	232		232.25	0.008308	2.22	11.75	14.37	0.78
Bolton Reach	9.635	5-year	43.32	230.5	232.37		232.69	0.006812	2.51	17.84	18.31	0.75
Bolton Reach	9.635	10-year	56.5	230.5	232.6		232.96	0.006462	2.69	22.23	20.28	0.75
Bolton Reach	9.635	25-year	74.39	230.5	232.86		233.29	0.006237	2.92	27.84	22.46	0.75
Bolton Reach	9.635	50-year	88.9	230.5	233.05		233.52	0.00618	3.09	32.13	23.99	0.76
Bolton Reach	9.635	100-year	104.04	230.5	233.22		233.74	0.006173	3.25	36.4	25.43	0.77
Bolton Reach	9.635	Regional	479.46	230.5	235.49	235.49	236.8	0.006561	5.51	135.03	68.68	0.89
Bolton Reach	9.63	2-year	26.12	230.4	231.9		232	0.002215	1.42	18.34	15.23	0.41
Bolton Reach	9.63	5-year	43.32	230.4	232.26		232.43	0.002623	1.79	24.49	18.52	0.47
Bolton Reach	9.63	10-year	56.5	230.4	232.49		232.69	0.002866	2.02	28.86	20.86	0.5
Bolton Reach	9.63	25-year	74.39	230.4	232.74		233.01	0.003155	2.29	34.52	23.55	0.53
Bolton Reach	9.63	50-year	88.9	230.4	232.92		233.23	0.003371	2.49	38.86	25.42	0.56
Bolton Reach	9.63	100-year	104.04	230.4	233.08		233.44	0.00368	2.67	43.22	27.17	0.58
Bolton Reach	9.63	Regional	479.46	230.4	235.43	235.09	236.28	0.004045	4.62	191.07	97.24	0.69
Bolton Reach	9.62	2-year	26.12	230.3	231.48		231.6	0.002767	1.63	22.31	30.47	0.48
Bolton Reach	9.62	5-year	43.32	230.3	231.81		231.98	0.002959	1.98	33.47	37.37	0.51
Bolton Reach	9.62	10-year	56.5	230.3	232.01		232.21	0.003101	2.2	41.27	41.52	0.54
Bolton Reach	9.62	25-year	74.39	230.3	232.23		232.47	0.003268	2.45	51.2	46.27	0.56
Bolton Reach	9.62	50-year	88.9	230.3	232.39		232.66	0.003405	2.64	58.71	49.55	0.58
Bolton Reach	9.62	100-year	104.04	230.3	232.54		232.84	0.003523	2.81	66.29	52.66	0.6
Bolton Reach	9.62	Regional	479.46	230.3	235.1		235.57	0.002801	4.16	269.52	106.29	0.61
Bolton Reach	9.61	2-year	26.12	230	231.23		231.3	0.001417	1.2	32.19	44.42	0.35
Bolton Reach	9.61	5-year	43.32	230	231.55		231.64	0.00158	1.48	47.84	54.42	0.38
Bolton Reach	9.61	10-year	56.5	230	231.74		231.85	0.001685	1.65	58.73	60.41	0.4
Bolton Reach	9.61	25-year	74.39	230	231.96		232.09	0.001792	1.84	72.76	67.34	0.42
Bolton Reach	9.61	50-year	88.9	230	232.12		232.26	0.001828	1.96	83.76	70.45	0.43
Bolton Reach	9.61	100-year	104.04	230	232.27		232.42	0.001845	2.07	94.8	72.79	0.44
Bolton Reach	9.61	Regional	479.46	230	234.97		235.21	0.001418	3.05	346.14	113.73	0.44
Bolton Reach	9.6	2-year	26.12	229.7	230.82		230.94	0.003637	1.78	26.05	46.38	0.54
Bolton Reach	9.6	5-year	43.32	229.7	231.1		231.26	0.003733	2.1	41.01	59.02	0.57
Bolton Reach	9.6	10-year	56.5	229.7	231.3		231.46	0.00355	2.24	53.31	67.66	0.57
Bolton Reach	9.6	25-year	74.39	229.7	231.54		231.71	0.003182	2.33	71.44	78.68	0.55
Bolton Reach	9.6	50-year	88.9	229.7	231.73		231.9	0.002882	2.37	87.18	87.13	0.53
Bolton Reach	9.6	100-year	104.04	229.7	231.92		232.08	0.002619	2.39	104.12	95.39	0.51
Bolton Reach	9.6	Regional	479.46	229.7	234.89		235	0.000904	2.48	490.17	150.63	0.35
Bolton Reach	9.59	2-year	26.12	229.3	230.45		230.51	0.001866	1.31	40.54	75.41	0.39
Bolton Reach	9.59	5-year	43.32	229.3	230.85		230.9	0.00127	1.32	76.72	105.41	0.34
Bolton Reach	9.59	10-year	56.5	229.3	231.11		231.15	0.000976	1.28	106.83	118.42	0.3
Bolton Reach	9.59	25-year	74.39	229.3	231.41		231.45	0.000761	1.26	143.35	122.34	0.28
Bolton Reach	9.59	50-year	88.9	229.3	231.62		231.66	0.000668	1.27	169.47	125.07	0.27
Bolton Reach	9.59	100-year	104.04	229.3	231.82		231.86	0.000663	1.29	194.55	127.64	0.26
Bolton Reach	9.59	Regional	479.46	229.3	234.83		234.89	0.000445	1.82	636.52	166.5	0.25
Bolton Reach	9.58	2-year	26.12	229	230.3		230.34	0.000752	0.91	41.32	52.35	0.26
Bolton Reach	9.58	5-year	43.32	229	230.72		230.77	0.000688	1.05	66.5	66.5	0.26
Bolton Reach	9.58	10-year	56.5	229	231		231.05	0.000648	1.13	85.97	75.65	0.26
Bolton Reach	9.58	25-year	74.39	229	231.3		231.36	0.000627	1.22	110.67	85.86	0.26
Bolton Reach	9.58	50-year	88.9	229	231.51		231.57	0.000623	1.29	129.52	92.91	0.26
Bolton Reach	9.58	100-year	104.04	229	231.71		231.78	0.000622	1.36	148.53	99.5	0.26
Bolton Reach	9.58	Regional	479.46	229	234.74		234.83	0.000463	1.93	596.81	184.87	0.26
Bolton Reach	9.57	2-year	26.12	228.7	230.06		230.14	0.001641	1.25	23.39	25.03	0.37
Bolton Reach	9.57	5-year	43.32	228.7	230.49		230.59	0.001515	1.48	36.9	38.85	0.37
Bolton Reach	9.57	10-year	56.5	228.7	230.76		230.88	0.001414	1.59	48.98	47.94	0.37
Bolton Reach	9.57	25-year	74.39	228.7	231.07		231.2	0.001362	1.72	65.01	57.04	0.37
Bolton Reach	9.57	50-year	88.9	228.7	231.27		231.41	0.00135	1.82	77.63	64.58	0.38
Bolton Reach	9.57	100-year	104.04	228.7	231.47		231.62	0.001342	1.91	90.72	70.89	0.38
Bolton Reach	9.57	Regional	479.46	228.7	234.57		234.73	0.000782	2.47	440.35	137.57	0.33
Bolton Reach	9.56	2-year	26.12	228.3	229.63		229.78	0.002868	1.78	18.86	20.71	0.49
Bolton Reach	9.56	5-year	43.32	228.3	230.03		230.24	0.003063	2.19	27.79	25.47	0.53
Bolton Reach	9.56	10-year	56.5	228.3	230.27		230.54	0.003232	2.46	35.17	34.77	0.56
Bolton Reach	9.56	25-year	74.39	228.3	230.55		230.86	0.003274	2.7	46.54	45.51	0.57
Bolton Reach	9.56	50-year	88.9	228.3	230.75		231.08	0.003247	2.85	56.47	53.15	0.58
Bolton Reach	9.56	100-year	104.04	228.3	230.96		231.3	0.003116	2.94	68.16	60.92	0.58
Bolton Reach	9.56	Regional	479.46	228.3	234.37		234.6	0.001223	3.2	391.25	128.06	0.41
Bolton Reach	9.55	2-year	26.12	228	229.22		229.34	0.002468	1.57	19.3	20.55	0.45
Bolton Reach	9.55	5-year	43.32	228	229.58		229.76	0.002689	1.95	27.32	23.54	0.5
Bolton Reach	9.55	10-year	56.5	228	229.8		230.03	0.002849	2.19	32.78	25.37	0.52
Bolton Reach	9.55	25-year	74.39	228	230.06		230.34	0.003071	2.48	39.42	27.25	0.55
Bolton Reach	9.55	50-year	88.9	228	230.23		230.56	0.003243	2.7	44.26	28.09	0.58
Bolton Reach	9.55	100-year	104.04	228	230.39		230.77	0.003426	2.9	48.88	28.87	0.6
Bolton Reach	9.55	Regional	479.46	228	232.4	232.4	234.08	0.007569	6.47	116.33	38.5	0.99
Bolton Reach	9.54	2-year	26.12	227.7	228.78		228.9	0.003026	1.61	20.12	26.86	0.49
Bolton Reach	9.54	5-year	43.32	227.7	229.14		229.31	0.002921	1.91	31.04	35.31	0.51
Bolton Reach	9.54	10-year	56.5	227.7	229.36		229.56	0.002862	2.09	39.78	43.01	0.52
Bolton Reach	9.54	25-year	74.39	227.7	229.63		229.85	0.0028	2.28	52.28	52.08	0.52
Bolton Reach	9.54	50-year	88.9	227.7	229.82		230.05	0.002724	2.39	62.79	58.63	0.52
Bolton Reach	9.54	100-year	104.04	227.7	230		230.24	0.002635	2.48	74.15	64.97	0.52
Bolton Reach	9.54	Regional	479.46	227.7	232.49		232.9	0.002261	3.76	268.98	91.19	0.55
Bolton Reach	9.53	2-year	26.12	227.3	228.57		228.61	0.001038	1.05	35.58	46.14	0.3
Bolton Reach	9.53	5-year	43.32	227.3</td								

Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	9.52	2-year	26.12	227	228.39		228.44	0.001057	1.12	39.64	52.56	0.3
Bolton Reach	9.52	5-year	43.32	227	228.79		228.85	0.001002	1.3	63.74	67.17	0.31
Bolton Reach	9.52	10-year	56.5	227	229.04		229.11	0.000976	1.39	81.52	76.17	0.31
Bolton Reach	9.52	25-year	74.39	227	229.33		229.4	0.000953	1.5	104.75	86.54	0.31
Bolton Reach	9.52	50-year	88.9	227	229.53		229.61	0.000939	1.58	123.05	93.9	0.32
Bolton Reach	9.52	100-year	104.04	227	229.72		229.81	0.000922	1.64	142.03	100.96	0.32
Bolton Reach	9.52	Regional	479.46	227	232.27		232.4	0.000904	2.52	455.29	139.59	0.35
Bolton Reach	9.51	2-year	26.12	226.7	228.19		228.25	0.001347	1.31	35.33	44.57	0.34
Bolton Reach	9.51	5-year	43.32	226.7	228.59		228.67	0.001329	1.53	55.75	56.36	0.36
Bolton Reach	9.51	10-year	56.5	226.7	228.84		228.93	0.001317	1.66	70.67	63.62	0.36
Bolton Reach	9.51	25-year	74.39	226.7	229.13		229.23	0.001294	1.79	90.11	71.09	0.37
Bolton Reach	9.51	50-year	88.9	226.7	229.33		229.44	0.001274	1.87	105.13	75.57	0.37
Bolton Reach	9.51	100-year	104.04	226.7	229.53		229.64	0.001254	1.95	120.42	79.88	0.37
Bolton Reach	9.51	Regional	479.46	226.7	232.01		232.22	0.001475	3.21	373.16	121.75	0.44
Bolton Reach	9.49	2-year	26.12	226.3	227.71		227.8	0.001807	1.47	28.92	36.51	0.4
Bolton Reach	9.49	5-year	43.32	226.3	228.13		228.24	0.001717	1.71	46.27	46.46	0.4
Bolton Reach	9.49	10-year	56.5	226.3	228.39		228.51	0.001688	1.84	58.86	52.51	0.41
Bolton Reach	9.49	25-year	74.39	226.3	228.68		228.82	0.001662	2	75.31	59.5	0.41
Bolton Reach	9.49	50-year	88.9	226.3	228.89		229.03	0.001644	2.1	88.3	64.49	0.42
Bolton Reach	9.49	100-year	104.04	226.3	229.09		229.24	0.001613	2.19	101.95	69.34	0.42
Bolton Reach	9.49	Regional	479.46	226.3	231.43		231.75	0.002122	3.77	328.73	124.89	0.53
Bolton Reach	9.48	2-year	26.12	226	227.48		227.54	0.001118	1.2	34.47	40.53	0.31
Bolton Reach	9.48	5-year	43.32	226	227.92		227.99	0.001069	1.4	54.72	51.25	0.32
Bolton Reach	9.48	10-year	56.5	226	228.18		228.26	0.001072	1.52	68.93	57.58	0.33
Bolton Reach	9.48	25-year	74.39	226	228.48		228.57	0.001079	1.66	87.28	64.86	0.34
Bolton Reach	9.48	50-year	88.9	226	228.69		228.8	0.001082	1.76	101.68	70.04	0.34
Bolton Reach	9.48	100-year	104.04	226	228.9		229.01	0.001072	1.84	116.91	75.14	0.35
Bolton Reach	9.48	Regional	479.46	226	231.17		231.45	0.001648	3.36	343.96	119.95	0.47
Bolton Reach	9.47	2-year	26.12	225.7	227.15		227.32	0.003187	1.97	19.41	24.85	0.52
Bolton Reach	9.47	5-year	43.32	225.7	227.56		227.78	0.003231	2.34	32.55	39.68	0.55
Bolton Reach	9.47	10-year	56.5	225.7	227.82		228.06	0.003046	2.48	44.32	49.31	0.54
Bolton Reach	9.47	25-year	74.39	225.7	228.15		228.38	0.002705	2.57	62.3	61.16	0.52
Bolton Reach	9.47	50-year	88.9	225.7	228.39		228.61	0.002446	2.6	78.05	69.91	0.51
Bolton Reach	9.47	100-year	104.04	225.7	228.63		228.84	0.002177	2.6	96.04	78.73	0.49
Bolton Reach	9.47	Regional	479.46	225.7	231.01		231.25	0.001859	3.57	373.76	140.31	0.49
Bolton Reach	9.46	2-year	26.12	225.3	227.01		227.05	0.000869	0.95	27.59	22.63	0.27
Bolton Reach	9.46	5-year	43.32	225.3	227.44		227.51	0.000852	1.14	44.27	54.51	0.28
Bolton Reach	9.46	10-year	56.5	225.3	227.72		227.78	0.000798	1.22	62.58	75.31	0.28
Bolton Reach	9.46	25-year	74.39	225.3	228.07		228.15	0.000693	1.27	93.26	97.31	0.27
Bolton Reach	9.46	50-year	88.9	225.3	228.33		228.4	0.000611	1.28	119.02	102.98	0.26
Bolton Reach	9.46	100-year	104.04	225.3	228.58		228.65	0.000543	1.29	145.78	108.56	0.24
Bolton Reach	9.46	Regional	479.46	225.3	230.9		231.05	0.00076	2.27	456.67	159.69	0.32
Bolton Reach	9.452	2-year	26.12	225.6	226.8		226.29	0.002213	1.49	17.54	21.5	0.43
Bolton Reach	9.452	5-year	43.32	225.6	227.16		227.35	0.002542	1.9	22.79	34.97	0.49
Bolton Reach	9.452	10-year	56.5	225.6	227.38		227.62	0.002797	2.18	25.97	51.01	0.52
Bolton Reach	9.452	25-year	74.39	225.6	227.64		227.96	0.003106	2.51	29.68	69.73	0.56
Bolton Reach	9.452	50-year	88.9	225.6	227.8		228.16	0.003401	2.77	32.14	82.13	0.59
Bolton Reach	9.452	100-year	104.04	225.6	227.96		228.43	0.003701	3.02	34.44	93.71	0.63
Bolton Reach	9.452	Regional	479.46	225.6	230.82		230.98	0.000824	2.29	445.01	158.47	0.33
Bolton Reach	9.4515	Bridge										
Bolton Reach	9.451	2-year	26.12	225.6	226.79		226.91	0.002297	1.51	17.34	21.39	0.44
Bolton Reach	9.451	5-year	43.32	225.6	227.15		227.33	0.00264	1.92	22.53	33.68	0.49
Bolton Reach	9.451	10-year	56.5	225.6	227.36		227.61	0.002911	2.2	25.66	49.45	0.53
Bolton Reach	9.451	25-year	74.39	225.6	227.61		227.94	0.003248	2.54	29.29	67.73	0.57
Bolton Reach	9.451	50-year	88.9	225.6	227.77		228.17	0.003574	2.81	31.67	79.74	0.61
Bolton Reach	9.451	100-year	104.04	225.6	227.92		228.4	0.003938	3.08	33.8	90.5	0.65
Bolton Reach	9.451	Regional	479.46	225.6	230.31		230.54	0.001343	2.71	366.17	147.16	0.41
Bolton Reach	9.45	2-year	26.12	225.2	226.73		226.76	0.000398	0.74	45.78	46.51	0.19
Bolton Reach	9.45	5-year	43.32	225.2	227.09		227.13	0.000495	0.95	64.34	56.7	0.22
Bolton Reach	9.45	10-year	56.5	225.2	227.32		227.37	0.00055	1.08	78.02	64.85	0.24
Bolton Reach	9.45	25-year	74.39	225.2	227.59		227.65	0.000595	1.22	96.94	74.67	0.25
Bolton Reach	9.45	50-year	88.9	225.2	227.77		227.85	0.000663	1.32	111.33	81.35	0.26
Bolton Reach	9.45	100-year	104.04	225.2	227.95		228.03	0.000663	1.42	125.86	87.58	0.27
Bolton Reach	9.45	Regional	479.46	225.2	230.17		230.38	0.001062	2.66	409.49	167.96	0.38
Bolton Reach	9.44	2-year	26.12	225.5	226.28	226.13	226.45	0.006391	1.88	16.49	30.87	0.68
Bolton Reach	9.44	5-year	43.32	225.5	226.5		226.8	0.004909	2.08	27.99	40.3	0.63
Bolton Reach	9.44	10-year	56.5	225.5	226.82		227.03	0.004232	2.18	37.39	46.61	0.61
Bolton Reach	9.44	25-year	74.39	225.5	227.11		227.32	0.003347	2.22	52.42	55.74	0.56
Bolton Reach	9.44	50-year	88.9	225.5	227.31		227.52	0.003011	2.27	63.98	62.39	0.54
Bolton Reach	9.44	100-year	104.04	225.5	227.48		227.7	0.002804	2.33	75.64	68.46	0.53
Bolton Reach	9.44	Regional	479.46	225.5	229.68		230.04	0.0024	3.55	307.42	143.04	0.55
Bolton Reach	9.43	2-year	26.12	224	225.32		225.43	0.002113	1.53	21.25	22.69	0.42
Bolton Reach	9.43	5-year	43.32	224	225.74		225.59	0.002093	1.83	31.87	27.17	0.44
Bolton Reach	9.43	10-year	56.5	224	225.99		226.18	0.002165	2.04	38.99	29.79	0.46
Bolton Reach	9.43	25-year	74.39	224	226.25		226.65	0.002465	2.36	48.45	42.96	0.5
Bolton Reach	9.43	50-year	88.9	224	226.43		226.72	0.00261	2.56	57	52.2	0.52
Bolton Reach	9.43	100-year	104.04	224	226.6		226.91	0.002742	2.74	66.08	60.49	0.54
Bolton Reach	9.43	Regional	479.46	224	228.95		229.4	0.00255	4.06	264.87	93.38	0.58
Bolton Reach	9.42	2-year	26.12	223.7	224.98		225.16	0.003422	1.9	16.72	17.87	0.54
Bolton Reach	9.42	5-year	43.32	223.7	225.34		225.61	0.003966	2.4	25	29.46	0.6
Bolton Reach	9.42	10-year	56.5	223.7	225.57		225.88	0.004043	2.65	32.6	37.21	0.62
Bolton Reach	9.42	25-year	74.39	223.7	225.8	225.49	226.17	0.004299	2.95	42.19	45.13	0.65
Bolton Reach	9.42	50-year	88.9	223.7	225.95		226.37	0.004056	3.18	49.33	50.23	0.68
Bolton Reach	9.42	100-year	104.04	223.7	226.08	225.87	226.54	0.004803	3.4	56.29	53.34	0.7
Bolton Reach	9.42	Regional	479.46	223.7	227.88		228.96	0.007355	6.11	178.54	82.86	0.95
Bolton Reach	9.41	2-year	26.12	223.3	224.58</							

Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	9.4	2-year	26.12	223	224.18		224.28	0.002542	1.55	25.67	38.39	0.46
Bolton Reach	9.4	5-year	43.32	223	224.52		224.65	0.002503	1.83	40.56	48.69	0.47
Bolton Reach	9.4	10-year	56.5	223	224.73		224.88	0.00247	1.98	51.64	55.12	0.48
Bolton Reach	9.4	25-year	74.39	223	224.98		225.15	0.002423	2.15	66.37	62.66	0.49
Bolton Reach	9.4	50-year	88.9	223	225.16		225.34	0.002327	2.23	78.01	65	0.48
Bolton Reach	9.4	100-year	104.04	223	225.34		225.51	0.002255	2.31	89.4	66.89	0.48
Bolton Reach	9.4	Regional	479.46	223	227.74		228.1	0.002272	3.72	282.09	93.26	0.55
Bolton Reach	9.39	2-year	26.12	222.5	224.03		224.07	0.000692	0.97	55.3	76.52	0.25
Bolton Reach	9.39	5-year	43.32	222.5	224.4		224.43	0.000667	1.09	83.54	78.55	0.25
Bolton Reach	9.39	10-year	56.5	222.5	224.62		224.66	0.000676	1.19	101.01	79.78	0.26
Bolton Reach	9.39	25-year	74.39	222.5	224.87		224.92	0.000699	1.3	121.5	81.2	0.27
Bolton Reach	9.39	50-year	88.9	222.5	225.05		225.11	0.00072	1.39	136.31	82.21	0.28
Bolton Reach	9.39	100-year	104.04	222.5	225.23		225.28	0.000741	1.47	150.52	83.17	0.28
Bolton Reach	9.39	Regional	479.46	222.5	227.6		227.78	0.001196	2.83	363.67	96.42	0.4
Bolton Reach	9.38	2-year	26.12	222.4	223.78		223.84	0.001244	1.21	34.06	46.12	0.33
Bolton Reach	9.38	5-year	43.32	222.4	224.12		224.21	0.001367	1.47	52.01	58.11	0.36
Bolton Reach	9.38	10-year	56.5	222.4	224.33		224.43	0.001441	1.63	64.7	65.28	0.37
Bolton Reach	9.38	25-year	74.39	222.4	224.56		224.68	0.001524	1.81	80.93	73.43	0.39
Bolton Reach	9.38	50-year	88.9	222.4	224.73		224.86	0.001563	1.93	93.88	79.34	0.4
Bolton Reach	9.38	100-year	104.04	222.4	224.9		225.03	0.001588	2.03	107.24	85	0.41
Bolton Reach	9.38	Regional	479.46	222.4	227.3		227.51	0.001386	2.98	394.46	140.63	0.43
Bolton Reach	9.37	2-year	26.12	222.2	223.48		223.52	0.000974	1.02	46.05	69.94	0.29
Bolton Reach	9.37	5-year	43.32	222.2	223.83		223.88	0.000927	1.18	74.49	89.93	0.29
Bolton Reach	9.37	10-year	56.5	222.2	224.05		224.1	0.000906	1.26	94.98	100.48	0.3
Bolton Reach	9.37	25-year	74.39	222.2	224.3		224.35	0.000864	1.34	120.84	106.89	0.3
Bolton Reach	9.37	50-year	88.9	222.2	224.48		224.53	0.000844	1.4	140.41	111.5	0.3
Bolton Reach	9.37	100-year	104.04	222.2	224.65		224.71	0.000803	1.46	159.83	115.89	0.3
Bolton Reach	9.37	Regional	479.46	222.2	227.1		227.21	0.000811	2.29	521.36	178.93	0.33
Bolton Reach	9.36	2-year	26.12	222	223.23		223.3	0.00137	1.19	29.65	37.35	0.34
Bolton Reach	9.36	5-year	43.32	222	223.56		223.65	0.001554	1.48	43.04	44.81	0.38
Bolton Reach	9.36	10-year	56.5	222	223.75		223.86	0.001707	1.67	51.84	49.1	0.4
Bolton Reach	9.36	25-year	74.39	222	223.97		224.11	0.00186	1.89	63.21	54.15	0.43
Bolton Reach	9.36	50-year	88.9	222	224.12		224.29	0.001957	2.04	72.06	57.77	0.45
Bolton Reach	9.36	100-year	104.04	222	224.27		224.46	0.002039	2.18	81.02	61.22	0.46
Bolton Reach	9.36	Regional	479.46	222	226.49		226.94	0.00252	3.81	273.13	112.03	0.57
Bolton Reach	9.35	2-year	26.12	221.5	222.64		222.7	0.001551	1.2	36.87	60.73	0.36
Bolton Reach	9.35	5-year	43.32	221.5	222.97		223.04	0.001508	1.39	59.04	77.62	0.37
Bolton Reach	9.35	10-year	56.5	221.5	223.16		223.23	0.00146	1.49	74.53	81.9	0.37
Bolton Reach	9.35	25-year	74.39	221.5	223.39		223.47	0.001412	1.6	93.61	85.43	0.37
Bolton Reach	9.35	50-year	88.9	221.5	223.55		223.64	0.00139	1.67	107.85	87.97	0.37
Bolton Reach	9.35	100-year	104.04	221.5	223.71		223.8	0.001378	1.75	121.78	90.38	0.38
Bolton Reach	9.35	Regional	479.46	221.5	226.01		226.21	0.001443	2.89	370.54	125.94	0.43
Bolton Reach	9.34	2-year	26.12	221.2	222.35		222.4	0.001303	1.11	36.98	57.82	0.33
Bolton Reach	9.34	5-year	43.32	221.2	222.68		222.75	0.001296	1.3	58.45	73.49	0.34
Bolton Reach	9.34	10-year	56.5	221.2	222.88		222.95	0.001309	1.42	73.79	82.89	0.35
Bolton Reach	9.34	25-year	74.39	221.2	223.11		223.19	0.001303	1.55	94.39	94.05	0.36
Bolton Reach	9.34	50-year	88.9	221.2	223.28		223.37	0.001287	1.63	111	102.16	0.36
Bolton Reach	9.34	100-year	104.04	221.2	223.44		223.53	0.001275	1.71	127.92	109.81	0.36
Bolton Reach	9.34	Regional	479.46	221.2	225.84		225.97	0.000923	2.36	463.56	152.38	0.35
Bolton Reach	9.33	2-year	26.12	220.9	222.16		222.2	0.000808	0.93	36.7	42.19	0.26
Bolton Reach	9.33	5-year	43.32	220.9	222.46		222.53	0.001009	1.2	49.89	46.28	0.31
Bolton Reach	9.33	10-year	56.5	220.9	222.63		222.71	0.001168	1.38	57.93	48.6	0.33
Bolton Reach	9.33	25-year	74.39	220.9	222.83		222.94	0.001344	1.59	67.93	51.34	0.37
Bolton Reach	9.33	50-year	88.9	220.9	222.98		223.11	0.001457	1.74	75.61	53.35	0.39
Bolton Reach	9.33	100-year	104.04	220.9	223.11		223.26	0.001517	1.89	82.98	55.09	0.4
Bolton Reach	9.33	Regional	479.46	220.9	225.11		225.66	0.002828	3.89	218.25	80.29	0.6
Bolton Reach	9.32	2-year	26.12	220.9	221.49	221.49	221.74	0.013265	2.26	13.25	33.35	0.94
Bolton Reach	9.32	5-year	43.32	220.9	221.74	221.71	222.03	0.00974	2.47	23.38	46.05	0.86
Bolton Reach	9.32	10-year	56.5	220.9	221.96	221.85	222.22	0.006779	2.4	34.79	57.07	0.74
Bolton Reach	9.32	25-year	74.39	220.9	222.21	222.45	222.62	0.005166	2.41	50.29	69.28	0.67
Bolton Reach	9.32	50-year	88.9	220.9	222.38	222.78	222.86	0.004473	2.43	62.91	77.82	0.64
Bolton Reach	9.32	100-year	104.04	220.9	222.54	222.78	222.78	0.00398	2.46	76.24	85.93	0.61
Bolton Reach	9.32	Regional	479.46	220.9	224.97	225.16	224.69	0.001536	2.79	430.75	206.58	0.44
Bolton Reach	9.31	2-year	26.12	219.6	221.1		221.14	0.00074	0.99	39.85	38.97	0.26
Bolton Reach	9.31	5-year	43.32	219.6	221.4		221.47	0.001021	1.31	52.22	43.44	0.31
Bolton Reach	9.31	10-year	56.5	219.6	221.57		221.66	0.001233	1.53	59.8	45.96	0.35
Bolton Reach	9.31	25-year	74.39	219.6	221.77		221.89	0.001465	1.78	69.47	48.98	0.39
Bolton Reach	9.31	50-year	88.9	219.6	221.92		222.06	0.001624	1.96	76.85	51.17	0.41
Bolton Reach	9.31	100-year	104.04	219.6	221.07		222.23	0.001756	2.12	84.45	53.34	0.43
Bolton Reach	9.31	Regional	479.46	219.6	224.08		224.69	0.003431	4.42	221.82	83.25	0.67
Bolton Reach	9.3	2-year	26.12	219.2	220.38		220.51	0.003409	1.79	28.07	69.51	0.53
Bolton Reach	9.3	5-year	43.32	219.2	220.68		220.79	0.002773	1.88	52.64	86.27	0.49
Bolton Reach	9.3	10-year	56.5	219.2	220.86		220.97	0.002509	1.93	68.2	87.53	0.48
Bolton Reach	9.3	25-year	74.39	219.2	221.06		221.18	0.002322	2.01	86.64	89	0.47
Bolton Reach	9.3	50-year	88.9	219.2	221.22		221.33	0.002234	2.07	100.13	90.06	0.47
Bolton Reach	9.3	100-year	104.04	219.2	221.35		221.47	0.002207	2.15	112.56	91.03	0.47
Bolton Reach	9.3	Regional	479.46	219.2	223.3		223.56	0.002619	3.6	303.24	104.73	0.57
Bolton Reach	9.29	2-year	26.12	219.1	220.15		220.2	0.00126	1.03	31.1	47.18	0.32
Bolton Reach	9.29	5-year	43.32	219.1	220.42		220.5	0.001466	1.29	46.55	66.04	0.36
Bolton Reach	9.29	10-year	56.5	219.1	220.58		220.68	0.001588	1.45	58.24	77.32	0.38
Bolton Reach	9.29	25-year	74.39	219.1	220.79		220.9	0.001623	1.6	75.46	91.43	0.39
Bolton Reach	9.29	50-year	88.9	219.1	220.93		221.05	0.001634	1.7	89.66	101.61	0.4
Bolton Reach	9.29	100-year	104.04	219.1	221.07		221.2	0.001622	1.78	104.19	106.92	0.4
Bolton Reach	9.29	Regional	479.46	219.1	223.01		223.26	0.001703	2.88	332.12	127.87	0.46
Bolton Reach	8.75	2-year	27.15	218.47	219.67		219.77	0.004106	1.45	20.05	43.95	0.55
Bolton Reach</												

Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: East Branch

#### HEC-RAS Hydraulic Output Summary



Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	8.74	2-year	27.15	217.71	219.49		219.53	0.000793	0.94	29	22.41	0.26
Bolton Reach	8.74	5-year	44.96	217.71	219.9		219.94	0.000649	1.01	75.83	122.65	0.25
Bolton Reach	8.74	10-year	58.76	217.71	220.13		220.17	0.000595	1.06	104.65	128.71	0.24
Bolton Reach	8.74	25-year	77.45	217.71	220.38		220.43	0.000562	1.12	138.36	135.29	0.24
Bolton Reach	8.74	50-year	92.6	217.71	220.55		220.6	0.00056	1.17	161.66	139.68	0.24
Bolton Reach	8.74	100-year	107.99	217.71	220.7		220.75	0.000566	1.23	183.1	143.64	0.25
Bolton Reach	8.74	Regional	463.25	217.71	222.72		222.81	0.000667	1.97	529.89	186.08	0.3
Bolton Reach	8.73	2-year	27.15	217.71	219.48		219.5	0.000478	0.7	38.69	32.08	0.2
Bolton Reach	8.73	5-year	44.96	217.71	219.89		219.92	0.000402	0.78	86.75	126.57	0.2
Bolton Reach	8.73	10-year	58.76	217.71	220.12		220.15	0.00038	0.83	116.34	131.24	0.2
Bolton Reach	8.73	25-year	77.45	217.71	220.37		220.4	0.00037	0.89	150.38	135.67	0.2
Bolton Reach	8.73	50-year	92.6	217.71	220.54		220.58	0.000376	0.95	173.55	138.62	0.2
Bolton Reach	8.73	100-year	107.99	217.71	220.69		220.73	0.000386	1	194.65	141.25	0.21
Bolton Reach	8.73	Regional	463.25	217.71	222.69		222.79	0.000546	1.78	511.22	168.76	0.27
Bolton Reach	8.72	2-year	27.15	217.66	219.21		219.32	0.002476	1.5	18.12	16.11	0.45
Bolton Reach	8.72	5-year	44.96	217.66	219.58		219.75	0.002964	1.83	24.82	26.55	0.51
Bolton Reach	8.72	10-year	58.76	217.66	219.76		219.98	0.003211	2.08	31.57	46.54	0.54
Bolton Reach	8.72	25-year	77.45	217.66	219.97	219.45	220.23	0.003404	2.34	43.63	69.08	0.57
Bolton Reach	8.72	50-year	92.6	217.66	220.11	219.66	220.4	0.003484	2.49	54.25	79	0.58
Bolton Reach	8.72	100-year	107.99	217.66	220.24	219.89	220.55	0.003515	2.62	65.13	86.73	0.59
Bolton Reach	8.72	Regional	463.25	217.66	222.41		222.64	0.001665	2.94	409.42	219	0.46
Bolton Reach	8.71	2-year	27.15	217.44	218.7		218.79	0.002755	1.33	20.45	24.34	0.46
Bolton Reach	8.71	5-year	44.96	217.44	219.05		219.17	0.002659	1.52	29.77	33.24	0.47
Bolton Reach	8.71	10-year	58.76	217.44	219.26		219.39	0.002469	1.65	38.71	54.08	0.47
Bolton Reach	8.71	25-year	77.45	217.44	219.49		219.65	0.002289	1.78	54.23	77.98	0.46
Bolton Reach	8.71	50-year	92.6	217.44	219.64		219.81	0.00224	1.87	66.23	82.03	0.47
Bolton Reach	8.71	100-year	107.99	217.44	219.78		219.96	0.002184	1.95	77.97	85.13	0.47
Bolton Reach	8.71	Regional	463.25	217.44	222.15		222.34	0.001114	2.45	376.92	152.92	0.38
Bolton Reach	8.7	2-year	27.15	217.04	218.31		218.41	0.002879	1.39	19.6	22.57	0.47
Bolton Reach	8.7	5-year	44.96	217.04	218.66		218.79	0.00279	1.61	27.99	25.12	0.49
Bolton Reach	8.7	10-year	58.76	217.04	218.87		219.03	0.002857	1.77	33.28	26.33	0.5
Bolton Reach	8.7	25-year	77.45	217.04	219.11		219.3	0.002746	1.91	46.74	87.28	0.5
Bolton Reach	8.7	50-year	92.6	217.04	219.29		219.48	0.002466	1.96	62.61	88.99	0.49
Bolton Reach	8.7	100-year	107.99	217.04	219.47		219.65	0.002194	1.98	78.43	90.66	0.47
Bolton Reach	8.7	Regional	463.25	217.04	221.96		222.18	0.001133	2.52	333.37	113.4	0.39
Bolton Reach	8.69	2-year	27.15	216.59	217.68		217.84	0.001516	1.79	15.2	18.34	0.63
Bolton Reach	8.69	5-year	44.96	216.59	218.02		218.24	0.004983	2.05	21.95	21.38	0.64
Bolton Reach	8.69	10-year	58.76	216.59	218.24		218.49	0.004593	2.22	26.89	25.23	0.63
Bolton Reach	8.69	25-year	77.45	216.59	218.5		218.79	0.004197	2.41	34.09	29.97	0.62
Bolton Reach	8.69	50-year	92.6	216.59	218.69		219.01	0.003987	2.54	40.13	33.79	0.62
Bolton Reach	8.69	100-year	107.99	216.59	218.88	218.39	219.22	0.003726	2.63	46.95	37.66	0.61
Bolton Reach	8.69	Regional	463.25	216.59	220.75	220.49	221.79	0.005165	4.91	141.94	61.99	0.81
Bolton Reach	8.68	2-year	27.15	216.37	217.38		217.61	0.007893	2.14	12.66	15.97	0.77
Bolton Reach	8.68	5-year	44.96	216.37	217.67	217.52	218	0.007992	2.58	17.62	19.28	0.81
Bolton Reach	8.68	10-year	58.76	216.37	217.85	217.71	218.26	0.007803	2.85	21.47	22.08	0.82
Bolton Reach	8.68	25-year	77.45	216.37	218.06	217.94	218.57	0.007824	3.17	26.51	26.31	0.84
Bolton Reach	8.68	50-year	92.6	216.37	218.2	218.12	218.79	0.008089	3.43	30.46	30.67	0.87
Bolton Reach	8.68	100-year	107.99	216.37	218.29	218.29	219.89	0.009028	3.76	33.33	33.54	0.93
Bolton Reach	8.68	Regional	463.25	216.37	220.4	220.4	221.58	0.006493	5.5	144.71	65.12	0.9
Bolton Reach	8.67	2-year	27.15	215.86	217.05		217.14	0.00263	1.38	19.75	23.35	0.46
Bolton Reach	8.67	5-year	44.96	215.86	217.44		217.56	0.002133	1.57	32.17	39.97	0.44
Bolton Reach	8.67	10-year	58.76	215.86	217.69		217.83	0.001916	1.67	44.33	57.11	0.43
Bolton Reach	8.67	25-year	77.45	215.86	218.01		218.15	0.00163	1.74	65.82	80.16	0.41
Bolton Reach	8.67	50-year	92.6	215.86	218.23		218.36	0.001435	1.76	83.92	83.59	0.39
Bolton Reach	8.67	100-year	107.99	215.86	218.33		218.49	0.001576	1.91	92.74	85.21	0.41
Bolton Reach	8.67	Regional	463.25	215.86	220.32		220.75	0.001617	3.02	292.77	102.29	0.46
Bolton Reach	8.66	2-year	27.15	215.32	216.89		216.96	0.001193	1.2	23.71	22.58	0.33
Bolton Reach	8.66	5-year	44.96	215.32	217.27		217.39	0.001403	1.53	33.92	32.16	0.37
Bolton Reach	8.66	10-year	58.76	215.32	217.51		217.66	0.001505	1.73	42.5	40.15	0.39
Bolton Reach	8.66	25-year	77.45	215.32	217.8		217.98	0.001549	1.92	59.82	77.68	0.4
Bolton Reach	8.66	50-year	92.6	215.32	218.03		218.21	0.001453	1.98	80.75	103.08	0.4
Bolton Reach	8.66	100-year	107.99	215.32	218.09		218.31	0.001753	2.21	86.98	104	0.44
Bolton Reach	8.66	Regional	463.25	215.32	220.32		220.57	0.001428	3.01	352.39	132.53	0.44
Bolton Reach	8.65	2-year	27.15	215.5	216.71		216.79	0.001802	1.34	27.21	37.77	0.39
Bolton Reach	8.65	5-year	44.96	215.5	217.1		217.21	0.001655	1.55	43.41	46.28	0.4
Bolton Reach	8.65	10-year	58.76	215.5	217.35		217.47	0.001616	1.68	55.82	54.03	0.4
Bolton Reach	8.65	25-year	77.45	215.5	217.66		217.79	0.001444	1.78	74.18	60.92	0.39
Bolton Reach	8.65	50-year	92.6	215.5	217.9		218.03	0.001319	1.83	89.23	64.04	0.38
Bolton Reach	8.65	100-year	107.99	215.5	217.86		218.09	0.001748	2.11	90.18	64.23	0.44
Bolton Reach	8.65	Regional	463.25	215.5	219.96		220.35	0.00228	3.64	293.56	130.39	0.55
Bolton Reach	8.64	2-year	27.15	215.01	216.59		216.67	0.001424	1.27	27.67	69.35	0.35
Bolton Reach	8.64	5-year	44.96	215.01	217.01		217.06	0.000766	1.1	63.79	70.92	0.27
Bolton Reach	8.64	10-year	58.76	215.01	217.28		217.33	0.000728	1.17	83.66	78.8	0.27
Bolton Reach	8.64	25-year	77.45	215.01	217.61		217.57	0.000651	1.23	111.45	88.13	0.26
Bolton Reach	8.64	50-year	92.6	215.01	217.87		217.69	0.000821	1.42	104.31	83.39	0.29
Bolton Reach	8.64	100-year	107.99	215.01	217.87		217.94	0.000749	1.45	124.71	83.4	0.34
Bolton Reach	8.64	Regional	463.25	215.01	219.93		220.17	0.001477	3.01	377.26	158.23	0.45
Bolton Reach	8.63	2-year	27.15	215.01	216.58		216.63	0.001012	1.02	34.7	63.72	0.3
Bolton Reach	8.63	5-year	44.96	215.01	217.01		217.06	0.000766	1.1	63.79	70.92	0.27
Bolton Reach	8.63	10-year	58.76	215.01	217.28		217.33	0.000728	1.17	83.66	78.8	0.27
Bolton Reach	8.63	25-year	77.45	215.01	217.61		217.57	0.000651	1.23	111.45	88.13	0.26
Bolton Reach	8.63	50-year	92.6	215.01	217.86		217.69	0.000597	1.27	134.28	94.34	0.26
Bolton Reach	8.63	100-year	107.99	215.01	217.86		217.94	0.000816	1.48	134.02	94.27	0.3
Bolton Reach	8.63	Regional	463.25	215.01	219.92		220.12	0.001132	2.61</td			

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MGT17401  
**River:** Cold Creek  
**Reach:** East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	8.61	2-year	27.15	214.8	216.43	215.7	216.53	0.001758	1.39	19.52	14.67	0.39
Bolton Reach	8.61	5-year	44.96	214.8	216.81	216.04	216.97	0.002315	1.78	25.27	57.9	0.45
Bolton Reach	8.61	10-year	58.76	214.8	217.03	216.26	217.24	0.002684	2.03	32.07	139.36	0.49
Bolton Reach	8.61	25-year	77.45	214.8	217.49	216.53	217.6	0.001305	1.66	97.72	145.81	0.36
Bolton Reach	8.61	50-year	92.6	214.8	217.78	216.72	217.86	0.000891	1.49	142.76	158.62	0.3
Bolton Reach	8.61	100-year	107.99	214.8	217.74	216.91	217.85	0.001347	1.81	135.7	156.62	0.37
Bolton Reach	8.61	Regional	463.25	214.8	219.91	218.39	220.01	0.000869	2.23	580.69	273.3	0.33
Bolton Reach	8.6	2-year	27.15	214.78	216.4	215.7	216.51	0.001979	1.49	18.25	13.22	0.4
Bolton Reach	8.6	5-year	44.96	214.78	216.74	216.04	216.94	0.002821	1.96	22.95	48.18	0.49
Bolton Reach	8.6	10-year	58.76	214.78	216.93	216.27	217.19	0.003541	2.29	25.6	69.33	0.56
Bolton Reach	8.6	25-year	77.45	214.78	217.14	216.56	217.51	0.004394	2.69	28.78	105.36	0.63
Bolton Reach	8.6	50-year	92.6	214.78	217.78	216.76	217.85	0.001036	1.52	140.2	159.01	0.32
Bolton Reach	8.6	100-year	107.99	214.78	217.72	216.96	217.84	0.001605	1.87	131.95	156.36	0.39
Bolton Reach	8.6	Regional	463.25	214.78	219.91	218.37	220.01	0.000883	2.15	592.62	279.94	0.32
Bolton Reach	8.595	Bridge										
Bolton Reach	8.59	2-year	27.15	214.79	216.4	215.68	216.5	0.00184	1.42	19.15	36.7	0.39
Bolton Reach	8.59	5-year	44.96	214.79	216.74	216.01	216.91	0.002559	1.86	24.19	85.36	0.47
Bolton Reach	8.59	10-year	58.76	214.79	216.92	216.24	217.16	0.003166	2.17	27.02	99.34	0.53
Bolton Reach	8.59	25-year	77.45	214.79	217.13	216.5	217.46	0.003783	2.55	30.42	123.88	0.59
Bolton Reach	8.59	50-year	92.6	214.79	217.28	216.7	217.69	0.004189	2.83	33	131.29	0.63
Bolton Reach	8.59	100-year	107.99	214.79	217.69	216.89	217.76	0.000999	1.55	166.25	160.73	0.31
Bolton Reach	8.59	Regional	463.25	214.79	219.88	218.12	219.96	0.000699	1.98	639.26	273.72	0.29
Bolton Reach	8.58	2-year	27.15	214.77	216.41	215.7	216.45	0.000967	0.98	41.12	67.12	0.29
Bolton Reach	8.58	5-year	44.96	214.77	216.79	216.09	216.83	0.000883	1.09	68.31	107.72	0.28
Bolton Reach	8.58	10-year	58.76	214.77	217	216.25	217.05	0.000834	1.19	85.15	131.05	0.29
Bolton Reach	8.58	25-year	77.45	214.77	217.25	216.4	217.3	0.000755	1.24	139.14	165.97	0.28
Bolton Reach	8.58	50-year	92.6	214.77	217.44	216.5	217.49	0.000674	1.24	172.04	176.95	0.27
Bolton Reach	8.58	100-year	107.99	214.77	217.7	216.6	217.74	0.000533	1.19	219.2	197.35	0.24
Bolton Reach	8.58	Regional	463.25	214.77	219.88	217.84	219.94	0.000501	1.76	824.75	442.09	0.26
Bolton Reach	8.57	2-year	27.15	214.5	216.32		216.4	0.001244	1.36	33.64	71.97	0.34
Bolton Reach	8.57	5-year	44.96	214.5	216.71		216.79	0.001059	1.45	70.65	103.24	0.32
Bolton Reach	8.57	10-year	58.76	214.5	216.93		217.01	0.000991	1.5	94.08	108.06	0.32
Bolton Reach	8.57	25-year	77.45	214.5	217.19		217.26	0.000993	1.56	122.71	113.41	0.31
Bolton Reach	8.57	50-year	92.6	214.5	217.38		217.46	0.000896	1.61	145.38	120.08	0.31
Bolton Reach	8.57	100-year	107.99	214.5	217.65		217.71	0.000742	1.56	177.45	126.24	0.29
Bolton Reach	8.57	Regional	463.25	214.5	219.8		219.91	0.000839	2.38	501.76	163.97	0.34
Bolton Reach	8.56	2-year	27.15	214.44	216.33		216.36	0.000456	0.81	47.37	82.12	0.21
Bolton Reach	8.56	5-year	44.96	214.44	216.72		216.75	0.000456	0.94	87.79	118.68	0.21
Bolton Reach	8.56	10-year	58.76	214.44	216.93		216.97	0.000465	1.01	114.81	130.59	0.22
Bolton Reach	8.56	25-year	77.45	214.44	217.19		217.23	0.000457	1.08	149.39	136.95	0.22
Bolton Reach	8.56	50-year	92.6	214.44	217.38		217.42	0.000444	1.12	175.8	139.65	0.22
Bolton Reach	8.56	100-year	107.99	214.44	217.64		217.68	0.000379	1.11	212.85	145.31	0.21
Bolton Reach	8.56	Regional	463.25	214.44	219.79		219.87	0.000561	1.87	570.07	178.09	0.27
Bolton Reach	8.55	2-year	27.15	214.44	216.23		216.3	0.001108	1.19	27.53	59.01	0.31
Bolton Reach	8.55	5-year	44.96	214.44	216.62		216.7	0.001032	1.34	63.2	113.82	0.31
Bolton Reach	8.55	10-year	58.76	214.44	216.85		216.92	0.000945	1.38	89.96	123.35	0.31
Bolton Reach	8.55	25-year	77.45	214.44	217.11		217.18	0.000839	1.41	124.27	131.02	0.29
Bolton Reach	8.55	50-year	92.6	214.44	217.31		217.38	0.000763	1.42	150.54	133.07	0.28
Bolton Reach	8.55	100-year	107.99	214.44	217.59		217.64	0.000597	1.35	187.86	136.28	0.26
Bolton Reach	8.55	Regional	463.25	214.44	219.73		219.82	0.000719	2.16	512.07	163.89	0.31
Bolton Reach	8.54	2-year	27.15	214.44	216.13		216.19	0.000999	1.08	30.2	51.74	0.3
Bolton Reach	8.54	5-year	44.96	214.44	216.52		216.59	0.000931	1.24	63.26	115.46	0.3
Bolton Reach	8.54	10-year	58.76	214.44	216.75		216.82	0.000825	1.28	91.06	120.48	0.29
Bolton Reach	8.54	25-year	77.45	214.44	217.11		217.09	0.000728	1.31	125.18	126.22	0.28
Bolton Reach	8.54	50-year	92.6	214.44	217.24		217.29	0.000668	1.33	151.34	129.6	0.27
Bolton Reach	8.54	100-year	107.99	214.44	217.53		217.58	0.000518	1.26	190.12	134.22	0.24
Bolton Reach	8.54	Regional	463.25	214.44	219.63		219.74	0.000694	2.14	488.81	150.3	0.31
Bolton Reach	8.53	2-year	27.15	214.44	216.08	215.19	216.12	0.000877	0.87	31.57	37.67	0.27
Bolton Reach	8.53	5-year	44.96	214.44	216.47	215.46	216.52	0.00078	1.01	54.12	76.9	0.27
Bolton Reach	8.53	10-year	58.76	214.44	216.71	215.66	216.76	0.000739	1.09	73.31	85.46	0.27
Bolton Reach	8.53	25-year	77.45	214.44	216.98	215.89	217.04	0.000696	1.17	97.84	93.24	0.27
Bolton Reach	8.53	50-year	92.6	214.44	217.18	216.03	217.25	0.000673	1.23	117.55	103.22	0.27
Bolton Reach	8.53	100-year	107.99	214.44	217.48	216.16	217.54	0.000537	1.2	150.78	118.74	0.24
Bolton Reach	8.53	Regional	463.25	214.44	219.55	217.73	219.69	0.000722	2.08	430.86	147.89	0.31
Bolton Reach	8.52	2-year	27.15	214.44	215.9		215.99	0.001624	1.32	26.45	49.07	0.38
Bolton Reach	8.52	5-year	44.96	214.44	216.33		216.42	0.001308	1.44	55.75	90.53	0.35
Bolton Reach	8.52	10-year	58.76	214.44	216.59		216.67	0.001106	1.46	82.36	109.44	0.33
Bolton Reach	8.52	25-year	77.45	214.44	216.89		216.97	0.000893	1.44	116.58	114.27	0.31
Bolton Reach	8.52	50-year	92.6	214.44	217.11		217.18	0.000805	1.46	141.59	118.88	0.3
Bolton Reach	8.52	100-year	107.99	214.44	217.43		217.49	0.000601	1.37	181.27	127.54	0.26
Bolton Reach	8.52	Regional	463.25	214.44	219.5		219.61	0.000787	2.26	547.07	273.92	0.33
Bolton Reach	8.51	2-year	27.15	214.18	215.68		215.74	0.001024	1.01	28.02	36.96	0.3
Bolton Reach	8.51	5-year	44.96	214.18	216.15		216.21	0.000882	1.13	54.04	75.92	0.28
Bolton Reach	8.51	10-year	58.76	214.18	216.43		216.49	0.000737	1.19	78.91	102.71	0.27
Bolton Reach	8.51	25-year	77.45	214.18	216.76		216.82	0.000621	1.21	116	118.5	0.26
Bolton Reach	8.51	50-year	92.6	214.18	216.99		217.05	0.000568	1.24	143.71	126.4	0.25
Bolton Reach	8.51	100-year	107.99	214.18	217.34		217.39	0.000441	1.15	190.13	134.68	0.22
Bolton Reach	8.51	Regional	463.25	214.18	219.37		219.48	0.000609	2	561.85	219.92	0.29
Bolton Reach	8.5	2-year	27.15	213.92	215.59		215.64	0.001012	0.99	27.47	23.7	0.29
Bolton Reach	8.5	5-year	44.96	213.92	216.06		216.13	0.001044	1.11	40.47	31.33	0.31
Bolton Reach	8.5	10-year	58.76	213.92	216.34		216.41	0.00095	1.2	50.04	37.44	0.3
Bolton Reach	8.5	25-year	77.45	213.92	216.66		216.75	0.000892	1.31	64.92	65.97	0.3
Bolton Reach	8.5	50-year	92.6	213.9								

Project Name: Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
 Project No.: MTG17401  
 River: Cold Creek  
 Reach: East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl	
Bolton Reach	8.49	2-year	27.15	213.75	215.57	214.49	215.61	0.000527	0.84	32.39	21.75	0.22	
Bolton Reach	8.49	5-year	44.96	213.75	216.04	214.75	216.1	0.000586	1.05	42.62	24.08	0.24	
Bolton Reach	8.49	10-year	58.76	213.75	216.32	214.93	216.39	0.000647	1.21	48.58	27.51	0.26	
Bolton Reach	8.49	25-year	77.45	213.75	216.62	215.13	216.72	0.000734	1.4	58.22	106.94	0.28	
Bolton Reach	8.49	50-year	92.6	213.75	216.82	215.28	216.94	0.000814	1.55	59.59	130.12	0.3	
Bolton Reach	8.49	100-year	107.99	213.75	217.17	215.43	217.31	0.000738	1.6	67.3	216.76	0.29	
Bolton Reach	8.49	Regional	463.25	213.75	219.33	217.61	219.4	0.000413	1.59	710.77	295.65	0.23	
Bolton Reach	8.485	Bridge											
Bolton Reach	8.48	2-year	27.15	213.71	215.55	214.5	215.6	0.000777	0.97	28.1	22.66	0.26	
Bolton Reach	8.48	5-year	44.96	213.71	216.01	214.81	216.08	0.000854	1.2	37.61	52.04	0.29	
Bolton Reach	8.48	10-year	58.76	213.71	216.28	215.01	216.37	0.000994	1.36	43.23	84.87	0.3	
Bolton Reach	8.48	25-year	77.45	213.71	216.57	215.29	216.69	0.001063	1.56	49.56	117.59	0.33	
Bolton Reach	8.48	50-year	92.6	213.71	216.76	215.44	216.91	0.001175	1.72	53.72	131.17	0.35	
Bolton Reach	8.48	100-year	107.99	213.71	216.92	215.59	217.1	0.001291	1.89	57.27	142.73	0.37	
Bolton Reach	8.48	Regional	463.25	213.71	219.25	217.5	219.32	0.000445	1.59	693.17	279.1	0.24	
Bolton Reach	8.47	2-year	27.15	213.42	215.54			215.55	0.000193	0.6	54.79	43.87	0.14
Bolton Reach	8.47	5-year	44.96	213.42	216			216.03	0.000236	0.76	77.94	68.42	0.16
Bolton Reach	8.47	10-year	58.76	213.42	216.27			216.3	0.000262	0.87	100.23	97.18	0.17
Bolton Reach	8.47	25-year	77.45	213.42	216.57			216.61	0.000286	0.97	135.64	143.25	0.18
Bolton Reach	8.47	50-year	92.6	213.42	216.77			216.82	0.000297	1.04	165.35	152.69	0.19
Bolton Reach	8.47	100-year	107.99	213.42	216.95			217	0.00031	1.1	192.6	160.85	0.19
Bolton Reach	8.47	Regional	463.25	213.42	219.23			219.29	0.000317	1.58	749.84	264.35	0.21
Bolton Reach	8.464	2-year	27.15	213.43	214.83			214.88	0.001448	1	27.2	30.51	0.34
Bolton Reach	8.464	5-year	44.96	213.43	215.22			215.29	0.001238	1.1	41.29	39.51	0.33
Bolton Reach	8.464	10-year	58.76	213.43	215.45			215.53	0.001145	1.19	50.85	43.92	0.32
Bolton Reach	8.464	25-year	77.45	213.43	215.72			215.8	0.001087	1.31	63.55	55.96	0.32
Bolton Reach	8.464	50-year	92.6	213.43	215.91			216	0.001015	1.38	75.44	68.66	0.32
Bolton Reach	8.464	100-year	107.99	213.43	216.03			216.14	0.001121	1.49	84.29	77.71	0.34
Bolton Reach	8.464	Regional	463.25	213.43	218.8			218.85	0.000254	1.27	647.44	257.64	0.19
Bolton Reach	8.458	2-year	27.15	212.97	214.66			214.72	0.000987	1.02	26.54	21.18	0.29
Bolton Reach	8.458	5-year	44.96	212.97	215.03			215.12	0.001262	1.3	34.7	23.62	0.34
Bolton Reach	8.458	10-year	58.76	212.97	215.24			215.35	0.001406	1.48	40	26.94	0.36
Bolton Reach	8.458	25-year	77.45	212.97	215.47			215.62	0.001591	1.71	47.12	34.9	0.39
Bolton Reach	8.458	50-year	92.6	212.97	215.64			215.81	0.001708	1.86	53.27	40.32	0.41
Bolton Reach	8.458	100-year	107.99	212.97	215.71			215.92	0.002084	2.09	56.05	44.85	0.45
Bolton Reach	8.458	Regional	463.25	212.97	218.7			218.8	0.000567	1.8	438.8	160.81	0.25
Bolton Reach	8.452	2-year	27.15	212.95	214.65			214.71	0.001055	1.05	25.91	21.03	0.3
Bolton Reach	8.452	5-year	44.96	212.95	215.02			215.11	0.001362	1.32	34	24.22	0.35
Bolton Reach	8.452	10-year	58.76	212.95	215.23			215.34	0.001476	1.51	39.63	28.68	0.37
Bolton Reach	8.452	25-year	77.45	212.95	215.46			215.61	0.001627	1.73	46.75	33.1	0.4
Bolton Reach	8.452	50-year	92.6	212.95	215.62			215.8	0.001726	1.88	52.97	42.74	0.42
Bolton Reach	8.452	100-year	107.99	212.95	215.69			215.91	0.002103	2.12	55.76	47.02	0.46
Bolton Reach	8.452	Regional	463.25	212.95	218.71			218.79	0.000416	1.7	504.24	243.26	0.24
Bolton Reach	8.446	2-year	27.15	212.89	214.64			214.7	0.000941	1.02	26.59	20.5	0.29
Bolton Reach	8.446	5-year	44.96	212.89	215			215.09	0.001281	1.31	34.36	22.97	0.34
Bolton Reach	8.446	10-year	58.76	212.89	215.21			215.32	0.00141	1.5	40.36	33.87	0.37
Bolton Reach	8.446	25-year	77.45	212.89	215.44			215.59	0.001547	1.71	48.99	40.04	0.39
Bolton Reach	8.446	50-year	92.6	212.89	215.61			215.78	0.001611	1.84	59.72	85.34	0.41
Bolton Reach	8.446	100-year	107.99	212.89	215.67			215.88	0.001931	2.06	65.34	93.06	0.45
Bolton Reach	8.446	Regional	463.25	212.89	218.74			218.77	0.000234	1.29	765.1	413.87	0.18
Bolton Reach	8.44	2-year	27.15	212.84	214.62			214.67	0.001075	1.03	26.26	22.23	0.3
Bolton Reach	8.44	5-year	44.96	212.84	214.97			215.06	0.001373	1.3	34.57	24.88	0.35
Bolton Reach	8.44	10-year	58.76	212.84	215.18			215.29	0.001488	1.48	40.36	32.24	0.37
Bolton Reach	8.44	25-year	77.45	212.84	215.41			215.55	0.001606	1.68	48.9	41.54	0.4
Bolton Reach	8.44	50-year	92.6	212.84	215.57			215.74	0.001684	1.82	57.08	70.64	0.41
Bolton Reach	8.44	100-year	107.99	212.84	215.62			215.83	0.002082	2.06	61.02	88.72	0.46
Bolton Reach	8.44	Regional	463.25	212.84	218.74			218.76	0.000143	1.01	907.23	375.09	0.14
Bolton Reach	8.434	2-year	27.15	212.77	214.6			214.65	0.000947	0.98	27.74	23.18	0.29
Bolton Reach	8.434	5-year	44.96	212.77	214.95			215.03	0.001228	1.24	36.29	25.85	0.33
Bolton Reach	8.434	10-year	58.76	212.77	215.16			215.26	0.001348	1.41	42.02	30.94	0.36
Bolton Reach	8.434	25-year	77.45	212.77	215.39			215.52	0.001474	1.61	49.92	37.83	0.38
Bolton Reach	8.434	50-year	92.6	212.77	215.55			215.71	0.001566	1.76	56.99	64.51	0.4
Bolton Reach	8.434	100-year	107.99	212.77	215.59			215.79	0.001917	2	60.11	83.97	0.45
Bolton Reach	8.434	Regional	463.25	212.77	218.74			218.76	0.000114	0.9	1001.53	382.24	0.13
Bolton Reach	8.428	2-year	27.15	212.73	214.58			214.64	0.000985	1.02	26.73	21.69	0.29
Bolton Reach	8.428	5-year	44.96	212.73	214.92			215.01	0.001324	1.31	34.43	23.87	0.35
Bolton Reach	8.428	10-year	58.76	212.73	215.12			215.23	0.001505	1.5	39.35	26.21	0.38
Bolton Reach	8.428	25-year	77.45	212.73	215.34			215.49	0.001697	1.73	45.48	29.58	0.41
Bolton Reach	8.428	50-year	92.6	212.73	215.49			215.68	0.001844	1.9	50.17	31.91	0.43
Bolton Reach	8.428	100-year	107.99	212.73	215.5	214.72		215.75	0.002465	2.21	50.57	40.95	0.5
Bolton Reach	8.428	Regional	463.25	212.73	218.74			218.76	0.000111	0.89	1002.94	360.61	0.12
Bolton Reach	8.422	2-year	27.15	212.58	214.57			214.62	0.000885	0.96	28.42	22.63	0.27
Bolton Reach	8.422	5-year	44.96	212.58	214.91			214.99	0.001155	1.24	36.34	24.63	0.33
Bolton Reach	8.422	10-year	58.76	212.58	215.11			215.21	0.001329	1.42	41.54	28.48	0.35
Bolton Reach	8.422	25-year	77.45	212.58	215.33			215.46	0.001506	1.65	48.09	31.17	0.39
Bolton Reach	8.422	50-year	92.6	212.58	215.48			215.64	0.001639	1.81	53.22	38.02	0.41
Bolton Reach	8.422	100-year	107.99	212.58	215.48			215.71	0.002205	2.11	53.46	38.45	0.47
Bolton Reach	8.422	Regional	463.25	212.58	218.72			218.75	0.000204	1.21	726.94	265.52	0.17
Bolton Reach	8.416	2-year	27.15	212.33	214.57	213.13	214.6	0.000888	0.77	35.33	21.22	0.19	
Bolton Reach	8.416	5-year	44.96	212.33	214.9	213.43	214.95	0.000606	1.06	42.45	22.64	0.24	
Bolton Reach	8.416	10-year	58.76	212.33	215.09	213.65	215.17	0.000755	1.26	46.66	23.26	0.28	
Bolton Reach	8.416	25-year	77.45	212.33	215.								

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Cold Creek  
**Reach:** East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	8.41	Regional	463.25	212.19	216.62	216.1	217.17	0.003406	3.5	176.56	121.79	0.63
Bolton Reach	8.404	2-year	27.15	212.19	214.54	214.57	0.000404	0.79	34.28	20.4	0.19	
Bolton Reach	8.404	5-year	44.96	212.19	214.85	214.91	0.000633	1.11	40.8	21.83	0.25	
Bolton Reach	8.404	10-year	58.76	212.19	215.02	215.11	0.000818	1.33	46.04	86.34	0.29	
Bolton Reach	8.404	25-year	77.45	212.19	215.24	215.35	0.000935	1.52	66.7	99.2	0.31	
Bolton Reach	8.404	50-year	92.6	212.19	215.41	215.52	0.000943	1.59	83.35	99.79	0.32	
Bolton Reach	8.404	100-year	107.99	212.19	215.37	215.54	0.00139	1.91	79.49	99.65	0.38	
Bolton Reach	8.404	Regional	463.25	212.19	216.22	216.22	216.97	0.005336	4.55	168.66	110.66	0.79
Bolton Reach	8.398	2-year	27.15	212.14	214.53	214.57	0.000381	0.78	34.69	19.8	0.19	
Bolton Reach	8.398	5-year	44.96	212.14	214.84	214.9	0.000613	1.1	41.29	31.63	0.24	
Bolton Reach	8.398	10-year	58.76	212.14	215.01	215.1	0.000785	1.32	50.28	203.08	0.28	
Bolton Reach	8.398	25-year	77.45	212.14	215.24	215.33	0.000741	1.37	98.83	214.84	0.28	
Bolton Reach	8.398	50-year	92.6	212.14	215.43	215.49	0.000616	1.31	138.33	215.2	0.26	
Bolton Reach	8.398	100-year	107.99	212.14	215.4	215.49	0.000914	1.58	131.82	215.14	0.31	
Bolton Reach	8.398	Regional	463.25	212.14	216.19	216.44	0.002506	3.12	303.13	219.59	0.54	
Bolton Reach	8.392	2-year	27.15	212.04	214.51	212.98	214.54	0.00028	0.69	39.54	21.95	0.16
Bolton Reach	8.392	5-year	44.96	212.04	214.81	214.86	0.000464	0.98	46.16	23.27	0.22	
Bolton Reach	8.392	10-year	58.76	212.04	215.01	213.44	0.000363	0.92	114.09	193.45	0.19	
Bolton Reach	8.392	25-year	77.45	212.04	215.24	213.67	0.000319	0.92	159.63	193.97	0.18	
Bolton Reach	8.392	50-year	92.6	212.04	215.42	213.83	0.000287	0.91	194.34	194.36	0.18	
Bolton Reach	8.392	100-year	107.99	212.04	215.39	215.43	0.000422	1.1	186.24	194.29	0.21	
Bolton Reach	8.392	Regional	463.25	212.04	216.06	215.58	0.001894	2.7	319.18	195.77	0.47	
Bolton Reach	8.386	2-year	27.15	212.04	214.52	212.96	214.53	0.000113	0.46	99.12	171.95	0.11
Bolton Reach	8.386	5-year	44.96	212.04	214.83	213.22	214.83	0.000124	0.53	153.53	181.45	0.11
Bolton Reach	8.386	10-year	58.76	212.04	215.02	213.4	215.03	0.000127	0.57	188.3	182.21	0.12
Bolton Reach	8.386	25-year	77.45	212.04	215.25	213.61	215.26	0.000129	0.61	230.58	183.14	0.12
Bolton Reach	8.386	50-year	92.6	212.04	215.43	213.78	0.000128	0.63	263.05	183.85	0.12	
Bolton Reach	8.386	100-year	107.99	212.04	215.4	213.93	0.000185	0.75	257.58	183.73	0.14	
Bolton Reach	8.386	Regional	463.25	212.04	216.05	215.12	0.001107	2.12	379.88	190.8	0.37	
Bolton Reach	8.38	2-year	27.15	212.04	214.51	212.84	214.52	0.000127	0.52	61.36	47.58	0.11
Bolton Reach	8.38	5-year	44.96	212.04	214.8	213.08	214.82	0.000216	0.74	76.5	56.17	0.15
Bolton Reach	8.38	10-year	58.76	212.04	215.01	213.23	215.02	0.000091	0.51	238.03	248.93	0.1
Bolton Reach	8.38	25-year	77.45	212.04	215.24	213.42	215.25	0.000091	0.54	296.54	255.91	0.1
Bolton Reach	8.38	50-year	92.6	212.04	215.42	213.56	215.43	0.000089	0.55	342.4	261.24	0.1
Bolton Reach	8.38	100-year	107.99	212.04	215.39	213.69	215.4	0.000129	0.66	334.16	260.29	0.12
Bolton Reach	8.38	Regional	463.25	212.04	216.02	214.99	216.1	0.00078	1.85	508.46	289.7	0.31
Bolton Reach	8.374	2-year	27.15	212.04	214.49	212.97	214.51	0.000205	0.63	49.73	37.74	0.14
Bolton Reach	8.374	5-year	44.96	212.04	214.77	213.25	214.81	0.00035	0.91	61.39	46.12	0.19
Bolton Reach	8.374	10-year	58.76	212.04	214.95	213.44	215.01	0.000449	1.08	70.27	51.67	0.22
Bolton Reach	8.374	25-year	77.45	212.04	215.16	213.64	215.24	0.000571	1.28	81.58	57.27	0.25
Bolton Reach	8.374	50-year	92.6	212.04	215.32	213.79	215.41	0.000665	1.43	91.03	61.39	0.27
Bolton Reach	8.374	100-year	107.99	212.04	215.24	213.94	215.37	0.000992	1.73	86.1	59.27	0.33
Bolton Reach	8.374	Regional	463.25	212.04	215.55	215.99	0.004346	3.89	257.18	257.7	0.71	
Bolton Reach	8.368	2-year	27.15	212.04	214.49	212.93	214.5	0.000188	0.55	51.15	36.68	0.13
Bolton Reach	8.368	5-year	44.96	212.04	214.77	213.19	214.8	0.000305	0.77	62.7	46.23	0.18
Bolton Reach	8.368	10-year	58.76	212.04	214.95	213.35	214.99	0.000381	0.92	71.72	52.6	0.2
Bolton Reach	8.368	25-year	77.45	212.04	215.19	213.57	215.21	0.000244	0.79	187.95	286.14	0.16
Bolton Reach	8.368	50-year	92.6	212.04	215.36	213.74	215.38	0.000216	0.78	237.84	291.39	0.15
Bolton Reach	8.368	100-year	107.99	212.04	215.3	213.89	215.33	0.000349	0.97	219.53	289.47	0.2
Bolton Reach	8.368	Regional	463.25	212.04	215.45	215.85	0.004244	3.52	265.26	294.23	0.69	
Bolton Reach	8.362	2-year	27.15	212.04	214.49	212.87	214.5	0.000148	0.51	54.76	36.07	0.12
Bolton Reach	8.362	5-year	44.96	212.04	214.77	213.1	214.79	0.000249	0.73	65.72	42.83	0.16
Bolton Reach	8.362	10-year	58.76	212.04	214.95	213.26	214.98	0.000318	0.87	73.9	47.33	0.18
Bolton Reach	8.362	25-year	77.45	212.04	215.19	213.46	215.2	0.000135	0.6	253.68	322.52	0.12
Bolton Reach	8.362	50-year	92.6	212.04	215.36	213.61	215.38	0.000124	0.61	309.58	327.97	0.12
Bolton Reach	8.362	100-year	107.99	212.04	215.3	213.75	215.32	0.000196	0.75	289.66	326.03	0.15
Bolton Reach	8.362	Regional	463.25	212.04	215.23	215.6	0.004408	3.49	264.69	323.6	0.7	
Bolton Reach	8.356	2-year	27.15	212.04	214.48	212.89	214.5	0.000116	0.54	51.78	33.36	0.13
Bolton Reach	8.356	5-year	44.96	212.04	214.76	213.13	214.79	0.000274	0.77	61.67	38.87	0.17
Bolton Reach	8.356	10-year	58.76	212.04	214.94	213.29	214.98	0.000354	0.92	68.93	42.54	0.19
Bolton Reach	8.356	25-year	77.45	212.04	215.19	213.48	215.2	0.000101	0.53	278.62	297.23	0.11
Bolton Reach	8.356	50-year	92.6	212.04	215.36	213.62	215.37	0.000098	0.54	330.11	303.59	0.11
Bolton Reach	8.356	100-year	107.99	212.04	215.3	213.77	215.32	0.000152	0.67	311.79	301.34	0.13
Bolton Reach	8.356	Regional	463.25	212.04	215.22	215.49	0.003366	3.08	287.95	298.39	0.61	
Bolton Reach	8.35	2-year	27.15	213.7	214.23	214.47	214.47	0.015709	2.17	12.53	26.55	1.01
Bolton Reach	8.35	5-year	44.96	213.7	214.43	214.43	214.74	0.01422	2.5	17.97	28.44	1
Bolton Reach	8.35	10-year	58.76	213.7	214.56	214.56	214.93	0.013305	2.7	21.77	29.8	
Bolton Reach	8.35	25-year	77.45	213.7	214.71	214.71	215.15	0.012358	2.95	26.48	31.61	0.99
Bolton Reach	8.35	50-year	92.6	213.7	214.83	214.83	215.32	0.011577	3.1	30.37	33.03	0.98
Bolton Reach	8.35	100-year	107.99	213.7	215.31	214.94	215.31	0.000155	0.46	355.86	325.66	0.12
Bolton Reach	8.35	Regional	463.25	213.7	215.28	215	0.003059	2.03	346.85	320.66	0.54	
Bolton Reach	8.344	2-year	27.15	212.04	213.44	212.73	213.47	0.000708	0.79	34.21	31.49	0.24
Bolton Reach	8.344	5-year	44.96	212.04	213.91	212.92	213.95	0.000614	0.91	49.51	33.26	0.24
Bolton Reach	8.344	10-year	58.76	212.04	214.22	213.04	214.27	0.000565	0.98	59.97	34.48	0.23
Bolton Reach	8.344	25-year	77.45	212.04	214.58	213.19	214.6	0.000226	0.7	189.47	251.3	0.15
Bolton Reach	8.344	50-year	92.6	212.04	214.85	213.31	214.86	0.000163	0.64	257.06	254.45	0.13
Bolton Reach	8.344	100-year	107.99	212.04	215.3	213.41	215.31	0.000085	0.52	377.53	284.04	0.1
Bolton Reach	8.344	Regional	463.25	212.04	215.15	214.73	0.00209	2.5	336.04	273.41	0.48	

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Cold Creek  
**Reach:** East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	8.338	2-year	27.15	212.04	213.42	212.74	213.46	0.000765	0.81	33.63	32.22	0.25
Bolton Reach	8.338	5-year	44.96	212.04	213.9	212.92	213.94	0.000637	0.91	49.53	34.53	0.24
Bolton Reach	8.338	10-year	58.76	212.04	214.23	213.05	214.25	0.000297	0.71	135.61	223.55	0.17
Bolton Reach	8.338	25-year	77.45	212.04	214.58	213.2	214.59	0.000182	0.62	223.36	272.45	0.14
Bolton Reach	8.338	50-year	92.6	212.04	214.85	213.32	214.86	0.000129	0.57	296.71	275.29	0.12
Bolton Reach	8.338	100-year	107.99	212.04	215.3	213.42	215.31	0.000066	0.46	426.76	304.3	0.09
Bolton Reach	8.338	Regional	463.25	212.04	215.15	214.64	215.26	0.001658	2.21	380.23	293	0.43
Bolton Reach	8.332	2-year	27.15	212.04	213.35	212.84	213.42	0.001716	1.16	23.49	23.93	0.37
Bolton Reach	8.332	5-year	44.96	212.04	213.83	213.07	213.91	0.001359	1.27	35.39	26.09	0.35
Bolton Reach	8.332	10-year	58.76	212.04	214.14	213.21	214.23	0.001208	1.35	43.73	28.89	0.34
Bolton Reach	8.332	25-year	77.45	212.04	214.58	213.4	214.59	0.000119	0.5	288.44	269.03	0.11
Bolton Reach	8.332	50-year	92.6	212.04	214.85	213.54	214.85	0.000089	0.47	360.49	269.88	0.1
Bolton Reach	8.332	100-year	107.99	212.04	215.3	213.67	215.31	0.000049	0.39	489.98	315.04	0.07
Bolton Reach	8.332	Regional	463.25	212.04	215.15	214.55	215.22	0.00121	1.86	441.9	293	0.37
Bolton Reach	8.326	2-year	27.15	211.92	213.32	212.74	213.4	0.001751	1.23	22.11	20.87	0.38
Bolton Reach	8.326	5-year	44.96	211.92	213.79	213.01	213.89	0.001539	1.38	32.57	23.27	0.37
Bolton Reach	8.326	10-year	58.76	211.92	214.1	213.18	214.21	0.00142	1.47	39.95	25.14	0.37
Bolton Reach	8.326	25-year	77.45	211.92	214.58	213.38	214.59	0.000101	0.47	308.42	272.31	0.1
Bolton Reach	8.326	50-year	92.6	211.92	214.85	213.54	214.85	0.000077	0.44	381.39	273.06	0.09
Bolton Reach	8.326	100-year	107.99	211.92	215.3	213.68	215.3	0.000044	0.37	511.09	299.08	0.07
Bolton Reach	8.326	Regional	463.25	211.92	215.13	214.5	215.2	0.001086	1.78	461.91	291.71	0.35
Bolton Reach	8.32	2-year	27.15	211.81	213.3	212.69	213.38	0.00174	1.25	21.64	19.61	0.38
Bolton Reach	8.32	5-year	44.96	211.81	213.77	212.98	213.87	0.001608	1.43	31.42	21.9	0.38
Bolton Reach	8.32	10-year	58.76	211.81	214.07	213.15	214.19	0.001521	1.53	38.33	23.64	0.38
Bolton Reach	8.32	25-year	77.45	211.81	214.58	213.37	214.58	0.000149	0.57	270.15	277.91	0.12
Bolton Reach	8.32	50-year	92.6	211.81	214.84	213.53	214.85	0.000108	0.53	347.42	296.69	0.11
Bolton Reach	8.32	100-year	107.99	211.81	215.3	213.68	215.3	0.000057	0.43	489.31	326.16	0.08
Bolton Reach	8.32	Regional	463.25	211.81	215.09	214.5	215.19	0.001568	2.14	422.93	313.26	0.42
Bolton Reach	8.314	2-year	27.15	211.69	213.26	212.61	213.34	0.001569	1.25	21.76	18.22	0.36
Bolton Reach	8.314	5-year	44.96	211.69	213.73	212.89	213.84	0.001559	1.47	30.6	19.72	0.38
Bolton Reach	8.314	10-year	58.76	211.69	214.03	213.08	214.16	0.001556	1.6	36.66	20.81	0.38
Bolton Reach	8.314	25-year	77.45	211.69	214.41	213.3	214.56	0.001415	1.74	45.05	23.49	0.38
Bolton Reach	8.314	50-year	92.6	211.69	214.84	213.46	214.85	0.000135	0.61	294.81	255.33	0.12
Bolton Reach	8.314	100-year	107.99	211.69	215.3	213.62	215.3	0.000007	0.49	418.11	282.38	0.09
Bolton Reach	8.314	Regional	463.25	211.69	214.98	214.57	215.14	0.002467	2.68	330.5	264.62	0.52
Bolton Reach	8.308	2-year	27.15	211.69	213.3		213.31	0.000281	0.53	72.08	73.63	0.15
Bolton Reach	8.308	5-year	44.96	211.69	213.79		213.8	0.000252	0.59	114.35	100.92	0.15
Bolton Reach	8.308	10-year	58.76	211.69	214.1		214.11	0.000203	0.58	147.62	108.24	0.14
Bolton Reach	8.308	25-year	77.45	211.69	214.5		214.51	0.000157	0.59	195.59	165.01	0.13
Bolton Reach	8.308	50-year	92.6	211.69	214.84		214.85	0.000121	0.57	253.14	174.39	0.11
Bolton Reach	8.308	100-year	107.99	211.69	215.29		215.3	0.000079	0.51	334.73	190.74	0.09
Bolton Reach	8.308	Regional	463.25	211.69	214.87		215.07	0.002879	2.78	258.39	174.43	0.56
Bolton Reach	8.302	2-year	27.15	211.69	213.03	212.78	213.24	0.005541	1.99	13.66	75.71	0.66
Bolton Reach	8.302	5-year	44.96	211.69	213.46	213.1	213.71	0.004612	2.23	20.14	89.53	0.63
Bolton Reach	8.302	10-year	58.76	211.69	213.72	213.29	214.02	0.004375	2.41	24.34	104.46	0.63
Bolton Reach	8.302	25-year	77.45	211.69	214.06	213.54	214.14	0.003939	2.58	30.05	108.27	0.61
Bolton Reach	8.302	50-year	92.6	211.69	214.39	213.71	214.74	0.003217	2.6	35.66	124.64	0.57
Bolton Reach	8.302	100-year	107.99	211.69	215.29	213.88	215.3	0.000067	0.45	351.43	177.38	0.09
Bolton Reach	8.302	Regional	463.25	211.69	214.84	214.5	215	0.002409	2.43	274.02	170.14	0.5
Bolton Reach	8.295	Bridge										
Bolton Reach	8.29	2-year	27.15	211.68	212.61	212.61	212.95	0.01424	2.57	10.57	107.59	1.01
Bolton Reach	8.29	5-year	44.96	211.68	212.89	212.89	213.34	0.012529	2.96	15.17	116.77	1
Bolton Reach	8.29	10-year	58.76	211.68	213.07	213.07	213.6	0.012005	3.22	18.23	124.39	1
Bolton Reach	8.29	25-year	77.45	211.68	213.29	213.29	213.92	0.011179	3.52	21.98	136.97	1
Bolton Reach	8.29	50-year	92.6	211.68	213.44	213.44	214.16	0.010959	3.76	24.61	145.8	1
Bolton Reach	8.29	100-year	107.99	211.68	213.6	213.6	214.39	0.010482	3.95	27.35	150.72	1
Bolton Reach	8.29	Regional	463.25	211.68	214.82	214.4	214.89	0.001106	1.76	413.17	235.09	0.35
Bolton Reach	8.284	2-year	27.15	210.98	211.99		212.07	0.003286	1.41	23.28	35.23	0.5
Bolton Reach	8.284	5-year	44.96	210.98	212.35		212.44	0.002688	1.46	44.58	82.89	0.47
Bolton Reach	8.284	10-year	58.76	210.98	212.56		212.63	0.002068	1.4	64.53	105.42	0.42
Bolton Reach	8.284	25-year	77.45	210.98	212.78		212.85	0.00152	1.35	89.43	114.94	0.37
Bolton Reach	8.284	50-year	92.6	210.98	212.95		213.01	0.001279	1.34	109.01	121.9	0.35
Bolton Reach	8.284	100-year	107.99	210.98	213.1		213.15	0.001164	1.36	127.59	135.28	0.34
Bolton Reach	8.284	Regional	463.25	210.98	214.78		214.86	0.000765	1.75	491.71	281.1	0.31
Bolton Reach	8.278	2-year	27.15	210.3	211.78		211.88	0.002797	1.41	19.27	21.1	0.47
Bolton Reach	8.278	5-year	44.96	210.3	212.12		212.26	0.002936	1.68	26.92	24.94	0.5
Bolton Reach	8.278	10-year	58.76	210.3	212.27		212.46	0.003244	1.92	31.02	26.93	0.54
Bolton Reach	8.278	25-year	77.45	210.3	212.43		212.69	0.003851	2.25	35.33	28.87	0.6
Bolton Reach	8.278	50-year	92.6	210.3	212.53	212.13	212.85	0.004411	2.52	38.97	55.32	0.65
Bolton Reach	8.278	100-year	107.99	210.3	212.62	212.27	212.99	0.004841	2.74	43.98	55.53	0.68
Bolton Reach	8.278	Regional	463.25	210.3	214	214	214.69	0.0055	4.38	170.6	128.8	0.8
Bolton Reach	8.272	2-year	27.15	210.3	211.7		211.83	0.003459	1.57	17.33	18.95	0.52
Bolton Reach	8.272	5-year	44.96	210.3	212.01		212.19	0.004189	1.9	23.83	34.67	0.59
Bolton Reach	8.272	10-year	58.76	210.3	212.16		212.39	0.004398	2.13	29.87	41.91	0.62
Bolton Reach	8.272	25-year	77.45	210.3	212.34		212.61	0.004575	2.37	37.41	44.8	0.64
Bolton Reach	8.272	50-year	92.6	210.3	212.45		212.76	0.004851	2.57	42.43	46.63	0.67
Bolton Reach	8.272	100-year	107.99	210.3	212.52	212.37	212.9	0.005594	2.85	45.9	52.83	0.73
Bolton Reach	8.272	Regional	463.25	210.3	214.03		214.48	0.003973	3.77	207.5	145.96	0.69
Bolton Reach	8.266	2-year	27.15	210.3	211.36		211.47	0.003484	1.43	18.95	23.97	0.51
Bolton Reach	8.266	5-year	44.96	210.3	211.62		211.78	0.003834	1.76	26.98	46.62	0.56
Bolton Reach	8.266	10-year	58.76	210.3	211.78		211.96	0.003803	1.93	35.96	67.19	0.57
Bolton Reach	8.266											

**HEC-RAS Hydraulic Output Summary**

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	8.254	2-year	27.15	210.1	211.01	210.9	211.2	0.008653	1.92	14.35	42.09	0.78
Bolton Reach	8.254	5-year	44.96	210.1	211.31		211.49	0.006227	1.94	29.26	57.34	0.69
Bolton Reach	8.254	10-year	58.76	210.1	211.49		211.67	0.005343	1.96	40.54	66.59	0.65
Bolton Reach	8.254	25-year	77.45	210.1	211.71		211.87	0.004008	1.95	65.75	128.02	0.59
Bolton Reach	8.254	50-year	92.6	210.1	211.92		212.04	0.002583	1.76	95.13	146.78	0.48
Bolton Reach	8.254	100-year	107.99	210.1	212.11		212.21	0.001872	1.63	123.63	156.01	0.42
Bolton Reach	8.254	Regional	463.25	210.1	214.15		214.19	0.000432	1.38	687.44	333.08	0.23
Bolton Reach	8.248	2-year	27.15	209.76	210.96	210.55	211.02	0.002059	1.12	24.17	29.64	0.4
Bolton Reach	8.248	5-year	44.96	209.76	211.25	210.74	211.34	0.002113	1.36	33.05	31.08	0.42
Bolton Reach	8.248	10-year	58.76	209.76	211.42	210.88	211.54	0.002249	1.53	38.33	31.91	0.44
Bolton Reach	8.248	25-year	77.45	209.76	211.62	211.03	211.77	0.002365	1.73	44.72	37.1	0.47
Bolton Reach	8.248	50-year	92.6	209.76	211.76	211.15	211.94	0.002449	1.88	49.3	40.09	0.48
Bolton Reach	8.248	100-year	107.99	209.76	211.9	211.26	212.11	0.002518	2.02	53.65	42.94	0.49
Bolton Reach	8.248	Regional	463.25	209.76	214.09	213.01	214.16	0.000561	1.65	578.5	341.22	0.27
Bolton Reach	8.245	Bridge										
Bolton Reach	8.236	2-year	27.15	209.57	210.92	210.37	210.98	0.001414	1.03	26.38	29.7	0.34
Bolton Reach	8.236	5-year	44.96	209.57	211.21	210.6	211.3	0.001689	1.3	34.67	32.25	0.38
Bolton Reach	8.236	10-year	58.76	209.57	211.38	210.73	211.49	0.001929	1.48	39.62	33.5	0.42
Bolton Reach	8.236	25-year	77.45	209.57	211.57	210.9	211.72	0.00216	1.7	45.63	34.92	0.45
Bolton Reach	8.236	50-year	92.6	209.57	211.71	211.03	211.88	0.002283	1.85	50.02	35.87	0.47
Bolton Reach	8.236	100-year	107.99	209.57	211.83	211.14	212.04	0.00241	2	54.03	36.73	0.49
Bolton Reach	8.236	Regional	463.25	209.57	213.92	213.05	214.09	0.001043	2.21	372.42	241.2	0.36
Bolton Reach	8.23	2-year	27.15	209.45	210.84		210.91	0.001729	1.23	23.43	30.5	0.38
Bolton Reach	8.23	5-year	44.96	209.45	211.09		211.21	0.002156	1.58	32.18	36.74	0.44
Bolton Reach	8.23	10-year	58.76	209.45	211.23		211.39	0.002502	1.83	37.48	38.63	0.48
Bolton Reach	8.23	25-year	77.45	209.45	211.4		211.6	0.002871	2.1	44.06	40.86	0.52
Bolton Reach	8.23	50-year	92.6	209.45	211.52		211.76	0.003091	2.29	49.21	42.86	0.55
Bolton Reach	8.23	100-year	107.99	209.45	211.63		211.91	0.003346	2.48	53.99	46.02	0.58
Bolton Reach	8.23	Regional	463.25	209.45	213.33	213	213.9	0.003782	4.06	192.23	128.34	0.69
Bolton Reach	8.224	2-year	27.15	209.45	210.81		210.88	0.001426	1.15	24.83	29.72	0.35
Bolton Reach	8.224	5-year	44.96	209.45	211.06		211.17	0.001938	1.53	32.97	37.17	0.42
Bolton Reach	8.224	10-year	58.76	209.45	211.19		211.35	0.00238	1.8	38.11	42.27	0.47
Bolton Reach	8.224	25-year	77.45	209.45	211.34		211.55	0.002911	2.12	44.77	48.08	0.53
Bolton Reach	8.224	50-year	92.6	209.45	211.44		211.7	0.003266	2.34	50.17	52.32	0.57
Bolton Reach	8.224	100-year	107.99	209.45	211.54		211.84	0.00363	2.56	55.25	55.73	0.6
Bolton Reach	8.224	Regional	463.25	209.45	212.88	212.88	213.78	0.006436	4.9	158.94	99.65	0.88
Bolton Reach	8.218	2-year	27.15	209.45	210.76		210.82	0.001533	1.13	24.97	31.3	0.36
Bolton Reach	8.218	5-year	44.96	209.45	210.98		211.09	0.002096	1.5	32.79	38.29	0.43
Bolton Reach	8.218	10-year	58.76	209.45	211.09		211.25	0.002693	1.8	37.22	46.93	0.49
Bolton Reach	8.218	25-year	77.45	209.45	211.2		211.42	0.003502	2.16	42.96	57.24	0.57
Bolton Reach	8.218	50-year	92.6	209.45	211.34		211.56	0.004062	2.41	47.91	64.82	0.62
Bolton Reach	8.218	100-year	107.99	209.45	211.32	211.05	211.67	0.00492	2.71	50.97	69.1	0.68
Bolton Reach	8.218	Regional	463.25	209.45	212.62	212.57	213.27	0.005718	4.34	186.47	129.71	0.81
Bolton Reach	8.206	2-year	27.15	209.45	210.25	210.25	210.53	0.010957	2.4	13.19	77.79	0.9
Bolton Reach	8.206	5-year	44.96	209.45	210.63	210.63	210.83	0.005192	2.18	37.33	160.63	0.66
Bolton Reach	8.206	10-year	58.76	209.45	210.73	210.73	210.94	0.005394	2.36	48.83	170.58	0.69
Bolton Reach	8.206	25-year	77.45	209.45	211.2	211.42	211.65	0.004062	2.72	71.36	188.16	0.74
Bolton Reach	8.206	50-year	92.6	209.45	211.28	210.93	211.56	0.004062	2.72	94.81	204.21	0.64
Bolton Reach	8.206	100-year	107.99	209.45	211.06	210.96	211.24	0.004318	2.48	106.55	387	0.22
Bolton Reach	8.206	Regional	463.25	209.45	212.97	211.81	213	0.000391	1.28	771.55		
Bolton Reach	8.2	2-year	27.15	209.45	210.34	209.77	210.34	0.000136	0.29	161.27	283.8	0.1
Bolton Reach	8.2	5-year	44.96	209.45	210.58	209.85	210.59	0.000114	0.32	231.9	285.33	0.1
Bolton Reach	8.2	10-year	58.76	209.45	210.71	209.9	210.71	0.000122	0.35	267.42	286.08	0.1
Bolton Reach	8.2	25-year	77.45	209.45	210.86	209.95	210.86	0.000132	0.39	309.35	286.97	0.11
Bolton Reach	8.2	50-year	92.6	209.45	210.97	209.99	210.98	0.000134	0.42	343.34	287.69	0.11
Bolton Reach	8.2	100-year	107.99	209.45	211.13	209.99	211.14	0.000121	0.43	389.84	289.86	0.11
Bolton Reach	8.2	Regional	463.25	209.45	212.96	210.46	212.97	0.000105	0.66	1056.5	349.02	0.11
Bolton Reach	8.19	2-year	27.15	208.8	210.23		210.28	0.001173	1.16	47.09	101.61	0.32
Bolton Reach	8.19	5-year	44.96	208.8	210.47		210.53	0.001345	1.39	73.05	116.26	0.36
Bolton Reach	8.19	10-year	58.76	208.8	210.57	210.2	210.65	0.001653	1.61	85.09	122.46	0.4
Bolton Reach	8.19	25-year	77.45	208.8	210.69		210.79	0.002003	1.85	100	129.73	0.44
Bolton Reach	8.19	50-year	92.6	208.8	210.79		210.91	0.002109	1.98	114.32	136.35	0.46
Bolton Reach	8.19	100-year	107.99	208.8	210.97	210.68	210.83	0.001782	1.93	140.12	147.53	0.43
Bolton Reach	8.19	Regional	463.25	208.8	212.78	212.92	212.71	0.001448	2.65	468.73	214.8	0.43
Bolton Reach	8.18	2-year	27.15	208.81	209.6	209.76	209.78	0.010276	1.92	18.73	79.96	0.83
Bolton Reach	8.18	5-year	44.96	208.81	209.76	209.76	209.97	0.009884	2.22	31.91	91.81	0.85
Bolton Reach	8.18	10-year	58.76	208.81	209.95		210.11	0.005809	2.01	51.49	107.02	0.68
Bolton Reach	8.18	25-year	77.45	208.81	210.25		210.34	0.002815	1.69	99.77	177.5	0.5
Bolton Reach	8.18	50-year	92.6	208.81	210.48		210.54	0.001636	1.45	141.73	181.99	0.39
Bolton Reach	8.18	100-year	107.99	208.81	210.79	210.83	210.83	0.000873	1.21	199.13	187.84	0.29
Bolton Reach	8.18	Regional	463.25	208.81	212.64		212.71	0.000728	1.79	578.22	220.51	0.3
Bolton Reach	8.17	2-year	27.15	208	209.16		209.21	0.001416	0.96	29.76	53.16	0.33
Bolton Reach	8.17	5-year	44.96	208	209.54		209.59	0.000994	1.03	58.8	98.26	0.3
Bolton Reach	8.17	10-year	58.76	208	209.8		209.85	0.00078	1.04	86.82	117.92	0.27
Bolton Reach	8.17	25-year	77.45	208	210.13		210.17	0.000584	1.02	129.74	141.33	0.24
Bolton Reach	8.17	50-year	92.6	208	210.39		210.42	0.000475	1.01	167.7	157.48	0.22
Bolton Reach	8.17	100-year	107.99	208	210.73	210.76	210.76	0.000326	0.92	224.07	169.39	0.19
Bolton Reach	8.17	Regional	463.25	208	212.54		212.62	0.000532	1.72	561.76	204.04	0.27
Bolton Reach	8.16	2-year	27.15	208	209.09		209.13	0.001508	0.91	32.02	66.58	0.34
Bolton Reach	8.16	5-year	44.96	208	209.5		209.54	0.000844	0.91	61.2	75.27	0.27
Bolton Reach	8.16	10-year	58.76	208	209.77		209.81	0.000676	0.94	82.32	83.23	0.25
Bolton Reach	8.16	25-year	77.45	208	210.1		210.15	0.000542	0.96	111.91	95.14	0.23
Bolton Reach	8.16	50-year	92.6	208	210.36		210.4	0.000447				

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Cold Creek  
**Reach:** East Branch



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Bolton Reach	8.15	2-year	27.15	207.5	209.02	208.14	209.06	0.000734	0.98	27.62	23.22	0.26
Bolton Reach	8.15	5-year	44.96	207.5	209.39	208.38	209.47	0.000952	1.3	34.58	27.14	0.31
Bolton Reach	8.15	10-year	58.76	207.5	209.62	208.55	209.73	0.001094	1.51	38.96	38.87	0.33
Bolton Reach	8.15	25-year	77.45	207.5	209.91	208.75	210.06	0.001229	1.74	44.4	63.72	0.36
Bolton Reach	8.15	50-year	92.6	207.5	210.13	208.9	210.31	0.001307	1.91	48.52	75.38	0.38
Bolton Reach	8.15	100-year	107.99	207.5	210.58	209.04	210.69	0.000782	1.54	100.63	88.75	0.3
Bolton Reach	8.15	Regional	463.25	207.5	212.15	211.09	212.48	0.001646	2.92	286.37	130.29	0.46
Bolton Reach	8.145	Bridge										
Bolton Reach	8.14	2-year	27.15	207.51	209	208.13	209.05	0.000733	0.98	27.6	31.09	0.26
Bolton Reach	8.14	5-year	44.96	207.51	209.36	208.37	209.44	0.000967	1.31	34.38	38.84	0.31
Bolton Reach	8.14	10-year	58.76	207.51	209.58	208.53	209.7	0.001126	1.52	38.56	45.42	0.34
Bolton Reach	8.14	25-year	77.45	207.51	209.81	208.74	209.98	0.001364	1.8	42.97	55.95	0.38
Bolton Reach	8.14	50-year	92.6	207.51	209.96	208.89	210.17	0.00158	2.02	45.76	62.62	0.42
Bolton Reach	8.14	100-year	107.99	207.51	210.09	209.03	210.34	0.001802	2.24	48.25	66.92	0.45
Bolton Reach	8.14	Regional	463.25	207.51	212.15	210.76	212.45	0.001335	2.72	288.47	127.42	0.42
Bolton Reach	8.13	2-year	27.15	207.49	208.99		209.03	0.001418	0.89	30.37	40.73	0.33
Bolton Reach	8.13	5-year	44.96	207.49	209.36		209.41	0.001046	0.98	47.86	53.02	0.3
Bolton Reach	8.13	10-year	58.76	207.49	209.6		209.65	0.000933	1.05	61.23	61.86	0.29
Bolton Reach	8.13	25-year	77.45	207.49	209.85		209.92	0.00088	1.14	78.21	73.01	0.29
Bolton Reach	8.13	50-year	92.6	207.49	210.02		210.09	0.000881	1.22	90.81	79.96	0.3
Bolton Reach	8.13	100-year	107.99	207.49	210.17		210.25	0.000864	1.29	103.1	83.32	0.3
Bolton Reach	8.13	Regional	463.25	207.49	212.18		212.4	0.001053	2.29	322.55	135.19	0.37
Bolton Reach	8.12	2-year	27.15	207.51	208.91		208.96	0.000987	1.08	44.96	68.39	0.3
Bolton Reach	8.12	5-year	44.96	207.51	209.3		209.35	0.000875	1.21	75.4	86.85	0.29
Bolton Reach	8.12	10-year	58.76	207.51	209.54		209.6	0.000829	1.29	97.76	97.81	0.29
Bolton Reach	8.12	25-year	77.45	207.51	209.8		209.86	0.000829	1.39	124.29	109.4	0.3
Bolton Reach	8.12	50-year	92.6	207.51	209.96		210.03	0.000854	1.48	143.01	116.89	0.31
Bolton Reach	8.12	100-year	107.99	207.51	210.12		210.19	0.000856	1.55	161.26	119.71	0.31
Bolton Reach	8.12	Regional	463.25	207.51	212.16		212.31	0.001067	2.56	441.12	155.58	0.38
Bolton Reach	8.11	2-year	27.15	207.15	208.85		208.88	0.000517	0.82	55.64	104.34	0.22
Bolton Reach	8.11	5-year	44.96	207.15	209.25		209.28	0.000417	0.87	107.3	136.96	0.21
Bolton Reach	8.11	10-year	58.76	207.15	209.5		209.53	0.000375	0.9	142.55	145.05	0.2
Bolton Reach	8.11	25-year	77.45	207.15	209.76		209.79	0.00037	0.97	181.86	158.37	0.2
Bolton Reach	8.11	50-year	92.6	207.15	209.93		209.96	0.00038	1.02	208.87	166.9	0.21
Bolton Reach	8.11	100-year	107.99	207.15	210.08		210.12	0.000385	1.07	235.09	172.05	0.21
Bolton Reach	8.11	Regional	463.25	207.15	212.15		212.21	0.000472	1.74	621.11	198.7	0.26
Bolton Reach	8.1	2-year	27.15	206.82	208.79		208.81	0.000329	0.68	82.23	151.66	0.17
Bolton Reach	8.1	5-year	44.96	206.82	209.22		209.23	0.000253	0.7	157.71	204.33	0.16
Bolton Reach	8.1	10-year	58.76	206.82	209.47		209.49	0.000214	0.7	211.25	212.3	0.15
Bolton Reach	8.1	25-year	77.45	206.82	209.73		209.75	0.0002	0.73	270.15	230.73	0.15
Bolton Reach	8.1	50-year	92.6	206.82	209.9		209.92	0.000202	0.76	309.16	237.66	0.15
Bolton Reach	8.1	100-year	107.99	206.82	210.06		210.07	0.000204	0.79	346.58	249.63	0.15
Bolton Reach	8.1	Regional	463.25	206.82	212.12		212.15	0.000242	1.25	962.42	319.81	0.18
Bolton Reach	8.09	2-year	27.15	206.81	208.79		208.81	0.000226	0.57	98.62	146.16	0.15
Bolton Reach	8.09	5-year	44.96	206.81	209.21		209.23	0.000197	0.63	164.06	174.41	0.14
Bolton Reach	8.09	10-year	58.76	206.81	209.47		209.48	0.000192	0.67	212.49	208.65	0.14
Bolton Reach	8.09	25-year	77.45	206.81	209.73		209.74	0.000186	0.71	276.02	258.79	0.14
Bolton Reach	8.09	50-year	92.6	206.81	209.9		209.91	0.000202	0.77	319.78	269.83	0.15
Bolton Reach	8.09	100-year	107.99	206.81	210.05		210.07	0.0002	0.8	362.17	277.51	0.15
Bolton Reach	8.09	Regional	463.25	206.81	212.12		212.15	0.000213	1.19	1016.6	336.52	0.17
Bolton Reach	8.08	2-year	27.15	206.82	208.78	207.52	208.8	0.000235	0.59	54.94	160.42	0.15
Bolton Reach	8.08	5-year	44.96	206.82	209.19	207.8	209.21	0.000279	0.75	74.79	199.24	0.17
Bolton Reach	8.08	10-year	58.76	206.82	209.43	207.97	209.47	0.000311	0.86	86.79	208.21	0.18
Bolton Reach	8.08	25-year	77.45	206.82	209.72	208.15	209.74	0.000173	0.69	275.7	391.34	0.14
Bolton Reach	8.08	50-year	92.6	206.82	209.89	208.27	209.9	0.000151	0.68	359.33	410.55	0.13
Bolton Reach	8.08	100-year	107.99	206.82	210.05	208.39	210.06	0.000153	0.71	422.17	437.44	0.13
Bolton Reach	8.08	Regional	463.25	206.82	212.12	209.78	212.14	0.000105	0.84	1467.46	506.67	0.12
Bolton Reach	8.075	Bridge										
Bolton Reach	8.07	2-year	27.15	206.58	208.77	207.41	208.78	0.000195	0.5	60.55	166.33	0.13
Bolton Reach	8.07	5-year	44.96	206.58	209.17	207.81	209.19	0.000224	0.63	80.79	204.41	0.15
Bolton Reach	8.07	10-year	58.76	206.58	209.42	207.98	209.44	0.000182	0.62	146.63	211.28	0.14
Bolton Reach	8.07	25-year	77.45	206.58	209.7	208.13	209.71	0.000141	0.6	260.92	401.52	0.12
Bolton Reach	8.07	50-year	92.6	206.58	209.87	208.22	209.88	0.000096	0.52	433.29	410.1	0.1
Bolton Reach	8.07	100-year	107.99	206.58	210.04	208.31	210.04	0.000099	0.55	493.58	424.76	0.11
Bolton Reach	8.07	Regional	463.25	206.58	212.1	209.66	212.11	0.00009	0.76	1523.68	499.08	0.11
Bolton Reach	8.06	2-year	27.15	206.58	208.76		208.77	0.000097	0.45	162.3	227.2	0.1
Bolton Reach	8.06	5-year	44.96	206.58	209.17		209.18	0.000087	0.48	257.86	240.41	0.1
Bolton Reach	8.06	10-year	58.76	206.58	209.42		209.43	0.000085	0.51	318.16	247.32	0.1
Bolton Reach	8.06	25-year	77.45	206.58	209.7		209.7	0.000086	0.54	387.66	253.31	0.1
Bolton Reach	8.06	50-year	92.6	206.58	209.87		209.88	0.000091	0.58	431.71	256.71	0.1
Bolton Reach	8.06	100-year	107.99	206.58	210.03		210.04	0.000095	0.61	473.72	260	0.11
Bolton Reach	8.06	Regional	463.25	206.58	212.08		212.1	0.000173	1.14	1045.47	292.94	0.16

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Humber River  
**Reach:** Downstream



#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
DOWNSTREAM	8.05	2-year	39.58	206.58	208.73		208.76	0.000433	0.83	96.16	179.51	0.2
DOWNSTREAM	8.05	5-year	66.42	206.58	209.14		209.17	0.000373	0.89	173.83	196.79	0.19
DOWNSTREAM	8.05	10-year	87.28	206.58	209.39		209.42	0.000355	0.93	223.4	203.67	0.19
DOWNSTREAM	8.05	25-year	114.97	206.58	209.67		209.69	0.000345	0.99	280.77	210.1	0.19
DOWNSTREAM	8.05	50-year	136.72	206.58	209.84		209.87	0.000353	1.04	317.02	213.56	0.2
DOWNSTREAM	8.05	100-year	159.21	206.58	210		210.03	0.000363	1.1	351.64	216.82	0.2
DOWNSTREAM	8.05	Regional	674.4	206.58	212		212.08	0.000593	1.97	820.62	249.41	0.28
DOWNSTREAM	8.04	2-year	39.58	206.57	208.6		208.69	0.001226	1.42	57.98	213.95	0.34
DOWNSTREAM	8.04	5-year	66.42	206.57	209.09		209.13	0.000585	1.15	164.99	221.42	0.24
DOWNSTREAM	8.04	10-year	87.28	206.57	209.35		209.38	0.000482	1.12	223.23	225.2	0.22
DOWNSTREAM	8.04	25-year	114.97	206.57	209.64		209.67	0.000426	1.13	287.9	229.9	0.22
DOWNSTREAM	8.04	50-year	136.72	206.57	209.81		209.84	0.000422	1.17	327.93	233.13	0.22
DOWNSTREAM	8.04	100-year	159.21	206.57	209.97		210	0.000422	1.21	365.95	236.15	0.22
DOWNSTREAM	8.04	Regional	674.4	206.57	211.98		212.04	0.000596	2	867.01	260	0.28
DOWNSTREAM	8.03	2-year	39.58	206.58	208.55		208.6	0.000743	1.15	84.48	195.74	0.27
DOWNSTREAM	8.03	5-year	66.42	206.58	209.07		209.09	0.000396	0.99	187.09	202.21	0.2
DOWNSTREAM	8.03	10-year	87.28	206.58	209.33		209.36	0.000355	1.01	240.69	204.66	0.2
DOWNSTREAM	8.03	25-year	114.97	206.58	209.62		209.64	0.000338	1.05	299.49	207.25	0.2
DOWNSTREAM	8.03	50-year	136.72	206.58	209.79		209.81	0.000347	1.11	335.34	208.75	0.2
DOWNSTREAM	8.03	100-year	159.21	206.58	209.95		209.98	0.000357	1.16	369.15	210.15	0.2
DOWNSTREAM	8.03	Regional	674.4	206.58	211.93		212	0.00063	2.11	801.06	225.38	0.29
DOWNSTREAM	8.022	2-year	39.58	206.57	208.53		208.56	0.000443	0.87	84.42	111.52	0.21
DOWNSTREAM	8.022	5-year	66.42	206.57	209.04		209.07	0.000371	0.95	145.6	127.8	0.2
DOWNSTREAM	8.022	10-year	87.28	206.57	209.3		209.33	0.000387	1.04	179.36	134.12	0.21
DOWNSTREAM	8.022	25-year	114.97	206.57	209.58		209.62	0.000415	1.15	217.79	141.77	0.22
DOWNSTREAM	8.022	50-year	136.72	206.57	209.74		209.79	0.000455	1.25	241.84	147.63	0.23
DOWNSTREAM	8.022	100-year	159.21	206.57	209.9		209.95	0.000492	1.35	265.22	153.1	0.24
DOWNSTREAM	8.022	Regional	674.4	206.57	211.78		211.95	0.001083	2.73	631.17	233.56	0.39
DOWNSTREAM	8.021	2-year	39.58	206.43	208.52		208.54	0.000196	0.62	134.46	137.1	0.14
DOWNSTREAM	8.021	5-year	66.42	206.43	209.03		209.05	0.000192	0.72	213.7	172.26	0.15
DOWNSTREAM	8.021	10-year	87.28	206.43	209.29		209.31	0.000206	0.8	259.73	184.36	0.15
DOWNSTREAM	8.021	25-year	114.97	206.43	209.57		209.59	0.000225	0.89	313.13	196.99	0.16
DOWNSTREAM	8.021	50-year	136.72	206.43	209.74		209.76	0.000246	0.97	346.53	203.66	0.17
DOWNSTREAM	8.021	100-year	159.21	206.43	209.89		209.92	0.000266	1.04	378.82	209.9	0.18
DOWNSTREAM	8.021	Regional	674.4	206.43	211.79		211.88	0.000588	2.08	849	281.93	0.29
DOWNSTREAM	8.02	2-year	39.58	206.36	208.49		208.51	0.000279	0.73	95.4	120.57	0.17
DOWNSTREAM	8.02	5-year	66.42	206.36	209		209.02	0.00026	0.82	166.37	155.94	0.17
DOWNSTREAM	8.02	10-year	87.28	206.36	209.25		209.28	0.000273	0.9	207.48	164.83	0.18
DOWNSTREAM	8.02	25-year	114.97	206.36	209.53		209.56	0.000294	1	254.42	174.61	0.19
DOWNSTREAM	8.02	50-year	136.72	206.36	209.69		209.73	0.000322	1.08	283.36	181.55	0.2
DOWNSTREAM	8.02	100-year	159.21	206.36	209.85		209.89	0.000349	1.16	311.47	188.04	0.21
DOWNSTREAM	8.02	Regional	674.4	206.36	211.68		211.8	0.000741	2.28	716.05	239.1	0.32
DOWNSTREAM	8.01	2-year	39.58	206.36	208.41	207.2	208.45	0.000463	0.93	65.12	102.14	0.21
DOWNSTREAM	8.01	5-year	66.42	206.36	208.93	207.52	208.97	0.000411	1.03	138.07	180.59	0.21
DOWNSTREAM	8.01	10-year	87.28	206.36	209.19	207.75	209.23	0.000397	1.08	188	197.04	0.21
DOWNSTREAM	8.01	25-year	114.97	206.36	209.47	208.08	209.51	0.000389	1.14	244.33	205.19	0.21
DOWNSTREAM	8.01	50-year	136.72	206.36	209.63	208.34	209.67	0.000412	1.22	277.76	213.21	0.22
DOWNSTREAM	8.01	100-year	159.21	206.36	209.78	208.48	209.83	0.000433	1.29	310.35	221.45	0.23
DOWNSTREAM	8.01	Regional	674.4	206.36	211.58	209.92	211.69	0.000772	2.31	756.2	267.5	0.33

**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Humber River  
**Reach:** Hopeful Creek

### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Hopeful Creek	9.7	2-year	3.55	249	249.68	249.68	249.77	0.016671	2.08	4.72	22.44	0.81
Hopeful Creek	9.7	5-year	5.85	249	250.94		250.95	0.000042	0.21	78.89	94.56	0.05
Hopeful Creek	9.7	10-year	7.55	249	251.92		251.92	0.000006	0.11	197.93	149.95	0.02
Hopeful Creek	9.7	25-year	9.83	249	253.44		253.44	0.000001	0.05	493.14	237.2	0.01
Hopeful Creek	9.7	50-year	11.75	249	255.02		255.02	0	0.03	939.75	327.69	0
Hopeful Creek	9.7	100-year	13.71	249	257.04		257.04	0	0.02	1742.85	494.59	0
Hopeful Creek	9.7	Regional	41.39	249	257.79		257.79	0	0.06	2141.93	574.39	0.01
Hopeful Creek	9.692	2-year	3.55	248	249.44	248.7	249.52	0.001338	1.25	2.84	61.31	0.34
Hopeful Creek	9.692	5-year	5.85	248	250.88	248.98	250.93	0.00035	1.02	5.72	109.03	0.19
Hopeful Creek	9.692	10-year	7.55	248	251.86	249.16	251.91	0.000218	0.98	7.69	141.52	0.16
Hopeful Creek	9.692	25-year	9.83	248	253.4	249.37	253.44	0.000121	0.91	10.75	259.6	0.13
Hopeful Creek	9.692	50-year	11.75	248	254.98	249.54	255.02	0.000073	0.84	13.93	388.75	0.1
Hopeful Creek	9.692	100-year	13.71	248	257.01	249.71	257.04	0.000042	0.76	17.97	553.16	0.08
Hopeful Creek	9.692	Regional	41.39	248	257.79	251.54	257.79	0	0.06	2515.22	616.53	0.01
Hopeful Creek	9.6915	Bridge										
Hopeful Creek	9.691	2-year	3.55	248	248.71	248.71	249.05	0.014883	2.58	1.38	30.48	0.99
Hopeful Creek	9.691	5-year	5.85	248	248.97	248.97	249.45	0.01367	3.07	1.91	45.3	1
Hopeful Creek	9.691	10-year	7.55	248	249.15	249.72	250.05	0.012853	3.34	2.26	51.81	1
Hopeful Creek	9.691	25-year	9.83	248	249.37	249.37	250.05	0.012171	3.65	2.7	58.96	1
Hopeful Creek	9.691	50-year	11.75	248	249.54	249.54	250.3	0.011524	3.85	3.05	64.82	1
Hopeful Creek	9.691	100-year	13.71	248	249.6	249.6	249.61	0.000433	0.77	54.08	66.72	0.19
Hopeful Creek	9.691	Regional	41.39	248	249.6	249.6	249.67	0.003942	2.31	54.08	66.72	0.59
Hopeful Creek	9.69	2-year	3.55	244.3	245.11	245.11	245.26	0.015795	2.28	3.52	11.63	0.81
Hopeful Creek	9.69	5-year	5.85	244.3	245.24	245.24	245.41	0.017681	2.67	5.24	14.39	0.88
Hopeful Creek	9.69	10-year	7.55	244.3	245.31	245.31	245.51	0.019098	2.91	6.32	15.89	0.92
Hopeful Creek	9.69	25-year	9.83	244.3	245.4	245.4	245.61	0.019962	3.14	7.77	17.69	0.96
Hopeful Creek	9.69	50-year	11.75	244.3	245.47	245.47	245.68	0.02017	3.29	8.99	19.07	0.97
Hopeful Creek	9.69	100-year	13.71	244.3	245.51	245.51	245.75	0.021552	3.49	9.94	20.08	1.01
Hopeful Creek	9.69	Regional	41.39	244.3	246.01	246.01	246.35	0.02644	4.85	22.37	30.37	1.19
Hopeful Creek	9.68	2-year	3.55	238.7	239.54	239.54	239.7	0.016063	2.35	3.24	9.93	0.82
Hopeful Creek	9.68	5-year	5.85	238.7	239.68	239.68	239.88	0.017707	2.75	4.87	12.36	0.88
Hopeful Creek	9.68	10-year	7.55	238.7	239.77	239.77	239.98	0.018252	2.95	6	13.8	0.91
Hopeful Creek	9.68	25-year	9.83	238.7	239.86	239.86	240.09	0.019319	3.21	7.34	15.32	0.95
Hopeful Creek	9.68	50-year	11.75	238.7	239.93	239.93	240.17	0.020015	3.39	8.41	16.44	0.98
Hopeful Creek	9.68	100-year	13.71	238.7	239.99	239.99	240.25	0.020563	3.55	9.46	17.46	1
Hopeful Creek	9.68	Regional	41.39	238.7	240.54	240.54	240.92	0.024855	4.94	21.47	26.53	1.16
Hopeful Creek	9.67	2-year	3.55	234	236.08		236.08	0.000089	0.32	28.6	30.74	0.07
Hopeful Creek	9.67	5-year	5.85	234	236.31		236.32	0.000133	0.42	36.12	34.58	0.09
Hopeful Creek	9.67	10-year	7.55	234	236.42		236.43	0.000171	0.49	39.97	36.39	0.1
Hopeful Creek	9.67	25-year	9.83	234	236.55		236.55	0.000218	0.58	44.67	38.49	0.12
Hopeful Creek	9.67	50-year	11.75	234	236.64		236.64	0.000257	0.64	48.16	39.97	0.13
Hopeful Creek	9.67	100-year	13.71	234	236.72		236.72	0.000294	0.7	51.51	41.35	0.14
Hopeful Creek	9.67	Regional	41.39	234	237.43		237.45	0.000724	1.28	85.39	53.29	0.22
Hopeful Creek	9.662	2-year	3.55	233	236.08	234.28	236.08	0.000015	0.17	56.55	41.82	0.03
Hopeful Creek	9.662	5-year	5.85	233	236.31	234.75	236.31	0.000026	0.24	66.58	45.4	0.04
Hopeful Creek	9.662	10-year	7.55	233	236.42	235.05	236.42	0.000036	0.29	71.59	47.09	0.05
Hopeful Creek	9.662	25-year	9.83	233	236.55	235.42	236.55	0.00005	0.34	77.61	49.03	0.06
Hopeful Creek	9.662	50-year	11.75	233	236.64	235.7	236.64	0.000062	0.39	82.03	50.41	0.07
Hopeful Creek	9.662	100-year	13.71	233	236.72	235.7	236.72	0.000074	0.43	86.22	51.69	0.07
Hopeful Creek	9.662	Regional	41.39	233	237.43	235.7	237.44	0.000246	0.89	127	62.76	0.14
Hopeful Creek	9.6615	Culvert										
Hopeful Creek	9.661	2-year	3.55	233	234.2	234.2	234.26	0.004938	1.59	5.38	12.59	0.49
Hopeful Creek	9.661	5-year	5.85	233	234.2	234.37	234.37	0.01341	2.61	5.38	12.59	0.8
Hopeful Creek	9.661	10-year	7.55	233	234.26	234.26	234.47	0.016735	3.02	6.1	13.45	0.9
Hopeful Creek	9.661	25-year	9.83	233	234.36	234.36	234.59	0.017146	3.24	7.57	15.06	0.93
Hopeful Creek	9.661	50-year	11.75	233	234.43	234.43	234.67	0.017911	3.43	8.64	16.12	0.96
Hopeful Creek	9.661	100-year	13.71	233	234.49	234.49	234.75	0.018603	3.61	9.67	17.09	0.98
Hopeful Creek	9.661	Regional	41.39	233	237.16	235.06	237.17	0.000354	1.02	110.45	58.52	0.16
Hopeful Creek	9.6605	2-year	3.55	231	232.6		232.6	0.000012	0.13	58.41	73.85	0.03
Hopeful Creek	9.6605	5-year	5.85	231	233.05		233.05	0.00001	0.14	96.35	95.52	0.03
Hopeful Creek	9.6605	10-year	7.55	231	233.33		233.33	0.000009	0.15	125.49	109.29	0.03
Hopeful Creek	9.6605	25-year	9.83	231	233.67		233.67	0.000008	0.15	164.64	125.43	0.03
Hopeful Creek	9.6605	50-year	11.75	231	233.9		233.9	0.000008	0.16	195.77	136.91	0.03
Hopeful Creek	9.6605	100-year	13.71	231	234.13		234.13	0.000007	0.16	227.73	147.77	0.03
Hopeful Creek	9.6605	Regional	41.39	231	237.16		237.16	0.000002	0.14	845.71	246.11	0.02



**Project Name:** Bolton Special Policy Area (SPA) Hydraulic Mapping Update  
**Project No.:** MTG17401  
**River:** Humber River  
**Reach:** Reach 2

#### HEC-RAS Hydraulic Output Summary

Reach	River Sta	Profile	Q Total (m³/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m²)	Top Width (m)	Froude # Chl
Reach2	9.66	2-year	22.51	231.7	232.9		232.94	0.001138	0.96	33.67	50	0.3
Reach2	9.66	5-year	36.92	231.7	233.33		233.37	0.000827	0.97	57.31	57.1	0.27
Reach2	9.66	10-year	47.78	231.7	233.61		233.64	0.000712	0.99	73.47	59.71	0.26
Reach2	9.66	25-year	62.89	231.7	233.94		233.98	0.000632	1.02	93.68	62.81	0.25
Reach2	9.66	50-year	75.17	231.7	234.17		234.21	0.000597	1.04	108.63	65.01	0.24
Reach2	9.66	100-year	88.19	231.7	234.39		234.43	0.000575	1.08	123.31	67.1	0.24
Reach2	9.66	Regional	436.28	231.7	237.35		237.47	0.000559	1.87	408.58	133.73	0.27
Reach2	9.65	2-year	22.51	231.3	232.72		232.77	0.00083	1.01	29.62	31.31	0.27
Reach2	9.65	5-year	36.92	231.3	233.16		233.22	0.000818	1.2	44.78	38.05	0.28
Reach2	9.65	10-year	47.78	231.3	233.44		233.51	0.000804	1.31	55.96	42.34	0.29
Reach2	9.65	25-year	62.89	231.3	233.76		233.85	0.000802	1.44	70.61	47.38	0.29
Reach2	9.65	50-year	75.17	231.3	233.99		234.09	0.000807	1.53	81.88	50.92	0.3
Reach2	9.65	100-year	88.19	231.3	234.21		234.31	0.000817	1.62	93.26	54.26	0.3
Reach2	9.65	Regional	436.28	231.3	237.03		237.32	0.001189	3.07	308.06	97.83	0.41





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**Appendix D**

**Floodplain Mapping**

