Appendix R
Drainage and Stormwater Management Assessment

Appendix R.1
Drainage and Hydrology Assessment for Mississauga Road/Old Main Street and Bush Street

Region of Peel

BUSH STREET & MISSISSAUGA ROAD CLASS EA

Existing Conditions Drainage Report, Draft

June 2010

10-3121

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1. INTRODUCTION

The Regional Municipality of Peel (the Region) is conducting a Schedule 'C' Municipal Class Environmental Assessment (EA) for the rehabilitation/reconstruction of Mississauga Road from Olde Base Line Road to Bush Street, through the Hamlet of Belfountain, and along Bush Street from Mississauga Road to Winston Churchill Boulevard (approximately 8.2 km). The study area is within the Credit River Watershed. The approximate limits of the study area are shown in **Figure 1**.

Mississauga Road (Peel Regional Road No. 1) is a north-south rural road under the jurisdiction of the Regional Municipality of Peel. Bush Street (Peel Regional Road 11) is a rural east-west road primarily within the Hamlet of Belfountain. Both Mississauga Road and Bush Street are two lane rural arterial roads.

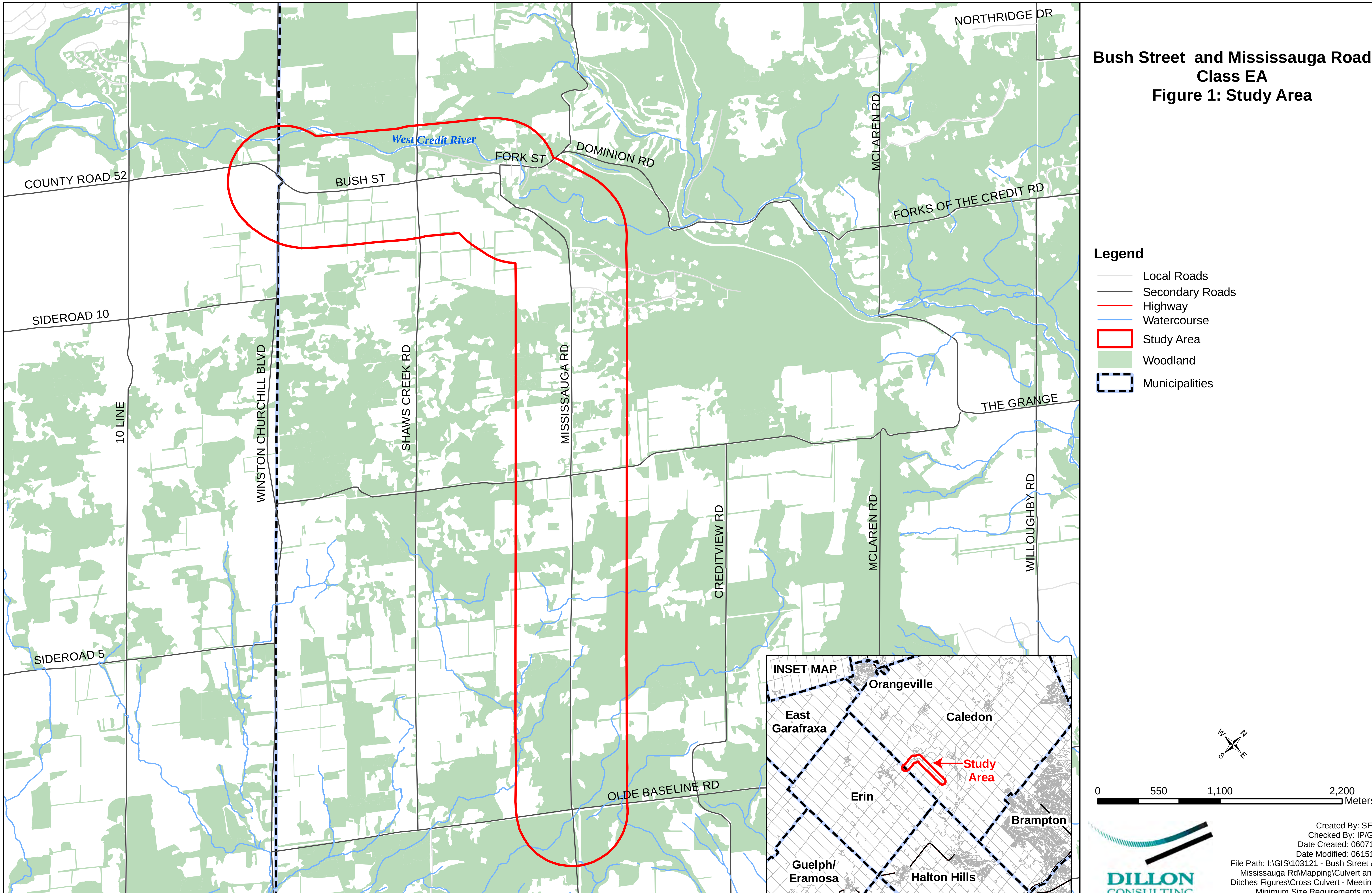
Dillon Consulting Limited (Dillon) has been retained by the Region to conduct several investigations, including a Drainage and Stormwater Assessment for the study area as part of the Class EA. The Drainage and Stormwater Management Assessment includes two Phases. This Drainage Report outlines the existing conditions as part of the Phase I Assessment. The Phase II assessment will be incorporated into this document upon completion of the other investigations and to finalize the Drainage and Stormwater Management Report.

1.1 Study Objectives

The study has been divided into two Phases which include objectives as listed below.

Phase I: Drainage Assessment and Hydraulic Analysis Objectives:

- Review existing drainage patterns and prepare a drainage mosaic for cross culverts and drainage system (i.e., ditches);
- Carry out hydrologic and hydraulic analysis for cross culverts for the 2, 5, 10, 25, 50 and 100 year events to determine existing levels-of-service (LOS) and any inadequacies; and
- Review the existing capacity of culverts and ditches and identify inadequacies with regard to handling stormwater drainage.



Bush Street and Mississauga Road Class EA
Figure 1: Study Area

Analysis of the Regional Storm (Hurricane Hazel), including peak flow modelling and mapping of the floodplain was not completed for the catchment areas under investigation as they were predominantly under 125 ha in size and did not warrant assessment of flood hazards. As noted in Understanding Natural Hazards (MNR, 2001), the flooding hazard limit or floodplain is generally applied to watercourses that drain areas that are equal to or greater than 125 ha.

Hydraulic impacts may include increases to upstream flood levels should the existing road profile elevation be raised (e.g., existing base, crushed in place). Mitigation measures may also be recommended as an opportunity to address existing capacity deficiencies not related to the proposed works.

Phase II: Stormwater Management Plan Objectives:

- Recommend mitigation measures to address hydraulic impacts associated with preferred rehabilitation option(s).
- Develop stormwater management (SWM) design criteria for the transportation corridor that conform to requirements of Credit Valley Conservation (CVC) and the Region;
- Develop SWM options/methods that provide quality and quantity control (to include enhanced grass swales, wet ponds, artificial wetlands, dry ponds, infiltration trenches and oil/grit separators). These SWM options will mitigate impacts of the preferred rehabilitation option(s);
- Identify design methods for the SWM solutions through geotechnical, geomorphologic, stream bed and bank erosion, and meander belt analysis; and
- Evaluate alternative SWM methods and recommend preferred SWM solutions.

It is anticipated that water quality and quantity impacts resulting from road rehabilitation will be minimal due to limited change in footprint. Along the rural transportation corridor, conveyance controls such as flat bottom grass-lined or enhanced swales have been considered, and the need for pond end-of-pipe controls is limited (i.e., no widening to necessitate peak flow controls). End-of-pipe oil-grit separators may also be considered in isolated areas if curb and gutter and storm sewers are preferred.

1.2 Data Collection

Background documents, guidelines and standards were reviewed. Below is the list of information reviewed:

- 2009 Survey, Region of Peel (Auto CAD data file);
- Culvert Structure Inventory, Region of Peel;

- Regional Road Improvements In The Belfountain Area Report, Town of Caledon, Totten Sims Hubicki Associates, January 1998.;
- GIS planning data including contour mapping and 2009 airphotos;
- CVC Stormwater Management Guidelines;
- CVC Standard Parameters Document;
- CVC floodplain map for West Credit River (Map 02);
- Region of Peel, Public Works Design, Specifications & Procedures Manuals
  - Storm Sewer Design Criteria (July, 2009);
  - Regional Roads and Traffic (February, 2010);
- Soil Map of Peel County, Soil Survey Report No. 18;
- Karst of Southern Ontario and Manitoulin Island (GIS mapping), Ontario Geological Survey & Ontario Ministry of Northern Development, Mines and Forestry (MNDMF); and
- MNR Understanding Natural Hazards (2001)

In addition to the background data, a field reconnaissance was conducted on April 16, 2010 and May 4, 2010 to develop familiarity with the existing road drainage system and to ground truth the culvert and ditch information provided by the Region of Peel surveys. Observations of significant water features and evidence of substantial roadside ponding were also noted. Inventory sheets of cross culverts along Bush Street and Mississauga Road within the study area had been compiled and are presented in **Appendix A**. Cross-sectional profiles of ditches at selected locations were also undertaken.

1.3 Road Drainage Area Characteristics

Drainage deficiencies exist at various locations along Bush Street and Mississauga Road and are primarily associated with drainage which is parallel to the road (i.e., road drainage systems that includes ditches and entrance culverts). These drainage deficiencies are a result of shoulder deficiencies such as the overgrowth of vegetation that impede proper drainage, as well as ponding areas on shoulders and road due to deteriorating surfaces. There are also several locations along these roads with little or inadequate ditching for the collection of storm runoff.

As the West Credit River travels parallel to Bush Street, the surface water drainage along Bush Street and the northern portion of Mississauga Road is predominantly flowing north towards the West Credit River. A high point is located just south of entrance culvert # 27 on Mississauga Road (please refer to **Figure 12** for entrance culvert locations). Catchment areas south of this high point generally drain south-westerly within the Credit River watershed, but some local terrain also directs drainage eastward.

2. CAPACITY ASSESSMENT

A hydraulic capacity assessment of existing conditions was undertaken based on the study objectives and is summarized in the sections below. Separate approaches have been established to evaluate the cross culverts and the road drainage systems. Culverts that transverse either Bush Street or Mississauga Road within the study area are considered "cross culverts" in this assessment. The road drainage system includes entrance culverts and roadside ditches, where entrance culverts are defined as culverts, typically along driveways, that convey ditch flows. For the cross culverts and ditches, a hydrologic assessment was first completed to develop design flows, followed by a hydraulic assessment to determine the level of service (LOS) provided. Based on the inventory information compiled by the Region and applying MTO level of capacity rating, the entrance culverts were assessed.

2.1 Design Criteria

The following design criteria have been established for the cross culverts, roadside ditches and entrance culverts based on the Region of Peel Design Guidelines (Region of Peel Public Works Design, Specifications and Procedures Manuals). These criteria have been communicated to and confirmed by the Region:

Cross Culverts

- Current guidelines require culverts that cross the roadway are to be designed for a 25 year storm with a 10 minute inlet time.
- A minimum 600 mm diameter CSP, PVC or approved equivalent be used for crossings of Regional Roads.

Roadside Ditches and Entrance Culverts

- Current guidelines require that storm sewers (applies to roadside ditches, as per communication with the Region) are to be designed using the local municipality's intensity, duration and frequency rainfall curves for a 10-year storm with 15 minute inlet time for the roadway of way only.
- For external areas draining to roadside ditches, the calculated time of concentration is determined based on a 15 minute minimum inlet time.
- A minimum 375 mm diameter CSP, PVC or approved equivalent be used for ditch crossings (entrance culverts).

2.2 Evaluation of Cross Culverts

2.2.1 Hydrologic Assessment

The approach taken in this assessment involved performing hydrologic modelling to determine the flows for a total of 14 cross culverts for a range of design flow events (i.e., 2 year to 100 year events). The Visual OTTHYMO v2.0 (VO2) hydrologic model was selected for this purpose. VO2 is a single event hydrologic model based on unit hydrograph theory and common types of unit hydrographs including Nash, William-Hann and SCS, and is well suited for various levels of hydrologic studies. In this analysis, the Nash instantaneous unit hydrograph was used, due to most of the external drainage areas to cross culverts being rural lands. Important input parameters required include the curve number of catchment area, initial abstraction value, time of concentration and the time to peak.

Drainage Area Characterization

Obtaining input parameters for the VO2 model required first establishing the drainage area tributary to each of the 14 cross culverts. **Figure 2** shows the locations of the cross culverts. A detailed GIS analysis to delineate these catchment boundaries and to characterize surface drainage patterns was undertaken using 1 m interval contour mapping. **Figure 3** presents the catchment delineation for the 13 cross culvert locations. Cross culvert # 44 is comprised of twin barrels and thus is counted as two culverts (designated as culvert # 44n and # 44s). Hence, there are a total of 14 cross culverts at 13 culvert locations shown on the map in **Figure 3**.

Some catchment areas are composed of rolling hills and depressional areas where they have the potential to retain a portion of the surface runoff during storm events. In many locations, these ineffective flow areas act as reservoirs to hold water for infiltration and evaporation and many are suspected to reduce the storm runoff to the cross culverts. Such depression areas are incorporated into the VO2 model to determine whether they are deemed ineffective. Where the modelling results indicate they are ineffective drainage areas, these depression zones have been excluded in the total drainage catchment area.

Based on the Soil Map of Peel County (Soil Survey Report No. 18), the surficial soils in the study area consist mostly of Dumfries loam, Caledon loam and Farmington loam (see **Figure 4**). According to these soil classifications, catchment areas would fall into hydrologic soil groups (HSG) “AB” or “B”, indicating lands of relatively good drainage and high infiltration rate. Figure 4 illustrates the soil types within the study area. The curve number (CN) is an indicator of runoff potential and is determined based on surficial soil, land-use and vegetative cover for the area of interest. An area-weighted CN and initial abstraction values (Ia) were determined for each catchment based on CVC guidelines. The time of concentration (Tc) for each catchment was estimated based on the Upland Method and/or the Kirpich's Equation for larger rural catchment areas. The time of concentration was then used to calculate the time to peak (Tp) value, which is based on the number of 'N' cascading linear reservoirs (N = 3 assumed for this analysis). All of these parameters are incorporated into the model. Table 1 below summarizes the catchment parameters for the cross culverts drainage areas. See **Appendix B** for detailed calculations.

Table 1: VO2 Model Parameters for Cross Culverts

Culvert ID #	Area (ha)	Total Area (ha)	CN	Ia (mm)	Tc (hr)	Tp (hr)
2	19.15	19.15	71.3	5.8	0.37	0.24
10	8.81	8.81	68.3	6.5	2.04	1.36
14	5.57	12.27	69.8	6.1	0.08	0.07
	6.71		64.3	8.7	0.48	0.32
16	2.15	4.23	71.9	5.0	0.16	0.10
	2.08		67.6	7.7	0.13	0.09
17	35.03	35.03	65.5	7.2	1.74	1.16
24	2.77	2.77	70.7	5.4	0.17	0.11
37	11.96	21.05	66.4	5.7	0.27	0.18
	3.90		69.4	4.9	0.11	0.07
	5.19		73.3	4.0	0.17	0.11
43	1.52	48.56	62.0	8.0	0.09	0.06
	1.80		58.8	8.5	0.10	0.07
	24.19		60.0	8.6	0.55	0.37
	21.05		From culvert # 37			
44	127.28	127.28	59.9	8.3	1.18	0.79
47	0.24	0.24	77.6	3.5	0.17	0.11
48	2.66	17.52	59.8	8.6	0.11	0.07
	14.63		58.0	9.4	0.86	0.57
	0.24		From culvert # 47			
55	7.71	7.71	62.5	9.1	0.44	0.29
56	0.91	0.91	64.9	8.5	0.17	0.11

Bush Street and Mississauga Road
Figure 2: Existing Cross Culvert Locations

Legend

16	Cross Culvert ID #
●	Cross Culvert
—	Watercourse

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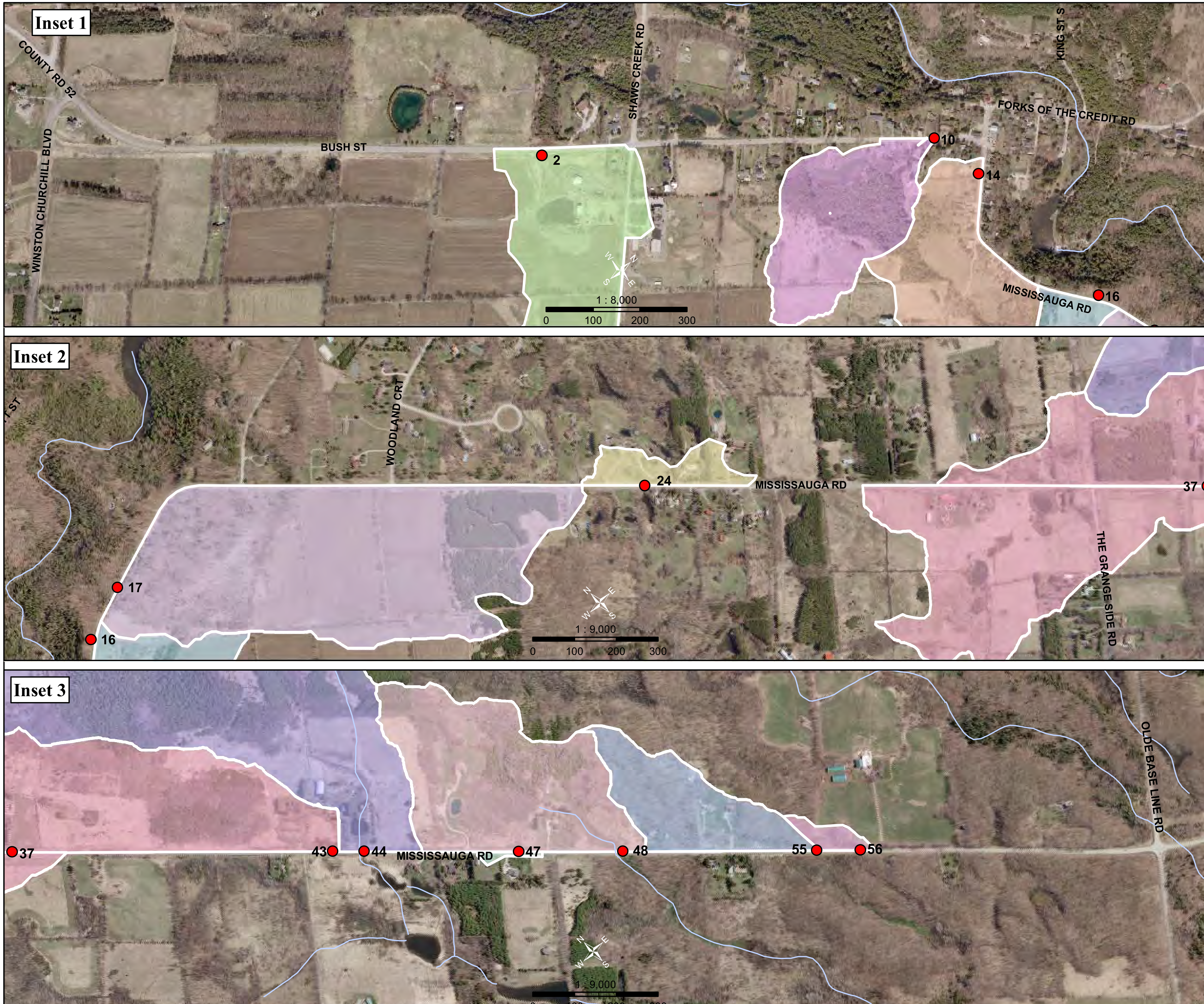
Bush Street and Mississauga Road
Figure 3: Cross Culvert - Drainage Areas



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10 Cross Culvert ID #

Cross Culvert

Watercourse

Drainage Area to Cross Culverts

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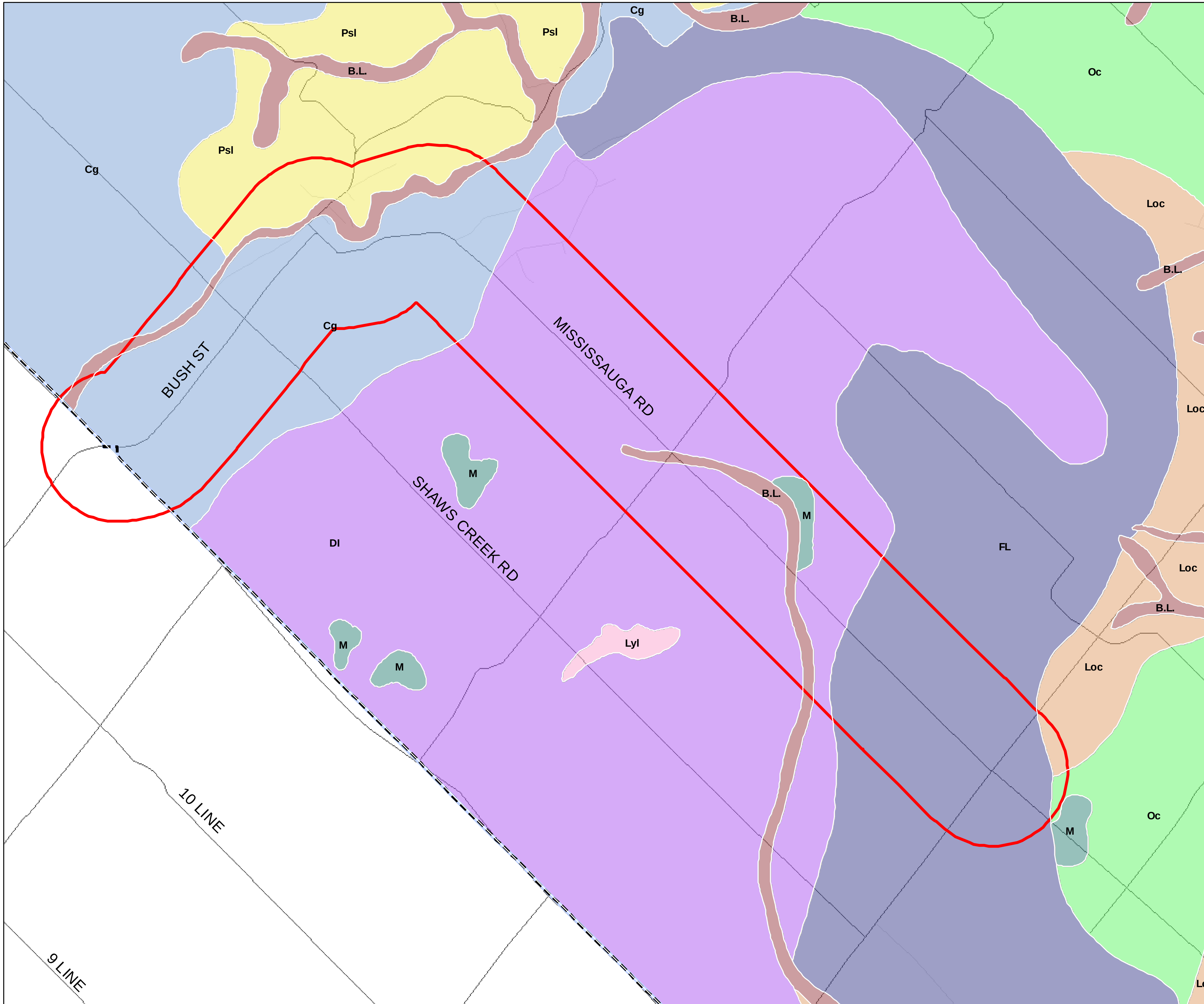
Bush Street and Mississauga Road Class EA
Figure 4: Soil Classification



Legend

- Local Roads
- Secondary Roads
- Highway
- Study Area
- Municipalities

Soil Classification

- B.L.: Bottom Land Variable
- Cg: Caledon Loam
- DL: Dumfries Loam
- FL: Farmington Loam
- Loc: Lockport Clay
- Lyl: Lily Loam
- M: Muck Variable
- Oc: Oneida Clay Loam
- Psl: Pontypool Sandy Loam

Source: Soil Survey Report No. 18.
Soil Survey of Peel County, Ontario. 1953.

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Based on the culvert invert elevations from the survey provided by the Region of Peel, culvert # 37 appears to be directing flows across Mississauga Road in a west to east direction. According to contour mapping, however, the location of culvert # 37 has a minor dip where runoff can potentially drain from both directions to the culvert. Furthermore, field visits indicated there was ponding on both sides of the culvert and the direction of flow was not visually evident. During field inspections it was observed that the ditches draining to culvert # 37 on the east side of Mississauga Road were quite deep and an embankment along the ditches was created as a result of constructing these deep ditches. This apparent barrier may prevent flows from readily travelling from west to east and, consequently, it may be possible that flows can pool and travel in the reverse direction. Under existing conditions, catchment delineation for culvert # 37 is based on Region survey information with an easterly flow. Analysis would need to be refined at detailed design considering proposed road work and detailed field reconnaissance to confirm detailed local topography.

Importantly, it is possible that a significant portion of the study area may be lying on Karst topography, which can potentially have a substantial impact on the amount and rate of runoff generated. The Ontario Ministry of Northern Development, Mines and Forestry (MNDMF) conducted extensive study and mapping of Karst in Southern Ontario and Manitoulin Island. GIS mapping of this digital data containing reconnaissance-level field information depicting the nature and regional distributions of karstification of Paleozoic bedrock for southern Ontario was obtained from MNDMF (Brunton and Dodge, 2007). **Figure 5** illustrates the location of potential Karst in the study area. As shown on the map, a majority of the study area is either on known, inferred or is potential Karst topography.

Karst is a distinctive topography resulting from geological weathering and erosion processes. It is shaped by the dissolution of a layer or layers of soluble bedrock, usually carbonate rock such as limestone and dolomite. Due to the subterranean drainage, there may be very limited surface water because storm runoff is able to seep through cracks and openings into the ground. Many karst regions, such as those in the Niagara Escarpment, display unique surface features such as sinkholes, caverns, and dolines. The underground drainage system created as a result of bed dissolution has the potential to result in significant losses of surface runoff to the subsurface regions.

The impact of Karst topography on runoff generation is often dynamic, and can be changed by anthropogenic developments over time. Given the difficulty in quantifying runoff reductions by potential Karst formations, the VO2 model did not discount this possible reduction in runoff. In essence, it is likely that the physical flow in reality would be smaller than the predicted modelled flow, but this would need to be confirmed with a flow monitoring program and detailed investigation. For the purpose of this study, the culvert sizing evaluation has used current modelling results and does not account for these losses.

Rainfall Data

The VO2 model was used to simulate the 2 to 100 year design events. Intensity-Duration-Frequency (IDF) data for these events was obtained from the CVC Stormwater Management Guidelines and CVC Standard Parameters documents. Based on the CVC guidelines, a 24 hour Chicago distribution was used in the model for the 2 to 100 year design storms.

Results

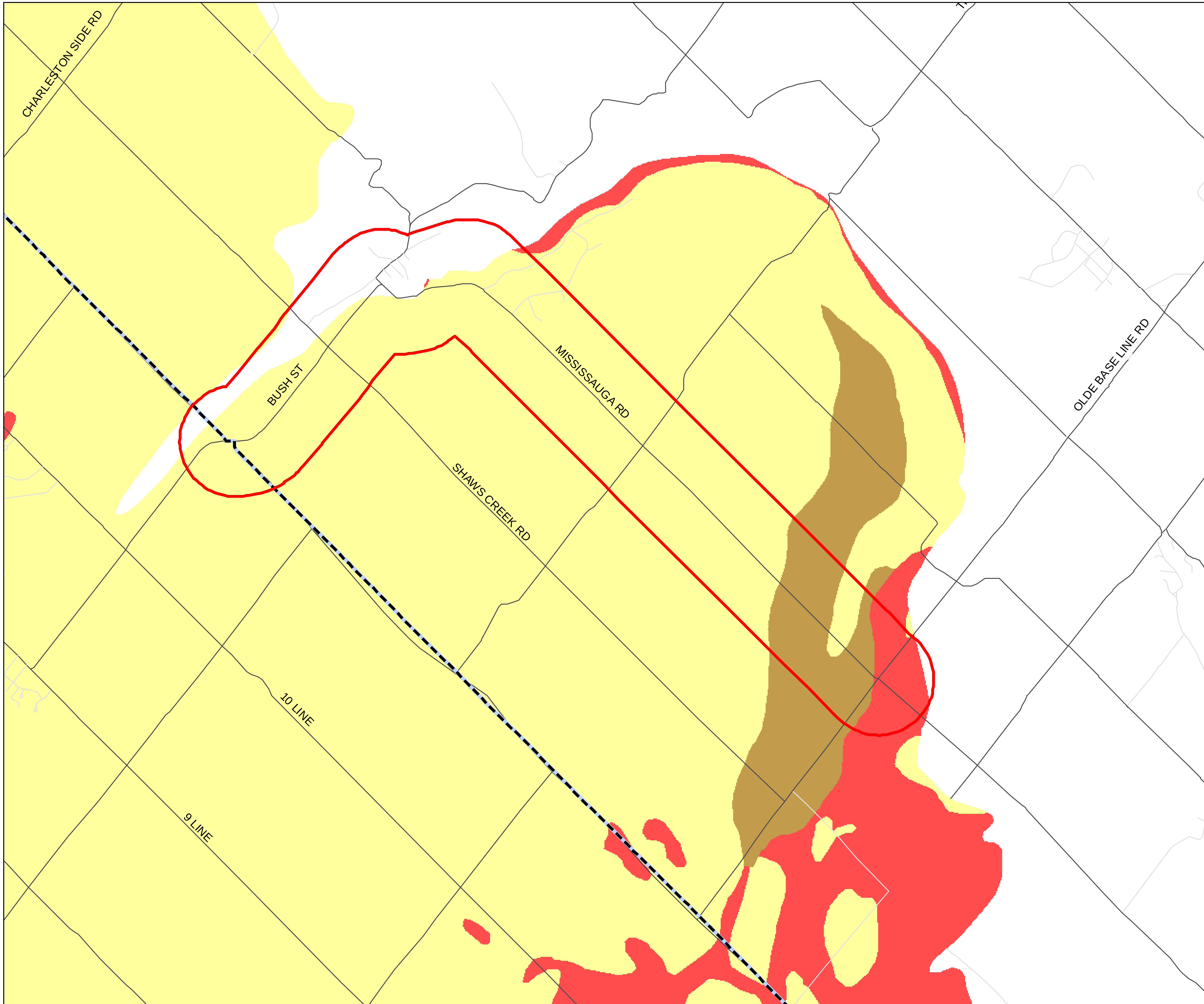
Using the model input parameters described above, the existing conditions VO2 model was run to generate peak flows. Table 2 below summarizes the modeling results for the 13 cross culvert locations. Detailed model outputs are in **Appendix C**.

Table 2: Summary of Existing Peak Flows to Draining to Each Cross Culvert

Culvert ID #	Area (ha)	VO2 Peak Flows (m^3/s)					
		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
2	19.15	0.65	1.10	1.44	1.90	2.30	2.65
10	8.81	0.08	0.13	0.18	0.24	0.29	0.33
14	12.27	0.24	0.43	0.60	0.83	1.02	1.20
16	4.23	0.19	0.33	0.44	0.59	0.72	0.85
17	35.03	0.31	0.54	0.72	0.96	1.18	1.38
24	2.77	0.15	0.24	0.31	0.41	0.49	0.57
37	21.05	0.31	0.50	0.65	1.42	1.88	3.29
43	48.56	0.53	0.92	1.37	2.68	3.37	4.99
44	127.28	1.19	2.12	2.87	3.91	4.86	5.70
47	0.24	0.02	0.03	0.03	0.04	0.05	0.06
48	17.52	0.16	0.28	0.39	0.53	0.66	0.87
55	7.71	0.15	0.27	0.37	0.50	0.61	0.72
56	0.91	0.03	0.06	0.08	0.11	0.13	0.16

The model results indicate relatively high peak flows for the relatively large drainage areas at some locations. There are several important factors potentially impacting the drainage characteristics of this area that suggest model flows are higher than actual flows. Runoff potential can be severely reduced due to deep losses to Karst topography. Also, with many depressed areas and rolling hills, the area of ineffective drainage may actually be higher than the conservative approach taken in the VO2 hydrologic model. As a result of these conditions, actual runoff to the cross culverts is substantially reduced relative to the modelled results.

Bush Street and Mississauga Road Class EA
Figure 5: Potential Karst Location



Legend

- Local Roads
- Secondary Roads
- Highway
- Study Area
- Municipalities

Karst Locations

- Known Location
- Inferred Location
- Potential Location

Source: Karst of Southern Ontario and Manitoulin Island. Ministry of Northern Development and Mines, 2007.

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Flooding due to poor conveyance across the road is likely limited throughout the study area due to the Karst landscape and rolling topography. Further details on this discussion are included below in the hydraulic assessment.

2.2.2 Hydraulic Assessment

The hydraulic assessment was based on a review of the culverts' physical conditions as well as hydraulic modelling using Bentley's CulvertMaster program. CulvertMaster is widely used in the design and analysis of culvert hydraulics, and solves most variables including culvert size, flow and headwater. Its can handle free surface flow, pressure and varied flow situations including backwater and drawdown curves.

A majority of the 14 cross culverts are CSPs while one is PVC pipe. Sizes range from 300 mm to 1200 mm. Table 3 summarizes the culvert characteristics.

Table 3: Cross Culvert Characteristics

Culvert ID #	Size (mm)	Type	Material	Slope (m/m)	Invert Elevation (m)		Effective X-S Area (%)
					U/S	D/S	
2	900	circular	CSP	0.017	387.32	386.73	90
10	450	circular	PVC	0.017	382.71	382.48	n/a
14	600	circular	CSP	0.028	380.43	379.94	90
16	300	circular	CSP	0.056	386.15	385.25	n/a
17	300	circular	CSP	0.035	384.68	384.33	5
24	400	circular	CSP	0.032	428.30	427.82	10
37	600	circular	CSP	0.031	418.80	418.41	60
43	900 x 500	ellipse	CSP	0.014	400.13	399.96	100
44n	1200 x 1000	ellipse	CSP	0.014	399.46	399.27	100
44s	1200 x 1000	ellipse	CSP	0.010	399.44	399.31	100
47	400	circular	CSP	0.017	398.17	397.96	60
48	400	circular	CSP	0.020	394.08	393.84	76
55	300	circular	CSP	0.026	388.76	388.43	60
56	300	circular	CSP	0.004	387.26	387.21	5

A capacity rating for each of the culverts was determined based on the existing physical conditions of the culverts as summarized in the culvert inventory compiled by the Region and the following MTO criteria shown in Table 4.

Table 4: Capacity Rating Criteria

Category	Description	Effective Cross Section
Very Good	Little to no sediment build up in pipe. Culvert ends are undamaged. Little to no debris blocking flow.	100 %
Good	Original culvert capacity diminished by 5% or less.	95 % - 99 %
Fair	Original culvert capacity diminished by less than 15%.	85 % - 94 %
Poor	Original culvert capacity diminished by less than 25%.	75 % - 84 %
Below Minimum Tolerable	Original culvert capacity diminished by more than 25%.	0 % - 74 %

Table 5 below summarized the capacity rating for each culvert and describes whether or not the current structure meets the Region's standards for minimum pipe size.

Table 5: Capacity Rating of Cross Culverts under Existing Conditions

Culvert ID #	Size (mm)	Capacity Rating (CR)	Meeting Region's current standard (min. 600mm)
2	900	Fair	Yes
10	450	Good	**No**
14	600	Fair	Yes
16	300	Fair	**No**
17	300	Below Minimum Tolerable	**No**
24	400	Below Minimum Tolerable	**No**
37	600	Below Minimum Tolerable	Yes
43	900 x 500	Very Good	Yes
44 (north)	1200 x 1000	Very Good	Yes
44 (south)	1200 x 1000	Very Good	Yes
47	400	Below Minimum Tolerable	**No**
48	400	Poor	**No**
55	300	Below Minimum Tolerable	**No**
56	300	Below Minimum Tolerable	**No**

The capacity rating along with additional information summarized in the Region's inventory sheets provides recommendations to maintain and/or upgrade specific culverts. As shown, some culvert sizes do not meet the Region's current standard; however in some cases the depth of cover over the road is not sufficient to accommodate a 600 mm culvert. However, these entrance culverts may have been consistent with standard practices at the time of construction. **Figure 6** illustrates the capacity rating and where culvert pipe sizes do not comply with the current Region standard. Detailed information is provided in **Appendix G**.

The hydraulic capacities of existing cross culverts were determined based on information provided by the Region (i.e., invert elevations and slopes) and with information recorded during the reconnaissance-level site visit (i.e., tailwater (TW) assumptions based on ponding observations at downstream side of culvert). If ponding was observed at the downstream end of the culvert, a conservative tailwater assumption would be considered whereby TW level would be set at the downstream obvert elevation in the CulvertMaster model.

The top of road elevation was determined at each cross culvert and assigned as the threshold elevation, above which flows would overtop the roadway. With these input parameters, Culvert Master was run and the hydraulic capacity with water level at the top of road elevation was estimated. Table 6 presents the maximum culvert flows before overtopping the roadway under existing conditions. Please refer to **Appendix E** for detailed input information. CulvertMaster model outputs are provided in **Appendix F**.

Bush Street and Mississauga Road
Figure 6: Cross Culvert - Capacity Rating

Legend

16 Cross Culvert ID #

Watercourse

Capacity Rating

- Very Good Condition
- Good Condition
- Fair Condition
- Poor Condition
- Below Minimum Tolerable

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Table 6: Existing Cross Culvert Hydraulic Capacity at Top of Road Elevation

Culvert ID #	Size (mm)	Invert Elevation (m)		At Top of Road		
		U/S	D/S	Elevation (m)	Capacity (m^3/s)	Level of Service (Return Period)
2	900	387.32	386.73	394.32	3.486	100-year
10	450	382.71	382.48	383.34	0.227	10-year
14	600	380.43	379.94	381.62	0.639	10-year
16	300	386.15	385.25	386.86	0.128	Less than 2-year
17	300	384.68	384.33	385.30	0.116	Less than 2-year
24	400	428.30	427.82	429.24	0.216	2-year
37	600	418.80	418.41	419.99	0.639	5-year
43	900 x 500	400.13	399.96	400.88	0.549	2-year
44n	1200 x 1000	399.46	399.27	400.76	1.687	10-year
44s	1200 x 1000	399.44	399.31	400.76	1.603	10-year
47	400	398.17	397.96	398.98	0.184	100-year
48	400	394.08	393.84	394.95	0.189	2-year
55	300	388.76	388.43	389.39	0.106	Less than 2-year
56	300	387.26	387.21	388.16	0.109	25-year

Comparing the hydrologic modelling results in Table 2 with the maximum culvert capacity in Table 6, an existing level of service is determined (last column of Table 6). **Figure 7** shows the existing level of service for cross culverts. As anticipated, the majority of the cross culverts do not meet the current Region's standard; that is, to provide a level of service for a 1 in 25 year storm event. This however, is expected, since many of the culverts do not even meet the minimum size requirement of 600 mm. As the culverts sizes are relatively small, flooding over the road on a frequent basis should be prevalent in this area.

If modelled flows to cross culverts are likely to be higher than reality (due to the discounting of the impact of Karst topography), the actual LOS provided by the cross culverts is presumably better than that indicated by the CulvertMaster model. The hydrologic and hydraulic model findings would indicate that flooding over the road is a frequent occurrence in this area. However, flooding issues within the study appear to be associated with drainage parallel to the road as a result of deficiencies with the drainage system (i.e. shoulder, ditches and entrance culverts). There is no known evidence of flooding due to poor drainage across the road as determined during the field visits. A local resident located near cross culvert # 43 indicated his property does experience occasional flooding due to poor conveyance of this structure. He also noted similar problems are not evident at culvert # 44. As noted above, flooding across the road is likely limited throughout the entire study area due to the potential Karst landscape and its influence on runoff flows. Based on these reasons, it may be more realistic and appropriate to adopt the Region's 600 mm minimum pipe size rather than meet a return period LOS. Following the minimum pipe size standard would likely be sufficient at most cross culvert locations to provide a 25-year level of service.

2.3 Evaluation of Road Drainage System

A separate approach has been established to review and evaluate the road drainage system, which includes entrance culverts and roadside ditches. A hydrologic assessment was conducted for ditches using the Rational Method, while the hydraulic review was completed based on the Manning's Equation. For entrance culverts, a capacity rating analysis similar to that of the cross culverts was carried out.

2.3.1 Hydrologic Assessment of Roadside Ditches

Although there are many roadside ditches along various stretches of Bush Street and Mississauga Road, only continuous ditches of significant length and those associated with entrance culverts were included in the review. In essence, ditches of very short lengths, with no distinct flow direction (e.g. ditch slopes alternating between positive and negative grades), and ditches that do not connect to any entrance culverts were not a part of the analysis. **Figure 8** identifies these 35 ditches that were analyzed as part of this investigation.

Each ditch identification number has a sub-section ID attached. A long ditch (e.g. ditch M115) may be divided into several sub-sections labelled A, B and C respectively. The points of division are landmarked by entrance culverts. For example, ditch M115 is identified with 3 distinct sections; namely, ditch M115-Section A, ditch M115-Section B and ditch M115-Section C. Each section is evaluated separately for flows. **Figure 9** illustrates how ditch sections are labelled.

Bush Street and Mississauga Road
Figure 7: Cross Culvert - Existing Level of Service

Legend

16 Cross Culvert ID #

Watercourse

Existing Level of Service

- < 2 year Storm Event
- 2 year Storm Event
- 5 year Storm Event
- 10 year Storm Event
- 25 year Storm Event
- > 100 year Storm Event

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Bush Street and Mississauga Road
Figure 8: Roadside Ditch Locations

Legend

M10 Roadside Ditch ID #
Entrance Culvert
Ditch Section A
Ditch Section B
Ditch Section C
Ditch Section D
Flow Direction*

*
M25
M25 Section D | M25 Section C | M25 Section B | M25 Section A

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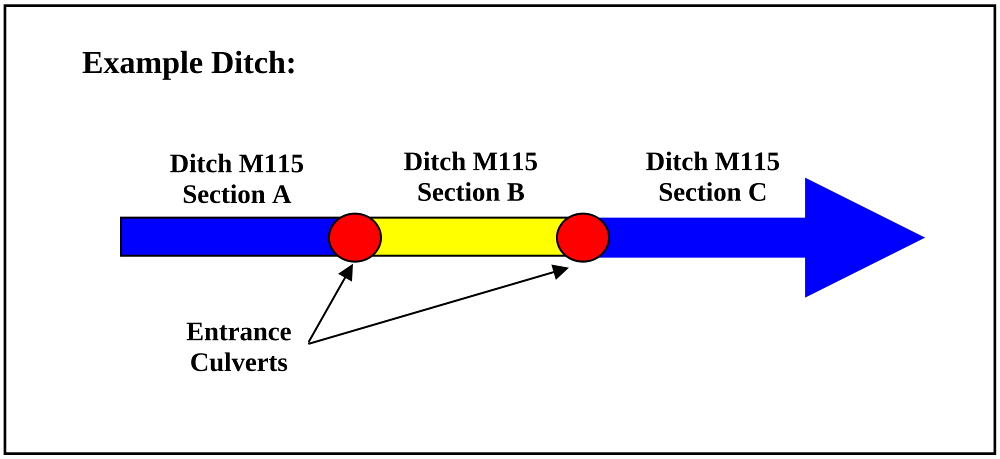
Figure 9: Ditch Identification and Section Labelling



<u>Drainage Area Characterization</u>

The Rational Method was used to complete the hydrologic assessment of the roadside ditches. Similar to the hydrologic evaluation for cross culverts, the drainage area tributary to each of the identified ditches was first determined. A detailed GIS analysis to delineate these catchment boundaries and to characterize surface drainage patterns was conducted. **Figure 10** presents the catchment delineation for roadside ditches.

As previously mentioned in the hydrologic assessment for cross culverts, the surficial soils in the study area consist mostly of loam. The appropriate runoff coefficients C were selected from the MTO Drainage Manual (Design Chart 1.07) based on this soil texture, along with the corresponding catchment land use and topography. The corresponding time of concentration (Tc) for each catchment was subsequently estimated based on the SCS Upland Method. A minimum inlet time of 10 minutes was used following the Region of Peel storm sewer design criteria (Section 4.0, July 2009).

<u>Rainfall Data</u>

Based on the Region of Peel Design Guidelines, the criteria used to review the road drainage system (ditches) are to be based on the 10-year design event. The Intensity-Duration-Frequency (IDF) data for these events was obtained from the CVC Stormwater Management Guidelines and CVC Standard Parameters documents. Using the Rational Method, the peak flows to ditches were determined for the 10-year design storm.

Bush Street and Mississauga Road
Figure 10: Drainage Areas to Roadside Ditches

Legend

- M10 — Roadside Ditch ID #
- Entrance Culvert
- Ditch Section A
- Ditch Section B
- Ditch Section C
- Ditch Section D
- Flow Direction*

Ditch Drain Areas

B10	M20	M70	M115
B15	M25	M75	M120
B18	M30	M80	M125
B20	M40	M85	M130
B25	M45	M90	M140
B30	M50	M95	M145
B35	M55	M100	M150
M10	M60	M105	M155
M15	M65	M110	

*

M25

M25 Section D | M25 Section C | M25 Section B | M25 Section A

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Results

Using the drainage area characteristics and the Rational Method, peak flows for each of the ditch sections were determined. Table 7 summarizes the catchment parameters for ditches as well as the results of the peak flow assessment. Please refer to **Appendix D** for detailed calculations.

Table 7: Roadside Ditches Characteristics and Peak Flows

Ditch ID	Ditch Sub-section ID	Rational Method				
		Total Drainage Area to Ditch (ha)	Area-weighted Runoff Coeff. C	$T_c = t$ (min)	Intensity based on 10-year storm (mm/hr)	Peak Flow to Ditches $Q_p = 0.00278CiA$ (m^3/s)
B10	A	0.57	0.426	17.4	90.1	0.06
B10	B	2.67	0.388	19.1	85.4	0.25
B15	A	0.41	0.406	15.9	94.7	0.04
B18	A	0.16	0.607	15.8	95.0	0.03
B20	A	1.91	0.498	17.0	91.1	0.24
B25	A	0.44	0.446	15.4	96.3	0.05
B25	B	0.98	0.427	16.0	94.2	0.11
B30	A	1.84	0.415	16.2	93.7	0.20
B35	A	0.79	0.435	15.0	97.6	0.09
M10	A	2.95	0.376	18.8	86.3	0.27
M10	B	20.42	0.364	20.1	83.0	1.71
M10	C	20.47	0.365	20.7	81.6	1.69
M100	A	0.05	0.652	16.2	93.5	0.01
M105	A	0.25	0.312	15.7	95.2	0.02
M105	B	0.48	0.318	16.4	93.0	0.04
M110	A	0.62	0.337	15.5	95.9	0.06
M110	B	0.77	0.345	15.9	94.7	0.07
M110	C	0.98	0.358	16.5	92.8	0.09
M110	D	2.29	0.361	23.6	75.3	0.17
M115	A	0.06	0.608	15.8	94.8	0.01
M115	B	0.14	0.639	17.2	90.6	0.02
M115	C	7.71	0.301	25.6	71.7	0.46
M120	A	0.10	0.624	17.2	90.5	0.02
M125	A	0.91	0.307	16.3	93.4	0.07
M130	A	0.06	0.705	17.1	91.0	0.01
M140	A	0.20	0.746	19.1	85.4	0.04
M145	A	0.23	0.433	16.1	93.8	0.03
M15	A	0.38	0.607	17.3	90.2	0.06
M15	B	0.75	0.546	18.7	86.5	0.10
M15	C	2.83	0.426	23.5	75.5	0.25
M150	A	0.22	0.661	17.7	89.1	0.04
M155	A	1.07	0.317	15.9	94.7	0.09
M155	B	1.40	0.332	16.7	92.1	0.12
M20	A	0.08	0.572	15.6	95.6	0.01

Ditch ID	Ditch Sub-section ID	Rational Method				
		Total Drainage Area to Ditch (ha)	Area-weighted Runoff Coeff. C	$T_c = t$ (min)	Intensity based on 10-year storm (mm/hr)	Peak Flow to Ditches Q_p = 0.00278CiA (m^3/s)
M20	B	0.17	0.667	16.5	92.8	0.03
M25	A	1.53	0.380	15.6	95.6	0.15
M25	B	2.66	0.408	18.9	85.9	0.26
M25	C	2.85	0.419	19.6	84.3	0.28
M25	D	4.73	0.401	20.2	82.6	0.44
M30	A	0.09	0.538	15.0	97.6	0.01
M40	A	0.47	0.381	16.9	91.6	0.05
M40	B	0.58	0.419	17.9	88.7	0.06
M40	C	1.86	0.359	20.8	81.3	0.15
M40	D	2.16	0.399	25.4	72.0	0.17
M45	A	0.16	0.609	17.1	90.8	0.02
M45	B	0.33	0.558	17.9	88.7	0.05
M45	C	20.14	0.355	26.3	70.5	1.40
M45	D	20.61	0.357	29.5	65.6	1.34
M50	A	0.57	0.434	16.8	91.9	0.06
M55	A	1.17	0.386	15.4	96.3	0.12
M65	A	3.04	0.345	16.6	92.3	0.27
M65	B	17.38	0.325	31.7	62.6	0.98
M65	C	17.44	0.327	32.4	61.8	0.98
M65	D	17.59	0.329	36.4	57.2	0.92
M75	A	0.16	0.587	16.2	93.7	0.02
M80	A	0.14	0.443	15.0	97.6	0.02
M80	B	0.17	0.494	15.5	95.9	0.02
M85	A	0.06	0.655	16.6	92.4	0.01
M90	A	0.24	0.585	17.5	89.7	0.04
M95	A	0.09	0.597	18.2	87.8	0.01
M95	B	17.04	0.286	28.9	66.4	0.90
M60	A	2.16	0.467	23.7	75.3	0.21
M60	B	2.26	0.474	24.9	73.0	0.22
M60	C	49.30	0.391	54.8	43.2	2.31
M70	A	0.06	0.696	16.0	94.1	0.01

The catchment areas for ditches are located on potential Karst topography, as mentioned previously in the hydrologic assessment for cross culverts (please see cross culvert sections for more details). Given the difficulty in quantifying runoff reductions by potential Karst landscapes, the Rational Method did not discount this probable reduction in runoff. However, actual runoff flows to ditches may be smaller than those estimated by the current Rational Method, but would need to be confirmed with additional flow monitoring and detailed investigation. For the purpose of this study a conservative approach has been followed since the evaluation has used modelled estimates and does not account for these losses. Nevertheless, it is important that Karst be acknowledged as a potential factor affecting drainage within the study area.

2.3.2 Hydraulic Review

Roadside Ditches

The hydraulic assessment of the roadside ditches was conducted using the Manning's Equation to determine their capacities and ultimately the level of service relative to the Region's standards. Representative cross sections of the ditches were obtained during the field reconnaissance for this purpose. Based on the estimated cross-sectional, longitudinal slope information and the ditch lining material (i.e., grass, vegetation, gravel, etc.), the ditch capacities were determined.

The physical conditions and cross sectional profiles of the roadside ditches vary extensively along Bush Street and Mississauga Road. Although some ditches are indicated on the 2009 survey drawing provided by the Region, field observations sometimes revealed that those ditches were not evident. Also, the cross sectional characteristics of a single ditch may change continuously along its length. However, the "representative" ditch cross-section information was obtained in the field for the most constrained section of the ditch. For a review of the ditch capacity, this level of analysis is deemed appropriate. More detailed analysis would include a survey of the entire ditch which is beyond the scope of this work.

Table 8 presents the ditch capacities estimated by Manning's Equation. An assessment of the 10-year peak flows for the ditches and the available ditch capacities determines whether or not they meet the Level of Service based on the Region's current standard. **Figure 11** summarizes these findings.

Bush Street and Mississauga Road
Figure 11: Roadside Ditch Level of Service

Legend

- **M10** Roadside Ditch ID #
- Entrance Culvert
- Ditches with Sufficient Capacity for 10 - Year Storm
- Ditches without Sufficient Capacity for 10 - Year Storm
- Flow Direction*

*

M25

M25 Section D | M25 Section C | M25 Section B | M25 Section A

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Table 8: Ditch Capacities and Level of Service

Ditch ID	Ditch Sub-section ID	Rational Method		Existing Ditch Cross Section Profile (estimated)						Level of Service (Is existing ditch capacity sufficient for the 10-year event?)
		Total Drainage Area to Ditch (ha)	Peak Flow to Ditches Q_p (m^3/s)	Top Width (m)	Depth (m)	Side Slope (H:V)	Bottom Width (m)	Long Slope (m/m)	Maximum Ditch Capacity (m^3/s) based on Manning's Eqn	
B10	A	0.57	0.06	1.8	0.25	2.5	0.5	0.016	0.34	Yes
B10	B	2.67	0.25	1.8	0.25	2.5	0.5	0.035	0.51	Yes
B15	A	0.41	0.04	7.0	0.49	4.1	3.0	0.090	12.1	Yes
B18	A	0.16	0.03	9.5	0.66	5.0	2.9	0.020	11.0	Yes
B20	A	1.91	0.24	3.7	0.84	2.2	0.0	0.035	5.04	Yes
B25	A	0.44	0.05	1.9	0.40	1.7	0.6	0.038	1.25	Yes
B25	B	0.98	0.11	1.9	0.40	1.7	0.6	0.084	1.85	Yes
B30	A	1.84	0.20	2.2	0.55	1.5	0.6	0.004	0.65	Yes
B35	A	0.79	0.09	0.4	0.34	0.6	0.0	0.020	0.06	**No**
M10	A	2.95	0.27	2.0	0.30	0.5	1.3	0.060	1.24	Yes
M10	B	20.42	1.71	3.1	1.32	1.0	0.0	0.016	4.14	Yes
M10	C	20.47	1.69	3.1	1.32	1.0	0.0	0.027	5.37	Yes
M100	A	0.05	0.01	1.5	0.40	0.0	1.5	0.011	0.84	Yes
M105	A	0.25	0.02	2.0	0.24	4.2	0.0	0.005	0.14	Yes
M105	B	0.48	0.04	2.0	0.24	4.2	0.0	0.014	0.22	Yes
M110	A	0.62	0.06	1.0	0.10	3.0	0.4	0.017	0.05	**No**
M110	B	0.77	0.07	1.0	0.10	3.0	0.4	0.039	0.08	Yes
M110	C	0.98	0.09	1.0	0.10	3.0	0.4	0.017	0.05	**No**
M110	D	2.29	0.17	1.0	0.10	3.0	0.4	0.006	0.03	**No**
M115	A	0.06	0.01	1.1	0.15	0.3	1.0	0.041	0.26	Yes
M115	B	0.14	0.02	1.1	0.15	0.3	1.0	0.022	0.19	Yes
M115	C	7.71	0.46	1.1	0.15	0.3	1.0	0.004	0.08	**No**
M120	A	0.10	0.02	No ditch evident observed in field					0	**No ditch evident**
M125	A	0.91	0.07	1.2	0.31	1.9	0	0.012	0.18	Yes
M130	A	0.06	0.01	No ditch evident observed in field					0	**No ditch evident**

Ditch ID	Ditch Sub-section ID	Rational Method		Existing Ditch Cross Section Profile (estimated)						Level of Service (Is existing ditch capacity sufficient for the 10-year event?)
		Total Drainage Area to Ditch (ha)	Peak Flow to Ditches Q_p (m^3/s)	Top Width (m)	Depth (m)	Side Slope (H:V)	Bottom Width (m)	Long Slope (m/m)	Maximum Ditch Capacity (m^3/s) based on Manning's Eqn	
M140	A	0.20	0.04	1.0	0.35	0.7	0.5	0.020	0.42	Yes
M145	A	0.23	0.03	No ditch evident observed in field					0	**No ditch evident**
M15	A	0.38	0.06	2.0	0.30	2.0	1.3	0.060	1.62	Yes
M15	B	0.75	0.10	1.9	0.60	1.0	0.7	0.052	2.82	Yes
M15	C	2.83	0.25	2.0	0.68	1.0	0.6	0.018	2.01	Yes
M150	A	0.22	0.04	1.7	0.48	1.0	0.7	0.039	1.62	Yes
M155	A	1.07	0.09	2.1	0.60	1.3	0.6	0.035	2.38	Yes
M155	B	1.40	0.12	2.1	0.60	1.3	0.6	0.053	2.92	Yes
M20	A	0.08	0.01	1.0	0.70	0.5	0	0.041	0.48	Yes
M20	B	0.17	0.03	1.0	0.70	0.5	0	0.037	0.46	Yes
M25	A	1.53	0.15	1.7	0.30	2.8	0	0.039	0.46	Yes
M25	B	2.66	0.26	1.7	0.30	2.8	0	0.009	0.22	**No**
M25	C	2.85	0.28	1.7	0.30	2.8	0	0.025	0.36	Yes
M25	D	4.73	0.44	1.7	0.30	2.8	0	0.014	0.27	**No**
M30	A	0.09	0.01	No ditch evident observed in field					0	**No ditch evident**
M40	A	0.47	0.05	1.5	0.30	0.5	1.2	0.020	0.70	Yes
M40	B	0.58	0.06	1.5	0.30	0.5	1.2	0.058	1.17	Yes
M40	C	1.86	0.15	1.8	0.33	2.7	0	0.010	0.28	Yes
M40	D	2.16	0.17	3.1	0.60	1.8	0.9	0.022	2.99	Yes
M45	A	0.16	0.02	2.5	0.75	1.0	1.0	0.034	4.49	Yes
M45	B	0.33	0.05	4.7	1.26	1.4	1.1	0.024	14.2	Yes
M45	C	20.14	1.40	2.1	0.65	0.8	1.0	0.020	2.43	Yes
M45	D	20.61	1.34	2.1	0.65	0.8	1.0	0.006	1.31	**No**
M50	A	0.57	0.06	1.9	0.40	1.5	0.7	0.027	1.10	Yes
M55	A	1.17	0.12	1.2	0.33	1.2	0.4	0.023	0.43	Yes
M65	A	3.04	0.27	2.0	0.60	1.3	0.5	0.010	1.15	Yes
M65	B	17.38	0.98	2.0	0.60	1.3	0.5	0.003	0.61	**No**

Ditch ID	Ditch Sub-section ID	Rational Method		Existing Ditch Cross Section Profile (estimated)						Level of Service (Is existing ditch capacity sufficient for the 10-year event?)
		Total Drainage Area to Ditch (ha)	Peak Flow to Ditches Q_p (m^3/s)	Top Width (m)	Depth (m)	Side Slope (H:V)	Bottom Width (m)	Long Slope (m/m)	Maximum Ditch Capacity (m^3/s) based on Manning's Eqn	
M65	C	17.44	0.98	2.0	0.60	1.3	0.5	0.054	2.65	Yes
M65	D	17.59	0.92	2.0	0.60	1.3	0.5	0.010	1.13	Yes
M75	A	0.16	0.02	2.2	0.20	5.5	0	0.020	0.22	Yes
M80	A	0.14	0.02	1.6	0.13	6.2	0	0.029	0.10	Yes
M80	B	0.17	0.02	1.6	0.13	6.2	0	0.029	0.10	Yes
M85	A	0.06	0.01	No ditch evident observed in field					0	**No ditch evident**
M90	A	0.24	0.04	2.2	0.32	3.4	0	0.024	0.52	Yes
M95	A	0.09	0.01	1.4	0.18	0.0	1.4	0.017	0.30	Yes
M95	B	17.04	0.90	1.4	0.18	0.0	1.4	0.017	0.30	**No**
M60	A	2.16	0.21	2.1	0.35	2.0	0.7	0.003	0.29	Yes
M60	B	2.26	0.22	2.1	0.35	2.0	0.7	0.042	1.20	Yes
M60	C	49.30	2.31	2.5	0.60	2.1	0	0.005	0.71	**No**
M70	A	0.06	0.01	1.5	0.60	0.6	0.8	0.025	1.12	Yes

Entrance Culverts

A capacity rating assignment, similar to the one conducted for cross culverts, was performed for entrance culverts as a part of this drainage system review. Table 9 presents the capacity rating of each entrance culvert and where culvert pipe sizes do not comply with current Region standards. **Figure 12** illustrates the capacity rating of entrance culverts. Please refer to **Appendix H** for detailed information.

Table 9: Capacity Rating of Entrance Culverts under Existing Conditions

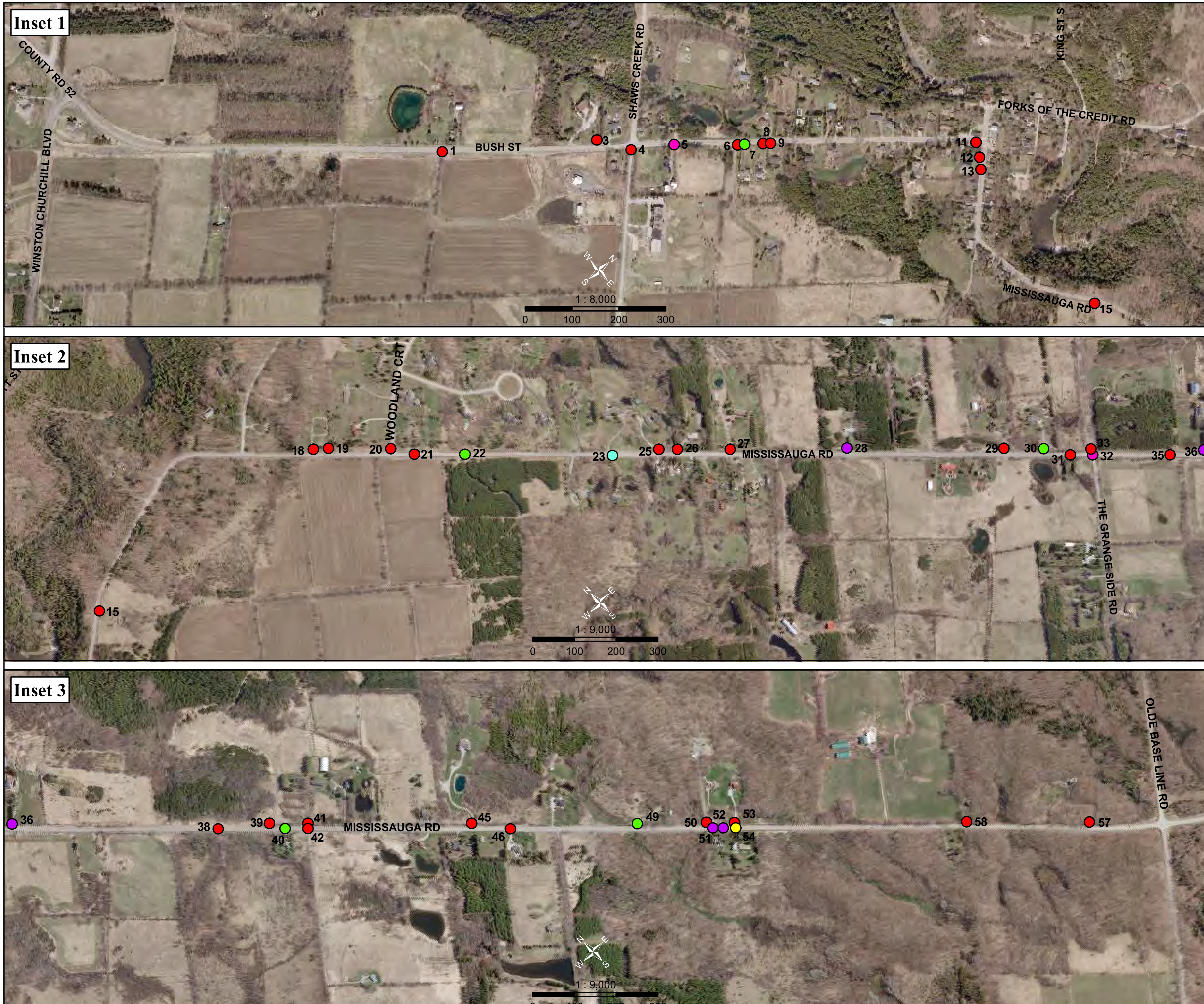
Culvert ID #	Size (mm)	Meeting Region's current standard (min. 375 mm)	Effective X-Sectional Area (%)	Capacity Rating (CR)
1	300	No	0	Below Minimum Tolerable
3	350	No	60	Below Minimum Tolerable
4	350	No	15	Below Minimum Tolerable
5	300	No	100	Very Good
6	300	No	0	Below Minimum Tolerable
7	300	No	95	Good
8	300	No	30	Below Minimum Tolerable
9*	300	No	40	Below Minimum Tolerable
11	300	No	n/a	Below Minimum Tolerable**
12	300	No	25	Below Minimum Tolerable
13	300	No	50	Below Minimum Tolerable
15	300	No	10	Below Minimum Tolerable
18	400	Yes	60	Below Minimum Tolerable
19	400	Yes	40	Below Minimum Tolerable
20	500	Yes	0	Below Minimum Tolerable
21	400	Yes	0	Below Minimum Tolerable
22	400	Yes	95	Good
23	400	Yes	n/a	n/a
25	400	Yes	20	Below Minimum Tolerable
26	400	Yes	60	Below Minimum Tolerable
27	300	No	16	Below Minimum Tolerable
28	400	Yes	n/a	Fair**
29	400	Yes	60	Below Minimum Tolerable
30	600	Yes	95	Good
31	600	Yes	40	Below Minimum Tolerable
32*	600	Yes	100	Very Good
33*	400	No	0	Below Minimum Tolerable
35	500	Yes	15	Below Minimum Tolerable
36	600	Yes	90	Fair
38	400	Yes	50	Below Minimum Tolerable
39	500	Yes	60	Below Minimum Tolerable
40	600	Yes	100	Very Good
41	500	Yes	70	Below Minimum Tolerable
42	500	Yes	40	Below Minimum Tolerable

Culvert ID #	Size (mm)	Meeting Region's current standard (min. 375 mm)	Effective X-Sectional Area (%)	Capacity Rating (CR)
45	400	Yes	5	Below Minimum Tolerable
46	300	No	15	Below Minimum Tolerable
49	500	Yes	95	Good
50	400	Yes	50	Below Minimum Tolerable
51	400	Yes	90	Fair
52	400	Yes	90	Fair
53	300	No	5	Below Minimum Tolerable
54	400	Yes	75	Poor
57	200	No	0	Below Minimum Tolerable
58	200	No	n/a	Below Minimum Tolerable**

Note: * = The culvert does not cross Bush Street or Mississauga Road, but transverse smaller side roads.
** = Region's inventory data not available for this culvert. Evaluation based on field observations.

They are required to have a minimum size of 600 mm.

Sizes of the 44 entrance culverts range from 200 mm to 600 mm. Some culvert sizes do not meet the Region's current standards (375 mm); however in some cases the depth of cover over the driveway road is not sufficient to accommodate a 375 mm diameter structure. Also, these entrance culverts may have been consistent with standard practices at the time of construction. In general, the entrance culverts do not provide sufficient capacity as the effective area has been diminished. The capacity rating along with additional information summarized in the Region's inventory sheets provides recommendations to maintain and/or upgrade these culverts.



Bush Street and Mississauga Road
Figure 12: Entrance Culvert - Capacity Rating

Legend

10	Entrance Culvert ID #
●	Very Good Condition
●	Good Condition
●	Fair Condition
●	Poor Condition
●	Below Minimum Tolerable
●	No Available Data

DILLON CONSULTING

Created By: SFG
Checked By: IP/GT
Date Created: 060710
Date Modified: 061510
File Path: I:\GIS\103121 - Bush Street & Mississauga Rd\Mapping\Culvert and Ditches Figures\Entrance Culvert - Capacity Rating.mxd

3. SUMMARY

The Drainage and Stormwater Management component of the Bush Street and Mississauga Road Class Environmental Assessment consists of two Phases. Phase I: The Drainage Assessment and Hydraulic Analysis documents the existing conditions and has been completed based on a review of background data, field investigations and a capacity assessment. Two separate approaches have been carried out for a) the cross culvert capacity assessment, and b) the road drainage system.

For the cross culverts, hydrologic and hydraulic modelling was completed. A VO2 hydrologic model was set-up and run to determine peak flows for the return period events (i.e., 2 – 100 year). Model peak flows are likely higher than actual peak flows due to the potential Karst topography and influence of ineffective drainage areas. The hydraulic analysis was performed using CulvertMaster to determine the level of service (LOS) provided by each structure. The model results indicate that in general, the majority of the cross culverts fail to provide the required LOS. Furthermore, many of the cross culverts also do not meet the Region's minimum size requirement (i.e., 600 mm diameter). Since the peak flow model estimates are likely higher than actual flow, the actual LOS provided by the cross culverts is likely better than indicated by CulvertMaster. It may be more realistic and appropriate to adopt the Region’s 600 mm minimum pipe size rather than meet a return period LOS. Following the pipe size standard would increase the theoretical level of service and balance the as yet undetermined extent of Karst landscape and rolling topography influencing the drainage characteristics.

For the road drainage system, which includes roadside ditches and entrance culverts, a simplified approach was taken to review the existing capacity and to identify inadequacies with regard to handling stormwater drainage. A hydrologic assessment was conducted for ditches using the Rational Method, while the hydraulic review was completed based on the Manning’s Equation. For entrance culverts, a capacity rating analysis using MTO criteria was carried out based on the existing physical conditions of the culverts as summarized in the culvert inventory compiled by the Region. The catchment areas for ditches are located on potential Karst topography, as aforementioned in the hydrologic assessment for cross culverts. Conservatively, the Rational Method was applied and the peak flows calculated may be higher than actual flows. In general, the ditches evaluated provided the required LOS. However, drainage issues do exist in the study area due to shoulder deficiencies and due to lack of ditching for the collection of storm runoff. A capacity rating was assigned to each entrance culvert based on the physical condition of these structures. In general, the physical condition of the majority of the entrance culverts was such that the capacity was below tolerable. The capacity rating along with additional information summarized in the Region’s inventory sheets provides recommendations to maintain and/or upgrade these culverts.

4. NEXT STEPS

The next steps include completion of the Phase II component, namely the development of a Stormwater Management Plan. First, a review of the Region's recommended road improvements will be undertaken to determine potential impacts to water resources. Alternative methods will be considered to mitigate the potential impacts. Design methods will be identified in consultation with other disciplines where appropriate (e.g., geotechnical, geomorphologic). Finally the alternative methods will be evaluated to recommend preferred stormwater management solutions.

Road improvements that could impact water resources may include additional ditches and changes in road footprint. It is anticipated that the addition of ditches will not significantly alter drainage areas and that similar flow patterns of similar magnitudes would exist under proposed conditions. Changes in the road footprint are likely to be minimal and therefore no significant water quality and quantity impacts are expected. Hydraulic impacts may include increases to upstream flood levels should the existing road profile elevation be raised (e.g., existing base, crushed in place).

Stormwater management measures will be identified to minimize potential water quality and quantity impacts. Along the rural transportation corridor, conveyance controls such as flat bottom grass-lined or enhanced swales have been considered, and the need for pond end-of-pipe controls is limited (i.e., no widening to necessitate peak flow controls). End-of-pipe oil-grit separators may also be considered in isolated areas if curb and gutter and storm sewers are preferred. To address hydraulic impacts, we will assess alternative culvert sizes. Mitigation measures may also be recommended as an opportunity to address existing capacity deficiencies not related to the proposed works.

5. REFERENCES

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Regional Municipality of Peel, February 2010. *Public Works Design, Specifications and Procedures Manual – Regional Roads and Traffic.*

Regional Municipality of Peel, July 2009. *Public Works Design, Specifications and Procedures Manual – Storm Sewer Design Criteria.*

Soil Survey of Peel County, Ontario 1953. *Report No. 18 of the Ontario Soil Survey*. Canada Department of Agriculture, Ottawa. Ontario Agricultural College, Guelph.

Totten Sims Hubicki Associates, 1998. *Regional Road Improvements In The Belfountain Area. Town of Caledon.*

Appendix A
Inventory Sheets

Inventory Sheets for Cross Culverts

Inventory of Hydraulic Structures

Project Information		Structure Information				Flow Conditions	
Project Name:	Bush St & Mississauga Rd EA	ID No:	Culvert # 10	Slope (m/m):	0.01677	Present? (Y/N):	Y
Project No:	10-3121	Location:	Bush St, west of Main	Barrel Condition:		Ave. Depth (mm):	100 - 300
Date:	16-Apr-10	Type:	culvert			Velocity (m/s):	
Field Crew:	GT/JH/BH	Material:	PVCINC	Inlet Type:		Flow (cms):	
Photo No:	2620-2626.JPG	Diameter (m):	0.45 m	Inlet Condition:		Silt (mm):	
Map Ref:	STA 1+965	Height (m):		Skew Angle (deg):	0	Tailwater/Backwater Condition:	
		Width (m):		Obvert to Road (m):			
		Length (m):	13.3	Construction Date:			
		U/S Invert Elev (m):	382.706	Other Comments:	pond u/s		
		D/S Invert Elev (m):	382.483				

Site Description / Comments

Photo 2620	D/S side
Photo 2621	D/S side
Photo 2622	D/S side
Photo 2623	U/S side
Photo 2624	U/S side
Photo 2625	U/S side
Photo 2626	U/S side

Site Photograph

Photo 2620

Inventory of Hydraulic Structures

Project Information		Structure Information				Flow Conditions	
Project Name:	Bush St & Mississauga Rd EA	ID No:	Culvert # 14	Slope (m/m):	0.029	Present? (Y/N):	Y
Project No:	10-3121	Location:	Bush St, & Old Main	Barrel Condition:	good	Ave. Depth (mm):	100 mm
Date:	16-Apr-10					Velocity (m/s):	
Field Crew:	GT/JH/BH	Type:	culvert	Inlet Type:		Flow (cms):	
Photo No:	2634-2639.JPG	Material:	CSP	Inlet Condition:		Silt (mm):	> 50% full D/S
Map Ref:	STA 42+955	Diameter (m):	0.60 m	Skew Angle (deg):		Tailwater/Backwater Condition:	
		Height (m):		Obvert to Road (m):			
		Width (m):		Construction Date:			
		Length (m):	17.2	Other Comments:			
		U/S Invert Elev (m):	380.433	Control Point U/S face of 21/22 1.87 m (12cm from 1.87m to obvert)			
		D/S Invert Elev (m):	379.933	survey at U/S face - vegetated grass /trees over bank, rocky bottom			

Site Description / Comments

Photo 2634	looking U/S
Photo 2635	U/S face
Photo 2636	looking U/S - showing split channel just U/S of culvert
Photo 2637	looking D/S
Photo 2638	looking D/S
Photo 2639	culvert face of side channel
side channel:	v-channel small trees over bank; veg/dirt bottom

Bankfull width measurements - along church parking lot
1.1m, 1.4m, 1.6m, 2.1m => ave 1.55 m (ave depth 10cm)

bed: gravel substrate

channel d/s slope = 5% (estimate)

Site Photograph

Photo 2635

Inventory of Hydraulic Structures

Project Information		Structure Information				Flow Conditions	
Project Name:	Bush St & Mississauga Rd EA	ID No:	Culvert # 16	Slope (m/m):	0.056	Present? (Y/N):	N
Project No:	10-3121	Location:	Bush St	Barrel Condition:	crushed	Ave. Depth (mm):	
Date:	16-Apr-10	Type:	circular			Velocity (m/s):	
Field Crew:	GT/JH/BH	Material:	CSP	Inlet Type:		Flow (cms):	
Photo No:	2640.jpg, 2641.jpg	Diameter (m):	0.3	Inlet Condition:		Silt (mm):	
Map Ref:	STA 42+540	Height (m):		Skew Angle (deg):	0	Tailwater/Backwater Condition:	
		Width (m):		Obvert to Road (m):			
		Length (m):	16.3	Construction Date:			
		U/S Invert Elev (m):	386.152	Other Comments:	Survey for u/s invert		
		D/S Invert Elev (m):	385.262	No channel d/s drains over escarpment			

Site Description / Comments

Survey points inverts u/s 99.21, d/s 98.32

Photo 2640.jpg d/s face
Photo 2641.jpg u/s face

Confirm culvert length

Site Photograph

Photo 2640

Inventory of Hydraulic Structures

Project Information

Project Name:	Bush St & Mississauga Rd EA
Project No:	10-3121
Date:	16-Apr-10
Field Crew:	GT/JH/BH
Photo No:	2644-2645.JPG
Map Ref:	STA 42+400

Structure Information

ID No:	Culvert # 17
Location:	Old Main St, west of Mississauga Rd
Type:	culvert
Material:	CSP
Diameter (m):	0.30 m
Height (m):	
Width (m):	
Length (m):	10.3
U/S Invert Elev (m):	384.684
D/S Invert Elev (m):	384.325

Slope (m/m):	0.03484
Barrel Condition:	crushed
Inlet Type:	
Inlet Condition:	
Skew Angle (deg):	
Obvert to Road (m):	
Construction Date:	
Other Comments:	no channel

Flow Conditions

Present? (Y/N):	N
Ave. Depth (mm):	
Velocity (m/s):	
Flow (cms):	
Silt (mm):	full
Tailwater/Backwater Condition:	

Site Description / Comments

Photo 2645 D/S side
Photo 2644 U/S side

Site Photograph

Photo 2644

Inventory of Hydraulic Structures

Project Information		Structure Information				Flow Conditions	
Project Name:	Bush St & Mississauga Rd EA	ID No:	Culvert # 24	Slope (m/m):	0.032	Present? (Y/N):	
Project No:	10-3121	Location:	Mississauga Rd,	Barrel Condition:		Ave. Depth (mm):	
Date:	16-Apr-10		south of Old Main St.			Velocity (m/s):	
Field Crew:	GT/JH/BH	Type:	culvert	Inlet Type:		Flow (cms):	
Photo No:	2663-2664.JPG	Material:	CSP	Inlet Condition:		Silt (mm):	full on U/S end
Map Ref:	STA 41+000	Diameter (m):	0.40 m	Skew Angle (deg):		Tailwater/Backwater Condition:	
		Height (m):		Obvert to Road (m):		ponding	
		Width (m):		Construction Date:			
		Length (m):	15.252	Other Comments:			
		U/S Invert Elev (m):	428.304		no definable channel		
		D/S Invert Elev (m):	427.816		no definable ditch		

Site Description / Comments

Photo 2664
Photo 2663

Site Photograph

Photo 2664

Inventory of Hydraulic Structures

Project Information

Project Name:	Bush St & Mississauga Rd EA
Project No:	10-3121
Date:	4-May
Field Crew:	BH/IP
Photo No:	6413-6416.JPG
Map Ref:	STA 39+650

Structure Information

ID No:	Culvert # 37
Location:	Mississauga Rd, south of Old Main St.
Type:	culvert
Material:	CSP
Diameter (m):	0.60 m
Height (m):	
Width (m):	
Length (m):	12.5
U/S Invert Elev (m):	418.796
D/S Invert Elev (m):	418.414

Slope (m/m):	0.03056
Barrel Condition:	
Inlet Type:	
Inlet Condition:	
Skew Angle (deg):	
Obvert to Road (m):	
Construction Date:	
Other Comments:	

Flow Conditions

Present? (Y/N):	N (ponding both ends)
Ave. Depth (mm):	
Velocity (m/s):	
Flow (cms):	
Silt (mm):	

Tailwater/Backwater Condition:

Site Description / Comments

Photo 6413	U/S side
Photo 6413b	U/S side
Photo 6414	D/S side
Photo 6415	Ditch connecting to D/S side (face south)
Photo 6416	Ditch connecting to U/S side (face north)

Site Photograph

Photo 6413b

Inventory of Hydraulic Structures

Project Information		Structure Information				Flow Conditions	
Project Name:	Bush St & Mississauga Rd EA	ID No:	Culvert # 43	Slope (m/m):	0.01353	Present? (Y/N):	N (ponding D/S end)
Project No:	10-3121	Location:	Mississauga Rd, south of Old Main St.	Barrel Condition:		Ave. Depth (mm):	
Date:	16-Apr-10					Velocity (m/s):	
Field Crew:	GT/JH/BH	Type:	culvert - elipse	Inlet Type:		Flow (cms):	
Photo No:	2671-2675.JPG	Material:	CSP	Inlet Condition:		Silt (mm):	
Map Ref:	STA 38+875	Diameter (m):	0.90 m	Skew Angle (deg):		Tailwater/Backwater Condition:	
		Height (m):	0.55 m	Obvert to Road (m):			
		Width (m):	0.9 m	Construction Date:			
		Length (m):	12.566	Other Comments:			
		U/S Invert Elev (m):	400.13	ponding in ditch; wide shallow			
		D/S Invert Elev (m):	399.96				

Site Description / Comments

Photo 2671 D/S side
Photo 2672 Ditch upslope
Photo 2673 Ditch downslope (to MNOP)

Flooding at 16065
* recommend lowering culvert; poor drainage

Photo 2674 U/S face
Photo 2675 U/S ditch; no ditch D/S

Ditch Info:
D/S Ditch - wide shallow trap
TW = 1.5 m
0.5 m Rd side
0.3 m other side
1:1 s/s

U/S Ditch - ponding along ditch
TW = 2.5 m
0.6 m Rd side
no bank fieldside

Site Photograph

Photo 2671

Inventory of Hydraulic Structures

Project Information		Structure Information				Flow Conditions	
Project Name:	Bush St & Mississauga Rd EA	ID No:	Culvert # 44n & 44s	Slope (N) (m/m):	0.01383	Present? (Y/N):	Y
Project No:	10-3121	Location:	Mississauga Rd, south of Old Main St.	Slope (S) (m/m):	0.00970	Ave. Depth (mm):	
Date:	16-Apr-10			Barrel Condition:		Velocity (m/s):	
Field Crew:	GT/JH/BH	Type:	2 Cell elipse culvert	Inlet Type:		Flow (cms):	
Photo No:	2676-2681..JPG	Material:	CSP	Inlet Condition:		Silt (mm):	15cm gravel
Map Ref:	STA 38+800	Diameter (m):	1.20 m	Skew Angle (deg):		Tailwater/Backwater Condition:	
		Height (m):		Obvert to Road (m):		*TW effected by pond	
		Width (m):	1.0 m	Construction Date:			
		Length (m):	13.815	Other Comments:			
		U/S Invert Elev (m):	399.461 (N), 399.442 (S)	*pond U/S embankment			
		D/S Invert Elev (m):	399.27 (N), 399.308 (S)				

Site Description / Comments

Photo 2676	L U/S
Photo 2677	U/S face
Photo 2678	L south
Photo 2679	L north
Photo 2680	L D/S
Photo 2681	D/S face

D/S channel veg overbank
0.3 m D
2.0 m wide
note: muck/gravel substrate
backwater from pond
no flow apparent

D/S side: top gravel to obvert 0.6 m

Site Photograph

Photo 2677

Inventory of Hydraulic Structures

Project Information		Structure Information				Flow Conditions	
Project Name:	Bush St & Mississauga Rd EA	ID No:	Culvert # 47	Slope (m/m):	0.01724	Present? (Y/N):	N (ponding D/S)
Project No:	10-3121	Location:	Mississauga Rd, south of Old Main St.	Barrel Condition:		Ave. Depth (mm):	
Date:	16-Apr-10	Type:	culvert	Inlet Type:		Velocity (m/s):	
Field Crew:	GT/JH/BH	Material:	CSP	Inlet Condition:		Flow (cms):	
Photo No:	2682-2684.JPG	Diameter (m):	0.4	Skew Angle (deg):		Silt (mm):	2 half full
Map Ref:	STA 38+425	Height (m):		Obvert to Road (m):		Tailwater/Backwater Condition:	
		Width (m):		Construction Date:			
		Length (m):	12.238	Other Comments:			
		U/S Invert Elev (m):	398.172				
		D/S Invert Elev (m):	397.961				

Site Description / Comments

Photo 2682 U/S face
Photo 2683 D/S face
Photo 2684 looking D/S

no channel
no ditch

Site Photograph

Photo 2683

Inventory of Hydraulic Structures

Project Information

Project Name:	Bush St & Mississauga Rd EA
Project No:	10-3121
Date:	16-Apr-10
Field Crew:	GT/JH/BH
Photo No:	2685-2687.JPG
Map Ref:	STA 38+175

Structure Information

ID No:	Culvert # 48
Location:	Mississauga Rd, south of Old Main St.
Type:	culvert
Material:	CSP
Diameter (m):	0.40 m
Height (m):	
Width (m):	
Length (m):	12.427
U/S Invert Elev (m):	394.083 S
D/S Invert Elev (m):	393.836 T

Slope (m/m):	0.020
Barrel Condition:	
Inlet Type:	
Inlet Condition:	
Skew Angle (deg):	
Obvert to Road (m):	
Construction Date:	
Other Comments:	

Flow Conditions

Present? (Y/N):	Y
Ave. Depth (mm):	
Velocity (m/s):	
Flow (cms):	
Silt (mm):	half full
Tailwater/Backwater Condition:	

Site Description / Comments

Photo 2685 L D/S
Photo 2686 D/S face
Photo 2687 L U/S

ponding D/S -> wetland D/S
GW at surface along ditch
ditch with water

Site Photograph

Photo 2685

Inventory of Hydraulic Structures

Project Information		Structure Information				Flow Conditions	
Project Name:	Bush St & Mississauga Rd EA	ID No:	Culvert # 55	Slope (m/m):	0.02620	Present? (Y/N):	N (ponding at D/S side & along ditch
Project No:	10-3121	Location:	Mississauga Rd, south of Old Main St.	Barrel Condition:		Ave. Depth (mm):	
Date:	16-Apr-10					Velocity (m/s):	
Field Crew:	GT/JH/BH	Type:	culvert	Inlet Type:		Flow (cms):	
Photo No:	2690.JPG	Material:	CSP	Inlet Condition:		Silt (mm):	
Map Ref:	STA 37+725	Diameter (m):	0.30 m	Skew Angle (deg):		Tailwater/Backwater Condition:	
		Height (m):		Obvert to Road (m):			
		Width (m):		Construction Date:			
		Length (m):	12.368	Other Comments:			
		U/S Invert Elev (m):	388.755				
		D/S Invert Elev (m):	388.431				

Site Description / Comments

Photo 2690

Ditch - TW 2.5 m
0.7 m D
1:1 s/s
(same for both sides of road)

Site Photograph

Photo 2690

Inventory of Hydraulic Structures

Project Information

Project Name: Bush St & Mississauga Rd EA
Project No: 10-3121
Date: 16-Apr-10
Field Crew: GT/JH/BH
Photo No: 2691-2693.JPG
Map Ref: STA 37+625

Structure Information

ID No: Culvert # 56
Location: Mississauga Rd, south of Old Main St.
Type: culvert
Material: CSP
Diameter (m): 0.30 m
Height (m):
Width (m):
Length (m): 11.496
U/S Invert Elev (m): 387.255
D/S Invert Elev (m): 387.208

Slope (m/m): 0.004088
Barrel Condition:
Inlet Type:
Inlet Condition:
Skew Angle (deg):
Obvert to Road (m):
Construction Date:
Other Comments:

Flow Conditions

Present? (Y/N):
Ave. Depth (mm):
Velocity (m/s):
Flow (cms):
Silt (mm): 10 cm
Tailwater/Backwater Condition:

Site Description / Comments

Photo 2691	D/S face
Photo 2692	look south
Photo 2693	look north
Photo 2694	U/S face
Photo 2695	south
Photo 2696	north

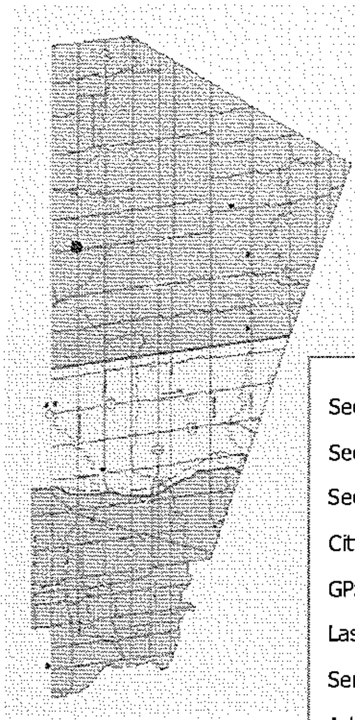
ditch is dry

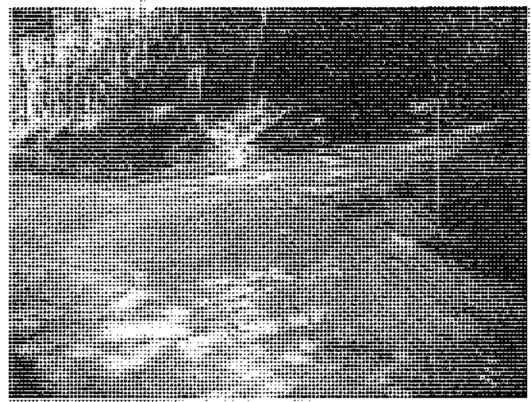
Site Photograph

Photo 2694

Region of Peel – Culvert Inventory Sheets

CULVERT NO. 261





Section - Road:	13690 - MISSISSAUGA ROAD
Section Start:	OLDE BASE LINE ROAD (REG. RD.# 12)
Section End:	0.7km N.OF OLDE BASE LINE ROAD
City/Town:	CALEDON
GPS Coord:	583682 E 4846007 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15457
Side of Road:	East

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	5	m2
Total Ditching Required :	6	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	5.95	m
Centre-Line Offset North	6.25	m
Exposed Length South	0	m
Exposed Length North	0.3	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

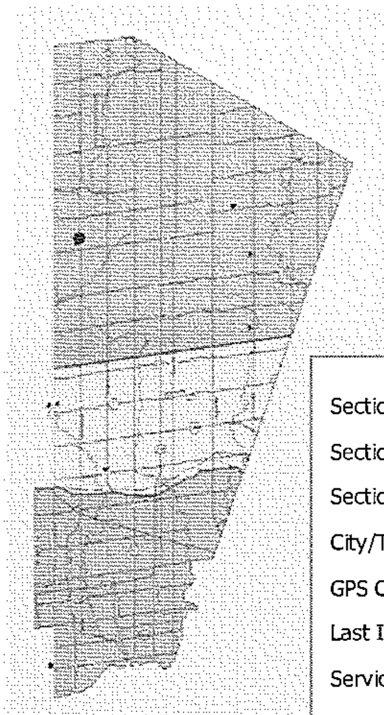
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

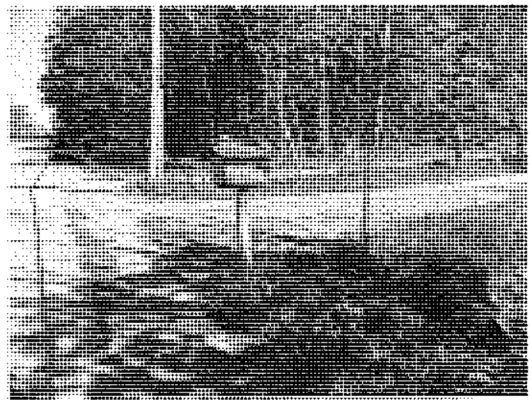
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean	$1,525
2		
3		
4	Grade and Sod w / Ditching	$950
5		
6		
	Total Incl. Mobilization and Contingency :	$3,219

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 262





Section - Road:	13690 - MISSISSAUGA ROAD
Section Start:	OLDE BASE LINE ROAD (REG. RD.# 12)
Section End:	0.7km N.OF OLDE BASE LINE ROAD
City/Town:	CALEDON
GPS Coord:	583025 E 4846657 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15797
Side of Road:	East

Effective Cross-Section:	50	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	15	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	9.2	m
Centre-Line Offset North	9.2	m
Exposed Length South	0.3	m
Exposed Length North	0.3	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

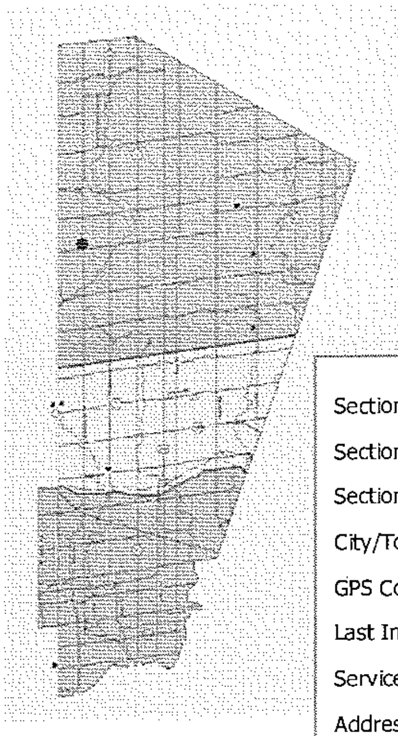
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

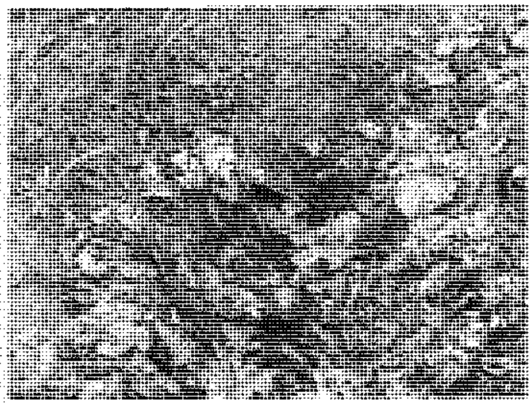
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

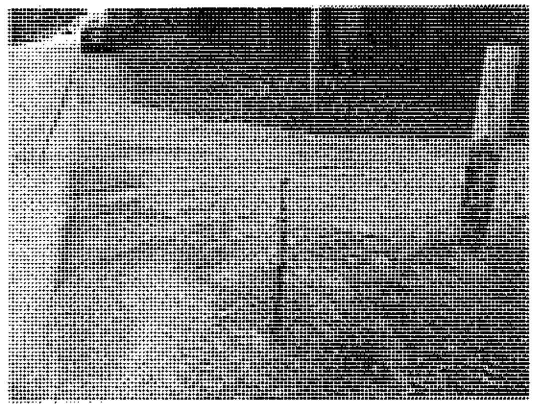
1	Flush/Clean & Re-Shape Ends	$2,500
2		
3		
4	Ditching	$2,250
5		
6		
	Total Incl. Mobilization and Contingency :	$6,063

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 263







Section - Road:	13690 - MISSISSAUGA ROAD
Section Start:	OLDE BASE LINE ROAD (REG. RD.# 12)
Section End:	0.7km N.OF OLDE BASE LINE ROAD
City/Town:	CALEDON
GPS Coord:	583472 E 4846209 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15606
Side of Road:	West

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

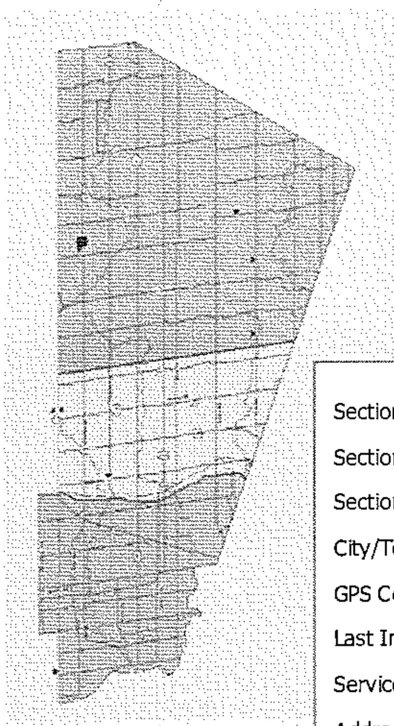
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

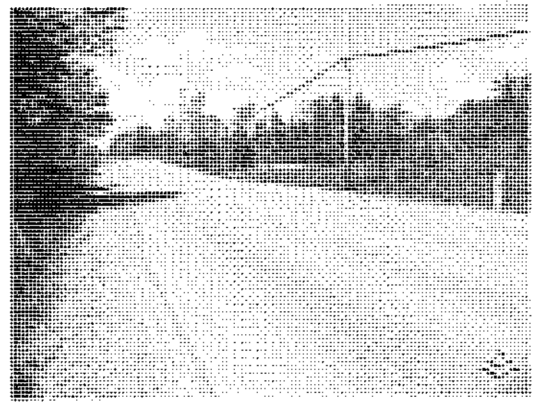
1	Full/Partial Replacement	$1,841
2		
3		
4	Ditching	$4,500
5		
6		
	Total Incl. Mobilization and Contingency :	$8,051

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	0	%
% Req. Replacement:	100	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	30	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.1	m
Centre-Line Offset North	4.1	m
Exposed Length South	0	m
Exposed Length North	100	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 264





Section - Road: 13690 - MISSISSAUGA ROAD

Section Start: OLDE BASE LINE ROAD (REG. RD.# 12)

Section End: 0.7km N.OF OLDE BASE LINE ROAD

City/Town: CALEDON

GPS Coord: 582902 E 4846784 N

Last Inspected: 5/31/2005

Service Type: Cross

Address/Cross Road: N/A

Side of Road: N/A

Effective Cross-Section: 76 %

% Req. Replacement: 0 %

Cross Section:

Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	2	
Markers Req. Straight:	0	
Markers Replace/Install:	0	
Centre-Line Offset West	6.1	m
Centre-Line Offset East	6.1	m
Exposed Length West	0	m
Exposed Length East	0	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

Shape/Type: Round

Material: Corrugated Steel

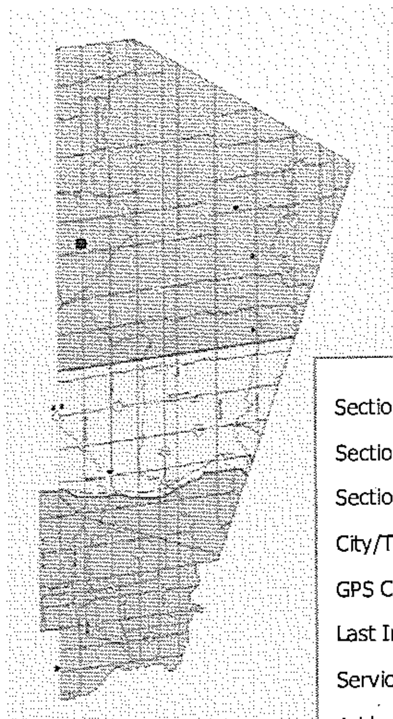
Surface: A [ ] B [x] C [ ]

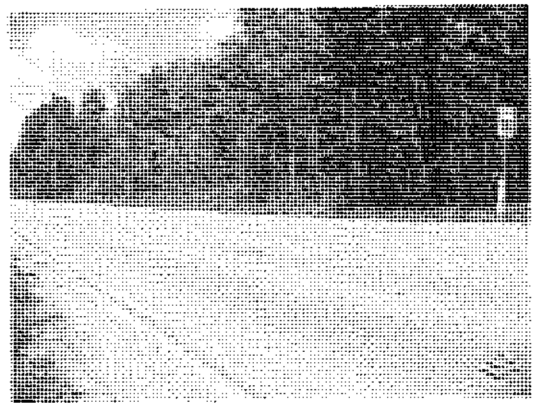
No Headwall Present at West	[x]	Pre-Fab Headwall at West	[ ]
No Headwall Present at East	[x]	Pre-Fab Headwall at East	[ ]
Concrete Headwall at West	[ ]	Gabion Headwall at West	[ ]
Concrete Headwall at East	[ ]	Gabion Headwall at East	[ ]
Barriers Present	[ ]	Marker Posts	[x]

1	Flush/Clean	$1,525
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$2,031

Immediately	[ ]
This Year	[ ]
1 -2 Years	[ ]
3 - 5 Years	[x]
6 - 10 Years	[ ]
11+ Years	[ ]
N/A	[ ]

CULVERT NO. 265





Section - Road:	13690 - MISSISSAUGA ROAD
Section Start:	OLDE BASE LINE ROAD (REG. RD.# 12)
Section End:	0.7km N.OF OLDE BASE LINE ROAD
City/Town:	CALEDON
GPS Coord:	583229 E 4846459 N
Last Inspected:	5/31/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

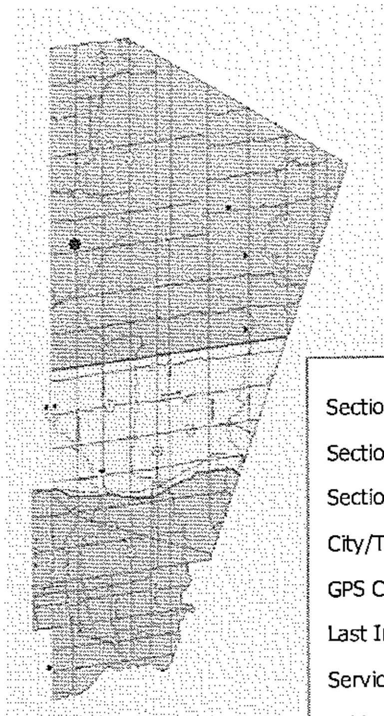
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

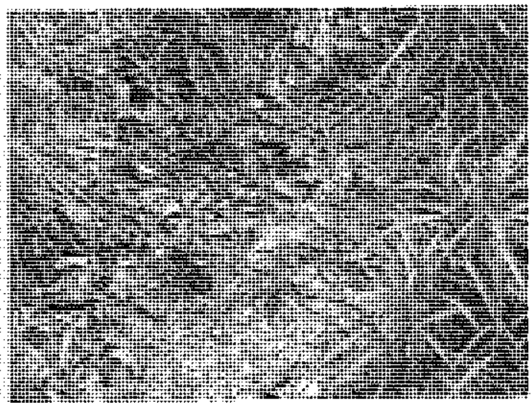
1	Flush/Clean	$1,438
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$2,673

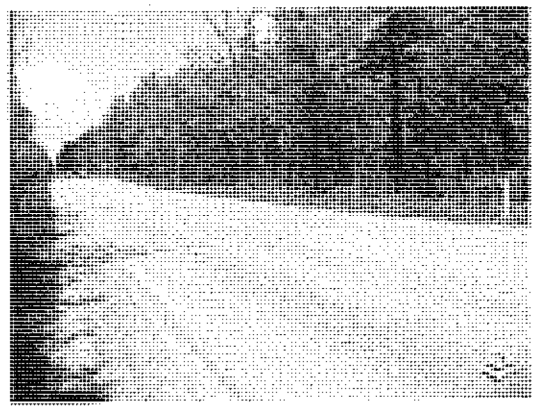
Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	60	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	2	
Markers Req. Straight:	0	
Markers Replace/Install:	0	
Centre-Line Offset West	5.85	m
Centre-Line Offset East	5.65	m
Exposed Length West	0.2	m
Exposed Length East	0	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.34	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 266







Section - Road:	13690 - MISSISSAUGA ROAD
Section Start:	OLDE BASE LINE ROAD (REG. RD.# 12)
Section End:	0.7km N.OF OLDE BASE LINE ROAD
City/Town:	CALEDON
GPS Coord:	583303 E 4846389 N
Last Inspected:	5/31/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Effective Cross-Section:	5	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	1	m2
Total Ditching Required :	2	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	2	
Markers Req. Straight:	0	
Markers Replace/Install:	0	
Centre-Line Offset West	5.55	m
Centre-Line Offset East	5.55	m
Exposed Length West	0	m
Exposed Length East	0	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

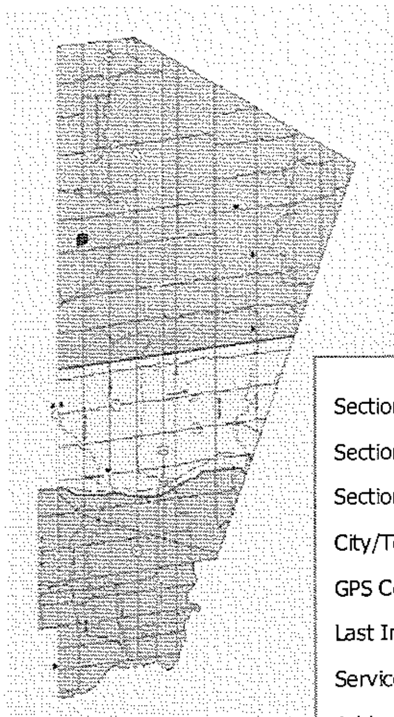
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

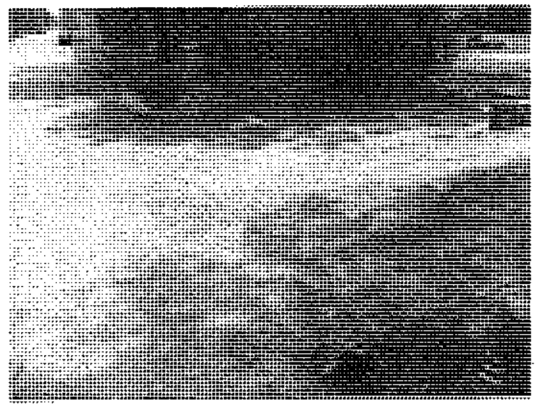
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

1	Flush/Clean	$1,388
2		
3		
4	Ditching	$300
5		
6		
	Total Incl. Mobilization and Contingency :	$2,235

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 267





Section - Road:	13690 - MISSISSAUGA ROAD
Section Start:	OLDE BASE LINE ROAD (REG. RD.# 12)
Section End:	0.7km N.OF OLDE BASE LINE ROAD
City/Town:	CALEDON
GPS Coord:	583036 E 4846690 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15790
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

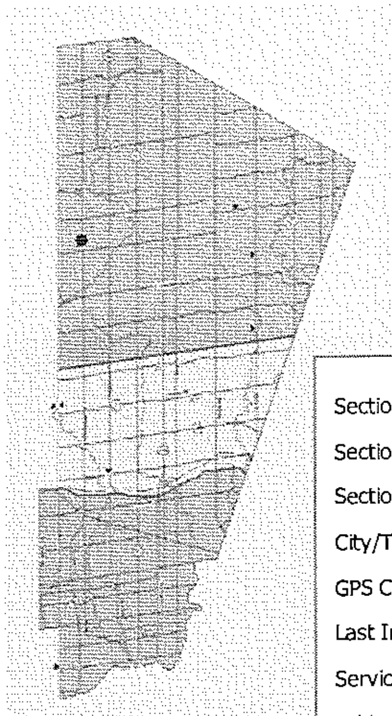
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

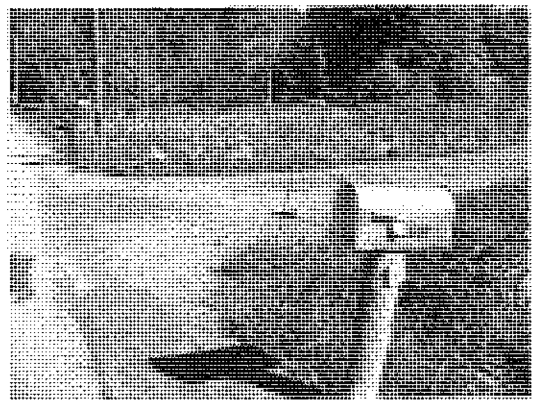
1	Flush/Clean	$800
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$1,875

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

Effective Cross-Section:	90	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.2	m
Centre-Line Offset North	3.2	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.1	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 268





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	583089 E 4846608 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15775
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

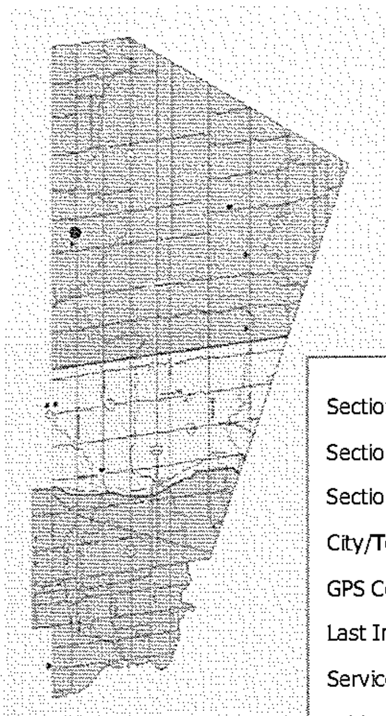
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

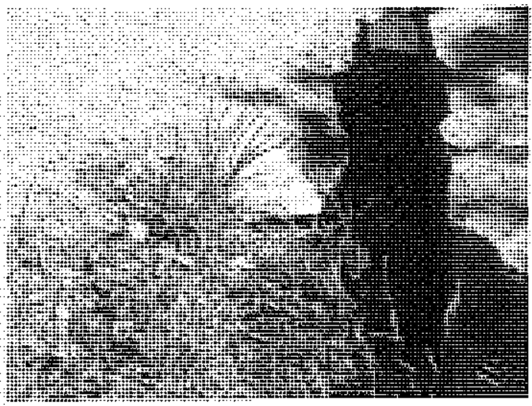
1	Flush/Clean	$900
2		
3		
4	Ditching	$1,350
5		
6		
	Total Incl. Mobilization and Contingency :	$2,938

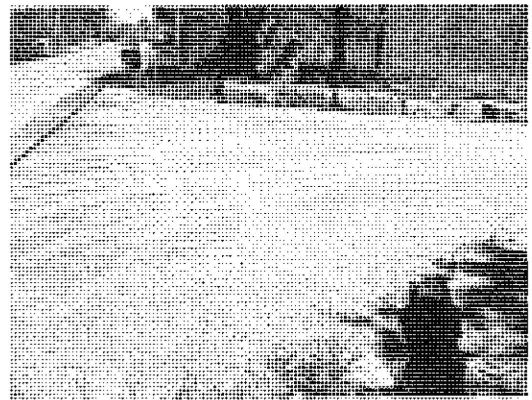
Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	5	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	9	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.65	m
Centre-Line Offset North	3.55	m
Exposed Length South	0.1	m
Exposed Length North	0	m
Maximum Overburden:	0.2	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 269







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	582652 E 4847056 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15977
Side of Road:	East

Effective Cross-Section:	5	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	20	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	5.95	m
Centre-Line Offset North	6.05	m
Exposed Length South	0.1	m
Exposed Length North	0.2	m
Maximum Overburden:	0.2	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

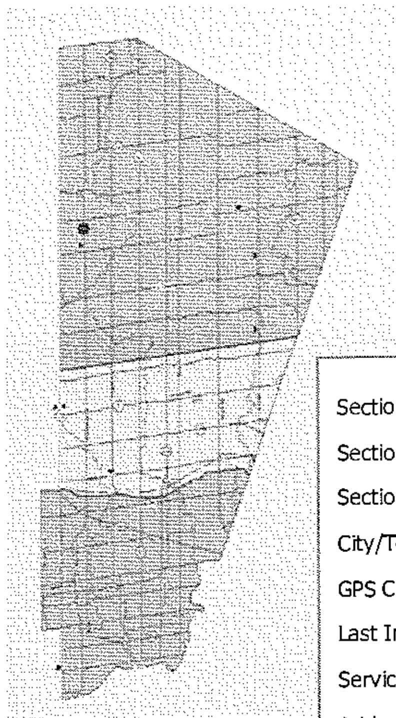
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

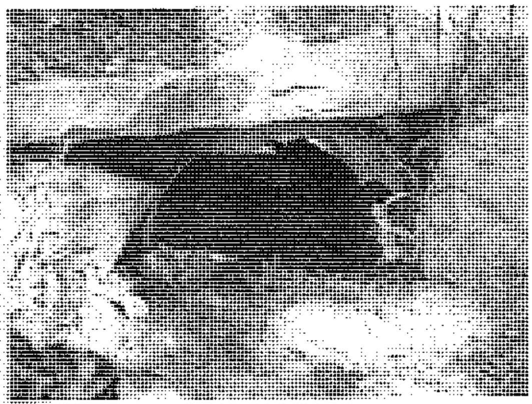
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

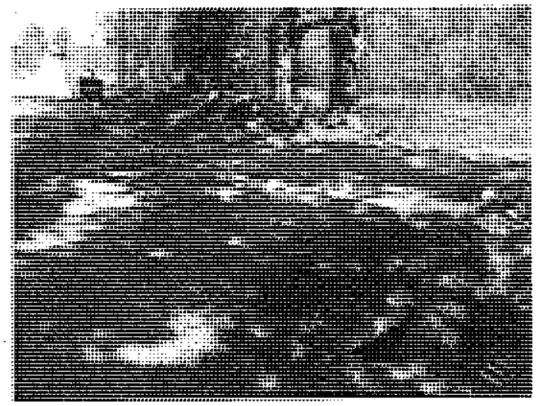
1	Flush/Clean & Re-Shape Ends	$1,700
2		
3		
4	Ditching	$3,000
5		
6		
	Total Incl. Mobilization and Contingency :	$6,000

Immediately	☐
This Year	☐
1 -2 Years	☑
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 270







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	582301 E 4847403 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	16117
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

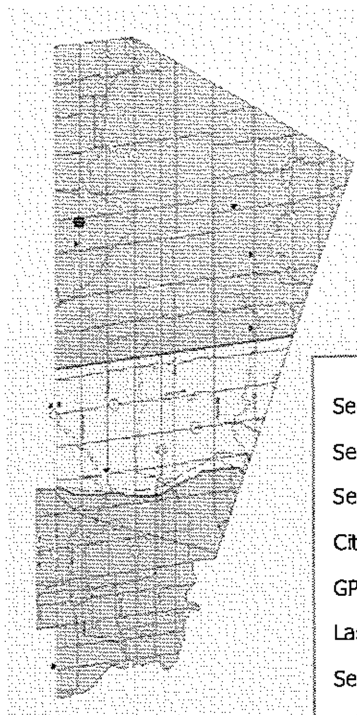
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

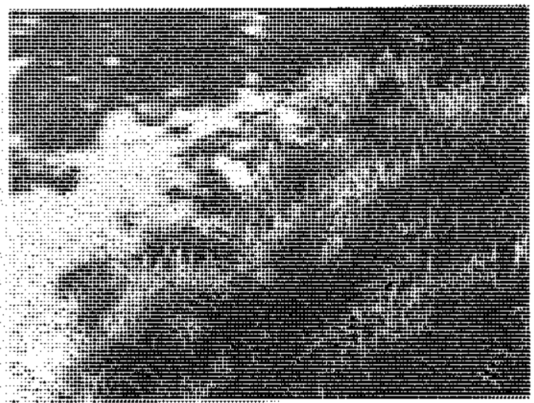
1	Flush/Clean	$1,200
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$2,375

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

Effective Cross-Section:	60	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.7	m
Centre-Line Offset North	4.9	m
Exposed Length South	0	m
Exposed Length North	0.2	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 271





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581977 E 4847725 N
Last Inspected:	5/27/2005
Service Type:	Field Entrance
Address/Cross Road:	N/A
Side of Road:	East

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	20	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	2.75	m
Centre-Line Offset North	2.75	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.1	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

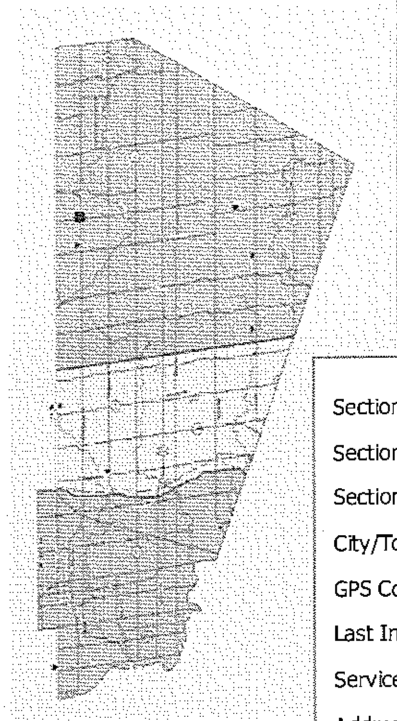
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

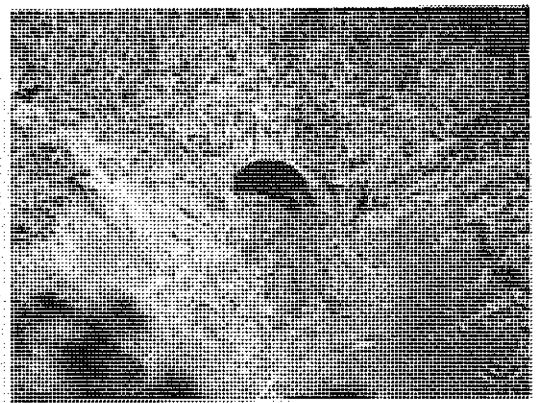
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

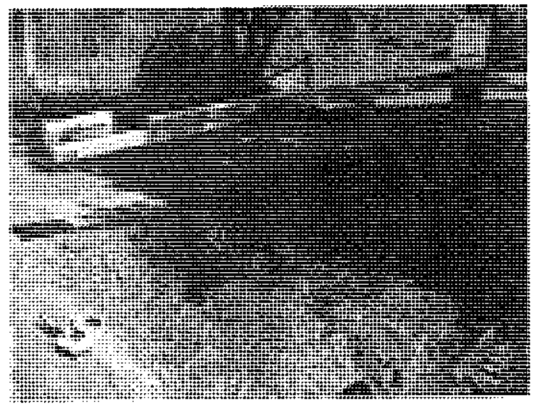
1	Flush/Clean	$688
2		
3		
4	Ditching	$3,000
5		
6		
	Total Incl. Mobilization and Contingency :	$4,735

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 272







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581588 E 4848111 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	16437
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

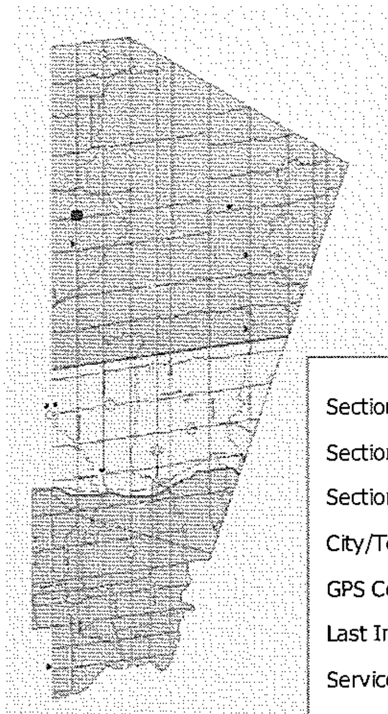
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

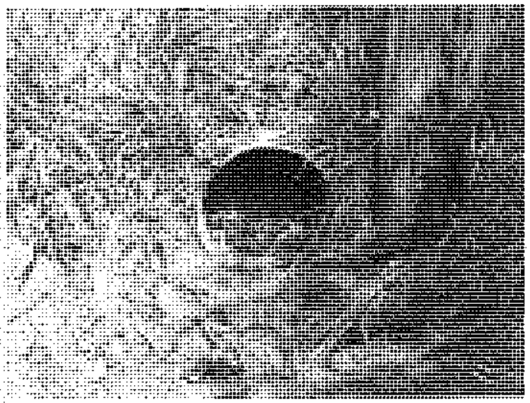
1	Flush/Clean	$1,200
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,625

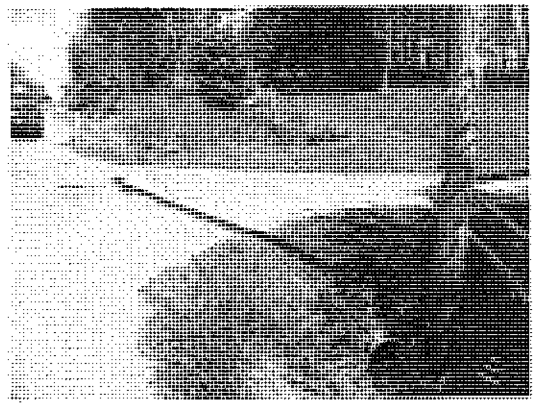
Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☑
N/A	☐

Effective Cross-Section:	95	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.8	m
Centre-Line Offset North	4.8	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	1	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 273







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581528 E 4848178 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	16461
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

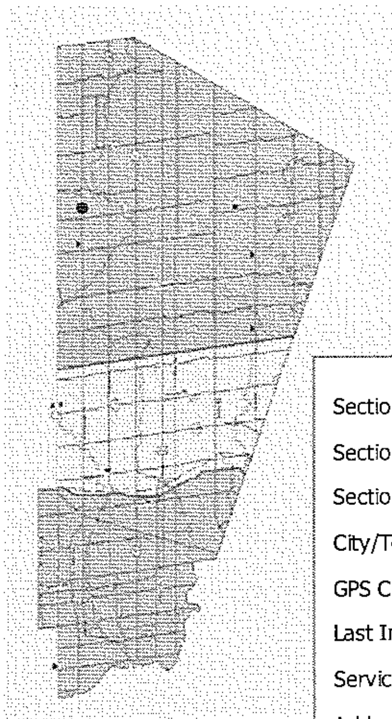
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

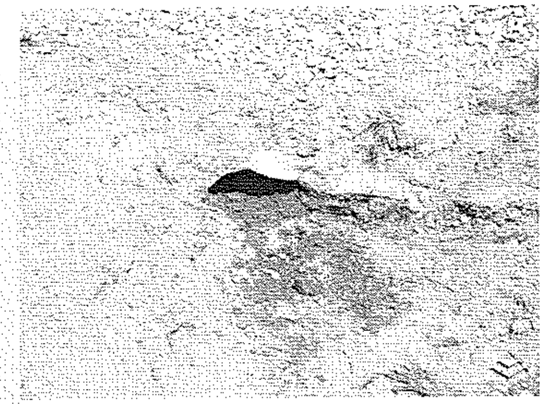
1	Flush/Clean	$1,162
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,578

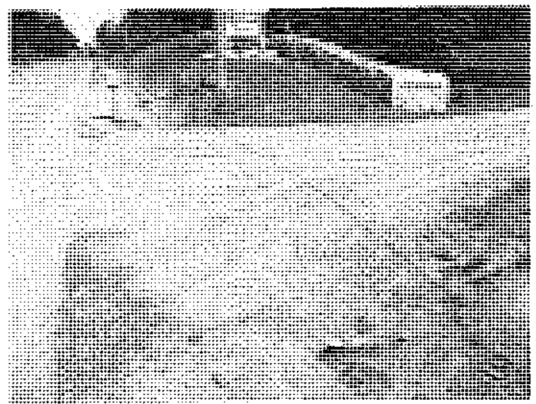
Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

Effective Cross-Section:	60	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.6	m
Centre-Line Offset North	4.7	m
Exposed Length South	0.1	m
Exposed Length North	0.2	m
Maximum Overburden:	0.3	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 274







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581056 E 4848641 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	16671
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

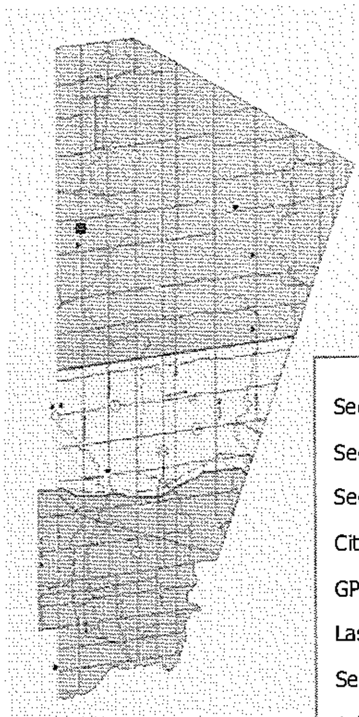
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

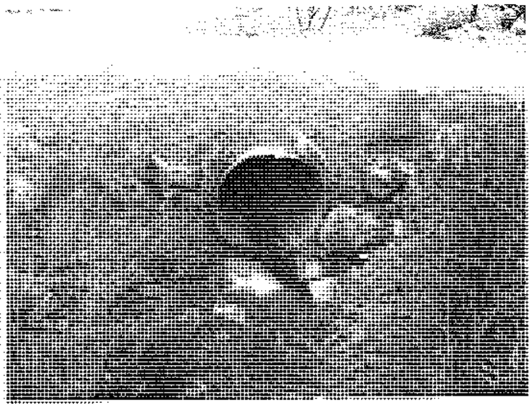
1	Flush/Clean	$1,200
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,625

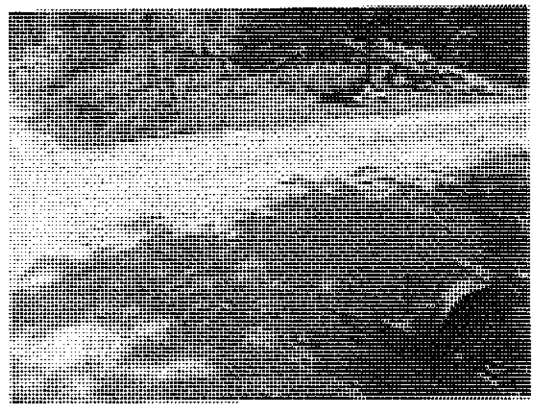
Immediately	☐
This Year	☐
1 -2 Years	☑
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	16	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.8	m
Centre-Line Offset North	4.8	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.3	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 275







Section - Road: 13760 - MISSISSAUGA ROAD
Section Start: 0.7km N.OF OLDE BASE LINE ROAD
Section End: S.LIMITS, BELFOUNTAIN
City/Town: CALEDON
GPS Coord: 582312 E 4847365 N
Last Inspected: 5/27/2005
Service Type: Entrance
Address/Cross Road: 16110
Side of Road: West

Shape/Type: Round
Material: Corrugated Steel
Surface: A ☐ B ☐ C ☑

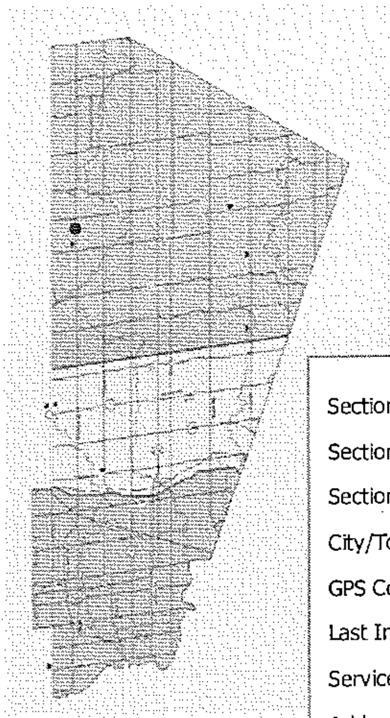
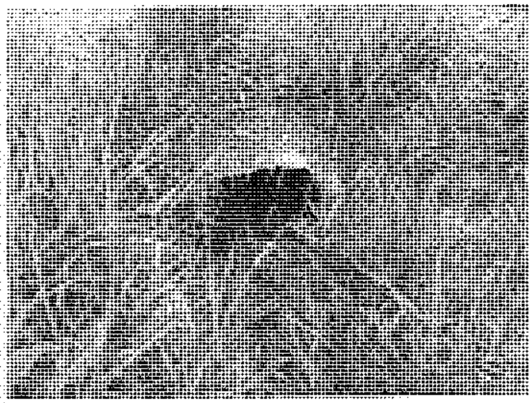
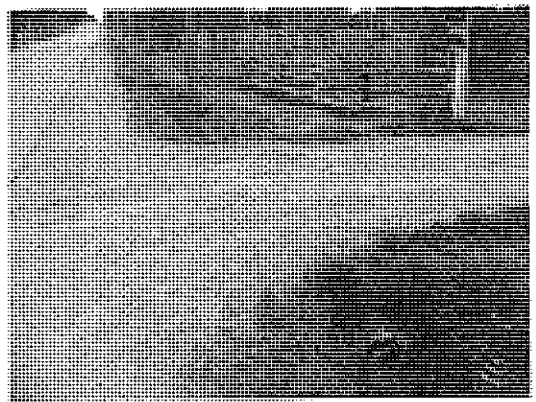
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Do Nothing	$0
2		
3		
4	Grade and Sod	$20
5		
6		
	Total Incl. Mobilization and Contingency :	$150

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☑
N/A	☐

Effective Cross-Section:	100	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	2	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.2	m
Centre-Line Offset North	3.1	m
Exposed Length South	0.2	m
Exposed Length North	0.1	m
Maximum Overburden:	0.1	m
Nominal Diameter:	0.6	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 276

Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	582355 E 4847329 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	16106
Side of Road:	West

Effective Cross-Section:	40	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	4	m2
Total Ditching Required :	6	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.15	m
Centre-Line Offset North	3.25	m
Exposed Length South	0	m
Exposed Length North	0.1	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

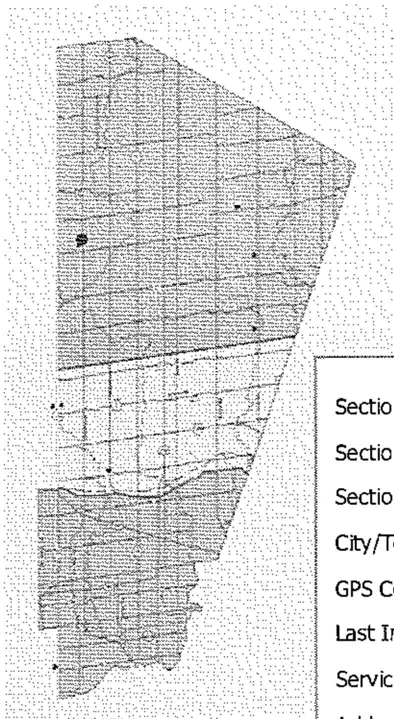
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

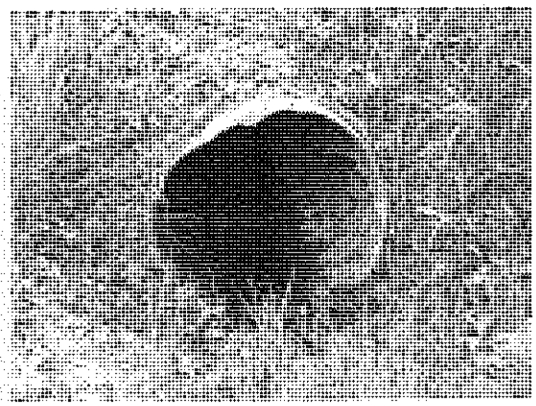
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean & Re-Shape Ends	$1,000
2		
3		
4	Grade and Sod w / Ditching	$940
5		
6		
	Total Incl. Mobilization and Contingency :	$2,550

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 277





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	583066 E 4846623 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15790-S
Side of Road:	West

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

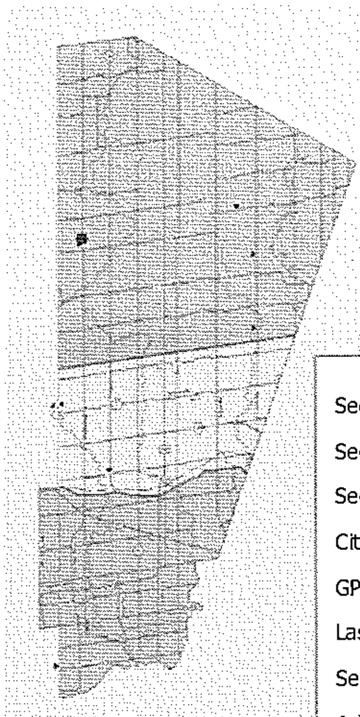
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

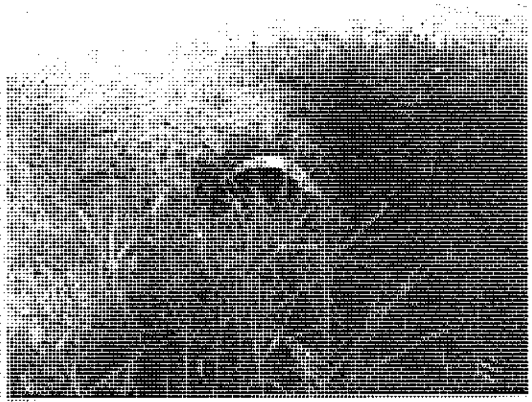
1	Do Nothing	$0
2		
3		
4	Ditching	$300
5		
6		
	Total Incl. Mobilization and Contingency :	$500

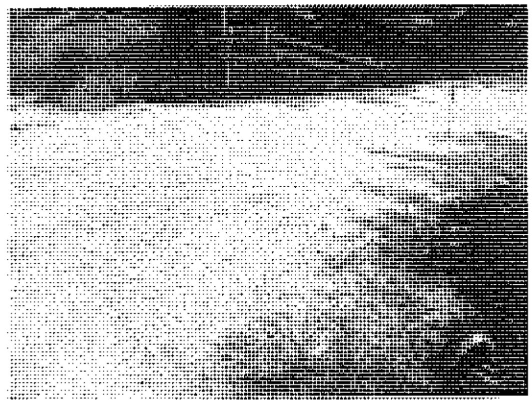
Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☑
N/A	☐

Effective Cross-Section:	90	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	2	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.15	m
Centre-Line Offset North	3.15	m
Exposed Length South	0.1	m
Exposed Length North	0.1	m
Maximum Overburden:	0.3	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 278







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	583078 E 4846605 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15774
Side of Road:	West

Effective Cross-Section:	75	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.3	m
Centre-Line Offset North	2.9	m
Exposed Length South	0.4	m
Exposed Length North	0	m
Maximum Overburden:	0.1	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

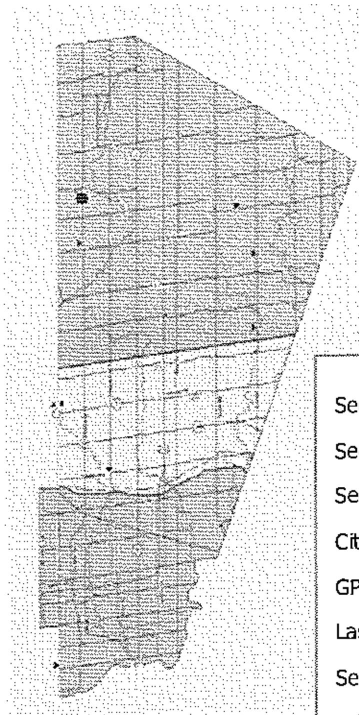
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

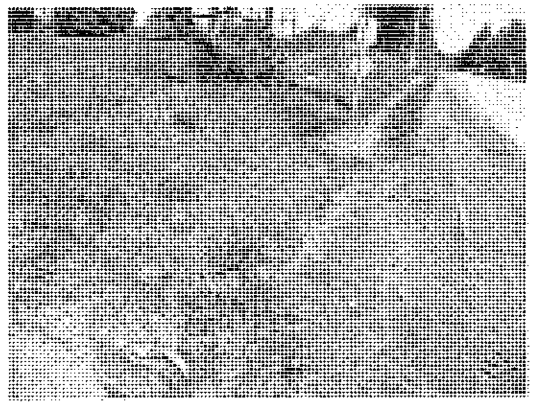
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean	$775
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,094

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☑
N/A	☐

CULVERT NO. 279





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	580515 E 4849173 N
Last Inspected:	5/30/2005
Service Type:	Field Entrance
Address/Cross Road:	N/A
Side of Road:	West

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.1	m
Centre-Line Offset North	3.1	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

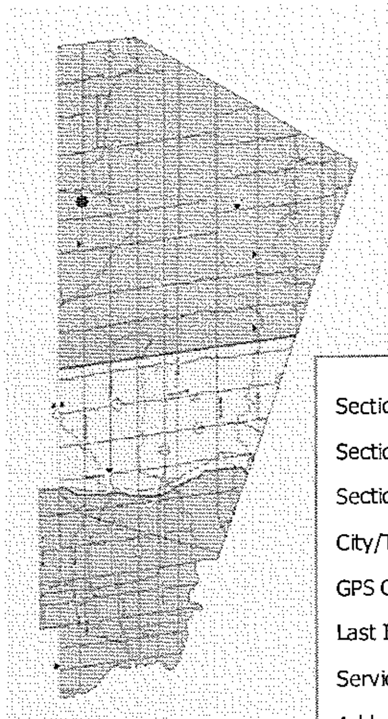
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

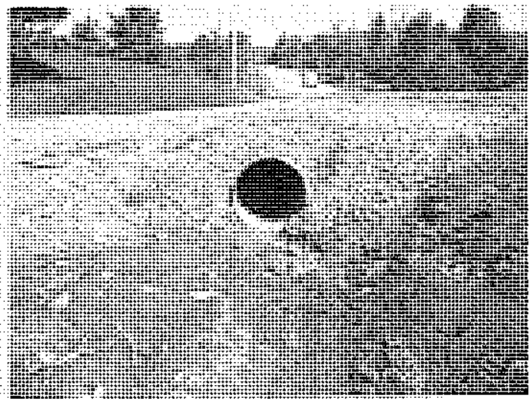
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

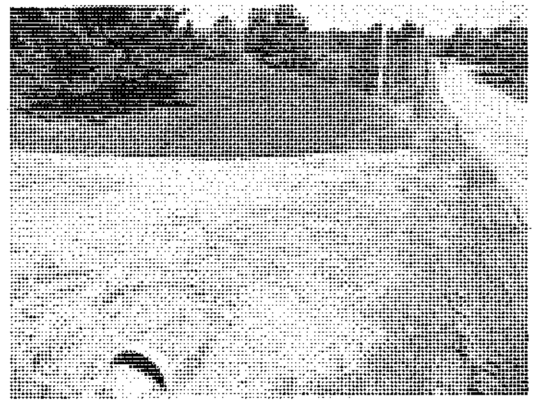
1	Flush/Clean & Re-Shape Ends	$975
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,344

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 280







Section - Road: 13760 - MISSISSAUGA ROAD
Section Start: 0.7km N.OF OLDE BASE LINE ROAD
Section End: S.LIMITS, BELFOUNTAIN
City/Town: CALEDON
GPS Coord: 580599 E 4849086 N
Last Inspected: 5/30/2005
Service Type: Entrance
Address/Cross Road: N/A
Side of Road: West

Effective Cross-Section: 95 %
% Req. Replacement: 0 %
Cross Section:

Area Req. Erosion Cntrl: 0 m2
Total Ditching Required : 0 m
Ditching on Private Prop: m
Volume of HW South m3
Volume of HW North m3
Headwall Repair South m3
Headwall Repair North m3
Pre-Fab HW SA South m2
Pre-Fab HW SA North m2
Gabions Req. at South m3
Gabions Req. at North m3
Total Barrier Length: m
Barriers Req. Repair: m
Barriers Replace/Install: 0 m
Number of Marker Posts:
Markers Req. Straight:
Markers Replace/Install: 0
Centre-Line Offset South 5.15 m
Centre-Line Offset North 5.05 m
Exposed Length South 0.2 m
Exposed Length North 0.1 m
Maximum Overburden: 0.3 m
Nominal Diameter: 0.46 m
Maximum Span: m
Interior Height: m

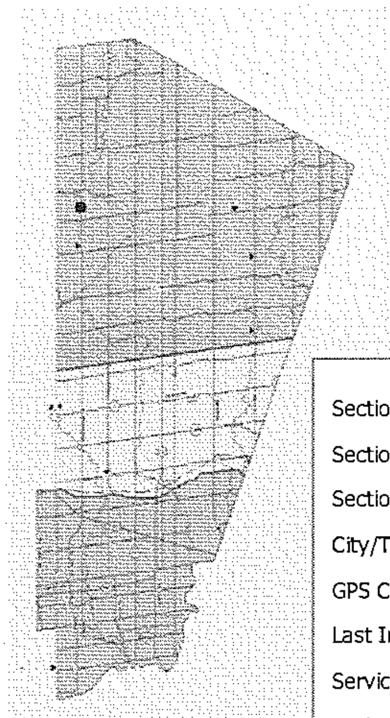
Shape/Type: Round
Material: Corrugated Steel
Surface: A ☐ B ☐ C ☑

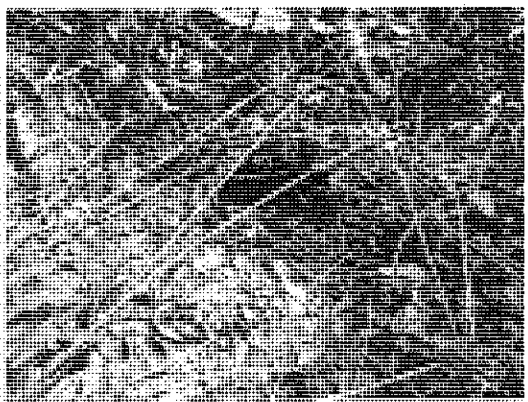
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

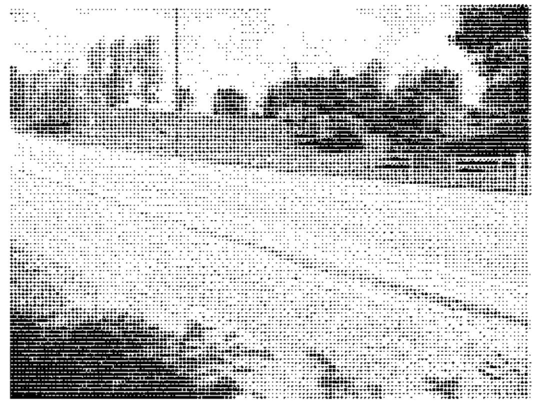
1	Do Nothing	$0
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$0

Immediately ☐
This Year ☐
1 -2 Years ☐
3 - 5 Years ☐
6 - 10 Years ☐
11+ Years ☐
N/A ☑

CULVERT NO. 281







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	580909 E 4848766 N
Last Inspected:	5/31/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

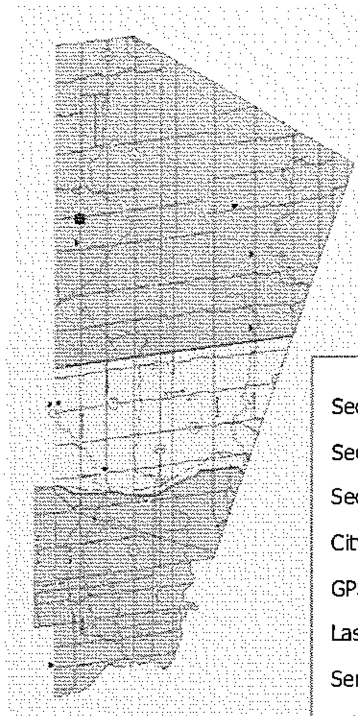
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

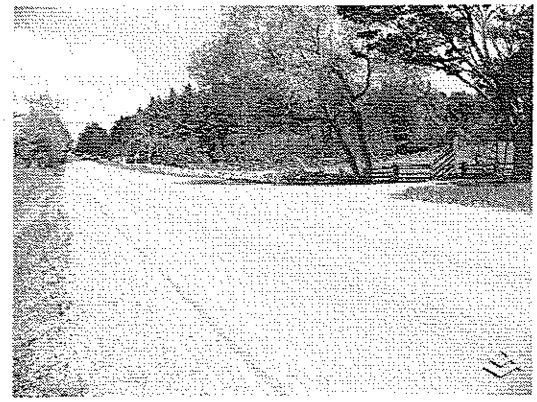
1	Flush/Clean	$1,888
2		
3		
4	Ditching	$900
5		
6		
	Total Incl. Mobilization and Contingency :	$3,610

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	10	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	6	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	2	
Markers Req. Straight:	0	
Markers Replace/Install:	0	
Centre-Line Offset West	7.55	m
Centre-Line Offset East	7.55	m
Exposed Length West	0	m
Exposed Length East	0	m
Maximum Overburden:	0.2	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 282





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581861 E 4847819 N
Last Inspected:	5/31/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

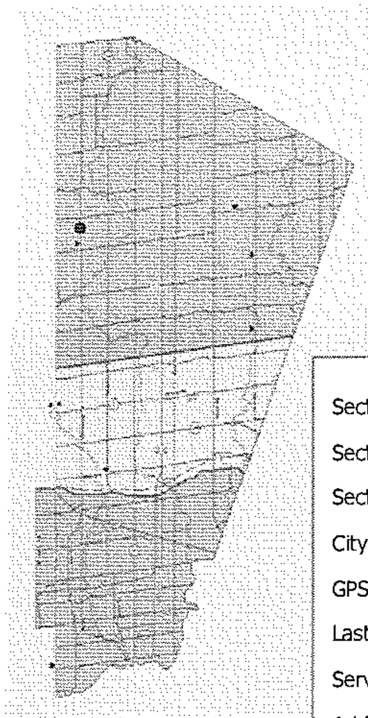
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

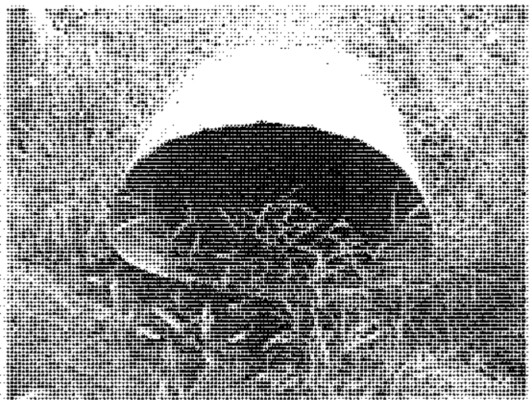
1	Flush/Clean & Re-Shape Ends	$1,800
2		
3		
4	Grade and Sod w / Ditching	$320
5		
6		
	Total Incl. Mobilization and Contingency :	$2,775

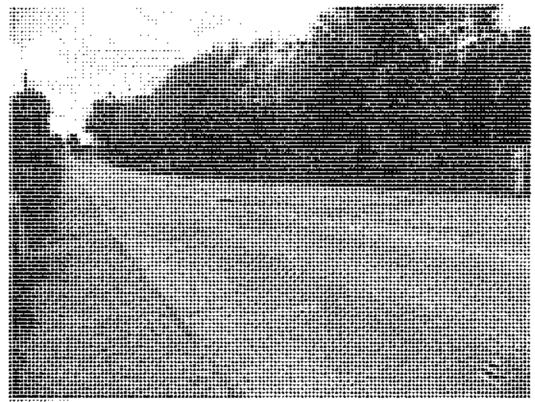
Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

Effective Cross-Section:	60	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	2	m2
Total Ditching Required :	2	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	2	
Markers Req. Straight:	0	
Markers Replace/Install:	0	
Centre-Line Offset West	6.4	m
Centre-Line Offset East	6.4	m
Exposed Length West	0	m
Exposed Length East	0	m
Maximum Overburden:	0.6	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 283







Section - Road:	13760 - MISSISSAUGA ROAD	
Section Start:	0.7km N.OF OLDE BASE LINE ROAD	
Section End:	S.LIMITS, BELFOUNTAIN	
City/Town:	CALEDON	
GPS Coord:	582404 E	4847277 N
Last Inspected:	5/31/2005	
Service Type:	Cross	
Address/Cross Road:	N/A	
Side of Road:	N/A	

Shape/Type:	Flat Bottom
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

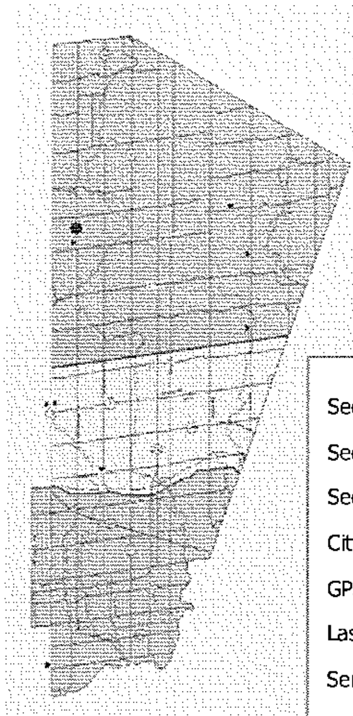
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

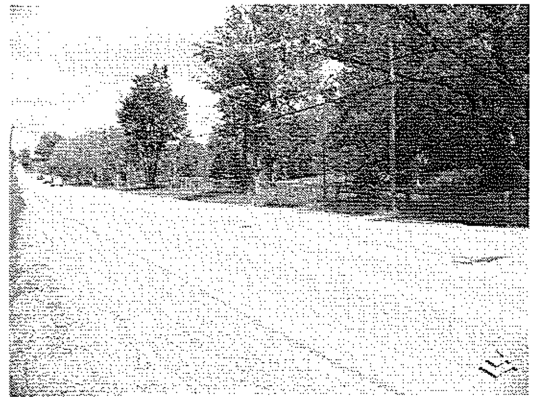
1	Do Nothing	$0
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$875

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☑
N/A	☐

Effective Cross-Section:	100	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	2	
Markers Req. Straight:	0	
Markers Replace/Install:	0	
Centre-Line Offset West	6.1	m
Centre-Line Offset East	5.9	m
Exposed Length West	0.4	m
Exposed Length East	0.2	m
Maximum Overburden:	0.1	m
Nominal Diameter:		m
Maximum Span:	0.85	m
Interior Height:	0.56	m

CULVERT NO. 284





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	582455 E 4847221 N
Last Inspected:	5/31/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Effective Cross-Section:	100 %
% Req. Replacement:	0 %
Cross Section:	
Area Req. Erosion Cntrl:	0 m2
Total Ditching Required :	0 m
Ditching on Private Prop:	m
Volume of HW West	m3
Volume of HW East	m3
Headwall Repair West	m3
Headwall Repair East	m3
Pre-Fab HW SA West	m2
Pre-Fab HW SA East	m2
Gabions Req. at West	m3
Gabions Req. at East	m3
Total Barrier Length:	m
Barriers Req. Repair:	m
Barriers Replace/Install:	0 m
Number of Marker Posts:	2
Markers Req. Straight:	0
Markers Replace/Install:	0
Centre-Line Offset West	6.8 m
Centre-Line Offset East	6.9 m
Exposed Length West	0.3 m
Exposed Length East	0.4 m
Maximum Overburden:	0.4 m
Nominal Diameter:	m
Maximum Span:	1 m
Interior Height:	0.7 m

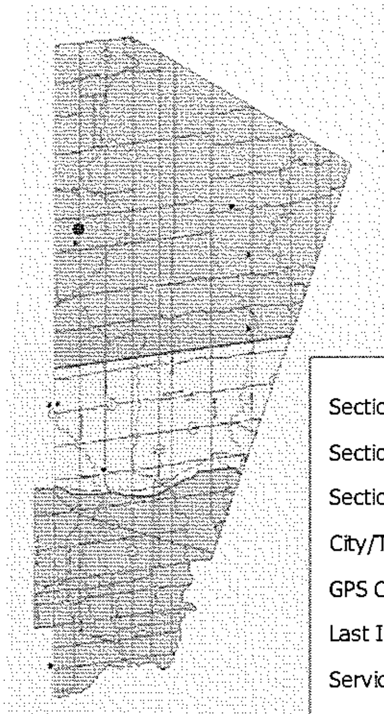
Shape/Type:	Flat Bottom
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

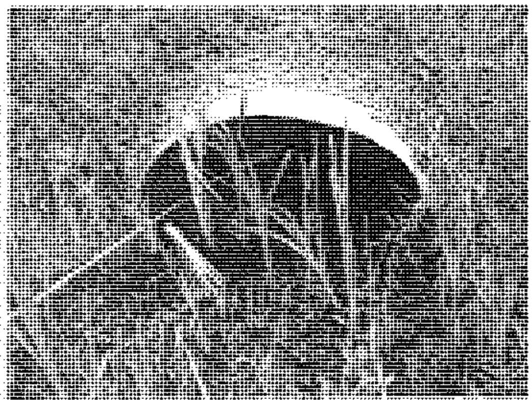
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

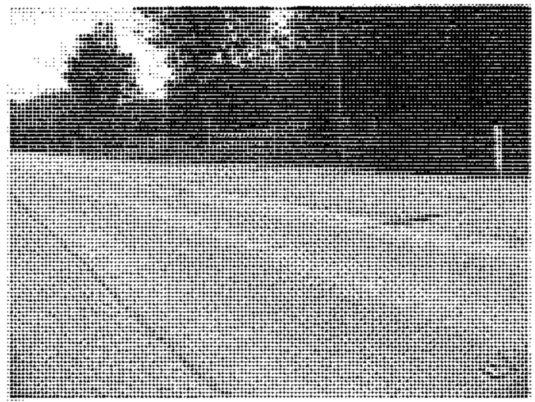
1	Do Nothing	$0
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$0

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☑

CULVERT NO. 285







Section - Road: 13760 - MISSISSAUGA ROAD

Section Start: 0.7km N.OF OLDE BASE LINE ROAD

Section End: S.LIMITS, BELFOUNTAIN

City/Town: CALEDON

GPS Coord: 582452 E 4847225 N

Last Inspected: 5/31/2005

Service Type: Cross

Address/Cross Road: N/A

Side of Road: N/A

Effective Cross-Section: 100 %

% Req. Replacement: 0 %

Cross Section:

Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	2	
Markers Req. Straight:	0	
Markers Replace/Install:	0	
Centre-Line Offset West	6.95	m
Centre-Line Offset East	6.75	m
Exposed Length West	0.3	m
Exposed Length East	0.1	m
Maximum Overburden:	0.5	m
Nominal Diameter:		m
Maximum Span:	1	m
Interior Height:	0.7	m

Shape/Type: Flat Bottom

Material: Corrugated Steel

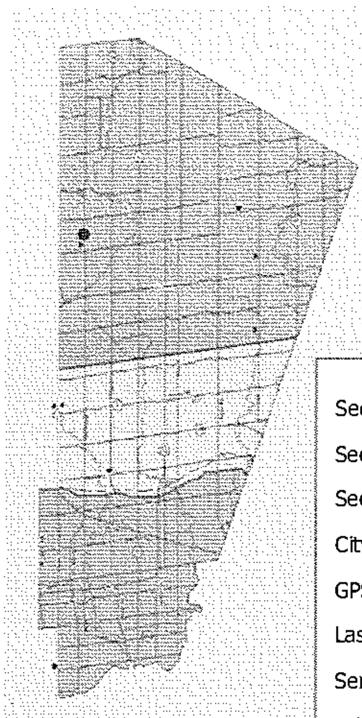
Surface: A ☐ B ☑ C ☐

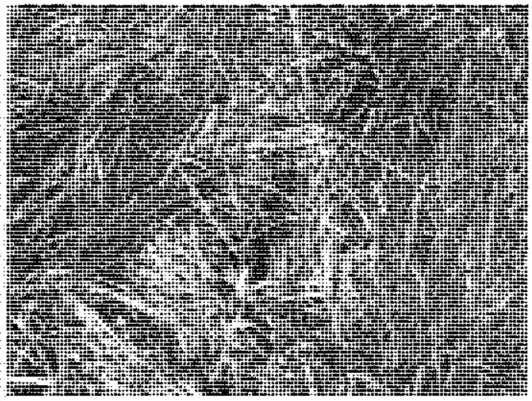
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

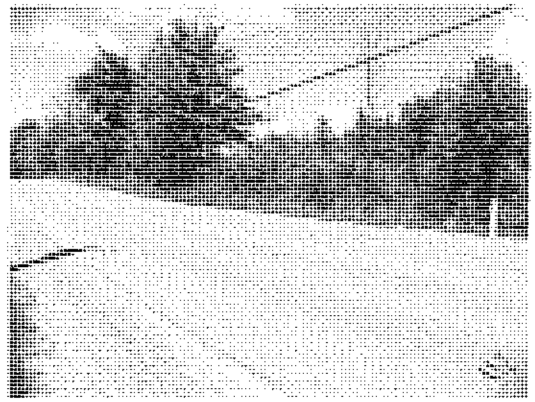
1	Do Nothing	$0
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$0

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☑

CULVERT NO. 286







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	582726 E 4846964 N
Last Inspected:	5/31/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Effective Cross-Section:	60	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	2	
Markers Req. Straight:	0	
Markers Replace/Install:	0	
Centre-Line Offset West	3.1	m
Centre-Line Offset East	9.1	m
Exposed Length West	0	m
Exposed Length East	6	m
Maximum Overburden:	0.7	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

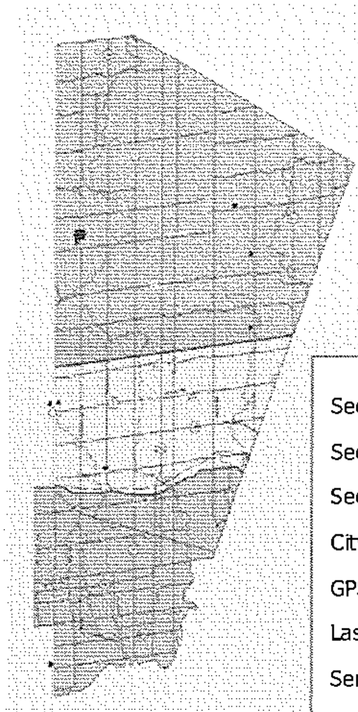
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

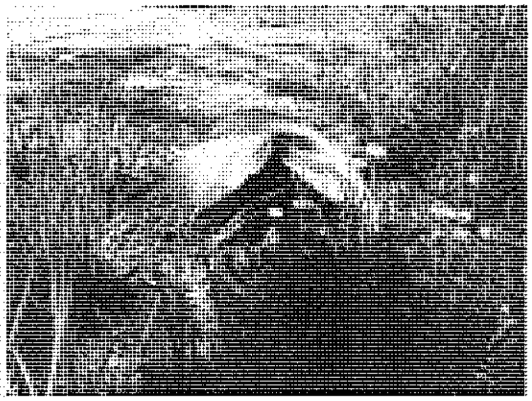
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

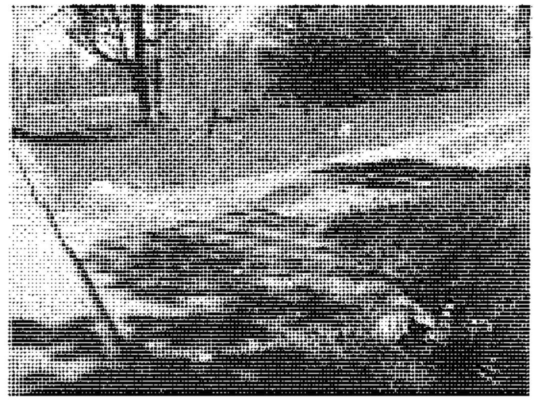
1	Flush/Clean	$1,525
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$2,781

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 287







Section - Road: 13760 - MISSISSAUGA ROAD
Section Start: 0.7km N.OF OLDE BASE LINE ROAD
Section End: S.LIMITS, BELFOUNTAIN
City/Town: CALEDON
GPS Coord: 582920 E 4846775 N
Last Inspected: 5/27/2005
Service Type: Field Entrance
Address/Cross Road: N/A
Side of Road: East

Shape/Type: Round
Material: Corrugated Steel
Surface: A ☐ B ☐ C ☑

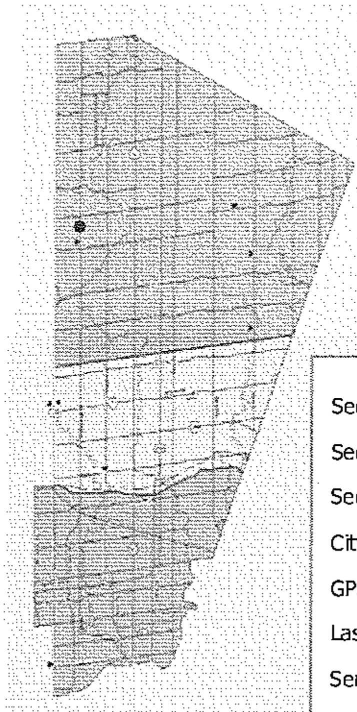
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

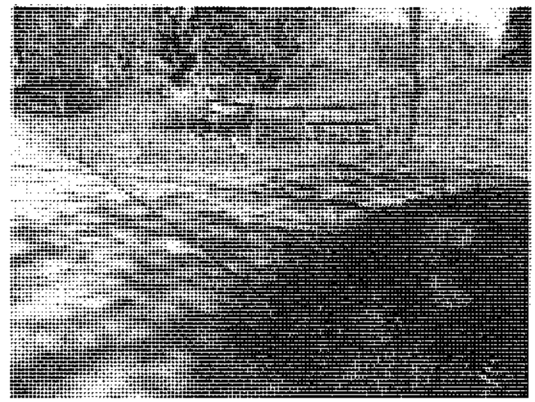
1	Flush/Clean & Re-Shape Ends	$975
2		
3		
4	Ditching	$450
5		
6		
	Total Incl. Mobilization and Contingency :	$1,906

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☑
N/A	☐

Effective Cross-Section:	95	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	3	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.2	m
Centre-Line Offset North	3	m
Exposed Length South	0.5	m
Exposed Length North	0.3	m
Maximum Overburden:	0	m
Nominal Diameter:	0.6	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 288





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	582363 E 4847324 N
Last Inspected:	5/27/2005
Service Type:	Field Entrance
Address/Cross Road:	N/A
Side of Road:	East

Effective Cross-Section:	70	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	3	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.25	m
Centre-Line Offset North	4.55	m
Exposed Length South	0.1	m
Exposed Length North	0.4	m
Maximum Overburden:	0.6	m
Nominal Diameter:	0.5	m
Maximum Span:		m
Interior Height:		m

Shape/Type: Round

Material: Corrugated Steel

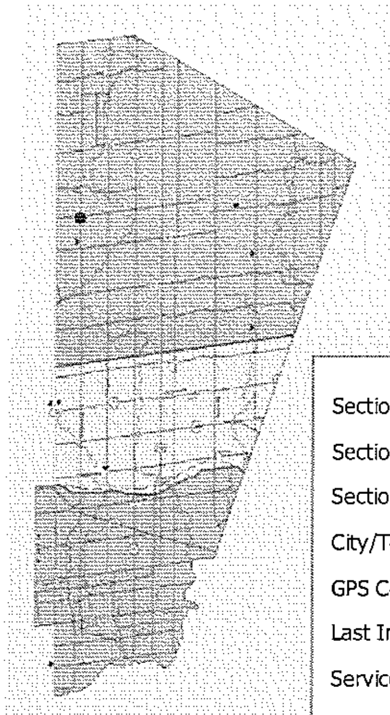
Surface: A ☐ B ☐ C ☑

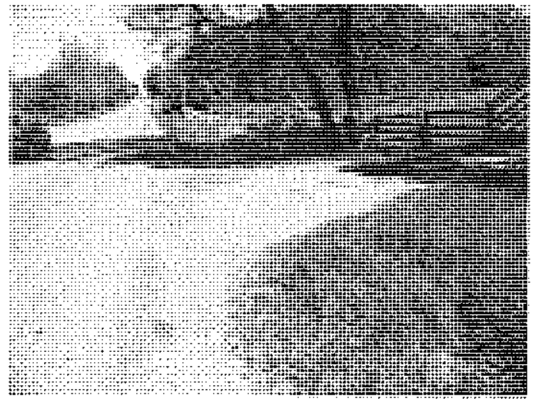
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean	$1,100
2		
3		
4	Ditching	$450
5		
6		
	Total Incl. Mobilization and Contingency :	$2,063

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

CULVERT NO. 289





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581862 E 4847829 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	16311
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

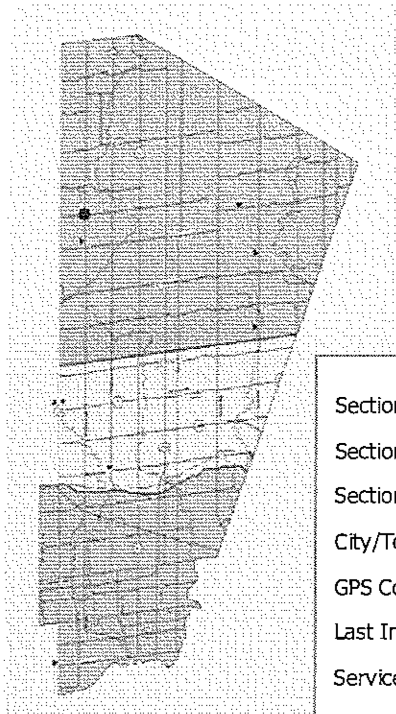
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean & Re-Shape Ends	$1,500
2		
3		
4	Ditching	$900
5		
6		
	Total Incl. Mobilization and Contingency :	$3,125

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

Effective Cross-Section:	90	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	6	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	5.2	m
Centre-Line Offset North	5.2	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.8	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 290



Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581663 E 4848034 N
Last Inspected:	5/27/2005
Service Type:	Intersection
Address/Cross Road:	Mississauga Rd + The Gra
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

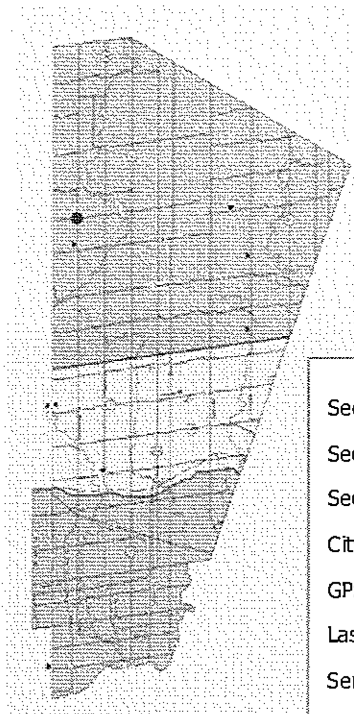
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☑

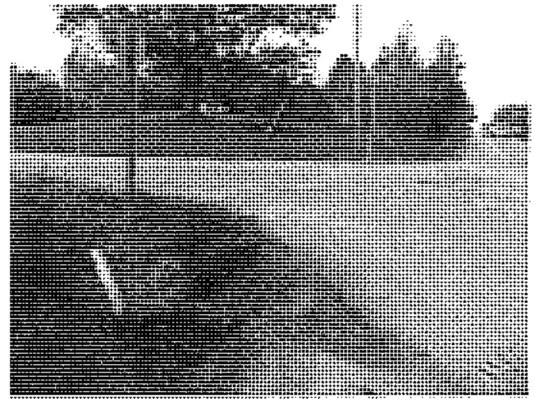
1	Flush/Clean	$2,550
2		
3		
4		
5		
6	Replace/Install Marker Posts	$10
	Total Incl. Mobilization and Contingency :	$3,325

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	1	
Markers Req. Straight:	0	
Markers Replace/Install:	1	
Centre-Line Offset South	10.2	m
Centre-Line Offset North	10.2	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 291





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581675 E 4848001 N
Last Inspected:	5/27/2005
Service Type:	Intersection
Address/Cross Road:	Mississauga Rd + The Gra
Side of Road:	West

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	1	
Markers Req. Straight:	1	
Markers Replace/Install:	1	
Centre-Line Offset South	10.2	m
Centre-Line Offset North	10.2	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

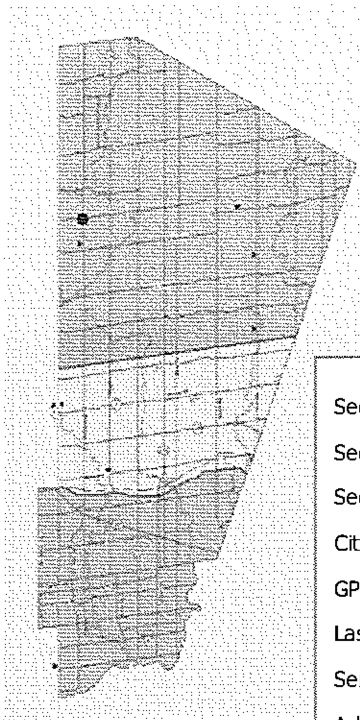
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

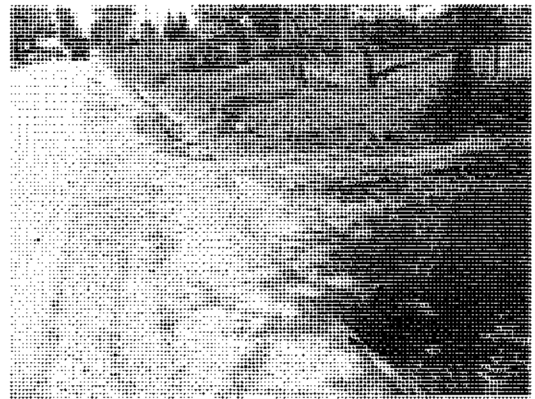
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☑

1	Flush/Clean	$2,550
2		
3		
4		
5		
6	Straighten & Replace/Install Marker Posts	$20
	Total Incl. Mobilization and Contingency :	$3,338

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 292





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581792 E 4847887 N
Last Inspected:	5/27/2005
Service Type:	Field Entrance
Address/Cross Road:	N/A
Side of Road:	West

Effective Cross-Section:	15	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	2.5	m
Centre-Line Offset North	2.5	m
Exposed Length South	0.1	m
Exposed Length North	0.1	m
Maximum Overburden:	0.3	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

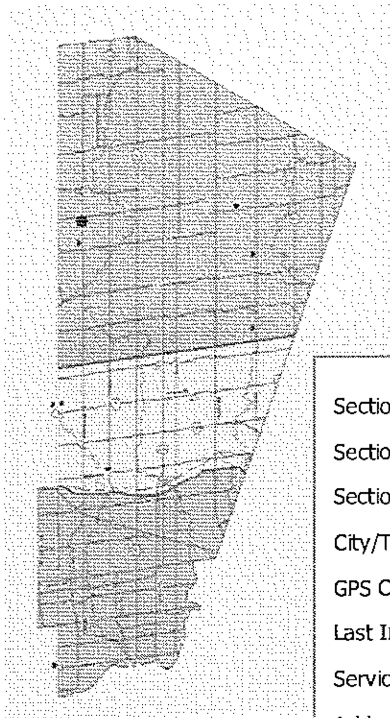
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

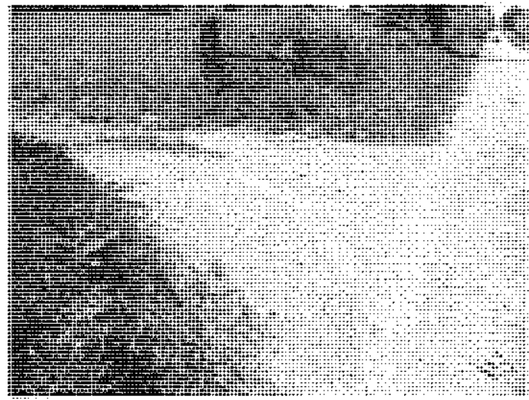
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean	$625
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$906

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 293





Section - Road:	13760 - MISSISSAUGA ROAD	
Section Start:	0.7km N.OF OLDE BASE LINE ROAD	
Section End:	S.LIMITS, BELFOUNTAIN	
City/Town:	CALEDON	
GPS Coord:	581958 E	4847722 N
Last Inspected:	5/27/2005	
Service Type:	Field Entrance	
Address/Cross Road:	N/A	
Side of Road:	West	

Effective Cross-Section:	5 %
% Req. Replacement:	0 %
Cross Section:	
Area Req. Erosion Cntrl:	0 m2
Total Ditching Required :	8 m
Ditching on Private Prop:	0 m
Volume of HW South	m3
Volume of HW North	m3
Headwall Repair South	m3
Headwall Repair North	m3
Pre-Fab HW SA South	m2
Pre-Fab HW SA North	m2
Gabions Req. at South	m3
Gabions Req. at North	m3
Total Barrier Length:	m
Barriers Req. Repair:	m
Barriers Replace/Install:	0 m
Number of Marker Posts:	
Markers Req. Straight:	
Markers Replace/Install:	0
Centre-Line Offset South	3.1 m
Centre-Line Offset North	3.1 m
Exposed Length South	0 m
Exposed Length North	0 m
Maximum Overburden:	0.2 m
Nominal Diameter:	0.3 m
Maximum Span:	m
Interior Height:	m

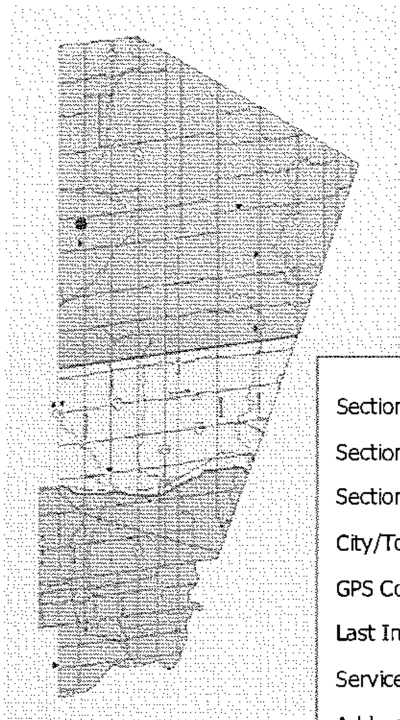
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

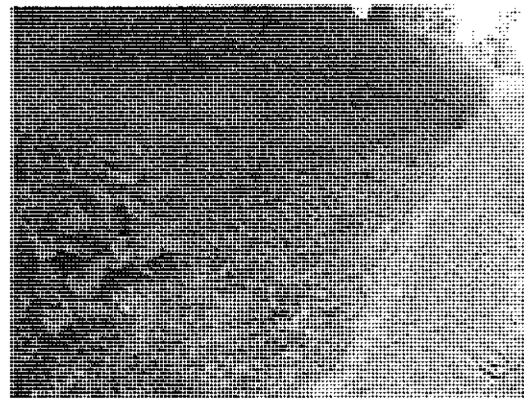
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean & Re-Shape Ends	$975
2		
3		
4	Ditching	$1,200
5		
6		
	Total Incl. Mobilization and Contingency :	$2,844

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 294





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	581952 E 4847423 N
Last Inspected:	5/27/2005
Service Type:	Field Entrance
Address/Cross Road:	N/A
Side of Road:	West

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	2	m2
Total Ditching Required :	9	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.5	m
Centre-Line Offset North	4.5	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.1	m
Nominal Diameter:	0.3	m
Maximum Span:		m
Interior Height:		m

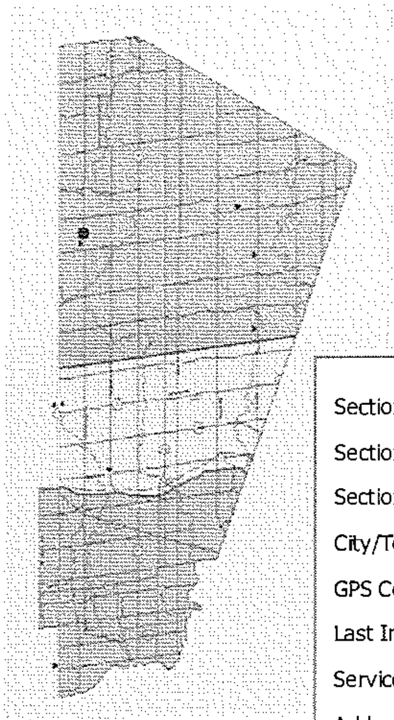
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

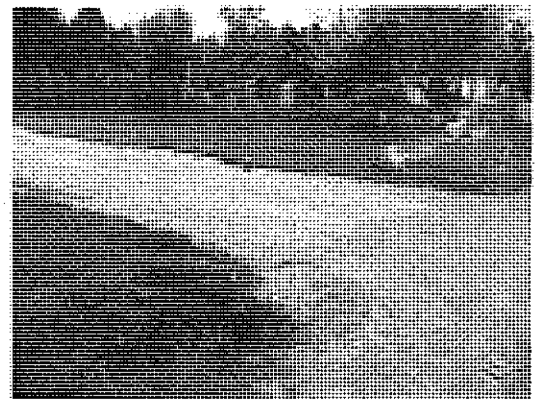
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean	$1,125
2		
3		
4	Ditching	$1,350
5		
6		
	Total Incl. Mobilization and Contingency :	$3,219

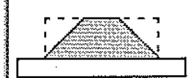
Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 295





Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	582696 E 4846952 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	15938
Side of Road:	West

Effective Cross-Section:	15	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	3	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.1	m
Centre-Line Offset North	3.1	m
Exposed Length South	0.1	m
Exposed Length North	0.1	m
Maximum Overburden:	0.1	m
Nominal Diameter:	0.3	m
Maximum Span:		m
Interior Height:		m

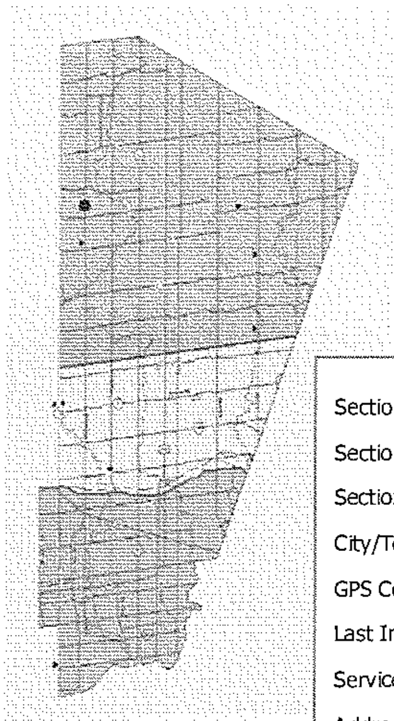
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

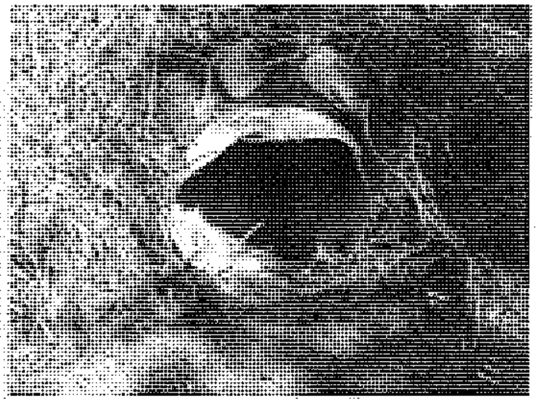
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

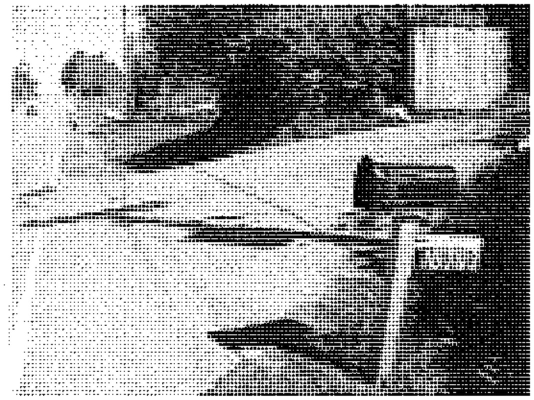
1	Flush/Clean	$775
2		
3		
4	Ditching	$450
5		
6		
	Total Incl. Mobilization and Contingency :	$1,656

Immediately	☐
This Year	☐
1 -2 Years	☑
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 296







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	580970 E 4848723 N
Last Inspected:	5/30/2005
Service Type:	Entrance
Address/Cross Road:	16703
Side of Road:	East

Effective Cross-Section:	60	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.8	m
Centre-Line Offset North	4.8	m
Exposed Length South	0.1	m
Exposed Length North	0.1	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

Shape/Type: Round

Material: Corrugated Steel

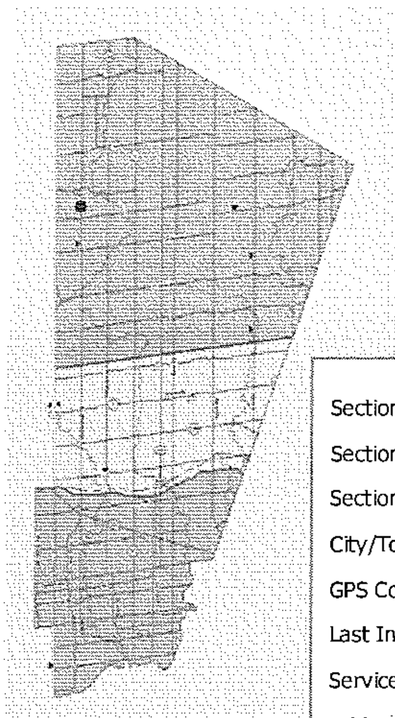
Surface: A ☐ B ☑ C ☐

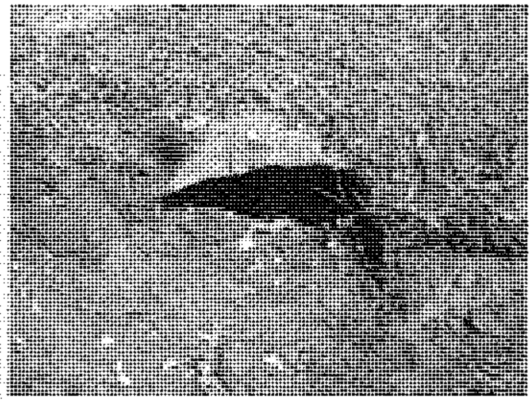
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

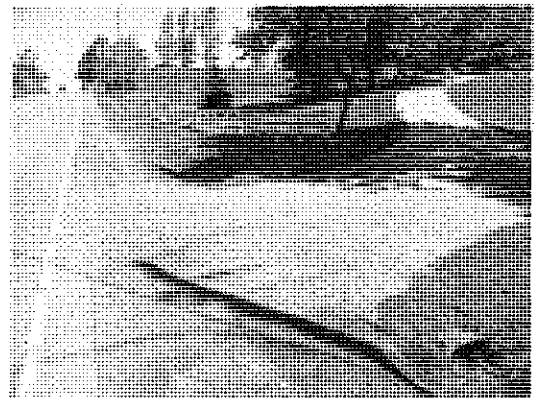
1	Flush/Clean & Re-Shape Ends	$1,400
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,875

Immediately	☐
This Year	☐
1 -2 Years	☑
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 297







Section - Road:	13760 - MISSISSAUGA ROAD
Section Start:	0.7km N.OF OLDE BASE LINE ROAD
Section End:	S.LIMITS, BELFOUNTAIN
City/Town:	CALEDON
GPS Coord:	580933 E 4848749 N
Last Inspected:	5/30/2005
Service Type:	Entrance
Address/Cross Road:	16735
Side of Road:	East

Effective Cross-Section:	20	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.8	m
Centre-Line Offset North	3.5	m
Exposed Length South	0.2	m
Exposed Length North	0.5	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

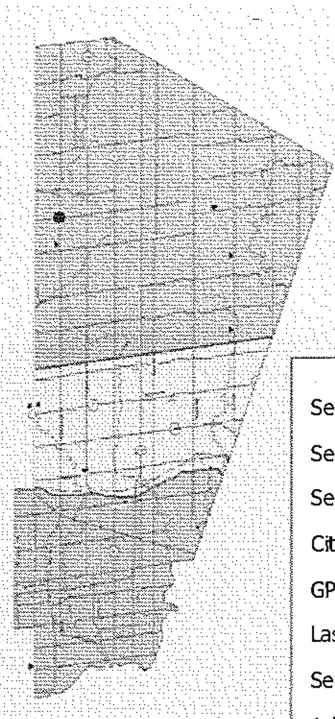
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

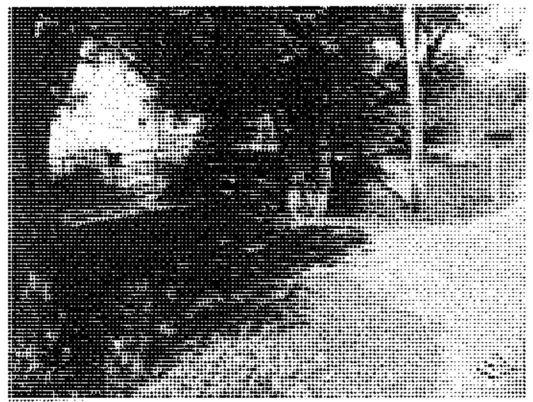
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean & Re-Shape Ends	$1,112
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,515

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 298





Section - Road: 13760 - MISSISSAUGA ROAD
Section Start: 0.7km N.OF OLDE BASE LINE ROAD
Section End: S.LIMITS, BELFOUNTAIN
City/Town: CALEDON
GPS Coord: 581622 E 4848059 N
Last Inspected: 5/30/2005
Service Type: Entrance
Address/Cross Road: 16416
Side of Road: West

Effective Cross-Section:	40 %
% Req. Replacement:	0 %
Cross Section:	
Area Req. Erosion Cntrl:	0 m2
Total Ditching Required :	4 m
Ditching on Private Prop:	0 m
Volume of HW South	m3
Volume of HW North	m3
Headwall Repair South	m3
Headwall Repair North	m3
Pre-Fab HW SA South	m2
Pre-Fab HW SA North	m2
Gabions Req. at South	m3
Gabions Req. at North	m3
Total Barrier Length:	m
Barriers Req. Repair:	m
Barriers Replace/Install:	0 m
Number of Marker Posts:	
Markers Req. Straight:	
Markers Replace/Install:	0
Centre-Line Offset South	3.55 m
Centre-Line Offset North	3.55 m
Exposed Length South	0 m
Exposed Length North	0 m
Maximum Overburden:	0.8 m
Nominal Diameter:	0.46 m
Maximum Span:	m
Interior Height:	m

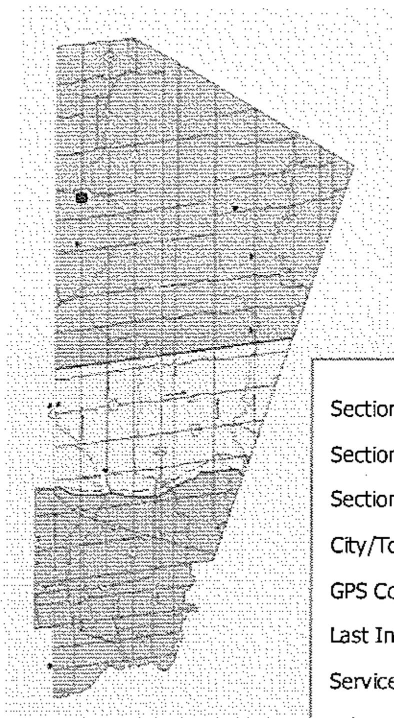
Shape/Type: Round
Material: Corrugated Steel
Surface: A ☐ B ☐ C ☑

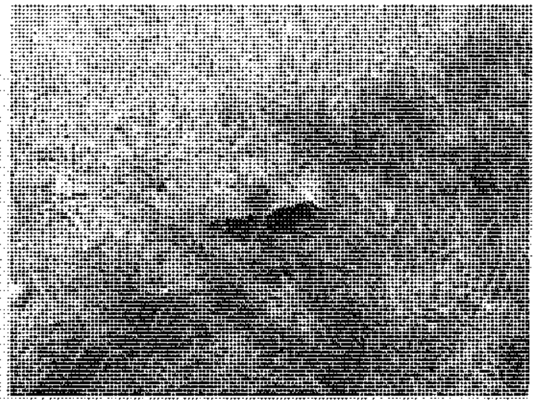
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

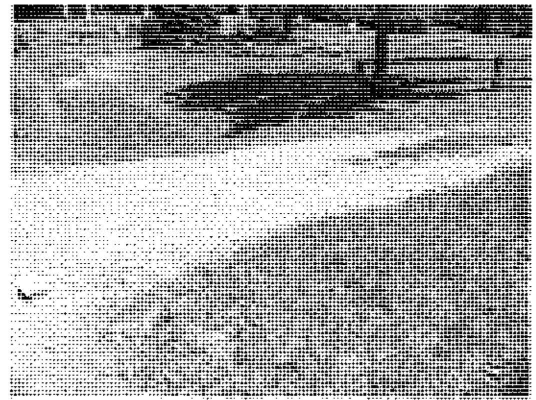
1	Flush/Clean	$888
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$1,985

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 299







Section - Road:	14240 - MISSISSAUGA ROAD
Section Start:	S.LIMITS, BELFOUNTAIN
Section End:	REG. RD. # 11
City/Town:	CALEDON
GPS Coord:	580374 E 4849321 N
Last Inspected:	5/27/2005
Service Type:	Field Entrance
Address/Cross Road:	N/A
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

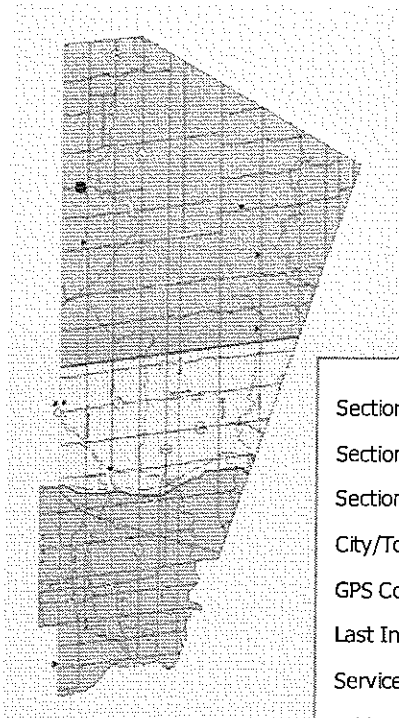
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

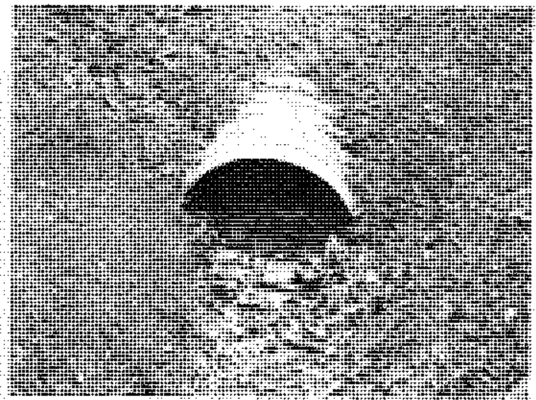
1	Flush/Clean & Re-Shape Ends	$1,000
2		
3		
4	Ditching	$900
5		
6		
	Total Incl. Mobilization and Contingency :	$2,500

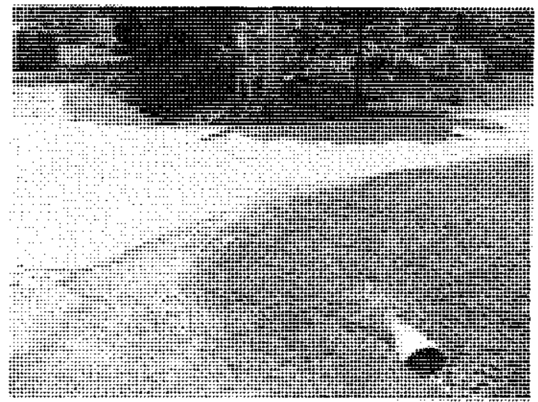
Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	40	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	6	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.2	m
Centre-Line Offset North	3.2	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 300







Section - Road:	14240 - MISSISSAUGA ROAD
Section Start:	S.LIMITS, BELFOUNTAIN
Section End:	REG. RD. # 11
City/Town:	CALEDON
GPS Coord:	579342 E 4849435 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	N/A
Side of Road:	West

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

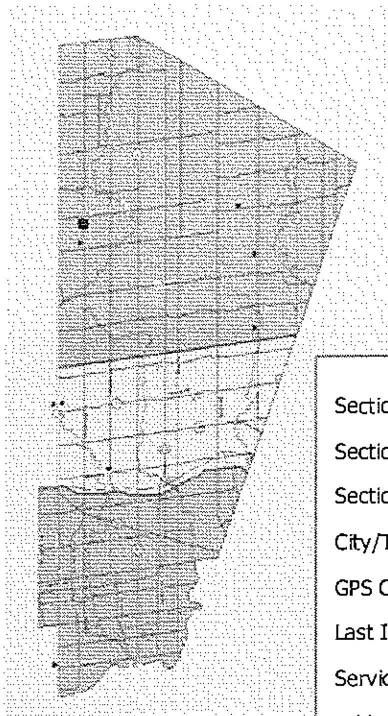
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

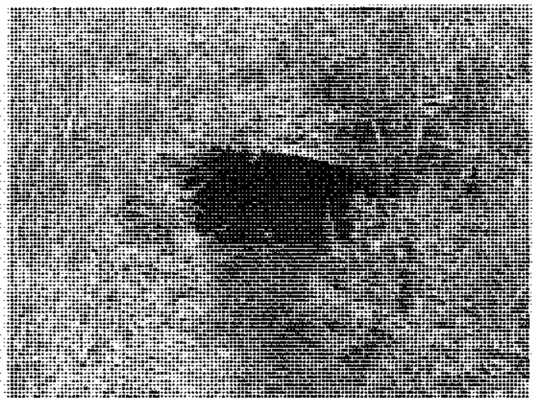
1	Flush/Clean	$1,175
2		
3		
4	Ditching	$1,200
5		
6		
	Total Incl. Mobilization and Contingency :	$3,094

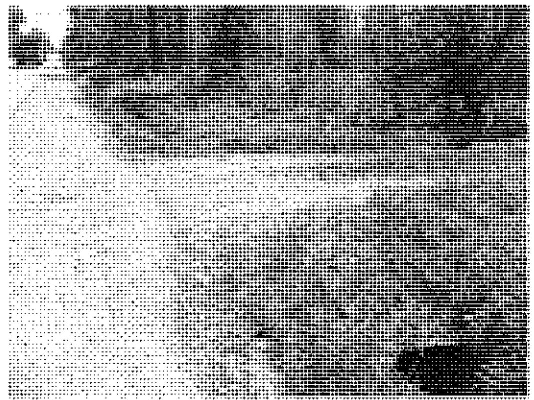
Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	50	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	8	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	4.55	m
Centre-Line Offset North	4.85	m
Exposed Length South	0.1	m
Exposed Length North	0.4	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 301







Section - Road:	14240 - MISSISSAUGA ROAD
Section Start:	S.LIMITS, BELFOUNTAIN
Section End:	REG. RD. # 11
City/Town:	CALEDON
GPS Coord:	582200 E 4847484 N
Last Inspected:	5/27/2005
Service Type:	Field Entrance
Address/Cross Road:	N/A
Side of Road:	West

Effective Cross-Section:	50	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	20	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	3.25	m
Centre-Line Offset North	3.25	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.4	m
Nominal Diameter:		m
Maximum Span:	1	m
Interior Height:	0.6	m

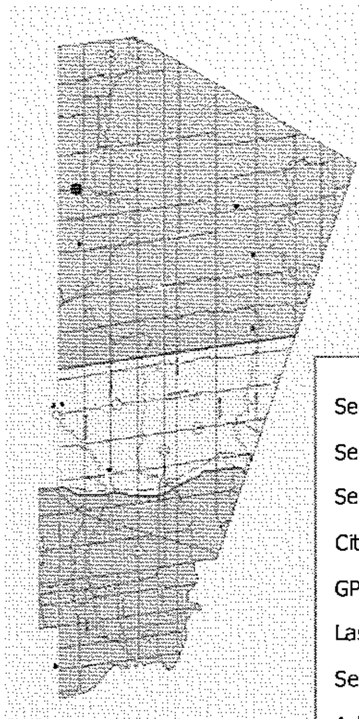
Shape/Type:	Oval
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

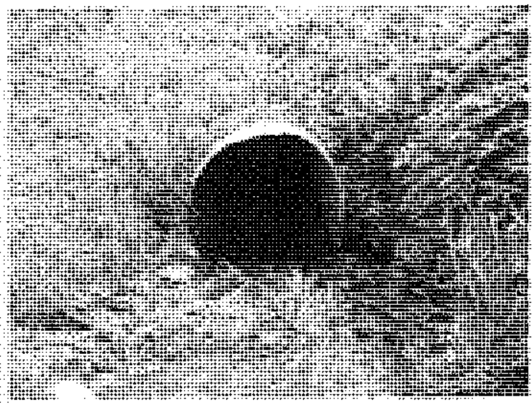
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

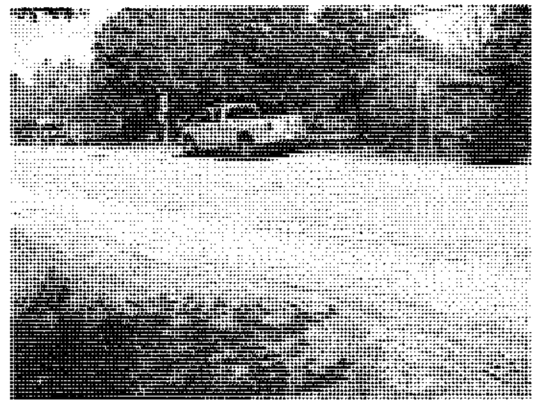
1	Flush/Clean & Re-Shape Ends	$1,012
2		
3		
4	Ditching	$3,000
5		
6		
	Total Incl. Mobilization and Contingency :	$5,140

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

CULVERT NO. 302







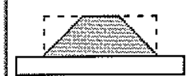
Section - Road:	14240 - MISSISSAUGA ROAD
Section Start:	S.LIMITS, BELFOUNTAIN
Section End:	REG. RD. # 11
City/Town:	CALEDON
GPS Coord:	579349 E 4849423 N
Last Inspected:	5/31/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

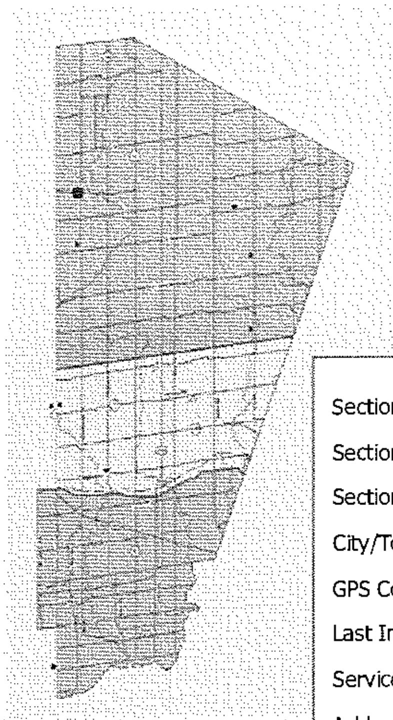
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

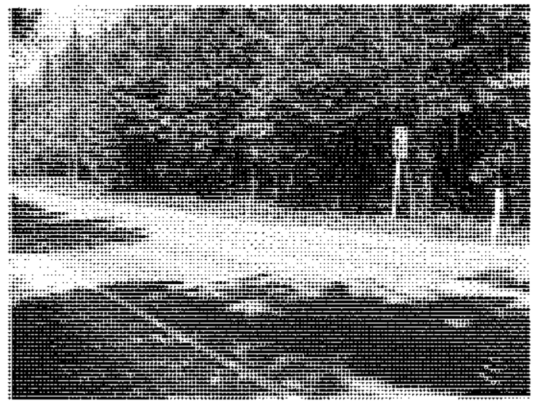
1	Flush/Clean	$2,175
2		
3		
4		
5		
6	Do Nothing	$0
	Total Incl. Mobilization and Contingency :	$2,844

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☑
N/A	☐

Effective Cross-Section:	90	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	2	
Centre-Line Offset West	8.55	m
Centre-Line Offset East	8.85	m
Exposed Length West	0.1	m
Exposed Length East	0.4	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.6	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 303





Section - Road:	14240 - MISSISSAUGA ROAD
Section Start:	S.LIMITS, BELFOUNTAIN
Section End:	REG. RD. # 11
City/Town:	CALEDON
GPS Coord:	579848 E 4849496 N
Last Inspected:	5/31/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

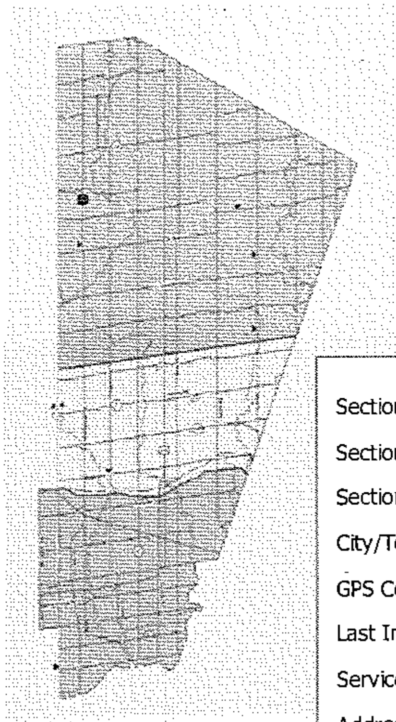
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

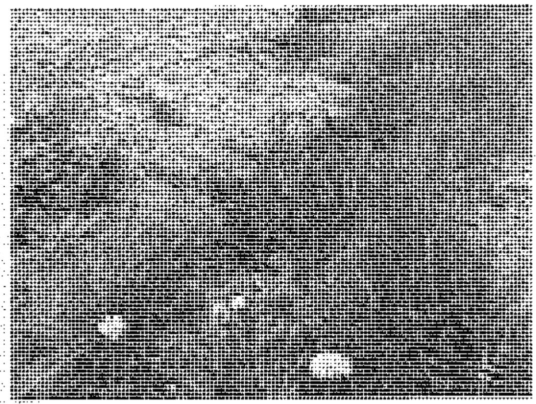
1	Flush/Clean & Re-Shape Ends	$1,500
2		
3		
4	Grade and Sod w / Ditching	$1,380
5		
6	Do Nothing	$0
	Total Incl. Mobilization and Contingency :	$3,725

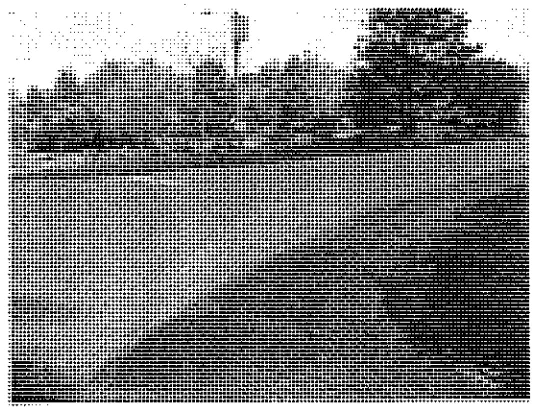
Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	5	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	3	m2
Total Ditching Required :	9	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	1	
Markers Req. Straight:	0	
Markers Replace/Install:	1	
Centre-Line Offset West	5.3	m
Centre-Line Offset East	5.1	m
Exposed Length West	0.2	m
Exposed Length East	0	m
Maximum Overburden:	0.2	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 304







Section - Road:	14240 - MISSISSAUGA ROAD
Section Start:	S.LIMITS, BELFOUNTAIN
Section End:	REG. RD. # 11
City/Town:	CALEDON
GPS Coord:	580493 E 4849207 N
Last Inspected:	5/27/2005
Service Type:	Intersection
Address/Cross Road:	Mississauga Rd + Woodla
Side of Road:	East

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

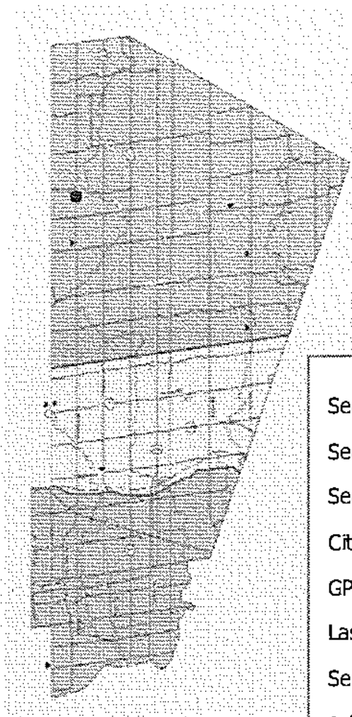
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

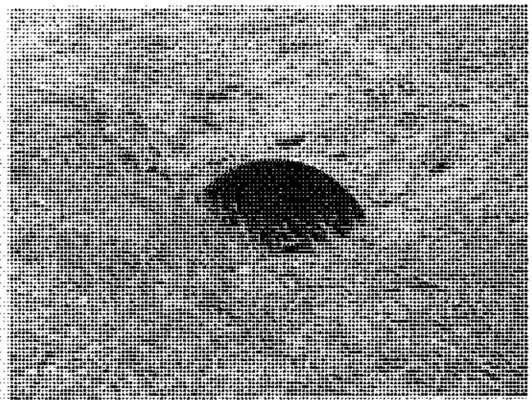
1	Flush/Clean	$2,775
2		
3		
4	Grade and Sod w/ Ditching	$1,220
5		
6		
	Total Incl. Mobilization and Contingency :	$5,119

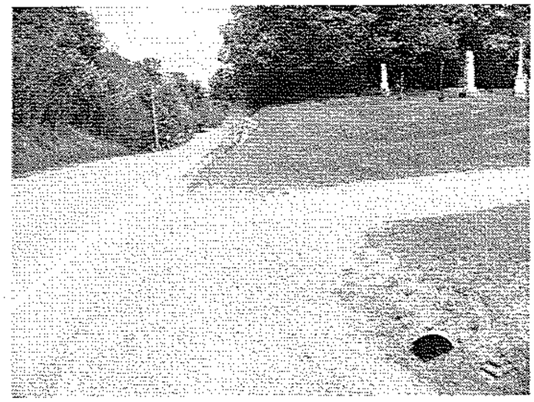
Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	2	m2
Total Ditching Required :	8	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	10.95	m
Centre-Line Offset North	11.25	m
Exposed Length South	0	m
Exposed Length North	0.3	m
Maximum Overburden:	0.2	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 305







Section - Road: 14240 - MISSISSAUGA ROAD
Section Start: S.LIMITS, BELFOUNTAIN
Section End: REG. RD. # 11
City/Town: CALEDON
GPS Coord: 580347 E 4849350 N
Last Inspected: 5/27/2005
Service Type: Entrance
Address/Cross Road: 17025
Side of Road: East

Effective Cross-Section:	60	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	3	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North	0.1	m3
Headwall Repair South		m3
Headwall Repair North	0	m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	8	m
Centre-Line Offset North	8	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.8	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

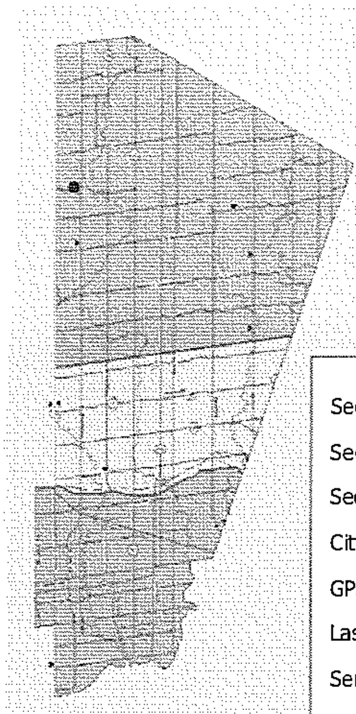
Shape/Type: Round
Material: Corrugated Steel
Surface: A ☐ B ☐ C ☑

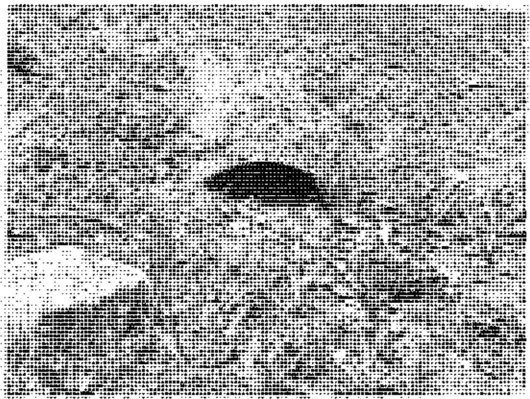
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☐	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☑	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean	$2,000
2		
3	Do Nothing	$0
4	Ditching	$450
5		
6		
	Total Incl. Mobilization and Contingency :	$3,188

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

CULVERT NO. 306





Section - Road:	14240 - MISSISSAUGA ROAD
Section Start:	S.LIMITS, BELFOUNTAIN
Section End:	REG. RD. # 11
City/Town:	CALEDON
GPS Coord:	579325 E 4849450 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	17266
Side of Road:	West

Effective Cross-Section:	25	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	2.95	m
Centre-Line Offset North	3.25	m
Exposed Length South	0	m
Exposed Length North	0.3	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

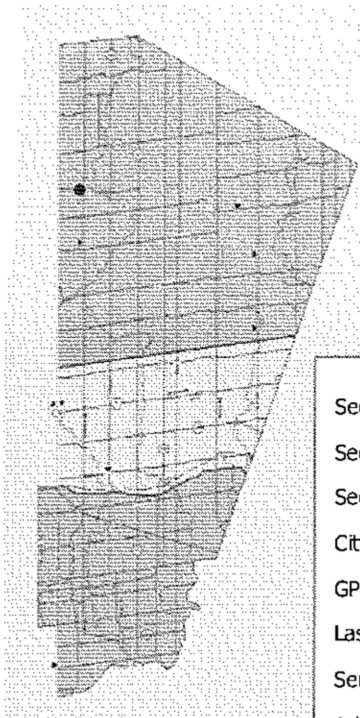
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

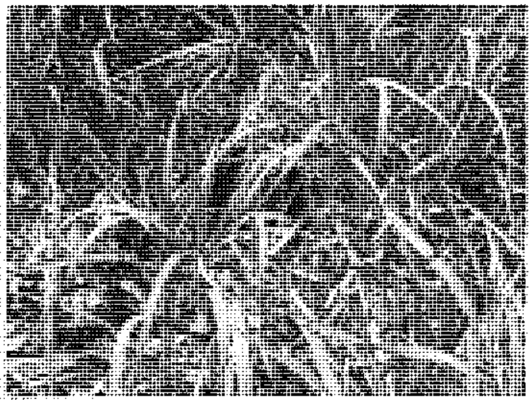
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

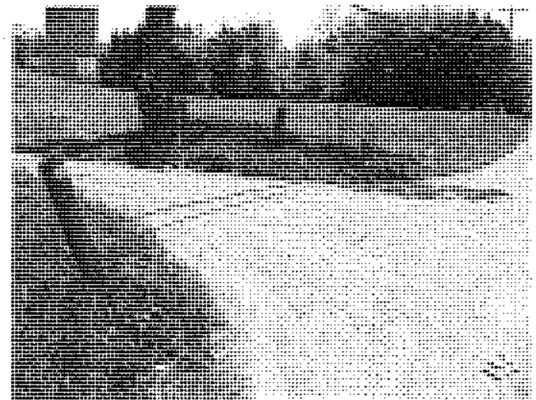
1	Flush/Clean & Re-Shape Ends	$975
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$2,094

Immediately	☐
This Year	☐
1 -2 Years	☑
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 307







Section - Road:	14240 - MISSISSAUGA ROAD
Section Start:	S.LIMITS, BELFOUNTAIN
Section End:	REG. RD. # 11
City/Town:	CALEDON
GPS Coord:	579723 E 4849445 N
Last Inspected:	5/27/2005
Service Type:	Entrance
Address/Cross Road:	N/A
Side of Road:	West

Effective Cross-Section:	10	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	8	m
Ditching on Private Prop:	0	m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset South	5	m
Centre-Line Offset North	5	m
Exposed Length South	0	m
Exposed Length North	0	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

Shape/Type: Round

Material: Corrugated Steel

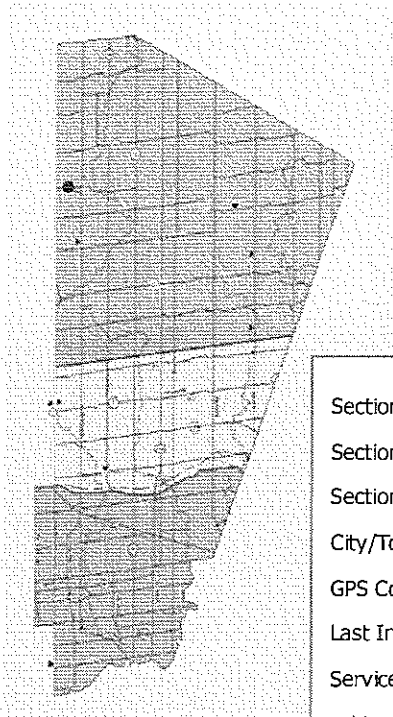
Surface: A ☐ B ☐ C ☑

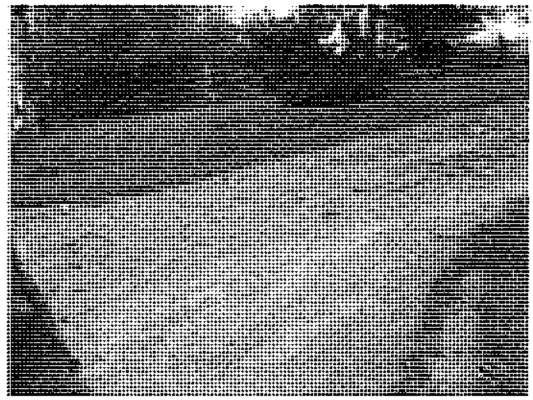
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean	$1,250
2		
3		
4	Ditching	$1,200
5		
6		
	Total Incl. Mobilization and Contingency :	$3,188

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 1734





Section - Road:	110700 - BUSH STREET
Section Start:	MISSISSAUGA RD. (REG. RD. # 1)
Section End:	SHAWS CREEK RD.
City/Town:	CALEDON
GPS Coord:	578880 E 4848967 N
Last Inspected:	8/23/2005
Service Type:	Entrance
Address/Cross Road:	523
Side of Road:	South

Effective Cross-Section:	100	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	4.25	m
Centre-Line Offset East	4.35	m
Exposed Length West	0	m
Exposed Length East	0.1	m
Maximum Overburden:	0.6	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

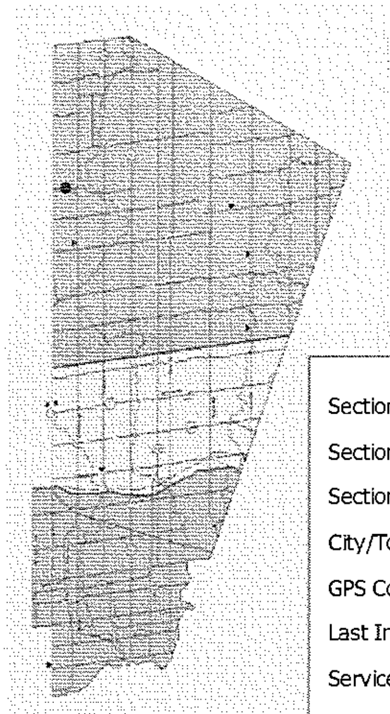
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

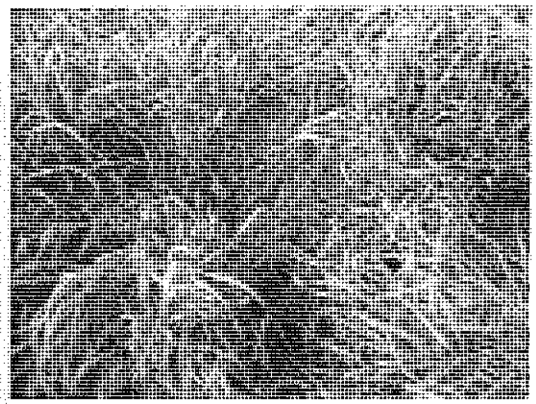
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

1	Do Nothing	$0
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$0

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☑
N/A	☐

CULVERT NO. 1735





Section - Road:	110700 - BUSH STREET
Section Start:	MISSISSAUGA RD. (REG. RD. # 1)
Section End:	SHAWS CREEK RD.
City/Town:	CALEDON
GPS Coord:	578961 E 4849065 N
Last Inspected:	8/23/2005
Service Type:	Entrance
Address/Cross Road:	593
Side of Road:	South

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

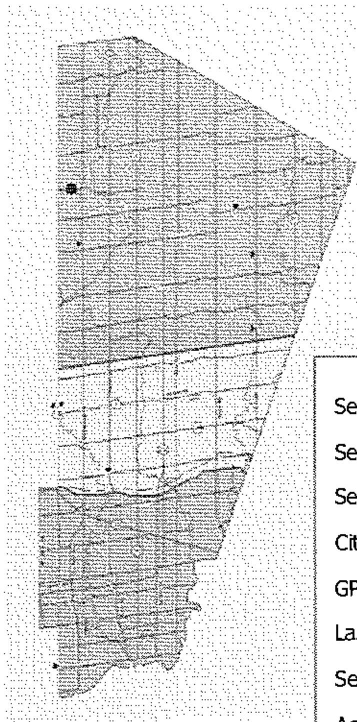
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

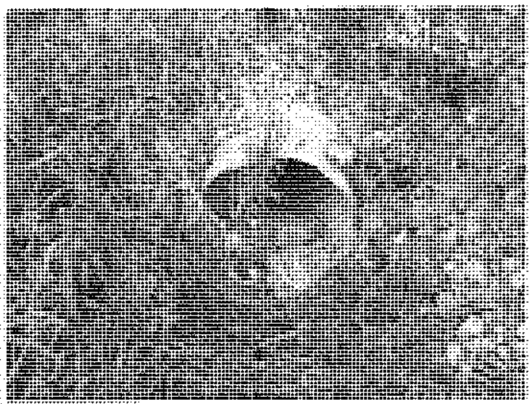
1	Flush/Clean	$1,138
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,548

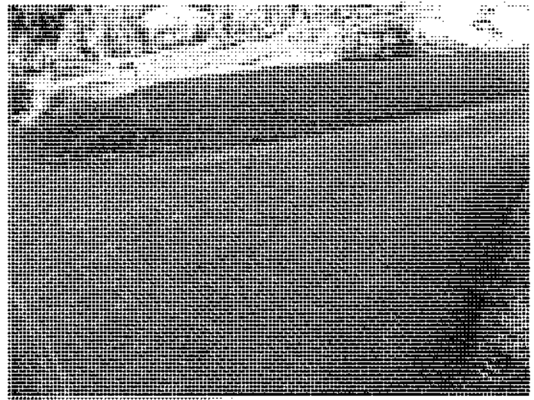
Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	4.55	m
Centre-Line Offset East	4.55	m
Exposed Length West	0	m
Exposed Length East	0	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 1736







Section - Road: 110700 - BUSH STREET
Section Start: MISSISSAUGA RD. (REG. RD. # 1)
Section End: SHAWS CREEK RD.
City/Town: CALEDON
GPS Coord: 578971 E 4849075 N
Last Inspected: 8/23/2005
Service Type: Entrance
Address/Cross Road: 595
Side of Road: South

Shape/Type: Round
Material: Corrugated Steel
Surface: A ☐ B ☑ C ☐

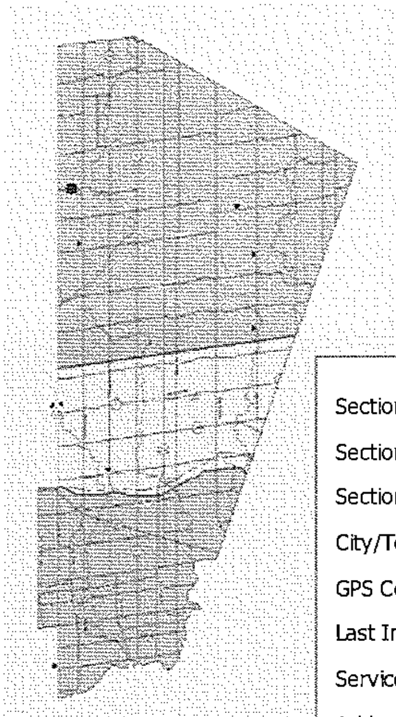
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

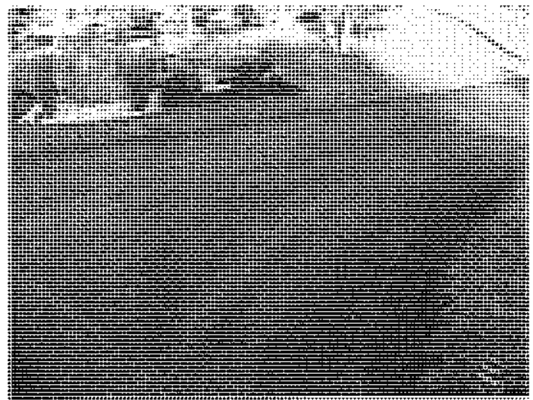
1	Flush/Clean	$1,175
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$1,594

Immediately ☐
This Year ☐
1 -2 Years ☐
3 - 5 Years ☐
6 - 10 Years ☐
11+ Years ☑
N/A ☐

Effective Cross-Section:	95	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	4.75	m
Centre-Line Offset East	4.65	m
Exposed Length West	0.2	m
Exposed Length East	0.1	m
Maximum Overburden:	0.3	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 1737





Section - Road:	110700 - BUSH STREET
Section Start:	MISSISSAUGA RD. (REG. RD. # 1)
Section End:	SHAWS CREEK RD.
City/Town:	CALEDON
GPS Coord:	578995 E 4849105 N
Last Inspected:	8/23/2005
Service Type:	Entrance
Address/Cross Road:	597
Side of Road:	South

Effective Cross-Section:	30	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	4.7	m
Centre-Line Offset East	4.6	m
Exposed Length West	0.5	m
Exposed Length East	0.4	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

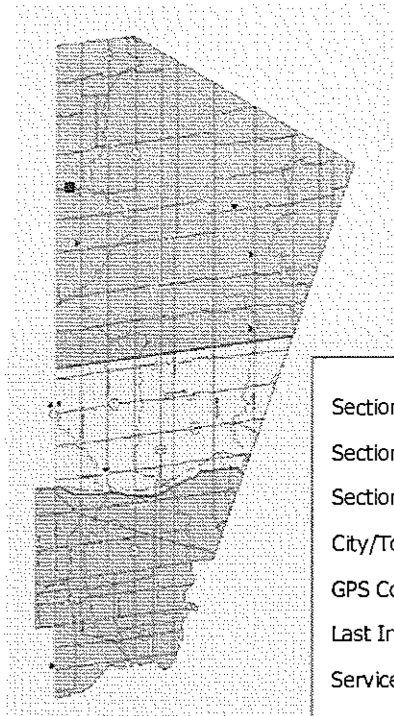
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A [ ] B [x] C [ ]

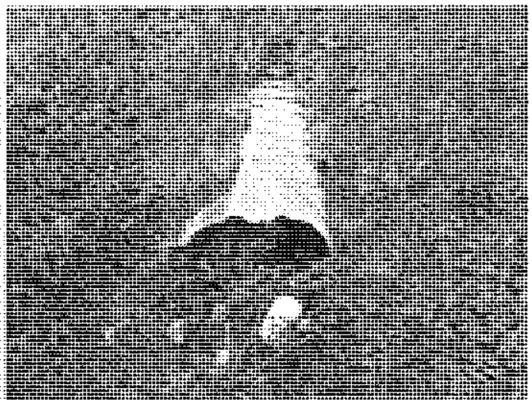
No Headwall Present at West	[x]	Pre-Fab Headwall at West	[ ]
No Headwall Present at East	[x]	Pre-Fab Headwall at East	[ ]
Concrete Headwall at West	[ ]	Gabion Headwall at West	[ ]
Concrete Headwall at East	[ ]	Gabion Headwall at East	[ ]
Barriers Present	[ ]	Marker Posts	[ ]

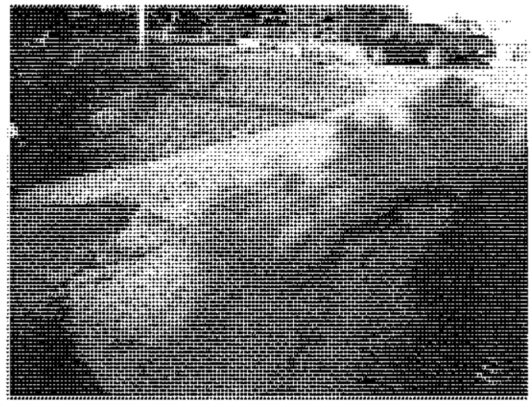
1	Flush/Clean & Re-Shape Ends	$1,362
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$2,578

Immediately	[ ]
This Year	[ ]
1 -2 Years	[ ]
3 - 5 Years	[x]
6 - 10 Years	[ ]
11+ Years	[ ]
N/A	[ ]

CULVERT NO. 1738







Section - Road:	110700 - BUSH STREET
Section Start:	MISSISSAUGA RD. (REG. RD. # 1)
Section End:	SHAWS CREEK RD.
City/Town:	CALEDON
GPS Coord:	579008 E 4849123 N
Last Inspected:	8/23/2005
Service Type:	Entrance
Address/Cross Road:	599
Side of Road:	South

Effective Cross-Section:	40	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	2	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	4.15	m
Centre-Line Offset East	3.45	m
Exposed Length West	0.7	m
Exposed Length East	0	m
Maximum Overburden:	0.6	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

Shape/Type: Round

Material: Corrugated Steel

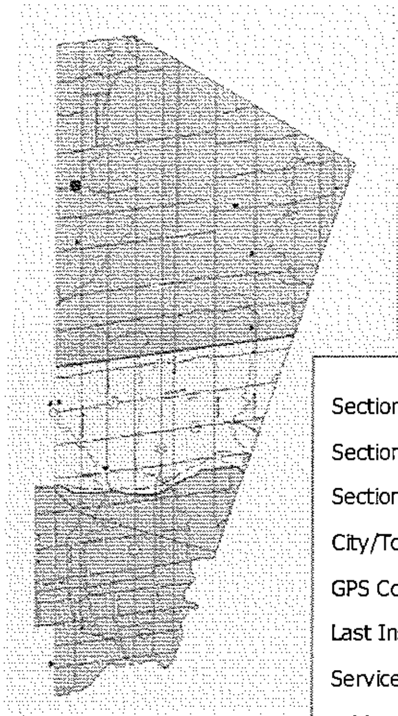
Surface: A ☐ B ☑ C ☐

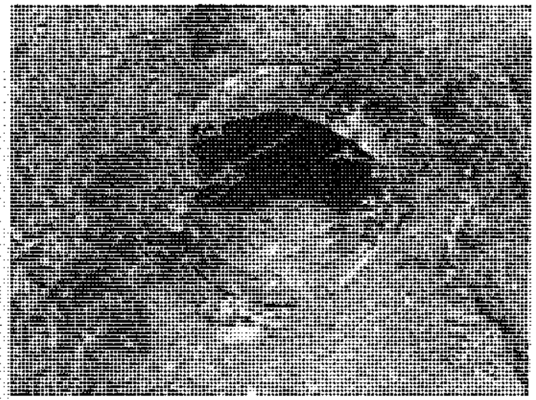
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

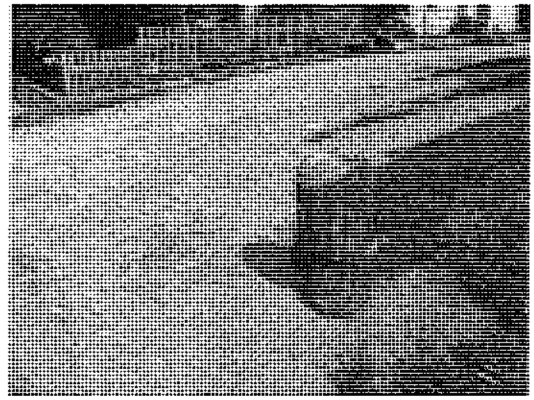
1	Flush/Clean	$950
2		
3		
4	Ditching	$300
5		
6		
	Total Incl. Mobilization and Contingency :	$1,688

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 1739







Section - Road:	110700 - BUSH STREET
Section Start:	MISSISSAUGA RD. (REG. RD. # 1)
Section End:	SHAWS CREEK RD.
City/Town:	CALEDON
GPS Coord:	579298 E 4849577 N
Last Inspected:	8/23/2005
Service Type:	Entrance
Address/Cross Road:	779
Side of Road:	South

Effective Cross-Section:	100	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	4.65	m
Centre-Line Offset East	4.55	m
Exposed Length West	0.1	m
Exposed Length East	0	m
Maximum Overburden:	0.2	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

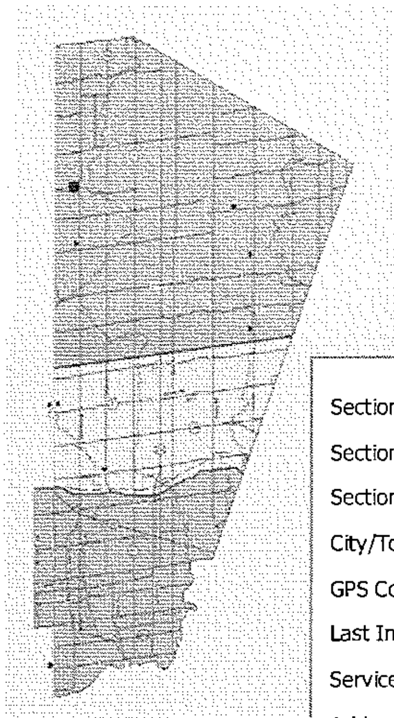
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

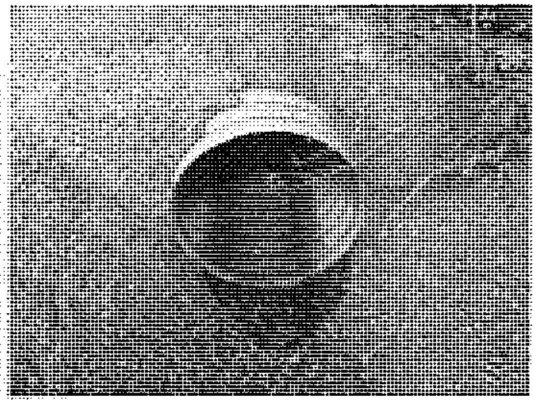
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

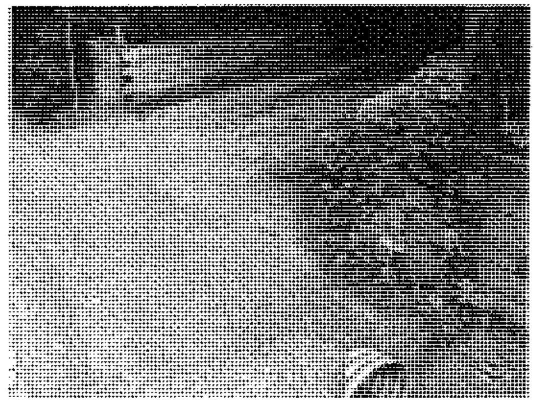
1	Do Nothing	$0
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$0

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☑

CULVERT NO. 1740







Section - Road:	110700 - BUSH STREET
Section Start:	MISSISSAUGA RD. (REG. RD. # 1)
Section End:	SHAWS CREEK RD.
City/Town:	CALEDON
GPS Coord:	579301 E 4849583 N
Last Inspected:	8/23/2005
Service Type:	Entrance
Address/Cross Road:	779
Side of Road:	South

Effective Cross-Section:	100	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	4.5	m
Centre-Line Offset East	4.5	m
Exposed Length West	0.2	m
Exposed Length East	0.2	m
Maximum Overburden:	0.2	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

Shape/Type: Round

Material: Corrugated Steel

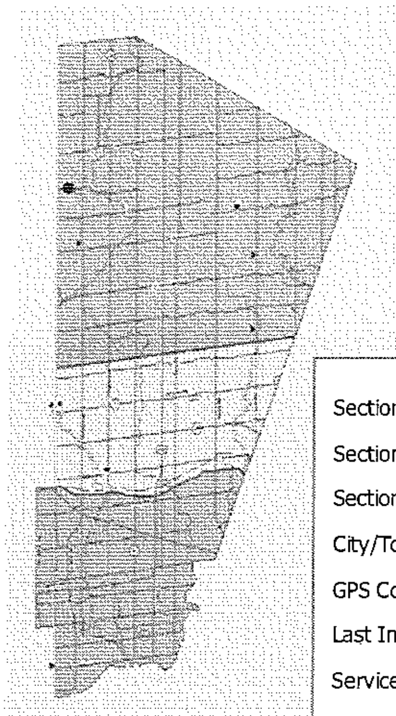
Surface: A ☐ B ☑ C ☐

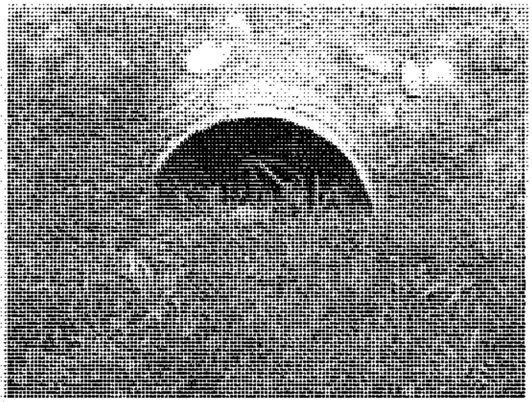
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

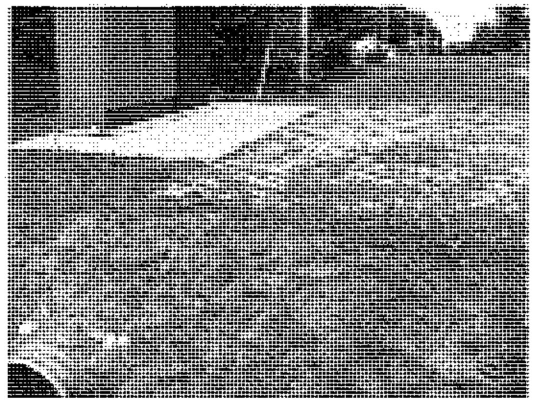
1	Do Nothing	$0
2		
3		
4		
5		
6		
	Total Incl. Mobilization and Contingency :	$0

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☑

CULVERT NO. 1741







Section - Road:	110820 - BUSH STREET
Section Start:	SHAWS CREEK RD.
Section End:	WINSTON CHURCHILL BLVD. (REG. RD. ;
City/Town:	CALEDON
GPS Coord:	578762 E 4848842 N
Last Inspected:	8/23/2005
Service Type:	Other Parallel
Address/Cross Road:	N/A
Side of Road:	North

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☑ B ☐ C ☐

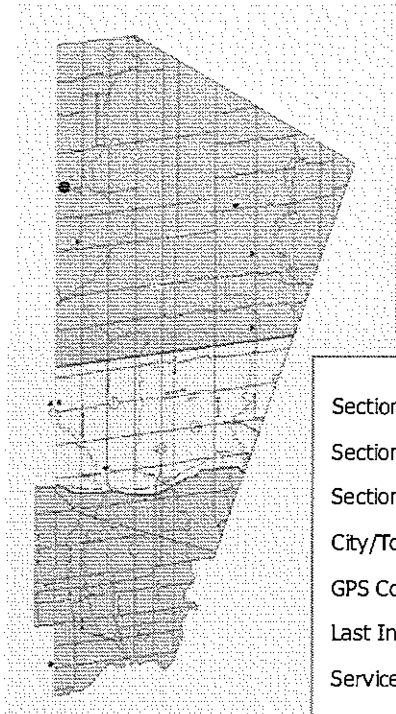
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

1	Flush/Clean	$1,150
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$2,313

Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☑
11+ Years	☐
N/A	☐

Effective Cross-Section:	60	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	4.5	m
Centre-Line Offset East	4.7	m
Exposed Length West	0.2	m
Exposed Length East	0.4	m
Maximum Overburden:	0.4	m
Nominal Diameter:	0.46	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 1742



Section - Road:	110820 - BUSH STREET
Section Start:	SHAWS CREEK RD.
Section End:	WINSTON CHURCHILL BLVD. (REG. RD. 1
City/Town:	CALEDON
GPS Coord:	578576 E 4848582 N
Last Inspected:	8/23/2005
Service Type:	Field Entrance
Address/Cross Road:	N/A
Side of Road:	South

Effective Cross-Section:	0	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	4	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:		
Markers Req. Straight:		
Markers Replace/Install:	0	
Centre-Line Offset West	3.15	m
Centre-Line Offset East	3.05	m
Exposed Length West	0.1	m
Exposed Length East	0	m
Maximum Overburden:	0.2	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

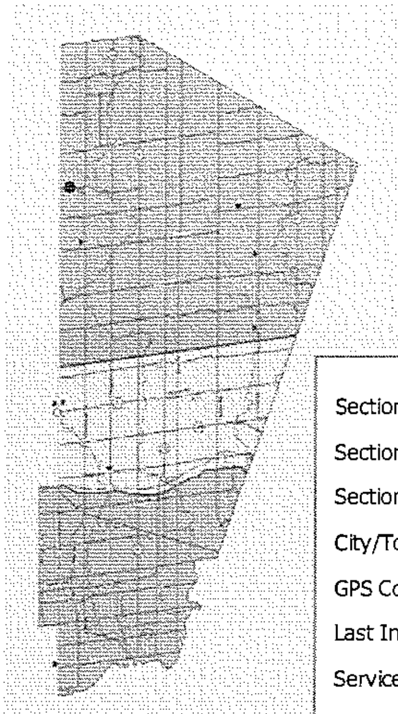
Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☐ C ☑

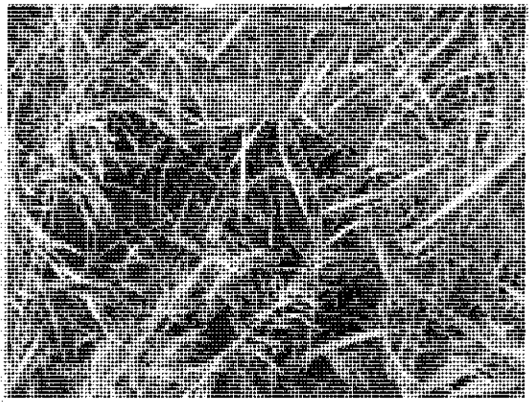
No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☐

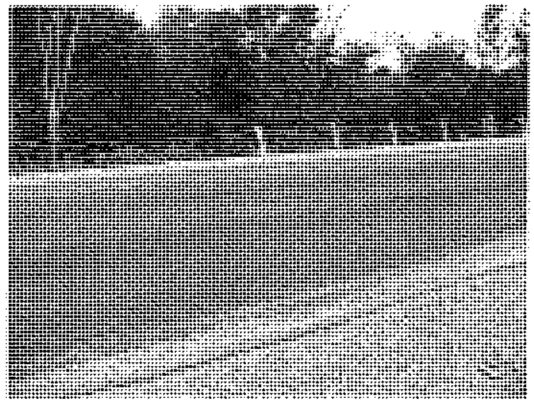
1	Flush/Clean	$775
2		
3		
4	Ditching	$600
5		
6		
	Total Incl. Mobilization and Contingency :	$1,844

Immediately	☐
This Year	☑
1 -2 Years	☐
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

CULVERT NO. 1743







Section - Road:	110820 - BUSH STREET
Section Start:	SHAWS CREEK RD.
Section End:	WINSTON CHURCHILL BLVD. (REG. RD.
City/Town:	CALEDON
GPS Coord:	578712 E 4848736 N
Last Inspected:	8/23/2005
Service Type:	Cross
Address/Cross Road:	N/A
Side of Road:	N/A

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

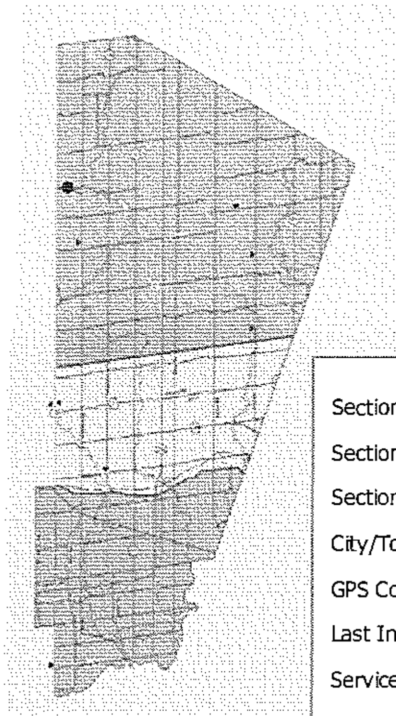
No Headwall Present at South	☑	Pre-Fab Headwall at South	☐
No Headwall Present at North	☑	Pre-Fab Headwall at North	☐
Concrete Headwall at South	☐	Gabion Headwall at South	☐
Concrete Headwall at North	☐	Gabion Headwall at North	☐
Barriers Present	☑	Marker Posts	☑

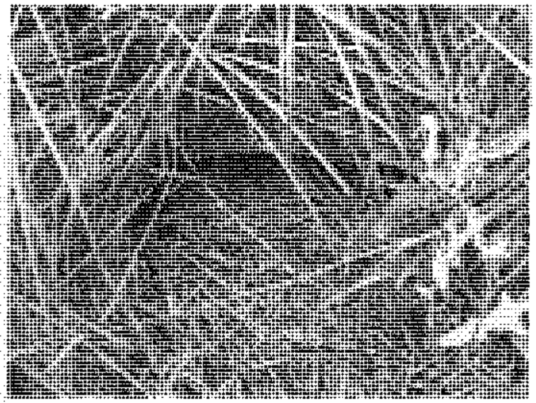
1	Do Nothing	$0
2		
3		
4		
5		
6	Replace/Install Marker Posts	$20
	Total Incl. Mobilization and Contingency :	$150

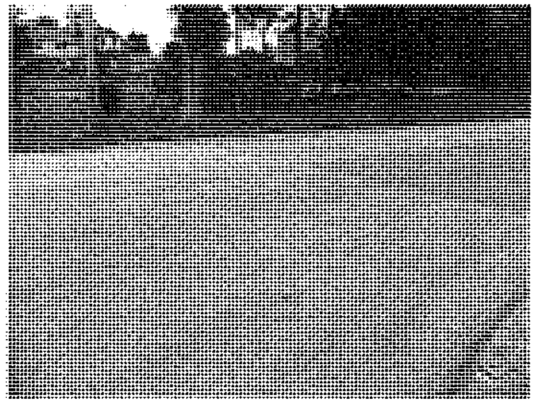
Immediately	☐
This Year	☐
1 -2 Years	☐
3 - 5 Years	☑
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Effective Cross-Section:	90	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	0	m
Ditching on Private Prop:		m
Volume of HW South		m3
Volume of HW North		m3
Headwall Repair South		m3
Headwall Repair North		m3
Pre-Fab HW SA South		m2
Pre-Fab HW SA North		m2
Gabions Req. at South		m3
Gabions Req. at North		m3
Total Barrier Length:	100	m
Barriers Req. Repair:	0	m
Barriers Replace/Install:	0	m
Number of Marker Posts:	1	
Markers Req. Straight:	0	
Markers Replace/Install:	2	
Centre-Line Offset South	15	m
Centre-Line Offset North	15	m
Exposed Length South	0.1	m
Exposed Length North	0.1	m
Maximum Overburden:	6.9	m
Nominal Diameter:	0.9	m
Maximum Span:		m
Interior Height:		m

CULVERT NO. 1744







Section - Road:	110820 - BUSH STREET
Section Start:	SHAWS CREEK RD.
Section End:	WINSTON CHURCHILL BLVD. (REG. RD.
City/Town:	CALEDON
GPS Coord:	578825 E 4848890 N
Last Inspected:	8/23/2005
Service Type:	Intersection
Address/Cross Road:	Shaw Creek Rd
Side of Road:	South

Effective Cross-Section:	15	%
% Req. Replacement:	0	%
Cross Section:		
Area Req. Erosion Cntrl:	0	m2
Total Ditching Required :	2	m
Ditching on Private Prop:	0	m
Volume of HW West		m3
Volume of HW East		m3
Headwall Repair West		m3
Headwall Repair East		m3
Pre-Fab HW SA West		m2
Pre-Fab HW SA East		m2
Gabions Req. at West		m3
Gabions Req. at East		m3
Total Barrier Length:		m
Barriers Req. Repair:		m
Barriers Replace/Install:	0	m
Number of Marker Posts:	1	
Markers Req. Straight:	0	
Markers Replace/Install:	1	
Centre-Line Offset West	7.15	m
Centre-Line Offset East	7.25	m
Exposed Length West	0	m
Exposed Length East	0.1	m
Maximum Overburden:	0.5	m
Nominal Diameter:	0.4	m
Maximum Span:		m
Interior Height:		m

Shape/Type:	Round
Material:	Corrugated Steel
Surface:	A ☐ B ☑ C ☐

No Headwall Present at West	☑	Pre-Fab Headwall at West	☐
No Headwall Present at East	☑	Pre-Fab Headwall at East	☐
Concrete Headwall at West	☐	Gabion Headwall at West	☐
Concrete Headwall at East	☐	Gabion Headwall at East	☐
Barriers Present	☐	Marker Posts	☑

1	Flush/Clean	$1,800
2		
3		
4	Ditching	$300
5		
6	Replace/Install Marker Posts	$10
	Total Incl. Mobilization and Contingency :	$2,763

Immediately	☐
This Year	☐
1 -2 Years	☑
3 - 5 Years	☐
6 - 10 Years	☐
11+ Years	☐
N/A	☐

Appendix B
VO2 Hydrologic Modelling Input Parameters for Cross Culverts

Table B-1: VO2 Parameters for Cross Culverts

Culvert ID #	VO2 ID #	Area (ha)	Total Area (ha)	CN	Ia (mm)	Tc (hr)	Tp (hr)	Comments	VO2 Results: Peak Flow (m^3/s) 2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
10	21	8.81	8.81	68.3	6.5	2.035	1.357		0.079	0.134	0.177	0.235	0.287	0.333
14	22	3.01	-	71.6	5.2	0.083	0.056	Ineffective Depression Area[1]						
14	24	5.03	-	72.5	4.8	0.118	0.079	Ineffective Depression Area[1]	-	-	-	-	-	-
14	27	0.68	-	72.2	4.9	0.083	0.056	Ineffective Depression Area[1]						
14	30	5.57		69.8	6.1	0.083	0.056							
14	32	6.71	12.27	64.3	8.7	0.480	0.320		0.243	0.432	0.598	0.827	1.019	1.204
14	31	-		channel routing: length = 477 m, slope = 0.0168 m/m; width = 85 m										
16	34	2.15		71.9	5.0	0.155	0.103							
16	36	2.08	4.23	67.6	7.7	0.127	0.085		0.193	0.329	0.438	0.59	0.721	0.845
16	35	-		channel routing: length = 107 m, slope = 0.0248 m/m; width = 70 m										
17	40	3.95	-	54.0	10.0	0.603	0.402	Ineffective Depression Area[1]	-	-	-	-	-	-
17	39	35.03	35.03	65.5	7.2	1.741	1.161		0.311	0.539	0.719	0.961	1.182	1.376
24	42	0.56	-	70.0	5.0	0.083	0.055	Ineffective Depression Area[1]						
24	44	0.87	-	64.6	6.7	0.083	0.055	Ineffective Depression Area[1]	-	-	-	-	-	-
24	47	0.48	-	70.0	5.0	0.083	0.055	Ineffective Depression Area[1]						
24	49	2.77	2.77	70.7	5.4	0.167	0.111		0.145	0.241	0.314	0.411	0.49	0.568
37	50	11.96		66.4	5.7	0.268	0.179	Effective Depression Area[2]						
37	52	3.90		69.4	4.9	0.107	0.071	Effective Depression Area[2]						
37	55	5.19	21.05	73.3	4.0	0.167	0.111		0.311	0.504	0.650	1.42	1.875	3.285
37	56	-		(Roadside ditch) channel routing: length = 354 m, slope = 0.0335 m/m; width = 2.5 m										
43	67	1.52		62.0	8.0	0.088	0.059	Effective Depression Area[2]						
43	69	1.80	48.56	58.8	8.5	0.103	0.069	Effective Depression Area[2]	0.529	0.918	1.370	2.678	3.366	4.985
43	72	24.19		60.0	8.6	0.553	0.369							
43	66	21.05		Includes area from culvert # 37										
44	76	127.28	127.28	59.9	8.3	1.178	0.785		1.186	2.119	2.872	3.908	4.855	5.701
47	82	0.24	0.24	77.6	3.5	0.167	0.111		0.017	0.027	0.034	0.044	0.052	0.059
48	78	2.66		59.8	8.6	0.107	0.071	Effective Depression Area[2]						
48	80	14.63	17.52	58.0	9.4	0.858	0.572		0.155	0.282	0.386	0.530	0.661	0.874
48	83	0.24		Includes area from culvert # 48										
55	84	7.71	7.71	62.5	9.1	0.436	0.291		0.149	0.268	0.365	0.497	0.614	0.722
56	85	0.91	0.91	64.9	8.5	0.167	0.111		0.034	0.06	0.08	0.108	0.131	0.154
2	86	19.15	19.15	71.3	5.8	0.366	0.244		0.654	1.097	1.438	1.9	2.288	2.647

Table B-2: Time of Concentration (T_c) Calculations for Cross Culverts

1) Kirpich's Equation for Estimating T_c: $T_c \text{ (min)} = 0.0195\,(L^{0.177})/(S^{0.385})$ where length (L) in metres, slope (S) in m/m

Note for using Kirpich's Eqn: For overland flow, grassed surfaces, multiply Tc by 2. For overland flow, concrete or ashphalt surfaces, multiply Tc by 0.4. For concrete channels, multiply Tc by 0.2. (Reference: Modern Sewer Design, 1980)

2) SCS Upland Method of Estimating Tc:

Code	Description	Velocity (m/s)
1	Forest with heavy ground litter & hay meadow (overland flow)	$=2.5*(s^{0.5})*0.3048$
2	Trash fallow or min tillage cultivation; contour or strip cropped & woodland (overland flow)	$=5.0*(s^{0.5})*0.3048$
3	Short grass pasture (overland flow)	$=7.0*(s^{0.5})*0.3048$
4	Cultivated, straight row (overland flow)	$=9.0*(s^{0.5})*0.3048$
5	Nearly bare and untilled (overland flow); & alluvial fans western mountain regions	$=10.0*(s^{0.5})*0.3048$
6	Grassed waterway	$=15.0*(s^{0.5})*0.3048$
7	Paved areas (sheet flow); & small upland gullies	$=20.0*(s^{0.5})*0.3048$

Culvert ID #	Area	Elevation E1	E2	change	Length	Overland slope	Land Use	Tc Method	Weighted overland slope	SCS Upland GND cover - Code	Overland velocity (see chart)	Travel time	Time of Conc	Time of Conc
	(ha)	(m)	(m)	(m)	(m)	(m/m)			(m/m)		(m/s)	(min)	(min)	(hr)
10	5.07	403	385.5	17.5	249	0.0703	Crop Field	SCS Upland	0.0703	4	0.73	5.70	122.08	2.035
	3.74	385.5	384.6	0.9	294	0.0031	Forest	SCS Upland	0.0031	1	0.04	116.4		
14	5.57	406	389	17	152.33	0.1116	Crop Field	SCS Upland	0.1116	4	0.92	2.77	Use 5 min to depression area[2]	0.083
	3.01	404.0	397	7	77	0.0905	Crop Field	SCS Upland	0.0905	4	0.83	1.56	Use 5 min to depression area[2]	0.083
	5.03	405.0	390	15	274	0.0548	Crop Field	SCS Upland	0.0548	4	0.64	7.11	7.11	0.118
	0.68	394.5	390	4.5	49	0.0924	Crop Field	SCS Upland	0.0924	4	0.83	0.97	Use 5 min to depression area[2]	0.083
	6.71	389	381	8	477	0.0168	Woodland/ Pasture	SCS Upland	0.0168	3	0.28	28.8	28.81	0.480
17	35.0	421	410	11	208	0.0528	Woodland	SCS Upland	0.0528	1	0.18	19.85	104.47	1.741
		410	404	6	419	0.0143	Crop Field	SCS Upland	0.0143	4	0.33	21.29		
		404	385.1	18.9	541	0.0349	Forest	SCS Upland	0.0349	1	0.14	63.33		
	3.95	430	415	15	345	0.0435	Woodland	SCS Upland	0.0435	1	0.16	36.19	36.19	0.603
24	2.77	436	428.4	7.6	139	0.0547	Lawn	SCS Upland	0.0547	3	0.50	4.64	Use minimum 10 minutes inlet time[1]	0.167
	0.56	n/a	n/a	n/a	n/a	n/a	Lawn	SCS Upland	n/a	n/a	n/a	n/a	Use 5 min to depression area[2]	0.083
	0.87	n/a	n/a	n/a	n/a	n/a	Lawn	SCS Upland	n/a	n/a	n/a	n/a	Use 5 min to depression area[2]	0.083
	0.48	n/a	n/a	n/a	n/a	n/a	Lawn	SCS Upland	n/a	n/a	n/a	n/a	Use 5 min to depression area[2]	0.083
37	11.96	434	427	7.0	309	0.0226	Lawn	SCS Upland	0.0226	3	0.32	16.07	16.07	0.268
	3.90	434	425	9.0	192	0.0468	Pasture	SCS Upland	0.0468	3	0.46	6.93	6.93	0.116
	5.19	430	421.6	8.4	209	0.0402	Crop Field	SCS Upland	0.0402	4	0.55	6.34	10.04	0.167
		n/a	n/a	n/a	155	0.0131	Ditch	SCS Upland	0.0131	7	0.70	3.70		
43	1.52	433	427	6	127	0.0472	Pasture	Kirpich's Eqn	0.0472	n/a	n/a	5.26	5.26	0.088
	1.80	432	421	11.0	178	0.0618	Forest	Kirpich's Eqn	0.0618	n/a	n/a	6.16	6.16	0.103
	24.19	427	400.2	26.8	1030	0.0260	Forest & Pasture	Kirpich's Eqn	0.0260	n/a	n/a	33.19	33.19	0.553
44	127.27	445	399.7	45.3	2360	0.0192	Woodland & Pasture	Kirpich's Eqn	0.0192	n/a	n/a	70.66	70.66	1.178
48	2.66	409	398	11	185	0.0595	Pasture	Kirpich's Eqn	0.0595	n/a	n/a	6.44	6.44	0.107
	14.62	402	398.5	3.5	764	0.0046	Pasture & Woodland	Kirpich's Eqn	0.0046	n/a	n/a	51.47	51.47	0.858
47	0.24	402	400	2	43	0.0462	Lawn	assume sheet flow	0.0462	3	0.46	1.57	Use minimum 10 minutes inlet time for cross culverts[1]	0.167
		400	398.5	1.5	45	0.0331	Ditch	assume conc. flow	0.0331	7	1.11	0.68		
55	7.7	401	399	2	100	0.0200	Woodland	SCS Upland	0.0200	2	0.22	7.73	26.18	0.436
		399	391.55	7.45	292	0.0255	Woodland	SCS Upland	0.0171	6	0.60	11.69		
		391.55	390	1.55	127	0.0122	Woodland	SCS Upland						
		389.5	388.8	0.7	162	0.0043	Ditch	SCS Upland	0.0043	7	0.40	6.77		
56	0.91	393.3	389.5	3.8	100	0.0380	Woodland	SCS Upland	0.0380	2	0.30	5.61	Use minimum 10 minutes inlet time for cross culverts[1]	0.167
		389.5	389	0.5	56	0.0089	Woodland	SCS Upland	0.0089	6	0.43	2.17		
		389	387.4	1.6	49	0.0325	Ditch	SCS Upland	0.0325	7	1.10	0.75		
16	4.23	405	398	7	185	0.0378	Crop Field	SCS Upland	0.0378	4	0.53	5.80	9.28	0.155
		398	390	8	59	0.1360	Woodland	SCS Upland	0.1360	1	0.28	3.49		
		390	386.2	3.8	154	0.0248	Meadow/ Pasture	SCS Upland	0.0248	3	0.34	7.62	7.62	0.127

2	19.15	411	408	3	96	0.0312	Pasture	SCS Upland	0.0312	3	0.38	4.26	21.98	0.366
		408	405.81	2.2	79	0.0277	Woodland	SCS Upland	0.0277	6	0.76	1.73		
		405.81	389	16.8	687	0.0245	Crop Field	SCS Upland	0.0245	6	0.72	16.0		
Note:														
1. Cross culverts are to be designed with a minimum inlet time of 10 minutes (Region of Peel Standards/Guidelines)														
2. A minimum tc of 5 minutes is assumed for areas draining to depression areas that act as ponds.														

Table B-3: CN and Initial Abstraction (Ia) Parameters for Cross Culverts

CVC Standard Parameters:

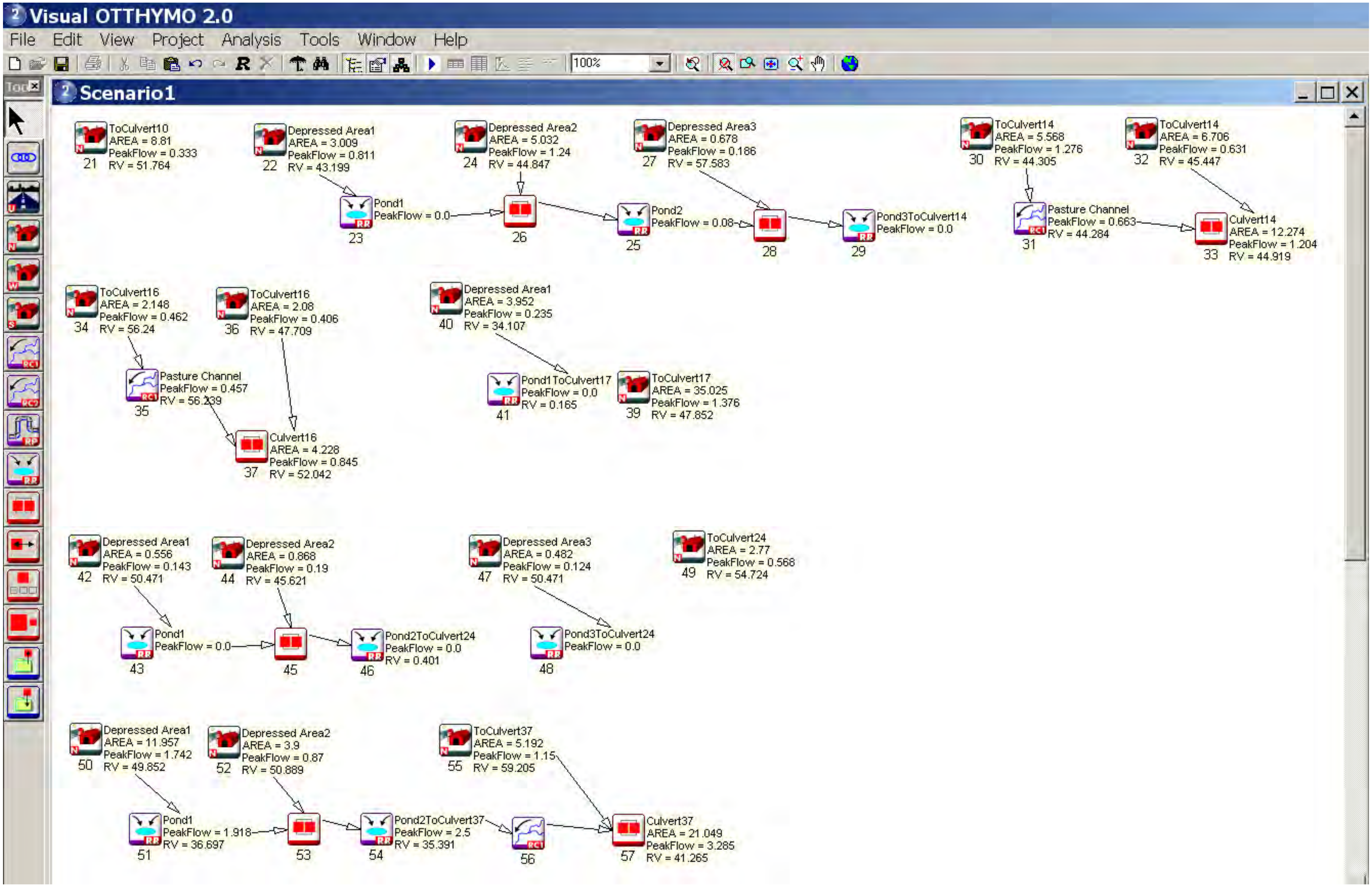
Cover	CN Value for Soil Group AB[1]	CN Value for Soil Group B	Ia (mm)
Woods	54	60	10
Meadows	62	66	8
Cultivated	70	74	4
Lawns	70	71	5
Impervious area	100	100	2

Note: 1.CN Values for Soil Group AB not available from CVC Guidelines; CN values from MTO Drainage Manual, Design Chart 1.09

Culvert ID #	Area (m^2)	Total Area (m^2)	Soil Group	Land Use	CN	Ia (mm)	Area-weighted CN	Area-weighted Ia (mm)	Comments
10	50674		B	Crop	74	4			
10	36914	88099	B	Forest	60	10	68.28	6.5	
10	511		B	Road	100	2			
14	20914	30091	B	Crop	74	4	71.56	5.2	
14	9177		B	Meadows	66	8			Ineffective Depression Area
14	9483	50325	B	Meadows	66	8	72.49	4.8	
14	40842		B	Crop	74	4			Ineffective Depression Area
14	1550	6776	B	Meadows	66	8	72.17	4.9	
14	5226		B	Crop	74	4			Ineffective Depression Area
14	29493	55677	B	Meadows	66	8	69.76	6.1	
14	26184		B	Crop	74	4			
14	1428		B	Road	100	2			
14	27086	67062	B	Woodland	60	10	64.3	8.7	
14	38548		B	Meadows	66	8			
17	39521	39521	AB	Forest	54	10	54	10	Ineffective Depression Area
17	58122		AB	Forest	54	10			
17	28645		AB	Crop	70	4			
17	2884		AB	Forest	54	10			
17	10174		AB	Meadows	62	8			
17	131		AB	Road	100	2			
17	121		AB	Road	100	2			
17	1137	350250	AB	Road	100	2	65.48	7.2	
17	585		AB	Road	100	2			
17	125541		B	Crop	74	4			
17	119360		B	Woodland	60	10			
17	864		B	Road	100	2			
17	2686		B	Road	100	2			
24	5557	5557	AB	Lawn	70	5	70	5	Ineffective Depression Area
24	2917	8680	AB	Forest	54	10	64.62	6.7	
24	5763		AB	Lawn	70	5			Ineffective Depression Area
24	4821	4821	AB	Lawn	70	5	70	5	Ineffective Depression Area
24	21786		AB	Lawn	70	5			
24	3414	27698	AB	Forest	54	10	70.73	5.4	
24	2498		AB	Road	100	2			
37	68926		AB	Crop	70	4			
37	33718	119566	AB	Woodland	54	10	66.44	5.7	
37	13132		AB	Lawn	70	5			
37	3790		AB	Road	100	2			Effective Depression Area
37	28246		AB	Crop	70	4			
37	9077	38997	AB	Meadow	62	8	69.43	4.9	
37	1674		AB	Impervious	100	2			Effective Depression Area
37	41999		AB	Crop	70	4			
37	3322	51917	AB	Meadow	62	8	73.30	4	
37	6596		AB	Road	100	2			
43	15215	15215	AB	Meadows	62	8	62	8	Effective Depression Area
43	12540	17986	AB	Woodland	54	10	58.84	8.49	
43	5446		AB	Lawn	70	5			Effective Depression Area
43	7568		AB	Road	100	2			
43	97938	241924	AB	Woodland	54	10	59.95	8.62	
43	136418		AB	Meadows	62	8			
44	335578		AB	Meadows	62	8			
44	302202	1272760	AB	Lawn	70	5	59.91	8.29	
44	634980		AB	Woodland	54	10			
47	1768	2368	AB	ImprovedLand	70	4	77.61	3.49	
47	600		AB	Road	100	2			
48	19265	26587	AB	Meadows	62	8	59.80	8.55	
48	7322		AB	Woodland	54	10			Effective Depression Area
48	2188		AB	Road	100	2			
48	5332		AB	Meadows	62	8			
48	12884	146246	AB	Lawn	70	5	58.04	9.37	
48	85514		AB	Woodland	54	10			
48	40328		B	Woodland	60	10			
55	66654		B	Woodland	60	10			
55	8799	77101	B	Cultivated	74	4	62.45	9.14	
55	1647		B	Road	100	2			
56	7071		B	Woodland	60	10			
56	1407	9092	B	Cultivated	74	4	64.87	8.53	
56	615		B	Road	100	2			
16	5528	21482	B	Woodland	66	8	71.94	5.03	
16	15954		B	Crop	74	4			
16	996	20803	B	Road	100	2	67.63	7.71	
16	19807		B	Meadows	66	8			
2	56550		B	Meadows	66	8			

2	23511	191486	B	Woodland	60	10	71.27	5.81	
2	9951		B	Road	100	2			
2	101475		B	Crop	74	4			

Appendix C
VO2 Hydrologic Modelling Outputs for Cross Culverts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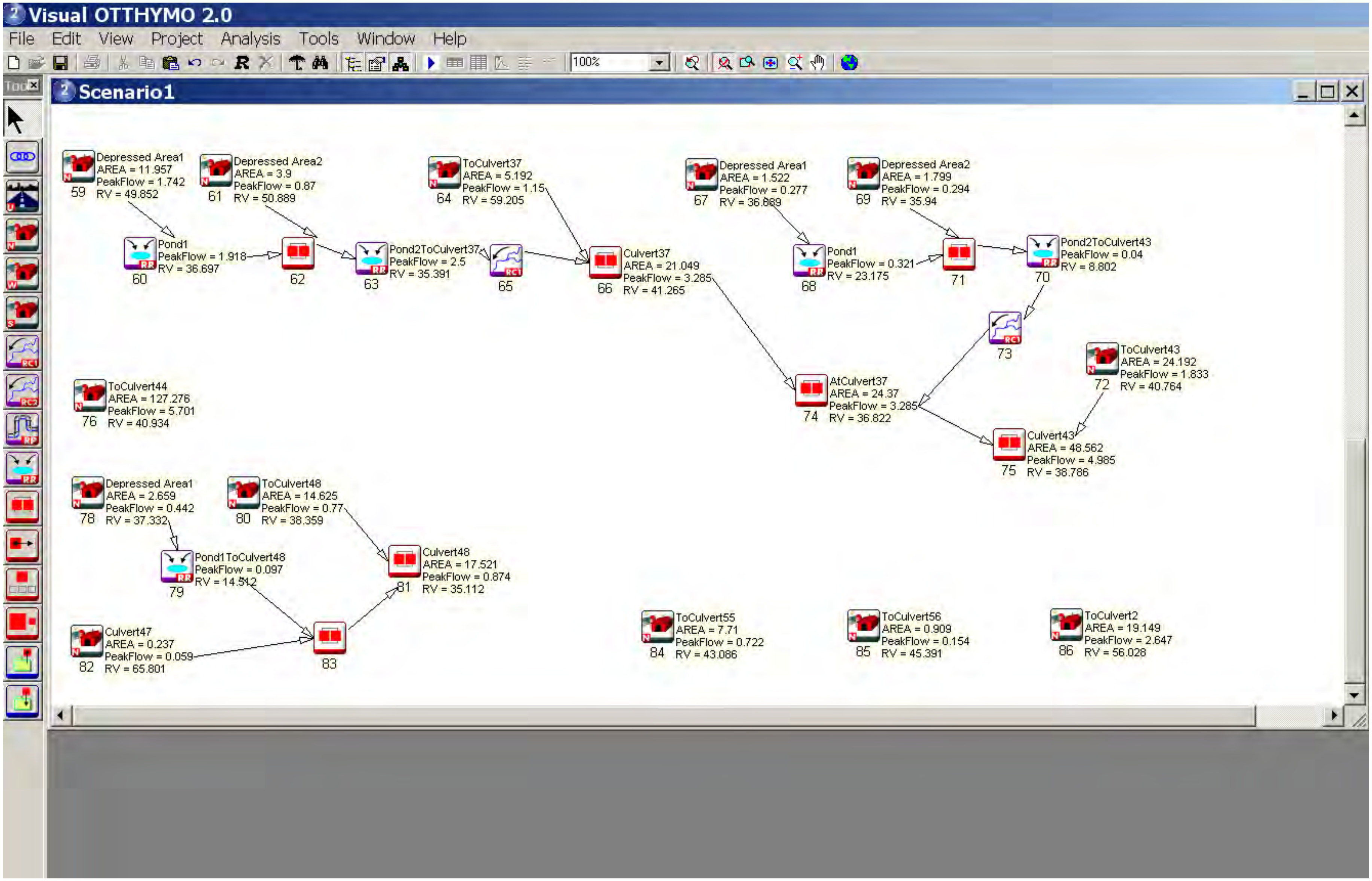
Scenario1
ToCulvert10
AREA = 8.81
PeakFlow = 0.333
RV = 51.764
21
Depressed Area1
AREA = 3.009
PeakFlow = 0.811
RV = 43.199
22
Depressed Area2
AREA = 5.032
PeakFlow = 1.24
RV = 44.847
24
Depressed Area3
AREA = 0.678
PeakFlow = 0.186
RV = 57.583
27
ToCulvert14
AREA = 5.568
PeakFlow = 1.276
RV = 44.305
30
ToCulvert14
AREA = 6.706
PeakFlow = 0.631
RV = 45.447
32
Pond1
PeakFlow = 0.0
23
26
Pond2
PeakFlow = 0.08
25
28
Pond3ToCulvert14
PeakFlow = 0.0
29
Pasture Channel
PeakFlow = 0.663
RV = 44.284
31
Culvert14
AREA = 12.274
PeakFlow = 1.204
RV = 44.919
33
ToCulvert16
AREA = 2.148
PeakFlow = 0.462
RV = 56.24
34
ToCulvert16
AREA = 2.08
PeakFlow = 0.406
RV = 47.709
36
Depressed Area1
AREA = 3.952
PeakFlow = 0.235
RV = 34.107
40
Pasture Channel
PeakFlow = 0.457
RV = 56.239
35
Pond1ToCulvert17
PeakFlow = 0.0
RV = 0.165
41
ToCulvert17
AREA = 35.025
PeakFlow = 1.376
RV = 47.852
39
Culvert16
AREA = 4.228
PeakFlow = 0.845
RV = 52.042
37
Depressed Area1
AREA = 0.556
PeakFlow = 0.143
RV = 50.471
42
Depressed Area2
AREA = 0.868
PeakFlow = 0.19
RV = 45.621
44
Depressed Area3
AREA = 0.482
PeakFlow = 0.124
RV = 50.471
47
ToCulvert24
AREA = 2.77
PeakFlow = 0.568
RV = 54.724
49
Pond1
PeakFlow = 0.0
43
45
Pond2ToCulvert24
PeakFlow = 0.0
RV = 0.401
46
Pond3ToCulvert24
PeakFlow = 0.0
48
Depressed Area1
AREA = 11.957
PeakFlow = 1.742
RV = 49.852
50
Depressed Area2
AREA = 3.9
PeakFlow = 0.87
RV = 50.889
52
ToCulvert37
AREA = 5.192
PeakFlow = 1.15
RV = 59.205
55
Pond1
PeakFlow = 1.918
RV = 36.697
51
53
Pond2ToCulvert37
PeakFlow = 2.5
RV = 35.391
54
56
Culvert37
AREA = 21.049
PeakFlow = 3.285
RV = 41.265
57



Visual OTTHYMO 2.0
File Edit View Project Analysis Tools Window Help
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Scenario1
Depressed Area1
AREA = 11.957
PeakFlow = 1.742
RV = 49.852
59
Depressed Area2
AREA = 3.9
PeakFlow = 0.87
RV = 50.889
61
ToCulvert37
AREA = 5.192
PeakFlow = 1.15
RV = 59.205
64
Depressed Area1
AREA = 1.522
PeakFlow = 0.277
RV = 36.889
67
Depressed Area2
AREA = 1.799
PeakFlow = 0.294
RV = 35.94
69
Pond1
PeakFlow = 1.918
RV = 36.697
60
62
Pond2ToCulvert37
PeakFlow = 2.5
RV = 35.391
63
65
Culvert37
AREA = 21.049
PeakFlow = 3.285
RV = 41.265
66
Pond1
PeakFlow = 0.321
RV = 23.175
68
71
Pond2ToCulvert43
PeakFlow = 0.04
RV = 8.802
70
73
ToCulvert43
AREA = 24.192
PeakFlow = 1.833
RV = 40.764
72
ToCulvert44
AREA = 127.276
PeakFlow = 5.701
RV = 40.934
76
AtCulvert37
AREA = 24.37
PeakFlow = 3.285
RV = 36.822
74
Culvert43
AREA = 48.562
PeakFlow = 4.985
RV = 38.786
75
Depressed Area1
AREA = 2.659
PeakFlow = 0.442
RV = 37.332
78
ToCulvert48
AREA = 14.625
PeakFlow = 0.77
RV = 38.359
80
Pond1ToCulvert48
PeakFlow = 0.097
RV = 14.512
79
Culvert48
AREA = 17.521
PeakFlow = 0.874
RV = 35.112
81
Culvert47
AREA = 0.237
PeakFlow = 0.059
RV = 65.801
82
83
ToCulvert55
AREA = 7.71
PeakFlow = 0.722
RV = 43.086
84
ToCulvert56
AREA = 0.909
PeakFlow = 0.154
RV = 45.391
85
ToCulvert2
AREA = 19.149
PeakFlow = 2.647
RV = 56.028
86

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==============================================================================

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DATE: 6/9/2010                              TIME: 9:48:35 AM

USER:



COMMENTS: ____________________________________________________________


--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 674.573
| Ptotal= 55.10 mm |                          B=   6.012
--------------------                          C=    .781
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =   .49

                    The CORRELATION coefficient is =  .9996

                     TIME       INPUT INT.          TAB. INT.
                    (min)        (mm/hr)             (mm/hr)
                       5.         102.00              103.59
                      10.          80.00               77.33
                      15.          64.00               62.54
                      30.          41.00               41.06
                      60.          24.00               25.58
                     120.          16.00               15.44
                     360.           6.30                6.71
                     720.           3.90                3.93
                    1440.           2.40                2.30

                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                  .08     .51 |  6.08     .91 | 12.08   11.16 | 18.08     .87
                  .17     .51 |  6.17     .92 | 12.17    9.01 | 18.17     .86
                  .25     .52 |  6.25     .93 | 12.25    7.59 | 18.25     .85
                  .33     .52 |  6.33     .94 | 12.33    6.58 | 18.33     .84
                  .42     .52 |  6.42     .96 | 12.42    5.82 | 18.42     .83
                  .50     .53 |  6.50     .97 | 12.50    5.22 | 18.50     .82
                  .58     .53 |  6.58     .98 | 12.58    4.75 | 18.58     .81
                  .67     .53 |  6.67     .99 | 12.67    4.36 | 18.67     .81
                  .75     .54 |  6.75    1.01 | 12.75    4.04 | 18.75     .80
                  .83     .54 |  6.83    1.02 | 12.83    3.76 | 18.83     .79
                  .92     .54 |  6.92    1.03 | 12.92    3.53 | 18.92     .78
                 1.00     .55 |  7.00    1.05 | 13.00    3.32 | 19.00     .78
                 1.08     .55 |  7.08    1.06 | 13.08    3.14 | 19.08     .77
                 1.17     .55 |  7.17    1.08 | 13.17    2.98 | 19.17     .76
                 1.25     .56 |  7.25    1.10 | 13.25    2.84 | 19.25     .76
                 1.33     .56 |  7.33    1.11 | 13.33    2.71 | 19.33     .75
                 1.42     .56 |  7.42    1.13 | 13.42    2.59 | 19.42     .74
                 1.50     .57 |  7.50    1.15 | 13.50    2.49 | 19.50     .74
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1.58	.57	7.58	1.17	13.58	2.39	19.58	.73
1.67	.57	7.67	1.19	13.67	2.30	19.67	.72
1.75	.58	7.75	1.21	13.75	2.22	19.75	.72
1.83	.58	7.83	1.23	13.83	2.15	19.83	.71
1.92	.59	7.92	1.25	13.92	2.08	19.92	.71
2.00	.59	8.00	1.27	14.00	2.01	20.00	.70
2.08	.59	8.08	1.29	14.08	1.95	20.08	.69
2.17	.60	8.17	1.32	14.17	1.90	20.17	.69
2.25	.60	8.25	1.34	14.25	1.84	20.25	.68
2.33	.61	8.33	1.37	14.33	1.80	20.33	.68
2.42	.61	8.42	1.40	14.42	1.75	20.42	.67
2.50	.62	8.50	1.43	14.50	1.70	20.50	.67
2.58	.62	8.58	1.46	14.58	1.66	20.58	.66
2.67	.62	8.67	1.49	14.67	1.62	20.67	.66
2.75	.63	8.75	1.53	14.75	1.59	20.75	.65
2.83	.63	8.83	1.56	14.83	1.55	20.83	.65
2.92	.64	8.92	1.60	14.92	1.52	20.92	.64
3.00	.64	9.00	1.64	15.00	1.49	21.00	.64
3.08	.65	9.08	1.68	15.08	1.46	21.08	.63
3.17	.65	9.17	1.73	15.17	1.43	21.17	.63
3.25	.66	9.25	1.77	15.25	1.40	21.25	.63
3.33	.66	9.33	1.82	15.33	1.37	21.33	.62
3.42	.67	9.42	1.88	15.42	1.35	21.42	.62
3.50	.67	9.50	1.94	15.50	1.32	21.50	.61
3.58	.68	9.58	2.00	15.58	1.30	21.58	.61
3.67	.69	9.67	2.07	15.67	1.28	21.67	.60
3.75	.69	9.75	2.14	15.75	1.25	21.75	.60
3.83	.70	9.83	2.21	15.83	1.23	21.83	.60
3.92	.70	9.92	2.30	15.92	1.21	21.92	.59
4.00	.71	10.00	2.39	16.00	1.19	22.00	.59
4.08	.71	10.08	2.49	16.08	1.17	22.08	.59
4.17	.72	10.17	2.60	16.17	1.16	22.17	.58
4.25	.73	10.25	2.73	16.25	1.14	22.25	.58
4.33	.73	10.33	2.86	16.33	1.12	22.33	.57
4.42	.74	10.42	3.02	16.42	1.11	22.42	.57
4.50	.75	10.50	3.19	16.50	1.09	22.50	.57
4.58	.75	10.58	3.39	16.58	1.08	22.58	.56
4.67	.76	10.67	3.61	16.67	1.06	22.67	.56
4.75	.77	10.75	3.88	16.75	1.05	22.75	.56
4.83	.78	10.83	4.19	16.83	1.03	22.83	.55
4.92	.78	10.92	4.56	16.92	1.02	22.92	.55
5.00	.79	11.00	5.01	17.00	1.01	23.00	.55
5.08	.80	11.08	5.58	17.08	.99	23.08	.54
5.17	.81	11.17	6.31	17.17	.98	23.17	.54
5.25	.82	11.25	7.28	17.25	.97	23.25	.54
5.33	.82	11.33	8.65	17.33	.96	23.33	.53
5.42	.83	11.42	10.72	17.42	.95	23.42	.53
5.50	.84	11.50	14.20	17.50	.93	23.50	.53
5.58	.85	11.58	21.19	17.58	.92	23.58	.53
5.67	.86	11.67	41.67	17.67	.91	23.67	.52
5.75	.87	11.75	103.59	17.75	.90	23.75	.52
5.83	.88	11.83	42.36	17.83	.89	23.83	.52
5.92	.89	11.92	21.91	17.92	.88	23.92	.51
6.00	.90	12.00	14.75	18.00	.87	24.00	.51

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| CALIB              |
| NASHYD    (0021) |   Area    (ha)=   8.81   Curve Number   (CN)= 68.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=    .248

     PEAK FLOW       (cms)=    .079 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  14.177
     TOTAL RAINFALL   (mm)=  55.099
     RUNOFF COEFFICIENT   =    .257

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD    (0027) |   Area    (ha)=    .68   Curve Number   (CN)= 72.2
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.91   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   2.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.033	.51	6.033	.91	12.033	11.16	18.03	.87
.067	.51	6.067	.91	12.067	11.16	18.07	.87
.100	.51	6.100	.92	12.100	10.08	18.10	.86

.133	.51	6.133	.92	12.133	9.01	18.13	.86
.167	.51	6.167	.92	12.167	9.01	18.17	.86
.200	.52	6.200	.93	12.200	7.59	18.20	.85
.233	.52	6.233	.93	12.233	7.59	18.23	.85
.267	.52	6.267	.94	12.267	7.08	18.27	.84
.300	.52	6.300	.94	12.300	6.58	18.30	.84
.333	.52	6.333	.94	12.333	6.57	18.33	.84
.367	.52	6.367	.96	12.367	5.82	18.37	.83
.400	.52	6.400	.96	12.400	5.82	18.40	.83
.433	.53	6.433	.96	12.433	5.52	18.43	.83
.467	.53	6.467	.97	12.467	5.22	18.47	.82
.500	.53	6.500	.97	12.500	5.22	18.50	.82
.533	.53	6.533	.98	12.533	4.75	18.53	.81
.567	.53	6.567	.98	12.567	4.75	18.57	.81
.600	.53	6.600	.99	12.600	4.56	18.60	.81
.633	.53	6.633	.99	12.633	4.36	18.63	.81
.667	.53	6.667	.99	12.667	4.36	18.67	.81
.700	.54	6.700	1.01	12.700	4.04	18.70	.80
.733	.54	6.733	1.01	12.733	4.04	18.73	.80
.767	.54	6.767	1.01	12.767	3.90	18.77	.79
.800	.54	6.800	1.02	12.800	3.76	18.80	.79
.833	.54	6.833	1.02	12.833	3.76	18.83	.79
.867	.54	6.867	1.03	12.867	3.53	18.87	.78
.900	.54	6.900	1.03	12.900	3.53	18.90	.78
.933	.54	6.933	1.04	12.933	3.42	18.93	.78
.967	.55	6.967	1.05	12.967	3.32	18.97	.78
1.000	.55	7.000	1.05	13.000	3.32	19.00	.78
1.033	.55	7.033	1.06	13.033	3.14	19.03	.77
1.067	.55	7.067	1.06	13.067	3.14	19.07	.77
1.100	.55	7.100	1.07	13.100	3.06	19.10	.77
1.133	.55	7.133	1.08	13.133	2.98	19.13	.76
1.167	.55	7.167	1.08	13.167	2.98	19.17	.76
1.200	.56	7.200	1.10	13.200	2.84	19.20	.76
1.233	.56	7.233	1.10	13.233	2.84	19.23	.76
1.267	.56	7.267	1.10	13.267	2.77	19.27	.75
1.300	.56	7.300	1.11	13.300	2.71	19.30	.75
1.333	.56	7.333	1.11	13.333	2.71	19.33	.75
1.367	.56	7.367	1.13	13.367	2.59	19.37	.74
1.400	.56	7.400	1.13	13.400	2.59	19.40	.74
1.433	.57	7.433	1.14	13.433	2.54	19.43	.74
1.467	.57	7.467	1.15	13.467	2.49	19.47	.74
1.500	.57	7.500	1.15	13.500	2.49	19.50	.74
1.533	.57	7.533	1.17	13.533	2.39	19.53	.73
1.567	.57	7.567	1.17	13.567	2.39	19.57	.73
1.600	.57	7.600	1.18	13.600	2.35	19.60	.73
1.633	.57	7.633	1.19	13.633	2.30	19.63	.72
1.667	.57	7.667	1.19	13.667	2.30	19.67	.72
1.700	.58	7.700	1.21	13.700	2.22	19.70	.72
1.733	.58	7.733	1.21	13.733	2.22	19.73	.72
1.767	.58	7.767	1.22	13.767	2.19	19.77	.71
1.800	.58	7.800	1.23	13.800	2.15	19.80	.71
1.833	.58	7.833	1.23	13.833	2.15	19.83	.71
1.867	.59	7.867	1.25	13.867	2.08	19.87	.71
1.900	.59	7.900	1.25	13.900	2.08	19.90	.71
1.933	.59	7.933	1.26	13.933	2.05	19.93	.70
1.967	.59	7.967	1.27	13.967	2.01	19.97	.70
2.000	.59	8.000	1.27	14.000	2.01	20.00	.70
2.033	.59	8.033	1.29	14.033	1.95	20.03	.69
2.067	.59	8.067	1.29	14.067	1.95	20.07	.69
2.100	.60	8.100	1.31	14.100	1.93	20.10	.69
2.133	.60	8.133	1.32	14.133	1.90	20.13	.69
2.167	.60	8.167	1.32	14.167	1.90	20.17	.69
2.200	.60	8.200	1.34	14.200	1.84	20.20	.68
2.233	.60	8.233	1.34	14.233	1.84	20.23	.68
2.267	.60	8.267	1.36	14.267	1.82	20.27	.68
2.300	.61	8.300	1.37	14.300	1.80	20.30	.68
2.333	.61	8.333	1.37	14.333	1.80	20.33	.68
2.367	.61	8.367	1.40	14.367	1.75	20.37	.67
2.400	.61	8.400	1.40	14.400	1.75	20.40	.67
2.433	.61	8.433	1.41	14.433	1.73	20.43	.67
2.467	.62	8.467	1.43	14.467	1.70	20.47	.67
2.500	.62	8.500	1.43	14.500	1.70	20.50	.67
2.533	.62	8.533	1.46	14.533	1.66	20.53	.66
2.567	.62	8.567	1.46	14.567	1.66	20.57	.66
2.600	.62	8.600	1.48	14.600	1.64	20.60	.66
2.633	.62	8.633	1.49	14.633	1.62	20.63	.66
2.667	.62	8.667	1.49	14.667	1.62	20.67	.66
2.700	.63	8.700	1.53	14.700	1.59	20.70	.65
2.733	.63	8.733	1.53	14.733	1.59	20.73	.65
2.767	.63	8.767	1.54	14.767	1.57	20.77	.65
2.800	.63	8.800	1.56	14.800	1.55	20.80	.65
2.833	.63	8.833	1.56	14.833	1.55	20.83	.65
2.867	.64	8.867	1.60	14.867	1.52	20.87	.64
2.900	.64	8.900	1.60	14.900	1.52	20.90	.64
2.933	.64	8.933	1.62	14.933	1.50	20.93	.64
2.967	.64	8.967	1.64	14.967	1.49	20.97	.64
3.000	.64	9.000	1.64	15.000	1.49	21.00	.64
3.033	.65	9.033	1.68	15.033	1.46	21.03	.63
3.067	.65	9.067	1.68	15.067	1.46	21.07	.63

3.100	.65	9.100	1.70	15.100	1.44	21.10	.63
3.133	.65	9.133	1.73	15.133	1.43	21.13	.63
3.167	.65	9.167	1.73	15.167	1.43	21.17	.63
3.200	.66	9.200	1.77	15.200	1.40	21.20	.63
3.233	.66	9.233	1.77	15.233	1.40	21.23	.63
3.267	.66	9.267	1.80	15.267	1.38	21.27	.62
3.300	.66	9.300	1.82	15.300	1.37	21.30	.62
3.333	.66	9.333	1.82	15.333	1.37	21.33	.62
3.367	.67	9.367	1.88	15.367	1.35	21.37	.62
3.400	.67	9.400	1.88	15.400	1.35	21.40	.62
3.433	.67	9.433	1.91	15.433	1.33	21.43	.62
3.467	.67	9.467	1.94	15.467	1.32	21.47	.61
3.500	.67	9.500	1.94	15.500	1.32	21.50	.61
3.533	.68	9.533	2.00	15.533	1.30	21.53	.61
3.567	.68	9.567	2.00	15.567	1.30	21.57	.61
3.600	.68	9.600	2.03	15.600	1.29	21.60	.61
3.633	.69	9.633	2.07	15.633	1.28	21.63	.60
3.667	.69	9.667	2.07	15.667	1.28	21.67	.60
3.700	.69	9.700	2.14	15.700	1.25	21.70	.60
3.733	.69	9.733	2.14	15.733	1.25	21.73	.60
3.767	.69	9.767	2.18	15.767	1.24	21.77	.60
3.800	.70	9.800	2.21	15.800	1.23	21.80	.60
3.833	.70	9.833	2.21	15.833	1.23	21.83	.60
3.867	.70	9.867	2.30	15.867	1.21	21.87	.59
3.900	.70	9.900	2.30	15.900	1.21	21.90	.59
3.933	.71	9.933	2.35	15.933	1.20	21.93	.59
3.967	.71	9.967	2.39	15.967	1.19	21.97	.59
4.000	.71	10.000	2.39	16.000	1.19	22.00	.59
4.033	.71	10.033	2.49	16.033	1.17	22.03	.59
4.067	.71	10.067	2.49	16.067	1.17	22.07	.59
4.100	.72	10.100	2.55	16.100	1.17	22.10	.58
4.133	.72	10.133	2.60	16.133	1.16	22.13	.58
4.167	.72	10.167	2.60	16.167	1.16	22.17	.58
4.200	.73	10.200	2.73	16.200	1.14	22.20	.58
4.233	.73	10.233	2.73	16.233	1.14	22.23	.58
4.267	.73	10.267	2.80	16.267	1.13	22.27	.58
4.300	.73	10.300	2.86	16.300	1.12	22.30	.57
4.333	.73	10.333	2.86	16.333	1.12	22.33	.57
4.367	.74	10.367	3.02	16.367	1.11	22.37	.57
4.400	.74	10.400	3.02	16.400	1.11	22.40	.57
4.433	.74	10.433	3.10	16.433	1.10	22.43	.57
4.467	.75	10.467	3.19	16.467	1.09	22.47	.57
4.500	.75	10.500	3.19	16.500	1.09	22.50	.57
4.533	.75	10.533	3.39	16.533	1.08	22.53	.56
4.567	.75	10.567	3.39	16.567	1.08	22.57	.56
4.600	.76	10.600	3.50	16.600	1.07	22.60	.56
4.633	.76	10.633	3.61	16.633	1.06	22.63	.56
4.667	.76	10.667	3.61	16.667	1.06	22.67	.56
4.700	.77	10.700	3.88	16.700	1.05	22.70	.56
4.733	.77	10.733	3.88	16.733	1.05	22.73	.56
4.767	.77	10.767	4.03	16.767	1.04	22.77	.56
4.800	.78	10.800	4.19	16.800	1.03	22.80	.55
4.833	.78	10.833	4.19	16.833	1.03	22.83	.55
4.867	.78	10.867	4.56	16.867	1.02	22.87	.55
4.900	.78	10.900	4.56	16.900	1.02	22.90	.55
4.933	.79	10.933	4.79	16.933	1.01	22.93	.55
4.967	.79	10.967	5.01	16.967	1.01	22.97	.55
5.000	.79	11.000	5.01	17.000	1.01	23.00	.55
5.033	.80	11.033	5.58	17.033	.99	23.03	.54
5.067	.80	11.067	5.58	17.067	.99	23.07	.54
5.100	.80	11.100	5.95	17.100	.99	23.10	.54
5.133	.81	11.133	6.31	17.133	.98	23.13	.54
5.167	.81	11.167	6.31	17.167	.98	23.17	.54
5.200	.82	11.200	7.28	17.200	.97	23.20	.54
5.233	.82	11.233	7.28	17.233	.97	23.23	.54
5.267	.82	11.267	7.97	17.267	.96	23.27	.54
5.300	.82	11.300	8.65	17.300	.96	23.30	.53
5.333	.82	11.333	8.66	17.333	.96	23.33	.53
5.367	.83	11.367	10.72	17.367	.95	23.37	.53
5.400	.83	11.400	10.72	17.400	.95	23.40	.53
5.433	.84	11.433	12.46	17.433	.94	23.43	.53
5.467	.84	11.467	14.20	17.467	.93	23.47	.53
5.500	.84	11.500	14.20	17.500	.93	23.50	.53
5.533	.85	11.533	21.19	17.533	.92	23.53	.53
5.567	.85	11.567	21.19	17.567	.92	23.57	.53
5.600	.86	11.600	31.45	17.600	.92	23.60	.52
5.633	.86	11.633	41.67	17.633	.91	23.63	.52
5.667	.86	11.667	41.75	17.667	.91	23.67	.52
5.700	.87	11.700	103.59	17.700	.90	23.70	.52
5.733	.87	11.733	103.59	17.733	.90	23.73	.52
5.767	.87	11.767	72.90	17.767	.90	23.77	.52
5.800	.88	11.800	42.36	17.800	.89	23.80	.52
5.833	.88	11.833	42.33	17.833	.89	23.83	.52
5.867	.89	11.867	21.91	17.867	.88	23.87	.51
5.900	.89	11.900	21.91	17.900	.88	23.90	.51
5.933	.89	11.933	18.32	17.933	.88	23.93	.51
5.967	.90	11.967	14.75	17.967	.87	23.97	.51
6.000	.90	12.000	14.74	18.000	.87	24.00	.51

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     Unit Hyd Qpeak  (cms)=    .466

     PEAK FLOW       (cms)=    .051 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  16.873
     TOTAL RAINFALL   (mm)=  55.099
     RUNOFF COEFFICIENT   =    .306

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD    (0024) |   Area    (ha)=   5.03   Curve Number   (CN)= 72.5
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.75   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   2.433

     PEAK FLOW       (cms)=    .335 (i)
     TIME TO PEAK    (hrs)=  11.800
     RUNOFF VOLUME    (mm)=  11.645
     TOTAL RAINFALL   (mm)=  55.099
     RUNOFF COEFFICIENT   =    .211

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD    (0022) |   Area    (ha)=   3.01   Curve Number   (CN)= 71.6
|ID= 1 DT= 2.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   2.069

     PEAK FLOW       (cms)=    .219 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  10.978
     TOTAL RAINFALL   (mm)=  55.099
     RUNOFF COEFFICIENT   =    .199

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0023) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .2156
                           .0001      .1117   |  20.0000      .2166

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0022)      3.01       .22     11.77      10.98
     OUTFLOW: ID= 1 (0023)      3.01       .00     13.60        .01

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .01
                   TIME SHIFT OF PEAK FLOW        (min)=110.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0330

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--------------------
| ADD HYD   (0026) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0024):     5.03    .335    11.80    11.64
        + ID2= 2 (0023):     3.01    .000    13.60      .01
          ==================================================
          ID = 3 (0026):     8.04    .335    11.80     7.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0025) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0003      .2171
                           .0001      .0498   |  20.0000      .2181
                           .0002      .1676   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0026)      8.04       .33     11.80       7.29
     OUTFLOW: ID= 1 (0025)      8.04       .00     13.67        .01
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              PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .03
              TIME SHIFT OF PEAK FLOW         (min)=112.00
              MAXIMUM  STORAGE   USED       (ha.m.)=  .0585

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--------------------
| ADD HYD   (0028) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0027):      .68    .051    11.77    16.87
        + ID2= 2 (0025):     8.04    .000    13.67      .01
          =================================================
          ID = 3 (0028):     8.72    .051    11.77     1.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| RESERVOIR (0029) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |    .0002      .0898
                            .0001      .0455   |  20.0000      .0908

                                   AREA     QPEAK     TPEAK       R.V.
                                   (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0028)        8.72        .05     11.77       1.32
     OUTFLOW: ID= 1 (0029)        8.72        .00     24.17        .01

              PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .05
              TIME SHIFT OF PEAK FLOW         (min)=744.00
              MAXIMUM  STORAGE   USED       (ha.m.)=  .0114

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0032) |   Area    (ha)=   6.71   Curve Number   (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .32

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	.51	6.083	.91	12.083	11.16	18.08	.87
.167	.51	6.167	.92	12.167	9.01	18.17	.86
.250	.52	6.250	.93	12.250	7.59	18.25	.85
.333	.52	6.333	.94	12.333	6.58	18.33	.84
.417	.52	6.417	.96	12.417	5.82	18.42	.83
.500	.53	6.500	.97	12.500	5.22	18.50	.82
.583	.53	6.583	.98	12.583	4.75	18.58	.81
.667	.53	6.667	.99	12.667	4.36	18.67	.81
.750	.54	6.750	1.01	12.750	4.04	18.75	.80
.833	.54	6.833	1.02	12.833	3.76	18.83	.79
.917	.54	6.917	1.03	12.917	3.53	18.92	.78
1.000	.55	7.000	1.05	13.000	3.32	19.00	.78
1.083	.55	7.083	1.06	13.083	3.14	19.08	.77
1.167	.55	7.167	1.08	13.167	2.98	19.17	.76
1.250	.56	7.250	1.10	13.250	2.84	19.25	.76
1.333	.56	7.333	1.11	13.333	2.71	19.33	.75
1.417	.56	7.417	1.13	13.417	2.59	19.42	.74
1.500	.57	7.500	1.15	13.500	2.49	19.50	.74
1.583	.57	7.583	1.17	13.583	2.39	19.58	.73
1.667	.57	7.667	1.19	13.667	2.30	19.67	.72
1.750	.58	7.750	1.21	13.750	2.22	19.75	.72
1.833	.58	7.833	1.23	13.833	2.15	19.83	.71
1.917	.59	7.917	1.25	13.917	2.08	19.92	.71
2.000	.59	8.000	1.27	14.000	2.01	20.00	.70
2.083	.59	8.083	1.29	14.083	1.95	20.08	.69
2.167	.60	8.167	1.32	14.167	1.90	20.17	.69
2.250	.60	8.250	1.34	14.250	1.84	20.25	.68
2.333	.61	8.333	1.37	14.333	1.80	20.33	.68
2.417	.61	8.417	1.40	14.417	1.75	20.42	.67
2.500	.62	8.500	1.43	14.500	1.70	20.50	.67
2.583	.62	8.583	1.46	14.583	1.66	20.58	.66
2.667	.62	8.667	1.49	14.667	1.62	20.67	.66
2.750	.63	8.750	1.53	14.750	1.59	20.75	.65
2.833	.63	8.833	1.56	14.833	1.55	20.83	.65
2.917	.64	8.917	1.60	14.917	1.52	20.92	.64
3.000	.64	9.000	1.64	15.000	1.49	21.00	.64
3.083	.65	9.083	1.68	15.083	1.46	21.08	.63
3.167	.65	9.167	1.73	15.167	1.43	21.17	.63
3.250	.66	9.250	1.77	15.250	1.40	21.25	.63
3.333	.66	9.333	1.82	15.333	1.37	21.33	.62

3.417	.67	9.417	1.88	15.417	1.35	21.42	.62
3.500	.67	9.500	1.94	15.500	1.32	21.50	.61
3.583	.68	9.583	2.00	15.583	1.30	21.58	.61
3.667	.69	9.667	2.07	15.667	1.28	21.67	.60
3.750	.69	9.750	2.14	15.750	1.25	21.75	.60
3.833	.70	9.833	2.21	15.833	1.23	21.83	.60
3.917	.70	9.917	2.30	15.917	1.21	21.92	.59
4.000	.71	10.000	2.39	16.000	1.19	22.00	.59
4.083	.71	10.083	2.49	16.083	1.17	22.08	.59
4.167	.72	10.167	2.60	16.167	1.16	22.17	.58
4.250	.73	10.250	2.73	16.250	1.14	22.25	.58
4.333	.73	10.333	2.86	16.333	1.12	22.33	.57
4.417	.74	10.417	3.02	16.417	1.11	22.42	.57
4.500	.75	10.500	3.19	16.500	1.09	22.50	.57
4.583	.75	10.583	3.39	16.583	1.08	22.58	.56
4.667	.76	10.667	3.61	16.667	1.06	22.67	.56
4.750	.77	10.750	3.88	16.750	1.05	22.75	.56
4.833	.78	10.833	4.19	16.833	1.03	22.83	.55
4.917	.78	10.917	4.56	16.917	1.02	22.92	.55
5.000	.79	11.000	5.01	17.000	1.01	23.00	.55
5.083	.80	11.083	5.58	17.083	.99	23.08	.54
5.167	.81	11.167	6.31	17.167	.98	23.17	.54
5.250	.82	11.250	7.28	17.250	.97	23.25	.54
5.333	.82	11.333	8.65	17.333	.96	23.33	.53
5.417	.83	11.417	10.72	17.417	.95	23.42	.53
5.500	.84	11.500	14.20	17.500	.93	23.50	.53
5.583	.85	11.583	21.19	17.583	.92	23.58	.53
5.667	.86	11.667	41.67	17.667	.91	23.67	.52
5.750	.87	11.750	103.59	17.750	.90	23.75	.52
5.833	.88	11.833	42.36	17.833	.89	23.83	.52
5.917	.89	11.917	21.91	17.917	.88	23.92	.51
6.000	.90	12.000	14.75	18.000	.87	24.00	.00

Unit Hyd Qpeak (cms)= .800

PEAK FLOW (cms)= .134 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 11.474
TOTAL RAINFALL (mm)= 55.057
RUNOFF COEFFICIENT = .208

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0030) | Area (ha)= 5.57 Curve Number (CN)= 69.8
|ID= 1 DT= 5.0 min | Ia (mm)= 6.12 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= .06

Unit Hyd Qpeak (cms)= 3.828

PEAK FLOW (cms)= .335 (i)
TIME TO PEAK (hrs)= 11.750
RUNOFF VOLUME (mm)= 12.384
TOTAL RAINFALL (mm)= 55.057
RUNOFF COEFFICIENT = .225

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ROUTE CHN (0031) |
| IN= 2---> OUT= 1 | Routing time step (min)'= 5.00

<------ DATA FOR SECTION (1.2) ------>

Distance	Elevation	Manning	
.00	386.25	.0300	
37.50	385.75	.0300 / .0300	Main Channel
47.50	385.75	.0300 / .0300	Main Channel
85.00	386.25	.0300	

<--------------------- TRAVEL TIME TABLE ---------------------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
.03	385.78	.150E+03	.1	.33	23.91
.05	385.80	.350E+03	.3	.47	16.85
.08	385.83	.599E+03	.7	.56	14.12
.11	385.86	.898E+03	1.2	.63	12.62
.13	385.88	.125E+04	1.8	.68	11.65
.16	385.91	.164E+04	2.5	.73	10.95
.18	385.93	.209E+04	3.3	.76	10.42
.21	385.96	.259E+04	4.3	.80	9.99
.24	385.99	.313E+04	5.4	.82	9.64
.26	386.01	.373E+04	6.7	.85	9.33
.29	386.04	.438E+04	8.0	.88	9.07
.32	386.07	.507E+04	9.6	.90	8.83
.34	386.09	.582E+04	11.2	.92	8.62
.37	386.12	.661E+04	13.1	.94	8.43

```
        .39   386.14    .745E+04      15.1           .96       8.25
        .42   386.17    .835E+04      17.2           .98       8.08
        .45   386.20    .929E+04      19.5          1.00       7.93
        .47   386.22    .103E+05      22.0          1.02       7.79
        .50   386.25    .113E+05      24.7          1.04       7.65

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0030)    5.57      .34   11.75  12.38       .05       .46
     OUTFLOW: ID= 1 (0031)    5.57      .12   11.92  12.36       .03       .34


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--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0032):     6.71    .134    12.08    11.47
        + ID2= 2 (0031):     5.57    .121    11.92    12.36
          ============================================
          ID = 3 (0033):    12.27    .243    12.00    11.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0036) |   Area    (ha)=   2.08   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.71   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=    .938

     PEAK FLOW       (cms)=    .096 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  12.652
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .230

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0034) |   Area    (ha)=   2.15   Curve Number   (CN)= 71.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.03   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .10

     Unit Hyd Qpeak  (cms)=    .795

     PEAK FLOW       (cms)=    .121 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  16.396
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .298

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ROUTE CHN (0035) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (    1.3) ------>
               Distance      Elevation       Manning
                    .00        388.25          .0300
                  30.00        387.75      .0300 / .0300  Main Channel
                  40.00        387.75      .0300 / .0300  Main Channel
                  70.00        388.25          .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)      (cu.m.)     (cms)        (m/s)      (min)
        .03   387.78    .327E+02        .1           .41       4.35
        .05   387.80    .744E+02        .4           .59       3.03
        .08   387.83    .125E+03        .8           .71       2.52
        .11   387.86    .185E+03       1.4           .80       2.25
        .13   387.88    .253E+03       2.0           .87       2.07
        .16   387.91    .330E+03       2.8           .92       1.95
        .18   387.93    .417E+03       3.7           .97       1.85
        .21   387.96    .512E+03       4.8          1.01       1.78
        .24   387.99    .616E+03       6.0          1.04       1.72
        .26   388.01    .729E+03       7.3          1.07       1.67
        .29   388.04    .851E+03       8.7          1.10       1.63
        .32   388.07    .982E+03      10.3          1.13       1.59
        .34   388.09    .112E+04      12.0          1.15       1.56
        .37   388.12    .127E+04      13.9          1.17       1.53
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        .39   388.14    .143E+04      15.9          1.19       1.50
        .42   388.17    .160E+04      18.0          1.21       1.48
        .45   388.20    .177E+04      20.3          1.23       1.45
        .47   388.22    .196E+04      22.8          1.25       1.43
        .50   388.25    .215E+04      25.4          1.27       1.41

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0034)    2.15      .12   11.83  16.40       .03       .41
     OUTFLOW: ID= 1 (0035)    2.15      .10   11.92  16.40       .02       .41


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--------------------
| ADD HYD   (0037) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0036):     2.08    .096    11.75    12.65
        + ID2= 2 (0035):     2.15    .104    11.92    16.40
          ==============================================
          ID = 3 (0037):     4.23    .193    11.83    14.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0039) |   Area    (ha)=  35.03   Curve Number   (CN)= 65.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.17   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.16

     Unit Hyd Qpeak  (cms)=   1.152

     PEAK FLOW       (cms)=    .311 (i)
     TIME TO PEAK    (hrs)=  13.083
     RUNOFF VOLUME    (mm)=  12.614
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .229

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0040) |   Area    (ha)=   3.95   Curve Number   (CN)= 54.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .40

     Unit Hyd Qpeak  (cms)=    .375

     PEAK FLOW       (cms)=    .044 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=   7.764
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .141

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0041) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1655
                           .0001      .0976   |  20.0000      .1665

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0040)      3.95       .04     12.17       7.76
     OUTFLOW: ID= 1 (0041)      3.95       .00     25.42        .03

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .07
                   TIME SHIFT OF PEAK FLOW         (min)=795.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0306

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--------------------
| CALIB            |
| NASHYD    (0044) |   Area    (ha)=    .87   Curve Number   (CN)= 64.6
|ID= 1 DT= 3.0 min |   Ia      (mm)=   6.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.

                                      ---- TRANSFORMED HYETOGRAPH ----
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.050	.51	6.050	.91	12.050	11.16	18.05	.87
.100	.51	6.100	.91	12.100	10.44	18.10	.86
.150	.51	6.150	.92	12.150	9.01	18.15	.86
.200	.52	6.200	.93	12.200	8.06	18.20	.85
.250	.52	6.250	.93	12.250	7.59	18.25	.85
.300	.52	6.300	.94	12.300	6.58	18.30	.84
.350	.52	6.350	.95	12.350	6.32	18.35	.84
.400	.52	6.400	.96	12.400	5.82	18.40	.83
.450	.53	6.450	.96	12.450	5.42	18.45	.82
.500	.53	6.500	.97	12.500	5.22	18.50	.82
.550	.53	6.550	.98	12.550	4.75	18.55	.81
.600	.53	6.600	.99	12.600	4.62	18.60	.81
.650	.53	6.650	.99	12.650	4.36	18.65	.81
.700	.54	6.700	1.00	12.700	4.15	18.70	.80
.750	.54	6.750	1.01	12.750	4.04	18.75	.80
.800	.54	6.800	1.02	12.800	3.76	18.80	.79
.850	.54	6.850	1.03	12.850	3.68	18.85	.79
.900	.54	6.900	1.03	12.900	3.53	18.90	.78
.950	.55	6.950	1.04	12.950	3.39	18.95	.78
1.000	.55	7.000	1.05	13.000	3.32	19.00	.78
1.050	.55	7.050	1.06	13.050	3.14	19.05	.77
1.100	.55	7.100	1.07	13.100	3.09	19.10	.77
1.150	.55	7.150	1.08	13.150	2.98	19.15	.76
1.200	.56	7.200	1.09	13.200	2.89	19.20	.76
1.250	.56	7.250	1.10	13.250	2.84	19.25	.76
1.300	.56	7.300	1.11	13.300	2.71	19.30	.75
1.350	.56	7.350	1.12	13.350	2.67	19.35	.75
1.400	.56	7.400	1.13	13.400	2.59	19.40	.74
1.450	.57	7.450	1.14	13.450	2.52	19.45	.74
1.500	.57	7.500	1.15	13.500	2.49	19.50	.74
1.550	.57	7.550	1.17	13.550	2.39	19.55	.73
1.600	.57	7.600	1.17	13.600	2.36	19.60	.73
1.650	.57	7.650	1.19	13.650	2.30	19.65	.72
1.700	.58	7.700	1.20	13.700	2.25	19.70	.72
1.750	.58	7.750	1.21	13.750	2.22	19.75	.72
1.800	.58	7.800	1.23	13.800	2.15	19.80	.71
1.850	.58	7.850	1.23	13.850	2.12	19.85	.71
1.900	.59	7.900	1.25	13.900	2.08	19.90	.71
1.950	.59	7.950	1.26	13.950	2.04	19.95	.70
2.000	.59	8.000	1.27	14.000	2.01	20.00	.70
2.050	.59	8.050	1.29	14.050	1.95	20.05	.69
2.100	.60	8.100	1.30	14.100	1.94	20.10	.69
2.150	.60	8.150	1.32	14.150	1.90	20.15	.69
2.200	.60	8.200	1.34	14.200	1.86	20.20	.69
2.250	.60	8.250	1.34	14.250	1.84	20.25	.68
2.300	.61	8.300	1.37	14.300	1.80	20.30	.68
2.350	.61	8.350	1.38	14.350	1.78	20.35	.68
2.400	.61	8.400	1.40	14.400	1.75	20.40	.67
2.450	.61	8.450	1.42	14.450	1.72	20.45	.67
2.500	.62	8.500	1.43	14.500	1.70	20.50	.67
2.550	.62	8.550	1.46	14.550	1.66	20.55	.66
2.600	.62	8.600	1.47	14.600	1.65	20.60	.66
2.650	.62	8.650	1.49	14.650	1.62	20.65	.66
2.700	.63	8.700	1.51	14.700	1.60	20.70	.65
2.750	.63	8.750	1.53	14.750	1.59	20.75	.65
2.800	.63	8.800	1.56	14.800	1.55	20.80	.65
2.850	.64	8.850	1.57	14.850	1.54	20.85	.65
2.900	.64	8.900	1.60	14.900	1.52	20.90	.64
2.950	.64	8.950	1.63	14.950	1.50	20.95	.64
3.000	.64	9.000	1.64	15.000	1.49	21.00	.64
3.050	.65	9.050	1.68	15.050	1.46	21.05	.63
3.100	.65	9.100	1.70	15.100	1.45	21.10	.63
3.150	.65	9.150	1.73	15.150	1.43	21.15	.63
3.200	.66	9.200	1.76	15.200	1.41	21.20	.63
3.250	.66	9.250	1.77	15.250	1.40	21.25	.63
3.300	.66	9.300	1.82	15.300	1.37	21.30	.62
3.350	.67	9.350	1.84	15.350	1.36	21.35	.62
3.400	.67	9.400	1.88	15.400	1.35	21.40	.62
3.450	.67	9.450	1.92	15.450	1.33	21.45	.61
3.500	.67	9.500	1.94	15.500	1.32	21.50	.61
3.550	.68	9.550	2.00	15.550	1.30	21.55	.61
3.600	.68	9.600	2.02	15.600	1.29	21.60	.61
3.650	.69	9.650	2.07	15.650	1.28	21.65	.60
3.700	.69	9.700	2.11	15.700	1.26	21.70	.60
3.750	.69	9.750	2.14	15.750	1.25	21.75	.60
3.800	.70	9.800	2.21	15.800	1.23	21.80	.60
3.850	.70	9.850	2.24	15.850	1.23	21.85	.60
3.900	.70	9.900	2.30	15.900	1.21	21.90	.59
3.950	.71	9.950	2.36	15.950	1.20	21.95	.59
4.000	.71	10.000	2.39	16.000	1.19	22.00	.59
4.050	.71	10.050	2.49	16.050	1.17	22.05	.59
4.100	.72	10.100	2.53	16.100	1.17	22.10	.58
4.150	.72	10.150	2.60	16.150	1.16	22.15	.58
4.200	.73	10.200	2.69	16.200	1.15	22.20	.58
4.250	.73	10.250	2.73	16.250	1.14	22.25	.58
4.300	.73	10.300	2.86	16.300	1.12	22.30	.57
4.350	.74	10.350	2.91	16.350	1.12	22.35	.57

```
              4.400      .74 |10.400    3.02 |16.400    1.11 | 22.40     .57
              4.450      .75 |10.450    3.13 |16.450    1.10 | 22.45     .57
              4.500      .75 |10.500    3.19 |16.500    1.09 | 22.50     .57
              4.550      .75 |10.550    3.39 |16.550    1.08 | 22.55     .56
              4.600      .76 |10.600    3.46 |16.600    1.07 | 22.60     .56
              4.650      .76 |10.650    3.61 |16.650    1.06 | 22.65     .56
              4.700      .77 |10.700    3.79 |16.700    1.05 | 22.70     .56
              4.750      .77 |10.750    3.88 |16.750    1.05 | 22.75     .56
              4.800      .78 |10.800    4.19 |16.800    1.03 | 22.80     .55
              4.850      .78 |10.850    4.31 |16.850    1.03 | 22.85     .55
              4.900      .78 |10.900    4.56 |16.900    1.02 | 22.90     .55
              4.950      .79 |10.950    4.86 |16.950    1.01 | 22.95     .55
              5.000      .79 |11.000    5.01 |17.000    1.01 | 23.00     .55
              5.050      .80 |11.050    5.58 |17.050     .99 | 23.05     .54
              5.100      .80 |11.100    5.82 |17.100     .99 | 23.10     .54
              5.150      .81 |11.150    6.31 |17.150     .98 | 23.15     .54
              5.200      .81 |11.200    6.96 |17.200     .97 | 23.20     .54
              5.250      .82 |11.250    7.29 |17.250     .97 | 23.25     .54
              5.300      .82 |11.300    8.65 |17.300     .96 | 23.30     .53
              5.350      .83 |11.350    9.34 |17.350     .95 | 23.35     .53
              5.400      .83 |11.400   10.72 |17.400     .95 | 23.40     .53
              5.450      .84 |11.450   13.04 |17.450     .94 | 23.45     .53
              5.500      .84 |11.500   14.20 |17.500     .93 | 23.50     .53
              5.550      .85 |11.550   21.19 |17.550     .92 | 23.55     .53
              5.600      .85 |11.600   28.03 |17.600     .92 | 23.60     .52
              5.650      .86 |11.650   41.67 |17.650     .91 | 23.65     .52
              5.700      .87 |11.700   82.98 |17.700     .91 | 23.70     .52
              5.750      .87 |11.750  103.56 |17.750     .90 | 23.75     .52
              5.800      .88 |11.800   42.36 |17.800     .89 | 23.80     .52
              5.850      .88 |11.850   35.53 |17.850     .89 | 23.85     .52
              5.900      .89 |11.900   21.91 |17.900     .88 | 23.90     .51
              5.950      .90 |11.950   17.13 |17.950     .88 | 23.95     .51
              6.000      .90 |12.000   14.75 |18.000     .87 | 24.00     .51

     Unit Hyd Qpeak  (cms)=    .596

     PEAK FLOW       (cms)=    .047 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  12.078
     TOTAL RAINFALL   (mm)=  55.099
     RUNOFF COEFFICIENT   =    .219

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0042) |   Area    (ha)=    .56   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .382

     PEAK FLOW       (cms)=    .039 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  14.052
     TOTAL RAINFALL   (mm)=  55.099
     RUNOFF COEFFICIENT   =    .255

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0043) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0357
                           .0001      .0118   |  20.0000      .0367

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0042)       .56       .04     11.75      14.05
     OUTFLOW: ID= 1 (0043)       .56       .00     20.10        .30

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .17
                   TIME SHIFT OF PEAK FLOW         (min)=501.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0076

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0045) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK      R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (0044):      .87     .047    11.75     12.08
        + ID2= 2 (0043):      .56     .000    20.10       .30
          ==================================================
          ID = 3 (0045):     1.42     .047    11.75      7.48
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     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0046) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1073
                           .0001      .0117   |  20.0000      .1083

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0045)      1.42       .05     11.75       7.48
     OUTFLOW: ID= 1 (0046)      1.42       .00     24.10        .23

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .19
                   TIME SHIFT OF PEAK FLOW         (min)=741.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0103

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0047) |   Area    (ha)=    .48   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .331

     PEAK FLOW       (cms)=    .033 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  14.052
     TOTAL RAINFALL   (mm)=  55.099
     RUNOFF COEFFICIENT   =    .255

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0048) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0731
                           .0001      .0496   |  20.0000      .0741

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0047)       .48       .03     11.75      14.05
     OUTFLOW: ID= 1 (0048)       .48       .00     20.15        .07

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=504.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0067

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0049) |   Area    (ha)=   2.77   Curve Number   (CN)= 70.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.35   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                               ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN | TIME    RAIN | TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |  hrs   mm/hr |  hrs   mm/hr |   hrs   mm/hr
                .083     .51 | 6.083    .91 |12.083  11.16 | 18.08     .87
                .167     .51 | 6.167    .92 |12.167   9.01 | 18.17     .86
                .250     .52 | 6.250    .93 |12.250   7.59 | 18.25     .85
                .333     .52 | 6.333    .94 |12.333   6.58 | 18.33     .84
                .417     .52 | 6.417    .96 |12.417   5.82 | 18.42     .83
                .500     .53 | 6.500    .97 |12.500   5.22 | 18.50     .82
                .583     .53 | 6.583    .98 |12.583   4.75 | 18.58     .81
                .667     .53 | 6.667    .99 |12.667   4.36 | 18.67     .81
                .750     .54 | 6.750   1.01 |12.750   4.04 | 18.75     .80
                .833     .54 | 6.833   1.02 |12.833   3.76 | 18.83     .79
                .917     .54 | 6.917   1.03 |12.917   3.53 | 18.92     .78
               1.000     .55 | 7.000   1.05 |13.000   3.32 | 19.00     .78
               1.083     .55 | 7.083   1.06 |13.083   3.14 | 19.08     .77
               1.167     .55 | 7.167   1.08 |13.167   2.98 | 19.17     .76
               1.250     .56 | 7.250   1.10 |13.250   2.84 | 19.25     .76
               1.333     .56 | 7.333   1.11 |13.333   2.71 | 19.33     .75
               1.417     .56 | 7.417   1.13 |13.417   2.59 | 19.42     .74
               1.500     .57 | 7.500   1.15 |13.500   2.49 | 19.50     .74
               1.583     .57 | 7.583   1.17 |13.583   2.39 | 19.58     .73
               1.667     .57 | 7.667   1.19 |13.667   2.30 | 19.67     .72
```

1.750	.58	7.750	1.21	13.750	2.22	19.75	.72
1.833	.58	7.833	1.23	13.833	2.15	19.83	.71
1.917	.59	7.917	1.25	13.917	2.08	19.92	.71
2.000	.59	8.000	1.27	14.000	2.01	20.00	.70
2.083	.59	8.083	1.29	14.083	1.95	20.08	.69
2.167	.60	8.167	1.32	14.167	1.90	20.17	.69
2.250	.60	8.250	1.34	14.250	1.84	20.25	.68
2.333	.61	8.333	1.37	14.333	1.80	20.33	.68
2.417	.61	8.417	1.40	14.417	1.75	20.42	.67
2.500	.62	8.500	1.43	14.500	1.70	20.50	.67
2.583	.62	8.583	1.46	14.583	1.66	20.58	.66
2.667	.62	8.667	1.49	14.667	1.62	20.67	.66
2.750	.63	8.750	1.53	14.750	1.59	20.75	.65
2.833	.63	8.833	1.56	14.833	1.55	20.83	.65
2.917	.64	8.917	1.60	14.917	1.52	20.92	.64
3.000	.64	9.000	1.64	15.000	1.49	21.00	.64
3.083	.65	9.083	1.68	15.083	1.46	21.08	.63
3.167	.65	9.167	1.73	15.167	1.43	21.17	.63
3.250	.66	9.250	1.77	15.250	1.40	21.25	.63
3.333	.66	9.333	1.82	15.333	1.37	21.33	.62
3.417	.67	9.417	1.88	15.417	1.35	21.42	.62
3.500	.67	9.500	1.94	15.500	1.32	21.50	.61
3.583	.68	9.583	2.00	15.583	1.30	21.58	.61
3.667	.69	9.667	2.07	15.667	1.28	21.67	.60
3.750	.69	9.750	2.14	15.750	1.25	21.75	.60
3.833	.70	9.833	2.21	15.833	1.23	21.83	.60
3.917	.70	9.917	2.30	15.917	1.21	21.92	.59
4.000	.71	10.000	2.39	16.000	1.19	22.00	.59
4.083	.71	10.083	2.49	16.083	1.17	22.08	.59
4.167	.72	10.167	2.60	16.167	1.16	22.17	.58
4.250	.73	10.250	2.73	16.250	1.14	22.25	.58
4.333	.73	10.333	2.86	16.333	1.12	22.33	.57
4.417	.74	10.417	3.02	16.417	1.11	22.42	.57
4.500	.75	10.500	3.19	16.500	1.09	22.50	.57
4.583	.75	10.583	3.39	16.583	1.08	22.58	.56
4.667	.76	10.667	3.61	16.667	1.06	22.67	.56
4.750	.77	10.750	3.88	16.750	1.05	22.75	.56
4.833	.78	10.833	4.19	16.833	1.03	22.83	.55
4.917	.78	10.917	4.56	16.917	1.02	22.92	.55
5.000	.79	11.000	5.01	17.000	1.01	23.00	.55
5.083	.80	11.083	5.58	17.083	.99	23.08	.54
5.167	.81	11.167	6.31	17.167	.98	23.17	.54
5.250	.82	11.250	7.28	17.250	.97	23.25	.54
5.333	.82	11.333	8.65	17.333	.96	23.33	.53
5.417	.83	11.417	10.72	17.417	.95	23.42	.53
5.500	.84	11.500	14.20	17.500	.93	23.50	.53
5.583	.85	11.583	21.19	17.583	.92	23.58	.53
5.667	.86	11.667	41.67	17.667	.91	23.67	.52
5.750	.87	11.750	103.59	17.750	.90	23.75	.52
5.833	.88	11.833	42.36	17.833	.89	23.83	.52
5.917	.89	11.917	21.91	17.917	.88	23.92	.51
6.000	.90	12.000	14.75	18.000	.87	24.00	.00

```
     Unit Hyd Qpeak  (cms)=    .952

     PEAK FLOW       (cms)=    .145 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  15.676
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .285

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0055) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .311 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  17.839
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .324

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0052) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935
```

```
     PEAK FLOW       (cms)=    .230 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  14.554
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .264

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0050) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=    .416 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  13.653
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .248

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------------
--------------------
| RESERVOIR (0051) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)     11.96       .42     11.92      13.65
     OUTFLOW: ID= 1 (0051)     11.96       .02     22.42        .50

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.85
                   TIME SHIFT OF PEAK FLOW         (min)=630.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1595

----------------------------------------------------------------------------------

--------------------
| ADD HYD   (0053) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0052):      3.90    .230    11.75    14.55
        + ID2= 2 (0051):     11.96    .016    22.42      .50
          ================================================
          ID = 3 (0053):     15.86    .230    11.75     3.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------------
--------------------
| RESERVOIR (0054) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0771
                           .0001      .0761   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0053)     15.86       .23     11.75       3.96
     OUTFLOW: ID= 1 (0054)     15.86       .00     24.92        .02

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=790.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0624

----------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0056) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.5) ------>
               Distance      Elevation       Manning
                    .00        425.00         .0300
                    .75        424.25     .0300 / .0300  Main Channel
                   1.75        424.25     .0300 / .0300  Main Channel
                   2.50        425.00         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
```

```
        .04   424.29    .145E+02        .0            .68        8.63
        .08   424.33    .302E+02        .1           1.05        5.61
        .12   424.37    .469E+02        .2           1.33        4.42
        .16   424.41    .647E+02        .3           1.57        3.76
        .20   424.45    .837E+02        .4           1.77        3.34
        .24   424.49    .104E+03        .6           1.94        3.04
        .28   424.53    .125E+03        .7           2.10        2.81
        .32   424.57    .147E+03        .9           2.23        2.64
        .36   424.61    .170E+03       1.1           2.36        2.50
        .39   424.64    .195E+03       1.4           2.47        2.39
        .43   424.68    .220E+03       1.6           2.57        2.30
        .47   424.72    .247E+03       1.9           2.66        2.22
        .51   424.76    .275E+03       2.1           2.75        2.15
        .55   424.80    .304E+03       2.4           2.83        2.09
        .59   424.84    .334E+03       2.7           2.90        2.04
        .63   424.88    .365E+03       3.1           2.97        1.99
        .67   424.92    .397E+03       3.4           3.03        1.95
        .71   424.96    .430E+03       3.8           3.09        1.91
        .75   425.00    .465E+03       4.1           3.14        1.88

                                       <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK    TPEAK   R.V.    MAX DEPTH   MAX VEL
                               (ha)    (cms)    (hrs)   (mm)       (m)       (m/s)
     INFLOW : ID= 2 (0054)    15.86      .00    24.92    .02        .00        .68
     OUTFLOW: ID= 1 (0056)    15.86      .00    24.92    .02        .00        .68


--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0057) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0055):      5.19    .311    11.83    17.84
        + ID2= 2 (0056):     15.86    .000    24.92      .02
          ===============================================
          ID = 3 (0057):     21.05    .311    11.83     4.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0058) |   Area    (ha)=  21.77   Curve Number   (CN)= 67.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   2.354

     PEAK FLOW       (cms)=    .524 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  14.403
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .262

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0059) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=    .416 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  13.653
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .248

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0060) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0059)      11.96       .42     11.92      13.65
     OUTFLOW: ID= 1 (0060)      11.96       .02     22.42        .50

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.85
```

```
                 TIME SHIFT OF PEAK FLOW         (min)=630.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  .1595

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0061) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .230 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  14.554
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .264

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0062) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0060):    11.96    .016    22.42      .50
        + ID2= 2 (0061):     3.90    .230    11.75    14.55
          ==================================================
          ID = 3 (0062):    15.86    .230    11.75     3.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0063) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0771
                           .0001      .0761   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0062)     15.86       .23     11.75       3.96
     OUTFLOW: ID= 1 (0063)     15.86       .00     24.92        .02

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                 TIME SHIFT OF PEAK FLOW         (min)=790.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  .0624

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0065) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
             <------ DATA FOR SECTION (   1.5) ------>
             Distance      Elevation       Manning
                  .00       425.00          .0300
                  .75       424.25     .0300 / .0300  Main Channel
                 1.75       424.25     .0300 / .0300  Main Channel
                 2.50       425.00          .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .04   424.29    .145E+02        .0            .68       8.63
        .08   424.33    .302E+02        .1           1.05       5.61
        .12   424.37    .469E+02        .2           1.33       4.42
        .16   424.41    .647E+02        .3           1.57       3.76
        .20   424.45    .837E+02        .4           1.77       3.34
        .24   424.49    .104E+03        .6           1.94       3.04
        .28   424.53    .125E+03        .7           2.10       2.81
        .32   424.57    .147E+03        .9           2.23       2.64
        .36   424.61    .170E+03       1.1           2.36       2.50
        .39   424.64    .195E+03       1.4           2.47       2.39
        .43   424.68    .220E+03       1.6           2.57       2.30
        .47   424.72    .247E+03       1.9           2.66       2.22
        .51   424.76    .275E+03       2.1           2.75       2.15
        .55   424.80    .304E+03       2.4           2.83       2.09
        .59   424.84    .334E+03       2.7           2.90       2.04
        .63   424.88    .365E+03       3.1           2.97       1.99
        .67   424.92    .397E+03       3.4           3.03       1.95
        .71   424.96    .430E+03       3.8           3.09       1.91
        .75   425.00    .465E+03       4.1           3.14       1.88

                                   <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK   TPEAK    R.V.   MAX DEPTH  MAX VEL
                             (ha)    (cms)   (hrs)    (mm)      (m)      (m/s)
```

```
     INFLOW : ID= 2 (0063)   15.86      .00   24.92    .02       .00       .68
     OUTFLOW: ID= 1 (0065)   15.86      .00   24.92    .02       .00       .68


-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0064)   |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min   |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .311 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  17.839
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .324

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0066)   |
|   1 +  2 =  3      |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0065):    15.86    .000    24.92      .02
        + ID2= 2 (0064):     5.19    .311    11.83    17.84
          ==================================================
          ID = 3 (0066):    21.05    .311    11.83     4.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0069)   |   Area    (ha)=   1.80   Curve Number   (CN)= 58.8
|ID= 1 DT= 5.0 min   |   Ia      (mm)=   8.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.005

     PEAK FLOW       (cms)=    .065 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=   8.754
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .159

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0067)   |   Area    (ha)=   1.52   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min   |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .995

     PEAK FLOW       (cms)=    .064 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=   9.243
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .168

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0068)   |
| IN= 2---> OUT= 1   |
| DT=  5.0 min       |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |  20.0000      .0207
                            .0001      .0206   |    .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0067)       1.52       .06     11.75       9.24
     OUTFLOW: ID= 1 (0068)       1.52       .00     24.08        .16

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .10
                   TIME SHIFT OF PEAK FLOW         (min)=740.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0138

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```
| ADD HYD   (0071) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0069):      1.80    .065    11.75     8.75
        + ID2= 2 (0068):      1.52    .000    24.08      .16
          ============================================
          ID = 3 (0071):      3.32    .065    11.75     4.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0070) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |  20.0000      .0708
                            .0001      .0707   |    .0000      .0000

                                   AREA     QPEAK     TPEAK       R.V.
                                   (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0071)         3.32       .07     11.75       4.82
     OUTFLOW: ID= 1 (0070)         3.32       .00     24.25        .02

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .03
                   TIME SHIFT OF PEAK FLOW         (min)=750.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0159

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0073) |
| IN= 2---> OUT= 1 |      Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.6) ------>
               Distance      Elevation       Manning
                    .00        421.26          .0300
                   1.10        420.66     .0300 / .0300  Main Channel
                   2.00        420.66     .0300 / .0300  Main Channel
                   3.10        421.26          .0300

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)     (cms)        (m/s)       (min)
        .03   420.69    .560E+01       .0           .05       59.24
        .06   420.72    .119E+02       .0           .09       35.98
        .09   420.75    .188E+02       .0           .12       26.61
        .13   420.79    .265E+02       .0           .14       21.37
        .16   420.82    .348E+02       .0           .17       17.97
        .19   420.85    .437E+02       .0           .20       15.58
        .22   420.88    .534E+02       .1           .22       13.79
        .25   420.91    .637E+02       .1           .25       12.40
        .28   420.94    .748E+02       .1           .27       11.29
        .32   420.98    .864E+02       .1           .30       10.38
        .35   421.01    .988E+02       .2           .32        9.61
        .38   421.04    .112E+03       .2           .34        8.96
        .41   421.07    .126E+03       .2           .37        8.41
        .44   421.10    .140E+03       .3           .39        7.92
        .47   421.13    .155E+03       .3           .41        7.50
        .51   421.17    .171E+03       .4           .43        7.12
        .54   421.20    .187E+03       .5           .45        6.78
        .57   421.23    .204E+03       .5           .48        6.48
        .60   421.26    .222E+03       .6           .50        6.21

                                          <---- hydrograph ---->   <-pipe / channel->
                                AREA     QPEAK    TPEAK    R.V.    MAX DEPTH  MAX VEL
                                (ha)     (cms)    (hrs)    (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0070)      3.32       .00    24.25     .02       .00        .05
     OUTFLOW: ID= 1 (0073)      3.32       .00    24.17     .02       .00        .05


--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0074) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0066):     21.05    .311    11.83     4.41
        + ID2= 2 (0073):      3.32    .000    24.17      .02
          ============================================
          ID = 3 (0074):     24.37    .311    11.83     3.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0072) |    Area    (ha)=  24.19   Curve Number   (CN)= 60.0
|ID= 1 DT= 5.0 min |    Ia      (mm)=   8.62   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=    .37
```

```
     Unit Hyd Qpeak  (cms)=   2.505

     PEAK FLOW       (cms)=    .377 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=   9.976
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .181

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0075) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0074):    24.37    .311    11.83     3.82
        + ID2= 2 (0072):    24.19    .377    12.17     9.98
          ==================================================
          ID = 3 (0075):    48.56    .529    11.92     6.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0076) |   Area    (ha)= 127.28   Curve Number   (CN)= 59.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.29   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .79

     Unit Hyd Qpeak  (cms)=   6.192

     PEAK FLOW       (cms)=   1.186 (i)
     TIME TO PEAK    (hrs)=  12.667
     RUNOFF VOLUME    (mm)=  10.091
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .183

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0077) |   Area    (ha)=  17.28   Curve Number   (CN)= 58.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.24   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=   1.154

     PEAK FLOW       (cms)=    .183 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=   9.230
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .168

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0082) |   Area    (ha)=    .24   Curve Number   (CN)= 77.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .081

     PEAK FLOW       (cms)=    .017 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  20.920
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .380

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0078) |   Area    (ha)=   2.66   Curve Number   (CN)= 59.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.55   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.418

     PEAK FLOW       (cms)=    .098 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=   9.141
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .166
```

```
     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0079) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0608
                           .0001      .0607   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0078)      2.66       .10     11.75       9.14
     OUTFLOW: ID= 1 (0079)      2.66       .00     24.17        .06

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=745.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0242

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0083) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0082):      .24    .017    11.83    20.92
        + ID2= 2 (0079):     2.66    .000    24.17      .06
          ==================================================
          ID = 3 (0083):     2.90    .017    11.83     1.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0080) |   Area    (ha)=  14.63   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.37   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=    .977

     PEAK FLOW       (cms)=    .152 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=   9.102
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .165

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0081) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0083):     2.90    .017    11.83     1.76
        + ID2= 2 (0080):    14.63    .152    12.42     9.10
          ==================================================
          ID = 3 (0081):    17.52    .155    12.42     7.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0084) |   Area    (ha)=   7.71   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.14   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=   1.012

     PEAK FLOW       (cms)=    .149 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  10.609
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .193

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0085) |   Area    (ha)=    .91   Curve Number   (CN)= 64.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.53   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .313
```

```
     PEAK FLOW       (cms)=    .034 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  11.551
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .210

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0086) |   Area    (ha)=  19.15   Curve Number   (CN)= 71.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.81   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=   2.995

     PEAK FLOW       (cms)=    .654 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  15.980
     TOTAL RAINFALL   (mm)=  55.057
     RUNOFF COEFFICIENT   =    .290

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1025.002
| Ptotal= 70.76 mm |                          B=   7.559
--------------------                          C=    .804
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =   .49

                    The CORRELATION coefficient is =  .9997
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	135.00	134.02
10.	100.00	102.36
15.	85.00	83.69
30.	58.00	55.55
60.	34.00	34.65
120.	21.00	20.78
360.	8.30	8.88
720.	5.10	5.13
1440.	3.10	2.95

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	.59	6.08	1.08	12.08	15.27	18.08	1.02
.17	.60	6.17	1.09	12.17	12.18	18.17	1.01
.25	.60	6.25	1.10	12.25	10.15	18.25	1.00
.33	.60	6.33	1.12	12.33	8.71	18.33	.99
.42	.61	6.42	1.13	12.42	7.64	18.42	.98
.50	.61	6.50	1.15	12.50	6.81	18.50	.97
.58	.61	6.58	1.16	12.58	6.16	18.58	.96
.67	.62	6.67	1.18	12.67	5.62	18.67	.95
.75	.62	6.75	1.20	12.75	5.18	18.75	.94
.83	.63	6.83	1.21	12.83	4.80	18.83	.93
.92	.63	6.92	1.23	12.92	4.48	18.92	.92
1.00	.63	7.00	1.25	13.00	4.20	19.00	.91
1.08	.64	7.08	1.27	13.08	3.96	19.08	.90
1.17	.64	7.17	1.29	13.17	3.75	19.17	.90
1.25	.65	7.25	1.31	13.25	3.56	19.25	.89
1.33	.65	7.33	1.33	13.33	3.39	19.33	.88
1.42	.65	7.42	1.35	13.42	3.23	19.42	.87
1.50	.66	7.50	1.37	13.50	3.09	19.50	.86
1.58	.66	7.58	1.40	13.58	2.97	19.58	.86
1.67	.67	7.67	1.42	13.67	2.85	19.67	.85
1.75	.67	7.75	1.44	13.75	2.75	19.75	.84
1.83	.68	7.83	1.47	13.83	2.65	19.83	.83
1.92	.68	7.92	1.50	13.92	2.56	19.92	.83
2.00	.69	8.00	1.53	14.00	2.47	20.00	.82
2.08	.69	8.08	1.56	14.08	2.40	20.08	.81
2.17	.70	8.17	1.59	14.17	2.32	20.17	.81
2.25	.70	8.25	1.62	14.25	2.26	20.25	.80
2.33	.71	8.33	1.65	14.33	2.19	20.33	.79
2.42	.71	8.42	1.69	14.42	2.13	20.42	.79
2.50	.72	8.50	1.72	14.50	2.08	20.50	.78
2.58	.72	8.58	1.76	14.58	2.02	20.58	.77

2.67	.73	8.67	1.80	14.67	1.97	20.67	.77
2.75	.73	8.75	1.85	14.75	1.93	20.75	.76
2.83	.74	8.83	1.89	14.83	1.88	20.83	.76
2.92	.74	8.92	1.94	14.92	1.84	20.92	.75
3.00	.75	9.00	1.99	15.00	1.80	21.00	.75
3.08	.76	9.08	2.05	15.08	1.76	21.08	.74
3.17	.76	9.17	2.10	15.17	1.72	21.17	.73
3.25	.77	9.25	2.16	15.25	1.69	21.25	.73
3.33	.77	9.33	2.23	15.33	1.65	21.33	.72
3.42	.78	9.42	2.30	15.42	1.62	21.42	.72
3.50	.79	9.50	2.37	15.50	1.59	21.50	.71
3.58	.79	9.58	2.45	15.58	1.56	21.58	.71
3.67	.80	9.67	2.54	15.67	1.53	21.67	.70
3.75	.81	9.75	2.63	15.75	1.50	21.75	.70
3.83	.82	9.83	2.74	15.83	1.48	21.83	.69
3.92	.82	9.92	2.85	15.92	1.45	21.92	.69
4.00	.83	10.00	2.97	16.00	1.43	22.00	.69
4.08	.84	10.08	3.10	16.08	1.41	22.08	.68
4.17	.84	10.17	3.25	16.17	1.38	22.17	.68
4.25	.85	10.25	3.41	16.25	1.36	22.25	.67
4.33	.86	10.33	3.59	16.33	1.34	22.33	.67
4.42	.87	10.42	3.80	16.42	1.32	22.42	.66
4.50	.88	10.50	4.03	16.50	1.30	22.50	.66
4.58	.89	10.58	4.29	16.58	1.28	22.58	.65
4.67	.89	10.67	4.60	16.67	1.26	22.67	.65
4.75	.90	10.75	4.96	16.75	1.25	22.75	.65
4.83	.91	10.83	5.38	16.83	1.23	22.83	.64
4.92	.92	10.92	5.89	16.92	1.21	22.92	.64
5.00	.93	11.00	6.52	17.00	1.20	23.00	.63
5.08	.94	11.08	7.31	17.08	1.18	23.08	.63
5.17	.95	11.17	8.33	17.17	1.16	23.17	.63
5.25	.96	11.25	9.71	17.25	1.15	23.25	.62
5.33	.97	11.33	11.67	17.33	1.13	23.33	.62
5.42	.98	11.42	14.64	17.42	1.12	23.42	.62
5.50	.99	11.50	19.66	17.50	1.11	23.50	.61
5.58	1.00	11.58	29.72	17.58	1.09	23.58	.61
5.67	1.01	11.67	58.04	17.67	1.08	23.67	.61
5.75	1.03	11.75	134.02	17.75	1.07	23.75	.60
5.83	1.04	11.83	58.98	17.83	1.06	23.83	.60
5.92	1.05	11.92	30.75	17.92	1.04	23.92	.60
6.00	1.06	12.00	20.46	18.00	1.03	24.00	.59

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| CALIB              |
| NASHYD    (0021) |   Area    (ha)=   8.81   Curve Number   (CN)= 68.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=    .248

     PEAK FLOW       (cms)=    .134 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  22.656
     TOTAL RAINFALL   (mm)=  70.759
     RUNOFF COEFFICIENT   =    .320

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
| NASHYD    (0027) |   Area    (ha)=    .68   Curve Number   (CN)= 72.2
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.91   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   2.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.033	.59	6.033	1.08	12.033	15.27	18.03	1.02
.067	.59	6.067	1.08	12.067	15.27	18.07	1.02
.100	.59	6.100	1.08	12.100	13.72	18.10	1.02
.133	.60	6.133	1.09	12.133	12.18	18.13	1.01
.167	.60	6.167	1.09	12.167	12.18	18.17	1.01
.200	.60	6.200	1.10	12.200	10.15	18.20	1.00
.233	.60	6.233	1.10	12.233	10.15	18.23	1.00
.267	.60	6.267	1.11	12.267	9.43	18.27	.99
.300	.60	6.300	1.12	12.300	8.71	18.30	.99
.333	.60	6.333	1.12	12.333	8.71	18.33	.99
.367	.61	6.367	1.13	12.367	7.64	18.37	.98
.400	.61	6.400	1.13	12.400	7.64	18.40	.98
.433	.61	6.433	1.14	12.433	7.22	18.43	.97
.467	.61	6.467	1.15	12.467	6.81	18.47	.97
.500	.61	6.500	1.15	12.500	6.81	18.50	.97
.533	.61	6.533	1.16	12.533	6.16	18.53	.96

.567	.61	6.567	1.16	12.567	6.16	18.57	.96
.600	.62	6.600	1.17	12.600	5.89	18.60	.95
.633	.62	6.633	1.18	12.633	5.62	18.63	.95
.667	.62	6.667	1.18	12.667	5.62	18.67	.95
.700	.62	6.700	1.20	12.700	5.18	18.70	.94
.733	.62	6.733	1.20	12.733	5.18	18.73	.94
.767	.62	6.767	1.20	12.767	4.99	18.77	.93
.800	.63	6.800	1.21	12.800	4.80	18.80	.93
.833	.63	6.833	1.21	12.833	4.80	18.83	.93
.867	.63	6.867	1.23	12.867	4.48	18.87	.92
.900	.63	6.900	1.23	12.900	4.48	18.90	.92
.933	.63	6.933	1.24	12.933	4.34	18.93	.92
.967	.63	6.967	1.25	12.967	4.20	18.97	.91
1.000	.63	7.000	1.25	13.000	4.20	19.00	.91
1.033	.64	7.033	1.27	13.033	3.96	19.03	.90
1.067	.64	7.067	1.27	13.067	3.96	19.07	.90
1.100	.64	7.100	1.28	13.100	3.85	19.10	.90
1.133	.64	7.133	1.29	13.133	3.75	19.13	.90
1.167	.64	7.167	1.29	13.167	3.75	19.17	.90
1.200	.65	7.200	1.31	13.200	3.56	19.20	.89
1.233	.65	7.233	1.31	13.233	3.56	19.23	.89
1.267	.65	7.267	1.32	13.267	3.47	19.27	.88
1.300	.65	7.300	1.33	13.300	3.39	19.30	.88
1.333	.65	7.333	1.33	13.333	3.39	19.33	.88
1.367	.65	7.367	1.35	13.367	3.23	19.37	.87
1.400	.65	7.400	1.35	13.400	3.23	19.40	.87
1.433	.66	7.433	1.36	13.433	3.16	19.43	.87
1.467	.66	7.467	1.37	13.467	3.09	19.47	.86
1.500	.66	7.500	1.37	13.500	3.09	19.50	.86
1.533	.66	7.533	1.40	13.533	2.97	19.53	.86
1.567	.66	7.567	1.40	13.567	2.97	19.57	.86
1.600	.67	7.600	1.41	13.600	2.91	19.60	.85
1.633	.67	7.633	1.42	13.633	2.85	19.63	.85
1.667	.67	7.667	1.42	13.667	2.85	19.67	.85
1.700	.67	7.700	1.44	13.700	2.75	19.70	.84
1.733	.67	7.733	1.44	13.733	2.75	19.73	.84
1.767	.67	7.767	1.46	13.767	2.70	19.77	.84
1.800	.68	7.800	1.47	13.800	2.65	19.80	.83
1.833	.68	7.833	1.47	13.833	2.65	19.83	.83
1.867	.68	7.867	1.50	13.867	2.56	19.87	.83
1.900	.68	7.900	1.50	13.900	2.56	19.90	.83
1.933	.68	7.933	1.51	13.933	2.52	19.93	.82
1.967	.69	7.967	1.53	13.967	2.47	19.97	.82
2.000	.69	8.000	1.53	14.000	2.47	20.00	.82
2.033	.69	8.033	1.56	14.033	2.40	20.03	.81
2.067	.69	8.067	1.56	14.067	2.40	20.07	.81
2.100	.69	8.100	1.57	14.100	2.36	20.10	.81
2.133	.70	8.133	1.59	14.133	2.32	20.13	.81
2.167	.70	8.167	1.59	14.167	2.32	20.17	.81
2.200	.70	8.200	1.62	14.200	2.26	20.20	.80
2.233	.70	8.233	1.62	14.233	2.26	20.23	.80
2.267	.70	8.267	1.64	14.267	2.22	20.27	.80
2.300	.71	8.300	1.65	14.300	2.19	20.30	.79
2.333	.71	8.333	1.65	14.333	2.19	20.33	.79
2.367	.71	8.367	1.69	14.367	2.13	20.37	.79
2.400	.71	8.400	1.69	14.400	2.13	20.40	.79
2.433	.71	8.433	1.71	14.433	2.10	20.43	.78
2.467	.72	8.467	1.72	14.467	2.08	20.47	.78
2.500	.72	8.500	1.72	14.500	2.08	20.50	.78
2.533	.72	8.533	1.76	14.533	2.02	20.53	.77
2.567	.72	8.567	1.76	14.567	2.02	20.57	.77
2.600	.72	8.600	1.78	14.600	2.00	20.60	.77
2.633	.73	8.633	1.80	14.633	1.97	20.63	.77
2.667	.73	8.667	1.80	14.667	1.97	20.67	.77
2.700	.73	8.700	1.85	14.700	1.93	20.70	.76
2.733	.73	8.733	1.85	14.733	1.93	20.73	.76
2.767	.74	8.767	1.87	14.767	1.90	20.77	.76
2.800	.74	8.800	1.89	14.800	1.88	20.80	.76
2.833	.74	8.833	1.89	14.833	1.88	20.83	.76
2.867	.74	8.867	1.94	14.867	1.84	20.87	.75
2.900	.74	8.900	1.94	14.900	1.84	20.90	.75
2.933	.75	8.933	1.97	14.933	1.82	20.93	.75
2.967	.75	8.967	1.99	14.967	1.80	20.97	.75
3.000	.75	9.000	1.99	15.000	1.80	21.00	.75
3.033	.76	9.033	2.05	15.033	1.76	21.03	.74
3.067	.76	9.067	2.05	15.067	1.76	21.07	.74
3.100	.76	9.100	2.07	15.100	1.74	21.10	.74
3.133	.76	9.133	2.10	15.133	1.72	21.13	.73
3.167	.76	9.167	2.10	15.167	1.72	21.17	.73
3.200	.77	9.200	2.16	15.200	1.69	21.20	.73
3.233	.77	9.233	2.16	15.233	1.69	21.23	.73
3.267	.77	9.267	2.20	15.267	1.67	21.27	.73
3.300	.77	9.300	2.23	15.300	1.65	21.30	.72
3.333	.77	9.333	2.23	15.333	1.65	21.33	.72
3.367	.78	9.367	2.30	15.367	1.62	21.37	.72
3.400	.78	9.400	2.30	15.400	1.62	21.40	.72
3.433	.78	9.433	2.34	15.433	1.60	21.43	.72
3.467	.79	9.467	2.37	15.467	1.59	21.47	.71
3.500	.79	9.500	2.37	15.500	1.59	21.50	.71

3.533	.79	9.533	2.45	15.533	1.56	21.53	.71
3.567	.79	9.567	2.45	15.567	1.56	21.57	.71
3.600	.80	9.600	2.50	15.600	1.55	21.60	.71
3.633	.80	9.633	2.54	15.633	1.53	21.63	.70
3.667	.80	9.667	2.54	15.667	1.53	21.67	.70
3.700	.81	9.700	2.63	15.700	1.50	21.70	.70
3.733	.81	9.733	2.63	15.733	1.50	21.73	.70
3.767	.81	9.767	2.68	15.767	1.49	21.77	.70
3.800	.82	9.800	2.74	15.800	1.48	21.80	.69
3.833	.82	9.833	2.74	15.833	1.48	21.83	.69
3.867	.82	9.867	2.85	15.867	1.45	21.87	.69
3.900	.82	9.900	2.85	15.900	1.45	21.90	.69
3.933	.83	9.933	2.91	15.933	1.44	21.93	.69
3.967	.83	9.967	2.97	15.967	1.43	21.97	.69
4.000	.83	10.000	2.97	16.000	1.43	22.00	.69
4.033	.84	10.033	3.10	16.033	1.41	22.03	.68
4.067	.84	10.067	3.10	16.067	1.41	22.07	.68
4.100	.84	10.100	3.17	16.100	1.39	22.10	.68
4.133	.84	10.133	3.25	16.133	1.38	22.13	.68
4.167	.84	10.167	3.25	16.167	1.38	22.17	.68
4.200	.85	10.200	3.41	16.200	1.36	22.20	.67
4.233	.85	10.233	3.41	16.233	1.36	22.23	.67
4.267	.86	10.267	3.50	16.267	1.35	22.27	.67
4.300	.86	10.300	3.59	16.300	1.34	22.30	.67
4.333	.86	10.333	3.59	16.333	1.34	22.33	.67
4.367	.87	10.367	3.80	16.367	1.32	22.37	.66
4.400	.87	10.400	3.80	16.400	1.32	22.40	.66
4.433	.87	10.433	3.91	16.433	1.31	22.43	.66
4.467	.88	10.467	4.03	16.467	1.30	22.47	.66
4.500	.88	10.500	4.03	16.500	1.30	22.50	.66
4.533	.89	10.533	4.29	16.533	1.28	22.53	.65
4.567	.89	10.567	4.29	16.567	1.28	22.57	.65
4.600	.89	10.600	4.45	16.600	1.27	22.60	.65
4.633	.89	10.633	4.60	16.633	1.26	22.63	.65
4.667	.89	10.667	4.60	16.667	1.26	22.67	.65
4.700	.90	10.700	4.96	16.700	1.25	22.70	.65
4.733	.90	10.733	4.96	16.733	1.25	22.73	.65
4.767	.91	10.767	5.17	16.767	1.24	22.77	.64
4.800	.91	10.800	5.38	16.800	1.23	22.80	.64
4.833	.91	10.833	5.38	16.833	1.23	22.83	.64
4.867	.92	10.867	5.89	16.867	1.21	22.87	.64
4.900	.92	10.900	5.89	16.900	1.21	22.90	.64
4.933	.93	10.933	6.21	16.933	1.20	22.93	.64
4.967	.93	10.967	6.52	16.967	1.20	22.97	.63
5.000	.93	11.000	6.52	17.000	1.19	23.00	.63
5.033	.94	11.033	7.31	17.033	1.18	23.03	.63
5.067	.94	11.067	7.31	17.067	1.18	23.07	.63
5.100	.95	11.100	7.82	17.100	1.17	23.10	.63
5.133	.95	11.133	8.33	17.133	1.16	23.13	.63
5.167	.95	11.167	8.34	17.167	1.16	23.17	.63
5.200	.96	11.200	9.71	17.200	1.15	23.20	.62
5.233	.96	11.233	9.71	17.233	1.15	23.23	.62
5.267	.97	11.267	10.69	17.267	1.14	23.27	.62
5.300	.97	11.300	11.67	17.300	1.13	23.30	.62
5.333	.97	11.333	11.67	17.333	1.13	23.33	.62
5.367	.98	11.367	14.64	17.367	1.12	23.37	.62
5.400	.98	11.400	14.64	17.400	1.12	23.40	.62
5.433	.99	11.433	17.15	17.433	1.11	23.43	.61
5.467	.99	11.467	19.66	17.467	1.11	23.47	.61
5.500	.99	11.500	19.67	17.500	1.11	23.50	.61
5.533	1.00	11.533	29.72	17.533	1.09	23.53	.61
5.567	1.00	11.567	29.72	17.567	1.09	23.57	.61
5.600	1.01	11.600	43.92	17.600	1.09	23.60	.61
5.633	1.01	11.633	58.04	17.633	1.08	23.63	.61
5.667	1.01	11.667	58.14	17.667	1.08	23.67	.61
5.700	1.03	11.700	134.02	17.700	1.07	23.70	.60
5.733	1.03	11.733	134.02	17.733	1.07	23.73	.60
5.767	1.03	11.767	96.40	17.767	1.06	23.77	.60
5.800	1.04	11.800	58.98	17.800	1.06	23.80	.60
5.833	1.04	11.833	58.95	17.833	1.06	23.83	.60
5.867	1.05	11.867	30.75	17.867	1.04	23.87	.60
5.900	1.05	11.900	30.75	17.900	1.04	23.90	.60
5.933	1.06	11.933	25.59	17.933	1.04	23.93	.59
5.967	1.06	11.967	20.46	17.967	1.03	23.97	.59
6.000	1.06	12.000	20.45	18.000	1.03	24.00	.59

```
Unit Hyd Qpeak  (cms)=    .466

PEAK FLOW       (cms)=    .082 (i)
TIME TO PEAK    (hrs)=  11.767
RUNOFF VOLUME    (mm)=  26.268
TOTAL RAINFALL   (mm)=  70.759
RUNOFF COEFFICIENT   =    .371

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```


| CALIB |

```
| NASHYD    (0024) |   Area    (ha)=   5.03   Curve Number   (CN)= 72.5
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.75   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   2.433

     PEAK FLOW       (cms)=    .543 (i)
     TIME TO PEAK    (hrs)=  11.800
     RUNOFF VOLUME    (mm)=  19.056
     TOTAL RAINFALL   (mm)=  70.759
     RUNOFF COEFFICIENT   =    .269

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0022) |   Area    (ha)=   3.01   Curve Number   (CN)= 71.6
|ID= 1 DT= 2.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   2.069

     PEAK FLOW       (cms)=    .355 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  18.122
     TOTAL RAINFALL   (mm)=  70.759
     RUNOFF COEFFICIENT   =    .256

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0023) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0002      .2156
                          .0001      .1117    |  20.0000      .2166

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0022)       3.01       .36     11.77      18.12
     OUTFLOW: ID= 1 (0023)       3.01       .00     13.60        .01

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .01
                   TIME SHIFT OF PEAK FLOW         (min)=110.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0545

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0026) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0024):     5.03    .543    11.80    19.06
        + ID2= 2 (0023):     3.01    .000    13.60      .01
          ==================================================
          ID = 3 (0026):     8.04    .543    11.80    11.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0025) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0003      .2171
                          .0001      .0498    |  20.0000      .2181
                          .0002      .1676    |    .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0026)       8.04       .54     11.80      11.93
     OUTFLOW: ID= 1 (0025)       8.04       .00     13.70        .01

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .03
                   TIME SHIFT OF PEAK FLOW         (min)=114.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0958

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0028) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0027):      .68    .082    11.77    26.27
        + ID2= 2 (0025):     8.04    .000    13.70      .01
```

```
         ==================================================
         ID = 3 (0028):     8.72    .082    11.77     2.05

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0029) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0898
                           .0001      .0455   |  20.0000      .0908

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
    INFLOW : ID= 2 (0028)       8.72       .08     11.77       2.05
    OUTFLOW: ID= 1 (0029)       8.72       .00     24.17        .02

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .05
                  TIME SHIFT OF PEAK FLOW         (min)=744.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0178

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0032) |   Area    (ha)=   6.71   Curve Number   (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .32

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	.59	6.083	1.08	12.083	15.27	18.08	1.02
.167	.60	6.167	1.09	12.167	12.18	18.17	1.01
.250	.60	6.250	1.10	12.250	10.15	18.25	1.00
.333	.60	6.333	1.12	12.333	8.71	18.33	.99
.417	.61	6.417	1.13	12.417	7.64	18.42	.98
.500	.61	6.500	1.15	12.500	6.81	18.50	.97
.583	.61	6.583	1.16	12.583	6.16	18.58	.96
.667	.62	6.667	1.18	12.667	5.62	18.67	.95
.750	.62	6.750	1.20	12.750	5.18	18.75	.94
.833	.63	6.833	1.21	12.833	4.80	18.83	.93
.917	.63	6.917	1.23	12.917	4.48	18.92	.92
1.000	.63	7.000	1.25	13.000	4.20	19.00	.91
1.083	.64	7.083	1.27	13.083	3.96	19.08	.90
1.167	.64	7.167	1.29	13.167	3.75	19.17	.90
1.250	.65	7.250	1.31	13.250	3.56	19.25	.89
1.333	.65	7.333	1.33	13.333	3.39	19.33	.88
1.417	.65	7.417	1.35	13.417	3.23	19.42	.87
1.500	.66	7.500	1.37	13.500	3.09	19.50	.86
1.583	.66	7.583	1.40	13.583	2.97	19.58	.86
1.667	.67	7.667	1.42	13.667	2.85	19.67	.85
1.750	.67	7.750	1.44	13.750	2.75	19.75	.84
1.833	.68	7.833	1.47	13.833	2.65	19.83	.83
1.917	.68	7.917	1.50	13.917	2.56	19.92	.83
2.000	.69	8.000	1.53	14.000	2.47	20.00	.82
2.083	.69	8.083	1.56	14.083	2.40	20.08	.81
2.167	.70	8.167	1.59	14.167	2.32	20.17	.81
2.250	.70	8.250	1.62	14.250	2.26	20.25	.80
2.333	.71	8.333	1.65	14.333	2.19	20.33	.79
2.417	.71	8.417	1.69	14.417	2.13	20.42	.79
2.500	.72	8.500	1.72	14.500	2.08	20.50	.78
2.583	.72	8.583	1.76	14.583	2.02	20.58	.77
2.667	.73	8.667	1.80	14.667	1.97	20.67	.77
2.750	.73	8.750	1.85	14.750	1.93	20.75	.76
2.833	.74	8.833	1.89	14.833	1.88	20.83	.76
2.917	.74	8.917	1.94	14.917	1.84	20.92	.75
3.000	.75	9.000	1.99	15.000	1.80	21.00	.75
3.083	.76	9.083	2.05	15.083	1.76	21.08	.74
3.167	.76	9.167	2.10	15.167	1.72	21.17	.73
3.250	.77	9.250	2.16	15.250	1.69	21.25	.73
3.333	.77	9.333	2.23	15.333	1.65	21.33	.72
3.417	.78	9.417	2.30	15.417	1.62	21.42	.72
3.500	.79	9.500	2.37	15.500	1.59	21.50	.71
3.583	.79	9.583	2.45	15.583	1.56	21.58	.71
3.667	.80	9.667	2.54	15.667	1.53	21.67	.70
3.750	.81	9.750	2.63	15.750	1.50	21.75	.70
3.833	.82	9.833	2.74	15.833	1.48	21.83	.69
3.917	.82	9.917	2.85	15.917	1.45	21.92	.69
4.000	.83	10.000	2.97	16.000	1.43	22.00	.69
4.083	.84	10.083	3.10	16.083	1.41	22.08	.68
4.167	.84	10.167	3.25	16.167	1.38	22.17	.68
4.250	.85	10.250	3.41	16.250	1.36	22.25	.67
4.333	.86	10.333	3.59	16.333	1.34	22.33	.67
4.417	.87	10.417	3.80	16.417	1.32	22.42	.66

```
                4.500      .88 |10.500    4.03 |16.500    1.30 | 22.50     .66
                4.583      .89 |10.583    4.29 |16.583    1.28 | 22.58     .65
                4.667      .89 |10.667    4.60 |16.667    1.26 | 22.67     .65
                4.750      .90 |10.750    4.96 |16.750    1.25 | 22.75     .65
                4.833      .91 |10.833    5.38 |16.833    1.23 | 22.83     .64
                4.917      .92 |10.917    5.89 |16.917    1.21 | 22.92     .64
                5.000      .93 |11.000    6.52 |17.000    1.20 | 23.00     .63
                5.083      .94 |11.083    7.31 |17.083    1.18 | 23.08     .63
                5.167      .95 |11.167    8.33 |17.167    1.16 | 23.17     .63
                5.250      .96 |11.250    9.71 |17.250    1.15 | 23.25     .62
                5.333      .97 |11.333   11.67 |17.333    1.13 | 23.33     .62
                5.417      .98 |11.417   14.64 |17.417    1.12 | 23.42     .62
                5.500      .99 |11.500   19.66 |17.500    1.11 | 23.50     .61
                5.583     1.00 |11.583   29.72 |17.583    1.09 | 23.58     .61
                5.667     1.01 |11.667   58.04 |17.667    1.08 | 23.67     .61
                5.750     1.03 |11.750  134.01 |17.750    1.07 | 23.75     .60
                5.833     1.04 |11.833   58.99 |17.833    1.06 | 23.83     .60
                5.917     1.05 |11.917   30.75 |17.917    1.04 | 23.92     .60
                6.000     1.06 |12.000   20.46 |18.000    1.03 | 24.00     .00

     Unit Hyd Qpeak  (cms)=    .800

     PEAK FLOW       (cms)=    .239 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  18.944
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .268

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0030) |   Area    (ha)=   5.57   Curve Number   (CN)= 69.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.12   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   3.828

     PEAK FLOW       (cms)=    .550 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  19.641
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .278

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0031) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                    .00        386.25         .0300
                  37.50        385.75     .0300 / .0300  Main Channel
                  47.50        385.75     .0300 / .0300  Main Channel
                  85.00        386.25         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   385.78    .150E+03        .1           .33      23.91
        .05   385.80    .350E+03        .3           .47      16.85
        .08   385.83    .599E+03        .7           .56      14.12
        .11   385.86    .898E+03       1.2           .63      12.62
        .13   385.88    .125E+04       1.8           .68      11.65
        .16   385.91    .164E+04       2.5           .73      10.95
        .18   385.93    .209E+04       3.3           .76      10.42
        .21   385.96    .259E+04       4.3           .80       9.99
        .24   385.99    .313E+04       5.4           .82       9.64
        .26   386.01    .373E+04       6.7           .85       9.33
        .29   386.04    .438E+04       8.0           .88       9.07
        .32   386.07    .507E+04       9.6           .90       8.83
        .34   386.09    .582E+04      11.2           .92       8.62
        .37   386.12    .661E+04      13.1           .94       8.43
        .39   386.14    .745E+04      15.1           .96       8.25
        .42   386.17    .835E+04      17.2           .98       8.08
        .45   386.20    .929E+04      19.5          1.00       7.93
        .47   386.22    .103E+05      22.0          1.02       7.79
        .50   386.25    .113E+05      24.7          1.04       7.65

                                     <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0030)    5.57      .55   11.75  19.64        .07       .52
     OUTFLOW: ID= 1 (0031)    5.57      .23   11.92  19.62        .04       .39
```

```
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0032):      6.71    .239    12.08    18.94
        + ID2= 2 (0031):      5.57    .227    11.92    19.62
          =============================================
          ID = 3 (0033):     12.27    .432    12.00    19.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0036) |   Area    (ha)=   2.08   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.71   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=    .938

     PEAK FLOW       (cms)=    .165 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  20.502
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .290

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0034) |   Area    (ha)=   2.15   Curve Number   (CN)= 71.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.03   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .10

     Unit Hyd Qpeak  (cms)=    .795

     PEAK FLOW       (cms)=    .198 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  25.577
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .362

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0035) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (    1.3) ------>
               Distance      Elevation       Manning
                    .00        388.25         .0300
                  30.00        387.75     .0300 / .0300  Main Channel
                  40.00        387.75     .0300 / .0300  Main Channel
                  70.00        388.25         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   387.78    .327E+02        .1           .41       4.35
        .05   387.80    .744E+02        .4           .59       3.03
        .08   387.83    .125E+03        .8           .71       2.52
        .11   387.86    .185E+03       1.4           .80       2.25
        .13   387.88    .253E+03       2.0           .87       2.07
        .16   387.91    .330E+03       2.8           .92       1.95
        .18   387.93    .417E+03       3.7           .97       1.85
        .21   387.96    .512E+03       4.8          1.01       1.78
        .24   387.99    .616E+03       6.0          1.04       1.72
        .26   388.01    .729E+03       7.3          1.07       1.67
        .29   388.04    .851E+03       8.7          1.10       1.63
        .32   388.07    .982E+03      10.3          1.13       1.59
        .34   388.09    .112E+04      12.0          1.15       1.56
        .37   388.12    .127E+04      13.9          1.17       1.53
        .39   388.14    .143E+04      15.9          1.19       1.50
        .42   388.17    .160E+04      18.0          1.21       1.48
        .45   388.20    .177E+04      20.3          1.23       1.45
        .47   388.22    .196E+04      22.8          1.25       1.43
        .50   388.25    .215E+04      25.4          1.27       1.41

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0034)    2.15      .20   11.83  25.58      .03       .45
     OUTFLOW: ID= 1 (0035)    2.15      .17   11.92  25.58      .03       .43
```

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--------------------
| ADD HYD   (0037) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0036):     2.08    .165    11.75    20.50
        + ID2= 2 (0035):     2.15    .174    11.92    25.58
          ==============================================
          ID = 3 (0037):     4.23    .329    11.83    23.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0039) |   Area    (ha)=  35.03   Curve Number   (CN)= 65.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.17   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.16

     Unit Hyd Qpeak  (cms)=   1.152

     PEAK FLOW       (cms)=    .539 (i)
     TIME TO PEAK    (hrs)=  13.083
     RUNOFF VOLUME    (mm)=  20.448
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .289

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0040) |   Area    (ha)=   3.95   Curve Number   (CN)= 54.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .40

     Unit Hyd Qpeak  (cms)=    .375

     PEAK FLOW       (cms)=    .082 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  13.300
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .188

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0041) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1655
                           .0001      .0976   |  20.0000      .1665

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0040)      3.95       .08     12.17      13.30
     OUTFLOW: ID= 1 (0041)      3.95       .00     25.42        .06

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .07
                  TIME SHIFT OF PEAK FLOW         (min)=795.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0523

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0044) |   Area    (ha)=    .87   Curve Number   (CN)= 64.6
|ID= 1 DT= 3.0 min |   Ia      (mm)=   6.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.


                                       ---- TRANSFORMED HYETOGRAPH ----
                       TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                        hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                       .050     .59 | 6.050    1.08 |12.050   15.27 | 18.05    1.02
                       .100     .59 | 6.100    1.08 |12.100   14.24 | 18.10    1.02
                       .150     .60 | 6.150    1.09 |12.150   12.18 | 18.15    1.01
                       .200     .60 | 6.200    1.10 |12.200   10.83 | 18.20    1.00
                       .250     .60 | 6.250    1.10 |12.250   10.15 | 18.25    1.00
                       .300     .60 | 6.300    1.12 |12.300    8.71 | 18.30     .99
                       .350     .60 | 6.350    1.12 |12.350    8.35 | 18.35     .99
                       .400     .61 | 6.400    1.13 |12.400    7.64 | 18.40     .98
                       .450     .61 | 6.450    1.14 |12.450    7.09 | 18.45     .97
                       .500     .61 | 6.500    1.15 |12.500    6.81 | 18.50     .97
                       .550     .61 | 6.550    1.16 |12.550    6.16 | 18.55     .96
```

.600	.62	6.600	1.17	12.600	5.98	18.60	.96
.650	.62	6.650	1.18	12.650	5.62	18.65	.95
.700	.62	6.700	1.19	12.700	5.32	18.70	.94
.750	.62	6.750	1.20	12.750	5.18	18.75	.94
.800	.63	6.800	1.21	12.800	4.80	18.80	.93
.850	.63	6.850	1.22	12.850	4.69	18.85	.93
.900	.63	6.900	1.23	12.900	4.48	18.90	.92
.950	.63	6.950	1.24	12.950	4.30	18.95	.92
1.000	.63	7.000	1.25	13.000	4.20	19.00	.91
1.050	.64	7.050	1.27	13.050	3.96	19.05	.90
1.100	.64	7.100	1.27	13.100	3.89	19.10	.90
1.150	.64	7.150	1.29	13.150	3.75	19.15	.90
1.200	.64	7.200	1.30	13.200	3.62	19.20	.89
1.250	.65	7.250	1.31	13.250	3.56	19.25	.89
1.300	.65	7.300	1.33	13.300	3.39	19.30	.88
1.350	.65	7.350	1.34	13.350	3.34	19.35	.88
1.400	.65	7.400	1.35	13.400	3.23	19.40	.87
1.450	.66	7.450	1.36	13.450	3.14	19.45	.87
1.500	.66	7.500	1.37	13.500	3.09	19.50	.86
1.550	.66	7.550	1.40	13.550	2.97	19.55	.86
1.600	.66	7.600	1.40	13.600	2.93	19.60	.85
1.650	.67	7.650	1.42	13.650	2.85	19.65	.85
1.700	.67	7.700	1.44	13.700	2.78	19.70	.84
1.750	.67	7.750	1.44	13.750	2.75	19.75	.84
1.800	.68	7.800	1.47	13.800	2.65	19.80	.83
1.850	.68	7.850	1.48	13.850	2.62	19.85	.83
1.900	.68	7.900	1.50	13.900	2.56	19.90	.83
1.950	.68	7.950	1.52	13.950	2.50	19.95	.82
2.000	.69	8.000	1.53	14.000	2.47	20.00	.82
2.050	.69	8.050	1.56	14.050	2.40	20.05	.81
2.100	.69	8.100	1.57	14.100	2.37	20.10	.81
2.150	.70	8.150	1.59	14.150	2.32	20.15	.81
2.200	.70	8.200	1.61	14.200	2.28	20.20	.80
2.250	.70	8.250	1.62	14.250	2.26	20.25	.80
2.300	.71	8.300	1.65	14.300	2.19	20.30	.79
2.350	.71	8.350	1.66	14.350	2.17	20.35	.79
2.400	.71	8.400	1.69	14.400	2.13	20.40	.79
2.450	.72	8.450	1.71	14.450	2.09	20.45	.78
2.500	.72	8.500	1.72	14.500	2.08	20.50	.78
2.550	.72	8.550	1.76	14.550	2.02	20.55	.77
2.600	.72	8.600	1.78	14.600	2.01	20.60	.77
2.650	.73	8.650	1.80	14.650	1.97	20.65	.77
2.700	.73	8.700	1.83	14.700	1.94	20.70	.76
2.750	.73	8.750	1.85	14.750	1.92	20.75	.76
2.800	.74	8.800	1.89	14.800	1.88	20.80	.76
2.850	.74	8.850	1.91	14.850	1.87	20.85	.76
2.900	.74	8.900	1.94	14.900	1.84	20.90	.75
2.950	.75	8.950	1.98	14.950	1.81	20.95	.75
3.000	.75	9.000	1.99	15.000	1.80	21.00	.75
3.050	.76	9.050	2.05	15.050	1.76	21.05	.74
3.100	.76	9.100	2.07	15.100	1.75	21.10	.74
3.150	.76	9.150	2.10	15.150	1.72	21.15	.73
3.200	.77	9.200	2.14	15.200	1.70	21.20	.73
3.250	.77	9.250	2.16	15.250	1.69	21.25	.73
3.300	.77	9.300	2.23	15.300	1.65	21.30	.72
3.350	.78	9.350	2.25	15.350	1.64	21.35	.72
3.400	.78	9.400	2.30	15.400	1.62	21.40	.72
3.450	.79	9.450	2.35	15.450	1.60	21.45	.72
3.500	.79	9.500	2.37	15.500	1.59	21.50	.71
3.550	.79	9.550	2.45	15.550	1.56	21.55	.71
3.600	.80	9.600	2.48	15.600	1.55	21.60	.71
3.650	.80	9.650	2.54	15.650	1.53	21.65	.70
3.700	.81	9.700	2.60	15.700	1.51	21.70	.70
3.750	.81	9.750	2.63	15.750	1.50	21.75	.70
3.800	.82	9.800	2.74	15.800	1.48	21.80	.69
3.850	.82	9.850	2.77	15.850	1.47	21.85	.69
3.900	.82	9.900	2.85	15.900	1.45	21.90	.69
3.950	.83	9.950	2.93	15.950	1.44	21.95	.69
4.000	.83	10.000	2.97	16.000	1.43	22.00	.69
4.050	.84	10.050	3.10	16.050	1.41	22.05	.68
4.100	.84	10.100	3.15	16.100	1.40	22.10	.68
4.150	.84	10.150	3.25	16.150	1.38	22.15	.68
4.200	.85	10.200	3.35	16.200	1.37	22.20	.67
4.250	.85	10.250	3.41	16.250	1.36	22.25	.67
4.300	.86	10.300	3.59	16.300	1.34	22.30	.67
4.350	.86	10.350	3.66	16.350	1.33	22.35	.67
4.400	.87	10.400	3.80	16.400	1.32	22.40	.66
4.450	.87	10.450	3.95	16.450	1.31	22.45	.66
4.500	.88	10.500	4.03	16.500	1.30	22.50	.66
4.550	.89	10.550	4.29	16.550	1.28	22.55	.65
4.600	.89	10.600	4.39	16.600	1.28	22.60	.65
4.650	.89	10.650	4.60	16.650	1.26	22.65	.65
4.700	.90	10.700	4.84	16.700	1.25	22.70	.65
4.750	.90	10.750	4.96	16.750	1.25	22.75	.65
4.800	.91	10.800	5.38	16.800	1.23	22.80	.64
4.850	.91	10.850	5.55	16.850	1.22	22.85	.64
4.900	.92	10.900	5.89	16.900	1.21	22.90	.64
4.950	.93	10.950	6.31	16.950	1.20	22.95	.64
5.000	.93	11.000	6.52	17.000	1.19	23.00	.63

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              5.050     .94 |11.050    7.31 |17.050    1.18 | 23.05     .63
              5.100     .94 |11.100    7.65 |17.100    1.17 | 23.10     .63
              5.150     .95 |11.150    8.33 |17.150    1.16 | 23.15     .63
              5.200     .96 |11.200    9.25 |17.200    1.15 | 23.20     .62
              5.250     .96 |11.250    9.71 |17.250    1.15 | 23.25     .62
              5.300     .97 |11.300   11.67 |17.300    1.13 | 23.30     .62
              5.350     .97 |11.350   12.66 |17.350    1.13 | 23.35     .62
              5.400     .98 |11.400   14.64 |17.400    1.12 | 23.40     .62
              5.450     .99 |11.450   17.99 |17.450    1.11 | 23.45     .61
              5.500     .99 |11.500   19.66 |17.500    1.11 | 23.50     .61
              5.550    1.00 |11.550   29.72 |17.550    1.09 | 23.55     .61
              5.600    1.01 |11.600   39.17 |17.600    1.09 | 23.60     .61
              5.650    1.01 |11.650   58.04 |17.650    1.08 | 23.65     .61
              5.700    1.02 |11.700  108.73 |17.700    1.07 | 23.70     .60
              5.750    1.03 |11.750  133.98 |17.750    1.07 | 23.75     .60
              5.800    1.04 |11.800   58.98 |17.800    1.06 | 23.80     .60
              5.850    1.04 |11.850   49.56 |17.850    1.05 | 23.85     .60
              5.900    1.05 |11.900   30.75 |17.900    1.04 | 23.90     .60
              5.950    1.06 |11.950   23.88 |17.950    1.04 | 23.95     .59
              6.000    1.06 |12.000   20.45 |18.000    1.03 | 24.00     .59

     Unit Hyd Qpeak  (cms)=    .596

     PEAK FLOW       (cms)=    .078 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  19.524
     TOTAL RAINFALL   (mm)=  70.759
     RUNOFF COEFFICIENT   =    .276

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD    (0042) |   Area    (ha)=    .56   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .382

     PEAK FLOW       (cms)=    .063 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  22.308
     TOTAL RAINFALL   (mm)=  70.759
     RUNOFF COEFFICIENT   =    .315

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0043) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0357
                           .0001      .0118   |  20.0000      .0367

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0042)       .56       .06     11.75      22.31
     OUTFLOW: ID= 1 (0043)       .56       .00     20.10        .49

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .16
                  TIME SHIFT OF PEAK FLOW         (min)=501.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0121

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--------------------
| ADD HYD   (0045) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0044):      .87     .078    11.75    19.52
        + ID2= 2 (0043):      .56     .000    20.10      .49
          ==============================================
          ID = 3 (0045):     1.42     .078    11.75    12.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0046) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1073
                           .0001      .0117   |  20.0000      .1083

                                AREA     QPEAK     TPEAK       R.V.
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                         (ha)     (cms)     (hrs)       (mm)
INFLOW : ID= 2 (0045)    1.42       .08     11.75      12.09
OUTFLOW: ID= 1 (0046)    1.42       .00     24.10        .32

             PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .13
             TIME SHIFT OF PEAK FLOW         (min)=741.00
             MAXIMUM  STORAGE   USED       (ha.m.)=  .0168

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--------------------
| CALIB             |
| NASHYD    (0047) |   Area    (ha)=    .48   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .331

     PEAK FLOW       (cms)=    .054 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  22.308
     TOTAL RAINFALL   (mm)=  70.759
     RUNOFF COEFFICIENT   =    .315

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0048) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0731
                           .0001      .0496   |  20.0000      .0741

                          AREA     QPEAK     TPEAK       R.V.
                          (ha)     (cms)     (hrs)       (mm)
INFLOW : ID= 2 (0047)      .48       .05     11.75      22.31
OUTFLOW: ID= 1 (0048)      .48       .00     20.15        .12

             PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
             TIME SHIFT OF PEAK FLOW         (min)=504.00
             MAXIMUM  STORAGE   USED       (ha.m.)=  .0107

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--------------------
| CALIB             |
| NASHYD    (0049) |   Area    (ha)=   2.77   Curve Number   (CN)= 70.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.35   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
          .083     .59 | 6.083    1.08 |12.083   15.27 | 18.08    1.02
          .167     .60 | 6.167    1.09 |12.167   12.18 | 18.17    1.01
          .250     .60 | 6.250    1.10 |12.250   10.15 | 18.25    1.00
          .333     .60 | 6.333    1.12 |12.333    8.71 | 18.33     .99
          .417     .61 | 6.417    1.13 |12.417    7.64 | 18.42     .98
          .500     .61 | 6.500    1.15 |12.500    6.81 | 18.50     .97
          .583     .61 | 6.583    1.16 |12.583    6.16 | 18.58     .96
          .667     .62 | 6.667    1.18 |12.667    5.62 | 18.67     .95
          .750     .62 | 6.750    1.20 |12.750    5.18 | 18.75     .94
          .833     .63 | 6.833    1.21 |12.833    4.80 | 18.83     .93
          .917     .63 | 6.917    1.23 |12.917    4.48 | 18.92     .92
         1.000     .63 | 7.000    1.25 |13.000    4.20 | 19.00     .91
         1.083     .64 | 7.083    1.27 |13.083    3.96 | 19.08     .90
         1.167     .64 | 7.167    1.29 |13.167    3.75 | 19.17     .90
         1.250     .65 | 7.250    1.31 |13.250    3.56 | 19.25     .89
         1.333     .65 | 7.333    1.33 |13.333    3.39 | 19.33     .88
         1.417     .65 | 7.417    1.35 |13.417    3.23 | 19.42     .87
         1.500     .66 | 7.500    1.37 |13.500    3.09 | 19.50     .86
         1.583     .66 | 7.583    1.40 |13.583    2.97 | 19.58     .86
         1.667     .67 | 7.667    1.42 |13.667    2.85 | 19.67     .85
         1.750     .67 | 7.750    1.44 |13.750    2.75 | 19.75     .84
         1.833     .68 | 7.833    1.47 |13.833    2.65 | 19.83     .83
         1.917     .68 | 7.917    1.50 |13.917    2.56 | 19.92     .83
         2.000     .69 | 8.000    1.53 |14.000    2.47 | 20.00     .82
         2.083     .69 | 8.083    1.56 |14.083    2.40 | 20.08     .81
         2.167     .70 | 8.167    1.59 |14.167    2.32 | 20.17     .81
         2.250     .70 | 8.250    1.62 |14.250    2.26 | 20.25     .80
         2.333     .71 | 8.333    1.65 |14.333    2.19 | 20.33     .79
         2.417     .71 | 8.417    1.69 |14.417    2.13 | 20.42     .79
         2.500     .72 | 8.500    1.72 |14.500    2.08 | 20.50     .78
         2.583     .72 | 8.583    1.76 |14.583    2.02 | 20.58     .77
         2.667     .73 | 8.667    1.80 |14.667    1.97 | 20.67     .77
         2.750     .73 | 8.750    1.85 |14.750    1.93 | 20.75     .76
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             2.833     .74 | 8.833    1.89 |14.833    1.88 | 20.83     .76
             2.917     .74 | 8.917    1.94 |14.917    1.84 | 20.92     .75
             3.000     .75 | 9.000    1.99 |15.000    1.80 | 21.00     .75
             3.083     .76 | 9.083    2.05 |15.083    1.76 | 21.08     .74
             3.167     .76 | 9.167    2.10 |15.167    1.72 | 21.17     .73
             3.250     .77 | 9.250    2.16 |15.250    1.69 | 21.25     .73
             3.333     .77 | 9.333    2.23 |15.333    1.65 | 21.33     .72
             3.417     .78 | 9.417    2.30 |15.417    1.62 | 21.42     .72
             3.500     .79 | 9.500    2.37 |15.500    1.59 | 21.50     .71
             3.583     .79 | 9.583    2.45 |15.583    1.56 | 21.58     .71
             3.667     .80 | 9.667    2.54 |15.667    1.53 | 21.67     .70
             3.750     .81 | 9.750    2.63 |15.750    1.50 | 21.75     .70
             3.833     .82 | 9.833    2.74 |15.833    1.48 | 21.83     .69
             3.917     .82 | 9.917    2.85 |15.917    1.45 | 21.92     .69
             4.000     .83 |10.000    2.97 |16.000    1.43 | 22.00     .69
             4.083     .84 |10.083    3.10 |16.083    1.41 | 22.08     .68
             4.167     .84 |10.167    3.25 |16.167    1.38 | 22.17     .68
             4.250     .85 |10.250    3.41 |16.250    1.36 | 22.25     .67
             4.333     .86 |10.333    3.59 |16.333    1.34 | 22.33     .67
             4.417     .87 |10.417    3.80 |16.417    1.32 | 22.42     .66
             4.500     .88 |10.500    4.03 |16.500    1.30 | 22.50     .66
             4.583     .89 |10.583    4.29 |16.583    1.28 | 22.58     .65
             4.667     .89 |10.667    4.60 |16.667    1.26 | 22.67     .65
             4.750     .90 |10.750    4.96 |16.750    1.25 | 22.75     .65
             4.833     .91 |10.833    5.38 |16.833    1.23 | 22.83     .64
             4.917     .92 |10.917    5.89 |16.917    1.21 | 22.92     .64
             5.000     .93 |11.000    6.52 |17.000    1.20 | 23.00     .63
             5.083     .94 |11.083    7.31 |17.083    1.18 | 23.08     .63
             5.167     .95 |11.167    8.33 |17.167    1.16 | 23.17     .63
             5.250     .96 |11.250    9.71 |17.250    1.15 | 23.25     .62
             5.333     .97 |11.333   11.67 |17.333    1.13 | 23.33     .62
             5.417     .98 |11.417   14.64 |17.417    1.12 | 23.42     .62
             5.500     .99 |11.500   19.66 |17.500    1.11 | 23.50     .61
             5.583    1.00 |11.583   29.72 |17.583    1.09 | 23.58     .61
             5.667    1.01 |11.667   58.04 |17.667    1.08 | 23.67     .61
             5.750    1.03 |11.750  134.01 |17.750    1.07 | 23.75     .60
             5.833    1.04 |11.833   58.99 |17.833    1.06 | 23.83     .60
             5.917    1.05 |11.917   30.75 |17.917    1.04 | 23.92     .60
             6.000    1.06 |12.000   20.46 |18.000    1.03 | 24.00     .00

     Unit Hyd Qpeak  (cms)=    .952

     PEAK FLOW       (cms)=    .241 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  24.615
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .348

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0055) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .504 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  27.461
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .388

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0052) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .374 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  22.838
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .323

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0050) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=    .705 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  21.776
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .308

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0051) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)     11.96       .71     11.92      21.78
     OUTFLOW: ID= 1 (0051)     11.96       .19     12.75       8.62

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 26.85
                   TIME SHIFT OF PEAK FLOW         (min)= 50.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .2080

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0053) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0052):     3.90     .374    11.75    22.84
        + ID2= 2 (0051):    11.96     .189    12.75     8.62
          ==================================================
          ID = 3 (0053):    15.86     .374    11.75    12.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0054) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0771
                           .0001      .0761   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0053)     15.86       .37     11.75      12.12
     OUTFLOW: ID= 1 (0054)     15.86       .12     13.25       7.32

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.89
                   TIME SHIFT OF PEAK FLOW         (min)= 90.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1332

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0056) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.5) ------>
               Distance      Elevation       Manning
                    .00        425.00          .0300
                    .75        424.25     .0300 / .0300  Main Channel
                   1.75        424.25     .0300 / .0300  Main Channel
                   2.50        425.00          .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .04   424.29    .145E+02        .0           .68       8.63
        .08   424.33    .302E+02        .1          1.05       5.61
        .12   424.37    .469E+02        .2          1.33       4.42
        .16   424.41    .647E+02        .3          1.57       3.76
        .20   424.45    .837E+02        .4          1.77       3.34
        .24   424.49    .104E+03        .6          1.94       3.04
        .28   424.53    .125E+03        .7          2.10       2.81
        .32   424.57    .147E+03        .9          2.23       2.64
        .36   424.61    .170E+03       1.1          2.36       2.50
        .39   424.64    .195E+03       1.4          2.47       2.39
        .43   424.68    .220E+03       1.6          2.57       2.30
        .47   424.72    .247E+03       1.9          2.66       2.22
        .51   424.76    .275E+03       2.1          2.75       2.15
```

```
        .55   424.80    .304E+03       2.4          2.83       2.09
        .59   424.84    .334E+03       2.7          2.90       2.04
        .63   424.88    .365E+03       3.1          2.97       1.99
        .67   424.92    .397E+03       3.4          3.03       1.95
        .71   424.96    .430E+03       3.8          3.09       1.91
        .75   425.00    .465E+03       4.1          3.14       1.88

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0054)   15.86      .12   13.25   7.32       .09      1.13
     OUTFLOW: ID= 1 (0056)   15.86      .08   13.50   7.32       .07       .96


-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0057) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0055):     5.19    .504    11.83    27.46
        + ID2= 2 (0056):    15.86    .079    13.50     7.32
          ===============================================
          ID = 3 (0057):    21.05    .504    11.83    12.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0058) |   Area    (ha)=  21.77   Curve Number   (CN)= 67.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   2.354

     PEAK FLOW       (cms)=    .886 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  22.801
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .322

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0059) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=    .705 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  21.776
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .308

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0060) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0059)     11.96       .71     11.92      21.78
     OUTFLOW: ID= 1 (0060)     11.96       .19     12.75       8.62

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 26.85
                   TIME SHIFT OF PEAK FLOW         (min)= 50.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .2080

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0061) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .374 (i)
```

```
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  22.838
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .323

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------

--------------------
| ADD HYD   (0062) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0060):    11.96    .189    12.75     8.62
        + ID2= 2 (0061):     3.90    .374    11.75    22.84
          ====================================================
          ID = 3 (0062):    15.86    .374    11.75    12.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| RESERVOIR (0063) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |  20.0000      .0771
                          .0001      .0761    |    .0000      .0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0062)     15.86       .37     11.75      12.12
     OUTFLOW: ID= 1 (0063)     15.86       .12     13.25       7.32

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.89
                   TIME SHIFT OF PEAK FLOW         (min)= 90.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1332

------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0065) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
              <------ DATA FOR SECTION (    1.5) ------>
              Distance      Elevation       Manning
                   .00        425.00          .0300
                   .75        424.25     .0300 / .0300  Main Channel
                  1.75        424.25     .0300 / .0300  Main Channel
                  2.50        425.00          .0300

        <--------------------- TRAVEL TIME TABLE ---------------------->
         DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
          (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
          .04   424.29    .145E+02        .0           .68       8.63
          .08   424.33    .302E+02        .1          1.05       5.61
          .12   424.37    .469E+02        .2          1.33       4.42
          .16   424.41    .647E+02        .3          1.57       3.76
          .20   424.45    .837E+02        .4          1.77       3.34
          .24   424.49    .104E+03        .6          1.94       3.04
          .28   424.53    .125E+03        .7          2.10       2.81
          .32   424.57    .147E+03        .9          2.23       2.64
          .36   424.61    .170E+03       1.1          2.36       2.50
          .39   424.64    .195E+03       1.4          2.47       2.39
          .43   424.68    .220E+03       1.6          2.57       2.30
          .47   424.72    .247E+03       1.9          2.66       2.22
          .51   424.76    .275E+03       2.1          2.75       2.15
          .55   424.80    .304E+03       2.4          2.83       2.09
          .59   424.84    .334E+03       2.7          2.90       2.04
          .63   424.88    .365E+03       3.1          2.97       1.99
          .67   424.92    .397E+03       3.4          3.03       1.95
          .71   424.96    .430E+03       3.8          3.09       1.91
          .75   425.00    .465E+03       4.1          3.14       1.88

                                    <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                             (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0063)   15.86      .12   13.25   7.32        .09      1.13
     OUTFLOW: ID= 1 (0065)   15.86      .08   13.50   7.32        .07       .96


------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0064) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777
```

```
     PEAK FLOW       (cms)=    .504 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  27.461
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .388

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0066) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0065):     15.86    .079    13.50     7.32
        + ID2= 2 (0064):      5.19    .504    11.83    27.46
          ==================================================
          ID = 3 (0066):     21.05    .504    11.83    12.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0069) |   Area    (ha)=   1.80   Curve Number   (CN)= 58.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.005

     PEAK FLOW       (cms)=    .114 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  14.609
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .207

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0067) |   Area    (ha)=   1.52   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .995

     PEAK FLOW       (cms)=    .111 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  15.239
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .216

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0068) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0207
                           .0001      .0206   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0067)      1.52       .11     11.75      15.24
     OUTFLOW: ID= 1 (0068)      1.52       .00     18.83       1.71

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.68
                   TIME SHIFT OF PEAK FLOW         (min)=425.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0209

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0071) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0069):      1.80    .114    11.75    14.61
        + ID2= 2 (0068):      1.52    .002    18.83     1.71
          ==================================================
          ID = 3 (0071):      3.32    .114    11.75     8.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0070) |
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```
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |  20.0000      .0708
                            .0001      .0707   |    .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0071)       3.32       .11     11.75       8.70
     OUTFLOW: ID= 1 (0070)       3.32       .00     24.25        .04

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=750.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0287

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0073) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.6) ------>
               Distance      Elevation       Manning
                    .00        421.26         .0300
                   1.10        420.66     .0300 / .0300  Main Channel
                   2.00        420.66     .0300 / .0300  Main Channel
                   3.10        421.26         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   420.69    .560E+01        .0           .05      59.24
        .06   420.72    .119E+02        .0           .09      35.98
        .09   420.75    .188E+02        .0           .12      26.61
        .13   420.79    .265E+02        .0           .14      21.37
        .16   420.82    .348E+02        .0           .17      17.97
        .19   420.85    .437E+02        .0           .20      15.58
        .22   420.88    .534E+02        .1           .22      13.79
        .25   420.91    .637E+02        .1           .25      12.40
        .28   420.94    .748E+02        .1           .27      11.29
        .32   420.98    .864E+02        .1           .30      10.38
        .35   421.01    .988E+02        .2           .32       9.61
        .38   421.04    .112E+03        .2           .34       8.96
        .41   421.07    .126E+03        .2           .37       8.41
        .44   421.10    .140E+03        .3           .39       7.92
        .47   421.13    .155E+03        .3           .41       7.50
        .51   421.17    .171E+03        .4           .43       7.12
        .54   421.20    .187E+03        .5           .45       6.78
        .57   421.23    .204E+03        .5           .48       6.48
        .60   421.26    .222E+03        .6           .50       6.21

                                        <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK    TPEAK    R.V.    MAX DEPTH   MAX VEL
                               (ha)    (cms)    (hrs)    (mm)       (m)       (m/s)
     INFLOW : ID= 2 (0070)     3.32      .00    24.25     .04       .00         .05
     OUTFLOW: ID= 1 (0073)     3.32      .00    24.17     .04       .00         .05


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--------------------
| ADD HYD   (0074) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (0066):     21.05     .504     11.83     12.29
        + ID2= 2 (0073):      3.32     .000     24.17       .04
          ==================================================
          ID = 3 (0074):     24.37     .504     11.83     10.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0072) |   Area    (ha)=  24.19   Curve Number   (CN)= 60.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .37

     Unit Hyd Qpeak  (cms)=   2.505

     PEAK FLOW       (cms)=    .679 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  16.630
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .235

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0075) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0074):    24.37    .504    11.83    10.62
        + ID2= 2 (0072):    24.19    .679    12.17    16.63
          ==================================================
          ID = 3 (0075):    48.56    .918    11.92    13.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0076) |   Area    (ha)= 127.28   Curve Number   (CN)= 59.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.29   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .79

     Unit Hyd Qpeak  (cms)=   6.192

     PEAK FLOW       (cms)=   2.119 (i)
     TIME TO PEAK    (hrs)=  12.667
     RUNOFF VOLUME    (mm)=  16.766
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .237

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0077) |   Area    (ha)=  17.28   Curve Number   (CN)= 58.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.24   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=   1.154

     PEAK FLOW       (cms)=    .333 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=  15.545
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .220

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0082) |   Area    (ha)=    .24   Curve Number   (CN)= 77.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .081

     PEAK FLOW       (cms)=    .027 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  31.589
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .447

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0078) |   Area    (ha)=   2.66   Curve Number   (CN)= 59.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.55   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.418

     PEAK FLOW       (cms)=    .171 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  15.233
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .215

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0079) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0608
                           .0001      .0607   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
```

```
                               (ha)      (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0078)      2.66       .17     11.75      15.23
     OUTFLOW: ID= 1 (0079)      2.66       .00     24.17        .09

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=745.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0403

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0083) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0082):      .24    .027    11.83    31.59
        + ID2= 2 (0079):     2.66    .000    24.17      .09
          ==================================================
          ID = 3 (0083):     2.90    .027    11.83     2.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0080) |   Area    (ha)=  14.63   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.37   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=    .977

     PEAK FLOW       (cms)=    .278 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=  15.359
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .217

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0081) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0083):     2.90    .027    11.83     2.67
        + ID2= 2 (0080):    14.63    .278    12.42    15.36
          ==================================================
          ID = 3 (0081):    17.52    .282    12.42    13.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0084) |   Area    (ha)=   7.71   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.14   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=   1.012

     PEAK FLOW       (cms)=    .268 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  17.682
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .250

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0085) |   Area    (ha)=    .91   Curve Number   (CN)= 64.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.53   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .313

     PEAK FLOW       (cms)=    .060 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  19.014
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .269

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0086) |   Area    (ha)=  19.15   Curve Number   (CN)= 71.3
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.81   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=   2.995

     PEAK FLOW       (cms)=   1.097 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  25.156
     TOTAL RAINFALL   (mm)=  70.710
     RUNOFF COEFFICIENT   =    .356

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1231.993
| Ptotal= 81.99 mm |                          B=   7.975
--------------------                          C=    .809
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =   .49

                    The CORRELATION coefficient is =  .9995
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	155.00	154.92
10.	115.00	119.01
15.	99.00	97.58
30.	70.00	64.98
60.	40.00	40.57
120.	24.00	24.32
360.	9.70	10.35
720.	5.90	5.96
1440.	3.60	3.42

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	.67	6.08	1.22	12.08	17.98	18.08	1.16
.17	.67	6.17	1.24	12.17	14.30	18.17	1.15
.25	.68	6.25	1.26	12.25	11.89	18.25	1.14
.33	.68	6.33	1.27	12.33	10.18	18.33	1.12
.42	.69	6.42	1.29	12.42	8.91	18.42	1.11
.50	.69	6.50	1.31	12.50	7.93	18.50	1.10
.58	.69	6.58	1.32	12.58	7.16	18.58	1.09
.67	.70	6.67	1.34	12.67	6.53	18.67	1.08
.75	.70	6.75	1.36	12.75	6.00	18.75	1.07
.83	.71	6.83	1.38	12.83	5.56	18.83	1.06
.92	.71	6.92	1.40	12.92	5.19	18.92	1.05
1.00	.72	7.00	1.42	13.00	4.86	19.00	1.04
1.08	.72	7.08	1.44	13.08	4.58	19.08	1.03
1.17	.73	7.17	1.47	13.17	4.32	19.17	1.02
1.25	.73	7.25	1.49	13.25	4.10	19.25	1.01
1.33	.74	7.33	1.51	13.33	3.90	19.33	1.00
1.42	.74	7.42	1.54	13.42	3.72	19.42	.99
1.50	.75	7.50	1.56	13.50	3.56	19.50	.98
1.58	.75	7.58	1.59	13.58	3.41	19.58	.97
1.67	.76	7.67	1.62	13.67	3.28	19.67	.96
1.75	.76	7.75	1.65	13.75	3.16	19.75	.95
1.83	.77	7.83	1.68	13.83	3.04	19.83	.95
1.92	.77	7.92	1.71	13.92	2.94	19.92	.94
2.00	.78	8.00	1.74	14.00	2.84	20.00	.93
2.08	.78	8.08	1.78	14.08	2.75	20.08	.92
2.17	.79	8.17	1.81	14.17	2.66	20.17	.91
2.25	.79	8.25	1.85	14.25	2.59	20.25	.91
2.33	.80	8.33	1.89	14.33	2.51	20.33	.90
2.42	.81	8.42	1.93	14.42	2.44	20.42	.89
2.50	.81	8.50	1.97	14.50	2.38	20.50	.89
2.58	.82	8.58	2.02	14.58	2.32	20.58	.88
2.67	.82	8.67	2.06	14.67	2.26	20.67	.87
2.75	.83	8.75	2.11	14.75	2.20	20.75	.86
2.83	.84	8.83	2.17	14.83	2.15	20.83	.86
2.92	.84	8.92	2.22	14.92	2.10	20.92	.85
3.00	.85	9.00	2.28	15.00	2.05	21.00	.85
3.08	.86	9.08	2.34	15.08	2.01	21.08	.84
3.17	.86	9.17	2.41	15.17	1.97	21.17	.83
3.25	.87	9.25	2.48	15.25	1.93	21.25	.83
3.33	.88	9.33	2.56	15.33	1.89	21.33	.82
3.42	.89	9.42	2.64	15.42	1.85	21.42	.81
3.50	.89	9.50	2.72	15.50	1.81	21.50	.81
3.58	.90	9.58	2.82	15.58	1.78	21.58	.80
3.67	.91	9.67	2.92	15.67	1.75	21.67	.80

```
              3.75      .92 |  9.75    3.03 | 15.75    1.72 | 21.75      .79
              3.83      .92 |  9.83    3.14 | 15.83    1.69 | 21.83      .79
              3.92      .93 |  9.92    3.27 | 15.92    1.66 | 21.92      .78
              4.00      .94 | 10.00    3.41 | 16.00    1.63 | 22.00      .78
              4.08      .95 | 10.08    3.57 | 16.08    1.60 | 22.08      .77
              4.17      .96 | 10.17    3.74 | 16.17    1.58 | 22.17      .77
              4.25      .97 | 10.25    3.93 | 16.25    1.55 | 22.25      .76
              4.33      .98 | 10.33    4.14 | 16.33    1.53 | 22.33      .76
              4.42      .99 | 10.42    4.38 | 16.42    1.50 | 22.42      .75
              4.50     1.00 | 10.50    4.65 | 16.50    1.48 | 22.50      .75
              4.58     1.01 | 10.58    4.96 | 16.58    1.46 | 22.58      .74
              4.67     1.01 | 10.67    5.32 | 16.67    1.44 | 22.67      .74
              4.75     1.03 | 10.75    5.75 | 16.75    1.42 | 22.75      .73
              4.83     1.04 | 10.83    6.24 | 16.83    1.40 | 22.83      .73
              4.92     1.05 | 10.92    6.85 | 16.92    1.38 | 22.92      .72
              5.00     1.06 | 11.00    7.59 | 17.00    1.36 | 23.00      .72
              5.08     1.07 | 11.08    8.52 | 17.08    1.34 | 23.08      .71
              5.17     1.08 | 11.17    9.74 | 17.17    1.32 | 23.17      .71
              5.25     1.09 | 11.25   11.37 | 17.25    1.31 | 23.25      .71
              5.33     1.10 | 11.33   13.69 | 17.33    1.29 | 23.33      .70
              5.42     1.11 | 11.42   17.22 | 17.42    1.28 | 23.42      .70
              5.50     1.13 | 11.50   23.19 | 17.50    1.26 | 23.50      .69
              5.58     1.14 | 11.58   35.13 | 17.58    1.24 | 23.58      .69
              5.67     1.15 | 11.67   68.35 | 17.67    1.23 | 23.67      .68
              5.75     1.17 | 11.75  154.92 | 17.75    1.21 | 23.75      .68
              5.83     1.18 | 11.83   69.45 | 17.83    1.20 | 23.83      .68
              5.92     1.20 | 11.92   36.35 | 17.92    1.19 | 23.92      .67
              6.00     1.21 | 12.00   24.14 | 18.00    1.17 | 24.00      .67

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0021) |   Area    (ha)=   8.81   Curve Number   (CN)= 68.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=    .248

     PEAK FLOW       (cms)=    .177 (i)
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  29.453
     TOTAL RAINFALL   (mm)=  81.991
     RUNOFF COEFFICIENT   =    .359

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0027) |   Area    (ha)=    .68   Curve Number   (CN)= 72.2
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.91   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   2.0 MIN. TIME STEP.


                                ---- TRANSFORMED HYETOGRAPH ----
              TIME     RAIN |  TIME     RAIN |  TIME     RAIN |  TIME     RAIN
               hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr
              .033      .67 | 6.033    1.22 |12.033   17.98 | 18.03     1.16
              .067      .67 | 6.067    1.22 |12.067   17.98 | 18.07     1.16
              .100      .67 | 6.100    1.23 |12.100   16.13 | 18.10     1.15
              .133      .67 | 6.133    1.24 |12.133   14.30 | 18.13     1.15
              .167      .67 | 6.167    1.24 |12.167   14.30 | 18.17     1.15
              .200      .68 | 6.200    1.26 |12.200   11.89 | 18.20     1.14
              .233      .68 | 6.233    1.26 |12.233   11.89 | 18.23     1.14
              .267      .68 | 6.267    1.26 |12.267   11.03 | 18.27     1.13
              .300      .68 | 6.300    1.27 |12.300   10.18 | 18.30     1.12
              .333      .68 | 6.333    1.27 |12.333   10.18 | 18.33     1.12
              .367      .69 | 6.367    1.29 |12.367    8.91 | 18.37     1.11
              .400      .69 | 6.400    1.29 |12.400    8.91 | 18.40     1.11
              .433      .69 | 6.433    1.30 |12.433    8.42 | 18.43     1.11
              .467      .69 | 6.467    1.31 |12.467    7.93 | 18.47     1.10
              .500      .69 | 6.500    1.31 |12.500    7.93 | 18.50     1.10
              .533      .69 | 6.533    1.32 |12.533    7.16 | 18.53     1.09
              .567      .69 | 6.567    1.32 |12.567    7.16 | 18.57     1.09
              .600      .70 | 6.600    1.33 |12.600    6.84 | 18.60     1.08
              .633      .70 | 6.633    1.34 |12.633    6.53 | 18.63     1.08
              .667      .70 | 6.667    1.34 |12.667    6.53 | 18.67     1.08
              .700      .70 | 6.700    1.36 |12.700    6.00 | 18.70     1.07
              .733      .70 | 6.733    1.36 |12.733    6.00 | 18.73     1.07
              .767      .71 | 6.767    1.37 |12.767    5.78 | 18.77     1.06
              .800      .71 | 6.800    1.38 |12.800    5.56 | 18.80     1.06
              .833      .71 | 6.833    1.38 |12.833    5.56 | 18.83     1.06
              .867      .71 | 6.867    1.40 |12.867    5.19 | 18.87     1.05
              .900      .71 | 6.900    1.40 |12.900    5.19 | 18.90     1.05
              .933      .71 | 6.933    1.41 |12.933    5.02 | 18.93     1.04
              .967      .72 | 6.967    1.42 |12.967    4.86 | 18.97     1.04
```

1.000	.72	7.000	1.42	13.000	4.86	19.00	1.04
1.033	.72	7.033	1.44	13.033	4.58	19.03	1.03
1.067	.72	7.067	1.44	13.067	4.58	19.07	1.03
1.100	.72	7.100	1.46	13.100	4.45	19.10	1.02
1.133	.73	7.133	1.47	13.133	4.32	19.13	1.02
1.167	.73	7.167	1.47	13.167	4.32	19.17	1.02
1.200	.73	7.200	1.49	13.200	4.10	19.20	1.01
1.233	.73	7.233	1.49	13.233	4.10	19.23	1.01
1.267	.73	7.267	1.50	13.267	4.00	19.27	1.00
1.300	.74	7.300	1.51	13.300	3.90	19.30	1.00
1.333	.74	7.333	1.51	13.333	3.90	19.33	1.00
1.367	.74	7.367	1.54	13.367	3.72	19.37	.99
1.400	.74	7.400	1.54	13.400	3.72	19.40	.99
1.433	.74	7.433	1.55	13.433	3.64	19.43	.98
1.467	.75	7.467	1.56	13.467	3.56	19.47	.98
1.500	.75	7.500	1.56	13.500	3.56	19.50	.98
1.533	.75	7.533	1.59	13.533	3.41	19.53	.97
1.567	.75	7.567	1.59	13.567	3.41	19.57	.97
1.600	.75	7.600	1.60	13.600	3.35	19.60	.97
1.633	.76	7.633	1.62	13.633	3.28	19.63	.96
1.667	.76	7.667	1.62	13.667	3.28	19.67	.96
1.700	.76	7.700	1.65	13.700	3.16	19.70	.95
1.733	.76	7.733	1.65	13.733	3.16	19.73	.95
1.767	.76	7.767	1.66	13.767	3.10	19.77	.95
1.800	.77	7.800	1.68	13.800	3.04	19.80	.95
1.833	.77	7.833	1.68	13.833	3.04	19.83	.95
1.867	.77	7.867	1.71	13.867	2.94	19.87	.94
1.900	.77	7.900	1.71	13.900	2.94	19.90	.94
1.933	.77	7.933	1.73	13.933	2.89	19.93	.93
1.967	.78	7.967	1.74	13.967	2.84	19.97	.93
2.000	.78	8.000	1.74	14.000	2.84	20.00	.93
2.033	.78	8.033	1.78	14.033	2.75	20.03	.92
2.067	.78	8.067	1.78	14.067	2.75	20.07	.92
2.100	.79	8.100	1.79	14.100	2.71	20.10	.92
2.133	.79	8.133	1.81	14.133	2.66	20.13	.91
2.167	.79	8.167	1.81	14.167	2.66	20.17	.91
2.200	.79	8.200	1.85	14.200	2.59	20.20	.91
2.233	.79	8.233	1.85	14.233	2.59	20.23	.91
2.267	.80	8.267	1.87	14.267	2.55	20.27	.90
2.300	.80	8.300	1.89	14.300	2.51	20.30	.90
2.333	.80	8.333	1.89	14.333	2.51	20.33	.90
2.367	.81	8.367	1.93	14.367	2.44	20.37	.89
2.400	.81	8.400	1.93	14.400	2.44	20.40	.89
2.433	.81	8.433	1.95	14.433	2.41	20.43	.89
2.467	.81	8.467	1.97	14.467	2.38	20.47	.89
2.500	.81	8.500	1.97	14.500	2.38	20.50	.89
2.533	.82	8.533	2.02	14.533	2.32	20.53	.88
2.567	.82	8.567	2.02	14.567	2.32	20.57	.88
2.600	.82	8.600	2.04	14.600	2.29	20.60	.87
2.633	.82	8.633	2.06	14.633	2.26	20.63	.87
2.667	.82	8.667	2.06	14.667	2.26	20.67	.87
2.700	.83	8.700	2.11	14.700	2.20	20.70	.86
2.733	.83	8.733	2.11	14.733	2.20	20.73	.86
2.767	.83	8.767	2.14	14.767	2.18	20.77	.86
2.800	.84	8.800	2.17	14.800	2.15	20.80	.86
2.833	.84	8.833	2.17	14.833	2.15	20.83	.86
2.867	.84	8.867	2.22	14.867	2.10	20.87	.85
2.900	.84	8.900	2.22	14.900	2.10	20.90	.85
2.933	.85	8.933	2.25	14.933	2.08	20.93	.85
2.967	.85	8.967	2.28	14.967	2.05	20.97	.85
3.000	.85	9.000	2.28	15.000	2.05	21.00	.85
3.033	.86	9.033	2.34	15.033	2.01	21.03	.84
3.067	.86	9.067	2.34	15.067	2.01	21.07	.84
3.100	.86	9.100	2.38	15.100	1.99	21.10	.84
3.133	.86	9.133	2.41	15.133	1.97	21.13	.83
3.167	.86	9.167	2.41	15.167	1.97	21.17	.83
3.200	.87	9.200	2.48	15.200	1.93	21.20	.83
3.233	.87	9.233	2.48	15.233	1.93	21.23	.83
3.267	.88	9.267	2.52	15.267	1.91	21.27	.82
3.300	.88	9.300	2.56	15.300	1.89	21.30	.82
3.333	.88	9.333	2.56	15.333	1.89	21.33	.82
3.367	.89	9.367	2.64	15.367	1.85	21.37	.81
3.400	.89	9.400	2.64	15.400	1.85	21.40	.81
3.433	.89	9.433	2.68	15.433	1.83	21.43	.81
3.467	.89	9.467	2.72	15.467	1.81	21.47	.81
3.500	.89	9.500	2.72	15.500	1.81	21.50	.81
3.533	.90	9.533	2.82	15.533	1.78	21.53	.80
3.567	.90	9.567	2.82	15.567	1.78	21.57	.80
3.600	.90	9.600	2.87	15.600	1.76	21.60	.80
3.633	.91	9.633	2.92	15.633	1.75	21.63	.80
3.667	.91	9.667	2.92	15.667	1.75	21.67	.80
3.700	.92	9.700	3.03	15.700	1.72	21.70	.79
3.733	.92	9.733	3.03	15.733	1.72	21.73	.79
3.767	.92	9.767	3.08	15.767	1.70	21.77	.79
3.800	.92	9.800	3.14	15.800	1.69	21.80	.79
3.833	.92	9.833	3.14	15.833	1.69	21.83	.79
3.867	.93	9.867	3.27	15.867	1.66	21.87	.78
3.900	.93	9.900	3.27	15.900	1.66	21.90	.78
3.933	.94	9.933	3.34	15.933	1.64	21.93	.78

3.967	.94	9.967	3.41	15.967	1.63	21.97	.78
4.000	.94	10.000	3.41	16.000	1.63	22.00	.78
4.033	.95	10.033	3.57	16.033	1.60	22.03	.77
4.067	.95	10.067	3.57	16.067	1.60	22.07	.77
4.100	.95	10.100	3.65	16.100	1.59	22.10	.77
4.133	.96	10.133	3.74	16.133	1.58	22.13	.77
4.167	.96	10.167	3.74	16.167	1.58	22.17	.77
4.200	.97	10.200	3.93	16.200	1.55	22.20	.76
4.233	.97	10.233	3.93	16.233	1.55	22.23	.76
4.267	.97	10.267	4.04	16.267	1.54	22.27	.76
4.300	.98	10.300	4.14	16.300	1.53	22.30	.76
4.333	.98	10.333	4.14	16.333	1.53	22.33	.76
4.367	.99	10.367	4.38	16.367	1.50	22.37	.75
4.400	.99	10.400	4.38	16.400	1.50	22.40	.75
4.433	.99	10.433	4.52	16.433	1.49	22.43	.75
4.467	1.00	10.467	4.65	16.467	1.48	22.47	.75
4.500	1.00	10.500	4.65	16.500	1.48	22.50	.75
4.533	1.01	10.533	4.96	16.533	1.46	22.53	.74
4.567	1.01	10.567	4.96	16.567	1.46	22.57	.74
4.600	1.01	10.600	5.14	16.600	1.45	22.60	.74
4.633	1.01	10.633	5.32	16.633	1.44	22.63	.74
4.667	1.01	10.667	5.32	16.667	1.44	22.67	.74
4.700	1.03	10.700	5.75	16.700	1.42	22.70	.73
4.733	1.03	10.733	5.75	16.733	1.42	22.73	.73
4.767	1.03	10.767	6.00	16.767	1.41	22.77	.73
4.800	1.04	10.800	6.24	16.800	1.40	22.80	.73
4.833	1.04	10.833	6.25	16.833	1.40	22.83	.73
4.867	1.05	10.867	6.85	16.867	1.38	22.87	.72
4.900	1.05	10.900	6.85	16.900	1.38	22.90	.72
4.933	1.05	10.933	7.22	16.933	1.37	22.93	.72
4.967	1.06	10.967	7.59	16.967	1.36	22.97	.72
5.000	1.06	11.000	7.59	17.000	1.36	23.00	.72
5.033	1.07	11.033	8.52	17.033	1.34	23.03	.71
5.067	1.07	11.067	8.52	17.067	1.34	23.07	.71
5.100	1.07	11.100	9.13	17.100	1.33	23.10	.71
5.133	1.08	11.133	9.74	17.133	1.32	23.13	.71
5.167	1.08	11.167	9.74	17.167	1.32	23.17	.71
5.200	1.09	11.200	11.37	17.200	1.31	23.20	.71
5.233	1.09	11.233	11.37	17.233	1.31	23.23	.71
5.267	1.10	11.267	12.53	17.267	1.30	23.27	.70
5.300	1.10	11.300	13.69	17.300	1.29	23.30	.70
5.333	1.10	11.333	13.69	17.333	1.29	23.33	.70
5.367	1.11	11.367	17.22	17.367	1.28	23.37	.70
5.400	1.11	11.400	17.22	17.400	1.28	23.40	.70
5.433	1.12	11.433	20.21	17.433	1.27	23.43	.69
5.467	1.13	11.467	23.19	17.467	1.26	23.47	.69
5.500	1.13	11.500	23.21	17.500	1.26	23.50	.69
5.533	1.14	11.533	35.13	17.533	1.24	23.53	.69
5.567	1.14	11.567	35.13	17.567	1.24	23.57	.69
5.600	1.15	11.600	51.78	17.600	1.24	23.60	.69
5.633	1.15	11.633	68.35	17.633	1.23	23.63	.68
5.667	1.15	11.667	68.46	17.667	1.23	23.67	.68
5.700	1.17	11.700	154.92	17.700	1.21	23.70	.68
5.733	1.17	11.733	154.92	17.733	1.21	23.73	.68
5.767	1.17	11.767	112.07	17.767	1.21	23.77	.68
5.800	1.18	11.800	69.45	17.800	1.20	23.80	.68
5.833	1.18	11.833	69.40	17.833	1.20	23.83	.68
5.867	1.20	11.867	36.35	17.867	1.19	23.87	.67
5.900	1.20	11.900	36.35	17.900	1.19	23.90	.67
5.933	1.20	11.933	30.23	17.933	1.18	23.93	.67
5.967	1.21	11.967	24.14	17.967	1.17	23.97	.67
6.000	1.21	12.000	24.13	18.000	1.17	24.00	.67

```
     Unit Hyd Qpeak  (cms)=    .466

     PEAK FLOW       (cms)=    .106 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  33.683
     TOTAL RAINFALL   (mm)=  81.990
     RUNOFF COEFFICIENT   =    .411

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD    (0024) |   Area    (ha)=   5.03   Curve Number   (CN)= 72.5
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.75   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   2.433

     PEAK FLOW       (cms)=    .703 (i)
     TIME TO PEAK    (hrs)=  11.800
     RUNOFF VOLUME    (mm)=  24.837
     TOTAL RAINFALL   (mm)=  81.990
     RUNOFF COEFFICIENT   =    .303

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| NASHYD    (0022) |   Area    (ha)=   3.01   Curve Number   (CN)= 71.6
|ID= 1 DT= 2.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   2.069

     PEAK FLOW       (cms)=    .461 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  23.720
     TOTAL RAINFALL   (mm)=  81.990
     RUNOFF COEFFICIENT   =    .289

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0023) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .2156
                           .0001      .1117   |  20.0000      .2166

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0022)      3.01       .46     11.77      23.72
     OUTFLOW: ID= 1 (0023)      3.01       .00     13.60        .01

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .01
                  TIME SHIFT OF PEAK FLOW         (min)=110.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0713

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--------------------
| ADD HYD   (0026) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0024):     5.03    .703    11.80    24.84
        + ID2= 2 (0023):     3.01    .000    13.60      .01
          ==================================================
          ID = 3 (0026):     8.04    .703    11.80    15.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0025) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0003      .2171
                           .0001      .0498   |  20.0000      .2181
                           .0002      .1676   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0026)      8.04       .70     11.80      15.55
     OUTFLOW: ID= 1 (0025)      8.04       .00     13.70        .02

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .02
                  TIME SHIFT OF PEAK FLOW         (min)=114.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .1249

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--------------------
| ADD HYD   (0028) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0027):      .68    .106    11.77    33.68
        + ID2= 2 (0025):     8.04    .000    13.70      .02
          ==================================================
          ID = 3 (0028):     8.72    .106    11.77     2.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0029) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0898
                           .0001      .0455   |  20.0000      .0908
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                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0028)      8.72       .11     11.77       2.63
     OUTFLOW: ID= 1 (0029)      8.72       .00     24.17        .02

               PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .05
               TIME SHIFT OF PEAK FLOW         (min)=744.00
               MAXIMUM  STORAGE   USED       (ha.m.)=  .0228

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--------------------
| CALIB              |
| NASHYD    (0032) |   Area    (ha)=   6.71   Curve Number   (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .32

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	.67	6.083	1.22	12.083	17.98	18.08	1.16
.167	.67	6.167	1.24	12.167	14.30	18.17	1.15
.250	.68	6.250	1.26	12.250	11.89	18.25	1.14
.333	.68	6.333	1.27	12.333	10.18	18.33	1.12
.417	.69	6.417	1.29	12.417	8.91	18.42	1.11
.500	.69	6.500	1.31	12.500	7.93	18.50	1.10
.583	.69	6.583	1.32	12.583	7.16	18.58	1.09
.667	.70	6.667	1.34	12.667	6.53	18.67	1.08
.750	.70	6.750	1.36	12.750	6.00	18.75	1.07
.833	.71	6.833	1.38	12.833	5.56	18.83	1.06
.917	.71	6.917	1.40	12.917	5.19	18.92	1.05
1.000	.72	7.000	1.42	13.000	4.86	19.00	1.04
1.083	.72	7.083	1.44	13.083	4.58	19.08	1.03
1.167	.73	7.167	1.47	13.167	4.32	19.17	1.02
1.250	.73	7.250	1.49	13.250	4.10	19.25	1.01
1.333	.74	7.333	1.51	13.333	3.90	19.33	1.00
1.417	.74	7.417	1.54	13.417	3.72	19.42	.99
1.500	.75	7.500	1.56	13.500	3.56	19.50	.98
1.583	.75	7.583	1.59	13.583	3.41	19.58	.97
1.667	.76	7.667	1.62	13.667	3.28	19.67	.96
1.750	.76	7.750	1.65	13.750	3.16	19.75	.95
1.833	.77	7.833	1.68	13.833	3.04	19.83	.95
1.917	.77	7.917	1.71	13.917	2.94	19.92	.94
2.000	.78	8.000	1.74	14.000	2.84	20.00	.93
2.083	.78	8.083	1.78	14.083	2.75	20.08	.92
2.167	.79	8.167	1.81	14.167	2.66	20.17	.91
2.250	.79	8.250	1.85	14.250	2.59	20.25	.91
2.333	.80	8.333	1.89	14.333	2.51	20.33	.90
2.417	.81	8.417	1.93	14.417	2.44	20.42	.89
2.500	.81	8.500	1.97	14.500	2.38	20.50	.89
2.583	.82	8.583	2.02	14.583	2.32	20.58	.88
2.667	.82	8.667	2.06	14.667	2.26	20.67	.87
2.750	.83	8.750	2.11	14.750	2.20	20.75	.86
2.833	.84	8.833	2.17	14.833	2.15	20.83	.86
2.917	.84	8.917	2.22	14.917	2.10	20.92	.85
3.000	.85	9.000	2.28	15.000	2.05	21.00	.85
3.083	.86	9.083	2.34	15.083	2.01	21.08	.84
3.167	.86	9.167	2.41	15.167	1.97	21.17	.83
3.250	.87	9.250	2.48	15.250	1.93	21.25	.83
3.333	.88	9.333	2.56	15.333	1.89	21.33	.82
3.417	.89	9.417	2.64	15.417	1.85	21.42	.81
3.500	.89	9.500	2.72	15.500	1.81	21.50	.81
3.583	.90	9.583	2.82	15.583	1.78	21.58	.80
3.667	.91	9.667	2.92	15.667	1.75	21.67	.80
3.750	.92	9.750	3.03	15.750	1.72	21.75	.79
3.833	.92	9.833	3.14	15.833	1.69	21.83	.79
3.917	.93	9.917	3.27	15.917	1.66	21.92	.78
4.000	.94	10.000	3.41	16.000	1.63	22.00	.78
4.083	.95	10.083	3.57	16.083	1.60	22.08	.77
4.167	.96	10.167	3.74	16.167	1.58	22.17	.77
4.250	.97	10.250	3.93	16.250	1.55	22.25	.76
4.333	.98	10.333	4.14	16.333	1.53	22.33	.76
4.417	.99	10.417	4.38	16.417	1.50	22.42	.75
4.500	1.00	10.500	4.65	16.500	1.48	22.50	.75
4.583	1.01	10.583	4.96	16.583	1.46	22.58	.74
4.667	1.01	10.667	5.32	16.667	1.44	22.67	.74
4.750	1.03	10.750	5.75	16.750	1.42	22.75	.73
4.833	1.04	10.833	6.24	16.833	1.40	22.83	.73
4.917	1.05	10.917	6.85	16.917	1.38	22.92	.72
5.000	1.06	11.000	7.59	17.000	1.36	23.00	.72
5.083	1.07	11.083	8.52	17.083	1.34	23.08	.71
5.167	1.08	11.167	9.74	17.167	1.32	23.17	.71
5.250	1.09	11.250	11.37	17.250	1.31	23.25	.71
5.333	1.10	11.333	13.69	17.333	1.29	23.33	.70
5.417	1.11	11.417	17.22	17.417	1.28	23.42	.70
5.500	1.13	11.500	23.19	17.500	1.26	23.50	.69

```
              5.583    1.14 |11.583   35.13 |17.583    1.24 | 23.58     .69
              5.667    1.15 |11.667   68.35 |17.667    1.23 | 23.67     .68
              5.750    1.17 |11.750  154.91 |17.750    1.21 | 23.75     .68
              5.833    1.18 |11.833   69.46 |17.833    1.20 | 23.83     .68
              5.917    1.20 |11.917   36.35 |17.917    1.19 | 23.92     .67
              6.000    1.21 |12.000   24.14 |18.000    1.17 | 24.00     .00

     Unit Hyd Qpeak  (cms)=    .800

     PEAK FLOW       (cms)=    .322 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  25.036
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .306

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0030) |   Area    (ha)=   5.57   Curve Number   (CN)= 69.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.12   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   3.828

     PEAK FLOW       (cms)=    .719 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  25.427
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .310

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ROUTE CHN (0031) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                   .00        386.25          .0300
                 37.50        385.75      .0300 / .0300  Main Channel
                 47.50        385.75      .0300 / .0300  Main Channel
                 85.00        386.25          .0300

      <--------------------- TRAVEL TIME TABLE --------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   385.78    .150E+03        .1           .33      23.91
        .05   385.80    .350E+03        .3           .47      16.85
        .08   385.83    .599E+03        .7           .56      14.12
        .11   385.86    .898E+03       1.2           .63      12.62
        .13   385.88    .125E+04       1.8           .68      11.65
        .16   385.91    .164E+04       2.5           .73      10.95
        .18   385.93    .209E+04       3.3           .76      10.42
        .21   385.96    .259E+04       4.3           .80       9.99
        .24   385.99    .313E+04       5.4           .82       9.64
        .26   386.01    .373E+04       6.7           .85       9.33
        .29   386.04    .438E+04       8.0           .88       9.07
        .32   386.07    .507E+04       9.6           .90       8.83
        .34   386.09    .582E+04      11.2           .92       8.62
        .37   386.12    .661E+04      13.1           .94       8.43
        .39   386.14    .745E+04      15.1           .96       8.25
        .42   386.17    .835E+04      17.2           .98       8.08
        .45   386.20    .929E+04      19.5          1.00       7.93
        .47   386.22    .103E+05      22.0          1.02       7.79
        .50   386.25    .113E+05      24.7          1.04       7.65

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0030)    5.57      .72   11.75  25.43      .08       .56
     OUTFLOW: ID= 1 (0031)    5.57      .32   11.92  25.41      .05       .45


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--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0032):     6.71    .322    12.08    25.04
        + ID2= 2 (0031):     5.57    .323    11.92    25.41
          ==================================================
          ID = 3 (0033):    12.27    .598    11.92    25.20

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| CALIB            |
| NASHYD    (0036) |   Area    (ha)=   2.08   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.71   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=    .938

     PEAK FLOW       (cms)=    .219 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  26.826
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .327

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0034) |   Area    (ha)=   2.15   Curve Number   (CN)= 71.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.03   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .10

     Unit Hyd Qpeak  (cms)=    .795

     PEAK FLOW       (cms)=    .258 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  32.829
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .401

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0035) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.3) ------>
               Distance      Elevation       Manning
                    .00         388.25         .0300
                  30.00         387.75     .0300 / .0300  Main Channel
                  40.00         387.75     .0300 / .0300  Main Channel
                  70.00         388.25         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   387.78    .327E+02        .1           .41       4.35
        .05   387.80    .744E+02        .4           .59       3.03
        .08   387.83    .125E+03        .8           .71       2.52
        .11   387.86    .185E+03       1.4           .80       2.25
        .13   387.88    .253E+03       2.0           .87       2.07
        .16   387.91    .330E+03       2.8           .92       1.95
        .18   387.93    .417E+03       3.7           .97       1.85
        .21   387.96    .512E+03       4.8          1.01       1.78
        .24   387.99    .616E+03       6.0          1.04       1.72
        .26   388.01    .729E+03       7.3          1.07       1.67
        .29   388.04    .851E+03       8.7          1.10       1.63
        .32   388.07    .982E+03      10.3          1.13       1.59
        .34   388.09    .112E+04      12.0          1.15       1.56
        .37   388.12    .127E+04      13.9          1.17       1.53
        .39   388.14    .143E+04      15.9          1.19       1.50
        .42   388.17    .160E+04      18.0          1.21       1.48
        .45   388.20    .177E+04      20.3          1.23       1.45
        .47   388.22    .196E+04      22.8          1.25       1.43
        .50   388.25    .215E+04      25.4          1.27       1.41

                                       <---- hydrograph ---->   <-pipe / channel->
                                 AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                 (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0034)       2.15      .26   11.83  32.83      .04       .48
     OUTFLOW: ID= 1 (0035)       2.15      .23   11.83  32.83      .04       .46


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--------------------
| ADD HYD   (0037) |
|   1 +  2 =  3    |        AREA     QPEAK    TPEAK      R.V.
--------------------        (ha)     (cms)    (hrs)      (mm)
          ID1= 1 (0036):    2.08     .219    11.75     26.83
        + ID2= 2 (0035):    2.15     .231    11.83     32.83
          ==================================================
          ID = 3 (0037):    4.23     .438    11.83     29.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0039) |   Area    (ha)=  35.03   Curve Number   (CN)= 65.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.17   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.16

     Unit Hyd Qpeak  (cms)=   1.152

     PEAK FLOW       (cms)=    .719 (i)
     TIME TO PEAK    (hrs)=  13.083
     RUNOFF VOLUME    (mm)=  26.788
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .327

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0040) |   Area    (ha)=   3.95   Curve Number   (CN)= 54.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .40

     Unit Hyd Qpeak  (cms)=    .375

     PEAK FLOW       (cms)=    .114 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  17.946
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .219

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0041) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000       .0000   |    .0002       .1655
                          .0001       .0976   |  20.0000       .1665

                               AREA     QPEAK     TPEAK        R.V.
                               (ha)     (cms)     (hrs)        (mm)
     INFLOW : ID= 2 (0040)     3.95       .11     12.17       17.95
     OUTFLOW: ID= 1 (0041)     3.95       .00     25.33         .08

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .06
                   TIME SHIFT OF PEAK FLOW         (min)=790.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0706

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0044) |   Area    (ha)=    .87   Curve Number   (CN)= 64.6
|ID= 1 DT= 3.0 min |   Ia      (mm)=   6.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.050	.67	6.050	1.22	12.050	17.98	18.05	1.16
.100	.67	6.100	1.23	12.100	16.75	18.10	1.16
.150	.67	6.150	1.24	12.150	14.30	18.15	1.15
.200	.68	6.200	1.25	12.200	12.69	18.20	1.14
.250	.68	6.250	1.26	12.250	11.88	18.25	1.14
.300	.68	6.300	1.27	12.300	10.18	18.30	1.12
.350	.68	6.350	1.28	12.350	9.75	18.35	1.12
.400	.69	6.400	1.29	12.400	8.91	18.40	1.11
.450	.69	6.450	1.30	12.450	8.26	18.45	1.10
.500	.69	6.500	1.31	12.500	7.93	18.50	1.10
.550	.69	6.550	1.32	12.550	7.16	18.55	1.09
.600	.70	6.600	1.33	12.600	6.95	18.60	1.09
.650	.70	6.650	1.34	12.650	6.53	18.65	1.08
.700	.70	6.700	1.36	12.700	6.18	18.70	1.07
.750	.70	6.750	1.36	12.750	6.00	18.75	1.07
.800	.71	6.800	1.38	12.800	5.56	18.80	1.06
.850	.71	6.850	1.39	12.850	5.44	18.85	1.05
.900	.71	6.900	1.40	12.900	5.19	18.90	1.05
.950	.72	6.950	1.42	12.950	4.97	18.95	1.04
1.000	.72	7.000	1.42	13.000	4.86	19.00	1.04
1.050	.72	7.050	1.44	13.050	4.58	19.05	1.03
1.100	.72	7.100	1.45	13.100	4.49	19.10	1.02
1.150	.73	7.150	1.47	13.150	4.32	19.15	1.02
1.200	.73	7.200	1.48	13.200	4.18	19.20	1.01

1.250	.73	7.250	1.49	13.250	4.10	19.25	1.01
1.300	.74	7.300	1.51	13.300	3.90	19.30	1.00
1.350	.74	7.350	1.52	13.350	3.84	19.35	.99
1.400	.74	7.400	1.54	13.400	3.72	19.40	.99
1.450	.74	7.450	1.56	13.450	3.62	19.45	.98
1.500	.75	7.500	1.56	13.500	3.56	19.50	.98
1.550	.75	7.550	1.59	13.550	3.41	19.55	.97
1.600	.75	7.600	1.60	13.600	3.37	19.60	.97
1.650	.76	7.650	1.62	13.650	3.28	19.65	.96
1.700	.76	7.700	1.64	13.700	3.20	19.70	.96
1.750	.76	7.750	1.65	13.750	3.16	19.75	.95
1.800	.77	7.800	1.68	13.800	3.04	19.80	.95
1.850	.77	7.850	1.69	13.850	3.01	19.85	.94
1.900	.77	7.900	1.71	13.900	2.94	19.90	.94
1.950	.78	7.950	1.73	13.950	2.87	19.95	.93
2.000	.78	8.000	1.74	14.000	2.84	20.00	.93
2.050	.78	8.050	1.78	14.050	2.75	20.05	.92
2.100	.78	8.100	1.79	14.100	2.72	20.10	.92
2.150	.79	8.150	1.81	14.150	2.66	20.15	.91
2.200	.79	8.200	1.84	14.200	2.61	20.20	.91
2.250	.79	8.250	1.85	14.250	2.59	20.25	.91
2.300	.80	8.300	1.89	14.300	2.51	20.30	.90
2.350	.80	8.350	1.90	14.350	2.49	20.35	.90
2.400	.81	8.400	1.93	14.400	2.44	20.40	.89
2.450	.81	8.450	1.96	14.450	2.40	20.45	.89
2.500	.81	8.500	1.97	14.500	2.38	20.50	.89
2.550	.82	8.550	2.02	14.550	2.32	20.55	.88
2.600	.82	8.600	2.03	14.600	2.30	20.60	.88
2.650	.82	8.650	2.06	14.650	2.26	20.65	.87
2.700	.83	8.700	2.10	14.700	2.22	20.70	.87
2.750	.83	8.750	2.11	14.750	2.20	20.75	.86
2.800	.84	8.800	2.17	14.800	2.15	20.80	.86
2.850	.84	8.850	2.18	14.850	2.13	20.85	.86
2.900	.84	8.900	2.22	14.900	2.10	20.90	.85
2.950	.85	8.950	2.26	14.950	2.07	20.95	.85
3.000	.85	9.000	2.28	15.000	2.05	21.00	.85
3.050	.86	9.050	2.34	15.050	2.01	21.05	.84
3.100	.86	9.100	2.37	15.100	2.00	21.10	.84
3.150	.86	9.150	2.41	15.150	1.97	21.15	.83
3.200	.87	9.200	2.46	15.200	1.94	21.20	.83
3.250	.87	9.250	2.48	15.250	1.93	21.25	.83
3.300	.88	9.300	2.56	15.300	1.89	21.30	.82
3.350	.88	9.350	2.58	15.350	1.87	21.35	.82
3.400	.89	9.400	2.64	15.400	1.85	21.40	.81
3.450	.89	9.450	2.69	15.450	1.83	21.45	.81
3.500	.89	9.500	2.72	15.500	1.81	21.50	.81
3.550	.90	9.550	2.82	15.550	1.78	21.55	.80
3.600	.90	9.600	2.85	15.600	1.77	21.60	.80
3.650	.91	9.650	2.92	15.650	1.75	21.65	.80
3.700	.91	9.700	2.99	15.700	1.73	21.70	.79
3.750	.92	9.750	3.03	15.750	1.72	21.75	.79
3.800	.92	9.800	3.14	15.800	1.69	21.80	.79
3.850	.93	9.850	3.19	15.850	1.68	21.85	.78
3.900	.93	9.900	3.27	15.900	1.66	21.90	.78
3.950	.94	9.950	3.37	15.950	1.64	21.95	.78
4.000	.94	10.000	3.41	16.000	1.63	22.00	.78
4.050	.95	10.050	3.57	16.050	1.60	22.05	.77
4.100	.95	10.100	3.63	16.100	1.59	22.10	.77
4.150	.96	10.150	3.74	16.150	1.58	22.15	.77
4.200	.96	10.200	3.87	16.200	1.56	22.20	.76
4.250	.97	10.250	3.93	16.250	1.55	22.25	.76
4.300	.98	10.300	4.14	16.300	1.53	22.30	.76
4.350	.98	10.350	4.22	16.350	1.52	22.35	.75
4.400	.99	10.400	4.38	16.400	1.50	22.40	.75
4.450	.99	10.450	4.56	16.450	1.49	22.45	.75
4.500	1.00	10.500	4.65	16.500	1.48	22.50	.75
4.550	1.01	10.550	4.96	16.550	1.46	22.55	.74
4.600	1.01	10.600	5.08	16.600	1.45	22.60	.74
4.650	1.01	10.650	5.32	16.650	1.44	22.65	.74
4.700	1.02	10.700	5.61	16.700	1.42	22.70	.73
4.750	1.03	10.750	5.75	16.750	1.42	22.75	.73
4.800	1.04	10.800	6.24	16.800	1.40	22.80	.73
4.850	1.04	10.850	6.45	16.850	1.39	22.85	.73
4.900	1.05	10.900	6.85	16.900	1.38	22.90	.72
4.950	1.05	10.950	7.34	16.950	1.37	22.95	.72
5.000	1.06	11.000	7.59	17.000	1.36	23.00	.72
5.050	1.07	11.050	8.52	17.050	1.34	23.05	.71
5.100	1.07	11.100	8.93	17.100	1.34	23.10	.71
5.150	1.08	11.150	9.74	17.150	1.32	23.15	.71
5.200	1.09	11.200	10.83	17.200	1.31	23.20	.71
5.250	1.09	11.250	11.37	17.250	1.31	23.25	.71
5.300	1.10	11.300	13.69	17.300	1.29	23.30	.70
5.350	1.11	11.350	14.87	17.350	1.29	23.35	.70
5.400	1.11	11.400	17.22	17.400	1.28	23.40	.70
5.450	1.12	11.450	21.21	17.450	1.26	23.45	.69
5.500	1.13	11.500	23.20	17.500	1.26	23.50	.69
5.550	1.14	11.550	35.13	17.550	1.24	23.55	.69
5.600	1.14	11.600	46.22	17.600	1.24	23.60	.69
5.650	1.15	11.650	68.35	17.650	1.23	23.65	.68

```
              5.700    1.16 |11.700  126.11 |17.700    1.22 | 23.70     .68
              5.750    1.17 |11.750  154.87 |17.750    1.21 | 23.75     .68
              5.800    1.18 |11.800   69.45 |17.800    1.20 | 23.80     .68
              5.850    1.19 |11.850   58.40 |17.850    1.20 | 23.85     .68
              5.900    1.20 |11.900   36.35 |17.900    1.19 | 23.90     .67
              5.950    1.20 |11.950   28.21 |17.950    1.18 | 23.95     .67
              6.000    1.21 |12.000   24.14 |18.000    1.17 | 24.00     .67

     Unit Hyd Qpeak  (cms)=    .596

     PEAK FLOW       (cms)=    .104 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  25.555
     TOTAL RAINFALL   (mm)=  81.990
     RUNOFF COEFFICIENT   =    .312

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0042) |   Area    (ha)=    .56   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .382

     PEAK FLOW       (cms)=    .081 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  28.843
     TOTAL RAINFALL   (mm)=  81.990
     RUNOFF COEFFICIENT   =    .352

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0043) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0002      .0357
                          .0001      .0118    |  20.0000      .0367

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0042)     .56       .08     11.75      28.84
     OUTFLOW: ID= 1 (0043)     .56       .00     20.10        .60

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .14
                   TIME SHIFT OF PEAK FLOW        (min)=501.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0157

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0045) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0044):      .87    .104    11.75    25.55
        + ID2= 2 (0043):      .56    .000    20.10      .60
          ==================================================
          ID = 3 (0045):     1.42    .104    11.75    15.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0046) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0002      .1073
                          .0001      .0117    |  20.0000      .1083

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0045)    1.42       .10     11.75      15.81
     OUTFLOW: ID= 1 (0046)    1.42       .00     24.10        .34

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .11
                   TIME SHIFT OF PEAK FLOW        (min)=741.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0220

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0047) |   Area    (ha)=    .48   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .331

     PEAK FLOW       (cms)=    .070 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  28.843
     TOTAL RAINFALL   (mm)=  81.990
     RUNOFF COEFFICIENT   =    .352

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0048) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0731
                           .0001      .0496   |  20.0000      .0741

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0047)       .48       .07     11.75      28.84
     OUTFLOW: ID= 1 (0048)       .48       .00     20.15        .15

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=504.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0138

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0049) |   Area    (ha)=   2.77   Curve Number   (CN)= 70.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.35   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	.67	6.083	1.22	12.083	17.98	18.08	1.16
.167	.67	6.167	1.24	12.167	14.30	18.17	1.15
.250	.68	6.250	1.26	12.250	11.89	18.25	1.14
.333	.68	6.333	1.27	12.333	10.18	18.33	1.12
.417	.69	6.417	1.29	12.417	8.91	18.42	1.11
.500	.69	6.500	1.31	12.500	7.93	18.50	1.10
.583	.69	6.583	1.32	12.583	7.16	18.58	1.09
.667	.70	6.667	1.34	12.667	6.53	18.67	1.08
.750	.70	6.750	1.36	12.750	6.00	18.75	1.07
.833	.71	6.833	1.38	12.833	5.56	18.83	1.06
.917	.71	6.917	1.40	12.917	5.19	18.92	1.05
1.000	.72	7.000	1.42	13.000	4.86	19.00	1.04
1.083	.72	7.083	1.44	13.083	4.58	19.08	1.03
1.167	.73	7.167	1.47	13.167	4.32	19.17	1.02
1.250	.73	7.250	1.49	13.250	4.10	19.25	1.01
1.333	.74	7.333	1.51	13.333	3.90	19.33	1.00
1.417	.74	7.417	1.54	13.417	3.72	19.42	.99
1.500	.75	7.500	1.56	13.500	3.56	19.50	.98
1.583	.75	7.583	1.59	13.583	3.41	19.58	.97
1.667	.76	7.667	1.62	13.667	3.28	19.67	.96
1.750	.76	7.750	1.65	13.750	3.16	19.75	.95
1.833	.77	7.833	1.68	13.833	3.04	19.83	.95
1.917	.77	7.917	1.71	13.917	2.94	19.92	.94
2.000	.78	8.000	1.74	14.000	2.84	20.00	.93
2.083	.78	8.083	1.78	14.083	2.75	20.08	.92
2.167	.79	8.167	1.81	14.167	2.66	20.17	.91
2.250	.79	8.250	1.85	14.250	2.59	20.25	.91
2.333	.80	8.333	1.89	14.333	2.51	20.33	.90
2.417	.81	8.417	1.93	14.417	2.44	20.42	.89
2.500	.81	8.500	1.97	14.500	2.38	20.50	.89
2.583	.82	8.583	2.02	14.583	2.32	20.58	.88
2.667	.82	8.667	2.06	14.667	2.26	20.67	.87
2.750	.83	8.750	2.11	14.750	2.20	20.75	.86
2.833	.84	8.833	2.17	14.833	2.15	20.83	.86
2.917	.84	8.917	2.22	14.917	2.10	20.92	.85
3.000	.85	9.000	2.28	15.000	2.05	21.00	.85
3.083	.86	9.083	2.34	15.083	2.01	21.08	.84
3.167	.86	9.167	2.41	15.167	1.97	21.17	.83
3.250	.87	9.250	2.48	15.250	1.93	21.25	.83
3.333	.88	9.333	2.56	15.333	1.89	21.33	.82
3.417	.89	9.417	2.64	15.417	1.85	21.42	.81
3.500	.89	9.500	2.72	15.500	1.81	21.50	.81
3.583	.90	9.583	2.82	15.583	1.78	21.58	.80
3.667	.91	9.667	2.92	15.667	1.75	21.67	.80
3.750	.92	9.750	3.03	15.750	1.72	21.75	.79
3.833	.92	9.833	3.14	15.833	1.69	21.83	.79

```
              3.917     .93 | 9.917    3.27 |15.917    1.66 | 21.92     .78
              4.000     .94 |10.000    3.41 |16.000    1.63 | 22.00     .78
              4.083     .95 |10.083    3.57 |16.083    1.60 | 22.08     .77
              4.167     .96 |10.167    3.74 |16.167    1.58 | 22.17     .77
              4.250     .97 |10.250    3.93 |16.250    1.55 | 22.25     .76
              4.333     .98 |10.333    4.14 |16.333    1.53 | 22.33     .76
              4.417     .99 |10.417    4.38 |16.417    1.50 | 22.42     .75
              4.500    1.00 |10.500    4.65 |16.500    1.48 | 22.50     .75
              4.583    1.01 |10.583    4.96 |16.583    1.46 | 22.58     .74
              4.667    1.01 |10.667    5.32 |16.667    1.44 | 22.67     .74
              4.750    1.03 |10.750    5.75 |16.750    1.42 | 22.75     .73
              4.833    1.04 |10.833    6.24 |16.833    1.40 | 22.83     .73
              4.917    1.05 |10.917    6.85 |16.917    1.38 | 22.92     .72
              5.000    1.06 |11.000    7.59 |17.000    1.36 | 23.00     .72
              5.083    1.07 |11.083    8.52 |17.083    1.34 | 23.08     .71
              5.167    1.08 |11.167    9.74 |17.167    1.32 | 23.17     .71
              5.250    1.09 |11.250   11.37 |17.250    1.31 | 23.25     .71
              5.333    1.10 |11.333   13.69 |17.333    1.29 | 23.33     .70
              5.417    1.11 |11.417   17.22 |17.417    1.28 | 23.42     .70
              5.500    1.13 |11.500   23.19 |17.500    1.26 | 23.50     .69
              5.583    1.14 |11.583   35.13 |17.583    1.24 | 23.58     .69
              5.667    1.15 |11.667   68.35 |17.667    1.23 | 23.67     .68
              5.750    1.17 |11.750  154.91 |17.750    1.21 | 23.75     .68
              5.833    1.18 |11.833   69.46 |17.833    1.20 | 23.83     .68
              5.917    1.20 |11.917   36.35 |17.917    1.19 | 23.92     .67
              6.000    1.21 |12.000   24.14 |18.000    1.17 | 24.00     .00

     Unit Hyd Qpeak  (cms)=    .952

     PEAK FLOW       (cms)=    .314 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  31.708
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .387

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0055) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .650 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  35.011
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .427

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0052) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .488 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  29.428
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .359

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0050) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=    .931 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  28.306
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .345

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0051) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |  20.0000      .1583
                          .0001      .1573    |    .0000      .0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)     11.96       .93     11.92      28.31
     OUTFLOW: ID= 1 (0051)     11.96       .82     12.25      15.15

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 88.17
                   TIME SHIFT OF PEAK FLOW         (min)= 20.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .2453

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--------------------
| ADD HYD   (0053) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0052):      3.90    .488    11.75    29.43
        + ID2= 2 (0051):     11.96    .821    12.25    15.15
          =================================================
          ID = 3 (0053):     15.86    .895    12.25    18.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0054) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |  20.0000      .0771
                          .0001      .0761    |    .0000      .0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0053)     15.86       .90     12.25      18.66
     OUTFLOW: ID= 1 (0054)     15.86       .59     12.33      13.86

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 65.67
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .2569

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0056) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (    1.5) ------>
               Distance      Elevation       Manning
                    .00        425.00          .0300
                    .75        424.25      .0300 / .0300  Main Channel
                   1.75        424.25      .0300 / .0300  Main Channel
                   2.50        425.00          .0300

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .04   424.29    .145E+02       .0            .68       8.63
        .08   424.33    .302E+02       .1           1.05       5.61
        .12   424.37    .469E+02       .2           1.33       4.42
        .16   424.41    .647E+02       .3           1.57       3.76
        .20   424.45    .837E+02       .4           1.77       3.34
        .24   424.49    .104E+03       .6           1.94       3.04
        .28   424.53    .125E+03       .7           2.10       2.81
        .32   424.57    .147E+03       .9           2.23       2.64
        .36   424.61    .170E+03      1.1           2.36       2.50
        .39   424.64    .195E+03      1.4           2.47       2.39
        .43   424.68    .220E+03      1.6           2.57       2.30
        .47   424.72    .247E+03      1.9           2.66       2.22
        .51   424.76    .275E+03      2.1           2.75       2.15
        .55   424.80    .304E+03      2.4           2.83       2.09
        .59   424.84    .334E+03      2.7           2.90       2.04
        .63   424.88    .365E+03      3.1           2.97       1.99
        .67   424.92    .397E+03      3.4           3.03       1.95
        .71   424.96    .430E+03      3.8           3.09       1.91
        .75   425.00    .465E+03      4.1           3.14       1.88

                                     <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                             (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0054)   15.86     .59   12.33  13.86        .24      1.96
     OUTFLOW: ID= 1 (0056)   15.86     .45   12.33  13.86        .20      1.80
```

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--------------------
| ADD HYD   (0057) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0055):      5.19    .650    11.83    35.01
        + ID2= 2 (0056):     15.86    .446    12.33    13.86
          ==================================================
          ID = 3 (0057):     21.05    .650    11.83    19.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0058) |   Area    (ha)=  21.77   Curve Number   (CN)= 67.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   2.354

     PEAK FLOW       (cms)=   1.168 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  29.525
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .360

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0059) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=    .931 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  28.306
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .345

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0060) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |  20.0000      .1583
                           .0001      .1573    |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0059)     11.96       .93     11.92      28.31
     OUTFLOW: ID= 1 (0060)     11.96       .82     12.25      15.15

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 88.17
                   TIME SHIFT OF PEAK FLOW        (min)= 20.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .2453

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0061) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .488 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  29.428
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .359

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0062) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
```

```
         ID1= 1 (0060):    11.96    .821    12.25    15.15
       + ID2= 2 (0061):     3.90    .488    11.75    29.43
         ==================================================
         ID = 3 (0062):    15.86    .895    12.25    18.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| RESERVOIR (0063) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000       .0000   |  20.0000      .0771
                          .0001       .0761   |    .0000      .0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0062)     15.86      .90     12.25      18.66
     OUTFLOW: ID= 1 (0063)     15.86      .59     12.33      13.86

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 65.67
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .2569

------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0065) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
              <------ DATA FOR SECTION (   1.5) ------>
              Distance      Elevation       Manning
                  .00         425.00         .0300
                  .75         424.25      .0300 / .0300  Main Channel
                 1.75         424.25      .0300 / .0300  Main Channel
                 2.50         425.00         .0300

        <--------------------- TRAVEL TIME TABLE ---------------------->
         DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
          (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
          .04   424.29    .145E+02        .0           .68       8.63
          .08   424.33    .302E+02        .1          1.05       5.61
          .12   424.37    .469E+02        .2          1.33       4.42
          .16   424.41    .647E+02        .3          1.57       3.76
          .20   424.45    .837E+02        .4          1.77       3.34
          .24   424.49    .104E+03        .6          1.94       3.04
          .28   424.53    .125E+03        .7          2.10       2.81
          .32   424.57    .147E+03        .9          2.23       2.64
          .36   424.61    .170E+03       1.1          2.36       2.50
          .39   424.64    .195E+03       1.4          2.47       2.39
          .43   424.68    .220E+03       1.6          2.57       2.30
          .47   424.72    .247E+03       1.9          2.66       2.22
          .51   424.76    .275E+03       2.1          2.75       2.15
          .55   424.80    .304E+03       2.4          2.83       2.09
          .59   424.84    .334E+03       2.7          2.90       2.04
          .63   424.88    .365E+03       3.1          2.97       1.99
          .67   424.92    .397E+03       3.4          3.03       1.95
          .71   424.96    .430E+03       3.8          3.09       1.91
          .75   425.00    .465E+03       4.1          3.14       1.88

                                       <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK    R.V.    MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)    (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0063)   15.86      .59   12.33   13.86       .24       1.96
     OUTFLOW: ID= 1 (0065)   15.86      .45   12.33   13.86       .20       1.80


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--------------------
| CALIB            |
| NASHYD    (0064) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .650 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  35.011
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .427

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0066) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
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```
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0065):    15.86    .446    12.33    13.86
        + ID2= 2 (0064):     5.19    .650    11.83    35.01
          ==============================================
          ID = 3 (0066):    21.05    .650    11.83    19.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0069) |   Area    (ha)=   1.80   Curve Number   (CN)= 58.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.005

     PEAK FLOW       (cms)=    .154 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  19.445
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .237

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD    (0067) |   Area    (ha)=   1.52   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .995

     PEAK FLOW       (cms)=    .148 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  20.147
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .246

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0068) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0207
                           .0001      .0206   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0067)      1.52       .15     11.75      20.15
     OUTFLOW: ID= 1 (0068)      1.52       .01     13.17       6.62

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.16
                   TIME SHIFT OF PEAK FLOW         (min)= 85.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0210

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--------------------
| ADD HYD   (0071) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0069):     1.80    .154    11.75    19.44
        + ID2= 2 (0068):     1.52    .008    13.17     6.62
          ==============================================
          ID = 3 (0071):     3.32    .154    11.75    13.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0070) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0708
                           .0001      .0707   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0071)      3.32       .15     11.75      13.57
     OUTFLOW: ID= 1 (0070)      3.32       .00     24.17        .07

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=745.00
```

```
                 MAXIMUM  STORAGE   USED       (ha.m.)=  .0448

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0073) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
             <------ DATA FOR SECTION (   1.6) ------>
             Distance      Elevation       Manning
                  .00        421.26         .0300
                 1.10        420.66     .0300 / .0300  Main Channel
                 2.00        420.66     .0300 / .0300  Main Channel
                 3.10        421.26         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)      (cu.m.)      (cms)        (m/s)      (min)
        .03   420.69    .560E+01        .0            .05      59.24
        .06   420.72    .119E+02        .0            .09      35.98
        .09   420.75    .188E+02        .0            .12      26.61
        .13   420.79    .265E+02        .0            .14      21.37
        .16   420.82    .348E+02        .0            .17      17.97
        .19   420.85    .437E+02        .0            .20      15.58
        .22   420.88    .534E+02        .1            .22      13.79
        .25   420.91    .637E+02        .1            .25      12.40
        .28   420.94    .748E+02        .1            .27      11.29
        .32   420.98    .864E+02        .1            .30      10.38
        .35   421.01    .988E+02        .2            .32       9.61
        .38   421.04    .112E+03        .2            .34       8.96
        .41   421.07    .126E+03        .2            .37       8.41
        .44   421.10    .140E+03        .3            .39       7.92
        .47   421.13    .155E+03        .3            .41       7.50
        .51   421.17    .171E+03        .4            .43       7.12
        .54   421.20    .187E+03        .5            .45       6.78
        .57   421.23    .204E+03        .5            .48       6.48
        .60   421.26    .222E+03        .6            .50       6.21

                                  <---- hydrograph ---->   <-pipe / channel->
                            AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                            (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0070)   3.32      .00   24.17    .07       .00       .05
     OUTFLOW: ID= 1 (0073)   3.32      .00   24.17    .06       .00       .05


--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0074) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0066):    21.05    .650    11.83    19.08
        + ID2= 2 (0073):     3.32    .000    24.17      .06
          ==================================================
          ID = 3 (0074):    24.37    .650    11.83    16.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0072) |   Area    (ha)=  24.19   Curve Number   (CN)= 60.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .37

     Unit Hyd Qpeak  (cms)=   2.505

     PEAK FLOW       (cms)=    .921 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  22.116
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .270

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0075) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0074):    24.37    .650    11.83    16.49
        + ID2= 2 (0072):    24.19    .921    12.17    22.12
          ==================================================
          ID = 3 (0075):    48.56   1.370    12.33    19.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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```
| CALIB              |
| NASHYD    (0076) |   Area    (ha)= 127.28   Curve Number   (CN)= 59.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.29   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .79

     Unit Hyd Qpeak  (cms)=   6.192

     PEAK FLOW       (cms)=   2.872 (i)
     TIME TO PEAK    (hrs)=  12.667
     RUNOFF VOLUME    (mm)=  22.263
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .272

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0077) |   Area    (ha)=  17.28   Curve Number   (CN)= 58.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.24   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=   1.154

     PEAK FLOW       (cms)=    .455 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=  20.780
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .254

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0082) |   Area    (ha)=    .24   Curve Number   (CN)= 77.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .081

     PEAK FLOW       (cms)=    .034 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  39.838
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .486

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0078) |   Area    (ha)=   2.66   Curve Number   (CN)= 59.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.55   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.418

     PEAK FLOW       (cms)=    .231 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  20.255
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .247

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0079) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |  20.0000      .0608
                          .0001      .0607    |    .0000      .0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0078)     2.66       .23     11.75      20.25
     OUTFLOW: ID= 1 (0079)     2.66       .00     24.17        .13

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW        (min)=745.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0535

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--------------------
| ADD HYD   (0083) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
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```
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0082):       .24    .034    11.83    39.84
        + ID2= 2 (0079):      2.66    .000    24.17      .13
          ==================================================
          ID = 3 (0083):      2.90    .034    11.83     3.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0080) |   Area    (ha)=  14.63   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.37   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=    .977

     PEAK FLOW       (cms)=    .381 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=  20.553
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .251

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0081) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0083):      2.90    .034    11.83     3.38
        + ID2= 2 (0080):     14.63    .381    12.42    20.55
          ==================================================
          ID = 3 (0081):     17.52    .386    12.33    17.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0084) |   Area    (ha)=   7.71   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.14   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=   1.012

     PEAK FLOW       (cms)=    .365 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  23.487
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .287

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0085) |   Area    (ha)=    .91   Curve Number   (CN)= 64.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.53   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .313

     PEAK FLOW       (cms)=    .080 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  25.089
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .306

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0086) |   Area    (ha)=  19.15   Curve Number   (CN)= 71.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.81   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=   2.995

     PEAK FLOW       (cms)=   1.438 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  32.434
     TOTAL RAINFALL   (mm)=  81.935
     RUNOFF COEFFICIENT   =    .396

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1649.671
| Ptotal= 94.15 mm |                          B=   9.457
--------------------                          C=    .830
                      used in:   INTENSITY =  A / (t + B)^C

                      Duration of storm  = 24.00 hrs
                      Storm time step    =  5.00 min
                      Time to peak ratio =   .49

                  The CORRELATION coefficient is =  .9992
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	180.00	179.69
10.	135.00	140.43
15.	117.00	116.15
30.	85.00	78.09
60.	49.00	48.84
120.	29.00	29.13
360.	11.00	12.20
720.	6.90	6.94
1440.	4.20	3.92

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	.69	6.08	1.29	12.08	21.88	18.08	1.22
.17	.69	6.17	1.31	12.17	17.23	18.17	1.21
.25	.70	6.25	1.33	12.25	14.18	18.25	1.19
.33	.70	6.33	1.34	12.33	12.04	18.33	1.18
.42	.71	6.42	1.36	12.42	10.46	18.42	1.17
.50	.71	6.50	1.38	12.50	9.25	18.50	1.15
.58	.72	6.58	1.40	12.58	8.29	18.58	1.14
.67	.72	6.67	1.42	12.67	7.52	18.67	1.13
.75	.73	6.75	1.44	12.75	6.88	18.75	1.12
.83	.73	6.83	1.46	12.83	6.34	18.83	1.11
.92	.74	6.92	1.49	12.92	5.89	18.92	1.10
1.00	.74	7.00	1.51	13.00	5.50	19.00	1.08
1.08	.75	7.08	1.53	13.08	5.16	19.08	1.07
1.17	.75	7.17	1.56	13.17	4.86	19.17	1.06
1.25	.76	7.25	1.58	13.25	4.59	19.25	1.05
1.33	.76	7.33	1.61	13.33	4.36	19.33	1.04
1.42	.77	7.42	1.64	13.42	4.15	19.42	1.03
1.50	.77	7.50	1.67	13.50	3.96	19.50	1.02
1.58	.78	7.58	1.70	13.58	3.78	19.58	1.01
1.67	.78	7.67	1.73	13.67	3.63	19.67	1.00
1.75	.79	7.75	1.76	13.75	3.48	19.75	1.00
1.83	.79	7.83	1.79	13.83	3.35	19.83	.99
1.92	.80	7.92	1.83	13.92	3.23	19.92	.98
2.00	.81	8.00	1.86	14.00	3.11	20.00	.97
2.08	.81	8.08	1.90	14.08	3.01	20.08	.96
2.17	.82	8.17	1.94	14.17	2.91	20.17	.95
2.25	.82	8.25	1.98	14.25	2.82	20.25	.94
2.33	.83	8.33	2.03	14.33	2.74	20.33	.94
2.42	.84	8.42	2.07	14.42	2.66	20.42	.93
2.50	.84	8.50	2.12	14.50	2.58	20.50	.92
2.58	.85	8.58	2.17	14.58	2.51	20.58	.91
2.67	.86	8.67	2.23	14.67	2.45	20.67	.91
2.75	.86	8.75	2.28	14.75	2.38	20.75	.90
2.83	.87	8.83	2.34	14.83	2.32	20.83	.89
2.92	.88	8.92	2.41	14.92	2.27	20.92	.89
3.00	.88	9.00	2.47	15.00	2.22	21.00	.88
3.08	.89	9.08	2.54	15.08	2.16	21.08	.87
3.17	.90	9.17	2.62	15.17	2.12	21.17	.86
3.25	.91	9.25	2.70	15.25	2.07	21.25	.86
3.33	.91	9.33	2.79	15.33	2.03	21.33	.85
3.42	.92	9.42	2.88	15.42	1.99	21.42	.85
3.50	.93	9.50	2.98	15.50	1.95	21.50	.84
3.58	.94	9.58	3.09	15.58	1.91	21.58	.83
3.67	.95	9.67	3.20	15.67	1.87	21.67	.83
3.75	.96	9.75	3.33	15.75	1.84	21.75	.82
3.83	.96	9.83	3.47	15.83	1.80	21.83	.82
3.92	.97	9.92	3.62	15.92	1.77	21.92	.81
4.00	.98	10.00	3.78	16.00	1.74	22.00	.80
4.08	.99	10.08	3.96	16.08	1.71	22.08	.80
4.17	1.00	10.17	4.16	16.17	1.68	22.17	.79
4.25	1.01	10.25	4.39	16.25	1.65	22.25	.79
4.33	1.02	10.33	4.64	16.33	1.62	22.33	.78
4.42	1.03	10.42	4.93	16.42	1.60	22.42	.78
4.50	1.04	10.50	5.25	16.50	1.57	22.50	.77
4.58	1.05	10.58	5.62	16.58	1.55	22.58	.77
4.67	1.06	10.67	6.06	16.67	1.53	22.67	.76
4.75	1.07	10.75	6.57	16.75	1.50	22.75	.76

4.83	1.08	10.83	7.17	16.83	1.48	22.83	.75
4.92	1.10	10.92	7.91	16.92	1.46	22.92	.75
5.00	1.11	11.00	8.82	17.00	1.44	23.00	.74
5.08	1.12	11.08	9.98	17.08	1.42	23.08	.74
5.17	1.13	11.17	11.49	17.17	1.40	23.17	.73
5.25	1.14	11.25	13.53	17.25	1.38	23.25	.73
5.33	1.16	11.33	16.46	17.33	1.36	23.33	.72
5.42	1.17	11.42	20.92	17.42	1.35	23.42	.72
5.50	1.18	11.50	28.48	17.50	1.33	23.50	.71
5.58	1.20	11.58	43.48	17.58	1.31	23.58	.71
5.67	1.21	11.67	83.71	17.67	1.30	23.67	.71
5.75	1.23	11.75	179.69	17.75	1.28	23.75	.70
5.83	1.24	11.83	85.03	17.83	1.26	23.83	.70
5.92	1.26	11.92	45.00	17.92	1.25	23.92	.69
6.00	1.27	12.00	29.68	18.00	1.23	24.00	.69

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--------------------
| CALIB             |
| NASHYD    (0021)  |   Area    (ha)=   8.81   Curve Number   (CN)= 68.3
|ID= 1 DT= 5.0 min  |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=    .248

     PEAK FLOW       (cms)=    .235 (i)
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  37.356
     TOTAL RAINFALL   (mm)=  94.147
     RUNOFF COEFFICIENT   =    .397

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0027)  |   Area    (ha)=    .68   Curve Number   (CN)= 72.2
|ID= 1 DT= 2.0 min  |   Ia      (mm)=   4.91   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   2.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.033	.69	6.033	1.29	12.033	21.88	18.03	1.22
.067	.69	6.067	1.29	12.067	21.88	18.07	1.22
.100	.69	6.100	1.30	12.100	19.55	18.10	1.21
.133	.69	6.133	1.31	12.133	17.23	18.13	1.21
.167	.69	6.167	1.31	12.167	17.23	18.17	1.21
.200	.70	6.200	1.33	12.200	14.18	18.20	1.19
.233	.70	6.233	1.33	12.233	14.18	18.23	1.19
.267	.70	6.267	1.33	12.267	13.11	18.27	1.19
.300	.70	6.300	1.34	12.300	12.04	18.30	1.18
.333	.70	6.333	1.34	12.333	12.04	18.33	1.18
.367	.71	6.367	1.36	12.367	10.46	18.37	1.17
.400	.71	6.400	1.36	12.400	10.46	18.40	1.17
.433	.71	6.433	1.37	12.433	9.85	18.43	1.16
.467	.71	6.467	1.38	12.467	9.25	18.47	1.15
.500	.71	6.500	1.38	12.500	9.25	18.50	1.15
.533	.72	6.533	1.40	12.533	8.29	18.53	1.14
.567	.72	6.567	1.40	12.567	8.29	18.57	1.14
.600	.72	6.600	1.41	12.600	7.90	18.60	1.14
.633	.72	6.633	1.42	12.633	7.52	18.63	1.13
.667	.72	6.667	1.42	12.667	7.52	18.67	1.13
.700	.73	6.700	1.44	12.700	6.88	18.70	1.12
.733	.73	6.733	1.44	12.733	6.88	18.73	1.12
.767	.73	6.767	1.45	12.767	6.61	18.77	1.11
.800	.73	6.800	1.46	12.800	6.34	18.80	1.11
.833	.73	6.833	1.46	12.833	6.34	18.83	1.11
.867	.74	6.867	1.49	12.867	5.89	18.87	1.10
.900	.74	6.900	1.49	12.900	5.89	18.90	1.10
.933	.74	6.933	1.50	12.933	5.69	18.93	1.09
.967	.74	6.967	1.51	12.967	5.50	18.97	1.08
1.000	.74	7.000	1.51	13.000	5.50	19.00	1.08
1.033	.75	7.033	1.53	13.033	5.16	19.03	1.07
1.067	.75	7.067	1.53	13.067	5.16	19.07	1.07
1.100	.75	7.100	1.54	13.100	5.01	19.10	1.07
1.133	.75	7.133	1.56	13.133	4.86	19.13	1.06
1.167	.75	7.167	1.56	13.167	4.86	19.17	1.06
1.200	.76	7.200	1.58	13.200	4.59	19.20	1.05
1.233	.76	7.233	1.58	13.233	4.59	19.23	1.05
1.267	.76	7.267	1.60	13.267	4.47	19.27	1.05
1.300	.76	7.300	1.61	13.300	4.36	19.30	1.04
1.333	.76	7.333	1.61	13.333	4.36	19.33	1.04
1.367	.77	7.367	1.64	13.367	4.15	19.37	1.03
1.400	.77	7.400	1.64	13.400	4.15	19.40	1.03

1.433	.77	7.433	1.65	13.433	4.05	19.43	1.03
1.467	.77	7.467	1.67	13.467	3.96	19.47	1.02
1.500	.77	7.500	1.67	13.500	3.96	19.50	1.02
1.533	.78	7.533	1.70	13.533	3.78	19.53	1.01
1.567	.78	7.567	1.70	13.567	3.78	19.57	1.01
1.600	.78	7.600	1.71	13.600	3.70	19.60	1.01
1.633	.78	7.633	1.73	13.633	3.63	19.63	1.00
1.667	.78	7.667	1.73	13.667	3.62	19.67	1.00
1.700	.79	7.700	1.76	13.700	3.48	19.70	1.00
1.733	.79	7.733	1.76	13.733	3.48	19.73	1.00
1.767	.79	7.767	1.78	13.767	3.41	19.77	.99
1.800	.79	7.800	1.79	13.800	3.35	19.80	.99
1.833	.79	7.833	1.79	13.833	3.35	19.83	.99
1.867	.80	7.867	1.83	13.867	3.23	19.87	.98
1.900	.80	7.900	1.83	13.900	3.23	19.90	.98
1.933	.80	7.933	1.85	13.933	3.17	19.93	.97
1.967	.81	7.967	1.86	13.967	3.11	19.97	.97
2.000	.81	8.000	1.86	14.000	3.11	20.00	.97
2.033	.81	8.033	1.90	14.033	3.01	20.03	.96
2.067	.81	8.067	1.90	14.067	3.01	20.07	.96
2.100	.81	8.100	1.92	14.100	2.96	20.10	.96
2.133	.82	8.133	1.94	14.133	2.91	20.13	.95
2.167	.82	8.167	1.94	14.167	2.91	20.17	.95
2.200	.82	8.200	1.98	14.200	2.82	20.20	.94
2.233	.82	8.233	1.98	14.233	2.82	20.23	.94
2.267	.83	8.267	2.01	14.267	2.78	20.27	.94
2.300	.83	8.300	2.03	14.300	2.74	20.30	.94
2.333	.83	8.333	2.03	14.333	2.74	20.33	.94
2.367	.84	8.367	2.07	14.367	2.66	20.37	.93
2.400	.84	8.400	2.07	14.400	2.66	20.40	.93
2.433	.84	8.433	2.10	14.433	2.62	20.43	.93
2.467	.84	8.467	2.12	14.467	2.58	20.47	.92
2.500	.84	8.500	2.12	14.500	2.58	20.50	.92
2.533	.85	8.533	2.17	14.533	2.51	20.53	.91
2.567	.85	8.567	2.17	14.567	2.51	20.57	.91
2.600	.85	8.600	2.20	14.600	2.48	20.60	.91
2.633	.86	8.633	2.23	14.633	2.45	20.63	.91
2.667	.86	8.667	2.23	14.667	2.45	20.67	.91
2.700	.86	8.700	2.28	14.700	2.38	20.70	.90
2.733	.86	8.733	2.28	14.733	2.38	20.73	.90
2.767	.87	8.767	2.31	14.767	2.35	20.77	.90
2.800	.87	8.800	2.34	14.800	2.32	20.80	.89
2.833	.87	8.833	2.34	14.833	2.32	20.83	.89
2.867	.88	8.867	2.41	14.867	2.27	20.87	.89
2.900	.88	8.900	2.41	14.900	2.27	20.90	.89
2.933	.88	8.933	2.44	14.933	2.24	20.93	.88
2.967	.88	8.967	2.47	14.967	2.22	20.97	.88
3.000	.88	9.000	2.47	15.000	2.22	21.00	.88
3.033	.89	9.033	2.54	15.033	2.16	21.03	.87
3.067	.89	9.067	2.54	15.067	2.16	21.07	.87
3.100	.90	9.100	2.58	15.100	2.14	21.10	.87
3.133	.90	9.133	2.62	15.133	2.12	21.13	.86
3.167	.90	9.167	2.62	15.167	2.12	21.17	.86
3.200	.91	9.200	2.70	15.200	2.07	21.20	.86
3.233	.91	9.233	2.70	15.233	2.07	21.23	.86
3.267	.91	9.267	2.74	15.267	2.05	21.27	.85
3.300	.91	9.300	2.79	15.300	2.03	21.30	.85
3.333	.91	9.333	2.79	15.333	2.03	21.33	.85
3.367	.92	9.367	2.88	15.367	1.99	21.37	.85
3.400	.92	9.400	2.88	15.400	1.99	21.40	.85
3.433	.93	9.433	2.93	15.433	1.97	21.43	.84
3.467	.93	9.467	2.98	15.467	1.95	21.47	.84
3.500	.93	9.500	2.98	15.500	1.95	21.50	.84
3.533	.94	9.533	3.09	15.533	1.91	21.53	.83
3.567	.94	9.567	3.09	15.567	1.91	21.57	.83
3.600	.94	9.600	3.15	15.600	1.89	21.60	.83
3.633	.95	9.633	3.20	15.633	1.87	21.63	.83
3.667	.95	9.667	3.20	15.667	1.87	21.67	.83
3.700	.96	9.700	3.33	15.700	1.84	21.70	.82
3.733	.96	9.733	3.33	15.733	1.84	21.73	.82
3.767	.96	9.767	3.40	15.767	1.82	21.77	.82
3.800	.96	9.800	3.47	15.800	1.80	21.80	.82
3.833	.96	9.833	3.47	15.833	1.80	21.83	.82
3.867	.97	9.867	3.62	15.867	1.77	21.87	.81
3.900	.97	9.900	3.62	15.900	1.77	21.90	.81
3.933	.98	9.933	3.70	15.933	1.75	21.93	.81
3.967	.98	9.967	3.78	15.967	1.74	21.97	.80
4.000	.98	10.000	3.78	16.000	1.74	22.00	.80
4.033	.99	10.033	3.96	16.033	1.71	22.03	.80
4.067	.99	10.067	3.96	16.067	1.71	22.07	.80
4.100	1.00	10.100	4.06	16.100	1.69	22.10	.80
4.133	1.00	10.133	4.16	16.133	1.68	22.13	.79
4.167	1.00	10.167	4.16	16.167	1.68	22.17	.79
4.200	1.01	10.200	4.39	16.200	1.65	22.20	.79
4.233	1.01	10.233	4.39	16.233	1.65	22.23	.79
4.267	1.02	10.267	4.52	16.267	1.64	22.27	.78
4.300	1.02	10.300	4.64	16.300	1.62	22.30	.78
4.333	1.02	10.333	4.64	16.333	1.62	22.33	.78
4.367	1.03	10.367	4.93	16.367	1.60	22.37	.78

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        4.400    1.03 |10.400    4.93 |16.400    1.60 | 22.40     .78
        4.433    1.04 |10.433    5.09 |16.433    1.59 | 22.43     .77
        4.467    1.04 |10.467    5.25 |16.467    1.57 | 22.47     .77
        4.500    1.04 |10.500    5.25 |16.500    1.57 | 22.50     .77
        4.533    1.05 |10.533    5.62 |16.533    1.55 | 22.53     .77
        4.567    1.05 |10.567    5.62 |16.567    1.55 | 22.57     .77
        4.600    1.06 |10.600    5.84 |16.600    1.54 | 22.60     .76
        4.633    1.06 |10.633    6.06 |16.633    1.53 | 22.63     .76
        4.667    1.06 |10.667    6.06 |16.667    1.53 | 22.67     .76
        4.700    1.07 |10.700    6.57 |16.700    1.50 | 22.70     .76
        4.733    1.07 |10.733    6.57 |16.733    1.50 | 22.73     .76
        4.767    1.08 |10.767    6.87 |16.767    1.49 | 22.77     .75
        4.800    1.08 |10.800    7.17 |16.800    1.48 | 22.80     .75
        4.833    1.08 |10.833    7.17 |16.833    1.48 | 22.83     .75
        4.867    1.10 |10.867    7.91 |16.867    1.46 | 22.87     .75
        4.900    1.10 |10.900    7.91 |16.900    1.46 | 22.90     .75
        4.933    1.10 |10.933    8.37 |16.933    1.45 | 22.93     .74
        4.967    1.11 |10.967    8.82 |16.967    1.44 | 22.97     .74
        5.000    1.11 |11.000    8.82 |17.000    1.44 | 23.00     .74
        5.033    1.12 |11.033    9.98 |17.033    1.42 | 23.03     .74
        5.067    1.12 |11.067    9.98 |17.067    1.42 | 23.07     .74
        5.100    1.13 |11.100   10.73 |17.100    1.41 | 23.10     .74
        5.133    1.13 |11.133   11.49 |17.133    1.40 | 23.13     .73
        5.167    1.13 |11.167   11.49 |17.167    1.40 | 23.17     .73
        5.200    1.14 |11.200   13.53 |17.200    1.38 | 23.20     .73
        5.233    1.14 |11.233   13.53 |17.233    1.38 | 23.23     .73
        5.267    1.15 |11.267   15.00 |17.267    1.37 | 23.27     .73
        5.300    1.16 |11.300   16.46 |17.300    1.36 | 23.30     .72
        5.333    1.16 |11.333   16.46 |17.333    1.36 | 23.33     .72
        5.367    1.17 |11.367   20.92 |17.367    1.35 | 23.37     .72
        5.400    1.17 |11.400   20.92 |17.400    1.35 | 23.40     .72
        5.433    1.18 |11.433   24.71 |17.433    1.34 | 23.43     .72
        5.467    1.18 |11.467   28.48 |17.467    1.33 | 23.47     .71
        5.500    1.18 |11.500   28.50 |17.500    1.33 | 23.50     .71
        5.533    1.20 |11.533   43.48 |17.533    1.31 | 23.53     .71
        5.567    1.20 |11.567   43.48 |17.567    1.31 | 23.57     .71
        5.600    1.21 |11.600   63.65 |17.600    1.30 | 23.60     .71
        5.633    1.21 |11.633   83.71 |17.633    1.30 | 23.63     .71
        5.667    1.21 |11.667   83.83 |17.667    1.30 | 23.67     .71
        5.700    1.23 |11.700  179.69 |17.700    1.28 | 23.70     .70
        5.733    1.23 |11.733  179.69 |17.733    1.28 | 23.73     .70
        5.767    1.24 |11.767  132.24 |17.767    1.27 | 23.77     .70
        5.800    1.24 |11.800   85.03 |17.800    1.26 | 23.80     .70
        5.833    1.24 |11.833   84.97 |17.833    1.26 | 23.83     .70
        5.867    1.26 |11.867   45.00 |17.867    1.25 | 23.87     .69
        5.900    1.26 |11.900   45.00 |17.900    1.25 | 23.90     .69
        5.933    1.27 |11.933   37.32 |17.933    1.24 | 23.93     .69
        5.967    1.27 |11.967   29.68 |17.967    1.23 | 23.97     .69
        6.000    1.27 |12.000   29.67 |18.000    1.23 | 24.00     .69

     Unit Hyd Qpeak  (cms)=    .466

     PEAK FLOW       (cms)=    .137 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  42.213
     TOTAL RAINFALL   (mm)=  94.146
     RUNOFF COEFFICIENT   =    .448

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| NASHYD    (0024) |   Area    (ha)=   5.03   Curve Number   (CN)= 72.5
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.75   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   2.433

     PEAK FLOW       (cms)=    .908 (i)
     TIME TO PEAK    (hrs)=  11.800
     RUNOFF VOLUME    (mm)=  32.210
     TOTAL RAINFALL   (mm)=  94.146
     RUNOFF COEFFICIENT   =    .342

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0022) |   Area    (ha)=   3.01   Curve Number   (CN)= 71.6
|ID= 1 DT= 2.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   2.069

     PEAK FLOW       (cms)=    .594 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  30.881
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     TOTAL RAINFALL   (mm)=  94.146
     RUNOFF COEFFICIENT   =    .328

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0023) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |    .0002      .2156
                            .0001      .1117   |  20.0000      .2166

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0022)       3.01       .59     11.77      30.88
     OUTFLOW: ID= 1 (0023)       3.01       .00     13.60        .02

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .01
                   TIME SHIFT OF PEAK FLOW         (min)=110.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0929

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--------------------
| ADD HYD   (0026) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0024):      5.03    .908    11.80    32.21
        + ID2= 2 (0023):      3.01    .000    13.60      .02
          ===================================================
          ID = 3 (0026):      8.04    .908    11.80    20.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0025) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |    .0003      .2171
                            .0001      .0498   |  20.0000      .2181
                            .0002      .1676   |    .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0026)       8.04       .91     11.80      20.16
     OUTFLOW: ID= 1 (0025)       8.04       .00     13.70        .02

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .02
                   TIME SHIFT OF PEAK FLOW         (min)=114.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1620

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--------------------
| ADD HYD   (0028) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0027):       .68    .137    11.77    42.21
        + ID2= 2 (0025):      8.04    .000    13.70      .02
          ===================================================
          ID = 3 (0028):      8.72    .137    11.77     3.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0029) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |    .0002      .0898
                            .0001      .0455   |  20.0000      .0908

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0028)       8.72       .14     11.77       3.30
     OUTFLOW: ID= 1 (0029)       8.72       .00     24.13        .03

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .05
                   TIME SHIFT OF PEAK FLOW         (min)=742.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0285

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| CALIB            |
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| NASHYD    (0032) |   Area     (ha)=   6.71   Curve Number   (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia       (mm)=   8.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .32
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NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	.69	6.083	1.29	12.083	21.88	18.08	1.22
.167	.69	6.167	1.31	12.167	17.23	18.17	1.21
.250	.70	6.250	1.33	12.250	14.18	18.25	1.19
.333	.70	6.333	1.34	12.333	12.04	18.33	1.18
.417	.71	6.417	1.36	12.417	10.46	18.42	1.17
.500	.71	6.500	1.38	12.500	9.25	18.50	1.15
.583	.72	6.583	1.40	12.583	8.29	18.58	1.14
.667	.72	6.667	1.42	12.667	7.52	18.67	1.13
.750	.73	6.750	1.44	12.750	6.88	18.75	1.12
.833	.73	6.833	1.46	12.833	6.34	18.83	1.11
.917	.74	6.917	1.49	12.917	5.89	18.92	1.10
1.000	.74	7.000	1.51	13.000	5.50	19.00	1.08
1.083	.75	7.083	1.53	13.083	5.16	19.08	1.07
1.167	.75	7.167	1.56	13.167	4.86	19.17	1.06
1.250	.76	7.250	1.58	13.250	4.59	19.25	1.05
1.333	.76	7.333	1.61	13.333	4.36	19.33	1.04
1.417	.77	7.417	1.64	13.417	4.15	19.42	1.03
1.500	.77	7.500	1.67	13.500	3.96	19.50	1.02
1.583	.78	7.583	1.70	13.583	3.78	19.58	1.01
1.667	.78	7.667	1.73	13.667	3.63	19.67	1.00
1.750	.79	7.750	1.76	13.750	3.48	19.75	1.00
1.833	.79	7.833	1.79	13.833	3.35	19.83	.99
1.917	.80	7.917	1.83	13.917	3.23	19.92	.98
2.000	.81	8.000	1.86	14.000	3.11	20.00	.97
2.083	.81	8.083	1.90	14.083	3.01	20.08	.96
2.167	.82	8.167	1.94	14.167	2.91	20.17	.95
2.250	.82	8.250	1.98	14.250	2.82	20.25	.94
2.333	.83	8.333	2.03	14.333	2.74	20.33	.94
2.417	.84	8.417	2.07	14.417	2.66	20.42	.93
2.500	.84	8.500	2.12	14.500	2.58	20.50	.92
2.583	.85	8.583	2.17	14.583	2.51	20.58	.91
2.667	.86	8.667	2.23	14.667	2.45	20.67	.91
2.750	.86	8.750	2.28	14.750	2.38	20.75	.90
2.833	.87	8.833	2.34	14.833	2.32	20.83	.89
2.917	.88	8.917	2.41	14.917	2.27	20.92	.89
3.000	.88	9.000	2.47	15.000	2.22	21.00	.88
3.083	.89	9.083	2.54	15.083	2.16	21.08	.87
3.167	.90	9.167	2.62	15.167	2.12	21.17	.86
3.250	.91	9.250	2.70	15.250	2.07	21.25	.86
3.333	.91	9.333	2.79	15.333	2.03	21.33	.85
3.417	.92	9.417	2.88	15.417	1.99	21.42	.85
3.500	.93	9.500	2.98	15.500	1.95	21.50	.84
3.583	.94	9.583	3.09	15.583	1.91	21.58	.83
3.667	.95	9.667	3.20	15.667	1.87	21.67	.83
3.750	.96	9.750	3.33	15.750	1.84	21.75	.82
3.833	.96	9.833	3.47	15.833	1.80	21.83	.82
3.917	.97	9.917	3.62	15.917	1.77	21.92	.81
4.000	.98	10.000	3.78	16.000	1.74	22.00	.80
4.083	.99	10.083	3.96	16.083	1.71	22.08	.80
4.167	1.00	10.167	4.16	16.167	1.68	22.17	.79
4.250	1.01	10.250	4.39	16.250	1.65	22.25	.79
4.333	1.02	10.333	4.64	16.333	1.62	22.33	.78
4.417	1.03	10.417	4.93	16.417	1.60	22.42	.78
4.500	1.04	10.500	5.25	16.500	1.57	22.50	.77
4.583	1.05	10.583	5.62	16.583	1.55	22.58	.77
4.667	1.06	10.667	6.06	16.667	1.53	22.67	.76
4.750	1.07	10.750	6.57	16.750	1.50	22.75	.76
4.833	1.08	10.833	7.17	16.833	1.48	22.83	.75
4.917	1.10	10.917	7.91	16.917	1.46	22.92	.75
5.000	1.11	11.000	8.82	17.000	1.44	23.00	.74
5.083	1.12	11.083	9.98	17.083	1.42	23.08	.74
5.167	1.13	11.167	11.49	17.167	1.40	23.17	.73
5.250	1.14	11.250	13.53	17.250	1.38	23.25	.73
5.333	1.16	11.333	16.46	17.333	1.36	23.33	.72
5.417	1.17	11.417	20.92	17.417	1.35	23.42	.72
5.500	1.18	11.500	28.48	17.500	1.33	23.50	.71
5.583	1.20	11.583	43.48	17.583	1.31	23.58	.71
5.667	1.21	11.667	83.71	17.667	1.30	23.67	.71
5.750	1.23	11.750	179.68	17.750	1.28	23.75	.70
5.833	1.24	11.833	85.04	17.833	1.26	23.83	.70
5.917	1.26	11.917	45.01	17.917	1.25	23.92	.69
6.000	1.27	12.000	29.69	18.000	1.23	24.00	.00

```
Unit Hyd Qpeak  (cms)=    .800

PEAK FLOW       (cms)=    .437 (i)
TIME TO PEAK    (hrs)=  12.083
RUNOFF VOLUME    (mm)=  32.207
TOTAL RAINFALL   (mm)=  94.090
```

```
     RUNOFF COEFFICIENT   =    .342

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0030) |   Area    (ha)=   5.57   Curve Number   (CN)= 69.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.12   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   3.828

     PEAK FLOW       (cms)=    .929 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  32.133
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .342

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0031) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                    .00        386.25         .0300
                  37.50        385.75     .0300 / .0300  Main Channel
                  47.50        385.75     .0300 / .0300  Main Channel
                  85.00        386.25         .0300

      <--------------------- TRAVEL TIME TABLE --------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)      (cu.m.)     (cms)        (m/s)      (min)
        .03   385.78    .150E+03        .1           .33      23.91
        .05   385.80    .350E+03        .3           .47      16.85
        .08   385.83    .599E+03        .7           .56      14.12
        .11   385.86    .898E+03       1.2           .63      12.62
        .13   385.88    .125E+04       1.8           .68      11.65
        .16   385.91    .164E+04       2.5           .73      10.95
        .18   385.93    .209E+04       3.3           .76      10.42
        .21   385.96    .259E+04       4.3           .80       9.99
        .24   385.99    .313E+04       5.4           .82       9.64
        .26   386.01    .373E+04       6.7           .85       9.33
        .29   386.04    .438E+04       8.0           .88       9.07
        .32   386.07    .507E+04       9.6           .90       8.83
        .34   386.09    .582E+04      11.2           .92       8.62
        .37   386.12    .661E+04      13.1           .94       8.43
        .39   386.14    .745E+04      15.1           .96       8.25
        .42   386.17    .835E+04      17.2           .98       8.08
        .45   386.20    .929E+04      19.5          1.00       7.93
        .47   386.22    .103E+05      22.0          1.02       7.79
        .50   386.25    .113E+05      24.7          1.04       7.65

                                  <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0030)  5.57     .93   11.75  32.13       .09        .59
     OUTFLOW: ID= 1 (0031)  5.57     .45   11.92  32.11       .06        .50


--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0032):      6.71    .437    12.08    32.21
        + ID2= 2 (0031):      5.57    .455    11.92    32.11
          ==============================================
          ID = 3 (0033):     12.27    .827    11.92    32.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0036) |   Area    (ha)=   2.08   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.71   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=    .938

     PEAK FLOW       (cms)=    .289 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  34.208
     TOTAL RAINFALL   (mm)=  94.090
```

```
     RUNOFF COEFFICIENT   =    .364

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0034) |   Area    (ha)=   2.15   Curve Number   (CN)= 71.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.03   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .10

     Unit Hyd Qpeak  (cms)=    .795

     PEAK FLOW       (cms)=    .336 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  41.182
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .438

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0035) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.3) ------>
               Distance      Elevation       Manning
                    .00        388.25          .0300
                  30.00        387.75     .0300 / .0300  Main Channel
                  40.00        387.75     .0300 / .0300  Main Channel
                  70.00        388.25          .0300

      <--------------------- TRAVEL TIME TABLE --------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   387.78    .327E+02        .1           .41       4.35
        .05   387.80    .744E+02        .4           .59       3.03
        .08   387.83    .125E+03        .8           .71       2.52
        .11   387.86    .185E+03       1.4           .80       2.25
        .13   387.88    .253E+03       2.0           .87       2.07
        .16   387.91    .330E+03       2.8           .92       1.95
        .18   387.93    .417E+03       3.7           .97       1.85
        .21   387.96    .512E+03       4.8          1.01       1.78
        .24   387.99    .616E+03       6.0          1.04       1.72
        .26   388.01    .729E+03       7.3          1.07       1.67
        .29   388.04    .851E+03       8.7          1.10       1.63
        .32   388.07    .982E+03      10.3          1.13       1.59
        .34   388.09    .112E+04      12.0          1.15       1.56
        .37   388.12    .127E+04      13.9          1.17       1.53
        .39   388.14    .143E+04      15.9          1.19       1.50
        .42   388.17    .160E+04      18.0          1.21       1.48
        .45   388.20    .177E+04      20.3          1.23       1.45
        .47   388.22    .196E+04      22.8          1.25       1.43
        .50   388.25    .215E+04      25.4          1.27       1.41

                                        <---- hydrograph ---->   <-pipe / channel->
                                  AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                  (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0034)        2.15      .34   11.83  41.18       .05        .53
     OUTFLOW: ID= 1 (0035)        2.15      .31   11.83  41.18       .04        .52


--------------------------------------------------------------------------------


--------------------
| ADD HYD   (0037) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0036):      2.08    .289    11.75    34.21
        + ID2= 2 (0035):      2.15    .314    11.83    41.18
          ==============================================
          ID = 3 (0037):      4.23    .590    11.83    37.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0039) |   Area    (ha)=  35.03   Curve Number   (CN)= 65.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.17   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.16

     Unit Hyd Qpeak  (cms)=   1.152

     PEAK FLOW       (cms)=    .961 (i)
     TIME TO PEAK    (hrs)=  13.083
     RUNOFF VOLUME    (mm)=  34.213
     TOTAL RAINFALL   (mm)=  94.090
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```
     RUNOFF COEFFICIENT   =    .364

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0040) |   Area    (ha)=   3.95   Curve Number   (CN)= 54.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .40

     Unit Hyd Qpeak  (cms)=    .375

     PEAK FLOW       (cms)=    .158 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  23.531
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .250

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0041) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1655
                           .0001      .0976   |  20.0000      .1665

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0040)      3.95       .16     12.17      23.53
     OUTFLOW: ID= 1 (0041)      3.95       .00     25.33        .10

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .06
                   TIME SHIFT OF PEAK FLOW         (min)=790.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0926

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0044) |   Area    (ha)=    .87   Curve Number   (CN)= 64.6
|ID= 1 DT= 3.0 min |   Ia      (mm)=   6.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.050	.69	6.050	1.29	12.050	21.88	18.05	1.22
.100	.69	6.100	1.30	12.100	20.33	18.10	1.22
.150	.69	6.150	1.31	12.150	17.23	18.15	1.21
.200	.70	6.200	1.32	12.200	15.20	18.20	1.20
.250	.70	6.250	1.33	12.250	14.18	18.25	1.19
.300	.70	6.300	1.34	12.300	12.04	18.30	1.18
.350	.70	6.350	1.35	12.350	11.51	18.35	1.18
.400	.71	6.400	1.36	12.400	10.46	18.40	1.17
.450	.71	6.450	1.37	12.450	9.65	18.45	1.16
.500	.71	6.500	1.38	12.500	9.25	18.50	1.15
.550	.72	6.550	1.40	12.550	8.29	18.55	1.14
.600	.72	6.600	1.41	12.600	8.03	18.60	1.14
.650	.72	6.650	1.42	12.650	7.52	18.65	1.13
.700	.72	6.700	1.43	12.700	7.09	18.70	1.12
.750	.73	6.750	1.44	12.750	6.88	18.75	1.12
.800	.73	6.800	1.46	12.800	6.34	18.80	1.11
.850	.73	6.850	1.47	12.850	6.19	18.85	1.10
.900	.74	6.900	1.49	12.900	5.89	18.90	1.10
.950	.74	6.950	1.50	12.950	5.63	18.95	1.09
1.000	.74	7.000	1.51	13.000	5.50	19.00	1.08
1.050	.75	7.050	1.53	13.050	5.16	19.05	1.07
1.100	.75	7.100	1.54	13.100	5.06	19.10	1.07
1.150	.75	7.150	1.56	13.150	4.86	19.15	1.06
1.200	.75	7.200	1.57	13.200	4.68	19.20	1.06
1.250	.76	7.250	1.58	13.250	4.59	19.25	1.05
1.300	.76	7.300	1.61	13.300	4.36	19.30	1.04
1.350	.76	7.350	1.62	13.350	4.29	19.35	1.04
1.400	.77	7.400	1.64	13.400	4.15	19.40	1.03
1.450	.77	7.450	1.66	13.450	4.02	19.45	1.03
1.500	.77	7.500	1.67	13.500	3.96	19.50	1.02
1.550	.78	7.550	1.70	13.550	3.78	19.55	1.01
1.600	.78	7.600	1.71	13.600	3.73	19.60	1.01
1.650	.78	7.650	1.73	13.650	3.63	19.65	1.00
1.700	.79	7.700	1.75	13.700	3.53	19.70	1.00
1.750	.79	7.750	1.76	13.750	3.48	19.75	1.00
1.800	.79	7.800	1.79	13.800	3.35	19.80	.99
1.850	.80	7.850	1.80	13.850	3.31	19.85	.98

1.900	.80	7.900	1.83	13.900	3.23	19.90	.98
1.950	.80	7.950	1.85	13.950	3.15	19.95	.97
2.000	.81	8.000	1.86	14.000	3.11	20.00	.97
2.050	.81	8.050	1.90	14.050	3.01	20.05	.96
2.100	.81	8.100	1.92	14.100	2.98	20.10	.96
2.150	.82	8.150	1.94	14.150	2.91	20.15	.95
2.200	.82	8.200	1.97	14.200	2.85	20.20	.95
2.250	.82	8.250	1.98	14.250	2.82	20.25	.94
2.300	.83	8.300	2.03	14.300	2.74	20.30	.94
2.350	.83	8.350	2.04	14.350	2.71	20.35	.93
2.400	.84	8.400	2.07	14.400	2.66	20.40	.93
2.450	.84	8.450	2.11	14.450	2.61	20.45	.92
2.500	.84	8.500	2.12	14.500	2.58	20.50	.92
2.550	.85	8.550	2.17	14.550	2.51	20.55	.91
2.600	.85	8.600	2.19	14.600	2.49	20.60	.91
2.650	.86	8.650	2.23	14.650	2.45	20.65	.91
2.700	.86	8.700	2.26	14.700	2.40	20.70	.90
2.750	.86	8.750	2.28	14.750	2.38	20.75	.90
2.800	.87	8.800	2.34	14.800	2.32	20.80	.89
2.850	.87	8.850	2.36	14.850	2.31	20.85	.89
2.900	.88	8.900	2.41	14.900	2.27	20.90	.89
2.950	.88	8.950	2.45	14.950	2.23	20.95	.88
3.000	.88	9.000	2.47	15.000	2.22	21.00	.88
3.050	.89	9.050	2.54	15.050	2.16	21.05	.87
3.100	.89	9.100	2.57	15.100	2.15	21.10	.87
3.150	.90	9.150	2.62	15.150	2.12	21.15	.86
3.200	.90	9.200	2.67	15.200	2.09	21.20	.86
3.250	.91	9.250	2.70	15.250	2.07	21.25	.86
3.300	.91	9.300	2.79	15.300	2.03	21.30	.85
3.350	.92	9.350	2.82	15.350	2.01	21.35	.85
3.400	.92	9.400	2.88	15.400	1.99	21.40	.85
3.450	.93	9.450	2.95	15.450	1.96	21.45	.84
3.500	.93	9.500	2.98	15.500	1.95	21.50	.84
3.550	.94	9.550	3.09	15.550	1.91	21.55	.83
3.600	.94	9.600	3.13	15.600	1.89	21.60	.83
3.650	.95	9.650	3.20	15.650	1.87	21.65	.83
3.700	.95	9.700	3.29	15.700	1.85	21.70	.82
3.750	.96	9.750	3.33	15.750	1.84	21.75	.82
3.800	.96	9.800	3.47	15.800	1.80	21.80	.82
3.850	.97	9.850	3.52	15.850	1.79	21.85	.81
3.900	.97	9.900	3.62	15.900	1.77	21.90	.81
3.950	.98	9.950	3.73	15.950	1.75	21.95	.81
4.000	.98	10.000	3.78	16.000	1.74	22.00	.80
4.050	.99	10.050	3.96	16.050	1.71	22.05	.80
4.100	.99	10.100	4.03	16.100	1.70	22.10	.80
4.150	1.00	10.150	4.16	16.150	1.68	22.15	.79
4.200	1.01	10.200	4.31	16.200	1.66	22.20	.79
4.250	1.01	10.250	4.39	16.250	1.65	22.25	.79
4.300	1.02	10.300	4.64	16.300	1.62	22.30	.78
4.350	1.02	10.350	4.74	16.350	1.62	22.35	.78
4.400	1.03	10.400	4.93	16.400	1.60	22.40	.78
4.450	1.04	10.450	5.14	16.450	1.58	22.45	.77
4.500	1.04	10.500	5.25	16.500	1.57	22.50	.77
4.550	1.05	10.550	5.62	16.550	1.55	22.55	.77
4.600	1.05	10.600	5.77	16.600	1.54	22.60	.76
4.650	1.06	10.650	6.06	16.650	1.53	22.65	.76
4.700	1.07	10.700	6.40	16.700	1.51	22.70	.76
4.750	1.07	10.750	6.57	16.750	1.50	22.75	.76
4.800	1.08	10.800	7.17	16.800	1.48	22.80	.75
4.850	1.09	10.850	7.42	16.850	1.47	22.85	.75
4.900	1.10	10.900	7.91	16.900	1.46	22.90	.75
4.950	1.10	10.950	8.52	16.950	1.45	22.95	.74
5.000	1.11	11.000	8.82	17.000	1.44	23.00	.74
5.050	1.12	11.050	9.98	17.050	1.42	23.05	.74
5.100	1.12	11.100	10.48	17.100	1.41	23.10	.74
5.150	1.13	11.150	11.49	17.150	1.40	23.15	.73
5.200	1.14	11.200	12.85	17.200	1.39	23.20	.73
5.250	1.14	11.250	13.54	17.250	1.38	23.25	.73
5.300	1.16	11.300	16.46	17.300	1.36	23.30	.72
5.350	1.16	11.350	17.95	17.350	1.36	23.35	.72
5.400	1.17	11.400	20.92	17.400	1.35	23.40	.72
5.450	1.18	11.450	25.96	17.450	1.33	23.45	.72
5.500	1.18	11.500	28.49	17.500	1.33	23.50	.71
5.550	1.20	11.550	43.48	17.550	1.31	23.55	.71
5.600	1.20	11.600	56.91	17.600	1.31	23.60	.71
5.650	1.21	11.650	83.71	17.650	1.30	23.65	.71
5.700	1.22	11.700	147.75	17.700	1.29	23.70	.70
5.750	1.23	11.750	179.64	17.750	1.28	23.75	.70
5.800	1.24	11.800	85.03	17.800	1.26	23.80	.70
5.850	1.25	11.850	71.66	17.850	1.26	23.85	.70
5.900	1.26	11.900	45.00	17.900	1.25	23.90	.69
5.950	1.27	11.950	34.78	17.950	1.24	23.95	.69
6.000	1.27	12.000	29.68	18.000	1.23	24.00	.69

```
Unit Hyd Qpeak  (cms)=    .596

PEAK FLOW       (cms)=    .136 (i)
TIME TO PEAK    (hrs)=  11.750
RUNOFF VOLUME    (mm)=  32.621
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```
     TOTAL RAINFALL   (mm)=  94.147
     RUNOFF COEFFICIENT   =    .346

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0042) |   Area    (ha)=    .56   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .382

     PEAK FLOW       (cms)=    .105 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  36.603
     TOTAL RAINFALL   (mm)=  94.147
     RUNOFF COEFFICIENT   =    .389

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0043) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0357
                           .0001      .0118   |  20.0000      .0367

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0042)       .56       .10     11.75      36.60
     OUTFLOW: ID= 1 (0043)       .56       .00     20.10        .70

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .13
                   TIME SHIFT OF PEAK FLOW         (min)=501.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0200

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0045) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0044):       .87    .136    11.75    32.62
        + ID2= 2 (0043):       .56    .000    20.10      .70
          ================================================
          ID = 3 (0045):      1.42    .136    11.75    20.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0046) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1073
                           .0001      .0117   |  20.0000      .1083

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0045)      1.42       .14     11.75      20.16
     OUTFLOW: ID= 1 (0046)      1.42       .00     24.10        .36

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .09
                   TIME SHIFT OF PEAK FLOW         (min)=741.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0282

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0047) |   Area    (ha)=    .48   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .331

     PEAK FLOW       (cms)=    .091 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  36.603
     TOTAL RAINFALL   (mm)=  94.147
     RUNOFF COEFFICIENT   =    .389

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```

```
--------------------
| RESERVOIR (0048) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |       OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------        (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000    |    .0002      .0731
                            .0001      .0496    |  20.0000      .0741

                                   AREA     QPEAK     TPEAK       R.V.
                                   (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0047)          .48       .09     11.75      36.60
     OUTFLOW: ID= 1 (0048)          .48       .00     20.15        .20

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=504.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0175

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0049) |   Area    (ha)=   2.77   Curve Number   (CN)= 70.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.35   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	.69	6.083	1.29	12.083	21.88	18.08	1.22
.167	.69	6.167	1.31	12.167	17.23	18.17	1.21
.250	.70	6.250	1.33	12.250	14.18	18.25	1.19
.333	.70	6.333	1.34	12.333	12.04	18.33	1.18
.417	.71	6.417	1.36	12.417	10.46	18.42	1.17
.500	.71	6.500	1.38	12.500	9.25	18.50	1.15
.583	.72	6.583	1.40	12.583	8.29	18.58	1.14
.667	.72	6.667	1.42	12.667	7.52	18.67	1.13
.750	.73	6.750	1.44	12.750	6.88	18.75	1.12
.833	.73	6.833	1.46	12.833	6.34	18.83	1.11
.917	.74	6.917	1.49	12.917	5.89	18.92	1.10
1.000	.74	7.000	1.51	13.000	5.50	19.00	1.08
1.083	.75	7.083	1.53	13.083	5.16	19.08	1.07
1.167	.75	7.167	1.56	13.167	4.86	19.17	1.06
1.250	.76	7.250	1.58	13.250	4.59	19.25	1.05
1.333	.76	7.333	1.61	13.333	4.36	19.33	1.04
1.417	.77	7.417	1.64	13.417	4.15	19.42	1.03
1.500	.77	7.500	1.67	13.500	3.96	19.50	1.02
1.583	.78	7.583	1.70	13.583	3.78	19.58	1.01
1.667	.78	7.667	1.73	13.667	3.63	19.67	1.00
1.750	.79	7.750	1.76	13.750	3.48	19.75	1.00
1.833	.79	7.833	1.79	13.833	3.35	19.83	.99
1.917	.80	7.917	1.83	13.917	3.23	19.92	.98
2.000	.81	8.000	1.86	14.000	3.11	20.00	.97
2.083	.81	8.083	1.90	14.083	3.01	20.08	.96
2.167	.82	8.167	1.94	14.167	2.91	20.17	.95
2.250	.82	8.250	1.98	14.250	2.82	20.25	.94
2.333	.83	8.333	2.03	14.333	2.74	20.33	.94
2.417	.84	8.417	2.07	14.417	2.66	20.42	.93
2.500	.84	8.500	2.12	14.500	2.58	20.50	.92
2.583	.85	8.583	2.17	14.583	2.51	20.58	.91
2.667	.86	8.667	2.23	14.667	2.45	20.67	.91
2.750	.86	8.750	2.28	14.750	2.38	20.75	.90
2.833	.87	8.833	2.34	14.833	2.32	20.83	.89
2.917	.88	8.917	2.41	14.917	2.27	20.92	.89
3.000	.88	9.000	2.47	15.000	2.22	21.00	.88
3.083	.89	9.083	2.54	15.083	2.16	21.08	.87
3.167	.90	9.167	2.62	15.167	2.12	21.17	.86
3.250	.91	9.250	2.70	15.250	2.07	21.25	.86
3.333	.91	9.333	2.79	15.333	2.03	21.33	.85
3.417	.92	9.417	2.88	15.417	1.99	21.42	.85
3.500	.93	9.500	2.98	15.500	1.95	21.50	.84
3.583	.94	9.583	3.09	15.583	1.91	21.58	.83
3.667	.95	9.667	3.20	15.667	1.87	21.67	.83
3.750	.96	9.750	3.33	15.750	1.84	21.75	.82
3.833	.96	9.833	3.47	15.833	1.80	21.83	.82
3.917	.97	9.917	3.62	15.917	1.77	21.92	.81
4.000	.98	10.000	3.78	16.000	1.74	22.00	.80
4.083	.99	10.083	3.96	16.083	1.71	22.08	.80
4.167	1.00	10.167	4.16	16.167	1.68	22.17	.79
4.250	1.01	10.250	4.39	16.250	1.65	22.25	.79
4.333	1.02	10.333	4.64	16.333	1.62	22.33	.78
4.417	1.03	10.417	4.93	16.417	1.60	22.42	.78
4.500	1.04	10.500	5.25	16.500	1.57	22.50	.77
4.583	1.05	10.583	5.62	16.583	1.55	22.58	.77
4.667	1.06	10.667	6.06	16.667	1.53	22.67	.76
4.750	1.07	10.750	6.57	16.750	1.50	22.75	.76
4.833	1.08	10.833	7.17	16.833	1.48	22.83	.75
4.917	1.10	10.917	7.91	16.917	1.46	22.92	.75

```
              5.000    1.11 |11.000    8.82 |17.000    1.44 | 23.00     .74
              5.083    1.12 |11.083    9.98 |17.083    1.42 | 23.08     .74
              5.167    1.13 |11.167   11.49 |17.167    1.40 | 23.17     .73
              5.250    1.14 |11.250   13.53 |17.250    1.38 | 23.25     .73
              5.333    1.16 |11.333   16.46 |17.333    1.36 | 23.33     .72
              5.417    1.17 |11.417   20.92 |17.417    1.35 | 23.42     .72
              5.500    1.18 |11.500   28.48 |17.500    1.33 | 23.50     .71
              5.583    1.20 |11.583   43.48 |17.583    1.31 | 23.58     .71
              5.667    1.21 |11.667   83.71 |17.667    1.30 | 23.67     .71
              5.750    1.23 |11.750  179.68 |17.750    1.28 | 23.75     .70
              5.833    1.24 |11.833   85.04 |17.833    1.26 | 23.83     .70
              5.917    1.26 |11.917   45.01 |17.917    1.25 | 23.92     .69
              6.000    1.27 |12.000   29.69 |18.000    1.23 | 24.00     .00

     Unit Hyd Qpeak  (cms)=    .952

     PEAK FLOW       (cms)=    .411 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  39.902
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .424

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0055) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .843 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  43.670
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .464

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0052) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .632 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  37.056
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .394

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0050) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=   1.238 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  35.923
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .382

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0051) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)     11.96      1.24     11.92      35.92
     OUTFLOW: ID= 1 (0051)     11.96      1.97     12.08      22.77
```

```
                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=159.41
                   TIME SHIFT OF PEAK FLOW         (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .2904

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                     CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0053) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0052):      3.90     .632    11.75    37.06
        + ID2= 2 (0051):     11.96    1.973    12.08    22.77
          ==================================================
          ID = 3 (0053):     15.86    2.133    12.08    26.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0054) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |  20.0000      .0771
                            .0001      .0761   |    .0000      .0000

                                   AREA     QPEAK     TPEAK       R.V.
                                   (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0053)        15.86      2.13     12.08      26.28
     OUTFLOW: ID= 1 (0054)        15.86      2.24     12.08      21.48

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=104.96
                   TIME SHIFT OF PEAK FLOW         (min)=   .00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0988

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                     CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0056) |
| IN= 2---> OUT= 1 |      Routing time step (min)'=  5.00
--------------------
                      <------ DATA FOR SECTION (   1.5) ------>
                      Distance      Elevation       Manning
                           .00         425.00         .0300
                           .75         424.25     .0300 / .0300  Main Channel
                          1.75         424.25     .0300 / .0300  Main Channel
                          2.50         425.00         .0300

         <--------------------- TRAVEL TIME TABLE ---------------------->
          DEPTH     ELEV      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
           (m)       (m)      (cu.m.)     (cms)        (m/s)       (min)
           .04    424.29    .145E+02        .0           .68        8.63
           .08    424.33    .302E+02        .1          1.05        5.61
           .12    424.37    .469E+02        .2          1.33        4.42
           .16    424.41    .647E+02        .3          1.57        3.76
           .20    424.45    .837E+02        .4          1.77        3.34
           .24    424.49    .104E+03        .6          1.94        3.04
           .28    424.53    .125E+03        .7          2.10        2.81
           .32    424.57    .147E+03        .9          2.23        2.64
           .36    424.61    .170E+03       1.1          2.36        2.50
           .39    424.64    .195E+03       1.4          2.47        2.39
           .43    424.68    .220E+03       1.6          2.57        2.30
           .47    424.72    .247E+03       1.9          2.66        2.22
           .51    424.76    .275E+03       2.1          2.75        2.15
           .55    424.80    .304E+03       2.4          2.83        2.09
           .59    424.84    .334E+03       2.7          2.90        2.04
           .63    424.88    .365E+03       3.1          2.97        1.99
           .67    424.92    .397E+03       3.4          3.03        1.95
           .71    424.96    .430E+03       3.8          3.09        1.91
           .75    425.00    .465E+03       4.1          3.14        1.88

                                        <---- hydrograph ---->   <-pipe / channel->
                                  AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                  (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0054)       15.86     2.24   12.08  21.48       .53      2.77
     OUTFLOW: ID= 1 (0056)       15.86     1.19   12.17  21.48       .36      2.38


-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0057) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0055):      5.19     .843    11.83    43.67
        + ID2= 2 (0056):     15.86    1.186    12.17    21.48
```

```
         ==================================================
         ID = 3 (0057):    21.05   1.420    12.17    26.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0058) |   Area    (ha)=  21.77   Curve Number   (CN)= 67.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   2.354

     PEAK FLOW       (cms)=   1.553 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  37.344
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .397

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0059) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=   1.238 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  35.923
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .382

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0060) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0059)     11.96      1.24     11.92      35.92
     OUTFLOW: ID= 1 (0060)     11.96      1.97     12.08      22.77

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=159.41
                 TIME SHIFT OF PEAK FLOW         (min)= 10.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  .2904

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0061) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .632 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  37.056
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .394

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0062) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0060):    11.96   1.973    12.08    22.77
       + ID2= 2 (0061):     3.90    .632    11.75    37.06
         ==================================================
         ID = 3 (0062):    15.86   2.133    12.08    26.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0063) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |  20.0000      .0771
                            .0001      .0761   |    .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0062)      15.86      2.13     12.08      26.28
     OUTFLOW: ID= 1 (0063)      15.86      2.24     12.08      21.48

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=104.96
                  TIME SHIFT OF PEAK FLOW         (min)=   .00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0988

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0065) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
              <------ DATA FOR SECTION (   1.5) ------>
              Distance      Elevation       Manning
                   .00        425.00          .0300
                   .75        424.25     .0300 / .0300  Main Channel
                  1.75        424.25     .0300 / .0300  Main Channel
                  2.50        425.00          .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .04   424.29    .145E+02        .0           .68       8.63
        .08   424.33    .302E+02        .1          1.05       5.61
        .12   424.37    .469E+02        .2          1.33       4.42
        .16   424.41    .647E+02        .3          1.57       3.76
        .20   424.45    .837E+02        .4          1.77       3.34
        .24   424.49    .104E+03        .6          1.94       3.04
        .28   424.53    .125E+03        .7          2.10       2.81
        .32   424.57    .147E+03        .9          2.23       2.64
        .36   424.61    .170E+03       1.1          2.36       2.50
        .39   424.64    .195E+03       1.4          2.47       2.39
        .43   424.68    .220E+03       1.6          2.57       2.30
        .47   424.72    .247E+03       1.9          2.66       2.22
        .51   424.76    .275E+03       2.1          2.75       2.15
        .55   424.80    .304E+03       2.4          2.83       2.09
        .59   424.84    .334E+03       2.7          2.90       2.04
        .63   424.88    .365E+03       3.1          2.97       1.99
        .67   424.92    .397E+03       3.4          3.03       1.95
        .71   424.96    .430E+03       3.8          3.09       1.91
        .75   425.00    .465E+03       4.1          3.14       1.88

                                      <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0063)    15.86     2.24   12.08  21.48       .53       2.77
     OUTFLOW: ID= 1 (0065)    15.86     1.19   12.17  21.48       .36       2.38


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0064) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .843 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  43.670
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .464

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0066) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0065):     15.86   1.186    12.17    21.48
        + ID2= 2 (0064):      5.19    .843    11.83    43.67
          ==================================================
          ID = 3 (0066):     21.05   1.420    12.17    26.96
```

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0069) |   Area    (ha)=   1.80   Curve Number   (CN)= 58.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.005

     PEAK FLOW       (cms)=    .205 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  25.194
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .268

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0067) |   Area    (ha)=   1.52   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .995

     PEAK FLOW       (cms)=    .196 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  25.942
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .276

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0068) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0207
                           .0001      .0206   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0067)      1.52       .20     11.75      25.94
     OUTFLOW: ID= 1 (0068)      1.52       .04     12.17      12.42

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.69
                   TIME SHIFT OF PEAK FLOW         (min)= 25.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0282

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0071) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0069):      1.80    .205    11.75    25.19
        + ID2= 2 (0068):      1.52    .042    12.17    12.42
          ==============================================
          ID = 3 (0071):      3.32    .205    11.75    19.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0070) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0708
                           .0001      .0707   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0071)      3.32       .21     11.75      19.34
     OUTFLOW: ID= 1 (0070)      3.32       .00     24.17        .10

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
                   TIME SHIFT OF PEAK FLOW         (min)=745.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0639

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0073) |
```

```
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
              <------ DATA FOR SECTION (   1.6) ------>
              Distance      Elevation       Manning
                   .00        421.26         .0300
                  1.10        420.66      .0300 / .0300  Main Channel
                  2.00        420.66      .0300 / .0300  Main Channel
                  3.10        421.26         .0300

     <--------------------- TRAVEL TIME TABLE ---------------------->
      DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
       (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       .03   420.69    .560E+01        .0           .05      59.24
       .06   420.72    .119E+02        .0           .09      35.98
       .09   420.75    .188E+02        .0           .12      26.61
       .13   420.79    .265E+02        .0           .14      21.37
       .16   420.82    .348E+02        .0           .17      17.97
       .19   420.85    .437E+02        .0           .20      15.58
       .22   420.88    .534E+02        .1           .22      13.79
       .25   420.91    .637E+02        .1           .25      12.40
       .28   420.94    .748E+02        .1           .27      11.29
       .32   420.98    .864E+02        .1           .30      10.38
       .35   421.01    .988E+02        .2           .32       9.61
       .38   421.04    .112E+03        .2           .34       8.96
       .41   421.07    .126E+03        .2           .37       8.41
       .44   421.10    .140E+03        .3           .39       7.92
       .47   421.13    .155E+03        .3           .41       7.50
       .51   421.17    .171E+03        .4           .43       7.12
       .54   421.20    .187E+03        .5           .45       6.78
       .57   421.23    .204E+03        .5           .48       6.48
       .60   421.26    .222E+03        .6           .50       6.21

                                     <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0070)     3.32      .00   24.17    .10       .00       .05
     OUTFLOW: ID= 1 (0073)     3.32      .00   24.17    .09       .00       .05


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--------------------
| ADD HYD   (0074) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0066):     21.05   1.420    12.17    26.96
        + ID2= 2 (0073):      3.32    .000    24.17      .09
          ==================================================
          ID = 3 (0074):     24.37   1.420    12.17    23.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0072) |   Area    (ha)=  24.19   Curve Number   (CN)= 60.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .37

     Unit Hyd Qpeak  (cms)=   2.505

     PEAK FLOW       (cms)=   1.258 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  28.625
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0075) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0074):     24.37   1.420    12.17    23.30
        + ID2= 2 (0072):     24.19   1.258    12.17    28.63
          ==================================================
          ID = 3 (0075):     48.56   2.678    12.17    25.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0076) |   Area    (ha)= 127.28   Curve Number   (CN)= 59.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.29   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .79
```

```
     Unit Hyd Qpeak  (cms)=   6.192

     PEAK FLOW       (cms)=   3.908 (i)
     TIME TO PEAK    (hrs)=  12.583
     RUNOFF VOLUME    (mm)=  28.782
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .306

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0077) |   Area    (ha)=  17.28   Curve Number   (CN)= 58.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.24   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=   1.154

     PEAK FLOW       (cms)=    .625 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=  27.019
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .287

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0082) |   Area    (ha)=    .24   Curve Number   (CN)= 77.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .081

     PEAK FLOW       (cms)=    .044 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  49.199
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .523

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0078) |   Area    (ha)=   2.66   Curve Number   (CN)= 59.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.55   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.418

     PEAK FLOW       (cms)=    .308 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  26.215
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .279

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0079) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0608
                           .0001      .0607   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0078)      2.66       .31     11.75      26.21
     OUTFLOW: ID= 1 (0079)      2.66       .01     17.17       3.40

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.97
                   TIME SHIFT OF PEAK FLOW         (min)=325.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0649

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0083) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0082):       .24     .044    11.83    49.20
        + ID2= 2 (0079):      2.66     .009    17.17     3.40
          ==================================================
          ID = 3 (0083):      2.90     .044    11.83     7.15
```

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0080) |   Area    (ha)=  14.63   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.37   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=    .977

     PEAK FLOW       (cms)=    .523 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=  26.746
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .284

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0081) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0083):      2.90    .044    11.83     7.15
        + ID2= 2 (0080):     14.63    .523    12.42    26.75
          ==================================================
          ID = 3 (0081):     17.52    .530    12.33    23.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0084) |   Area    (ha)=   7.71   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.14   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=   1.012

     PEAK FLOW       (cms)=    .497 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  30.350
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .323

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0085) |   Area    (ha)=    .91   Curve Number   (CN)= 64.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.53   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .313

     PEAK FLOW       (cms)=    .108 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  32.229
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0086) |   Area    (ha)=  19.15   Curve Number   (CN)= 71.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.81   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=   2.995

     PEAK FLOW       (cms)=   1.900 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  40.838
     TOTAL RAINFALL   (mm)=  94.090
     RUNOFF COEFFICIENT   =    .434

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************
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--------------------
| CHICAGO STORM    |     IDF curve parameters: A=1931.219
| Ptotal=105.44 mm |                           B=  10.500
--------------------                           C=    .836
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  = 24.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =   .49

                    The CORRELATION coefficient is =  .9993
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	200.00	195.31
10.	145.00	154.60
15.	130.00	128.81
30.	96.00	87.50
60.	55.00	55.05
120.	32.00	32.90
360.	13.00	13.75
720.	7.60	7.80
1440.	4.70	4.39

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	.75	6.08	1.41	12.08	25.27	18.08	1.34
.17	.75	6.17	1.43	12.17	19.86	18.17	1.32
.25	.76	6.25	1.45	12.25	16.30	18.25	1.30
.33	.76	6.33	1.47	12.33	13.80	18.33	1.29
.42	.77	6.42	1.49	12.42	11.96	18.42	1.28
.50	.77	6.50	1.51	12.50	10.55	18.50	1.26
.58	.78	6.58	1.54	12.58	9.43	18.58	1.25
.67	.78	6.67	1.56	12.67	8.53	18.67	1.23
.75	.79	6.75	1.58	12.75	7.79	18.75	1.22
.83	.79	6.83	1.61	12.83	7.18	18.83	1.21
.92	.80	6.92	1.63	12.92	6.65	18.92	1.20
1.00	.80	7.00	1.66	13.00	6.20	19.00	1.18
1.08	.81	7.08	1.68	13.08	5.80	19.08	1.17
1.17	.82	7.17	1.71	13.17	5.46	19.17	1.16
1.25	.82	7.25	1.74	13.25	5.16	19.25	1.15
1.33	.83	7.33	1.77	13.33	4.89	19.33	1.14
1.42	.83	7.42	1.80	13.42	4.64	19.42	1.13
1.50	.84	7.50	1.83	13.50	4.43	19.50	1.12
1.58	.84	7.58	1.86	13.58	4.23	19.58	1.11
1.67	.85	7.67	1.90	13.67	4.05	19.67	1.10
1.75	.86	7.75	1.94	13.75	3.88	19.75	1.09
1.83	.86	7.83	1.97	13.83	3.73	19.83	1.08
1.92	.87	7.92	2.01	13.92	3.59	19.92	1.07
2.00	.88	8.00	2.05	14.00	3.47	20.00	1.06
2.08	.88	8.08	2.10	14.08	3.35	20.08	1.05
2.17	.89	8.17	2.14	14.17	3.24	20.17	1.04
2.25	.90	8.25	2.19	14.25	3.13	20.25	1.03
2.33	.90	8.33	2.24	14.33	3.04	20.33	1.02
2.42	.91	8.42	2.29	14.42	2.95	20.42	1.01
2.50	.92	8.50	2.34	14.50	2.86	20.50	1.00
2.58	.92	8.58	2.40	14.58	2.78	20.58	1.00
2.67	.93	8.67	2.46	14.67	2.71	20.67	.99
2.75	.94	8.75	2.52	14.75	2.64	20.75	.98
2.83	.95	8.83	2.59	14.83	2.57	20.83	.97
2.92	.95	8.92	2.66	14.92	2.51	20.92	.96
3.00	.96	9.00	2.74	15.00	2.45	21.00	.96
3.08	.97	9.08	2.82	15.08	2.39	21.08	.95
3.17	.98	9.17	2.90	15.17	2.34	21.17	.94
3.25	.99	9.25	3.00	15.25	2.29	21.25	.93
3.33	1.00	9.33	3.09	15.33	2.24	21.33	.93
3.42	1.00	9.42	3.20	15.42	2.19	21.42	.92
3.50	1.01	9.50	3.31	15.50	2.14	21.50	.91
3.58	1.02	9.58	3.43	15.58	2.10	21.58	.91
3.67	1.03	9.67	3.57	15.67	2.06	21.67	.90
3.75	1.04	9.75	3.71	15.75	2.02	21.75	.89
3.83	1.05	9.83	3.87	15.83	1.98	21.83	.89
3.92	1.06	9.92	4.04	15.92	1.95	21.92	.88
4.00	1.07	10.00	4.23	16.00	1.91	22.00	.87
4.08	1.08	10.08	4.43	16.08	1.88	22.08	.87
4.17	1.09	10.17	4.66	16.17	1.85	22.17	.86
4.25	1.10	10.25	4.92	16.25	1.82	22.25	.86
4.33	1.11	10.33	5.21	16.33	1.79	22.33	.85
4.42	1.12	10.42	5.54	16.42	1.76	22.42	.84
4.50	1.14	10.50	5.91	16.50	1.73	22.50	.84
4.58	1.15	10.58	6.34	16.58	1.70	22.58	.83
4.67	1.16	10.67	6.84	16.67	1.68	22.67	.83
4.75	1.17	10.75	7.43	16.75	1.65	22.75	.82
4.83	1.18	10.83	8.14	16.83	1.63	22.83	.82
4.92	1.20	10.92	8.99	16.92	1.60	22.92	.81
5.00	1.21	11.00	10.05	17.00	1.58	23.00	.81
5.08	1.22	11.08	11.40	17.08	1.56	23.08	.80
5.17	1.24	11.17	13.16	17.17	1.54	23.17	.80

5.25	1.25	11.25	15.55	17.25	1.51	23.25	.79
5.33	1.27	11.33	18.96	17.33	1.49	23.33	.79
5.42	1.28	11.42	24.16	17.42	1.47	23.42	.78
5.50	1.30	11.50	32.93	17.50	1.46	23.50	.78
5.58	1.31	11.58	50.12	17.58	1.44	23.58	.77
5.67	1.33	11.67	94.83	17.67	1.42	23.67	.77
5.75	1.34	11.75	195.31	17.75	1.40	23.75	.76
5.83	1.36	11.83	96.28	17.83	1.38	23.83	.76
5.92	1.38	11.92	51.86	17.92	1.37	23.92	.75
6.00	1.39	12.00	34.32	18.00	1.35	24.00	.75

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| CALIB              |
| NASHYD    (0021) |   Area    (ha)=   8.81   Curve Number   (CN)= 68.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=    .248

     PEAK FLOW       (cms)=    .287 (i)
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  45.125
     TOTAL RAINFALL   (mm)= 105.442
     RUNOFF COEFFICIENT   =    .428

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
| NASHYD    (0027) |   Area    (ha)=    .68   Curve Number   (CN)= 72.2
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.91   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   2.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.033	.75	6.033	1.41	12.033	25.27	18.03	1.34
.067	.75	6.067	1.41	12.067	25.27	18.07	1.34
.100	.75	6.100	1.42	12.100	22.56	18.10	1.33
.133	.75	6.133	1.43	12.133	19.86	18.13	1.32
.167	.75	6.167	1.43	12.167	19.85	18.17	1.32
.200	.76	6.200	1.45	12.200	16.30	18.20	1.30
.233	.76	6.233	1.45	12.233	16.30	18.23	1.30
.267	.76	6.267	1.46	12.267	15.05	18.27	1.30
.300	.76	6.300	1.47	12.300	13.80	18.30	1.29
.333	.76	6.333	1.47	12.333	13.80	18.33	1.29
.367	.77	6.367	1.49	12.367	11.96	18.37	1.28
.400	.77	6.400	1.49	12.400	11.96	18.40	1.28
.433	.77	6.433	1.50	12.433	11.25	18.43	1.27
.467	.77	6.467	1.51	12.467	10.55	18.47	1.26
.500	.77	6.500	1.51	12.500	10.54	18.50	1.26
.533	.78	6.533	1.54	12.533	9.43	18.53	1.25
.567	.78	6.567	1.54	12.567	9.43	18.57	1.25
.600	.78	6.600	1.55	12.600	8.98	18.60	1.24
.633	.78	6.633	1.56	12.633	8.53	18.63	1.23
.667	.78	6.667	1.56	12.667	8.53	18.67	1.23
.700	.79	6.700	1.58	12.700	7.79	18.70	1.22
.733	.79	6.733	1.58	12.733	7.79	18.73	1.22
.767	.79	6.767	1.59	12.767	7.48	18.77	1.22
.800	.79	6.800	1.61	12.800	7.18	18.80	1.21
.833	.79	6.833	1.61	12.833	7.17	18.83	1.21
.867	.80	6.867	1.63	12.867	6.65	18.87	1.20
.900	.80	6.900	1.63	12.900	6.65	18.90	1.20
.933	.80	6.933	1.64	12.933	6.42	18.93	1.19
.967	.80	6.967	1.66	12.967	6.20	18.97	1.18
1.000	.80	7.000	1.66	13.000	6.20	19.00	1.18
1.033	.81	7.033	1.68	13.033	5.80	19.03	1.17
1.067	.81	7.067	1.68	13.067	5.80	19.07	1.17
1.100	.81	7.100	1.70	13.100	5.63	19.10	1.17
1.133	.82	7.133	1.71	13.133	5.46	19.13	1.16
1.167	.82	7.167	1.71	13.167	5.46	19.17	1.16
1.200	.82	7.200	1.74	13.200	5.16	19.20	1.15
1.233	.82	7.233	1.74	13.233	5.16	19.23	1.15
1.267	.82	7.267	1.75	13.267	5.02	19.27	1.14
1.300	.83	7.300	1.77	13.300	4.89	19.30	1.14
1.333	.83	7.333	1.77	13.333	4.89	19.33	1.14
1.367	.83	7.367	1.80	13.367	4.64	19.37	1.13
1.400	.83	7.400	1.80	13.400	4.64	19.40	1.13
1.433	.84	7.433	1.82	13.433	4.53	19.43	1.12
1.467	.84	7.467	1.83	13.467	4.43	19.47	1.12
1.500	.84	7.500	1.83	13.500	4.42	19.50	1.12
1.533	.84	7.533	1.86	13.533	4.23	19.53	1.11
1.567	.84	7.567	1.86	13.567	4.23	19.57	1.11

1.600	.85	7.600	1.88	13.600	4.14	19.60	1.10
1.633	.85	7.633	1.90	13.633	4.05	19.63	1.10
1.667	.85	7.667	1.90	13.667	4.05	19.67	1.10
1.700	.86	7.700	1.94	13.700	3.88	19.70	1.09
1.733	.86	7.733	1.94	13.733	3.88	19.73	1.09
1.767	.86	7.767	1.95	13.767	3.81	19.77	1.08
1.800	.86	7.800	1.97	13.800	3.73	19.80	1.08
1.833	.86	7.833	1.97	13.833	3.73	19.83	1.08
1.867	.87	7.867	2.01	13.867	3.59	19.87	1.07
1.900	.87	7.900	2.01	13.900	3.59	19.90	1.07
1.933	.87	7.933	2.03	13.933	3.53	19.93	1.06
1.967	.88	7.967	2.05	13.967	3.47	19.97	1.06
2.000	.88	8.000	2.05	14.000	3.47	20.00	1.06
2.033	.88	8.033	2.10	14.033	3.35	20.03	1.05
2.067	.88	8.067	2.10	14.067	3.35	20.07	1.05
2.100	.89	8.100	2.12	14.100	3.29	20.10	1.04
2.133	.89	8.133	2.14	14.133	3.24	20.13	1.04
2.167	.89	8.167	2.14	14.167	3.24	20.17	1.04
2.200	.90	8.200	2.19	14.200	3.13	20.20	1.03
2.233	.90	8.233	2.19	14.233	3.13	20.23	1.03
2.267	.90	8.267	2.21	14.267	3.09	20.27	1.03
2.300	.90	8.300	2.24	14.300	3.04	20.30	1.02
2.333	.90	8.333	2.24	14.333	3.04	20.33	1.02
2.367	.91	8.367	2.29	14.367	2.95	20.37	1.01
2.400	.91	8.400	2.29	14.400	2.95	20.40	1.01
2.433	.91	8.433	2.32	14.433	2.91	20.43	1.01
2.467	.92	8.467	2.34	14.467	2.86	20.47	1.00
2.500	.92	8.500	2.34	14.500	2.86	20.50	1.00
2.533	.92	8.533	2.40	14.533	2.78	20.53	1.00
2.567	.92	8.567	2.40	14.567	2.78	20.57	1.00
2.600	.93	8.600	2.43	14.600	2.75	20.60	.99
2.633	.93	8.633	2.46	14.633	2.71	20.63	.99
2.667	.93	8.667	2.46	14.667	2.71	20.67	.99
2.700	.94	8.700	2.52	14.700	2.64	20.70	.98
2.733	.94	8.733	2.52	14.733	2.64	20.73	.98
2.767	.94	8.767	2.56	14.767	2.60	20.77	.98
2.800	.95	8.800	2.59	14.800	2.57	20.80	.97
2.833	.95	8.833	2.59	14.833	2.57	20.83	.97
2.867	.95	8.867	2.66	14.867	2.51	20.87	.96
2.900	.95	8.900	2.66	14.900	2.51	20.90	.96
2.933	.96	8.933	2.70	14.933	2.48	20.93	.96
2.967	.96	8.967	2.74	14.967	2.45	20.97	.96
3.000	.96	9.000	2.74	15.000	2.45	21.00	.96
3.033	.97	9.033	2.82	15.033	2.39	21.03	.95
3.067	.97	9.067	2.82	15.067	2.39	21.07	.95
3.100	.98	9.100	2.86	15.100	2.36	21.10	.95
3.133	.98	9.133	2.90	15.133	2.34	21.13	.94
3.167	.98	9.167	2.90	15.167	2.34	21.17	.94
3.200	.99	9.200	3.00	15.200	2.29	21.20	.93
3.233	.99	9.233	3.00	15.233	2.29	21.23	.93
3.267	.99	9.267	3.05	15.267	2.26	21.27	.93
3.300	1.00	9.300	3.09	15.300	2.24	21.30	.93
3.333	1.00	9.333	3.09	15.333	2.24	21.33	.93
3.367	1.00	9.367	3.20	15.367	2.19	21.37	.92
3.400	1.00	9.400	3.20	15.400	2.19	21.40	.92
3.433	1.01	9.433	3.26	15.433	2.17	21.43	.92
3.467	1.01	9.467	3.31	15.467	2.14	21.47	.91
3.500	1.01	9.500	3.31	15.500	2.14	21.50	.91
3.533	1.02	9.533	3.43	15.533	2.10	21.53	.91
3.567	1.02	9.567	3.43	15.567	2.10	21.57	.91
3.600	1.03	9.600	3.50	15.600	2.08	21.60	.90
3.633	1.03	9.633	3.57	15.633	2.06	21.63	.90
3.667	1.03	9.667	3.57	15.667	2.06	21.67	.90
3.700	1.04	9.700	3.71	15.700	2.02	21.70	.89
3.733	1.04	9.733	3.71	15.733	2.02	21.73	.89
3.767	1.05	9.767	3.79	15.767	2.00	21.77	.89
3.800	1.05	9.800	3.87	15.800	1.98	21.80	.89
3.833	1.05	9.833	3.87	15.833	1.98	21.83	.89
3.867	1.06	9.867	4.04	15.867	1.95	21.87	.88
3.900	1.06	9.900	4.04	15.900	1.95	21.90	.88
3.933	1.07	9.933	4.13	15.933	1.93	21.93	.88
3.967	1.07	9.967	4.23	15.967	1.91	21.97	.87
4.000	1.07	10.000	4.23	16.000	1.91	22.00	.87
4.033	1.08	10.033	4.43	16.033	1.88	22.03	.87
4.067	1.08	10.067	4.43	16.067	1.88	22.07	.87
4.100	1.09	10.100	4.55	16.100	1.86	22.10	.87
4.133	1.09	10.133	4.66	16.133	1.85	22.13	.86
4.167	1.09	10.167	4.66	16.167	1.85	22.17	.86
4.200	1.10	10.200	4.92	16.200	1.82	22.20	.86
4.233	1.10	10.233	4.92	16.233	1.82	22.23	.86
4.267	1.11	10.267	5.07	16.267	1.80	22.27	.85
4.300	1.11	10.300	5.21	16.300	1.79	22.30	.85
4.333	1.11	10.333	5.21	16.333	1.79	22.33	.85
4.367	1.12	10.367	5.54	16.367	1.76	22.37	.84
4.400	1.12	10.400	5.54	16.400	1.76	22.40	.84
4.433	1.13	10.433	5.73	16.433	1.74	22.43	.84
4.467	1.14	10.467	5.91	16.467	1.73	22.47	.84
4.500	1.14	10.500	5.91	16.500	1.73	22.50	.84
4.533	1.15	10.533	6.34	16.533	1.70	22.53	.83

4.567	1.15	10.567	6.34	16.567	1.70	22.57	.83
4.600	1.15	10.600	6.59	16.600	1.69	22.60	.83
4.633	1.16	10.633	6.84	16.633	1.68	22.63	.83
4.667	1.16	10.667	6.84	16.667	1.68	22.67	.83
4.700	1.17	10.700	7.43	16.700	1.65	22.70	.82
4.733	1.17	10.733	7.43	16.733	1.65	22.73	.82
4.767	1.18	10.767	7.78	16.767	1.64	22.77	.82
4.800	1.18	10.800	8.14	16.800	1.63	22.80	.82
4.833	1.18	10.833	8.14	16.833	1.63	22.83	.82
4.867	1.20	10.867	8.99	16.867	1.60	22.87	.81
4.900	1.20	10.900	8.99	16.900	1.60	22.90	.81
4.933	1.20	10.933	9.52	16.933	1.59	22.93	.81
4.967	1.21	10.967	10.05	16.967	1.58	22.97	.81
5.000	1.21	11.000	10.05	17.000	1.58	23.00	.81
5.033	1.22	11.033	11.40	17.033	1.56	23.03	.80
5.067	1.22	11.067	11.40	17.067	1.56	23.07	.80
5.100	1.23	11.100	12.28	17.100	1.55	23.10	.80
5.133	1.24	11.133	13.16	17.133	1.54	23.13	.80
5.167	1.24	11.167	13.16	17.167	1.54	23.17	.80
5.200	1.25	11.200	15.55	17.200	1.51	23.20	.79
5.233	1.25	11.233	15.55	17.233	1.51	23.23	.79
5.267	1.26	11.267	17.25	17.267	1.50	23.27	.79
5.300	1.27	11.300	18.96	17.300	1.49	23.30	.79
5.333	1.27	11.333	18.96	17.333	1.49	23.33	.79
5.367	1.28	11.367	24.16	17.367	1.47	23.37	.78
5.400	1.28	11.400	24.16	17.400	1.47	23.40	.78
5.433	1.29	11.433	28.55	17.433	1.47	23.43	.78
5.467	1.30	11.467	32.93	17.467	1.46	23.47	.78
5.500	1.30	11.500	32.95	17.500	1.46	23.50	.78
5.533	1.31	11.533	50.12	17.533	1.44	23.53	.77
5.567	1.31	11.567	50.12	17.567	1.44	23.57	.77
5.600	1.32	11.600	72.53	17.600	1.43	23.60	.77
5.633	1.33	11.633	94.83	17.633	1.42	23.63	.77
5.667	1.33	11.667	94.96	17.667	1.42	23.67	.77
5.700	1.34	11.700	195.31	17.700	1.40	23.70	.76
5.733	1.34	11.733	195.31	17.733	1.40	23.73	.76
5.767	1.35	11.767	145.66	17.767	1.39	23.77	.76
5.800	1.36	11.800	96.28	17.800	1.38	23.80	.76
5.833	1.36	11.833	96.22	17.833	1.38	23.83	.76
5.867	1.38	11.867	51.86	17.867	1.37	23.87	.75
5.900	1.38	11.900	51.86	17.900	1.37	23.90	.75
5.933	1.39	11.933	43.06	17.933	1.36	23.93	.75
5.967	1.39	11.967	34.32	17.967	1.35	23.97	.75
6.000	1.39	12.000	34.30	18.000	1.35	24.00	.75

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     Unit Hyd Qpeak  (cms)=    .466

     PEAK FLOW       (cms)=    .161 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  50.527
     TOTAL RAINFALL   (mm)= 105.441
     RUNOFF COEFFICIENT   =    .479

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
| NASHYD    (0024) |   Area    (ha)=   5.03   Curve Number   (CN)= 72.5
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.75   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   2.433

     PEAK FLOW       (cms)=   1.073 (i)
     TIME TO PEAK    (hrs)=  11.800
     RUNOFF VOLUME    (mm)=  39.018
     TOTAL RAINFALL   (mm)= 105.441
     RUNOFF COEFFICIENT   =    .370

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD    (0022) |   Area    (ha)=   3.01   Curve Number   (CN)= 71.6
|ID= 1 DT= 2.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   2.069

     PEAK FLOW       (cms)=    .700 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  37.512
     TOTAL RAINFALL   (mm)= 105.441
     RUNOFF COEFFICIENT   =    .356

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| RESERVOIR (0023) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000       .0000  |     .0002      .2156
                            .0001       .1117  |  20.0000      .2166

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0022)       3.01       .70     11.77      37.51
     OUTFLOW: ID= 1 (0023)       3.01       .00     13.60        .02

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .01
                   TIME SHIFT OF PEAK FLOW         (min)=110.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1128

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| ADD HYD   (0026) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0024):      5.03   1.073    11.80    39.02
        + ID2= 2 (0023):      3.01    .000    13.60      .02
          ==================================================
          ID = 3 (0026):      8.04   1.073    11.80    24.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| RESERVOIR (0025) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000       .0000  |     .0003      .2171
                            .0001       .0498  |  20.0000      .2181
                            .0002       .1676  |     .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0026)       8.04      1.07     11.80      24.43
     OUTFLOW: ID= 1 (0025)       8.04       .00     13.70        .21

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .02
                   TIME SHIFT OF PEAK FLOW         (min)=114.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1962

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--------------------
| ADD HYD   (0028) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0027):       .68    .161    11.77    50.53
        + ID2= 2 (0025):      8.04    .000    13.70      .21
          ==================================================
          ID = 3 (0028):      8.72    .161    11.77     4.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0029) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000       .0000  |     .0002      .0898
                            .0001       .0455  |  20.0000      .0908

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0028)       8.72       .16     11.77       4.12
     OUTFLOW: ID= 1 (0029)       8.72       .00     29.77        .05

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .05
                   TIME SHIFT OF PEAK FLOW         (min)=******
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0355

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0032) |   Area    (ha)=   6.71   Curve Number   (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .32

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.083	.75	6.083	1.41	12.083	25.27	18.08	1.34
.167	.75	6.167	1.43	12.167	19.86	18.17	1.32
.250	.76	6.250	1.45	12.250	16.30	18.25	1.30
.333	.76	6.333	1.47	12.333	13.80	18.33	1.29
.417	.77	6.417	1.49	12.417	11.96	18.42	1.28
.500	.77	6.500	1.51	12.500	10.55	18.50	1.26
.583	.78	6.583	1.54	12.583	9.43	18.58	1.25
.667	.78	6.667	1.56	12.667	8.53	18.67	1.23
.750	.79	6.750	1.58	12.750	7.79	18.75	1.22
.833	.79	6.833	1.61	12.833	7.18	18.83	1.21
.917	.80	6.917	1.63	12.917	6.65	18.92	1.20
1.000	.80	7.000	1.66	13.000	6.20	19.00	1.18
1.083	.81	7.083	1.68	13.083	5.80	19.08	1.17
1.167	.82	7.167	1.71	13.167	5.46	19.17	1.16
1.250	.82	7.250	1.74	13.250	5.16	19.25	1.15
1.333	.83	7.333	1.77	13.333	4.89	19.33	1.14
1.417	.83	7.417	1.80	13.417	4.64	19.42	1.13
1.500	.84	7.500	1.83	13.500	4.43	19.50	1.12
1.583	.84	7.583	1.86	13.583	4.23	19.58	1.11
1.667	.85	7.667	1.90	13.667	4.05	19.67	1.10
1.750	.86	7.750	1.94	13.750	3.88	19.75	1.09
1.833	.86	7.833	1.97	13.833	3.73	19.83	1.08
1.917	.87	7.917	2.01	13.917	3.59	19.92	1.07
2.000	.88	8.000	2.05	14.000	3.47	20.00	1.06
2.083	.88	8.083	2.10	14.083	3.35	20.08	1.05
2.167	.89	8.167	2.14	14.167	3.24	20.17	1.04
2.250	.90	8.250	2.19	14.250	3.13	20.25	1.03
2.333	.90	8.333	2.24	14.333	3.04	20.33	1.02
2.417	.91	8.417	2.29	14.417	2.95	20.42	1.01
2.500	.92	8.500	2.34	14.500	2.86	20.50	1.00
2.583	.92	8.583	2.40	14.583	2.78	20.58	1.00
2.667	.93	8.667	2.46	14.667	2.71	20.67	.99
2.750	.94	8.750	2.52	14.750	2.64	20.75	.98
2.833	.95	8.833	2.59	14.833	2.57	20.83	.97
2.917	.95	8.917	2.66	14.917	2.51	20.92	.96
3.000	.96	9.000	2.74	15.000	2.45	21.00	.96
3.083	.97	9.083	2.82	15.083	2.39	21.08	.95
3.167	.98	9.167	2.90	15.167	2.34	21.17	.94
3.250	.99	9.250	3.00	15.250	2.29	21.25	.93
3.333	1.00	9.333	3.09	15.333	2.24	21.33	.93
3.417	1.00	9.417	3.20	15.417	2.19	21.42	.92
3.500	1.01	9.500	3.31	15.500	2.14	21.50	.91
3.583	1.02	9.583	3.43	15.583	2.10	21.58	.91
3.667	1.03	9.667	3.57	15.667	2.06	21.67	.90
3.750	1.04	9.750	3.71	15.750	2.02	21.75	.89
3.833	1.05	9.833	3.87	15.833	1.98	21.83	.89
3.917	1.06	9.917	4.04	15.917	1.95	21.92	.88
4.000	1.07	10.000	4.23	16.000	1.91	22.00	.87
4.083	1.08	10.083	4.43	16.083	1.88	22.08	.87
4.167	1.09	10.167	4.66	16.167	1.85	22.17	.86
4.250	1.10	10.250	4.92	16.250	1.82	22.25	.86
4.333	1.11	10.333	5.21	16.333	1.79	22.33	.85
4.417	1.12	10.417	5.54	16.417	1.76	22.42	.84
4.500	1.14	10.500	5.91	16.500	1.73	22.50	.84
4.583	1.15	10.583	6.34	16.583	1.70	22.58	.83
4.667	1.16	10.667	6.84	16.667	1.68	22.67	.83
4.750	1.17	10.750	7.43	16.750	1.65	22.75	.82
4.833	1.18	10.833	8.14	16.833	1.63	22.83	.82
4.917	1.20	10.917	8.99	16.917	1.60	22.92	.81
5.000	1.21	11.000	10.05	17.000	1.58	23.00	.81
5.083	1.22	11.083	11.40	17.083	1.56	23.08	.80
5.167	1.24	11.167	13.16	17.167	1.54	23.17	.80
5.250	1.25	11.250	15.55	17.250	1.51	23.25	.79
5.333	1.27	11.333	18.96	17.333	1.49	23.33	.79
5.417	1.28	11.417	24.16	17.417	1.47	23.42	.78
5.500	1.30	11.500	32.93	17.500	1.46	23.50	.78
5.583	1.31	11.583	50.12	17.583	1.44	23.58	.77
5.667	1.33	11.667	94.83	17.667	1.42	23.67	.77
5.750	1.34	11.750	195.29	17.750	1.40	23.75	.76
5.833	1.36	11.833	96.29	17.833	1.38	23.83	.76
5.917	1.38	11.917	51.86	17.917	1.37	23.92	.75
6.000	1.39	12.000	34.32	18.000	1.35	24.00	.00

Unit Hyd Qpeak (cms)= .800

PEAK FLOW (cms)= .538 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 39.323
TOTAL RAINFALL (mm)= 105.380
RUNOFF COEFFICIENT = .373

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0030) |   Area    (ha)=   5.57   Curve Number   (CN)= 69.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.12   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   3.828

     PEAK FLOW       (cms)=   1.096 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  38.704
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .367

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0031) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                   .00         386.25          .0300
                 37.50         385.75     .0300 / .0300  Main Channel
                 47.50         385.75     .0300 / .0300  Main Channel
                 85.00         386.25          .0300

      <--------------------- TRAVEL TIME TABLE --------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   385.78    .150E+03        .1           .33      23.91
        .05   385.80    .350E+03        .3           .47      16.85
        .08   385.83    .599E+03        .7           .56      14.12
        .11   385.86    .898E+03       1.2           .63      12.62
        .13   385.88    .125E+04       1.8           .68      11.65
        .16   385.91    .164E+04       2.5           .73      10.95
        .18   385.93    .209E+04       3.3           .76      10.42
        .21   385.96    .259E+04       4.3           .80       9.99
        .24   385.99    .313E+04       5.4           .82       9.64
        .26   386.01    .373E+04       6.7           .85       9.33
        .29   386.04    .438E+04       8.0           .88       9.07
        .32   386.07    .507E+04       9.6           .90       8.83
        .34   386.09    .582E+04      11.2           .92       8.62
        .37   386.12    .661E+04      13.1           .94       8.43
        .39   386.14    .745E+04      15.1           .96       8.25
        .42   386.17    .835E+04      17.2           .98       8.08
        .45   386.20    .929E+04      19.5          1.00       7.93
        .47   386.22    .103E+05      22.0          1.02       7.79
        .50   386.25    .113E+05      24.7          1.04       7.65

                                   <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0030)  5.57     1.10   11.75  38.70       .10        .62
     OUTFLOW: ID= 1 (0031)  5.57      .56   11.92  38.68       .07        .52


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--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0032):      6.71     .538    12.08    39.32
       + ID2= 2 (0031):      5.57     .560    11.92    38.68
         ==================================================
         ID = 3 (0033):     12.27    1.019    11.92    39.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0036) |   Area    (ha)=   2.08   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.71   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=    .938

     PEAK FLOW       (cms)=    .347 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  41.483
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .394

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB             |
| NASHYD    (0034)  |   Area     (ha)=   2.15   Curve Number   (CN)= 71.9
|ID= 1 DT= 5.0 min  |   Ia       (mm)=   5.03   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=    .10

     Unit Hyd Qpeak  (cms)=    .795

     PEAK FLOW       (cms)=    .400 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  49.325
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .468

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ROUTE CHN (0035) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.3) ------>
               Distance      Elevation       Manning
                   .00        388.25          .0300
                 30.00        387.75     .0300 / .0300  Main Channel
                 40.00        387.75     .0300 / .0300  Main Channel
                 70.00        388.25          .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   387.78    .327E+02        .1           .41       4.35
        .05   387.80    .744E+02        .4           .59       3.03
        .08   387.83    .125E+03        .8           .71       2.52
        .11   387.86    .185E+03       1.4           .80       2.25
        .13   387.88    .253E+03       2.0           .87       2.07
        .16   387.91    .330E+03       2.8           .92       1.95
        .18   387.93    .417E+03       3.7           .97       1.85
        .21   387.96    .512E+03       4.8          1.01       1.78
        .24   387.99    .616E+03       6.0          1.04       1.72
        .26   388.01    .729E+03       7.3          1.07       1.67
        .29   388.04    .851E+03       8.7          1.10       1.63
        .32   388.07    .982E+03      10.3          1.13       1.59
        .34   388.09    .112E+04      12.0          1.15       1.56
        .37   388.12    .127E+04      13.9          1.17       1.53
        .39   388.14    .143E+04      15.9          1.19       1.50
        .42   388.17    .160E+04      18.0          1.21       1.48
        .45   388.20    .177E+04      20.3          1.23       1.45
        .47   388.22    .196E+04      22.8          1.25       1.43
        .50   388.25    .215E+04      25.4          1.27       1.41

                                      <---- hydrograph ---->   <-pipe / channel->
                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0034)      2.15      .40   11.83  49.32       .05       .58
     OUTFLOW: ID= 1 (0035)      2.15      .39   11.83  49.32       .05       .57


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--------------------
| ADD HYD   (0037) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0036):      2.08    .347    11.75    41.48
       + ID2= 2 (0035):      2.15    .387    11.83    49.32
         ==================================================
         ID = 3 (0037):      4.23    .721    11.83    45.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB             |
| NASHYD    (0039)  |   Area     (ha)=  35.03   Curve Number   (CN)= 65.5
|ID= 1 DT= 5.0 min  |   Ia       (mm)=   7.17   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=   1.16

     Unit Hyd Qpeak  (cms)=   1.152

     PEAK FLOW       (cms)=   1.182 (i)
     TIME TO PEAK    (hrs)=  13.083
     RUNOFF VOLUME    (mm)=  41.553
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .394

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0040) |   Area    (ha)=   3.95   Curve Number   (CN)= 54.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .40

     Unit Hyd Qpeak  (cms)=    .375

     PEAK FLOW       (cms)=    .198 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  29.178
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .277

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0041) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1655
                           .0001      .0976   |  20.0000      .1665

                                AREA     QPEAK     TPEAK        R.V.
                                (ha)     (cms)     (hrs)        (mm)
     INFLOW : ID= 2 (0040)      3.95       .20     12.17       29.18
     OUTFLOW: ID= 1 (0041)      3.95       .00     25.25         .13

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .06
                   TIME SHIFT OF PEAK FLOW         (min)=785.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1148

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--------------------
| CALIB            |
| NASHYD    (0044) |   Area    (ha)=    .87   Curve Number   (CN)= 64.6
|ID= 1 DT= 3.0 min |   Ia      (mm)=   6.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.050	.75	6.050	1.41	12.050	25.27	18.05	1.34
.100	.75	6.100	1.42	12.100	23.46	18.10	1.33
.150	.75	6.150	1.43	12.150	19.86	18.15	1.32
.200	.76	6.200	1.44	12.200	17.49	18.20	1.31
.250	.76	6.250	1.45	12.250	16.30	18.25	1.30
.300	.76	6.300	1.47	12.300	13.80	18.30	1.29
.350	.77	6.350	1.48	12.350	13.19	18.35	1.29
.400	.77	6.400	1.49	12.400	11.96	18.40	1.28
.450	.77	6.450	1.51	12.450	11.02	18.45	1.27
.500	.77	6.500	1.51	12.500	10.55	18.50	1.26
.550	.78	6.550	1.54	12.550	9.43	18.55	1.25
.600	.78	6.600	1.54	12.600	9.13	18.60	1.24
.650	.78	6.650	1.56	12.650	8.53	18.65	1.23
.700	.79	6.700	1.57	12.700	8.04	18.70	1.23
.750	.79	6.750	1.58	12.750	7.79	18.75	1.22
.800	.79	6.800	1.61	12.800	7.18	18.80	1.21
.850	.80	6.850	1.61	12.850	7.00	18.85	1.21
.900	.80	6.900	1.63	12.900	6.65	18.90	1.20
.950	.80	6.950	1.65	12.950	6.35	18.95	1.19
1.000	.80	7.000	1.66	13.000	6.20	19.00	1.18
1.050	.81	7.050	1.68	13.050	5.80	19.05	1.17
1.100	.81	7.100	1.69	13.100	5.69	19.10	1.17
1.150	.82	7.150	1.71	13.150	5.46	19.15	1.16
1.200	.82	7.200	1.73	13.200	5.26	19.20	1.15
1.250	.82	7.250	1.74	13.250	5.16	19.25	1.15
1.300	.83	7.300	1.77	13.300	4.89	19.30	1.14
1.350	.83	7.350	1.78	13.350	4.80	19.35	1.13
1.400	.83	7.400	1.80	13.400	4.64	19.40	1.13
1.450	.84	7.450	1.82	13.450	4.50	19.45	1.12
1.500	.84	7.500	1.83	13.500	4.43	19.50	1.12
1.550	.84	7.550	1.86	13.550	4.23	19.55	1.11
1.600	.85	7.600	1.88	13.600	4.17	19.60	1.10
1.650	.85	7.650	1.90	13.650	4.05	19.65	1.10
1.700	.85	7.700	1.92	13.700	3.94	19.70	1.09
1.750	.86	7.750	1.94	13.750	3.88	19.75	1.09
1.800	.86	7.800	1.97	13.800	3.73	19.80	1.08
1.850	.87	7.850	1.99	13.850	3.69	19.85	1.07
1.900	.87	7.900	2.01	13.900	3.59	19.90	1.07
1.950	.87	7.950	2.04	13.950	3.51	19.95	1.06
2.000	.88	8.000	2.05	14.000	3.47	20.00	1.06
2.050	.88	8.050	2.10	14.050	3.35	20.05	1.05
2.100	.88	8.100	2.11	14.100	3.31	20.10	1.04

2.150	.89	8.150	2.14	14.150	3.24	20.15	1.04
2.200	.89	8.200	2.17	14.200	3.17	20.20	1.03
2.250	.90	8.250	2.19	14.250	3.13	20.25	1.03
2.300	.90	8.300	2.24	14.300	3.04	20.30	1.02
2.350	.91	8.350	2.25	14.350	3.01	20.35	1.02
2.400	.91	8.400	2.29	14.400	2.95	20.40	1.01
2.450	.91	8.450	2.32	14.450	2.89	20.45	1.01
2.500	.92	8.500	2.34	14.500	2.86	20.50	1.00
2.550	.92	8.550	2.40	14.550	2.78	20.55	1.00
2.600	.93	8.600	2.42	14.600	2.76	20.60	.99
2.650	.93	8.650	2.46	14.650	2.71	20.65	.99
2.700	.94	8.700	2.50	14.700	2.66	20.70	.98
2.750	.94	8.750	2.52	14.750	2.64	20.75	.98
2.800	.95	8.800	2.59	14.800	2.57	20.80	.97
2.850	.95	8.850	2.62	14.850	2.55	20.85	.97
2.900	.95	8.900	2.66	14.900	2.51	20.90	.96
2.950	.96	8.950	2.71	14.950	2.47	20.95	.96
3.000	.96	9.000	2.74	15.000	2.45	21.00	.96
3.050	.97	9.050	2.82	15.050	2.39	21.05	.95
3.100	.97	9.100	2.85	15.100	2.37	21.10	.95
3.150	.98	9.150	2.90	15.150	2.34	21.15	.94
3.200	.98	9.200	2.97	15.200	2.30	21.20	.94
3.250	.99	9.250	3.00	15.250	2.29	21.25	.93
3.300	1.00	9.300	3.09	15.300	2.24	21.30	.93
3.350	1.00	9.350	3.13	15.350	2.22	21.35	.92
3.400	1.00	9.400	3.20	15.400	2.19	21.40	.92
3.450	1.01	9.450	3.27	15.450	2.16	21.45	.92
3.500	1.01	9.500	3.31	15.500	2.14	21.50	.91
3.550	1.02	9.550	3.43	15.550	2.10	21.55	.91
3.600	1.03	9.600	3.48	15.600	2.09	21.60	.90
3.650	1.03	9.650	3.57	15.650	2.06	21.65	.90
3.700	1.04	9.700	3.66	15.700	2.03	21.70	.90
3.750	1.04	9.750	3.71	15.750	2.02	21.75	.89
3.800	1.05	9.800	3.87	15.800	1.98	21.80	.89
3.850	1.05	9.850	3.92	15.850	1.97	21.85	.88
3.900	1.06	9.900	4.04	15.900	1.95	21.90	.88
3.950	1.07	9.950	4.16	15.950	1.92	21.95	.88
4.000	1.07	10.000	4.23	16.000	1.91	22.00	.87
4.050	1.08	10.050	4.43	16.050	1.88	22.05	.87
4.100	1.08	10.100	4.51	16.100	1.87	22.10	.87
4.150	1.09	10.150	4.66	16.150	1.85	22.15	.86
4.200	1.10	10.200	4.84	16.200	1.83	22.20	.86
4.250	1.10	10.250	4.92	16.250	1.82	22.25	.86
4.300	1.11	10.300	5.21	16.300	1.79	22.30	.85
4.350	1.12	10.350	5.32	16.350	1.78	22.35	.85
4.400	1.12	10.400	5.54	16.400	1.76	22.40	.84
4.450	1.13	10.450	5.79	16.450	1.74	22.45	.84
4.500	1.14	10.500	5.91	16.500	1.73	22.50	.84
4.550	1.15	10.550	6.34	16.550	1.70	22.55	.83
4.600	1.15	10.600	6.51	16.600	1.69	22.60	.83
4.650	1.16	10.650	6.84	16.650	1.68	22.65	.83
4.700	1.17	10.700	7.24	16.700	1.66	22.70	.82
4.750	1.17	10.750	7.43	16.750	1.65	22.75	.82
4.800	1.18	10.800	8.14	16.800	1.63	22.80	.82
4.850	1.19	10.850	8.42	16.850	1.62	22.85	.82
4.900	1.20	10.900	8.99	16.900	1.60	22.90	.81
4.950	1.21	10.950	9.70	16.950	1.59	22.95	.81
5.000	1.21	11.000	10.05	17.000	1.58	23.00	.81
5.050	1.22	11.050	11.40	17.050	1.56	23.05	.80
5.100	1.23	11.100	11.98	17.100	1.55	23.10	.80
5.150	1.24	11.150	13.16	17.150	1.54	23.15	.80
5.200	1.25	11.200	14.75	17.200	1.52	23.20	.79
5.250	1.25	11.250	15.55	17.250	1.51	23.25	.79
5.300	1.27	11.300	18.96	17.300	1.49	23.30	.79
5.350	1.27	11.350	20.69	17.350	1.49	23.35	.78
5.400	1.28	11.400	24.16	17.400	1.47	23.40	.78
5.450	1.29	11.450	30.01	17.450	1.46	23.45	.78
5.500	1.30	11.500	32.93	17.500	1.46	23.50	.78
5.550	1.31	11.550	50.12	17.550	1.44	23.55	.77
5.600	1.32	11.600	65.05	17.600	1.43	23.60	.77
5.650	1.33	11.650	94.83	17.650	1.42	23.65	.77
5.700	1.34	11.700	161.87	17.700	1.41	23.70	.76
5.750	1.34	11.750	195.25	17.750	1.40	23.75	.76
5.800	1.36	11.800	96.28	17.800	1.38	23.80	.76
5.850	1.37	11.850	81.45	17.850	1.38	23.85	.76
5.900	1.38	11.900	51.86	17.900	1.37	23.90	.75
5.950	1.39	11.950	40.15	17.950	1.36	23.95	.75
6.000	1.39	12.000	34.31	18.000	1.35	24.00	.75

```
Unit Hyd Qpeak  (cms)=    .596

PEAK FLOW       (cms)=    .162 (i)
TIME TO PEAK    (hrs)=  11.750
RUNOFF VOLUME    (mm)=  39.615
TOTAL RAINFALL   (mm)= 105.442
RUNOFF COEFFICIENT   =    .376

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| NASHYD    (0042) |   Area    (ha)=    .56   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .382

     PEAK FLOW       (cms)=    .124 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  44.093
     TOTAL RAINFALL   (mm)= 105.442
     RUNOFF COEFFICIENT   =    .418

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0043) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0357
                           .0001      .0118   |  20.0000      .0367

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0042)       .56       .12     11.75      44.09
     OUTFLOW: ID= 1 (0043)       .56       .00     20.10        .79

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .12
                   TIME SHIFT OF PEAK FLOW         (min)=501.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0241

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--------------------
| ADD HYD   (0045) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0044):      .87    .162    11.75    39.61
        + ID2= 2 (0043):      .56    .000    20.10      .79
          ==================================================
          ID = 3 (0045):     1.42    .162    11.75    24.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0046) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1073
                           .0001      .0117   |  20.0000      .1083

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0045)      1.42       .16     11.75      24.45
     OUTFLOW: ID= 1 (0046)      1.42       .00     24.15        .38

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .08
                   TIME SHIFT OF PEAK FLOW         (min)=744.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0343

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0047) |   Area    (ha)=    .48   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .331

     PEAK FLOW       (cms)=    .107 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  44.093
     TOTAL RAINFALL   (mm)= 105.442
     RUNOFF COEFFICIENT   =    .418

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0048) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
```

```
                  .0000       .0000   |    .0002       .0731
                  .0001       .0496   |  20.0000       .0741

                        AREA      QPEAK      TPEAK        R.V.
                        (ha)      (cms)      (hrs)        (mm)
INFLOW : ID= 2 (0047)    .48        .11      11.75       44.09
OUTFLOW: ID= 1 (0048)    .48        .00      20.15         .24

              PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .04
              TIME SHIFT OF PEAK FLOW         (min)=504.00
              MAXIMUM  STORAGE   USED       (ha.m.)=  .0211

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--------------------
| CALIB              |
| NASHYD    (0049) |   Area    (ha)=   2.77   Curve Number   (CN)= 70.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.35   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

    NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	.75	6.083	1.41	12.083	25.27	18.08	1.34
.167	.75	6.167	1.43	12.167	19.86	18.17	1.32
.250	.76	6.250	1.45	12.250	16.30	18.25	1.30
.333	.76	6.333	1.47	12.333	13.80	18.33	1.29
.417	.77	6.417	1.49	12.417	11.96	18.42	1.28
.500	.77	6.500	1.51	12.500	10.55	18.50	1.26
.583	.78	6.583	1.54	12.583	9.43	18.58	1.25
.667	.78	6.667	1.56	12.667	8.53	18.67	1.23
.750	.79	6.750	1.58	12.750	7.79	18.75	1.22
.833	.79	6.833	1.61	12.833	7.18	18.83	1.21
.917	.80	6.917	1.63	12.917	6.65	18.92	1.20
1.000	.80	7.000	1.66	13.000	6.20	19.00	1.18
1.083	.81	7.083	1.68	13.083	5.80	19.08	1.17
1.167	.82	7.167	1.71	13.167	5.46	19.17	1.16
1.250	.82	7.250	1.74	13.250	5.16	19.25	1.15
1.333	.83	7.333	1.77	13.333	4.89	19.33	1.14
1.417	.83	7.417	1.80	13.417	4.64	19.42	1.13
1.500	.84	7.500	1.83	13.500	4.43	19.50	1.12
1.583	.84	7.583	1.86	13.583	4.23	19.58	1.11
1.667	.85	7.667	1.90	13.667	4.05	19.67	1.10
1.750	.86	7.750	1.94	13.750	3.88	19.75	1.09
1.833	.86	7.833	1.97	13.833	3.73	19.83	1.08
1.917	.87	7.917	2.01	13.917	3.59	19.92	1.07
2.000	.88	8.000	2.05	14.000	3.47	20.00	1.06
2.083	.88	8.083	2.10	14.083	3.35	20.08	1.05
2.167	.89	8.167	2.14	14.167	3.24	20.17	1.04
2.250	.90	8.250	2.19	14.250	3.13	20.25	1.03
2.333	.90	8.333	2.24	14.333	3.04	20.33	1.02
2.417	.91	8.417	2.29	14.417	2.95	20.42	1.01
2.500	.92	8.500	2.34	14.500	2.86	20.50	1.00
2.583	.92	8.583	2.40	14.583	2.78	20.58	1.00
2.667	.93	8.667	2.46	14.667	2.71	20.67	.99
2.750	.94	8.750	2.52	14.750	2.64	20.75	.98
2.833	.95	8.833	2.59	14.833	2.57	20.83	.97
2.917	.95	8.917	2.66	14.917	2.51	20.92	.96
3.000	.96	9.000	2.74	15.000	2.45	21.00	.96
3.083	.97	9.083	2.82	15.083	2.39	21.08	.95
3.167	.98	9.167	2.90	15.167	2.34	21.17	.94
3.250	.99	9.250	3.00	15.250	2.29	21.25	.93
3.333	1.00	9.333	3.09	15.333	2.24	21.33	.93
3.417	1.00	9.417	3.20	15.417	2.19	21.42	.92
3.500	1.01	9.500	3.31	15.500	2.14	21.50	.91
3.583	1.02	9.583	3.43	15.583	2.10	21.58	.91
3.667	1.03	9.667	3.57	15.667	2.06	21.67	.90
3.750	1.04	9.750	3.71	15.750	2.02	21.75	.89
3.833	1.05	9.833	3.87	15.833	1.98	21.83	.89
3.917	1.06	9.917	4.04	15.917	1.95	21.92	.88
4.000	1.07	10.000	4.23	16.000	1.91	22.00	.87
4.083	1.08	10.083	4.43	16.083	1.88	22.08	.87
4.167	1.09	10.167	4.66	16.167	1.85	22.17	.86
4.250	1.10	10.250	4.92	16.250	1.82	22.25	.86
4.333	1.11	10.333	5.21	16.333	1.79	22.33	.85
4.417	1.12	10.417	5.54	16.417	1.76	22.42	.84
4.500	1.14	10.500	5.91	16.500	1.73	22.50	.84
4.583	1.15	10.583	6.34	16.583	1.70	22.58	.83
4.667	1.16	10.667	6.84	16.667	1.68	22.67	.83
4.750	1.17	10.750	7.43	16.750	1.65	22.75	.82
4.833	1.18	10.833	8.14	16.833	1.63	22.83	.82
4.917	1.20	10.917	8.99	16.917	1.60	22.92	.81
5.000	1.21	11.000	10.05	17.000	1.58	23.00	.81
5.083	1.22	11.083	11.40	17.083	1.56	23.08	.80
5.167	1.24	11.167	13.16	17.167	1.54	23.17	.80
5.250	1.25	11.250	15.55	17.250	1.51	23.25	.79
5.333	1.27	11.333	18.96	17.333	1.49	23.33	.79

```
              5.417    1.28 |11.417   24.16 |17.417    1.47 | 23.42     .78
              5.500    1.30 |11.500   32.93 |17.500    1.46 | 23.50     .78
              5.583    1.31 |11.583   50.12 |17.583    1.44 | 23.58     .77
              5.667    1.33 |11.667   94.83 |17.667    1.42 | 23.67     .77
              5.750    1.34 |11.750  195.29 |17.750    1.40 | 23.75     .76
              5.833    1.36 |11.833   96.29 |17.833    1.38 | 23.83     .76
              5.917    1.38 |11.917   51.86 |17.917    1.37 | 23.92     .75
              6.000    1.39 |12.000   34.32 |18.000    1.35 | 24.00     .00

     Unit Hyd Qpeak  (cms)=    .952

     PEAK FLOW       (cms)=    .490 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  47.911
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .455

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0055) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .998 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  52.081
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0052) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .748 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  44.525
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .423

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0050) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=   1.496 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  43.427
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .412

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0051) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)     11.96      1.50     11.92      43.43
     OUTFLOW: ID= 1 (0051)     11.96      2.44     12.00      30.27

                PEAK   FLOW   REDUCTION [Qout/Qin](%)=163.13
                TIME SHIFT OF PEAK FLOW         (min)=  5.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  .3292

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
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                   CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0053) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0052):       3.90     .748    11.75    44.52
       + ID2= 2 (0051):      11.96    2.441    12.00    30.27
         ==================================================
         ID = 3 (0053):      15.86    2.722    12.00    33.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0054) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |  20.0000      .0771
                            .0001      .0761   |    .0000      .0000

                                 AREA      QPEAK      TPEAK        R.V.
                                 (ha)      (cms)      (hrs)        (mm)
     INFLOW : ID= 2 (0053)      15.86       2.72      12.00       33.78
     OUTFLOW: ID= 1 (0054)      15.86       2.89      12.00       28.98

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=106.21
                  TIME SHIFT OF PEAK FLOW         (min)=   .00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .1044

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0056) |
| IN= 2---> OUT= 1 |      Routing time step (min)'=  5.00
--------------------
              <------ DATA FOR SECTION (   1.5) ------>
              Distance      Elevation       Manning
                   .00        425.00          .0300
                   .75        424.25      .0300 / .0300  Main Channel
                  1.75        424.25      .0300 / .0300  Main Channel
                  2.50        425.00          .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .04   424.29    .145E+02        .0            .68       8.63
        .08   424.33    .302E+02        .1           1.05       5.61
        .12   424.37    .469E+02        .2           1.33       4.42
        .16   424.41    .647E+02        .3           1.57       3.76
        .20   424.45    .837E+02        .4           1.77       3.34
        .24   424.49    .104E+03        .6           1.94       3.04
        .28   424.53    .125E+03        .7           2.10       2.81
        .32   424.57    .147E+03        .9           2.23       2.64
        .36   424.61    .170E+03       1.1           2.36       2.50
        .39   424.64    .195E+03       1.4           2.47       2.39
        .43   424.68    .220E+03       1.6           2.57       2.30
        .47   424.72    .247E+03       1.9           2.66       2.22
        .51   424.76    .275E+03       2.1           2.75       2.15
        .55   424.80    .304E+03       2.4           2.83       2.09
        .59   424.84    .334E+03       2.7           2.90       2.04
        .63   424.88    .365E+03       3.1           2.97       1.99
        .67   424.92    .397E+03       3.4           3.03       1.95
        .71   424.96    .430E+03       3.8           3.09       1.91
        .75   425.00    .465E+03       4.1           3.14       1.88

                                    <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                             (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0054)   15.86     2.89   12.00  28.98       .61      2.93
     OUTFLOW: ID= 1 (0056)   15.86     1.42   12.08  28.98       .40      2.49


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--------------------
| ADD HYD   (0057) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0055):       5.19     .998    11.83    52.08
       + ID2= 2 (0056):      15.86    1.422    12.08    28.98
         ==================================================
         ID = 3 (0057):      21.05    1.875    12.00    34.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0058) |   Area    (ha)=  21.77   Curve Number   (CN)= 67.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   2.354

     PEAK FLOW       (cms)=   1.885 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  45.031
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .427

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0059) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=   1.496 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  43.427
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .412

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0060) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |  20.0000      .1583
                          .0001      .1573    |    .0000      .0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0059)     11.96      1.50     11.92      43.43
     OUTFLOW: ID= 1 (0060)     11.96      2.44     12.00      30.27

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=163.13
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .3292

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                     CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0061) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .748 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  44.525
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .423

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0062) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0060):    11.96   2.441    12.00    30.27
        + ID2= 2 (0061):     3.90    .748    11.75    44.52
          ==================================================
          ID = 3 (0062):    15.86   2.722    12.00    33.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0063) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0771
                           .0001      .0761   |    .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0062)      15.86      2.72     12.00      33.78
     OUTFLOW: ID= 1 (0063)      15.86      2.89     12.00      28.98

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=106.21
                   TIME SHIFT OF PEAK FLOW         (min)=   .00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1044

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                     CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0065) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (    1.5) ------>
               Distance      Elevation       Manning
                    .00        425.00         .0300
                    .75        424.25     .0300 / .0300  Main Channel
                   1.75        424.25     .0300 / .0300  Main Channel
                   2.50        425.00         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .04   424.29    .145E+02        .0           .68       8.63
        .08   424.33    .302E+02        .1          1.05       5.61
        .12   424.37    .469E+02        .2          1.33       4.42
        .16   424.41    .647E+02        .3          1.57       3.76
        .20   424.45    .837E+02        .4          1.77       3.34
        .24   424.49    .104E+03        .6          1.94       3.04
        .28   424.53    .125E+03        .7          2.10       2.81
        .32   424.57    .147E+03        .9          2.23       2.64
        .36   424.61    .170E+03       1.1          2.36       2.50
        .39   424.64    .195E+03       1.4          2.47       2.39
        .43   424.68    .220E+03       1.6          2.57       2.30
        .47   424.72    .247E+03       1.9          2.66       2.22
        .51   424.76    .275E+03       2.1          2.75       2.15
        .55   424.80    .304E+03       2.4          2.83       2.09
        .59   424.84    .334E+03       2.7          2.90       2.04
        .63   424.88    .365E+03       3.1          2.97       1.99
        .67   424.92    .397E+03       3.4          3.03       1.95
        .71   424.96    .430E+03       3.8          3.09       1.91
        .75   425.00    .465E+03       4.1          3.14       1.88

                                           <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0063)    15.86     2.89   12.00  28.98        .61      2.93
     OUTFLOW: ID= 1 (0065)    15.86     1.42   12.08  28.98        .40      2.49


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--------------------
| CALIB            |
| NASHYD    (0064) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=    .998 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  52.081
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .494

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0066) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0065):     15.86    1.422    12.08    28.98
        + ID2= 2 (0064):      5.19     .998    11.83    52.08
          ==================================================
          ID = 3 (0066):     21.05    1.875    12.00    34.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB              |
| NASHYD    (0069) |   Area    (ha)=   1.80   Curve Number   (CN)= 58.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.005

     PEAK FLOW       (cms)=    .249 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  30.951
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .294

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0067) |   Area    (ha)=   1.52   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .995

     PEAK FLOW       (cms)=    .235 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  31.712
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .301

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0068) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0207
                           .0001      .0206   |    .0000      .0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0067)        1.52       .24     11.75      31.71
     OUTFLOW: ID= 1 (0068)        1.52       .10     12.00      18.20

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 42.20
                   TIME SHIFT OF PEAK FLOW         (min)= 15.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0319

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--------------------
| ADD HYD   (0071) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0069):     1.80    .249    11.75    30.95
        + ID2= 2 (0068):     1.52    .099    12.00    18.20
          ==================================================
          ID = 3 (0071):     3.32    .249    11.75    25.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0070) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0708
                           .0001      .0707   |    .0000      .0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0071)        3.32       .25     11.75      25.11
     OUTFLOW: ID= 1 (0070)        3.32       .01     17.17       3.82

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.32
                   TIME SHIFT OF PEAK FLOW         (min)=325.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0711

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0073) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.6) ------>
               Distance      Elevation       Manning
                    .00        421.26         .0300
```

```
                1.10        420.66     .0300 / .0300  Main Channel
                2.00        420.66     .0300 / .0300  Main Channel
                3.10        421.26         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   420.69    .560E+01        .0           .05       59.24
        .06   420.72    .119E+02        .0           .09       35.98
        .09   420.75    .188E+02        .0           .12       26.61
        .13   420.79    .265E+02        .0           .14       21.37
        .16   420.82    .348E+02        .0           .17       17.97
        .19   420.85    .437E+02        .0           .20       15.58
        .22   420.88    .534E+02        .1           .22       13.79
        .25   420.91    .637E+02        .1           .25       12.40
        .28   420.94    .748E+02        .1           .27       11.29
        .32   420.98    .864E+02        .1           .30       10.38
        .35   421.01    .988E+02        .2           .32        9.61
        .38   421.04    .112E+03        .2           .34        8.96
        .41   421.07    .126E+03        .2           .37        8.41
        .44   421.10    .140E+03        .3           .39        7.92
        .47   421.13    .155E+03        .3           .41        7.50
        .51   421.17    .171E+03        .4           .43        7.12
        .54   421.20    .187E+03        .5           .45        6.78
        .57   421.23    .204E+03        .5           .48        6.48
        .60   421.26    .222E+03        .6           .50        6.21

                                      <---- hydrograph ---->   <-pipe / channel->
                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                                (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (0070)      3.32      .01   17.17   3.82       .09       .11
     OUTFLOW: ID= 1 (0073)      3.32      .01   19.00   3.67       .06       .08


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--------------------
| ADD HYD   (0074) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0066):     21.05   1.875    12.00    34.68
        + ID2= 2 (0073):      3.32    .005    19.00     3.67
          ==================================================
          ID = 3 (0074):     24.37   1.875    12.00    30.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0072) |   Area    (ha)=  24.19   Curve Number   (CN)= 60.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .37

     Unit Hyd Qpeak  (cms)=   2.505

     PEAK FLOW       (cms)=   1.558 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  35.132
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .333

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0075) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0074):     24.37   1.875    12.00    30.45
        + ID2= 2 (0072):     24.19   1.558    12.17    35.13
          ==================================================
          ID = 3 (0075):     48.56   3.366    12.08    32.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0076) |   Area    (ha)= 127.28   Curve Number   (CN)= 59.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.29   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .79

     Unit Hyd Qpeak  (cms)=   6.192

     PEAK FLOW       (cms)=   4.855 (i)
     TIME TO PEAK    (hrs)=  12.583
     RUNOFF VOLUME    (mm)=  35.297
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     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .335

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0077) |   Area    (ha)=  17.28   Curve Number   (CN)= 58.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.24   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=   1.154

     PEAK FLOW       (cms)=    .779 (i)
     TIME TO PEAK    (hrs)=  12.333
     RUNOFF VOLUME    (mm)=  33.277
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .316

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0082) |   Area    (ha)=    .24   Curve Number   (CN)= 77.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .081

     PEAK FLOW       (cms)=    .051 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  58.214
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .552

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0078) |   Area    (ha)=   2.66   Curve Number   (CN)= 59.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.55   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.418

     PEAK FLOW       (cms)=    .374 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  32.174
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .305

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0079) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0608
                           .0001      .0607   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0078)      2.66       .37     11.75      32.17
     OUTFLOW: ID= 1 (0079)      2.66       .03     13.25       9.35

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.74
                  TIME SHIFT OF PEAK FLOW         (min)= 90.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0717

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--------------------
| ADD HYD   (0083) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0082):      .24    .051    11.83    58.21
        + ID2= 2 (0079):     2.66    .029    13.25     9.35
          ==============================================
          ID = 3 (0083):     2.90    .051    11.83    13.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB              |
| NASHYD    (0080) |   Area    (ha)=  14.63   Curve Number   (CN)= 58.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.37   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=    .977

     PEAK FLOW       (cms)=    .652 (i)
     TIME TO PEAK    (hrs)=  12.417
     RUNOFF VOLUME    (mm)=  32.962
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .313

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0081) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0083):     2.90    .051    11.83    13.35
        + ID2= 2 (0080):    14.63    .652    12.42    32.96
          ==================================================
          ID = 3 (0081):    17.52    .661    12.33    29.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0084) |   Area    (ha)=   7.71   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.14   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=   1.012

     PEAK FLOW       (cms)=    .614 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  37.186
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .353

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
| NASHYD    (0085) |   Area    (ha)=    .91   Curve Number   (CN)= 64.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.53   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .313

     PEAK FLOW       (cms)=    .131 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  39.306
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .373

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
| NASHYD    (0086) |   Area    (ha)=  19.15   Curve Number   (CN)= 71.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.81   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=   2.995

     PEAK FLOW       (cms)=   2.288 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  49.047
     TOTAL RAINFALL   (mm)= 105.380
     RUNOFF COEFFICIENT   =    .465

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ** SIMULATION NUMBER:   6 **
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| CHICAGO STORM    |     IDF curve parameters: A=2147.367
| Ptotal=114.71 mm |                           B=  10.512
--------------------                           C=    .839
                        used in:   INTENSITY =  A / (t + B)^C
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Duration of storm = 24.00 hrs
Storm time step = 5.00 min
Time to peak ratio = .49

The CORRELATION coefficient is = .9991

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	220.00	215.25
10.	160.00	170.27
15.	140.00	141.79
30.	107.00	96.19
60.	61.00	60.42
120.	35.00	36.05
360.	14.00	15.02
720.	8.30	8.50
1440.	5.10	4.78

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	.80	6.08	1.52	12.08	27.59	18.08	1.43
.17	.81	6.17	1.54	12.17	21.65	18.17	1.41
.25	.81	6.25	1.56	12.25	17.75	18.25	1.40
.33	.82	6.33	1.58	12.33	15.01	18.33	1.38
.42	.82	6.42	1.60	12.42	12.99	18.42	1.37
.50	.83	6.50	1.62	12.50	11.45	18.50	1.35
.58	.83	6.58	1.65	12.58	10.23	18.58	1.34
.67	.84	6.67	1.67	12.67	9.25	18.67	1.32
.75	.84	6.75	1.70	12.75	8.44	18.75	1.31
.83	.85	6.83	1.72	12.83	7.77	18.83	1.30
.92	.85	6.92	1.75	12.92	7.19	18.92	1.28
1.00	.86	7.00	1.78	13.00	6.70	19.00	1.27
1.08	.87	7.08	1.81	13.08	6.27	19.08	1.26
1.17	.87	7.17	1.84	13.17	5.90	19.17	1.24
1.25	.88	7.25	1.87	13.25	5.57	19.25	1.23
1.33	.88	7.33	1.90	13.33	5.28	19.33	1.22
1.42	.89	7.42	1.93	13.42	5.01	19.42	1.21
1.50	.90	7.50	1.97	13.50	4.78	19.50	1.20
1.58	.90	7.58	2.00	13.58	4.56	19.58	1.18
1.67	.91	7.67	2.04	13.67	4.37	19.67	1.17
1.75	.92	7.75	2.08	13.75	4.19	19.75	1.16
1.83	.92	7.83	2.12	13.83	4.02	19.83	1.15
1.92	.93	7.92	2.16	13.92	3.87	19.92	1.14
2.00	.94	8.00	2.21	14.00	3.73	20.00	1.13
2.08	.94	8.08	2.25	14.08	3.61	20.08	1.12
2.17	.95	8.17	2.30	14.17	3.49	20.17	1.11
2.25	.96	8.25	2.35	14.25	3.37	20.25	1.10
2.33	.97	8.33	2.40	14.33	3.27	20.33	1.09
2.42	.97	8.42	2.46	14.42	3.17	20.42	1.08
2.50	.98	8.50	2.52	14.50	3.08	20.50	1.07
2.58	.99	8.58	2.58	14.58	3.00	20.58	1.07
2.67	1.00	8.67	2.65	14.67	2.91	20.67	1.06
2.75	1.01	8.75	2.71	14.75	2.84	20.75	1.05
2.83	1.01	8.83	2.79	14.83	2.77	20.83	1.04
2.92	1.02	8.92	2.86	14.92	2.70	20.92	1.03
3.00	1.03	9.00	2.95	15.00	2.63	21.00	1.02
3.08	1.04	9.08	3.03	15.08	2.57	21.08	1.02
3.17	1.05	9.17	3.13	15.17	2.51	21.17	1.01
3.25	1.06	9.25	3.23	15.25	2.46	21.25	1.00
3.33	1.07	9.33	3.33	15.33	2.40	21.33	.99
3.42	1.08	9.42	3.45	15.42	2.35	21.42	.98
3.50	1.09	9.50	3.57	15.50	2.30	21.50	.98
3.58	1.09	9.58	3.70	15.58	2.26	21.58	.97
3.67	1.10	9.67	3.84	15.67	2.21	21.67	.96
3.75	1.11	9.75	4.00	15.75	2.17	21.75	.96
3.83	1.13	9.83	4.17	15.83	2.13	21.83	.95
3.92	1.14	9.92	4.35	15.92	2.09	21.92	.94
4.00	1.15	10.00	4.56	16.00	2.05	22.00	.94
4.08	1.16	10.08	4.78	16.08	2.02	22.08	.93
4.17	1.17	10.17	5.03	16.17	1.98	22.17	.92
4.25	1.18	10.25	5.31	16.25	1.95	22.25	.92
4.33	1.19	10.33	5.63	16.33	1.92	22.33	.91
4.42	1.20	10.42	5.98	16.42	1.89	22.42	.90
4.50	1.22	10.50	6.39	16.50	1.86	22.50	.90
4.58	1.23	10.58	6.86	16.58	1.83	22.58	.89
4.67	1.24	10.67	7.40	16.67	1.80	22.67	.89
4.75	1.25	10.75	8.05	16.75	1.77	22.75	.88
4.83	1.27	10.83	8.82	16.83	1.74	22.83	.87
4.92	1.28	10.92	9.75	16.92	1.72	22.92	.87
5.00	1.30	11.00	10.91	17.00	1.69	23.00	.86
5.08	1.31	11.08	12.38	17.08	1.67	23.08	.86
5.17	1.33	11.17	14.30	17.17	1.65	23.17	.85
5.25	1.34	11.25	16.92	17.25	1.62	23.25	.85
5.33	1.36	11.33	20.66	17.33	1.60	23.33	.84
5.42	1.37	11.42	26.37	17.42	1.58	23.42	.84
5.50	1.39	11.50	36.00	17.50	1.56	23.50	.83
5.58	1.40	11.58	54.94	17.58	1.54	23.58	.83

5.67	1.42	11.67	104.25	17.67	1.52	23.67	.82
5.75	1.44	11.75	215.25	17.75	1.50	23.75	.82
5.83	1.46	11.83	105.85	17.83	1.48	23.83	.81
5.92	1.48	11.92	56.85	17.92	1.47	23.92	.81
6.00	1.50	12.00	37.53	18.00	1.45	24.00	.80

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| CALIB             |
| NASHYD    (0021) |   Area    (ha)=   8.81   Curve Number   (CN)= 68.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=    .248

     PEAK FLOW       (cms)=    .333 (i)
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  51.764
     TOTAL RAINFALL   (mm)= 114.710
     RUNOFF COEFFICIENT   =    .451

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB             |
| NASHYD    (0027) |   Area    (ha)=    .68   Curve Number   (CN)= 72.2
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.91   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   2.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.033	.80	6.033	1.52	12.033	27.59	18.03	1.43
.067	.80	6.067	1.52	12.067	27.59	18.07	1.43
.100	.80	6.100	1.53	12.100	24.61	18.10	1.42
.133	.81	6.133	1.54	12.133	21.65	18.13	1.41
.167	.81	6.167	1.54	12.167	21.64	18.17	1.41
.200	.81	6.200	1.56	12.200	17.75	18.20	1.40
.233	.81	6.233	1.56	12.233	17.75	18.23	1.40
.267	.81	6.267	1.57	12.267	16.37	18.27	1.39
.300	.82	6.300	1.58	12.300	15.01	18.30	1.38
.333	.82	6.333	1.58	12.333	15.00	18.33	1.38
.367	.82	6.367	1.60	12.367	12.99	18.37	1.37
.400	.82	6.400	1.60	12.400	12.99	18.40	1.37
.433	.82	6.433	1.61	12.433	12.22	18.43	1.36
.467	.83	6.467	1.62	12.467	11.45	18.47	1.35
.500	.83	6.500	1.62	12.500	11.45	18.50	1.35
.533	.83	6.533	1.65	12.533	10.23	18.53	1.34
.567	.83	6.567	1.65	12.567	10.23	18.57	1.34
.600	.84	6.600	1.66	12.600	9.74	18.60	1.33
.633	.84	6.633	1.67	12.633	9.25	18.63	1.32
.667	.84	6.667	1.67	12.667	9.25	18.67	1.32
.700	.84	6.700	1.70	12.700	8.44	18.70	1.31
.733	.84	6.733	1.70	12.733	8.44	18.73	1.31
.767	.85	6.767	1.71	12.767	8.10	18.77	1.30
.800	.85	6.800	1.72	12.800	7.77	18.80	1.30
.833	.85	6.833	1.72	12.833	7.77	18.83	1.30
.867	.85	6.867	1.75	12.867	7.19	18.87	1.28
.900	.85	6.900	1.75	12.900	7.19	18.90	1.28
.933	.86	6.933	1.76	12.933	6.95	18.93	1.28
.967	.86	6.967	1.78	12.967	6.70	18.97	1.27
1.000	.86	7.000	1.78	13.000	6.70	19.00	1.27
1.033	.87	7.033	1.81	13.033	6.27	19.03	1.26
1.067	.87	7.067	1.81	13.067	6.27	19.07	1.26
1.100	.87	7.100	1.82	13.100	6.09	19.10	1.25
1.133	.87	7.133	1.84	13.133	5.90	19.13	1.24
1.167	.87	7.167	1.84	13.167	5.90	19.17	1.24
1.200	.88	7.200	1.87	13.200	5.57	19.20	1.23
1.233	.88	7.233	1.87	13.233	5.57	19.23	1.23
1.267	.88	7.267	1.88	13.267	5.42	19.27	1.23
1.300	.88	7.300	1.90	13.300	5.28	19.30	1.22
1.333	.88	7.333	1.90	13.333	5.27	19.33	1.22
1.367	.89	7.367	1.93	13.367	5.01	19.37	1.21
1.400	.89	7.400	1.93	13.400	5.01	19.40	1.21
1.433	.89	7.433	1.95	13.433	4.89	19.43	1.20
1.467	.90	7.467	1.97	13.467	4.78	19.47	1.20
1.500	.90	7.500	1.97	13.500	4.77	19.50	1.20
1.533	.90	7.533	2.00	13.533	4.56	19.53	1.18
1.567	.90	7.567	2.00	13.567	4.56	19.57	1.18
1.600	.91	7.600	2.02	13.600	4.46	19.60	1.18
1.633	.91	7.633	2.04	13.633	4.37	19.63	1.17
1.667	.91	7.667	2.04	13.667	4.37	19.67	1.17
1.700	.92	7.700	2.08	13.700	4.19	19.70	1.16
1.733	.92	7.733	2.08	13.733	4.19	19.73	1.16

1.767	.92	7.767	2.10	13.767	4.11	19.77	1.16
1.800	.92	7.800	2.12	13.800	4.02	19.80	1.15
1.833	.92	7.833	2.12	13.833	4.02	19.83	1.15
1.867	.93	7.867	2.16	13.867	3.87	19.87	1.14
1.900	.93	7.900	2.16	13.900	3.87	19.90	1.14
1.933	.93	7.933	2.18	13.933	3.80	19.93	1.14
1.967	.94	7.967	2.21	13.967	3.73	19.97	1.13
2.000	.94	8.000	2.21	14.000	3.73	20.00	1.13
2.033	.94	8.033	2.25	14.033	3.61	20.03	1.12
2.067	.94	8.067	2.25	14.067	3.61	20.07	1.12
2.100	.95	8.100	2.28	14.100	3.55	20.10	1.12
2.133	.95	8.133	2.30	14.133	3.49	20.13	1.11
2.167	.95	8.167	2.30	14.167	3.49	20.17	1.11
2.200	.96	8.200	2.35	14.200	3.37	20.20	1.10
2.233	.96	8.233	2.35	14.233	3.37	20.23	1.10
2.267	.96	8.267	2.38	14.267	3.32	20.27	1.10
2.300	.97	8.300	2.40	14.300	3.27	20.30	1.09
2.333	.97	8.333	2.40	14.333	3.27	20.33	1.09
2.367	.97	8.367	2.46	14.367	3.17	20.37	1.08
2.400	.97	8.400	2.46	14.400	3.17	20.40	1.08
2.433	.98	8.433	2.49	14.433	3.13	20.43	1.08
2.467	.98	8.467	2.52	14.467	3.08	20.47	1.07
2.500	.98	8.500	2.52	14.500	3.08	20.50	1.07
2.533	.99	8.533	2.58	14.533	3.00	20.53	1.07
2.567	.99	8.567	2.58	14.567	3.00	20.57	1.07
2.600	.99	8.600	2.61	14.600	2.95	20.60	1.06
2.633	1.00	8.633	2.65	14.633	2.91	20.63	1.06
2.667	1.00	8.667	2.65	14.667	2.91	20.67	1.06
2.700	1.01	8.700	2.71	14.700	2.84	20.70	1.05
2.733	1.01	8.733	2.71	14.733	2.84	20.73	1.05
2.767	1.01	8.767	2.75	14.767	2.80	20.77	1.04
2.800	1.01	8.800	2.79	14.800	2.77	20.80	1.04
2.833	1.01	8.833	2.79	14.833	2.77	20.83	1.04
2.867	1.02	8.867	2.86	14.867	2.70	20.87	1.03
2.900	1.02	8.900	2.86	14.900	2.70	20.90	1.03
2.933	1.03	8.933	2.91	14.933	2.66	20.93	1.03
2.967	1.03	8.967	2.95	14.967	2.63	20.97	1.02
3.000	1.03	9.000	2.95	15.000	2.63	21.00	1.02
3.033	1.04	9.033	3.03	15.033	2.57	21.03	1.02
3.067	1.04	9.067	3.03	15.067	2.57	21.07	1.02
3.100	1.04	9.100	3.08	15.100	2.54	21.10	1.01
3.133	1.05	9.133	3.13	15.133	2.51	21.13	1.01
3.167	1.05	9.167	3.13	15.167	2.51	21.17	1.01
3.200	1.06	9.200	3.23	15.200	2.46	21.20	1.00
3.233	1.06	9.233	3.23	15.233	2.46	21.23	1.00
3.267	1.06	9.267	3.28	15.267	2.43	21.27	1.00
3.300	1.07	9.300	3.33	15.300	2.40	21.30	.99
3.333	1.07	9.333	3.33	15.333	2.40	21.33	.99
3.367	1.08	9.367	3.45	15.367	2.35	21.37	.98
3.400	1.08	9.400	3.45	15.400	2.35	21.40	.98
3.433	1.08	9.433	3.51	15.433	2.33	21.43	.98
3.467	1.09	9.467	3.57	15.467	2.30	21.47	.98
3.500	1.09	9.500	3.57	15.500	2.30	21.50	.98
3.533	1.09	9.533	3.70	15.533	2.26	21.53	.97
3.567	1.09	9.567	3.70	15.567	2.26	21.57	.97
3.600	1.10	9.600	3.77	15.600	2.24	21.60	.97
3.633	1.10	9.633	3.84	15.633	2.21	21.63	.96
3.667	1.10	9.667	3.84	15.667	2.21	21.67	.96
3.700	1.11	9.700	4.00	15.700	2.17	21.70	.96
3.733	1.11	9.733	4.00	15.733	2.17	21.73	.96
3.767	1.12	9.767	4.08	15.767	2.15	21.77	.95
3.800	1.13	9.800	4.17	15.800	2.13	21.80	.95
3.833	1.13	9.833	4.17	15.833	2.13	21.83	.95
3.867	1.14	9.867	4.35	15.867	2.09	21.87	.94
3.900	1.14	9.900	4.35	15.900	2.09	21.90	.94
3.933	1.14	9.933	4.46	15.933	2.07	21.93	.94
3.967	1.15	9.967	4.56	15.967	2.05	21.97	.94
4.000	1.15	10.000	4.56	16.000	2.05	22.00	.94
4.033	1.16	10.033	4.78	16.033	2.02	22.03	.93
4.067	1.16	10.067	4.78	16.067	2.02	22.07	.93
4.100	1.16	10.100	4.91	16.100	2.00	22.10	.93
4.133	1.17	10.133	5.03	16.133	1.98	22.13	.92
4.167	1.17	10.167	5.04	16.167	1.98	22.17	.92
4.200	1.18	10.200	5.31	16.200	1.95	22.20	.92
4.233	1.18	10.233	5.31	16.233	1.95	22.23	.92
4.267	1.19	10.267	5.47	16.267	1.93	22.27	.91
4.300	1.19	10.300	5.63	16.300	1.92	22.30	.91
4.333	1.19	10.333	5.63	16.333	1.92	22.33	.91
4.367	1.20	10.367	5.98	16.367	1.89	22.37	.90
4.400	1.20	10.400	5.98	16.400	1.89	22.40	.90
4.433	1.21	10.433	6.19	16.433	1.87	22.43	.90
4.467	1.22	10.467	6.39	16.467	1.86	22.47	.90
4.500	1.22	10.500	6.39	16.500	1.85	22.50	.90
4.533	1.23	10.533	6.86	16.533	1.83	22.53	.89
4.567	1.23	10.567	6.86	16.567	1.83	22.57	.89
4.600	1.24	10.600	7.13	16.600	1.81	22.60	.89
4.633	1.24	10.633	7.40	16.633	1.80	22.63	.89
4.667	1.24	10.667	7.41	16.667	1.80	22.67	.89
4.700	1.25	10.700	8.05	16.700	1.77	22.70	.88

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              4.733    1.25 |10.733    8.05 |16.733    1.77 | 22.73     .88
              4.767    1.26 |10.767    8.43 |16.767    1.76 | 22.77     .88
              4.800    1.27 |10.800    8.82 |16.800    1.74 | 22.80     .87
              4.833    1.27 |10.833    8.82 |16.833    1.74 | 22.83     .87
              4.867    1.28 |10.867    9.75 |16.867    1.72 | 22.87     .87
              4.900    1.28 |10.900    9.75 |16.900    1.72 | 22.90     .87
              4.933    1.29 |10.933   10.33 |16.933    1.71 | 22.93     .87
              4.967    1.30 |10.967   10.91 |16.967    1.69 | 22.97     .86
              5.000    1.30 |11.000   10.91 |17.000    1.69 | 23.00     .86
              5.033    1.31 |11.033   12.38 |17.033    1.67 | 23.03     .86
              5.067    1.31 |11.067   12.38 |17.067    1.67 | 23.07     .86
              5.100    1.32 |11.100   13.34 |17.100    1.66 | 23.10     .85
              5.133    1.33 |11.133   14.30 |17.133    1.65 | 23.13     .85
              5.167    1.33 |11.167   14.30 |17.167    1.65 | 23.17     .85
              5.200    1.34 |11.200   16.92 |17.200    1.62 | 23.20     .85
              5.233    1.34 |11.233   16.92 |17.233    1.62 | 23.23     .85
              5.267    1.35 |11.267   18.79 |17.267    1.61 | 23.27     .84
              5.300    1.36 |11.300   20.66 |17.300    1.60 | 23.30     .84
              5.333    1.36 |11.333   20.66 |17.333    1.60 | 23.33     .84
              5.367    1.37 |11.367   26.37 |17.367    1.58 | 23.37     .84
              5.400    1.37 |11.400   26.37 |17.400    1.58 | 23.40     .84
              5.433    1.38 |11.433   31.20 |17.433    1.57 | 23.43     .83
              5.467    1.39 |11.467   36.00 |17.467    1.56 | 23.47     .83
              5.500    1.39 |11.500   36.03 |17.500    1.56 | 23.50     .83
              5.533    1.40 |11.533   54.94 |17.533    1.54 | 23.53     .83
              5.567    1.40 |11.567   54.94 |17.567    1.54 | 23.57     .83
              5.600    1.41 |11.600   79.66 |17.600    1.53 | 23.60     .82
              5.633    1.42 |11.633  104.25 |17.633    1.52 | 23.63     .82
              5.667    1.42 |11.667  104.39 |17.667    1.52 | 23.67     .82
              5.700    1.44 |11.700  215.25 |17.700    1.50 | 23.70     .82
              5.733    1.44 |11.733  215.25 |17.733    1.50 | 23.73     .82
              5.767    1.45 |11.767  160.41 |17.767    1.49 | 23.77     .81
              5.800    1.46 |11.800  105.85 |17.800    1.48 | 23.80     .81
              5.833    1.46 |11.833  105.78 |17.833    1.48 | 23.83     .81
              5.867    1.48 |11.867   56.85 |17.867    1.47 | 23.87     .81
              5.900    1.48 |11.900   56.85 |17.900    1.47 | 23.90     .81
              5.933    1.49 |11.933   47.16 |17.933    1.46 | 23.93     .80
              5.967    1.50 |11.967   37.53 |17.967    1.45 | 23.97     .80
              6.000    1.50 |12.000   37.52 |18.000    1.45 | 24.00     .80

     Unit Hyd Qpeak  (cms)=    .466

     PEAK FLOW       (cms)=    .186 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  57.583
     TOTAL RAINFALL   (mm)= 114.709
     RUNOFF COEFFICIENT   =    .502

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0024) |   Area    (ha)=   5.03   Curve Number   (CN)= 72.5
|ID= 1 DT= 2.0 min |   Ia      (mm)=   4.75   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   2.433

     PEAK FLOW       (cms)=   1.240 (i)
     TIME TO PEAK    (hrs)=  11.800
     RUNOFF VOLUME    (mm)=  44.847
     TOTAL RAINFALL   (mm)= 114.709
     RUNOFF COEFFICIENT   =    .391

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0022) |   Area    (ha)=   3.01   Curve Number   (CN)= 71.6
|ID= 1 DT= 2.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=   2.069

     PEAK FLOW       (cms)=    .811 (i)
     TIME TO PEAK    (hrs)=  11.767
     RUNOFF VOLUME    (mm)=  43.199
     TOTAL RAINFALL   (mm)= 114.709
     RUNOFF COEFFICIENT   =    .377

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0023) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                           .0000      .0000    |    .0002      .2156
                           .0001      .1117    |  20.0000      .2166

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0022)      3.01       .81     11.77      43.20
     OUTFLOW: ID= 1 (0023)      3.01       .00     13.60        .03

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .01
                   TIME SHIFT OF PEAK FLOW         (min)=110.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1299

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0026) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0024):      5.03    1.240    11.80    44.85
        + ID2= 2 (0023):      3.01     .000    13.60      .03
          ==================================================
          ID = 3 (0026):      8.04    1.240    11.80    28.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0025) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0003      .2171
                           .0001      .0498   |  20.0000      .2181
                           .0002      .1676   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0026)      8.04      1.24     11.80      28.07
     OUTFLOW: ID= 1 (0025)      8.04       .08     13.07       1.77

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.42
                   TIME SHIFT OF PEAK FLOW         (min)= 76.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .2180

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--------------------
| ADD HYD   (0028) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0027):       .68     .186    11.77    57.58
        + ID2= 2 (0025):      8.04     .080    13.07     1.77
          ==================================================
          ID = 3 (0028):      8.72     .186    11.77     6.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0029) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0898
                           .0001      .0455   |  20.0000      .0908

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0028)      8.72       .19     11.77       6.11
     OUTFLOW: ID= 1 (0029)      8.72       .00     66.63        .24

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .06
                   TIME SHIFT OF PEAK FLOW         (min)=******
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0512

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0032) |   Area    (ha)=   6.71   Curve Number   (CN)= 64.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .32

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                      ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
```

.083	.80	6.083	1.52	12.083	27.59	18.08	1.43
.167	.81	6.167	1.54	12.167	21.65	18.17	1.41
.250	.81	6.250	1.56	12.250	17.75	18.25	1.40
.333	.82	6.333	1.58	12.333	15.01	18.33	1.38
.417	.82	6.417	1.60	12.417	12.99	18.42	1.37
.500	.83	6.500	1.62	12.500	11.45	18.50	1.35
.583	.83	6.583	1.65	12.583	10.23	18.58	1.34
.667	.84	6.667	1.67	12.667	9.25	18.67	1.32
.750	.84	6.750	1.70	12.750	8.44	18.75	1.31
.833	.85	6.833	1.72	12.833	7.77	18.83	1.30
.917	.85	6.917	1.75	12.917	7.19	18.92	1.28
1.000	.86	7.000	1.78	13.000	6.70	19.00	1.27
1.083	.87	7.083	1.81	13.083	6.27	19.08	1.26
1.167	.87	7.167	1.84	13.167	5.90	19.17	1.24
1.250	.88	7.250	1.87	13.250	5.57	19.25	1.23
1.333	.88	7.333	1.90	13.333	5.28	19.33	1.22
1.417	.89	7.417	1.93	13.417	5.01	19.42	1.21
1.500	.90	7.500	1.97	13.500	4.78	19.50	1.20
1.583	.90	7.583	2.00	13.583	4.56	19.58	1.18
1.667	.91	7.667	2.04	13.667	4.37	19.67	1.17
1.750	.92	7.750	2.08	13.750	4.19	19.75	1.16
1.833	.92	7.833	2.12	13.833	4.02	19.83	1.15
1.917	.93	7.917	2.16	13.917	3.87	19.92	1.14
2.000	.94	8.000	2.21	14.000	3.73	20.00	1.13
2.083	.94	8.083	2.25	14.083	3.61	20.08	1.12
2.167	.95	8.167	2.30	14.167	3.49	20.17	1.11
2.250	.96	8.250	2.35	14.250	3.37	20.25	1.10
2.333	.97	8.333	2.40	14.333	3.27	20.33	1.09
2.417	.97	8.417	2.46	14.417	3.17	20.42	1.08
2.500	.98	8.500	2.52	14.500	3.08	20.50	1.07
2.583	.99	8.583	2.58	14.583	3.00	20.58	1.07
2.667	1.00	8.667	2.65	14.667	2.91	20.67	1.06
2.750	1.01	8.750	2.71	14.750	2.84	20.75	1.05
2.833	1.01	8.833	2.79	14.833	2.77	20.83	1.04
2.917	1.02	8.917	2.86	14.917	2.70	20.92	1.03
3.000	1.03	9.000	2.95	15.000	2.63	21.00	1.02
3.083	1.04	9.083	3.03	15.083	2.57	21.08	1.02
3.167	1.05	9.167	3.13	15.167	2.51	21.17	1.01
3.250	1.06	9.250	3.23	15.250	2.46	21.25	1.00
3.333	1.07	9.333	3.33	15.333	2.40	21.33	.99
3.417	1.08	9.417	3.45	15.417	2.35	21.42	.98
3.500	1.09	9.500	3.57	15.500	2.30	21.50	.98
3.583	1.09	9.583	3.70	15.583	2.26	21.58	.97
3.667	1.10	9.667	3.84	15.667	2.21	21.67	.96
3.750	1.11	9.750	4.00	15.750	2.17	21.75	.96
3.833	1.13	9.833	4.17	15.833	2.13	21.83	.95
3.917	1.14	9.917	4.35	15.917	2.09	21.92	.94
4.000	1.15	10.000	4.56	16.000	2.05	22.00	.94
4.083	1.16	10.083	4.78	16.083	2.02	22.08	.93
4.167	1.17	10.167	5.03	16.167	1.98	22.17	.92
4.250	1.18	10.250	5.31	16.250	1.95	22.25	.92
4.333	1.19	10.333	5.63	16.333	1.92	22.33	.91
4.417	1.20	10.417	5.98	16.417	1.89	22.42	.90
4.500	1.22	10.500	6.39	16.500	1.86	22.50	.90
4.583	1.23	10.583	6.86	16.583	1.83	22.58	.89
4.667	1.24	10.667	7.40	16.667	1.80	22.67	.89
4.750	1.25	10.750	8.05	16.750	1.77	22.75	.88
4.833	1.27	10.833	8.82	16.833	1.74	22.83	.87
4.917	1.28	10.917	9.75	16.917	1.72	22.92	.87
5.000	1.30	11.000	10.91	17.000	1.69	23.00	.86
5.083	1.31	11.083	12.38	17.083	1.67	23.08	.86
5.167	1.33	11.167	14.30	17.167	1.65	23.17	.85
5.250	1.34	11.250	16.92	17.250	1.62	23.25	.85
5.333	1.36	11.333	20.66	17.333	1.60	23.33	.84
5.417	1.37	11.417	26.37	17.417	1.58	23.42	.84
5.500	1.39	11.500	36.00	17.500	1.56	23.50	.83
5.583	1.40	11.583	54.93	17.583	1.54	23.58	.83
5.667	1.42	11.667	104.25	17.667	1.52	23.67	.82
5.750	1.44	11.750	215.23	17.750	1.50	23.75	.82
5.833	1.46	11.833	105.86	17.833	1.48	23.83	.81
5.917	1.48	11.917	56.85	17.917	1.47	23.92	.81
6.000	1.50	12.000	37.53	18.000	1.45	24.00	.00

```
    Unit Hyd Qpeak  (cms)=    .800

    PEAK FLOW       (cms)=    .631 (i)
    TIME TO PEAK    (hrs)=  12.083
    RUNOFF VOLUME    (mm)=  45.447
    TOTAL RAINFALL   (mm)= 114.644
    RUNOFF COEFFICIENT   =    .396

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0030) |    Area    (ha)=   5.57   Curve Number   (CN)= 69.8
|ID= 1 DT= 5.0 min |    Ia      (mm)=   6.12   # of Linear Res.(N)= 3.00
--------------------    U.H. Tp(hrs)=    .06
```

```
     Unit Hyd Qpeak  (cms)=   3.828

     PEAK FLOW       (cms)=   1.276 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  44.305
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .386

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0031) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                    .00         386.25         .0300
                  37.50         385.75     .0300 / .0300  Main Channel
                  47.50         385.75     .0300 / .0300  Main Channel
                  85.00         386.25         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   385.78    .150E+03        .1           .33      23.91
        .05   385.80    .350E+03        .3           .47      16.85
        .08   385.83    .599E+03        .7           .56      14.12
        .11   385.86    .898E+03       1.2           .63      12.62
        .13   385.88    .125E+04       1.8           .68      11.65
        .16   385.91    .164E+04       2.5           .73      10.95
        .18   385.93    .209E+04       3.3           .76      10.42
        .21   385.96    .259E+04       4.3           .80       9.99
        .24   385.99    .313E+04       5.4           .82       9.64
        .26   386.01    .373E+04       6.7           .85       9.33
        .29   386.04    .438E+04       8.0           .88       9.07
        .32   386.07    .507E+04       9.6           .90       8.83
        .34   386.09    .582E+04      11.2           .92       8.62
        .37   386.12    .661E+04      13.1           .94       8.43
        .39   386.14    .745E+04      15.1           .96       8.25
        .42   386.17    .835E+04      17.2           .98       8.08
        .45   386.20    .929E+04      19.5          1.00       7.93
        .47   386.22    .103E+05      22.0          1.02       7.79
        .50   386.25    .113E+05      24.7          1.04       7.65

                                      <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.    MAX DEPTH   MAX VEL
                              (ha)    (cms)   (hrs)   (mm)       (m)       (m/s)
     INFLOW : ID= 2 (0030)    5.57     1.28   11.75  44.30       .11        .64
     OUTFLOW: ID= 1 (0031)    5.57      .66   11.92  44.28       .08        .55


--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0032):     6.71    .631    12.08    45.45
        + ID2= 2 (0031):     5.57    .663    11.92    44.28
          ==================================================
          ID = 3 (0033):    12.27   1.204    11.92    44.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0036) |   Area    (ha)=   2.08   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.71   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=    .938

     PEAK FLOW       (cms)=    .406 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  47.709
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .416

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0034) |   Area    (ha)=   2.15   Curve Number   (CN)= 71.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.03   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .10
```

```
     Unit Hyd Qpeak  (cms)=    .795

     PEAK FLOW       (cms)=    .462 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  56.240
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .491

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0035) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.3) ------>
               Distance      Elevation       Manning
                    .00        388.25          .0300
                  30.00        387.75     .0300 / .0300  Main Channel
                  40.00        387.75     .0300 / .0300  Main Channel
                  70.00        388.25          .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .03   387.78    .327E+02        .1           .41       4.35
        .05   387.80    .744E+02        .4           .59       3.03
        .08   387.83    .125E+03        .8           .71       2.52
        .11   387.86    .185E+03       1.4           .80       2.25
        .13   387.88    .253E+03       2.0           .87       2.07
        .16   387.91    .330E+03       2.8           .92       1.95
        .18   387.93    .417E+03       3.7           .97       1.85
        .21   387.96    .512E+03       4.8          1.01       1.78
        .24   387.99    .616E+03       6.0          1.04       1.72
        .26   388.01    .729E+03       7.3          1.07       1.67
        .29   388.04    .851E+03       8.7          1.10       1.63
        .32   388.07    .982E+03      10.3          1.13       1.59
        .34   388.09    .112E+04      12.0          1.15       1.56
        .37   388.12    .127E+04      13.9          1.17       1.53
        .39   388.14    .143E+04      15.9          1.19       1.50
        .42   388.17    .160E+04      18.0          1.21       1.48
        .45   388.20    .177E+04      20.3          1.23       1.45
        .47   388.22    .196E+04      22.8          1.25       1.43
        .50   388.25    .215E+04      25.4          1.27       1.41

                                          <---- hydrograph ---->   <-pipe / channel->
                                AREA    QPEAK   TPEAK    R.V.    MAX DEPTH  MAX VEL
                                (ha)    (cms)   (hrs)    (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0034)      2.15      .46   11.83   56.24       .06        .60
     OUTFLOW: ID= 1 (0035)      2.15      .46   11.83   56.24       .06        .60


--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0037) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0036):      2.08    .406    11.75    47.71
        + ID2= 2 (0035):      2.15    .457    11.83    56.24
          ==================================================
          ID = 3 (0037):      4.23    .845    11.83    52.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0039) |   Area    (ha)=  35.03   Curve Number   (CN)= 65.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.17   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.16

     Unit Hyd Qpeak  (cms)=   1.152

     PEAK FLOW       (cms)=   1.376 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  47.852
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .417

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0040) |   Area    (ha)=   3.95   Curve Number   (CN)= 54.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=  10.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .40
```

```
     Unit Hyd Qpeak  (cms)=    .375

     PEAK FLOW       (cms)=    .235 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  34.107
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .298

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0041) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1655
                           .0001      .0976   |  20.0000      .1665

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0040)      3.95       .23     12.17      34.11
     OUTFLOW: ID= 1 (0041)      3.95       .00     25.25        .16

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .07
                   TIME SHIFT OF PEAK FLOW         (min)=785.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .1342

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0044) |   Area    (ha)=    .87   Curve Number   (CN)= 64.6
|ID= 1 DT= 3.0 min |   Ia      (mm)=   6.68   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

         NOTE:  RAINFALL WAS TRANSFORMED TO   3.0 MIN. TIME STEP.

                                       ---- TRANSFORMED HYETOGRAPH ----
                        TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                         hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                        .050     .80 | 6.050    1.52 |12.050   27.59 | 18.05    1.43
                        .100     .80 | 6.100    1.52 |12.100   25.60 | 18.10    1.43
                        .150     .81 | 6.150    1.54 |12.150   21.65 | 18.15    1.41
                        .200     .81 | 6.200    1.55 |12.200   19.04 | 18.20    1.40
                        .250     .81 | 6.250    1.56 |12.250   17.74 | 18.25    1.40
                        .300     .82 | 6.300    1.58 |12.300   15.01 | 18.30    1.38
                        .350     .82 | 6.350    1.59 |12.350   14.33 | 18.35    1.38
                        .400     .82 | 6.400    1.60 |12.400   12.99 | 18.40    1.37
                        .450     .83 | 6.450    1.62 |12.450   11.96 | 18.45    1.36
                        .500     .83 | 6.500    1.62 |12.500   11.45 | 18.50    1.35
                        .550     .83 | 6.550    1.65 |12.550   10.23 | 18.55    1.34
                        .600     .83 | 6.600    1.65 |12.600    9.90 | 18.60    1.33
                        .650     .84 | 6.650    1.67 |12.650    9.25 | 18.65    1.32
                        .700     .84 | 6.700    1.69 |12.700    8.71 | 18.70    1.31
                        .750     .84 | 6.750    1.70 |12.750    8.44 | 18.75    1.31
                        .800     .85 | 6.800    1.72 |12.800    7.77 | 18.80    1.30
                        .850     .85 | 6.850    1.73 |12.850    7.58 | 18.85    1.29
                        .900     .85 | 6.900    1.75 |12.900    7.19 | 18.90    1.28
                        .950     .86 | 6.950    1.77 |12.950    6.87 | 18.95    1.27
                       1.000     .86 | 7.000    1.78 |13.000    6.70 | 19.00    1.27
                       1.050     .87 | 7.050    1.81 |13.050    6.27 | 19.05    1.26
                       1.100     .87 | 7.100    1.82 |13.100    6.15 | 19.10    1.25
                       1.150     .87 | 7.150    1.84 |13.150    5.90 | 19.15    1.24
                       1.200     .88 | 7.200    1.86 |13.200    5.68 | 19.20    1.24
                       1.250     .88 | 7.250    1.87 |13.250    5.57 | 19.25    1.23
                       1.300     .88 | 7.300    1.90 |13.300    5.28 | 19.30    1.22
                       1.350     .89 | 7.350    1.91 |13.350    5.19 | 19.35    1.22
                       1.400     .89 | 7.400    1.93 |13.400    5.01 | 19.40    1.21
                       1.450     .89 | 7.450    1.95 |13.450    4.85 | 19.45    1.20
                       1.500     .90 | 7.500    1.97 |13.500    4.77 | 19.50    1.20
                       1.550     .90 | 7.550    2.00 |13.550    4.56 | 19.55    1.18
                       1.600     .91 | 7.600    2.01 |13.600    4.50 | 19.60    1.18
                       1.650     .91 | 7.650    2.04 |13.650    4.37 | 19.65    1.17
                       1.700     .91 | 7.700    2.07 |13.700    4.25 | 19.70    1.17
                       1.750     .92 | 7.750    2.08 |13.750    4.19 | 19.75    1.16
                       1.800     .92 | 7.800    2.12 |13.800    4.02 | 19.80    1.15
                       1.850     .93 | 7.850    2.13 |13.850    3.97 | 19.85    1.15
                       1.900     .93 | 7.900    2.16 |13.900    3.87 | 19.90    1.14
                       1.950     .93 | 7.950    2.19 |13.950    3.78 | 19.95    1.14
                       2.000     .94 | 8.000    2.21 |14.000    3.73 | 20.00    1.13
                       2.050     .94 | 8.050    2.25 |14.050    3.61 | 20.05    1.12
                       2.100     .95 | 8.100    2.27 |14.100    3.57 | 20.10    1.12
                       2.150     .95 | 8.150    2.30 |14.150    3.49 | 20.15    1.11
                       2.200     .96 | 8.200    2.33 |14.200    3.41 | 20.20    1.11
                       2.250     .96 | 8.250    2.35 |14.250    3.37 | 20.25    1.10
                       2.300     .97 | 8.300    2.40 |14.300    3.27 | 20.30    1.09
                       2.350     .97 | 8.350    2.42 |14.350    3.24 | 20.35    1.09
```

2.400	.97	8.400	2.46	14.400	3.17	20.40	1.08
2.450	.98	8.450	2.50	14.450	3.11	20.45	1.08
2.500	.98	8.500	2.52	14.500	3.08	20.50	1.07
2.550	.99	8.550	2.58	14.550	3.00	20.55	1.07
2.600	.99	8.600	2.60	14.600	2.97	20.60	1.06
2.650	1.00	8.650	2.65	14.650	2.91	20.65	1.06
2.700	1.00	8.700	2.69	14.700	2.86	20.70	1.05
2.750	1.01	8.750	2.71	14.750	2.84	20.75	1.05
2.800	1.01	8.800	2.79	14.800	2.77	20.80	1.04
2.850	1.02	8.850	2.81	14.850	2.74	20.85	1.04
2.900	1.02	8.900	2.86	14.900	2.70	20.90	1.03
2.950	1.03	8.950	2.92	14.950	2.65	20.95	1.03
3.000	1.03	9.000	2.95	15.000	2.63	21.00	1.02
3.050	1.04	9.050	3.03	15.050	2.57	21.05	1.02
3.100	1.04	9.100	3.06	15.100	2.55	21.10	1.01
3.150	1.05	9.150	3.13	15.150	2.51	21.15	1.01
3.200	1.05	9.200	3.19	15.200	2.48	21.20	1.00
3.250	1.06	9.250	3.23	15.250	2.46	21.25	1.00
3.300	1.07	9.300	3.33	15.300	2.40	21.30	.99
3.350	1.07	9.350	3.37	15.350	2.39	21.35	.99
3.400	1.08	9.400	3.45	15.400	2.35	21.40	.98
3.450	1.08	9.450	3.53	15.450	2.32	21.45	.98
3.500	1.09	9.500	3.57	15.500	2.30	21.50	.98
3.550	1.09	9.550	3.70	15.550	2.26	21.55	.97
3.600	1.10	9.600	3.75	15.600	2.24	21.60	.97
3.650	1.10	9.650	3.84	15.650	2.21	21.65	.96
3.700	1.11	9.700	3.95	15.700	2.19	21.70	.96
3.750	1.11	9.750	4.00	15.750	2.17	21.75	.96
3.800	1.13	9.800	4.17	15.800	2.13	21.80	.95
3.850	1.13	9.850	4.23	15.850	2.12	21.85	.95
3.900	1.14	9.900	4.35	15.900	2.09	21.90	.94
3.950	1.14	9.950	4.49	15.950	2.07	21.95	.94
4.000	1.15	10.000	4.56	16.000	2.05	22.00	.94
4.050	1.16	10.050	4.78	16.050	2.02	22.05	.93
4.100	1.16	10.100	4.87	16.100	2.01	22.10	.93
4.150	1.17	10.150	5.03	16.150	1.98	22.15	.92
4.200	1.18	10.200	5.22	16.200	1.96	22.20	.92
4.250	1.18	10.250	5.31	16.250	1.95	22.25	.92
4.300	1.19	10.300	5.63	16.300	1.92	22.30	.91
4.350	1.20	10.350	5.75	16.350	1.91	22.35	.91
4.400	1.20	10.400	5.98	16.400	1.89	22.40	.90
4.450	1.21	10.450	6.26	16.450	1.87	22.45	.90
4.500	1.22	10.500	6.39	16.500	1.85	22.50	.90
4.550	1.23	10.550	6.86	16.550	1.83	22.55	.89
4.600	1.23	10.600	7.04	16.600	1.82	22.60	.89
4.650	1.24	10.650	7.40	16.650	1.80	22.65	.89
4.700	1.25	10.700	7.83	16.700	1.78	22.70	.88
4.750	1.25	10.750	8.05	16.750	1.77	22.75	.88
4.800	1.27	10.800	8.82	16.800	1.74	22.80	.87
4.850	1.27	10.850	9.13	16.850	1.74	22.85	.87
4.900	1.28	10.900	9.75	16.900	1.72	22.90	.87
4.950	1.29	10.950	10.52	16.950	1.70	22.95	.86
5.000	1.30	11.000	10.91	17.000	1.69	23.00	.86
5.050	1.31	11.050	12.38	17.050	1.67	23.05	.86
5.100	1.32	11.100	13.02	17.100	1.66	23.10	.85
5.150	1.33	11.150	14.30	17.150	1.65	23.15	.85
5.200	1.34	11.200	16.05	17.200	1.63	23.20	.85
5.250	1.34	11.250	16.92	17.250	1.62	23.25	.85
5.300	1.36	11.300	20.66	17.300	1.60	23.30	.84
5.350	1.36	11.350	22.56	17.350	1.60	23.35	.84
5.400	1.37	11.400	26.37	17.400	1.58	23.40	.84
5.450	1.38	11.450	32.80	17.450	1.57	23.45	.83
5.500	1.39	11.500	36.01	17.500	1.56	23.50	.83
5.550	1.40	11.550	54.94	17.550	1.54	23.55	.83
5.600	1.41	11.600	71.40	17.600	1.53	23.60	.82
5.650	1.42	11.650	104.25	17.650	1.52	23.65	.82
5.700	1.43	11.700	178.31	17.700	1.51	23.70	.82
5.750	1.44	11.750	215.19	17.750	1.50	23.75	.82
5.800	1.46	11.800	105.85	17.800	1.48	23.80	.81
5.850	1.46	11.850	89.49	17.850	1.48	23.85	.81
5.900	1.48	11.900	56.85	17.900	1.47	23.90	.81
5.950	1.49	11.950	43.96	17.950	1.45	23.95	.80
6.000	1.50	12.000	37.53	18.000	1.45	24.00	.80

```
Unit Hyd Qpeak  (cms)=    .596

PEAK FLOW       (cms)=    .190 (i)
TIME TO PEAK    (hrs)=  11.750
RUNOFF VOLUME    (mm)=  45.621
TOTAL RAINFALL   (mm)= 114.710
RUNOFF COEFFICIENT   =    .398

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0042) |   Area    (ha)=    .56   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
```

```
--------------------  U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .382

     PEAK FLOW       (cms)=    .143 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  50.471
     TOTAL RAINFALL   (mm)= 114.710
     RUNOFF COEFFICIENT   =    .440

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0043) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0357
                           .0001      .0118   |  20.0000      .0367

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0042)       .56       .14     11.75      50.47
     OUTFLOW: ID= 1 (0043)       .56       .00     20.10        .86

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .12
                   TIME SHIFT OF PEAK FLOW         (min)=501.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0276

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--------------------
| ADD HYD   (0045) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0044):      .87     .190    11.75    45.62
        + ID2= 2 (0043):      .56     .000    20.10      .86
          ==================================================
          ID = 3 (0045):     1.42     .190    11.75    28.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0046) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .1073
                           .0001      .0117   |  20.0000      .1083

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0045)      1.42       .19     11.75      28.15
     OUTFLOW: ID= 1 (0046)      1.42       .00     24.15        .40

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   .07
                   TIME SHIFT OF PEAK FLOW         (min)=744.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0395

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0047) |   Area    (ha)=    .48   Curve Number   (CN)= 70.0
|ID= 1 DT= 3.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .331

     PEAK FLOW       (cms)=    .124 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  50.471
     TOTAL RAINFALL   (mm)= 114.710
     RUNOFF COEFFICIENT   =    .440

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0048) |
| IN= 2---> OUT= 1 |
| DT=  3.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0002      .0731
                           .0001      .0496   |  20.0000      .0741

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
```

```
     INFLOW : ID= 2 (0047)       .48       .12     11.75      50.47
     OUTFLOW: ID= 1 (0048)       .48       .00     20.15        .28

                  PEAK    FLOW   REDUCTION [Qout/Qin](%)=   .04
                  TIME SHIFT OF PEAK FLOW         (min)=504.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0242

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0049) |   Area    (ha)=   2.77   Curve Number   (CN)= 70.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.35   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.083	.80	6.083	1.52	12.083	27.59	18.08	1.43
.167	.81	6.167	1.54	12.167	21.65	18.17	1.41
.250	.81	6.250	1.56	12.250	17.75	18.25	1.40
.333	.82	6.333	1.58	12.333	15.01	18.33	1.38
.417	.82	6.417	1.60	12.417	12.99	18.42	1.37
.500	.83	6.500	1.62	12.500	11.45	18.50	1.35
.583	.83	6.583	1.65	12.583	10.23	18.58	1.34
.667	.84	6.667	1.67	12.667	9.25	18.67	1.32
.750	.84	6.750	1.70	12.750	8.44	18.75	1.31
.833	.85	6.833	1.72	12.833	7.77	18.83	1.30
.917	.85	6.917	1.75	12.917	7.19	18.92	1.28
1.000	.86	7.000	1.78	13.000	6.70	19.00	1.27
1.083	.87	7.083	1.81	13.083	6.27	19.08	1.26
1.167	.87	7.167	1.84	13.167	5.90	19.17	1.24
1.250	.88	7.250	1.87	13.250	5.57	19.25	1.23
1.333	.88	7.333	1.90	13.333	5.28	19.33	1.22
1.417	.89	7.417	1.93	13.417	5.01	19.42	1.21
1.500	.90	7.500	1.97	13.500	4.78	19.50	1.20
1.583	.90	7.583	2.00	13.583	4.56	19.58	1.18
1.667	.91	7.667	2.04	13.667	4.37	19.67	1.17
1.750	.92	7.750	2.08	13.750	4.19	19.75	1.16
1.833	.92	7.833	2.12	13.833	4.02	19.83	1.15
1.917	.93	7.917	2.16	13.917	3.87	19.92	1.14
2.000	.94	8.000	2.21	14.000	3.73	20.00	1.13
2.083	.94	8.083	2.25	14.083	3.61	20.08	1.12
2.167	.95	8.167	2.30	14.167	3.49	20.17	1.11
2.250	.96	8.250	2.35	14.250	3.37	20.25	1.10
2.333	.97	8.333	2.40	14.333	3.27	20.33	1.09
2.417	.97	8.417	2.46	14.417	3.17	20.42	1.08
2.500	.98	8.500	2.52	14.500	3.08	20.50	1.07
2.583	.99	8.583	2.58	14.583	3.00	20.58	1.07
2.667	1.00	8.667	2.65	14.667	2.91	20.67	1.06
2.750	1.01	8.750	2.71	14.750	2.84	20.75	1.05
2.833	1.01	8.833	2.79	14.833	2.77	20.83	1.04
2.917	1.02	8.917	2.86	14.917	2.70	20.92	1.03
3.000	1.03	9.000	2.95	15.000	2.63	21.00	1.02
3.083	1.04	9.083	3.03	15.083	2.57	21.08	1.02
3.167	1.05	9.167	3.13	15.167	2.51	21.17	1.01
3.250	1.06	9.250	3.23	15.250	2.46	21.25	1.00
3.333	1.07	9.333	3.33	15.333	2.40	21.33	.99
3.417	1.08	9.417	3.45	15.417	2.35	21.42	.98
3.500	1.09	9.500	3.57	15.500	2.30	21.50	.98
3.583	1.09	9.583	3.70	15.583	2.26	21.58	.97
3.667	1.10	9.667	3.84	15.667	2.21	21.67	.96
3.750	1.11	9.750	4.00	15.750	2.17	21.75	.96
3.833	1.13	9.833	4.17	15.833	2.13	21.83	.95
3.917	1.14	9.917	4.35	15.917	2.09	21.92	.94
4.000	1.15	10.000	4.56	16.000	2.05	22.00	.94
4.083	1.16	10.083	4.78	16.083	2.02	22.08	.93
4.167	1.17	10.167	5.03	16.167	1.98	22.17	.92
4.250	1.18	10.250	5.31	16.250	1.95	22.25	.92
4.333	1.19	10.333	5.63	16.333	1.92	22.33	.91
4.417	1.20	10.417	5.98	16.417	1.89	22.42	.90
4.500	1.22	10.500	6.39	16.500	1.86	22.50	.90
4.583	1.23	10.583	6.86	16.583	1.83	22.58	.89
4.667	1.24	10.667	7.40	16.667	1.80	22.67	.89
4.750	1.25	10.750	8.05	16.750	1.77	22.75	.88
4.833	1.27	10.833	8.82	16.833	1.74	22.83	.87
4.917	1.28	10.917	9.75	16.917	1.72	22.92	.87
5.000	1.30	11.000	10.91	17.000	1.69	23.00	.86
5.083	1.31	11.083	12.38	17.083	1.67	23.08	.86
5.167	1.33	11.167	14.30	17.167	1.65	23.17	.85
5.250	1.34	11.250	16.92	17.250	1.62	23.25	.85
5.333	1.36	11.333	20.66	17.333	1.60	23.33	.84
5.417	1.37	11.417	26.37	17.417	1.58	23.42	.84
5.500	1.39	11.500	36.00	17.500	1.56	23.50	.83
5.583	1.40	11.583	54.93	17.583	1.54	23.58	.83
5.667	1.42	11.667	104.25	17.667	1.52	23.67	.82
5.750	1.44	11.750	215.23	17.750	1.50	23.75	.82

```
             5.833    1.46 |11.833  105.86 |17.833    1.48 | 23.83     .81
             5.917    1.48 |11.917   56.85 |17.917    1.47 | 23.92     .81
             6.000    1.50 |12.000   37.53 |18.000    1.45 | 24.00     .00

     Unit Hyd Qpeak  (cms)=    .952

     PEAK FLOW       (cms)=    .568 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  54.724
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .477

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0055) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=   1.150 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  59.205
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .516

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0052) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .870 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  50.889
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .444

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (0050) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=   1.742 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  49.852
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .435

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0051) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)     11.96      1.74     11.92      49.85
     OUTFLOW: ID= 1 (0051)     11.96      1.92     12.00      36.70

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=110.09
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .3041

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0053) |
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0052):     3.90     .870    11.75    50.89
        + ID2= 2 (0051):    11.96    1.918    12.00    36.70
          ==================================================
          ID = 3 (0053):    15.86    2.240    12.00    40.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0054) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000       .0000   |  20.0000      .0771
                          .0001       .0761   |    .0000      .0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0053)      15.86      2.24     12.00      40.19
     OUTFLOW: ID= 1 (0054)      15.86      2.50     11.92      35.39

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=111.63
                   TIME SHIFT OF PEAK FLOW         (min)= -5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .3757

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                     CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0056) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
              <------ DATA FOR SECTION (   1.5) ------>
              Distance      Elevation       Manning
                   .00        425.00         .0300
                   .75        424.25     .0300 / .0300  Main Channel
                  1.75        424.25     .0300 / .0300  Main Channel
                  2.50        425.00         .0300

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
         .04   424.29    .145E+02       .0           .68       8.63
         .08   424.33    .302E+02       .1          1.05       5.61
         .12   424.37    .469E+02       .2          1.33       4.42
         .16   424.41    .647E+02       .3          1.57       3.76
         .20   424.45    .837E+02       .4          1.77       3.34
         .24   424.49    .104E+03       .6          1.94       3.04
         .28   424.53    .125E+03       .7          2.10       2.81
         .32   424.57    .147E+03       .9          2.23       2.64
         .36   424.61    .170E+03      1.1          2.36       2.50
         .39   424.64    .195E+03      1.4          2.47       2.39
         .43   424.68    .220E+03      1.6          2.57       2.30
         .47   424.72    .247E+03      1.9          2.66       2.22
         .51   424.76    .275E+03      2.1          2.75       2.15
         .55   424.80    .304E+03      2.4          2.83       2.09
         .59   424.84    .334E+03      2.7          2.90       2.04
         .63   424.88    .365E+03      3.1          2.97       1.99
         .67   424.92    .397E+03      3.4          3.03       1.95
         .71   424.96    .430E+03      3.8          3.09       1.91
         .75   425.00    .465E+03      4.1          3.14       1.88

                                      <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK    R.V.   MAX DEPTH   MAX VEL
                               (ha)    (cms)   (hrs)    (mm)      (m)       (m/s)
     INFLOW : ID= 2 (0054)    15.86     2.50   11.92   35.39       .56       2.84
     OUTFLOW: ID= 1 (0056)    15.86     2.64   12.00   35.39       .58       2.87


--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0057) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0055):     5.19    1.150    11.83    59.20
        + ID2= 2 (0056):    15.86    2.638    12.00    35.39
          ==================================================
          ID = 3 (0057):    21.05    3.285    12.00    41.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0058) |   Area    (ha)=  21.77   Curve Number   (CN)= 67.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.22   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   2.354

     PEAK FLOW       (cms)=   2.189 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  51.600
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .450

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0059) |   Area    (ha)=  11.96   Curve Number   (CN)= 66.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.74   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .18

     Unit Hyd Qpeak  (cms)=   2.557

     PEAK FLOW       (cms)=   1.742 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)=  49.852
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .435

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0060) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .1583
                           .0001      .1573   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0059)     11.96      1.74     11.92      49.85
     OUTFLOW: ID= 1 (0060)     11.96      1.92     12.00      36.70

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=110.09
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .3041

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0061) |   Area    (ha)=   3.90   Curve Number   (CN)= 69.4
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.85   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .08

     Unit Hyd Qpeak  (cms)=   1.935

     PEAK FLOW       (cms)=    .870 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  50.889
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .444

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------


--------------------
| ADD HYD   (0062) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0060):    11.96   1.918    12.00    36.70
        + ID2= 2 (0061):     3.90    .870    11.75    50.89
          ==================================================
          ID = 3 (0062):    15.86   2.240    12.00    40.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0063) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0771
                           .0001      .0761   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
```

```
                              (ha)      (cms)      (hrs)       (mm)
     INFLOW : ID= 2 (0062)     15.86      2.24      12.00      40.19
     OUTFLOW: ID= 1 (0063)     15.86      2.50      11.92      35.39

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=111.63
                   TIME SHIFT OF PEAK FLOW         (min)= -5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .3757

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                     CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0065) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.5) ------>
               Distance      Elevation       Manning
                    .00        425.00          .0300
                    .75        424.25     .0300 / .0300  Main Channel
                   1.75        424.25     .0300 / .0300  Main Channel
                   2.50        425.00          .0300

      <--------------------- TRAVEL TIME TABLE --------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
        .04   424.29    .145E+02        .0           .68        8.63
        .08   424.33    .302E+02        .1          1.05        5.61
        .12   424.37    .469E+02        .2          1.33        4.42
        .16   424.41    .647E+02        .3          1.57        3.76
        .20   424.45    .837E+02        .4          1.77        3.34
        .24   424.49    .104E+03        .6          1.94        3.04
        .28   424.53    .125E+03        .7          2.10        2.81
        .32   424.57    .147E+03        .9          2.23        2.64
        .36   424.61    .170E+03       1.1          2.36        2.50
        .39   424.64    .195E+03       1.4          2.47        2.39
        .43   424.68    .220E+03       1.6          2.57        2.30
        .47   424.72    .247E+03       1.9          2.66        2.22
        .51   424.76    .275E+03       2.1          2.75        2.15
        .55   424.80    .304E+03       2.4          2.83        2.09
        .59   424.84    .334E+03       2.7          2.90        2.04
        .63   424.88    .365E+03       3.1          2.97        1.99
        .67   424.92    .397E+03       3.4          3.03        1.95
        .71   424.96    .430E+03       3.8          3.09        1.91
        .75   425.00    .465E+03       4.1          3.14        1.88

                                         <---- hydrograph ---->   <-pipe / channel->
                             AREA    QPEAK    TPEAK    R.V.    MAX DEPTH   MAX VEL
                             (ha)    (cms)    (hrs)    (mm)       (m)       (m/s)
     INFLOW : ID= 2 (0063)   15.86     2.50   11.92  35.39        .56        2.84
     OUTFLOW: ID= 1 (0065)   15.86     2.64   12.00  35.39        .58        2.87


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0064) |   Area    (ha)=   5.19   Curve Number   (CN)= 73.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=   1.777

     PEAK FLOW       (cms)=   1.150 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  59.205
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .516

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0066) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0065):    15.86   2.638    12.00    35.39
        + ID2= 2 (0064):     5.19   1.150    11.83    59.20
          ===============================================
          ID = 3 (0066):    21.05   3.285    12.00    41.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0069) |   Area    (ha)=   1.80   Curve Number   (CN)= 58.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07
```

```
     Unit Hyd Qpeak  (cms)=   1.005

     PEAK FLOW       (cms)=    .294 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  35.940
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .313

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0067) |   Area    (ha)=   1.52   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .06

     Unit Hyd Qpeak  (cms)=    .995

     PEAK FLOW       (cms)=    .277 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  36.689
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .320

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0068) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0207
                           .0001      .0206   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0067)      1.52       .28     11.75      36.69
     OUTFLOW: ID= 1 (0068)      1.52       .32     11.92      23.18

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=115.72
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0383

     **** WARNING : HYDROGRAPH PEAK WAS NOT REDUCED.
                    CHECK OUTFLOW/STORAGE TABLE  OR REDUCE DT.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0071) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0069):      1.80    .294     11.75    35.94
        + ID2= 2 (0068):      1.52    .321     11.92    23.18
          ==================================================
          ID = 3 (0071):      3.32    .478     11.92    30.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0070) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0708
                           .0001      .0707   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0071)      3.32       .48     11.92      30.09
     OUTFLOW: ID= 1 (0070)      3.32       .04     13.75       8.80

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.40
                  TIME SHIFT OF PEAK FLOW         (min)=110.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0915

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (0073) |
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
              <------ DATA FOR SECTION (   1.6) ------>
              Distance      Elevation       Manning
                  .00        421.26         .0300
                 1.10        420.66     .0300 / .0300  Main Channel
                 2.00        420.66     .0300 / .0300  Main Channel
                 3.10        421.26         .0300
```

```
     <---------------------- TRAVEL TIME TABLE ---------------------->
      DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
       (m)      (m)      (cu.m.)     (cms)        (m/s)      (min)
       .03   420.69    .560E+01        .0           .05       59.24
       .06   420.72    .119E+02        .0           .09       35.98
       .09   420.75    .188E+02        .0           .12       26.61
       .13   420.79    .265E+02        .0           .14       21.37
       .16   420.82    .348E+02        .0           .17       17.97
       .19   420.85    .437E+02        .0           .20       15.58
       .22   420.88    .534E+02        .1           .22       13.79
       .25   420.91    .637E+02        .1           .25       12.40
       .28   420.94    .748E+02        .1           .27       11.29
       .32   420.98    .864E+02        .1           .30       10.38
       .35   421.01    .988E+02        .2           .32        9.61
       .38   421.04    .112E+03        .2           .34        8.96
       .41   421.07    .126E+03        .2           .37        8.41
       .44   421.10    .140E+03        .3           .39        7.92
       .47   421.13    .155E+03        .3           .41        7.50
       .51   421.17    .171E+03        .4           .43        7.12
       .54   421.20    .187E+03        .5           .45        6.78
       .57   421.23    .204E+03        .5           .48        6.48
       .60   421.26    .222E+03        .6           .50        6.21

                                  <---- hydrograph ---->   <-pipe / channel->
                         AREA    QPEAK   TPEAK   R.V.    MAX DEPTH  MAX VEL
                         (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
     INFLOW : ID= 2 (0070)    3.32     .04   13.75   8.80       .18       .18
     OUTFLOW: ID= 1 (0073)    3.32     .02   14.08   8.66       .18       .18

     **** WARNING:  COMPUTATIONS FAILED TO CONVERGE.

-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0074) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0066):    21.05   3.285    12.00    41.26
        + ID2= 2 (0073):     3.32    .022    14.08     8.66
          ==================================================
          ID = 3 (0074):    24.37   3.285    12.00    36.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0072) |   Area    (ha)=  24.19   Curve Number   (CN)= 60.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.62   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .37

     Unit Hyd Qpeak  (cms)=   2.505

     PEAK FLOW       (cms)=   1.833 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)=  40.764
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .356

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0075) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0074):    24.37   3.285    12.00    36.82
        + ID2= 2 (0072):    24.19   1.833    12.17    40.76
          ==================================================
          ID = 3 (0075):    48.56   4.985    12.00    38.79

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0076) |   Area    (ha)= 127.28   Curve Number   (CN)= 59.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.29   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .79

     Unit Hyd Qpeak  (cms)=   6.192

     PEAK FLOW       (cms)=   5.701 (i)
     TIME TO PEAK    (hrs)=  12.583
     RUNOFF VOLUME    (mm)=  40.934
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .357
```

```
     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0077) |   Area    (ha)=  17.28   Curve Number   (CN)= 58.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.24   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=   1.154

     PEAK FLOW       (cms)=    .918 (i)
     TIME TO PEAK    (hrs)=  12.333
     RUNOFF VOLUME    (mm)=  38.708
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0082) |   Area    (ha)=    .24   Curve Number   (CN)= 77.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.49   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .081

     PEAK FLOW       (cms)=    .059 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  65.801
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .574

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0078) |   Area    (ha)=   2.66   Curve Number   (CN)= 59.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.55   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .07

     Unit Hyd Qpeak  (cms)=   1.418

     PEAK FLOW       (cms)=    .442 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)=  37.332
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .326

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0079) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |  20.0000      .0608
                           .0001      .0607   |    .0000      .0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0078)      2.66       .44     11.75      37.33
     OUTFLOW: ID= 1 (0079)      2.66       .10     12.42      14.51

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.04
                   TIME SHIFT OF PEAK FLOW         (min)= 40.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  .0795

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0083) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0082):      .24     .059    11.83    65.80
        + ID2= 2 (0079):     2.66     .097    12.42    14.51
          ==================================================
          ID = 3 (0083):     2.90     .105    12.42    18.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (0080) |   Area    (ha)=  14.63   Curve Number   (CN)= 58.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.37   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .57

     Unit Hyd Qpeak  (cms)=    .977

     PEAK FLOW       (cms)=    .770 (i)
     TIME TO PEAK    (hrs)=  12.333
     RUNOFF VOLUME    (mm)=  38.359
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .335

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0081) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0083):     2.90    .105    12.42    18.71
        + ID2= 2 (0080):    14.63    .770    12.33    38.36
          ==============================================
          ID = 3 (0081):    17.52    .874    12.42    35.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0084) |   Area    (ha)=   7.71   Curve Number   (CN)= 62.5
|ID= 1 DT= 5.0 min |   Ia      (mm)=   9.14   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=   1.012

     PEAK FLOW       (cms)=    .722 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  43.086
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .376

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0085) |   Area    (ha)=    .91   Curve Number   (CN)= 64.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.53   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .11

     Unit Hyd Qpeak  (cms)=    .313

     PEAK FLOW       (cms)=    .154 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)=  45.391
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .396

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0086) |   Area    (ha)=  19.15   Curve Number   (CN)= 71.3
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.81   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=   2.995

     PEAK FLOW       (cms)=   2.647 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)=  56.028
     TOTAL RAINFALL   (mm)= 114.644
     RUNOFF COEFFICIENT   =    .489

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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Appendix D
Rational Method Calculations for Roadside Ditches

Table D-1: Peak Flows (Qp) to Roadside Ditches for 10-year Design Storm Event

			Rational Method								Existing Ditch Dimension (estimated)						
Ditch ID	Ditch Sub-section ID	Total Drainage Area to Ditch (m^2)	Total Drainage Area to Ditch (ha)	Area-weighted C	IDF Parameter A (10-year)	IDF Parameter b (10-year)	IDF Parameter c (10-year)	$t = T_c$ (min)	Intensity (mm/hr) where $I=A/(t + B)^C$	Peak Flow to Ditches $Q_p = 0.0027778CiA$ (m^3/s)	Estimated Top Width (m)	Estimated Depth	Side Slope (H:V)	Estimated Bottom Width (m)	Long Slope (m/m)	Maximum Ditch Capacity (m^3/s) based on Manning's Eqn	Does existing ditch have sufficient capacity? (Yes/No)
B10	A	5665	0.57	0.426	1219.9	7.84	0.8073	17.4	90.14	0.06	1.8	0.25	2.5	0.5	0.016	0.34	Yes
B10	B	26705	2.67	0.388	1219.9	7.84	0.8073	19.1	85.39	0.25	1.8	0.25	2.5	0.5	0.035	0.51	Yes
B15	A	4069	0.41	0.406	1219.9	7.84	0.8073	15.9	94.68	0.04	7.0	0.49	4.1	3.0	0.090	12.1	Yes
B18	A	1563	0.16	0.607	1219.9	7.84	0.8073	15.8	95.01	0.03	9.5	0.66	5.0	2.9	0.020	11.0	Yes
B20	A	19120	1.91	0.498	1219.9	7.84	0.8073	17.0	91.09	0.24	3.7	0.84	2.2	0.0	0.035	5.04	Yes
B25	A	4352	0.44	0.446	1219.9	7.84	0.8073	15.4	96.34	0.05	1.9	0.40	1.7	0.6	0.038	1.25	Yes
B25	B	9799	0.98	0.427	1219.9	7.84	0.8073	16.0	94.20	0.11	1.9	0.40	1.7	0.6	0.084	1.85	Yes
B30	A	18397	1.84	0.415	1219.9	7.84	0.8073	16.2	93.75	0.20	2.2	0.55	1.5	0.6	0.004	0.65	Yes
B35	A	7916	0.79	0.435	1219.9	7.84	0.8073	15.0	97.60	0.09	0.4	0.34	0.6	0.0	0.020	0.06	No
M10	A	29457	2.95	0.376	1219.9	7.84	0.8073	18.8	86.31	0.27	2.0	0.30	0.5	1.3	0.060	1.24	Yes
M10	B	204158	20.42	0.364	1219.9	7.84	0.8073	20.1	83.03	1.71	3.1	1.32	1.0	0.0	0.016	4.14	Yes
M10	C	204660	20.47	0.365	1219.9	7.84	0.8073	20.7	81.58	1.69	3.1	1.32	1.0	0.0	0.027	5.37	Yes
M100	A	456	0.05	0.652	1219.9	7.84	0.8073	16.2	93.54	0.01	1.5	0.40	0.0	1.5	0.011	0.84	Yes
M105	A	2534	0.25	0.312	1219.9	7.84	0.8073	15.7	95.21	0.02	2.0	0.24	4.2	0.0	0.005	0.14	Yes
M105	B	4807	0.48	0.318	1219.9	7.84	0.8073	16.4	93.04	0.04	2.0	0.24	4.2	0.0	0.014	0.22	Yes
M110	A	6246	0.62	0.337	1219.9	7.84	0.8073	15.5	95.93	0.06	1.0	0.10	3.0	0.4	0.017	0.05	No
M110	B	7659	0.77	0.345	1219.9	7.84	0.8073	15.9	94.75	0.07	1.0	0.10	3.0	0.4	0.039	0.08	Yes
M110	C	9826	0.98	0.358	1219.9	7.84	0.8073	16.5	92.80	0.09	1.0	0.10	3.0	0.4	0.017	0.05	No
M110	D	22856	2.29	0.361	1219.9	7.84	0.8073	23.6	75.31	0.17	1.0	0.10	3.0	0.4	0.006	0.03	No
M115	A	644	0.06	0.608	1219.9	7.84	0.8073	15.8	94.78	0.01	1.1	0.15	0.3	1.0	0.041	0.26	Yes
M115	B	1405	0.14	0.639	1219.9	7.84	0.8073	17.2	90.65	0.02	1.1	0.15	0.3	1.0	0.022	0.19	Yes
M115	C	77101	7.71	0.301	1219.9	7.84	0.8073	25.6	71.72	0.46	1.1	0.15	0.3	1.0	0.004	0.08	No
M120	A	981	0.10	0.624	1219.9	7.84	0.8073	17.2	90.50	0.02	No ditch evident observed in field					0	No ditch evident
M125	A	9092	0.91	0.307	1219.9	7.84	0.8073	16.3	93.43	0.07	1.2	0.31	1.9	0	0.012	0.18	Yes
M130	A	601	0.06	0.705	1219.9	7.84	0.8073	17.1	90.97	0.01	No ditch evident observed in field					0	No ditch evident
M140	A	2035	0.20	0.746	1219.9	7.84	0.8073	19.1	85.44	0.04	1.0	0.35	0.7	0.5	0.020	0.42	Yes
M145	A	2327	0.23	0.433	1219.9	7.84	0.8073	16.1	93.84	0.03	No ditch evident observed in field					0	No ditch evident
M15	A	3800	0.38	0.607	1219.9	7.84	0.8073	17.3	90.21	0.06	2.0	0.30	2.0	1.3	0.060	1.62	Yes
M15	B	7456	0.75	0.546	1219.9	7.84	0.8073	18.7	86.50	0.10	1.9	0.60	1.0	0.7	0.052	2.82	Yes
M15	C	28256	2.83	0.426	1219.9	7.84	0.8073	23.5	75.50	0.25	2.0	0.68	1.0	0.6	0.018	2.01	Yes
M150	A	2178	0.22	0.661	1219.9	7.84	0.8073	17.7	89.12	0.04	1.7	0.48	1.0	0.7	0.039	1.62	Yes
M155	A	10650	1.07	0.317	1219.9	7.84	0.8073	15.9	94.71	0.09	2.1	0.60	1.3	0.6	0.035	2.38	Yes
M155	B	14048	1.40	0.332	1219.9	7.84	0.8073	16.7	92.12	0.12	2.1	0.60	1.3	0.6	0.053	2.92	Yes
M20	A	815	0.08	0.572	1219.9	7.84	0.8073	15.6	95.59	0.01	1.0	0.70	0.5	0	0.041	0.48	Yes
M20	B	1662	0.17	0.667	1219.9	7.84	0.8073	16.5	92.77	0.03	1.0	0.70	0.5	0	0.037	0.46	Yes
M25	A	15338	1.53	0.380	1219.9	7.84	0.8073	15.6	95.56	0.15	1.7	0.30	2.8	0	0.039	0.46	Yes
M25	B	26607	2.66	0.408	1219.9	7.84	0.8073	18.9	85.88	0.26	1.7	0.30	2.8	0	0.009	0.22	No
M25	C	28466	2.85	0.419	1219.9	7.84	0.8073	19.6	84.26	0.28	1.7	0.30	2.8	0	0.025	0.36	Yes
M25	D	47310	4.73	0.401	1219.9	7.84	0.8073	20.2	82.65	0.44	1.7	0.30	2.8	0	0.014	0.27	No
M30	A	872	0.09	0.538	1219.9	7.84	0.8073	15.0	97.60	0.01	No ditch evident observed in field					0	No ditch evident
M40	A	4705	0.47	0.381	1219.9	7.84	0.8073	16.9	91.56	0.05	1.5	0.30	0.5	1.2	0.020	0.70	Yes
M40	B	5824	0.58	0.419	1219.9	7.84	0.8073	17.9	88.69	0.06	1.5	0.30	0.5	1.2	0.058	1.17	Yes
M40	C	18624	1.86	0.359	1219.9	7.84	0.8073	20.8	81.34	0.15	1.8	0.33	2.7	0	0.010	0.28	Yes
M40	D	21576	2.16	0.399	1219.9	7.84	0.8073	25.4	72.05	0.17	3.1	0.60	1.8	0.9	0.022	2.99	Yes
M45	A	1627	0.16	0.609	1219.9	7.84	0.8073	17.1	90.79	0.02	2.5	0.75	1.0	1.0	0.034	4.49	Yes
M45	B	3296	0.33	0.558	1219.9	7.84	0.8073	17.9	88.68	0.05	4.7	1.26	1.4	1.1	0.024	14.2	Yes
M45	C	201430	20.14	0.355	1219.9	7.84	0.8073	26.3	70.48	1.40	2.1	0.65	0.8	1.0	0.020	2.43	Yes
M45	D	206080	20.61	0.357	1219.9	7.84	0.8073	29.5	65.60	1.34	2.1	0.65	0.8	1.0	0.006	1.31	No

M50	A	5713	0.57	0.434	1219.9	7.84	0.8073	16.8	91.93	0.06	1.9	0.40	1.5	0.7	0.027	1.10	Yes
M55	A	11683	1.17	0.386	1219.9	7.84	0.8073	15.4	96.29	0.12	1.2	0.33	1.2	0.4	0.023	0.43	Yes
M65	A	30449	3.04	0.345	1219.9	7.84	0.8073	16.6	92.32	0.27	2.0	0.60	1.3	0.5	0.010	1.15	Yes
M65	B	173842	17.38	0.325	1219.9	7.84	0.8073	31.7	62.63	0.98	2.0	0.60	1.3	0.5	0.003	0.61	No
M65	C	174445	17.44	0.327	1219.9	7.84	0.8073	32.4	61.82	0.98	2.0	0.60	1.3	0.5	0.054	2.65	Yes
M65	D	175927	17.59	0.329	1219.9	7.84	0.8073	36.4	57.24	0.92	2.0	0.60	1.3	0.5	0.010	1.13	Yes
M75	A	1628	0.16	0.587	1219.9	7.84	0.8073	16.2	93.72	0.02	2.2	0.20	5.5	0	0.020	0.22	Yes
M80	A	1387	0.14	0.443	1219.9	7.84	0.8073	15.0	97.60	0.02	1.6	0.13	6.2	0	0.029	0.10	Yes
M80	B	1721	0.17	0.494	1219.9	7.84	0.8073	15.5	95.95	0.02	1.6	0.13	6.2	0	0.029	0.10	Yes
M85	A	649	0.06	0.655	1219.9	7.84	0.8073	16.6	92.44	0.01	No ditch evident observed in field					0	No ditch evident
M90	A	2424	0.24	0.585	1219.9	7.84	0.8073	17.5	89.66	0.04	2.2	0.32	3.4	0	0.024	0.52	Yes
M95	A	937	0.09	0.597	1219.9	7.84	0.8073	18.2	87.75	0.01	1.4	0.18	0.0	1.4	0.017	0.30	Yes
M95	B	170396	17.04	0.286	1219.9	7.84	0.8073	28.9	66.42	0.90	1.4	0.18	0.0	1.4	0.017	0.30	No
M60	A	21612	2.16	0.467	1219.9	7.84	0.8073	23.7	75.26	0.21	2.1	0.35	2.0	0.7	0.003	0.29	Yes
M60	B	22586	2.26	0.474	1219.9	7.84	0.8073	24.9	72.99	0.22	2.1	0.35	2.0	0.7	0.042	1.20	Yes
M60	C	492954	49.30	0.391	1219.9	7.84	0.8073	54.8	43.24	2.31	2.5	0.60	2.1	0	0.005	0.71	No
M70	A	607	0.06	0.696	1219.9	7.84	0.8073	16.0	94.15	0.01	1.5	0.60	0.6	0.8	0.025	1.12	Yes

Table D-2: Time of Concentration (Tc) Calculations for Roadside Ditches

SCS Upland Method of Estimating Tc:

Code	Description	Velocity (m/s)
1	Forest with heavy ground litter & hay meadow (overland flow)	$=2.5*(s^{0.5})*0.3048$
2	Trash fallow or min tillage cultivation; contour or strip cropped & woodland (overland flow)	$=5.0*(s^{0.5})*0.3048$
3	Short grass pasture (overland flow)	$=7.0*(s^{0.5})*0.3048$
4	Cultivated, straight row (overland flow)	$=9.0*(s^{0.5})*0.3048$
5	Nearly bare and untilled (overland flow); & alluvial fans western mountain regions	$=10.0*(s^{0.5})*0.3048$
6	Grassed waterway	$=15.0*(s^{0.5})*0.3048$
7	Paved areas (sheet flow); & small upland gullies	$=20.0*(s^{0.5})*0.3048$

			Overland Travel Path (1)								Overland Travel Path (2)										Ditch Travel Path								
Ditch ID	Ditch Sub-section ID	Total Drainage Area to Ditch (ha)	Elevation E1	Elevation E2	Elevation Change	Flow Length (m)	Slope (m/m)	SCS Upland GND cover - Code	Velocity (see chart)	Travel Time (min)	Elevation E1	Elevation E2	Elevation Change	Flow Length (m)	Slope (m/m)	SCS Upland GND cover - Code	Velocity (see chart)	Travel Time (min)	Total Overland Travel Time before entering ditch (min)	Inlet Travel Time to Ditch (min) (Use minimum inlet time of 15 min.)	Elevation E1	Elevation E2	Elevation Change	Ditch Flow Length (m)	Ditch slope (m/m)	SCS Upland GND cover - Code	Velocity (see chart)	Ditch Travel Time (min)	Time of Concentration (min) (Tc = Inlet Travel Time + Ditch Travel Time)
B10	A	0.57	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	396.5	394.7	1.8	110	0.0163	7	0.78	2.36	17.36
B10	B	2.67	400	396	4	187	0.0214	4	0.40	7.76	396	393.5	2.5	67	0.0375	6	0.88	1.26	Overland travel time 9.02 min < 17.36 min	Use 17.36	394.3	390.1	4.2	120	0.0351	7	1.14	1.75	19.11
B15	A	0.41	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	396.4	387.7	8.7	96	0.0904	7	1.83	0.87	15.87
B18	A	0.16	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	393.1	392.3	0.8	40	0.0200	7	0.86	0.77	15.77
B20	A	1.91	400	398	2	100	0.0200	4	0.39	4.30	398	392.6	5.4	93	0.0581	6	1.10	1.41	Overland travel time 5.70 min < 15 min	Use 15	392.6	387.7	4.9	140	0.0351	7	1.14	2.04	17.04
B25	A	0.44	399.2	393	6.2	166	0.0373	4	0.53	5.24	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 5.24 min < 15 min	Use 15	392.2	391.2	1	26	0.0379	7	1.19	0.37	15.37
B25	B	0.98	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Less than 15 min < 15.37 min	Use 15.37	391.2	385.4	5.8	69	0.0836	7	1.76	0.66	16.03
B30	A	1.84	403	398	5	93	0.0539	4	0.64	2.43	398	384.7	13.3	177	0.0750	6	1.25	2.36	Overland travel time 4.80 min < 15 min	Use 15	383.9	383.8	0.1	26	0.0038	7	0.38	1.17	16.17
B35	A	0.79	385	381.4	3.6	103	0.0348	4	0.51	3.37	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 3.37 min < 15 min	Use 15	Negligible ditch travel time								15.00
M10	A	2.95	435	432	3	120	0.0250	3	0.34	5.93	432	427	5	52	0.0957	6	1.41	0.62	Overland travel time 6.54 min < 15 min	Use 15	428.2	408.1	20.1	336	0.0598	7	1.49	3.76	18.76
M10	B	20.42	440	433	7	100	0.0700	4	0.73	2.30	433	406.5	26.5	813	0.0326	6	0.83	16.42	Overland travel time 18.71 min < 18.76 min	Use 18.76	406.5	405.2	1.3	68	0.0191	7	0.84	1.35	20.06
M10	C	20.47	Overland travel time less than 20.06 min.								n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 20.06 min	Use 20.06	405.2	404.2	1	37	0.0271	7	1.00	0.61	20.68
M100	A	0.05	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	394.6	394.1	0.5	47	0.0107	7	0.63	1.23	16.23
M105	A	0.25	397	395	2	119	0.0168	2	0.20	10.02	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 10.02 min < 15 min	Use 15	394.6	394.5	0.1	19	0.0053	7	0.44	0.71	15.71
M105	B	0.48	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 15.71 min	Use 15.71	394.5	394.1	0.4	29	0.0137	7	0.71	0.68	16.39
M110	A	0.62	394	391.4	2.6	101	0.0258	2	0.24	6.86	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 6.86 min < 15 min	Use 15	391.5	391.1	0.4	24	0.0170	7	0.80	0.49	15.49
M110	B	0.77	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 15.49 min	Use 15.49	391.1	390.1	1	26	0.0386	7	1.20	0.36	15.85
M110	C	0.98	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 15.85 min	Use 15.85	390.1	389.6	0.5	29	0.0170	7	0.79	0.62	16.47
M110	D	2.29	Overland travel time less than 16.47 min.								n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 16.47 min	Use 16.47	389.6	388.3	1.3	208	0.0063	7	0.48	7.18	23.65
M115	A	0.06	Overland travel time less than 15 minutes.								n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Less than 15 min	Use 15	393.8	391.2	2.6	63	0.0414	7	1.24	0.84	15.84
M115	B	0.14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 15.84 min	Use 15.84	391.2	389.6	1.6	73	0.0220	7	0.90	1.34	17.19
M115	C	7.71	400.9	398	2.9	126	0.0231	2	0.23	9.06	398	389.3	8.7	378	0.0230	6	0.69	9.09	Overland travel time 18.15 min > 17.19 min	Use 18.15	389.6	388.8	0.8	181	0.0044	7	0.40	7.46	25.61
M120	A	0.10	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	388.7	387.4	1.3	95	0.0136	7	0.71	2.24	17.24
M125	A	0.91	393	389.5	3.5	96	0.0363	2	0.29	5.53	389.5	388	1.5	59	0.0253	6	0.73	1.36	Overland travel time 6.89 min < 15 min	Use 15	388	387.4	0.6	50	0.0119	7	0.66	1.27	16.27
M130	A	0.06	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	387.9	387.3	0.6	70	0.0085	7	0.56	2.08	17.08
M140	A	0.20	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	388	383.7	4.3	213	0.0202	7	0.87	4.09	19.09
M145	A	0.23	388	387	1	43	0.0230	2	0.23	3.13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 3.13 min < 15 min	Use 15	386.8	386	0.8	52	0.0155	7	0.76	1.14	16.14
M15	A	0.38	436	431	5	62	0.0810	3	0.61	1.70	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 1.70 min < 15 min	Use 15	431	414.1	16.9	231	0.0731	7	1.65	2.34	17.34
M15	B	0.75	Overland travel time less than 17.34 minutes.								n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 17.34 min	Use 17.34	414.1	408.2	5.9	113	0.0524	7	1.40	1.34	18.68
M15	C	2.83	415	405.8	9.2	100	0.092	3	0.65	2.58	n/a	n/a	n/a	194	0.0920	6	1.39	2.34	Overland travel time 4.91 min < 18.68 min	Use 18.68	408.2	403.8	4.4	241	0.0183	7	0.82	4.87	23.55
M150	A	0.22	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	381.8	374	7.8	198	0.0395	7	1.21	2.72	17.72
M155	A	1.07	383.8	381.6	2.2	96	0.0230	2	0.23	6.91	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 6.91 min < 15 min	Use 15	380.3	378.2	2.1	59	0.0353	7	1.15	0.86	15.86
M155	B	1.40	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 15.86 min	Use 15.86	378.2	374.5	3.7	70	0.0530	7	1.40	0.83	16.69
M20	A	0.08	436	434	2	21	0.0966	4	0.85	0.40	434	433	1	20	0.0497	6	1.02	0.33	Overland travel time 0.73 min < 15 min	Use 15	432.7	430.9	1.8	44	0.0409	7	1.23	0.59	15.59
M20	B	0.17	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 15.59 min	Use 15.59	430.4	428.1	2.3	62	0.0370	7	1.17	0.89	16.48
M25	A	1.53	438	434.9	3.1	118	0.0262	4	0.44	4.43	435.1	433.3	1.8	81	0.0222	7	0.91	1.49	Overland travel time 5.93 min < 15 min	Use 15	433.3	431.6	1.7	44	0.0390	7	1.20	0.60	15.60
M25	B	2.66	436	432	4	105	0.0381	4	0.54	3.27	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 3.27 min < 15.60 min	Use 15.60	431.4	430.3	1.1	117	0.0094	7	0.59	3.32	18.92
M25	C	2.85	435	430	5	104	0.0482	4	0.60	2.87	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 2.87 min < 18.92 min	Use 18.92	430	429.1	0.9	37	0.0246	7	0.96	0.64	19.56
M25	D	4.73	436	432	4	56	0.0718	3	0.57	1.62	432	429	3	206	0.0146	6	0.55	6.20	Overland travel time 7.82 min < 19.56 min	Use 19.56	428.8	428.4	0.4	29	0.0139	7	0.72	0.66	20.22
M30	A	0.09	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	435.1	434.6	0.5	53	0.0094	7	0.59	1.49	Overland travel time 1.49 min < 15 min	Use 15	Negligible ditch travel time								15.00
M40	A	0.47	434	432.8	1.2	46	0.0259	4	0.44	1.75	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 1.75 min < 15 min	Use 15	432.8	430.8	2	98	0.0204	7	0.87	1.88	16.88
M40	B	0.58	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 16.88 min	Use 16.88	430.8	425.7	5.1	88	0.0580	7	1.47	1.00	17.88
M40	C	1.86	434	428	6	99	0.0606	4	0.68	2.44	428	425.7	2.3	100	0.0230	6	0.69	2.40	Overland travel time 4.85 min < 17.88 min	Use 17.88	425.7	424.7	1	104	0.0096	7	0.60	2.91	20.78
M40	D	2.16	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 20.78 min	Use 20.78	424.7	419	5.7	254	0.0224	7	0.91	4.64	25.42
M45	A	0.16	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	429.8	425	4.8	143	0.0335	7	1.12	2.14	17.14
M45	B	0.33	426	424.8	1.2	19	0.0616	4	0.68	0.48	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 0.48 min < 17.14 min	Use 17.14	425	424	1	42	0.0239	7	0.94	0.74	17.88
M45	C	20.14	436	431	5	82	0.0609	4	0.68	2.02	431	422.9	8.1	660	0.0123	6	0.51	21.71	Overland travel time 23.73 min > 17.88 min	Use 23.73	422.3	419.7	2.6	133	0.0195	7	0.85	2.61	26.34
M45	D	20.61	Overland travel time less than 26.34 min.								n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 26.34 min	Use 26.34	419.5	419	0.5	88	0.0057	7	0.46	3.17	29.52
M50	A	0.57	424	421.8	2.2	103	0.0214	4	0.40	4.26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 4.26 min < 15 min	Use 15	421.4	418.6	2.8	105	0.0267	7	1.00	1.76	16.76
M55	A	1.17	424	420.22	3.78	101	0.0374	4	0.53	3.17	420.22	419.5	0.72	60	0.0120	6	0.50	1.99	Overland travel time 5.16 min < 15 min	Use 15	419.4	418.9	0.5	21	0.0234	7	0.93	0.38	15.38
M65	A	3.04	419	415	4	105	0.0381	4	0.54	3.27	415	405	10	140	0.0716	6	1.22	1.90	Overland travel time 5.17 min < 15 min	Use 15	405	404.4	0.6	60	0.0101	7	0.61	1.63	16.63
M65	B	17.38	435	431	4	110	0.0363	3	0.41	4.52	431	404.1	26.9	982	0.0274	6	0.76	21.64	Overland travel time 26.16 min > 16.63 min	Use 26.16	404	403.7	0.3	108	0.0028	7	0.32	5.57	31.73
M65	C	17.44	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 31.73 min	Use 31.73	403.7	400.8	2.9	54	0.0536	7	1.41	0.64	32.37
M65	D	17.59	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 32.37 min	Use 32.37	400.8	399.4	1.4	145	0.0097	7	0.60	4.02	36.39
M75	A	0.16	406	402.6	3.4	66	0.0514	3	0.48	2.28	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 2.28 min < 15 min	Use 15	402.6	401.4	1.2	61	0.0198	7	0.86	1.18	16.18
M80	A	0.14	402	399.4	2.6	56	0.0462	3	0.46	2.04	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time 2.04 min < 15 min	Use 15	Negligible ditch travel time								15.00
M80	B	0.17	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 15 min	Use 15	399.4	398.5	0.9	31	0.0295	7	1.05	0.49	15.49
M85	A	0.06	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	399	398.5	0.5	55	0.0090	7	0.58	1.59	16.59
M90	A	0.24	398.3	398.2	0.1	26	0.0039	4	0.17	2.51	398.2	397.6	0.6	6	0.1071	6	1.50	0.06	Overland travel time 2.57 min < 15 min	Use 15	397.6	394.1	3.5	144	0.0243	7	0.95	2.53	17.53
M95	A	0.09	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	397.2	394.5	2.7	155	0.0174	7	0.80	3.21	18.21
M95	B	17.04	411	405	6	112	0.0535	1	0.18	10.61	405	394.1	10.9	651	0.0167	6	0.59	18.34	Overland travel time 28.95 min > 18.21 min	Use 28.95	Negligible ditch travel time								28.95
M60	A	2.16	424	413	11	90	0.1218	4	0.96	1.57	413	404.7	8.3	174	0.0478	6	1.00	2.90	Overland travel time 4.47 min < 15 min	Use 15	404.7	404.3	0.4	159	0.0025	7	0.31	8.67	23.67
M60	B	2.26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Overland travel time < 23.67 min	Use 23.67	404.3	400.5	3.8	91	0.0418	7	1.25	1.22	24.89
M60	C	49.30	Ditch M45 (tc=29.52min) upstream of this ditch M60 (subsection C).							29.52	419.5	400.3	19.2	970	0.0198	6	0.64	25.14	Overland travel time 54.66 min > 24.89 min	Use 54.66	n/a	n/a	n/a	3	0.0046	7	0.41	0.11	54.77
M70	A	0.06	Overland travel time less than 15 minutes.								Overland travel time less than 15 minutes.								Less than 15 min	Use 15	400.9	399.4	1.5	60	0.0250	7	0.96	1.04	16.04

Table D-3: Runoff Coefficient C for Areas Draining to Roadside Ditches

				Land Use Breakdown						Runoff Coefficient C[1]						
Ditch ID	Ditch Sub-section ID	Total Drainage Area to Ditch (m^2)	Total Drainage Area to Ditch (ha)	Pond Area (m^2)	Forest Area (m^2)	Woodland Area (m^2)	Crop Area (m^2)	Grassed Area (m^2)	Impervious Area (m^2)	Pond	Forest	Woodland	Crop	Grassed Area	Impervious Area	Area-weighted C
B10	A	5665	0.57	0	0	0	4947	0	719	0.05	0.25	0.25	0.35	0.28	0.95	0.426
B10	B	26705	2.67	0	0	0	25022	0	1670	0.05	0.25	0.25	0.35	0.28	0.95	0.388
B15	A	4069	0.41	0	0	1271	2208	0	591	0.05	0.25	0.25	0.35	0.28	0.95	0.406
B18	A	1563	0.16	0	0	0	0	894	669	0.05	0.30	0.30	0.45	0.35	0.95	0.607
B20	A	19120	1.91	0	0	0	0	14391	4729	0.05	0.30	0.30	0.45	0.35	0.95	0.498
B25	A	4352	0.44	0	0	0	0	3277	1075	0.05	0.25	0.25	0.35	0.28	0.95	0.446
B25	B	9799	0.98	0	0	1349	2435	4050	1959	0.05	0.25	0.25	0.35	0.28	0.95	0.427
B30	A	18397	1.84	0	0	0	0	16398	1999	0.05	0.30	0.30	0.45	0.35	0.95	0.415
B35	A	7916	0.79	0	0	0	0	6085	1831	0.05	0.25	0.25	0.35	0.28	0.95	0.435
M10	A	29457	2.95	0	0	15211	0	11684	2558	0.05	0.30	0.30	0.45	0.35	0.95	0.376
M10	B	204158	20.42	0	0	138450	0	49409	16209	0.05	0.30	0.30	0.45	0.35	0.95	0.364
M10	C	204660	20.47	0	0	138450	0	49628	16486	0.05	0.30	0.30	0.45	0.35	0.95	0.365
M100	A	456	0.05	0	0	209	0	0	247	0.05	0.30	0.30	0.45	0.35	0.95	0.652
M105	A	2534	0.25	0	0	2310	0	0	224	0.05	0.25	0.25	0.45	0.28	0.95	0.312
M105	B	4807	0.48	0	0	2310	0	2137	375	0.05	0.25	0.25	0.45	0.28	0.95	0.318
M110	A	6246	0.62	0	0	5466	0	0	780	0.05	0.25	0.25	0.35	0.28	0.95	0.337
M110	B	7659	0.77	0	0	6616	0	0	1040	0.05	0.25	0.25	0.35	0.28	0.95	0.345
M110	C	9826	0.98	0	0	6616	0	1772	1438	0.05	0.25	0.25	0.35	0.28	0.95	0.358
M110	D	22856	2.29	0	0	12366	0	7162	3334	0.05	0.25	0.25	0.35	0.28	0.95	0.361
M115	A	644	0.06	0	0	315	0	0	329	0.05	0.25	0.25	0.45	0.28	0.95	0.608
M115	B	1405	0.14	0	0	626	0	0	783	0.05	0.25	0.25	0.45	0.28	0.95	0.639
M115	C	77101	7.71	0	0	65265	0	6475	5355	0.05	0.25	0.25	0.45	0.28	0.95	0.301
M120	A	981	0.10	0	0	492	0	0	489	0.05	0.30	0.30	0.45	0.35	0.95	0.624
M125	A	9092	0.91	0	0	8357	0	0	735	0.05	0.30	0.25	0.45	0.35	0.95	0.307
M130	A	601	0.06	0	0	227	0	0	374	0.05	0.30	0.30	0.45	0.35	0.95	0.705
M140	A	2035	0.20	0	0	637	0	0	1398	0.05	0.30	0.30	0.45	0.35	0.95	0.746
M145	A	2327	0.23	0	0	1852	0	0	474	0.05	0.30	0.30	0.45	0.35	0.95	0.433
M15	A	3800	0.38	0	0	0	0	2170	1631	0.05	0.30	0.30	0.45	0.35	0.95	0.607
M15	B	7456	0.75	0	0	0	2870	2170	2451	0.05	0.30	0.30	0.35	0.35	0.95	0.546
M15	C	28256	2.83	0	0	491	21996	2170	3638	0.05	0.30	0.30	0.35	0.35	0.95	0.426
M150	A	2178	0.22	0	0	967	0	0	1211	0.05	0.30	0.30	0.45	0.35	0.95	0.661
M155	A	10650	1.07	0	0	9630	0	0	1020	0.05	0.30	0.25	0.45	0.35	0.95	0.317
M155	B	14048	1.40	0	0	12420	0	0	1642	0.05	0.30	0.25	0.45	0.35	0.95	0.332
M20	A	815	0.08	0	0	474	0	0	341	0.05	0.30	0.30	0.45	0.35	0.95	0.572
M20	B	1662	0.17	0	0	474	0	270	917	0.05	0.30	0.30	0.45	0.35	0.95	0.667
M25	A	15338	1.53	0	0	1493	10042	2906	897	0.05	0.30	0.30	0.35	0.35	0.95	0.380
M25	B	26607	2.66	0	0	1493	10042	12366	2702	0.05	0.30	0.30	0.35	0.35	0.95	0.408
M25	C	28466	2.85	0	0	1493	10042	13548	3377	0.05	0.30	0.30	0.35	0.35	0.95	0.419
M25	D	47310	4.73	801	0	4041	10042	27690	4731	0.05	0.30	0.30	0.35	0.35	0.95	0.401
M30	A	872	0.09	0	0	553	0		319	0.05	0.30	0.30	0.45	0.35	0.95	0.538
M40	A	4705	0.47	0	0	2916	0	1060	729	0.05	0.30	0.25	0.45	0.35	0.95	0.381
M40	B	5824	0.58	0	0	3508	0	1060	1255	0.05	0.30	0.25	0.45	0.35	0.95	0.419
M40	C	18624	1.86	0	0	3508	0	12766	2362	0.05	0.30	0.25	0.45	0.28	0.95	0.359
M40	D	21576	2.16	0	0	3508	0	14098	3992	0.05	0.30	0.25	0.45	0.28	0.95	0.399
M45	A	1627	0.16	0	0	854	0	0	773	0.05	0.30	0.30	0.45	0.35	0.95	0.609
M45	B	3296	0.33	0	0	854	0	1230	1212	0.05	0.30	0.30	0.45	0.35	0.95	0.558
M45	C	201430	20.14	3510	0	29582	138562	23752	6034	0.05	0.30	0.30	0.35	0.35	0.95	0.355
M45	D	206080	20.61	3510	0	29582	142676	23752	6560	0.05	0.30	0.30	0.35	0.35	0.95	0.357
M50	A	5713	0.57	0	0	0	4916	0	797	0.05	0.30	0.30	0.35	0.35	0.95	0.434
M55	A	11683	1.17	0	0	0	10981	0	702	0.05	0.30	0.30	0.35	0.35	0.95	0.386
M65	A	30449	3.04	0	0	12274	16371	0	1804	0.05	0.25	0.25	0.35	0.28	0.95	0.345
M65	B	173842	17.38	0	0	59039	104686	6617	3500	0.05	0.25	0.25	0.35	0.28	0.95	0.325
M65	C	174445	17.44	0	0	59039	104686	6902	3815	0.05	0.25	0.25	0.35	0.28	0.95	0.327
M65	D	175927	17.59	0	0	59780	104686	6902	4554	0.05	0.25	0.25	0.35	0.28	0.95	0.329
M75	A	1628	0.16	0	0	0	0	984	644	0.05	0.30	0.30	0.45	0.35	0.95	0.587
M80	A	1387	0.14	0	0	0	0	1049	338	0.05	0.30	0.30	0.45	0.28	0.95	0.443
M80	B	1721	0.17	0	0	0	0	1172	549	0.05	0.30	0.30	0.45	0.28	0.95	0.494
M85	A	649	0.06	0	0	0	0	319	330	0.05	0.30	0.30	0.45	0.35	0.95	0.655
M90	A	2424	0.24	0	0	0	0	1473	951	0.05	0.30	0.30	0.45	0.35	0.95	0.585
M95	A	937	0.09	0	0	0	0	494	443	0.05	0.25	0.25	0.35	0.28	0.95	0.597
M95	B	170396	17.04	1210	0	128315	13353	18895	6254	0.05	0.25	0.25	0.35	0.28	0.95	0.286
M60	A	21612	2.16	0	0	4956	12217	1859	2579	0.05	0.30	0.30	0.45	0.35	0.95	0.467
M60	B	22586	2.26	0	0	5412	12217	1859	3097	0.05	0.30	0.30	0.45	0.35	0.95	0.474
M60	C	492954	49.30	3513	0	143153	167668	160329	19089	0.05	0.30	0.30	0.45	0.35	0.95	0.391
M70	A	607	0.06	0	0	0	0	257	350	0.05	0.30	0.30	0.45	0.35	0.95	0.696

Table D-4: IDF Values (CVC Guidelines)

IDF Values (ABOVE the escarpment)

Duration (min)	2yr	5yr	10yr	25yr	50yr	100yr
5	102	135	155	180	200	220
10	80	100	115	135	145	160
15	64	85	99	117	130	140
30	41	58	70	85	96	107
60	24	34	40	49	55	61
120	16	21	24	29	32	35
360	6.3	8.3	9.7	11	13	14
720	3.9	5.1	5.9	6.9	7.6	8.3
1440	2.4	3.1	3.6	4.2	4.7	5.1

$I = A / (t + B)^C$

Parameter A	637.5921	993.47959	1219.92	1637.321	1871.883	2118.166
Parameter B	5.3	7.14	7.84	9.35	10.04	10.31
Parameter C	0.772434	0.7987811	0.80732	0.828517	0.830688	0.836766

Appendix E
Culvert Master Input Parameters
for Cross Culverts

Table E-1: Culvert Master Parameters for Cross Culverts

				Invert Elevation (m)		Obvert Elevation (m)		At U/S Obvert		At Top of Road			
Culvert ID #	Size/Height (m)	Slope (m/m)	Length (m)	U/S	D/S	U/S	D/S	Elevation (m)	Modelled Flow (m^3/s)	Elevation (m)	Modelled Flow (m^3/s)	Level of Service (Return Period)	Notes
10	0.45	0.0168	13.3	382.71	382.48	383.16	382.93	383.16	0.133	383.34	0.227	10-year	
17	0.30	0.0348	10.3	384.68	384.33	384.98	384.63	384.98	0.048	385.30	0.116	Less than 2-year	
24	0.40	0.0320	15.3	428.30	427.82	428.70	428.22	428.70	0.094	429.24	0.216	2-year	Size modelled as 375mm
37	0.60	0.0306	12.5	418.80	418.41	419.40	419.01	419.40	0.274	419.99	0.639	5-year	
43	0.55	0.0135	12.6	400.13	399.96	400.68	400.51	400.68	0.352	400.88	0.549	2-year	Size modelled as 525mm
44	1.20	0.0138	13.8	399.46	399.27	400.66	400.47	400.66	1.356	400.76	1.687	10-year	
44	1.20	0.0097	13.8	399.44	399.31	400.64	400.51	400.64	1.156	400.76	1.603	10-year	
47	0.40	0.0173	12.2	398.17	397.96	398.57	398.36	398.57	0.098	398.98	0.184	100-year	Size modelled as 375mm
48	0.40	0.0198	12.5	394.08	393.84	394.48	394.24	394.48	0.098	394.95	0.189	2-year	Size modelled as 375mm
55	0.30	0.0261	12.4	388.76	388.43	389.06	388.73	389.06	0.048	389.39	0.106	Less than 2-year	
56	0.30	0.0041	11.5	387.26	387.21	387.56	387.51	387.56	0.044	388.16	0.109	25-year	
14	0.60	0.0285	17.2	380.43	379.94	381.03	380.54	381.03	0.274	381.62	0.639	10-year	
16	0.30	0.0557	16.3	386.15	385.25	386.45	385.55	386.45	0.048	386.86	0.128	Less than 2-year	
2	0.90	0.0172	34.0	387.32	386.73	388.22	387.63	388.22	0.754	394.32	3.486	100-year	

Appendix F
Culvert Master Outputs
for Cross Culverts

Culvert # 2

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Elev:	388.39	m	Discharge	1.0000	m^3/s
Inlet Control HW Elev.	388.30	m	Tailwater Elevation	N/A	m
Outlet Control HW Elev.	388.39	m	Control Type	Entrance Control	
Headwater Depth/Height	1.17				

Grades					
Upstream Invert	387.32	m	Downstream Invert	386.73	m
Length	34.00	m	Constructed Slope	0.017235	m/m

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.59	m
Slope Type	Steep		Normal Depth	0.59	m
Flow Regime	Supercritical		Critical Depth	0.59	m
Velocity Downstream	2.24	m/s	Critical Slope	0.017158	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	388.39	m	Upstream Velocity Head	0.26	m
Ke	0.90		Entrance Loss	0.23	m

Inlet Control Properties					
Inlet Control HW Elev.	388.30	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.7	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	387.32	394.32	0.10	m

HW Elev. (m)	Discharge (m³/s)
387.32	0.0000
387.42	0.0120
387.52	0.0465
387.62	0.1019
387.72	0.1760
387.82	0.2670
387.92	0.3725
388.02	0.4904
388.12	0.6184
388.22	0.7538
388.32	0.8946
388.42	1.0427
388.52	1.2137
388.62	1.3817
388.72	1.4740
388.82	1.5430
388.92	1.5889
389.02	1.6369
389.12	1.6854
389.22	1.7337
389.32	1.7814
389.42	1.8285
389.52	1.8748
389.62	1.9203
389.72	1.9650
389.82	2.0090
389.92	2.0522
390.02	2.0947
390.12	2.1364
390.22	2.1775
390.32	2.2180
390.42	2.2577
390.52	2.2969
390.62	2.3355
390.72	2.3735
390.82	2.4110
390.92	2.4480
391.02	2.4844
391.12	2.5203
391.22	2.5558
391.32	2.5908
391.42	2.6254
391.52	2.6595
391.62	2.6933
391.72	2.7266
391.82	2.7596
391.92	2.7921
392.02	2.8244
392.12	2.8562
392.22	2.8877
392.32	2.9189

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
392.42	2.9498
392.52	2.9804
392.62	3.0106
392.72	3.0406
392.82	3.0703
392.92	3.0997
393.02	3.1288
393.12	3.1576
393.22	3.1862
393.32	3.2146
393.42	3.2427
393.52	3.2706
393.62	3.2982
393.72	3.3256
393.82	3.3528
393.92	3.3798
394.02	3.4066
394.12	3.4331
394.22	3.4595
394.32	3.4856

Culvert # 10

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	390.09	m	Discharge	1.0000	m³/s
Inlet Control HW Elev.	386.04	m	Tailwater Elevation	N/A	m
Outlet Control HW Elev.	390.09	m	Control Type	Outlet Control	
Headwater Depth/Height	16.16				

Grades					
Upstream Invert	382.71	m	Downstream Invert	382.48	m
Length	13.30	m	Constructed Slope	0.016767	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.46	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.46	m
Velocity Downstream	6.09	m/s	Critical Slope	0.256806	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.020	
Section Material	Corrugated HDPE 18-24 inch (Corrugated Interior)		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	390.09	m	Upstream Velocity Head	1.89	m
Ke	0.90		Entrance Loss	1.70	m

Inlet Control Properties					
Inlet Control HW Elev.	386.04	m	Flow Control	Submerged	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	0.2	m²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	382.71	383.34	0.01	m

HW Elev. (m)	Discharge (m^3/s)
382.71	0.0000
382.72	0.0001
382.73	0.0004
382.74	0.0008
382.75	0.0014
382.76	0.0021
382.77	0.0030
382.78	0.0041
382.79	0.0053
382.80	0.0067
382.81	0.0082
382.82	0.0099
382.83	0.0117
382.84	0.0137
382.85	0.0158
382.86	0.0180
382.87	0.0204
382.88	0.0229
382.89	0.0255
382.90	0.0282
382.91	0.0311
382.92	0.0341
382.93	0.0372
382.94	0.0404
382.95	0.0438
382.96	0.0472
382.97	0.0507
382.98	0.0544
382.99	0.0581
383.00	0.0619
383.01	0.0659
383.02	0.0699
383.03	0.0740
383.04	0.0781
383.05	0.0824
383.06	0.0867
383.07	0.0911
383.08	0.0956
383.09	0.1001
383.10	0.1047
383.11	0.1093
383.12	0.1140
383.13	0.1188
383.14	0.1236
383.15	0.1284
383.16	0.1333
383.17	0.1382
383.18	0.1431
383.19	0.1481
383.20	0.1531
383.21	0.1581

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
383.22	0.1632
383.23	0.1682
383.24	0.1733
383.25	0.1784
383.26	0.1834
383.27	0.1885
383.28	0.1936
383.29	0.1987
383.30	0.2038
383.31	0.2089
383.32	0.2143
383.33	0.2205
383.34	0.2268

Culvert # 14

Culvert Analysis Report
Culvert-1

Culvert Summary

Computed Headwater Eleva	383.10	m	Discharge	1.0000	m³/s
Inlet Control HW Elev.	382.88	m	Tailwater Elevation	0.00	m
Outlet Control HW Elev.	383.10	m	Control Type	Outlet Control	
Headwater Depth/Height	4.37				

Grades

Upstream Invert	380.43	m	Downstream Invert	379.93	m
Length	17.20	m	Constructed Slope	0.029070	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.59	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.59	m
Velocity Downstream	3.47	m/s	Critical Slope	0.072455	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	383.10	m	Upstream Velocity Head	0.60	m
Ke	0.90		Entrance Loss	0.54	m

Inlet Control Properties

Inlet Control HW Elev.	382.88	m	Flow Control	Submerged	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	380.43	381.62	0.01	m

HW Elev. (m)	Discharge (m³/s)
380.43	0.0000
380.44	0.0001
380.45	0.0004
380.46	0.0009
380.47	0.0016
380.48	0.0024
380.49	0.0035
380.50	0.0048
380.51	0.0062
380.52	0.0078
380.53	0.0096
380.54	0.0116
380.55	0.0138
380.56	0.0161
380.57	0.0186
380.58	0.0212
380.59	0.0240
380.60	0.0270
380.61	0.0302
380.62	0.0335
380.63	0.0370
380.64	0.0406
380.65	0.0444
380.66	0.0483
380.67	0.0523
380.68	0.0565
380.69	0.0609
380.70	0.0654
380.71	0.0700
380.72	0.0748
380.73	0.0797
380.74	0.0847
380.75	0.0898
380.76	0.0951
380.77	0.1005
380.78	0.1060
380.79	0.1116
380.80	0.1173
380.81	0.1232
380.82	0.1291
380.83	0.1352
380.84	0.1413
380.85	0.1476
380.86	0.1539
380.87	0.1604
380.88	0.1669
380.89	0.1735
380.90	0.1803
380.91	0.1870
380.92	0.1939
380.93	0.2008

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
380.94	0.2078
380.95	0.2148
380.96	0.2220
380.97	0.2292
380.98	0.2365
380.99	0.2438
381.00	0.2511
381.01	0.2586
381.02	0.2660
381.03	0.2735
381.04	0.2811
381.05	0.2887
381.06	0.2963
381.07	0.3040
381.08	0.3117
381.09	0.3194
381.10	0.3271
381.11	0.3350
381.12	0.3428
381.13	0.3506
381.14	0.3584
381.15	0.3662
381.16	0.3741
381.17	0.3819
381.18	0.3897
381.19	0.3975
381.20	0.4053
381.21	0.4132
381.22	0.4210
381.23	0.4288
381.24	0.4366
381.25	0.4444
381.26	0.4521
381.27	0.4599
381.28	0.4676
381.29	0.4752
381.30	0.4830
381.31	0.4906
381.32	0.4982
381.33	0.5058
381.34	0.5133
381.35	0.5208
381.36	0.5283
381.37	0.5357
381.38	0.5431
381.39	0.5480
381.40	0.5523
381.41	0.5565
381.42	0.5607
381.43	0.5649
381.44	0.5690
381.45	0.5732
381.46	0.5772
381.47	0.5813
381.48	0.5853

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m^3/s)
381.49	0.5893
381.50	0.5933
381.51	0.5972
381.52	0.6012
381.53	0.6050
381.54	0.6089
381.55	0.6128
381.56	0.6166
381.57	0.6204
381.58	0.6241
381.59	0.6279
381.60	0.6316
381.61	0.6353
381.62	0.6390

Culvert # 16

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	458.34	m	Discharge	1.0000	m³/s
Inlet Control HW Elev.	420.39	m	Tailwater Elevation	0.00	m
Outlet Control HW Elev.	458.34	m	Control Type	Outlet Control	
Headwater Depth/Height	236.82				

Grades					
Upstream Invert	386.15	m	Downstream Invert	385.25	m
Length	16.30	m	Constructed Slope	0.055521	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.30	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.30	m
Velocity Downstream	13.71	m/s	Critical Slope	3.348955	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	458.34	m	Upstream Velocity Head	9.58	m
Ke	0.90		Entrance Loss	8.62	m

Inlet Control Properties					
Inlet Control HW Elev.	420.39	m	Flow Control	Submerged	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	386.15	386.86	0.01	m

HW Elev. (m)	Discharge (m³/s)
386.15	0.0000
386.16	0.0001
386.17	0.0003
386.18	0.0006
386.19	0.0011
386.20	0.0017
386.21	0.0024
386.22	0.0033
386.23	0.0043
386.24	0.0053
386.25	0.0065
386.26	0.0078
386.27	0.0093
386.28	0.0108
386.29	0.0124
386.30	0.0141
386.31	0.0159
386.32	0.0178
386.33	0.0197
386.34	0.0218
386.35	0.0239
386.36	0.0261
386.37	0.0283
386.38	0.0307
386.39	0.0331
386.40	0.0355
386.41	0.0380
386.42	0.0405
386.43	0.0431
386.44	0.0457
386.45	0.0484
386.46	0.0510
386.47	0.0537
386.48	0.0565
386.49	0.0592
386.50	0.0620
386.51	0.0647
386.52	0.0675
386.53	0.0703
386.54	0.0730
386.55	0.0758
386.56	0.0785
386.57	0.0813
386.58	0.0840
386.59	0.0867
386.60	0.0894
386.61	0.0921
386.62	0.0947
386.63	0.0973
386.64	0.0990
386.65	0.1005

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
386.66	0.1019
386.67	0.1033
386.68	0.1047
386.69	0.1061
386.70	0.1075
386.71	0.1089
386.72	0.1102
386.73	0.1115
386.74	0.1128
386.75	0.1141
386.76	0.1154
386.77	0.1167
386.78	0.1179
386.79	0.1192
386.80	0.1204
386.81	0.1216
386.82	0.1228
386.83	0.1240
386.84	0.1252
386.85	0.1263
386.86	0.1275

Culvert # 17

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	437.32	m	Discharge	1.0000	m^3/s
Inlet Control HW Elev.	418.92	m	Tailwater Elevation	N/A	m
Outlet Control HW Elev.	437.32	m	Control Type	Outlet Control	
Headwater Depth/Height	172.69				

Grades					
Upstream Invert	384.68	m	Downstream Invert	384.33	m
Length	10.30	m	Constructed Slope	0.034854	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.30	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.30	m
Velocity Downstream	13.71	m/s	Critical Slope	3.348955	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	437.32	m	Upstream Velocity Head	9.58	m
Ke	0.90		Entrance Loss	8.62	m

Inlet Control Properties					
Inlet Control HW Elev.	418.92	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	384.68	385.30	0.01	m

HW Elev. (m)	Discharge (m³/s)
384.68	0.0000
384.69	0.0001
384.70	0.0003
384.71	0.0006
384.72	0.0011
384.73	0.0017
384.74	0.0024
384.75	0.0033
384.76	0.0043
384.77	0.0053
384.78	0.0065
384.79	0.0078
384.80	0.0093
384.81	0.0108
384.82	0.0124
384.83	0.0141
384.84	0.0159
384.85	0.0178
384.86	0.0197
384.87	0.0218
384.88	0.0239
384.89	0.0261
384.90	0.0283
384.91	0.0307
384.92	0.0331
384.93	0.0355
384.94	0.0380
384.95	0.0405
384.96	0.0431
384.97	0.0457
384.98	0.0484
384.99	0.0510
385.00	0.0537
385.01	0.0565
385.02	0.0592
385.03	0.0620
385.04	0.0647
385.05	0.0675
385.06	0.0703
385.07	0.0730
385.08	0.0758
385.09	0.0785
385.10	0.0813
385.11	0.0840
385.12	0.0867
385.13	0.0894
385.14	0.0921
385.15	0.0947
385.16	0.0970
385.17	0.0985
385.18	0.1000

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m^3/s)
385.19	0.1014
385.20	0.1029
385.21	0.1043
385.22	0.1057
385.23	0.1071
385.24	0.1084
385.25	0.1098
385.26	0.1111
385.27	0.1124
385.28	0.1137
385.29	0.1150
385.30	0.1159

Culvert # 24

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Elev	451.24	m	Discharge	1.0000	m^3/s
Inlet Control HW Elev.	442.46	m	Tailwater Elevation	N/A	m
Outlet Control HW Elev.	451.24	m	Control Type	Outlet Control	
Headwater Depth/Height	60.19				

Grades					
Upstream Invert	428.30	m	Downstream Invert	427.82	m
Length	15.30	m	Constructed Slope	0.031895	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.38	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.38	m
Velocity Downstream	8.77	m/s	Critical Slope	1.000129	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	451.24	m	Upstream Velocity Head	3.92	m
Ke	0.90		Entrance Loss	3.53	m

Inlet Control Properties					
Inlet Control HW Elev.	442.46	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	428.30	429.24	0.01	m

HW Elev. (m)	Discharge (m³/s)
428.30	0.0000
428.31	0.0000
428.32	0.0003
428.33	0.0007
428.34	0.0012
428.35	0.0019
428.36	0.0027
428.37	0.0037
428.38	0.0048
428.39	0.0061
428.40	0.0074
428.41	0.0089
428.42	0.0106
428.43	0.0123
428.44	0.0142
428.45	0.0162
428.46	0.0183
428.47	0.0205
428.48	0.0228
428.49	0.0252
428.50	0.0277
428.51	0.0304
428.52	0.0331
428.53	0.0359
428.54	0.0388
428.55	0.0417
428.56	0.0448
428.57	0.0479
428.58	0.0511
428.59	0.0544
428.60	0.0578
428.61	0.0612
428.62	0.0646
428.63	0.0681
428.64	0.0717
428.65	0.0753
428.66	0.0789
428.67	0.0826
428.68	0.0863
428.69	0.0901
428.70	0.0939
428.71	0.0977
428.72	0.1015
428.73	0.1054
428.74	0.1092
428.75	0.1131
428.76	0.1169
428.77	0.1208
428.78	0.1247
428.79	0.1286
428.80	0.1324

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
428.81	0.1363
428.82	0.1401
428.83	0.1439
428.84	0.1477
428.85	0.1515
428.86	0.1553
428.87	0.1590
428.88	0.1627
428.89	0.1663
428.90	0.1694
428.91	0.1715
428.92	0.1735
428.93	0.1756
428.94	0.1776
428.95	0.1796
428.96	0.1816
428.97	0.1836
428.98	0.1855
428.99	0.1874
429.00	0.1893
429.01	0.1912
429.02	0.1931
429.03	0.1949
429.04	0.1967
429.05	0.1984
429.06	0.1992
429.07	0.2001
429.08	0.2009
429.09	0.2018
429.10	0.2027
429.11	0.2036
429.12	0.2046
429.13	0.2055
429.14	0.2064
429.15	0.2074
429.16	0.2083
429.17	0.2092
429.18	0.2102
429.19	0.2111
429.20	0.2121
429.21	0.2130
429.22	0.2140
429.23	0.2149
429.24	0.2159

Culvert # 37

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	421.25	m	Discharge	1.0000	m³/s
Inlet Control HW Elev.	421.25	m	Tailwater Elevation	419.01	m
Outlet Control HW Elev.	421.19	m	Control Type	Inlet Control	
Headwater Depth/Height	4.02				

Grades					
Upstream Invert	418.80	m	Downstream Invert	418.41	m
Length	12.50	m	Constructed Slope	0.030560	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.60	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.59	m
Velocity Downstream	3.44	m/s	Critical Slope	0.072455	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	421.19	m	Upstream Velocity Head	0.60	m
Ke	0.90		Entrance Loss	0.54	m

Inlet Control Properties					
Inlet Control HW Elev.	421.25	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	418.80	419.99	0.01	m

HW Elev. (m)	Discharge (m³/s)
418.80	0.0000
418.81	0.0000
418.82	0.0000
418.83	0.0000
418.84	0.0000
418.85	0.0000
418.86	0.0000
418.87	0.0000
418.88	0.0000
418.89	0.0000
418.90	0.0000
418.91	0.0000
418.92	0.0000
418.93	0.0000
418.94	0.0000
418.95	0.0000
418.96	0.0000
418.97	0.0000
418.98	0.0000
418.99	0.0000
419.00	0.0000
419.01	0.0000
419.02	0.0148
419.03	0.0355
419.04	0.0479
419.05	0.0572
419.06	0.0646
419.07	0.0707
419.08	0.0757
419.09	0.0800
419.10	0.0834
419.11	0.0862
419.12	0.0898
419.13	0.0951
419.14	0.1005
419.15	0.1060
419.16	0.1116
419.17	0.1173
419.18	0.1232
419.19	0.1291
419.20	0.1352
419.21	0.1413
419.22	0.1476
419.23	0.1539
419.24	0.1604
419.25	0.1669
419.26	0.1735
419.27	0.1803
419.28	0.1870
419.29	0.1939
419.30	0.2008

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
419.31	0.2078
419.32	0.2148
419.33	0.2220
419.34	0.2292
419.35	0.2365
419.36	0.2438
419.37	0.2511
419.38	0.2586
419.39	0.2660
419.40	0.2735
419.41	0.2811
419.42	0.2887
419.43	0.2963
419.44	0.3040
419.45	0.3117
419.46	0.3194
419.47	0.3271
419.48	0.3350
419.49	0.3428
419.50	0.3506
419.51	0.3584
419.52	0.3662
419.53	0.3741
419.54	0.3819
419.55	0.3896
419.56	0.3975
419.57	0.4053
419.58	0.4132
419.59	0.4210
419.60	0.4288
419.61	0.4366
419.62	0.4444
419.63	0.4521
419.64	0.4599
419.65	0.4676
419.66	0.4752
419.67	0.4830
419.68	0.4906
419.69	0.4982
419.70	0.5058
419.71	0.5133
419.72	0.5208
419.73	0.5283
419.74	0.5357
419.75	0.5431
419.76	0.5482
419.77	0.5525
419.78	0.5567
419.79	0.5609
419.80	0.5651
419.81	0.5692
419.82	0.5733
419.83	0.5774
419.84	0.5815
419.85	0.5855

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m^3/s)
419.86	0.5895
419.87	0.5935
419.88	0.5974
419.89	0.6013
419.90	0.6052
419.91	0.6091
419.92	0.6129
419.93	0.6167
419.94	0.6205
419.95	0.6243
419.96	0.6281
419.97	0.6318
419.98	0.6355
419.99	0.6392

Culvert # 43

Culvert Analysis Report
Culvert-1

Culvert Summary

Computed Headwater Eleva	401.74	m	Discharge	1.0000	m^3/s
Inlet Control HW Elev.	401.26	m	Tailwater Elevation	400.51	m
Outlet Control HW Elev.	401.74	m	Control Type	Outlet Control	
Headwater Depth/Height	2.95				

Grades

Upstream Invert	400.13	m	Downstream Invert	399.96	m
Length	12.60	m	Constructed Slope	0.013492	m/m

Hydraulic Profile

Profile	PressureProfile		Depth, Downstream	0.55	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.51	m
Velocity Downstream	2.70	m/s	Critical Slope	0.039100	m/m

Section

Section Shape	Horizontal Ellipse		Mannings Coefficient	0.024	
Section Material	Concrete		Span	0.86	m
Section Size	550 x 860 mm		Rise	0.55	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	401.74	m	Upstream Velocity Head	0.37	m
Ke	0.90		Entrance Loss	0.33	m

Inlet Control Properties

Inlet Control HW Elev.	401.26	m	Flow Control	N/A	
Inlet Type	Groove end projecting (horizontal ellipse)		Area Full	0.4	m^2
K	0.00450		HDS 5 Chart	29	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Rating Table Report
Culvert-1

Range Data:

	Minimum	Maximum	Increment	
Allowable HW E	400.13	400.88	0.01	m

HW Elev. (m)	Discharge (m^3/s)
400.13	0.0000
400.14	0.0000
400.15	0.0000
400.16	0.0000
400.17	0.0000
400.18	0.0000
400.19	0.0000
400.20	0.0000
400.21	0.0000
400.22	0.0000
400.23	0.0000
400.24	0.0000
400.25	0.0000
400.26	0.0000
400.27	0.0000
400.28	0.0000
400.29	0.0000
400.30	0.0000
400.31	0.0000
400.32	0.0000
400.33	0.0000
400.34	0.0000
400.35	0.0000
400.36	0.0000
400.37	0.0000
400.38	0.0000
400.39	0.0000
400.40	0.0000
400.41	0.0000
400.42	0.0000
400.43	0.0000
400.44	0.0000
400.45	0.0000
400.46	0.0000
400.47	0.0000
400.48	0.0000
400.49	0.0000
400.50	0.0000
400.51	0.0000
400.52	0.0803
400.53	0.1141
400.54	0.1402
400.55	0.1625
400.56	0.1823
400.57	0.2004
400.58	0.2172
400.59	0.2330
400.60	0.2481
400.61	0.2624
400.62	0.2763
400.63	0.2897

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
400.64	0.3027
400.65	0.3153
400.66	0.3277
400.67	0.3398
400.68	0.3517
400.69	0.3634
400.70	0.3749
400.71	0.3862
400.72	0.3974
400.73	0.4084
400.74	0.4192
400.75	0.4299
400.76	0.4404
400.77	0.4508
400.78	0.4609
400.79	0.4709
400.80	0.4807
400.81	0.4903
400.82	0.4996
400.83	0.5086
400.84	0.5173
400.85	0.5257
400.86	0.5340
400.87	0.5418
400.88	0.5492

Culvert # 44n

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	400.58	m	Discharge	1.0000	m^3/s
Inlet Control HW Elev.	400.47	m	Tailwater Elevation	400.47	m
Outlet Control HW Elev.	400.58	m	Control Type	Outlet Control	
Headwater Depth/Height	0.91				

Grades					
Upstream Invert	399.46	m	Downstream Invert	399.27	m
Length	13.80	m	Constructed Slope	0.013841	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	1.20	m
Slope Type	Steep		Normal Depth	0.53	m
Flow Regime	Subcritical		Critical Depth	0.54	m
Velocity Downstream	0.86	m/s	Critical Slope	0.012636	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.22	m
Section Size	1200 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	400.58	m	Upstream Velocity Head	0.05	m
Ke	0.90		Entrance Loss	0.04	m

Inlet Control Properties					
Inlet Control HW Elev.	400.47	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.2	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	399.46	400.76	0.01	m

HW Elev. (m)	Discharge (m³/s)
399.46	0.0000
399.47	0.0000
399.48	0.0000
399.49	0.0000
399.50	0.0000
399.51	0.0000
399.52	0.0000
399.53	0.0000
399.54	0.0000
399.55	0.0000
399.56	0.0000
399.57	0.0000
399.58	0.0000
399.59	0.0000
399.60	0.0000
399.61	0.0000
399.62	0.0000
399.63	0.0000
399.64	0.0000
399.65	0.0000
399.66	0.0000
399.67	0.0000
399.68	0.0000
399.69	0.0000
399.70	0.0000
399.71	0.0000
399.72	0.0000
399.73	0.0000
399.74	0.0000
399.75	0.0000
399.76	0.0000
399.77	0.0000
399.78	0.0000
399.79	0.0000
399.80	0.0000
399.81	0.0000
399.82	0.0000
399.83	0.0000
399.84	0.0000
399.85	0.0000
399.86	0.0000
399.87	0.0000
399.88	0.0000
399.89	0.0000
399.90	0.0000
399.91	0.0000
399.92	0.0000
399.93	0.0000
399.94	0.0000
399.95	0.0000
399.96	0.0000

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
399.97	0.0000
399.98	0.0000
399.99	0.0000
400.00	0.0000
400.01	0.0000
400.02	0.0000
400.03	0.0000
400.04	0.0000
400.05	0.0000
400.06	0.0000
400.07	0.0000
400.08	0.0000
400.09	0.0000
400.10	0.0000
400.11	0.0000
400.12	0.0000
400.13	0.0000
400.14	0.0000
400.15	0.0000
400.16	0.0000
400.17	0.0000
400.18	0.0000
400.19	0.0000
400.20	0.0000
400.21	0.0000
400.22	0.0000
400.23	0.0000
400.24	0.0000
400.25	0.0000
400.26	0.0000
400.27	0.0000
400.28	0.0000
400.29	0.0000
400.30	0.0000
400.31	0.0000
400.32	0.0000
400.33	0.0000
400.34	0.0000
400.35	0.0000
400.36	0.0000
400.37	0.0000
400.38	0.0000
400.39	0.0000
400.40	0.0000
400.41	0.0000
400.42	0.0000
400.43	0.0000
400.44	0.0000
400.45	0.0000
400.46	0.0000
400.47	0.0970
400.48	0.3204
400.49	0.4433
400.50	0.5392
400.51	0.6207

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
400.52	0.6929
400.53	0.7585
400.54	0.8190
400.55	0.8755
400.56	0.9287
400.57	0.9792
400.58	1.0273
400.59	1.0735
400.60	1.1178
400.61	1.1606
400.62	1.2020
400.63	1.2421
400.64	1.2811
400.65	1.3190
400.66	1.3560
400.67	1.3921
400.68	1.4275
400.69	1.4620
400.70	1.4959
400.71	1.5291
400.72	1.5618
400.73	1.5938
400.74	1.6254
400.75	1.6564
400.76	1.6869

Culvert # 44s

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	400.61	m	Discharge	1.0000	m³/s
Inlet Control HW Elev.	400.51	m	Tailwater Elevation	400.51	m
Outlet Control HW Elev.	400.61	m	Control Type	Outlet Control	
Headwater Depth/Height	0.96				

Grades					
Upstream Invert	399.44	m	Downstream Invert	399.31	m
Length	13.80	m	Constructed Slope	0.009710	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	1.20	m
Slope Type	Mild		Normal Depth	0.58	m
Flow Regime	Subcritical		Critical Depth	0.54	m
Velocity Downstream	0.86	m/s	Critical Slope	0.012636	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	1.22	m
Section Size	1200 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	400.61	m	Upstream Velocity Head	0.04	m
Ke	0.90		Entrance Loss	0.04	m

Inlet Control Properties					
Inlet Control HW Elev.	400.51	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	1.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	399.44	400.76	0.01	m

HW Elev. (m)	Discharge (m³/s)
399.44	0.0000
399.45	0.0000
399.46	0.0000
399.47	0.0000
399.48	0.0000
399.49	0.0000
399.50	0.0000
399.51	0.0000
399.52	0.0000
399.53	0.0000
399.54	0.0000
399.55	0.0000
399.56	0.0000
399.57	0.0000
399.58	0.0000
399.59	0.0000
399.60	0.0000
399.61	0.0000
399.62	0.0000
399.63	0.0000
399.64	0.0000
399.65	0.0000
399.66	0.0000
399.67	0.0000
399.68	0.0000
399.69	0.0000
399.70	0.0000
399.71	0.0000
399.72	0.0000
399.73	0.0000
399.74	0.0000
399.75	0.0000
399.76	0.0000
399.77	0.0000
399.78	0.0000
399.79	0.0000
399.80	0.0000
399.81	0.0000
399.82	0.0000
399.83	0.0000
399.84	0.0000
399.85	0.0000
399.86	0.0000
399.87	0.0000
399.88	0.0000
399.89	0.0000
399.90	0.0000
399.91	0.0000
399.92	0.0000
399.93	0.0000
399.94	0.0000

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
399.95	0.0000
399.96	0.0000
399.97	0.0000
399.98	0.0000
399.99	0.0000
400.00	0.0000
400.01	0.0000
400.02	0.0000
400.03	0.0000
400.04	0.0000
400.05	0.0000
400.06	0.0000
400.07	0.0000
400.08	0.0000
400.09	0.0000
400.10	0.0000
400.11	0.0000
400.12	0.0000
400.13	0.0000
400.14	0.0000
400.15	0.0000
400.16	0.0000
400.17	0.0000
400.18	0.0000
400.19	0.0000
400.20	0.0000
400.21	0.0000
400.22	0.0000
400.23	0.0000
400.24	0.0000
400.25	0.0000
400.26	0.0000
400.27	0.0000
400.28	0.0000
400.29	0.0000
400.30	0.0000
400.31	0.0000
400.32	0.0000
400.33	0.0000
400.34	0.0000
400.35	0.0000
400.36	0.0000
400.37	0.0000
400.38	0.0000
400.39	0.0000
400.40	0.0000
400.41	0.0000
400.42	0.0000
400.43	0.0000
400.44	0.0000
400.45	0.0000
400.46	0.0000
400.47	0.0000
400.48	0.0000
400.49	0.0000

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m^3/s)
400.50	0.0000
400.51	0.1981
400.52	0.3708
400.53	0.4859
400.54	0.5787
400.55	0.6588
400.56	0.7301
400.57	0.7956
400.58	0.8560
400.59	0.9126
400.60	0.9660
400.61	1.0167
400.62	1.0651
400.63	1.1116
400.64	1.1562
400.65	1.1993
400.66	1.2410
400.67	1.2815
400.68	1.3207
400.69	1.3590
400.70	1.3962
400.71	1.4326
400.72	1.4682
400.73	1.5029
400.74	1.5370
400.75	1.5704
400.76	1.6031

Culvert # 47

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	418.22	m	Discharge	1.0000	m^3/s
Inlet Control HW Elev.	412.33	m	Tailwater Elevation	N/A	m
Outlet Control HW Elev.	418.22	m	Control Type	Outlet Control	
Headwater Depth/Height	52.63				

Grades					
Upstream Invert	398.17	m	Downstream Invert	397.96	m
Length	12.20	m	Constructed Slope	0.017295	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.38	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.38	m
Velocity Downstream	8.77	m/s	Critical Slope	1.000129	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	418.22	m	Upstream Velocity Head	3.92	m
Ke	0.90		Entrance Loss	3.53	m

Inlet Control Properties					
Inlet Control HW Elev.	412.33	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	398.17	398.98	0.01	m

HW Elev. (m)	Discharge (m³/s)
398.17	0.0000
398.18	0.0000
398.19	0.0003
398.20	0.0007
398.21	0.0013
398.22	0.0020
398.23	0.0029
398.24	0.0038
398.25	0.0050
398.26	0.0062
398.27	0.0076
398.28	0.0091
398.29	0.0107
398.30	0.0125
398.31	0.0143
398.32	0.0163
398.33	0.0184
398.34	0.0206
398.35	0.0229
398.36	0.0254
398.37	0.0279
398.38	0.0306
398.39	0.0333
398.40	0.0362
398.41	0.0392
398.42	0.0422
398.43	0.0454
398.44	0.0486
398.45	0.0520
398.46	0.0554
398.47	0.0589
398.48	0.0626
398.49	0.0662
398.50	0.0700
398.51	0.0739
398.52	0.0778
398.53	0.0818
398.54	0.0859
398.55	0.0900
398.56	0.0941
398.57	0.0983
398.58	0.1026
398.59	0.1068
398.60	0.1111
398.61	0.1153
398.62	0.1195
398.63	0.1237
398.64	0.1277
398.65	0.1315
398.66	0.1352
398.67	0.1387

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m^3/s)
398.68	0.1418
398.69	0.1447
398.70	0.1472
398.71	0.1494
398.72	0.1504
398.73	0.1517
398.74	0.1529
398.75	0.1542
398.76	0.1555
398.77	0.1568
398.78	0.1582
398.79	0.1595
398.80	0.1608
398.81	0.1622
398.82	0.1635
398.83	0.1648
398.84	0.1662
398.85	0.1675
398.86	0.1688
398.87	0.1701
398.88	0.1715
398.89	0.1728
398.90	0.1741
398.91	0.1754
398.92	0.1767
398.93	0.1780
398.94	0.1793
398.95	0.1806
398.96	0.1818
398.97	0.1831
398.98	0.1844

Culvert # 48

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	414.42	m	Discharge	1.0000	m^3/s
Inlet Control HW Elev.	408.24	m	Tailwater Elevation	394.24	m
Outlet Control HW Elev.	414.42	m	Control Type	Outlet Control	
Headwater Depth/Height	53.39				

Grades					
Upstream Invert	394.08	m	Downstream Invert	393.84	m
Length	12.50	m	Constructed Slope	0.019760	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.40	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.38	m
Velocity Downstream	8.77	m/s	Critical Slope	1.000129	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.38	m
Section Size	375 mm		Rise	0.38	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	414.42	m	Upstream Velocity Head	3.92	m
Ke	0.90		Entrance Loss	3.53	m

Inlet Control Properties					
Inlet Control HW Elev.	408.24	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	394.08	394.95	0.01	m

HW Elev. (m)	Discharge (m³/s)
394.08	0.0000
394.09	0.0000
394.10	0.0000
394.11	0.0000
394.12	0.0000
394.13	0.0000
394.14	0.0000
394.15	0.0000
394.16	0.0000
394.17	0.0000
394.18	0.0000
394.19	0.0000
394.20	0.0000
394.21	0.0000
394.22	0.0000
394.23	0.0000
394.24	0.0110
394.25	0.0172
394.26	0.0218
394.27	0.0259
394.28	0.0294
394.29	0.0327
394.30	0.0358
394.31	0.0387
394.32	0.0415
394.33	0.0443
394.34	0.0471
394.35	0.0499
394.36	0.0527
394.37	0.0556
394.38	0.0586
394.39	0.0617
394.40	0.0650
394.41	0.0684
394.42	0.0721
394.43	0.0760
394.44	0.0801
394.45	0.0844
394.46	0.0888
394.47	0.0935
394.48	0.0981
394.49	0.1028
394.50	0.1074
394.51	0.1118
394.52	0.1159
394.53	0.1196
394.54	0.1229
394.55	0.1257
394.56	0.1280
394.57	0.1299
394.58	0.1317

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m^3/s)
394.59	0.1331
394.60	0.1348
394.61	0.1367
394.62	0.1385
394.63	0.1402
394.64	0.1420
394.65	0.1437
394.66	0.1454
394.67	0.1471
394.68	0.1488
394.69	0.1505
394.70	0.1521
394.71	0.1537
394.72	0.1553
394.73	0.1569
394.74	0.1585
394.75	0.1600
394.76	0.1616
394.77	0.1631
394.78	0.1646
394.79	0.1661
394.80	0.1676
394.81	0.1691
394.82	0.1705
394.83	0.1720
394.84	0.1734
394.85	0.1748
394.86	0.1762
394.87	0.1776
394.88	0.1790
394.89	0.1804
394.90	0.1818
394.91	0.1831
394.92	0.1845
394.93	0.1858
394.94	0.1871
394.95	0.1885

Culvert # 55

Culvert Analysis Report
Culvert-1

Culvert Summary					
Computed Headwater Eleva	448.46	m	Discharge	1.0000	m^3/s
Inlet Control HW Elev.	422.99	m	Tailwater Elevation	388.73	m
Outlet Control HW Elev.	448.46	m	Control Type	Outlet Control	
Headwater Depth/Height	195.88				

Grades					
Upstream Invert	388.76	m	Downstream Invert	388.43	m
Length	12.40	m	Constructed Slope	0.026129	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.30	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.30	m
Velocity Downstream	13.71	m/s	Critical Slope	3.348955	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	448.46	m	Upstream Velocity Head	9.58	m
Ke	0.90		Entrance Loss	8.62	m

Inlet Control Properties					
Inlet Control HW Elev.	422.99	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	388.76	389.39	0.01	m

HW Elev. (m)	Discharge (m³/s)
388.76	0.0000
388.77	0.0001
388.78	0.0003
388.79	0.0006
388.80	0.0011
388.81	0.0017
388.82	0.0024
388.83	0.0033
388.84	0.0043
388.85	0.0053
388.86	0.0065
388.87	0.0078
388.87	0.0093
388.88	0.0108
388.90	0.0124
388.90	0.0141
388.91	0.0159
388.92	0.0178
388.94	0.0197
388.95	0.0218
388.96	0.0239
388.96	0.0261
388.97	0.0283
388.99	0.0307
389.00	0.0331
389.01	0.0355
389.02	0.0380
389.03	0.0405
389.04	0.0431
389.05	0.0457
389.06	0.0484
389.07	0.0510
389.08	0.0537
389.09	0.0565
389.09	0.0592
389.10	0.0620
389.11	0.0647
389.12	0.0675
389.14	0.0703
389.15	0.0735
389.15	0.0768
389.16	0.0802
389.17	0.0836
389.19	0.0869
389.20	0.0905
389.21	0.0922
389.21	0.0930
389.23	0.0930
389.24	0.0931
389.25	0.0936
389.26	0.0942

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m^3/s)
389.27	0.0949
389.28	0.0957
389.29	0.0965
389.30	0.0974
389.31	0.0982
389.32	0.0990
389.32	0.0998
389.34	0.1007
389.34	0.1015
389.35	0.1023
389.36	0.1031
389.38	0.1039
389.39	0.1047
389.40	0.1055

Culvert # 56

Culvert Analysis Report
Culvert-1

Culvert Summary

Computed Headwater Eleva	444.22	m	Discharge	1.0000	m³/s
Inlet Control HW Elev.	421.50	m	Tailwater Elevation	N/A	m
Outlet Control HW Elev.	444.22	m	Control Type	Outlet Control	
Headwater Depth/Height	186.90				

Grades

Upstream Invert	387.26	m	Downstream Invert	387.21	m
Length	11.50	m	Constructed Slope	0.004087	m/m

Hydraulic Profile

Profile	PressureProfile		Depth, Downstream	0.30	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.30	m
Velocity Downstream	13.71	m/s	Critical Slope	3.348955	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	444.22	m	Upstream Velocity Head	9.58	m
Ke	0.90		Entrance Loss	8.62	m

Inlet Control Properties

Inlet Control HW Elev.	421.50	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Rating Table Report
Culvert-1

Range Data:				
	Minimum	Maximum	Increment	
Allowable HW E	387.26	388.16	0.01	m

HW Elev. (m)	Discharge (m³/s)
387.26	0.0000
387.27	0.0001
387.28	0.0002
387.29	0.0006
387.30	0.0010
387.31	0.0016
387.32	0.0023
387.33	0.0031
387.34	0.0041
387.35	0.0051
387.36	0.0062
387.37	0.0075
387.38	0.0089
387.39	0.0104
387.40	0.0119
387.40	0.0136
387.42	0.0153
387.43	0.0172
387.44	0.0190
387.45	0.0210
387.46	0.0230
387.47	0.0250
387.48	0.0271
387.49	0.0292
387.50	0.0314
387.51	0.0336
387.52	0.0357
387.53	0.0378
387.54	0.0400
387.55	0.0421
387.56	0.0444
387.57	0.0465
387.58	0.0486
387.59	0.0506
387.59	0.0525
387.60	0.0542
387.62	0.0557
387.63	0.0569
387.64	0.0582
387.65	0.0595
387.65	0.0608
387.67	0.0620
387.68	0.0632
387.69	0.0644
387.70	0.0656
387.71	0.0668
387.72	0.0679
387.73	0.0691
387.74	0.0702
387.75	0.0713
387.76	0.0724

Rating Table Report
Culvert-1

HW Elev. (m)	Discharge (m³/s)
387.77	0.0734
387.78	0.0745
387.79	0.0755
387.80	0.0766
387.81	0.0776
387.82	0.0786
387.83	0.0796
387.84	0.0806
387.84	0.0816
387.85	0.0826
387.87	0.0835
387.88	0.0845
387.89	0.0854
387.90	0.0864
387.91	0.0873
387.92	0.0882
387.93	0.0891
387.94	0.0900
387.95	0.0909
387.96	0.0918
387.97	0.0927
387.98	0.0936
387.99	0.0945
388.00	0.0953
388.01	0.0962
388.02	0.0970
388.03	0.0979
388.04	0.0987
388.04	0.0996
388.06	0.1004
388.07	0.1012
388.08	0.1020
388.09	0.1028
388.09	0.1037
388.11	0.1045
388.12	0.1053
388.13	0.1060
388.14	0.1068
388.15	0.1076
388.16	0.1084
388.17	0.1092

Appendix G
Capacity Rating for Cross Culverts

Table G-1: Capacity Rating for Cross Culverts

Capacity Rating Criteria

Category	Description	Effective Cross-Section (%)
Very Good	Little to no sediment build up in pipe. Culvert ends are undamaged. Little to no debris blocking flow.	100%
Good	Original culvert capacity diminished by 5% or less.	95 % - 99 %
Fair	Original culvert capacity diminished by less than 15%.	85 % - 94 %
Poor	Original culvert capacity diminished by less than 25%.	75 % - 84 %
Below Minimum Tolerable	Original culvert capacity diminished by more than 25%.	0 % - 74 %

Culvert ID #	Culvert Type	Diameter Size / Height (m)	Diameter Size Meets Region's Standard (Minimum 600 mm)	Capacity Rating (CR)
10	cross culvert	0.45	No	Good
17	cross culvert	0.30	No	Below Minimum Tolerable
24	cross culvert	0.40	No	Below Minimum Tolerable
37	cross culvert	0.60	Yes	Below Minimum Tolerable
43	cross culvert	0.9 x 0.55	Yes	Very Good
44 (north)	cross culvert	1.2 x 1.0	Yes	Very Good
44 (south)	cross culvert	1.2 x 1.0	Yes	Very Good
47	cross culvert	0.40	No	Below Minimum Tolerable
48	cross culvert	0.40	No	Poor
55	cross culvert	0.30	No	Below Minimum Tolerable
56	cross culvert	0.30	No	Below Minimum Tolerable
14	cross culvert	0.60	Yes	Fair
16	cross culvert	0.30	No	Fair
2	cross culvert	0.90	Yes	Fair

Appendix H
Capacity Rating for Entrance Culverts

Table H-1: Capacity Rating for Entrance Culverts

Capacity Rating Criteria

Category	Description	Effective Cross-Section (%)
Very Good	Little to no sediment build up in pipe. Culvert ends are undamaged. Little to no debris blocking flow.	100%
Good	Original culvert capacity diminished by 5% or less.	95 % - 99 %
Fair	Original culvert capacity diminished by less than 15%.	85 % - 94 %
Poor	Original culvert capacity diminished by less than 25%.	75 % - 84 %
Below Minimum Tolerable	Original culvert capacity diminished by more than 25%.	0 % - 74 %

Culvert ID #	Culvert Type	Diameter Size / Height (m)	Diameter Size Meets Region's Standard (Minimum 375 mm)	Capacity Rating (CR)
1	entrance culvert	0.30	No	Below Minimum Tolerable
3	entrance culvert	0.35	No	Below Minimum Tolerable
4	entrance culvert	0.35	No	Below Minimum Tolerable
5	entrance culvert	0.30	No	Very Good
6	entrance culvert	0.30	No	Below Minimum Tolerable
7	entrance culvert	0.30	No	Good
8	entrance culvert	0.30	No	Below Minimum Tolerable
9	entrance culvert	0.30	No	Below Minimum Tolerable
11	entrance culvert	0.30	No	Below Minimum Tolerable
12	entrance culvert	0.30	No	Below Minimum Tolerable
13	entrance culvert	0.30	No	Below Minimum Tolerable
15	entrance culvert	0.30	No	Below Minimum Tolerable
18	entrance culvert	0.40	Yes	Below Minimum Tolerable
19	entrance culvert	0.40	Yes	Below Minimum Tolerable
20	entrance culvert	0.50	Yes	Below Minimum Tolerable
21	entrance culvert	0.40	Yes	Below Minimum Tolerable
22	entrance culvert	0.40	Yes	Good
23	entrance culvert	0.40	Yes	n/a
25	entrance culvert	0.40	Yes	Below Minimum Tolerable
26	entrance culvert	0.40	Yes	Below Minimum Tolerable
27	entrance culvert	0.30	No	Below Minimum Tolerable
28	entrance culvert	0.40	Yes	Fair
29	entrance culvert	0.40	Yes	Below Minimum Tolerable
30	entrance culvert	0.60	Yes	Good
31	entrance culvert	0.60	Yes	Below Minimum Tolerable
32	entrance culvert	0.60	Yes	Very Good
33	entrance culvert	0.40	Yes	Below Minimum Tolerable
35	entrance culvert	0.50	Yes	Below Minimum Tolerable
36	entrance culvert	0.60	Yes	Fair
38	entrance culvert	0.40	Yes	Below Minimum Tolerable
39	entrance culvert	0.50	Yes	Below Minimum Tolerable
40	entrance culvert	0.60	Yes	Good
41	entrance culvert	0.50	Yes	Below Minimum Tolerable
42	entrance culvert	0.50	Yes	Below Minimum Tolerable
45	entrance culvert	0.40	Yes	Below Minimum Tolerable
46	entrance culvert	0.30	No	Below Minimum Tolerable
49	entrance culvert	0.50	Yes	Good
50	entrance culvert	0.40	Yes	Below Minimum Tolerable
51	entrance culvert	0.40	Yes	Fair
52	entrance culvert	0.40	Yes	Fair
53	entrance culvert	0.30	No	Below Minimum Tolerable
54	entrance culvert	0.40	Yes	Poor
57	entrance culvert	0.20	No	Below Minimum Tolerable
58	entrance culvert	0.20	No	Below Minimum Tolerable

Appendix R.2
Drainage and Hydrology Assessment for Winston Churchill Boulevard and Olde Base Line Road

Region of Peel

Drainage and Hydrology Report

Olde Base Line Road and Winston Churchill Boulevard, Town of Caledon, Region of Peel

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January 2014 (revised May 2014)

HDR

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1. INTRODUCTION

The Regional Municipality of Peel (the Region) is conducting a Schedule “C” Municipal Class Environmental Assessment (EA) to provide a comprehensive and environmentally sound Transportation and Road Infrastructure Improvement Plan using a Context Sensitive Solutions Approach for the following Regional Road corridors:

- Winston Churchill Boulevard (Peel Regional Road 19, Wellington County Road 25) – from Olde Base Line Road to Bush Street;
- Olde Base Line Road (Regional Road 12) – from Winston Churchill Boulevard to Mississauga Road;
- Mississauga Road and Old Main Street (Regional Road 1) – from Olde Base Line Road to Bush Street; and
- Bush Street (Regional Road 11) – from Mississauga Road / Old Main Street to Winston Churchill Boulevard;

The approximate limits of the Study Area are shown in **Exhibit 1-1**.

This Drainage and Hydrology Report was prepared to document the drainage and hydrologic assessments that were undertaken for Olde Base Line Road and Winston Churchill Boulevard.

The drainage assessments for the remaining roads are documented under separate cover in the *Bush Street and Mississauga Road Class EA Existing Conditions Drainage Report - Draft, June 2010* prepared by Dillon Consulting Limited.

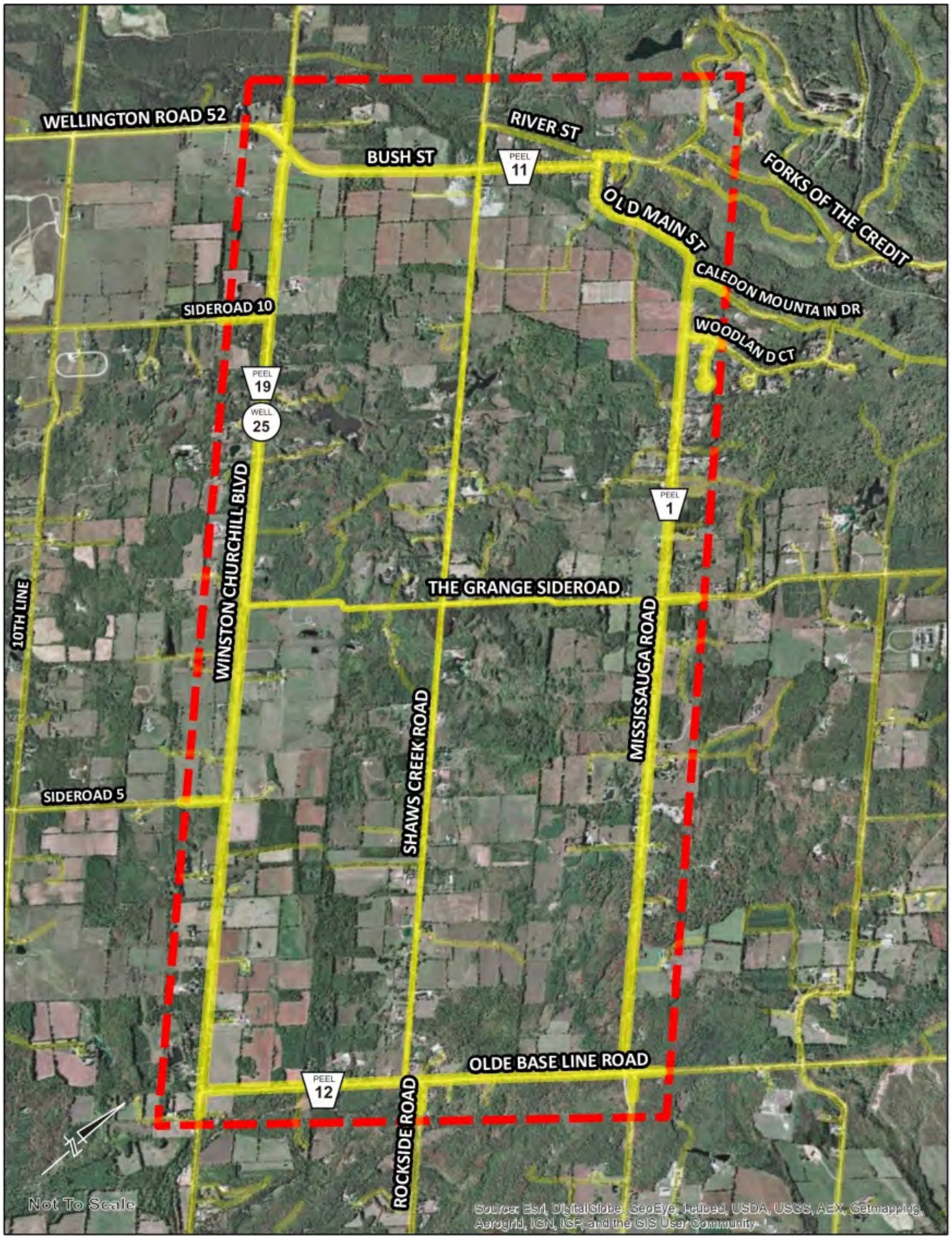

Exhibit 1-1: Study Area

1.1 Description of the Road Network

Winston Churchill Boulevard (Peel Regional Road 19, Wellington County Road 25) between Bush Street and Olde Base Line Road is a two-lane rural, north-south major road that is approximately 6.0 km in length. Adjacent land uses along the roadway include numerous private residences and farms, with driveways and accesses on Winston Churchill Boulevard. The vertical alignment of the road is a rolling profile with some moderate crests and sags. Winston Churchill Boulevard marks the boundary between Caledon (Peel Region) and the Town of Erin (Wellington County). Jurisdiction of the road is shared between Peel Region and Wellington County. The posted speed limit varies between 60 km/h and 70 km/h.

The existing cross-section of Winston Churchill Boulevard consists of two 3.1-3.6 m travel lanes with partially paved shoulders ranging between 1.2-3.0 m (of which 0-1.0 m is paved). The existing right-of-way is predominantly 20-23 m, but ranges between 20 m to 28 m. The range of dimensions for the different cross-sectional elements along the corridor is shown in **Exhibit 1-2**.

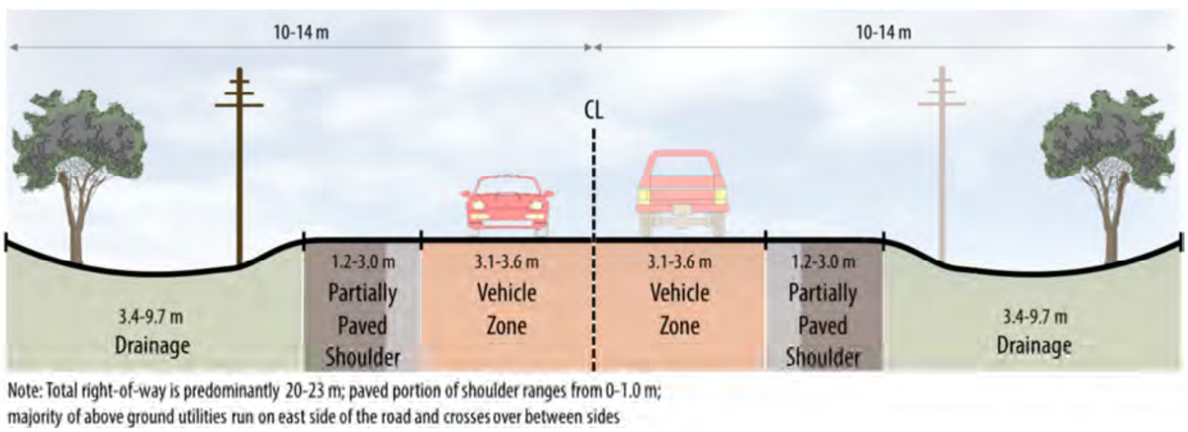

Exhibit 1-2: Winston Churchill Boulevard Existing Cross Section

Olde Base Line Road (Regional Road 12) between Winston Churchill Boulevard and Mississauga Road is a two-lane rural, east-west major road, approximately 2.8 km in length. Adjacent land uses along the roadway consists mainly of undeveloped land, with some private residences and farms that have direct access to the road. The vertical alignment of the roadway consists of sharp crests and sag curves. The road is under the Region of Peel's jurisdiction and the posted speed limit is 60 km/h. Olde Base Line Road has offset intersections with Shaws Creek Road and Rockside Road.

The existing cross-section of Olde Base Line Road consists of two 3.4-3.5 m wide travel lanes with unpaved shoulders ranging between 0.4-0.8 m. The range of dimensions for the different cross-sectional elements along the corridor is shown in **Exhibit 1-3**.

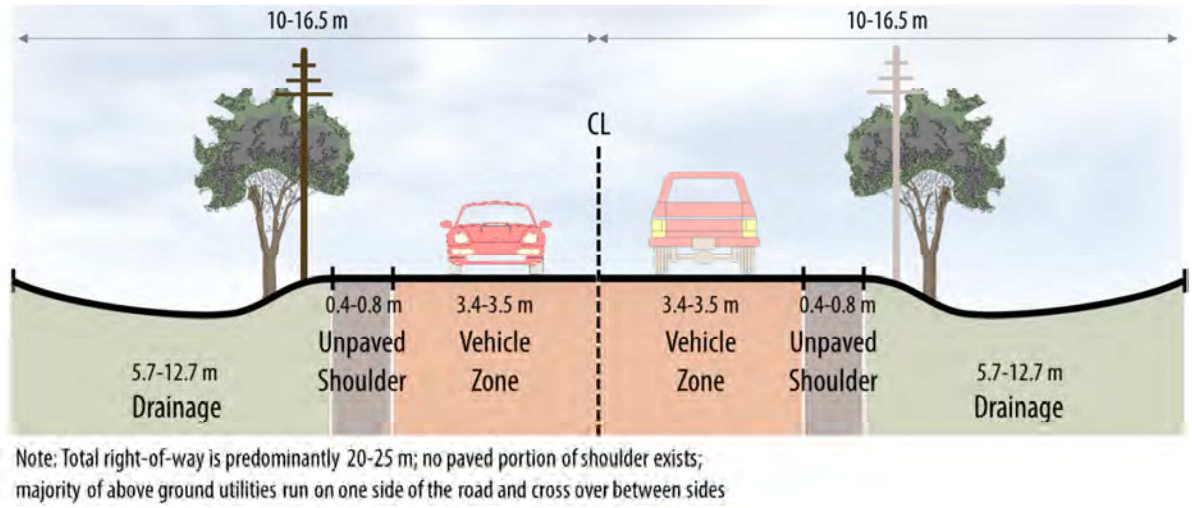

Exhibit 1-3: Olde Base Line Road Existing Cross Section

Mississauga Road (Regional Road 1), between Olde Base Line Road and Caledon Mountain Drive is a two-lane rural north-south major road approximately 5.4 km in length. There are numerous vertical curves along the alignment of the roadway, resulting in a rolling vertical alignment. The adjacent land uses of this area include numerous private residences and farms with unpaved driveway accesses; the cemetery grounds of Melville White Church on the west side of the road, approximately 1.6 km north of Olde Base Line Road; and the Blair-Belfountain Community Cemetery, on the east side of the road, approximately 4.8 km north of Olde Base Line Road. The road is under the Region of Peel's jurisdiction and the posted speed limit varies between 60 km/h to 70 km/h.

The existing cross-section of Mississauga Road consists of two 3.3-3.5 m travel lanes with partially paved shoulders ranging between 0.5-2.3 m in width (of which 0-2.3 m is paved). The existing right-of-way varies between 20-28 m, and is predominantly 20 m throughout the corridor. The range of dimensions for the different cross-sectional elements along the corridor is shown in **Exhibit 1-4**.

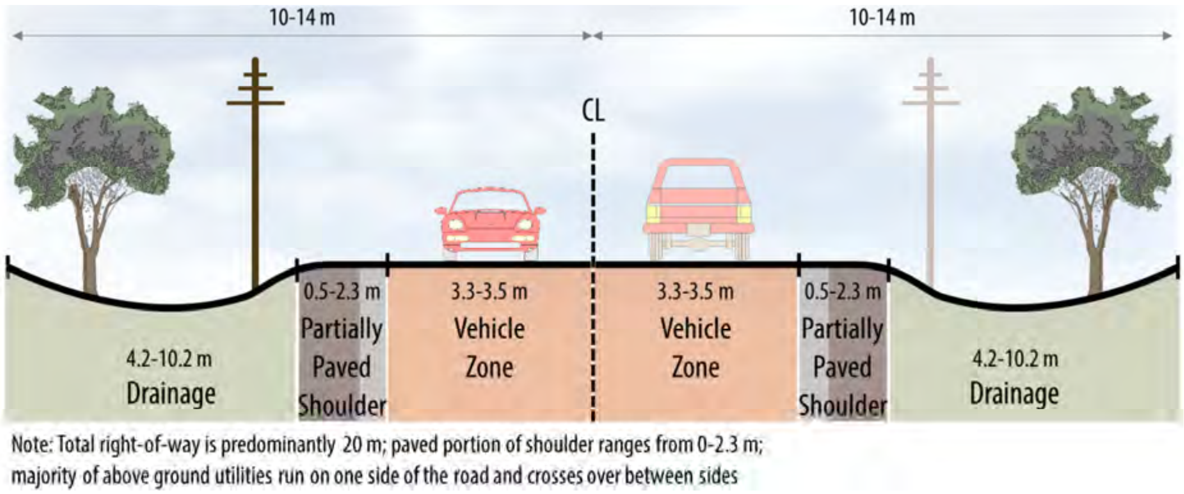

Exhibit 1-4: Mississauga Road Existing Cross Section

Old Main Street (Regional Road 1), a continuation of Mississauga Road north of Caledon Mountain Drive to Bush Street, is a major road approximately 1.1 km in length. It has a rural two-lane cross section south of Belfountain, and has urban characteristics in the village of Belfountain. The vertical alignment of the roadway generally descends towards the north, with a 5% downgrade towards Bush Street. The horizontal alignment has several relatively sharp horizontal curves. The adjacent land uses of this area include private residences and community buildings, with various driveways with direct access onto Old Main Street. On-street parking is permitted in the urban area directly south of Bush Street. The road is under the Region of Peel's jurisdiction and the posted speed limit varies between 40 km/h and 50 km/h.

In the village of Belfountain, which includes a portion of Bush Street (Regional Road 11), the existing cross-section consists of two 3.2-3.7 m travel lanes with partially paved shoulders ranging between 0.5-2.7 m (of which 0.2-2.0 m is paved). The existing right-of-way within the village (on both Old Main Street and Bush Street) varies between 10-20 m, and is predominantly 20 m. The range of dimensions for the different cross-sectional elements along the corridor is shown in **Exhibit 1-5**.

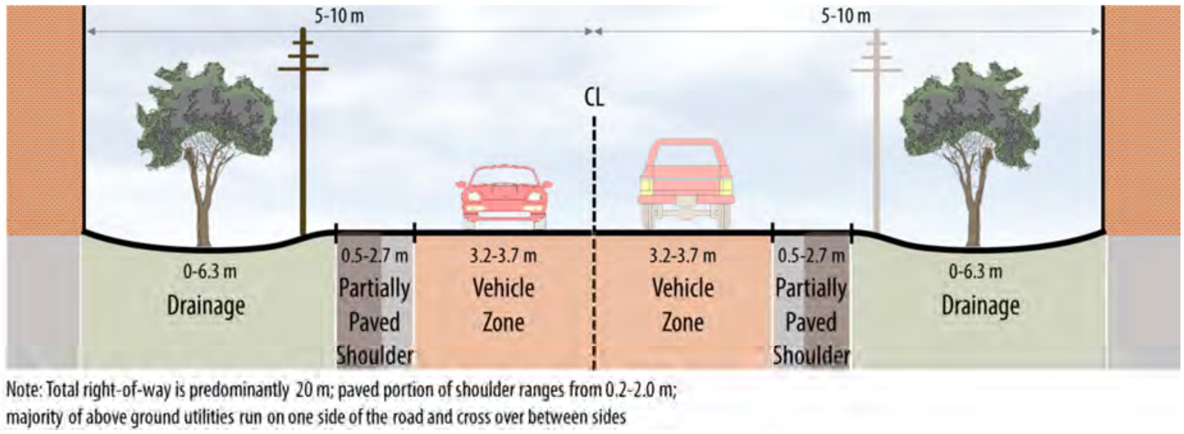

Exhibit 1-5: Belfountain Village Existing Cross Section (Old Main Street and Bush Street)

Bush Street (Regional Road 11) between Old Main Street and Winston Churchill Boulevard is a two-lane, east-west major road, approximately 2.1 km in length. In the village of Belfountain, it has urban characteristics at a 40 km/h speed limit, with numerous driveways for homes and businesses. West of the community, Bush Street has a rural cross-section. The vertical alignment of Bush Street rises with a 9-10% grade from the east as it approaches Shaws Creek Road, with a sharp vertical crest east of the Shaws Creek Road intersection. West of Shaws Creek Road, the vertical alignment is relatively flat with some moderate crests and sags. West of the community of Belfountain, the posted speed limit varies between 40 km/h and 80 km/h. Bush Street falls under the Region of Peel's jurisdiction.

The existing cross-section of Bush Street outside the community of Belfountain consists of two 3.2-3.8 m travel lanes with partially paved shoulders ranging between 1.3-3.5 m (of which 0.2-1.5 m is paved). The right-of-way along Bush Street, west of Belfountain Village to Shaws Creek Road is predominantly 20 m, but ranges between 20-25 m. In the section of Bush Street from Shaws Creek Road to Winston Churchill Boulevard, the right-of-way is predominantly 30 m, but ranges from 30-45 m. The range of dimensions for the different cross-sectional elements along the corridor is shown in **Exhibit 1-6**.

Bush Street intersects Winston Churchill Boulevard at two off-set intersections located on the reverse curve on Bush Street. The north leg of Winston Churchill Boulevard is offset approximately 80 m west of the south leg.

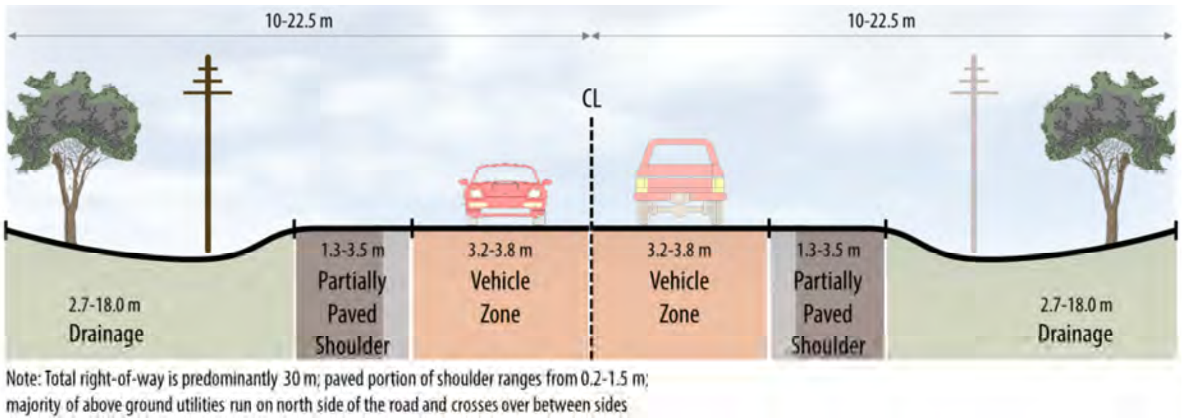

Exhibit 1-6: Bush Street Existing Cross Section

1.2 Study Objectives

To undertake the assessment and analysis for the two subject roads (Winston Churchill Boulevard and Olde Base Line Road), the following primary study objectives were addressed:

- Review existing drainage patterns and prepare a drainage mosaic for cross culverts and drainage system, and determine peak design flows;
- Carry out hydrology and hydraulic analysis for cross culverts for the design storm events;
- Review the existing capacity of culverts and identify inadequacies;
- Recommend sizing for culvert upgrades;

1.3 Data Collection and Review

The following information was also reviewed in the preparation of the report:

- *Summary of Findings (Draft) rev.1 Minor Culvert Condition Survey along Bush Street, Mississauga Road, Olde Baseline Road and Winston Churchill Boulevard, Belfountain ON*, dated September 4, 2013 prepared by Coffey Geotechnics Inc.;
- Survey (November 2012), Murray Layout Inc. (Auto CAD data file);
- Preferred Design Drawings (Plan as of PIC #2 - November 2013 and Profile as of January 2014);
- Region of Peel, Public Works Design, Specifications & Procedures Manuals for Linear Infrastructure
  - Storm Sewer Design Criteria (Revised July 2009)
  - Regional Roads and Traffic (Revised February 2010
- Credit Valley Conservation Stormwater Management Guidelines (August 2012);
- Credit Valley Conservation Standard Parameters Document;
- Soil Map of Peel County, Soil Survey Report No. 18;
- Geography Network Canada Ontario Basic Mapping (OBM) topographic base map (GIS mapping, retrieved online September 5, 2012).
- *Bush Street and Mississauga Road Class EA Existing Conditions Drainage Report - Draft, June 2010* prepared by Dillon Consulting Limited.

2. SUMMARY OF CULVERT ASSESSMENT REPORT

An assessment of the road drainage system for Winston Churchill Boulevard and Olde Base Line Road, is included in the *Summary of Findings (Draft) rev.1 Minor Culvert Condition Survey along Bush Street, Mississauga Road, Olde Baseline Road and Winston Churchill Boulevard, Belfountain ON*, dated September 4, 2013 prepared by Coffey Geotechnics Inc. The centreline culvert recommendations, for Winston Churchill Boulevard and Olde Base Line Road, from this report and HDR's site visit (September 2013) are summarized in **Table 2-1**. Culvert locations and corresponding identification numbers are illustrated in **Appendix A**.

The results of the culvert condition survey indicated that five (5) culverts along Olde Base Line Road require repair and/or flushing and/or re-grading; zero (0) culverts require replacement. Along Winston Churchill Boulevard two (2) culverts require replacement due to poor condition, and fourteen (14) culverts require repair and/or flushing and/or re-grading.

Table 2-1: Existing Culvert Inspection Recommendations – Cross Culverts

Culvert ID	Coffey Report ID	Type / Material	Shape	Size (mm)	Length (m)	Flow Direction	Overall Condition	Recommendation
	Olde Base Line Road							
OBL-01	N/A	CSP	Circular	450	12.50	N-S		Culvert was not picked up on survey or culvert inspection. Repair damage on north end, flush and cleanout, re-grade ditch.
OBL-02	CUL-012-140	CSP	Circular	600	14.30	N-S	Good	Do Nothing.
OBL-03	CUL-012-141	CSP	Circular	600	15.90	N-S	Good	Do Nothing.
OBL-04	CUL-012-150	RCB	Box	3300 x 1200	23.10	N-S	Good	Do Nothing.
OBL-05	CUL-012-152	CSP	Circular	450	12.50	N-S	Fair	Repair south end, flush and re-grade.
OBL-06	CUL-012-142	HDPE	Circular	450	20.50	N-S	Good	Do Nothing.
OBL-07	CUL-012-143	HDPE	Circular	450	12.00	N-S	Good	Do Nothing.
OBL-08	CUL-012-144	RCB	Box	3050 x 1400	26.60	N-S	Good	Do Nothing.
OBL-09	CUL-012-146	CSP	Circular	400	10.50	S-N	Poor	Flush culvert and re-grade
OBL-10	CUL-012-147	CSP	Circular	400	12.35	N-S	Poor to Fair	Repair north end.
OBL-11	CUL-012-148	CSP	Circular	400	12.30	N-S	Poor to Fair	Repair south end.
	Winston Churchill Boulevard							
WCB-01	N/A	CSP	Circular	250 (Twin)	13.50	E-W		Re-ditch on east end, particularly north of the culvert.
WCB-02	CUL-019-351	CSP	Circular	400	12.20	E-W	Fair to Poor	Flush and repair west end.
WCB-03	CUL-019-350	CSP	Circular	400	12.10	E-W	Poor	Replace.
WCB-04	CUL-019-349	CSP	Circular	400	13.75	W-E	Fair to Good	Repair west end.
WCB-05	CUL-019-348	CSP	Circular	400	12.80	E-W	Fair	Repair west end.
WCB-06	CUL-019-347	CSP	Circular	600	11.00	E-W	Fair	Flush culvert.
WCB-07	CUL-019-346	CSP	Circular	400	12.35	E-W	Poor	Flush and repair.
WCB-08	CUL-019-345	HDPE	Circular	600	13.60	E-W	Good	Do Nothing.
WCB-09	CUL-019-344	CSP	Arch	1400 x 900	15.50	E-W	Fair	Flush culvert.

Culvert ID	Coffey Report ID	Type / Material	Shape	Size (mm)	Length (m)	Flow Direction	Overall Condition	Recommendation
WCB-10	CUL-019-343	CSP	Circular	400	12.70	E-W	Fair	Flush and repair east end.
WCB-11	CUL-019-397	CSP	Circular	400	15.50	W-E	Fair to Poor	Flush and repair east end.
WCB-12	CUL-019-396	CSP	Circular	600	18.20	W-E		Repair east end.
WCB-13	CUL-019-388	CSP	Circular	400	16.00	W-E	Poor	Flush and repair culvert.
WCB-14	CUL-019-394	CSP	Circular	450	22.20	E-W	Fair to Poor	Replace.
WCB-15	CUL-019-393	CSP	Circular	450	18.20	E-W	Fair to Good	Repair west end.
WCB-16	CUL-019-392	CSP	Circular	750	14.90	W-E	Fair	Flush and repair.
WCB-17	CUL-019-391	CSP	Circular	900	15.00	E-W	Good	Do Nothing.
WCB-18	CUL-019-390	CSP	Circular	900	23.00	E-W	Good	Flush and remove debris.

Notes:
1. CSP – Corrugated Steel
2. HDPE – High Density Polyethylene
3. RCB – Rigid Concrete Box
4. Only cross-culverts within the project limits are listed in **Table 2-1**.

3. CAPACITY ASSESSMENT

Based on the Study objectives a hydraulic capacity assessment of all cross culverts within the study area was undertaken for both the existing and proposed conditions. Culverts that transverse either Winston Churchill Boulevard or Olde Base Line Road are considered “cross culverts”. The results are summarized in **Sections 3.2** and **3.3** below. Driveway / entrance culverts are discussed in **Section 3.4**.

3.1 Design Criteria

The Region of Peel has, in practice, adopted the Ministry of Transportation Directive B-100 (MTO, October 16, 1980) and more recently the MTO Drainage Design Standards (2008) which requires that all hydraulic crossings be designed to allow the specified freeboard between the edge of travelled way and the upstream water surface elevation for specified storm events. Under the rural arterial classification, culverts with a total span up to 6m are designed for the 25 year design storm event (MTO Standard WC-1). The hydraulic freeboard requirements are as follows:

- The required freeboard for the assessment of crossings that are not classified as watercourses has been specified as 0.3 m (MTO Standard SD-13) which is a minor crossing and conveys runoff from a local external catchment area.
- The required freeboard for the assessment of crossings that are designated as watercourses, has been specified as 1.0 m for culvert crossings on arterial roads (MTO Standard WC-7).

Credit Valley Conservation has designated the following crossings as ‘watercourses’: On Olde Base Line Road, crossings OBL-02, OBL-04 and OBL-08; on Winston Churchill Boulevard, crossings WCB-06, WCB-09, WCB-14 and WCB-16. Crossings designated as watercourses are to be designed to be flood-free under the 100 year and Regional storm events, whichever is greater, as feasible. As directed by CVC, all watercourse crossings should be open-bottom with sizing based on hydraulic analysis and a fluvial geomorphologic considerations.

In addition to the above, the Region of Peel Design Guidelines stipulate that culverts crossing Regional Roads are to have a minimum 600 mm diameter and driveway culverts are to have a minimum 375mm diameter (inside diameter). Pipes are to be comprised of Corrugated Steel (CS), Polyethylene (PE) or an approved equivalent.

Storm Sewers

Storm sewers are to be designed using the local municipality’s intensity, duration and frequency rainfall curves for a 10 year storm with 15 minute inlet time for the roadway of way only. In the event the storm water catchment area includes areas beyond the right of way, the inlet time shall be calculated using the local municipality drainage calculation sheets and appropriate rainfall intensity tables. Pipe sizing shall be for full flow with a minimum velocity of 0.75 m/s and a maximum velocity of 3.5 m/s.

3.2 Evaluation of Cross Culverts – Existing Conditions

3.2.1 Existing Condition Hydrologic Assessment

Hydrologic modelling, for the 25 year storm event, was undertaken for a total of 29 cross culverts (11 on Olde Base Line Road and 18 on Winston Churchill Boulevard). The hydrologic assessment was conducted to quantify the design peak flow to be conveyed by each culvert. A combination of spreadsheet calculations and hydrologic models (SWMHYMO) were utilized to establish the single event flow rates. Both models utilize Intensity-Duration Frequency (IDF) curves established by the CVC Stormwater Management Guidelines and CVC Standard Parameters documents.

3.2.1.1 Drainage Area Characterization

The drainage area tributary to each of the 29 cross culverts were established using a detailed Geographic Information System (GIS) analysis (consisting of topographic maps and contour data) and survey base mapping and aerial photography. **Appendix A** presents the culvert locations and catchment area plan for the 29 cross culvert locations.

Based on the Soil Map of Peel County (Soil Survey Report No. 18, November 1955), the majority of the lands within the study area consist of Dumfries loam, Caledon loam or Farmington loam (See **Appendix B**).

The Rational Method was used to calculate the peak design flows for all culvert watershed areas, with the exception of two culverts on Olde Base Line Road, OBL-04 and OBL-08, as it provides an accurate estimate of peak design flows for watershed areas less than 100 hectares in size. For watershed areas greater than 100 hectares (OBL-04 and OBL-08) the SWMHYMO model was utilized to compute the 2 to 100 year peak flows as well as the Regional event. In addition, the SWMHYMO model was used to calculate the Regional storm peak flows at all CVC designated ‘watercourse’ crossings.

As the composite runoff coefficient was less than 0.40 for all contributing catchments, the time of concentration was calculated using the Airport Formula. The rainfall intensity, duration, and frequency (IDF) values were obtained from the CVC guidelines. A 24 hour Chicago distribution was used in the model for the 25 year design storm. These IDF values are also consistent with those used in the *Bush Street and Mississauga Road Class EA Existing Conditions Drainage Report - Draft, June 2010* prepared by Dillon Consulting Limited.

The hydrologic analysis accounts for the irregular topography of the Belfountain area, which is dotted with numerous pocket wetlands as well as more extensive complex wetland systems. These features have a pronounced effect in reducing runoff and peak flows within a given catchment, through natural retention and detention of stormwater runoff. When coupled with infiltration and evaporation, these systems provide significant benefits in reducing the overall rate and volume of runoff.

A summary of the peak flows determined at each of the cross culvert locations on Olde Base Line Road and Winston Churchill Boulevard is provided in **Table 3-1**.

Table 3-1: Summary of Peak Design Flows Draining to Cross Culvert

Drainage Area ID / Culvert ID	Approximate Station Location	Peak Design Flow Calculations			
		Time of Concentration (min)	Design Storm (years)	Rainfall Intensity (mm/hr)	Peak Design Flow (m^3/s)
Olde Base Line Road					
OBL-01	30+030	60.25	25	48.69	0.48
OBL-02	30+540	86.25	2	19.14	0.92
			5	26.61	1.28
			10	31.15	1.50
			25	37.43	1.80
			50	42.25	2.03
			100	46.33	2.23
			Regional	n/a	5.23*
OBL-03	30+715	62.46	25	47.45	0.49
OBL-04	30+940	103.90	2	n/a	1.08*
			5	n/a	1.97*
			10	n/a	2.68*
			25	n/a	3.69*
			50	n/a	4.60*
			100	n/a	5.41*
			Regional	n/a	14.78*
OBL-05	31+280	59.32	25	49.24	0.22
OBL-06	31+300	82.51	25	38.69	0.11
OBL-07	31+380	41.99	25	62.66	0.05
OBL-08	31+410	171.04	2	n/a	2.54*
			5	n/a	4.61*
			10	n/a	6.30*
			25	n/a	8.65*
			50	n/a	10.81*
			100	n/a	12.73*
			Regional	n/a	46.80*
OBL-09	32+080	29.97	25	78.15	0.24
OBL-10	32+230	25.38	25	86.6	0.09

Drainage Area ID / Culvert ID	Approximate Station Location	Peak Design Flow Calculations			
		Time of Concentration (min)	Design Storm (years)	Rainfall Intensity (mm/hr)	Peak Design Flow (m^3/s)
OBL-11	32+340	83.97	25	38.19	0.89
Winston Churchill Boulevard					
WCB-01	40+030	47.76	25	57.36	0.05
WCB-02	40+480	43.35	25	61.31	0.15
WCB-03	40+660	53.81	25	52.78	0.13
WCB-04	40+870	34.69	25	71.15	0.08
WCB-05	41+110	28.07	25	81.41	0.05
WCB-06	41+400	55.21	2	26.53	0.20
			5	36.76	0.28
			10	43.05	0.33
			25	51.83	0.40
			50	58.39	0.45
			100	64.10	0.49
			Regional	n/a	1.25*
WCB-07	41+710	30.02	25	65.71	0.63
WCB-08	41+890	26.4	25	84.55	0.56
WCB-09	42+195	56.12	2	20.84	1.14
			5	28.95	1.58
			10	33.90	1.85
			25	40.76	2.22
			50	46.00	2.51
			100	50.46	2.75
			Regional	n/a	7.50*
WCB-10	42+750	23.15	25	91.48	0.19
WCB-11	43+130	26.28	25	84.78	0.070
WCB-12	43+210	41.18	25	62.47	0.18
WCB-13[+]	44+140	-	25	-	0
WCB-14	44+310	18.87	2	54.32	0.023
			5	73.69	0.031
			10	86.04	0.036
			25	102.82	0.043
			50	114.47	0.048
			100	125.95	0.053
			Regional	n/a	0.063

Drainage Area ID / Culvert ID	Approximate Station Location	Peak Design Flow Calculations			
		Time of Concentration (min)	Design Storm (years)	Rainfall Intensity (mm/hr)	Peak Design Flow (m^3/s)
WCB-15	44+615	30.82	25	76.77	0.25
WCB-16	44+945	57.82	2	25.66	0.53
			5	35.57	0.74
			10	41.66	0.86
			25	50.15	1.04
			50	56.51	1.17
			100	62.04	1.28
			Regional	n/a	3.33*
WCB-17	45+095	87.14	25	37.14	1.16
WCB-18	45+865	80.72	25	39.33	1.73

Notes:
* Design Flow determined from SWMHYMO model
+WCB-13 Equalization Culvert
Peak Design Flow calculated using Rational Method: $Q = 0.0028*C*I*A$
Rainfall Intensity calculated using a rainfall intensity: $I_{25} = A*(T_C+B)^{-C}$
Time of concentration (for C < 0.40) calculated using Airport Formula: $T_C = (3.26 *(1.1 – C) * L^{0.5})/ (S_w.^{0.33})$
T_C and Peak Flow calculations presented in Tables B-3.1 to B-3.4 in Appendix B.3 – Hydrologic Calculations

3.2.2 Fluvial Geomorphic Assessment

A fluvial geomorphic assessment was completed for all culvert crossing locations designated by CVC as ‘watercourses’. The results of this assessment show the minimum size span necessary to accommodate channel morphologic characteristics. The locations and span recommendations are summarized in **Table 3-2** below.

Table 3-2: Geomorphic Assessment Recommendations

Crossing Location	Existing Culvert Size (mm)	Recommended Span (m)
OBL-02	600 CSP	3.0
OBL-04	3300 x 1200 RCB	6.0
OBL-08	3050 x 1400 RCB	6.0
WCB-06	600 CSP	1.5
WCB-09	1400 x 900 Arch	6.0
WCB-14	450 CSP	1.5
WCB-16	750 CSP	3.0

Complete results of the fluvial geomorphic assessment are documented under separate cover (*Caledon Road Improvements EA – Geomorphic Assessment*, dated May 2014 prepared by Parish Geomorphic)

3.2.3 Existing Condition Hydraulic Assessment

The hydraulic assessment was undertaken using Bentley's CulvertMaster software. The assessment indicated that under existing conditions, in order to meet the hydraulic design criteria, meeting Peel Region's minimum size requirements, and accounting for fluvial geomorphic considerations, eleven (11) culverts along Olde Base Line Road and fourteen (14) culverts along Winston Churchill Boulevard will require upgrading. Of these, eighteen (18) culverts require upgrade solely to meet the Region's minimum size requirement. Since the results of the fluvial geomorphic assessment indicated that all watercourse crossings would need to be upgraded to meet the recommended span the 2 – 100 year and Regional storm event analysis was not completed for existing conditions. However, this analysis was completed for the proposed conditions (see Section 3.3).

A summary of the existing cross culvert hydraulic performance is presented in **Table 3-3**; recommendations from the culvert condition survey and geomorphic assessment are also included. A summary of the CulvertMaster input parameters is provided in **Appendix D** along with the CulvertMaster model output files.

Table 3-3: Summary of Existing Cross Culvert Hydraulic Performance for the 25 Year Peak Flow and Recommendations

Drainage Area ID / Culvert ID	Culvert Size	Peak Design Flow	U/S Invert	D/S Invert	Length	Slope	CulvertMaster Calculations: Maximum Allowable Headwater Elevation	Calculated Headwater Elevation	Delta Headwater	Theoretical Tailwater Elevation	Critical Depth	Recommendations and Notes
	(mm)	(m^3/s)	(m)	(m)	(m)	%	(m)	(m)	(m)	(m)	(m)	
Olde Base Line Road												
OBL-01	450	0.479	372.40	372.25	12.50	1.200	372.90	374.63	-1.73	372.48	0.44	Upgrade based on hydraulic analysis and minimum size requirements. Repair damage on north end, flush and cleanout, re-grade ditch based on CIR.
OBL-02	600	1.800	372.71	372.70	14.30	0.070	372.55	380.84	-8.29	373.31	0.61	Upgrade based on hydraulic analysis with consideration of 100 Year and Regional storm events and to meet geomorphic recommended span.
OBL-03	600	0.490	369.16	369.09	15.90	0.440	369.62	370.23	-0.61	369.62	0.46	Upgrade based on hydraulic analysis.
OBL-04	3300 x 1200	3.69*	369.35	369.25	23.10	0.433	370.23	370.25	-0.02	370.09	0.47	Consider upgrading to meet 100 Year and/or Regional storm events and to meet geomorphic recommended span.
OBL-05	450	0.220	371.80	371.62	12.50	1.464	372.41	372.41	0.00	372.01	0.33	Upgrade to minimum size requirements. Repair south end, flush and re-grade ditches based on CIR.
OBL-06	450	0.111	371.91	371.56	20.50	1.712	372.18	372.26	-0.08	371.90	0.23	Upgrade based on hydraulic analysis and minimum size requirements.
OBL-07	450	0.049	370.92	370.73	12.00	1.558	371.35	371.14	0.21	371.03	0.15	Upgrade to minimum size requirements.
OBL-08	3050 x 1400	8.6*	370.22	370.19	26.60	0.102	371.15	371.90	-0.75	371.36	0.93	Consider upgrading based on hydraulic analysis to meet 100 Year and/or Regional storm events and to meet geomorphic recommended span..
OBL-09	400	0.244	372.54	372.48	10.50	0.533	373.16	373.72	-0.56	372.86	0.35	Upgrade based on hydraulic analysis and minimum size requirements. Flush culvert and re-grade ditched based on CIR.
OBL-10	400	0.094	373.56	373.42	12.35	1.190	373.79	373.94	-0.16	373.73	0.22	Upgrade based on hydraulic analysis and minimum size requirements. Repair north end based on CIR.
OBL-11	400	0.892	373.24	372.91	12.30	2.675	373.64	385.88	-12.25	373.11	0.40	Upgrade based on hydraulic analysis and minimum size requirements. Repair south end based on CIR.
Winston Churchill Boulevard												
WCB-01	250 (Twin)	0.045	372.44	372.15	13.5	2.148	372.58	373.25	-0.67	372.34	0.12	Upgrade based on hydraulic analysis and minimum size requirements. Re-ditch on east end, particularly north of the culvert based on CIR.

Drainage Area ID / Culvert ID	Culvert Size (mm)	Peak Design Flow (m^3/s)	U/S Invert (m)	D/S Invert (m)	Length (m)	Slope %	CulvertMaster Calculations: Maximum Allowable Headwater Elevation (m)	Calculated Headwater Elevation (m)	Delta Headwater (m)	Theoretical Tailwater Elevation (m)	Critical Depth (m)	Recommendations and Notes
WCB-02	400	0.154	381.34	381.15	12.2	1.541	381.65	381.87	-0.22	381.49	0.28	Upgrade based on hydraulic analysis and minimum size requirements. Flush and repair west end based on CIR.
WCB-03	400	0.134	382.82	382.79	12.1	0.207	383.34	383.42	-0.08	383.13	0.27	Upgrade based on hydraulic analysis, minimum size requirements and CIR.
WCB-04	400	0.084	385.21	384.85	13.75	2.582	385.22	385.57	-0.35	385.16	0.21	Upgrade based on hydraulic analysis and minimum size requirements. Repair west end based on CIR.
WCB-05	400	0.051	392.33	392.28	12.8	0.406	392.88	392.61	0.27	392.56	0.16	Upgrade to minimum size requirements. Repair west end based on CIR.
WCB-06	600	0.396	393.03	392.96	11	0.700	393.61	393.79	-0.18	393.46	0.41	Upgrade based on hydraulic analysis with consideration of 100 Year and Regional storm events and to meet geomorphic recommended span. Flush culvert based on CIR.
WCB-07	400	0.630	393.07	392.94	12.35	1.061	393.60	399.63	-6.03	393.34	0.4	Upgrade based on hydraulic analysis and minimum size requirements. Flush and repair based on CIR.
WCB-08	600	0.556	394.27	394.00	13.6	1.985	395.18	395.07	0.11	394.55	0.49	Do Nothing
WCB-09	1400 x 900	2.224	399.91	399.85	15.5	0.387	400.52	401.26	-0.74	400.63	0.66	Upgrade based on hydraulic analysis with consideration of 100 Year and Regional storm events and to meet geomorphic recommended span. Flush culvert based on CIR.
WCB-10	400	0.191	417.62	417.38	12.7	1.890	418.33	418.33	0.00	417.74	0.32	Upgrade to minimum size requirements. Flush and repair east end based on CIR.
WCB-11	400	0.069	425.25	425.17	15.5	0.516	425.95	425.57	0.38	425.47	0.19	Upgrade to minimum size requirements. Flush and repair east end based on CIR.
WCB-12	600	0.175	424.86	424.42	18.2	2.418	426.90	425.32	1.58	424.86	0.27	Repair east end based on CIR.
WCB-13	400	0	424.69	424.55	16	0.875	Equalization Culvert					Upgrade to minimum size requirements.
WCB-14	450	0.004	419.61	419.09	22.2	2.360	421.16	419.68	1.48	419.33	0.04	Upgrade to minimum size requirements and to meet geomorphic recommended span. Replace based on CIR.
WCB-15	450	0.249	416.82	416.60	18.2	1.221	418.30	417.65	0.65	417.00	0.35	Upgrade to minimum size requirements. Repair west end based on CIR.

Drainage Area ID / Culvert ID	Culvert Size (mm)	Peak Design Flow (m^3/s)	U/S Invert (m)	D/S Invert (m)	Length (m)	Slope %	CulvertMaster Calculations: Maximum Allowable Headwater Elevation (m)	Calculated Headwater Elevation (m)	Delta Headwater (m)	Theoretical Tailwater Elevation (m)	Critical Depth (m)	Recommendations and Notes
WCB-16	750	1.037	410.30	409.82	14.9	3.255	411.32	411.64	-0.32	410.51	0.63	Upgrade based on hydraulic analysis with consideration of 100 Year and Regional storm events and to meet geomorphic recommended span. Flush and repair based on CIR.
WCB-17	900	1.157	408.45	408.41	15	0.267	409.93	409.69	0.24	409.18	0.63	Do Nothing.
WCB-18	900	1.733	389.93	389.88	23	0.257	392.79	392.07	0.71	390.71	0.77	Flush and remove debris based on CIR.

*OBL-04 and OBL-08 - Peak Design Flow determined from SWMHYMO model.

3.3 Evaluation of Cross Culverts – Proposed Conditions

3.3.1 Proposed Condition Hydrologic Assessment

Similar to the Existing Conditions Assessment, a hydrologic analysis was completed for the current land use conditions to assess the hydraulic performance of the proposed drainage system. In addition, for all CVC designated watercourse crossings, additional hydrologic analysis was completed to identify peak flows for the 2, 5, 10, 25, 50, 100 and Regional storm events.

Under future conditions, the drainage area tributary to each of the 29 cross culverts would remain predominantly unchanged. A combination of spreadsheet calculations and hydrologic models (SWMHYMO) were utilized to establish the storm event peak flow rates. Both models utilize Intensity-Duration Frequency (IDF) curves established by the CVC Stormwater Management Guidelines and CVC Standard Parameters documents.

3.3.2 Proposed Condition Hydraulic Assessment

The hydraulic assessment was based on the preliminary proposed horizontal road design (as of PIC #2 - November 2013) and vertical profile design as of January 2014. Similar to the existing conditions assessment, hydraulic modelling was completed using Bentley's CulvertMaster software. A summary of the proposed cross culvert hydraulic performance is presented in **Table 3-4**. A listing of CulvertMaster input and output parameters are presented in **Appendix E**.

3.3.2.1 Cross-Culverts (Non-Watercourse)

Where possible, the roadway profile was adjusted to ensure that the minimum culvert diameter could be provided (i.e. 600mm). The assessment indicated that under the proposed conditions, for the 25 year storm event, most of the culverts will now meet the required freeboard (0.3 m) based on the proposed upgrades. Where the "Delta Headwater" column shows a negative value, this indicates that the required freeboard at the culvert crossing has not been met, in spite of any upgrades to the culvert. This is discussed more fully below:

Culvert OBL-06 – Due to roadway profile constraints, upgrading this culvert to the minimum 600mm diameter is not feasible. In order to achieve the required freeboard, a second 450mm culvert cell was added, which reduced the headwater elevation at the inlet sufficiently to meet the required design criteria.

Culvert OBL-11 – The proposed upgrade to a twin 600 mm diameter CSP is based on meeting the 0.3 metre freeboard requirement as well as meeting the culvert minimum size requirements. Based on the hydraulic analysis, the proposed upgrade will provide a major improvement over existing conditions and eliminate potential overtopping of the roadway, despite not fully meeting the freeboard requirements.

3.3.2.2 Cross-Culverts (CVC Designated Watercourses)

As noted in **Section 3.1** (Design Criteria) crossings designated as a Watercourse by the CVC are to be designed to be flood free for the 100 year and Regional storm events, whichever is greater (as feasible). In addition, they should be open-bottom with sizing based on both hydraulic analysis and fluvial geomorphic assessment. The assessment indicated that under proposed conditions, for the 100 year and/or Regional storm events, all of the CVC designated watercourse crossings will not meet the required criteria for flood free (i.e. no overtopping) conditions. With respect to the 25 year storm event only two culverts, WCB-09 and WCB-16, will meet the required freeboard of 1.0 meter. This is shown where the “Delta Headwater” column shows a negative value, indicating that the required freeboard at the culvert crossing has not been met, in spite of any upgrades to the culvert. This is discussed more fully below:

Culvert OBL-02 – This culvert was upgraded from a 600mm pipe to an open bottom concrete box culvert of dimensions 3.0m x 1.2m which significantly increases the capacity of this crossing of the Rogers Creek tributary (Tributary ‘B’). Based on the hydraulic assessment, under existing conditions, overtopping of the roadway would occur during the 25 year storm event. Under proposed conditions for this event the culvert would not meet the requisite freeboard of 1.0 meter but the resulting headwater elevation would remain approximately 0.7 meters below the roadway edge of pavement. Similarly, under the 100 year and Regional storm events overtopping of the road will not occur as the resultant headwaters would remain at approximately 0.6 meters and 0.2 meters below the roadway edges of pavement respectively. The proposed culvert meets the 3.0m span recommended by the fluvial geomorphic assessment.

Culvert OBL-04 – This culvert conveys flow along Tributary ‘A’ of Rogers Creek. The existing culvert is 3.3m x 1.2m concrete box culvert and is in good condition. Under the 25 year storm flow conditions, the culvert would not meet the requisite freeboard, but the upstream headwater would remain approximately 0.9 metres below the roadway edge of pavement. Similarly, the 100 year event will not overtop the roadway, with a freeboard of 0.7 metres. Under Regional storm conditions however, overtopping of the road will occur. The fluvial geomorphic assessment recommends that this crossing have a minimum 6.0m span. However, it is not recommended to upgrade this culvert or raise the roadway profile further for the following reasons:

- The existing culvert is structurally stable and in good condition;
- There is no historical evidence that overtopping of the roadway has occurred at this crossing (through discussions with local property owners)
- Based on the hydraulic analysis, no overtopping is expected to occur under the 25 or 100 year storm events;
- Raising the roadway profile would potentially increase flooding upstream of the Culvert OBL-4 under the Regional storm event. Consequently, any increase in the

overtopping elevation would have a corresponding increase in the flood elevation upstream of the crossing.

Culvert OBL-08 – This culvert conveys flows along Tributary 'A' of Second Creek. The existing culvert is a 3.05m x 1.4m concrete box culvert and is in excellent condition. Under the 25 year storm event, the culvert would not meet the requisite freeboard, but the upstream headwater would remain approximately 0.2 metres below the roadway edge of pavement. Similarly, the 100 year event will not overtop the roadway, with a freeboard of 0.6 metres. Under Regional storm conditions however, overtopping of the road will occur. The fluvial geomorphic assessment recommends that this crossing have a minimum 6.0m span. However, due to the very shallow profile of Olde Base Line Road at this location, it is not recommended to upgrade this culvert nor raise the roadway profile due to the following:

- The existing culvert is structurally stable and in good condition;
- There is no historical evidence that overtopping of the roadway has occurred at this crossing (through discussions with local property owners)
- Based on the hydraulic analysis, no overtopping is expected to occur under the 25 or 100 year storm events;
- Raising the roadway profile would potentially increase flooding upstream of the Culvert OBL-08 under the Regional storm event. Consequently, any increase in the overtopping elevation would have a corresponding increase in the flood elevation upstream of the crossing.

Culvert WCB-06 – This culvert was upgraded from a 600mm pipe to an open bottom concrete box culvert of dimensions 1.8m x 0.6m which significantly increases the capacity of this unnamed watercourse. Under proposed conditions, for the 25 year, storm event, the culvert would not meet the requisite freeboard of 1.0 meter but the resulting headwater elevation would remain approximately 0.4 meters below the roadway edge of pavement. Similarly, under the 100 year and Regional storm events overtopping of the road will not occur as the resultant headwaters would remain at approximately 0.4 meters and 0.1 meters below the roadway edges of pavement respectively. The proposed culvert exceeds the minimum 1.5m span recommended by the fluvial geomorphic assessment.

Culvert WCB-09 – This culvert conveys flows along Tributary 'C' of Rogers Creek. An upgrade to the existing culvert (1.4m x 0.9m pipe arch) to an open bottom concrete box culvert of dimensions 6.0m x 1.5m is proposed which significantly increases the capacity of this watercourse. The proposed 6.0m span is a recommendation from the fluvial geomorphic assessment. Under proposed conditions, for the 25 year storm event, the resulting headwater elevation will meet the 1.0 metre freeboard requirement. Similarly, a resultant freeboard of 1.2 meters will be provided for the 100 year storm event. Under the Regional storm conditions the resultant freeboard will be 1.1 meters and overtopping of the roadway will not occur.

Culvert WCB-14 – This culvert was upgraded from a 450mm pipe to the minimum size open bottom concrete box culvert (1.8m x 0.9m). This significantly increases the capacity of this unnamed watercourse. Under proposed conditions, for the 25 year storm event, the resulting headwater elevation will greatly exceed the 1.0 meter freeboard requirement. Similarly, a resultant freeboard of 6.8 meters will be provided for both the 100 year and Regional storm events. Overtopping of the roadway will not occur. The proposed culvert exceeds the minimum 1.5m span recommended by the fluvial geomorphic assessment.

Culvert WCB-16 – This culvert was upgraded from a 750mm pipe to an open bottom concrete box culvert of dimensions 3.0m x 1.2m which significantly increases the capacity of this unnamed watercourse. The proposed 3.0m span is a recommendation from the fluvial geomorphic assessment. Under proposed conditions, for the 25 year storm event, the culvert will meet the requisite freeboard of 1.0 meter. Under the 100 year and Regional storm events overtopping of the road will not occur as the resultant headwaters would remain at approximately 1.0 meters and 0.6 meters below the roadway edges of pavement respectively.

3.3.2.3 Equalization Culvert

An equalization culvert is a culvert that is used to balance the elevation of water on both sides of a roadway crossing location. Typically, there is no positive drainage outlet (e.g. to a receiving watercourse) on either side of the crossing. As such, drainage is confined and water levels will fluctuate as a result of surface runoff and or changes to groundwater levels. There is one culvert in the study area (WCB-13) that functions as an equalization culvert allowing wetland flow to move from one side of the road to the other. This culvert was upgraded from a 400mm pipe to the minimum 600mm diameter pipe as per Region of Peel standards.

Table 3-4: Summary of Proposed Conditions Cross Culvert Hydraulic Performance

Drainage Area ID / Culvert ID	Existing Culvert Size	Proposed Culvert Size	Recommendation and Notes	Design Storm	CulvertMaster Calculations				
					Maximum Allowable Headwater Elevation	Calculated Headwater Elevation	Delta Headwater	Theoretical Tailwater Elevation	Critical Depth
	(mm)	(mm)		(years)	(m)	(m)	(m)	(m)	(m)
Olde Base Line Road									
OBL-01	450 CSP	Twin 600 CSP	Upgrade to twin 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements. The culvert location will also be shifted approximately 15m east in order to obtain adequate cover over the proposed pipe. Existing invert elevations will be maintained.	25	373.00	372.93	0.06	372.71	0.32
OBL-02	600 CSP	3000 x 1200 PRCONC	Tributary B of Rogers Creek. Upgrade to an open bottom 3000 mm x 1200 mm box culvert based on hydraulic analysis and fluvial geomorphic assessment. Upgrade will provide a major improvement over existing conditions.	25	373.19	373.53	-0.34	373.47	0.33
				100	374.19	373.57	0.62	373.49	0.38
				Regional	374.19	373.95	0.24	373.64	0.67
OBL-03	600 CSP	-	Maintain existing culvert. Hydraulic upgrade no longer required due to proposed vertical profile modifications.	25	372.58	370.23	2.35	369.62	0.46
OBL-04	3300 x 1200 PRCONC	-	Tributary A of Rogers Creek. Maintain existing concrete box culvert. Hydraulic / fluvial geomorphic upgrade not recommended due to good culvert condition and roadway vertical profile constraints.	25	370.23	370.30	-0.07	370.10	0.50
				100	371.23	370.52	0.71	370.18	0.65
				Regional	371.23	370.26	-1.03	370.45	1.20

Drainage Area ID / Culvert ID	Existing Culvert Size	Proposed Culvert Size	Recommendation and Notes	Design Storm	CultvertMaster Calculations: Maximum Allowable Headwater Elevation	Calculated Headwater Elevation	Delta Headwater	Theoretical Tailwater Elevation	Critical Depth
	(mm)	(mm)		(years)	(m)	(m)	(m)	(m)	(m)
OBL-05	450 CSP	600 CSP	Upgrade to 600 mm ∅ CSP based on minimum size requirements. Re-grade ditches.	25	372.41	372.31	0.10	372.07	0.30
OBL-06	450 PE	Twin 450 HDPE	Twin existing 450 mm ∅ culvert based on hydraulic analysis. Existing HDPE pipe was recently replaced, therefore maintain existing pipe and add second cell. Due to roadway vertical profile constraints upgrade to minimum size requirements (600 mm ∅) is not feasible.	25	372.13	372.14	-0.01	371.87	0.16
OBL-07	450 HDPE	-	Existing HDPE pipe was recently replaced, therefore maintain exiting pipe.	25	371.56	371.14	0.42	371.03	0.15
OBL-08	3050 x 1400 PRCONC	-	Maintain existing concrete box culvert. Tributary A of Second Creek. Hydraulic / fluvial geomorphic upgrade not recommended due to good culvert condition and roadway vertical profile constraints.	25	371.07	371.90	-0.83	371.36	0.94
				100	372.07	371.51	0.56	371.50	1.21
				Regional	372.07	385.56	-13.49	371.65	1.52
OBL-09	400 CSP	600 CSP	Upgrade to 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements. Re-grade ditches.	25	374.29	373.11	1.18	372.94	0.32
OBL-10	400 CSP	600 CSP	Upgrade to 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements.	25	374.43	373.89	0.54	373.81	0.19

Drainage Area ID / Culvert ID	Existing Culvert Size	Proposed Culvert Size	Recommendation and Notes	Design Storm	CulvertMaster Calculations				
					Maximum Allowable Headwater Elevation	Calculated Headwater Elevation	Delta Headwater	Theoretical Tailwater Elevation	Critical Depth
	(mm)	(mm)		(years)	(m)	(m)	(m)	(m)	(m)
OBL-11	400 CSP	Twin 600 CSP	Upgrade to twin 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements. Upgrade will provide a major improvement over existing conditions and eliminate potential overtopping of the roadway.	25	373.81	374.06	-0.25	373.43	0.44
Winston Churchill Boulevard									
WCB-01	Twin 250 CSP	N/A	Existing culverts to be removed, and replaced by DICB and sewer.	25	N/A				
WCB-02	400 CSP	Twin 400 CSP	Upgrade to twin 400 mm ∅ culvert based on hydraulic analysis. Maintain existing pipe and add additional cell. Due to vertical profile constraints upgrade to minimum size requirements (600 mm ∅) is not feasible. Flush and repair west end of existing culvert.	25	381.66	381.67	-0.01	381.49	0.28
WCB-03	400 CSP	Twin 400 CSP	Replace existing culvert with twin 400 mm ∅ culverts based on hydraulic analysis and condition assessment. Due to vertical profile constraints upgrade to minimum size requirements (600 mm ∅) is not feasible.	25	383.28	383.17	0.11	383.08	0.18
WCB-04	400 CSP	600 CSP	Upgrade to 600 mm ∅ culvert based on hydraulic analysis and minimum size requirements.	25	385.75	385.52	0.23	385.24	0.18

Drainage Area ID / Culvert ID	Existing Culvert Size (mm)	Proposed Culvert Size (mm)	Recommendation and Notes	Design Storm (years)	CulvertMaster Calculations: Maximum Allowable Headwater Elevation (m)	Calculated Headwater Elevation (m)	Delta Headwater (m)	Theoretical Tailwater Elevation (m)	Critical Depth (m)
WCB-05	400 CSP	600 CSP	Upgrade to 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements.	25	393.45	392.67	0.79	392.65	0.14
WCB-06	600 CSP	1800 x 600 PRCONC	Upgrade to an 1800 mm x 600 mm open bottom box culvert based on hydraulic analysis (exceeds fluvial geomorphic recommended span). Upgrade will provide a major improvement over existing conditions and eliminate potential overtopping of the roadway.	25	392.81	393.39	-0.58	393.35	0.17
				100	393.81	393.43	0.38	393.36	0.19
				Regional	393.81	393.68	0.13	393.44	0.36
WCB-07	400 CSP	700 CSP	Upgrade to 700 mm ∅ CSP based on hydraulic analysis and minimum size requirements.	25	394.12	394.00	0.12	393.54	0.50
WCB-08	600 PE	-	Maintain existing culvert. Hydraulic upgrade not required.	25	395.36	395.07	0.29	394.55	0.49
WCB-09	1400 x 900 CSPA	6000 x 1500 PRCONC	Upgrade to 6000 mm x 1500 mm open bottom box culvert based on fluvial geomorphic assessment	25	401.08	400.75	0.32	400.73	0.24
				100	402.08	400.89	1.19	400.75	0.28
				Regional	402.08	400.94	1.13	400.88	0.54
WCB-10	400 CSP	600 CSP	Upgrade to 600 mm ∅ CSP based on minimum size requirements.	25	418.35	418.11	0.24	417.82	0.28
WCB-11	400 CSP	600 CSP	Upgrade to 600 mm ∅ CSP based on minimum size requirements.	25	427.26	425.59	1.67	425.56	0.17
WCB-12	600 CSP	-	Maintain existing culvert and repair east end.	25	426.88	425.32	1.56	424.86	0.27

Drainage Area ID / Culvert ID	Existing Culvert Size	Proposed Culvert Size	Recommendation and Notes	Design Storm	CulvertMaster Calculations				
					Maximum Allowable Headwater Elevation	Calculated Headwater Elevation	Delta Headwater	Theoretical Tailwater Elevation	Critical Depth
	(mm)	(mm)		(years)	(m)	(m)	(m)	(m)	(m)
WCB-13	400 CSP	600 CSP	Upgrade to 600 mm ∅ CSP based on minimum size requirements.	-	Equalization Culvert				
WCB-14	450 CSP	1800 x 900 PRCONC	Upgrade to minimum 1800 mm x 900 mm open bottom box culvert based on CVC watercourse classification, fluvial geomorphic assessment and condition assessment.	25	426.55	419.69	5.86	419.69	0.3
				100	426.55	419.74	6.81	419.74	0.4
				Regional	426.55	419.79	6.76	419.79	0.5
WCB-15	450 CSP	600 CSP	Upgrade to 600 mm ∅ CSP based on minimum size requirements.	25	418.53	417.37	1.16	417.06	0.32
WCB-16	750 CSP	3000 x 1200 PRCONC	Upgrade to 300000 mm x 1200 mm open bottom box culvert based on fluvial geomorphic assessment and hydraulic analysis.	25	410.77	410.72	0.05	410.54	0.23
				100	411.77	410.79	0.98	410.56	0.26
				Regional	411.77	411.22	0.55	410.68	0.50
WCB-17	900 CSP	-	Maintain existing culvert.	25	410.15	409.69	0.46	409.18	0.63
WCB-18	900 CSP	-	Maintain existing culvert. Flush and remove debris based on condition assessment.	25	392.97	392.07	0.90	390.71	0.77

3.4 Driveway Culverts

Driveway / entrance culverts impacted by the proposed corridor improvements will be replaced by like sizes or upgraded as required to meet the minimum proposed sizing in compliance with Region of Peel Design Guidelines. The Region of Peel Design Guidelines stipulates that driveway / entrance culverts (i.e. ditch crossings) are to have a minimum 375mm diameter (inside diameter). Pipes are to be comprised of Corrugated Steel (CS), Polyethylene (PE) or an approved equivalent.

4. SUMMARY

The proposed improvements to Old Base Line Road and Winston Churchill Boulevard will result in the upgrading / modification / removal of seven (7) culverts on Olde Base Line Road and fourteen (14) culverts on Winston Churchill Boulevard. These recommendations will be confirmed during detailed design. A summary of the proposed culvert recommendations is presented in **Table 4-1**.

Table 4-1: Summary of Culvert Recommendations

Culvert ID	Recommendations
OBL-01	Upgrade to twin 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements. The culvert location will also be shifted approximately 15m east in order to obtain adequate cover over the proposed pipe. Existing invert elevations will be maintained.
OBL-02	Tributary B of Rogers Creek. Upgrade to 3000 x 1200 mm open bottom concrete box culvert based on fluvial geomorphic assessment and hydraulic analysis. Upgrade will provide a major improvement over existing conditions.
OBL-03	Maintain existing culvert. Hydraulic upgrade no longer required due to proposed vertical profile modifications.
OBL-04	Tributary A of Rogers Creek. Maintain existing (3300 x 1200mm) concrete box culvert. Hydraulic upgrade not feasible due to roadway vertical profile constraints.
OBL-05	Upgrade to 600 mm ∅ CSP based on minimum size requirements. Re-grade ditches.
OBL-06	Twin existing 450 mm ∅ culvert based on hydraulic analysis. Existing HDPE pipe was recently replaced, therefore maintain existing pipe and add second cell. Due to vertical profile constraints upgrade to minimum size requirements (600 mm ∅) is not feasible.
OBL-07	Existing HDPE pipe was recently replaced, therefore maintain existing pipe.
OBL-08	Maintain existing (3050 x 1400mm) concrete box culvert. Tributary A of Second Creek. Hydraulic upgrade not feasible due to roadway vertical profile constraints.
OBL-09	Upgrade to 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements. Re-grade ditches.
OBL-10	Upgrade to 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements.
OBL-11	Upgrade to twin 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements. Upgrade will provide a major improvement over existing conditions and eliminate potential overtopping of the roadway.
WCB-01	Existing culverts to be removed, and replaced by DICB and sewer.
WCB-02	Upgrade to twin 400 mm ∅ culvert based on hydraulic analysis. Maintain

Culvert ID	Recommendations
	existing pipe and add additional cell. Due to vertical profile constraints upgrade to minimum size requirements (600 mm ∅) is not feasible. Flush and repair west end of existing culvert.
WCB-03	Replace existing culvert with twin 400 mm ∅ culverts based on hydraulic analysis and condition assessment. Due to vertical profile constraints upgrade to minimum size requirements (600 mm ∅) is not feasible.
WCB-04	Upgrade to 600 mm ∅ culvert based on hydraulic analysis and minimum size requirements.
WCB-05	Upgrade to 600 mm ∅ CSP based on hydraulic analysis and minimum size requirements.
WCB-06	Unnamed watercourse. Upgrade to 1800 x 600 mm open bottom concrete box culvert based on hydraulic analysis. Upgrade will provide a major improvement over existing conditions and eliminate potential overtopping of the roadway.
WCB-07	Upgrade to 700 mm ∅ CSP based on hydraulic analysis and minimum size requirements.
WCB-08	Maintain existing culvert. Hydraulic upgrade not required.
WCB-09	Tributary C of Rogers Creek. Upgrade to 6000 x 1500 mm open bottom concrete box culvert based on fluvial geomorphic assessment.
WCB-10	Upgrade to 600 mm ∅ CSP based on minimum size requirements.
WCB-11	Upgrade to 600 mm ∅ CSP based on minimum size requirements.
WCB-12	Maintain existing culvert and repair east end.
WCB-13	Upgrade to 600 mm ∅ CSP based on minimum size requirements.
WCB-14	Unnamed watercourse. Upgrade to 1800 x 900 mm open bottom box culvert based on CVC watercourse classification, fluvial geomorphic assessment and culvert condition assessment.
WCB-15	Upgrade to 600 mm ∅ CSP based on minimum size requirements.
WCB-16	Unnamed watercourse. Upgrade to 3000 x 1200 mm open bottom concrete box culvert based on fluvial geomorphic assessment and hydraulic analysis.
WCB-17	Maintain existing culvert.
WCB-18	Maintain existing culvert. Flush and remove debris based on condition assessment.

5. NEXT STEPS

The next steps include development and completion of a Stormwater Management Plan.

Stormwater Management Practices (SWMP's) for the management of roadway runoff generally fall into two categories; those that address water quantity and those that manage water quality of surface runoff. Water quantity management issues relate to properly sizing watercourse crossings of the roadway corridor, as well as the conveyance of roadway runoff along the roadway corridor for minor and major storm events. In addition, water quantity management strategies can include the need for facilities to address downstream flood and erosion potential from the development (expansion) of the roadway right-of-way.

In terms of water quality, the SWMP's relate to the treatment of new pavement and where possible, the treatment of existing pavement; however, current legislation solely relates to the former. Typically, the treatment level is related to the standards defined in the watershed or sub-watershed planning study, which are dependant on the quality and sensitivity of the receiving stream system.

Various Best management practices or Stormwater Management practices are available to address both the quantity and quality of runoff from roadways. Due to the linear nature of roadway corridors, however, the full spectrum of stormwater management practices is typically not appropriate.

There are a number of SWMP's which can be used to treat runoff and / or control peak flows from roadway surfaces. These include the following:

- Wet ponds / wetlands / hybrids (generally linear facilities);
- Grassed swales;
- Oil-grit separators;
- Off-site stormwater management facilities; and
- Cash-in-lieu of on-site treatment.

The applicability of these SWMP's will be reviewed and appropriate measures identified to minimize potential water quantity and quality impacts related to the proposed road corridor improvements.

6. REFERENCES

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Dillon Consulting Limited, *Bush Street and Mississauga Road Class EA Existing Conditions Drainage Report - Draft,* June 2010.

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Regional Municipality of Peel, *Public Works Design, Specifications and Procedures Manual – Storm Sewer Design*, July 2009.

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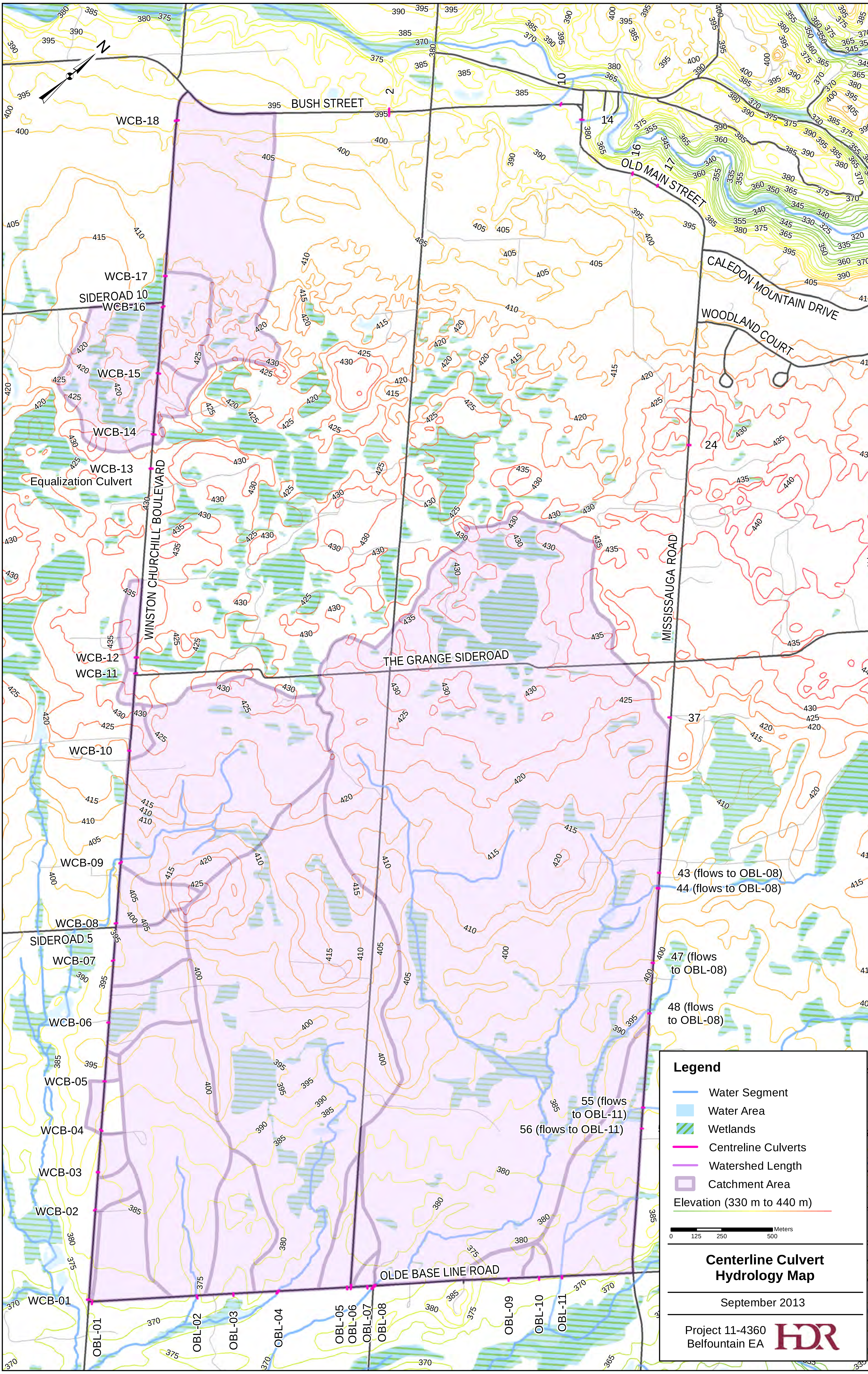
Credit Valley Conservation (CVC), *CVC Standard Parameters – Appendix B*.

Soil Survey of Peel County, Ontario 1953, Report No. 18 of the Ontario Soil Survey. Canada Department of Agriculture, Ottawa. Ontario Agricultural College, Guelph.

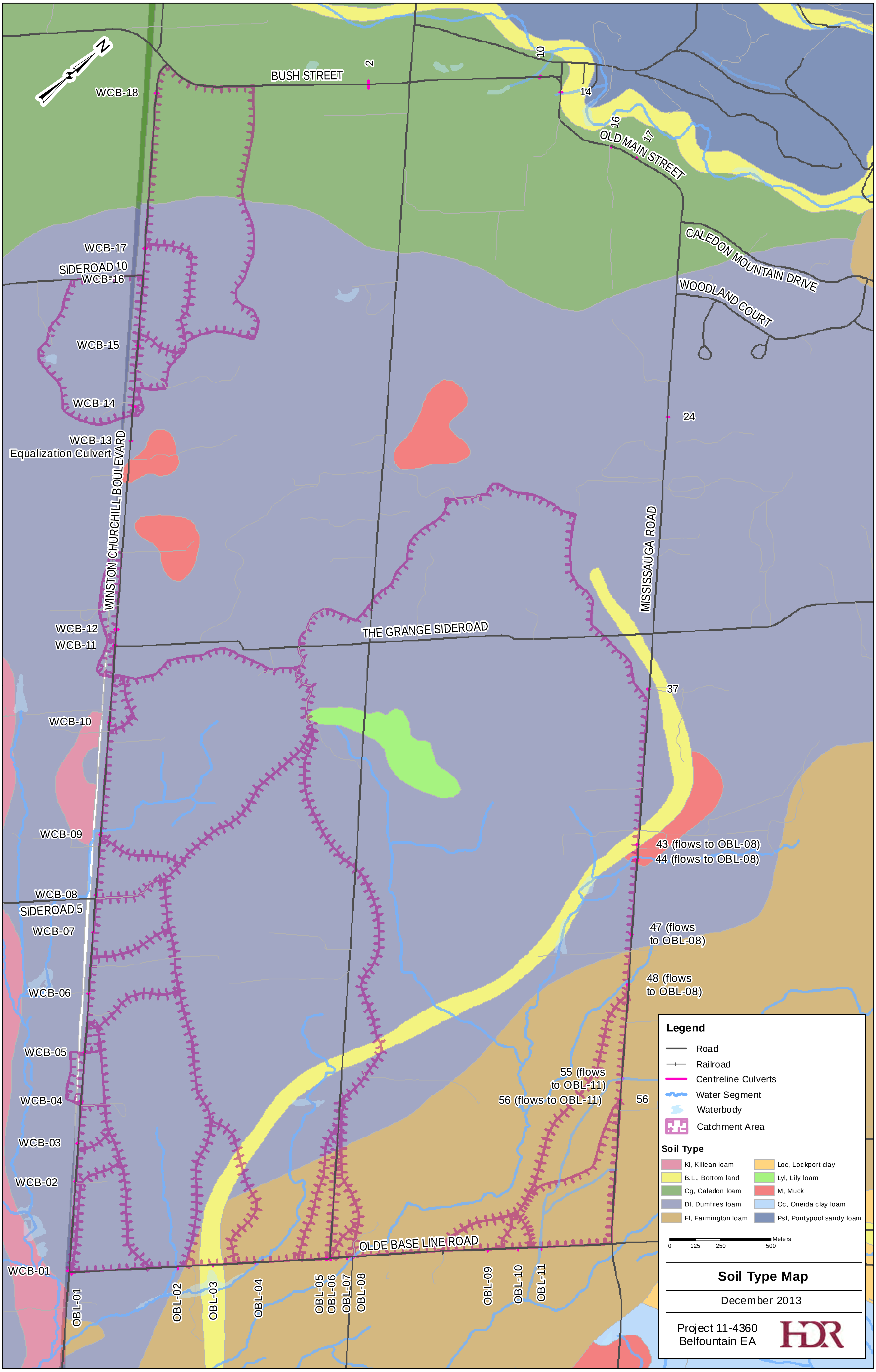
Experimental Farms Service, Dominion Department of Agriculture, Ottawa, *Soil Survey of Peel County, Ontario, Report No. 18*, 1953.

Appendix A
Hydrology Map



N
BUSH STREET
OLD MAIN STREET
CALEDON MOUNTAIN DRIVE
WOODLAND COURT
SIDEROAD 10
WINSTON CHURCHILL BOULEVARD
MISSISSAUGA ROAD
THE GRANGE SIDEROAD
SIDEROAD 5
OLDE BASE LINE ROAD
WCB-18
WCB-17
WCB-16
WCB-15
WCB-14
WCB-13
Equalization Culvert
WCB-12
WCB-11
WCB-10
WCB-09
WCB-08
WCB-07
WCB-06
WCB-05
WCB-04
WCB-03
WCB-02
WCB-01
2
10
14
16
17
24
37
43 (flows to OBL-08)
44 (flows to OBL-08)
47 (flows to OBL-08)
48 (flows to OBL-08)
55 (flows to OBL-11)
56 (flows to OBL-11)
OBL-01
OBL-02
OBL-03
OBL-04
OBL-05
OBL-06
OBL-07
OBL-08
OBL-09
OBL-10
OBL-11
Legend
Water Segment
Water Area
Wetlands
Centreline Culverts
Watershed Length
Catchment Area
Elevation (330 m to 440 m)
0 125 250 500 Meters
Centerline Culvert Hydrology Map
September 2013
Project 11-4360
Belfountain EA

Appendix B
Soils Map



N
BUSH STREET
2
10
14
16
17
OLD MAIN STREET
CALEDON MOUNTAIN DRIVE
WOODLAND COURT
WCB-18
WCB-17
SIDEROAD 10
WCB-16
WCB-15
WCB-14
WCB-13
Equalization Culvert
WINSTON CHURCHILL BOULEVARD
24
MISSISSAUGA ROAD
WCB-12
WCB-11
THE GRANGE SIDEROAD
37
WCB-10
WCB-09
43 (flows to OBL-08)
44 (flows to OBL-08)
WCB-08
SIDEROAD 5
WCB-07
47 (flows to OBL-08)
48 (flows to OBL-08)
WCB-06
WCB-05
55 (flows to OBL-11)
56 (flows to OBL-11)
56
WCB-04
WCB-03
WCB-02
WCB-01
OLDE BASE LINE ROAD
OBL-01
OBL-02
OBL-03
OBL-04
OBL-05
OBL-06
OBL-07
OBL-08
OBL-09
OBL-10
OBL-11
Legend
Road
Railroad
Centreline Culverts
Water Segment
Waterbody
Catchment Area
Soil Type
Kl, Killean loam
B.L., Bottom land
Cg, Caledon loam
Dl, Dumfries loam
Fl, Farmington loam
Loc, Lockport clay
Lyl, Lily loam
M, Muck
Oc, Oneida clay loam
Psl, Pontypool sandy loam
Meters
0 125 250 500
Soil Type Map
December 2013
Project 11-4360
Belfountain EA
HDR

Appendix C
Hydrologic Calculations

Appendix C.1.

Time of Concentration & Peak Design Flow Calculations

OBL-01: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient: 0.28

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
OBL-01	OBL-01	12.65	715	1.678	12.0	0.22	0.475	1.004	0.256	0.084
								Used		

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OBL-01: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	12.65	3.54
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	12.65	3.54

Compute Composite C => 0.28

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 60.25 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 48.69 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.28 co-efficient
A= 12.65 ha
i= 48.69 mm/hr

Compute design flow: Q= 0.479 m3/s

OBL-02: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.32

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
OBL-02	OBL-02	53.32	1650	1.697	28.0	0.23	0.948	1.437	0.446	0.159
								Used		

<<<input data in these squares only

OBL-02: Peak Flow Calculation (2 Year Storm Event)

Composite Runoff Coefficient "C"

Project:	Belfountain EA
Project No.:	6776
Date:	3-Apr-14
Modelled by:	CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	70	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	37.32	13.06
2	15	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	8.00	2.24
3	15	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	8.00	2.00
Total	100.00		**Total Area**	53.32	17.30

Compute Composite C => 0.32

<<<input data in these squares only

Rainfall Intensity (i)

A= 701.618
B= 6.014
C= 0.796

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 86.25 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 19.14 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.32 co-efficient
A= 53.32 ha
i= 19.14 mm/hr

Compute design flow: Q= 0.921 m3/s

OBL-02: Peak Flow Calculation (5 Year Storm Event)

Composite Runoff Coefficient "C"

Project:	Belfountain EA
Project No.:	6776
Date:	3-Apr-14
Modelled by:	CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	70	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	37.32	13.06
2	15	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	8.00	2.24
3	15	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	8.00	2.00
Total	100.00		**Total Area**	53.32	17.30

Compute Composite C => 0.32

<<<input data in these squares only

Rainfall Intensity (i)

A= 1025.002
B= 7.559
C= 0.804

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 86.25 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 26.61 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.32 co-efficient
A= 53.32 ha
i= 26.61 mm/hr

Compute design flow: Q= 1.280 m3/s

OBL-02: Peak Flow Calculation (10 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	70	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	37.32	13.06
2	15	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	8.00	2.24
3	15	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	8.00	2.00
Total	100.00		**Total Area**	53.32	17.30

Compute Composite C => 0.32

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Rainfall Intensity (i)

A= 1231.993
B= 7.975
C= 0.809

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 86.25 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 31.15 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.32 co-efficient
A= 53.32 ha
i= 31.15 mm/hr

Compute design flow: Q= 1.499 m3/s

OBL-02: Peak Flow Calculation (25 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	70	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	37.32	13.06
2	15	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	8.00	2.24
3	15	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	8.00	2.00
Total	100.00		**Total Area**	53.32	17.30

Compute Composite C => 0.32

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Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 86.25 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 37.43 mm/hr
$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.32 co-efficient
A= 53.32 ha
i= 37.43 mm/hr

Compute design flow: Q= 1.800 m3/s

OBL-02: Peak Flow Calculation (50 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	70	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	37.32	13.06
2	15	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	8.00	2.24
3	15	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	8.00	2.00
Total	100.00		**Total Area**	53.32	17.30

Compute Composite C => 0.32

<<<input data in these squares only

Rainfall Intensity (i)

A= 1931.219
B= 10.5
C= 0.836

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 86.25 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 42.25 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.32 co-efficient
A= 53.32 ha
i= 42.25 mm/hr

Compute design flow: Q= 2.032 m3/s

OBL-02: Peak Flow Calculation (100 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	70	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	37.32	13.06
2	15	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	8.00	2.24
3	15	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	8.00	2.00
Total	100.00		**Total Area**	53.32	17.30

Compute Composite C => 0.32

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Rainfall Intensity (i)

A= 2147.367
B= 10.512
C= 0.839

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 86.25 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 46.33 mm/hr

$I_x = A^*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.32 co-efficient
A= 53.32 ha
i= 46.33 mm/hr

Compute design flow: Q= 2.229 m3/s

OBL-03: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient: 0.25

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
OBL-03	OBL-03	15.10	770	1.905	14.7	0.28	0.490	1.041	0.258	0.088
								Used		

<<<input data in these squares only

OBL-03: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	98	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	14.80	3.70
2	2	Lakes and Wetlands (Ref. MTO Design Chart 1.07)	0.05	0.30	0.02
				0.00	0.00
Total	100.00		**Total Area**	15.10	3.71

Compute Composite C => 0.25

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 62.46 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 47.45 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.25 co-efficient
A= 15.10 ha
i= 47.45 mm/hr

Compute design flow: Q= 0.490 m3/s

OBL-05: Time of Concentration

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.28

Upland Method

Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
OBL-05	OBL-05	5.73	635	1.470	9.3	0.17	0.469	0.989	0.200	0.076
								Used		

<<<input data in these squares only

OBL-05: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	5.73	1.60
2				0.00	0.00
3				0.00	0.00
Total	100.00		**Total Area**	5.73	1.60

Compute Composite C => 0.28

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 59.32 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 49.24 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.28 co-efficient
A= 5.73 ha
i= 49.24 mm/hr

Compute design flow: Q= 0.220 m3/s

OBL-06: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.27

Upland Method   Other Equations

							Bransby Williams (Use if C > 0.4)	Airport (Use if C < 0.4)	Hyns	Kirpich
Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Tc (hr)	Tc (hr)	Tc (hr)	Tc (hr)
OBL-06	OBL-06	3.86	1070	1.246	13.3	0.10	0.850	1.375	0.185	0.114

Used

<<<input data in these squares only

OBL-06: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	40	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	1.54	0.39
2	60	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	2.32	0.65
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	3.86	1.03

Compute Composite C => 0.27

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 82.51 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 38.69 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.27 co-efficient
A= 3.86 ha
i= 38.69 mm/hr

Compute design flow: Q= 0.111 m3/s

OBL-07: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.25

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
OBL-07	OBL-07	1.12	185	0.721	1.3	-0.14	0.186	0.700	0.147	0.030
								Used		

<<<input data in these squares only

OBL-07: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	1.12	0.28
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	1.12	0.28

Compute Composite C => 0.25

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 41.99 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 62.66 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.25 co-efficient
A= 1.12 ha
i= 62.66 mm/hr

Compute design flow: Q= 0.049 m3/s

OBL-09: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.30

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
OBL-09	OBL-09	3.75	230	2.319	5.3	0.37	0.162	0.499	0.137	0.035
								Used		

<<<input data in these squares only

OBL-09: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project:	Belfountain EA
Project No.:	6776
Date:	9-Oct-13
Modelled by:	CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	3.75	1.13
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	3.75	1.13

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 29.97 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 78.15 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 3.75 ha
i= 78.15 mm/hr

Compute design flow: Q= 0.244 m3/s

OBL-10: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.25

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
OBL-10	OBL-10	1.56	175	3.048	5.3	0.48	0.127	0.423	0.086	0.028
								Used		

<<<input data in these squares only

OBL-10: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	1.56	0.39
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	1.56	0.39

Compute Composite C => 0.25

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 25.38 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 86.60 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.25 co-efficient
A= 1.56 ha
i= 86.60 mm/hr

Compute design flow: Q= 0.094 m3/s

OBL-11: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.26

Upland Method

Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
OBL-11	OBL-11	32.95	1355	1.771	24.0	0.25	0.810	1.399	0.362	0.137
								Used		

<<<input data in these squares only

OBL-11: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	50	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	16.48	4.94
2	40	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	13.18	3.30
3	10	Lakes and Wetlands (Ref. MTO Design Chart 1.07)	0.05	3.30	0.16
				0.00	0.00
Total	100.00		**Total Area**	32.95	8.40

Compute Composite C => 0.26

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 83.97 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 38.19 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.26 co-efficient
A= 32.95 ha
i= 38.19 mm/hr

Compute design flow: Q= 0.892 m3/s

WCB-01: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient: 0.28

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-01	WCB-01	1.00	460	1.739	8.0	0.24	0.391	0.796	0.094	0.059

Used

<<<input data in these squares only

WCB-01: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project:	Belfountain EA
Project No.:	6776
Date:	9-Oct-13
Modelled by:	CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	1.00	0.28
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	1.00	0.28

Compute Composite C => 0.28

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 47.76 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 57.36 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.28 co-efficient
A= 1.00 ha
i= 57.36 mm/hr

Compute design flow: Q= 0.045 m3/s

WCB-02: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.29

Upland Method Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-02	WCB-02	3.08	270	0.988	2.7	-0.01	0.230	0.723	0.188	0.039
								Used		

<<<input data in these squares only

WCB-02: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	80	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	2.46	0.69
	20	Cultivated, flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	0.62	0.22
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	3.08	0.91

Compute Composite C => 0.29

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 43.35 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 61.31 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.29 co-efficient
A= 3.08 ha
i= 61.31 mm/hr

Compute design flow: Q= 0.154 m3/s

WCB-03: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient: 0.35

Upland Method | Other Equations

							Bransby Williams (Use if C > 0.4)	Airport (Use if C < 0.4)	Hyns	Kirpich
Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Tc (hr)	Tc (hr)	Tc (hr)	Tc (hr)
WCB-03	WCB-03	2.60	290	0.460	1.3	-0.34	0.292	0.897	0.250	0.042
								Used		

<<<input data in these squares only

WCB-03: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Cultivated, flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	2.60	0.91
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	2.60	0.91

Compute Composite C => 0.35

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 53.81 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 52.78 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.35 co-efficient
A= 2.60 ha
i= 52.78 mm/hr

Compute design flow: Q= 0.134 m3/s

WCB-04: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.25

Upland Method   Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-04	WCB-04	1.70	255	2.092	5.3	0.32	0.198	0.578	0.106	0.038
								Used		

<<<input data in these squares only

WCB-04: Peak Design Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	1.70	0.43
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	1.70	0.43

Compute Composite C => 0.25

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 34.69 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 71.15 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.25 co-efficient
A= 1.70 ha
i= 71.15 mm/hr

Compute design flow: Q= 0.084 m3/s

WCB-05: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient: 0.25

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-05	WCB-05	0.90	150	1.778	2.7	0.25	0.128	0.468	0.089	0.025
								Used		

<<<input data in these squares only

WCB-05: Peak Design Flow

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	0.90	0.23
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	0.90	0.23

Compute Composite C => 0.25

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 28.07 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 81.41 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.25 co-efficient
A= 0.90 ha
i= 81.41 mm/hr

Compute design flow: Q= 0.051 m3/s

WCB-06: Time of Concentration Calculation

Project:	Belfountain EA
Project No.:	6776
Date:	9-Oct-13
Modelled by:	CK

Enter runoff coefficient 0.23

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-06	WCB-06	11.96	510	1.569	8.0	0.20	0.345	0.920	0.258	0.064
								Used		

<<<input data in these squares only

WCB-06: Peak Flow Calculation (2 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	45	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	5.38	1.35
2	30	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.59	1.26
3	25	Lakes and Wetlands (Ref. MTO Design Chart 1.07)	0.05	2.99	0.15
				0.00	0.00
Total	100.00		**Total Area**	11.96	2.75

Compute Composite C => 0.23

<<<input data in these squares only

Rainfall Intensity (i)

A= 701.618
B= 6.014
C= 0.796

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 55.21 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 26.53 mm/hr

$I_x = A^*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 11.96 ha
i= 26.53 mm/hr

Compute design flow: Q= 0.203 m3/s

WCB-06: Peak Flow Calculation (5 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	45	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	5.38	1.35
2	30	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.59	1.26
3	25	Lakes and Wetlands (Ref. MTO Design Chart 1.07)	0.05	2.99	0.15
				0.00	0.00
Total	100.00		**Total Area**	11.96	2.75

Compute Composite C => 0.23

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Rainfall Intensity (i)

A= 1025.002
B= 7.559
C= 0.804

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 55.21 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 36.76 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 11.96 ha
i= 36.76 mm/hr

Compute design flow: Q= 0.281 m3/s

WCB-06: Peak Flow Calculation (10 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	45	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	5.38	1.35
2	30	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.59	1.26
3	25	Lakes and Wetlands (Ref. MTO Design Chart 1.07)	0.05	2.99	0.15
				0.00	0.00
Total	100.00		**Total Area**	11.96	2.75

Compute Composite C => 0.23

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Rainfall Intensity (i)

A= 1231.993
B= 7.975
C= 0.809

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 55.21 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 43.05 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 11.96 ha
i= 43.05 mm/hr

Compute design flow: Q= 0.329 m3/s

WCB-06: Peak Flow Calculation (25 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	45	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	5.38	1.35
2	30	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.59	1.26
3	25	Lakes and Wetlands (Ref. MTO Design Chart 1.07)	0.05	2.99	0.15
				0.00	0.00
Total	100.00		**Total Area**	11.96	2.75

Compute Composite C => 0.23

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Rainfall Intensity (i)

A= 1649.671
B= 9.457
C= 0.83
tc= 55.21 mins (Airport Formula) *Change cell based on method*

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

Compute Intensity i= 51.83 mm/hr

$I_x = A^*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 11.96 ha
i= 51.83 mm/hr

Compute design flow: Q= 0.396 m3/s

WCB-06: Peak Flow Calculation (50 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	45	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	5.38	1.35
2	30	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.59	1.26
3	25	Lakes and Wetlands (Ref. MTO Design Chart 1.07)	0.05	2.99	0.15
				0.00	0.00
Total	100.00		**Total Area**	11.96	2.75

Compute Composite C => 0.23

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Rainfall Intensity (i)

A= 1931.219
B= 10.5
C= 0.836
A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)
tc= 55.21 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 58.39 mm/hr
$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 11.96 ha
i= 58.39 mm/hr

Compute design flow: Q= 0.446 m3/s

WCB-06: Peak Flow Calculation (100 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	45	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	5.38	1.35
2	30	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.59	1.26
3	25	Lakes and Wetlands (Ref. MTO Design Chart 1.07)	0.05	2.99	0.15
				0.00	0.00
Total	100.00		**Total Area**	11.96	2.75

Compute Composite C => 0.23

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Rainfall Intensity (i)

A= 2147.367
B= 10.512
C= 0.839

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 55.21 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 64.10 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 11.96 ha
i= 64.10 mm/hr

Compute design flow: Q= 0.490 m3/s

WCB-07: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 19-Dec-13
Modelled by: AR

Enter runoff coefficient: 0.35

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-07	WCB-07	9.86	650	4.103	26.7	0.61	0.370	0.652	0.154	0.078
								Used		

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WCB-07: Peak Design Flow Calculation

Composite Runoff Coefficient "C"

Project:	Belfountain EA
Project No.:	6776
Date:	19-Dec-13
Modelled by:	AR

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	40	Woodland hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.94	1.38
2	60	Cultivated flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	5.92	2.07
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	9.86	3.45

Compute Composite C => 0.35

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Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 39.12 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 65.71 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.35 co-efficient
A= 9.86 ha
i= 65.71 mm/hr

Compute design flow: Q= 0.630 m3/s

WCB-08: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.33

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-08	WCB-08	7.22	440	8.182	36.0	0.91	0.225	0.440	0.099	0.057
								Used		

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WCB-08: Peak Design Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	25	Pasture hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.40	1.81	0.72
2	25	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	1.81	0.63
3	50	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	3.61	1.01
				0.00	0.00
Total	100.00		**Total Area**	7.22	2.36

Compute Composite C => 0.33

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Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 26.40 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 84.55 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.33 co-efficient
A= 7.22 ha
i= 84.55 mm/hr

Compute design flow: Q= 0.556 m3/s

WCB-09: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 19-Dec-13
Modelled by: AR

Enter runoff coefficient 0.26

Upland Method

Other Equations

							Bransby Williams (Use if C > 0.4)	Airport (Use if C < 0.4)	Hyns	Kirpich
Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Tc (hr)	Tc (hr)	Tc (hr)	Tc (hr)
WCB-09	WCB-09	75.48	1200	1.889	22.7	0.28	0.651	1.282	0.486	0.124
								Used		

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WCB-09: Peak Flow Calculation (2 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	25	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	18.87	4.72
2	20	Pasture hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.40	15.10	6.04
3	30	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	22.64	7.93
4	25	Lakes and wetlands (Ref: MTO Design Chart 1.07)	0.05	18.87	0.94
Total	100.00		**Total Area**	75.48	19.62

Compute Composite C **=>** 0.26

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Rainfall Intensity (i)

A= 701.618
B= 6.014
C= 0.796

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 76.90 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 20.84 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.26 co-efficient
A= 75.48 ha
i= 20.84 mm/hr

Compute design flow: Q= 1.137 m3/s

WCB-09: Peak Flow Calculation (5 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	25	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	18.87	4.72
2	20	Pasture hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.40	15.10	6.04
3	30	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	22.64	7.93
4	25	Lakes and wetlands (Ref: MTO Design Chart 1.07)	0.05	18.87	0.94
Total	100.00		**Total Area**	75.48	19.62

Compute Composite C => 0.26

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Rainfall Intensity (i)

A= 1025.002
B= 7.559
C= 0.804

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 76.90 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 28.95 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.26 co-efficient
A= 75.48 ha
i= 28.95 mm/hr

Compute design flow: Q= 1.580 m3/s

WCB-09: Peak Flow Calculation (10 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	25	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	18.87	4.72
2	20	Pasture hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.40	15.10	6.04
3	30	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	22.64	7.93
4	25	Lakes and wetlands (Ref: MTO Design Chart 1.07)	0.05	18.87	0.94
Total	100.00		**Total Area**	75.48	19.62

Compute Composite C => 0.26

<<<input data in these squares only

Rainfall Intensity (i)

A=	1231.993	*A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)*
B=	7.975	
C=	0.809	
tc=	76.90	mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 33.90 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.26 co-efficient
A= 75.48 ha
i= 33.90 mm/hr

Compute design flow: Q= 1.850 m3/s

WCB-09: Peak Flow Calculation (25 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	25	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	18.87	4.72
2	20	Pasture hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.40	15.10	6.04
3	30	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	22.64	7.93
4	25	Lakes and wetlands (Ref: MTO Design Chart 1.07)	0.05	18.87	0.94
Total	100.00		**Total Area**	75.48	19.62

Compute Composite C => 0.26

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 76.90 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 40.76 mm/hr
$I_x = A^*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.26 co-efficient
A= 75.48 ha
i= 40.76 mm/hr

Compute design flow: Q= 2.224 m3/s

WCB-09: Peak Flow Calculation (50 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	25	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	18.87	4.72
2	20	Pasture hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.40	15.10	6.04
3	30	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	22.64	7.93
4	25	Lakes and wetlands (Ref: MTO Design Chart 1.07)	0.05	18.87	0.94
Total	100.00		**Total Area**	75.48	19.62

Compute Composite C => 0.26

<<<input data in these squares only

Rainfall Intensity (i)

A= 1931.219
B= 10.5
C= 0.836

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 76.90 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 46.00 mm/hr

$I_x = A^*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.26 co-efficient
A= 75.48 ha
i= 46.00 mm/hr

Compute design flow: Q= 2.509 m3/s

WCB-09: Peak Flow Calculation (100 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	25	Woodland flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.25	18.87	4.72
2	20	Pasture hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.40	15.10	6.04
3	30	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	22.64	7.93
4	25	Lakes and wetlands (Ref: MTO Design Chart 1.07)	0.05	18.87	0.94
Total	100.00		**Total Area**	75.48	19.62

Compute Composite C => 0.26

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Rainfall Intensity (i)

A= 2147.367
B= 10.512
C= 0.839

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 76.90 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 50.46 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.26 co-efficient
A= 75.48 ha
i= 50.46 mm/hr

Compute design flow: Q= 2.753 m3/s

WCB-10: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.35

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-10	WCB-10	2.15	240	4.444	10.7	0.65	0.157	0.386	0.082	0.036
								Used		

<<<input data in these squares only

WCB-10: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	2.15	0.75
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	2.15	0.75

Compute Composite C => 0.35

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 23.15 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 91.48 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.35 co-efficient
A= 2.15 ha
i= 91.48 mm/hr

Compute design flow: Q= 0.191 m3/s

WCB-11: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.28

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-11	WCB-11	1.05	170	2.353	4.0	0.37	0.135	0.438	0.083	0.028
								Used		

<<<input data in these squares only

WCB-11: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	1.05	0.29
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	1.05	0.29

Compute Composite C => 0.28

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 26.28 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 84.78 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.28 co-efficient
A= 1.05 ha
i= 84.78 mm/hr

Compute design flow: Q= 0.069 m3/s

WCB-12: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient: 0.30

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-12	WCB-12	3.34	380	1.754	6.7	0.24	0.286	0.703	0.149	0.051
								Used		

<<<input data in these squares only

WCB-12: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project:	Belfountain EA
Project No.:	6776
Date:	9-Oct-13
Modelled by:	CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	70	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	2.34	0.65
2	30	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	1.00	0.35
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	3.34	1.01

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*

B= 9.457 *Chicago Storm, 25-year*

C= 0.83

tc= 42.18 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 62.47 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient

A= 3.34 ha

i= 62.47 mm/hr

Compute design flow: Q= 0.175 m3/s

WCB-14: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.30

Upland Method

Other Equations

							Bransby Williams (Use if C > 0.4)	Airport (Use if C < 0.4)	Hyns	Kirpich
Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Tc (hr)	Tc (hr)	Tc (hr)	Tc (hr)
WCB-14	WCB-14	0.50	100	2.667	2.7	0.43	0.084	0.314	0.059	0.018
								Used		

<<<input data in these squares only

WCB-14: Peak Flow Calculation (2 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-May-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	0.50	0.15
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	0.50	0.15

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 701.618
B= 6.014
C= 0.796

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 18.87 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 54.32 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 0.50 ha
i= 54.32 mm/hr

Compute design flow: Q= 0.023 m3/s

WCB-14: Peak Flow Calculation (5 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-May-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	0.50	0.15
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	0.50	0.15

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 1025.002
B= 7.559
C= 0.804

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 18.87 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 73.69 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 0.50 ha
i= 73.69 mm/hr

Compute design flow: Q= 0.031 m3/s

WCB-14: Peak Flow Calculation (10 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-May-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	0.50	0.15
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	0.50	0.15

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 1231.993
B= 7.975
C= 0.809

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 18.87 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 86.04 mm/hr

$I_x = A^*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 0.50 ha
i= 86.04 mm/hr

Compute design flow: Q= 0.036 m3/s

WCB-14: Peak Flow Calculation (25 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	0.50	0.15
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	0.50	0.15

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 18.87 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 102.82 mm/hr
$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 0.50 ha
i= 102.82 mm/hr

Compute design flow: Q= 0.043 m3/s

WCB-14: Peak Flow Calculation (50 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-May-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	0.50	0.15
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	0.50	0.15

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 1931.219
B= 10.5
C= 0.836

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 18.87 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 114.47 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 0.50 ha
i= 114.47 mm/hr

Compute design flow: Q= 0.048 m3/s

WCB-14: Peak Flow Calculation (100 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-May-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	0.50	0.15
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	0.50	0.15

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 2147.367
B= 10.512
C= 0.839

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 18.87 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 125.95 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 0.50 ha
i= 125.95 mm/hr

Compute design flow: Q= 0.053 m3/s

WCB-15: Time of Concentration Calculation

Project:	Belfountain EA
Project No.:	6776
Date:	9-Oct-13
Modelled by:	CK

Enter runoff coefficient 0.30

Upland Method   Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-15	WCB-15	3.89	260	2.564	6.7	0.41	0.179	0.514	0.133	0.038
								Used		

<<<input data in these squares only

WCB-15: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	100	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	3.89	1.17
				0.00	0.00
				0.00	0.00
				0.00	0.00
Total	100.00		**Total Area**	3.89	1.17

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 30.82 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 76.77 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 3.89 ha
i= 76.77 mm/hr

Compute design flow: Q= 0.249 m3/s

WCB-16: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.23

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-16	WCB-16	32.33	920	3.333	30.7	0.52	0.485	0.964	0.269	0.101
								Used		

<<<input data in these squares only

WCB-16: Peak Flow Calculation (2 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	60	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	19.40	5.82
2	10	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.23	1.13
3	30	Lakes and Wetlands (Ref: MTO Design Chart 1.07)	0.05	9.70	0.48
				0.00	0.00
Total	100.00		**Total Area**	32.33	7.44

Compute Composite C => 0.23

<<<input data in these squares only

Rainfall Intensity (i)

A= 701.618
B= 6.014
C= 0.796

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 57.82 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 25.66 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 32.33 ha
i= 25.66 mm/hr

Compute design flow: Q= 0.530 m3/s

WCB-16: Peak Flow Calculation (5 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	60	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	19.40	5.82
2	10	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.23	1.13
3	30	Lakes and Wetlands (Ref: MTO Design Chart 1.07)	0.05	9.70	0.48
				0.00	0.00
Total	100.00		**Total Area**	32.33	7.44

Compute Composite C => 0.23

<<<input data in these squares only

Rainfall Intensity (i)

A= 1025.002
B= 7.559
C= 0.804

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 57.82 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 35.57 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 32.33 ha
i= 35.57 mm/hr

Compute design flow: Q= 0.735 m3/s

WCB-16: Peak Flow Calculation (10 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	60	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	19.40	5.82
2	10	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.23	1.13
3	30	Lakes and Wetlands (Ref: MTO Design Chart 1.07)	0.05	9.70	0.48
				0.00	0.00
Total	100.00		**Total Area**	32.33	7.44

Compute Composite C => 0.23

<<<input data in these squares only

Rainfall Intensity (i)

A= 1231.993
B= 7.975
C= 0.809

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 57.82 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 41.66 mm/hr

$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 32.33 ha
i= 41.66 mm/hr

Compute design flow: Q= 0.861 m3/s

WCB-16: Peak Flow Calculation (25 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	60	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	19.40	5.82
2	10	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.23	1.13
3	30	Lakes and Wetlands (Ref: MTO Design Chart 1.07)	0.05	9.70	0.48
				0.00	0.00
Total	100.00		**Total Area**	32.33	7.44

Compute Composite C => 0.23

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 57.82 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 50.15 mm/hr
$I_x = A*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 32.33 ha
i= 50.15 mm/hr

Compute design flow: Q= 1.037 m3/s

WCB-16: Peak Flow Calculation (50 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	60	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	19.40	5.82
2	10	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.23	1.13
3	30	Lakes and Wetlands (Ref: MTO Design Chart 1.07)	0.05	9.70	0.48
				0.00	0.00
Total	100.00		**Total Area**	32.33	7.44

Compute Composite C => 0.23

<<<input data in these squares only

Rainfall Intensity (i)

A= 1931.219
B= 10.5
C= 0.836

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 57.82 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 56.51 mm/hr

$I_x = A^*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 32.33 ha
i= 56.51 mm/hr

Compute design flow: Q= 1.168 m3/s

WCB-16: Peak Flow Calculation (100 Year Storm Event)

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 3-Apr-14
Modelled by: CH

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	60	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	19.40	5.82
2	10	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	3.23	1.13
3	30	Lakes and Wetlands (Ref: MTO Design Chart 1.07)	0.05	9.70	0.48
				0.00	0.00
Total	100.00		**Total Area**	32.33	7.44

Compute Composite C => 0.23

<<<input data in these squares only

Rainfall Intensity (i)

A= 2147.367
B= 10.512
C= 0.839

A, B, & C parameters based on CVC Rainfall Intenstiy Duration Frequency Curves (CVC Standard Parameters - Appendix B)

tc= 57.82 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 62.04 mm/hr

$I_x = A^*(tc+B)^{-C}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.23 co-efficient
A= 32.33 ha
i= 62.04 mm/hr

Compute design flow: Q= 1.282 m3/s

WCB-17: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.26

Upland Method | Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-17	WCB-17	43.50	1030	1.036	10.7	0.02	0.666	1.452	0.517	0.111
								Used		

<<<input data in these squares only

WCB-17: Peak Flow Calculation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	65	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	28.28	8.48
2	15	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	6.53	2.28
3	20	Lakes and Wetlands (Ref: MTO Design Chart 1.07)	0.05	8.70	0.44
				0.00	0.00
Total	100.00		**Total Area**	43.50	11.20

Compute Composite C => 0.26

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 87.14 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 37.14 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.26 co-efficient
A= 43.50 ha
i= 37.14 mm/hr

Compute design flow: Q= 1.157 m3/s

WCB-18: Time of Concentration Calculation

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Enter runoff coefficient 0.30

Upland Method   Other Equations

Culvert ID	Catchment ID	Area (ha)	Length (m)	Slope (%)	Height (m)	Log Slope (%)	Bransby Williams (Use if C > 0.4) Tc (hr)	Airport (Use if C < 0.4) Tc (hr)	Hyns Tc (hr)	Kirpich Tc (hr)
WCB-18	WCB-18	52.77	1440	1.852	26.7	0.27	0.813	1.345	0.427	0.143
								Used		

<<<input data in these squares only

WCB-18: Peak Design Calcuation

Composite Runoff Coefficient "C"

Project: Belfountain EA
Project No.: 6776
Date: 9-Oct-13
Modelled by: CK

Drainage Area ID	Area (%)	Land Use	Runoff Coefficient	Area (ha)	A x C
1	10	Woodland hilly slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	5.28	1.85
2	20	Woodland rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.30	10.55	3.17
3	20	Pasture rolling slopes - Loam (Ref: MTO Design Chart 1.07)	0.35	10.55	3.69
4	48	Pasture flat slopes - Loam (Ref: MTO Design Chart 1.07)	0.28	25.33	7.09
5	2	Lakes and Wetlands (Ref: MTO Design Chart 1.07)	0.05	1.06	0.05
Total	100.00		**Total Area**	52.77	15.85

Compute Composite C => 0.30

<<<input data in these squares only

Rainfall Intensity (i)

A= 1649.671 *Using Dillon, June 2010, Bush Street & Mississauga Road Class EA Existing Conditions Drainage Report, Draft*
B= 9.457 *Chicago Storm, 25-year*
C= 0.83
tc= 80.72 mins (Airport Formula) *Change cell based on method*

Compute Intensity i= 39.33 mm/hr

$I_{25} = 1649.671*(T_C+9.457)^{-0.83}$

Peak Flow Calculation - Rational Method

Q=0.00278*C*i*A

C= 0.30 co-efficient
A= 52.77 ha
i= 39.33 mm/hr

Compute design flow: Q= 1.733 m3/s

Appendix C.2.

SWMHYMO Output

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O      9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9   =========
                                                      9   9  9   9   # 1432652
       StormWater Management HYdrologic Model          999    999    =========

 *******************************************************************************
 ***************************** SWMHYMO Ver/4.05  ******************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 *******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 *******************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: HDR inc.                                     +++++++++
 +++++++++                richmond hill        SERIAL#:1432652         +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *******************************************************************************
 *********            ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********            Maximum value for ID numbers  :     10           *********
 *********            Max. number of rainfall points: 105408           *********
 *********            Max. number of flow points    : 105408           *********
 *******************************************************************************


 **********************   D E T A I L E D   O U T P U T   *********************
 *******************************************************************************
 *         DATE: 2014-04-03     TIME: 14:27:53     RUN COUNTER: 000062         *
 *******************************************************************************
 * Input   filename: C:\C-Drive\PEELBE~1\SWMHYMO\2yr.DAT                        *
 * Output  filename: C:\C-Drive\PEELBE~1\SWMHYMO\2yr.out                        *
 * Summary filename: C:\C-Drive\PEELBE~1\SWMHYMO\2yr.sum                        *
 * User comments:                                                               *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 *******************************************************************************

--------------------------------------------------------------------------------
-
001:0001------------------------------------------------------------------------
-
*
* PROJECT NUMBER:
* Belfountain Class Environmental Assessment
* Region of Peel
*
* EXISTING CONDITIONS - Cross-Culvert Hydrologic Analysis
*
*
* DATE: October 2013
*
*
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*
*
* 2 YEAR, 24 HOUR CHICAGO STORM
*
* FILE NAME:
*
****************************************************************************
* PRECIPITATION: From Dillon, June 2010, Bush St. and Mississauga Road EA
*                Existing Conditions Drainage Report
****************************************************************************
*
--------------------
| START            |  Project  dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

--------------------  Rainfall dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=
-------------------------------------------------------------------------------------
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001:0002-----------------------------------------------------------------------------
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--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 674.500
| Ptotal= 55.09 mm |                          B=   6.010
--------------------                          C=    .781
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	.516	6.17	1.680	12.17	1.503	18.17	.733
.33	.525	6.33	1.821	12.33	1.455	18.33	.724
.50	.534	6.50	1.991	12.50	1.411	18.50	.714
.67	.544	6.67	2.203	12.67	1.370	18.67	.706
.83	.554	6.83	2.473	12.83	1.332	18.83	.697
1.00	.564	7.00	2.832	13.00	1.296	19.00	.688
1.17	.575	7.17	3.335	13.17	1.262	19.17	.680
1.33	.587	7.33	4.094	13.33	1.230	19.33	.672
1.50	.599	7.50	5.393	13.50	1.200	19.50	.665
1.67	.611	7.67	8.184	13.67	1.171	19.67	.657
1.83	.625	7.83	19.347	13.83	1.144	19.83	.650
2.00	.638	8.00	77.331	14.00	1.118	20.00	.642
2.17	.653	8.17	25.395	14.17	1.094	20.17	.635
2.33	.668	8.33	13.556	14.33	1.071	20.33	.629
2.50	.684	8.50	9.352	14.50	1.048	20.50	.622
2.67	.702	8.67	7.204	14.67	1.027	20.67	.615
2.83	.720	8.83	5.898	14.83	1.007	20.83	.609
3.00	.739	9.00	5.019	15.00	.988	21.00	.603
3.17	.759	9.17	4.385	15.17	.969	21.17	.597
3.33	.781	9.33	3.904	15.33	.952	21.33	.591
3.50	.804	9.50	3.528	15.50	.935	21.50	.585
3.67	.829	9.67	3.223	15.67	.918	21.67	.579
3.83	.856	9.83	2.972	15.83	.903	21.83	.574
4.00	.884	10.00	2.761	16.00	.888	22.00	.569
4.17	.915	10.17	2.581	16.17	.873	22.17	.563
4.33	.949	10.33	2.426	16.33	.859	22.33	.558

```
          4.50    .986 |  10.50   2.290 |  16.50    .846 |  22.50    .553
          4.67   1.026 |  10.67   2.170 |  16.67    .833 |  22.67    .548
          4.83   1.069 |  10.83   2.063 |  16.83    .820 |  22.83    .543
          5.00   1.118 |  11.00   1.968 |  17.00    .808 |  23.00    .538
          5.17   1.171 |  11.17   1.882 |  17.17    .796 |  23.17    .534
          5.33   1.231 |  11.33   1.804 |  17.33    .785 |  23.33    .529
          5.50   1.298 |  11.50   1.733 |  17.50    .774 |  23.50    .524
          5.67   1.374 |  11.67   1.668 |  17.67    .763 |  23.67    .520
          5.83   1.461 |  11.83   1.609 |  17.83    .753 |  23.83    .516
          6.00   1.562 |  12.00   1.554 |  18.00    .743 |  24.00    .511

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001:0003------------------------------------------------------------------------
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*
*  Determine runoff from Catchment OBL-04
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  163.70   Curve Number   (CN)=65.00
| 01:001000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.150

     Unit Hyd Qpeak  (cms)=    5.437

     PEAK FLOW       (cms)=    1.083 (i)
     TIME TO PEAK    (hrs)=    9.500
     RUNOFF VOLUME    (mm)=   12.062
     TOTAL RAINFALL   (mm)=   55.093
     RUNOFF COEFFICIENT   =     .219

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-08
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  647.70   Curve Number   (CN)=60.00
| 02:002000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.900

     Unit Hyd Qpeak  (cms)=   13.020

     PEAK FLOW       (cms)=    2.545 (i)
     TIME TO PEAK    (hrs)=   10.500
     RUNOFF VOLUME    (mm)=   10.247
     TOTAL RAINFALL   (mm)=   55.093
     RUNOFF COEFFICIENT   =     .186

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005------------------------------------------------------------------------
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*
*PRINT HYD           ID=[1],   # OF PCYCLES=[6]
      FINISH
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-
**********************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-04-03     at 14:27:53
==================================================================================
=
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===================================================================================

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999   999    =========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9 9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9 9   9   Ver  4.05
     S   W W   M   M  H   H    Y    M   M  O   O      9999  9999   Sept 2011
 SSSSS   W W   M   M  H   H    Y    M   M   OOO          9     9   =========
                                                     9   9 9   9   # 1432652
      StormWater Management HYdrologic Model          999   999    =========

 *******************************************************************************
 ***************************** SWMHYMO Ver/4.05  ******************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 *******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 *******************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: HDR inc.                                     +++++++++
 +++++++++                richmond hill        SERIAL#:1432652         +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *******************************************************************************
 *********            ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********            Maximum value for ID numbers  :     10           *********
 *********            Max. number of rainfall points: 105408           *********
 *********            Max. number of flow points    : 105408           *********
 *******************************************************************************


 **********************   D E T A I L E D   O U T P U T   *********************
 *******************************************************************************
 *         DATE: 2014-04-03     TIME: 14:28:39     RUN COUNTER: 000063         *
 *******************************************************************************
 * Input   filename: C:\C-Drive\PEELBE~1\SWMHYMO\5yr.DAT                        *
 * Output  filename: C:\C-Drive\PEELBE~1\SWMHYMO\5yr.out                        *
 * Summary filename: C:\C-Drive\PEELBE~1\SWMHYMO\5yr.sum                        *
 * User comments:                                                              *
 * 1:__________________________________________________________________________*
 * 2:__________________________________________________________________________*
 * 3:__________________________________________________________________________*
 *******************************************************************************

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001:0001------------------------------------------------------------------------
-
*
* PROJECT NUMBER:
* Belfountain Class Environmental Assessment
* Region of Peel
*
* EXISTING CONDITIONS - Cross-Culvert Hydrologic Analysis
*
*
* DATE: October 2013
*
*
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*
*
* 5 YEAR, 24 HOUR CHICAGO STORM
*
* FILE NAME:
*
**************************************************************************
* PRECIPITATION: From Dillon, June 2010, Bush St. and Mississauga Road EA
*                Existing Conditions Drainage Report
**************************************************************************
*
--------------------
| START            |  Project  dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

--------------------  Rainfall dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=
------------------------------------------------------------------------------------
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001:0002----------------------------------------------------------------------------
-
--------------------
| CHICAGO STORM    |     IDF curve parameters: A=1025.000
| Ptotal= 70.76 mm |                           B=   7.560
--------------------                           C=    .804
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  = 24.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio =   .33
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	.597	6.17	2.045	12.17	1.819	18.17	.860
.33	.608	6.33	2.225	12.33	1.759	18.33	.848
.50	.619	6.50	2.445	12.50	1.703	18.50	.837
.67	.631	6.67	2.720	12.67	1.651	18.67	.826
.83	.643	6.83	3.075	12.83	1.602	18.83	.816
1.00	.655	7.00	3.550	13.00	1.557	19.00	.805
1.17	.669	7.17	4.222	13.17	1.514	19.17	.795
1.33	.682	7.33	5.254	13.33	1.474	19.33	.786
1.50	.697	7.50	7.052	13.50	1.436	19.50	.776
1.67	.712	7.67	11.002	13.67	1.400	19.67	.767
1.83	.728	7.83	27.015	13.83	1.367	19.83	.758
2.00	.745	8.00	102.359	14.00	1.335	20.00	.750
2.17	.762	8.17	35.662	14.17	1.304	20.17	.741
2.33	.781	8.33	18.737	14.33	1.275	20.33	.733
2.50	.801	8.50	12.671	14.50	1.248	20.50	.725
2.67	.821	8.67	9.601	14.67	1.221	20.67	.717
2.83	.843	8.83	7.757	14.83	1.196	20.83	.709
3.00	.867	9.00	6.529	15.00	1.173	21.00	.702
3.17	.892	9.17	5.652	15.17	1.150	21.17	.694
3.33	.918	9.33	4.994	15.33	1.128	21.33	.687
3.50	.947	9.50	4.482	15.50	1.107	21.50	.680
3.67	.977	9.67	4.072	15.67	1.087	21.67	.674
3.83	1.010	9.83	3.736	15.83	1.067	21.83	.667
4.00	1.045	10.00	3.455	16.00	1.049	22.00	.660
4.17	1.083	10.17	3.217	16.17	1.031	22.17	.654
4.33	1.125	10.33	3.012	16.33	1.014	22.33	.648

```
             4.50   1.170 |  10.50   2.834 |  16.50    .997 |  22.50    .642
             4.67   1.219 |  10.67   2.677 |  16.67    .981 |  22.67    .636
             4.83   1.274 |  10.83   2.539 |  16.83    .966 |  22.83    .630
             5.00   1.334 |  11.00   2.415 |  17.00    .951 |  23.00    .624
             5.17   1.401 |  11.17   2.304 |  17.17    .937 |  23.17    .618
             5.33   1.475 |  11.33   2.204 |  17.33    .923 |  23.33    .613
             5.50   1.560 |  11.50   2.113 |  17.50    .909 |  23.50    .607
             5.67   1.656 |  11.67   2.030 |  17.67    .896 |  23.67    .602
             5.83   1.766 |  11.83   1.953 |  17.83    .884 |  23.83    .597
             6.00   1.894 |  12.00   1.883 |  18.00    .871 |  24.00    .592

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001:0003------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-04
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  163.70   Curve Number   (CN)=65.00
| 01:001000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.150

     Unit Hyd Qpeak  (cms)=    5.437

     PEAK FLOW       (cms)=    1.971 (i)
     TIME TO PEAK    (hrs)=    9.333
     RUNOFF VOLUME    (mm)=   19.740
     TOTAL RAINFALL   (mm)=   70.759
     RUNOFF COEFFICIENT   =     .279

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0004------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-08
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  647.70   Curve Number   (CN)=60.00
| 02:002000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.900

     Unit Hyd Qpeak  (cms)=   13.020

     PEAK FLOW       (cms)=    4.613 (i)
     TIME TO PEAK    (hrs)=   10.333
     RUNOFF VOLUME    (mm)=   16.970
     TOTAL RAINFALL   (mm)=   70.759
     RUNOFF COEFFICIENT   =     .240

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005------------------------------------------------------------------------
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*
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*
*
*
*PRINT HYD            ID=[1],   # OF PCYCLES=[6]
      FINISH
-------------------------------------------------------------------------------------
-
*************************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-04-03     at 14:28:39
=====================================================================================
=
```

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================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999   999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9 9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9 9   9    Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O      9999  9999    Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO          9     9    =========
                                                      9   9 9   9    # 1432652
       StormWater Management HYdrologic Model          999   999    =========

 *******************************************************************************
 ***************************** SWMHYMO Ver/4.05  ******************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                  *********
 *******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 *******************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: HDR inc.                                     +++++++++
 +++++++++                richmond hill         SERIAL#:1432652        +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *******************************************************************************
 *********            ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********            Maximum value for ID numbers  :     10           *********
 *********            Max. number of rainfall points: 105408           *********
 *********            Max. number of flow points    : 105408           *********
 *******************************************************************************


 **********************   D E T A I L E D   O U T P U T   *********************
 *******************************************************************************
 *         DATE: 2014-04-03     TIME: 14:29:05     RUN COUNTER: 000064         *
 *******************************************************************************
 * Input   filename: C:\C-Drive\PEELBE~1\SWMHYMO\10yr.DAT                      *
 * Output  filename: C:\C-Drive\PEELBE~1\SWMHYMO\10yr.out                      *
 * Summary filename: C:\C-Drive\PEELBE~1\SWMHYMO\10yr.sum                      *
 * User comments:                                                              *
 * 1:__________________________________________________________________________*
 * 2:__________________________________________________________________________*
 * 3:__________________________________________________________________________*
 *******************************************************************************

--------------------------------------------------------------------------------
-
001:0001------------------------------------------------------------------------
-
*
* PROJECT NUMBER:
* Belfountain Class Environmental Assessment
* Region of Peel
*
* EXISTING CONDITIONS - Cross-Culvert Hydrologic Analysis
*
*
* DATE: October 2013
*
*
```

```
*
*
* 10 YEAR, 24 HOUR CHICAGO STORM
*
* FILE NAME:
*
***************************************************************************
* PRECIPITATION: From Dillon, June 2010, Bush St. and Mississauga Road EA
*                Existing Conditions Drainage Report
***************************************************************************
*
--------------------
| START             |  Project  dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

--------------------  Rainfall dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=
-------------------------------------------------------------------------------------
-
001:0002-----------------------------------------------------------------------------
-
--------------------
| CHICAGO STORM     |     IDF curve parameters: A=1232.000
| Ptotal= 81.99 mm  |                           B=   7.970
--------------------                            C=    .809
                          used in:   INTENSITY =  A / (t + B)^C

                          Duration of storm  = 24.00 hrs
                          Storm time step    = 10.00 min
                          Time to peak ratio =   .33

             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .17    .676 |   6.17   2.342 |  12.17   2.079 |  18.17    .975
              .33    .688 |   6.33   2.551 |  12.33   2.010 |  18.33    .962
              .50    .701 |   6.50   2.806 |  12.50   1.946 |  18.50    .950
              .67    .714 |   6.67   3.126 |  12.67   1.886 |  18.67    .937
              .83    .728 |   6.83   3.539 |  12.83   1.830 |  18.83    .925
             1.00    .742 |   7.00   4.094 |  13.00   1.777 |  19.00    .913
             1.17    .757 |   7.17   4.882 |  13.17   1.728 |  19.17    .902
             1.33    .773 |   7.33   6.095 |  13.33   1.681 |  19.33    .891
             1.50    .789 |   7.50   8.216 |  13.50   1.638 |  19.50    .880
             1.67    .807 |   7.67  12.899 |  13.67   1.597 |  19.67    .870
             1.83    .825 |   7.83  31.896 |  13.83   1.558 |  19.83    .860
             2.00    .844 |   8.00 119.037 |  14.00   1.521 |  20.00    .850
             2.17    .864 |   8.17  42.134 |  14.17   1.486 |  20.17    .840
             2.33    .885 |   8.33  22.094 |  14.33   1.453 |  20.33    .831
             2.50    .908 |   8.50  14.882 |  14.50   1.421 |  20.50    .821
             2.67    .932 |   8.67  11.235 |  14.67   1.391 |  20.67    .812
             2.83    .957 |   8.83   9.050 |  14.83   1.362 |  20.83    .804
             3.00    .984 |   9.00   7.597 |  15.00   1.335 |  21.00    .795
             3.17   1.012 |   9.17   6.563 |  15.17   1.308 |  21.17    .787
             3.33   1.043 |   9.33   5.788 |  15.33   1.283 |  21.33    .779
             3.50   1.075 |   9.50   5.187 |  15.50   1.259 |  21.50    .771
             3.67   1.110 |   9.67   4.706 |  15.67   1.236 |  21.67    .763
             3.83   1.148 |   9.83   4.312 |  15.83   1.214 |  21.83    .755
             4.00   1.188 |  10.00   3.983 |  16.00   1.192 |  22.00    .748
             4.17   1.232 |  10.17   3.705 |  16.17   1.172 |  22.17    .740
             4.33   1.280 |  10.33   3.466 |  16.33   1.152 |  22.33    .733
```

```
             4.50   1.331 |  10.50   3.258 |  16.50   1.133 |  22.50    .726
             4.67   1.388 |  10.67   3.076 |  16.67   1.115 |  22.67    .719
             4.83   1.451 |  10.83   2.915 |  16.83   1.097 |  22.83    .713
             5.00   1.520 |  11.00   2.771 |  17.00   1.080 |  23.00    .706
             5.17   1.597 |  11.17   2.642 |  17.17   1.064 |  23.17    .700
             5.33   1.683 |  11.33   2.526 |  17.33   1.048 |  23.33    .693
             5.50   1.781 |  11.50   2.420 |  17.50   1.032 |  23.50    .687
             5.67   1.891 |  11.67   2.324 |  17.67   1.017 |  23.67    .681
             5.83   2.019 |  11.83   2.235 |  17.83   1.003 |  23.83    .675
             6.00   2.167 |  12.00   2.154 |  18.00    .989 |  24.00    .670

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001:0003------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-04
*
*
----------------------
| CALIB NASHYD        |   Area    (ha)=  163.70   Curve Number   (CN)=65.00
| 01:001000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.150

     Unit Hyd Qpeak  (cms)=    5.437

     PEAK FLOW       (cms)=    2.689 (i)
     TIME TO PEAK    (hrs)=    9.333
     RUNOFF VOLUME    (mm)=   25.976
     TOTAL RAINFALL   (mm)=   81.991
     RUNOFF COEFFICIENT   =     .317

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-08
*
*
----------------------
| CALIB NASHYD        |   Area    (ha)=  647.70   Curve Number   (CN)=60.00
| 02:002000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.900

     Unit Hyd Qpeak  (cms)=   13.020

     PEAK FLOW       (cms)=    6.303 (i)
     TIME TO PEAK    (hrs)=   10.333
     RUNOFF VOLUME    (mm)=   22.500
     TOTAL RAINFALL   (mm)=   81.991
     RUNOFF COEFFICIENT   =     .274

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005------------------------------------------------------------------------
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*
*
*PRINT HYD            ID=[1],   # OF PCYCLES=[6]
      FINISH
------------------------------------------------------------------------------------
-
************************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-04-03     at 14:29:05
====================================================================================
=
```

```
===================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999   999   =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9 9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9 9   9  Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O      9999  9999  Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO          9     9  =========
                                                       9   9 9   9  # 1432652
        StormWater Management HYdrologic Model           999   999  =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ******************************
 *********  A single event and continuous hydrologic simulation model   *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.           *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: HDR inc.                                      +++++++++
 +++++++++                richmond hill          SERIAL#:1432652        +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********             ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********             Maximum value for ID numbers  :     10          *********
 *********             Max. number of rainfall points: 105408          *********
 *********             Max. number of flow points    : 105408          *********
 ********************************************************************************


 **********************   D E T A I L E D   O U T P U T   *********************
 ********************************************************************************
 *         DATE: 2014-04-03     TIME: 14:29:30     RUN COUNTER: 000065          *
 ********************************************************************************
 * Input   filename: C:\C-Drive\PEELBE~1\SWMHYMO\25yr.DAT                        *
 * Output  filename: C:\C-Drive\PEELBE~1\SWMHYMO\25yr.out                        *
 * Summary filename: C:\C-Drive\PEELBE~1\SWMHYMO\25yr.sum                        *
 * User comments:                                                                *
 * 1:____________________________________________________________________________*
 * 2:____________________________________________________________________________*
 * 3:____________________________________________________________________________*
 ********************************************************************************

----------------------------------------------------------------------------------
-
001:0001--------------------------------------------------------------------------
-
*
* PROJECT NUMBER:
* Belfountain Class Environmental Assessment
* Region of Peel
*
* EXISTING CONDITIONS - Cross-Culvert Hydrologic Analysis
*
*
* DATE: October 2013
*
*
```

```
*
*
* 25 YEAR, 24 HOUR CHICAGO STORM
*
* FILE NAME:
*
**************************************************************************
* PRECIPITATION: From Dillon, June 2010, Bush St. and Mississauga Road EA
*                Existing Conditions Drainage Report
**************************************************************************
*
--------------------
| START            |  Project  dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

--------------------  Rainfall dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=
------------------------------------------------------------------------------------
-
001:0002----------------------------------------------------------------------------
-
--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1649.700
| Ptotal= 94.15 mm |                          B=   9.457
--------------------                          C=    .830
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17    .697 |   6.17   2.542 |  12.17   2.244 |  18.17   1.019
               .33    .710 |   6.33   2.781 |  12.33   2.166 |  18.33   1.005
               .50    .723 |   6.50   3.076 |  12.50   2.093 |  18.50    .991
               .67    .737 |   6.67   3.447 |  12.67   2.025 |  18.67    .978
               .83    .752 |   6.83   3.929 |  12.83   1.962 |  18.83    .965
              1.00    .768 |   7.00   4.584 |  13.00   1.904 |  19.00    .952
              1.17    .784 |   7.17   5.525 |  13.17   1.848 |  19.17    .940
              1.33    .801 |   7.33   6.992 |  13.33   1.797 |  19.33    .928
              1.50    .818 |   7.50   9.600 |  13.50   1.748 |  19.50    .916
              1.67    .837 |   7.67  15.464 |  13.67   1.702 |  19.67    .905
              1.83    .856 |   7.83  39.330 |  13.83   1.659 |  19.83    .894
              2.00    .877 |   8.00 140.434 |  14.00   1.618 |  20.00    .883
              2.17    .899 |   8.17  52.114 |  14.17   1.579 |  20.17    .873
              2.33    .922 |   8.33  27.094 |  14.33   1.542 |  20.33    .862
              2.50    .946 |   8.50  17.964 |  14.50   1.507 |  20.50    .853
              2.67    .972 |   8.67  13.367 |  14.67   1.474 |  20.67    .843
              2.83    .999 |   8.83  10.634 |  14.83   1.442 |  20.83    .834
              3.00   1.028 |   9.00   8.834 |  15.00   1.412 |  21.00    .824
              3.17   1.059 |   9.17   7.563 |  15.17   1.383 |  21.17    .815
              3.33   1.092 |   9.33   6.619 |  15.33   1.355 |  21.33    .807
              3.50   1.127 |   9.50   5.891 |  15.50   1.328 |  21.50    .798
              3.67   1.165 |   9.67   5.313 |  15.67   1.303 |  21.67    .790
              3.83   1.206 |   9.83   4.843 |  15.83   1.279 |  21.83    .781
              4.00   1.251 |  10.00   4.453 |  16.00   1.255 |  22.00    .774
              4.17   1.299 |  10.17   4.124 |  16.17   1.233 |  22.17    .766
              4.33   1.351 |  10.33   3.843 |  16.33   1.211 |  22.33    .758
```

```
              4.50   1.408 |  10.50   3.600 |  16.50   1.191 |  22.50    .751
              4.67   1.471 |  10.67   3.388 |  16.67   1.171 |  22.67    .743
              4.83   1.540 |  10.83   3.201 |  16.83   1.151 |  22.83    .736
              5.00   1.617 |  11.00   3.035 |  17.00   1.133 |  23.00    .729
              5.17   1.702 |  11.17   2.886 |  17.17   1.115 |  23.17    .722
              5.33   1.799 |  11.33   2.753 |  17.33   1.097 |  23.33    .716
              5.50   1.907 |  11.50   2.632 |  17.50   1.081 |  23.50    .709
              5.67   2.032 |  11.67   2.522 |  17.67   1.065 |  23.67    .703
              5.83   2.176 |  11.83   2.421 |  17.83   1.049 |  23.83    .696
              6.00   2.343 |  12.00   2.329 |  18.00   1.034 |  24.00    .690

------------------------------------------------------------------------------------
-
001:0003----------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-04
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  163.70   Curve Number   (CN)=65.00
| 01:001000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.150

     Unit Hyd Qpeak  (cms)=    5.437

     PEAK FLOW       (cms)=    3.694 (i)
     TIME TO PEAK    (hrs)=    9.333
     RUNOFF VOLUME    (mm)=   33.293
     TOTAL RAINFALL   (mm)=   94.149
     RUNOFF COEFFICIENT   =     .354

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
-
001:0004----------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-08
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  647.70   Curve Number   (CN)=60.00
| 02:002000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.900

     Unit Hyd Qpeak  (cms)=   13.020

     PEAK FLOW       (cms)=    8.646 (i)
     TIME TO PEAK    (hrs)=   10.333
     RUNOFF VOLUME    (mm)=   29.050
     TOTAL RAINFALL   (mm)=   94.149
     RUNOFF COEFFICIENT   =     .309

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
-
001:0005----------------------------------------------------------------------------
-
*
*
```

```
*
*
*
*PRINT HYD           ID=[1],   # OF PCYCLES=[6]
      FINISH
-----------------------------------------------------------------------------------
-
***********************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-04-03     at 14:29:30
===================================================================================
=
```

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999   999   =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9 9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9 9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O      9999  9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO          9     9   =========
                                                       9   9 9   9   # 1432652
        StormWater Management HYdrologic Model          999   999    =========

 *******************************************************************************
 ***************************** SWMHYMO Ver/4.05  ******************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 *******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 *******************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: HDR inc.                                     +++++++++
 +++++++++                richmond hill        SERIAL#:1432652         +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *******************************************************************************
 *********            ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********            Maximum value for ID numbers  :     10           *********
 *********            Max. number of rainfall points: 105408           *********
 *********            Max. number of flow points    : 105408           *********
 *******************************************************************************


 **********************   D E T A I L E D   O U T P U T   *********************
 *******************************************************************************
 *         DATE: 2014-04-03     TIME: 14:29:52     RUN COUNTER: 000066         *
 *******************************************************************************
 * Input   filename: C:\C-Drive\PEELBE~1\SWMHYMO\50yr.DAT                      *
 * Output  filename: C:\C-Drive\PEELBE~1\SWMHYMO\50yr.out                      *
 * Summary filename: C:\C-Drive\PEELBE~1\SWMHYMO\50yr.sum                      *
 * User comments:                                                              *
 * 1:__________________________________________________________________________*
 * 2:__________________________________________________________________________*
 * 3:__________________________________________________________________________*
 *******************************************************************************

--------------------------------------------------------------------------------
-
001:0001------------------------------------------------------------------------
-
*
* PROJECT NUMBER:
* Belfountain Class Environmental Assessment
* Region of Peel
*
* EXISTING CONDITIONS - Cross-Culvert Hydrologic Analysis
*
*
* DATE: October 2013
*
*
```

```
*
*
* 50 YEAR, 24 HOUR CHICAGO STORM
*
* FILE NAME:
*
****************************************************************************
* PRECIPITATION: From Dillon, June 2010, Bush St. and Mississauga Road EA
*                Existing Conditions Drainage Report
****************************************************************************
*
--------------------
| START            |  Project  dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

--------------------  Rainfall dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=
--------------------------------------------------------------------------------------
-
001:0002------------------------------------------------------------------------------
-
--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1931.200
| Ptotal=105.44 mm |                          B=  10.500
--------------------                          C=    .836
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.17	.757	6.17	2.817	12.17	2.481	18.17	1.112
.33	.771	6.33	3.088	12.33	2.392	18.33	1.096
.50	.786	6.50	3.422	12.50	2.310	18.50	1.081
.67	.801	6.67	3.844	12.67	2.234	18.67	1.066
.83	.818	6.83	4.395	12.83	2.164	18.83	1.052
1.00	.835	7.00	5.146	13.00	2.098	19.00	1.038
1.17	.852	7.17	6.229	13.17	2.036	19.17	1.024
1.33	.871	7.33	7.926	13.33	1.978	19.33	1.011
1.50	.890	7.50	10.958	13.50	1.923	19.50	.998
1.67	.911	7.67	17.797	13.67	1.872	19.67	.986
1.83	.932	7.83	45.267	13.83	1.823	19.83	.973
2.00	.955	8.00	154.597	14.00	1.778	20.00	.962
2.17	.979	8.17	59.844	14.17	1.734	20.17	.950
2.33	1.004	8.33	31.318	14.33	1.693	20.33	.939
2.50	1.031	8.50	20.713	14.50	1.654	20.50	.928
2.67	1.059	8.67	15.350	14.67	1.617	20.67	.917
2.83	1.090	8.83	12.162	14.83	1.581	20.83	.907
3.00	1.122	9.00	10.065	15.00	1.548	21.00	.897
3.17	1.156	9.17	8.587	15.17	1.515	21.17	.887
3.33	1.193	9.33	7.493	15.33	1.485	21.33	.877
3.50	1.232	9.50	6.652	15.50	1.455	21.50	.868
3.67	1.274	9.67	5.985	15.67	1.427	21.67	.859
3.83	1.320	9.83	5.443	15.83	1.400	21.83	.850
4.00	1.369	10.00	4.995	16.00	1.374	22.00	.841
4.17	1.422	10.17	4.618	16.17	1.349	22.17	.832
4.33	1.480	10.33	4.297	16.33	1.325	22.33	.824

```
             4.50   1.544 |  10.50   4.019 |  16.50   1.302 |  22.50    .816
             4.67   1.614 |  10.67   3.777 |  16.67   1.280 |  22.67    .808
             4.83   1.691 |  10.83   3.564 |  16.83   1.258 |  22.83    .800
             5.00   1.777 |  11.00   3.375 |  17.00   1.238 |  23.00    .792
             5.17   1.872 |  11.17   3.207 |  17.17   1.218 |  23.17    .785
             5.33   1.980 |  11.33   3.055 |  17.33   1.199 |  23.33    .777
             5.50   2.102 |  11.50   2.918 |  17.50   1.180 |  23.50    .770
             5.67   2.242 |  11.67   2.794 |  17.67   1.162 |  23.67    .763
             5.83   2.403 |  11.83   2.680 |  17.83   1.145 |  23.83    .756
             6.00   2.593 |  12.00   2.576 |  18.00   1.128 |  24.00    .749

--------------------------------------------------------------------------------
-
001:0003------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-04
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  163.70   Curve Number   (CN)=65.00
| 01:001000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.150

     Unit Hyd Qpeak  (cms)=    5.437

     PEAK FLOW       (cms)=    4.603 (i)
     TIME TO PEAK    (hrs)=    9.333
     RUNOFF VOLUME    (mm)=   40.539
     TOTAL RAINFALL   (mm)=  105.441
     RUNOFF COEFFICIENT   =     .384

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0004------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-08
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  647.70   Curve Number   (CN)=60.00
| 02:002000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.900

     Unit Hyd Qpeak  (cms)=   13.020

     PEAK FLOW       (cms)=   10.817 (i)
     TIME TO PEAK    (hrs)=   10.333
     RUNOFF VOLUME    (mm)=   35.591
     TOTAL RAINFALL   (mm)=  105.441
     RUNOFF COEFFICIENT   =     .338

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0005------------------------------------------------------------------------
-
*
*
```

```
*
*
*
*PRINT HYD           ID=[1],   # OF PCYCLES=[6]
      FINISH
---------------------------------------------------------------------------------
-
*********************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-04-03     at 14:29:52
=================================================================================
=
```

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O      9999   9999    Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9    =========
                                                       9   9  9   9   # 1432652
        StormWater Management HYdrologic Model           999    999    =========

 ******************************************************************************
 ***************************** SWMHYMO Ver/4.05  *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors     *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 ******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884          *********
 *********                  Gatineau, Quebec: (819) 243-6858          *********
 *********                  E-Mail: swmhymo@jfsa.Com                  *********
 ******************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: HDR inc.                                     +++++++++
 +++++++++               richmond hill         SERIAL#:1432652         +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ******************************************************************************
 *********            ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********            Maximum value for ID numbers  :     10            *********
 *********            Max. number of rainfall points: 105408            *********
 *********            Max. number of flow points    : 105408            *********
 ******************************************************************************


 **********************   D E T A I L E D   O U T P U T   *********************
 ******************************************************************************
 *         DATE: 2014-04-03     TIME: 14:30:02     RUN COUNTER: 000067        *
 ******************************************************************************
 * Input   filename: C:\C-Drive\PEELBE~1\SWMHYMO\100yr.DAT                    *
 * Output  filename: C:\C-Drive\PEELBE~1\SWMHYMO\100yr.out                    *
 * Summary filename: C:\C-Drive\PEELBE~1\SWMHYMO\100yr.sum                    *
 * User comments:                                                             *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 ******************************************************************************

--------------------------------------------------------------------------------
-
001:0001------------------------------------------------------------------------
-
*
* PROJECT NUMBER:
* Belfountain Class Environmental Assessment
* Region of Peel
*
* EXISTING CONDITIONS - Cross-Culvert Hydrologic Analysis
*
*
* DATE: October 2013
*
*
```

```
*
*
* 100 YEAR, 24 HOUR CHICAGO STORM
*
* FILE NAME:
*
****************************************************************************
* PRECIPITATION: From Dillon, June 2010, Bush St. and Mississauga Road EA
*                Existing Conditions Drainage Report
****************************************************************************
*
--------------------
| START            |  Project  dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

--------------------  Rainfall dir.: C:\C-Drive\PEELBE~1\SWMHYMO\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=
------------------------------------------------------------------------------------
-
001:0002----------------------------------------------------------------------------
-
--------------------
| CHICAGO STORM    |    IDF curve parameters: A=2147.400
| Ptotal=114.71 mm |                          B=  10.500
--------------------                          C=    .839
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17    .809 |   6.17   3.031 |  12.17   2.667 |  18.17   1.191
               .33    .824 |   6.33   3.324 |  12.33   2.572 |  18.33   1.174
               .50    .840 |   6.50   3.686 |  12.50   2.483 |  18.50   1.157
               .67    .857 |   6.67   4.144 |  12.67   2.401 |  18.67   1.141
               .83    .874 |   6.83   4.742 |  12.83   2.325 |  18.83   1.126
              1.00    .892 |   7.00   5.557 |  13.00   2.253 |  19.00   1.111
              1.17    .911 |   7.17   6.735 |  13.17   2.187 |  19.17   1.096
              1.33    .931 |   7.33   8.585 |  13.33   2.124 |  19.33   1.082
              1.50    .952 |   7.50  11.894 |  13.50   2.065 |  19.50   1.068
              1.67    .974 |   7.67  19.382 |  13.67   2.010 |  19.67   1.055
              1.83    .998 |   7.83  49.592 |  13.83   1.957 |  19.83   1.042
              2.00   1.022 |   8.00 170.354 |  14.00   1.908 |  20.00   1.029
              2.17   1.048 |   8.17  65.649 |  14.17   1.861 |  20.17   1.017
              2.33   1.075 |   8.33  34.228 |  14.33   1.817 |  20.33   1.005
              2.50   1.104 |   8.50  22.579 |  14.50   1.774 |  20.50    .993
              2.67   1.134 |   8.67  16.700 |  14.67   1.734 |  20.67    .982
              2.83   1.167 |   8.83  13.210 |  14.83   1.696 |  20.83    .970
              3.00   1.201 |   9.00  10.918 |  15.00   1.660 |  21.00    .959
              3.17   1.238 |   9.17   9.306 |  15.17   1.625 |  21.17    .949
              3.33   1.277 |   9.33   8.112 |  15.33   1.592 |  21.33    .938
              3.50   1.320 |   9.50   7.195 |  15.50   1.560 |  21.50    .928
              3.67   1.365 |   9.67   6.469 |  15.67   1.530 |  21.67    .918
              3.83   1.414 |   9.83   5.880 |  15.83   1.501 |  21.83    .909
              4.00   1.467 |  10.00   5.393 |  16.00   1.473 |  22.00    .899
              4.17   1.525 |  10.17   4.984 |  16.17   1.446 |  22.17    .890
              4.33   1.587 |  10.33   4.635 |  16.33   1.420 |  22.33    .881
```

```
              4.50   1.656 |  10.50   4.334 |  16.50   1.395 |  22.50    .872
              4.67   1.731 |  10.67   4.071 |  16.67   1.371 |  22.67    .864
              4.83   1.814 |  10.83   3.840 |  16.83   1.348 |  22.83    .855
              5.00   1.907 |  11.00   3.636 |  17.00   1.326 |  23.00    .847
              5.17   2.010 |  11.17   3.453 |  17.17   1.305 |  23.17    .839
              5.33   2.126 |  11.33   3.289 |  17.33   1.284 |  23.33    .831
              5.50   2.258 |  11.50   3.140 |  17.50   1.264 |  23.50    .823
              5.67   2.409 |  11.67   3.006 |  17.67   1.245 |  23.67    .816
              5.83   2.584 |  11.83   2.883 |  17.83   1.226 |  23.83    .808
              6.00   2.788 |  12.00   2.771 |  18.00   1.208 |  24.00    .801

------------------------------------------------------------------------------------
-
001:0003----------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-04
*
*
----------------------
| CALIB NASHYD        |   Area    (ha)=  163.70   Curve Number   (CN)=65.00
| 01:001000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.150

     Unit Hyd Qpeak  (cms)=    5.437

     PEAK FLOW       (cms)=    5.407 (i)
     TIME TO PEAK    (hrs)=    9.333
     RUNOFF VOLUME    (mm)=   46.770
     TOTAL RAINFALL   (mm)=  114.712
     RUNOFF COEFFICIENT   =     .408

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
-
001:0004----------------------------------------------------------------------------
-
*
*  Determine runoff from Catchment OBL-08
*
*
----------------------
| CALIB NASHYD        |   Area    (ha)=  647.70   Curve Number   (CN)=60.00
| 02:002000 DT=10.00 |   Ia      (mm)=   8.000   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.900

     Unit Hyd Qpeak  (cms)=   13.020

     PEAK FLOW       (cms)=   12.726 (i)
     TIME TO PEAK    (hrs)=   10.333
     RUNOFF VOLUME    (mm)=   41.252
     TOTAL RAINFALL   (mm)=  114.712
     RUNOFF COEFFICIENT   =     .360

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
-
001:0005----------------------------------------------------------------------------
-
*
*
```

```
*
*
*
*PRINT HYD           ID=[1],   # OF PCYCLES=[6]
      FINISH
-----------------------------------------------------------------------------------
-
***********************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2014-04-03     at 14:30:02
===================================================================================
=
```

```
==============================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                        9   9  9   9   # 1432652
        StormWater Management HYdrologic Model           999    999    =========

 *****************************************************************************
 ***************************** SWMHYMO Ver/4.05  ****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors       *********
 *********                 OTTHYMO-83 and OTTHYMO-89.                   *********
 *****************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.           *********
 *********                  Ottawa,  Ontario: (613) 836-3884            *********
 *********                  Gatineau, Quebec: (819) 243-6858            *********
 *********                  E-Mail: swmhymo@jfsa.Com                    *********
 *****************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: HDR inc.                                   +++++++++
 +++++++++                richmond hill        SERIAL#:1432652       +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *****************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++           *********
 *********           Maximum value for ID numbers  :     10          *********
 *********           Max. number of rainfall points: 105408          *********
 *********           Max. number of flow points    : 105408          *********
 *****************************************************************************


 *********************   D E T A I L E D   O U T P U T   *********************
 *****************************************************************************
 *        DATE: 2014-05-12     TIME: 10:12:29     RUN COUNTER: 000074        *
 *****************************************************************************
 * Input   filename: C:\C-Drive\PEELBE~1\SWMHYMO\HAZ.DAT                     *
 * Output  filename: C:\C-Drive\PEELBE~1\SWMHYMO\HAZ.out                     *
 * Summary filename: C:\C-Drive\PEELBE~1\SWMHYMO\HAZ.sum                     *
 * User comments:                                                            *
 * 1:_________________________________________________________________________*
 * 2:_________________________________________________________________________*
 * 3:_________________________________________________________________________*
 *****************************************************************************

------------------------------------------------------------------------------
001:0001----------------------------------------------------------------------
*
* PROJECT NUMBER:
* Belfountain Class Environmental Assessment
* Region of Peel
*
* EXISTING CONDITIONS - Cross-Culvert Hydrologic Analysis
*
*
* DATE: October 2013
*
* Regional Storm - Hurricane Hazel
*
* FILE NAME:
*
*************************************************************************
* PRECIPITATION: From Dillon, June 2010, Bush St. and Mississauga Road EA
*              Existing Conditions Drainage Report
*************************************************************************
*
--------------------
| START            |  Project  dir.: C:\C-Drive\PEELBE~1\SWMHYMO\
--------------------  Rainfall dir.: C:\C-Drive\PEELBE~1\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=HAZEL-HR.STM
------------------------------------------------------------------------------
001:0002----------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: Hurricane Hazel for the last 12 hrs of t
| Ptotal= 212.00 mm|    Comments: Hurricane Hazel for the last 12 hrs of t
--------------------
                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                1.00   6.000 |   4.00  13.000 |   7.00  23.000 |  10.00  53.000
                2.00   4.000 |   5.00  17.000 |   8.00  13.000 |  11.00  38.000
                3.00   6.000 |   6.00  13.000 |   9.00  13.000 |  12.00  13.000

------------------------------------------------------------------------------
001:0003----------------------------------------------------------------------
*
*  Determine runoff from Catchment OBL-02
*
----------------------
| CALIB NASHYD       |   Area    (ha)=   53.30   Curve Number   (CN)=80.00
| 01:001000 DT=10.00 |   Ia      (mm)=  12.700   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .960

     Ia as  0.2xS     (mm)=   12.700
     Unit Hyd Qpeak  (cms)=    2.121

     PEAK FLOW       (cms)=    5.233 (i)
     TIME TO PEAK    (hrs)=   11.167
     RUNOFF VOLUME    (mm)=  151.143
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .713

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
001:0004----------------------------------------------------------------------
*
*
*  Determine runoff from Catchment OBL-04
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  163.70   Curve Number   (CN)=78.00
| 02:001001 DT=10.00 |   Ia      (mm)=  14.328   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.150

     Ia as  0.2xS     (mm)=   14.328
     Unit Hyd Qpeak  (cms)=    5.437

     PEAK FLOW       (cms)=   14.785 (i)
     TIME TO PEAK    (hrs)=   11.333
     RUNOFF VOLUME    (mm)=  145.088
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .684

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
001:0005----------------------------------------------------------------------
*
*
*  Determine runoff from Catchment OBL-08
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=  647.70   Curve Number   (CN)=78.00
| 03:001002 DT=10.00 |   Ia      (mm)=  14.328   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=   1.900

     Ia as  0.2xS     (mm)=   14.328
     Unit Hyd Qpeak  (cms)=   13.020

     PEAK FLOW       (cms)=   46.822 (i)
     TIME TO PEAK    (hrs)=   12.000
     RUNOFF VOLUME    (mm)=  145.088
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .684

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
001:0006----------------------------------------------------------------------
*
*
*  Determine runoff from Catchment WCB-06
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.96   Curve Number   (CN)=76.00
| 04:001003 DT=10.00 |   Ia      (mm)=  16.042   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .610

     Ia as  0.2xS     (mm)=   16.042
     Unit Hyd Qpeak  (cms)=     .749

     PEAK FLOW       (cms)=    1.248 (i)
     TIME TO PEAK    (hrs)=   10.500
     RUNOFF VOLUME    (mm)=  139.044
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .656

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
001:0007----------------------------------------------------------------------
*
*
*  Determine runoff from Catchment WCB-09
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=   75.50   Curve Number   (CN)=78.00
| 05:001004 DT=10.00 |   Ia      (mm)=  14.328   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .850

     Ia as  0.2xS     (mm)=   14.328
     Unit Hyd Qpeak  (cms)=    3.393

     PEAK FLOW       (cms)=    7.504 (i)
     TIME TO PEAK    (hrs)=   11.000
     RUNOFF VOLUME    (mm)=  145.088
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .684

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
001:0008----------------------------------------------------------------------
*
*
*  Determine runoff from Catchment WCB-16
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=   32.30   Curve Number   (CN)=76.00
| 06:001005 DT=10.00 |   Ia      (mm)=  16.042   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .640

     Ia as  0.2xS     (mm)=   16.042
     Unit Hyd Qpeak  (cms)=    1.928

     PEAK FLOW       (cms)=    3.331 (i)
     TIME TO PEAK    (hrs)=   10.500
     RUNOFF VOLUME    (mm)=  139.044
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .656

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
001:0009----------------------------------------------------------------------
*
*
*  Determine runoff from Catchment WCB-14
*
*
----------------------
| CALIB NASHYD       |   Area    (ha)=     .50   Curve Number   (CN)=76.00
| 07:001006 DT= 5.00 |   Ia      (mm)=  16.042   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .210

     Ia as  0.2xS     (mm)=   16.042
     Unit Hyd Qpeak  (cms)=     .091

     PEAK FLOW       (cms)=     .063 (i)
     TIME TO PEAK    (hrs)=   10.000
     RUNOFF VOLUME    (mm)=  139.043
     TOTAL RAINFALL   (mm)=  212.000
     RUNOFF COEFFICIENT   =     .656

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
001:0010----------------------------------------------------------------------
*
*
*

      FINISH
------------------------------------------------------------------------------
******************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
    Simulation ended on 2014-05-12     at 10:12:29
==============================================================================


```

Appendix C.3.
Hydrologic Summary Table

		Watershed Area		Watershed Slope, Using the 85/10 Method					Peak Design Flow Calculations						
Culvert No.	Station	Total Watershed Area (A, m^2)	Total Watershed Area (A, ha)	Watershed Length (L, m)	Elevation at 85% (h_{85}, m)	Elevation at 85% (h_{10}, m)	Difference in Elevation (Δh, m)	Watershed Slope (S_w, %)	Runoff Coefficient (C)	Time of Concentration Method	Time of Concentration (T_c, min)	Return Period (x)	Rainfall Intensity for x Year Return Period (i, mm/hr) $i_x = 1649.671 * (T_c + 9.457)$ ^ -0.83	Design Peak Flow for x Year Return Period (Q, m^3/s) Qx = 0.0028*C*i*A	Unit Flow Rate (Q/A, m/s)
Olde Base Line Road															
OBL-01	30+030	126500	12.65	715	385	376	9	1.678	0.28	Airport Formula	60.25	25	48.69	0.479	0.038
OBL-02	30+540	533200	53.32	1650	394	373	21	1.697	0.32	Airport Formula	86.25	2	19.14	0.921	0.017
(Tributary B of												5	26.61	1.28	0.024
Rogers Creek)												10	31.15	1.499	0.028
												25	37.43	1.8	0.034
												50	42.25	2.032	0.038
												100	46.33	2.229	0.042
												Regional	N/A	5.233 (See Note 1)	0.098
OBL-03	30+715	151000	15.1	770	385	374	11	1.905	0.25	Airport Formula	62.46	25	47.45	0.49	0.032
OBL-04	30+940	1636600	163.66	2400	417	376	41	2.278	0.25	Airport Formula	103.9	2	N/A	1.08 (See Note 1)	0.007
(Tributary A of												5	N/A	1.97 (See Note 1)	0.012
Rogers Creek)												10	N/A	2.68 (See Note 1)	0.016
												25	N/A	3.69 (See Note 1)	0.023
												50	N/A	4.6 (See Note 1)	0.028
												100	N/A	5.41 (See Note 1)	0.033
												Regional	N/A	14.78 (See Note 1)	0.090
OBL-05	31+280	57300	5.73	635	382	375	7	1.470	0.28	Airport Formula	59.32	25	49.24	0.22	0.038
OBL-06	31+300	38600	3.86	785	385	375	10	1.699	0.27	Airport Formula	82.51	25	38.69	0.111	0.029
OBL-07	31+380	11200	1.12	185	376	375	1	0.721	0.25	Airport Formula	41.99	25	62.66	0.049	0.044
OBL-08	31+410	6476850	647.685	4500	421	376	45	1.333	0.25	Airport Formula	171.04	2	N/A	2.54 (See Note 1)	0.004
(Tributary A of												5	N/A	4.61 (See Note 1)	0.007
Second Creek)												10	N/A	6.3 (See Note 1)	0.010
												25	N/A	8.65 (See Note 1)	0.013
												50	N/A	10.81 (See Note 1)	0.017
												100	N/A	12.73 (See Note 1)	0.020
												Regional	N/A	46.8 (See Note 1)	0.072
OBL-09	32+080	37500	3.75	230	380	376	4	2.319	0.3	Airport Formula	29.97	25	78.15	0.244	0.065
OBL-10	32+230	15600	1.56	175	380	376	4	3.048	0.25	Airport Formula	25.38	25	86.6	0.094	0.060
OBL-11	32+340	406600	40.66	1355	394	376	18	1.771	0.28	Airport Formula	83.97	25	38.19	0.892	0.022

Note 1: Peak Flow determined from SYMHYMO Model

		Watershed Area		Watershed Slope, Using the 85/10 Method					Peak Design Flow Calculations						
Culvert No.	Station	Total Watershed Area (A, m^2)	Total Watershed Area (A, ha)	Watershed Length (L, m)	Elevation at 85% (h_{85}, m)	Elevation at 85% (h_{10}, m)	Difference in Elevation (Δh, m)	Watershed Slope (S_w, %)	Runoff Coefficient (C)	Time of Concentration Method	Time of Concentration (T_c, min)	Return Period (x)	Rainfall Intensity for x Year Return Period (i, mm/hr) $i_x = 1649.671 * (T_c + 9.457)$ ^ -0.83	Design Peak Flow for x Year Return Period (Q, m^3/s) Qx = 0.0028*C*i*A	Unit Flow Rate (Q/A, m/s)
Winston Churchill Boulevard															
WCB-01	40+030	10000	1	460	383	377	6	1.739	0.28	Airport Formula	47.76	25	57.36	0.045	0.045
WCB-02	40+480	30800	3.08	270	385	383	2	0.988	0.29	Airport Formula	43.35	25	61.31	0.154	0.050
WCB-03	40+660	26000	2.6	290	385	384	1	0.460	0.35	Airport Formula	53.81	25	52.78	0.134	0.052
WCB-04	40+870	17000	1.7	255	394	390	4	2.092	0.25	Airport Formula	34.69	25	71.15	0.084	0.049
WCB-05	41+110	9000	0.9	150	395	393	2	1.778	0.25	Airport Formula	28.07	25	81.41	0.051	0.057
WCB-06	41+400	119600	11.96	510	399	393	6	1.569	0.23	Airport Formula	55.21	2	26.53	0.203	0.017
(Watercourse)												5	36.76	0.281	0.023
												10	43.05	0.329	0.028
												25	51.83	0.396	0.033
												50	58.39	0.446	0.037
												100	64.1	0.49	0.041
												Regional	N/A	1.248 (See Note 1)	0.104
WCB-07	41+710	98600	9.86	650	418	398	20	4.103	0.35	Airport Formula	39.12		65.71	0.63	0.064
WCB-08	41+890	72200	7.22	440	425	398	27	8.182	0.33	Airport Formula	26.4		84.55	0.556	0.077
WCB-09	42+195	754800	75.48	1200	420	403	17	1.889	0.26	Airport Formula	76.9	2	20.84	1.137	0.015
(Tributary C of Rogers Creek)												5	28.95	1.58	0.021
												10	33.90	1.85	0.025
												25	40.76	2.224	0.029
												50	46.00	2.509	0.033
												100	50.46	2.753	0.036
												Regional	N/A	7.504 (See Note 1)	0.099
WCB-10	42+750	21500	2.15	240	430	422	8	4.444	0.35	Airport Formula	23.15	25	91.48	0.191	0.089
WCB-11	43+130	10500	1.05	170	430	427	3	2.353	0.28	Airport Formula	26.28	25	84.78	0.069	0.066
WCB-12	43+210	33400	3.34	380	435	430	5	1.754	0.3	Airport Formula	41.18	25	62.47	0.175	0.052
WCB-13	44+140	Equalization Culvert	-	0			0	-						Equalization Culvert	-
WCB-14	44+310	500	0.05	100	425	423	2	2.667	0.3	Airport Formula	18.87	2	54.32	0.023	0.460
(Watercourse)												5	73.69	0.031	0.620
												10	86.04	0.036	0.720
												25	102.82	0.043	0.860
												50	114.47	0.048	0.960
												100	125.95	0.053	1.060
												Regional	N/A	0.063 (See Note 1)	1.260
WCB-15	44+615	38900	3.89	260	425	420	5	2.564	0.3	Airport Formula	30.82	25	76.77	0.249	0.064
WCB-16	44+945	323300	32.33	920	435	412	23	3.333	0.23	Airport Formula	57.82	2	25.66	0.53	0.016
(Watercourse)												5	35.57	0.735	0.023
												10	41.66	0.861	0.027
												25	50.15	1.037	0.032
												50	56.51	1.168	0.036
												100	62.04	1.282	0.040
												Regional	N/A	3.331 (See Note 1)	0.103
WCB-17	45+095	435000	43.5	1030	420	412	8	1.036	0.26	Airport Formula	87.14	25	37.14	1.157	0.027
WCB-18	45+865	527700	52.77	1440	420	400	20	1.852	0.3	Airport Formula	80.72	25	39.33	1.733	0.033

Note 1: Peak Flow determined from SYMHYMO Model

Appendix D

CulvertMaster Assessment (Existing Conditions)

Appendix D.1.

CulvertMaster Output (Existing Conditions)

Culvert Calculator Report
OBL-01 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	372.90	m	Headwater Depth/Height	4.88	
Computed Headwater Eleva	374.63	m	Discharge	0.4790	m³/s
Inlet Control HW Elev.	374.19	m	Tailwater Elevation	372.70	m
Outlet Control HW Elev.	374.63	m	Control Type	Outlet Control	

Grades

Upstream Invert	372.40	m	Downstream Invert	372.25	m
Length	12.50	m	Constructed Slope	0.012000	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.45	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.44	m
Velocity Downstream	2.93	m/s	Critical Slope	0.076944	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	374.63	m	Upstream Velocity Head	0.43	m
Ke	0.90		Entrance Loss	0.39	m

Inlet Control Properties

Inlet Control HW Elev.	374.19	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-02 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	372.55	m	Headwater Depth/Height	13.34	
Computed Headwater Eleva	380.84	m	Discharge	1.8000	m³/s
Inlet Control HW Elev.	379.94	m	Tailwater Elevation	373.31	m
Outlet Control HW Elev.	380.84	m	Control Type	Outlet Control	

Grades

Upstream Invert	372.71	m	Downstream Invert	372.70	m
Length	14.30	m	Constructed Slope	0.000699	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.61	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.61	m
Velocity Downstream	6.17	m/s	Critical Slope	0.255430	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	380.84	m	Upstream Velocity Head	1.94	m
Ke	0.90		Entrance Loss	1.75	m

Inlet Control Properties

Inlet Control HW Elev.	379.94	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-03 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	369.62	m	Headwater Depth/Height	1.75	
Computed Headwater Eleva	370.23	m	Discharge	0.4900	m³/s
Inlet Control HW Elev.	370.01	m	Tailwater Elevation	369.62	m
Outlet Control HW Elev.	370.23	m	Control Type	Outlet Control	

Grades					
Upstream Invert	369.16	m	Downstream Invert	369.09	m
Length	15.90	m	Constructed Slope	0.004403	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.53	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.46	m
Velocity Downstream	1.82	m/s	Critical Slope	0.024000	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	370.23	m	Upstream Velocity Head	0.14	m
Ke	0.90		Entrance Loss	0.13	m

Inlet Control Properties					
Inlet Control HW Elev.	370.01	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-04 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	370.23	m	Headwater Depth/Height	0.73	
Computed Headwater Eleva	370.25	m	Discharge	3.6900	m³/s
Inlet Control HW Elev.	370.15	m	Tailwater Elevation	370.09	m
Outlet Control HW Elev.	370.25	m	Control Type	Outlet Control	

Grades					
Upstream Invert	369.35	m	Downstream Invert	369.25	m
Length	23.10	m	Constructed Slope	0.004329	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	0.84	m
Slope Type	Steep		Normal Depth	0.41	m
Flow Regime	Subcritical		Critical Depth	0.47	m
Velocity Downstream	1.20	m/s	Critical Slope	0.002892	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.66	m
Section Size	3660 x 1220 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	370.25	m	Upstream Velocity Head	0.10	m
Ke	0.70		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	370.15	m	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	4.5	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-05 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	372.41	m	Headwater Depth/Height	1.34	
Computed Headwater Eleva	372.41	m	Discharge	0.2200	m^3/s
Inlet Control HW Elev.	372.39	m	Tailwater Elevation	372.01	m
Outlet Control HW Elev.	372.41	m	Control Type	Outlet Control	

Grades					
Upstream Invert	371.80	m	Downstream Invert	371.62	m
Length	12.50	m	Constructed Slope	0.014640	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.39	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.33	m
Velocity Downstream	1.47	m/s	Critical Slope	0.024754	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	372.41	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	372.39	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-06 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	372.18	m	Headwater Depth/Height	0.74	
Computed Headwater Eleva	372.25	m	Discharge	0.1110	m³/s
Inlet Control HW Elev.	372.23	m	Tailwater Elevation	371.90	m
Outlet Control HW Elev.	372.25	m	Control Type	Entrance Control	

Grades

Upstream Invert	371.91	m	Downstream Invert	371.56	m
Length	20.50	m	Constructed Slope	0.016927	m/m

Hydraulic Profile

Profile	CompositeS1S2		Depth, Downstream	0.34	m
Slope Type	Steep		Normal Depth	0.16	m
Flow Regime	N/A		Critical Depth	0.23	m
Velocity Downstream	0.86	m/s	Critical Slope	0.004590	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	372.25	m	Upstream Velocity Head	0.09	m
Ke	0.20		Entrance Loss	0.02	m

Inlet Control Properties

Inlet Control HW Elev.	372.23	m	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	0.2	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
OBL-07 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	371.35	m	Headwater Depth/Height	0.47	
Computed Headwater Eleva	371.14	m	Discharge	0.0490	m³/s
Inlet Control HW Elev.	371.12	m	Tailwater Elevation	371.03	m
Outlet Control HW Elev.	371.14	m	Control Type	Entrance Control	

Grades					
Upstream Invert	370.92	m	Downstream Invert	370.73	m
Length	12.00	m	Constructed Slope	0.015583	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.30	m
Slope Type	Steep		Normal Depth	0.11	m
Flow Regime	N/A		Critical Depth	0.15	m
Velocity Downstream	0.43	m/s	Critical Slope	0.004190	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	371.14	m	Upstream Velocity Head	0.05	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	371.12	m	Flow Control	N/A	
Inlet Type	Groove end projecting		Area Full	0.2	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
OBL-08 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	371.15	m	Headwater Depth/Height	1.10	
Computed Headwater Eleva	371.90	m	Discharge	8.6000	m^3/s
Inlet Control HW Elev.	371.82	m	Tailwater Elevation	371.36	m
Outlet Control HW Elev.	371.90	m	Control Type	Outlet Control	

Grades					
Upstream Invert	370.22	m	Downstream Invert	370.19	m
Length	26.60	m	Constructed Slope	0.001128	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.17	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.93	m
Velocity Downstream	2.41	m/s	Critical Slope	0.003206	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	371.90	m	Upstream Velocity Head	0.28	m
Ke	0.70		Entrance Loss	0.20	m

Inlet Control Properties					
Inlet Control HW Elev.	371.82	m	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	4.6	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-09 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	373.16	m	Headwater Depth/Height	2.96	
Computed Headwater Eleva	373.72	m	Discharge	0.2440	m^3/s
Inlet Control HW Elev.	373.44	m	Tailwater Elevation	372.86	m
Outlet Control HW Elev.	373.72	m	Control Type	Outlet Control	

Grades					
Upstream Invert	372.54	m	Downstream Invert	372.48	m
Length	10.50	m	Constructed Slope	0.005333	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.38	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.35	m
Velocity Downstream	1.99	m/s	Critical Slope	0.042266	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	373.72	m	Upstream Velocity Head	0.19	m
Ke	0.90		Entrance Loss	0.17	m

Inlet Control Properties					
Inlet Control HW Elev.	373.44	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-10 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	373.79	m	Headwater Depth/Height	0.94	
Computed Headwater Eleva	373.94	m	Discharge	0.0940	m³/s
Inlet Control HW Elev.	373.91	m	Tailwater Elevation	373.73	m
Outlet Control HW Elev.	373.94	m	Control Type	Outlet Control	

Grades					
Upstream Invert	373.56	m	Downstream Invert	373.42	m
Length	12.35	m	Constructed Slope	0.011336	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.31	m
Slope Type	Mild		Normal Depth	0.27	m
Flow Regime	Subcritical		Critical Depth	0.22	m
Velocity Downstream	0.90	m/s	Critical Slope	0.020082	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	373.94	m	Upstream Velocity Head	0.05	m
Ke	0.90		Entrance Loss	0.05	m

Inlet Control Properties					
Inlet Control HW Elev.	373.91	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-11 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	373.64	m	Headwater Depth/Height	31.60	
Computed Headwater Eleva	385.88	m	Discharge	0.8920	m^3/s
Inlet Control HW Elev.	382.59	m	Tailwater Elevation	373.31	m
Outlet Control HW Elev.	385.88	m	Control Type	Outlet Control	

Grades

Upstream Invert	373.24	m	Downstream Invert	372.91	m
Length	12.30	m	Constructed Slope	0.026829	m/m

Hydraulic Profile

Profile	PressureProfile		Depth, Downstream	0.40	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.40	m
Velocity Downstream	7.10	m/s	Critical Slope	0.609186	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	385.88	m	Upstream Velocity Head	2.57	m
Ke	0.90		Entrance Loss	2.31	m

Inlet Control Properties

Inlet Control HW Elev.	382.59	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-01 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary				
Allowable HW Elevation	372.58 m	Headwater Depth/Height	0.82	
Computed Headwater Eleva	372.65 m	Discharge	0.0450	m^3/s
Inlet Control HW Elev.	372.62 m	Tailwater Elevation	372.34	m
Outlet Control HW Elev.	372.65 m	Control Type	Outlet Control	

Grades				
Upstream Invert	372.44 m	Downstream Invert	372.15	m
Length	13.50 m	Constructed Slope	0.021481	m/m

Hydraulic Profile				
Profile	M1	Depth, Downstream	0.19	m
Slope Type	Mild	Normal Depth	0.12	m
Flow Regime	Subcritical	Critical Depth	0.12	m
Velocity Downstream	0.55 m/s	Critical Slope	0.021759	m/m

Section				
Section Shape	Circular	Mannings Coefficient	0.024	
Section Material	CMP	Span	0.25	m
Section Size	250 mm	Rise	0.25	m
Number Sections	2			

Outlet Control Properties				
Outlet Control HW Elev.	372.65 m	Upstream Velocity Head	0.05	m
Ke	0.90	Entrance Loss	0.04	m

Inlet Control Properties				
Inlet Control HW Elev.	372.62 m	Flow Control	N/A	
Inlet Type	Projecting	Area Full	0.1	m^2
K	0.03400	HDS 5 Chart	2	
M	1.50000	HDS 5 Scale	3	
C	0.05530	Equation Form	1	
Y	0.54000			

Culvert Calculator Report
WCB-02 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	381.65	m	Headwater Depth/Height	1.33	
Computed Headwater Eleva	381.87	m	Discharge	0.1540	m^3/s
Inlet Control HW Elev.	381.84	m	Tailwater Elevation	381.49	m
Outlet Control HW Elev.	381.87	m	Control Type	Outlet Control	

Grades					
Upstream Invert	381.34	m	Downstream Invert	381.15	m
Length	12.20	m	Constructed Slope	0.014074	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.34	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.28	m
Velocity Downstream	1.35	m/s	Critical Slope	0.025457	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	381.87	m	Upstream Velocity Head	0.08	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	381.84	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-03 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	383.34	m	Headwater Depth/Height	1.49	
Computed Headwater Eleva	383.42	m	Discharge	0.1340	m³/s
Inlet Control HW Elev.	383.27	m	Tailwater Elevation	383.13	m
Outlet Control HW Elev.	383.42	m	Control Type	Outlet Control	

Grades

Upstream Invert	382.82	m	Downstream Invert	382.79	m
Length	12.10	m	Constructed Slope	0.002479	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.34	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.27	m
Velocity Downstream	1.18	m/s	Critical Slope	0.023318	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	383.42	m	Upstream Velocity Head	0.06	m
Ke	0.90		Entrance Loss	0.05	m

Inlet Control Properties

Inlet Control HW Elev.	383.27	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-04 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	385.22	m	Headwater Depth/Height	0.91	
Computed Headwater Elev:	385.57	m	Discharge	0.0840	m^3/s
Inlet Control HW Elev.	385.53	m	Tailwater Elevation	385.16	m
Outlet Control HW Elev.	385.57	m	Control Type	Entrance Control	

Grades

Upstream Invert	385.21	m	Downstream Invert	384.85	m
Length	13.75	m	Constructed Slope	0.026182	m/m

Hydraulic Profile

Profile	CompositeS1S2		Depth, Downstream	0.19	m
Slope Type	Steep		Normal Depth	0.19	m
Flow Regime	N/A		Critical Depth	0.21	m
Velocity Downstream	1.42	m/s	Critical Slope	0.019458	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	385.57	m	Upstream Velocity Head	0.08	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties

Inlet Control HW Elev.	385.53	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-05 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	392.88	m	Headwater Depth/Height	0.70	
Computed Headwater Eleva	392.61	m	Discharge	0.0510	m^3/s
Inlet Control HW Elev.	392.57	m	Tailwater Elevation	392.56	m
Outlet Control HW Elev.	392.61	m	Control Type	Outlet Control	

Grades					
Upstream Invert	392.33	m	Downstream Invert	392.28	m
Length	12.80	m	Constructed Slope	0.003906	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.20	m
Slope Type	Mild		Normal Depth	0.25	m
Flow Regime	Subcritical		Critical Depth	0.16	m
Velocity Downstream	0.81	m/s	Critical Slope	0.017912	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	392.61	m	Upstream Velocity Head	0.02	m
Ke	0.90		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	392.57	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-06 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	393.61	m	Headwater Depth/Height	1.26	
Computed Headwater Eleva	393.80	m	Discharge	0.3960	m^3/s
Inlet Control HW Elev.	393.74	m	Tailwater Elevation	393.46	m
Outlet Control HW Elev.	393.80	m	Control Type	Outlet Control	

Grades					
Upstream Invert	393.03	m	Downstream Invert	392.96	m
Length	11.00	m	Constructed Slope	0.006364	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.50	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.41	m
Velocity Downstream	1.55	m/s	Critical Slope	0.020617	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	393.80	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	393.74	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	0.3	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-07 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	393.60	m	Headwater Depth/Height	16.39	
Computed Headwater Eleva	399.63	m	Discharge	0.6300	m^3/s
Inlet Control HW Elev.	397.84	m	Tailwater Elevation	393.34	m
Outlet Control HW Elev.	399.63	m	Control Type	Outlet Control	

Grades					
Upstream Invert	393.07	m	Downstream Invert	392.94	m
Length	12.35	m	Constructed Slope	0.010526	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.40	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.40	m
Velocity Downstream	5.01	m/s	Critical Slope	0.296130	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	399.63	m	Upstream Velocity Head	1.28	m
Ke	0.90		Entrance Loss	1.15	m

Inlet Control Properties					
Inlet Control HW Elev.	397.84	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-08 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary						
Allowable HW Elevation	395.18	m	Headwater Depth/Height	1.31	
Computed Headwater Eleva	395.07	m	Discharge	0.5600	m³/s
Inlet Control HW Elev.	395.07	m	Tailwater Elevation	394.55	m
Outlet Control HW Elev.	395.06	m	Control Type	Inlet Control	

Grades					
Upstream Invert	394.27	m	Downstream Invert	394.00	m
Length	13.60	m	Constructed Slope	0.019853	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.36	m
Slope Type	Steep		Normal Depth	0.33	m
Flow Regime	N/A		Critical Depth	0.49	m
Velocity Downstream	3.10	m/s	Critical Slope	0.006833	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	395.06	m	Upstream Velocity Head	0.26	m
Ke	0.20		Entrance Loss	0.05	m

Inlet Control Properties					
Inlet Control HW Elev.	395.07	m	Flow Control	N/A	
Inlet Type	Groove end projecting		Area Full	0.3	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
WCB-09 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	400.52	m	Headwater Depth/Height	1.39	
Computed Headwater Eleva	401.26	m	Discharge	2.2240	m^3/s
Inlet Control HW Elev.	401.17	m	Tailwater Elevation	400.63	m
Outlet Control HW Elev.	401.26	m	Control Type	Outlet Control	

Grades					
Upstream Invert	399.91	m	Downstream Invert	399.85	m
Length	15.50	m	Constructed Slope	0.003871	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.78	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.66	m
Velocity Downstream	2.28	m/s	Critical Slope	0.016868	m/m

Section					
Section Shape	Arch		Mannings Coefficient	0.024	
Section MateSteel and Aluminum Var CR			Span	1.45	m
Section Size	1390 x 970 mm		Rise	0.97	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	401.26	m	Upstream Velocity Head	0.21	m
Ke	0.90		Entrance Loss	0.19	m

Inlet Control Properties					
Inlet Control HW Elev.	401.17	m	Flow Control	N/A	
Inlet Type	Thin wall projecting		Area Full	1.1	m^2
K	0.03400		HDS 5 Chart	34	
M	1.50000		HDS 5 Scale	3	
C	0.04960		Equation Form	1	
Y	0.57000				

Culvert Calculator Report
WCB-10 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	418.33	m	Headwater Depth/Height	1.77	
Computed Headwater Eleva	418.33	m	Discharge	0.1910	m³/s
Inlet Control HW Elev.	418.25	m	Tailwater Elevation	417.74	m
Outlet Control HW Elev.	418.33	m	Control Type	Outlet Control	

Grades					
Upstream Invert	417.62	m	Downstream Invert	417.38	m
Length	12.70	m	Constructed Slope	0.018898	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.36	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.32	m
Velocity Downstream	1.60	m/s	Critical Slope	0.030710	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	418.33	m	Upstream Velocity Head	0.12	m
Ke	0.90		Entrance Loss	0.11	m

Inlet Control Properties					
Inlet Control HW Elev.	418.25	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-11 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	425.95	m	Headwater Depth/Height	0.85	
Computed Headwater Eleva	425.59	m	Discharge	0.0690	m^3/s
Inlet Control HW Elev.	425.54	m	Tailwater Elevation	425.47	m
Outlet Control HW Elev.	425.59	m	Control Type	Outlet Control	

Grades					
Upstream Invert	425.25	m	Downstream Invert	425.17	m
Length	15.50	m	Constructed Slope	0.005161	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.30	m
Slope Type	Mild		Normal Depth	0.28	m
Flow Regime	Subcritical		Critical Depth	0.19	m
Velocity Downstream	0.68	m/s	Critical Slope	0.018650	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	425.59	m	Upstream Velocity Head	0.03	m
Ke	0.90		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	425.54	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-12 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	426.90	m	Headwater Depth/Height	0.76	
Computed Headwater Eleva	425.32	m	Discharge	0.1750	m³/s
Inlet Control HW Elev.	425.26	m	Tailwater Elevation	424.86	m
Outlet Control HW Elev.	425.32	m	Control Type	Entrance Control	

Grades					
Upstream Invert	424.86	m	Downstream Invert	424.42	m
Length	18.20	m	Constructed Slope	0.024176	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.44	m
Slope Type	Steep		Normal Depth	0.24	m
Flow Regime	N/A		Critical Depth	0.27	m
Velocity Downstream	0.78	m/s	Critical Slope	0.015910	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	425.32	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	425.26	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-14 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	421.16	m	Headwater Depth/Height	0.15	
Computed Headwater Eleva	419.68	m	Discharge	0.0040	m³/s
Inlet Control HW Elev.	419.66	m	Tailwater Elevation	419.33	m
Outlet Control HW Elev.	419.68	m	Control Type	Entrance Control	

Grades					
Upstream Invert	419.61	m	Downstream Invert	419.09	m
Length	22.20	m	Constructed Slope	0.023423	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.24	m
Slope Type	Steep		Normal Depth	0.04	m
Flow Regime	N/A		Critical Depth	0.04	m
Velocity Downstream	0.05	m/s	Critical Slope	0.020017	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	419.68	m	Upstream Velocity Head	0.01	m
Ke	0.90		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	419.66	m	Flow Control	Unsubmerged	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-15 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	418.30 m	Headwater Depth/Height	1.82
Computed Headwater Eleva	417.65 m	Discharge	0.2490 m^3/s
Inlet Control HW Elev.	417.48 m	Tailwater Elevation	417.00 m
Outlet Control HW Elev.	417.65 m	Control Type	Outlet Control

Grades

Upstream Invert	416.82 m	Downstream Invert	416.60 m
Length	18.20 m	Constructed Slope	0.012088 m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile	Depth, Downstream	0.35 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.35 m
Velocity Downstream	1.85 m/s	Critical Slope	0.027438 m/m

Section

Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	417.65 m	Upstream Velocity Head	0.12 m
Ke	0.90	Entrance Loss	0.11 m

Inlet Control Properties

Inlet Control HW Elev.	417.48 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	0.2 m^2
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Calculator Report
WCB-16 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	411.32	m	Headwater Depth/Height	1.76	
Computed Headwater Eleva	411.64	m	Discharge	1.0370	m³/s
Inlet Control HW Elev.	411.64	m	Tailwater Elevation	410.51	m
Outlet Control HW Elev.	411.58	m	Control Type	Inlet Control	

Grades					
Upstream Invert	410.30	m	Downstream Invert	409.82	m
Length	14.90	m	Constructed Slope	0.032215	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.58	m
Slope Type	Steep		Normal Depth	0.58	m
Flow Regime	N/A		Critical Depth	0.63	m
Velocity Downstream	2.81	m/s	Critical Slope	0.027132	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	411.58	m	Upstream Velocity Head	0.34	m
Ke	0.90		Entrance Loss	0.31	m

Inlet Control Properties					
Inlet Control HW Elev.	411.64	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-17 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	409.93	m	Headwater Depth/Height	1.36	
Computed Headwater Eleva	409.69	m	Discharge	1.1570	m³/s
Inlet Control HW Elev.	409.56	m	Tailwater Elevation	409.18	m
Outlet Control HW Elev.	409.69	m	Control Type	Outlet Control	

Grades					
Upstream Invert	408.45	m	Downstream Invert	408.41	m
Length	15.00	m	Constructed Slope	0.002667	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.77	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.63	m
Velocity Downstream	1.96	m/s	Critical Slope	0.018669	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	409.69	m	Upstream Velocity Head	0.16	m
Ke	0.90		Entrance Loss	0.14	m

Inlet Control Properties					
Inlet Control HW Elev.	409.56	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.7	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-18 Existing Conditions

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	392.79	m	Headwater Depth/Height	2.34	
Computed Headwater Eleva	392.07	m	Discharge	1.7330	m³/s
Inlet Control HW Elev.	391.69	m	Tailwater Elevation	390.71	m
Outlet Control HW Elev.	392.07	m	Control Type	Outlet Control	

Grades					
Upstream Invert	389.93	m	Downstream Invert	389.88	m
Length	23.00	m	Constructed Slope	0.002174	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.83	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.77	m
Velocity Downstream	2.77	m/s	Critical Slope	0.027475	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	392.07	m	Upstream Velocity Head	0.36	m
Ke	0.90		Entrance Loss	0.32	m

Inlet Control Properties					
Inlet Control HW Elev.	391.69	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.7	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Appendix D.2.
CulvertMaster Summary Table
(Existing Conditions)

			Peak Design Flow Calculations																		CulvertMaster Calculations			
Culvert No.	Road	Station	Watershed Time of Concentration	Design Storm	Rainfall Intensity	Peak Design Flow	Material	Shape	Size / Diameter		Length	Depth of Fill	Flow Direction	U/S Invert	D/S Invert	Slope	Edge of Pavement Elevation	Minimum Freeboard	Minimum Clearance	Maximum Allowable Headwater Elevation	Calculated Headwater Elevation	Delta Headwater	Theoretical /Calculated Tailwater Elevation	Critical Depth
			Tc (min)	(years)	I (mm/hr)	Q (m^3/s)			Span (mm)	Rise (mm)	(m)	(m)		(m)	(m)	(%)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
OBL-01	Olde Base Line Road	30+030	60.25	25	48.69	0.479	CSP	Circular		450	12.5	0.35	N-S	372.4	372.25	1.200	373.200	0.3	0	372.90	374.63	-1.73	372.70	0.44
OBL-02	Olde Base Line Road	30+540	86.25	25	37.43	1.8	CSP	Circular		600	14.3	0.24	N-S	372.71	372.70	0.070	373.545	1.0	0.3	372.55	380.84	-8.29	373.31	0.61
OBL-03	Olde Base Line Road	30+715	62.46	25	47.45	0.49	CSP	Circular		600	15.9	0.16	N-S	369.16	369.09	0.440	369.920	0.3	0	369.62	370.23	-0.61	369.62	0.46
OBL-04	Olde Base Line Road	30+940	103.9	25	n/a	3.69 (See Note 1)	RCB	Box	3300	1200	23.1	0.68	N-S	369.35	369.25	0.433	371.229	1.0	0.3	370.23	370.25	-0.02	370.09	0.47
OBL-05	Olde Base Line Road	31+280	59.32	25	49.24	0.22	CSP	Circular		450	12.5	0.46	N-S	371.80	371.62	1.464	372.713	0.3	0	372.41	372.41	0.00	372.01	0.33
OBL-06	Olde Base Line Road	31+300	82.51	25	38.69	0.111	HDPE	Circular		450	20.5	0.12	N-S	371.91	371.56	1.712	372.480	0.3	0	372.18	372.25	-0.07	371.90	0.23
OBL-07	Olde Base Line Road	31+380	41.99	25	62.66	0.049	HDPE	Circular		450	12	0.28	N-S	370.92	370.73	1.558	371.650	0.3	0	371.35	371.14	0.21	371.03	0.15
OBL-08	Olde Base Line Road	31+410	171.04	25	n/a	8.6 (See Note 1)	RCB	Box	3050	1400	26.6	0.53	N-S	370.22	370.19	0.102	372.148	1.0	0.3	371.15	371.9	-0.75	371.36	0.93
OBL-09	Olde Base Line Road	32+080	29.97	25	78.15	0.244	CSP	Circular		400	10.5	0.52	S-N	372.54	372.48	0.533	373.464	0.3	0	373.16	373.72	-0.56	372.86	0.35
OBL-10	Olde Base Line Road	32+230	25.38	25	86.6	0.094	CSP	Circular		400	12.35	0.12	N-S	373.56	373.42	1.190	374.085	0.3	0	373.79	373.94	-0.16	373.73	0.22
OBL-11	Olde Base Line Road	32+340	83.97	25	38.19	0.892	CSP	Circular		400	12.3	0.29	N-S	373.24	372.91	2.675	373.935	0.3	0	373.64	385.88	-12.25	373.31	0.4
WCB-01	Winston Churchill Boulevard	40+030	47.76	25	57.36	0.045	CSP	Twin Circular		250	13.5	0.19	E-W	372.44	372.15	2.148	372.878	0.3	0	372.58	372.65	-0.07	372.34	0.12
WCB-02	Winston Churchill Boulevard	40+480	43.35	25	61.31	0.154	CSP	Circular		400	12.2	0.21	E-W	381.34	381.15	1.541	381.950	0.3	0	381.65	381.87	-0.22	381.49	0.28
WCB-03	Winston Churchill Boulevard	40+660	53.81	25	52.78	0.134	CSP	Circular		400	12.1	0.42	E-W	382.82	382.79	0.207	383.638	0.3	0	383.34	383.42	-0.08	383.13	0.27
WCB-04	Winston Churchill Boulevard	40+870	34.69	25	71.15	0.084	CSP	Circular		400	13.75	0.20	W-E	385.21	384.85	2.582	385.520	0.3	0	385.22	385.57	-0.35	385.16	0.21
WCB-05	Winston Churchill Boulevard	41+110	28.07	25	81.41	0.051	CSP	Circular		400	12.8	0.46	E-W	392.33	392.28	0.406	393.183	0.3	0	392.88	392.61	0.27	392.56	0.16
WCB-06	Winston Churchill Boulevard	41+400	55.21	25	51.83	0.396	CSP	Circular		600	11	0.28	E-W	393.03	392.96	0.700	393.910	0.3	0	393.61	393.8	-0.19	393.46	0.41
WCB-07	Winston Churchill Boulevard	41+710	39.12	25	65.71	0.63	CSP	Circular		400	12.35	0.43	E-W	393.07	392.94	1.061	393.900	0.3	0	393.60	399.63	-6.03	393.34	0.4
WCB-08	Winston Churchill Boulevard	41+890	26.4	25	84.55	0.556	HDPE	Circular		600	13.6	0.61	E-W	394.27	394.00	1.985	395.480	0.3	0	395.18	395.07	0.11	394.55	0.49
WCB-09	Winston Churchill Boulevard	42+195	76.9	25	40.76	2.224	CSPA	Arch	1400	900	15.5	0.71	E-W	399.91	399.85	0.387	401.520	1.0	0.3	400.52	401.26	-0.74	400.63	0.66
WCB-10	Winston Churchill Boulevard	42+750	23.15	25	91.48	0.191	CSP	Circular		400	12.7	0.61	E-W	417.62	417.38	1.890	418.630	0.3	0	418.33	418.33	0.00	417.74	0.32
WCB-11	Winston Churchill Boulevard	43+130	26.28	25	84.78	0.069	CSP	Circular		400	15.5	0.60	W-E	425.25	425.17	0.516	426.250	0.3	0	425.95	425.59	0.36	425.47	0.19
WCB-12	Winston Churchill Boulevard	43+210	41.18	25	62.47	0.175	CSP	Circular		600	18.2	1.74	W-E	424.86	424.42	2.418	427.200	0.3	0	426.90	425.32	1.58	424.86	0.27
WCB-13	Winston Churchill Boulevard	44+140	0	25	0	0	CSP	Circular		400	16	1.34	W-E	424.69	424.55	0.875	426.425	0.3	0	426.13	Equalization Culvert		424.75	
WCB-14	Winston Churchill Boulevard	44+310	18.87	25	102.82	0.004	CSP	Circular		450	22.2	1.40	E-W	419.61	419.09	2.360	421.458	0.3	0	421.16	419.68	1.48	419.33	0.04
WCB-15	Winston Churchill Boulevard	44+615	30.82	25	76.77	0.249	CSP	Circular		450	18.2	1.33	E-W	416.82	416.60	1.221	418.600	0.3	0	418.30	417.65	0.65	417.00	0.35
WCB-16	Winston Churchill Boulevard	44+945	57.82	25	50.15	1.037	CSP	Circular		750	14.9	0.57	W-E	410.30	409.82	3.255	411.622	0.3	0	411.32	411.64	-0.32	410.51	0.63
WCB-17	Winston Churchill Boulevard	45+095	87.14	25	37.14	1.157	CSP	Circular		900	15	0.88	E-W	408.45	408.41	0.267	410.234	0.3	0	409.93	409.69	0.24	409.18	0.63
WCB-18	Winston Churchill Boulevard	45+865	80.72	25	39.33	1.733	CSP	Circular		900	23	2.25	E-W	389.93	389.88	0.257	393.085	0.3	0	392.79	392.07	0.71	390.71	0.77

Note 1: 25 year peak flow determined from SWMHYMO Model

Appendix E
CulvertMaster Assessment
(Future Conditions)

Appendix E.1.

CulvertMaster Output
(Future Conditions)

Culvert Calculator Report
OBL-01 - Future Conditions - Upgrade 2x600

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	373.00	m	Headwater Depth/Height	0.87	
Computed Headwater Eleva	372.93	m	Discharge	0.4790	m^3/s
Inlet Control HW Elev.	372.89	m	Tailwater Elevation	372.71	m
Outlet Control HW Elev.	372.93	m	Control Type	Outlet Control	

Grades					
Upstream Invert	372.40	m	Downstream Invert	372.25	m
Length	12.50	m	Constructed Slope	0.012000	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.46	m
Slope Type	Mild		Normal Depth	0.35	m
Flow Regime	Subcritical		Critical Depth	0.32	m
Velocity Downstream	1.01	m/s	Critical Slope	0.016883	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	372.93	m	Upstream Velocity Head	0.08	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties					
Inlet Control HW Elev.	372.89	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.6	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-02 - Future Conditions - Upgrade 3000 x1200 Box (025 yr)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	373.19	m	Headwater Depth/Height	0.67	
Computed Headwater Eleva	373.53	m	Discharge	1.8000	m³/s
Inlet Control HW Elev.	373.47	m	Tailwater Elevation	373.47	m
Outlet Control HW Elev.	373.53	m	Control Type	Outlet Control	

Grades					
Upstream Invert	372.71	m	Downstream Invert	372.70	m
Length	14.30	m	Constructed Slope	0.000699	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.77	m
Slope Type	Mild		Normal Depth	0.64	m
Flow Regime	Subcritical		Critical Depth	0.33	m
Velocity Downstream	0.77	m/s	Critical Slope	0.005328	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1220 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	373.53	m	Upstream Velocity Head	0.03	m
Ke	0.70		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	373.47	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	3.7	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-02 - Future Conditions - Upgrade 3000 x1200 Box (100 yr)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	374.19	m	Headwater Depth/Height	0.71	
Computed Headwater Eleva	373.57	m	Discharge	2.2290	m³/s
Inlet Control HW Elev.	373.49	m	Tailwater Elevation	373.49	m
Outlet Control HW Elev.	373.57	m	Control Type	Outlet Control	

Grades					
Upstream Invert	372.71	m	Downstream Invert	372.70	m
Length	14.30	m	Constructed Slope	0.000699	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.79	m
Slope Type	Mild		Normal Depth	0.75	m
Flow Regime	Subcritical		Critical Depth	0.38	m
Velocity Downstream	0.93	m/s	Critical Slope	0.005266	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1220 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	373.57	m	Upstream Velocity Head	0.04	m
Ke	0.70		Entrance Loss	0.03	m

Inlet Control Properties					
Inlet Control HW Elev.	373.49	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	3.7	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-02 - Future Conditions - Upgrade 3000 x1200 Box (Regional)

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	374.19	m	Headwater Depth/Height	1.02	
Computed Headwater Eleva	373.95	m	Discharge	5.2330	m³/s
Inlet Control HW Elev.	373.85	m	Tailwater Elevation	373.64	m
Outlet Control HW Elev.	373.95	m	Control Type	Outlet Control	

Grades

Upstream Invert	372.71	m	Downstream Invert	372.70	m
Length	14.30	m	Constructed Slope	0.000699	m/m

Hydraulic Profile

Profile	M2		Depth, Downstream	0.94	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.67	m
Velocity Downstream	1.83	m/s	Critical Slope	0.005265	m/m

Section

Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1220 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	373.95	m	Upstream Velocity Head	0.16	m
Ke	0.70		Entrance Loss	0.11	m

Inlet Control Properties

Inlet Control HW Elev.	373.85	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	3.7	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-03 - Future Conditions - Maintian Existing

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	372.58	m	Headwater Depth/Height	1.75	
Computed Headwater Eleva	370.23	m	Discharge	0.4900	m^3/s
Inlet Control HW Elev.	370.01	m	Tailwater Elevation	369.62	m
Outlet Control HW Elev.	370.23	m	Control Type	Outlet Control	

Grades

Upstream Invert	369.16	m	Downstream Invert	369.09	m
Length	15.90	m	Constructed Slope	0.004403	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.53	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.46	m
Velocity Downstream	1.82	m/s	Critical Slope	0.024000	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	370.23	m	Upstream Velocity Head	0.14	m
Ke	0.90		Entrance Loss	0.13	m

Inlet Control Properties

Inlet Control HW Elev.	370.01	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-04 - Future Conditions - Maintain Existing (025 yr)

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	370.23 m	Headwater Depth/Height	0.79
Computed Headwater Eleva	370.30 m	Discharge	3.6900 m³/s
Inlet Control HW Elev.	370.20 m	Tailwater Elevation	370.10 m
Outlet Control HW Elev.	370.30 m	Control Type	Outlet Control

Grades

Upstream Invert	369.35 m	Downstream Invert	369.25 m
Length	23.10 m	Constructed Slope	0.004329 m/m

Hydraulic Profile

Profile	M1	Depth, Downstream	0.85 m
Slope Type	Mild	Normal Depth	0.53 m
Flow Regime	Subcritical	Critical Depth	0.50 m
Velocity Downstream	1.32 m/s	Critical Slope	0.005081 m/m

Section

Section Shape	Box	Mannings Coefficient	0.017
Section Material	Concrete	Span	3.30 m
Section Size	3300 x 1200 mm	Rise	1.20 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	370.30 m	Upstream Velocity Head	0.11 m
Ke	0.70	Entrance Loss	0.08 m

Inlet Control Properties

Inlet Control HW Elev.	370.20 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	4.0 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Calculator Report
OBL-04 - Future Conditions - Maintain Existing (100 yr)

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	371.23 m	Headwater Depth/Height	0.98
Computed Headwater Eleva	370.52 m	Discharge	5.4100 m³/s
Inlet Control HW Elev.	370.46 m	Tailwater Elevation	370.18 m
Outlet Control HW Elev.	370.52 m	Control Type	Outlet Control

Grades

Upstream Invert	369.35 m	Downstream Invert	369.25 m
Length	23.10 m	Constructed Slope	0.004329 m/m

Hydraulic Profile

Profile	M1	Depth, Downstream	0.93 m
Slope Type	Mild	Normal Depth	0.69 m
Flow Regime	Subcritical	Critical Depth	0.65 m
Velocity Downstream	1.76 m/s	Critical Slope	0.005094 m/m

Section

Section Shape	Box	Mannings Coefficient	0.017
Section Material	Concrete	Span	3.30 m
Section Size	3300 x 1200 mm	Rise	1.20 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	370.52 m	Upstream Velocity Head	0.19 m
Ke	0.70	Entrance Loss	0.13 m

Inlet Control Properties

Inlet Control HW Elev.	370.46 m	Flow Control	N/A
Inlet Type	0° wingwall flares	Area Full	4.0 m²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Calculator Report
OBL-04 - Future Conditions - Maintain Existing (Regional)

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	371.23	m	Headwater Depth/Height	2.43	
Computed Headwater Eleva	372.26	m	Discharge	14.7800	m³/s
Inlet Control HW Elev.	372.26	m	Tailwater Elevation	370.45	m
Outlet Control HW Elev.	371.94	m	Control Type	Inlet Control	

Grades

Upstream Invert	369.35	m	Downstream Invert	369.25	m
Length	23.10	m	Constructed Slope	0.004329	m/m

Hydraulic Profile

Profile	PressureProfile		Depth, Downstream	1.20	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	1.20	m
Velocity Downstream	3.73	m/s	Critical Slope	0.012030	m/m

Section

Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.30	m
Section Size	3300 x 1200 mm		Rise	1.20	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	371.94	m	Upstream Velocity Head	0.71	m
Ke	0.70		Entrance Loss	0.50	m

Inlet Control Properties

Inlet Control HW Elev.	372.26	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	4.0	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-05 - Future Conditions - Upgrade 1x600

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	372.41	m	Headwater Depth/Height	0.84	
Computed Headwater Eleva	372.31	m	Discharge	0.2200	m³/s
Inlet Control HW Elev.	372.26	m	Tailwater Elevation	372.07	m
Outlet Control HW Elev.	372.31	m	Control Type	Outlet Control	

Grades					
Upstream Invert	371.80	m	Downstream Invert	371.62	m
Length	12.50	m	Constructed Slope	0.014640	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.45	m
Slope Type	Mild		Normal Depth	0.31	m
Flow Regime	Subcritical		Critical Depth	0.30	m
Velocity Downstream	0.95	m/s	Critical Slope	0.016557	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	372.31	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	372.26	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-06 - Future Conditions - Upgrade 2x450

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	372.13	m	Headwater Depth/Height	0.51	
Computed Headwater Eleva	372.14	m	Discharge	0.1110	m^3/s
Inlet Control HW Elev.	372.13	m	Tailwater Elevation	371.87	m
Outlet Control HW Elev.	372.14	m	Control Type	Entrance Control	

Grades					
Upstream Invert	371.91	m	Downstream Invert	371.56	m
Length	20.50	m	Constructed Slope	0.016927	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.31	m
Slope Type	Steep		Normal Depth	0.11	m
Flow Regime	N/A		Critical Depth	0.16	m
Velocity Downstream	0.47	m/s	Critical Slope	0.004207	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	372.14	m	Upstream Velocity Head	0.06	m
Ke	0.20		Entrance Loss	0.01	m

Inlet Control Properties					
Inlet Control HW Elev.	372.13	m	Flow Control	N/A	
Inlet Type	Groove end projecting		Area Full	0.3	m^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
OBL-07 - Future Conditions Maintain Existing

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	371.56 m	Headwater Depth/Height	0.47
Computed Headwater Eleva	371.14 m	Discharge	0.0490 m³/s
Inlet Control HW Elev.	371.12 m	Tailwater Elevation	371.03 m
Outlet Control HW Elev.	371.14 m	Control Type	Entrance Control

Grades

Upstream Invert	370.92 m	Downstream Invert	370.73 m
Length	12.00 m	Constructed Slope	0.015583 m/m

Hydraulic Profile

Profile	CompositeS1S2	Depth, Downstream	0.30 m
Slope Type	Steep	Normal Depth	0.11 m
Flow Regime	N/A	Critical Depth	0.15 m
Velocity Downstream	0.43 m/s	Critical Slope	0.004190 m/m

Section

Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Corrugated HDPE (Smooth Interior)	Span	0.46 m
Section Size	450 mm	Rise	0.46 m
Number Sections	1		

Outlet Control Properties

Outlet Control HW Elev.	371.14 m	Upstream Velocity Head	0.05 m
Ke	0.20	Entrance Loss	0.01 m

Inlet Control Properties

Inlet Control HW Elev.	371.12 m	Flow Control	N/A
Inlet Type	Groove end projecting	Area Full	0.2 m²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		

Culvert Calculator Report
OBL-08 - Future Conditions - Maintain Existing (025 yr)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	371.07	m	Headwater Depth/Height	1.10	
Computed Headwater Eleva	371.90	m	Discharge	8.6500	m³/s
Inlet Control HW Elev.	371.82	m	Tailwater Elevation	371.36	m
Outlet Control HW Elev.	371.90	m	Control Type	Outlet Control	

Grades					
Upstream Invert	370.22	m	Downstream Invert	370.19	m
Length	26.60	m	Constructed Slope	0.001128	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.17	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.94	m
Velocity Downstream	2.43	m/s	Critical Slope	0.003208	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	371.90	m	Upstream Velocity Head	0.28	m
Ke	0.70		Entrance Loss	0.20	m

Inlet Control Properties					
Inlet Control HW Elev.	371.82	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	4.6	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-08 - Future Conditions - Maintain Existing (100 yr)

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	372.07	m	Headwater Depth/Height	1.50	
Computed Headwater Eleva	372.51	m	Discharge	12.7300	m^3/s
Inlet Control HW Elev.	372.51	m	Tailwater Elevation	371.50	m
Outlet Control HW Elev.	372.39	m	Control Type	Inlet Control	

Grades

Upstream Invert	370.22	m	Downstream Invert	370.19	m
Length	26.60	m	Constructed Slope	0.001128	m/m

Hydraulic Profile

Profile	M2		Depth, Downstream	1.31	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	1.21	m
Velocity Downstream	3.19	m/s	Critical Slope	0.003391	m/m

Section

Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	372.39	m	Upstream Velocity Head	0.44	m
Ke	0.70		Entrance Loss	0.31	m

Inlet Control Properties

Inlet Control HW Elev.	372.51	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	4.6	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-08 - Future Conditions - Maintain Existing (Regional)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	372.07	m	Headwater Depth/Height	10.06	
Computed Headwater Eleva	385.56	m	Discharge	46.8000	m^3/s
Inlet Control HW Elev.	385.56	m	Tailwater Elevation	371.65	m
Outlet Control HW Elev.	381.64	m	Control Type	Inlet Control	

Grades					
Upstream Invert	370.22	m	Downstream Invert	370.19	m
Length	26.60	m	Constructed Slope	0.001128	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	1.52	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	1.52	m
Velocity Downstream	10.08	m/s	Critical Slope	0.042321	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	381.64	m	Upstream Velocity Head	5.18	m
Ke	0.70		Entrance Loss	3.62	m

Inlet Control Properties					
Inlet Control HW Elev.	385.56	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	4.6	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
OBL-09 - Future Conditions - Upgrade 1x600

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	374.29	m	Headwater Depth/Height	0.93	
Computed Headwater Eleva	373.11	m	Discharge	0.2440	m³/s
Inlet Control HW Elev.	373.04	m	Tailwater Elevation	372.94	m
Outlet Control HW Elev.	373.11	m	Control Type	Outlet Control	

Grades					
Upstream Invert	372.54	m	Downstream Invert	372.48	m
Length	10.50	m	Constructed Slope	0.005333	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.46	m
Slope Type	Mild		Normal Depth	0.48	m
Flow Regime	Subcritical		Critical Depth	0.32	m
Velocity Downstream	1.04	m/s	Critical Slope	0.016965	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	373.11	m	Upstream Velocity Head	0.05	m
Ke	0.90		Entrance Loss	0.05	m

Inlet Control Properties					
Inlet Control HW Elev.	373.04	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-10 - Future Conditions - Upgrade 1x600

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	374.43	m	Headwater Depth/Height	0.54	
Computed Headwater Eleva	373.89	m	Discharge	0.0940	m³/s
Inlet Control HW Elev.	373.83	m	Tailwater Elevation	373.81	m
Outlet Control HW Elev.	373.89	m	Control Type	Outlet Control	

Grades					
Upstream Invert	373.56	m	Downstream Invert	373.42	m
Length	12.35	m	Constructed Slope	0.011336	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.41	m
Slope Type	Mild		Normal Depth	0.21	m
Flow Regime	Subcritical		Critical Depth	0.19	m
Velocity Downstream	0.45	m/s	Critical Slope	0.015204	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	373.89	m	Upstream Velocity Head	0.03	m
Ke	0.90		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	373.83	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
OBL-11 - Future Conditions - Upgrade 2x600

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	373.81	m	Headwater Depth/Height	1.35	
Computed Headwater Eleva	374.06	m	Discharge	0.8920	m^3/s
Inlet Control HW Elev.	374.01	m	Tailwater Elevation	373.43	m
Outlet Control HW Elev.	374.06	m	Control Type	Entrance Control	

Grades					
Upstream Invert	373.24	m	Downstream Invert	372.91	m
Length	12.30	m	Constructed Slope	0.026829	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.52	m
Slope Type	Steep		Normal Depth	0.41	m
Flow Regime	N/A		Critical Depth	0.44	m
Velocity Downstream	1.68	m/s	Critical Slope	0.022282	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	374.06	m	Upstream Velocity Head	0.20	m
Ke	0.90		Entrance Loss	0.18	m

Inlet Control Properties					
Inlet Control HW Elev.	374.01	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.6	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-02 - Future Conditions - Upgrade 2x400

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	381.66	m	Headwater Depth/Height	0.84	
Computed Headwater Eleva	381.68	m	Discharge	0.1540	m³/s
Inlet Control HW Elev.	381.65	m	Tailwater Elevation	381.45	m
Outlet Control HW Elev.	381.68	m	Control Type	Outlet Control	

Grades

Upstream Invert	381.34	m	Downstream Invert	381.15	m
Length	12.20	m	Constructed Slope	0.014074	m/m

Hydraulic Profile

Profile	M1		Depth, Downstream	0.30	m
Slope Type	Mild		Normal Depth	0.22	m
Flow Regime	Subcritical		Critical Depth	0.20	m
Velocity Downstream	0.76	m/s	Critical Slope	0.019040	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	2				

Outlet Control Properties

Outlet Control HW Elev.	381.68	m	Upstream Velocity Head	0.06	m
Ke	0.90		Entrance Loss	0.06	m

Inlet Control Properties

Inlet Control HW Elev.	381.65	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-03 - Future Conditions - Upgrade 2x400

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	383.28	m	Headwater Depth/Height	0.88	
Computed Headwater Eleva	383.17	m	Discharge	0.1340	m³/s
Inlet Control HW Elev.	383.10	m	Tailwater Elevation	383.08	m
Outlet Control HW Elev.	383.17	m	Control Type	Outlet Control	

Grades					
Upstream Invert	382.82	m	Downstream Invert	382.79	m
Length	12.10	m	Constructed Slope	0.002479	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.29	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.18	m
Velocity Downstream	0.69	m/s	Critical Slope	0.018570	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.40	m
Section Size	400 mm		Rise	0.40	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	383.17	m	Upstream Velocity Head	0.02	m
Ke	0.90		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	383.10	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-04 - Future Conditions - Upgrade 1x600

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	385.75	m	Headwater Depth/Height	0.51	
Computed Headwater Eleva	385.52	m	Discharge	0.0840	m³/s
Inlet Control HW Elev.	385.46	m	Tailwater Elevation	385.24	m
Outlet Control HW Elev.	385.52	m	Control Type	Entrance Control	

Grades					
Upstream Invert	385.21	m	Downstream Invert	384.85	m
Length	13.75	m	Constructed Slope	0.026182	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.39	m
Slope Type	Steep		Normal Depth	0.16	m
Flow Regime	N/A		Critical Depth	0.18	m
Velocity Downstream	0.43	m/s	Critical Slope	0.015189	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	385.52	m	Upstream Velocity Head	0.07	m
Ke	0.90		Entrance Loss	0.06	m

Inlet Control Properties					
Inlet Control HW Elev.	385.46	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-05 - Future Conditions - Upgrade 1x600

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	393.45	m	Headwater Depth/Height	0.55	
Computed Headwater Eleva	392.67	m	Discharge	0.0510	m³/s
Inlet Control HW Elev.	392.65	m	Tailwater Elevation	392.65	m
Outlet Control HW Elev.	392.67	m	Control Type	Outlet Control	

Grades

Upstream Invert	392.33	m	Downstream Invert	392.28	m
Length	12.80	m	Constructed Slope	0.003906	m/m

Hydraulic Profile

Profile	M1		Depth, Downstream	0.37	m
Slope Type	Mild		Normal Depth	0.20	m
Flow Regime	Subcritical		Critical Depth	0.14	m
Velocity Downstream	0.28	m/s	Critical Slope	0.015367	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	392.67	m	Upstream Velocity Head	0.01	m
Ke	0.90		Entrance Loss	0.00	m

Inlet Control Properties

Inlet Control HW Elev.	392.65	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-06 - Future Conditions - Upgrade 1829 x 610 Box (025 yr)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	392.81	m	Headwater Depth/Height	0.59	
Computed Headwater Eleva	393.39	m	Discharge	0.3960	m³/s
Inlet Control HW Elev.	393.35	m	Tailwater Elevation	393.35	m
Outlet Control HW Elev.	393.39	m	Control Type	Outlet Control	

Grades					
Upstream Invert	393.03	m	Downstream Invert	392.96	m
Length	11.00	m	Constructed Slope	0.006364	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.39	m
Slope Type	Mild		Normal Depth	0.17	m
Flow Regime	Subcritical		Critical Depth	0.17	m
Velocity Downstream	0.56	m/s	Critical Slope	0.006429	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	1.83	m
Section Size	1829 x 610 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	393.39	m	Upstream Velocity Head	0.02	m
Ke	0.70		Entrance Loss	0.02	m

Inlet Control Properties					
Inlet Control HW Elev.	393.35	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	1.1	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-06 - Future Conditions - Upgrade 1829 x 610 Box (100 yr)

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	393.81	m	Headwater Depth/Height	0.63	
Computed Headwater Eleva	393.42	m	Discharge	0.4900	m³/s
Inlet Control HW Elev.	393.36	m	Tailwater Elevation	393.36	m
Outlet Control HW Elev.	393.42	m	Control Type	Outlet Control	

Grades

Upstream Invert	393.03	m	Downstream Invert	392.96	m
Length	11.00	m	Constructed Slope	0.006364	m/m

Hydraulic Profile

Profile	S1		Depth, Downstream	0.40	m
Slope Type	Steep		Normal Depth	0.19	m
Flow Regime	Subcritical		Critical Depth	0.19	m
Velocity Downstream	0.67	m/s	Critical Slope	0.006327	m/m

Section

Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	1.83	m
Section Size	1829 x 610 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	393.42	m	Upstream Velocity Head	0.03	m
Ke	0.70		Entrance Loss	0.02	m

Inlet Control Properties

Inlet Control HW Elev.	393.36	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	1.1	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-06 - Future Conditions - Upgrade 1829 x 610 Box (Regional)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	393.51	m	Headwater Depth/Height	1.07	
Computed Headwater Eleva	393.68	m	Discharge	1.2480	m³/s
Inlet Control HW Elev.	393.65	m	Tailwater Elevation	393.44	m
Outlet Control HW Elev.	393.68	m	Control Type	Outlet Control	

Grades					
Upstream Invert	393.03	m	Downstream Invert	392.96	m
Length	11.00	m	Constructed Slope	0.006364	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	0.48	m
Slope Type	Steep		Normal Depth	0.36	m
Flow Regime	Subcritical		Critical Depth	0.36	m
Velocity Downstream	1.42	m/s	Critical Slope	0.006204	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	1.83	m
Section Size	1829 x 610 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	393.68	m	Upstream Velocity Head	0.14	m
Ke	0.70		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	393.65	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	1.1	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-07 - Future Conditions - Upgrade 1x700

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	394.12	m	Headwater Depth/Height	1.33	
Computed Headwater Eleva	394.00	m	Discharge	0.6300	m³/s
Inlet Control HW Elev.	393.96	m	Tailwater Elevation	393.54	m
Outlet Control HW Elev.	394.00	m	Control Type	Outlet Control	

Grades

Upstream Invert	393.07	m	Downstream Invert	392.94	m
Length	12.35	m	Constructed Slope	0.010526	m/m

Hydraulic Profile

Profile	M2		Depth, Downstream	0.60	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.50	m
Velocity Downstream	1.79	m/s	Critical Slope	0.021273	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.70	m
Section Size	700 mm		Rise	0.70	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	394.00	m	Upstream Velocity Head	0.14	m
Ke	0.90		Entrance Loss	0.13	m

Inlet Control Properties

Inlet Control HW Elev.	393.96	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.4	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-08 - Future Conditions - Maintain Existing

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	395.36	m	Headwater Depth/Height	1.31	
Computed Headwater Eleva	395.07	m	Discharge	0.5600	m³/s
Inlet Control HW Elev.	395.07	m	Tailwater Elevation	394.55	m
Outlet Control HW Elev.	395.06	m	Control Type	Inlet Control	

Grades					
Upstream Invert	394.27	m	Downstream Invert	394.00	m
Length	13.60	m	Constructed Slope	0.019853	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.36	m
Slope Type	Steep		Normal Depth	0.33	m
Flow Regime	N/A		Critical Depth	0.49	m
Velocity Downstream	3.10	m/s	Critical Slope	0.006833	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	395.06	m	Upstream Velocity Head	0.26	m
Ke	0.20		Entrance Loss	0.05	m

Inlet Control Properties					
Inlet Control HW Elev.	395.07	m	Flow Control	N/A	
Inlet Type	Groove end projecting		Area Full	0.3	m²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

Culvert Calculator Report
WCB-09 - Future Conditions - Upgrade 6000 x 1524 Box (025 yr)

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	401.08	m	Headwater Depth/Height	0.55	
Computed Headwater Eleva	400.75	m	Discharge	2.2240	m^3/s
Inlet Control HW Elev.	400.73	m	Tailwater Elevation	400.73	m
Outlet Control HW Elev.	400.75	m	Control Type	Outlet Control	

Grades

Upstream Invert	399.91	m	Downstream Invert	399.85	m
Length	15.50	m	Constructed Slope	0.003871	m/m

Hydraulic Profile

Profile	M1		Depth, Downstream	0.88	m
Slope Type	Mild		Normal Depth	0.27	m
Flow Regime	Subcritical		Critical Depth	0.24	m
Velocity Downstream	0.41	m/s	Critical Slope	0.005548	m/m

Section

Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	2				

Outlet Control Properties

Outlet Control HW Elev.	400.75	m	Upstream Velocity Head	0.01	m
Ke	0.70		Entrance Loss	0.01	m

Inlet Control Properties

Inlet Control HW Elev.	400.73	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	9.3	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-09 - Future Conditions - Upgrade 6000 x1524 Box (100 yr)

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	402.08	m	Headwater Depth/Height	0.64	
Computed Headwater Eleva	400.89	m	Discharge	2.7530	m^3/s
Inlet Control HW Elev.	400.87	m	Tailwater Elevation	400.75	m
Outlet Control HW Elev.	400.89	m	Control Type	Outlet Control	

Grades

Upstream Invert	399.91	m	Downstream Invert	399.85	m
Length	15.50	m	Constructed Slope	0.003871	m/m

Hydraulic Profile

Profile	M1		Depth, Downstream	1.02	m
Slope Type	Mild		Normal Depth	0.31	m
Flow Regime	Subcritical		Critical Depth	0.28	m
Velocity Downstream	0.44	m/s	Critical Slope	0.005437	m/m

Section

Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	2				

Outlet Control Properties

Outlet Control HW Elev.	400.89	m	Upstream Velocity Head	0.01	m
Ke	0.70		Entrance Loss	0.01	m

Inlet Control Properties

Inlet Control HW Elev.	400.87	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	9.3	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-09 - Future Conditions - Upgrade 6000 x1524 Box (Regional)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	402.08	m	Headwater Depth/Height	0.68	
Computed Headwater Eleva	400.94	m	Discharge	7.5040	m³/s
Inlet Control HW Elev.	400.82	m	Tailwater Elevation	400.88	m
Outlet Control HW Elev.	400.94	m	Control Type	Outlet Control	

Grades					
Upstream Invert	399.91	m	Downstream Invert	399.85	m
Length	15.50	m	Constructed Slope	0.003871	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.90	m
Slope Type	Mild		Normal Depth	0.59	m
Flow Regime	Subcritical		Critical Depth	0.54	m
Velocity Downstream	1.37	m/s	Critical Slope	0.005214	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1520 mm		Rise	1.52	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	400.94	m	Upstream Velocity Head	0.11	m
Ke	0.70		Entrance Loss	0.08	m

Inlet Control Properties					
Inlet Control HW Elev.	400.82	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	9.3	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-10 - Future Conditions - Upgrade 1x600

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	418.35	m	Headwater Depth/Height	0.80	
Computed Headwater Eleva	418.11	m	Discharge	0.1910	m³/s
Inlet Control HW Elev.	418.04	m	Tailwater Elevation	417.82	m
Outlet Control HW Elev.	418.11	m	Control Type	Entrance Control	

Grades					
Upstream Invert	417.62	m	Downstream Invert	417.38	m
Length	12.70	m	Constructed Slope	0.018898	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.44	m
Slope Type	Steep		Normal Depth	0.27	m
Flow Regime	N/A		Critical Depth	0.28	m
Velocity Downstream	0.85	m/s	Critical Slope	0.016105	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	418.11	m	Upstream Velocity Head	0.11	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	418.04	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-11 - Future Conditions - Upgrade 1x600

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	427.26	m	Headwater Depth/Height	0.56	
Computed Headwater Eleva	425.59	m	Discharge	0.0690	m³/s
Inlet Control HW Elev.	425.56	m	Tailwater Elevation	425.56	m
Outlet Control HW Elev.	425.59	m	Control Type	Outlet Control	

Grades

Upstream Invert	425.25	m	Downstream Invert	425.17	m
Length	15.50	m	Constructed Slope	0.005161	m/m

Hydraulic Profile

Profile	M1		Depth, Downstream	0.39	m
Slope Type	Mild		Normal Depth	0.22	m
Flow Regime	Subcritical		Critical Depth	0.17	m
Velocity Downstream	0.35	m/s	Critical Slope	0.015220	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	425.59	m	Upstream Velocity Head	0.01	m
Ke	0.90		Entrance Loss	0.01	m

Inlet Control Properties

Inlet Control HW Elev.	425.56	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-12 - Future Conditions - Maintain Existing

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	426.88	m	Headwater Depth/Height	0.76	
Computed Headwater Eleva	425.32	m	Discharge	0.1750	m³/s
Inlet Control HW Elev.	425.26	m	Tailwater Elevation	424.86	m
Outlet Control HW Elev.	425.32	m	Control Type	Entrance Control	

Grades

Upstream Invert	424.86	m	Downstream Invert	424.42	m
Length	18.20	m	Constructed Slope	0.024176	m/m

Hydraulic Profile

Profile	CompositeS1S2		Depth, Downstream	0.44	m
Slope Type	Steep		Normal Depth	0.24	m
Flow Regime	N/A		Critical Depth	0.27	m
Velocity Downstream	0.78	m/s	Critical Slope	0.015910	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	425.32	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties

Inlet Control HW Elev.	425.26	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-14 - Future Conditions - Upgrade 1800 x 900 Box (025 yr)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	425.55	m	Headwater Depth/Height	0.09	
Computed Headwater Eleva	419.69	m	Discharge	0.0230	m^3/s
Inlet Control HW Elev.	419.69	m	Tailwater Elevation	419.69	m
Outlet Control HW Elev.	419.69	m	Control Type	Outlet Control	

Grades					
Upstream Invert	419.61	m	Downstream Invert	419.09	m
Length	22.20	m	Constructed Slope	0.023423	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	0.60	m
Slope Type	Steep		Normal Depth	0.02	m
Flow Regime	Subcritical		Critical Depth	0.03	m
Velocity Downstream	0.02	m/s	Critical Slope	0.010016	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	1.83	m
Section Size	1830 x 910 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	419.69	m	Upstream Velocity Head	0.00	m
Ke	0.70		Entrance Loss	0.00	m

Inlet Control Properties					
Inlet Control HW Elev.	419.69	m	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	1.7	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-14 - Future Conditions - Upgrade 1800 x 900 Box (100 yr)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	426.55	m	Headwater Depth/Height	0.15	
Computed Headwater Eleva	419.74	m	Discharge	0.0530	m³/s
Inlet Control HW Elev.	419.74	m	Tailwater Elevation	419.74	m
Outlet Control HW Elev.	419.74	m	Control Type	Outlet Control	

Grades					
Upstream Invert	419.61	m	Downstream Invert	419.09	m
Length	22.20	m	Constructed Slope	0.023423	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	0.65	m
Slope Type	Steep		Normal Depth	0.03	m
Flow Regime	Subcritical		Critical Depth	0.04	m
Velocity Downstream	0.04	m/s	Critical Slope	0.008543	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	1.83	m
Section Size	1830 x 910 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	419.74	m	Upstream Velocity Head	0.00	m
Ke	0.70		Entrance Loss	0.00	m

Inlet Control Properties					
Inlet Control HW Elev.	419.74	m	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	1.7	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-14 - Future Conditions - Upgrade 1800 x 900 Box (Regional)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	426.25	m	Headwater Depth/Height	0.20	
Computed Headwater Eleva	419.79	m	Discharge	0.0630	m³/s
Inlet Control HW Elev.	419.79	m	Tailwater Elevation	419.79	m
Outlet Control HW Elev.	419.79	m	Control Type	Outlet Control	

Grades					
Upstream Invert	419.61	m	Downstream Invert	419.09	m
Length	22.20	m	Constructed Slope	0.023423	m/m

Hydraulic Profile					
Profile	S1		Depth, Downstream	0.70	m
Slope Type	Steep		Normal Depth	0.04	m
Flow Regime	Subcritical		Critical Depth	0.05	m
Velocity Downstream	0.05	m/s	Critical Slope	0.008283	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	1.83	m
Section Size	1830 x 910 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	419.79	m	Upstream Velocity Head	0.00	m
Ke	0.70		Entrance Loss	0.00	m

Inlet Control Properties					
Inlet Control HW Elev.	419.79	m	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	1.7	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-15 - Future Conditions - Upgrade 1x600

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	418.53	m	Headwater Depth/Height	0.90	
Computed Headwater Eleva	417.37	m	Discharge	0.2490	m^3/s
Inlet Control HW Elev.	417.33	m	Tailwater Elevation	417.06	m
Outlet Control HW Elev.	417.37	m	Control Type	Outlet Control	

Grades

Upstream Invert	416.82	m	Downstream Invert	416.60	m
Length	18.20	m	Constructed Slope	0.012088	m/m

Hydraulic Profile

Profile	M1		Depth, Downstream	0.46	m
Slope Type	Mild		Normal Depth	0.36	m
Flow Regime	Subcritical		Critical Depth	0.32	m
Velocity Downstream	1.05	m/s	Critical Slope	0.017056	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	417.37	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties

Inlet Control HW Elev.	417.33	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-16 - Future Conditions - Upgrade 3000 x 1219 Box (025 yr)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	410.77	m	Headwater Depth/Height	0.35	
Computed Headwater Eleva	410.72	m	Discharge	1.0370	m³/s
Inlet Control HW Elev.	410.66	m	Tailwater Elevation	410.54	m
Outlet Control HW Elev.	410.72	m	Control Type	Entrance Control	

Grades					
Upstream Invert	410.30	m	Downstream Invert	409.82	m
Length	14.90	m	Constructed Slope	0.032215	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.72	m
Slope Type	Steep		Normal Depth	0.13	m
Flow Regime	N/A		Critical Depth	0.23	m
Velocity Downstream	0.47	m/s	Critical Slope	0.005588	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1220 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	410.72	m	Upstream Velocity Head	0.11	m
Ke	0.70		Entrance Loss	0.08	m

Inlet Control Properties					
Inlet Control HW Elev.	410.66	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	3.7	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-16 - Future Conditions - Upgrade 3000 x1219 Box (100 yr)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	411.47	m	Headwater Depth/Height	0.40	
Computed Headwater Eleva	410.79	m	Discharge	1.2820	m^3/s
Inlet Control HW Elev.	410.72	m	Tailwater Elevation	410.56	m
Outlet Control HW Elev.	410.79	m	Control Type	Entrance Control	

Grades					
Upstream Invert	410.30	m	Downstream Invert	409.82	m
Length	14.90	m	Constructed Slope	0.032215	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.76	m
Slope Type	Steep		Normal Depth	0.15	m
Flow Regime	N/A		Critical Depth	0.26	m
Velocity Downstream	0.55	m/s	Critical Slope	0.005472	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1220 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	410.79	m	Upstream Velocity Head	0.13	m
Ke	0.70		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev.	410.72	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	3.7	m^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-16 - Future Conditions - Upgrade 3000 x1219 Box (Regional)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	411.47	m	Headwater Depth/Height	0.75	
Computed Headwater Eleva	411.22	m	Discharge	3.3310	m³/s
Inlet Control HW Elev.	411.12	m	Tailwater Elevation	410.68	m
Outlet Control HW Elev.	411.22	m	Control Type	Entrance Control	

Grades					
Upstream Invert	410.30	m	Downstream Invert	409.82	m
Length	14.90	m	Constructed Slope	0.032215	m/m

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.86	m
Slope Type	Steep		Normal Depth	0.27	m
Flow Regime	N/A		Critical Depth	0.50	m
Velocity Downstream	1.27	m/s	Critical Slope	0.005213	m/m

Section					
Section Shape	Box		Mannings Coefficient	0.017	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1220 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	411.22	m	Upstream Velocity Head	0.25	m
Ke	0.70		Entrance Loss	0.17	m

Inlet Control Properties					
Inlet Control HW Elev.	411.12	m	Flow Control	N/A	
Inlet Type	0° wingwall flares		Area Full	3.7	m²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

Culvert Calculator Report
WCB-17 - Future Conditions - Maintain Existing

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	410.15	m	Headwater Depth/Height	1.36	
Computed Headwater Eleva	409.69	m	Discharge	1.1570	m³/s
Inlet Control HW Elev.	409.56	m	Tailwater Elevation	409.18	m
Outlet Control HW Elev.	409.69	m	Control Type	Outlet Control	

Grades

Upstream Invert	408.45	m	Downstream Invert	408.41	m
Length	15.00	m	Constructed Slope	0.002667	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.77	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.63	m
Velocity Downstream	1.96	m/s	Critical Slope	0.018669	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	409.69	m	Upstream Velocity Head	0.16	m
Ke	0.90		Entrance Loss	0.14	m

Inlet Control Properties

Inlet Control HW Elev.	409.56	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.7	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
WCB-18 - Future Conditions - Maintain Existing

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	392.97	m	Headwater Depth/Height	2.34	
Computed Headwater Eleva	392.07	m	Discharge	1.7330	m³/s
Inlet Control HW Elev.	391.69	m	Tailwater Elevation	390.71	m
Outlet Control HW Elev.	392.07	m	Control Type	Outlet Control	

Grades					
Upstream Invert	389.93	m	Downstream Invert	389.88	m
Length	23.00	m	Constructed Slope	0.002174	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.83	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.77	m
Velocity Downstream	2.77	m/s	Critical Slope	0.027475	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.91	m
Section Size	900 mm		Rise	0.91	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	392.07	m	Upstream Velocity Head	0.36	m
Ke	0.90		Entrance Loss	0.32	m

Inlet Control Properties					
Inlet Control HW Elev.	391.69	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.7	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Appendix E.2.

CulvertMaster Summary Table

(Future Conditions)

			Peak Design Flow Calculations																		CulvertMaster Calculations				
Culvert No.	Road	Station	Watershed Time of Concentration	Design Storm	Rainfall Intensity	Peak Design Flow	Material	Shape	Size / Diameter		Length	Depth of Fill	Flow Direction	U/S Invert	D/S Invert	Slope	Proposed Edge of Pavement Elevation	Minimum Freeboard	Minimum Clearance	Maximum Allowable Headwater Elevation	Calculated Headwater Elevation	Delta Headwater	Theoretical/ Calculated Tailwater Elevation	Critical Depth	Recommendations
			Tc (min)	(years)	I (mm/hr)	Q (m^3/s)			Span (mm)	Rise (mm)	(m)	(m)		(m)	(m)	(%)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	
OBL-01	Olde Base Line Road	30+030	60.25	25	48.69	0.479	CSP	Circular		600	12.5	0.29	N-S	372.4	372.25	1.200	373.295	0.3	0	373.00	372.93	0.06	372.71	0.32	**Upgrade to Twin 600 (existing 1 x 450)**
OBL-02	Olde Base Line Road	30+540	86.25	25	37.43	1.8	RCB	Box	3000	1200	14.3	0.28	N-S	372.71	372.70	0.070	374.190	1.0	0.3	373.19	373.53	-0.34	373.47	0.33	**Upgrade to 3000 x 1200 Box Open Bottom / watercourse (existing 600 CSP)**
				100	46.33	2.229	RCB	Box	3000	1200	14.3	0.28		372.71	372.70	0.070	374.190	0.0	0.3	374.19	373.57	0.62	373.49	0.38	
				Regional	N/A	5.233 (See Note 1)	RCB	Box	3000	1200	14.3	0.28		372.71	372.70	0.070	374.190	0.0	0.3	374.19	373.95	0.24	373.64	0.67	
OBL-03	Olde Base Line Road	30+715	62.46	25	47.45	0.49	CSP	Circular		600	15.9	3.12	N-S	369.16	369.09	0.440	372.877	0.3	0	372.58	370.23	2.35	369.62	0.46	Maintain existing culvert
OBL-04	Olde Base Line Road	30+940	103.9	25	N/A	3.69 (See Note 1)	RCB	Box	3300	1200	23.1	0.68	N-S	369.35	369.25	0.433	371.230	1.0	0.3	370.23	370.3	-0.07	370.10	0.5	Maintain existing culvert (3300 x 1200) (Watercourse)
				100	N/A	5.41 (See Note 1)	RCB	Box	3300	1200	23.1			369.35	369.25	0.433	371.230	0.0	0.3	371.23	370.52	0.71	370.18	0.65	
				Regional	N/A	14.78 (See Note 1)	RCB	Box	3300	1200	23.1			369.35	369.25	0.433	371.230	0.0	0.3	371.23	372.26	-1.03	370.45	1.2	
OBL-05	Olde Base Line Road	31+280	59.32	25	49.24	0.22	CSP	Circular		600	12.5	0.31	N-S	371.80	371.62	1.464	372.707	0.3	0	372.41	372.31	0.10	372.07	0.3	**Upgrade to 600 (existing 450)**
OBL-06	Olde Base Line Road	31+300	82.51	25	38.69	0.111	HDPE	Circular		450	20.5	0.06	N-S	371.91	371.56	1.712	372.426	0.3	0	372.13	372.14	-0.01	371.87	0.16	**Upgrade to Twin 450 (existing 450)**
OBL-07	Olde Base Line Road	31+380	41.99	25	62.66	0.049	HDPE	Circular		450	12	0.49	N-S	370.92	370.73	1.558	371.864	0.3	0	371.56	371.14	0.42	371.03	0.15	Maintain exiting culvert
OBL-08	Olde Base Line Road	31+410	171.04	25	N/A	8.65 (See Note 1)	RCB	Box	3050	1400	26.6	0.45	N-S	370.22	370.19	0.102	372.070	1.0	0.3	371.07	371.9	-0.83	371.36	0.94	Maintain existing culvert (3050 x 1400) (Watercourse)
				100	N/A	12.73 (See Note 1)	RCB	Box	3050	1400	26.6	0.45		370.22	370.19	0.102	372.070	0.0	0.3	372.07	371.51	0.56	371.50	1.21	
				Regional	N/A	46.8 (See Note 1)	RCB	Box	3050	1400	26.6	0.45		370.22	370.19	0.102	372.070	0.0	0.3	372.07	385.56	-13.49	371.65	1.52	
OBL-09	Olde Base Line Road	32+080	29.97	25	78.15	0.244	CSP	Circular		600	10.5	1.45	S-N	372.54	372.48	0.533	374.593	0.3	0	374.29	373.11	1.18	372.94	0.32	**Upgrade to 600 (existing 400)**
OBL-10	Olde Base Line Road	32+230	25.38	25	86.60	0.094	CSP	Circular		600	12.35	0.57	N-S	373.56	373.42	1.190	374.731	0.3	0	374.43	373.89	0.54	373.81	0.19	**Upgrade to 600 (existing 400)**
OBL-11	Olde Base Line Road	32+340	83.97	25	38.19	0.892	CSP	Circular		600	12.3	0.27	N-S	373.24	372.91	2.675	374.113	0.3	0	373.81	374.06	-0.25	373.43	0.44	**Upgrade to Twin 600 (existing 400)**

Note 1: Peak flow determined from SWMHYMO Model

			Peak Design Flow Calculations																		CulvertMaster Calculations				
Culvert No.	Road	Station	Watershed Time of Concentration	Design Storm	Rainfall Intensity	Peak Design Flow	Material	Shape	Size / Diameter		Length	Depth of Fill	Flow Direction	U/S Invert	D/S Invert	Slope	Proposed Edge of Pavement Elevation	Minimum Freeboard	Minimum Clearance	Maximum Allowable Headwater Elevation	Calculated Headwater Elevation	Delta Headwater	Theoretical/ Calculated Tailwater Elevation	Critical Depth	Recommendations
			Tc (min)	(years)	I (mm/hr)	Q (m^3/s)			Span (mm)	Rise (mm)	(m)	(m)		(m)	(m)	(%)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	
WCB-01	Winston Churchill Boulevard	40+030	47.76	25	57.36	0.045	CSP	Circular		0.25	13.5	0.30	E-W	372.44	372.15	2.148	372.741	0.3	0	372.44	372.65	-0.21	372.21	0.12	**Remove existing culverts and replace with DICB and sewer.**
WCB-02	Winston Churchill Boulevard	40+480	43.35	25	61.31	0.154	CSP	Circular		400	12.2	0.22	E-W	381.34	381.15	1.541	381.961	0.3	0	381.66	381.68	-0.02	381.45	0.2	**Upgrade to Twin 400 (existing 400)**
WCB-03	Winston Churchill Boulevard	40+660	53.81	25	52.78	0.134	CSP	Circular		400	12.1	0.36	E-W	382.82	382.79	0.207	383.582	0.3	0	383.28	383.17	0.11	383.08	0.18	**Upgrade to Twin 400 (existing 400)**
WCB-04	Winston Churchill Boulevard	40+870	34.69	25	71.15	0.084	CSP	Circular		600	13.75	0.24	W-E	385.21	384.85	2.582	386.049	0.3	0	385.75	385.52	0.23	385.24	0.18	**Upgrade to 600 (existing 400)**
WCB-05	Winston Churchill Boulevard	41+110	28.07	25	81.41	0.051	CSP	Circular		600	12.8	0.82	E-W	392.33	392.28	0.406	393.748	0.3	0	393.45	392.67	0.78	392.65	0.14	**Upgrade to 600 (existing 400)**
WCB-06	Winston Churchill Boulevard	41+400	55.21	25	51.83	0.396	RCB	Box	1829	610	11	0.17	E-W	393.03	392.96	0.700	393.814	1.0	0.3	392.81	393.39	-0.58	393.35	0.17	**Upgrade to 1800 x 610 Box Open Bottom (existing 600 CSP)**
				100	64.10	0.49	RCB	Box	1829	610	11	0.17		393.03	392.96	0.700	393.814	0.0	0.3	393.81	393.43	0.38	393.36	0.19	
				Regional	N/A	1.248 (See Note 1)	RCB	Box	1829	610	11	0.17		393.03	392.96	0.700	393.814	0.0	0.3	393.81	393.68	0.13	393.44	0.36	
WCB-07	Winston Churchill Boulevard	41+710	39.12	25	65.71	0.63	CSP	Circular		700	12.35	0.65	E-W	393.07	392.94	1.061	394.418	0.3	0	394.12	394.00	0.12	393.54	0.5	**Upgrade to 700 (existing 400)**
WCB-08	Winston Churchill Boulevard	41+890	26.4	25	84.55	0.556	HDPE	Circular		600	13.6	0.79	E-W	394.27	394.00	1.985	395.662	0.3	0	395.36	395.07	0.29	394.55	0.49	Maintain Existing
WCB-09	Winston Churchill Boulevard	42+195	76.9	25	40.76	2.224	RCB	Box	6000	1524	15.5	0.64	E-W	399.91	399.85	0.387	402.075	1.0	0.3	401.08	400.75	0.32	400.73	0.24	**Upgrade to 6000 x 1500 Box Open Bottom (existing 1400x900 arch)**
				100	50.46	2.753	RCB	Box	6000	1524	15.5	0.64		399.91	399.85	0.387	402.075	0.0	0.3	402.08	400.89	1.19	400.75	0.28	
				Regional	N/A	7.504 (See Note 1)	RCB	Box	6000	1524	15.5	0.64		399.91	399.85	0.387	402.075	0.0	0.3	402.08	400.94	1.13	400.88	0.54	
WCB-10	Winston Churchill Boulevard	42+750	23.15	25	91.48	0.191	CSP	Circular		600	12.7	0.43	E-W	417.62	417.38	1.890	418.649	0.3	0	418.35	418.11	0.24	417.82	0.28	**Upgrade to 600 (existing 400)**
WCB-11	Winston Churchill Boulevard	43+130	26.28	25	84.78	0.069	CSP	Circular		600	15.5	1.71	W-E	425.25	425.17	0.516	427.557	0.3	0	427.26	425.59	1.67	425.56	0.17	**Upgrade to 600 (existing 400)**
WCB-12	Winston Churchill Boulevard	43+210	41.18	25	62.47	0.175	CSP	Circular		600	18.2	1.72	W-E	424.86	424.42	2.418	427.182	0.3	0	426.88	425.32	1.56	424.86	0.27	Maintain Existing
WCB-13	Winston Churchill Boulevard	44+140	0	25	-	Equalization Culvert	CSP	Circular		600	16	1.18	W-E	424.69	424.55	0.875	426.474	0.3	0	426.17	Equalization Culvert		424.85		**Upgrade to 600 (existing 400)**
WCB-14	Winston Churchill Boulevard	44+310	18.87	25	54.32	0.023	CSP	Circular	1800	900	22.2	6.04	E-W	419.61	419.09	2.360	426.549	1	0	425.55	419.69	5.86	419.69	0.3	**Upgrade to 1800 x 900 Box Open Bottom (existing 450)**
				100	125.95	0.053	RCB	Circular	1800	900	22.2	6.04	E-W	419.61	419.09	2.360	426.549	0	0	426.55	419.74	6.81	419.74	0.4	
				Regional	N/A	0.063 (See Note 1)	RCB	Circular	1800	900	22.2	6.04	E-W	419.61	419.09	2.360	426.549	0	0	426.55	419.79	6.76	419.79	0.5	
WCB-15	Winston Churchill Boulevard	44+615	30.82	25	76.77	0.249	CSP	Circular		600	18.2	1.41	E-W	416.82	416.60	1.221	418.829	0.3	0	418.53	417.37	1.16	417.06	0.32	**Upgrade to 600 (existing 450)**
WCB-16			57.82	25	50.15	1.037	RCB	Box	3000	1219	14.9	0.25	W-E	410.30	409.82	3.255	411.773	1	0	410.77	410.72	0.05	410.54	0.23	**Upgrade to 1800 x 1200 Box Open Bottom (existing 750 CSP)**
				100	62.04	1.282	RCB	Box	3000	1219	14.9	0.25	W-E	410.30	409.82	3.255	411.773	0	0	411.77	410.79	0.98	410.56	0.26	
				Regional	N/A	3.331 (See Note 1)	RCB	Box	3000	1219	14.9	0.25	W-E	410.30	409.82	3.255	411.773	0	0	411.77	411.22	0.55	410.68	0.50	
WCB-17	Winston Churchill Boulevard	45+095	87.14	25	37.14	1.157	CSP	Circular		900	15	1.10	E-W	408.45	408.41	0.267	410.449	0.3	0	410.15	409.69	0.46	409.18	0.63	Maintain Existing
WCB-18	Winston Churchill Boulevard	45+865	80.72	25	39.33	1.733	CSP	Circular		900	23	2.43	E-W	389.93	389.88	0.257	393.268	0.3	0	392.97	392.07	0.90	390.71	0.77	Maintian Existing

Note 1: Peak flow determined from SWMHYMO Model

HDR

Appendix R.3
Stormwater Management Report

Region of Peel

Stormwater Management Report

Mississauga Road / Old Main Street, Bush Street, Olde Base Line Road and Winston Churchill Boulevard, Town of Caledon, Region of Peel

Submitted by:
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May 2014

HDR

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23 June '14
PROVINCE OF ONTARIO

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1. INTRODUCTION

The Regional Municipality of Peel (the Region) is conducting a Schedule "C" Municipal Class Environmental Assessment (EA) to provide a comprehensive and environmentally sound Transportation and Road Infrastructure Improvement Plan using a Context Sensitive Solutions Approach for the following Regional Road corridors:

- Winston Churchill Boulevard (Peel Regional Road 19, Wellington County Road 25) – from Olde Base Line Road to Bush Street;
- Olde Base Line Road (Regional Road 12) – from Winston Churchill Boulevard to Mississauga Road;
- Mississauga Road and Old Main Street (Regional Road 1) – from Olde Base Line Road to Bush Street; and
- Bush Street (Regional Road 11) – from Mississauga Road / Old Main Street to Winston Churchill Boulevard;

The approximate limits of the Study Area are shown in **Exhibit 1-1**.

Subsequent to the *Bush Street and Mississauga Road Class EA Existing Conditions Drainage Report - Draft, June 2010* prepared by Dillon Consulting Limited and the *Drainage and Hydrology Report, Olde Baseline Road and Winston Churchill Boulevard, Town of Caledon, Region of Peel, Draft January 2014* prepared by HDR Corporation, this report was prepared to document the Stormwater Management strategy proposed for the improvements to the four corridors noted above.

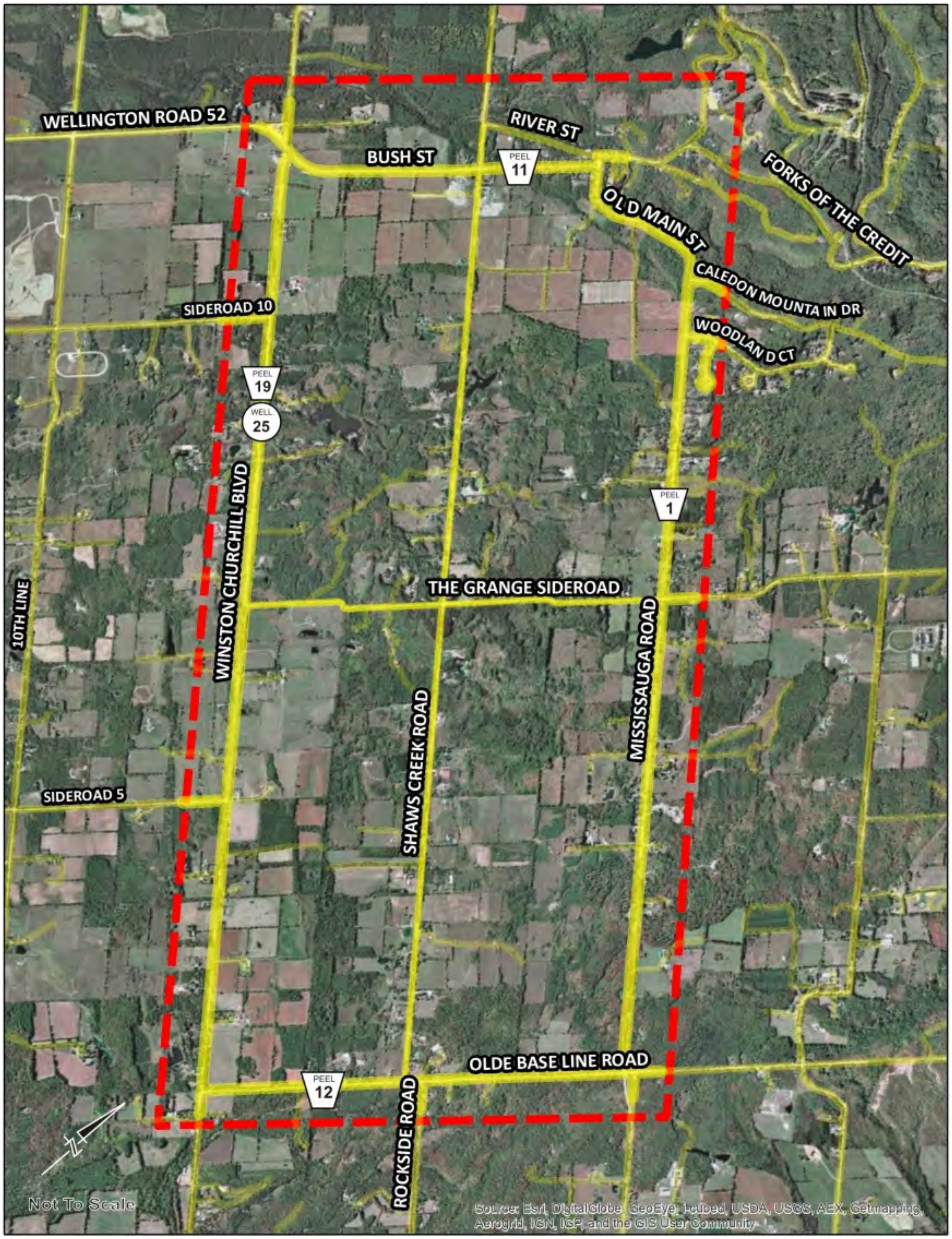


Exhibit 1-1: Study Area

1.1 Description of the Proposed Roadway Improvements

The following sections briefly describe the proposed roadway improvements along each corridor.

1.1.1 Winston Churchill Boulevard

Due to the existing topography and constraints along the right-of-way, and to minimize grading impacts to adjacent properties and features, a semi-rural cross-section is proposed for the majority of the corridor, between Stations 40+000 (Olde Base Line Road) and 45+800. This cross-section consists of one 3.5 m wide travel lane in each direction, with a 1.7 m wide paved shoulder to accommodate active transportation and a 0.5 m mountable curb on each side of the road (illustrated in **Exhibit 1-2**). A 0.3 m rounding and a 2:1 slope then match to existing ground on either side of the road. Drainage is addressed through sub-surface infrastructure. This cross-section connects to a semi-rural cross-section at Olde Base Line Road.

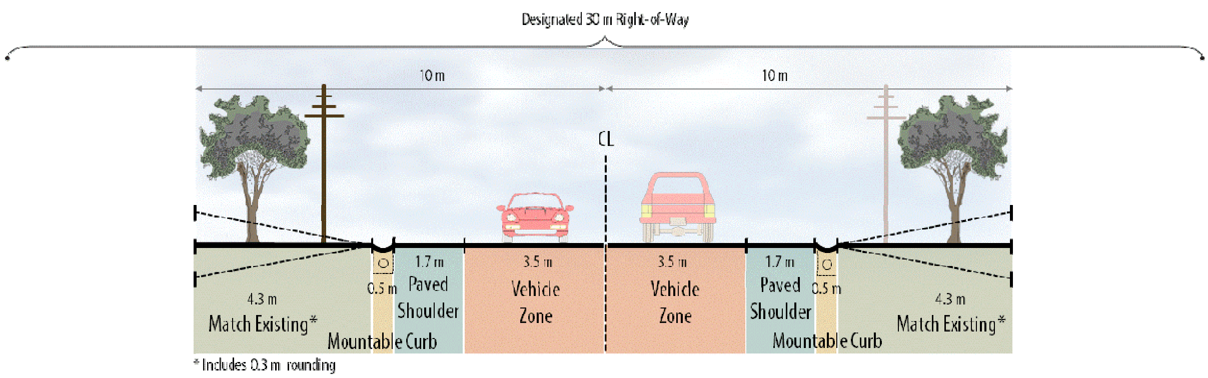


Exhibit 1-2: 11.4 m Platform Semi-Rural Cross-Section for Winston Churchill Boulevard

Between Stations 45+800 and 45+940, where there is a steep slope and an existing guiderail on either side of the road, the proposed design will match to existing conditions. The road platform (including one 3.5 m travel lane in each direction and 1.7 m paved shoulder on each side of the road) will fit between the existing guiderails, and drainage will follow existing conditions, with water flowing down the steep slopes on either side of the road. No mountable curb is proposed through this segment.

Between Stations 45+940 and 46+025 (Bush Street intersection), where a wider, less constrained right-of-way is available, a rural cross-section is proposed. This cross-section consists of one 3.5 m wide travel lane in each direction, with a 1.7 m wide paved shoulder and 0.5 m rounding on each side of the road (illustrated in **Exhibit 1-3**). Drainage is addressed through ditches with 2:1 slopes on either side. This cross-section connects to a rural cross-section at Bush Street.

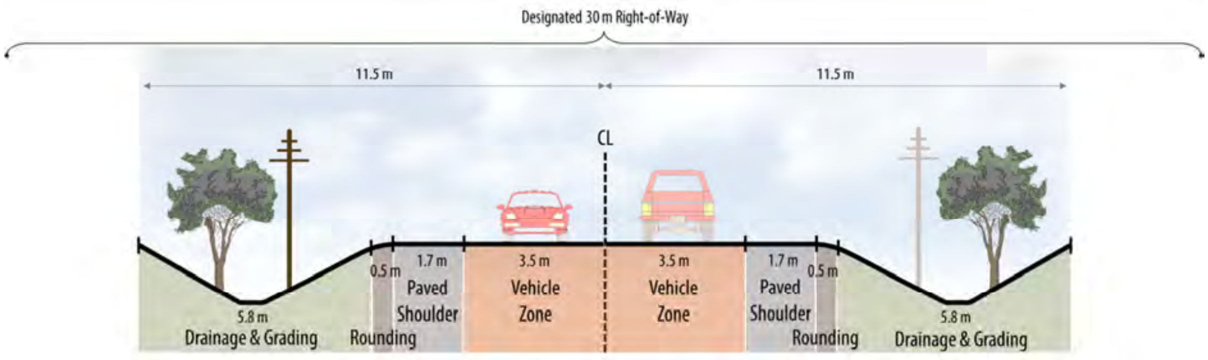


Exhibit 1-3: 11.4 m Platform Rural Cross-Section for Winston Churchill Boulevard

The proposed vertical alignment accommodates a 70 km/h design speed. This vertical alignment was chosen to match the existing road profile wherever possible, while at the same time improving any existing substandard grades and vertical curves to meet the geometric standards required for the class of the road. The vertical profile also aims to minimize impacts to existing entrances and driveways, and to reduce grading impacts to adjacent properties and features.

1.1.2 Olde Base Line Road

Due to the existing topography and constraints along the right-of-way, and to minimize grading impacts to adjacent properties and features, a semi-rural cross-section is proposed for the majority of the corridor, between Stations 30+000 (Winston Churchill Boulevard) and 30+945, and between 31+380 and 32+760 (Mississauga Road). This cross-section consists of one 3.5 m wide travel lane in each direction, with a 1.7 m wide paved shoulder to accommodate active transportation and a 0.5 m mountable curb on each side of the road (illustrated in **Exhibit 1-4**) 0.3 m rounding and a 2:1 slope then match to existing ground on either side of the road. Drainage is addressed through underground infrastructure. This cross-section connects to a semi-rural cross-section at Winston Churchill Boulevard and Mississauga Road.

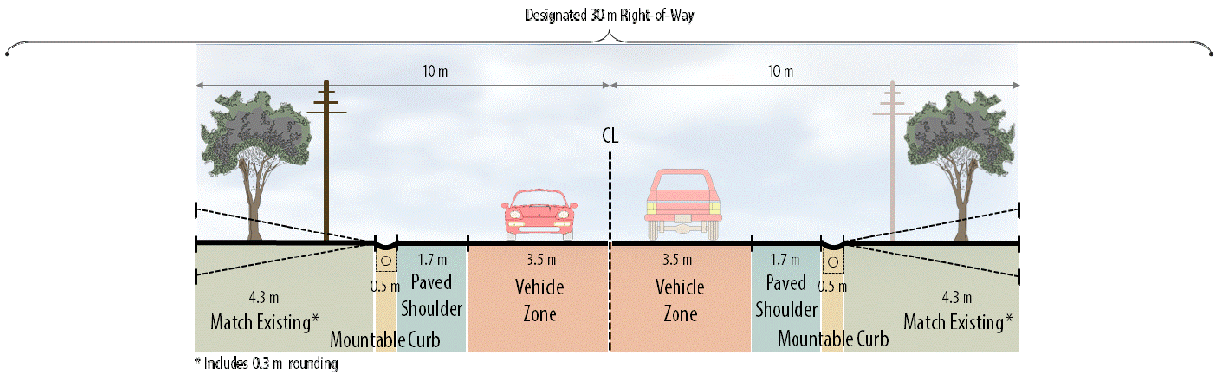


Exhibit 1-4: 11.4 m Platform Semi-Rural Cross-Section for Olde Base Line Road

Between Stations 30+945 and 31+380, a semi-rural cross-section was also considered for continuity, but due to the sensitive watercourse at this location where the design has the potential to address storm water management quality and improve flow conveyance, and where the wider right-of-way can accommodate more extensive grading, a rural cross-section is proposed. This cross-section consists of one 3.5 m wide travel lane in each direction, with a 1.7 m wide paved shoulder and 0.5 m rounding on each side of the road (illustrated in **Exhibit 1-5**). Drainage is addressed through ditches with 2:1 slopes on either side.

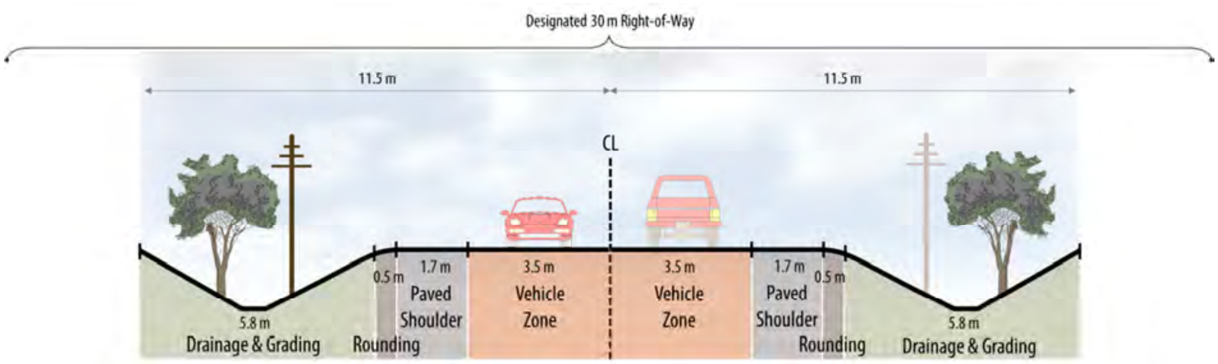


Exhibit 1-5: 11.4 m Platform Rural Cross-Section for Olde Base Line Road

The proposed vertical alignment accommodates a 60 km/h design speed. This vertical alignment was chosen to match the existing road profile wherever possible, while at the same time improving any existing substandard grades and vertical curves to meet the geometric standards required for the class of the road. The vertical profile also aims to minimize impacts to existing entrances and driveways, and to reduce grading impacts to adjacent properties and features.

1.1.3 Mississauga Road / Old Main Street

Due to the existing topography and constraints along the narrow right-of-way, and to minimize grading impacts to adjacent properties and features, a semi-rural cross-section is proposed for the entire length of the corridor, between Olde Base Line Road and approximately 580 m north/west of Caledon Mountain Drive. This cross-section consists of one 3.5 m wide travel lane in each direction, with a 1.7 m wide paved shoulder to accommodate active transportation and a 0.5 m mountable curb on each side of the road (illustrated in **Exhibit 1-6**). 0.3 m rounding and a 2:1 slope then match to existing ground on either side of the road. Drainage is addressed through underground infrastructure. This cross-section connects to a semi-rural cross-section at Olde Base Line Road, and transitions into a semi-rural cross-section through the Belfountain Village.

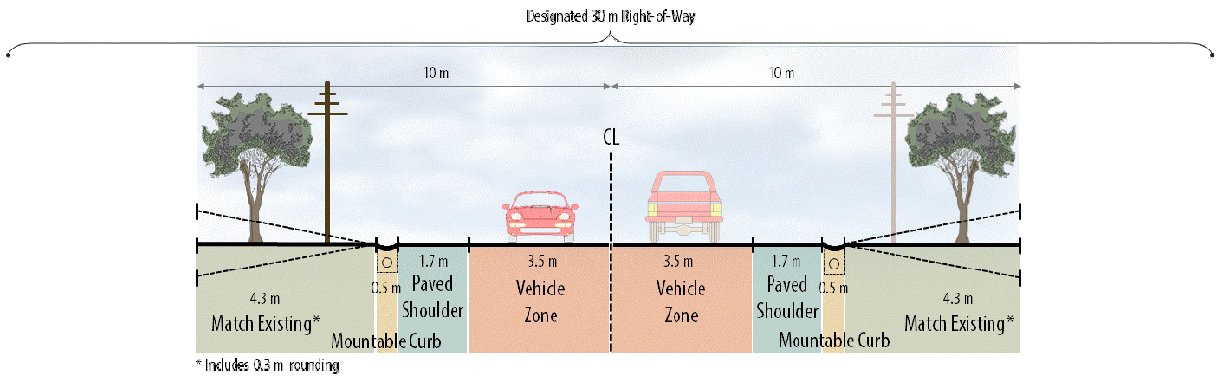


Exhibit 1-6: 11.4 m Platform Semi-Rural Cross-Section for Mississauga Rd. / Old Main St.

The proposed vertical alignment accommodates a 60-70 km/h design speed. Between Olde Base Line Road and approximately 250 m north of Caledon Mountain Drive, the proposed design follows a 70 km/h design speed. North/west of this location, towards the village, the design follows a 60 km/h design speed to accommodate the existing 50 km/h posted speed limit. This vertical alignment was chosen to match the existing road profile wherever possible, while at the same time improving any existing substandard grades and vertical curves to meet the geometric standards required for the class of the road. The vertical profile also aims to minimize impacts to existing entrances and driveways, and to reduce grading impacts to adjacent properties and features.

1.1.4 Belfountain Village

Due to a narrow and highly constrained right-of-way, and to minimize grading impacts to adjacent properties and features, a semi-rural cross-section is proposed through the Belfountain Village, with different cross-section variations for different segments.

On Bush Street, the proposed cross-section consists of one 3.3 m wide travel lane in each direction, with a 0.5 m mountable curb on each side of the road and a 1.7 m wide sidewalk on the south side to connect to the Belfountain Elementary School on Shaws Creek Road south of Bush. This cross-section is illustrated in **Exhibit 1-7**. A 0.3 m rounding and a 2:1 slope then match to existing ground on either side of the road, although extensive grading is not required. Drainage is addressed through underground infrastructure. For consistency, this cross-section will start at Shaws Creek Road (just west of the Belfountain Village study limits) and end at Mississauga Road / Old Main Street, where it connects to another semi-rural cross-section.

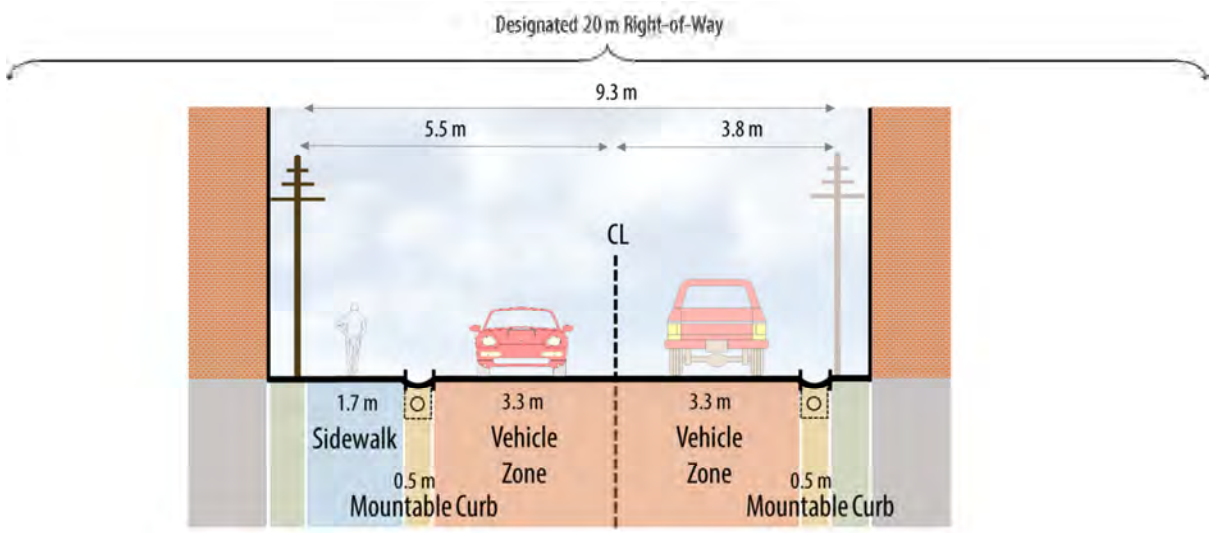


Exhibit 1-7: 9.3 m Platform Semi-Rural Cross-Section with Sidewalk for Belfountain Village (Shaws Creek Rd. to Mississauga Rd. / Old Main St.)

Between Bush Street and the Belfountain Community Centre, the proposed cross-section consists of one 3.3 m wide travel lane in each direction, with 2.4 m wide on-street parking on the east side and a 0.5 m mountable curb on each side of the road. A 1.7 m wide sidewalk on the west side connects to the sidewalk on the south side of Bush Street. This cross-section is illustrated in **Exhibit 1-8.** A 0.3 m rounding and a 2:1 slope then match to existing ground on either side of the road, although extensive grading is not required. Drainage is addressed through underground infrastructure. This cross-section connects to another semi-rural cross-section east of the Community Centre.

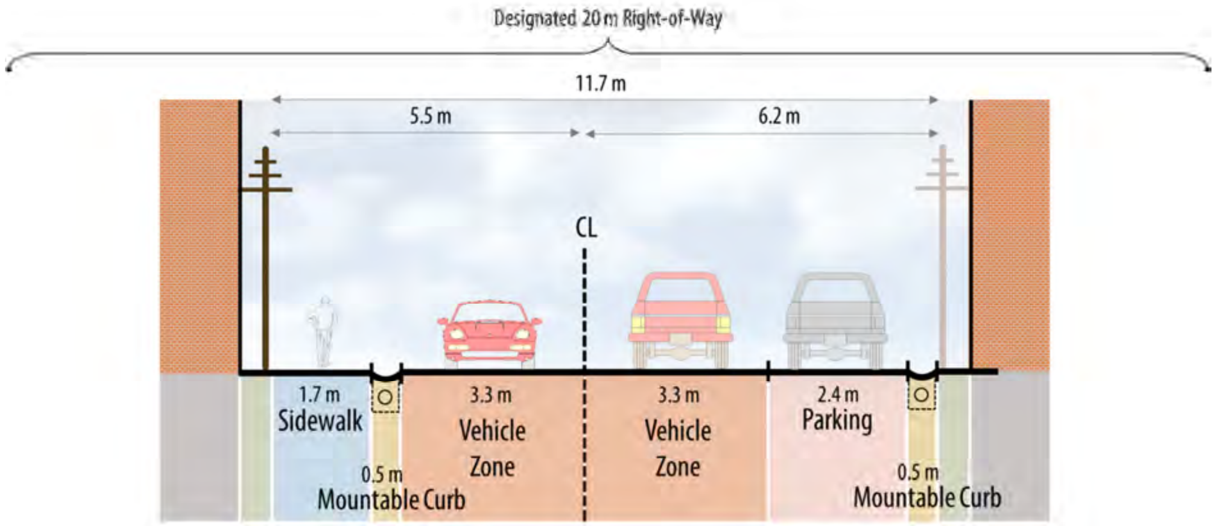


Exhibit 1-8: 11.7 m Platform Semi-Rural Cross-Section with Sidewalk and Parking for Belfountain Village (Bush St. to Community Centre)

Between the Belfountain Community Centre and north/west of Caledon Mountain Drive, the proposed cross-section consists of one 3.3 m wide travel lane in each direction, with a 1.7 m wide paved shoulder on the south side and a 0.5 m mountable curb on each side of the road. This cross-section is illustrated in **Exhibit 1-9**. A 0.3 m rounding and a 2:1 slope then match to existing ground on either side of the road, although extensive grading is not required. Drainage is addressed through underground infrastructure.

At the pinch point just east of the Community Centre, where the right-of-way is highly constrained by a retaining wall / guiderail on the north side, and buildings, fences and other features on the south side, the paved shoulder width is proposed to be reduced as required to minimize impacts. East of the pinch point, where the right-of-way is less constrained, it is proposed to introduce a paved shoulder on the north side as well and widen the travel lanes to 3.5 m to transition to a cross-section consistent to that proposed south of Caledon Mountain Drive.

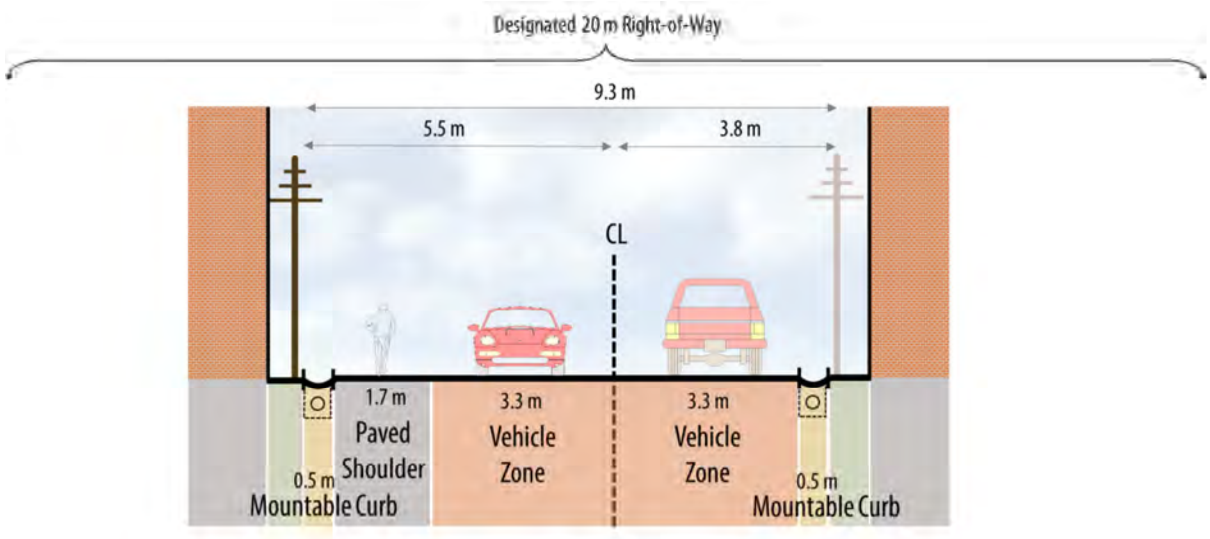


Exhibit 1-9: 9.3 m Platform Semi-Rural Cross-Section with Paved Shoulder for Belfountain Village (Community Centre to north/west of Caledon Mountain Drive)

The proposed horizontal alignment generally follows the existing road centreline with the exception of a slight realignment to the north between Stations 11+975 and 12+100 to minimize impacts and avoid property acquisition on the south side.

Due to the narrow and highly constrained right-of-way though Belfountain Village and the low proposed posted speed limit, the proposed design generally follows the existing road profile and accommodates a 50km/h design speed. The proposed vertical profile aims to minimize impacts to existing entrances and driveways, and to reduce grading impacts to adjacent properties and features. This vertical alignment was chosen to match the existing road profile wherever possible, while at the same time improving any existing substandard grades and vertical curves to meet the geometric standards required for the class of the road to the extent possible.

1.1.5 Bush Street

Due to a wider available right-of-way along Bush Street, a rural cross-section can be accommodated and is therefore proposed for the majority of the corridor, between Stations 10+000 (Winston Churchill Boulevard) and 11+125, and between Stations 11+220 and 11+365 (Shaws Creek Road). This cross-section consists of one 3.5 m wide travel lane in each direction, with a 1.7 m wide paved shoulder to accommodate active transportation and 0.5 m rounding on each side of the road (refer to **Exhibit 1-10**). Drainage is addressed through ditches with 2:1 slopes on either side. This cross-section connects to a rural cross-section at Winston Churchill Boulevard.

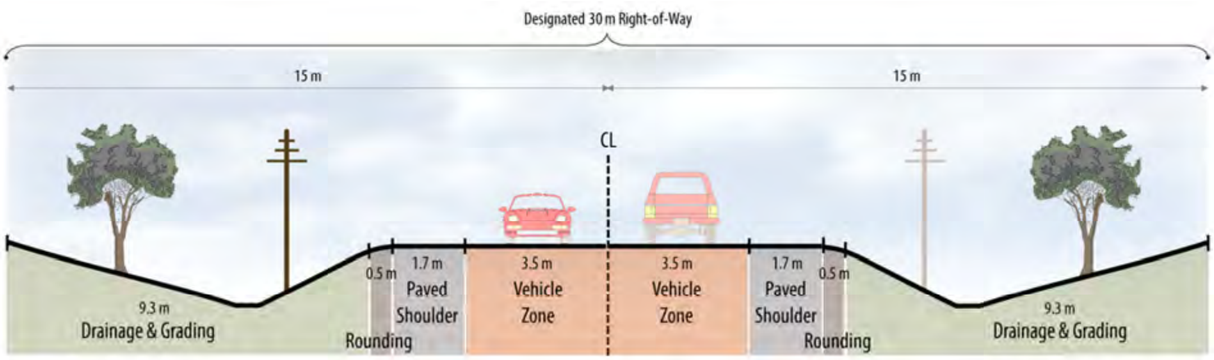


Exhibit 1-10: 11.4 m Platform Rural Cross-Section for Bush Street

Between Stations 11+125 and 11+220, where there is a steep slope and an existing guiderail on either side of the road, the proposed design will match to existing conditions. The road platform (including one 3.5 m travel lane in each direction and 1.7 m paved shoulder on each side of the road) will fit between the existing guiderails, and drainage will follow existing conditions, with water flowing down the steep slopes on either side of the road. No mountable curb is proposed through this segment.

East of Shaws Creek, a transition to a semi-rural cross-section is proposed for continuity with the cross-section through the Belfountain Village.

The proposed vertical alignment accommodates a 60-80 km/h design speed. Between Winston Churchill Boulevard and Shaws Creek Road, the proposed design follows an 80 km/h design speed. East of Shaws Creek Road, towards the village, the design follows a 60 km/h design speed to accommodate the existing 50 km/h posted speed limit. This vertical alignment was chosen to match the existing road profile wherever possible, while at the same time improving any existing substandard grades and vertical curves to meet the geometric standards required for the class of the road. The vertical profile also aims to minimize impacts to existing entrances and driveways, and to reduce grading impacts to adjacent properties and features.

1.2 Objectives of Drainage and Stormwater Management Study

The purpose of this Stormwater Management Report was to develop a stormwater management plan for the Mississauga Road, Old Main Street, Bush Street, Olde Base Line Road, and Winston Churchill Boulevard Class EA project that will address both water quantity and quality issues. In essence, the Stormwater Management Report was carried out with the view of minimizing the potential impacts of the proposed road widening on the natural environment, while ensuring an adequate roadway drainage system is incorporated as part of the overall improvements.

The objectives of the Drainage and Stormwater Management Report are to develop a strategy for the project that will:

- Identify potential stormwater runoff quality and quantity impacts to the receiving watercourses from the increased pavement area in comparison with the existing condition;
- Address concerns from the review agencies including the Credit Valley Conservation Authority (CVC), Ministry of Natural Resources (MNR), as well as the development community, and any public interest groups; and
- Propose an appropriate pavement drainage system for roadway operation and safety.

2. BACKGROUND INFORMATION

The following information was also reviewed in the preparation of the report:

1. *Belfountain Transportation Corridor Class Environmental Assessment Study, Peel Region - Natural Heritage Report – Existing Conditions and Natural Feature Constraints, August 2013* prepared by Natural Resource Solutions Inc.

2. *Bush Street and Mississauga Road Class EA Existing Conditions Drainage Report - Draft, June 2010* prepared by Dillon Consulting Limited.

3. *Drainage and Hydrology Report, Olde Baseline Road and Winston Churchill Boulevard, Town of Caledon, Region of Peel, Draft January 2014* prepared by HDR Corporation.

4. Preferred Design Drawings (Plan and Profile) dated February 21, 2014;

2.1 Land Use

The study area is part of the Greenbelt Plan Area and includes part of the Niagara Escarpment Plan Area. The existing land use in the vicinity of the study area is primarily agricultural and rural residential.

2.2 Soils

Based on the Soil Map of Peel County (Soil Survey Report No. 18, November 1955), the majority of the lands within the study area consist of Dumfries loam, Caledon loam or Farmington loam.

2.3 Watershed Descriptions

The study area is located in the Credit River watershed and specifically within the West Credit River subwatershed and the Cheltenham to Glen Williams subwatershed.

2.3.1 West Credit Subwatershed

Two unnamed tributaries, identified as A and B in this report are found within the study area which are part of the West Credit subwatershed. The two unnamed tributaries drain into the west branch of the Credit River, near Belfountain, upstream of the Forks of the Credit. Tributary A is a headwater tributary which flows north under Bush Street and connects to the west branch of the Credit River less than 150 m to the west of the study area. The origin of flow for this feature is located outside of the study area and is formed through groundwater seepages and runoff. Tributary B is located within Belfountain and drains under Old Main

Street into the Credit River to the north of the study area. This feature has a steep gradient and carries surface runoff from the neighbouring areas to the west branch of the Credit River.

2.3.2 Cheltenham to Glen Williams Subwatershed

Three tributaries to the Credit River fall within the study area. These tributaries are Rogers Creek, Second Creek, and an Unnamed Tributary.

Second Creek
Second Creek and its unnamed tributaries cross the study area three times, twice along Mississauga Road (Tributaries A and B) and once along Olde Baseline Road (Tributary A). All of the unnamed tributaries, along with Second Creek itself, flow in a southwesterly direction through wetlands and numerous online ponds. The unnamed tributaries that cross the study area originate within wetlands to the north of Mississauga Road Second Creek connects with the main branch of the Credit River approximately 6 km downstream of the culvert crossing along Olde Baseline Road.

Unnamed Tributary
The two tributaries to an unnamed watercourse cross under Mississauga Road near Olde Baseline Road These tributaries flow in a southeasterly direction and converge upstream of a crossing of Olde Baseline Road, and subsequently drain into the unnamed watercourse approximately 120 m east of the study area. The crossings along Mississauga Road are all located within low lying wetland features. The culvert crossing along Olde Baseline Road appears to be a constructed drainage feature to carry surface runoff to the unnamed tributary. The unnamed tributary eventually drains into the main branch of the Credit River to the south of the study area.

Rogers Creek
Rogers Creek and its unnamed tributaries cross the study area three times. Tributary A to Rogers Creek crosses under Olde Baseline Road and flows in a southeasterly direction. This tributary originates upstream of the crossing location and is formed through agricultural runoff, online ponds, and potentially groundwater seepages. Tributary B to Rogers Creek also crosses under Olde Baseline Road and flows in a southeasterly direction. The tributary is a headwater feature and originates through agricultural runoff as well as groundwater features. The third tributary to Rogers Creek (Tributary C) crosses under Winston Churchill Boulevard and flows in a southeasterly direction. This feature flows through numerous wetland features before its confluence with Rogers Creek.

2.4 Designated Natural Areas

2.4.1 Provincially Significant Wetlands

Portions of two Provincially Significant Wetlands (PSW) complexes occur within the study area: the Eramosa River-Blue Spring Creek PSW Complex and the Caledon Mountain PSW Complex.

The Eramosa River-Blue Spring Creek PSW is located in the extreme south-western portion of the study area, adjacent to Winston Churchill Boulevard and west of The Grange Side Road.

The Caledon Mountain PSW is comprised of seven smaller wetlands, being predominantly swamp (95%), and a lesser extent marsh (5%). The PSW is important for whitetailed deer (Odocoileus virginianus) as well as for fish spawning and rearing, particularly for brook trout (Salvelinus fontinalis). The PSW lies within the east end of the study, along Winston Churchill Boulevard and Mississauga Road.

2.4.2 Life Science Areas of Natural and Scientific Interest

Two Life Science Areas of Natural and Scientific Interest (ANSIs) occur within the study area: the Caledon Mountain Slope Forest ANSI and the Credit Forks ANSI.

Caledon Mountain Slope Forest ANSI is a large tract of primarily deciduous forest, harbouring locally significant lands for mammals, predominantly white-tailed deer. The ANSI offers habitat for sizeable populations of amphibians, predominantly salamanders. The Caledon Mountain Slope Forest ANSI is located within the Caledon Mountain ESA (described below), and within the eastern end of the study area, adjacent to Olde Baseline Road.

The Credit Forks ANSI is comprised of 46 individual wetlands, and supports locally significant habitat for white-tailed deer, herpetofauna (specifically snapping turtle (Chelydra serpentine), and supports potential waterfowl breeding and staging habitats. The ANSI is located in the northwestern portion of the study area, along Mississauga Road and Bush Street.

2.4.3 Environmentally Significant or Sensitive Areas

Three Environmentally Significant Areas (ESAs) occur within the study area: the Grange Woods ESA, Caledon Mountain ESA, and the Credit Forks – Devil's Pulpit ESA.

The Caledon Mountain ESA is within the Niagara Escarpment Plan Area and is also part of the Region of Peel Core Greenlands System (Region of Peel 2008). The Caledon Mountain ESA abuts the eastern end of the study area, along Olde Baseline Road.

The Credit Forks – Devil's Pulpit ESA, located on the Niagara Escarpment, provides some of the most extensive and complimentary views of the escarpment. The Credit Forks – Devil's Pulpit ESA is a major outlier valley feature, displaying rugged talus slopes. It is one of the most important regions for fish spawning and nursery habitat in the region, and supports a wide diversity of fish species. The Credit Forks – Devil's Pulpit ESA is located peripherally on the extreme northwestern portion of the study area, along Mississauga Road and the Credit River.

The Grange Woods ESA is comprised of seven individual wetlands, largely comprised of swamp (96%), and to a lesser extent marsh (4%) habitat. Hydrologically, the Grange Woods ESA is connected by surface water to adjacent wetlands, up to 0.5 km away. The ESA provides valuable habitat to the flora and fauna of the region, and is locally significant as winter cover for wildlife, specifically white-tailed deer. The Grange Woods ESA is located along the northern section of the study area, specifically along Mississauga Road, west of The Grange Sideroad.

2.4.4 Credit Valley Conservation Natural Area Inventory Regions

Three sites identified within the Credit Valley Conservation's (CVC's) Natural Areas Inventory (NAI) fall within the study area: Tenth Line – 5 Sideroad South, Winston Churchill – Ballinafad, and Mississauga Road-Grange Central.

The Tenth Line – 5 Sideroad South NAI site consists of 140 ha of rolling topography, mixed with open grassland and interior forest habitats. The property is currently entirely private. This property has a diverse set of vegetation communities and is similarly diverse in regards to the flora and fauna found within the property. Several SAR and species of conservation concern have been confirmed to be present throughout this site, including butternut (Juglans cinerea), barn swallow (Hirundo rustica), Canada warbler (Cardellina canadensis), hooded warbler (Setophaga citrina), bobolink (Dolichionyx oryzivorus), eastern meadowlark (Sturnella magna), and western chorus frog (Pseudacris triseriata).

The Winston Churchill – Ballinafad NAI site consists of 717 ha and is regarded as an exceptional property with high quality natural areas. Ownership is primarily private (83%), versus public (17%). This property is regarded as particularly ecologically diverse, due to its size, location and distinct elevational properties (being along the Niagara Escarpment. A total of seven SAR and species of conservation concern have been confirmed present on this site: American hart's-tongue fern (Asplenium scolopendrium var. americanum), butternut, barn swallow, Canada warbler, bobolink, eastern meadowlark, and western chorus frog. Numerous regionally rare plant and bird species have also been observed throughout the property.

The Mississauga Road-Grange Central NAI site is the second largest of the three NAI regions in the study area vicinity at 263 ha. This natural area is predominantly swamp and deciduous forest, with scattered mixed and coniferous forest. SAR and species of conservation concern found on-site include: butternut, Canada warbler, hooded warbler, and monarch (Danaus plexippus).

2.5 Fisheries

2.5.1 West Credit River Subwatershed

The west branch of the Credit River within the area of Belfountain is considered to be a coldwater fishery. The documented fish community within the west branch of the river includes a variety of species that exhibit varied life history requirements and trophic statuses. Sensitive cool/coldwater species have also been identified within the west branch of the Credit River.

Redside dace (Clinostomus elongatus), which is listed as Endangered under the ESA, has also been observed as occurring within 1 km of the study area within the west branch of the Credit River; however, this species is not known to occur in the portion of the watercourses in the study area. No other SAR fish or mussels were identified as occurring within the study area.

Brook trout are also found within the unnamed Tributary A to the West Credit River. Additional species information was not available for this tributary and no information was provided for Tributary B.

2.5.2 Cheltenham to Glen Williams Subwatershed

Both Rogers Creek and Second Creek are considered coldwater fisheries. The fish community is better documented within Rogers Creek than Second Creek but both have sensitive cool/coldwater species, including brook trout and rainbow trout. No significant species are known from these watercourses.

3. SURFACE WATER MANAGEMENT

The following sections discuss the proposed drainage system, outline the applicable stormwater management guidelines, review and select appropriate stormwater management strategies, and summarize the proposed stormwater management plan.

3.1 Description of the Proposed Subsurface Drainage System

The majority of the roadway corridor improvements recommend the provision of a semi-rural roadway cross-section. As such a sub-surface drainage system is recommended for inclusion into the roadway cross-section. The subsurface drainage system will consist of a series of catchbasins, storm sewers and subdrains which will collect and convey both the granular base material and surface runoff and discharge to existing drainage outlets. The storm sewers shall be sized to accommodate a 10 year return period event, using a minimum inlet time of 15 minutes as per Region of Peel design standards. The design of the sewers will need to take into account any drainage from roadway boulevard areas as well as drainage external to the roadway right-of-way. In addition, where the roadway is adjacent to wetlands or in areas of a high groundwater table, storm sewer trenches shall include trench-plug units to ensure groundwater resources are not affected.

Effort has been made to ensure that existing drainage patterns and locations are maintained throughout the various roadway corridors. A conceptual storm system layout is illustrated on the preliminary design plates.

3.2 Drainage and Stormwater Management Criteria

In accordance with the Region of Peel guidelines, the stormwater management plan should conform to the following documents / guidelines:

1. MOEE Stormwater Management Practices Planning and Design Manual, March 2003.
2. Credit Valley Conservation Authority Valley Policies for water management.

3.2.1 Pavement Drainage Criteria

Minor System

The storm sewer system draining the pavement for the ultimate roadway configuration is to be designed to the 10 year design storm standard.

Major System

The major drainage system for the roadway is to be designed to convey overland flow to the adjacent watercourse in a safe manner.

3.2.2 Water Quality Control Criteria

Credit Valley Conservation requires water quality controls commensurate with the maximum downstream habitat type. In this case, all watercourses within the study limits require "Enhanced" protection (Level 1). Level 1 protection is to be provided, as a minimum for a pavement area equivalent to the new pavement area.

The MOEE Stormwater Management Practices and Planning Manual, March 2003, provides guidance for the selection of appropriate levels of stormwater quality protection for enhanced habitats, based on removal of total suspended solids (TSS).

3.3 Pavement Area Analysis

A pavement area analysis was undertaken to determine whether or not the proposed improvements to Mississauga Road, Old Main Street, Bush Street, Olde Base Line Road and Winston Churchill Boulevard corridors will result in an increase in impervious coverage when compared to existing conditions. The existing and proposed pavement areas, based on the preferred design, are summarized in **Table 3-1**.

Table 3-1: Existing and Proposed Pavement Areas

Location	Existing Pavement Area (m^2)	Proposed Pavement Area (m^2)	Increase in Pavement Area (m^2)	Increase in paved area (%)
Mississauga Road	50,000	65,190	15,190	30%
Bush Street / Old Main Street	18,250	20,420	2,170	12%
Olde Base Line Road	20,650	28,580	7,930	38%
Winston Churchill Boulevard	44,420	63,750	19,330	44%
TOTAL	**133,320**	**177,940**	**44,620**	**33%**

The pavement analysis determined that the proposed improvements will result in a 33% (4.46 ha) increase in impervious area over existing conditions. Therefore, stormwater management measures will be required in order to offset the impacts associated with the increase in pavement.

3.4 Stormwater Management Options

Stormwater Management Practices (SWMP's) for the management of roadway runoff generally fall into two categories; those that address water quantity and those that manage water quality of surface runoff. Water quantity management issues relate to properly sizing watercourse crossings of the roadway corridor, as well as the conveyance of roadway runoff along the roadway corridor for minor and major storm events. In addition, water quantity management strategies can include the need for facilities to address downstream flood and erosion potential from the development (expansion) of the roadway right-of-way.

In terms of water quality, the SWMP's relate to the treatment of new pavement and where possible, the treatment of existing pavement; however, current legislation solely relates to the former. Typically, the treatment level is related to the standards defined in the watershed or sub-watershed planning study, which are dependant on the quality and sensitivity of the receiving stream system.

Various Best management practices or Stormwater Management practices are available to address both the quantity and quality of runoff from roadways. Due to the linear nature of roadway corridors, however, the full spectrum of stormwater management practices is typically not appropriate.

There are a number of SWMP's which can be used to treat runoff and / or control peak flows from roadway surfaces. These include the following:

1. Water Quality Inlets
2. Vegetative Facilities
    - Filter strips
    - Enhanced grassed swales
3. Infiltration Facilities
    - Infiltration basins
    - Infiltration trenches
    - Soak-away pits
4. Detention Facilities
    - Extended detention wet ponds
    - Extended detention dry ponds
    - Extended detention wetlands

The applicability of these SWMP's are reviewed below and appropriate measures identified to minimize potential water quantity and quality impacts related to the proposed road corridor improvements.

3.4.1 Water Quality Inlets

Water quality inlets, also known as oil / grit separators, combine storage chambers for sediment trapping and oil separation with drainage inlets or inflow sewers for intercepting or receiving roadway stormwater runoff. Oil / grit separators (OGS) are capable of removing up to 80% of the annual sediment load when properly designed as a source control for small areas. This type of SWMP was considered feasible for this study.

3.4.2 Vegetative Facilities

Vegetative facilities treat runoff through filtration and sedimentation. With appropriate site condition, they can provide effective treatment of sediment. They have limited effectiveness for controlling peak flows and downstream erosion.

Filter Strips

Filter Strips operate through a combination of sedimentation and infiltration. Shallow flows are routed over grassed filter strips, which slow down runoff to enhance both the retention of the particulate matter and the infiltration of the runoff with its dissolved constituents. Filter strips are applicable to a rural road cross section where there are at least several meters of grassed shoulder on the side of the roadway in addition to the standard shoulder and ditch. They may also be applicable where there are high vegetated embankments at deep valley crossings. Vegetated filter strips were not considered to be a water quality treatment option for the any of the corridors in our study area due to limited land availability.

Grassed Swales

Grassed swales are formed by widening the roadway ditches and in some instances, installing small, porous check dams to retard the flow. The check dams slow down and detain the flow which increase the degree of sedimentation and infiltration that occurs. The enlarged ditches provide additional storage capacity for flow retention and sediment accumulation. Due to the limited storage capacities in ditches, the degree of flow control may be small. However, they are relatively more effective at controlling runoff from smaller, more frequent events which results in some erosion control benefit. The sediment storage capacity is also relatively small and may require more frequent clean out than a detention pond. For the grassed swales to be effective at providing the desired treatment for runoff, they should be designed with a maximum flow of 0.15 m^3/s for the 25 mm Chicago type storm distribution and a maximum flow velocity of 0.5 m/s. Grassed swales can be created by relatively minor modifications to the standard ditches in a rural roadway section. Grassed swales were considered to be a feasible water quality treatment option for segments of Old Base Line Road and Bush Street, where a rural road cross-section is proposed.

However, should the design parameters not meet the above MOE’s criteria, check dam installation may be necessary to “Enhance” the quality of treatment. In such cases, grassed swales with check dams would need to be included to treat the roadway storm runoff.

3.4.3 Infiltration Facilities

Infiltration facilities capture runoff for infiltration to groundwater. This reduces the rates of runoff to the streams and provides a high level of treatment through the capture of both particulate and dissolved constituents. These types of facilities reduce water temperature impacts and enhance stream base flows through groundwater recharge. Since the volume of runoff to the receiving streams is reduced, these facilities also contribute to controlling downstream erosion and peak flow increases.

The disadvantage of these types of facilities is that they tend to become clogged by sediment wash-off from the roadway. As a result, the maintenance of an infiltration facility may be more frequent and more costly than other types of stormwater management. A second disadvantage is the need to protect the groundwater from contamination from chlorides and other constituents of road runoff. For these reasons, infiltration facilities were not considered further.

3.4.4 Stormwater Management Detention Facilities

Detention facilities operate on the basis of temporary storage of runoff to promote the removal of pollutants through sedimentation. They are generally effective at removing particulate constituents such as sediments and metals but ineffective at removing dissolved constituents such as salt. Extended detention wet ponds and constructed wetlands are considered to be effective at achieving an enhanced level of treatment for roadway runoff. Extended detention dry ponds generally do not provide this level of treatment. Detention facilities are also effective for erosion and peak flow (flood) control.

The disadvantage of these facilities is their large land requirement. For this project, there is a space constraint within the right-of-way that would not accommodate the construction of detention facilities.

3.4.5 Feasible Stormwater Management Options

Based on the screening of stormwater management options documented in **Sections 3.4.1** to **3.4.4**, oil grit separators and grassed swales are considered to be feasible for the study corridors.

3.5 Proposed Stormwater Management Plan

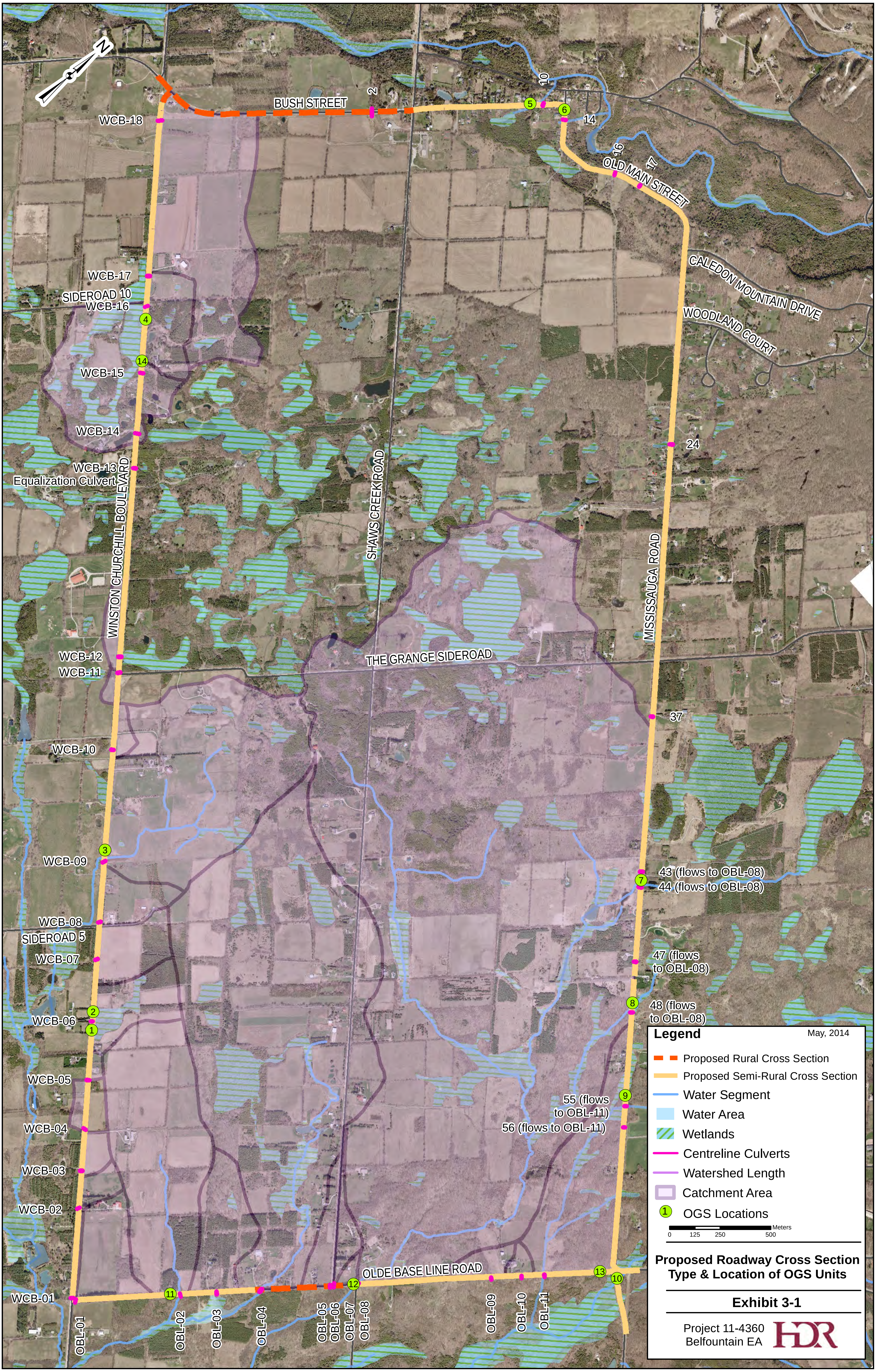
The proposed stormwater management plan for the project has been developed by examining the opportunities and constraints within the entire project area. The proposed plan consists of rural and semi-rural roadway sections. Runoff from the paved roadway area will be conveyed by existing roadside ditches, proposed grassed swales, new subsurface drainage system and existing and proposed culverts. The proposed locations of all rural and semi-rural roadway sections are illustrated in **Exhibit 3-1**.

The majority of the existing rural cross-sections will be converted into semi-rural cross-sections with a subsurface drainage system. The subsurface drainage system will consist of a series of catchbasins, storm sewers and subdrains which will collect and convey both the granular base material and surface runoff and discharge to existing drainage outlets.

Where the existing rural ditch system is to remain, ditches will be re-graded to flat-bottom swale systems (grassed swales), where possible, to provide additional water quality benefits within the project limits. They will continue to collect and convey drainage from external lands along the roadway corridors to the respective culvert crossing locations.

As previously indicated in **Table 3-1**, under the proposed condition, the total roadway pavement area will be increased by 44,620m^2 (4.46 ha). This increase forms the basis for the level of water quality treatment to be provided.

Oil grit separator and grassed swales were selected for stormwater management quality control to treat the roadway runoff corresponding to the additional pavement area resulting from the roadway improvements. These stormwater management practices are described in more detail below.


N
BUSH STREET
OLD MAIN STREET
CALEDON MOUNTAIN DRIVE
WOODLAND COURT
SIDEROAD 10
SIDEROAD 5
WINSTON CHURCHILL BOULEVARD
SHAWS CREEK ROAD
MISSISSAUGA ROAD
THE GRANGE SIDEROAD
OLDE BASE LINE ROAD
Equalization Culvert
WCB-18
WCB-17
WCB-16
WCB-15
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Legend
May, 2014
Proposed Rural Cross Section
Proposed Semi-Rural Cross Section
Water Segment
Water Area
Wetlands
Centreline Culverts
Watershed Length
Catchment Area
OGS Locations
0 125 250 500 Meters
Proposed Roadway Cross Section Type & Location of OGS Units
Exhibit 3-1
Project 11-4360
Belfountain EA
HDR

3.5.1 Oil / Grit Separator Option

Due to limited land availability, the principal features of the proposed stormwater management system are the provision of oil-grit separator (OGS) units to provide water quality control. The recommended placement of the OGS units was focused on locations with fisheries sensitivity (i.e. watercourse crossing that support direct fish habitat) and locations of Provincially Significant Wetlands. These locations are listed in **Table 3-2** as identified in the *Belfountain Transportation Corridor Class Environmental Assessment Study, Peel Region - Natural Heritage Report – Existing Conditions and Natural Feature Constraints, August 2013* prepared by Natural Resource Solutions Inc. Report.

Table 3-2: OGS Locations

Location (Culvert ID)	Station	OGS Unit I.D No.	Paved Treatment Area (ha)	Notes
Winston Churchill Blvd. (WCB-06)	41+400	1 and 2	0.373	Provincially Significant Wetland Fisheries Habitat
Winston Churchill Blvd. (WCB-09)	43+010	3	0.632	Tributary C of Rogers Creek Fisheries Habitat
Winston Churchill Blvd (WCB-15)	44+610	14	0.274	Unnamed Watercourse
Winston Churchill Blvd. (WCB-16)	44+950	4	0.374	Provincially Significant Wetland
Bush Street (10)	12+010	5	0.198	Tributary A of Credit River Fish Habitat
Old Main Street (14)	26+375	6	0.396	Tributary B of Credit River
Mississauga Road (44)	22+210	7	0.828	Tributary A of Second Creek Fish Habitat
Mississauga Road (48)	21+595	8	0.2130	Tributary B of Second Creek Wetland Contribution
Mississauga Road (55)	21+130	9	0.535	Provincially Significant Wetland
Mississauga Road	20+220	10	0.472	Unnamed watercourse
Olde Base Line Road (OBL-02)	30+540	11	0.368	Tributary B of Rogers Creek
Olde Base Line Road (OBL-08)	30+400	12	0.513	Discharges downstream to Tributary A of Second Creek
Olde Base Line Road	32+650	13	0.593	Wetland / Jefferson Salamander Regulated Habitat
Total		**14**	**5.56**	

A total of fourteen (14) OGS units are proposed (see **Exhibit 3-1**) providing a total collective area for stormwater treatment of 5.56 ha. Water quality criteria will be met at each OGS location based on Enhanced (Level 1) protection as outlined in the MOE Stormwater Management Practices Manual. For further illustration please refer to Appendix A to Appendix K.

3.5.2 Grassed Swale Option

To augment the impacts associated with the increased pavement, wide bottom (1.0m) grassed swales are proposed at the locations listed in **Table 3-3**.

Table 3-3: Grassed Swale Locations

Location	Station		Length (m)
	From	To	
Olde Base Line Road (North Side)	30+940	31+280	340
Olde Base Line Road (South Side)	30+940	31+240	300
Bush Street (North Side)	10+000	11+140	1,140
	11+200	11+350	150
Bush Street (South Side)	10+000	10+200	200
	10+300	10+580	280
	10+820	11+120	300
	11+200	11+350	150
Winston Churchill Blvd. (West Side)	45+940	46+010	70
Winston Churchill Blvd. (East Side)	45+950	46+010	60
Total			**2,990**

Based on a typical pavement width of 11.5 metres, the potential collective area of treatment that can be provided by the grassed swales noted in **Table 3-3** above is approximately 3.4 ha. During detailed design, the location and performance characteristics of the swales will need to be confirmed to ensure that all swale criteria can be met.

3.5.3 Summary of Water Quality Recommendations

The stormwater management strategy recommended for this project will provide water quality treatment to 5.56 ha of pavement area through the use of OGS units and approximately 3.4 ha of pavement area through the incorporation of grassed swales along the roadway corridors. Therefore the treated pavement area would significantly exceed the additional pavement area of 4.46 ha resulting from the roadway improvements. This represents a 101% increase in treated pavement area over additional pavement area.

4. EROSION AND SEDIMENT CONTROL DURING CONSTRUCTIONS

Erosion and sediment control measures should be implemented and monitored through the construction period. Construction activity should be conducted during periods that are least likely to result in in-stream impacts to fish habitat.

Detailed erosion and sediment control plans will be required as part of the detailed design component for all phases of the construction. The erosion and sediment control plans will be subject to review and approval by the various external agencies involved in the project. These would include the Credit Valley Conservation Authority.

During construction, disturbances to watercourse riparian vegetation should be minimized. If riparian vegetation is removed or disturbed, erosion and sediment control measures such as silt fences, rock flow check dams and sedimentation ponds should be utilized to provide a maximum protection of local and downstream aquatic resources. These measures should be maintained during construction and until disturbed areas have been stabilized with seed and mulch. Additionally, topsoil should not be stockpiled close to the watercourses and water should not be withdrawn from these sensitive streams for construction purposes.

The site engineer and contractor will be responsible for delineating work areas, and ensuring that erosion and sediment control measures are functional. In addition, the engineer will ensure that provisions related to fisheries and watercourse protection is met and that fish habitat compensation measures are implemented in accordance with the terms and conditions of the Fisheries Act Authorization.

5. SUMMARY AND CONCLUSIONS

The preliminary stormwater management plan is designed to prevent impacts from the future roadway configuration by using available technologies and opportunities to achieve the highest degree of control possible given the constraints of the study corridor. The following design elements are recommended as part of the proposed roadway improvements;

1. Where the roadway improvements recommend the provision of a semi-rural roadway cross-section, a sub-surface drainage system is recommended for inclusion into the roadway cross-section. The subsurface drainage system will consist of a series of catchbasins, storm sewers and subdrains which will collect and convey both the granular base material and surface runoff and discharge to existing drainage outlets. The storm sewers shall be sized to accommodate a 10 year return period event, using a minimum inlet time of 15 minutes as per Region of Peel design standards. The design of the sewers will need to take into account any drainage from roadway boulevard areas as well as drainage external to the roadway right-of-way. Effort has been made to ensure that existing drainage patterns and locations are maintained throughout the various roadway corridors. A conceptual storm system layout is illustrated on the preliminary design plates.
2. The principal features of the project's stormwater management system are the provision of oil-grit separator units to provide water quality control. A total of twelve (12) OGS units are proposed providing a total collective area for stormwater treatment of 4.68 ha. Water quality criteria will be met at each OGS location based on Enhanced (Level 1) protection as outlined in the MOE Stormwater Management Practices Manual.
3. Existing roadside ditches will be re-graded to flat-bottom swale systems (grassed swales), where possible, to provide additional water quality benefits within the project limits. There is a potential to treat up to 3.4 hectares of pavement area through the incorporation of grassed swale systems. It is recommended that during detail design, the proposed grassed swale areas are reviewed for their effectiveness in meeting the MOE criteria for flowrate, velocity and contributing area.
4. Erosion and sediment control measures should be implemented and monitored through the construction period. Construction activity should be conducted during periods that are least likely to result in in-stream impacts to fish habitat.

6. REFERENCES

HDR Corporation, Preferred Design Drawings (Plan and Profile), Draft February 21, 2014;

HDR Corporation, *Drainage and Hydrology Report, Olde Baseline Road and Winston Churchill Boulevard, Town of Caledon, Region of Peel*, Draft January 2014

Natural Resource Solutions Inc., *Belfountain Transportation Corridor Class Environmental Assessment Study, Peel Region - Natural Heritage Report – Existing Conditions and Natural Feature Constraints*, August 2013

Dillon Consulting Limited, *Bush Street and Mississauga Road Class EA Existing Conditions Drainage Report - Draft,* June 2010.

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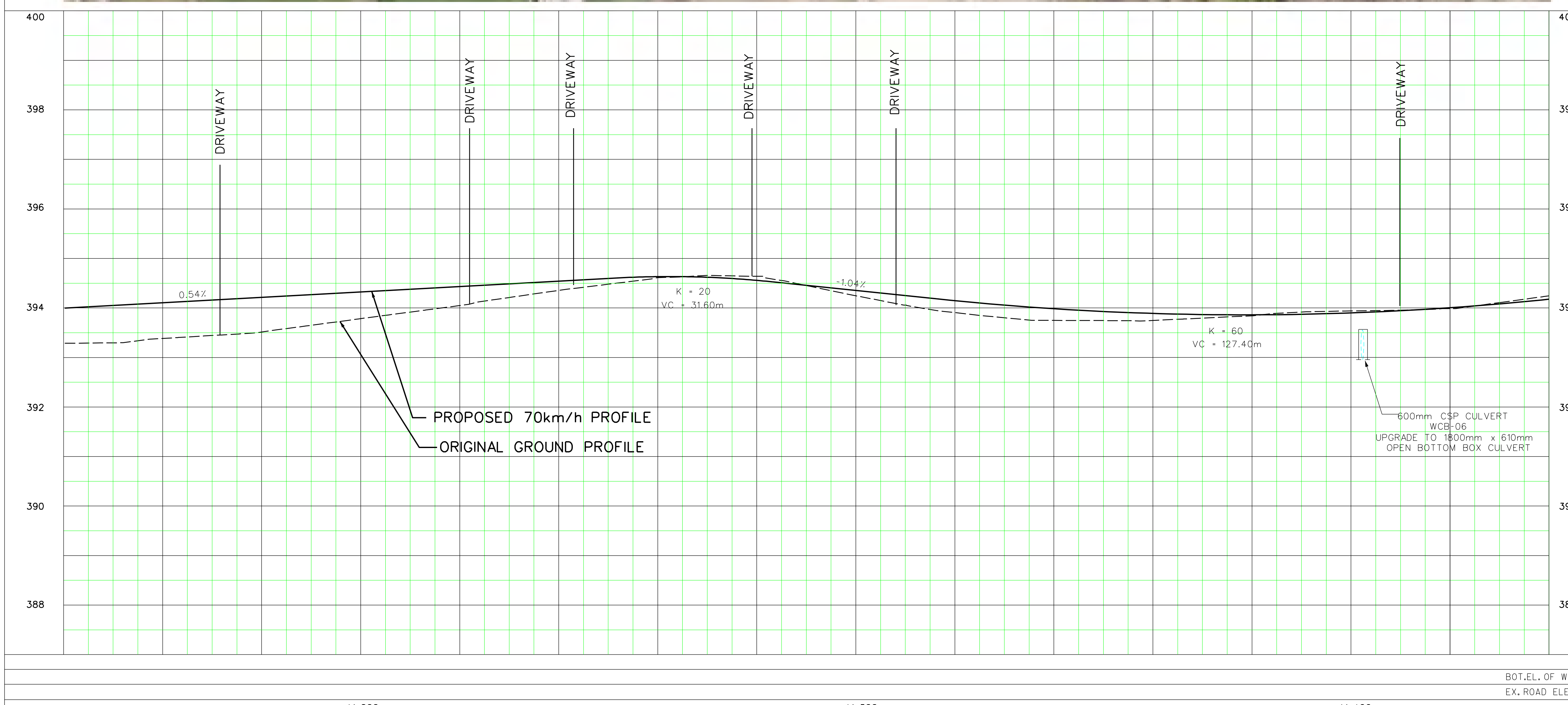
Regional Municipality of Peel, *Public Works Design, Specifications and Procedures Manual – Storm Sewer Design*, July 2009.

Regional Municipality of Peel, *Public Works Design, Specifications and Procedures Manual – Regional Roads and Traffic*, February 2010.

Credit Valley Conservation (CVC), *Stormwater Management Guidelines*, August 2012.

Appendix A
Proposed OGS System Treatment Area
OGS 1 & 2 (WCB-06)

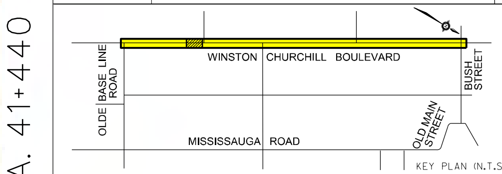


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ Chkd.____

Approved by ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

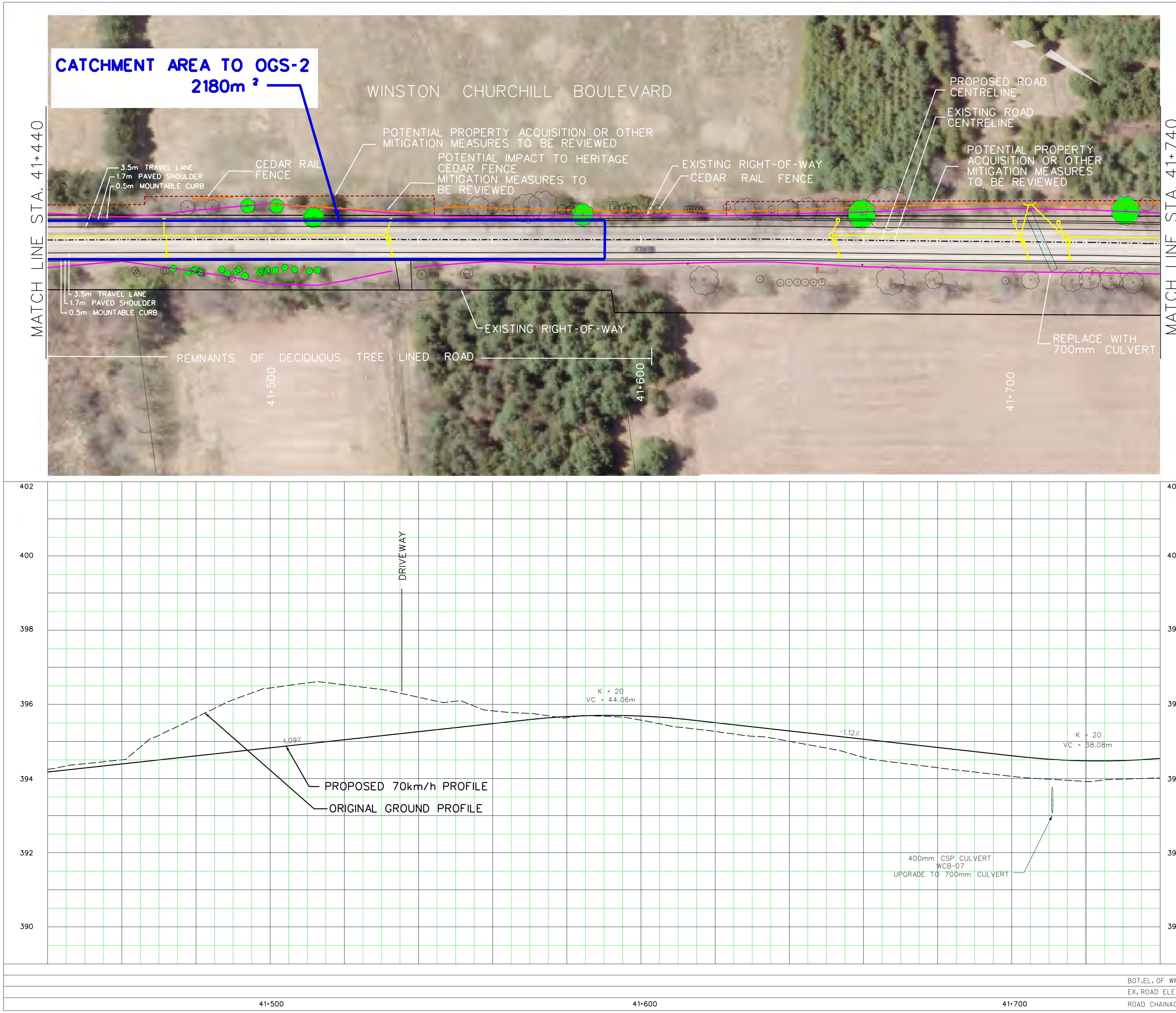
Region of Peel
Working for you

WINSTON CHURCHILL BOULEVARD

(FROM STA 41+140 to STA 41+440)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCBI	Plan No. -D

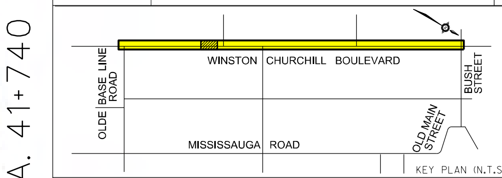


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only. To Be Verified In Field By Contractor.

Designed by ____ Chkd. ____ Approved by ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel

Working for you

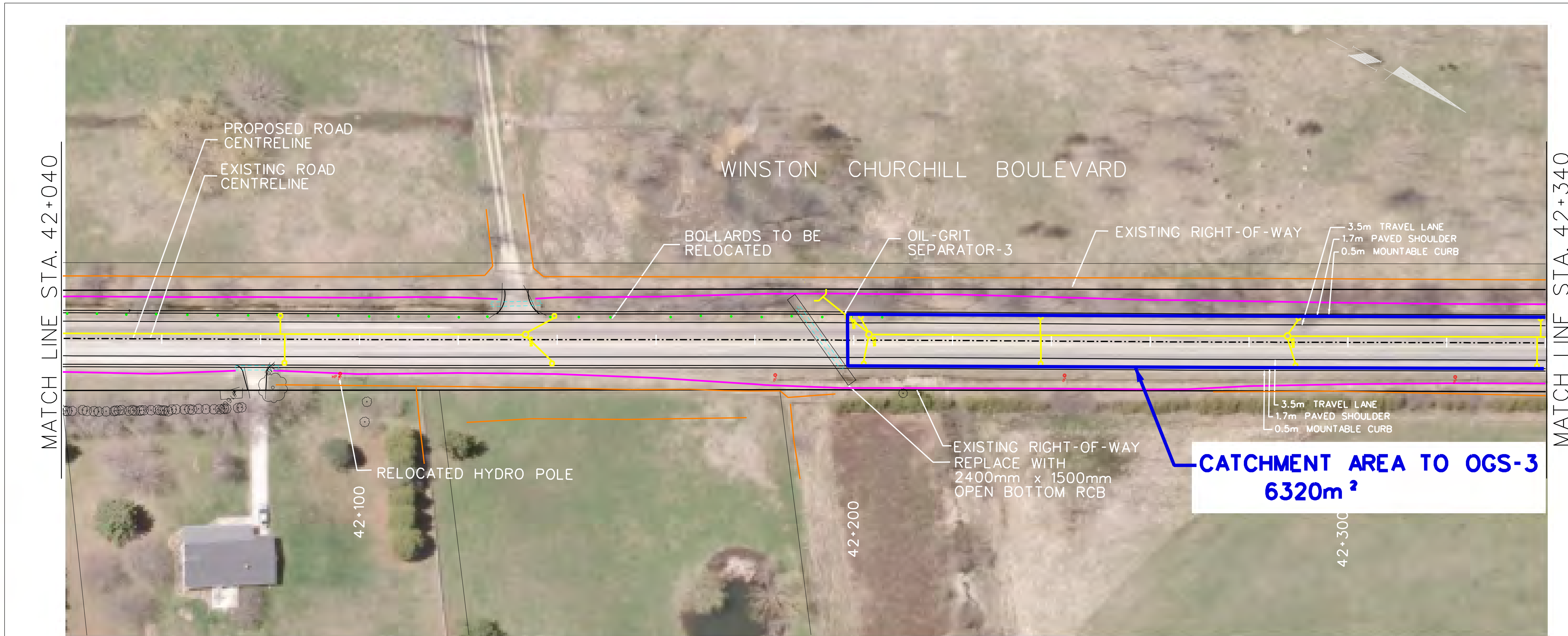
WINSTON CHURCHILL BOULEVARD

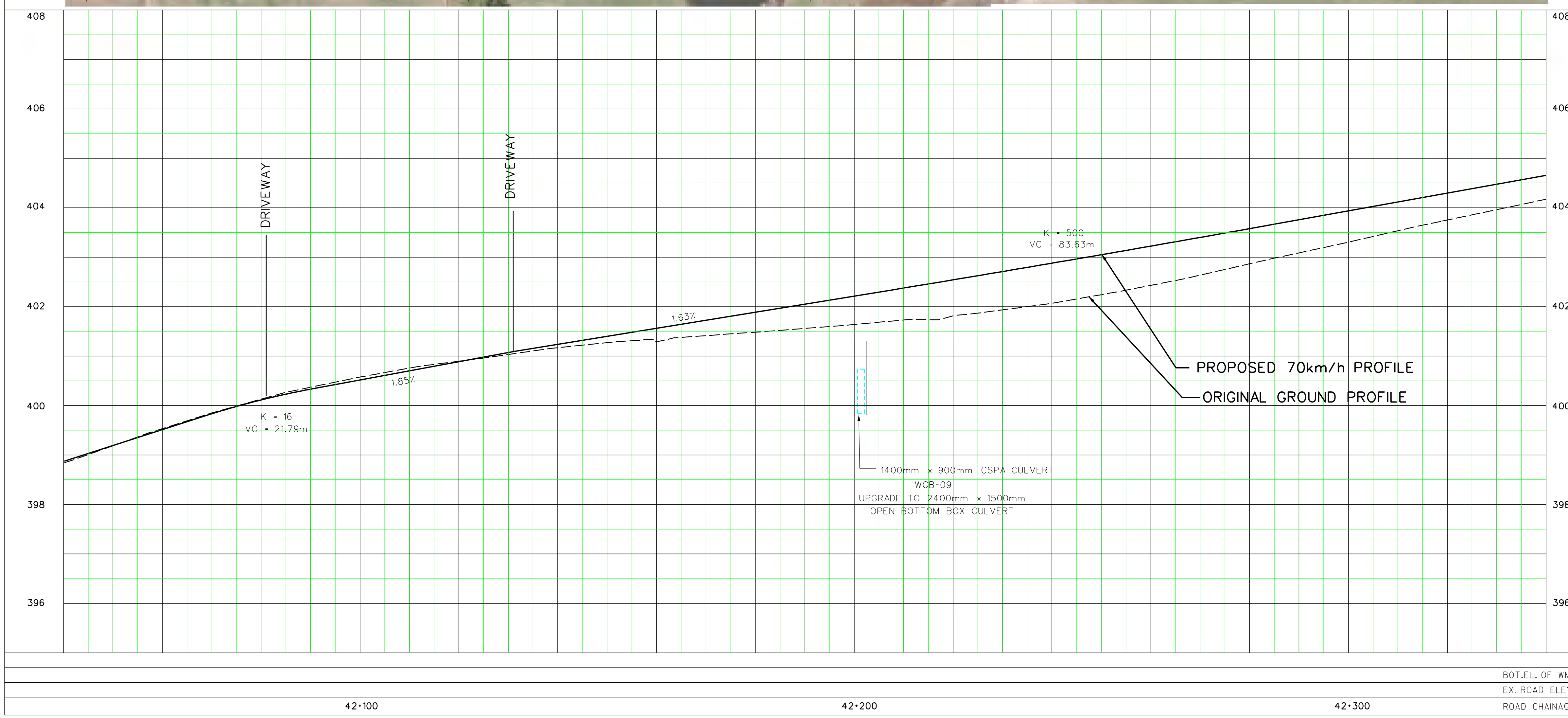
(FROM STA 41+440 to STA 41+740)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCB2	Plan No. -D

Appendix B
Proposed OGS System Treatment Area
OGS 3 (WCB-09)



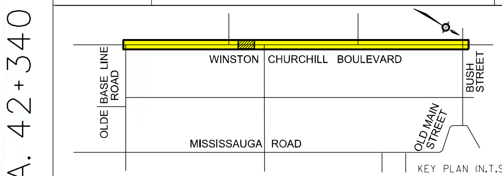


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR
48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE
1m 0 1 2 3m VERTICAL SCALE

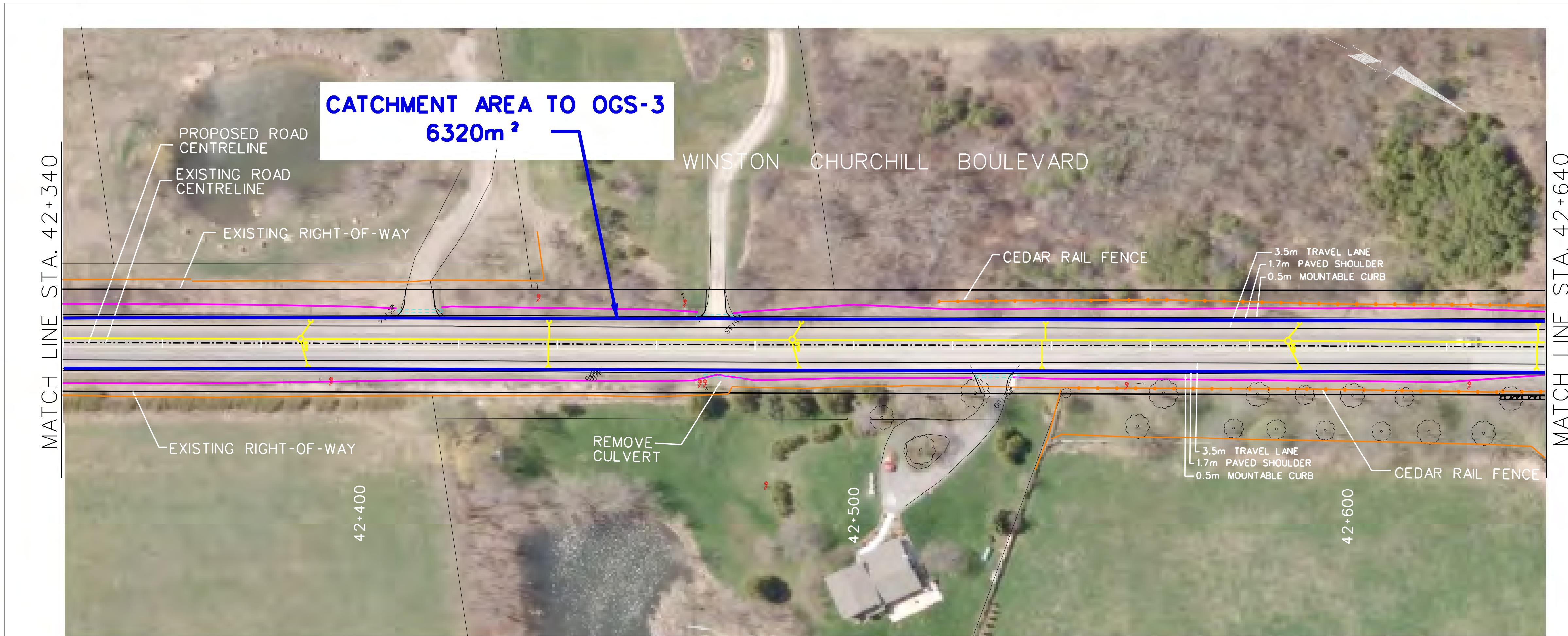
Region of Peel
Working for you

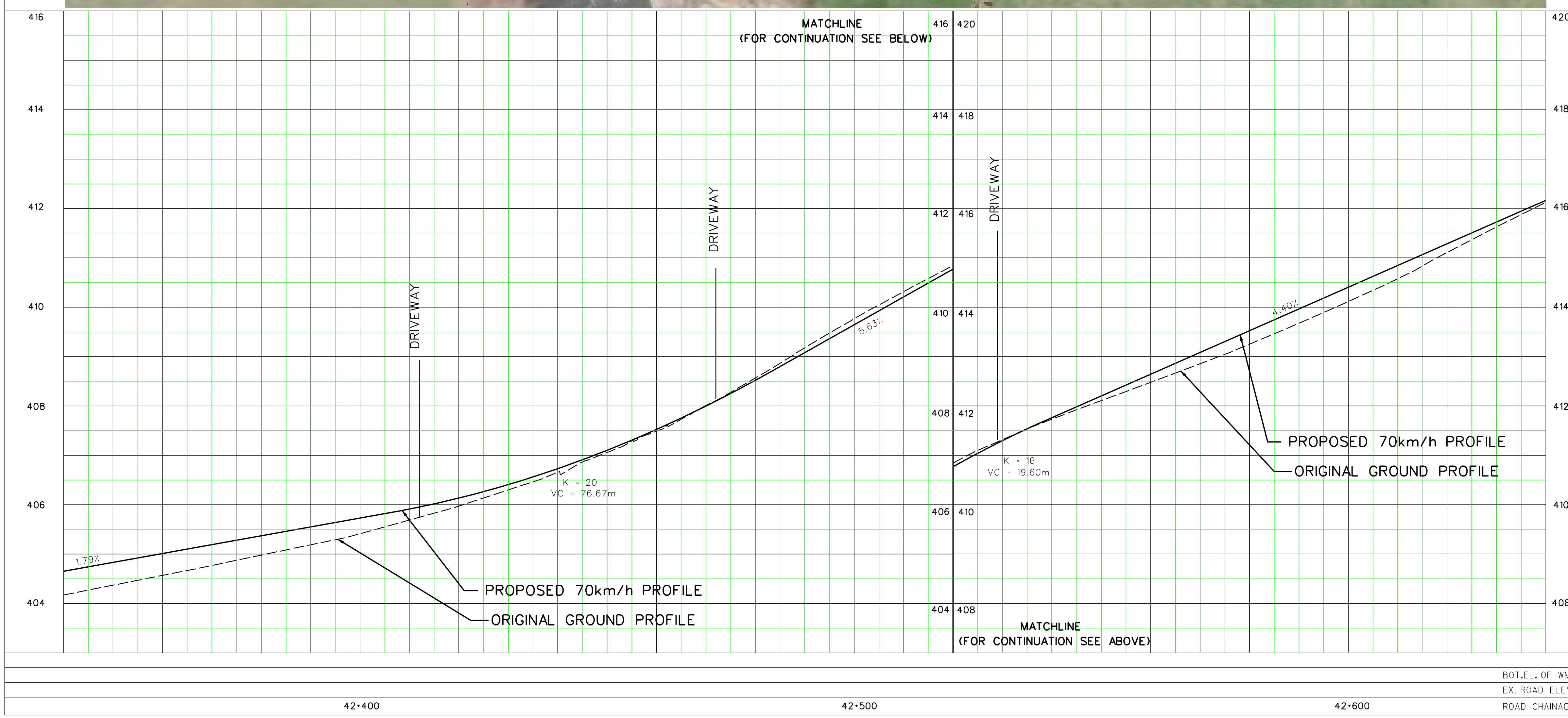
WINSTON CHURCHILL BOULEVARD

(FROM STA 42+040 to STA 42+340)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCB3	Plan No. -D



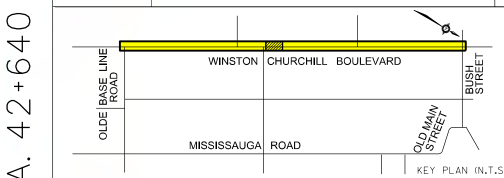


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located

Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

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CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

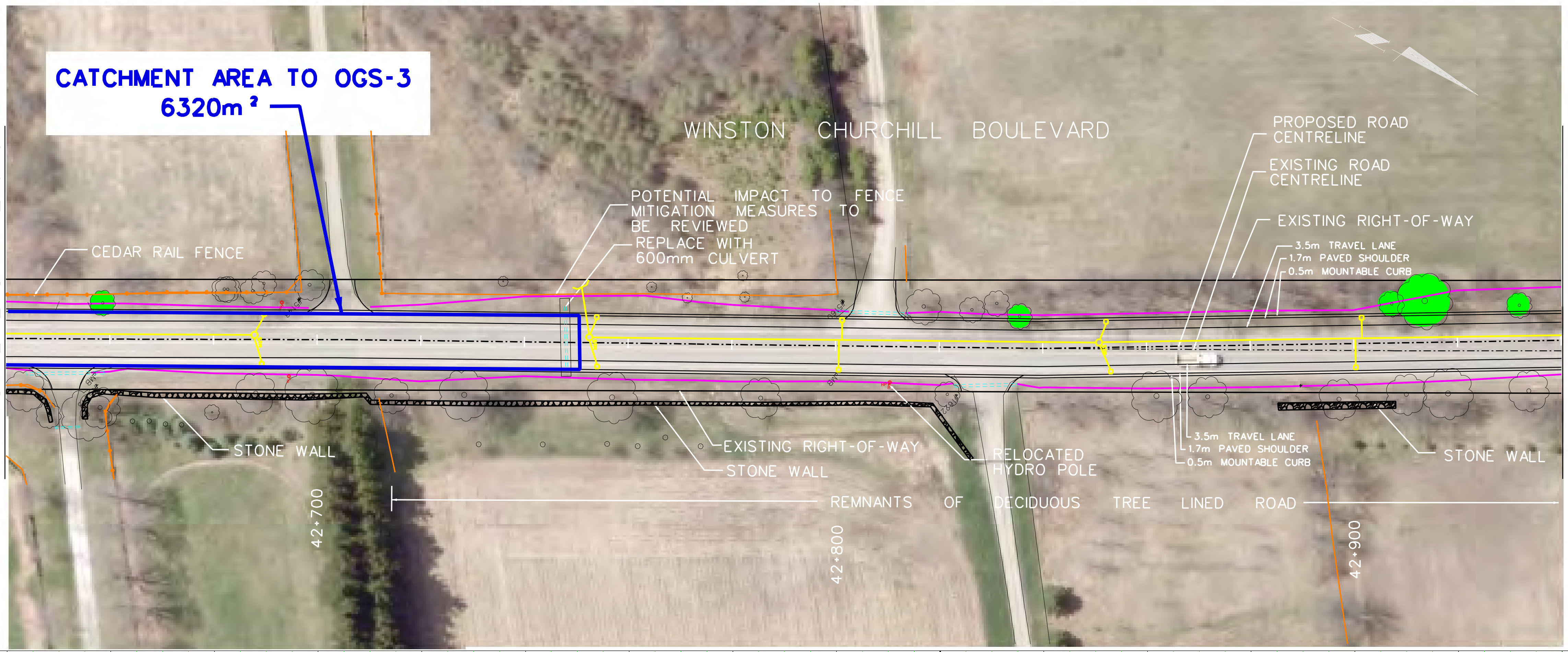
Region of Peel
Working for you

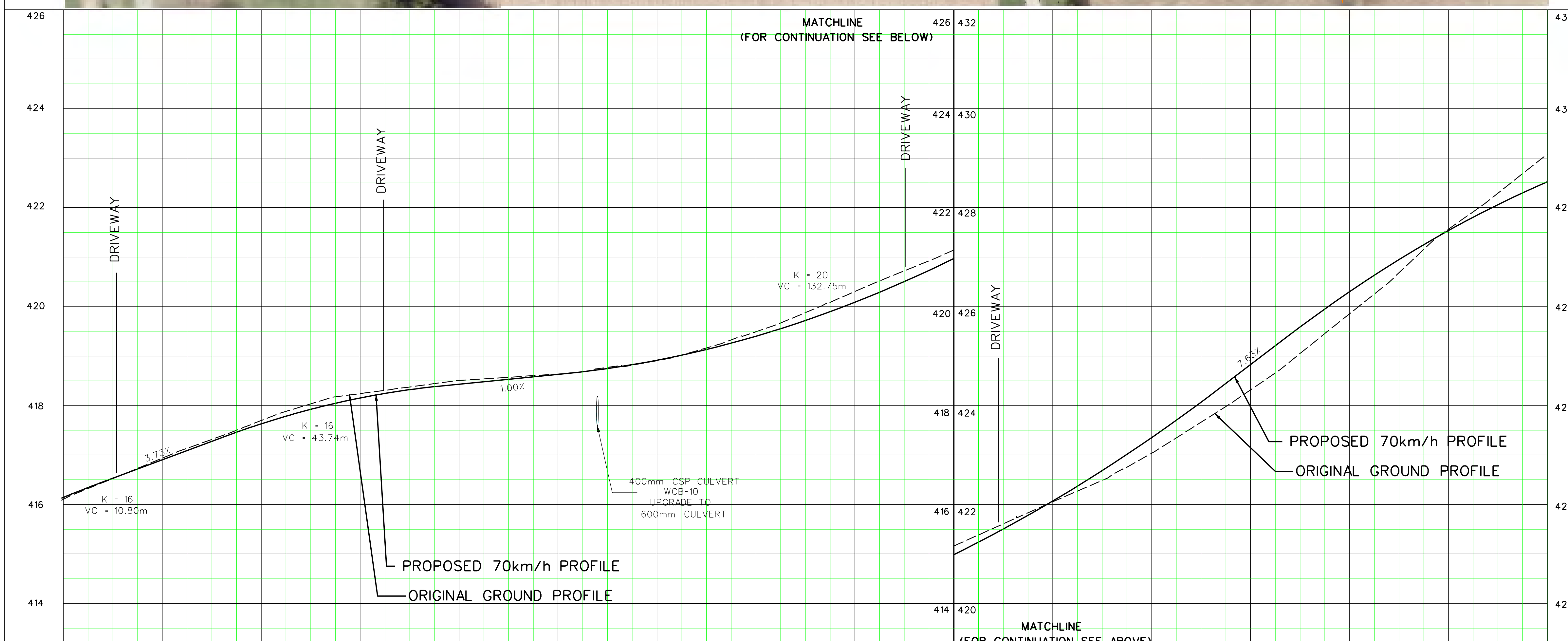
WINSTON CHURCHILL BOULEVARD

(FROM STA 42+340 to STA 42+640)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCB4	Plan No. -D





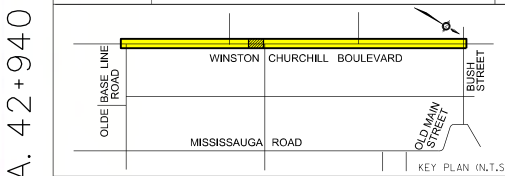
BOT.EL. OF WM.			
EX. ROAD ELEV.			
ROAD CHAINAGE	42+700	42+800	42+900

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

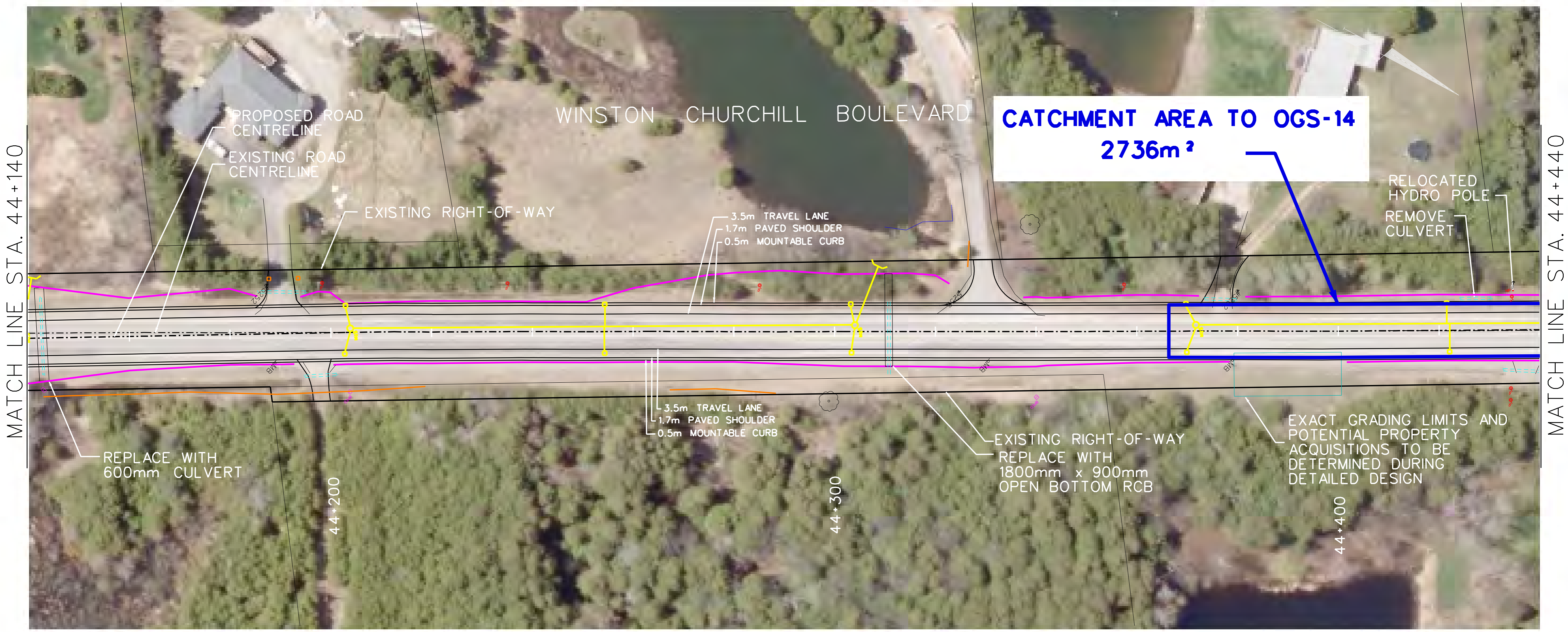
WINSTON CHURCHILL BOULEVARD

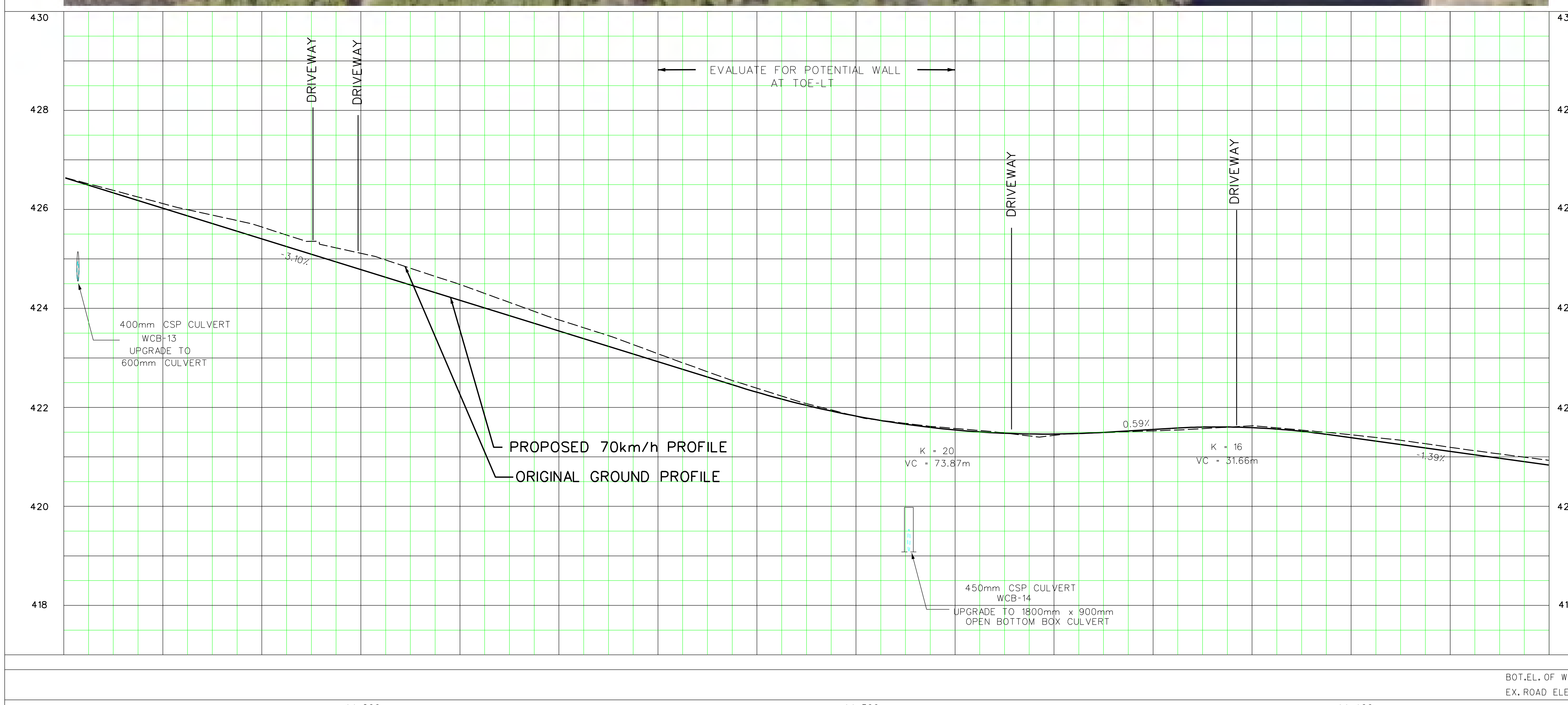
(FROM STA 42+640 to STA 42+940)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCB5	Plan No. -D

Appendix C
Proposed OGS System Treatment Area
OGS 14 (WCB-15)





SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.

KEY PLAN (N.T.S.): WINSTON CHURCHILL BOULEVARD; OLDE BASE LINE ROAD; MISSISSAUGA ROAD; OLD MAIN STREET; BUSH STREET

LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by Chkd. Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL	CABLE TELEVISION/FIBREOPTIC PROVIDERS:
CITY OF MISSISSAUGA WORKS DEPT.	BELL CANADA
CITY OF BRAMPTON WORKS DEPT.	ENERSOURCE TELECOM
TOWN OF CALEDON WORKS DEPT.	HYDRO ONE TELECOM
BELL CANADA	ROGERS CABLE
ENBRIDGE INCORPORATED-GAS DISTRIBUTION	ALLSTREAM
ONTARIO MINISTRY OF TRANSPORTATION	PSN (PUBLIC SECTOR NETWORK)
ONTARIO CLEAN WATER AGENCY	FUTUREWAY (FCIBROADBAND)
HYDRO ONE NETWORKS	
ENERSOURCE, HYDRO MISSISSAUGA	
HYDRO ONE BRAMPTON	

HORIZONTAL SCALE: 10m 0 10 20 30m

VERTICAL SCALE: 1m 0 1 2 3m

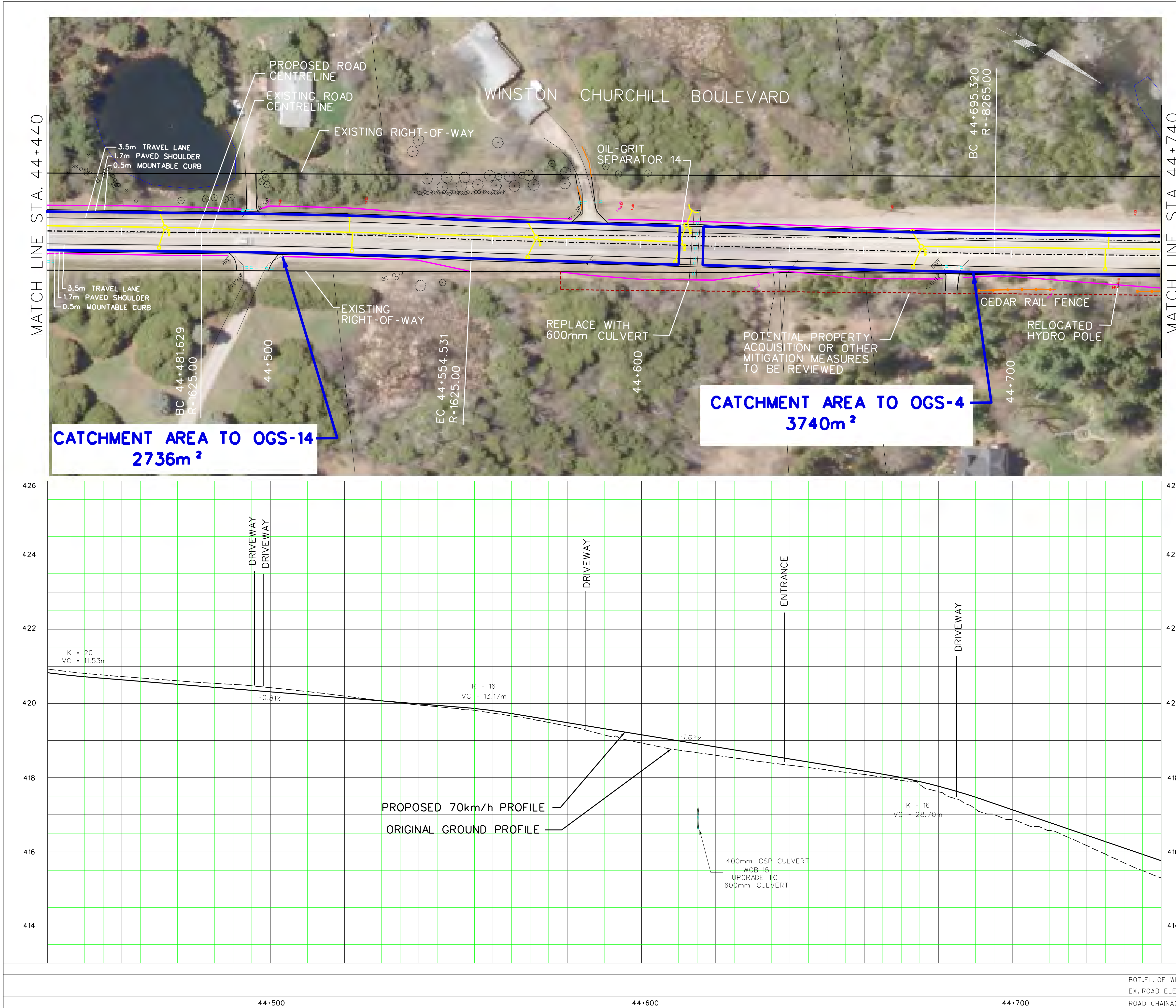
Region of Peel
Working for you

WINSTON CHURCHILL BOULEVARD

(FROM STA 44+140 to STA 44+440)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCB6	Plan No. -D



SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.

LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

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- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

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Designed by ______ Chkd. ______ Approved by ______

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL	CABLE TELEVISION/FIBREOPTIC PROVIDERS:
CITY OF MISSISSAUGA WORKS DEPT.	BELL CANADA
CITY OF BRAMPTON WORKS DEPT.	ENERSOURCE TELECOM
TOWN OF CALEDON WORKS DEPT.	HYDRO ONE TELECOM
BELL CANADA	ROGERS CABLE
ENBRIDGE INCORPORATED-GAS DISTRIBUTION	ALLSTREAM
ONTARIO MINISTRY OF TRANSPORTATION	PSN (PUBLIC SECTOR NETWORK)
ONTARIO CLEAN WATER AGENCY	FUTUREWAY (FCI BROADBAND)
HYDRO ONE NETWORKS	
ENERSOURCE, HYDRO MISSISSAUGA	
HYDRO ONE BRAMPTON	

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

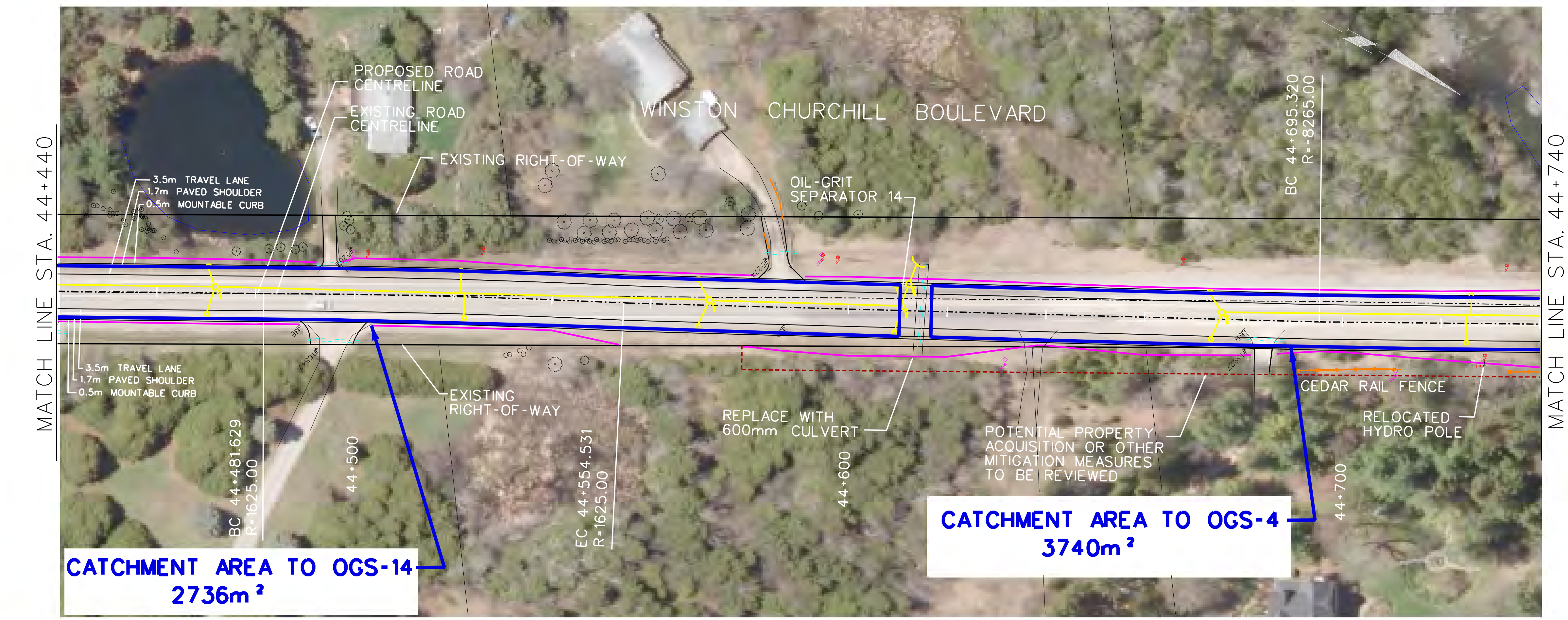
WINSTON CHURCHILL BOULEVARD

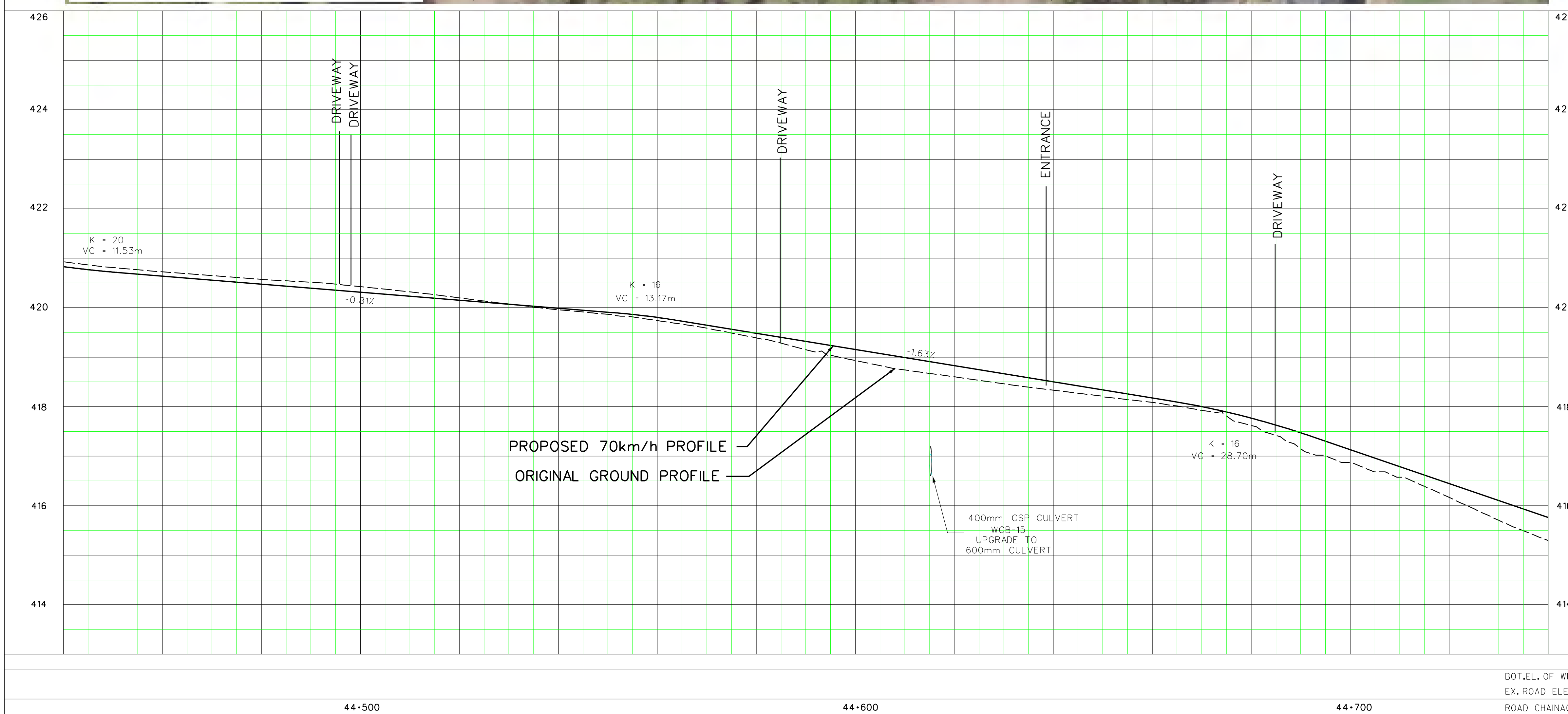
(FROM STA 44+440 to STA 44+740)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCB7	Plan No. -D

Appendix D
Proposed OGS System Treatment Area
OGS 4 (WCB-16)



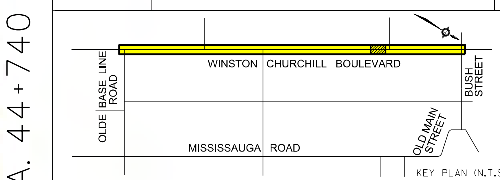


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ Chkd. ____ Approved by ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE
1m 0 1 2 3m VERTICAL SCALE

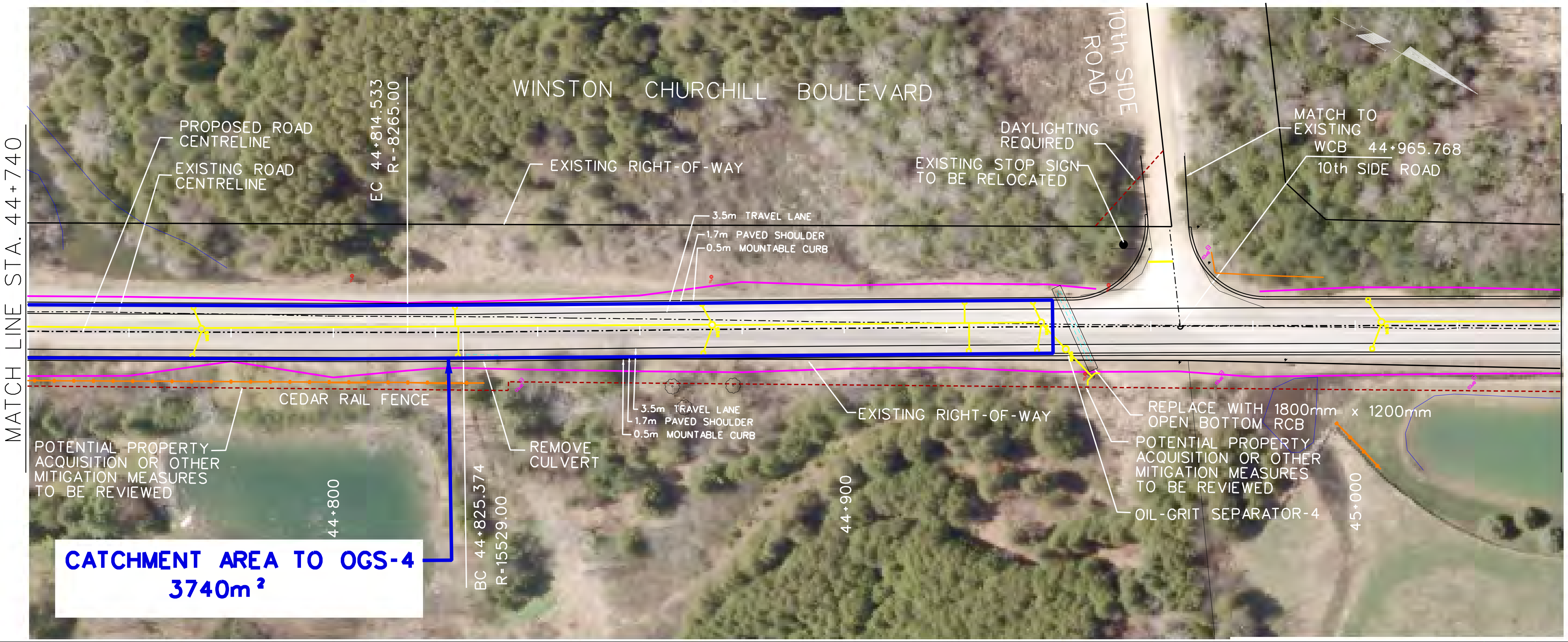
Region of Peel
Working for you

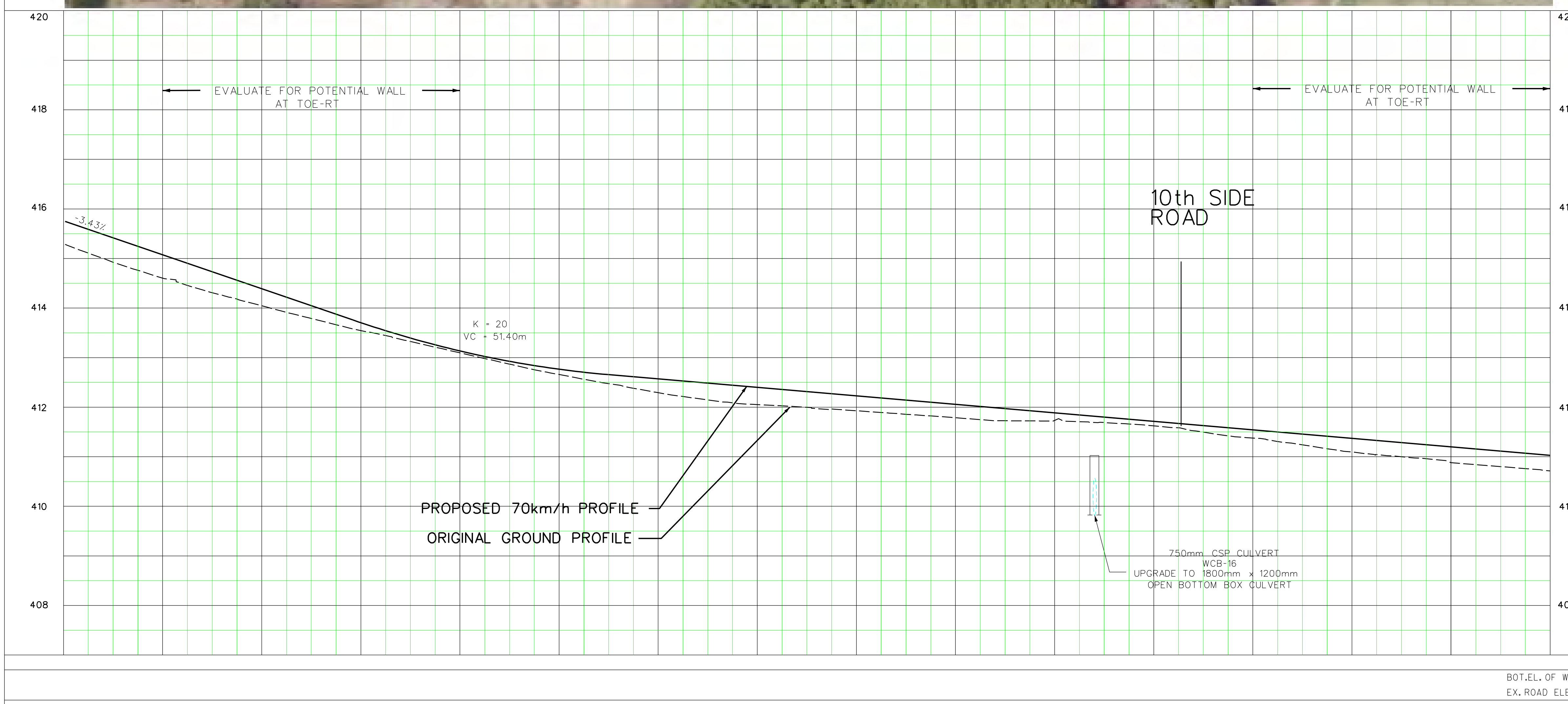
WINSTON CHURCHILL BOULEVARD

(FROM STA 44+440 to STA 44+740)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCB7	Plan No. -D



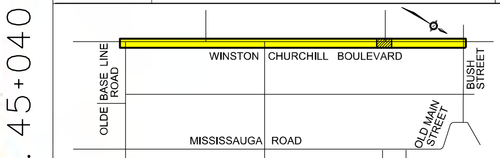


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



KEY PLAN (N.T.S.)

LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL	CABLE TELEVISION/FIBREOPTIC PROVIDERS:
CITY OF MISSISSAUGA WORKS DEPT.	BELL CANADA
CITY OF BRAMPTON WORKS DEPT.	ENERSOURCE TELECOM
TOWN OF CALEDON WORKS DEPT.	HYDRO ONE TELECOM
BELL CANADA	ROGERS CABLE
ENBRIDGE INCORPORATED-GAS DISTRIBUTION	ALLSTREAM
ONTARIO MINISTRY OF TRANSPORTATION	PSN (PUBLIC SECTOR NETWORK)
ONTARIO CLEAN WATER AGENCY	FUTUREWAY (FCI BROADBAND)
HYDRO ONE NETWORKS	
ENERSOURCE, HYDRO MISSISSAUGA	
HYDRO ONE BRAMPTON	

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel

Working for you

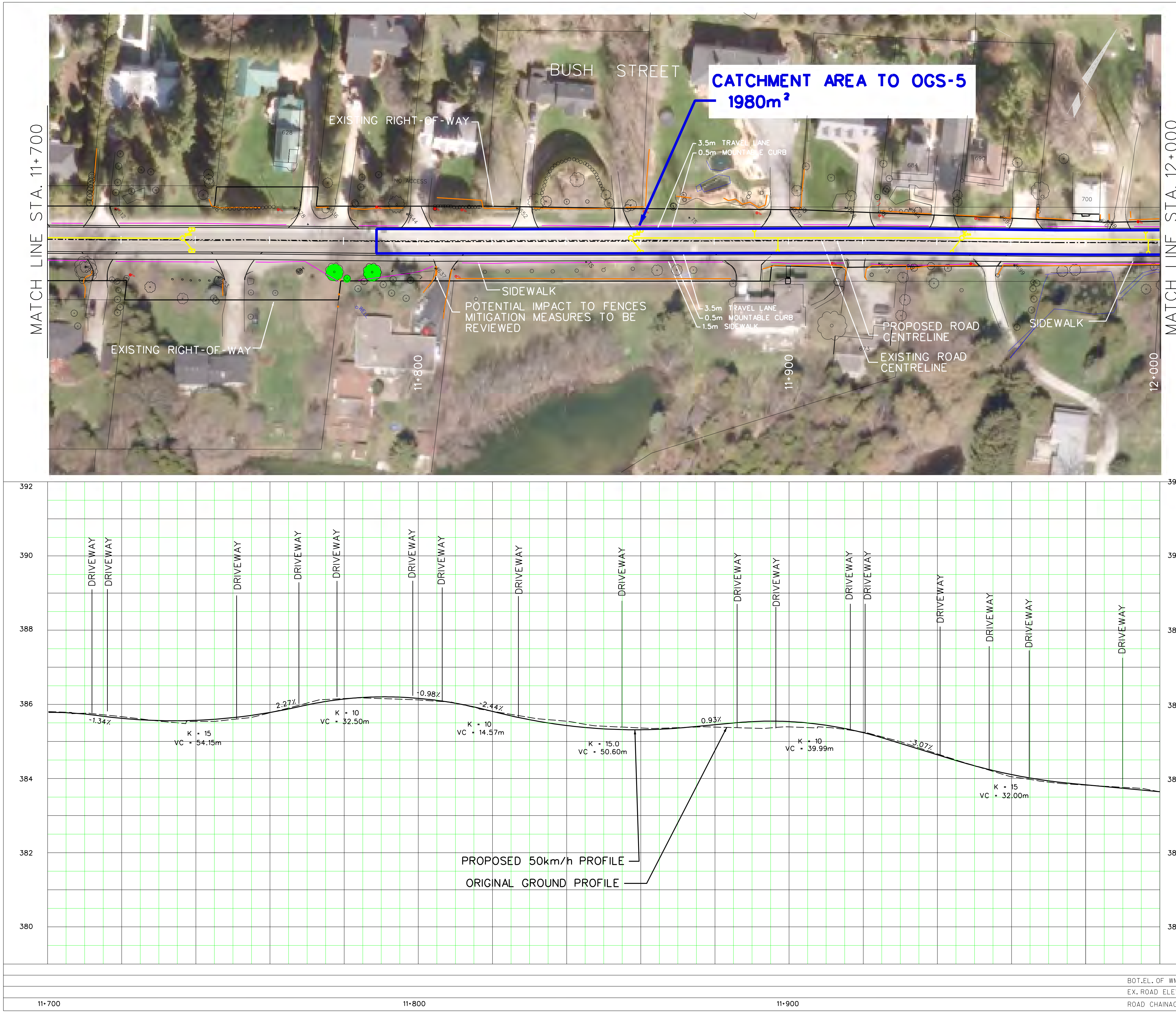
WINSTON CHURCHILL BOULEVARD

(FROM STA 44+740 to STA 45+040)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet WCB8	Plan No. -D

Appendix E
Proposed OGS System Treatment Area
OGS 5 (Bush Street 10)



SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.

WINSTON CHURCHILL BOULEVARD
OLDE BASE LINE ROAD
MISSISSAUGA ROAD
OLD MAIN STREET
BUSH STREET
KEY PLAN (N.T.S.)

LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

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Designed by Chkd. Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

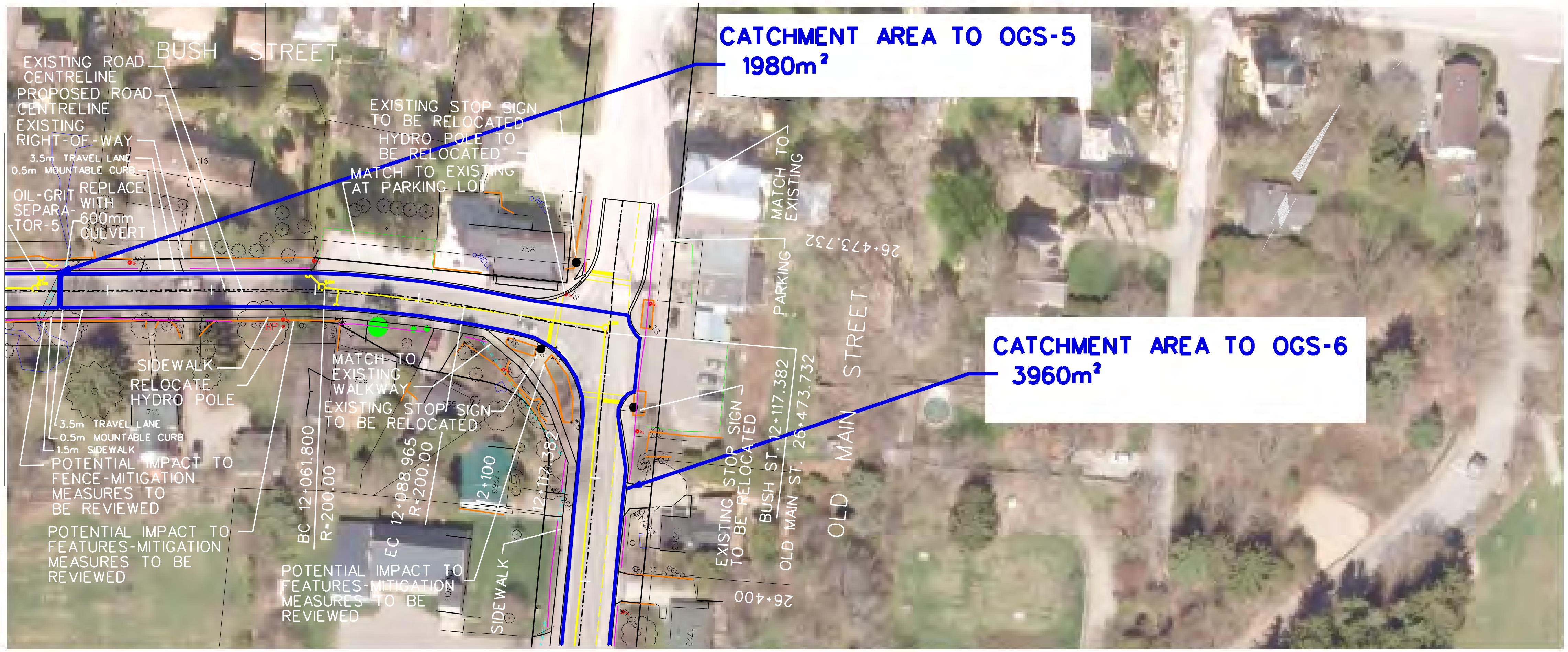
CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

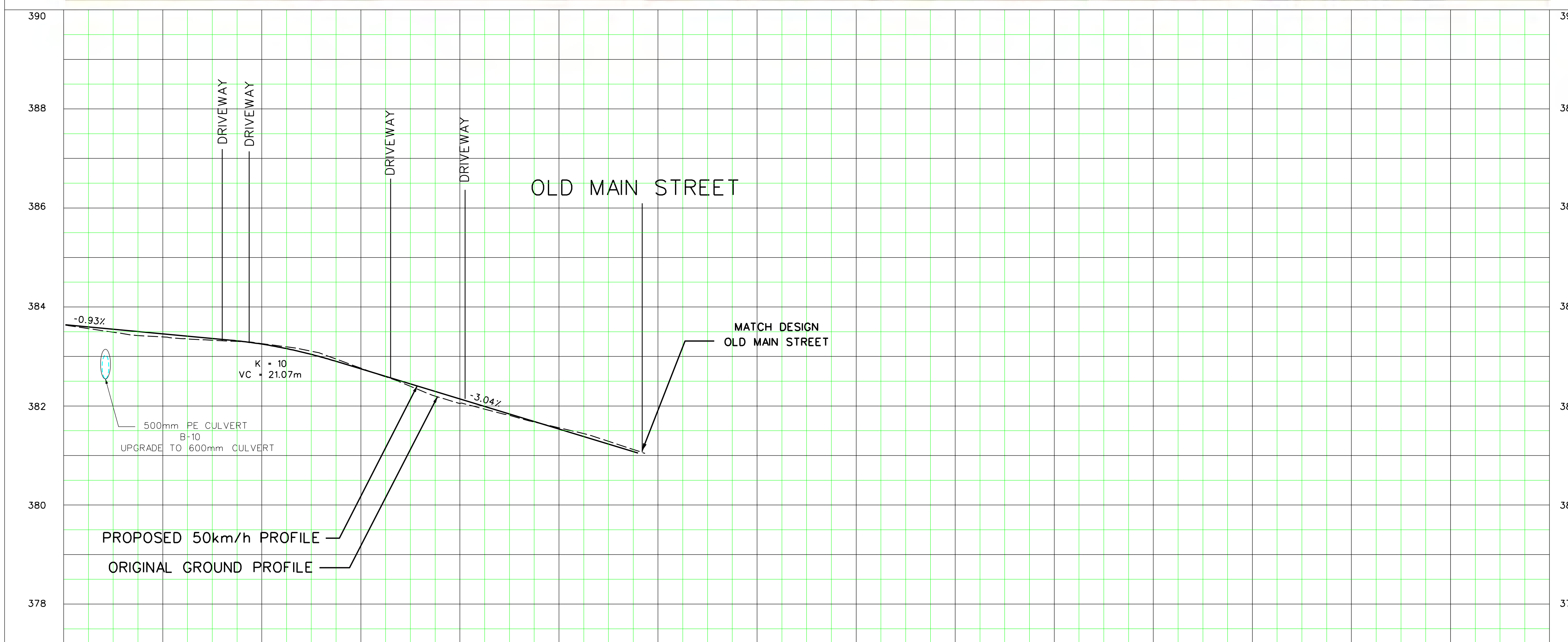
10m 0 10 20 30m HORIZONTAL SCALE
1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

BUSH STREET
(FROM STA 11+700 to STA 12+000)
PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY , 2014	Sheet B1	Plan No. -D





BOT.EL. OF WM.	
EX. ROAD ELEV.	
ROAD CHAINAGE	12+000 / 12+100 / 12+200

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.

KEY PLAN (N.T.S.)

OLDE BASE LINE ROAD, WINSTON CHURCHILL BOULEVARD, MISSISSAUGA ROAD, BUSH STREET, OLD MAIN STREET

LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ Chkd. ____ Approved by ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE
1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

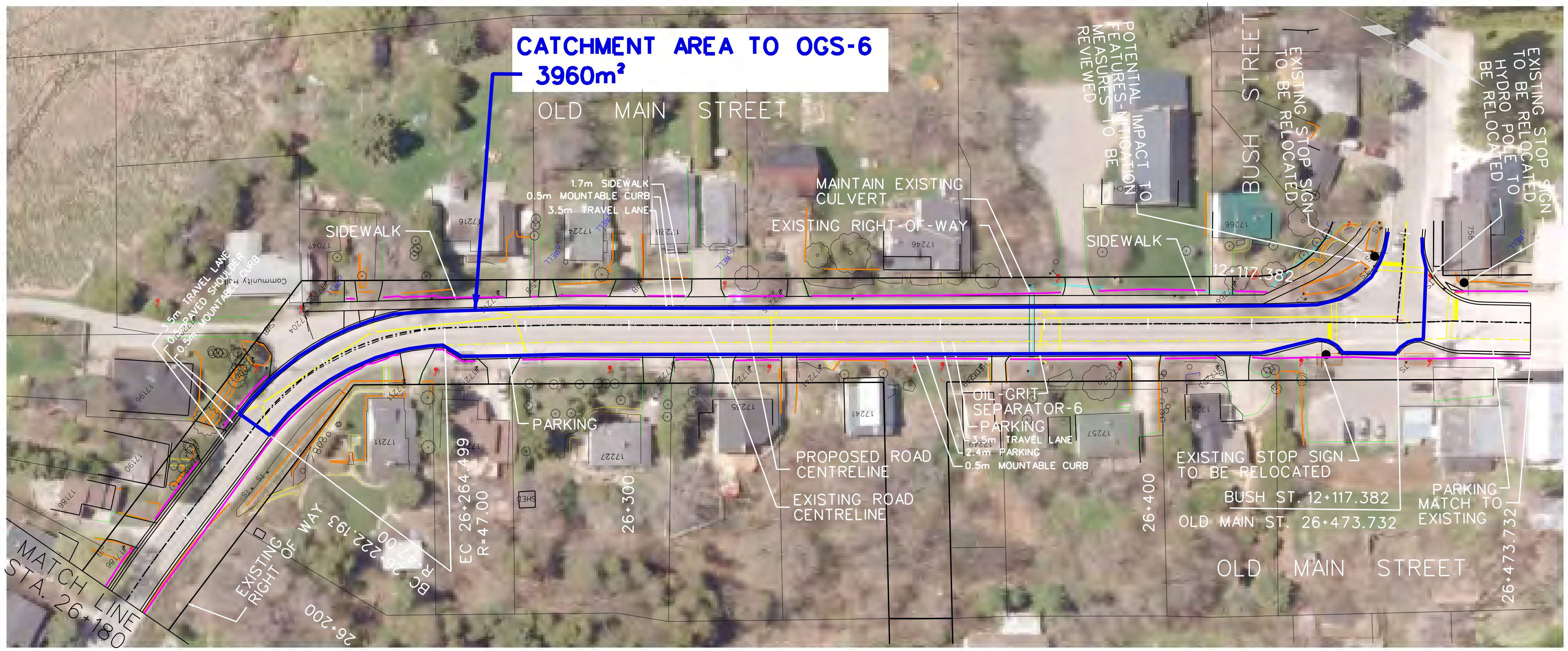
BUSH STREET

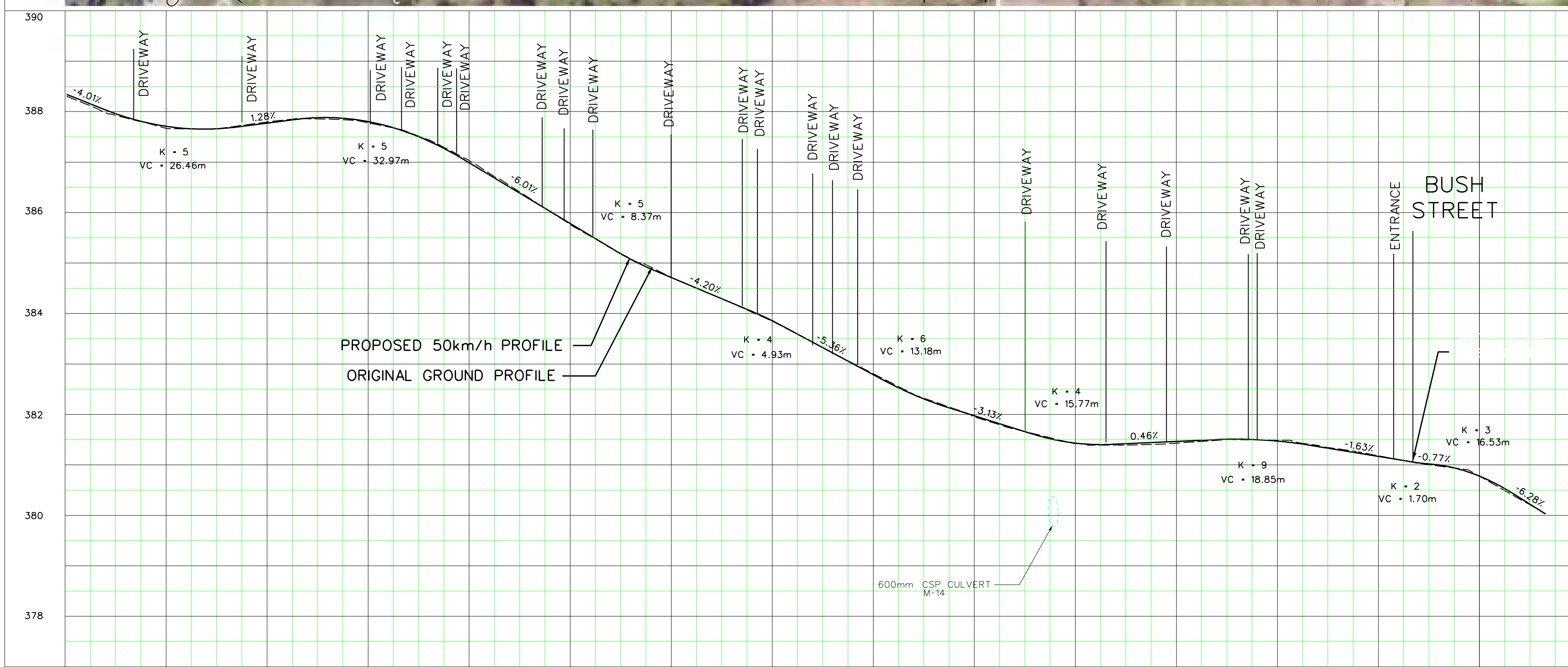
(FROM STA 12+000 to STA 12+117)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet B2	Plan No. -D

Appendix F
Proposed OGS System Treatment Area
OGS 6 (Olde Main Street 14)





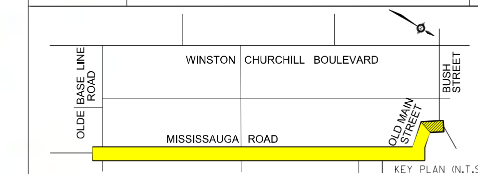
BOT.EL. OF WM.	
EX. ROAD ELEV.	
ROAD CHAINAGE	26+200 · 26+300 · 26+400

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by   Chkd.   Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

HORIZONTAL SCALE: 10m 0 10 20 30m
VERTICAL SCALE: 1m 0 1 2 3m

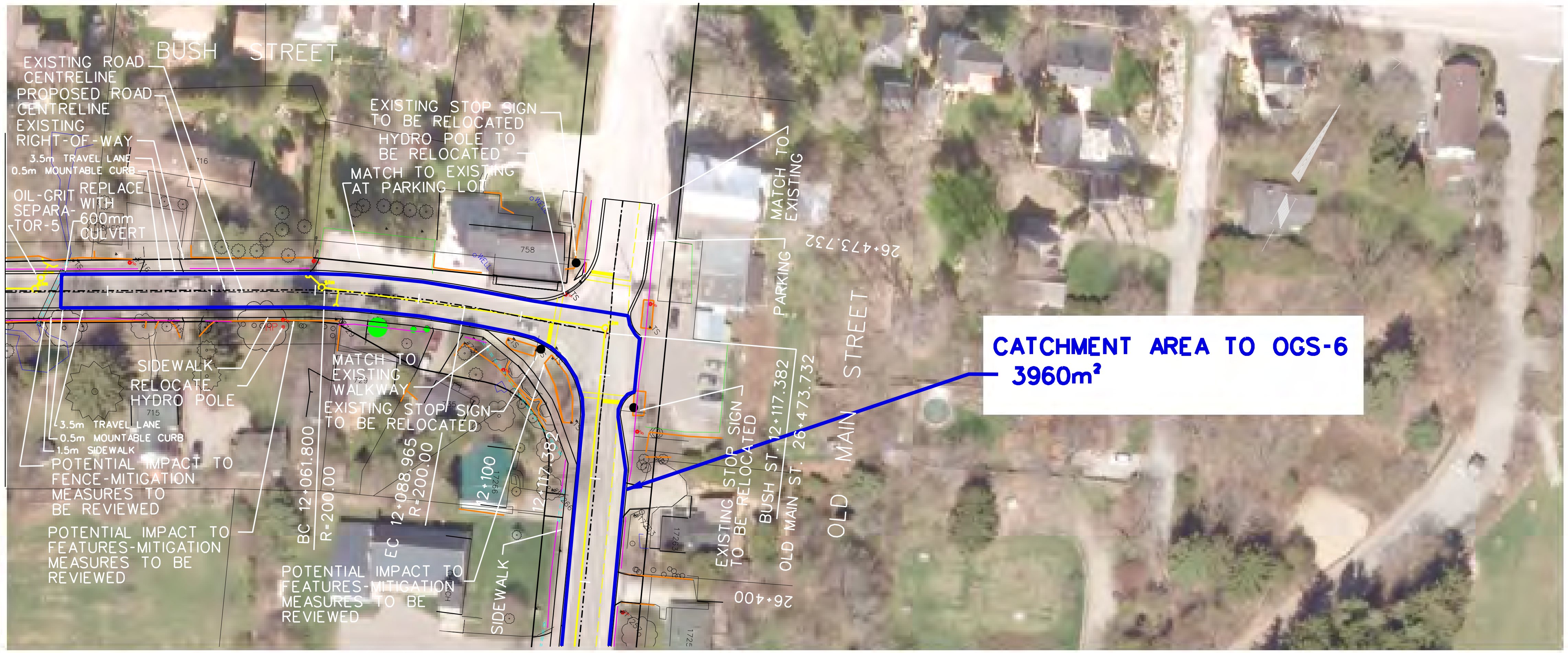
Region of Peel
Working for you

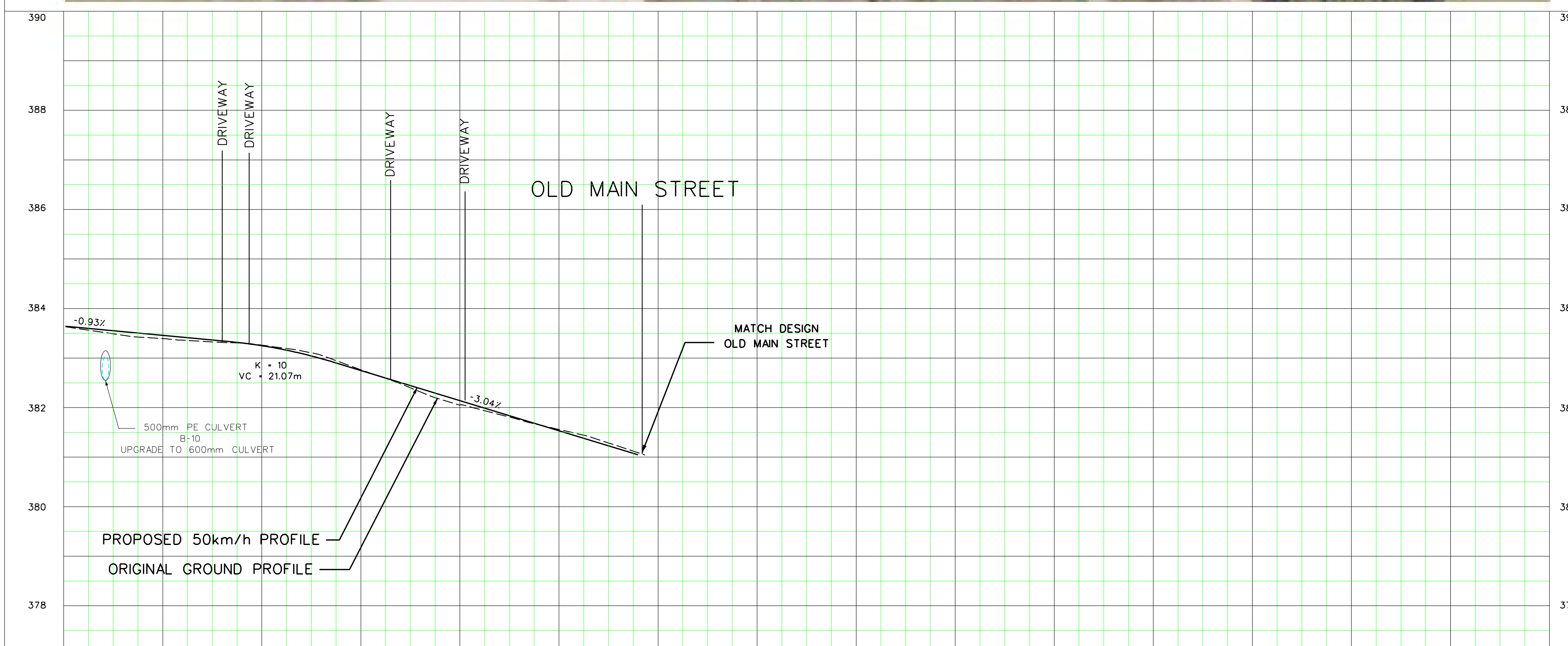
MISSISSAUGA ROAD/ OLD MAIN STREET

(FROM STA 26+180 to STA 26+480)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M10	Plan No. -D





12+000	12+100	12+200

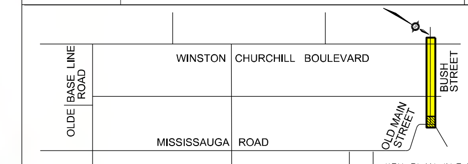
BOT.EL. OF WM.
EX. ROAD ELEV.
ROAD CHAINAGE

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____	Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL	CABLE TELEVISION/FIBREOPTIC PROVIDERS:
CITY OF MISSISSAUGA WORKS DEPT.	BELL CANADA
CITY OF BRAMPTON WORKS DEPT.	ENERSOURCE TELECOM
TOWN OF CALEDON WORKS DEPT.	HYDRO ONE TELECOM
BELL CANADA	ROGERS CABLE
ENBRIDGE INCORPORATED-GAS DISTRIBUTION	ALLSTREAM
ONTARIO MINISTRY OF TRANSPORTATION	PSN (PUBLIC SECTOR NETWORK)
ONTARIO CLEAN WATER AGENCY	FUTUREWAY (FCI BROADBAND)
HYDRO ONE NETWORKS	
ENERSOURCE, HYDRO MISSISSAUGA	
HYDRO ONE BRAMPTON	

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel

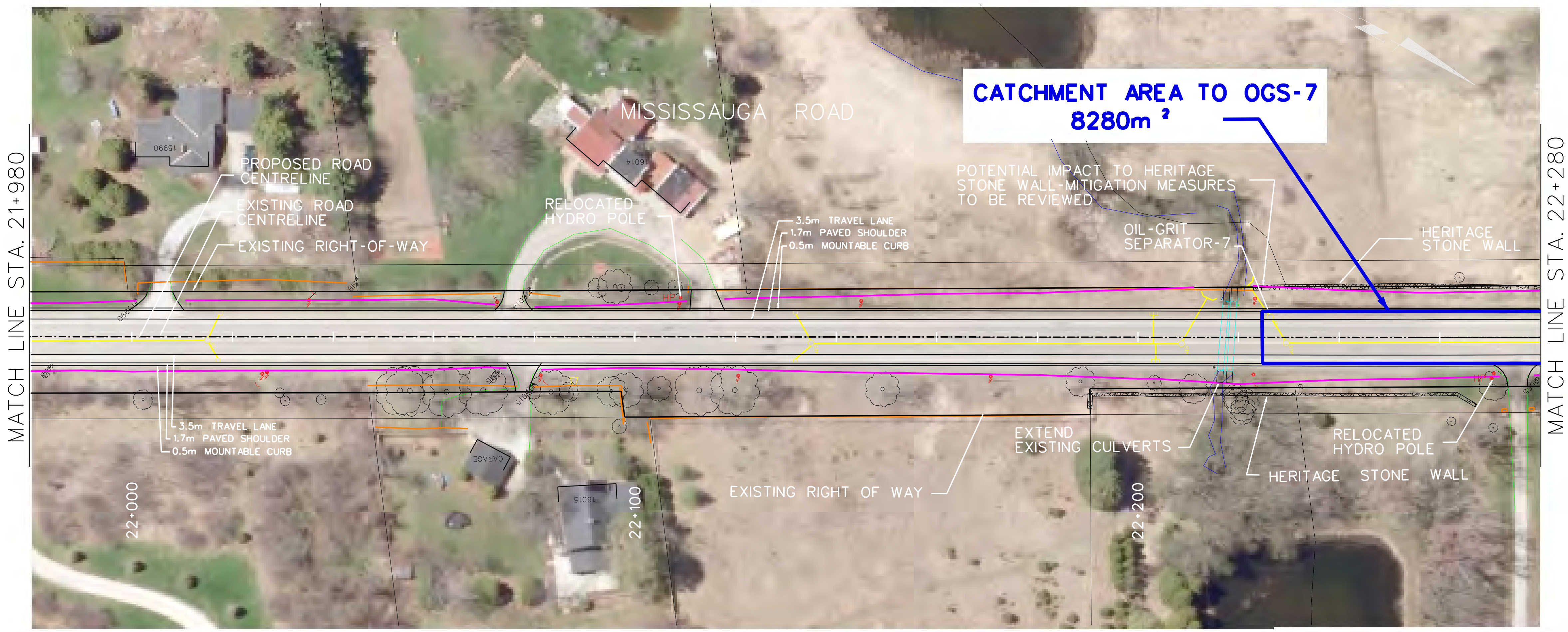
Working for you

MISSISSAUGA ROAD/ OLD MAIN STREET

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M11	Plan No. -D

Appendix G
Proposed OGS System Treatment Area
OGS 7 (Mississauga Rd. 44)

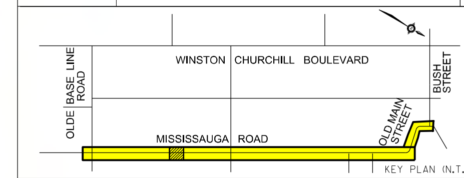


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
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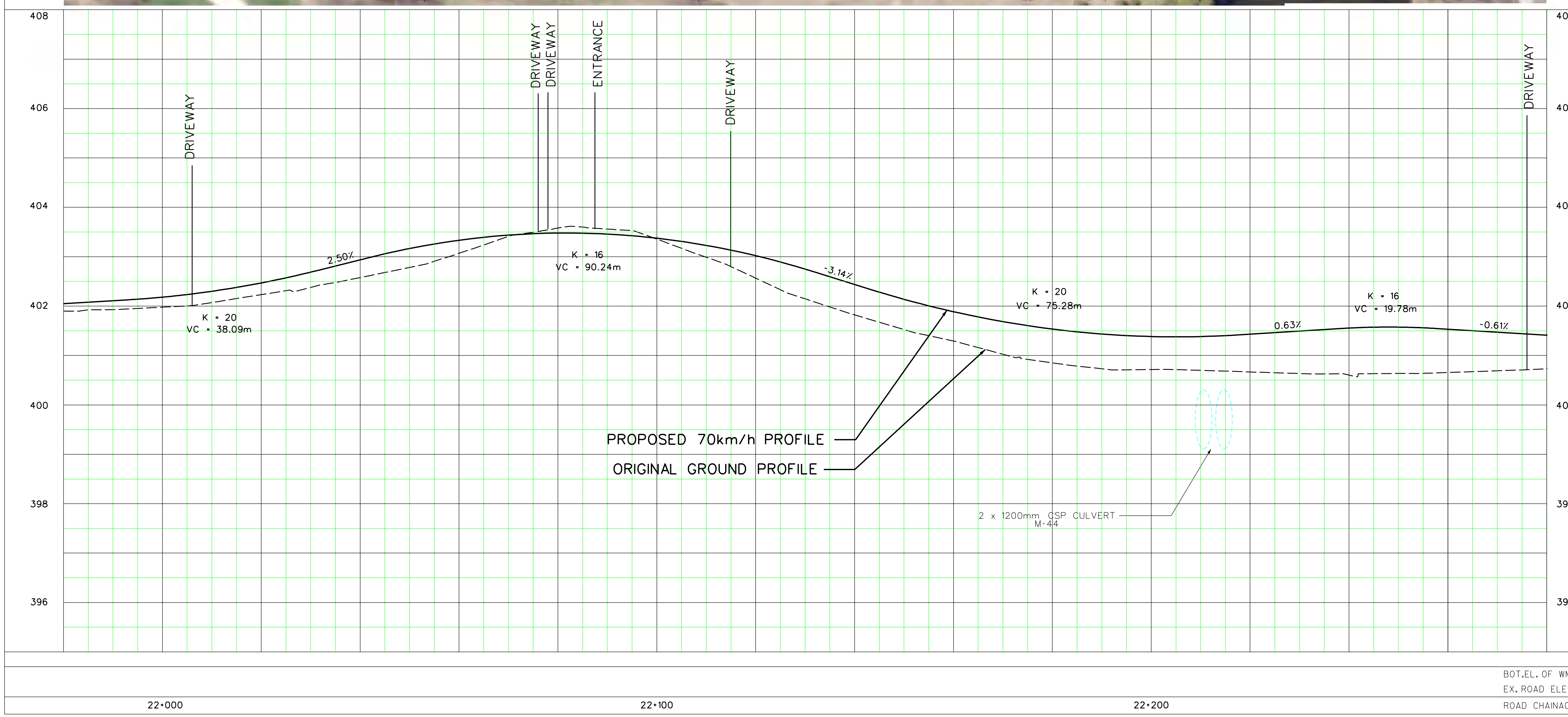
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN



General Notes

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- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

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Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

MISSISSAUGA ROAD/ OLD MAIN STREET

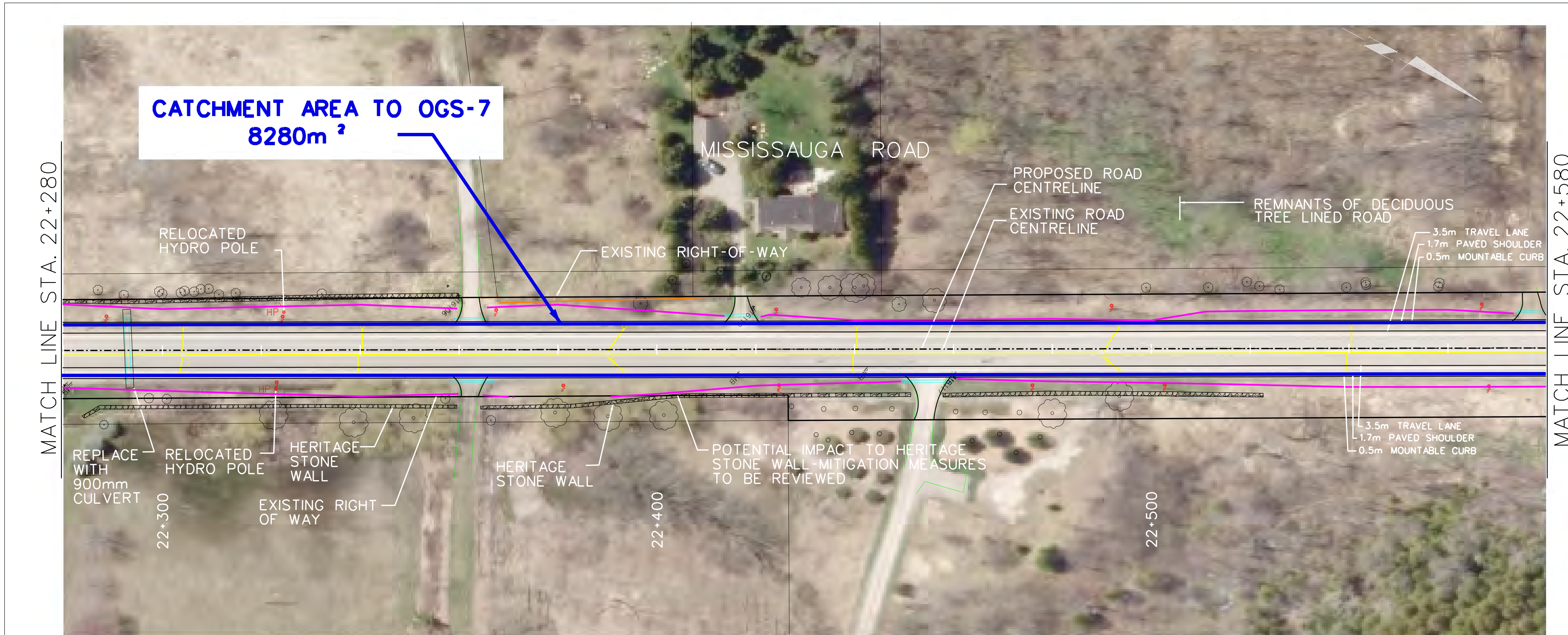
(FROM STA 21+980 to STA 22+280)

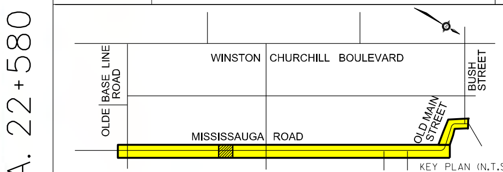
PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M6	Plan No. -D

SERVICE DATA					
SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS		
DATE	DETAILS	INIT.



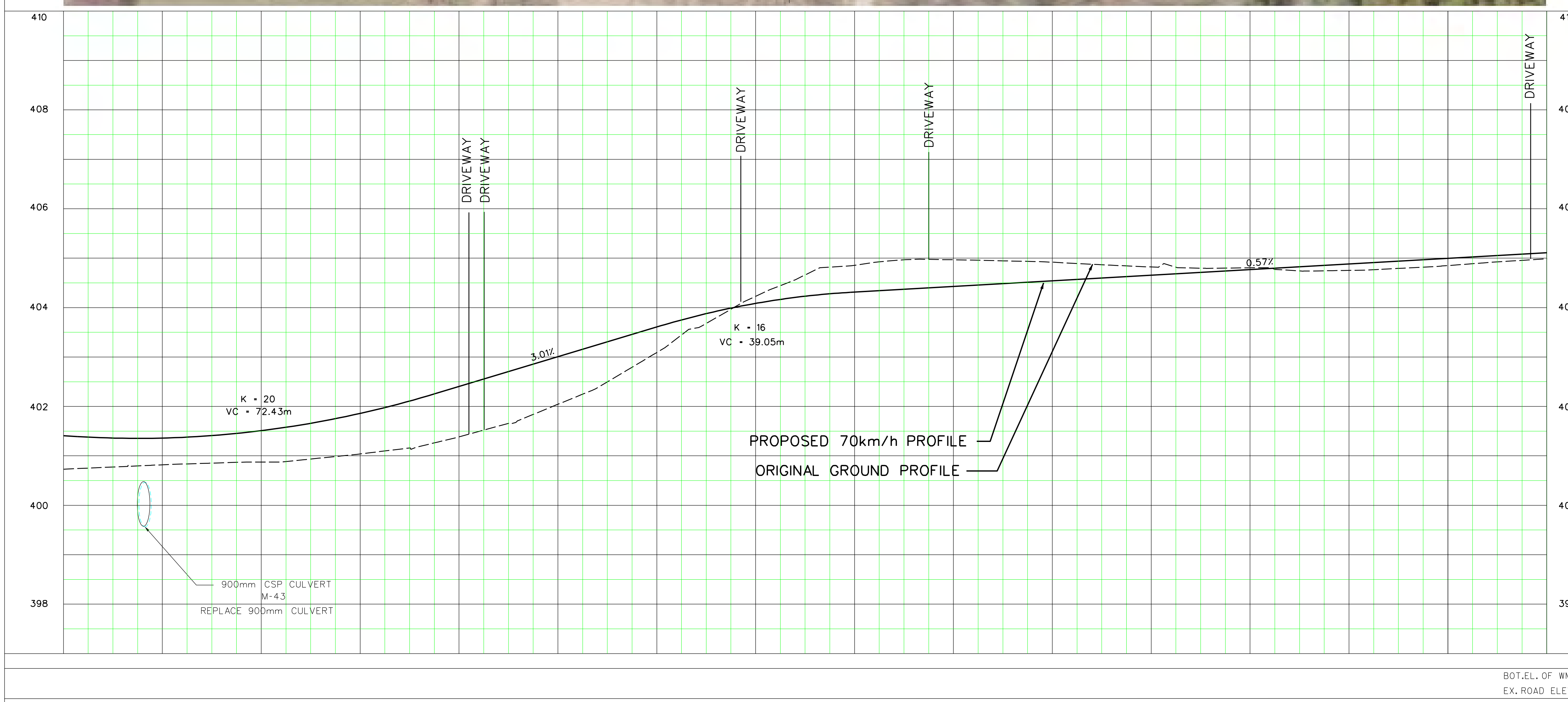


LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN



General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

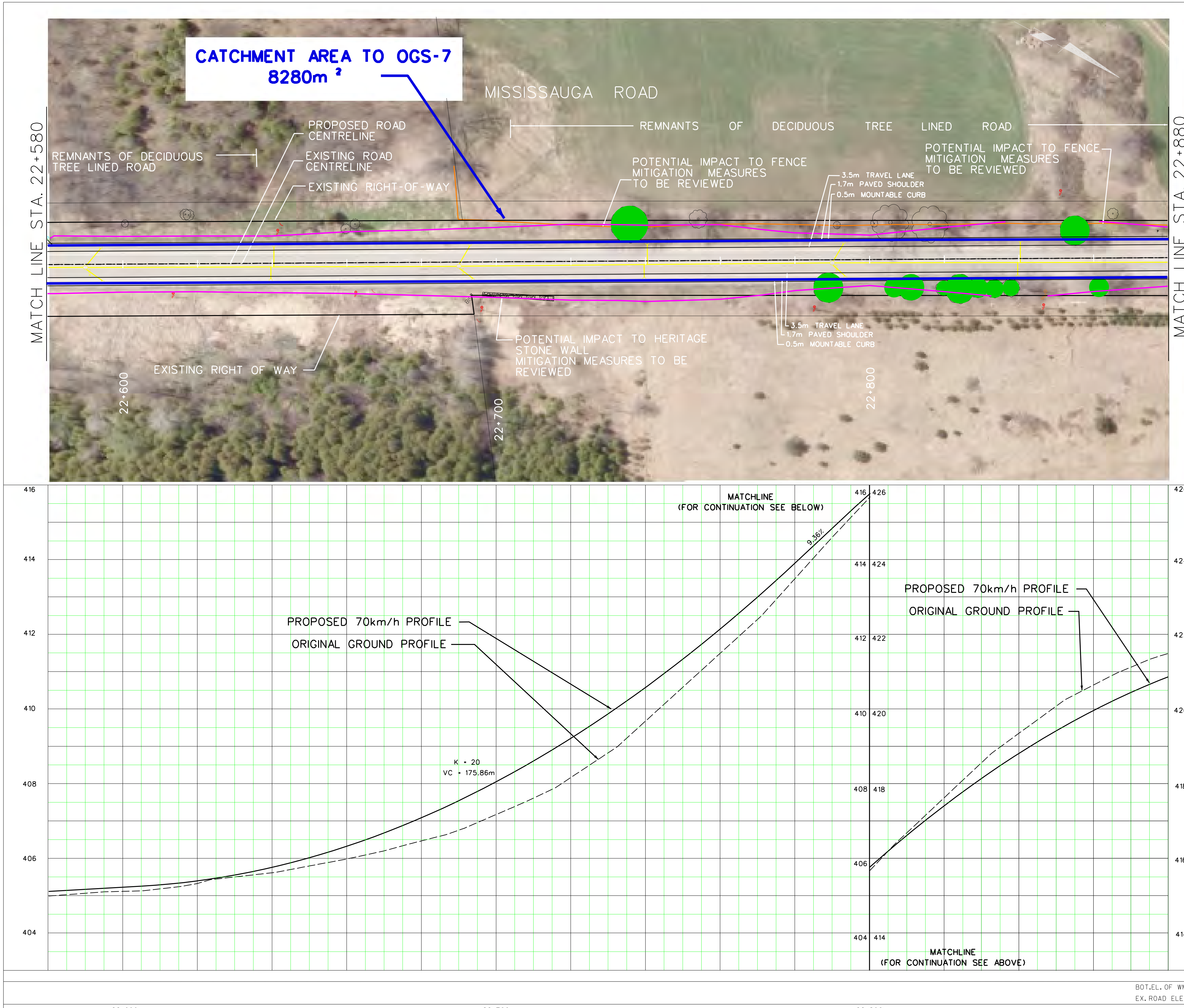
Region of Peel
Working for you

MISSISSAUGA ROAD/ OLD MAIN STREET

(FROM STA 22+280 to STA 22+580)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M7	Plan No. -D

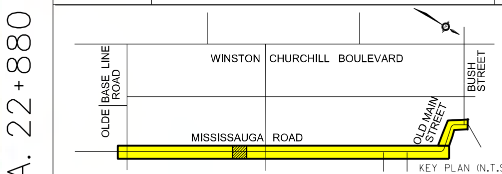


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

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B.M. No. Elev.

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Designed by Chkd. Approved by

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CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
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ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
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ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

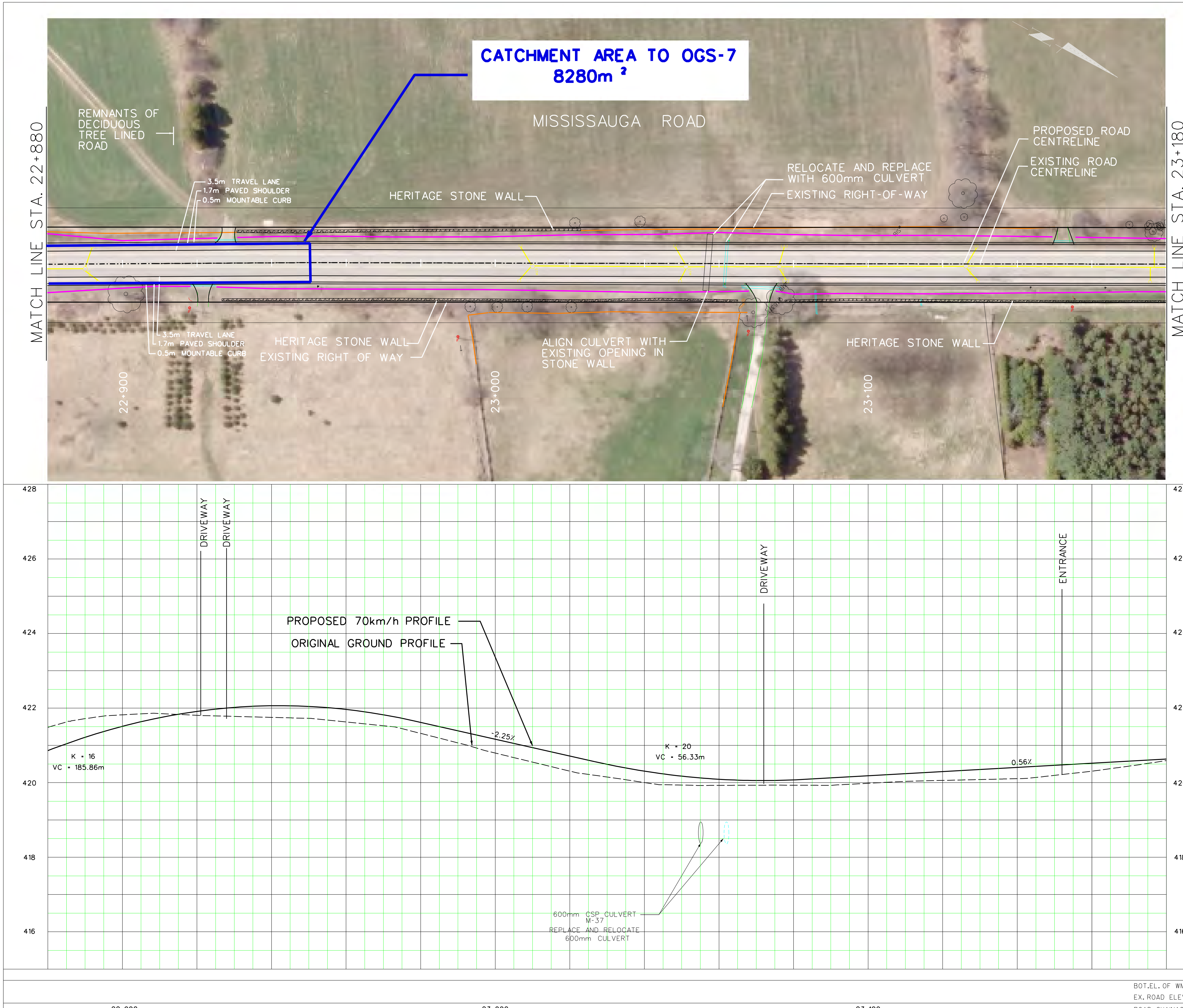
1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

MISSISSAUGA ROAD/
OLD MAIN STREET
(FROM STA 22+580 to STA 22+880)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M8	Plan No. -D



SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNC. CABLES		

REVISIONS

DATE	DETAILS	INIT.

KEY PLAN (N.T.S.)

OLDE BASE LINE ROAD — WINSTON CHURCHILL BOULEVARD — BUSH STREET — OLD MAIN STREET — MISSISSAUGA ROAD

LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

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B.M. No. Elev.

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Designed by Chkd. Approved by

NOTICE TO CONTRACTOR

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CITY OF BRAMPTON WORKS DEPT.	ENERSOURCE TELECOM
TOWN OF CALEDON WORKS DEPT.	HYDRO ONE TELECOM
BELL CANADA	ROGERS CABLE
ENBRIDGE INCORPORATED-GAS DISTRIBUTION	ALLSTREAM
ONTARIO MINISTRY OF TRANSPORTATION	PSN (PUBLIC SECTOR NETWORK)
ONTARIO CLEAN WATER AGENCY	FUTUREWAY (FCI BROADBAND)
HYDRO ONE NETWORKS	
ENERSOURCE, HYDRO MISSISSAUGA	
HYDRO ONE BRAMPTON	

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

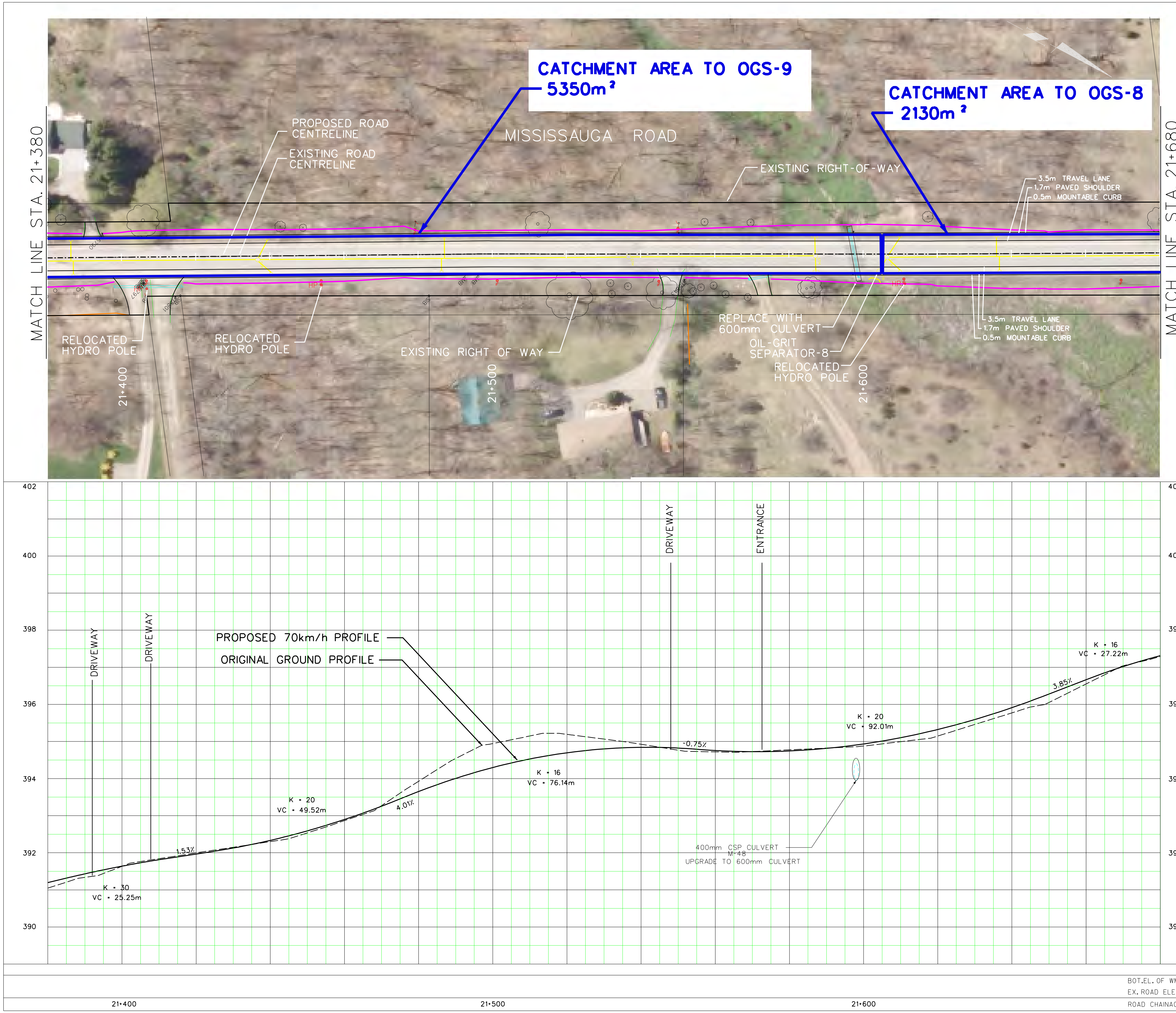
MISSISSAUGA ROAD/ OLD MAIN STREET

(FROM STA 22+880 to STA 23+180)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M9	Plan No. -D

Appendix H
Proposed OGS System Treatment Area
OGS 8 (Mississauga Rd. 48)

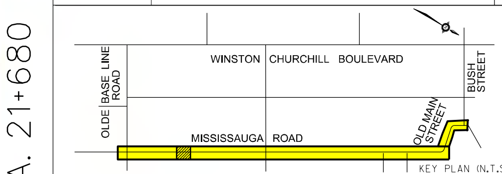


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
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B.M. No. Elev.

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Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
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HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

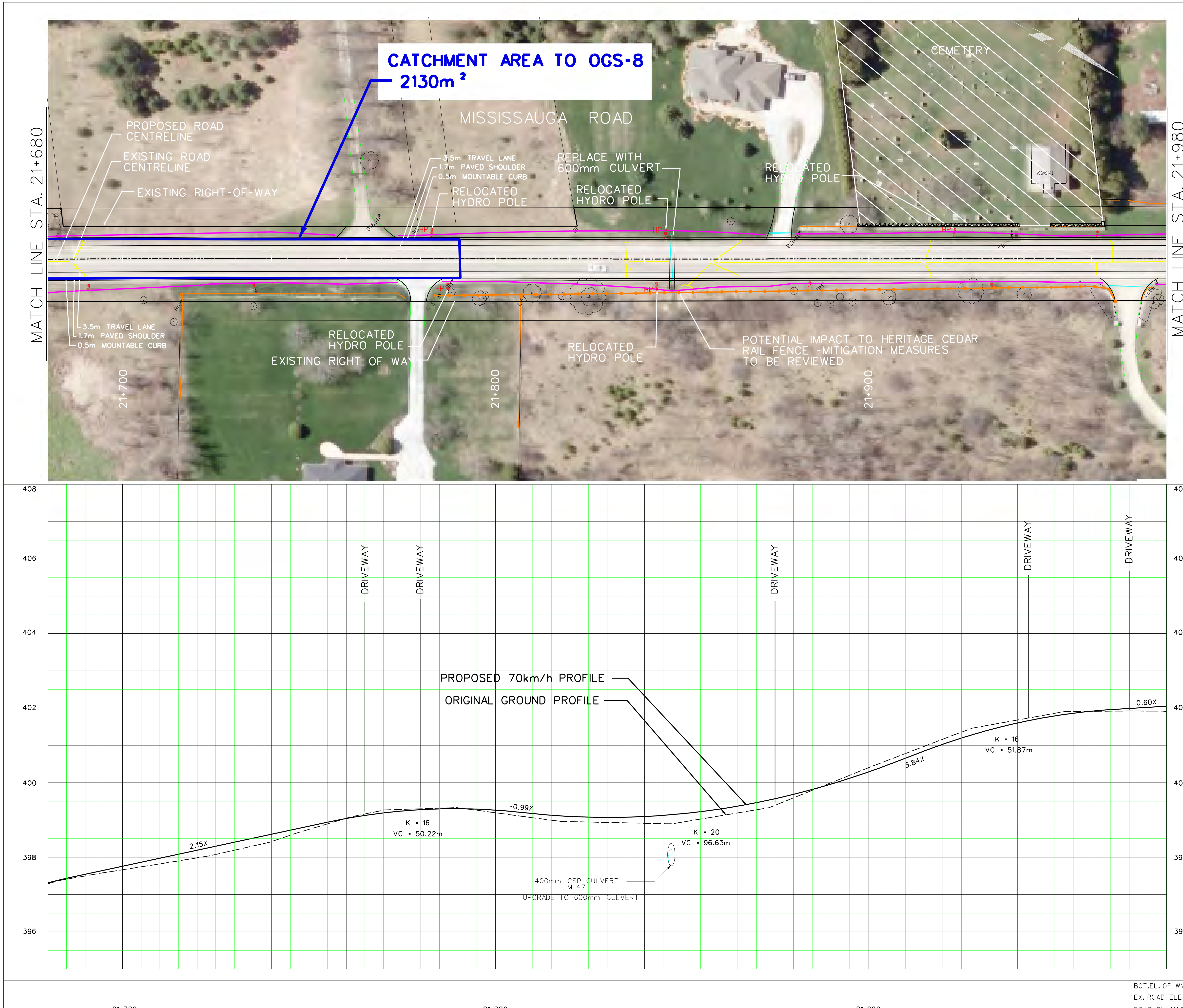
Region of Peel
Working for you

MISSISSAUGA ROAD/ OLD MAIN STREET

(FROM STA 21+380 to STA 21+680)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M4	Plan No. -D

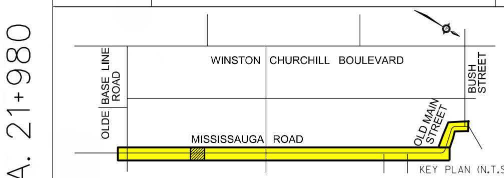


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
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- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

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- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

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Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL	CABLE TELEVISION/FIBREOPTIC PROVIDERS:
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CITY OF BRAMPTON WORKS DEPT.	ENERSOURCE TELECOM
TOWN OF CALEDON WORKS DEPT.	HYDRO ONE TELECOM
BELL CANADA	ROGERS CABLE
ENBRIDGE INCORPORATED-GAS DISTRIBUTION	ALLSTREAM
ONTARIO MINISTRY OF TRANSPORTATION	PSN (PUBLIC SECTOR NETWORK)
ONTARIO CLEAN WATER AGENCY	FUTUREWAY (FCI BROADBAND)
HYDRO ONE NETWORKS	
ENERSOURCE, HYDRO MISSISSAUGA	
HYDRO ONE BRAMPTON	

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

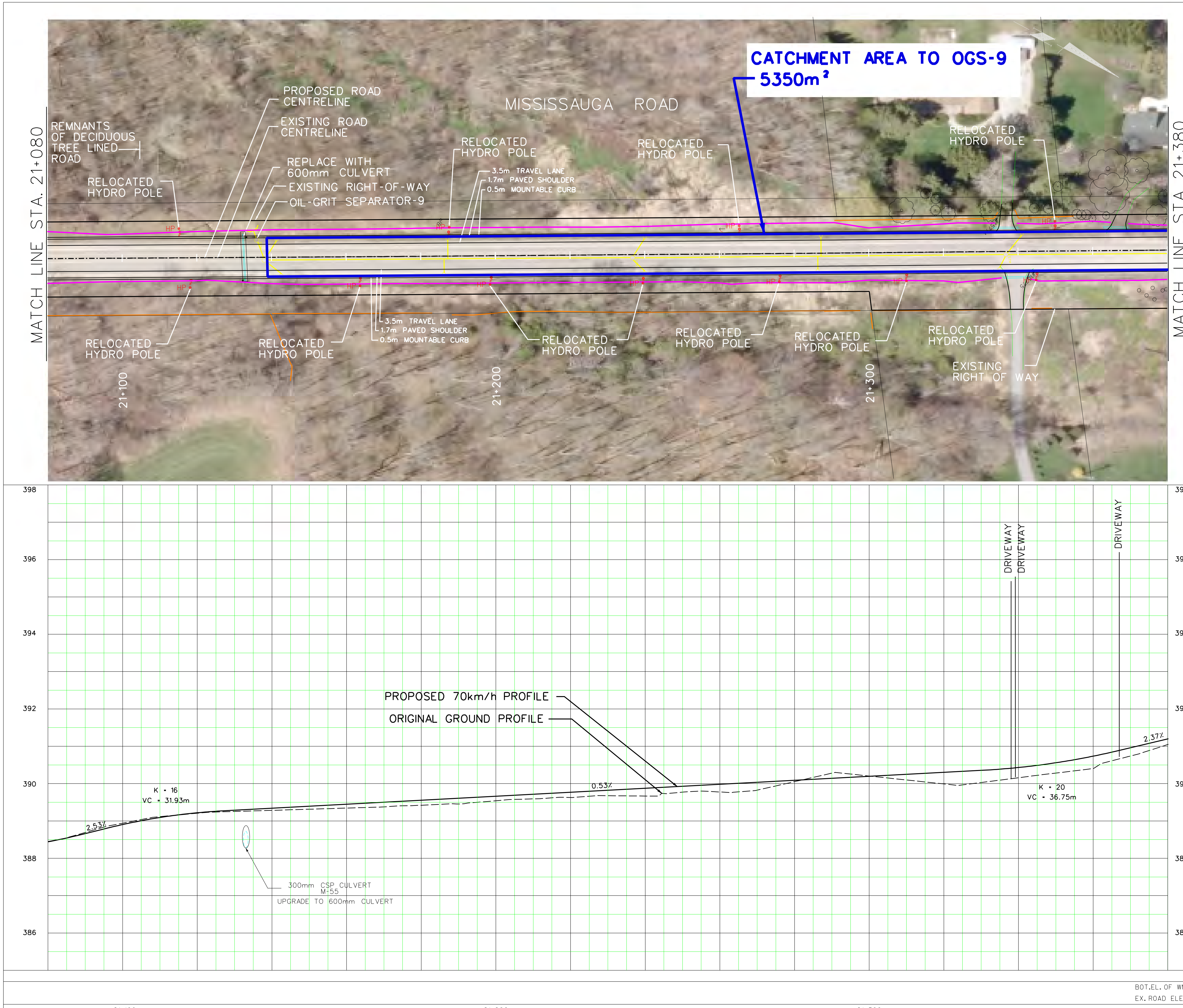
MISSISSAUGA ROAD/ OLD MAIN STREET

(FROM STA 21+680 to STA 21+980)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M5	Plan No. -D

Appendix I
Proposed OGS System Treatment Area
OGS 9 (Mississauga Rd. 55)

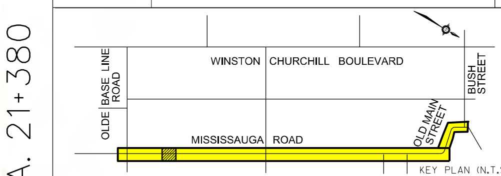


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
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- EXISTING CULVERT
- PROPOSED CULVERT
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- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

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Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

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ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
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ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

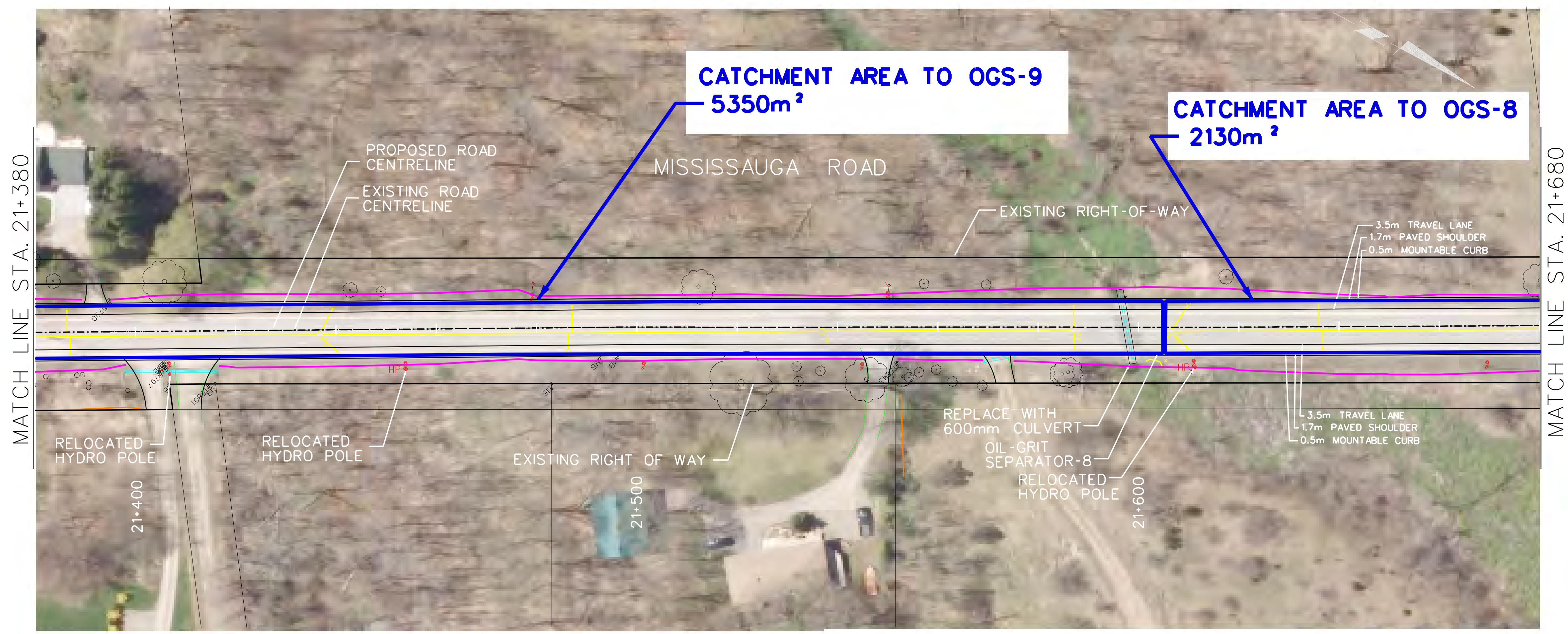
1m 0 1 2 3m VERTICAL SCALE

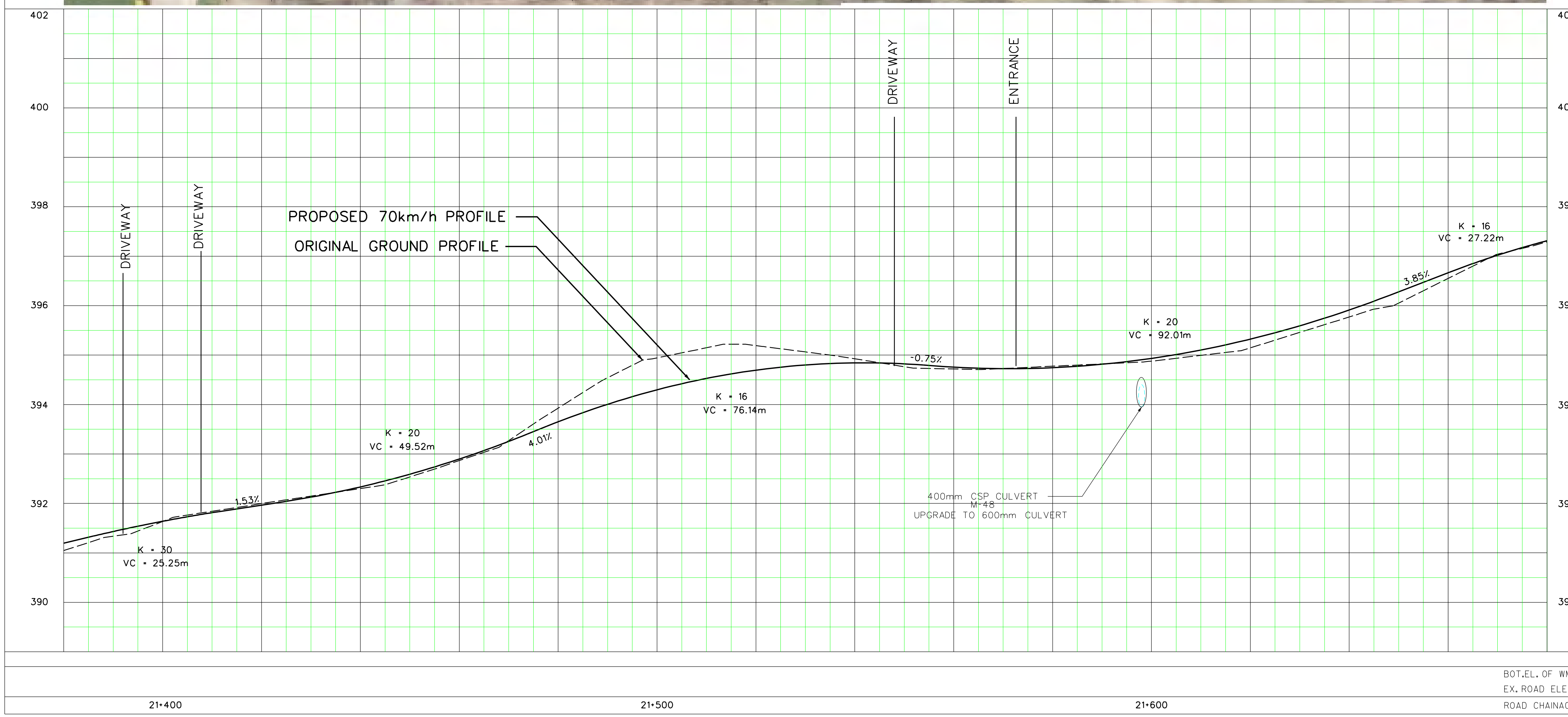
Region of Peel
Working for you

MISSISSAUGA ROAD/ OLD MAIN STREET
(FROM STA 21+080 to STA 21+380)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M3	Plan No. -D





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STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
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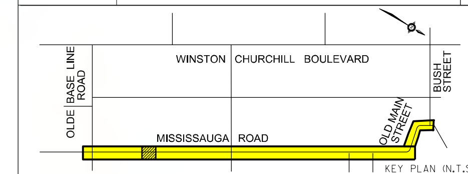
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
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- EXISTING CENTRE LINE
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Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

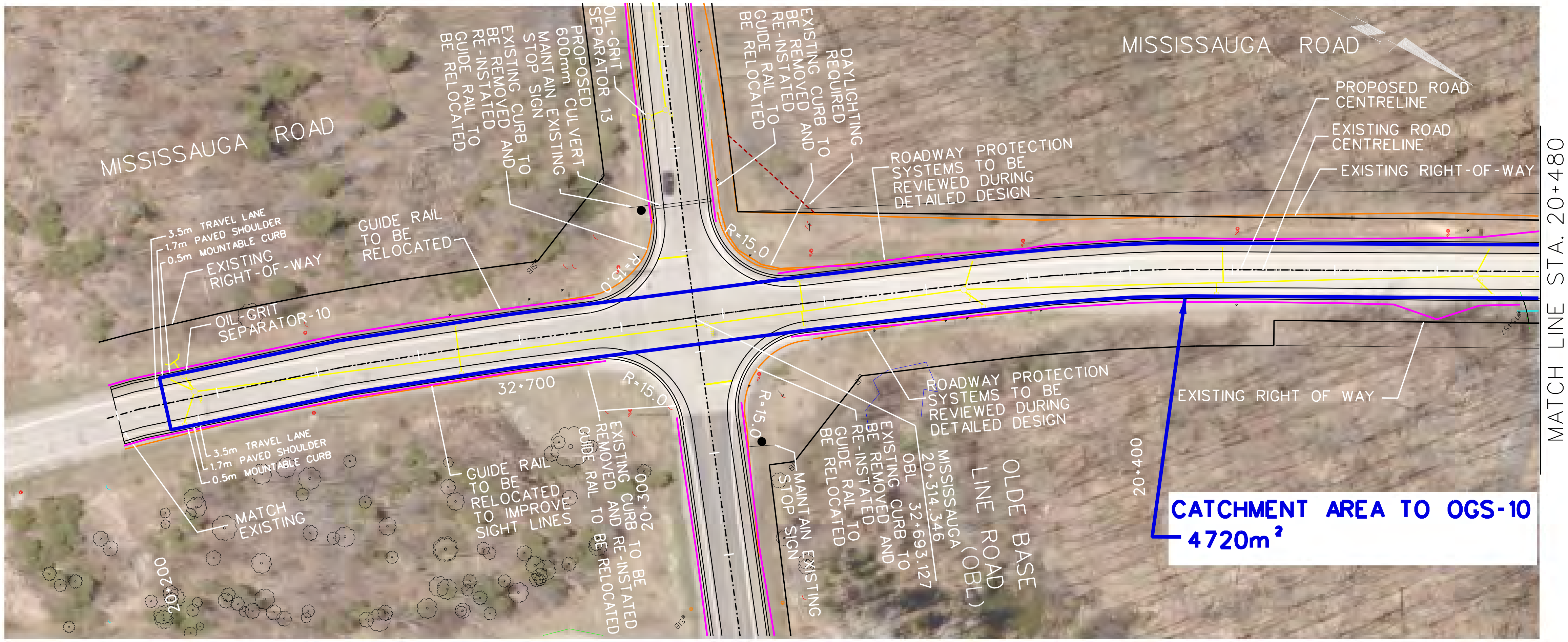
MISSISSAUGA ROAD/ OLD MAIN STREET

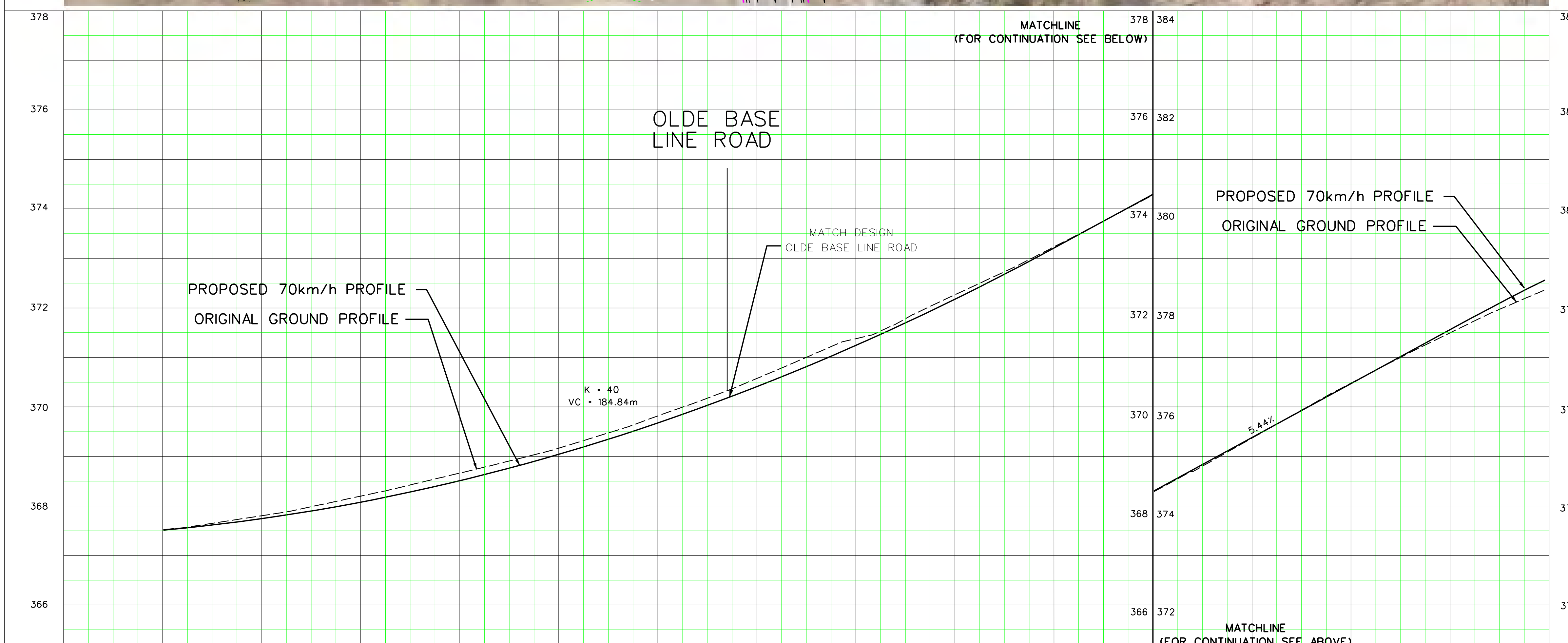
(FROM STA 21+380 to STA 21+680)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M4	Plan No. -D

Appendix J
Proposed OGS System Treatment Area
OGS 10 (Mississauga Rd.)





BOT.EL. OF WM.
EX. ROAD ELEV.
ROAD CHAINAGE

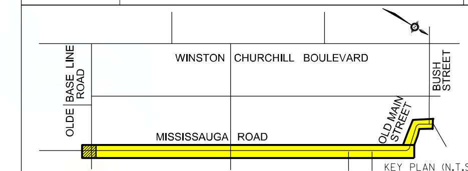
20+200 20+300 20+400

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ Chkd. ____ Approved by ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCIBROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

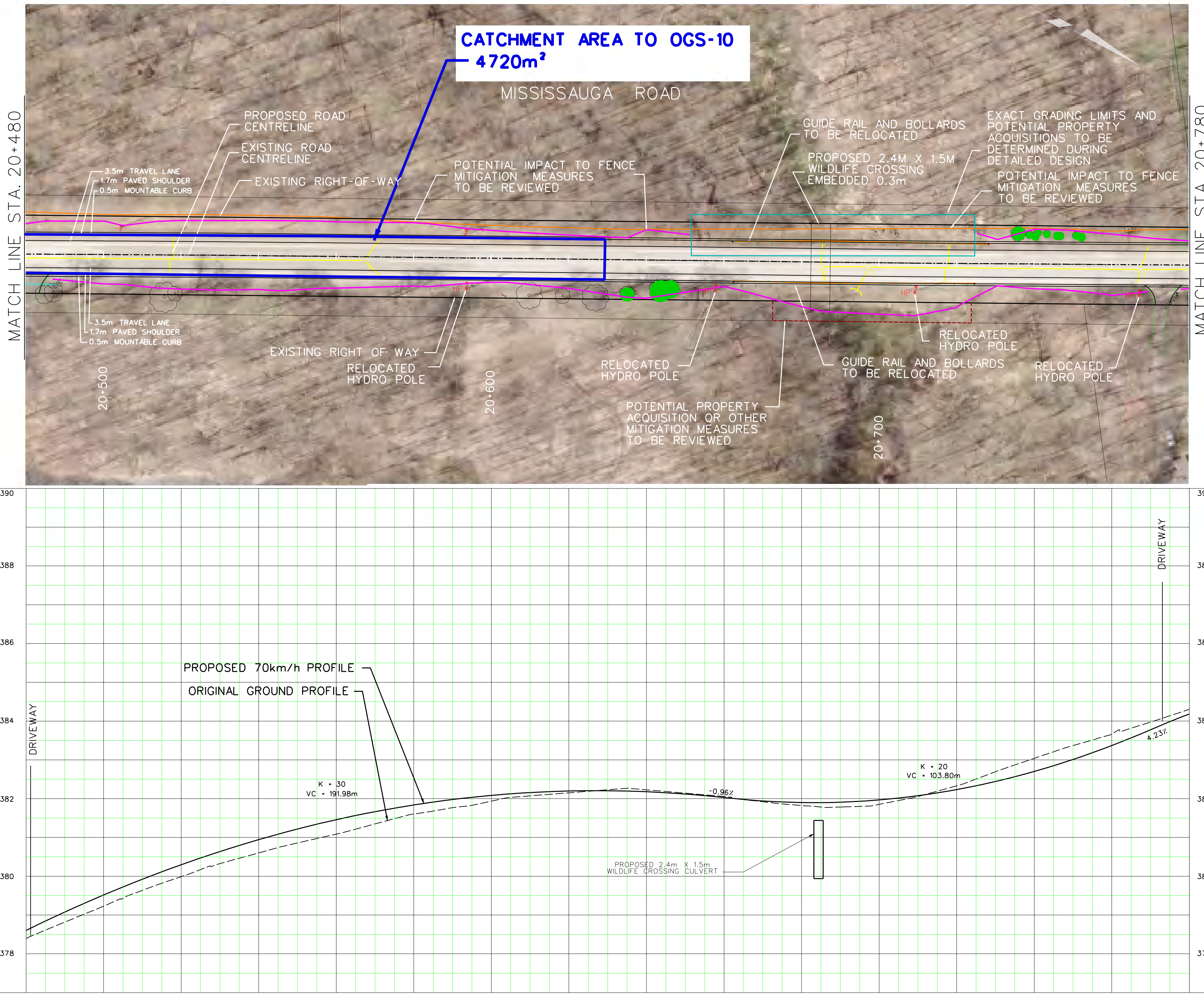
Region of Peel
Working for you

MISSISSAUGA ROAD/ OLD MAIN STREET

(FROM STA 20+200 to STA 20+480)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet MI	Plan No. -D



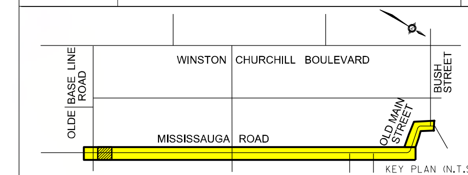
BOT.EL. OF WM.			
EX. ROAD ELEV.			
ROAD CHAINAGE	20+500	20+600	20+700

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by Chkd.

Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

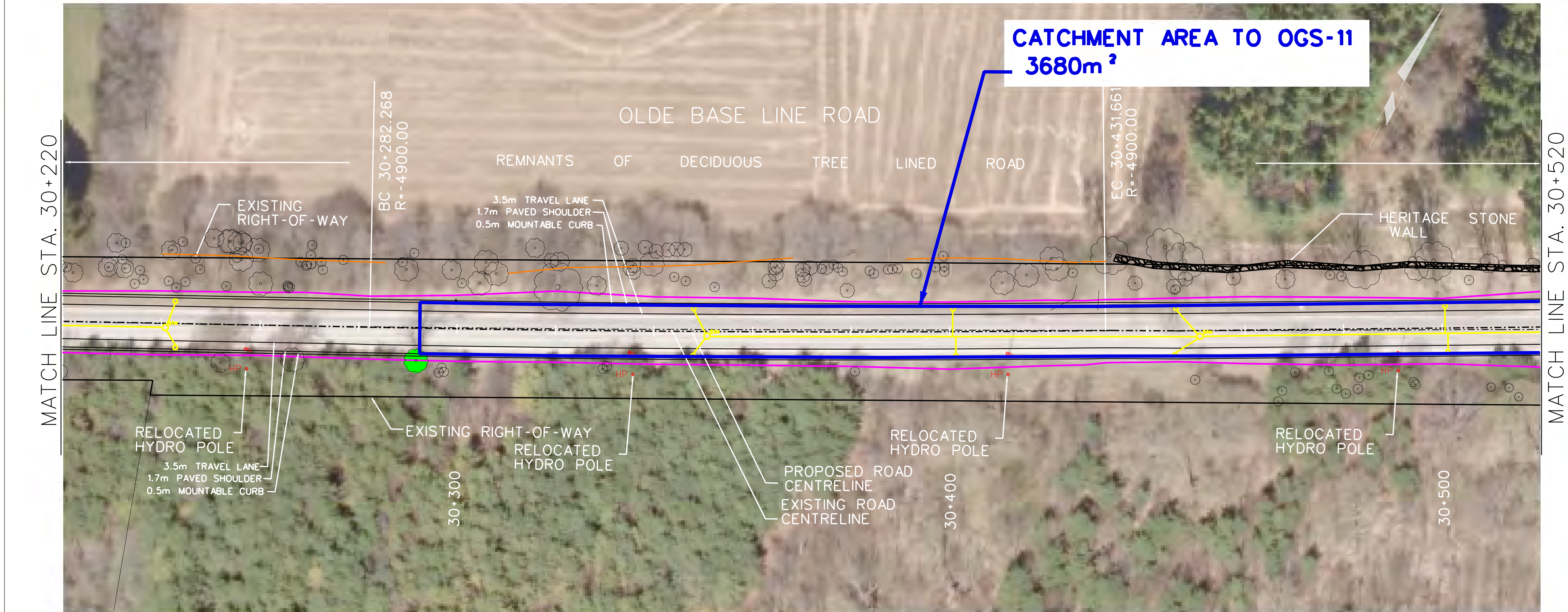
MISSISSAUGA ROAD/ OLD MAIN STREET

(FROM STA 20+480 to STA 20+780)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet M2	Plan No. -D

Appendix K
Proposed OGS System Treatment Area
OGS 11 (OBL-02)

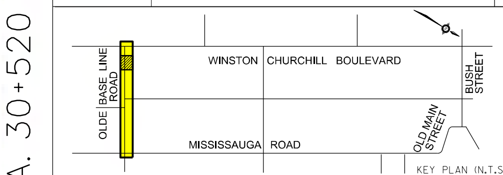


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.

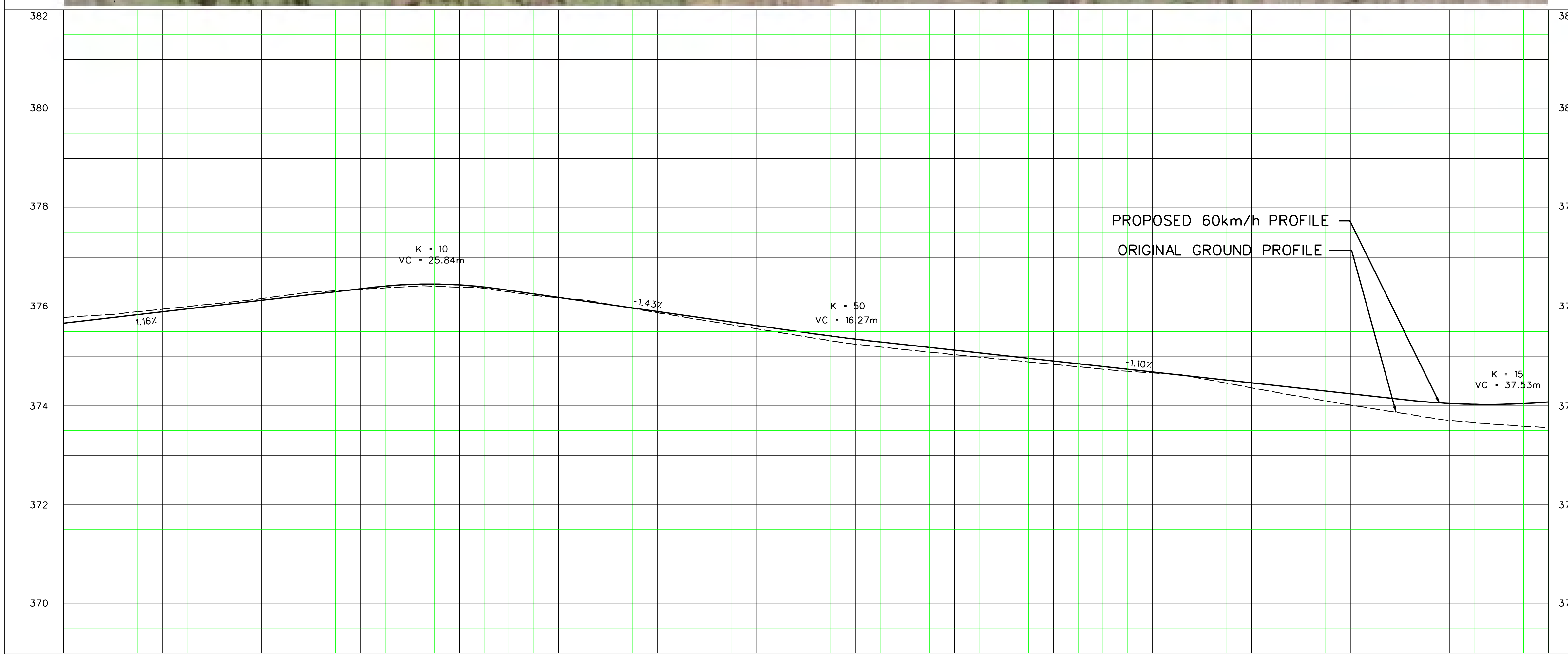


LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN



General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

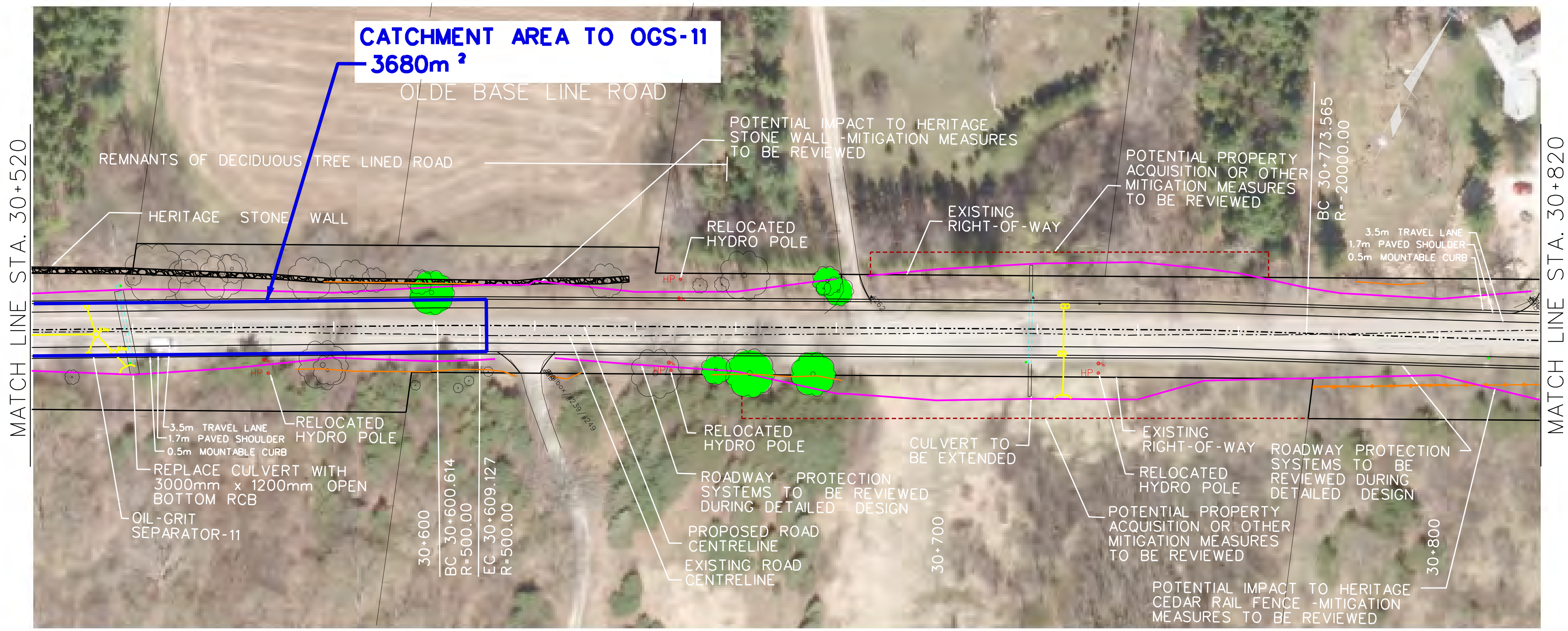
Region of Peel
Working for you

OLDE BASE LINE ROAD

(FROM STA 30+220 to STA 30+520)

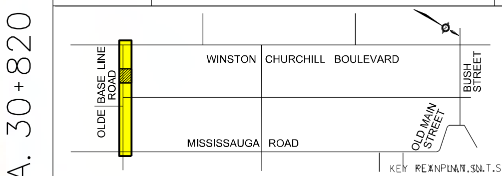
PROPOSED OGS SYSTEM TREATMENT AREAS

		BOT.EL. OF WM.	CAD Area	Area X-X	Project No. XX-XXX
		EX. ROAD ELEV.	Checked by	Drawn by JM	
30+300	30+400	30+500 ROAD CHAINAGE	Date MAY, 2014	Sheet OBL1	Plan No. -D



SERVICE DATA					
SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS		
DATE	DETAILS	INIT.

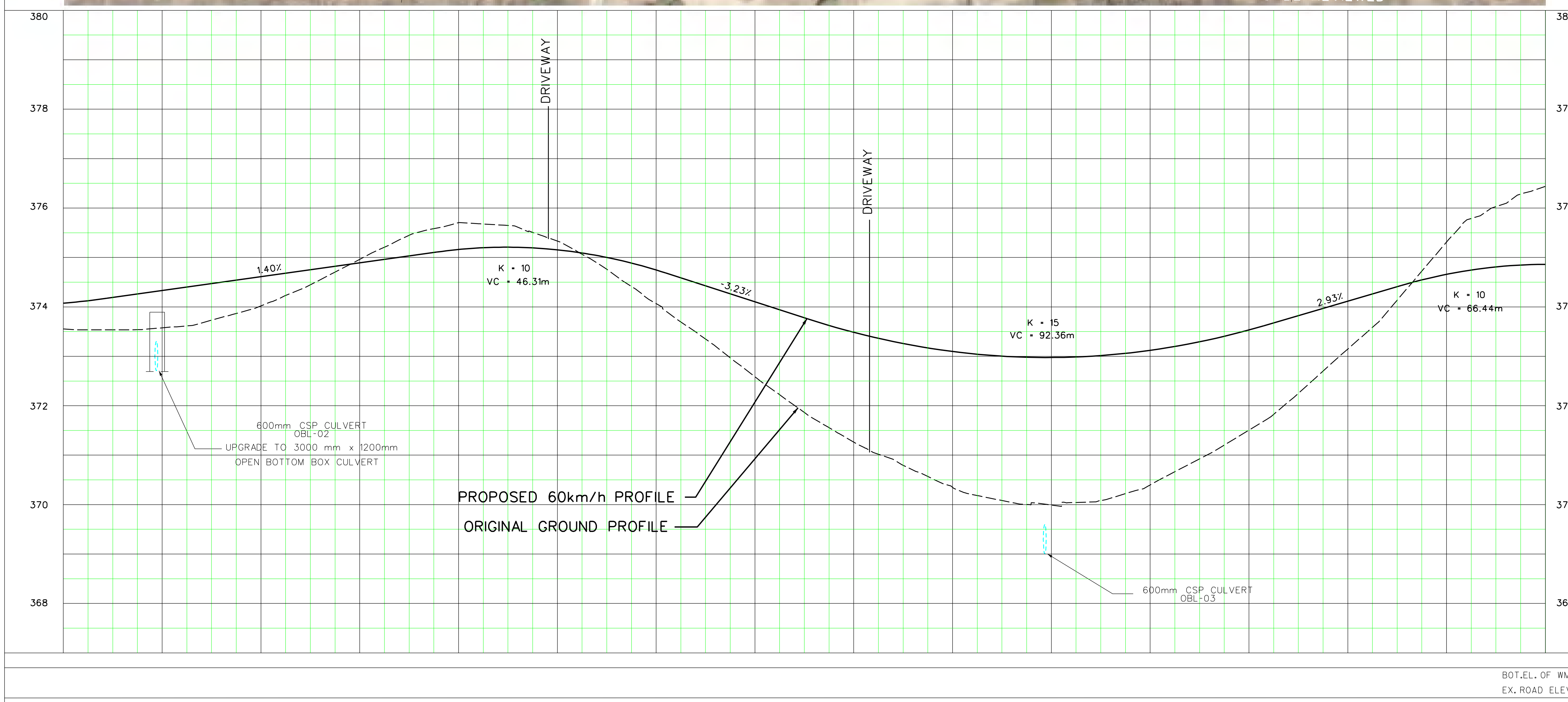


LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN



General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

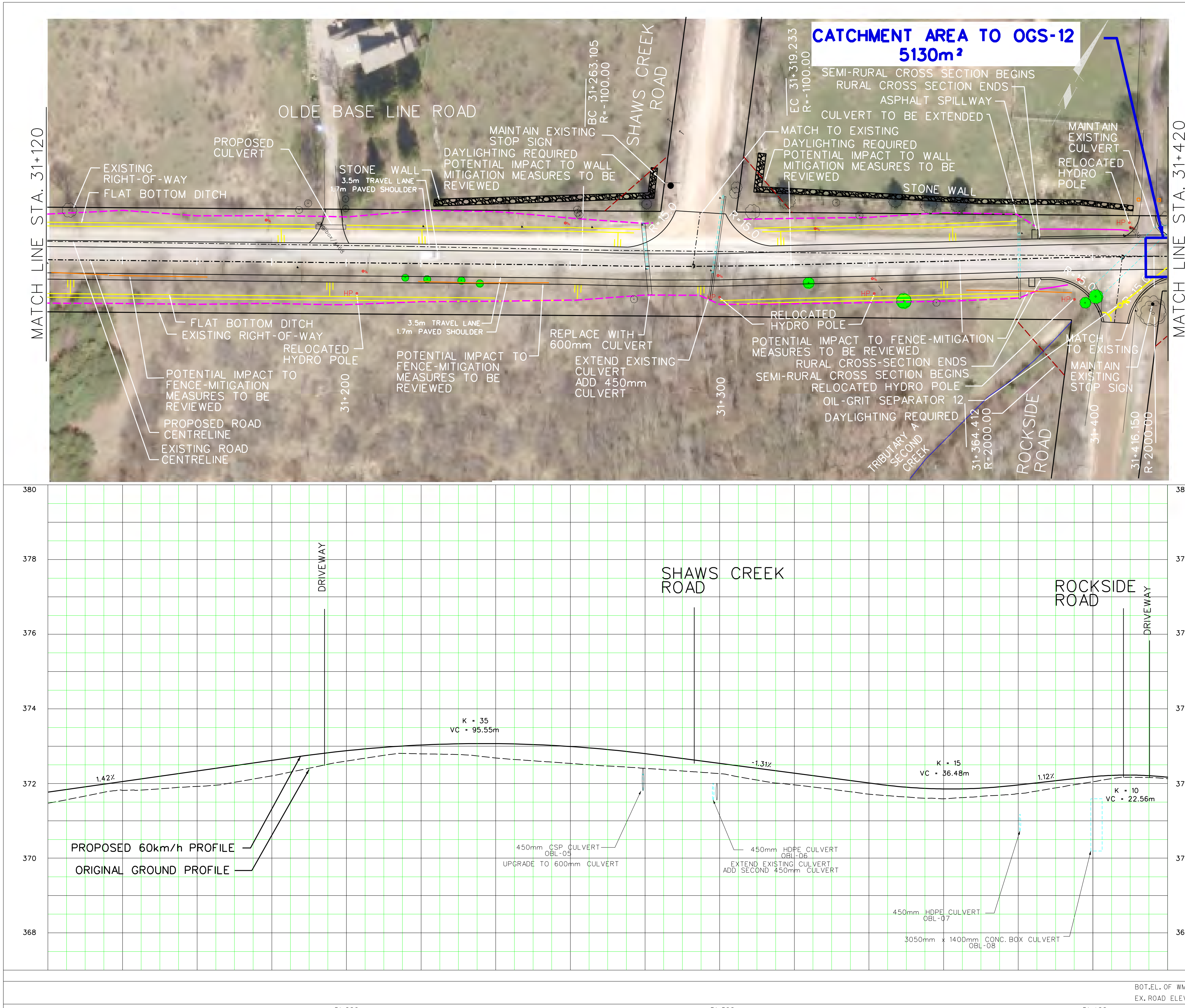
OLDE BASE LINE ROAD

(FROM STA 30+520 to STA 30+820)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet OBL2	Plan No. -D

Appendix L
Proposed OGS System Treatment Area
OGS 12 (OBL-08)



SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.

KEY PLAN (N.T.S.)

LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only. To Be Verified In Field By Contractor.

Designed by Chkd. Approved by

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL	CABLE TELEVISION/FIBREOPTIC PROVIDERS:
CITY OF MISSISSAUGA WORKS DEPT.	BELL CANADA
CITY OF BRAMPTON WORKS DEPT.	ENERSOURCE TELECOM
TOWN OF CALEDON WORKS DEPT.	HYDRO ONE TELECOM
BELL CANADA	ROGERS CABLE
ENBRIDGE INCORPORATED-GAS DISTRIBUTION	ALLSTREAM
ONTARIO MINISTRY OF TRANSPORTATION	PSN (PUBLIC SECTOR NETWORK)
ONTARIO CLEAN WATER AGENCY	FUTUREWAY (FCIBROADBAND)
HYDRO ONE NETWORKS	
ENERSOURCE HYDRO MISSISSAUGA	
HYDRO ONE BRAMPTON	

HORIZONTAL SCALE: 10m 0 10 20 30m

VERTICAL SCALE: 1m 0 1 2 3m

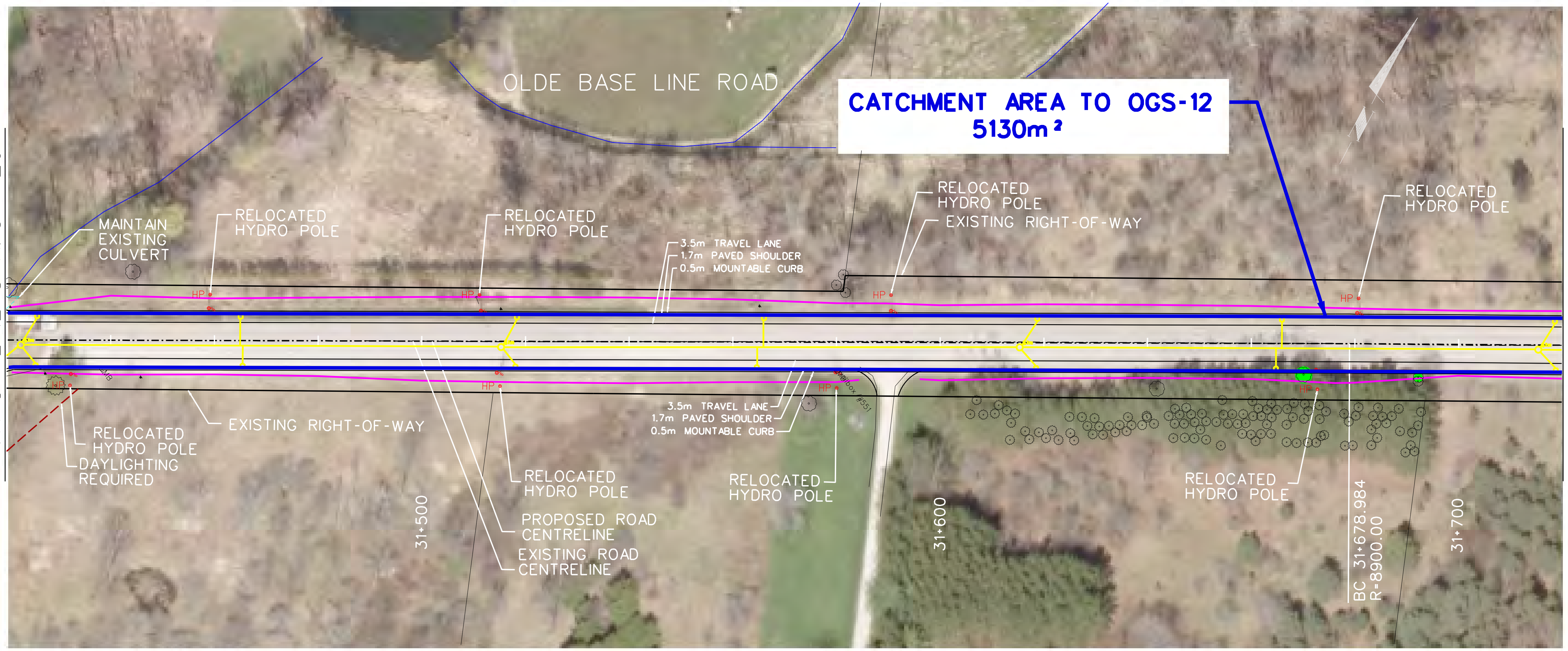
Region of Peel
Working for you

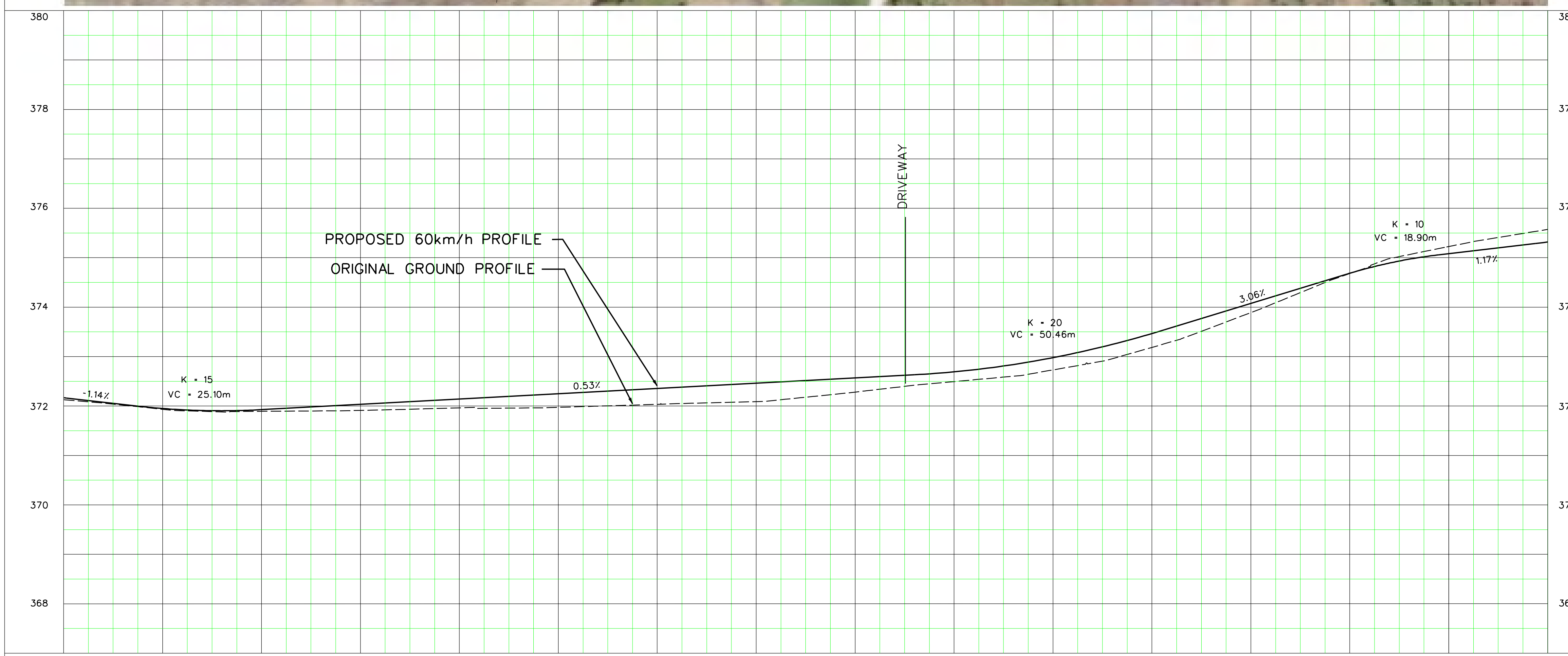
OLDE BASE LINE ROAD

(FROM STA 31+120 to STA 31+420)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet OBL3	Plan No. -D





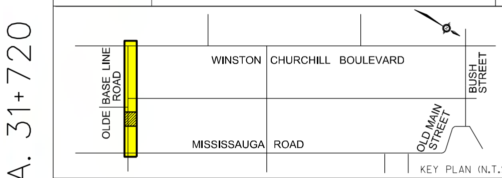
BOT.EL. OF WM.	
EX. ROAD ELEV.	
ROAD CHAINAGE	31+500 · 31+600 · 31+700

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

- All Driveways ASPHALT Unless Otherwise Noted.
- All Service Locations Are Approximate And Must Be Located Accurately In The Field
- Denotes Building - Not Located
- Denotes Building Located
- Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ Chkd.____ Approved by ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

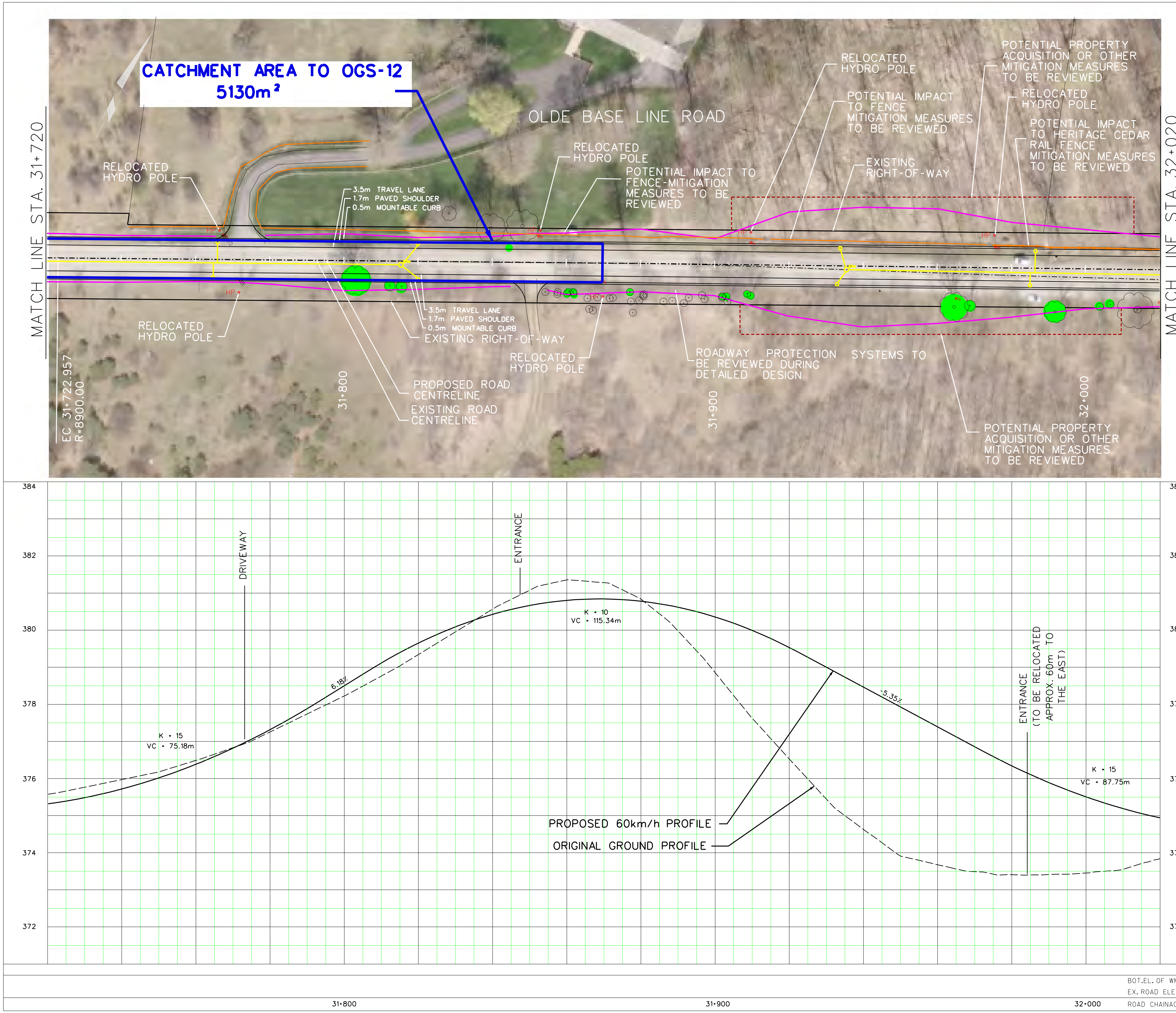
Region of Peel
Working for you

OLDE BASE LINE ROAD

(FROM STA 31+420 to STA 31+720)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet OBL4	Plan No. -D

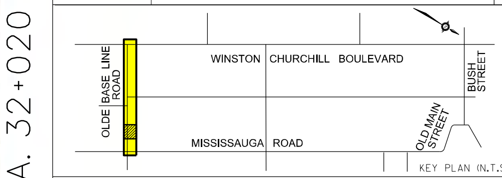


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

- PROPOSED GRADING LIMIT (RURAL CROSS SECTION)
- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
- CULTURALLY SIGNIFICANT FENCE
- HERITAGE STONE WALL
- PROPOSED CENTRE LINE
- EXISTING CENTRE LINE
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
- DITCH GRADING
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

NOTES

1. DRIVEWAYS TO BE REGRADED AS REQUIRED
2. HYDRO POLE RELOCATIONS ARE PRELIMINARY
3. REMOVAL OR REPLACEMENT OF DRIVEWAY CULVERTS IN SEMI-RURAL CROSS SECTIONS TO BE REVIEWED IN DETAILED DESIGN

General Notes

All Driveways ASPHALT Unless Otherwise Noted.
All Service Locations Are Approximate And Must Be Located Accurately In The Field
Denotes Building - Not Located
Denotes Building Located
Type 'B' Bedding Unless Otherwise Noted (SAN)

B.M. No. Elev.

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by ____ ____ ____ ____ Chkd.____

Approved by ____ ____ ____ ____ ____

NOTICE TO CONTRACTOR

48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING

THE REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA WORKS DEPT.
CITY OF BRAMPTON WORKS DEPT.
TOWN OF CALEDON WORKS DEPT.
BELL CANADA
ENBRIDGE INCORPORATED-GAS DISTRIBUTION
ONTARIO MINISTRY OF TRANSPORTATION
ONTARIO CLEAN WATER AGENCY
HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
HYDRO ONE BRAMPTON

CABLE TELEVISION/FIBREOPTIC PROVIDERS:
BELL CANADA
ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCIBROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

Region of Peel
Working for you

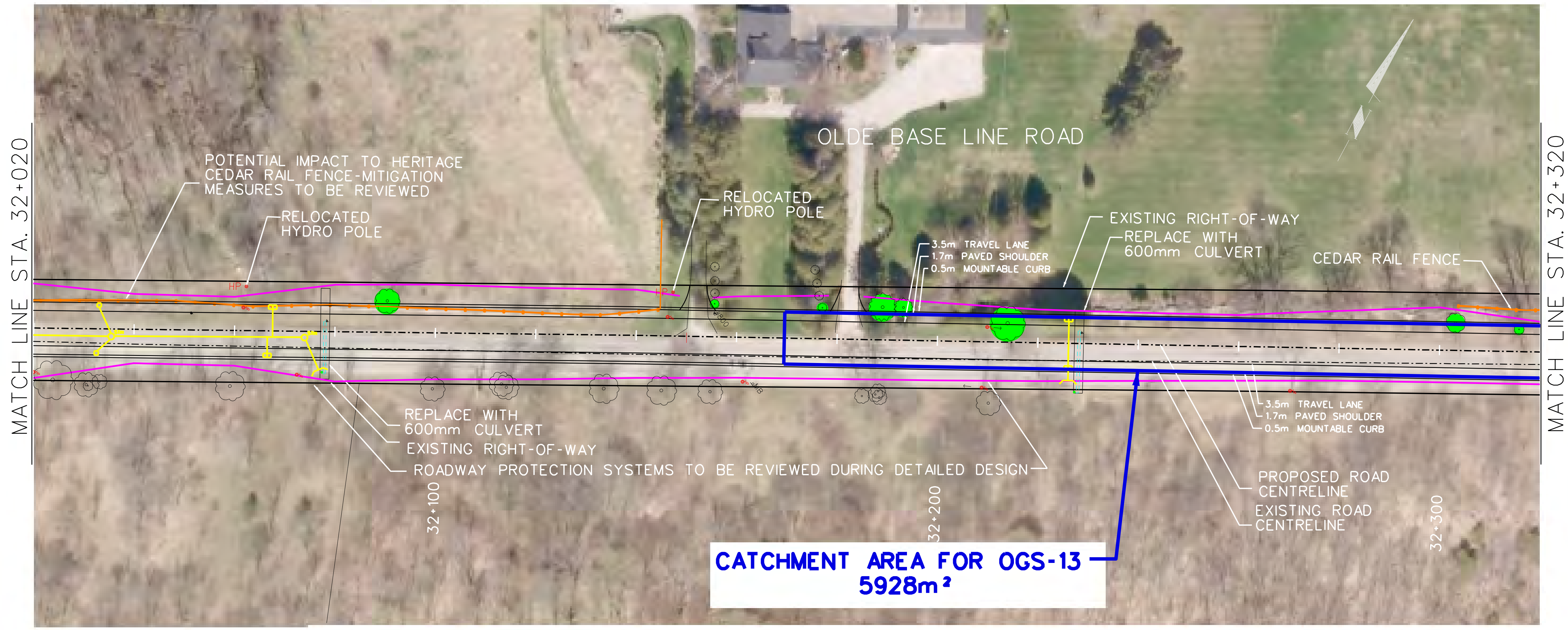
OLDE BASE LINE ROAD

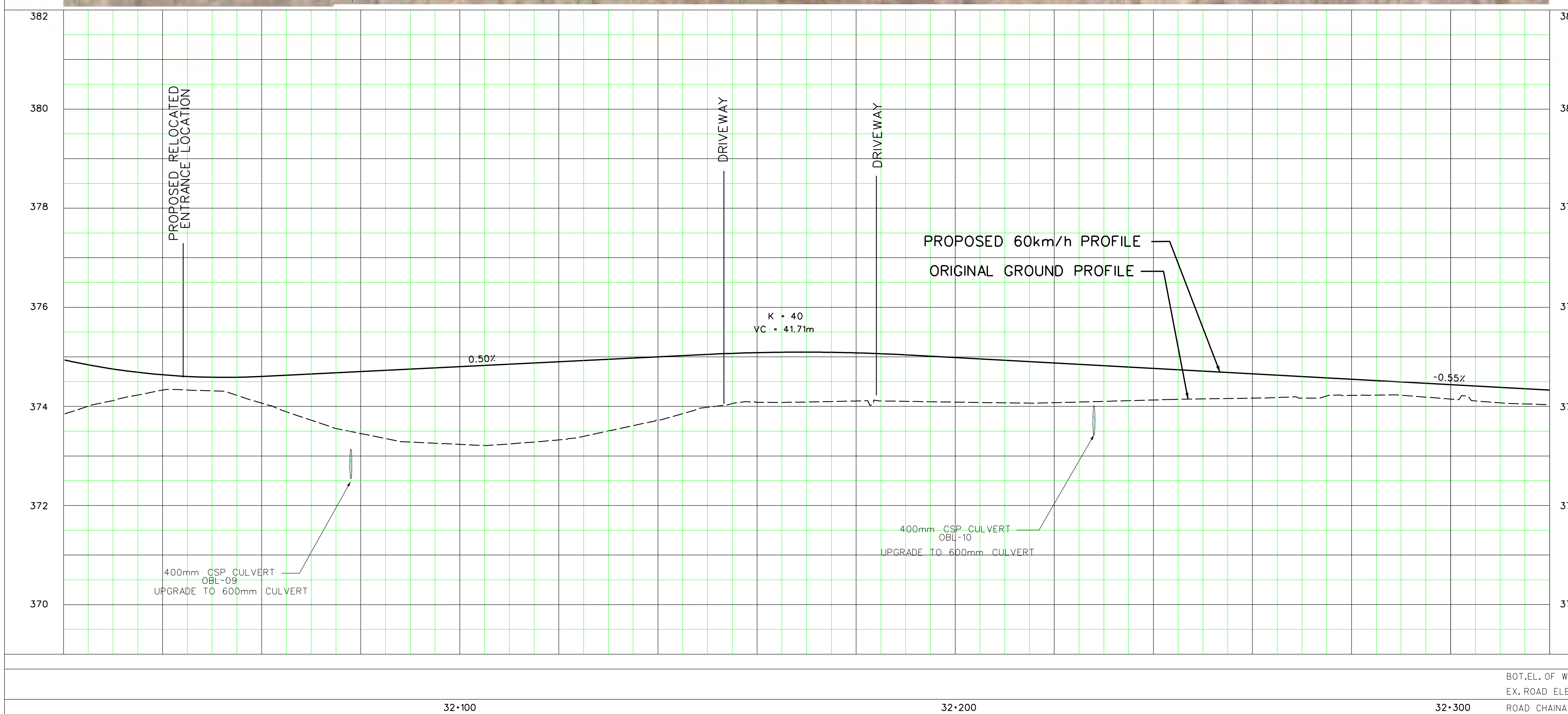
(FROM STA 31+720 to STA 32+020)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet OBL5	Plan No. -D

Appendix M
Proposed OGS System Treatment Area
OGS 13 (Old Base Line Road)



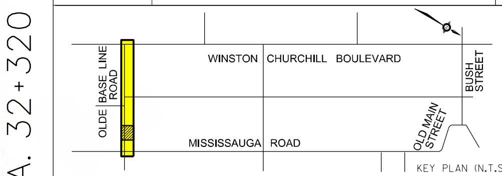


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



LEGEND:

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- PROPOSED GRADING LIMIT (SEMI-RURAL CROSS SECTION)
- PROPOSED PROPERTY LINE
- FENCE/GUIDE RAIL
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- PROPOSED CENTRE LINE
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- PROPOSED EDGE OF ASPHALT
- EXISTING RIGHT OF WAY
- EXISTING CULVERT
- PROPOSED CULVERT
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- PROPOSED CATCHBASIN
- TRAFFIC SIGN
- HP HYDRO POLE
- VEGETATION REMOVALS

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Designed by ____ Chkd. ____

Approved by ____

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HYDRO ONE NETWORKS
ENERSOURCE, HYDRO MISSISSAUGA
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ENERSOURCE TELECOM
HYDRO ONE TELECOM
ROGERS CABLE
ALLSTREAM
PSN (PUBLIC SECTOR NETWORK)
FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

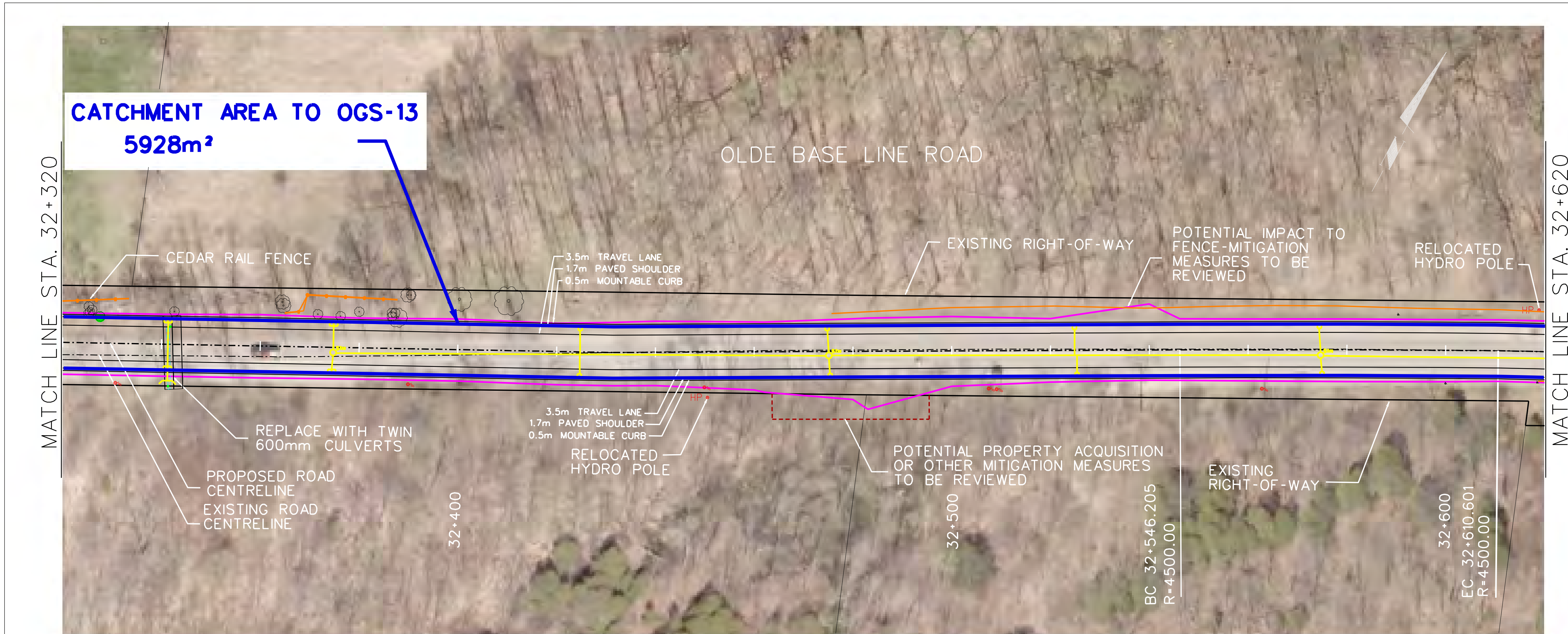
Region of Peel
Working for you

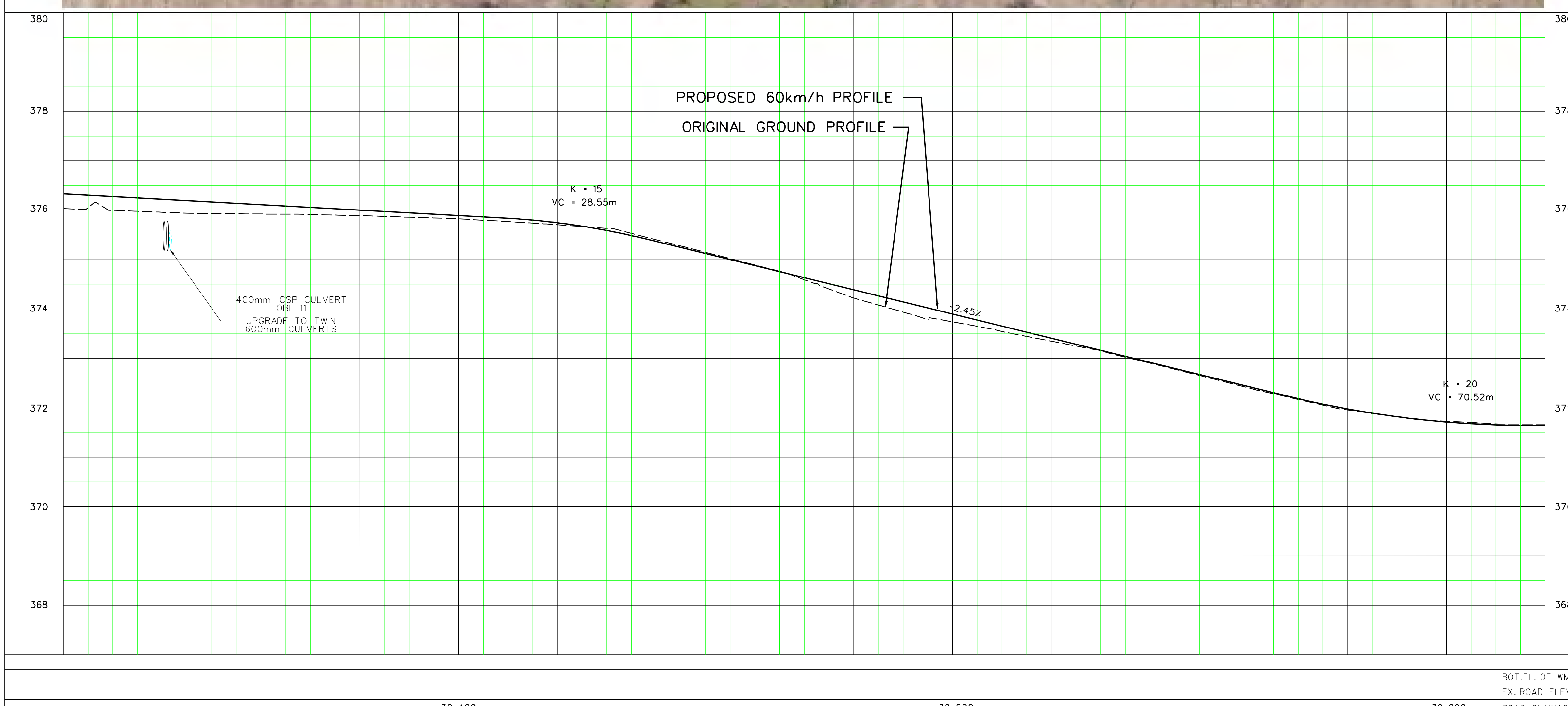
OLDE BASE LINE ROAD

(FROM STA 32+020 to STA 32+320)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet OBL6	Plan No. -D





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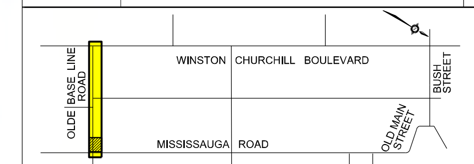
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



KEY PLAN (N.T.S.)

LEGEND:

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FUTUREWAY (FCI BROADBAND)

10m 0 10 20 30m HORIZONTAL SCALE

1m 0 1 2 3m VERTICAL SCALE

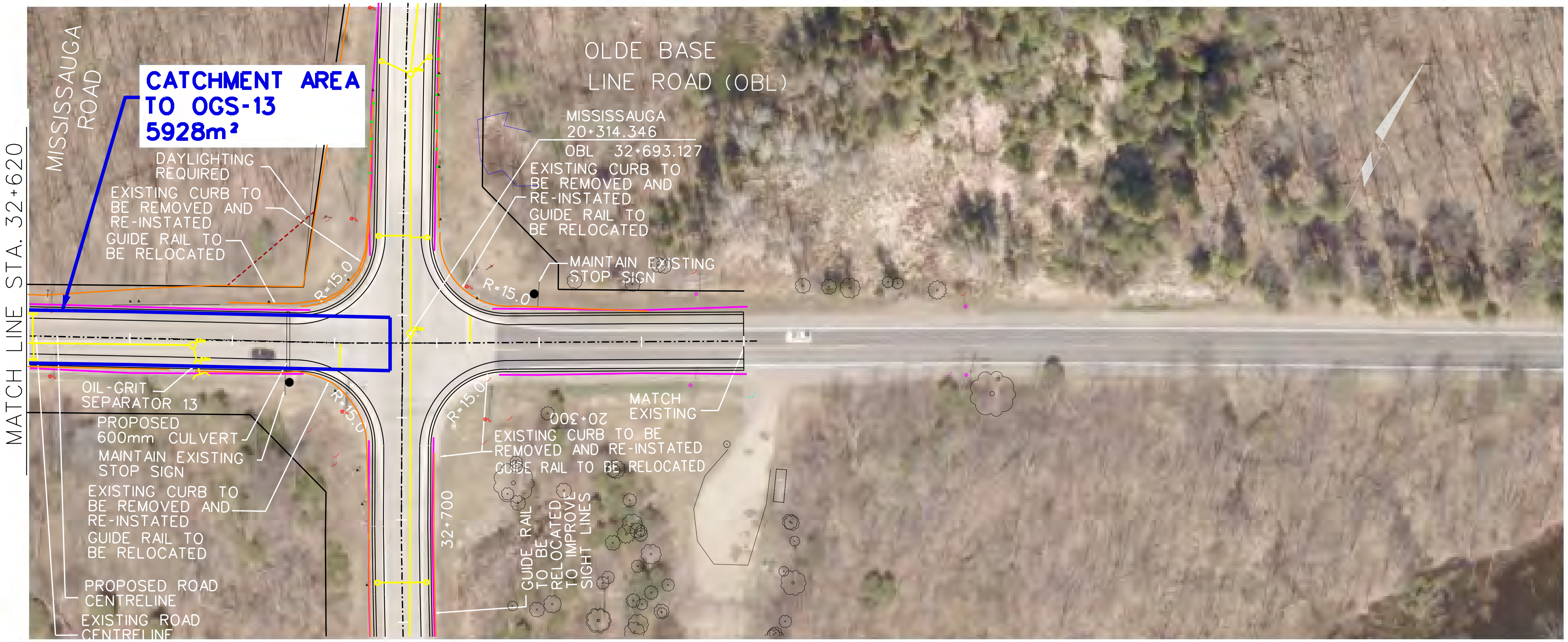
Region of Peel
Working for you

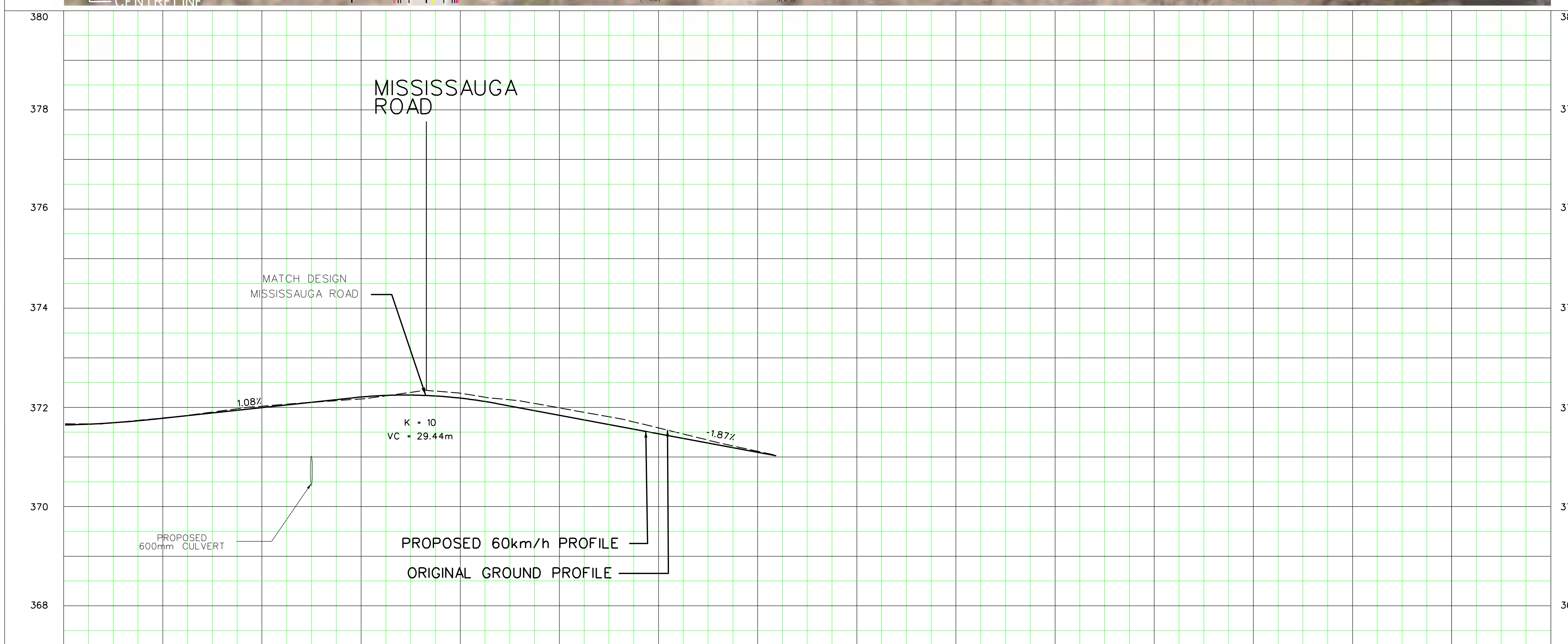
OLDE BASE LINE ROAD

(FROM STA 32+320 to STA 32+620)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area x-x	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet OBL7	Plan No. -D





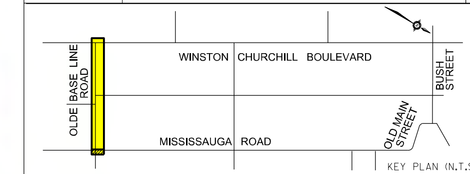
BOT.EL. OF WM.			
EX. ROAD ELEV.			
ROAD CHAINAGE	32+700	32+800	32+900

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.



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Region of Peel
Working for you

OLDE BASE LINE ROAD

(FROM STA 32+620 to STA 32+760)

PROPOSED OGS SYSTEM TREATMENT AREAS

CAD Area	Area X-X	Project No. XX-XXX
Checked by	Drawn by JM	
Date MAY, 2014	Sheet OBL8	Plan No. -D

HDR