APPENDIX

J STORMWATER DRAINAGE ASSESSMENT

Environmental Assessment Study of Arterial Roads within the Highway 427 Industrial Secondary Plan Area (Area 47)

Part B: Stormwater Drainage Assessment

City of Brampton and Region of Peel
TP115086

Prepared for:

City of Brampton & Region of Peel

1/20/2023

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Environmental Assessment Study of Arterial Roads within the Highway 427 Industrial Secondary Plan Area (Area 47)

TP115086

Prepared for:

City of Brampton & Region of Peel

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Preface

Wood Environment & Infrastructure Solutions, a division of Wood Canada Limited (Wood), has been retained by the City of Brampton and Region of Peel to conduct a Schedule C Municipal Class EA for a future arterial road network within Secondary Plan Area 47.

The City of Brampton, to accommodate future growth in north-east Brampton, has approved a secondary plan for Area 47. The area is bound by Mayfield Road to the north, Castlemore Road to the south, Regional Road 50 (RR50) to the east and The Gore Road to the west.

The City of Brampton has identified through its Transportation and Transit Master Plan (TTMP, 2009), and supporting studies the need for additional road network capacity up to 2031. As part of these studies, road network improvements within Secondary Plan Area 47 were recommended. The recommended road improvements are being addressed by the current Class EA in two parts:

Part A (Region owned R.O.W.s[1]):

1. A new six-lane north-south major arterial road (Arterial A2) from Mayfield Road east of Clarkway Drive to Major Mackenzie Drive/RR50; and,
2. Widening of Coleraine Drive from Arterial A2 to Mayfield Road including realignment at Arterial A2 west of RR50; and,

Part B (City owned R.O.W.s):

1. A new four-lane east-west minor arterial road from The Gore Road to Arterial A2 (E-W arterial);
2. Widening of Clarkway Drive from Castlemore Road to E-W Arterial to four lanes and urbanizing Clarkway Drive between E-W arterial and Mayfield Road with possible continuous centre turn lane; and
3. Widening of Countryside Drive to four lanes from Clarkway Drive to RR50 including realignment at RR50.

In order to service this growth, new infrastructure must be provided that recognizes the capacity needs of planned growth and the objectives of protecting established communities and businesses from threats created by surface water drainage. As per Section 4.2.1.1 and Figure 4.4 of the MESP (ref. Aquafor Beech, 2016) the SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region R.O.W.s for the required water quantity, water quality, and erosion control SWM requirements. This approach has been adopted as the overall premise for design of the stormwater quantity, quality and erosion features required for all the roadways within the Study Area. Notwithstanding, the following negotiations are still ongoing:

- The Region and City are in discussion to formalize acceptance of stormwater discharge of the Region's roadway drainage systems to City owned drainage systems and SWM facilities; and,
- The Region, City and land owner's are in discussion regarding the overall premise for stormwater management for the Study Area, particularly along Coleraine Drive. This has driven the evaluation of alternatives focused on a stormwater management facility located near the intersection of Coleraine Drive and Arterial A2.

Decisions regarding these ongoing negotiations are a prerequisite to developing a preferred alternative for stormwater management for the Study Area. As such, alternative solutions will be developed and assessed in detailed design leading to a preferred approach and the road drainage as per the catchments divide provided in this report will be the responsibility of the R.O.W. adjacent land owners to accommodate.

1 R.O.W. = road right-of-way

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1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, a division of Wood Canada Limited (Wood), has been retained by the City of Brampton and Region of Peel to conduct a Schedule C Municipal Class EA (Class EA) for a future arterial road network within Secondary Plan Area 47.

The City of Brampton continues to grow and urbanize, and to accommodate future growth in north-east Brampton, Council has approved a secondary plan for Area 47. Area 47 is bound by Mayfield Road to the north, Castlemore Road to the south, Regional Road 50 (RR50) to the east and The Gore Road to the west (ref. Figure 1-1). To service this growth, new infrastructure must be provided that recognizes the capacity needs of planned growth and the objectives of protecting established communities and businesses from threats created by surface water drainage.

The City of Brampton has identified through its Transportation and Transit Master Plan (TTMP, 2009), and supporting studies (including the Highway 427 Extension Area Transportation Master Plan and the Highway 427 Industrial Secondary Plan (Area 47) Transportation Master Plan) the need for additional capacity in the road network up to the planning horizon year of 2031. As part of these studies, road network improvements within Secondary Plan Area 47 were recommended. The recommended road improvements are being addressed by the current Class EA in two parts:

Part A (Region owned R.O.W.s[2]):

3. A new six-lane north-south major arterial road (Arterial A2) from Mayfield Road east of Clarkway Drive to Major Mackenzie Drive/RR50; and,
4. Widening of Coleraine Drive from Arterial A2 to Mayfield Road including realignment at Arterial A2 west of RR50; and,

Part B (City owned R.O.W.s):

4. A new four-lane east-west minor arterial road from The Gore Road to Arterial A2 (E-W arterial);
5. Widening of Clarkway Drive from Castlemore Road to E-W Arterial to four lanes and urbanizing Clarkway Drive between E-W arterial and Mayfield Road with possible continuous centre turn lane; and
6. Widening of Countryside Drive to four lanes from Clarkway Drive to RR50 including realignment at RR50.

The Part A and Part B features, as described above, are illustrated in Figure 1-1, as well as Plans 1 and 12 (ref. Appendix C).

The Highway 427 Industrial Secondary Plan (Area 47) Transportation Master Plan has satisfactorily completed Phases 1 and 2 of the Municipal Class EA process for the recommended arterial road network improvements and recommended commencement of Phases 3 and 4 of the EA process. The current study will satisfy Phases 3 and 4 of the Class EA requirements for the identified arterial road improvements.

This report has been prepared to document the stormwater drainage conditions for Part B of the Study Area. The following sections describe the background review, the assessment of existing and proposed hydraulic structures within Part B of the Study Area including hydraulic analyses, establish the proposed arterial road R.O.W. drainage conditions, and summarize stormwater management criteria for the proposed arterial road improvements, and new arterial roads. Part B of the Study Area includes drainage to the Clarkway and Gore Road Tributaries.

Stormwater drainage conditions for Part A of the Study Area are documented under separate cover.

2 R.O.W. = road right-of-way

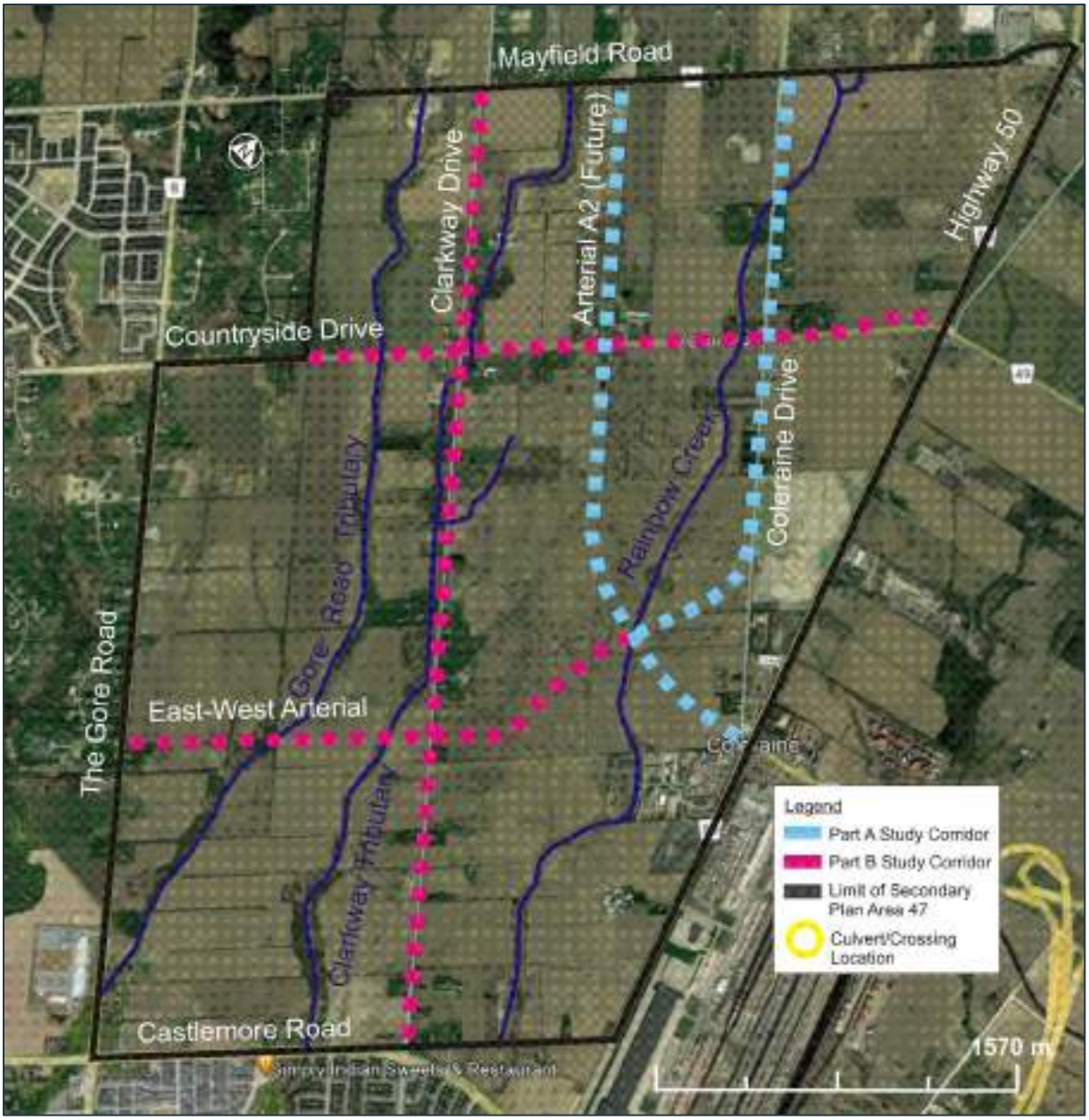


Figure 1-1 Study Corridors

(background image source Google Earth Pro™)

2.0 BACKGROUND REVIEW

2.1 Previous Studies

Several previous studies have been completed which are relevant to the current project as summarized below.

Humber River Hydrology Update, Civica Infrastructure Inc., June 2015

This study, prepared as a joint effort between the Toronto and Region Conservation Authority (TRCA) and Civica Infrastructure Inc. (Civica), was an update to the hydrologic model of the Humber River Watershed. The update was completed to reflect the increase in urban development, including stormwater management facilities constructed within the last 15 years, and included significantly refined subcatchment discretization. The hydrologic model was developed in Visual OTTHYMO 4 (VO4) for existing land uses and future land uses based on approved Regional and local municipality Official Plans. The model for the Humber River Watershed was a new model which superseded the previous SWMHYMO model developed by Aquafor Beech Limited (ref. Humber River Watershed Hydrology Update, November 2002). Peak flows were reported for the 2 to 500-year return periods and the Regional Storm event (Hurricane Hazel). The model was calibrated using rainfall-runoff data from recent storm events. Of the 6-hour, 12-hour, and 24-hour AES distribution design storms simulated, the 6-hour and 12-hour storms were found to be the critical storms (i.e. these storms generated the highest peak flows). The study found that the 2 to 100-year unit flow relationship equations provided in the TRCA Stormwater Management Criteria (2012) are sufficient to maintain existing conditions peak flows under the proposed future land use condition.

Master Environmental Servicing Plan: Highway 427 Industrial Secondary Plan Area ("Area 47"), Aquafor Beech Limited, May 9, 2016

This Master Environmental Servicing Plan (MESP) was prepared for the "Area 47" study area to address the constraints and opportunities associated with the proposed land use changes. The MESP provides a comprehensive management plan including stormwater and natural heritage strategies to protect the natural environment resources within the Study Area. Part of the MESP involved extending and updating TRCA generated HEC-RAS models of The Gore Road Tributary, the Clarkway Tributary, and Rainbow Creek.

2.2 Data, Mapping & Models

In addition to the reporting described in Section 2.1, additional background data, mapping and models have been provided by the City of Brampton, TRCA, Aquafor Beech, and Wood's Geotechnical Team. The following summarizes the data relevant to this assessment:

City of Brampton

- Various digital GIS base mapping layers including roads, property, watercourses, subwatershed boundaries, Official Plan land use, etc.
- Aerial photography
- Digital terrain mapping

TRCA

- Various digital GIS mapping layers including watercourses, TRCA regulation limit, meander belt, floodplain limits, etc.
- Visual OTTHYMO 4.0 hydrologic model of the Humber River Watershed (2015)

- Existing Conditions 6-hour AES 2 year – 100-year Design Storm Peak Flows (March 2018) from revised Humber River Hydrology Update
- Existing & Future Conditions Regional Storm Peak Flows (March 2018) from revised Humber River Hydrology Update
- HEC-RAS hydraulic models of the Gore Road Tributary, the Clarkway Tributary, and Rainbow Creek (March 2018)

Aquafor Beech

- HEC-RAS hydraulic models of The Gore Road Tributary, the Clarkway Tributary, and Rainbow Creek (2016 - Superseded by CDC. TMIG, dated July 2018).
- Various digital GIS base mapping layers including contours, watercourses, HEC-RAS section lines, and floodlines.

Wood's Geotechnical Team

- Borehole logs - 47 borehole logs were advanced by Wood's Geotechnical Team in the period January 2020 to April 2020 along the Coleraine Drive and Arterial A2 R.O.W.s. Relevant borehole logs are provided in Appendix A.

3.0 STORMWATER MANAGEMENT

3.1 Existing Conditions Storm Drainage

The Part B Study Area is located within the Humber River Watershed and contributes drainage to both the West Humber and the Main Humber subwatersheds. In the context of the West Humber subwatershed, the Study Area is located within the headwaters. There are two (2) tributaries that drain through the Part B Study Area, namely the Gore Road Tributary and the Clarkway Tributary (ref. Figure 3-1).

The existing land uses are predominantly agricultural, with a dispersion of pasture land and low-density residential. The soil type encountered throughout the Study Area is dominated by imperfectly drained stone-free clays, underlain by silty sand.

Under existing conditions, approximately 27.6 ha of existing R.O.W. (imperviousness = 16.3%) (i.e. Countryside Drive and Clarkway Drive) contributes stormwater runoff to the subject watercourses.

The existing R.O.W.s consist of rural cross-sections with ditches. Overland drainage from external lands enters the existing R.O.W.s at various points and is conveyed by the existing ditches to the watercourse receivers (i.e. Gore Road Tributary and the Clarkway Tributary).

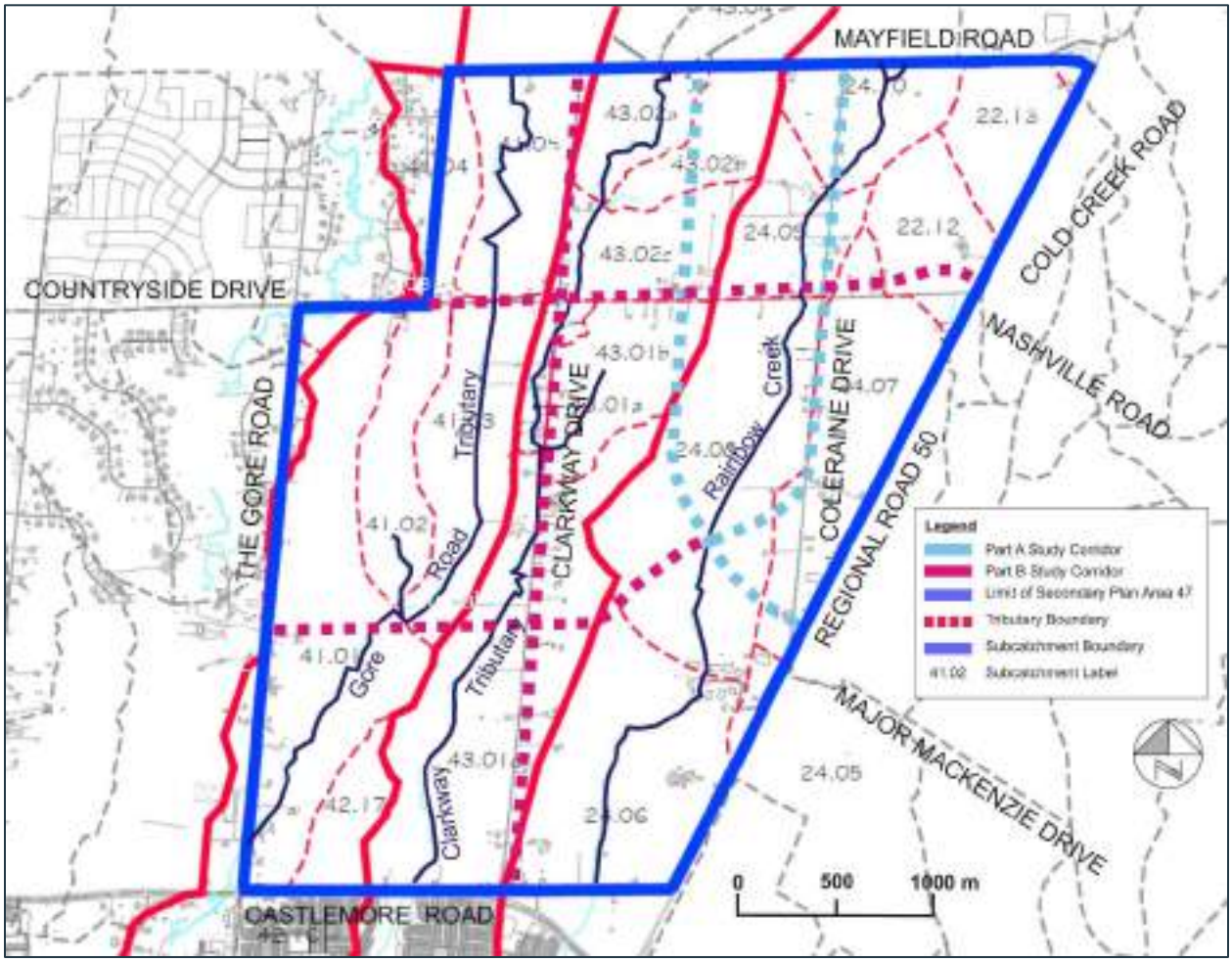


Figure 3-1 Existing Condition Drainage

3.1.1 Hydrologic Assessment

The hydrologic assessment completed for the Part B Study Area has estimated 2-year through 100-year return period peak flows for study relevant watercourses for existing land use conditions with stormwater management at key locations, including existing road crossings and the Study Area boundary. Application of existing land use conditions is considered conservative for the return period events as the future conditions peak flows are generally lower than existing conditions due to the application of unitary release rates. For the purposes of sizing future hydraulic crossings, as a component of the next phase of the study, the most conservative of the existing and future land use peak flows will be applied.

Peak flows have been simulated in the hydraulic model (Section 4.0) to assess the performance of the existing hydraulic structures (i.e. bridges & culverts).

3.1.1.1 Methodology

The Rational Method has been used to calculate the peak flows for 2 to 100-year storm events according to the Region of Peel IDF data (which is marginally higher than the City's design IDF rainfall). As well, a VO6 model has been developed to simulate the Regional (Hazel Storm), 6-hour and 12-hour AES design storm events peak flows for comparison with the Rational Method results. The subcatchments have been discretized to obtain peak flows suited to each reach within the Clarkway Tributary HEC-RAS model. Figure 3-1 provides the existing conditions catchment layout for the Study Area. The naming for the discretized subcatchments retains the parent catchment number, with a subscript of either "a", "b", or "c".

The estimated peak flows have been input to the HEC-RAS hydraulic model to estimate flood levels throughout the Part B Study Area. The updates to the HEC-RAS model are discussed in Section 4.0 of this report.

3.1.1.2 Results

The 6-hour and 12-hour duration, 2-year to 100-year return period AES distribution and Regional Storm events have been simulated using the VO6 hydrologic model. Peak flow estimates from the Rational Method and the VO6 model have been compared and it has been determined that the Rational Method produced the highest peak flows.

Using Region of Peel IDF data, peak flow estimates for the 2-year to 100-year storm events have been calculated for the existing and proposed conditions. Overall, the size of the discretized subcatchments is the same, however, the subcatchment imperviousness has increased significantly reflecting proposed development. A summary of the peak flows at key locations is included in Appendix B.

3.2 Future Conditions Storm Drainage

As outlined in Section 1.0, the future condition for Part B of the Study Area proposes a new four-lane east-west minor arterial road from The Gore Road to Arterial A2 (E-W arterial); widening of Clarkway Drive from Castlemore Road to E-W Arterial to four lanes and urbanizing Clarkway Drive between E-W arterial and Mayfield Road with a possible continuous center turn lane, and widening of Countryside Drive to four lanes from Clarkway Drive to RR50 including realignment at RR50. Urbanized cross-sections are proposed for all R.O.W.s.

A proposed road profile was developed by the City, Region, and Wood. The future condition storm drainage boundaries were developed based on the proposed road profile and are illustrated in Plans 5 to 12 (ref. Appendix C).

Under future conditions: Approximately 33.24 ha of future R.O.W. (imperviousness = 63.7%) (i.e. Clarkway Drive, Countryside Drive, and E-W Arterial) is proposed to contribute to stormwater runoff to the Clarkway Tributary. This proposes an increase of the impervious area of 15.73 ha relative to existing conditions. The increase is made up of the new and widened R.O.W.s. Table 3-1 summarizes the changes in imperviousness of each roadway between the existing and proposed conditions.

Table 3-1 Existing and Proposed Subcatchments Imperviousness

Road	ROW (ha)	Existing Imp (%)	Proposed Imp (%)	Net Imp Increase (%)
Countryside Dr.	8.48	19.0	73.6	54.6
Clarkway Dr.	16.93	21.4	57.1	35.7
E-W Arterial	7.83	2.4	67.0	64.6

Under future ultimate development conditions, external drainage will not enter the R.O.W.s. Notwithstanding, the proposed roadways may be constructed prior to the development of adjacent blocks. As such, and until development of adjacent blocks commences, temporary conveyance (e.g. ditches and culverts) to the downstream receiving systems under the interim conditions will be required.

3.3 Soils and Groundwater

Wood has advanced and prepared 94 borehole logs along the Part B road alignments. The soil types encountered within the Study Area are dominated by imperfectly drained stone-free clays, underlain by silty sand. These soil types have a typical saturated hydraulic conductivity value ranging between 7×10^{-5} and 2×10^{-4} (ref. User's Guide to SWMM5, 13th Edition).

Borehole logs indicate that groundwater was encountered within 21 boreholes, ranging in depths of 0.6 m to 4.6 m below existing ground surface for Clarkway Drive and depths of 1.5 m to 8.2 m for Countryside Drive. The remaining boreholes indicate that groundwater was not encountered to the depth of the individual borehole.

In general, the future conditions road profile proposes to raise grades within the R.O.W. limits. Therefore, depths from surface to groundwater levels will increase under future conditions, ranging in depths of 3.1 m to 8.7 m below the proposed ground surface for Coleraine Drive and depths of 1.2 m to 9.7 m for Arterial A2. A summary of the borehole logs, groundwater levels and separation from existing and proposed grades is provided in Appendix B.

3.4 Stormwater Management Design Criteria

The stormwater management analyses of the Study Area has considered design criteria from several agencies including, the City of Brampton, the Toronto and Region Conservation Authority (TRCA), the Ministry of Transportation (MTO). In addition to agency design criteria, the stormwater management analyses of the Study Area will also consider design criteria outlined in the MESP (ref. Aquafor Beech, 2016). The stormwater management criteria relevant to the Study Area are outlined below.

3.4.1 City of Brampton (2008)

All design shall comply with the City of Brampton's Subdivision Design Manual (Brampton, 2008)[3]. As previously noted, the future roadways are planned as Arterial Roads. The following excerpts from the

3 Available via URL https://www.brampton.ca/en/Business/planning-development/Documents/Eng/2008_subdivision_design_manual.pdf

Subdivision Design Manual are relevant:

- Part III (1) Stormwater Management
  - Where required, stormwater management techniques shall be implemented to the satisfaction of the City of Brampton, the local Conservation Authority and all concerned departments and agencies.
- Part III (3) The Minor System (Storm Sewers)
  - The storm sewer design must meet the following City of Brampton criteria for storm sewer design, based on City of Brampton Rainfall Intensity Curves (Standard Drawing No: 343) and a time of concentration of ten (10) minutes.
  - Item (a) Minimum Standard No. 1: A ten-year return storm design plus adequate provision for continuous overland drainage of roads.
- Part III (18) Overland Flow
  - Item (a): The major stormwater system must be designed to accommodate runoff exceeding the capacity of the minor system for the flows up to the 100-year return frequency. Major overland flow must be contained within the road allowance and walkways only.
  - Item: (f) The Major Storm Overland Flow (100-year and greater): In the event that the major storm overland flow from a subdivision exceeds the capacity of the maximum number of catchbasins as specified above, major storm overland flow shall be allowed to flow onto the arterial or major collector roads with the condition that the additional flow from the subdivisions would not cause the ponding depth to exceed 0.15 m above the gutter along the arterial or major collector roads. A minimum of 2 lanes of roadway pavement must be flood-free at all times for emergency vehicles during the major storm event. However, the major overland flow shall not be permitted to flow across any arterial or major collector roads under any circumstances.
- Part VI (3) Culverts and Bridges: Culverts and bridges under arterial roads must be designed to prevent overtopping during all storm conditions including the Regional storm.

3.4.2 Region of Peel (2019)

- *Minor System:* Storm sewers are to convey the 10-year storm event, and are to be designed using Region of Peel IDF information;
- *Major System:* Regional road R.O.W.s, including both urban and rural, are to convey flows generated by the R.O.W. itself, up to the 100-year storm event;
- External lands should not drain to the Region's storm sewer system;
- *Water Balance:* For Low Volume Groundwater Recharge Areas (LGRA), provided the site does not impact a sensitive ecological feature, or require a subwatershed study, or Environmental Impact Study (EIS), the proponent has the option to:
  - provide a minimum post development recharge of the first 5 mm for any precipitation event, or;
  - complete a site-specific water balance to identify pre-development groundwater recharge rates

  As per Figure C.10 from the TRCA Stormwater Management Guidelines (ref. TRCA, August 2012) the Study Area is located within a LGRA. Refer to Appendix A for Figure C.10 of (TRCA, August 2012).
- *Road Reconstruction:* New linear projects without restrictions and subject to the approved Source Protection Plan, that results in the creation of impervious surface(s) and/or fully reconstructs the

existing impervious surfaces, shall control per the mandatory control hierarchy the larger of the following:

- The runoff generated from the geographically specific 90th percentile rainfall event (27 mm) from the new and/or fully reconstructed impervious surfaces on the site. The site shall be required to maintain the pre-development water balance, or;
- The runoff generated from the geographically specific 90th percentile rainfall event (27 mm) from the net increase in impervious area(s) on the site. The site shall be required to maintain the pre-development water balance.

As per Map 3.4 of the "Approved Source Protection Plan: CTC Source Protection Region", prepared by the CTC Source Protection Committee, dated March 25, 2019 (ref. Appendix A), the Study Area is located outside of the nearest Wellhead Protection Area (WHPA-Q1/Q2), and is therefore not subject to the approved Source Protection Plan. As such, the road reconstruction criteria as stated above would not apply to the Part B Study Area4.

- *Climate Change:* Per Section 7.2.2 of the Region's SWM Criteria (2019), the Region has a four (4) step process for considering climate change resiliency in the design of SWM infrastructure.

3.4.3 Toronto and Region Conservation Authority (2012)

- *Quantity Control:* Control post-development peak flows to target rates established using the unit flow relationships for Sub Basin 36 (Equation F) for all storms up to and including the 100-year storm (i.e., 2, 5, 10, 25, 50, and 100-year storms);
- *Quality Control:* MOE Enhanced Level (Level 1) Water Quality Control (80% Average Annual Removal of Total Suspended Solids [TSS]). A treatment train solution is to be implemented;
- *Water Balance:* For sites located within a LGRA best efforts to maintain recharge are expected, provided the site does not impact an ecological feature; and
- *Erosion Control:* Minimum infiltration of 5 mm is required. For sites with a SWM pond, extended detention of the 25 mm event for a period of 48 hours may also be required.

As per Figure C.10 from the TRCA Stormwater Management Guidelines (ref. TRCA, August 2012) the Study Area is located within a LGRA. Refer to Appendix A for Figure C.10.

3.4.4 Master Environmental Servicing Plan (2016)

- *Quantity Control: TRCA Criteria – Control* post-development peak flows to target rates established using the unit flow relationships for Sub Basin 36 (Equation F) for all storms up to and including the 100-year storm (i.e., 2, 5, 10, 25, 50, and 100-year storms);
- *Quality Control:* MOE Enhanced Level (Level 1) Water Quality Control;
- *Water Balance:* Infiltration of runoff from a 5 mm storm event using Low-Impact Development (LID) Best Management Practices (BMPs); and
- *Erosion Control:* For drainage to Rainbow Creek, Clarkway Tributary, and Gore Road Tributary, extended detention of the 25 mm storm event for a period of 48 hours is required. For drainage to Headwater

4 Please note that despite this, the Region has noted to Wood that the road reconstruction criteria should still be applied to the Regional owned R.O.W.s within the Study Area (ref. Email correspondence Bubas-Khan, dated October 28, 2020). As such, this criterion is to be applied to the Part A R.O.W.s (i.e. Coleraine Drive and Arterial A2).

Drainage Features (HDFs), extended detention of the 25 mm storm event for a period of 120 hours is required.

As per Section 4.2.1.1 and Figure 4.4 of the MESP (ref. Aquafor Beech, 2016) the SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region R.O.W.s for the water quantity, water quality, and erosion control SWM requirements noted above. As such, Wood has not addressed these SWM criteria in this report as it is assumed to be addressed by the reporting prepared for the Area 47 development blocks.

Based on the foregoing, the water balance criteria (ref. Section 3.5), and road reconstruction criteria (ref. Section 3.6) are addressed with this report.

It should be noted that if any of the development blocks that are intended to provide the water quantity, water quality, and erosion control SWM requirements for a portion of the City and Region R.O.W.s be developed with privately-owned SWM infrastructure, the City and Region R.O.W. drainage cannot drain into the development block without a formal agreement. If a formal agreement is not established, then the requisite water quantity, water quality, and erosion control SWM requirements for the R.O.W. drainage must be implemented within the R.O.W. These details are to be determined as each development block advances to the detailed design stage.

Notwithstanding, it should be noted that conveyance of R.O.W. drainage to the SWM facilities within the development blocks may not be feasible (e.g., grading constraints). In addition, the proposed roadways may be constructed prior to the development of adjacent blocks. Therefore, consideration of management of stormwater runoff within the R.O.W. is required.

In this context, discussions between the City and Region are ongoing on the issue of possible management of roadway stormwater runoff from each other's R.O.W.'s. Further discussions are required in this regard and any agreement may influence the design of SWM systems for this development area.

3.5 Water Balance

As outlined in Section 3.4, the Region, TRCA, and MESP have water balance criteria that require the on-site retention of the larger of the runoff volume from a 5 mm storm event and the pre-development water balance/groundwater recharge volume. Table 3-6 below outlines the volumes for each subcatchment, with an identification of the larger volume requirement.

Pre-development water balance volumes were calculated using Table 3-2 (Urban Lawns/Shallow Rooted Crops) of the Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual (SWMPDM, 2003), and historical rainfall data obtained from the Environment Canada rainfall gauge located at the Toronto Lester B. Pearson International Airport (Gauge A). Monthly and daily precipitation data were obtained for the years 1995 to 2019 and converted into an annual average rainfall depth. The pre-development water balance volumes were calculated using the proposed R.O.W. subcatchments and existing impervious conditions (ref. Plans 1 to 4, Appendix C). Supporting calculations are provided in Appendix B.

Post-Development runoff volumes from the 5 mm storm event were calculated using the proposed R.O.W.s and proposed imperviousness (ref. Plans 5 to 12, Appendix C).

Table 3-2 Water Balance Retention Volume Requirements

Subcatchment	Pre-Development Water Balance/Groundwater Recharge Volume (Average Daily Volume in m^3)	Post-Development Runoff Volume from 5 mm Storm Event (m^3)
CS1	5.0	**56.6**
CS2	0.8	**11.3**
CS3	2.6	**38.8**
CS5	5.9	**57.0**
CS6	1.4	**13.2**
CS7	4.2	**38.4**
CS9	2.3	**31.4**
CS10	1.3	**18.0**
CS11	0.4	**6.5**
CS12	2.0	**16.4**
CS13	2.3	**18.0**
CS14	0.8	**6.6**
CL1	4.5	**24.3**
CL2	13.3	**102.0**
CL3	11.6	**93.2**
CL4	7.6	**57.5**
CL5	7.7	**61.0**
CL6	5.4	**71.5**
CL7	6.2	**74.4**
EW1	9.9	**82.6**
EW2	6.1	**46.5**
EW3	6.1	**49.8**
EW4	5.0	**40.9**
EW5	1.2	**9.1**
EW6	4.1	**33.5**

Note(s):

1. Bolded values indicate governing water balance volume

As outlined in Table3-2, the runoff volumes from the 5 mm storm event govern the water balance retention volume requirements, compared to the pre-development groundwater recharge volume. Water Balance retention volume requirements are discussed further in Section 3.7, and a long list of stormwater management practices suitable to achieving the water balance criteria are outlined in Section 3.7.2.

As outlined in Section 3.7.2, the SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region R.O.W.s for the water quantity, water quality, and erosion control SWM requirements. Information pertaining to the way the major and minor systems of the City and Region R.O.W.s would be connected to the systems servicing the development blocks has not been made available for the current study. As such, the subcatchments represented on Plans 1 to 12 (ref. Appendix C), and the corresponding water balance volume requirements, should be reviewed and refined when this information becomes available. This is expected to occur at the detailed design stage.

3.6 Road Reconstruction

As outlined in Section 3.4, the Region's road reconstruction criterion is to be applied to Part B R.O.W.s. The road reconstruction criterion requires new linear projects that result in the creation of impervious surface(s) and/or fully reconstructs the existing impervious surface, to provide storage for the greater volume associated with the following scenarios:

1. The runoff generated from the geographically specific 90th percentile rainfall event (27 mm) from the new and/or fully reconstructed impervious surfaces on the site. The site shall be required to maintain the pre-development water balance, or;
2. The runoff generated from the geographically specific 90th percentile rainfall event (27 mm) from the net increase in impervious area(s) on the site. The site shall be required to maintain the pre-development water balance.

Based on a review of the proposed R.O.W.s, scenario #1, as described above, would generate larger runoff volume as the new and/or fully reconstructed impervious surface area is larger than the net increase in impervious surface area. Therefore, calculations of the runoff from the 90th percentile rainfall event were completed for this scenario. The impervious coverages and resulting runoff volumes are summarized in Table 3-3 below. Supporting calculations for both scenarios are provided in Appendix B.

Table 3-3 Region's Volume Control Requirements for Linear Developments (m^3)

Subcatchment	Total Proposed Impervious Area (ha)	Runoff Volume from 27 mm Storm Event (m^3)
CS1	1.1	**304.3**
CS2	0.2	**60.9**
CS3	0.8	**209.2**
CS5	1.1	**307.7**
CS6	0.3	**71.5**
CS7	0.8	**207.1**
CS9	0.6	**169.7**
CS10	0.4	**97.2**
CS11	0.1	**35.3**
CS12	0.3	**88.6**
CS13	0.4	**97.2**
CS14	0.1	**35.8**
CL1	0.5	**131.2**
CL2	2.0	**550.5**
CL3	1.9	**503.1**
CL4	1.2	**310.6**
CL5	1.2	**329.4**
CL6	1.4	**386.3**
CL7	1.5	**401.6**
EW1	1.7	**445.9**
EW2	0.9	**251.2**
EW3	1.0	**268.7**
EW4	0.8	**220.8**
EW5	0.2	**49.0**
EW6	0.7	**180.8**

It is concluded from a comparison of the water balance retention requirements, presented in Table 3-2 to the road reconstruction runoff volume control requirements, presented in Table 3-3, that the latter criterion governs. Retention volume requirements are discussed further in Section 3.7, along with a long list of stormwater management practices suitable for the study area.

3.7 Stormwater Management Opportunities

3.7.1 General Stormwater Management Opportunities

Stormwater Management practices (SWMPs) for the management of roadway runoff generally fall into two categories: those that address stormwater quantity (including erosion) and those that manage stormwater quality of surface runoff. In addition, Low Impact Development (LID) best management practices are designed to provide water quality treatment and quantity control for smaller, more frequent storm events, and water retention.

As outlined in Section 3.4.1, stormwater quantity, quality and erosion criteria for the Study Area are to be provided by the internal development blocks within Area 47. As such, proposed works for the current study are limited to water balance and road reconstruction criteria.

In terms of water balance and road reconstruction criteria, the SWMPs relate to the retention (i.e. infiltration) of runoff from the new pavement, and where possible, runoff from the existing pavement; however, current legislation solely relates to the former. Typically, the required retention volumes are dictated by agency standards, and are also often defined in a watershed or subwatershed planning study. Water balance and road reconstruction retention volume requirements for the Study Area are outlined in Table 3-1 and Table 3-2 respectively, and it has been determined that the City's road reconstruction criteria govern the retention volume requirements.

Various Best Management Practices or Stormwater Management practices are available to address the water balance retention volume requirements of runoff from roadways. Due to the linear nature of roadway corridors however, not all stormwater management practices are considered to be appropriate. Typically, suitable BMPs for linear roadway corridor come in the form of Low-Impact Development (LID) BMPs. Various LID BMPs are reviewed in the following section. The review was completed to determine suitability of each LID BMP in managing the water balance retention volume requirements, taking into consideration the Study Area topography, soils, groundwater level, and future conditions land use.

It is directed that detailed evaluation of stormwater management alternatives be evaluated as a component of detailed design.

3.7.2 Low Impact Development Best Management Practices

Low Impact Development represents the application of a suite of BMPs normally related to source and conveyance storm water management controls to promote infiltration and pollutant removal on a local site by site basis. These measures rely on eliminating the direct connection between impervious surfaces such as roads and the storm drainage system, as well as the promotion of infiltration of road drainage. General design guidelines and considerations for source and conveyance controls have been advanced since the early 1990's as part of the Ministry of Municipal Affairs and Housing (MMAH) "Making Choices" and in 1994 as part of the Ministry of the Environment's original Best Management Practices Guidelines.

Subsequent to the 1994 MOE Guidelines, technologies and standards have been developed further for the application of source and conveyance controls. These have evolved into a class of BMPs referred to as Low Impact Development (LID) practices, which have advanced as an integrated form of site planning and storm servicing to maintain water balance and providing storm water quality control for urban developments. Initial results from studies in other settings have demonstrated that LID practices provide benefits by way

of reducing the erosion potential within receiving watercourses and thereby reducing the total volume of end-of-pipe storm water erosion control requirements. In addition, due to volumetric controls afforded by LID BMP's, water quality is also improved through a reduction in mass loading. The benefits from LID storm water management practices are generally focused on the more frequent storm events (e.g. 2-year storm) of lower volumes as opposed to the less frequent storm events (e.g. 100-year storm) with higher volumes. It is also recognized that the forms of LID practices which promote infiltration or filtration through a granular medium provide thermal mitigation for storm runoff.

Guidelines regarding the application of LID practices and techniques have been developed within various jurisdictions in the United States and Canada. The Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) have produced the 2010 Low Impact Development Stormwater Management Manual, for the design and application of LID measures, various LID techniques, as well as their function that are applicable to road projects. While most of these are typically implemented to provide water quality and/or water quantity control, they can also be utilized to provide water balance retention given their ability to capture and retain runoff volume. Descriptions of various LID BMPs with infiltration capabilities are provided below.

3.7.2.1 Infiltration Trenches

Infiltration trenches can be positioned at surface level or below ground (i.e. subsurface). At-surface infiltration trenches are designed to receive surface runoff, while subsurface infiltration trenches receive runoff that has been captured by catch basins and/or storm sewers. Infiltration trenches are preferred in areas that have reasonable infiltration properties (15 mm/ hr, 1 x 10^{-6} cm/s), but can be implemented in all soil types as long as they are large enough to store the design volume.

For R.O.W.s, at-surface infiltration trenches are restricted to the pervious areas within the boulevards or island areas (if proposed). Subsurface infiltration trenches can be positioned beneath impervious areas such as sidewalks and multi-use pathways. For subsurface infiltration trenches receiving drainage from catch basins, all catch basins should be fitted with goss traps to filter floatable debris.

Infiltration trenches are restricted in depth by local groundwater levels. As per the Low Impact Development Stormwater Management Planning and Design Guide (ref. CVC, TRCA, 2010), the minimum separation between the underside of an infiltration trench and the seasonally high groundwater level is 1.0 m. As outlined in Section 3.4, depths from surface to groundwater levels will increase under future conditions, ranging in depths of 1.2 m – 9.7 m below proposed ground surface. Infiltration trenches will likely require a depth of at least 500 mm. Therefore, to implement an infiltration trench, the minimum depth from surface to groundwater level would have to be at least 1.5 m. Many boreholes did not encounter groundwater during drilling, indicating that there are no restrictions to the depth of infiltration trenches in those areas, up to the termination of the borehole. Infiltration trench feasibility would need to be considered on a location-by-location basis based on the preceding identified depths.

3.7.2.2 Permeable Pavers/ Pavement

Permeable pavement could be implemented for the entirety, or for sections, of the proposed sidewalks and multi-use trails. Permeable paved sidewalks and multi-use trails would reduce the runoff volume from paved surfaces within the urban road R.O.W. As a standalone LID BMP, however, it would not be able to meet the water balance criteria, as it would treat a limited area and would not treat the roadway itself (which would be expected to generate the largest portion of runoff). It is understood that the Region does not prefer to implement permeable pavement on their projects due to operations/maintenance issues and performance concerns. As such, permeable pavement is not recommended for implementation.

3.7.2.3 Pervious Pipes

Pervious pipes could be used in combination with either bioretention systems or infiltration trenches. As a standalone SWM measure, pervious pipes can be a cost-effective and relatively simple method to achieve water balance requirements, while eliminating the need for surface space within the right-of-way.

3.7.2.4 Conventional Underground Storage (Cellular Systems)

Modular style plastic chambers (e.g. Brentwood™, StormTech™, Triton™, or other equivalent and approved systems), could be considered to achieve water balance requirements. Conventional underground storage can be implemented in a similar manner to subsurface infiltration trenches, receiving runoff that has been captured by catch basins and/or storm sewers. Conventional underground storage is typically implemented to achieve water quantity requirements; however, these systems often serve also to achieve water balance requirements by making the bottom of the storage tank infiltrative.

3.7.2.5 Bioretention Systems

Bioretention systems can be implemented in the pervious areas within the boulevards or island areas (if proposed), similar to at-surface infiltration trenches. Bioretention systems should be approximately 10% to 20% in size of the contributing drainage area, with typical drainage areas of 0.50 ha and a maximum drainage area of 0.80 ha. Slopes within bioretention systems are typically 1% to 5%. Bioretention systems are also preferred in areas that have reasonable infiltration properties (15 mm/ hr, 1 x 10^{-6} cm/s), but can be implemented in all soil types if the water quality event can be temporarily stored (typical depths 0.15 m to 0.25 m) before infiltrating and an underdrain is provided. Bioretention systems should have forebays for a form of surface water pre-treatment. Catch basins fitted with goss traps can be used to filter out floatable debris before directing runoff to the infiltrative component of the bioretention system.

3.7.2.6 Enhanced Grassed Swales

Grassed swales designed with a trapezoidal geometry and flat longitudinal profiles with largely un-maintained turf can provide infiltration, similar to bioretention cells. Their application in linear corridors is particularly appropriate and can be further enhanced through the introduction of check dams to provide additional on-line storage. Their application in urbanized roadway cross-sections (i.e. curb and gutter) often requires alternative grading and roadway configurations which can compromise the function of the roadway itself and are therefore typically not preferred in those cases. Notwithstanding, gutter outlets along outside lanes have been demonstrated to function effectively where the right-of-way can accommodate the design. Based on the proposed ultimate urbanized road ROW, enhanced grassed swales are likely not a practical water balance measure.

3.7.2.7 Filter Strips

Filter strips are typically designed for small drainage areas (less than 2 ha ±) and are applied as part of a treatment train. Filter strips require flat areas with slopes ranging from 1 to 5% and are usually in the range of 10 to 20 m in length in the direction of flow. Flow leaving filter strips should be a maximum of 0.10 m depth, based on a 10 mm storm event. Based on the limited space within the proposed R.O.W.s, filter strips are likely not a practical water balance measure.

Based on the foregoing review, the following LID BMPs have been short-listed:

- Infiltration Trenches;
- Pervious Pavers/Pavement;
- Pervious Pipes;

- Conventional Underground Storage; and
- Bioretention Systems

As outlined in Section 3.4.1, the SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region R.O.W.s for the water quantity, water quality, and erosion control SWM requirements. Information pertaining to the way the major and minor systems of the City and Region R.O.W.s would be connected to the systems servicing the development blocks has not been made available for the current study. As such, the advantages, and disadvantages of the short-listed LID BMPs should be further reviewed and refined when this information becomes available. This is expected to occur at the detailed design stage.

4.0 HYDRAULICS

4.1 Purpose

Hydraulics relates to the calculation of water surface elevations and velocities for the design storm peak flows generated by the hydrologic models and supports assessment of hydraulic structure performance (i.e. capacity, overtopping conditions, etc.) and delineation of floodplains. Structures included in this evaluation are outlined in Table 4-1 and illustrated in Figure 4-1.

This report section documents the evaluation of the Part B crossing.

Table 4-1 Structures included for Assessment for Parts A and B

Project Component	Crossing Reference	HEC-RAS Reference			Watercourse	Crossing Location
		River	Reach	Section		
Part A	I	River-4	Reach-1	24.4425	Rainbow Creek	Coleraine Drive
	G	River-4	Reach-1	24.343		proposed intersection of Coleraine Drive and E-W Arterial A2
Part B	H	River-4	Reach-1	24.424		Countryside Drive
	B	Gore Road Trib	Reach1	1412.42	Gore Road Tributary	Countryside Drive
	A	Gore Road Trib	Reach1	1410.052		E-W Arterial A2
	E	Clarkway Trib	Reach3	1512.505	Clarkway Tributary	Countryside Drive
	D	Clarkway Trib	Reach2	1512.372		Clarkway Drive
	F	River11	Reach 11	356.6		Clarkway Drive
	C	Clarkway Trib	Reach31	1510.123		E-W Arterial A2

4.2 Methodology

TRCA prepared the original HEC-RAS hydraulic models for The Gore Road and Clarkway Tributaries of the West Humber River. The two (2) HEC-RAS models were extended upstream to the northern limit of Area 47 (where required) and updated as part of the Master Environmental Servicing Report (Aquafor Beech Ltd., May 2016).

The Gore Road Tributary model extends from north of Humber Station Road downstream to the confluence of the Gore Road Tributary and the West Humber Main Branch.

The Clarkway Tributary model extends from just north of Healey Road downstream to the confluence of the Clarkway Tributary and the West Humber Main Branch. The same confluence is shared by The Gore Road Tributary.

All models contain several bridges/culverts and branches along their entire lengths. The models, as originally received by Wood, contained 2-year to 100-year return period and Regional Storm peak flows, as well as a set of peak flows entitled "TRCA 2014". The TRCA 2014 peak flows are of similar magnitude to the Regional Storm peak flows. The original models contained a downstream boundary condition of Known Water Surface Elevations.

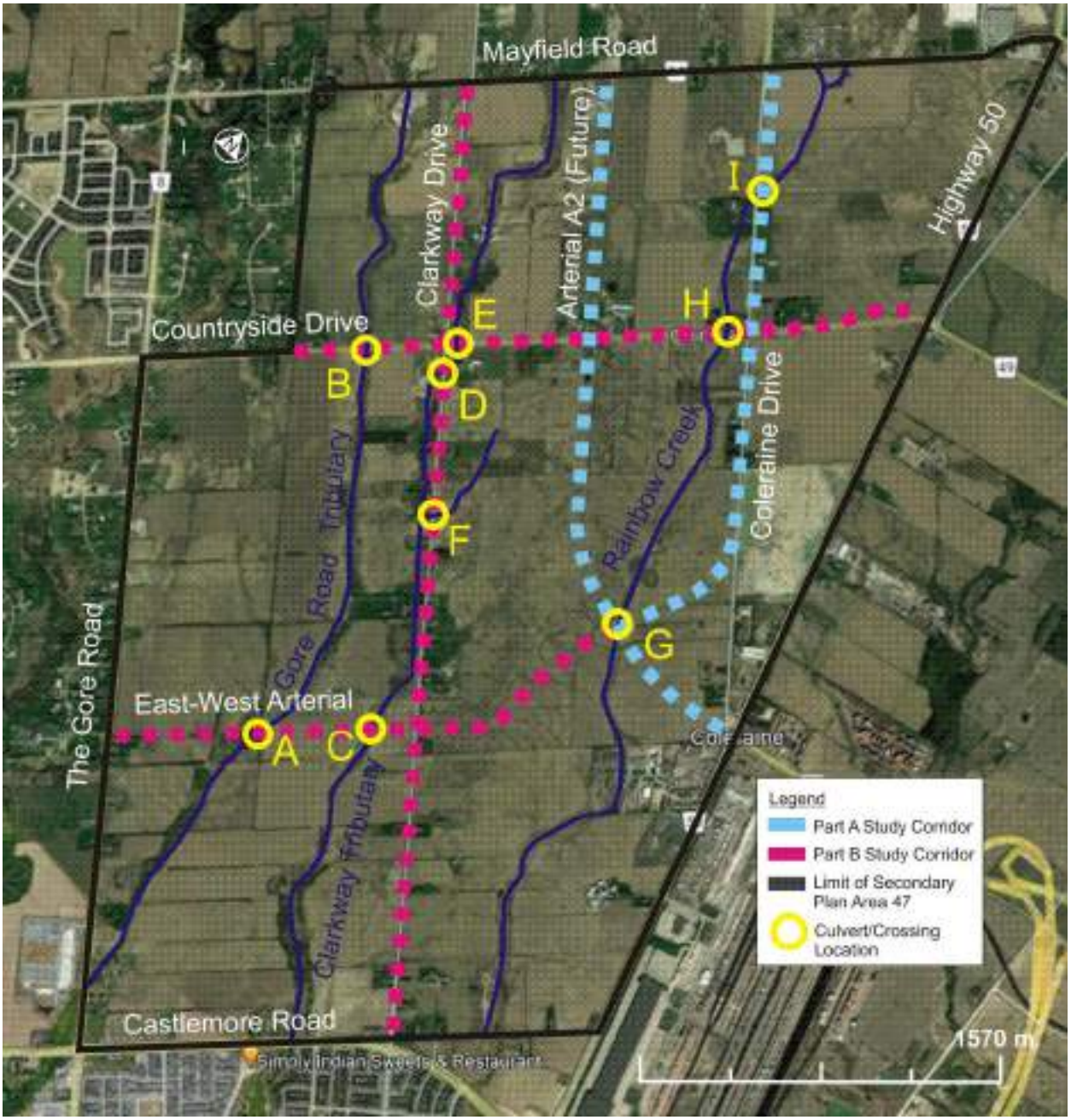


Figure 4-1 Structures included for Assessment for Parts A and B

(background image source Google Earth Pro™)

The HEC-RAS models have been reviewed and refined for the current study. Revisions include updates to hydraulic crossings within the Study Area, as well as updates to flow change locations and peak flows based on the rational method. The following crossings have been updated with respect to crossing span, crossing length, ineffective flow areas, high chord, reach lengths, deck/roadway data, and road widths:

The Gore Road Tributary	Countryside Drive box culvert (Culvert B)
Clarkway Tributary	Countryside Drive bridge (Culvert E)
	Clarkway Drive bridge (Culvert D)

Updates were based on a combination of topographic survey of the rights-of-way and hydraulic structures, and DTM provided by the City, as well as structural condition assessments completed by Wood.

One (1) culvert crossing (Culvert F as illustrated on Figure 4-1) was added to the Clarkway Tributary HEC-RAS model. The culvert is a 1.5 m diameter Corrugated Steel Pipe (CSP) located on Clarkway Drive, south of Countryside Drive, and conveys drainage from a headwater feature of the Clarkway Tributary. The DTM provided by the City has been utilized to establish two (2) cross-sections upstream and one (1) cross-section downstream of the culvert. The culvert size was measured by Matrix Solutions Inc. as part of the Geomorphologic Assessment for the current study.

Relevant crossing characteristics are provided in Table 4-2.

In addition to the crossing information, peak flows have been updated utilizing the rational method for The Gore Road and Clarkway Tributary models within the Study Area. Flow change locations were also added and removed where required.

Boundary conditions have been maintained consistent with the Aquafor Beech 2016 models. One exception is noted for the Clarkway Tributary model wherein the boundary conditions for this model were set the same as the Gore Road Tributary model as they share the same downstream section.

It is noted that, to Wood's knowledge, the flow values contained in the steady flow files are not reflective of climate change projections. Per Section 7.2.2 of the Region's SWM Criteria (2019), the Region has a four (4) step process for considering climate change resiliency in the design of SWM infrastructure. As such, Wood recommends that climate change influences be assessed at the detailed design stage as necessary.

Table 4-2 Part B Existing Culverts

Crossing Reference	Watercourse	Road	Structure		Future Road Classification
			Type	Size (m)	
B	Gore Trib	Countryside Drive	Concrete Box Culvert - Open Bottom	5.52 x 1.52	Urban Arterial
D	Clarkway Trib	Clarkway Drive	Concrete Box Culvert - Open Bottom	6.82 x 1.94	Urban Arterial
E	Clarkway Trib	Countryside Drive	Steel Girder Bridge	6.88 x 1.34	Urban Arterial
F	Clarkway Trib	Clarkway Drive	CSP	1.50 dia.	Urban Arterial
H	Rainbow Creek	Countryside Drive	Concrete Box Culvert - Open Bottom	3.05 x 1.22	Urban Arterial

4.3 Hydraulic Structure Performance Assessment

4.3.1 Hydraulic Structure Sizing Criteria

The hydraulic assessment of the Study Area has considered design criteria from several agencies including, the Region, City, the MTO, and the Ministry of Natural Resources and Forestry (MNRF) as follows.

4.3.1.1 The Region of Peel

No overtopping of the roadway during the Regional Storm Event is to occur at culverts and bridges.

4.3.1.2 City of Brampton

Culverts and bridges under arterial roads must be designed to prevent overtopping during all storm conditions including the Regional Storm.

4.3.1.3 MTO

MTO guidelines for culvert and bridge hydraulic design are based on providing a set freeboard and clearance. Freeboard is measured from the design event water surface elevation to the edge of travelled way. Clearance is measured from the design event water surface elevation to the obvert of the crossing. The design event, freeboard and clearance required consider the road classification and the total structure span. MTO guidelines are summarized in Table 4-3. The existing crossings have been assessed based on the future road classifications which are proposed to be classified as Urban Arterial.

Table 4-3 Standard Road Classification Design Flows for Bridges and Culverts

Functional Road Classification	MTO[1] Design Flow Return Period (years)		Freeboard Criteria (m) [1]	Clearance Criteria for Bridges (m) [1]	Clearance Criteria for Open-Footing Culverts (m) [1,2]
	Total Span less than or equal to 6.0 m	Total Span greater than 6.0 m			
Freeway, Urban Arterial	50	100	1.0	1.0	0.3
Rural Arterial, Collector	25	50	1.0	1.0	0.3
Local	10	25	0.3	0.3	0.3

Note(s)

1. Highway Drainage Design Standard (MTO, January 2008)
2. It is noted that there are no clearance criteria for closed-footing culverts

4.3.1.4 MNRF

The MNRF's guidelines relate to the safe passage of pedestrians and passenger and emergency vehicles across the length of road over which the Regulatory storm event may overtop. Safe passage is determined by overtopping depths, overtopping velocities and consideration for the combined impact (i.e. product of depth and velocity) and represents 'low risk' to the method of transportation (i.e. pedestrian or vehicle). Table 4-4 summarizes the maximum allowable depths and velocities.

Table 4-4 Design Criteria for Pedestrian and Vehicular Access

Access	Maximum Overtopping Depth (m)	Maximum Overtopping Velocity (m/s)	Maximum Product (m^2/s)
Pedestrian	0.3	1.7	0.4
Passenger Vehicle	0.3	3.0	N/A[1]
Emergency Vehicle	0.9	4.5	N/A[1]

Note(s): [1] Highway Drainage Design Standard (MTO, January 2008)

4.3.2 Existing Conditions

4.3.2.1 Hydraulic Performance Evaluation

All existing roads within the Study Area are proposed to be classified as Urban Arterial in the future and have been assessed on this basis. It is noted that the MNRF criteria are not relevant for the proposed conditions since the travelled way is required to be flood-free for the Regional Storm (ref. Section 4.3.1) as directed by Region of Peel requirements. However, the existing conditions assessment has considered these criteria for information purposes. The criteria for safe passage have been applied assuming ingress/egress for pedestrians.

The results of the hydraulic structure performance assessment are summarized in Tables 4-5 and 4-6. The results indicate that none of the existing Study Area Part B culverts meet both applicable MTO and/or MNRF design criteria and will therefore be considered for upgrade as part of the Preferred Alternative. The HEC-RAS model is provided in Appendix B.

It is also noted that Culvert F, under existing conditions, is a private driveway structure and is not within control of the City or Region; however, it has been included in the current assessment as backwater from the structure contributes to flooding of Clarkway Drive (ref. Section 4.4). As such, upgrade of this structure may be required to meet 'flood-free' criteria for the future arterial roads.

Table 4-5 Existing Culvert Performance - MTO Criteria

Crossing Reference	Capacity Criteria (Frequency in Years		Required Freeboard (m)	Provided Freeboard (m)[1]	Required Clearance (m)	Provided Clearance (m)[1]	Criteria Achieved?
	Design	Actual					
B	50 Year	100 Year	1.00	0.62	0.30	<0.00	No
C[2]	N/A	50 Year	N/A	0.63	N/A	0.53	N/A [2]
D	100 Year	5 Year	1.00	<0.00	1.00	<0.00	No
E	100 Year	5 Year	1.00	<0.00	1.00	<0.00	No
F	50 Year	<2 Year	1.00	<0.00	N/A	N/A	No
H	100 Year	5 Year	1.00	<0.00	1.00	<0.00	No

Notes: [1] Values shown are at the design storm conveyance requirement
[2] Private structure (existing conditions), backwater influences Clarkway Drive
[3] Structure capacity assessed using MTO Nomograph (Design Chart 2.32), ref. Appendix A

Table 4-6 Existing Culvert Performance - MNRF Criteria

Crossing Reference	Ingress/ Egress Mode	Overtopping				Maximum Allowable Product (D x V)	Actual Product (D x V)	Criteria Achieved?
		Maximum Allowable Depth (m)	Actual Depth (m)	Maximum Allowable Velocity (m/s)	Actual Velocity (m/s)			
B	Pedestrian	0.30	0.44	1.70	0.91	0.40	0.40	No
C	N/A	N/A	0.61	N/A	1.37	N/A	0.84	N/A
D	Pedestrian	0.30	0.52	1.70	2.14	0.40	1.11	No
E	Pedestrian	0.30	1.43	1.70	2.20	0.40	0.10	No
F	Pedestrian	0.30	0.24	1.70	0.25	0.40	0.06	Yes
H	Pedestrian	0.30	0.23	1.70	2.02	0.40	0.46	No

Notes: [1] Provided values are for Regulatory event (Regional Storm)
[2] Culvert performance not assessed against MNRF criteria

4.3.2.2 Existing Conditions Flooding Evaluation

There are existing sections of Clarkway Drive, unassociated with hydraulic crossings, that are predicted to be inundated during various design storm events due to the roadway's proximity to the Clarkway Tributary. The vertical profile of these sections of Clarkway Drive will need to be raised to elevate the travelled way above the Regional Storm floodplain for 'flood-free' access. Table 4-7 summarizes the sections of roadway predicted to be inundated and identifies the frequency of flooding (ref. Figure 4-2).

It is noted that raising the road profile will have impacts on floodplain storage that will need to be mitigated by way of compensatory cut to achieve a net-zero impact, as required by TRCA.

Table 4-7 Existing Roadway Flooding Areas

Roadway Flooding ID	Chainage measured south from the Countryside Drive & Clarkway Drive intersection	Flood Frequency (Storm Event)
F1	490 m to 600 m south	Regional
F2	900 m south	25 Year
F3	1040 m south	Regional
F4	1200 m south	10 Year
F5	1400 m to 1580 m south	Regional

4.3.3 Proposed Conditions

Proposed culvert configurations crossing the Gore Road Tributary and the Clarkway Tributary are summarized in Table 4-8. Additionally, four scenarios incorporating alternate crossing configurations have been evaluated for crossings A and C along the proposed new road, Arterial A2 (E-W arterial), namely:

- **Scenario 1** – Spans are based on an openness ratio of 0.6
- **Scenario 2** – 40 m spans (i.e. the largest single span structures that can be designed as a rigid frame)
- **Scenario 3** – Full span of floodplains
- **Scenario 4** – Spans are based on an openness ratio of 1.0
- **Scenario 5** – 35 m spans (proposed by Candevcon)

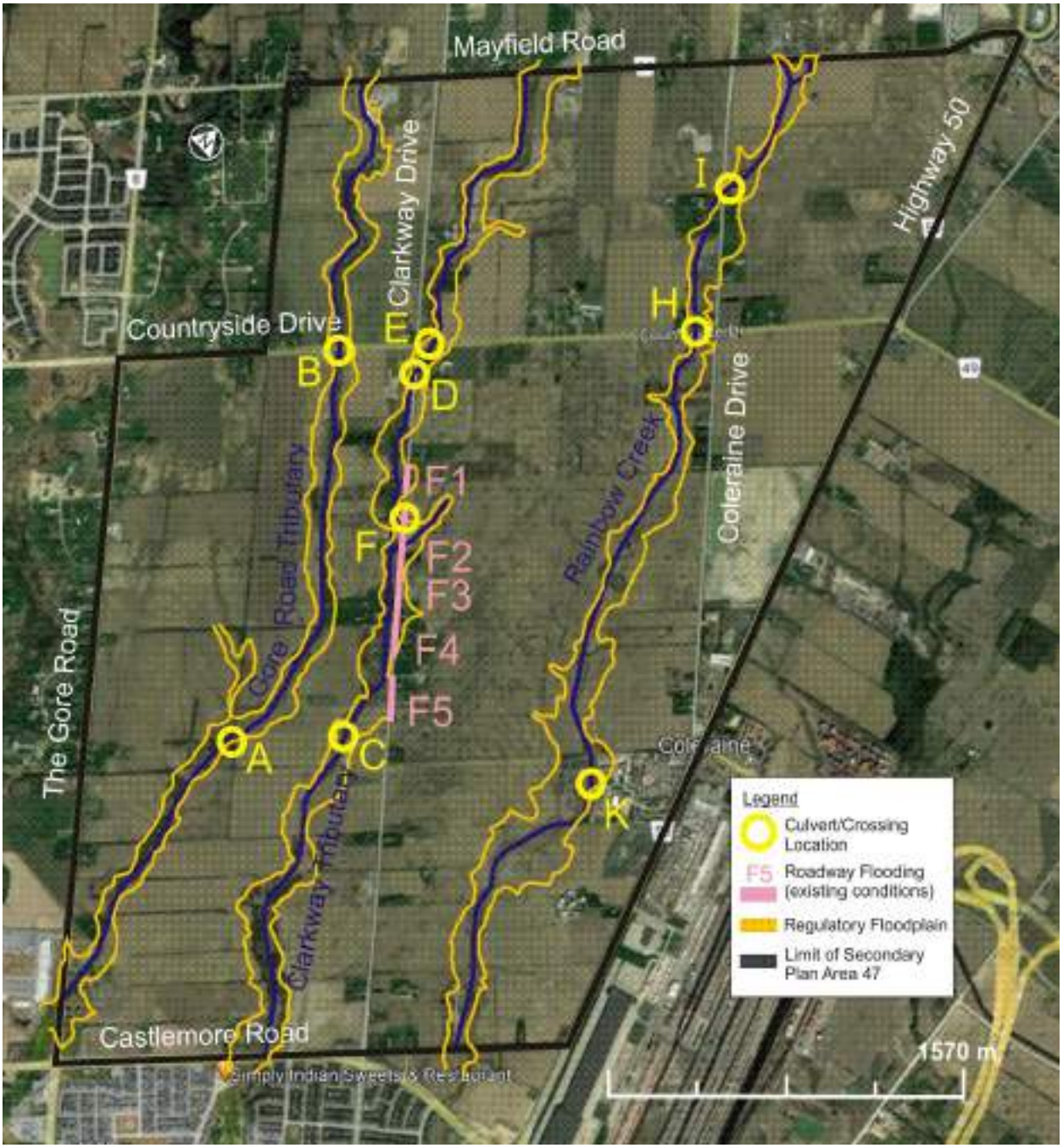


Figure 4-2 Existing Conditions Flooding Evaluation

(background image source Google Earth Pro™)

In the rest of this report, the "Proposed Condition" refers to scenario 5. The evaluations considered a variety of factors related to potential impacts/issues resulting from the implementation of each scenario, as follows:

- **Existing Creek Re-Alignment** – Impacts that the alternative may have on existing creek system, requiring adjustment to the creek alignment. Smaller re-alignment lengths are preferable.
- **Floodplain Encroachment** – Impacts that the alternative may have on the existing floodplain limits, requiring supplementation of lost floodplain storage, recognizing that smaller floodplain encroachment area is preferable.
- **Hydraulic Criteria** – as outlined in Section 4.3.1.

Table 4-8 Proposed Culvert Configurations

Crossing Reference	Watercourse	Road	Span (m)	Rise (m)	Length (m)	Type/Configuration
A	Gore Trib	EW Arterial	35	3	69.41	Bridge
B	Gore Trib	Countryside Drive	6.4	2.13	36	Culvert
C	Clarkway Trib	EW Arterial	35	4	120	Bridge
D	Clarkway Trib	Clarkway Drive	36	4.11	30	Bridge
E	Clarkway Trib	Countryside Drive	40	4.23	36	Bridge
F	Clarkway Trib	Clarkway Drive	1.5	1.5	12	Culvert
H	Rainbow Creek	Countryside Drive	17	2	53	Bridge

4.3.3.1 Hydraulic Performance Evaluation

As outlined in Section 1.0, the future conditions for Part B of the Study Area proposes a new four-lane east-west minor arterial road from The Gore Road to Arterial A2 (E-W arterial); widening of Clarkway Drive from Castlemore Road to E-W Arterial to four lanes and urbanizing Clarkway Drive between E-W arterial and Mayfield Road with possible continuous centre turn lane; and widening of Countryside Drive to four lanes from Clarkway Drive to RR50 including realignment at RR50.

The proposed crossings (ref. Figure 4-1) have been sized using the HEC-RAS models provided by TRCA. The geometry files representing the proposed conditions of the realigned Clarkway Tributary and Gore Road Tributary have been revised, including adjustments to structure coding, as well as the addition, removal, and adjustment to bounding cross sections. Geometries for the added cross sections have been estimated by interpolating between two (2) original cross sections contained in the received model (ref. Appendix B for HEC-RAS model details). The Part B crossings have been sized to meet the criteria outlined under Section 4.3.1 with the proposed configurations outlined in Tables 4-8 and 4-9.

The hydraulic performance of the proposed culverts is summarized in Tables 4-10 and 4-11. The results indicate that the proposed sizes for the crossings within the Study Area satisfy both the MTO and Region design criteria. As previously noted, the MNRF criteria are not relevant for the proposed conditions as the travelled way is required to be flood-free for the Regional Storm (ref. Section 4.3.1). As such, the results for the MNRF criteria have not been presented.

Table 4-9 Proposed Culvert Configurations

Crossing Reference	Watercourse	Road	Span (m)	Rise (m)	Length (m)	Type/Configuration
Scenario 1 - Spans are based on an openness ratio of 0.6						
A	Gore Trib	EW Arterial	13.88	3	69.41	Bridge
C	Clarkway Trib	EW Arterial	26.88	3	120	Bridge
Scenario 2 - 40 m spans						
A	Gore Trib	EW Arterial	40	3	69.41	Bridge
C	Clarkway Trib	EW Arterial	40	3	120	Bridge
Scenario 3 - Full span of floodplains						
A	Gore Trib	EW Arterial	85	3	69.41	Bridge
C	Clarkway Trib	EW Arterial	85	3	120	Bridge
Scenario 4 - Spans are based on an openness ratio of 1.0						
A	Gore Trib	EW Arterial	24	3	69.41	Bridge
C	Clarkway Trib	EW Arterial	45	3	120	Bridge
Scenario 5 – 35 m Spans						
A	Gore Trib	EW Arterial	35	3	69.41	Bridge
C	Clarkway Trib	EW Arterial	35	4	120	Bridge

Table 4-10 Part B Crossings - Proposed Configuration Hydraulic Performance

Crossing Reference	MTO Design Criteria			Hydraulic Performance		
	Design Event (Return Period)	Freeboard (m)	Clearance (m)	Design Event (Return Period)	Freeboard (m)	Clearance (m)
Scenario 1 - Spans are based on an openness ratio of 0.6						
A	100 Year	1.00	0.30	100 Year	2.54 m	1.31 m
C	100 Year	1.00	0.30	100 Year	5.90 m	1.01 m
Scenario 2 - 40 m spans						
A	100 Year	1.00	0.30	100 Year	2.80 m	1.70 m
C	100 Year	1.00	0.30	100 Year	6.60 m	1.20 m
Scenario 3 - Full span of floodplains						
A	100 Year	1.00	0.30	100 Year	2.64 m	1.75 m
C	100 Year	1.00	0.30	100 Year	6.25 m	1.33 m
Scenario 4 - Spans are based on an openness ratio of 1.0						
A	100 Year	1.00	0.30	100 Year	2.71 m	1.49 m
C	100 Year	1.00	0.30	100 Year	6.19 m	1.22 m
Scenario 5 – 35 m Spans						
A	100 Year	1.00	0.30	100 Year	2.53 m	1.64 m
C	100 Year	1.00	0.30	100 Year	5.87 m	2.15 m

Table 4-11 Part B Crossings - Proposed Configuration Hydraulic Performance

Crossing Reference	MTO Design Criteria			Hydraulic Performance		
	Design Event (Return Period)	Freeboard (m)	Clearance (m)	Design Event (Return Period)	Freeboard (m)	Clearance (m)
B	50 Year	1.00	0.30	50 Year	1.38	0.81
D	100 Year	1.00	0.30	100 Year	1.88	1.60
E	100 Year	1.00	0.30	100 Year	2.07	1.31
F	50 Year	1.00	0.30	50 Year	1.29	0
H	100 Year	1.00	0.30	100 Year	1.85	0.39

Tables 4-12 to 4-16 summarize the comparison of existing and proposed conditions along the Gore Road Tributary and the Clarkway Tributary from Castlemore Road to Mayfield Road. It is noted that there are no changes in computed water surface elevations or computed channel velocities between proposed and existing conditions downstream of Old Castlemore Road, where no changes are contemplated as part of the Area 47 development plans.

Between Old Castlemore Road and Mayfield, channel alterations are contemplated, as are new and replaced watercourse crossings at roadways (specifically crossings A, C and D). In the reaches of Gore Road Tributary and Clarkway Tributary, the reconfiguration of the HEC-RAS model to model proposed conditions does not allow direct comparison, section for section, with the existing conditions model, however, the following observations are noted:

- Between Old Castlemore Road and the new structures proposed at Arterial A2, computed water surface elevations for proposed conditions are slightly higher than those computed under existing conditions, for both Regional and 100-year flood conditions. But for both crossings, the rise remains less than 0.2 m.
- Between the new structures proposed at the intersection of Arterial A2 and the new Countryside Drive culvert, computed water surface elevations for proposed conditions are generally higher than those computed under existing conditions, for both Regional and 100-year flood conditions.

4.3.3.2 Proposed Conditions Flooding Evaluation

The potential impacts of changed water surface elevations on the existing flooding risk of adjacent private properties and the land use plans approved as part of Block Plan Areas 47-1 and 47-2 planning process has been assessed. The Block Plans, in part, define the valley corridor within which the floodplain should reside. TRCA has noted that the Block Plans were developed in the 2014 time frame and are based, in part, on floodplain mapping current at that time. TRCA acknowledges that the floodplain mapping for the relevant watercourses has since been updated and has advised this EA that the Block Plans will be updated as development proceeds. As such, any comparison to the current Block Plans is considered qualitative only.

This flood risk assessment is founded on floodplain inundation limits generated using the HEC-RAS RAS-Mapper software. The flood limits are based on existing conditions flood data and the existing Digital Elevation Model (DEM) previously provided to Wood by the City. It should be noted that water surface elevations were plotted without any alterations/modifications in the DEM (therefore representing existing conditions).

Wood is not aware of the exact DEM used by TRCA to delineate their floodplain inundation limits, therefore, the comparisons illustrated on Figures 4-3 through 4-7 are considered qualitative only.

**Table 4-12 The Gore Road Tributary (Reach-1) –
Comparison of Existing and Proposed Hydraulic Conditions – Regional Flood Event**

HEC-RAS Section	Profile	Existing Conditions		Proposed Conditions		Change in	
		W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)
		A	B	C	D	=C-A	=D-B
1413.956	Regional	220.29	0.87	220.29	0.87	0	0
1413.794	Regional	219.71	0.57	219.71	0.57	0	0
1413.674	Regional	219.22	0.86	219.22	0.85	0	-0.01
1413.411	Regional	218.4	0.84	218.4	0.85	0	0.01
1413.199	Regional	217.52	1.56	217.55	1.5	0.03	-0.06
1413.003	Regional	216.31	0.95	216.27	1	-0.04	0.05
1412.814	Regional	215.55	1.78	215.65	1.55	0.1	-0.23
1412.603	Regional	215.12	1.57	215.45	1.16	0.33	-0.41
1412.431	Regional	214.63	1.59	215.38	0.84	0.75	-0.75
1412.428	Regional	214.62	1.48	215.2	1.9	0.58	0.42
1412.42	**Countryside Drive**						
1412.412	Regional	214.28	1.63	214.23	3.53	-0.05	1.9
1412.405	Regional	213.87	1.66	213.79	1.78	-0.08	0.12
1412.236	Regional	213.23	0.96	213.23	0.96	0	0
1411.983	Regional	212.32	0.84	212.32	0.84	0	0
1411.783	Regional	211.6	2.14	211.6	2.14	0	0
1411.583	Regional	210.59	2.35	210.59	2.35	0	0
1411.383	Regional	209.67	1.99	209.67	1.99	0	0
1411.183	Regional	208.72	2.32	208.72	2.32	0	0
1410.983	Regional	207.79	2.27	207.79	2.27	0	0
1410.783	Regional	207.03	1.13	207.03	1.14	0	0.01
1410.583	Regional	205.93	2.54	205.93	2.53	0	-0.01
1410.482	Regional	205.67	0.94	205.67	0.94	0	0
1410.383	Regional	205.15	2.55	205.12	2.66	-0.03	0.11
1410.183	Regional	204.51	2	204.79	1.48	0.28	-0.52
1410.11*	Regional	204.3	1.54	204.59	1.75	0.29	0.21
1410.052	**EW Arterial A2**						
1410.00*	Regional	203.91	2.15	204	2.63	0.09	0.48
1409.889	Regional	203.21	1.53	203.21	1.53	0	0

**Table 4-13 The Gore Road Tributary (Reach-1) –
Comparison of Existing and Proposed Hydraulic Conditions – 100-Year Flood Event**

HEC-RAS Section	Profile	Existing Conditions		Proposed Conditions		Change in	
		W. S. Elev (m) A	Vel Chnl (m/s) B	W. S. Elev (m) C	Vel Chnl (m/s) D	W. S. Elev (m) =C-A	Vel Chnl (m/s) =D-B
1413.956	Regional	219.96	0.61	219.96	0.61	0	0
1413.794	Regional	219.44	0.4	219.44	0.4	0	0
1413.674	Regional	218.94	0.71	218.94	0.7	0	-0.01
1413.411	Regional	218.05	0.63	218.05	0.64	0	0.01
1413.199	Regional	217.15	1.33	217.15	1.31	0	-0.02
1413.003	Regional	216.01	0.71	216	0.72	-0.01	0.01
1412.814	Regional	215.09	1.63	215.1	1.6	0.01	-0.03
1412.603	Regional	214.58	1.18	214.54	1.24	-0.04	0.06
1412.431	Regional	214.06	1.33	214.16	1.38	0.1	0.05
1412.428	Regional	214.01	1.51	214.1	1.55	0.09	0.04
1412.42	**Countryside Drive**						
1412.412	Regional	213.7	2.84	213.67	2.57	-0.03	-0.27
1412.405	Regional	213.65	1.86	213.4	1.45	-0.25	-0.41
1412.236	Regional	212.79	0.77	212.79	0.77	0	0
1411.983	Regional	211.86	0.61	211.86	0.61	0	0
1411.783	Regional	211.17	1.63	211.17	1.63	0	0
1411.583	Regional	210.19	1.76	210.19	1.76	0	0
1411.383	Regional	209.22	1.52	209.22	1.52	0	0
1411.183	Regional	208.32	1.58	208.32	1.57	0	-0.01
1410.983	Regional	207.26	1.98	207.26	1.99	0	0.01
1410.783	Regional	206.62	0.73	206.62	0.73	0	0
1410.583	Regional	205.47	2.45	205.47	2.45	0	0
1410.482	Regional	205.1	0.72	205.11	0.71	0.01	-0.01
1410.383	Regional	204.68	1.73	204.62	1.95	-0.06	0.22
1410.183	Regional	203.91	1.71	203.99	1.44	0.08	-0.27
1410.11*	Regional	203.7	1.08	203.8	1.14	0.1	0.06
1410.052	**EW Arterial A2**						
1410.00*	Regional	203.42	1.36	203.47	1.47	0.05	0.11
1409.889	Regional	202.57	1.74	202.57	1.74	0	0

**Table 4-14 Clarkway Tributary (Reach-31) –
Comparison of Existing and Proposed Hydraulic Conditions – Regional Flood Event**

HEC-RAS Section	Profile	Existing Conditions		Proposed Conditions		Change in	
		W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)
		A	B	C	D	=C-A	=D-B
1511.588	Regional	211.8	2.16	211.74	0.8	-0.06	-1.36
1511.584	Regional	211.81	1.8	211.75	0.92	-0.06	-0.88
1511.577	**Private Driveway 4**						
1511.572	Regional	211.74	2.05	211.56	1.46	-0.18	-0.59
1511.568	Regional	211.74	2	211.54	0.85	-0.2	-1.15
1511.473	Regional	211.66	0.85	211.45	1	-0.21	0.15
1511.47	Regional	211.64	1.02	211.45	0.77	-0.19	-0.25
1511.465	**Private Driveway 3**						
1511.459	Regional	211.32	2.64	210.86	1.58	-0.46	-1.06
1511.456	Regional	211.07	3.47	210.51	3.15	-0.56	-0.32
1511.385	Regional	210.58	2.5	210.38	1.3	-0.2	-1.2
1511.185	Regional	210.33	1.56	210.29	0.76	-0.04	-0.8
1511.156	Regional	210.31	0.85	210.25	0.8	-0.06	-0.05
1511.151	Regional	210.23	2.06	210.24	0.99	0.01	-1.07
1511.145	**Private Driveway 2**						
1511.138	Regional	209.97	1.47	209.44	2.01	-0.53	0.54
1511.13	Regional	209.61	3.57	209.37	2.18	-0.24	-1.39
1510.981	Regional	208.51	2.76	208.28	1.61	-0.23	-1.15
1510.788	Regional	208.19	0.96	207.94	1.59	-0.25	0.63
1510.693	Regional	207.77	3.01	207.55	3.2	-0.22	0.19
1510.589	Regional	207.47	2.68	207.47	0.69	0	-1.99
1510.56	Regional	207.4	2.34	207.44	0.87	0.04	-1.47
1510.556	Regional	207.4	1.79	207.41	1.63	0.01	-0.16
1510.546	**Private Driveway 1**						
1510.54	Regional	206.98	2.07	207.06	1.91	0.08	-0.16
1510.534	Regional	206.97	1.32	207.05	1.2	0.08	-0.12
1510.386	Regional	206.28	2.55	206.69	1.85	0.41	-0.7
1510.186	Regional	205.48	3.08	206.26	2.58	0.78	-0.5
1510.123	**EW Arterial A2**						
1510.06*	Regional	205.12	2.32	205.1	4.43	-0.02	2.11
1509.93*	Regional	204.74	2.52	204.73	2.53	-0.01	0.01
1509.863	Regional	204.5	2.76	204.5	2.76	0	0

**Table 4-15 Clarkway Tributary (Reach-31) –
Comparison of Existing and Proposed Hydraulic Conditions – 100-Year Flood Event**

HEC-RAS Section	Profile	Existing Conditions		Proposed Conditions		Change in	
		W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)
		A	B	C	D	=C-A	=D-B
1511.588	Regional	211.17	1.15	210.75	0.46	-0.42	-0.69
1511.584	Regional	211.17	1	210.72	1.04	-0.45	0.04
1511.577	**Private Driveway 4**						
1511.572	Regional	211.15	1.05	210.59	1.32	-0.56	0.27
1511.568	Regional	211.15	1.03	210.61	0.45	-0.54	-0.58
1511.473	Regional	211.12	0.43	210.58	0.46	-0.54	0.03
1511.47	Regional	211.12	0.53	210.58	0.36	-0.54	-0.17
1511.465	**Private Driveway 3**						
1511.459	Regional	210.17	2.18	209.84	2.55	-0.33	0.37
1511.456	Regional	209.85	3.1	209.77	2.53	-0.08	-0.57
1511.385	Regional	209.87	1.55	209.61	0.67	-0.26	-0.88
1511.185	Regional	209.78	0.78	209.57	0.36	-0.21	-0.42
1511.156	Regional	209.77	0.45	209.57	0.38	-0.2	-0.07
1511.151	Regional	209.75	1.06	209.56	0.47	-0.19	-0.59
1511.145	**Private Driveway 2**						
1511.138	Regional	209.02	1.94	208.79	3.77	-0.23	1.83
1511.13	Regional	208.64	3.02	208.74	1.16	0.1	-1.86
1510.981	Regional	207.86	2.36	207.63	2.21	-0.23	-0.15
1510.788	Regional	207.42	0.82	207.23	1	-0.19	0.18
1510.693	Regional	207.14	1.83	207.1	1.49	-0.04	-0.34
1510.589	Regional	206.85	2.14	207.05	0.4	0.2	-1.74
1510.56	Regional	206.83	1.61	207.04	0.45	0.21	-1.16
1510.556	Regional	206.83	1.2	206.61	2.68	-0.22	1.48
1510.546	**Private Driveway 1**						
1510.54	Regional	206.23	3.42	206.2	3.86	-0.03	0.44
1510.534	Regional	206.32	1.26	206.3	1.29	-0.02	0.03
1510.386	Regional	205.54	1.88	205.59	1.76	0.05	-0.12
1510.186	Regional	204.87	2.02	205.06	1.83	0.19	-0.19
1510.123	**EW Arterial A2**						
1510.06*	Regional	204.36	2.27	204.38	2.89	0.02	0.62
1509.93*	Regional	204.01	1.78	204.01	1.78	0	0
1509.863	Regional	203.84	1.84	203.84	1.84	0	0

**Table 4-16 Clarkway Tributary (Reach-2) –
Comparison of Existing and Proposed Hydraulic Conditions – Regional Flood Event**

HEC-RAS Section	Profile	Existing Conditions		Proposed Conditions		Change in	
		W. S. Elev (m) A	Vel Chnl (m/s) B	W. S. Elev (m) C	Vel Chnl (m/s) D	W. S. Elev (m) =C-A	Vel Chnl (m/s) =D-B
1513.456	100-year	218.68	3.35	218.68	3.35	0	0
1513.385	100-year	218.65	1.17	218.66	1.17	0.01	0
1513.185	100-year	217.38	3.07	217.36	3.13	-0.02	0.06
1512.981	100-year	216.74	1.25	216.9	1.09	0.16	-0.16
1512.786	100-year	215.84	3.3	216.57	2.03	0.73	-1.27
1512.589	100-year	215.5	1	216.52	1.03	1.02	0.03
1512.515	100-year	215.47	1.05	216.51	0.97	1.04	-0.08
1512.512	100-year	215.43	1.69	216.49	1.19	1.06	-0.5
1512.505	**Countryside Drive**						
1512.494	100-year	214.65	4.12	216.32	2.14	1.67	-1.98
1512.488	100-year	214.45	3.41	215.47	4.67	1.02	1.26
1512.371	100-year	214.22	0.76	215.26	1.59	1.04	0.83
1512.364	100-year	214.2	0.91	214.96	2.89	0.76	1.98
1512.356	**Clarkway Drive**						
1512.345	100-year	214.14	1.55	214.04	4.12	-0.1	2.57
1512.34	100-year	214.14	1.33	214.08	1.99	-0.06	0.66
1512.182	100-year	213.9	1.32	213.79	1.25	-0.11	-0.07
1511.983	100-year	213.08	1.63	212.89	1.92	-0.19	0.29
1511.898	100-year	212.74	1.31	212.61	1.03	-0.13	-0.28
1511.787	100-year	212.08	1.92	212.12	1.85	0.04	-0.07
1511.723	100-year	211.91	0.94	211.97	0.89	0.06	-0.05

**Table 4-17 Clarkway Tributary (Reach-2) –
Comparison of Existing and Proposed Hydraulic Conditions – 100-Year Flood Event**

HEC-RAS Section	Profile	Existing Conditions		Proposed Conditions		Change in	
		W. S. Elev (m) A	Vel Chnl (m/s) B	W. S. Elev (m) C	Vel Chnl (m/s) D	W. S. Elev (m) =C-A	Vel Chnl (m/s) =D-B
1513.456	100-year	218.17	2.58	218.17	2.58	0	0
1513.385	100-year	217.97	1.13	217.98	1.12	0.01	-0.01
1513.185	100-year	216.88	2.06	216.87	2.08	-0.01	0.02
1512.981	100-year	216.14	1.12	216.17	1.07	0.03	-0.05
1512.786	100-year	215.25	2.62	215.17	2.89	-0.08	0.27
1512.589	100-year	215.04	0.66	215.12	1	0.08	0.34
1512.515	100-year	215.03	0.6	215.11	0.88	0.08	0.28
1512.512	100-year	215.01	1.08	215.1	0.91	0.09	-0.17
1512.505	**Countryside Drive**						
1512.494	100-year	214.15	3.33	214.88	1.55	0.73	-1.78
1512.488	100-year	213.94	2.46	214.48	2.92	0.54	0.46
1512.371	100-year	213.73	0.47	213.89	2.52	0.16	2.05
1512.364	100-year	213.64	1.35	213.92	2.03	0.28	0.68
1512.356	**Clarkway Drive**						
1512.345	100-year	213.45	1.88	213.04	3.44	-0.41	1.56
1512.34	100-year	213.45	1.34	213.26	1.7	-0.19	0.36
1512.182	100-year	213.16	1.08	212.98	0.86	-0.18	-0.22
1511.983	100-year	212.28	1.3	212.12	1.62	-0.16	0.32
1511.898	100-year	211.96	0.94	211.85	0.76	-0.11	-0.18
1511.787	100-year	211.31	1.61	211.2	1.9	-0.11	0.29
1511.723	100-year	211.21	0.57	210.91	0.83	-0.3	0.26

Table 4-18 describes the four scenarios which have been evaluated with reference to floodplain comparison illustration figures and assessment outcomes. Based on ESRI Areal Imagery in ArcGIS Pro, none of the scenarios that are presented here represent a significant increased flood risk to private properties meaning, no structure/building that was located outside of the current TRCA floodplain would be located within the floodplain under any of the scenarios, however, a detailed comparison with approved Block Plans will be warranted when they are available. Notwithstanding, Scenario 3 (i.e., full span of floodplains) was found to have the least impact to the upstream computed water surface elevations and spatial extent of the floodplain. Detailed tables with water surface elevations comparisons are provided in Tables 4-14 and 4-15 in the preceding section.

Table 4-18 Proposed Conditions Flood Evaluation Summary

Scenario	Reference Figure	Outcome
1	4-3	The resultant computed water surface elevations are approximately 1 to 2 m higher than existing TRCA floodplain conditions. As a result, the Regional Storm floodplain is significantly larger in comparison to the existing TRCA floodplain just upstream of crossings.
2	4-4	The resultant computed water surface elevations are higher by less than 1 m at Crossing A and less than 1.12 m at Crossing B. As a result, the Regional Storm floodplain is somewhat larger in comparison to the existing TRCA floodplain just upstream of crossings.
3	4-5	The resultant computed water surface elevations are essentially unchanged (less than 0.01 m) at Crossing A and less than 0.17 m higher at Crossing B. As a result, the Regional Storm floodplain is only marginally changed in comparison to the existing TRCA floodplain just upstream of crossings.
4	4-6	The resultant computed water surface elevations are higher by less than 0.70 m at Crossing A and less than 0.56 m at Crossing B. As a result, the Regional Storm floodplain is somewhat larger in comparison to the existing TRCA floodplain just upstream of crossings.
5	4-7	The resultant computed water surface elevations are higher by less than 0.29 m at Crossing A and less than 0.57 m at Crossing B. As a result, the Regional Storm floodplain is somewhat larger in comparison to the existing TRCA floodplain just upstream of crossings.

4.3.3.3 Preferred Crossing Sizing Scenario

As noted previously, the determination of a preferred crossings (A and C) scenario has been based on consideration of several factors related to potential impacts and/or issues resulting from the implementation of each scenario, namely requirements for watercourse re-alignment, floodplain impacts and hydraulic performance criteria (ref. Table 4-19).

In consideration of the evaluation criteria and information available to this assessment, Scenario 5 has been deemed to best meet the hydraulic criteria. Optimization of the design and associated cost may result in loss of developable lands to accommodate a larger floodplain.

4.3.3.4 Cut/Fill Evaluation

A cut/fill evaluation was performed for Clarkway Tributary-Reach 31 for creek alignment. This creek re-alignment is required to accommodate the proposed 30m right-of-way for Clarkway Drive. Cut/fill totals for HEC-RAS sections are listed in Table 4-20. Figure 4-7 illustrates an example of cut/fill for a HEC-RAS section. The results along the reach are near balanced with 41,533 m^3 of fill and 43,425 m^3 of cut resulting in an excess cut of 1,892 m^3.

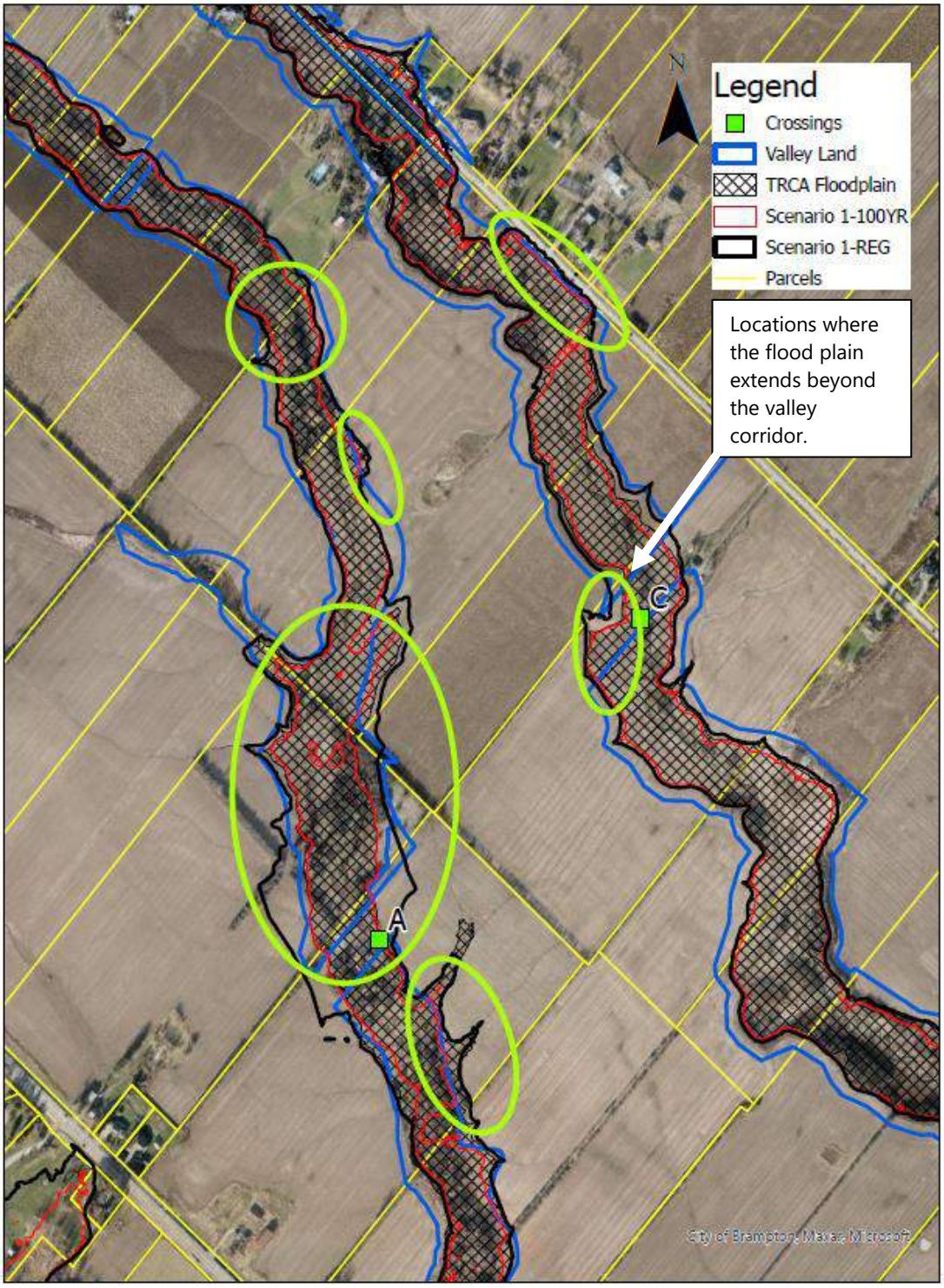


Figure 4-3 Scenario 1 and Existing Valley Land Comparison

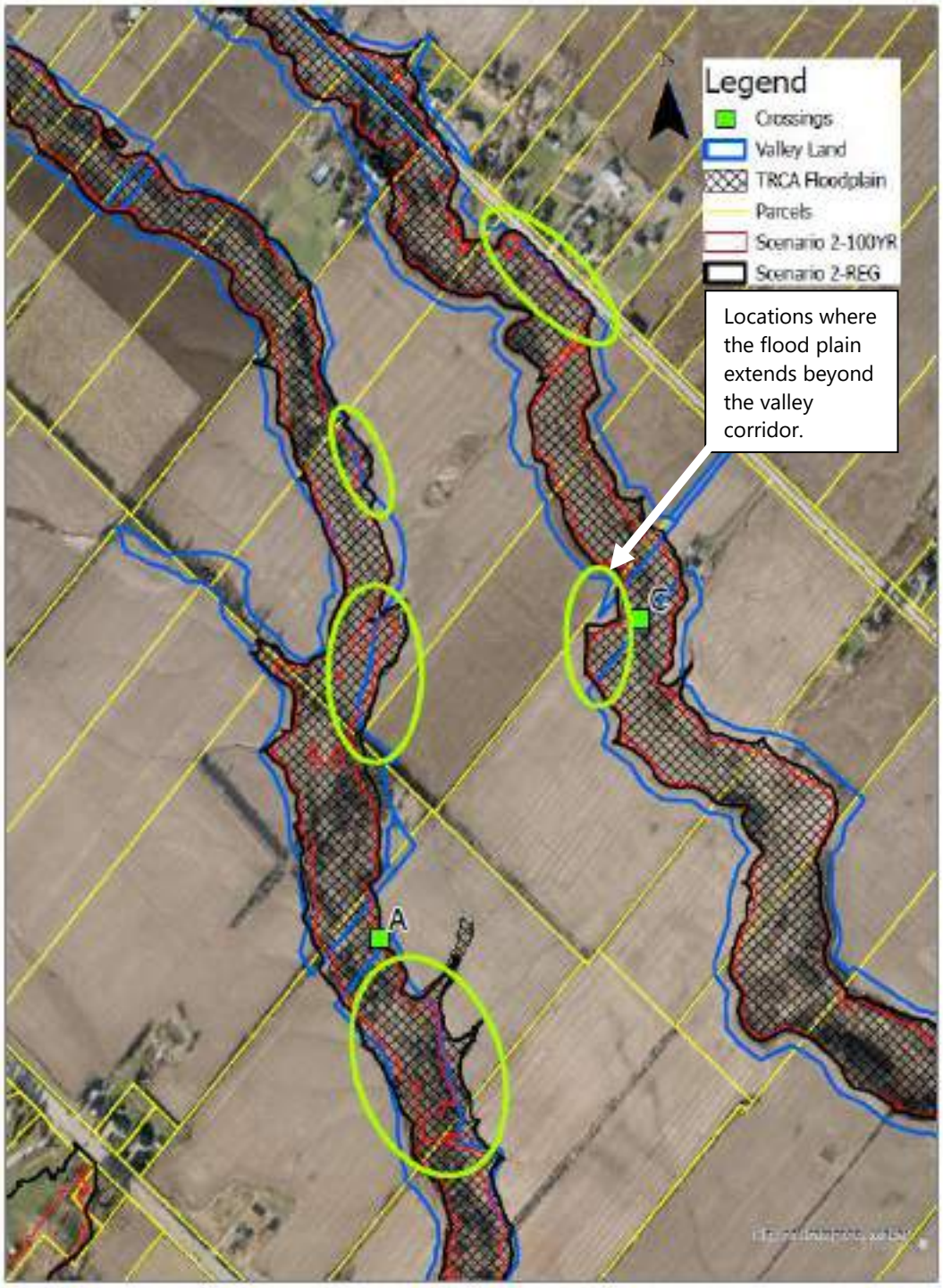


Figure 4-4 Scenario 2 and Existing Valley Land Comparison

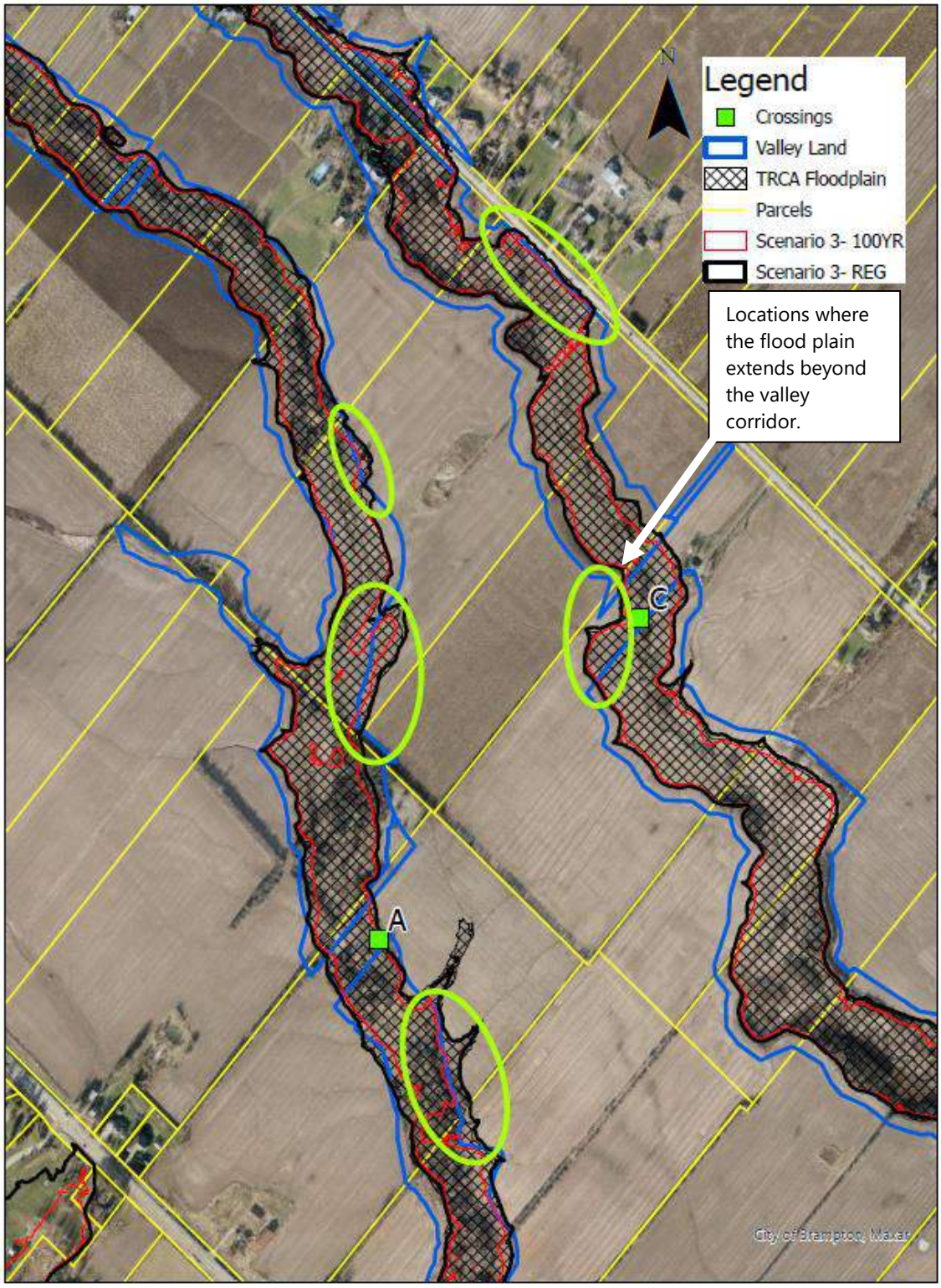


Figure 4-5 Scenario 3 and Existing Valley Land Comparison

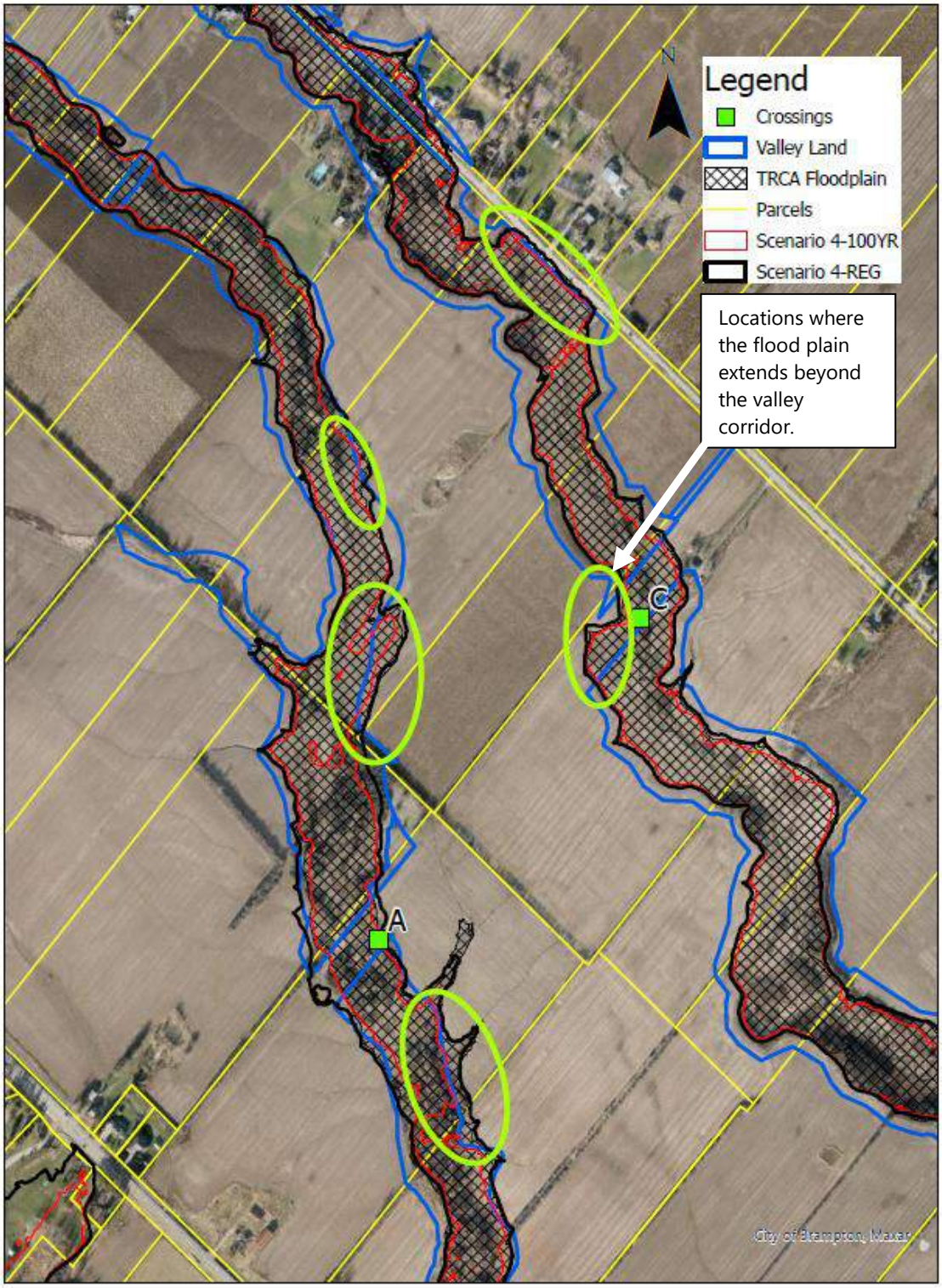


Figure 4-6 Scenario 4 and Existing Valley Land Comparison

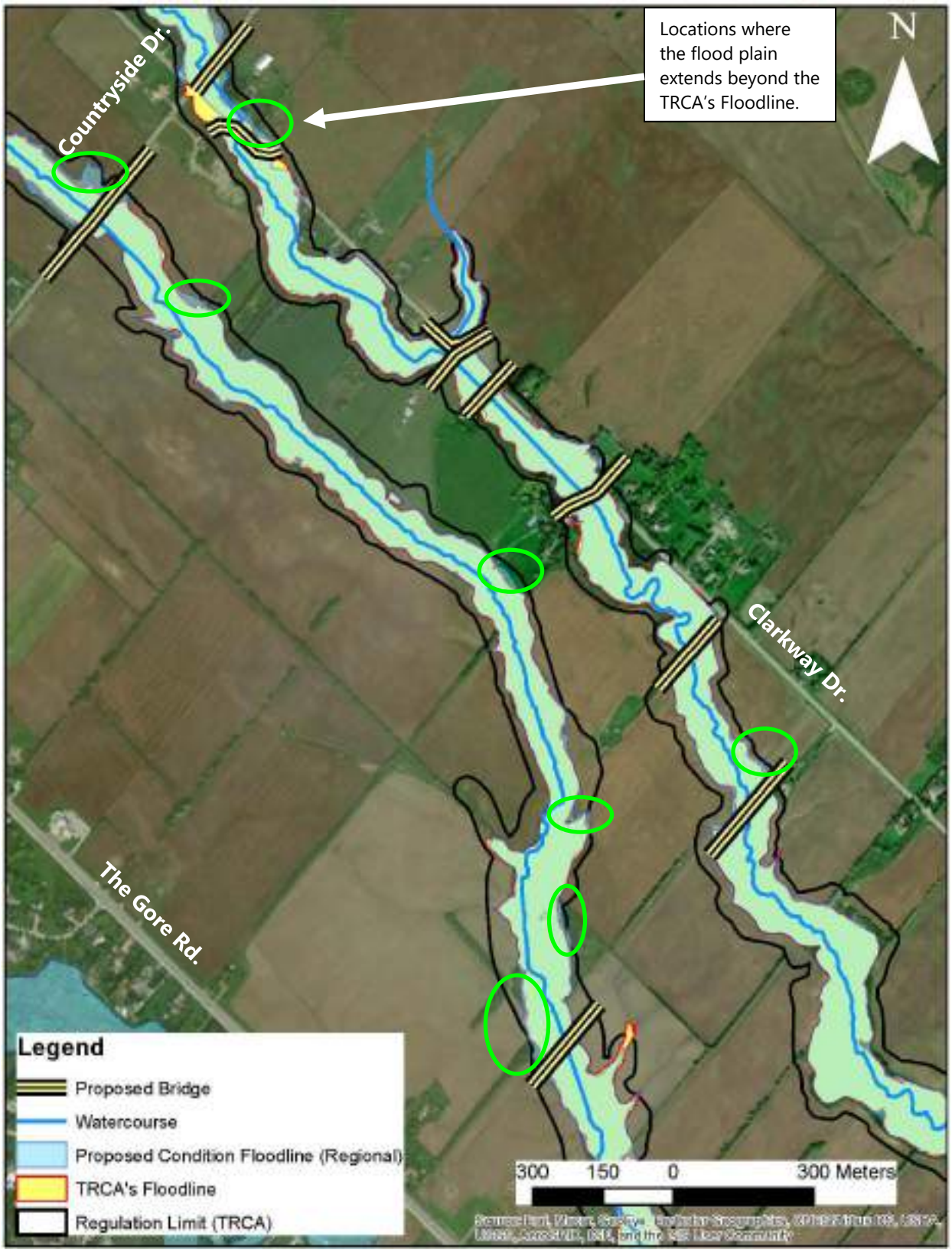


Figure 4-7 Final Proposed Condition Floodline Map (Scenario 5)

Table 4-19 Crossing Configurations Evaluations

Scenario	Basis	Need for Creek Re-Alignment	Floodplain Impacts	Hydraulic Performance (MTO Criteria)
1	Spans are based on an openness ratio of 0.6	Yes	High	Met
2	40 m spans (i.e. the largest single span structures that can be designed as a rigid frame)	Yes	Medium	Met
3	Full span of floodplains	Yes	Low	Met
4	Spans are based on an openness ratio of 1.0	Yes	Medium	Met
5	35 m spans	Yes	Medium	Met

Table 4-20 Cut/Fill Totals

HEC-RAS Section	Volume (m^3)		
	Fill A	Cut B	Change in Cut/Fill =A-B
1510.556	127	147	-20
1510.56	64	66	-2
1510.589	529	573	-44
1510.693	2,549	2,423	126
1510.788	2,582	2,648	-66
1511.13	15,339	16,520	-1,181
1511.138	408	471	-63
1511.151	886	940	-54
1511.156	1,287	1,065	221
1511.185	1,433	1,801	-368
1511.385	5,583	4,790	793
1511.456	2,528	2,567	-39
1511.459	147	186	-39
1511.47	1,160	1,514	-354
1511.473	221	160	61
1511.568	5,962	6,725	-763
1511.572	195	212	-17
1511.584	469	547	-78
1511.588	66	72	-6
Totals	**41,533**	**43,425**	**-1,892**

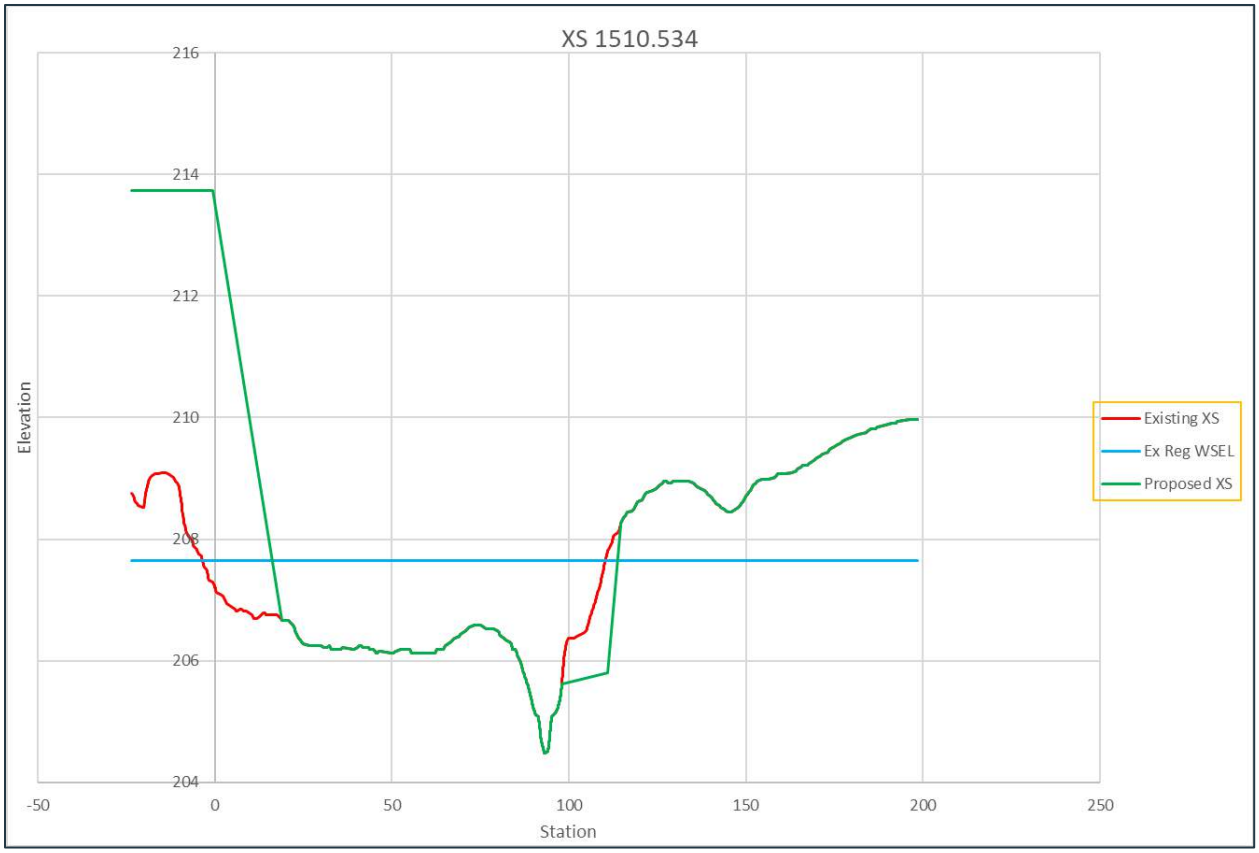


Figure 4-8 HEC-RAS section showing a cut/fill example

5.0 SUMMARY AND RECOMMENDATIONS

The following conclusions and recommendations stem from the foregoing hydrologic and hydraulic assessments for the Part B right-of-ways.

5.1 Summary

1. The right-of-ways are required to control the runoff from the 90th percentile storm event, as per the Region of Peel road reconstruction criteria.
2. Based on available borehole logs and groundwater information, the runoff from the 90th percentile storm event can be controlled via on-site retention by implementing Low-Impact Development Best Management Practices within the right-of-way.
3. The existing crossing of Clarkway Drive (F) does not meet the applicable Ministry of Transportation criteria for conveyance, and the applicable Regional Peel criteria for conveyance.
4. The proposed crossings of Countryside Drive (B and E) and Clarkway Drive (D) have been sized to meet the applicable Ministry of Transportation criteria for freeboard and conveyance, and the applicable Region of Peel criteria for conveyance.
5. The new proposed crossings of EW Arterial have been sized to meet the applicable Ministry of Transportation criteria for freeboard, clearance, and conveyance, and the applicable Region of Peel criteria for conveyance.
6. A comparison of computed water surface elevations and computed channel velocities under existing and proposed conditions, indicates that changes are expected, within Area 47.
7. A flood risk assessment of alternate crossing configurations has been completed. It has been noted that the underlying Block Plans defining the valley corridor are out of date regarding flood, but will be revised through the land development process. The assessment noted locations where the proposed floodplain extended outside of the valley corridor. However, the comparisons documented for this assessment are consider qualitative only.
8. A cut/fill assessment was completed for Clarkway Tributary-Reach 31 for creek alignment.

5.2 Recommendations

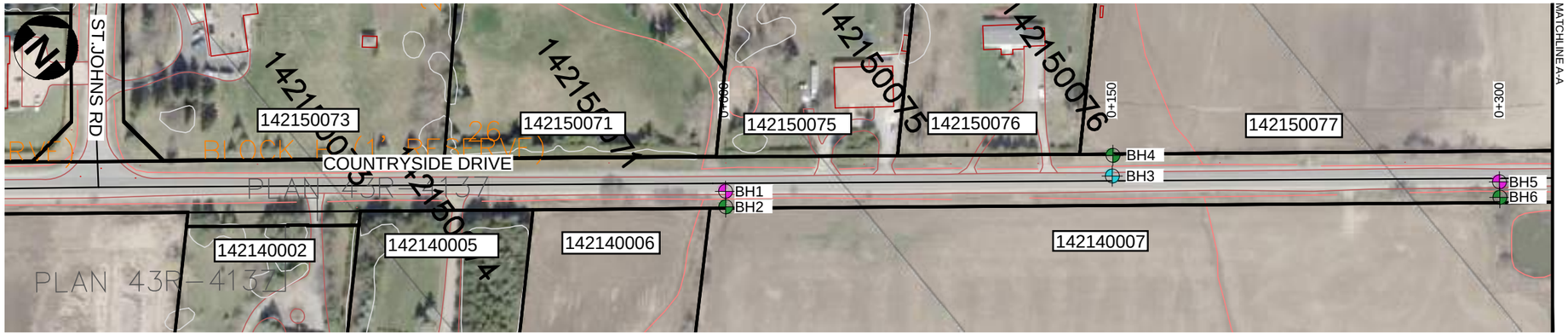
1. Wood understands that multi-lateral discussions are underway but have yet not reached conclusion at the time of writing of this report. As a result, if there are any changes in the road profiles those will need to be updated to reflect correctly in the hydrologic-hydraulic modeling components and resultant calculations.
2. Considering the impacts on the floodplain and water surface elevations, Wood recommends that the bridge spans for the crossings A and C across EW Arterial be set to 35 m.
3. It is recommended that Gore Road Tributary and Clarkway Tributary Creek alterations for the reach from EW Arterial to Mayfield Road be designed to achieve a near zero change in computed results between existing and proposed conditions.

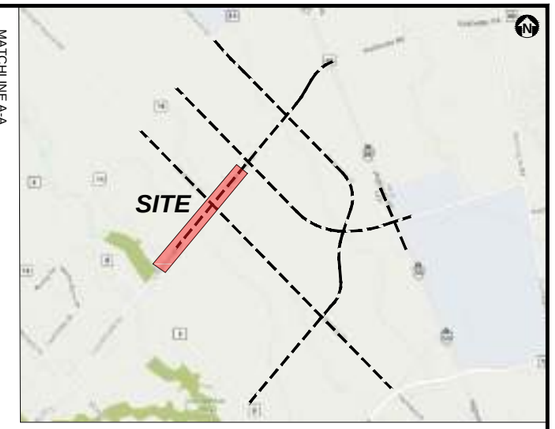
Appendix A: Background Information

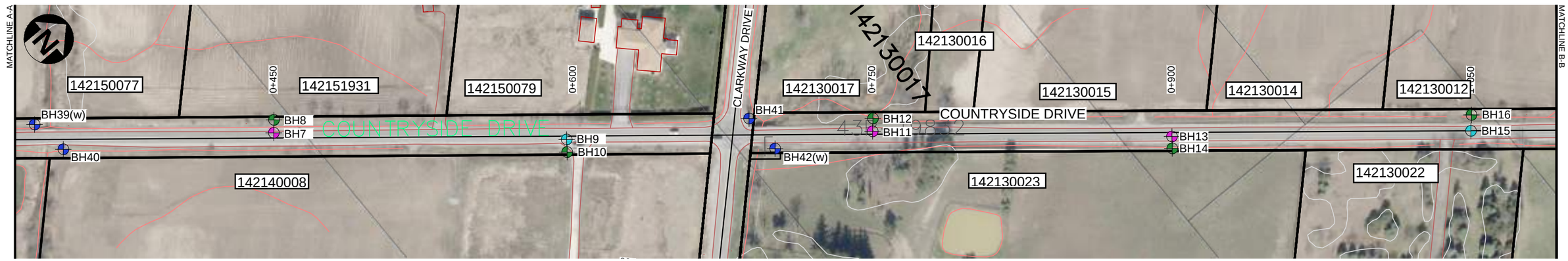
wood.

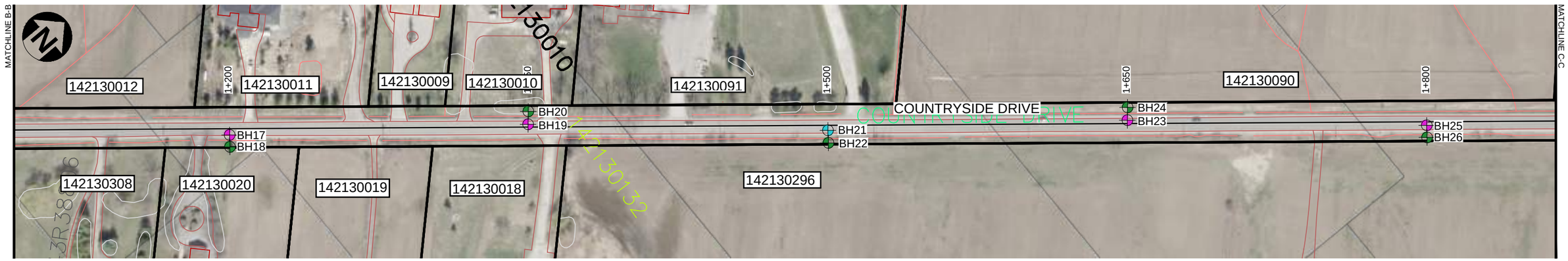
Appendix A: Background Information

wood.









0 30 60 90 120m

APPROXIMATE SCALE

LEGEND

- BOREHOLE LOCATION (MDL/EP - depth 1.5m)
- BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
- BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
- BOREHOLE LOCATION (depth 10m)
- (w) MONITORING WELL LOCATIONS

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wood.

KW

CHK'D BY: SM

DATUM: NAD83

PROJECTION: UTM Zone 17T

SCALE: AS SHOWN

TITLE

SITE AND BOREHOLE LOCATION PLAN
(COUNTRYSIDE DRIVE)

PROJECT

GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROADS WITHIN HIGHWAY 427 INDUSTRIAL SECONDARY PLAN AREA (AREA 17)
CITY OF BRAMPTON, ONTARIO

DATE: JUNE 2019

PROJECT NO: TP115068

RFQ NO: 2015-016

FIGURE No. 1A

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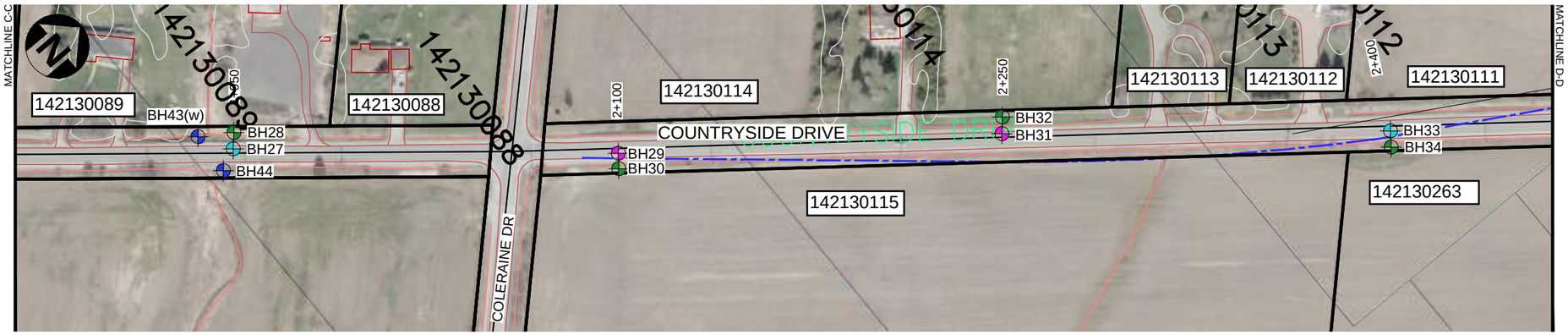

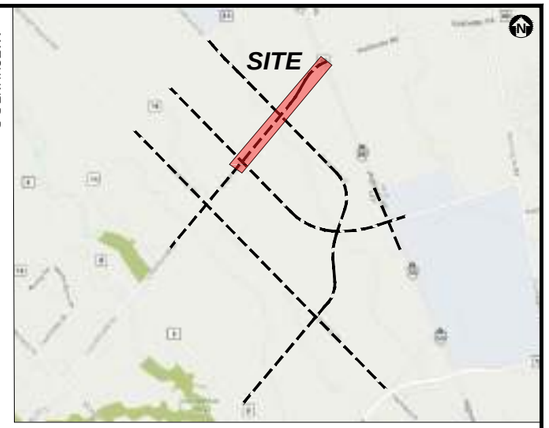

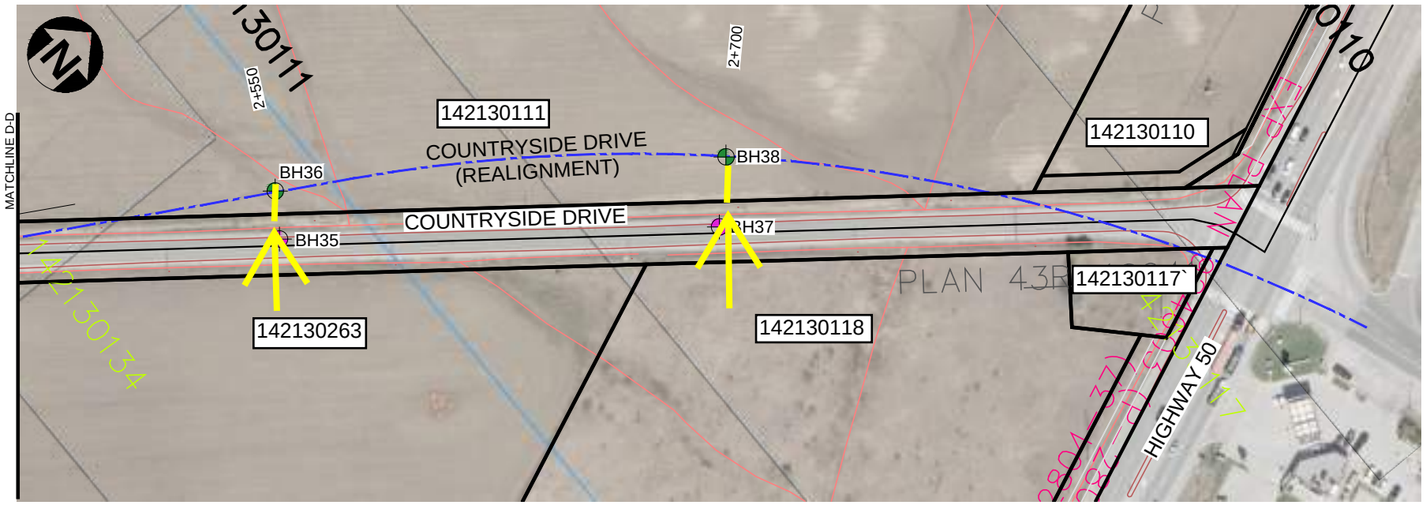

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CHK'D BY:	SM
DATUM:	NAD83
PROJECTION:	UTM Zone 17T
SCALE:	AS SHOWN

TITLE: SITE AND BOREHOLE LOCATION PLAN (COUNTRYSIDE DRIVE)

PROJECT: GEOTECHNICAL INVESTIGATIONS
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CITY OF BRAMPTON, ONTARIO

DATE:	JUNE 2019
PROJECT NO:	TP115068
RFQ NO:	2015-016
FIGURE No.	1B

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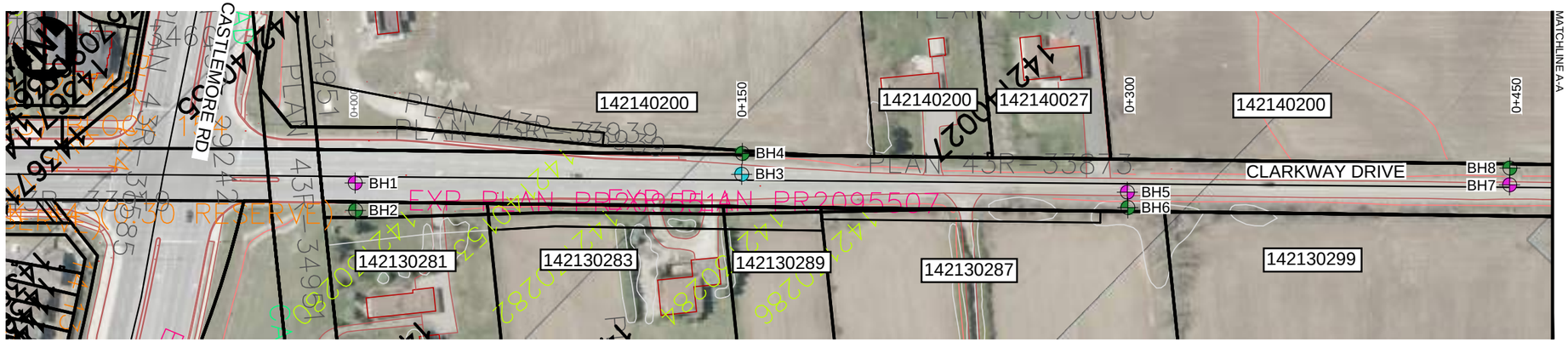

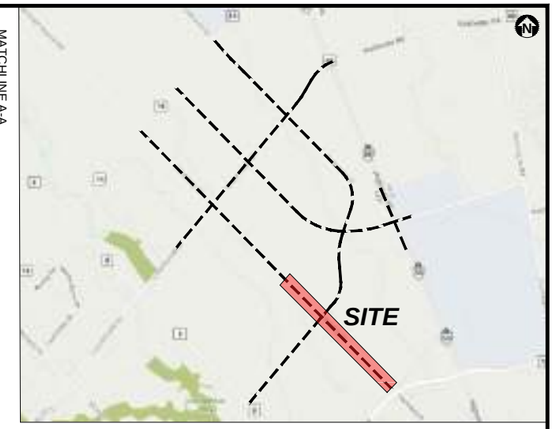

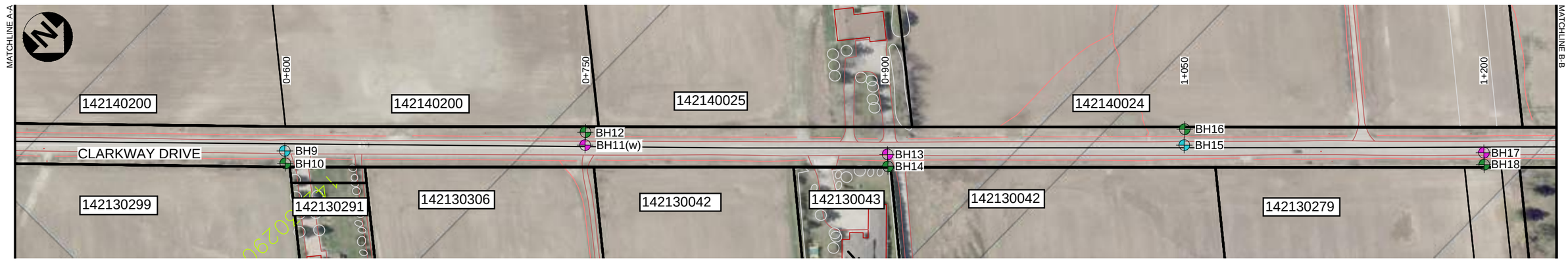

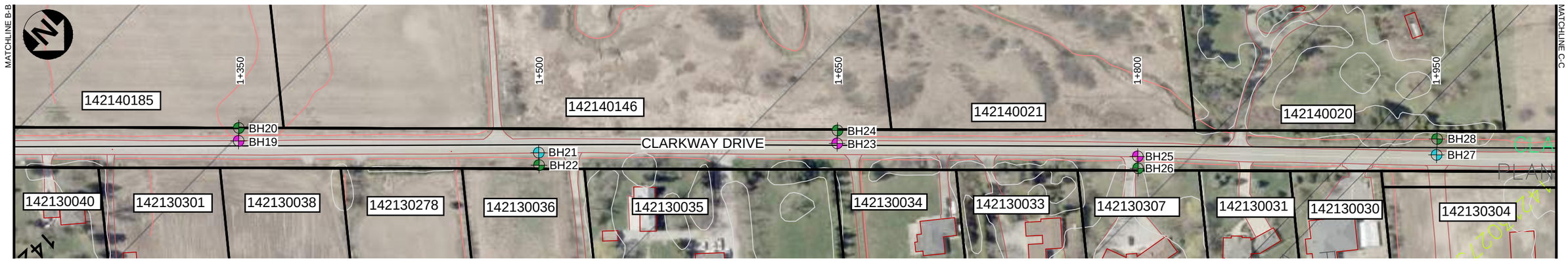

0 30 60 90 120m

APPROXIMATE SCALE

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- BOREHOLE LOCATION (depth 10m)
- (w) MONITORING WELL LOCATIONS

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FIGURE No. 1A

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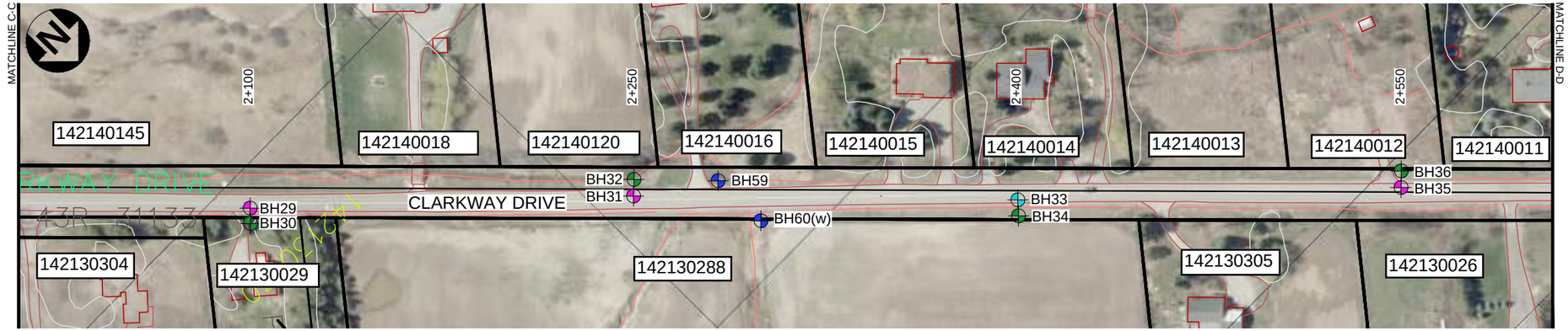

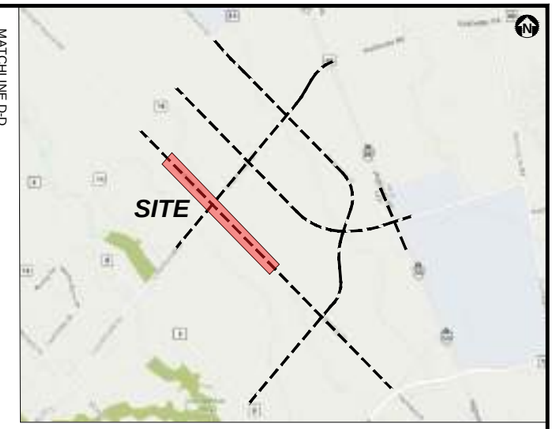

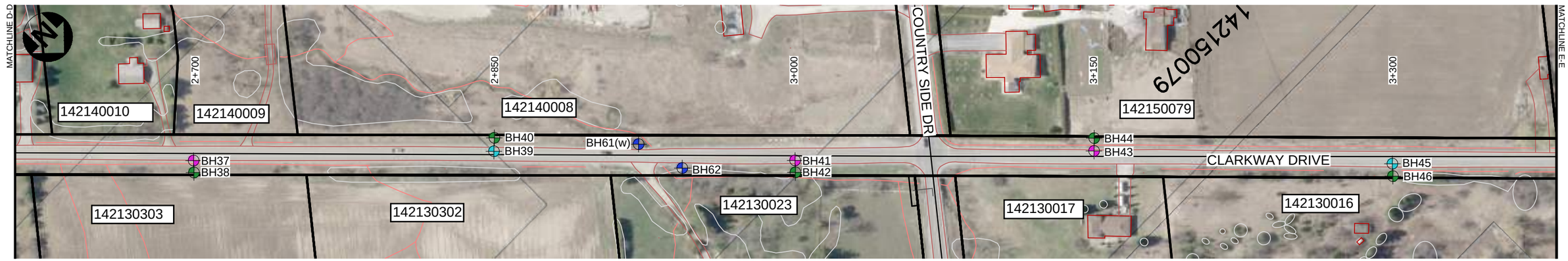

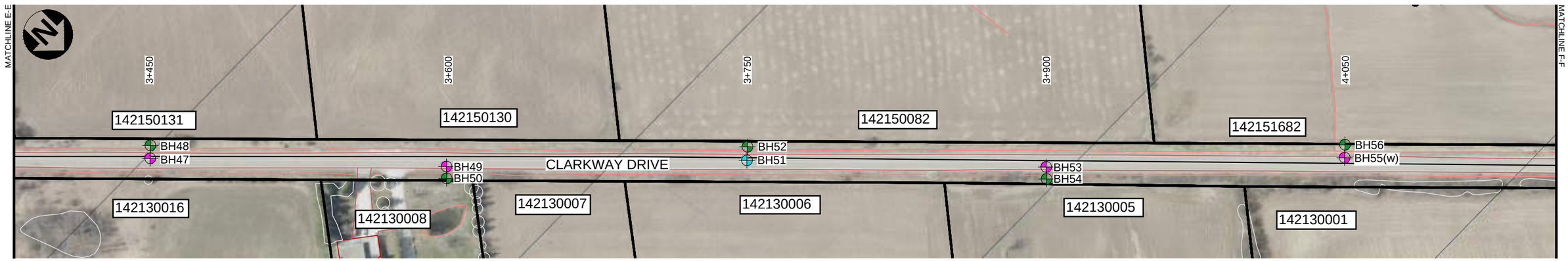

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FIGURE No. 1B

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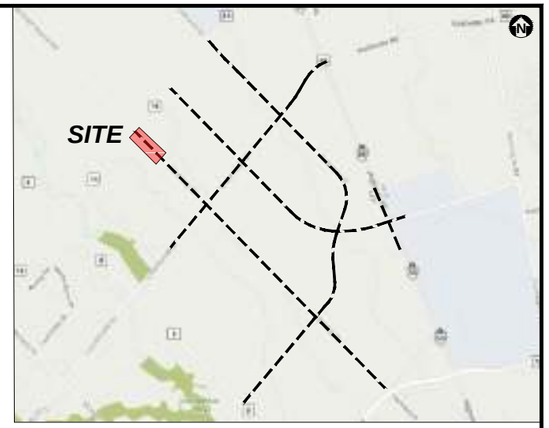

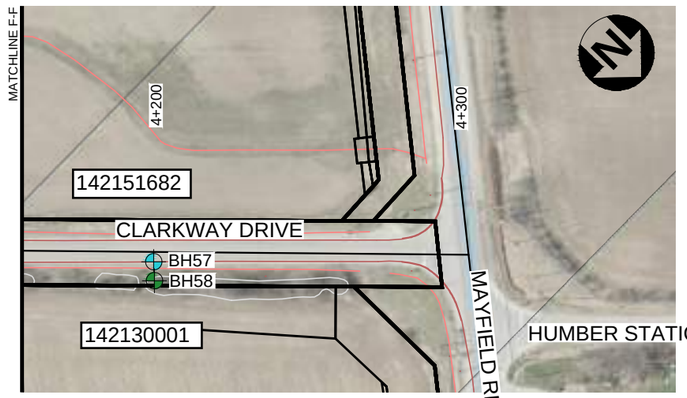

0 30 60 90 120m

APPROXIMATE SCALE

LEGEND

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- BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
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CITY OF BRAMPTON, ONTARIO

DATE:	JUNE 2019
PROJECT NO:	TP115068
RFQ NO:	2015-016
FIGURE No.	1C

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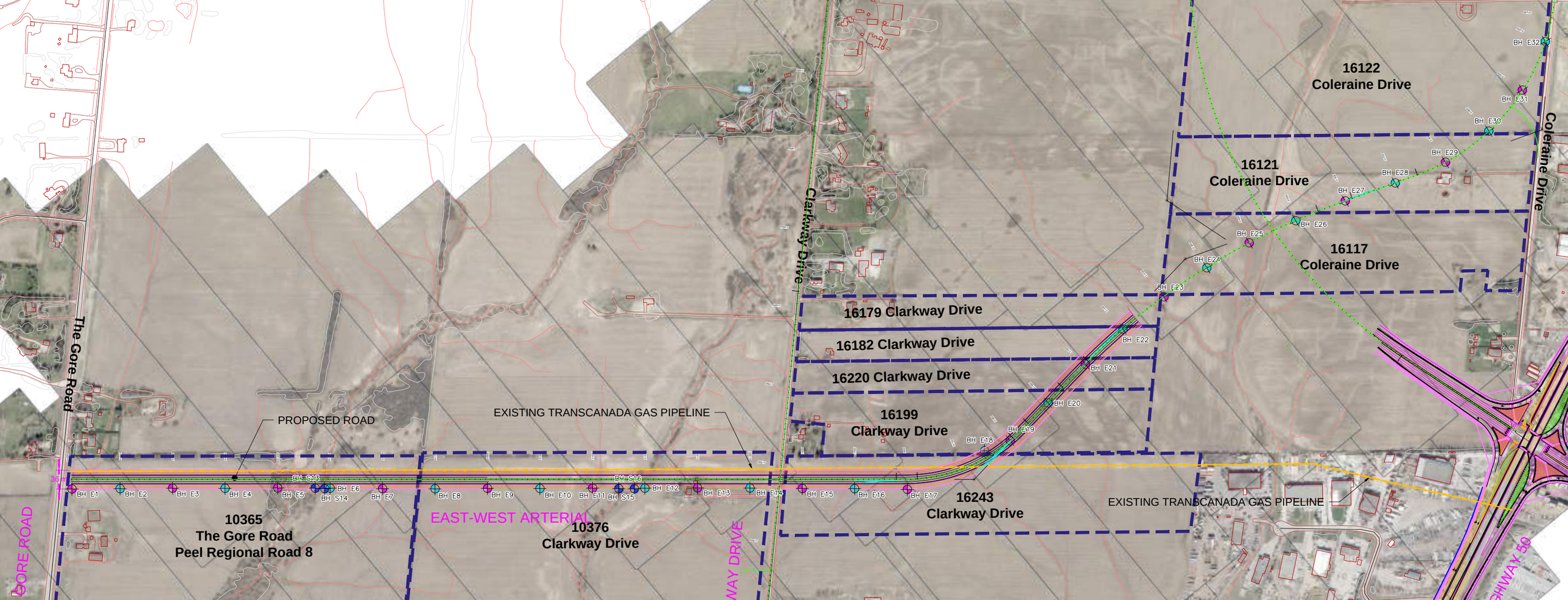
The Gore Road
Clarkway Drive
Coleraine Drive
PROPOSED ROAD
EXISTING TRANSCANADA GAS PIPELINE
EXISTING TRANSCANADA GAS PIPELINE
EAST-WEST ARTERIAL
GORE ROAD
WAY DRIVE
HIGHWAY 50
16122
Coleraine Drive
16121
Coleraine Drive
16117
Coleraine Drive
16179 Clarkway Drive
16182 Clarkway Drive
16220 Clarkway Drive
16199
Clarkway Drive
16243
Clarkway Drive
10365
The Gore Road
Peel Regional Road 8
10376
Clarkway Drive
BH E1
BH E2
BH E3
BH E4
BH E5
BH S13
BH S14
BH E6
BH E7
BH E8
BH E9
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BH E21
BH E22
BH E23
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BH E26
BH E27
BH E28
BH E29
BH E30
BH E31
BH E32

RECORD OF BOREHOLE No. BH C1

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:603645 N:4852294	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020 Date Completed: Mar 25, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 215.8 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 100 mm ASPHALT	215.7										
	brown Sand and Gravel FILL moist	0.1	SS	1	83	12			○	⊠		
		214.9					1	215				
	grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	0.9	SS	2	92	8			○	⊠		
			SS	3	100	8		214	○	⊠		
		213.6					2					
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders hard	2.2	SS	4	100	40			○	⊠		
		212.8					3	213				
	END OF BOREHOLE	3.0										

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50 Vogell Road, Units 3 & 4
Richmond Hill, Ontario, L4B 3K6
Canada
Tel. No.: (905) 415-2632
www.woodplc.com

▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C2

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:603646 N:4852295	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020	Date Completed: Mar 25, 2020	Revision No.: 0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 215.1 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown **Sand and Gravel FILL** moist		SS	1	75	6						
		214.5										
	dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.6	SS	2	100	7	1	214				
			SS	3	100	19						
		213.2										
	END OF BOREHOLE	1.8										

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Canada
Tel. No.: (905) 415-2632
www.woodplc.com

▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C3

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:603738 N:4852420	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020 Date Completed: Mar 25, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 216.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 90 mm ASPHALT	216.4										
	brown	0.1										
	Sand and Gravel FILL	216.2										
	moist	0.3										
	dark brown / brown		SS	1	83	5		216	○	⊠		
	Silty Clay / Clayey Silt FILL											
	trace sand, trace gravel, trace organics	215.6										
	brown	0.9					1					
	SILTY CLAY / CLAYEY SILT TILL											
	trace sand, trace gravel		SS	2	100	9			○	⊠		
	stiff							215				
		215.0										
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C5

Project Number:	TP115086	Drilling Location:	Countryside Drive E:603831 N:4852531	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020 Date Completed: Mar 25, 2020	Revision No.:	0, 8/14/20

Lithology Plot	DESCRIPTION	Elev.	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
	Geodetic Ground Surface Elevation: 214.6 m							
	about 100 mm ASPHALT	214.5						
	brown **Sand and Gravel FILL** moist	0.1 213.8	SS	1	83	30		214
	dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	0.8 213.1	SS	2	100	38	1	
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to sandy, trace gravel hard	1.5	SS	3	83	46		213
			SS	4	100	82	2	212
	--------- grey		SS	5	100	69	3 ▽	211
			SS	6	79	52	4 ■	
			SS	7	100	55 / 150mm		210
	END OF BOREHOLE	209.7 4.9						

FIELD TESTING

Penetration Testing: ○ SPT □ PPT ● DCPT

MTO Vane*: △ Intact ▲ Remould

Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa): 20 40 60 80

55 150 mm

LAB TESTING

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400

W_P W W_L

Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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▽ Groundwater encountered on completion of drilling on 3/25/2020 at a depth of: 3.0 m. ■ Cave in depth after removal of augers: 4.0 m.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C6

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:603832 N:4852529	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020 Date Completed: Mar 25, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	Geodetic Ground Surface Elevation: 214.6 m										
	brown **Sand and Gravel FILL** moist 214.0	SS	1	83	11			○			
	brown 0.6 **Silty Clay / Clayey Silt FILL** trace sand, trace to some gravel 213.4	SS	2	88	34	1	214	○			
	brown 1.2 **SILTY CLAY / CLAYEY SILT TILL** trace to sandy, trace gravel hard 213.0 1.7	SS	3	100	75		213	○			
	END OF BOREHOLE										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C7

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:603917 N:4852640	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020 Date Completed: Mar 25, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 216.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 100 mm ASPHALT	216.4										
	brown **Sand and Gravel FILL** moist	0.1 215.9	SS	1	50	15		216				
	dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.6 215.5										
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard	1.1	SS	2	100	16	1					
			SS	3	100	28		215				
	--------- grey						2					
			SS	4	100	32		214				
		213.5					3					
	END OF BOREHOLE	3.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C8

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:603915 N:4852650	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020	Date Completed: Mar 25, 2020	Revision No.: 0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 216.6 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown **Sand and Gravel FILL** moist		SS	1	42	9			○			
	216.0 brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard	0.6	SS	2	100	22	1	216	○			
			SS	3	58	49		215	○			
	214.8 **END OF BOREHOLE**	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C9

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604016 N:4852761	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020 Date Completed: Mar 25, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 218.3 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 110 mm ASPHALT	218.2										
	brown Sand and Gravel FILL moist	0.1 217.9										
	dark grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	0.5 217.4	SS	1	83	10		218	○	⊠		
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	0.9 216.8	SS	2	100	20	1	217	○	⊠		
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C11

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604113 N:4852893	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 27, 2020 Date Completed: Mar 27, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 215.2 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 120 mm ASPHALT	215.0										
	brown **Sand and Gravel FILL** moist	0.1	SS	1	83	21						
		214.4					1	214				
	dark grey / grey **Silty Clay / Clayey Silt FILL** trace sand, trace to some gravel, trace organics	0.8	SS	2	100	18						
			SS	3	92	7						
		212.9					2	213				
	brown / brownish grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard	2.2	SS	4	100	17						
							3	212				
			SS	5	100	29						
	--------- grey		SS	6	83	22	4	211				
			SS	7	83	34	5 ▽					
		210.0						210				
	END OF BOREHOLE	5.2										

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▽ Groundwater encountered on completion of drilling on 3/27/2020 at a depth of: 4.9 m.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C12

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604113 N:4852900	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 25, 2020 Date Completed: Mar 25, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 213.6 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 100 mm TOPSOIL	213.5										
	brown **Sand and Gravel FILL** moist	0.1 213.0	SS	1	75	6		213	○			
	dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.6 212.4	SS	2	100	6	1		○			
	END OF BOREHOLE	1.2										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C13

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604197 N:4852992	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 27, 2020 Date Completed: Mar 27, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 219.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 140 mm ASPHALT	218.9										
	brown	0.1										
	Sand and Gravel FILL moist	218.5 0.5										
	dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	218.1	SS	1	83	11			○	⊠		
	brown/grey	0.9					1	218				
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard		SS	2	100	17			○	⊠		
			SS	3	100	23	2	217	○	⊠		
			SS	4	100	30			○	⊠		
		215.9					3	216				
	END OF BOREHOLE	3.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C15

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604285 N:4853111	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 27, 2020 Date Completed: Mar 27, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
Geodetic Ground Surface Elevation: 219.7 m												
	about 130 mm ASPHALT	219.6										
	brown	0.1										
	Sand and Gravel FILL	219.2										
	moist	0.5										
	dark grey / brown		SS	1	100	16		219	○			
	Silty Clay / Clayey Silt FILL											
	trace sand, trace to some gravel, trace organics	218.8										
	brown	0.9					1					
	SILTY CLAY / CLAYEY SILT TILL											
	trace to some sand, trace gravel		SS	2	100	8			○			
	firm											
		218.2										
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C17

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604386 N:4853230	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 27, 2020 Date Completed: Mar 27, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 219.9 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: SPT, PPT, DCPT; MTO Vane* Intact/Remould; Nilcon Vane* Intact/Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: COV (LEL), TOV (LEL) 2 4 6 8; COV (ppm), TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 130 mm ASPHALT	219.8										
	brown	0.1										
	Sand and Gravel FILL	219.5										
	moist	0.4										
	dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	219.0	SS	1	100	11						
	brown / brownish grey	0.9					1	219				
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard		SS	2	88	14						
			SS	3	100	24	2	218				
			SS	4	100	41						
							3	217				
			SS	5	100	30						
	--------- grey		SS	6	50	14	4	216				
			SS	7	100	20						
		214.9					5	215				
	END OF BOREHOLE	5.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C18

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604388 N:4853229	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Apr 1, 2020 Date Completed: Apr 1, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 219.9 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	brown **Sand and Gravel FILL** moist	219.3	SS	1	88	5			○			
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff to very stiff	0.6	SS	2	100	12	1	219	○			
			SS	3	100	19			○			
	END OF BOREHOLE	218.1 1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C20

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604492 N:4853362	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Apr 1, 2020 Date Completed: Apr 1, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 220.2 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	brown **Sand and Gravel FILL** moist 219.8	SS	1	100	16		220	○			
	dark grey / brown 0.5 **Silty Clay / Clayey Silt FILL** trace sand, trace to some gravel, trace organics 219.0	SS	2	67	11	1		○			
	END OF BOREHOLE 1.2 Borehole was terminated due to the close proximity of existing watermain										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C21

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604570 N:4853458	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 27, 2020 Date Completed: Mar 27, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.3 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 200 mm ASPHALT	221.1										
	brown	0.2										
	Sand and Gravel FILL	220.8										
	moist	0.5	SS	1	100	9		221	○	⊠		
	dark grey / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	220.4					1					
	brown	0.9										
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff	219.7	SS	2	100	14		220	○	⊠		
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C23

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604645 N:4853563	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 27, 2020 Date Completed: Mar 27, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.3 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 150 mm ASPHALT	221.2										
	brown Sand and Gravel FILL moist	0.1 220.7	SS	1	100	16		221				
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	0.6 220.4					1					
	brown / brownish grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders very stiff to hard	0.9	SS	2	100	8		220				
			SS	3	100	23	2					
			SS	4	100	41		219				
			SS	5	100	44	3	218				
			SS	6	100	30	4	217				
	--------- grey		SS	7	100	18	5					
		216.1										
	END OF BOREHOLE	5.2										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C24

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604647 N:4853568	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Apr 1, 2020 Date Completed: Apr 1, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 220.9 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	brown **Sand and Gravel FILL** moist	220.3	SS	1	67	5						
	dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	0.6 219.7	SS	2	100	15	1	220				
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders stiff to very stiff	1.2 219.1	SS	3	58	22						
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C25

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604747 N:4853682	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 27, 2020 Date Completed: Mar 27, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
Geodetic Ground Surface Elevation: 220.9 m												
	about 150 mm ASPHALT	220.7										
	brown	0.1										
	Sand and Gravel FILL											
	moist	220.3	SS	1	100	11			○			
	dark grey	0.6										
	Silty Clay / Clayey Silt FILL	219.9						220				
	trace sand, trace gravel, trace organics	0.9					1					
	brown /brownish grey		SS	2	100	14			○			
	SILTY CLAY / CLAYEY SILT TILL											
	trace to some sand, trace gravel		SS	3	100	25		219	○			
	stiff to hard						2					
			SS	4	100	46		218	○			
		217.8					3					
	END OF BOREHOLE	3.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C27 / BH S7

wood.

Project Number:	TP115086	Drilling Location:	Culvert at Countryside Drive E:604850 N:4853816	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 26, 2020 Date Completed: Mar 26, 2020	Revision No.:	0, 8/14/20

Lithology Plot	DESCRIPTION	Elev.	Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Field Testing	Lab Testing	Instrumentation Installation	Comments & Grain Size Distribution (%)
	Geodetic Ground Surface Elevation: 217.8 m										GR SA SI CL
	about 130 mm ASPHALT	217.6									
	brown	0.1									
	Sand and Gravel FILL trace to some silt moist			SS	1	83	17				
		216.9									
	dark brown / dark grey	0.9									
	Silty Clay / Clayey Silt FILL some sand, trace to some gravel, trace organics			SS	2	100	11				
				SS	3	100	13				
		215.6									
	brown	2.2									
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders hard			SS	4	21	40				
				SS	5	100	59				
				SS	6	50	62 / 150mm	62 150 mm			
				SS	7	100	55 / 150mm	55 150 mm			
	-------- grey			SS	8	25	67				
				SS	9	100	44				
				SS	10	67	50				
		208.0									
	END OF BOREHOLE	9.8									

Field Testing: Penetration Testing — ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80

Instrumentation Installation

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▽ Groundwater encountered on completion of drilling on 3/26/2020 at a depth of: 2.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

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RECORD OF BOREHOLE No. BH C27 / BH S7

Project Number: **TP115086** Project Name: **Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Countryside Drive, Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1													

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C29

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604945 N:4853935	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 19, 2020 Date Completed: Mar 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.4 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 150 mm ASPHALT	221.2										
	brown	221.1										
	Sand and Gravel FILL moist	0.3										
	dark grey /grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics		SS	1	100	18	1	221		20		
			SS	2	83	11		220		23		
		219.9										
	brown	1.5					2					
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard		SS	3	88	36				15		
			SS	4	100	55 / 150mm		219	55 / 150 mm	13		
			SS	5	100	50 / 100mm	3		50 / 100 mm	12		
	---------							218				
	grey		SS	6	100	50 / 100mm	4		50 / 100 mm	14		
								217				
		216.5	SS	7	100	74 / 150mm			74 / 150 mm	12		
	END OF BOREHOLE	4.9										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C30

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:604944 N:4853931	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 19, 2020 Date Completed: Mar 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown **Sand and Gravel FILL** moist	220.7 0.3	SS	1	83	10						
	dark grey /brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	219.8	SS	2	100	19	1	220				
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	1.2 219.2	SS	3	25	17						
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C31

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:605023 N:4854046	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 19, 2020 Date Completed: Mar 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING			
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.7 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 150 mm ASPHALT	221.6										
	brown Sand and Gravel FILL moist	0.1 221.1	SS	1	83	11		221	○	△ 5 ○ 12		
	dark grey /brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	0.6 220.2	SS	2	100	9	1		○	⊠ ○ 21		
	brown SILTY CLAY / CLAYEY SILT TILL trace to sandy, trace gravel hard	1.5 218.7	SS	3	100	38	2	220	○	⊠ ○ 15		
	END OF BOREHOLE	3.0	SS	4	100	94	3	219	○	○⊠ ○ 15		

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▽ Groundwater encountered on completion of drilling on 3/19/2020 at a depth of: 1.5 m. ⊠ Cave in depth after removal of augers: 2.7 m.

RECORD OF BOREHOLE No. BH C32

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:605023 N:4854047	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 19, 2020	Date Completed: Mar 19, 2020	Revision No.: 0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.7 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	brown **Sand and Gravel FILL** moist	221.1	SS	1	50	8									
	dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	0.6 220.5	SS	2	100	13	1	221							
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to sandy, trace gravel hard	1.2 219.8	SS	3	100	33		220							
	END OF BOREHOLE	1.8													

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C33

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:605131 N:4854170	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 19, 2020 Date Completed: Mar 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.8 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 100 mm ASPHALT	221.7 0.1										
	brown Sand and Gravel FILL moist	221.3 0.5										
	dark grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	220.9	SS	1	83	12		221	○	⊠		
	brown	0.9					1					
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	220.2	SS	2	100	22			○	⊠		
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C35

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:605211 N:4854296	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 19, 2020 Date Completed: Mar 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 220.6 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 100 mm ASPHALT	220.5 0.1										
	brown Sand and Gravel FILL moist	220.2 0.5										
	dark grey /brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	219.7	SS	1	100	10		220	○	⊠		
	brownish grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard	0.9 219.1	SS	2	100	45	1		○	⊠		
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH C37

wood.

Project Number:	TP115086	Drilling Location:	Countryside Drive E:605295 N:4854406	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 19, 2020 Date Completed: Mar 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING			
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 220.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 90 mm ASPHALT	220.0 0.1										
	brown Sand and Gravel FILL moist	219.6 0.4										
	brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	219.1	SS	1	100	16			○	⊠		
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard	0.9 218.5	SS	2	83	47	1	219	○	⊠		
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH S8

wood.

Project Number:	TP115086	Drilling Location:	Culvert at Countryside Drive E:604854 N:4853824	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 26, 2020 Date Completed: Mar 26, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 219.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 140 mm ASPHALT	219.4										
	brown	0.1										
	Sand and Gravel FILL trace to some silt moist		SS	1	42	15		219				
		218.6										
	dark brown	0.9					1					
	Silty Clay / Clayey Silt FILL some sand, trace to some gravel, trace organics		SS	2	92	6		218				
			SS	3	83	6	2					
		217.3										
	brown	2.2										
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders hard		SS	4	100	56		217				
			SS	5	33	45	3					
			SS	6	100	72 / 150mm	4	216	72 150 mm			
	--------- trace to some shale fragments		SS	7	100	50 / 80mm		215	50 80 mm			
							5	214				
	-------- grey		SS	8	100	60	6	213				
							7	212				
			SS	9	100	31	8					
								211				
							9					
		209.9	SS	10	100	50		210				
	END OF BOREHOLE	9.7										

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▽ Groundwater encountered on completion of drilling on 3/26/2020 at a depth of: 2.4 m.

Scale: 1 : 53

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RECORD OF BOREHOLE No. BH S8

Project Number: **TP115086** Project Name: **Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Countryside Drive, Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.8 m Sand Filter: 5.8 - 6.1 m Screen: 6.1													

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S9

Project Number:	TP115086	Drilling Location:	Culvert at Countryside Drive E:604080 N:4852848	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 18, 2020 Date Completed: Mar 18, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	Geodetic Ground Surface Elevation: 214.4 m														
	about 150 mm ASPHALT	214.3													
	grey	214.2													
	Sand and Gravel FILL trace to some silt moist	0.3													
	dark brown Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel		SS	1	100	9	1	214		19					
			SS	2	83	8		213		23					
		212.6	SS	3	100	7	2			19					
	brown to grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace to some gravel, cobbles/boulders firm to hard	1.8								15					
			SS	4	100	53		212		18					
	-------- grey		SS	5	100	19	3	211		14					
			SS	6	0	50 / 30mm	4		50 / 30 mm						
			SS	7	100	50 / 80mm		210	50 / 80 mm	9					
							5	209							
			SS	8	100	50 / 100mm	6		50 / 100 mm	11					
								208							
							7								
			SS	9	100	65 / 150mm		207	65 / 150 mm	14					
							8								
								206							
							9								
		205.0	SS	10	100	65 / 150mm		205	65 / 150 mm	15					
	END OF BOREHOLE	9.4													

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH S10

Project Number:	TP115086	Drilling Location:	Culvert at Countryside Drive E:604082 N:4852848	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 18, 2020 Date Completed: Mar 18, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 213.8 m

Lithology Plot	DESCRIPTION	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Depth (m)	Field Testing: Undrained Shear Strength (kPa)	Lab Testing: W_P / W / W_L	Instrumentation Installation
	about 150 mm ASPHALT	213.6								
	brown	213.5								
	Sand and Gravel FILL trace to some silt moist	213.5 0.3	SS	1	100	7	1		16	
	brown Silty Clay / Clayey Silt FILL trace to some gravel		SS	2	100	9	2		22	
		212.3								
	brown to grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace to some gravel, cobbles/boulders very stiff to hard	1.5	SS	3	83	19	3		18	
			SS	4	75	25	4		15	
	-------- grey		SS	5	100	15	5		12	
			SS	6	100	64 / 150mm	6	64 / 150 mm	8	
			SS	7	100	53 / 150mm	7	53 / 150 mm	16	
			SS	8	100	62 / 150mm	8	62 / 150 mm	19	
			SS	9	100	75 / 150mm	9	75 / 150 mm	12	
		204.4	SS	10	100	50 / 100mm	10	50 / 100 mm	13	
	END OF BOREHOLE	9.4								

Field Testing: Penetration Testing — ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80

COMMENTS & GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL

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▽ Groundwater encountered on completion of drilling on 3/18/2020 at a depth of: 8.2 m.

Scale: 1 : 53

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RECORD OF BOREHOLE No. BH S10

Project Number: **TP115086** Project Name: **Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Countryside Drive, Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 9.1 m Screen: 6.1										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S11

Project Number:	TP115086	Drilling Location:	Culvert at Countryside Drive E:603849 N:4852560	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 24, 2020 Date Completed: Mar 24, 2020	Revision No.:	0, 8/14/20

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
	Geodetic Ground Surface Elevation: 213.2 m						
	about 200 mm ASPHALT						
	213.0						
	brown 0.2						
	Sand and Gravel FILL						
	trace to some silt						
	moist 212.6						
	0.6	SS	1	100	9		
	dark grey/brown						
	Silty Clay / Clayey Silt FILL					1	
	trace to some gravel, trace organics	SS	2	83	7		212
		SS	3	100	16	2	
	211.0						
	brown to grey 2.2						211
	SILTY SAND / SANDY SILT						
	trace gravel	SS	4	100	46		
	dense					3	
	moist to wet	SS	5	83	39		210
	---						
	grey	SS	6	83	44	4	209
		SS	7	333	35		
						5	208
						6	207
		SS	8	88	35		
	---					7	206
	trace shale fragments	SS	9	100	55 / 150mm		
						8	205
	204.7						
	brown to grey 8.5						
	SILTY CLAY / CLAYEY SILT TILL						
	trace sand to sandy, trace to some gravel, cobbles/boulders					9	
	hard 204.0	SS	10	100	50 / 80mm		204
	END OF BOREHOLE 9.2						

FIELD TESTING

Penetration Testing: ○ SPT □ PPT ● DCPT

MTO Vane*: △ Intact ▲ Remould

Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa): 20 40 60 80

55 / 150 mm

50 / 80 mm

LAB TESTING

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8

△ COV (ppm) □ TOV (ppm) 100 200 300 400

W_P W W_L

Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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▽ Groundwater encountered on completion of drilling on 3/24/2020 at a depth of: 2.1 m. ◘ Cave in depth after removal of augers: 7.6 m.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S12

wood.

Project Number:	TP115086	Drilling Location:	Culvert at Countryside Drive E:603857 N:4852567	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Countryside Drive, Brampton, Ontario	Date Started:	Mar 24, 2020 Date Completed: Mar 24, 2020	Revision No.:	0, 8/14/20

Lithology Plot	DESCRIPTION	Elev.	Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	Geodetic Ground Surface Elevation: 213.5 m								Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80		GR SA SI CL
	about 140 mm ASPHALT	213.3										
	brown	0.1										
	Sand and Gravel FILL trace to some silt moist	212.9		SS	1	100	12	213				
	darkgrey/ brown	0.6	1									
	Silty Clay / Clayey Silt FILL trace to some gravel, trace organics			SS	2	67	6	212				
				SS	3	83	7					
		211.3	2									
	brown to grey	2.2										
	SILTY SAND / SANDY SILT trace gravel compact to very dense moist to wet			SS	4	75	20	211				
			3									
	grey			SS	5	83	36	210				
				SS	6	100	91					
			4					209		104		
				SS	7	100	104					
			5					208				
		207.7		SS	8	100	50 / 30mm		50 / 30 mm			
	END OF BOREHOLE	5.8										
	Auger refusal at 5.8 m depth. 50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m; Bentonite: 0.6 - 2.1 m; Sand Filter: 2.1 - 5.8 m; Screen: 2.7											

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D1

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:606251 N:4850676	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 18, 2020 Date Completed: Feb 18, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 205.6 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 150 mm ASPHALT	205.5										
	brown Sand and Gravel FILL moist	0.1	SS	1	100	94		205		3		
		204.9										
	brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	0.7	SS	2	100	29	1			17		
		204.1						204				
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard	1.5	SS	3	100	27	2			14		
			SS	4	100	36		203		14		
		202.6					3					
	END OF BOREHOLE	3.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D2

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:606254 N:4850680	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 18, 2020 Date Completed: Feb 18, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 206.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 50 mm TOPSOIL	205.9 0.0										
	brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics		SS	1	100	6			○			
			SS	2	100	15	1	205	○			
		204.8										
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders hard	1.2 204.1	SS	3	100	36			○			
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D3

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:606138 N:4850776	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 18, 2020 Date Completed: Feb 18, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 206.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 130 mm ASPHALT	205.8										
	brown Sand and Gravel FILL moist	0.1 205.4										
	brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	0.6	SS	1	79	12						
		204.6	SS	2	100	16	1	205				
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	204.4 1.4 1.5										
	END OF BOREHOLE											

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D5

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 18, 2020	Date Completed: Feb 18, 2020	Revision No.: 0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 205.7 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 110 mm ASPHALT	205.6										
	brown **Sand and Gravel FILL** moist	0.1 205.1	SS	1	100	20		205		6 12		
	brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.6 204.5	SS	2	100	9	1			19		
	brown/grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders stiff	1.2	SS	3	58	11		204		16		
			SS	4	0	9	2	203				
			SS	5	17	14	3	202		22		
			SS	6	75	10	4			21		
			SS	7		NA		201		15		
		200.7					5					
	END OF BOREHOLE	5.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D6

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 18, 2020	Date Completed: Feb 18, 2020	Revision No.: 0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
Geodetic Ground Surface Elevation: 206.1 m															
	brown **Sand and Gravel FILL** some fines moist	205.5	SS	1	100	17		206	○	8		36	49	(15)	
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel firm to stiff	0.6	SS	2	33	8	1	205	○	14					
			SS	3	25	8			○	13					
	END OF BOREHOLE	204.3 1.8													

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D7

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605935 N:4850986	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 18, 2020 Date Completed: Feb 18, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 205.9 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 100 mm ASPHALT	205.8										
	brown Sand and Gravel FILL moist	0.1 205.3	SS	1	100	36			○	11		
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	0.6					1	205				
			SS	2	100	10			○	23		
			SS	3	100	6	2	204	○	28		
		203.7										
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	2.2										
			SS	4	100	20			○	15		
		202.9					3	203				
	END OF BOREHOLE	3.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D8

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605935 N:	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 18, 2020 Date Completed: Feb 18, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	Geodetic Ground Surface Elevation: 205.6 m										
	brown **Sand and Gravel FILL** moist	SS	1	83	22			○			
		SS	2	0	NA		205				
	204.7 **END OF BOREHOLE** 0.9 Borehole was terminated due to the exisitng Bell cable.										Borehole was terminated due to the existing utility cables.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D9

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605832 N:4851092	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 19, 2020 Date Completed: Feb 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 207.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 100 mm ASPHALT	206.9 0.1										
	brown **Sand and Gravel FILL** moist		SS	1	75	27						
		206.1										
	grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, cobbles	0.9	SS	2	83	12	1	206				
		205.5										
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D11

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605720 N:4851194	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 19, 2020 Date Completed: Feb 19, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 207.9 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Undrained Shear Strength (kPa)	LAB TESTING: Plastic / Liquid	INSTRUMENTATION INSTALLATION
	about 90 mm ASPHALT	207.9									
	brown Sand and Gravel FILL moist	0.1 207.6 0.3									
	brown Silty Clay / Clayey Silt FILL trace sand, trace gravel		SS	1	75	38				6	
			SS	2	100	14	1	207		15	
		206.4									
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff to very stiff	1.5	SS	3	83	11	2	206		20	
			SS	4	100	11				15	
			SS	5	100	22	3	205		16	
	--------- grey		SS	6	92	19	4	204		14	
			SS	7	100	16				15	
		202.9					5	203			
	END OF BOREHOLE	5.0									

Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400

W_P W W_L; Plastic Liquid 20 40 60 80

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D13

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605607 N:4851398	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 19, 2020 Date Completed: Feb 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 209.3 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 100 mm ASPHALT	209.2										
	brown Sand and Gravel FILL moist	0.1	SS	1	100	50 / 150mm		209	50 / 150 mm	4		
		208.7										
	brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, cobbles/boulders	0.6										
		208.0	SS	2	83	NA	1	208		13		
	brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders very stiff	1.2	SS	3	54	NA	2			14		
								207				
			SS	4	100	NA				14		
		206.2					3					
	END OF BOREHOLE	3.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D15

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605513 N:4851403	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 19, 2020 Date Completed: Feb 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 209.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: SPT, PPT, DCPT; MTO Vane* Intact/Remould; Nilcon Vane* Intact/Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: COV (LEL), TOV (LEL) 2 4 6 8; COV (ppm), TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 100 mm ASPHALT	209.4										
	brown Sand and Gravel FILL moist	0.1	SS	1	100	44		209	○			
		208.6					1					
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	0.9	SS	2	67	15		208	○			
		208.0										
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D17

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605385 N:4851532	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Apr 1, 2020 Date Completed: Apr 1, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 210.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 100 mm ASPHALT	210.4										
	0.1 brown **Sand and Gravel FILL** moist		SS	1	83	37	0	210	○			
		209.3	SS	2	92	9	1	209	○			
	1.2 brown / dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics		SS	3	100	10	2	208	○			
			SS	4	100	11	3	207	○			
		206.7	SS	5	100	10	4	206	○			
	3.7 grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff		SS	6	100	10	5		○			
		205.3	SS	7	83	11			○			
	5.2 **END OF BOREHOLE**											

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D18

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605387 N:4851534	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Apr 1, 2020 Date Completed: Apr 1, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 210.1 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	brown **Sand and Gravel FILL** moist	SS	1	83	12						
	209.0	SS	2	75	13	1	209				
	dark grey 1.1 **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	SS	3	63	8						
	208.2 **END OF BOREHOLE** 1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D19

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605297 N:4851614	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 19, 2020 Date Completed: Feb 19, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 210.6 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (○ SPT □ PPT ● DCPT); MTO Vane* (△ Intact ▲ Remould); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING: Soil Vapour Reading (▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400); W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
	about 90 mm ASPHALT	210.5 0.1													
	brown Sand and Gravel FILL moist	210.0	SS	1	100	47		210		5					
	brown / dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	0.6 209.7					1								
	grey SILTY CLAY / CLAYEY SILT TILL trace sand to sandy, trace gravel very stiff	0.9	SS	2	58	13				19					
			SS	3	79	23	2	209		16		2	22	49	27
			SS	4	83	29		208		16					
		207.6					3								
	END OF BOREHOLE	3.0													

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D21

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605194 N:4851719	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 19, 2020 Date Completed: Feb 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 209.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 90 mm ASPHALT	209.0 0.1										
	brown **Sand and Gravel FILL** cobbles/boulders moist		SS	1	79	48						
			SS	2	42	29	1	208				
		207.5										
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D23

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:605071 N:4851839	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 19, 2020 Date Completed: Feb 19, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 209.2 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 90 mm ASPHALT	209.1 0.1										
	brown **Sand and Gravel FILL** moist		SS	1	58	35		209		4		
		208.3					1					
	grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.9	SS	2	75	11		208		16		
		207.7					2					
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel hard to very stiff	1.5	SS	3	100	30				19		
	-------- grey		SS	4	100	36		207		20		
							3					
			SS	5	100	22		206		20		
			SS	6	0	18	4	205		19		
			SS	7	22	19	5			21		
		204.2										
	END OF BOREHOLE	5.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D25

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604975 N:4851935	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 24, 2020 Date Completed: Feb 24, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 209.1 m

Lithology Plot	DESCRIPTION	Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Elevation (m)
	about 90 mm ASPHALT	209.0					
	brown Sand and Gravel FILL moist	0.1	SS	1	100	28	
		208.1					
	grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	0.9	SS	2	100	12	208
		207.5					
	grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff to firm	1.5	SS	3	83	10	207
			SS	4	83	7	
		206.0					
	END OF BOREHOLE	3.0					

FIELD TESTING: Penetration Testing — ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Sample Number	Lab Test
1	5
2	14
3	13
4	18

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D27

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604867 N:4852040	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 24, 2020 Date Completed: Feb 24, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 208.6 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 90 mm ASPHALT	208.5 0.1										
	brown Sand and Gravel FILL moist		SS	1	100	26		208	○			
		207.7										
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics	0.9	SS	2	100	7	1		○			
		207.1										
	END OF BOREHOLE	1.5										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D29

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604765 N:4852155	Logged by:	MM
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 25, 2020 Date Completed: Feb 25, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 211.7 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 150 mm TOPSOIL	211.6										
	brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.2	SS	1	83	7						
			SS	2	100	17	1	211				
			SS	3	92	20						
		209.9						210				
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D31

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604668 N:4852236	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 210.0 m

Lithology Plot	DESCRIPTION	Elevation	Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (SPT, PPT, DCPT); MTO Vane* (Intact, Remould); Nilcon Vane* (Intact, Remould); * Undrained Shear Strength (kPa)	LAB TESTING: Soil Vapour Reading COV (LEL), TOV (LEL), COV (ppm), TOV (ppm); W_P, W, W_L; Plastic, Liquid	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 130 mm ASPHALT	209.9											
	brown Sand and Gravel FILL moist	0.1		SS	1	94	68				4		
		209.3											
	dark brown Sandy Silt FILL trace to some clay, trace gravel	0.7		SS	2	100	9	1	209		14		
				SS	3	100	9				23		
		207.8						2	208				
	grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel firm to stiff	2.2		SS	4	100	8				15		
								3	207				
				SS	5	100	9				13		
		206.5											
	END OF BOREHOLE	3.5											

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D32

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604666 N:4852234	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 208.3 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	about 110 mm ASPHALT	208.1							Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80		GR SA SI CL
	brown **Sand and Gravel FILL** moist	0.1 207.6	SS	1	100	41		208				
	dark brown **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	0.6	SS	2	92	10	1					
			SS	3	83	13		207				
		206.4										
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D33

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604548 N:4852361	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 13, 2020 Date Completed: Feb 13, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 214.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 110 mm ASPHALT	213.9 0.1										
	brown Sand and Gravel FILL moist		SS	1	89	41			○			
		213.3										
	dark brown	0.7										
	Silty Clay / Clayey Silt FILL trace sand, trace gravel		SS	2	100	14	1	213	○			
			SS	3	100	20			○			
		212.2 1.8										
	END OF BOREHOLE											

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D35

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604458 N:4852462	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 212.9 m

Lithology Plot	DESCRIPTION	Elev.	Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Field Testing: Undrained Shear Strength (kPa)	Lab Testing: Soil Vapour Reading COV (LEL)	Lab Testing: Soil Vapour Reading TOV (LEL)	Lab Testing: COV (ppm)	Lab Testing: TOV (ppm)	Lab Testing: Plastic / Liquid
	about 130 mm ASPHALT	212.8													
	brown Sand and Gravel FILL moist	212.2	0.1	SS	1	89	46				4				
	grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel, trace wood fragments in SS2		0.7	SS	2	100	11	1	212		15				
				SS	3	67	5	2	211		16				
				SS	4	89	9				20				
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to stiff	210.0	2.9	SS	5	89	16	3	210		18				
	grey							4	209						
		207.9		SS	6	89	14	5	208		15				
	END OF BOREHOLE		5.0												

Penetration Testing: SPT, PPT, DCPT; MTO Vane* Intact / Remould; Nilcon Vane* Intact / Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Soil Vapour Reading: COV (LEL) / TOV (LEL) 2 4 6 8; COV (ppm) / TOV (ppm) 100 200 300 400

W_P W W_L; Plastic 20 40 60 80 Liquid

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D36

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604437 N:4852462	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 211.9 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown **Sand and Gravel FILL** moist	211.3	SS	1	75	34			○			
	grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	0.6	SS	2	83	13	1	211	○			
			SS	3	79	13			○			
	END OF BOREHOLE	210.1 1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D37

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604335 N:4852470	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 13, 2020 Date Completed: Feb 13, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 214.5 m

Lithology Plot	DESCRIPTION	Elevation	Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
	about 110 mm ASPHALT	214.3	0.0				
	brown Sand and Gravel FILL moist		0.1	SS	1		17
		213.8	0.7				
	grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel			SS	2	100	9
				SS	3	0	0
		211.6	2.9	SS	4	100	16
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	210.9	3.5	SS	5	22	27
	END OF BOREHOLE						

FIELD TESTING: Penetration Testing — ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL

▽ No freestanding groundwater measured in open borehole on completion of drilling.

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RECORD OF BOREHOLE No. BH D38

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604336 N:4852567	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 13, 2020 Date Completed: Feb 13, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 215.3 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	brown **Sand and Gravel FILL** moist 214.7	SS	1	75	18		215	○			
	grey / brown 0.6 **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	SS	2	83	12	1		○			
		SS	3	75	9		214	○			
	213.4 **END OF BOREHOLE** 1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D39

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604234 N:4852659	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 213.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 150 mm ASPHALT	212.9										
	brown **Sand and Gravel FILL** moist	0.1	SS	1	89	34			○			
		212.3										
	dark grey **Sandy Silt FILL** trace to some clay, trace gravel	0.7	SS	2	100	9	1	212	○			
			SS	3	72	9			○			
		211.0										
	END OF BOREHOLE	2.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D40

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604138 N:4852764	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 13, 2020 Date Completed: Feb 13, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	Geodetic Ground Surface Elevation: 212.9 m											
	about 150 mm ASPHALT	212.8	SS	1	100	50 / 150mm			150 mm			
	brown **Sand and Gravel FILL** moist	0.1										
			SS	2	89	20	1	212				
		211.5										
	grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	1.4	SS	3	83	10	2	211				
			SS	4	56	7						
			SS	5	50	16	3	210				
		209.1										
	grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel firm to stiff	3.8					4	209				
			SS	6	94	8						
		207.9					5	208				
	END OF BOREHOLE	5.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D41

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604141 N:4852766	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 13, 2020 Date Completed: Feb 13, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	Geodetic Ground Surface Elevation: 213.9 m														
	about 110 mm ASPHALT	213.8	SS	1	100	50 / 150mm			150 mm	4		35	50	13	2
	brown **Sand and Gravel FILL** some silt, trace clay moist	0.1													
			SS	2	67	45	1	213		7					
		212.5													
	grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	1.4													
			SS	3	75	12	2	212		16					
		211.7													
	END OF BOREHOLE	2.1													

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D43

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604009 N:4852887	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 217.5 m

Lithology Plot	DESCRIPTION	Elevation (m)	Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
	about 130 mm ASPHALT	217.3	0.1				
	brown Sand and Gravel FILL moist	217.2	0.3	SS	1	83	12
	dark grey /brown Silty Clay / Clayey Silt FILL trace sand, trace gravel						
			1	SS	2	100	12
		216.1					
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard		1.4	SS	3	100	27
			2				
				SS	4	100	44
	grey		3				
		214.0		SS	5	89	44
	END OF BOREHOLE		3.5				

FIELD TESTING: Penetration Testing — ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading — ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D44

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:604007 N:4852886	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 216.8 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown **Sand and Gravel FILL** moist	216.7 0.1	SS	1	83	8						
	brown / dark grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel, trace organics		SS	2	75	16	1	216				
		215.6										
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	1.2	SS	3	88	27						
		215.0						215				
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D45

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603917 N:4852984	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 218.8 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 130 mm ASPHALT	218.7										
	brown	218.5 0.4										
	Sand and Gravel FILL moist	0.3	SS	1	75	9						
	brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel		SS	2	83	14	1	218				
		217.6										
	brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard	1.2	SS	3	100	36						
		217.0						217				
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D47

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603816 N:4853079	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 219.9 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 160 mm ASPHALT	219.8										
	brown Sand and Gravel FILL moist	219.6 0.3	SS	1	83	8			○	○ 21		
	dark brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel											
			SS	2	89	12	1	219	○	○ 17		
		218.5										
	brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard	1.4	SS	3	100	18	2	218	○	○ 14		
			SS	4	100	41			○	○ 14		
							3	217				
			SS	5	100	37			○	○ 14		
	---------- grey						4	216				
			SS	6	94	17			○	○ 17		
		214.9					5	215				
	END OF BOREHOLE	5.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D48

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603814 N:4853078	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 219.9 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown **Sand and Gravel FILL** moist	219.7 0.1	SS	1	75	4						
	dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel		SS	2	100	12	1	219				
		218.6										
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	1.2	SS	3	100	24						
		218.0										
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D49

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603698 N:4853200	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 220.8 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (○ SPT □ PPT ● DCPT); MTO Vane* (△ Intact ▲ Remould); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING: Soil Vapour Reading (▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400); W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
	about 120 mm ASPHALT	220.6													
	brown Sand and Gravel FILL moist	0.1 220.4 0.3	SS	1	83	6				14					
	brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel		SS	2	89	10	1	220		24					
			SS	3	100	8	2	219		16					
		218.5													
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	2.2	SS	4	100	23		218		14					
	------- grey		SS	5	100	28	3			13		2	19	48	31
	END OF BOREHOLE	217.3 3.5													

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D50

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603700 N:4853201	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 220.8 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown	220.7										
	Sand and Gravel FILL	0.1	SS	1	79	7			○			
	moist											
	brown / grey											
	Silty Clay / Clayey Silt FILL		SS	2	83	13	1	220	○			
	trace sand, trace gravel, trace organics											
		219.6										
	brown	1.2										
	SILTY CLAY / CLAYEY SILT TILL		SS	3		24			○			
	trace to some sand, trace gravel											
	very stiff							219				
		219.0										
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D51

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603599 N:4853290	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 100 mm ASPHALT	221.4 0.1										
	brown Sand and Gravel FILL moist	221.2 0.2	SS	1	89	9			○	△		
	dark brown Silty Clay / Clayey Silt FILL trace sand, trace gravel							221				
			SS	2	100	7	1		○	⊠		
		220.1										
	brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	1.4						220				
			SS	3	100	27			○	⊠		
		219.5										
	END OF BOREHOLE	2.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D53

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603497 N:4853398	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 222.0 m

Description	Depth (m)	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Field Testing	Lab Testing
about 130 mm ASPHALT	221.9							
brown Sand and Gravel FILL moist	0.1 / 221.7 / 0.3							
brown / dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics			SS	1	94	13		6
			SS	2	100	10		13
		1 / 221	SS	3	100	16		15
	219.8	2 / 220						
brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard	2.2		SS	4	100	29		15
grey		3 / 219	SS	5	100	22		16
		4 / 218						
	217.0	5 / 217	SS	6	100	36		13
END OF BOREHOLE	5.0							

Field Testing: Penetration Testing — ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Instrumentation / Installation

COMMENTS & GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH D54

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603499 N:4853399	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.7 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown **Sand and Gravel FILL** moist	221.6 0.1	SS	1	100	6			○			
	brown / dark brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	221.1 0.6						221				
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel firm to very stiff		SS	2	83	7	1		○			
			SS	3	33	23		220	○			
	END OF BOREHOLE	219.9 1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D55

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603388 N:4853502	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 222.5 m

Lithology Plot	DESCRIPTION	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Depth (m)	Elevation (m)	Field Testing	Lab Testing	Instrumentation Installation	Comments & Grain Size Distribution (%)
	about 150 mm ASPHALT	222.4										
	brown Sand and Gravel FILL moist	222.2 0.3	SS	1	89	12						
	brown / grey Silty Clay / Clayey Silt FILL trace sand, trace gravel							222				
			SS	2	94	24	1					
		221.1						221				
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard	1.4	SS	3	100	30	2					
			SS	4	100	59		220				
		219.0	SS	5	100	38	3					
	END OF BOREHOLE	3.5										

Field Testing: Penetration Testing — ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading — ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80

Comments & Grain Size Distribution (%): GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D56

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603380 N:4853532	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 222.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	brown **Sand and Gravel FILL** moist	221.9 0.2	SS	1	75	8			○	△		
	brown / dark brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	221.4 0.6										
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff to very stiff		SS	2	92	15	1	221	○	⊠		
			SS	3	46	26			○	⊠		
		220.2										
	END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D57

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Drive E:603286 N:4853614	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 223.6 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 85 mm ASPHALT	223.5 0.1										
	about 180 mm CONCRETE	223.4 0.3	SS	1	94	6			○			
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel	222.9						223				
	brown / grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff to very stiff	0.7	SS	2	100	13	1		○			
			SS	3	89	20		222	○			
		221.6										
	END OF BOREHOLE	2.0										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH S13

wood.

Project Number:	TP115086	Drilling Location:	Culvert at Clarkway Drive E:604621 N:4852286	Logged by:	MM
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 25, 2020 Date Completed: Feb 25, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 210.2 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	FIELD TESTING: SPT N	LAB TESTING: Plastic / Liquid	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
	about 80 mm ASPHALT 210.1					0	210							
	0.1 brown Sand and Gravel FILL trace to some silt moist	SS	1	100	62			4						
	209.2					1	209							
	greyish brown 1.0 Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel, trace organics	SS	2	63	8			6						
		SS	3	100	15	2	208	14						
		SS	4	100	9			12						
		SS	5	100	7	3	207	15						
	206.1					4	206							
	grey 4.1 SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	SS	6	100	27	5	205	12			3	16	50	31
	204.6					6	204							
	grey 5.6 SILTY SAND / SANDY SILT trace gravel, cobbles/boulders loose to very dense moist to wet	SS	7	133	22			19						
		SS	8	100	9	7	203	18						
	200.9	SS	9	100	55 / 130mm	8	202	55 / 130 mm	14					
	END OF BOREHOLE 9.3					9	201							

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400

PenetrationTesting: ○ SPT □ PPT ● DCPT

MTO Vane*: △ Intact ▲ Remould

Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

W_P W W_L Plastic Liquid 20 40 60 80

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▽ Groundwater encountered on completion of drilling on 2/25/2020 at a depth of: 4.3 m. ◘ Cave in depth after removal of augers: 1.5 m.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH S13

Project Number: **TP115086** Project Name: **Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Clarkway Drive, Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 4.0 m Sand Filter: 4.0 - 7.6 m Screen: 4.6													

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S14

wood.

Project Number:	TP115086	Drilling Location:	Culvert at Clarkway Drive E:604618 N:4852293	Logged by:	MM
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 25, 2020 Date Completed: Feb 25, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 210.0 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	FIELD TESTING: SPT N / PPT / DCPT	LAB TESTING: Moisture Content (%)	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
	about 90 mm ASPHALT 209.9													
	0.1													
	grey **Sand and Gravel FILL** trace to some silt moist	SS	1	100	67				4					
						1	209							
	208.7	SS	2	63	30				4, 11					
	brown to grey 1.2 **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel													
		SS	3	92	14	2	208		15					
		SS	4	63	6				14					
						3	207							
		SS	5	100	10				12					
	205.9					4	206							
	grey 4.1 **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel soft to stiff	SS	6	83	3				16					
						5	205							
						6	204							
		SS	7	133	13				22					
	202.8					7	203							
	grey 7.2 **SILTY SAND / SANDY SILT** trace to some clay, trace gravel dense to very dense moist to wet													
		SS	8	67	31	8	202		21		51	47	2	
						9	201							
	200.7	SS	9	100	60 / 150mm			60 / 150 mm	13					
	END OF BOREHOLE 9.3													

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400

PenetrationTesting: ○ SPT □ PPT ● DCPT

MTO Vane*: △ Intact ▲ Remould

Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

W_P W W_L Plastic Liquid 20 40 60 80

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▽ Groundwater encountered on completion of drilling on 2/25/2020 at a depth of: 4.1 m.

RECORD OF BOREHOLE No. BH S15

wood.

Project Number:	TP115086	Drilling Location:	Culvert at Clarkway Drive E:604169 N:4852729	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 24, 2020 Date Completed: Feb 24, 2020	Revision No.:	0, 8/14/20

Geodetic Ground Surface Elevation: 212.7 m

Lithology Plot	DESCRIPTION	Elev.	Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
	about 100 mm ASPHALT	212.6	0.1				
	grey Sand and Gravel FILL trace to some silt moist			SS	1	79	37
		211.8					
	brown Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel		0.9	SS	2	42	14
				SS	3	100	8
		210.5	2.2				
	grey SILTY CLAY / CLAYEY SILT TILL trace sand to sandy, trace gravel, cobbles/boulders very stiff to hard			SS	4	185	25
				SS	5	100	68 / 180mm
				SS	6	46	20
				SS	7	100	67 / 250mm
				SS	8	100	92 / 250mm
				SS	9	89	94
		203.2		SS	10	100	59 / 150mm
	END OF BOREHOLE		9.4				

FIELD TESTING: Penetration Testing — ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L; Plastic Liquid 20 40 60 80

Depth (m)	Elevation (m)	Undrained Shear Strength (kPa)	Plastic / Liquid
1	212		3
2	211		16
			20
3	210		20
4	209	68 / 180 mm	16
5	208		11
6	207	67 / 250 mm	10
7	206	92 / 250 mm	18
8	205		22
9	204	59 / 150 mm	19

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
6	31	46	17

▽ No freestanding groundwater measured in open borehole on completion of drilling. ◘ Cave in depth after removal of augers: 9.4 m.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH S16

wood.

Project Number:	TP115086	Drilling Location:	Culvert at Clarkway Drive E:604158 N:4852745	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 24, 2020 Date Completed: Feb 24, 2020	Revision No.:	0, 8/14/20

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 213.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	about 90 mm ASPHALT	213.0 0.1										
	grey **Sand and Gravel FILL** trace to some silt moist		SS	1	100	32				11		
		212.1					1	212				
	dark grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel	0.9	SS	2	83	14				12		
			SS	3	100	8	2	211		24		
		210.8										
	brown to grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders very stiff to hard	2.2	SS	4	100	22				16		
			SS	5	100	37	3	210		14		
			SS	6	100	29	4	209		12		
	--------- grey		SS	7	100	62				9		
							5	208				
			SS	8	100	50 / 100mm	6	207	50 / 100 mm	12		
							7	206				
			SS	9	100	70 / 150mm			70 / 150 mm	8		
							8	205				
							9	204				
			SS	10	100	71				16		
		203.3										
	END OF BOREHOLE	9.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH S16

wood.

Project Number: **TP115086** Project Name: **Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)**

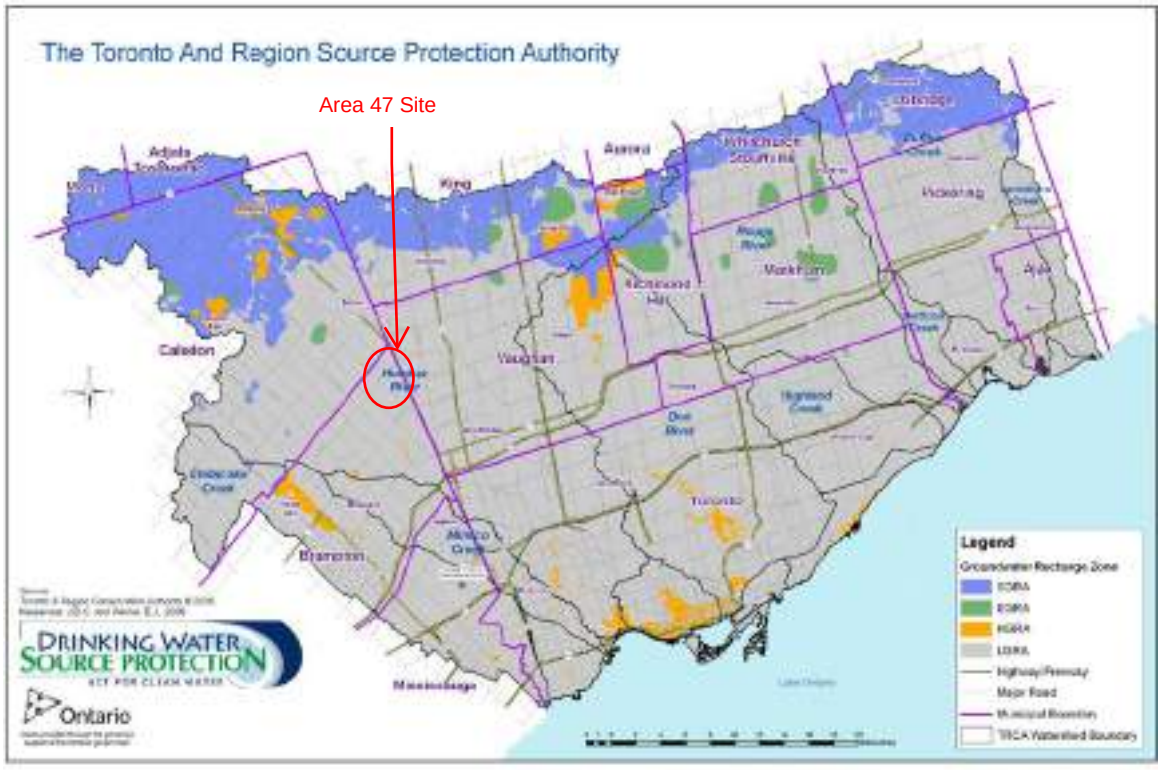
Project Location: **Clarkway Drive, Brampton, Ontario**

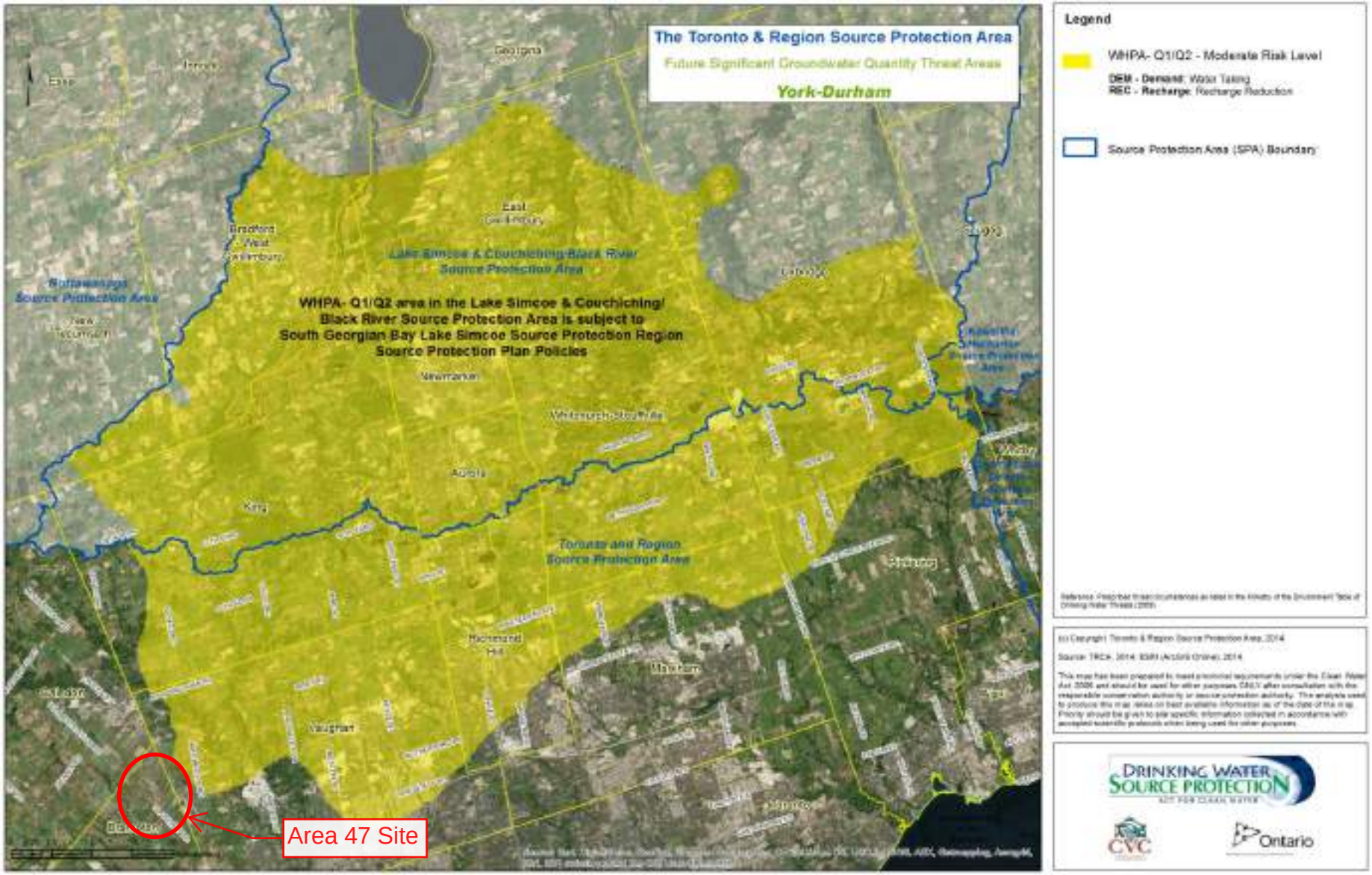
LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 9.1 m Screen: 6.1													

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Figure C 10: Recharge Area Classification





Map 3.4: York-Durham – Future Significant Groundwater Quantity Threat Areas

Appendix B: Supporting Calculations

wood.

Catchment	Subcatchments	NHYD	Area (ha)	TIMP (ha)	XIMP (ha)	TIMP (%)	XIMP (%)	100-Year 6-Hour AES (Bloor, TRCA) PKFW (m3/s)	100-Year 12-Hour AES (Bloor, TRCA) PKFW (m3/s)	Regional - Hazel PKFW (m3/s)	100-Year Rational Method (City's IDF) PKFW (m3/s)
C6	CL1	201	1.07	0.49	0.30	0.46	0.28	0.179	0.102	0.151	0.417
G8	CL2	202	4.20	2.04	1.36	0.49	0.32	0.712	0.405	0.594	1.695
C4	CL3	203	3.35	1.86	1.26	0.56	0.38	0.586	0.332	0.477	1.449
C3	CL4	204	2.46	1.15	0.66	0.47	0.27	0.413	0.235	0.348	0.976
R1	CL5	205	1.98	1.22	0.88	0.62	0.45	0.356	0.200	0.284	0.905
R1	CL6	206	1.95	1.43	1.17	0.74	0.60	0.367	0.205	0.282	0.984
C2	CL7	207	1.93	1.49	1.22	0.77	0.63	0.367	0.205	0.280	1.003
G7	CS10 & CS11	208	0.73	0.49	0.37	0.67	0.50	0.134	0.075	0.105	0.351
G6	CS12	209	0.49	0.33	0.25	0.67	0.51	0.090	0.050	0.070	0.235
G4	CS13 & CS14	210	0.74	0.49	0.37	0.67	0.50	0.136	0.076	0.106	0.352
C5a	CS9	211	0.88	0.63	0.49	0.71	0.55	0.164	0.092	0.127	0.438
R3	EW1	212	2.33	1.65	1.29	0.71	0.55	0.434	0.242	0.336	1.154
G5a	EW2	213	1.55	0.93	0.66	0.60	0.42	0.276	0.156	0.222	0.699
G3	EW3	214	1.47	1.00	0.76	0.68	0.52	0.270	0.151	0.212	0.708
C1	EW4	215	1.22	0.82	0.62	0.67	0.51	0.224	0.125	0.175	0.584
G1	EW5	216	0.27	0.18	0.14	0.67	0.50	0.049	0.028	0.039	0.130
G2	EW6	217	0.98	0.67	0.51	0.68	0.52	0.180	0.101	0.141	0.475
R8	CS1 & CS2	218	1.77	1.35	1.06	0.76	0.60	0.336	0.187	0.257	0.916
R6	CS3	219	0.98	0.78	0.61	0.79	0.62	0.188	0.105	0.142	0.518
R7a	CS5	220	1.54	1.14	0.89	0.74	0.58	0.290	0.162	0.223	0.782
R4b	CS6	221	0.34	0.26	0.22	0.78	0.64	0.065	0.036	0.049	0.178
R5	CS7	222	1.01	0.77	0.60	0.76	0.59	0.192	0.107	0.146	0.521

Runoff Generated from the 90th Percentile Rainfall Event (27mm)

Subcatchment	Total Area (ha)	Pervious Area (ha)		Impervious Area (ha)			27 mm Runoff Volume (m^3)	
		Proposed	Existing	Proposed	Existing	Net	Total Imp Area	Net Increase
Countryside Drive								
CS1	1.46	0.34	1.19	1.13	0.27	0.85	304.3	230.3
CS2	0.30	0.08	0.18	0.23	0.12	0.10	60.9	28.0
CS3	0.98	0.21	0.60	0.77	0.38	0.40	209.2	107.1
CS5	1.54	0.40	1.40	1.14	0.15	0.99	307.7	268.4
CS6	0.34	0.08	0.34	0.26	0.00	0.26	71.5	71.0
CS7	1.01	0.24	1.00	0.77	0.01	0.76	207.1	204.6
CS9	0.88	0.26	0.53	0.63	0.35	0.28	169.7	74.3
CS10	0.54	0.18	0.31	0.36	0.23	0.13	97.2	36.2
CS11	0.19	0.06	0.10	0.13	0.09	0.04	35.3	10.4
CS12	0.49	0.16	0.48	0.33	0.01	0.32	88.6	86.2
CS13	0.54	0.18	0.54	0.36	0.00	0.36	97.2	97.2
CS14	0.20	0.07	0.20	0.13	0.00	0.13	35.8	35.8
Clarkway Drive								
CL1	1.07	0.58	1.06	0.49	0.00	0.48	131.2	130.1
CL2	4.20	2.16	3.13	2.04	1.07	0.97	550.5	261.6
CL3	3.35	1.49	2.75	1.86	0.60	1.26	503.1	340.9
CL4	2.46	1.31	1.79	1.15	0.67	0.48	310.6	129.4
CL5	1.98	0.76	1.81	1.22	0.17	1.05	329.4	284.1
CL6	1.95	0.51	1.28	1.43	0.67	0.76	386.3	206.5
CL7	1.93	0.44	1.48	1.49	0.45	1.04	401.6	279.7
E-W Arterial A2								
EW1	2.33	0.68	2.33	1.65	0.00	1.65	445.9	445.9
EW2	1.55	0.62	1.43	0.93	0.12	0.81	251.2	218.0
EW3	1.47	0.47	1.45	1.00	0.02	0.98	268.7	263.7
EW4	1.22	0.40	1.18	0.82	0.03	0.79	220.8	212.3
EW5	0.27	0.09	0.27	0.18	0.00	0.18	49.0	49.0
EW6	0.98	0.31	0.96	0.67	0.02	0.65	180.8	175.7

Runoff Generated from a 5mm Rainfall Event

Subcatchment	Impervious Area (ha)	5 mm Runoff Volume (m^3)
Countryside Drive		
CS1	1.13	56.35
CS2	0.23	11.27
CS3	0.77	38.75
CS5	1.14	56.98
CS6	0.26	13.24
CS7	0.77	38.35
CS9	0.63	31.44
CS10	0.36	18.00
CS11	0.13	6.53
CS12	0.33	16.41
CS13	0.36	18.00
CS14	0.13	6.64
Clarkway Drive		
CL1	0.49	24.30
CL2	2.04	101.95
CL3	1.86	93.17
CL4	1.15	57.51
CL5	1.22	61.00
CL6	1.43	71.53
CL7	1.49	74.37
E-W Arterial A2		
EW1	1.65	82.58
EW2	0.93	46.52
EW3	1.00	49.77
EW4	0.82	40.88
EW5	0.18	9.07
EW6	0.67	33.48

Pre-Development Water Balance Volume Calculations - Countryside Drive

Notes: Ratios of runoff, evapotranspiration, and infiltration as per Table 3.1 of MOE SWMPDM 2003

Drainage Area Table (ha)

Land Cover	Soil Group	Subcatchment CS1	Subcatchment CS2	Subcatchment CS3	Subcatchment CS5	Subcatchment CS6	Subcatchment CS7	Subcatchment CS9	Subcatchment CS10	Subcatchment CS11	Subcatchment CS12	Subcatchment CS13	Subcatchment CS14
		Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)
Pervious Area	A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1.19	0.18	0.60	1.40	0.34	1.00	0.53	0.31	0.10	0.48	0.54	0.20
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Impervious Area	N/A	0.27	0.12	0.38	0.15	0.00	0.01	0.35	0.23	0.09	0.01	0.00	0.00
Totals		**1.47**	**0.30**	**0.98**	**1.54**	**0.34**	**1.01**	**0.88**	**0.54**	**0.20**	**0.49**	**0.54**	**0.20**

Soil Group Weighting (per Table 3.1 of SWMPDM 2003)

Soil Group	Runoff	Infiltration	Evapotranspiration	Precipitation
A	149	276	515	940
B	187	228	525	940
C	222	182	536	940
D	270	145	525	940
A	16%	29%	55%	100%
B	20%	24%	56%	100%
C	24%	19%	57%	100%
D	29%	15%	56%	100%

Annual Soil Infiltration (mm)

Year Range	Average Annual Precipitation (mm)	Soil A Infiltration (mm)	Soil B Infiltration (mm)	Soil C Infiltration (mm)	Soil D Infiltration (mm)
1995 - 2019	797.6	234.19	193.46	154.43	123.03

Annual Subcatchment Infiltration (m^3)

Subcatchment #:	Subcatchment CS1	Subcatchment CS2	Subcatchment CS3	Subcatchment CS5	Subcatchment CS6	Subcatchment CS7	Subcatchment CS9	Subcatchment CS10	Subcatchment CS11	Subcatchment CS12	Subcatchment CS13	Subcatchment CS14
Volume:	1839.23	281.06	929.65	2154.26	523.51	1544.27	820.01	481.81	159.06	742.80	830.82	305.77

Daily Subcatchment Infiltration (m^3)

Subcatchment #:	Subcatchment CS1	Subcatchment CS2	Subcatchment CS3	Subcatchment CS5	Subcatchment CS6	Subcatchment CS7	Subcatchment CS9	Subcatchment CS10	Subcatchment CS11	Subcatchment CS12	Subcatchment CS13	Subcatchment CS14
Volume:	5.04	0.77	2.55	5.90	1.43	4.23	2.25	1.32	0.44	2.04	2.28	0.84

Pre-Development Water Balance Volume Calculations - Clarkway Drive

Notes: Ratios of runoff, evapotranspiration, and infiltration as per Table 3.1 of MOE SWMPDM 2003

Drainage Area Table (ha)

Land Cover	Soil Group	Subcatchment CL1	Subcatchment CL2	Subcatchment CL3	Subcatchment CL4	Subcatchment CL5	Subcatchment CL6	Subcatchment CL7
		Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)
Pervious Area	A	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	C	1.06	3.13	2.75	1.79	1.81	1.28	1.48
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Impervious Area	N/A	0.00	1.07	0.60	0.67	0.17	0.67	0.45
Totals		**1.07**	**4.20**	**3.35**	**2.47**	**1.98**	**1.95**	**1.93**

Soil Group Weighting (per Table 3.1 of SWMPDM 2003)

Soil Group	Runoff	Infiltration	Evapotranspiration	Precipitation
A	149	276	515	940
B	187	228	525	940
C	222	182	536	940
D	270	145	525	940
A	16%	29%	55%	100%
B	20%	24%	56%	100%
C	24%	19%	57%	100%
D	29%	15%	56%	100%

Annual Soil Infiltration (mm)

Year Range	Average Annual Precipitation (mm)	Soil A Infiltration (mm)	Soil B Infiltration (mm)	Soil C Infiltration (mm)	Soil D Infiltration (mm)
1995 - 2019	797.6	234.19	193.46	154.43	123.03

Annual Subcatchment Infiltration (m^3)

Subcatchment #:	Subcatchment CL1	Subcatchment CL2	Subcatchment CL3	Subcatchment CL4	Subcatchment CL5	Subcatchment CL6	Subcatchment CL7
Volume:	1641.56	4836.67	4245.21	2770.43	2798.22	1976.67	2277.80

Daily Subcatchment Infiltration (m^3)

Subcatchment #:	Subcatchment CL1	Subcatchment CL2	Subcatchment CL3	Subcatchment CL4	Subcatchment CL5	Subcatchment CL6	Subcatchment CL7
Volume:	4.50	13.25	11.63	7.59	7.67	5.42	6.24

Pre-Development Water Balance Volume Calculations - E-W Arterial A2

Notes: Ratios of runoff, evapotranspiration, and infiltration as per Table 3.1 of MOE SWMPDM 2003

Drainage Area Table (ha)

Land Cover	Soil Group	Subcatchment EW1	Subcatchment EW2	Subcatchment EW3	Subcatchment EW4	Subcatchment EW5	Subcatchment EW6
		Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)	Contributing Area (ha)
Pervious Area	A	0.00	0.00	0.00	0.00	0.00	0.00
	B	0.00	0.00	0.00	0.00	0.00	0.00
	C	2.33	1.43	1.45	1.19	0.27	0.96
	D	0.00	0.00	0.00	0.00	0.00	0.00
Impervious Area	N/A	0.00	0.12	0.02	0.03	0.00	0.02
Totals		**2.33**	**1.56**	**1.47**	**1.22**	**0.27**	**0.98**

Soil Group Weighting (per Table 3.1 of SWMPDM 2003)

Soil Group	Runoff	Infiltration	Evapotranspiration	Precipitation
A	149	276	515	940
B	187	228	525	940
C	222	182	536	940
D	270	145	525	940
A	16%	29%	55%	100%
B	20%	24%	56%	100%
C	24%	19%	57%	100%
D	29%	15%	56%	100%

Annual Soil Infiltration (mm)

Year Range	Average Annual Precipitation (mm)	Soil A Infiltration (mm)	Soil B Infiltration (mm)	Soil C Infiltration (mm)	Soil D Infiltration (mm)
1995 - 2019	797.6	234.19	193.46	154.43	123.03

Annual Subcatchment Infiltration (m^3)

Subcatchment #:	Subcatchment EW1	Subcatchment EW2	Subcatchment EW3	Subcatchment EW4	Subcatchment EW5	Subcatchment EW6
Volume:	3604.34	2211.40	2239.20	1829.96	418.50	1487.14

Daily Subcatchment Infiltration (m^3)

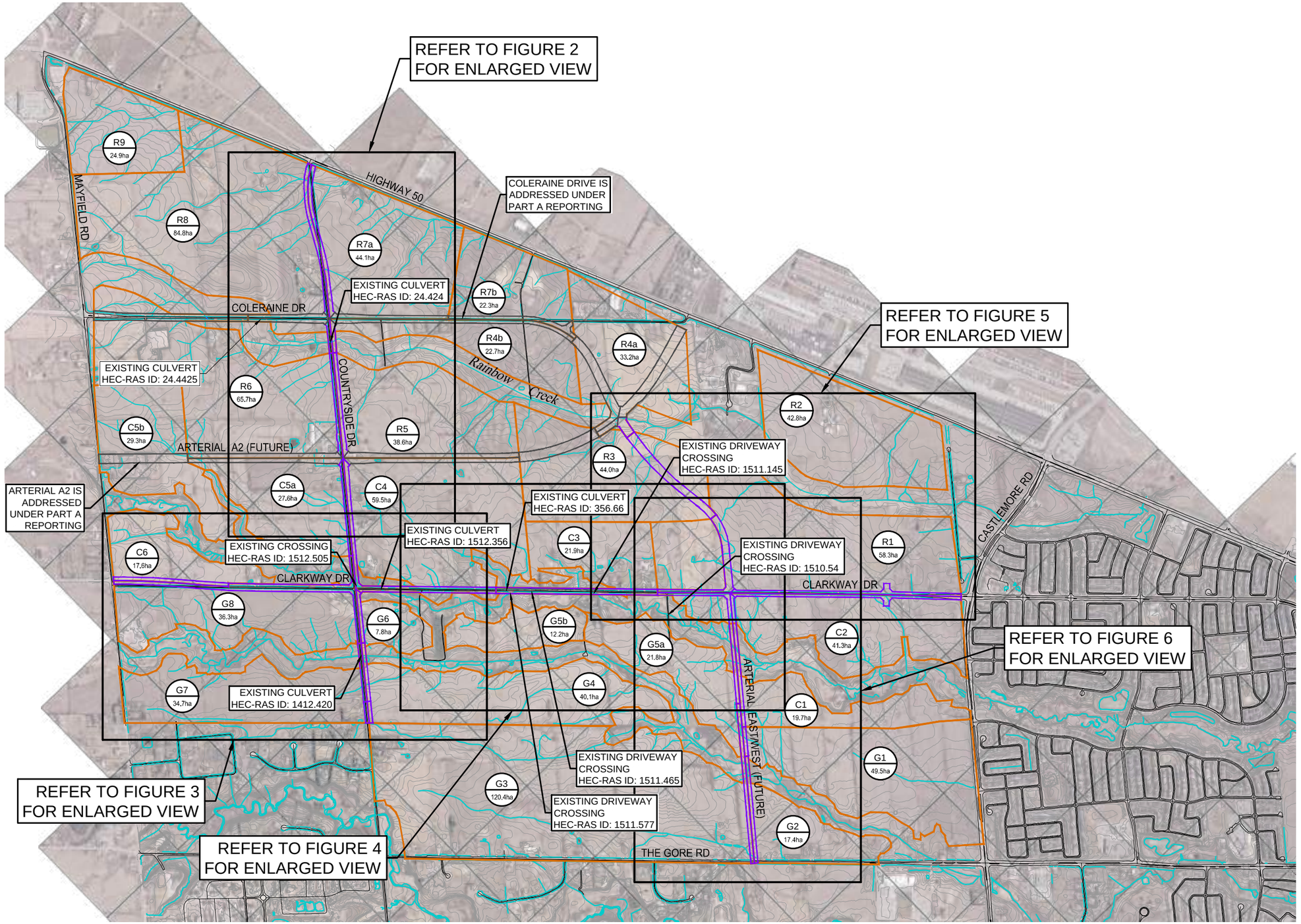
Subcatchment #:	Subcatchment EW1	Subcatchment EW2	Subcatchment EW3	Subcatchment EW4	Subcatchment EW5	Subcatchment EW6
Volume:	9.87	6.06	6.13	5.01	1.15	4.07

Borehole Log ID	BH Plan Station	Road Profile Station	Ground Surface Elevation (m)	End of Borehole Elevation (m)	GW Depth (m)	GW Level Elev. (m)	Proposed Road Surface Elevation (m)	GW Depth from Proposed Road Surface (m)
Countryside Drive								
C1	0+000	10+20	215.8	212.8	(Dry)	-	215.7	>2.9
C2	0+000	10+20	215.1	213.2	(Dry)	-	215.7	>2.5
C3	0+150	10+170	216.5	215.0	(Dry)	-	216.4	>1.4
C5	0+300	10+320	214.6	209.7	3	211.6	215.5	3.9
C6	0+300	10+320	214.6	213.0	(Dry)	-	215.5	>2.5
S11	0+330	10+350	213.2	204.0	2.1	211.1	215.6	4.5
S12	0+344	10+364	213.5	207.7	(Dry)	-	215.7	>8
C7	0+450	10+470	216.5	213.5	(Dry)	-	216.2	>2.7
C8	0+450	10+470	216.6	214.8	(Dry)	-	216.2	>1.4
C9	0+600	10+620	218.3	216.8	(Dry)	-	217.0	>0.2
S9	0+693	10+713	214.4	205.0	(Dry)	-	217.5	>12.5
S10	0+705	10+725	213.8	204.4	8.2	205.6	217.5	11.9
C11	0+750	10+770	215.2	210.0	4.9	210.3	217.8	7.5
C12	0+750	10+770	213.6	212.4	(Dry)	-	217.8	>5.4
C13	0+900	10+920	219.0	215.9	(Dry)	-	218.5	>2.6
C15	1+050	11+70	219.7	218.2	(Dry)	-	219.3	>1.1
C17	1+200	11+220	219.9	214.9	(Dry)	-	220.1	>5.2
C18	1+200	11+220	219.9	218.1	(Dry)	-	220.1	>2
C20	1+350	11+370	220.2	219.0	(Dry)	-	220.8	>1.8
C21	1+500	11+520	221.3	219.7	(Dry)	-	221.6	>1.9
C23	1+650	11+670	221.3	220.4	(Dry)	-	222.2	>1.8
C24	1+650	11+670	220.9	219.1	(Dry)	-	222.2	>3.1
C25	1+800	11+820	220.9	217.8	(Dry)	-	222.5	>4.7
S8	1+945	11+965	219.5	209.9	2.4	217.1	222.3	5.2
C27	1+950	11+970	217.8	208.0	2.7	215.1	222.3	7.2
C29	2+100	12+120	221.4	216.5	(Dry)	-	221.6	>5.1
C30	2+100	12+120	221.0	219.2	(Dry)	-	221.6	>2.4
C31	2+250	12+270	221.7	218.7	1.5	220.2	220.9	0.7
C32	2+250	12+270	221.7	219.8	(Dry)	-	220.9	>1.1
C33	2+400	12+420	221.8	220.2	(Dry)	-	220.1	-
C35	2+550	12+570	220.6	219.1	(Dry)	-	219.4	>0.3
C37	2+700	12+720	220.0	218.5	(Dry)	-	218.6	>0.1

Borehole Log ID	BH Plan Station	Road Profile Station	Ground Surface Elevation (m)	End of Borehole Elevation (m)	GW Depth (m)	GW Level Elev. (m)	Proposed Road Surface Elevation (m)	GW Depth from Proposed Road Surface (m)
Clarkway Drive								
D1	0+000	14+310	205.6	202.6	(Dry)	-	205.6	>3
D2	0+000	14+310	206.0	204.1	(Dry)	-	206.0	>1.9
D3	0+150	14+160	206.0	204.4	(Dry)	-	206.3	>1.9
D5	0+300	14+10	205.7	200.7	(Dry)	-	206.3	>5.6
D6	0+300	14+10	206.1	204.3	(Dry)	-	206.3	>2
D7	0+450	13+860	205.9	202.9	(Dry)	-	206.0	>3.1
D8	0+450	13+860	205.6	204.7	(Dry)	-	206.0	>1.3
D9	0+600	13+710	207.0	205.5	(Dry)	-	206.9	>1.4
D11	0+750	13+560	207.9	202.9	(Dry)	-	207.8	>4.9
D13	0+900	13+410	209.3	206.2	(Dry)	-	208.8	>2.6
D15	1+050	13+260	209.5	208.0	(Dry)	-	209.8	>1.8
D17	1+200	13+110	210.5	205.3	(Dry)	-	210.7	>5.4
D18	1+200	13+110	210.1	208.2	(Dry)	-	210.7	>2.5
D19	1+350	12+960	210.6	207.6	(Dry)	-	211.4	>3.8
D21	1+500	12+810	209.0	207.5	(Dry)	-	210.9	>3.4
D23	1+650	12+660	209.2	204.2	(Dry)	-	210.0	>5.8
D25	1+800	12+510	209.1	206.0	(Dry)	-	209.2	>3.2
D27	1+950	12+360	208.6	207.1	(Dry)	-	208.9	>1.8
D29	2+100	12+210	211.7	209.9	(Dry)	-	210.1	>0.2
D31	2+250	12+60	210.0	206.5	(Dry)	-	211.5	>4.9
D32	2+250	12+60	208.3	206.4	(Dry)	-	211.5	>5
D33	2+400	11+910	214.0	212.2	(Dry)	-	212.6	>0.4
D35	2+550	11+760	212.9	207.9	(Dry)	-	213.7	>5.8
D36	2+550	11+760	211.9	210.1	(Dry)	-	213.7	>3.6
D37	2+700	11+610	214.5	210.9	(Dry)	-	214.8	>3.9
D38	2+700	11+610	215.3	213.4	(Dry)	-	214.8	>1.4
D39	2+850	11+460	213	211	(Dry)	-	215.8	>4.8
D40	2+850	11+460	212.9	207.9	(Dry)	-	215.8	>7.9
D41	3+000	11+310	213.9	211.7	(Dry)	-	216.9	>5.2
D43	3+150	11+160	217.5	214	(Dry)	-	217.9	>3.9
D44	3+150	11+160	216.8	215	(Dry)	-	217.9	>2.9
D45	3+300	11+10	218.8	217	(Dry)	-	219.0	>2
D47	3+450	10+860	219.9	214.9	(Dry)	-	220.1	>5.2
D48	3+450	10+860	219.9	218	(Dry)	-	220.1	>2.1
D49	3+600	10+710	220.8	217.3	(Dry)	-	221.1	>3.8
D50	3+600	10+710	220.8	219	(Dry)	-	221.1	>2.1
D51	3+750	10+560	221.5	219.5	(Dry)	-	222.2	>2.7
D53	3+900	10+410	222	217	(Dry)	-	223.2	>6.2
D54	3+900	10+410	221.7	219.9	(Dry)	-	223.2	>3.3
D55	4+050	10+260	222.5	219	(Dry)	-	224.3	>5.3
D56	4+050	10+260	222	220.2	(Dry)	-	224.3	>4.1
D57	4+200	10+110	223.6	221.6	(Dry)	-	225.4	>3.8

Appendix C: Plans

wood.



LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 44.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(EXISTING CONDITION)

wood.

Scale 1:10000 (0 100 200 400)
Consultant File No. TP115086
Plan No. 1

Plotted: 2021-11-05
Last Saved: 2021-11-05
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
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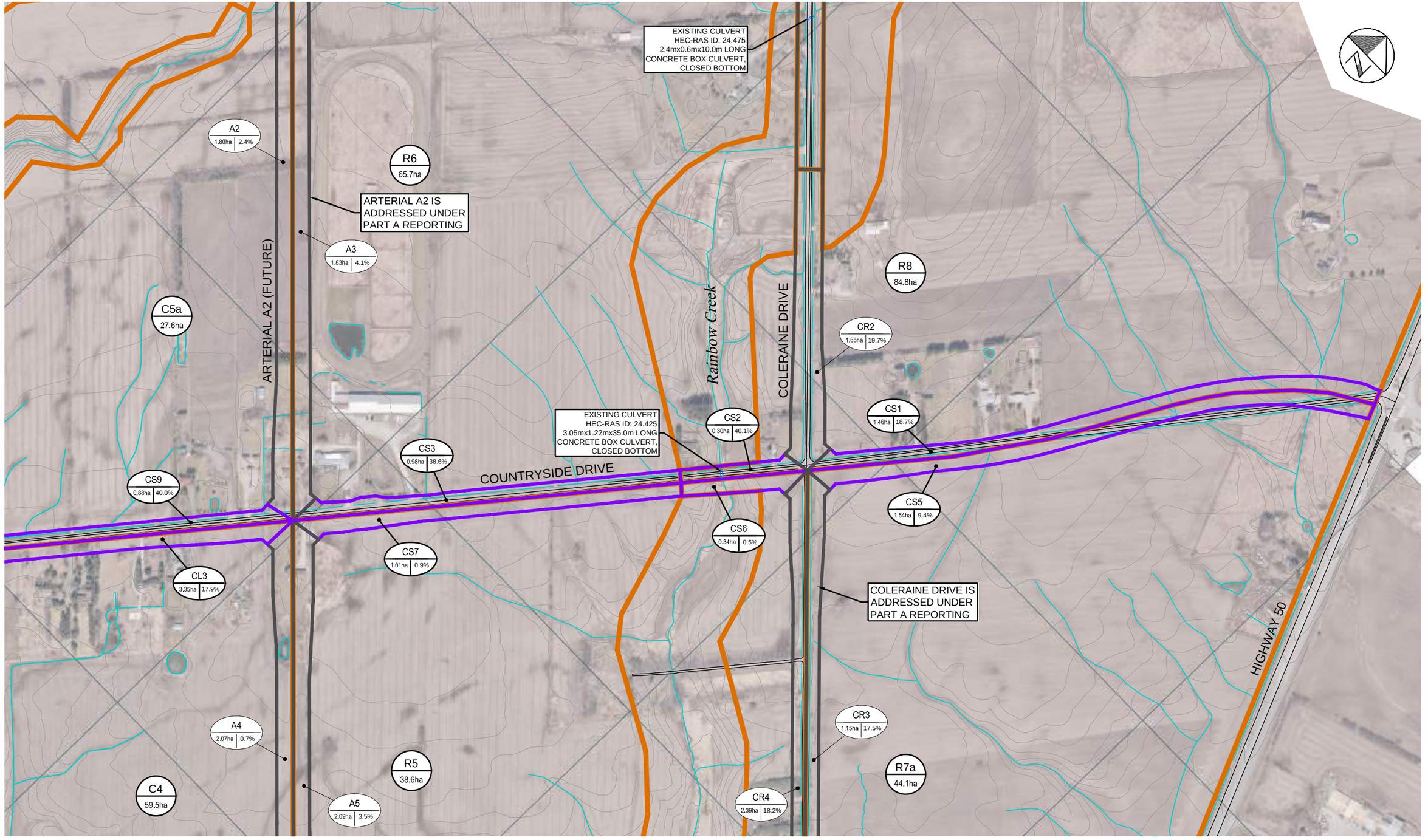

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(EXISTING CONDITION)

wood.

Scale 1:2500 (0 25 50 100)
Consultant File No. TP115086
Plan No. 2

Path: I:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2021-06(PtB)\Fig2-6 Catchment-Exs(PtB).dwg
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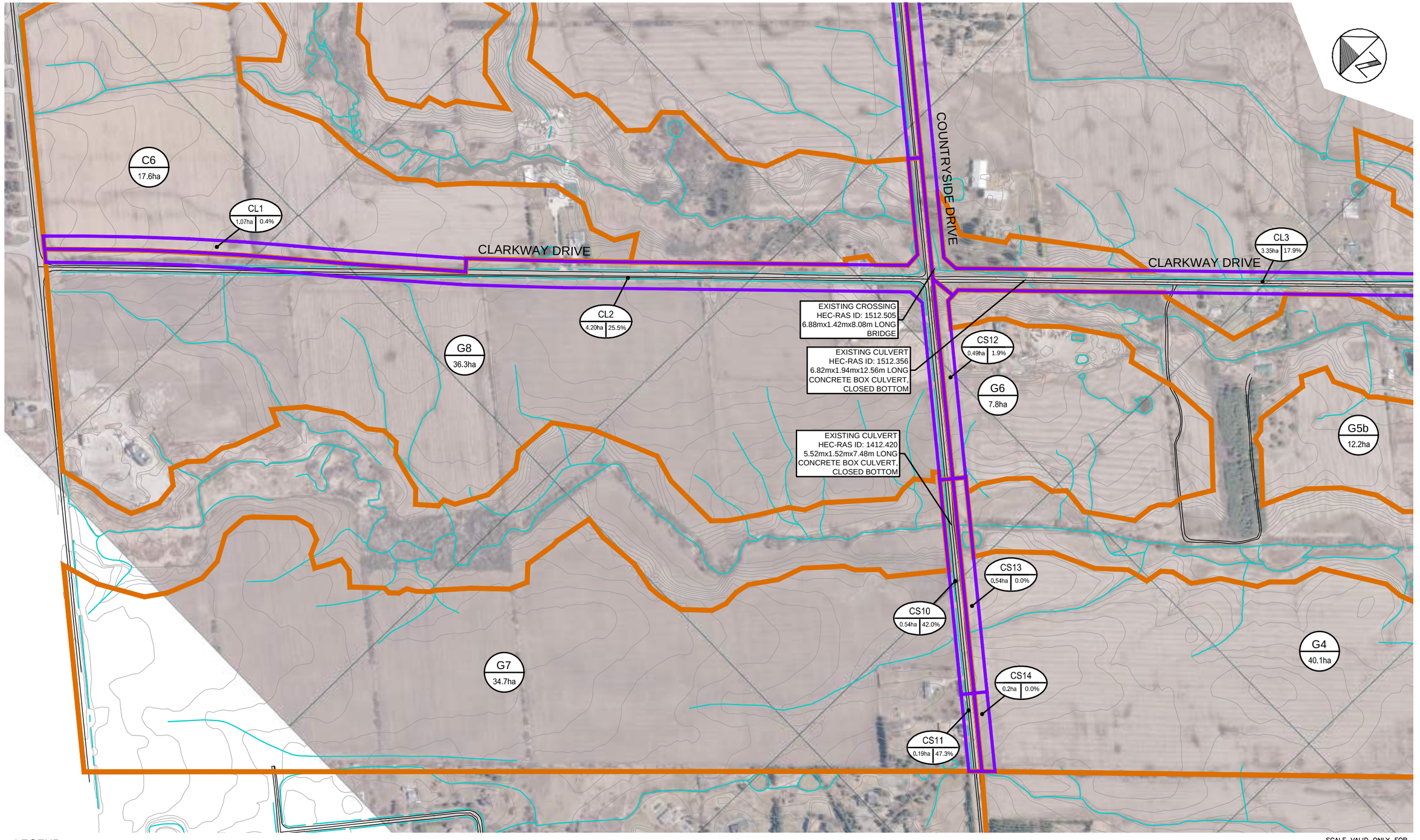
Last Saved By: richard.bartolo
Plotted: 2021-11-05
Last Saved: 2021-11-05



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LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 (0.75ha | 73.4%) — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 (0.75ha | 73.4%) — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 (25.0ha) — SUBCATCHMENT ID# / SUBCATCHMENT AREA

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(EXISTING CONDITION)

wood.

Scale 1:2500 (0 25 50 100)
Consultant File No. TP115086
Plan No. 3

C4
59.5ha

R3
44.0ha

EW1
2.33ha | 0.0%

R1
58.3ha

C3
21.9ha

ARTERIAL EAST/WEST (FUTURE)

EXISTING CULVERT
HEC-RAS ID: 356.66
1.5mØx12.0m LONG
CIRCULAR CULVERT

EXISTING DRIVEWAY CROSSING
HEC-RAS ID: 1511.145
4.1mx1.41mx5.43m LONG
BRIDGE

EXISTING DRIVEWAY CROSSING
HEC-RAS ID: 1510.546
5.28mx2.08mx5.19m LONG
BRIDGE

CL3
3.35ha | 17.9%

CL4
2.46ha | 27.2%

CL5
1.98ha | 8.5%

CL6
1.95ha | 34.2%

CLARKWAY DRIVE

CLARKWAY DRIVE

EW2
1.55ha | 7.9%

EW4
1.22ha | 2.6%

CL7
1.93ha | 23.4%

C2
41.3ha

EXISTING DRIVEWAY CROSSING
HEC-RAS ID: 1511.465
4.9mx1.84mx5.01m LONG
BRIDGE

EXISTING DRIVEWAY CROSSING
HEC-RAS ID: 1511.577
6.5mx2.0mx4.47m LONG
BRIDGE

G5b
12.2ha

G5a
21.8ha

G4
40.1ha

C1
19.7ha

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'
- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA

ROAD DRAINAGE 'PART B'
- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA

MESP DEVELOPMENT DRAINAGE
- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(EXISTING CONDITION)

wood.

Scale 1:2500
0 25 50 100

Consultant File No.
TP115086

Plan No.
4

Path: i:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PRO\2021-06(PTB).Fig2-6 Catchment-Exs(PTB).dwg
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Plotted: 2021-11-05
Last Saved: 2021-11-05

COLERAINE DRIVE AND ARTERIAL A2 ARE ADDRESSED UNDER PART A REPORTING

CR6 2.39ha 0.0%

A8 2.68ha 0.0%

A7 0.33ha 0.0%

CR7 0.49ha 0.0%

ARTERIAL EAST/WEST (FUTURE)

R2 42.8ha

Rainbow Creek

R3 44.0ha

EW1 2.33ha 0.0%

C3 21.9ha

EXISTING DRIVEWAY CROSSING
HEC-RAS ID: 1511.145
4.1mx1.41mx5.43m LONG BRIDGE

EXISTING DRIVEWAY CROSSING
HEC-RAS ID: 1510.546
5.28mx2.08mx5.19m LONG BRIDGE

CL5 1.98ha 8.5%

CLARKWAY DRIVE

ARTERIAL EAST/WEST (FUTURE)

R1 58.3ha

CL6 1.95ha 34.2%

CLARKWAY DRIVE

CASTLEMORE ROAD

EW2 1.55ha 7.9%

EW4 1.22ha 2.6%

CL7 1.93ha 23.4%

C2 41.3ha

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4%
  - SUBCATCHMENT ID#
  - PERCENTAGE OF IMPERVIOUS AREA
  - SUBCATCHMENT AREA

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4%
  - SUBCATCHMENT ID#
  - PERCENTAGE OF IMPERVIOUS AREA
  - SUBCATCHMENT AREA

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha
  - SUBCATCHMENT ID#
  - SUBCATCHMENT AREA

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(EXISTING CONDITION)

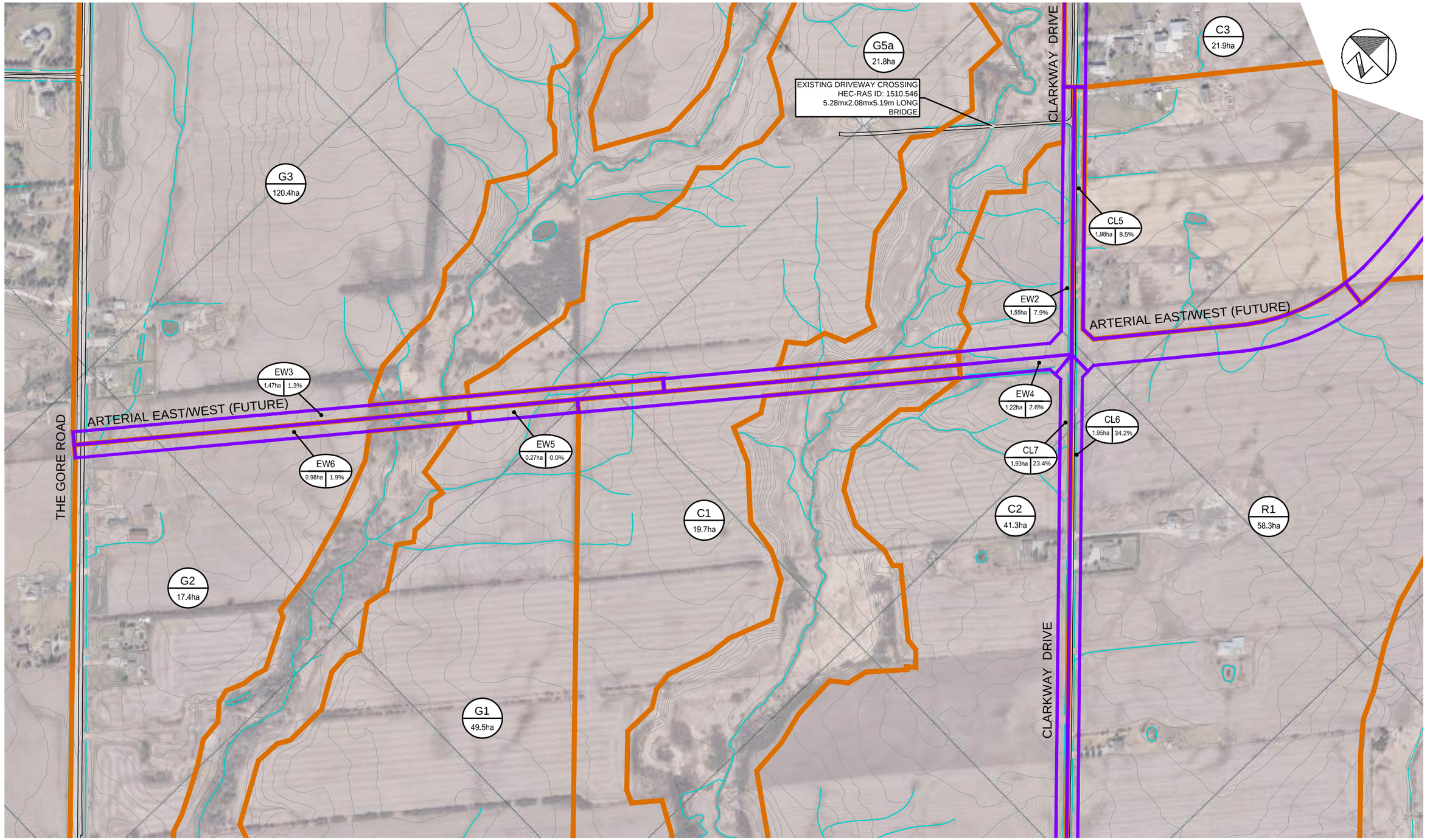
wood.

Scale 1:2500 (0 25 50 100)

Consultant File No. TP115086

Plan No. 5

Path: i:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2021-06(PTB)\Fig2-6 Catchment-Exs(PTB).dwg
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Plotted: 2021-11-05
Last Saved: 2021-11-05



LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(EXISTING CONDITION)

wood.

Scale 1:2500 (0 25 50 100)

Consultant File No. TP115086

Plan No. 6

Plotted: 2021-11-05
Last Saved: 2021-11-05
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Path: i:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2021-06(PTB)\Fig2-6 Catchment-Exs(PTB).dwg

REFER TO FIGURE 6
FOR ENLARGED VIEW

REFER TO FIGURE 8
FOR ENLARGED VIEW

HIGHWAY 50

MAYFIELD ROAD

RAINBOW CREEK PROPOSED
TO BE REALIGNED (BY OTHERS)
IN THIS LOCATION

COUNTRYSIDE DRIVE WILL
BE ADDRESSED UNDER
PART B REPORTING

COLERAINE DRIVE

PROPOSED CROSSING REPLACEMENT
(PART 'B' ROADS)
17.0mx2.0mx53.4m

CULVERT ID: 24.4425
PROPOSED CROSSING REPLACEMENT
17.0mx2.2mx47.3m LONG BRIDGE

COUNTRYSIDE DRIVE

Rainbow Creek

RAINBOW CREEK PROPOSED
TO BE MODIFIED (BY OTHERS)
IN THIS LOCATION

ARTERIAL A2

CULVERT ID: 24.343
PROPOSED NEW CROSSING
25.0mx2.5mx75.0m LONG BRIDGE

EAST / WEST
ARTERIAL (PART B)

EAST/WEST ARTERIAL
WILL BE ADDRESSED
UNDER PART B
REPORTING

RAINBOW CREEK PROPOSED
TO BE REALIGNED (BY OTHERS)
IN THIS LOCATION

CLARKWAY DRIVE

CLARKWAY DRIVE WILL
BE ADDRESSED UNDER
PART B REPORTING

REFER TO FIGURE 7
FOR ENLARGED VIEW

R9 24.9ha
R8 84.8ha
R7a 44.1ha
R7b 22.3ha
R6 65.7ha
R5 38.6ha
R4b 22.7ha
R4a 33.2ha
R3 44.0ha
R2 42.8ha
R1 58.3ha
C6 17.6ha
C5b 29.3ha
C5a 27.6ha
C4 59.5ha
C3 21.9ha
G8 36.3ha
G6 7.8ha

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 44.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- R6 — STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR
24"x36" VERSION

Path: I:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2021-08(PA-Rev)\Fig5 Catchment-Fut(Overall).dwg
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Plotted: 2021-11-05
Last Saved: 2021-11-05

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTON
REGION OF PEEL

SUBCATCHMENT
BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:6000
0 50 100 200
Consultant File No.
TP115086
Plan No.
5

R9

R9
24.9ha

MAYFIELD ROAD

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY R8

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY R7a

HIGHWAY 50

COUNTRYSIDE DRIVE

R8

R7a

COUNTRYSIDE DRIVE WILL
BE ADDRESSED UNDER
PART B REPORTING

HEC-RAS ID: 24.4425
PROPOSED CROSSING REPLACEMENT
17.0mx2.2mx47.3m LONG BRIDGE

R8
84.8ha

CS1
1.46ha | 77.0%

CS5
1.54ha | 74.0%

R7a
44.1ha

CR2
1.65ha | 74.0%

CR3
1.15ha | 71.2%

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY R7a

COLERAINE DRIVE

CR1
2.94ha | 70.2%

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY R6

RAINBOW CREEK PROPOSED
TO BE REALIGNED (BY OTHERS)
IN THIS LOCATION

PROPOSED CROSSING
REPLACEMENT (PART 'B' ROADS)
17.0mx2.0mx53.4m

CR4
2.39ha | 70.5%

Rainbow Creek

CS2
0.30ha | 74.2%

CS6
0.34ha | 77.6%

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 (0.75ha | 73.4%): SUBCATCHMENT ID#, PERCENTAGE OF IMPERVIOUS AREA, SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 (0.75ha | 73.4%): SUBCATCHMENT ID#, PERCENTAGE OF IMPERVIOUS AREA, SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 (25.0ha): SUBCATCHMENT ID#, SUBCATCHMENT AREA
- R6: STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR
24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:2500
0 25 50 100

Consultant File No.
TP115086

Plan No.
6

Path: I:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PRO\2021-08(PIA-Rev)\Fig6-8 Catchment-Fut.dwg
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Plotted: 2021-11-05
Last Saved: 2021-11-05

HEC-RAS ID: 24.4425
PROPOSED CROSSING REPLACEMENT
17.0mx2.2mx47.3m LONG BRIDGE

R8
84.8ha

CS1
1.46ha | 77.0%

CS5
1.54ha | 74.0%

R7a
44.1ha

CR2
1.65ha | 74.0%

CR3
1.15ha | 71.2%

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY R7a

COLERAINE DRIVE

CR1
2.94ha | 70.2%

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY R6

RAINBOW CREEK PROPOSED
TO BE REALIGNED (BY OTHERS)
IN THIS LOCATION

PROPOSED CROSSING
REPLACEMENT (PART 'B' ROADS)
17.0mx2.0mx53.4m

CR4
2.39ha | 70.5%

Rainbow Creek

CS2
0.30ha | 74.2%

CS6
0.34ha | 77.6%

RAINBOW CREEK PROPOSED
TO BE MODIFIED (BY OTHERS)
IN THIS LOCATION

R6

R5

MAYFIELD ROAD

COUNTRYSIDE DRIVE

CS3
0.98ha | 79.0%

COUNTRYSIDE DRIVE WILL
BE ADDRESSED UNDER
PART B REPORTING

C5b
29.3ha

R6
65.7ha

CS7
1.01ha | 76.0%

DEPTH TO GROUNDWATER IN
THIS AREA IS NOTED TO BE
ONLY 1.2m BELOW FUTURE
ROAD GRADE. AS SUCH, THERE
IS A POTENTIAL RESTRICTION ON
IMPLEMENTING LID IN THIS AREA

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY R6

A3
1.83ha | 78.3%

R5
38.6ha

A5
2.09ha | 79.8%

ARTERIAL A2

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY R6

A1
2.07ha | 79.2%

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY C5b

A2
1.80ha | 77.9%

MAJOR/MINOR
SYSTEM FLOW TO
SWM FACILITY C5a

A4
2.07ha | 79.3%

C5b

C5a
27.6ha

CS9
0.88ha | 71.1%

CL3
3.35ha | 55.6%

C4
59.5ha

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'
- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'
- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE
- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- R6 — STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR
24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:2500
0 25 50 100

Consultant File No.
TP115086

Plan No.
7

Path: i:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PRO\2021-08(PA-Rev)\Fig6-8 Catchment-Fut.dwg
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Plotted: 2021-11-05
Last Saved: 2021-11-05

R7a
44.1ha

R7b
22.3ha

CR3
1.15ha | 71.2%

CR5
1.39ha | 75.5%

CR4
2.39ha | 70.5%

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R7a

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R7b

COLERAINE DRIVE

HIGHWAY 50

R4b
22.7ha

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R4b

R4a
33.2ha

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R4a

RAINBOW CREEK PROPOSED TO BE MODIFIED (BY OTHERS) IN THIS LOCATION

Rainbow Creek

R4b

R5

COLERAINE DRIVE

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R4a

ARTERIAL A2

R4a

CR6
2.39ha | 79.4%

A8
2.68ha | 78.9%

RAINBOW CREEK PROPOSED TO BE REALIGNED (BY OTHERS) IN THIS LOCATION

PROPOSED NEW CROSSING
HEC-RAS ID: 24.343
25.0mx2.5mx75.0m LONG BRIDGE

DEPTH TO GROUNDWATER IN THIS AREA IS NOTED TO BE ONLY 1.2m BELOW FUTURE ROAD GRADE. AS SUCH, THERE IS A POTENTIAL RESTRICTION ON IMPLEMENTING LID IN THIS AREA

R5
38.6ha

A5
2.09ha | 79.8%

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R5

ARTERIAL A2

A7
0.33ha | 84.2%

CR7
0.49ha | 90.9%

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R3

EAST / WEST ARTERIAL (PART B)

A6
2.04ha | 74.9%

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY C4

EAST/WEST ARTERIAL WILL BE ADDRESSED UNDER PART B REPORTING

A4
2.07ha | 79.3%

C4
59.5ha

R3
44.0ha

EW1
2.33ha | 70.8%

R3

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- R6 — STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:2500
0 25 50 100

Consultant File No.
TP115086

Plan No.
8

Path: I:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2021-08(PA-Rev)\Fig6-8 Catchment-Fut.dwg
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Plotted: 2021-11-05
Last Saved: 2021-11-05

REFER TO FIGURE 8
FOR ENLARGED VIEW

PROPOSED CROSSING REPLACEMENT
HEC-RAS ID: 24.424

RAINBOW CREEK
PROPOSED TO BE
REALIGNED (BY OTHERS)
IN THIS LOCATION

COLERAINE DRIVE IS
ADDRESSED UNDER
PART A REPORTING

RAINBOW CREEK PROPOSED
TO BE MODIFIED (BY OTHERS)
IN THIS LOCATION

PROPOSED NEW CROSSING
HEC-RAS ID: 24.343

REFER TO FIGURE 11
FOR ENLARGED VIEW

PROPOSED CROSSING REPLACEMENT
HEC-RAS ID: 24.4425

RAINBOW CREEK PROPOSED
TO BE REALIGNED (BY OTHERS)
IN THIS LOCATION

ARTERIAL A2 IS
ADDRESSED
UNDER PART A
REPORTING

REFER TO FIGURE 12
FOR ENLARGED VIEW

REFER TO FIGURE 9
FOR ENLARGED VIEW

REFER TO FIGURE 10
FOR ENLARGED VIEW

HIGHWAY 50
MAYFIELD RD
COLERAINE DR
COUNTRYSIDE DR
ARTERIAL A2
CLARKWAY DR
THE GORE RD
ARTERIAL EASTWEST
CASTLEMORE RD
Rainbow Creek

R9 24.9ha
R8 84.8ha
R7a 44.1ha
R7b 22.3ha
R6 65.7ha
R5 38.6ha
R4b 22.7ha
R4a 33.2ha
R3 44.0ha
R2 42.8ha
R1 58.3ha
C6 17.6ha
C5b 29.3ha
C5a 27.6ha
C4 59.5ha
C3 21.9ha
C2 41.3ha
C1 19.7ha
G8 36.3ha
G7 34.7ha
G6 7.8ha
G5b 12.2ha
G5a 21.8ha
G4 40.1ha
G3 120.4ha
G2 17.4ha
G1 49.5ha

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- SUBCATCHMENT ID# (e.g. R3)
- SUBCATCHMENT AREA (e.g. 44.0ha)
- STORMWATER MANAGEMENT FACILITY AND REFERENCE ID# (e.g. R6)

SCALE VALID ONLY FOR
24"x36" VERSION

Path: I:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PRO\2021-06(PTB)\Fig7 Catchment-Fut(Overall-PTB).dwg
Plotted By: richard.bartolo
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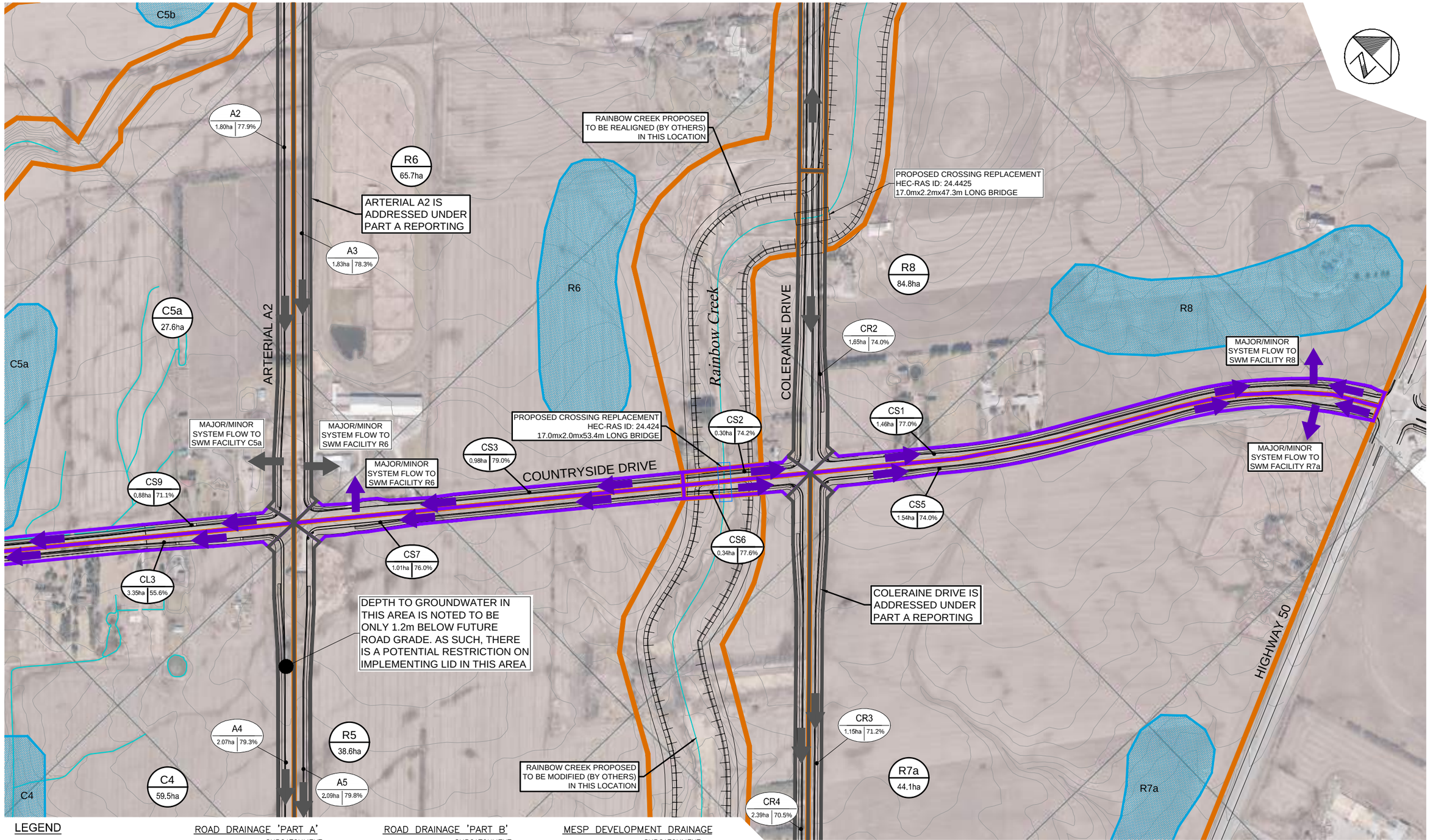
Plotted: 2021-11-05
Last Saved: 2021-11-05

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTON
REGION OF PEEL

SUBCATCHMENT
BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:6000
0 50 100 200
Consultant File No.
TP115086
Plan No.
7



LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- R6 — STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:2500 (0 25 50 100)

Consultant File No. TP115086

Plan No. 8

Path: i:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2021-06(PtB)\Fig8-12 Catchment-Ful(PtB).dwg
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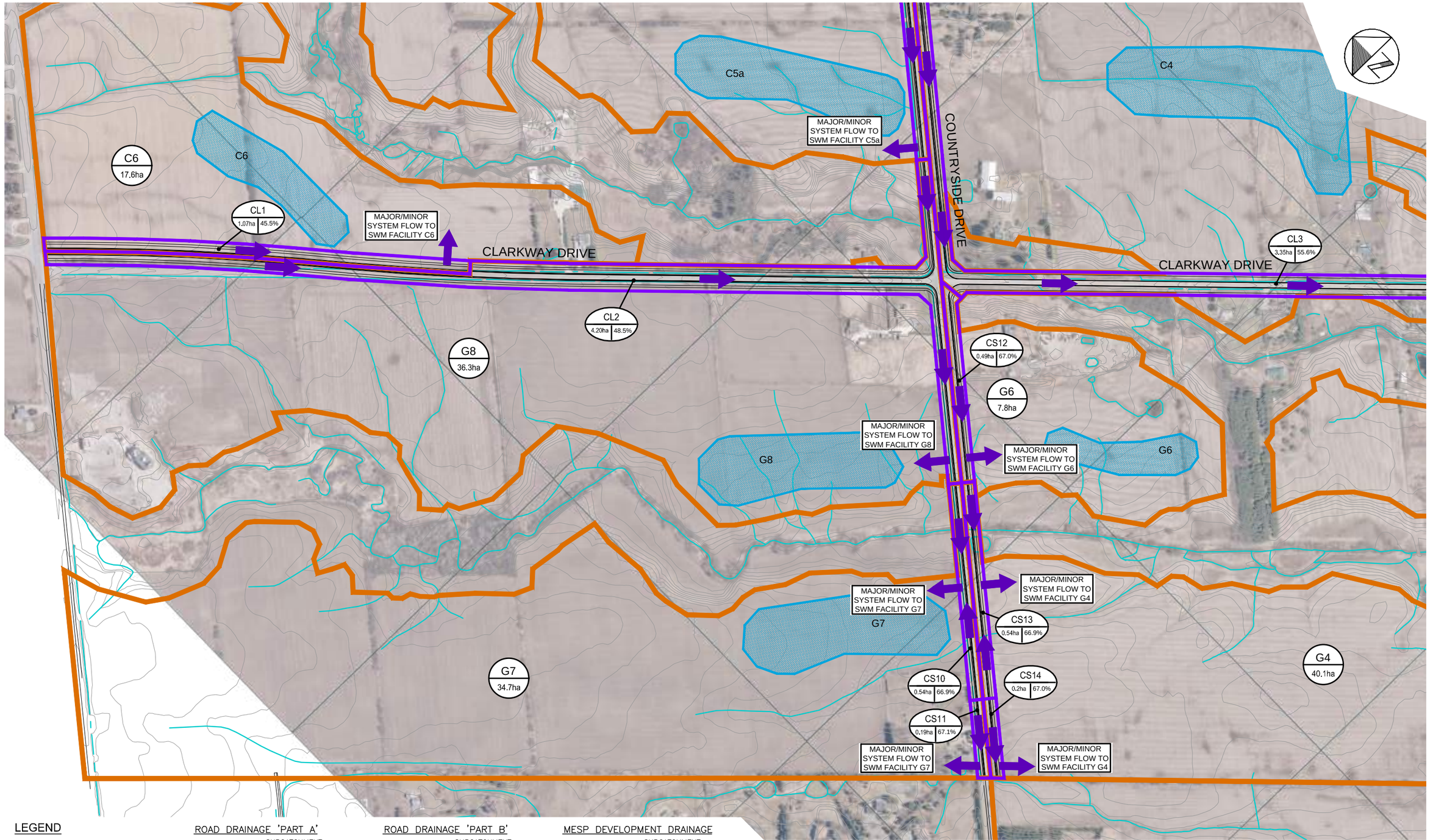
Last Saved By: richard.bortolo
Plotted: 2021-11-05
Last Saved: 2021-11-05



LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 / 0.75ha / 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 / 0.75ha / 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 / 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- R6 — STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:2500 (0 25 50 100)
Consultant File No. TP115086
Plan No. 9

Plotted: 2021-11-05
Last Saved: 2021-11-05
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Path: i:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PRO\2021-06(PtB)\Fig8-12 Catchment-Ful(PtB).dwg

C4
59.5ha

R3
44.0ha

R3

EW1
2.33ha | 70.8%

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R3

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R1

C4

C3
21.9ha

C3

R1
58.3ha

ARTERIAL EAST/WEST

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY C4

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY C3

CL3
3.35ha | 55.6%

CLARKWAY DRIVE

CL4
2.46ha | 46.7%

CLARKWAY DRIVE

CL5
1.98ha | 61.6%

CL6
1.95ha | 73.5%

EW2
1.55ha | 59.8%

EW4
1.22ha | 67.2%

CL7
1.93ha | 77.2%

C2
41.3ha

G5b

G5b
12.2ha

G6

G5a
21.8ha

G5a

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY G5a

G4
40.1ha

G4

C1
19.7ha

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- R6 — STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT ARTERIAL ROADS - AREA 47

CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN (FUTURE CONDITION)

wood.

Scale 1:2500
0 25 50 100

Consultant File No.
TP115086

Plan No.
10

Path: I:\TP115086\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PRO\2021-06(PtB)\Fig8-12 Catchment-Ful(PtB).dwg
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Last Saved: 2021-11-05

COLERAINE DRIVE AND ARTERIAL A2 ARE ADDRESSED UNDER PART A REPORTING

CR6 | 2.39ha | 79.4%

A8 | 2.68ha | 78.9%

PROPOSED NEW CROSSING
HEC-RAS ID: 24.343
25.0mx2.5mx75.0m LONG BRIDGE

RAINBOW CREEK PROPOSED TO BE REALIGNED (BY OTHERS) IN THIS LOCATION

R2 | 42.8ha

A7 | 0.33ha | 84.2%

CR7 | 0.49ha | 90.9%

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R3

ARTERIAL EAST/WEST

Rainbow Creek

R3 | 44.0ha

EW1 | 2.33ha | 70.8%

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R3

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R1

C3 | 21.9ha

R1 | 58.3ha

CL5 | 1.98ha | 61.6%

CL6 | 1.95ha | 73.5%

CLARKWAY DRIVE

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY R1

CASTLEMORE ROAD

EW2 | 1.55ha | 59.8%

EW4 | 1.22ha | 67.2%

CL7 | 1.93ha | 77.2%

C2 | 41.3ha

MAJOR/MINOR SYSTEM FLOW TO SWM FACILITY C2

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- A1 | 0.75ha | 73.4% — SUBCATCHMENT ID# / PERCENTAGE OF IMPERVIOUS AREA / SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- R3 | 25.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- R6 — STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:2500 (0 25 50 100)

Consultant File No. TP115086

Plan No. 11

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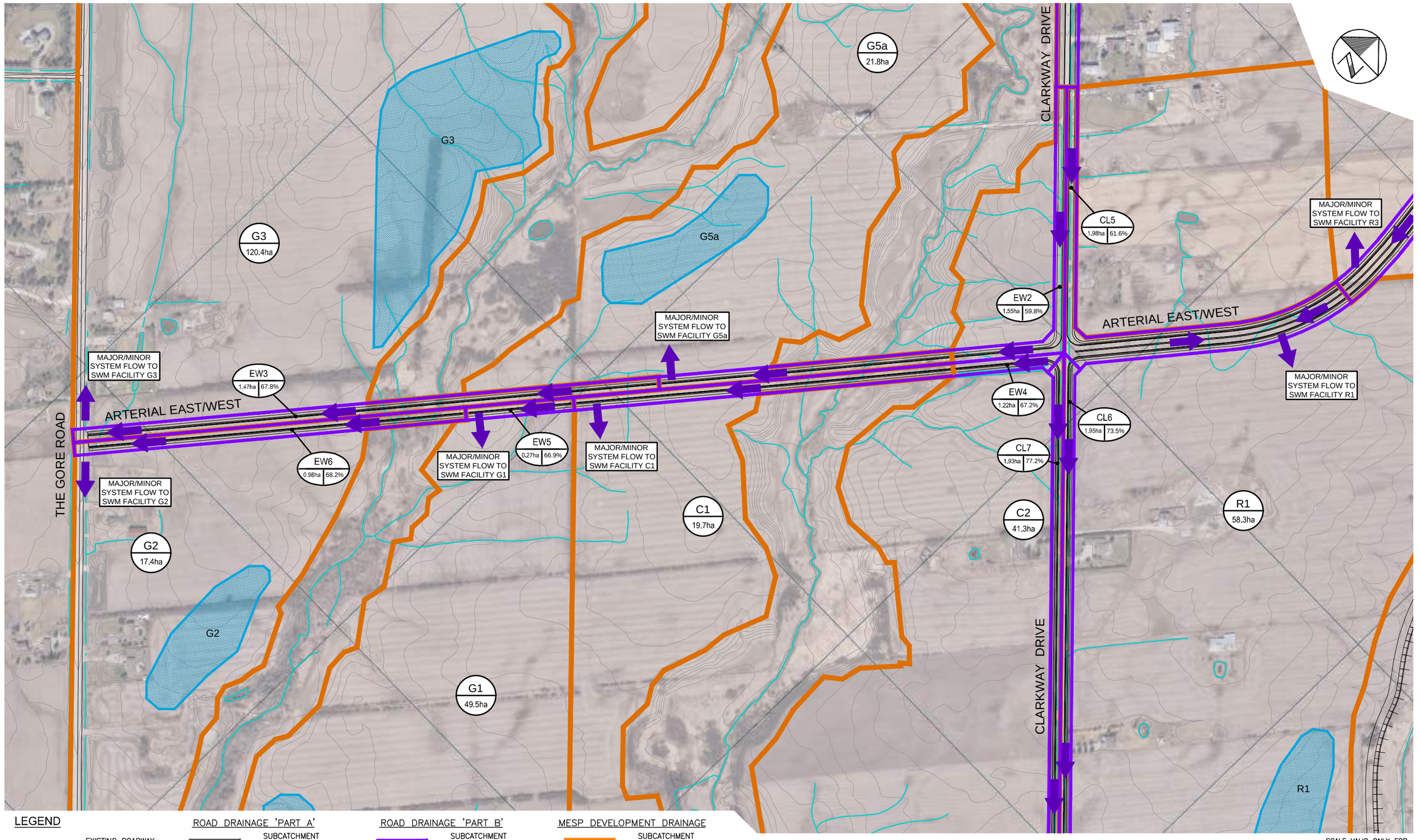

LEGEND

- EXISTING ROADWAY
- WATERCOURSE
- CONTOUR (0.5m)

ROAD DRAINAGE 'PART A'

- SUBCATCHMENT BOUNDARY
- SUBCATCHMENT ID#
- PERCENTAGE OF IMPERVIOUS AREA
- SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

ROAD DRAINAGE 'PART B'

- SUBCATCHMENT BOUNDARY
- SUBCATCHMENT ID#
- PERCENTAGE OF IMPERVIOUS AREA
- SUBCATCHMENT AREA
- MAJOR/MINOR SYSTEM FLOW DIRECTION

MESP DEVELOPMENT DRAINAGE

- SUBCATCHMENT BOUNDARY
- SUBCATCHMENT ID#
- SUBCATCHMENT AREA
- STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#

SCALE VALID ONLY FOR 24"x36" VERSION

ENVIRONMENTAL ASSESSMENT
ARTERIAL ROADS - AREA 47
CITY OF BRAMPTOM
REGION OF PEEL

SUBCATCHMENT BOUNDARY PLAN
(FUTURE CONDITION)

wood.

Scale 1:2500 (0 25 50 100)

Consultant File No. TP115086

Plan No. 12

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