CITY OF WINDSOR

Technical Volume 3 Report – Functional Design, Estimated Cost and Implementation

Sewer and Coastal Flood Protection Master Plan

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1.0 Introduction

1.1 Summary

The purpose of this Technical Report Volume III is to supplement the EA Master Plan Report, Technical Report Volumes I and II, and to detail the functional design and analysis of the recommended sewer and coastal flood protection solutions. Functional designs include the recommended public infrastructure improvements to meet the project objectives. Recommended private property improvements such as downspout and/or foundation drain disconnection are discussed in detail in Technical Report Volume II. Below is a summary of what is included within the Volume III report:

- Summary of the level of service criteria, as detailed in *Technical Report Volume II*, used to develop the basement and surface flooding solutions;
- Summary of the functional design process and methodology;
- Summary of the coastal flood protection functional design process and recommended solutions;
- A summary of the functional design and cost estimate assumptions for the recommended storm, sanitary, and coastal flood protection solutions;
- Detailed design considerations;
- Overview of the recommended implementation plan; and
- Conclusions and recommendations for the recommended functional design solutions.

1.2 Technical Reports

Two additional reports, Technical Report Volume I and Technical Report Volume II, summarize details related to the engineering, design, and stormwater management modelling related to the project. Below summarizes the contents of the two additional technical reports:

Technical Report Volume I

- Identification of new sewer and drainage data collected in 2018;
- Summary of data used from the Flow Monitoring and Hydraulic Modeling of the Sewer System report (Dillon & Aquafor, 2016);
- Process and methodology for expanding the existing City-wide sewer model including calibration; and
- Identification of the existing baseline sewer and overland drainage conditions within the City, including the characterization of rainfall-derived inflow and inflation (RDII).

Technical Report Volume II

- Identification of the level of service criteria for basement and surface flooding solutions;
- Delineation of the existing level of service for basement and surface flooding risks;

- Overview of the solution development process including alternatives for basement and surface flooding solutions; and
- A background review of coastal flooding risk and level of service criteria.

The EA Master Plan Report provides a broad summary of the proposed works for this project but is limited in engineering and scientific details.

1.3 Service Areas

As identified in Technical Report Volume II, the City of Windsor was separated into three major service areas based on sanitary sewage drainage boundaries which included East Windsor, Central Windsor, and South Windsor.

The functional design solutions outlined in this report are separated based on the identified service areas. The recommended solutions detail the proposed works and related costs within each service area.

Refer to Figure 1.1, which displays the service area boundaries used to separate the drainage areas.

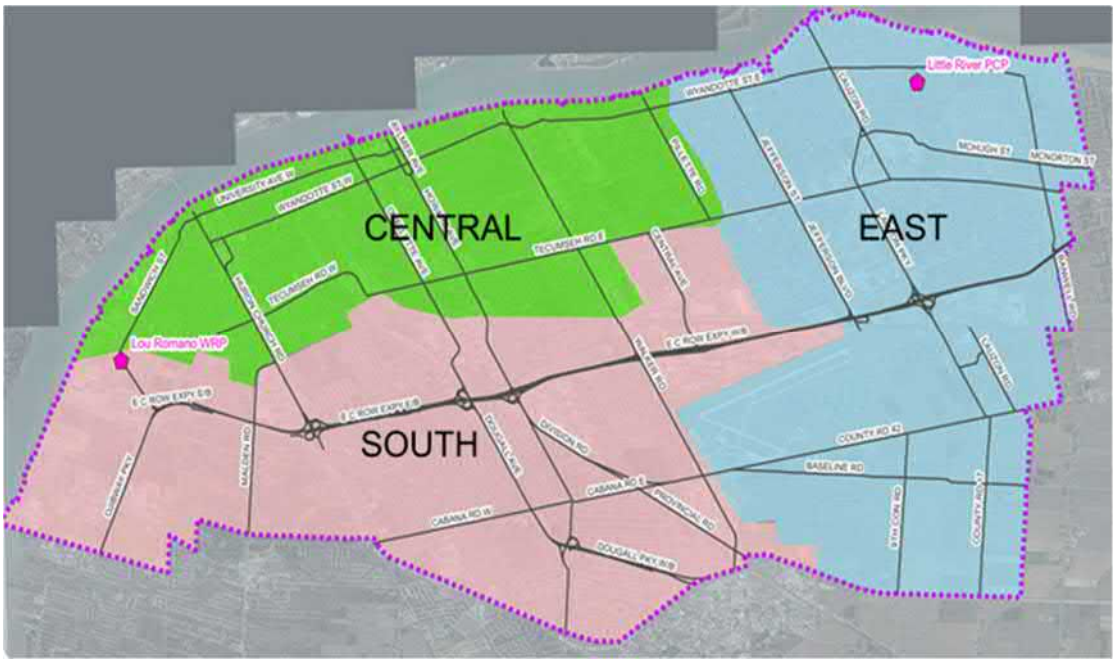

Figure 1.1: City of Windsor - Service Areas

1.4 Level of Service

In order to develop comprehensive long term solutions to address surface and basement flooding, level of service (LOS) criteria for the sewer improvements had to be determined. The recommended LOS

criteria are based on feedback from multiple stakeholders and consultation with the City of Windsor, as identified in Technical Report Volume II sections 2.0 and 4.0.

The LOS criteria were recommended for the storm, sanitary, and combined sewer systems for existing and future development conditions. An adaptive approach was taken to develop functional design solutions that provide a flexible LOS to account for a reasonable degree of uncertainty due to climate change.

It is important to note that the recommended LOS criteria be maintained as refinements are made to the functional design. The City Master Sewer Infoworks model should be used as a tool to confirm that level of service is maintained.

Table 1.1: Sanitary and Combined Sewer Drainage LOS for Basement Flooding

Consideration	Criteria	Objective
Wet Weather Flow	1:100 Year Storm Event Sewer hydraulic grade line (HGL) is more than 1.8 m below existing ground elevation.	Reduce the risk of basement flooding for storm events up to and including the 1:100 year storm event for 90% or more of the houses/buildings within the City.

Table 1.2: Storm Sewer Drainage LOS for Surface Flooding

Consideration	Criteria - Storm Drainage	Objective
Major Storm System	1:100 Year Event Less than 0.30 m of surface flooding in the Right-of-Way (ROW), where feasible for 1:100-year storm event for a major overland drainage system.	Accepted criteria for assessing risks of property damage.
	1:100 Year Event plus 40% Climate Change Surface flooding below lowest building opening elevations where feasible (modelled as flow-spread not impacting building footprint), but in particular for any higher risk uses*; for 1:100-year storm event + 40% climate change factor for both volume [1] and intensity [2] and; Less than 0.30 m of surface flooding in the ROW for arterial and collector roads. *Including, but not limited to, hospitals, schools, day-cares, long-term care facilities, emergency services, City maintenance facilities, major roads and transportation facilities.	Provide enhanced/variable level of service where there is a higher consequence of surface flooding.
Minor Storm System	1:5 Year Event HGL is at least 0.3m below ground based on available outlet receiving capacity; and	No surface flooding under the minor storm

Consideration	Criteria - Storm Drainage	Objective
	No increase to the HGL downstream	

[1] The "Urban Stress Test" storm as defined in the Windsor/Essex Regional Stormwater Management Standards Manual (2018) would test the resiliency of the storm drainage system under higher volume storm conditions.
[2] It is proposed that a 1:100 year, 4-hour storm with rainfall intensity increased by a factor of 40% would be considered sufficient to test the resiliency of the storm drainage systems under higher intensity storm conditions

2.0 Functional Designs

As a component of the EA Master Plan Report, functional designs for all recommended sewer systems, detention facilities, pump stations and landform barrier improvements were to be developed. The functional designs identify the infrastructure improvements required to achieve the target levels of service for basement, surface and coastal flooding. The functional designs are intended to progress the designs to a preliminary design level. The preliminary designs detail the required size and general location of the proposed storm and sanitary improvements and confirm the proposed solutions are generally feasible. Due to the scope of the project area, there are factors that could not be assessed when completing the functional designs. For instance, checking potential conflicts with watermains and third party utilities within any given right of way was outside the scope of this study.

The following section provides an identification of the design criteria and assumptions used as a part of the functional designs, and what additional information must be confirmed as a part of the detailed design process.

2.1 Existing Information

The functional design of the recommended solutions took into consideration available existing information within the solution areas, including sewer infrastructure, soil conditions, property information, and general site topography from City LiDAR information. As previously noted, size/location information for other right-of-way infrastructures such as watermains and third party utilities (hydro, gas, telecommunications) was not included as a part of the functional design considerations. The following sections outline the information that was utilized to complete the functional design.

2.1.1 Sewer Infrastructure

The existing sewer system information used in the analysis of the functional design solutions was provided by the City of Windsor in the form of as-built drawings, GIS shapefiles, and the City Sewer Atlas. This information includes the data available to the design team prior to December 2019 for sewer types, sizes, inverts, slopes, age of sewers and general alignments of the existing City wide sewer network.

As can be expected using as-built records and/or digital information as opposed to field surveys, there are limitations with their use and potential errors or misinformation. During the functional design process, a number of gaps in information, including missing inverts, invert anomalies, and seemingly incorrect flow directions were identified. Due to the scope of the proposed works, it was not feasible to confirm all missing data. Reasonable assumptions were made where recommended solutions

encountered locations with missing data. In the case of missing inverts or pipe sizing, upstream and downstream pipe data were used to interpolate the missing information.

2.1.2 Soil Conditions

General soils information for the City was determined by reviewing the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) soil distributions map and the geotechnical report that was completed for the project: Geotechnical Review of Selected Sites, City of Windsor Sewer Master Plan (Golder, 2020) (Appendix J). The majority of the existing soils throughout the City are Brookston Clay and characterized as having poor natural drainage and very slow infiltration rates. There are smaller regions of Clyde Clay, Granby Sand and Berrien Sand which also have poor or imperfect drainage. The west waterfront portions of the City and a section at the south end of the City contain areas of Burford Loam which is characterized as being well draining with rapid infiltration.

The soil conditions at the proposed outfalls were determined to consist mostly of fill materials which are not ideal for sewer installations. Initial recommendations for sewer installations at these locations are outlined in the geotechnical report noted above.

Geotechnical recommendations were outlined in the report based on the available historical and existing site information. The report details the recommendations for sewer and stormwater management facility installations in various soil types, new outfall construction and LID implementation. These recommendations should be reviewed as part of the detailed design process to refine the functional design solutions.

The information and recommendations provided were sufficient to complete the functional design but are not recommended to be used for detailed design. A detailed geotechnical site investigation should be completed for all recommended solutions during detailed design to confirm the findings from the functional geotechnical design report.

2.1.3 Topography

In general, the topography is relatively flat within the Little River, Turkey Creek, and Detroit River Watersheds. The topography within the central portion of the City is relatively higher than in the aforementioned areas. This was confirmed by analyzing existing digital elevation models, LiDAR survey, and spot elevations from the City Sewer Atlas. Figure 2.1 details general elevations throughout the City.

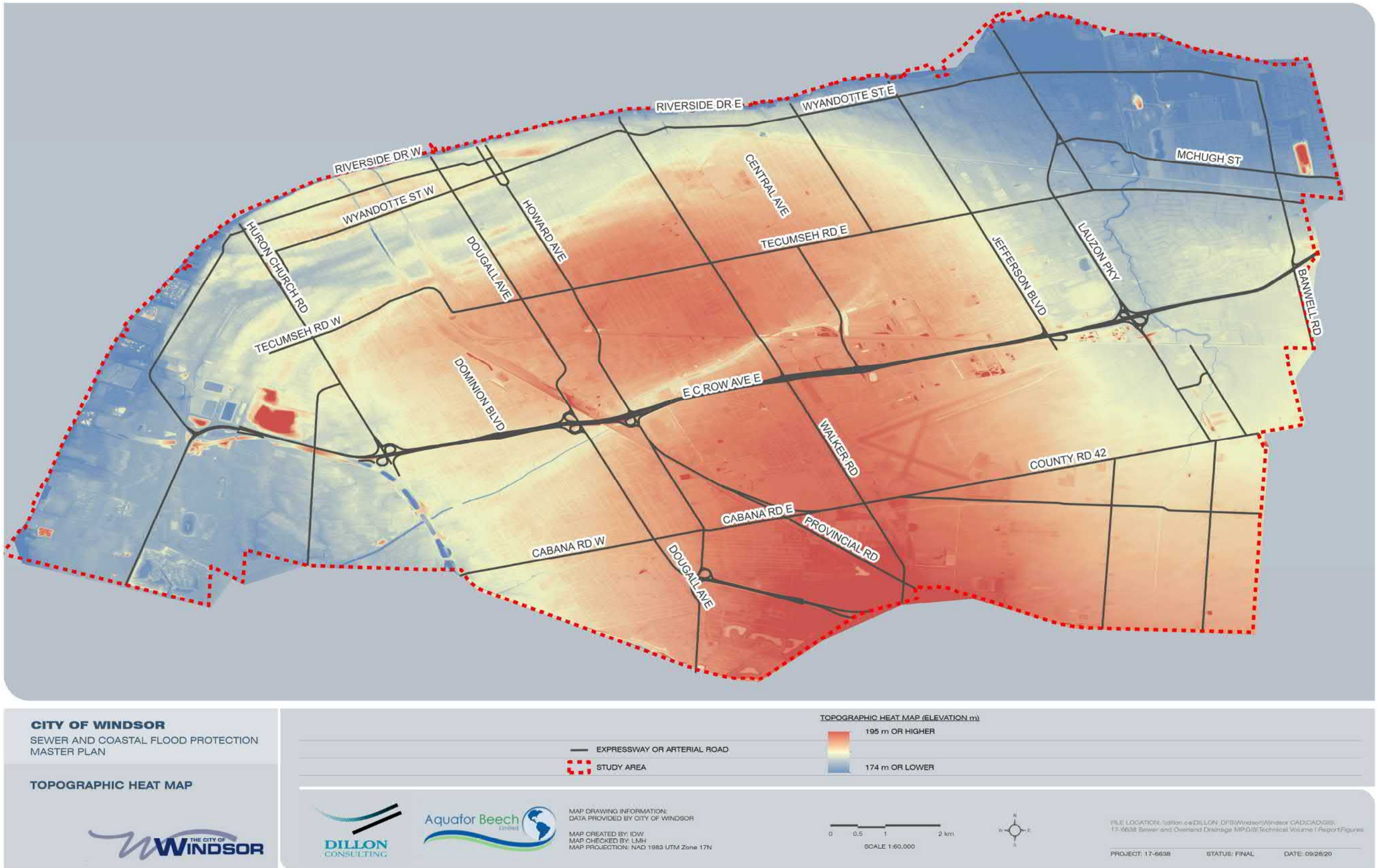

Figure 2.1: Windsor Elevation Map

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As shown in Figure 2.1, the East Windsor service area is fairly low lying when compared to the other service areas in the City. This service area is particularly vulnerable to surface and basement flooding due to its elevation relative to the surrounding watercourses (Lake St. Clair, Detroit River and Little River). For this reason, coastal flood protection measures are necessary in addition to storm sewer improvements. Refer to Section 5.0 for more information on coastal flood protection measures within the East Windsor service area. It should also be noted that there are low lying areas along the west boundary of the City along the Detroit River; these areas are also vulnerable to flooding due to their existing topography. Assessment of the west are of the City is not part of the scope of this study but will be reviewed under a separate City initiative.

The existing topography was used in the analysis of the functional design solutions to determine if cover requirements could be met for the proposed sewer improvements. As stated in Section 2.2.5, there are some instances where minimum cover requirements could not be met based on the size of the proposed infrastructure and the existing topography. In these locations, road grading changes should be considered to ensure adequate cover is achieved.

The information gathered for this report was sufficient to complete the functional design but should not be used to complete a detailed design. As part of the detailed design of the recommended solutions, a detailed topographical survey should be completed to ensure all land features are accounted for and to confirm existing ground elevations.

2.1.4 Property Information

The existing property information for the City was compiled from the City of Windsor GIS property fabric, aerial imagery, and as-built information. The functional design of the preferred solutions utilized this information to implement improvements within existing City rights-of-way where feasible.

Due to the width of some right-of-ways in the various solution areas and/or the location of the existing infrastructure within the right-of-way, some proposed improvements were recommended on or near private property. In these cases, working/construction or permanent easements would be required, or the City would need to purchase a portion of the lands to facilitate installation of the infrastructure improvements.

Some existing sewers alignment are on, or cross, what appears to be private property. If improvements were identified for these sewers, the existing alignments were maintained on private property. Prior to detailed design, the City should review if existing easements are in place or if additional land acquisitions or easements are required.

When the various recommended solutions within each service area proceed to detailed design, a detailed review of the existing property information using legal surveys should be completed to identify

any discrepancies with the information provided as part of the functional design. This will be needed to confirm any easements and or property acquisition identified in the functional design solutions.

2.2 Design Criteria

The design criteria that was applied for the recommended storm and sanitary solutions was derived from the road and sewer design guidelines, including the City of Windsor Development Manual (May 2015), the City of Windsor Standard Engineering Drawings (dates vary), the Ministry of the Environment Design Guidelines for Sewage Works (2008), the Windsor/Essex Region Stormwater Management Standards Manual (December, 2018), and standard engineering principles and practices. Should changes to the aforementioned design standards be implemented, the detailed design for recommended solutions will require updates to meet the current design standards. The following sections detail the guidelines and development manuals reviewed in order to establish the functional design criteria.

2.2.1 Storm and Sanitary Sewer Alignments

The City of Windsor Development Manual outlines the preferred location of the storm and sanitary infrastructure based on typical utility cross sections for various road cross sections. As per the City Standard Engineering Drawings AS-206A, B, C, and D (Standard Utility Cross-Sections), preferred locations for storm and sanitary sewers within the right-of-way are provided. The recommended solutions were designed to satisfy this requirement, where feasible. As the majority of recommended solutions are within already built up areas where other infrastructures exist, maintaining these criteria was not necessarily achievable.

Recommended sewer placement/alignments provided were developed without the knowledge of below grade amenities such as watermains and third party utilities (gas main, telecommunications lines etc.). During detailed design, the identified sewer alignments may require adjustment as additional information regarding below grade infrastructure is determined.

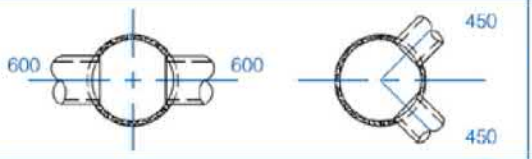
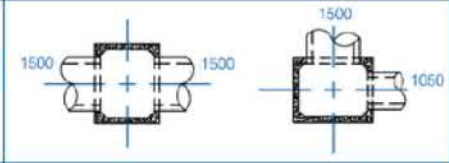
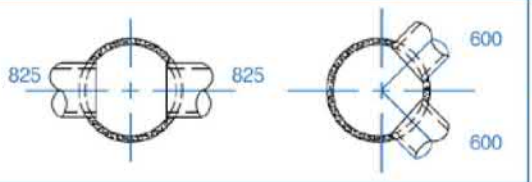
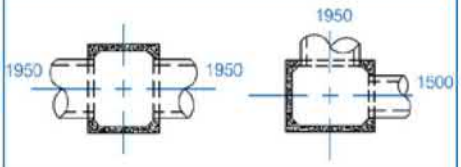
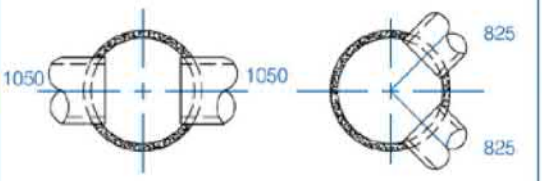
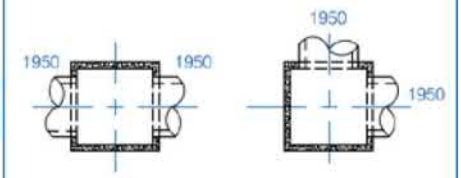
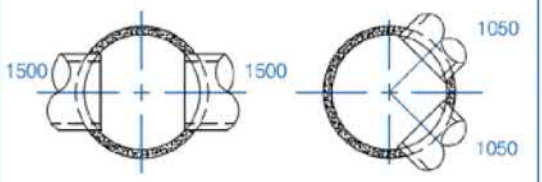
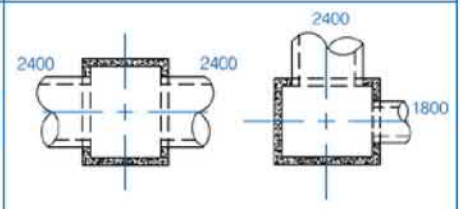
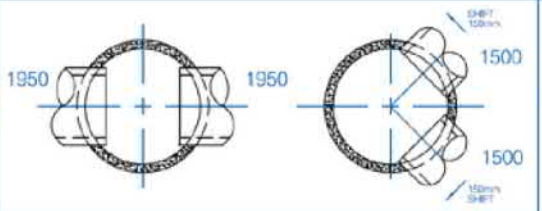
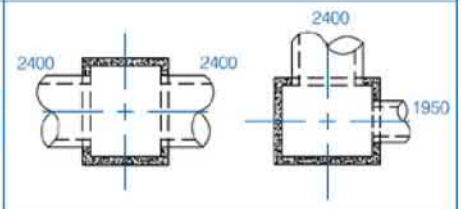
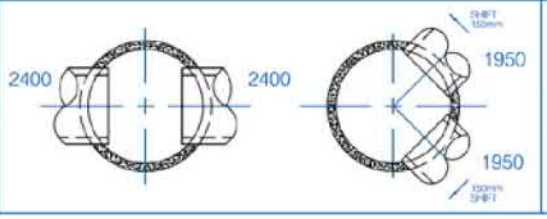
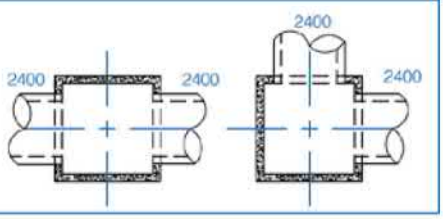
There were some instances where the placement of the storm or sanitary sewers within the right-of-way for the recommended solution was not feasible. Reasons for this included limited existing right-of-way width, size of proposed sewer improvements, location of existing infrastructure within the right-of-way, depth of existing infrastructure, or other.

Solutions that have proposed sewers outside of the right-of-way will require private property easements or property acquisition. Some recommended solutions that are currently identified being placed within existing rights-of-way may require additional property acquisitions once placement of all roadway infrastructure is confirmed.

2.2.2 Maintenance Holes

The design criteria for maintenance holes was derived from the City of Windsor Development Manual and industry standard sizing guidelines. In most situations, standard precast manholes are proposed; however, there are locations where larger sewers are required (e.g., Dougall and Eugenie St. East solution) where manhole tees and/or precast or custom manhole chambers are recommended.

Table 2.1: Maximum Pipe Size for Manholes - Forterra

MH SIZE (mm)	Max. Pipe Size for Straight Through and Right Angles	MH SIZE (mm)	Max. Pipe Size for Straight Through and Right Angles
1200		2400 x 1800	
1500		3000 x 2400	
1800		3000 x 3000	
2400		3800 x 2400	
3000		3800 x 3000	
3600		3800 x 3800	

Above detail provided in the Forterra Precast - Ontario Price List, February 2020

Table 2.1 details the typical maintenance hole sizes based on the diameters of the inlet and outlet pipes. This table was utilized in conjunction with the Table 2.2 below to determine the required manhole sizes for all the recommended storm and sanitary solutions.

Manhole spacing was generally maximized for functional design based on the proposed storm and sanitary sewer sizes and the City of Windsor Development Manual standards. Manholes were also placed at all junctions with side streets/adjoining sewers. A conservative approach was taken for pipe sizes greater than 1500mm in diameter. Although the City design guidelines permit manhole spacing greater than 150m, it was assumed that pipe sizes 1500mm diameter or greater would have manholes spaced a maximum of 150m. Table 2.2 details the maximum manhole spacing as per City of Windsor Development Manual. Manholes shall be placed in accordance with the City of Windsor design standards during detailed design.

Table 2.2: Maximum Manhole Spacing

City of Windsor Development Manual - Maximum Manhole Spacing

Pipe Size	Distance Between Manholes
Up to 675mm dia.	120 m
750 mm dia. to 1350mm dia.	150 m
1500mm dia. and above	>150 m (Special study required to determine optimum spacing. City Engineer approval required)

There are instances where storm and sanitary sewer manholes should be lockable to mitigate risk of manhole lids being displaced by the water pressure of sewer system surcharging during major events. Areas, where this would be suitable, are rail or roadway crossings where significant surface flooding may occur (e.g., Walker Road and the CPR Rail crossing).

During sewer and road reconstruction all sanitary manholes shall be equipped with sanitary manhole rain catchers to prevent potential I&I into the sewer system. The City should follow manufacturer guidelines and confirm if vents will be required. Standing water will sit within the catchers after rain events; therefore, the City will need to include sanitary sewer manholes as part of their mosquito control program.

2.2.3 Private Drain Connections

Private Drain Connections, or PDC's, are the service connections from a mainline sewer to private property. Existing and proposed PDC's were considered when completing the functional analysis of the recommended solutions. Based on the City of Windsor Development Manual, storm and sanitary PDC's were assumed to be 150mm in diameter with a 2% slope projecting from the springline of the sewer main to the property line. With this assumption, approximate elevations for PDC crossings were established for the proposed and existing sewers within a given right-of-way. This information was utilized to determine potential conflicts with the proposed sewer infrastructure.

It should be noted that depths, connection points, slopes and sizes of existing PDC's can vary greatly. It was assumed that any existing PDC could be connected to the new sewers using the above noted design criteria. However, alterations may need to be made during detailed design, or construction, once locations/depths of existing lot PDC's are determined.

2.2.4 Pipe Sizing and Slopes

2.2.4.1 Storm Sewers

As per the City of Windsor Development Manual (May 2015), the minimum pipe size of any storm main is 300mm in diameter. A majority of the solutions within the three service areas have pipe sizes greater than 300mm in diameter. There are some instances where 300mm diameter pipes are proposed (e.g., to function as a flow restrictor to limit the flow outletting from larger trunk sewers or detention facilities, or replacement of existing 300mm diameter sewers).

All recommended storm sewer solutions are to be smooth walled with a Manning's n-value of 0.013. The minimum and maximum velocities within the sewers are to be 0.76m/s and 3.0m/s, respectively per the Development Manual and the MECP Guidelines. Minimum slopes for storm sewers based on the size of sewer can also be found in the Development Manual.

Standard pipe sizes were recommended where feasible. There are some instances, specifically with the larger box culverts, where non-standard sizes were recommended. If during detailed design, and more site specific information is available, the recommended sewer size can be altered if the model updates identify no negative impacts.

2.2.4.2 Sanitary Sewers

The design criteria used for sanitary sewers can be found in the City of Windsor Development Manual (May 2015). The design criteria include the minimum pipe size, minimum and maximum velocities, population densities per land use, infiltration and residential sewage flow rates. The recommended sanitary sewers are to be smooth walled with a Manning's n-value of 0.013. The minimum and maximum velocities within the sewers are to be 0.75m/s and 3.0m/s, respectively per the Development Manual.

Any changes to sewer design criteria during the course of the implementation phase are to be incorporated into the detailed designs.

For larger trunk sewers, including the proposed in-line storage sanitary sewers, low flow channels should be considered to be incorporated into the larger sewers to convey dry weather flows.

2.2.5 Storm and Sanitary Sewer Cover Requirements

Storm and sanitary sewer minimum cover requirements were established based on the City of Windsor Development Manual Standards. These requirements were utilized to determine if the recommended solutions achieved the minimum coverage and if potential road grading changes are required to be implemented in conjunction with the sewer infrastructure improvements.

As per the Development Manual, all storm sewers are to have a minimum of 1m of cover above the top of the pipe. Sanitary sewers are to have a minimum cover of 2.8m above the top of the pipe. These values were utilized to check ground cover on all recommended solutions.

2.3 Functional Design Assumptions

Due to the scope of proposed works and the high level nature of the functional design and analysis, various assumptions were made to streamline the preliminary/functional design process. Design assumptions used in the development of the recommended functional design solutions include, but are not limited to, the following:

- Minimum sewer sizing was based upon results of the stormwater and sanitary sewer models developed as a part of this project;
- Sewer and manhole designs adhere to City of Windsor and Ministry of Environment, Conservation and Parks design standards;
- Side street sewers will be appropriately sized and connected to the mainline/functional design sewers;
- Existing underground infrastructure (i.e., watermain, gas, communications, hydro) will be replaced, relocated, or deflected if required to facilitate any proposed sewer, stormwater management facility, or landform barrier installation;
- Combined sewer overflows will be eliminated when the recommended storm solutions are installed;
- Full road reconstruction (including the installation of roadways, curbs, pedestrian/active transportation facilities, street lighting, and traffic signals as required) will be completed during the installation of the recommended functional design solutions;
- All recommended storm and sanitary sewers are to be smooth walled;
- Where feasible, the recommended storm and sanitary solution alignments will generally follow the existing sewer alignment that is being replaced;
- All known future development areas were assumed to be fully developed;

2.4 Conflicts with Existing Infrastructure

In order to complete the recommended solutions to a functional design level, potential conflicts with existing sewer infrastructure were reviewed. Proposed improvements were checked in relation to

existing sewer infrastructure, assumed private drain connection locations/elevations, and private property impacts.

Information regarding the methodology used to complete the conflict checks can be found in the following sections.

2.4.1 Storm Sewer, Sanitary Sewer, and Combined Sewer Conflicts

The functional design of the preferred solutions took into consideration potential horizontal and vertical conflicts with existing sewer infrastructure within each solution area.

Various considerations were made to mitigate potential conflicts with existing sewer infrastructure, including adjustments to proposed alignments to achieve proper horizontal clearance from the sanitary sewer (as defined by MECP guidelines) and other sewer infrastructure, lowering or raising proposed sewer inverts or pipe slopes, re-routing sewers along streets with less infrastructure, or re-aligning existing infrastructure. In many cases, a combination of the above considerations was implemented to achieve the recommended functional design solutions.

In a few situations in East Windsor, sewer crossing conflicts could not be mitigated through any of the above noted means. Accordingly, a detail providing guidance on how to address the conflict during detailed design was developed. Typical Detail 3 (Figure 2.2 in Section 2.5.1), depicts the approved methodology for addressing sewer conflicts; however, each instance will require review and confirmation once the site specific information is determined. The instances of anticipated sewer conflict are identified on the functional design drawings.

During the detailed design of storm and sanitary sewers, sewer sizing and slopes should generally follow the functional design solution recommendations unless site constraints do not allow it. In these instances, the recommended sewer sizes and/or slopes can be altered (i.e., circular pipes can be revised to box culverts) if the minimum required flow rates from the InfoWorks model are achieved. Alteration of slopes within a specific project area should not fundamentally alter the downstream inverts as identified on the functional design plans.

The functional design of the recommended sewer improvements assumed replacement of existing sewers regardless of age. During detailed design, consideration should be given to utilizing the existing sewers and providing an adjacent/parallel sewer to make up the additional capacity required to meet the functional design requirements. Sewer inspections would be required to confirm the condition and potential future life expectancy of the existing sewer(s) to determine if it is a feasible option to maintain any given run of the sewer. Additionally, other means of sewer improvements could be utilized (such as trenchless sewer relining) if the capacity and HGL requirements are met.

The locations of the recommended sewers may be altered during detailed design to better suit site conditions. Still, they should follow City Standard Utility Cross-Section drawings AS-206A, B, C, and D if possible. During detailed design, if it is found that sewers cannot be installed within the City owned right-of-way, discussions with property owners will need to take place to confirm the easement or property acquisition requirements.

2.4.2 Ground Cover Conflicts

The design criteria detailed in Section 2.2 and the existing City topography was utilized to complete the ground cover checks on the recommended storm and sanitary sewer solutions as part of the functional design process. The vertical alignments and associated cover from the top of the recommended sewer improvements were compared to the existing LiDAR topography to determine the approximate ground cover.

During detailed design, the cover for all improvements shall be reviewed to confirm that adequate cover is provided. If it is identified that minimum sewer cover cannot be achieved, other options are available to achieve the minimum cover, such as replacing circular pipes with arch pipes or box culverts of equal or greater capacity.

2.4.3 Private Drain Connection Conflicts

As mentioned in Section 2.2.3 of this report, approximate private drain connection (PDC) elevations were established, and potential sewer conflicts with PDC's were determined.

To mitigate conflicts with existing and proposed PDC's, the proposed storm and sanitary sewer solutions were designed to allow for a minimum 300mm of separation at PDC crossings where feasible. In some instances, specifically, where proposed sewers had similar inverts to the existing sewers, minimum PDC cover requirements could not be met. At these locations, a more detailed review of existing PDC information will need to be completed during detailed design to determine if cover requirements can be met.

In some instances, a separate local sewer(s) - parallel to the proposed trunk sewer - may be required to be installed to allow all PDC connections to the sewer system. Some municipalities in Ontario define a maximum size of the sewer to which a PDC may be connected. At present, the City of Windsor does not provide specific direction on when a local sewer would be required. For the purposes of this report, it is assumed that a PDC may connect to any size trunk sewer. However, due to potential crossing conflicts and/or the depth of the proposed sewer infrastructure, connecting PDCs directly to the larger sewers may not be feasible or desirable.

2.4.4 Side Street Sewers

During the functional design of the proposed solutions, side street sewer improvements were not considered nor identified within the related figures. When developing the detailed designs for the various solution areas, side street sewer connections must be accounted for, and suitably sized to meet the City design requirements.

It is recommended that during construction of the proposed trunk sewer improvements, side street sewer stubs/improvements should be designed and installed to the limits of construction to avoid re-excavation of the reconstructed roads. The size(s) of the stubs should be confirmed by utilizing the InfoWorks model that has been developed.

2.4.5 Trunk vs. Local Sewers

The functional design solutions for the various solution areas have a wide range of sewers sizes proposed. The sewers range from smaller diameter sewers to larger box culverts. It is important to note the distinction between a trunk sewer and a local sewer. Trunk sewers are generally larger diameter sewers or box culverts intended to intercept flow from various tributary sewer systems and convey that flow to an outlet or outfall. Local sewers are generally smaller sewers intended to convey flow to other local sewers or the larger trunk sewers. Design manuals for some municipalities in Ontario provide guidance as to what defines a trunk sewer compared to a local sewer. At present, the City of Windsor does not provide specific direction on when a local sewer would be required. For the purposes of this report, it is assumed that a PDC may connect to any size sewer, including a trunk sewer. However, due to potential crossing conflicts and/or the depth of the proposed trunk sewer infrastructure, connecting PDCs or catch basins directly to the larger sewers may not be feasible or desirable. In these instances, the installation of a parallel local sewer, which connects to the trunk sewer downstream, may be necessary to negate any identified connection issues. It should be noted that the implementation of a local sewer may require additional ROW width to install.

The cost estimates completed for this project do not account for any local sewers. The installation of a secondary local sewer will likely increase the overall construction costs, although the cost may be slightly offset by lesser costs for PDC connections. As noted above, the addition of a local sewer may require additional property acquisition.

During detailed design, discussions with the City will be needed to determine where local sewers may be warranted in addition to the proposed trunk sewers.

2.4.6 New or Improved Outfalls

As detailed in the functional design figures within Appendix F-1 and Appendix F-2, new or improved outfalls are recommended to the Detroit River. During detailed design, consideration should be given to the surface and subsurface conditions as well as the natural environment impacts for each site.

As mentioned in the geotechnical report completed for this project (Appendix J), the installation of these new outfalls is likely to take place in fill areas. Based on the recommendations from the report, sewer installations within fill areas are not considered to be acceptable for supporting the proposed infrastructure. Various solutions are recommended and should be considered during detailed design, including excavating the unsuitable fill material and replacing with clean engineered fill or supporting the proposed infrastructure on grade beam type foundations. Cofferdams would likely be required at all outfall locations to facilitate sewer installation into existing watercourses at the proposed inverts.

The improved outfall locations identified on the functional design figures will require the removal of the existing outfall and existing upstream sewer infrastructure. Detailed geotechnical investigations at the proposed outfalls should be completed during detailed design to confirm subsurface conditions and requirements for infrastructure installation.

2.4.7 Watermain and Utility Relocations

Due to the scale of the proposed works, it was not feasible or cost effective to check for conflicts with existing watermain or utility infrastructure.

It was determined during the functional design and analysis of the individual solution areas that watermain and utility relocations and deflections will likely need to take place in conjunction with proposed sewer installations. As part of the detailed design process, as-built information should be gathered as well as pre-engineering locates to determine the approximate location of each utility within the right-of-way. Relocation/replacement of utilities or deflection will likely be required to facilitate the installation of the sewer improvements.

All relevant utility design standards and guidelines at the time of detailed design should be utilized when completing the design of the recommended solutions. Coordination with the relevant utility companies will be required from the detailed design stage through construction completion. Open and frequent communication with utility companies is crucial as construction lead times vary significantly between companies.

Relocations of existing watermain and utility infrastructure may require property acquisition or working easements for installation and maintenance if it is determined that there is insufficient room to accommodate the relocation within the right-of-way.

2.4.8 Property Impacts

The functional design of the preferred solutions took into consideration potential property impacts within the various solution areas throughout the City. However, as previously noted, only impacts as they relate to the sewer and/or flood protection improvement solutions were reviewed. In many situations the preferred solutions include much larger sewers than presently exist. As a result, other utility infrastructure may require relocation to permit the sewer installation that in turn may necessitate

property acquisitions or easements beyond the current right-of-way limits of a given roadway. Any property impacts as a result of these trickle down utility relocations have not been assessed and are not included as a part of the functional designs. Additionally, property impacts required as a result of City required road widenings, sidewalks, trails or bike lanes have not been assessed.

The functional designs were assessed to minimize potential property acquisitions/impacts. Options utilized to maintain improvements within existing right-of-ways included re-routing sewers to less constrained right-of-ways and shifting horizontal alignments away from property lines where feasible.

There are various proposed solutions where property acquisition and/or easements cannot be avoided due to their location within the solution area. Final property impacts are to be determined during detailed design once all sewer, watermain, utility and road improvements are determined.

2.5 Inline Storage System

In-line storage through the use of box culverts is proposed for both the sanitary and storm recommended solutions. In-line storage refers to the storage of flows such that the peak flow is controlled to the capacity of the downstream infrastructure (built or natural) and that storage is maintained within the right-of-way.

For the Windsor sanitary sewer system, wet weather I&I under the 1:100-year event necessitated the use of in-line storage with a controlled release to the Little River Pollution Control Plant (LRPCP). For the storm system, in-line storage is used to prevent an increased inflow to Little River as mandated by the Essex Region Conservation Authority (ERCA).

For the functional design of these in-line storage facilities, three (3) details have been provided that address outlet controlled flow release, transition sewer that connects two cells of the in-line storage facility to address conflicts with existing infrastructure, and transition connecting to segments of conveyance to address similar conflicts with existing infrastructure. The typical details are illustrated in Figures 2.2 through Figure 2.4 and are summarized below:

2.5.1 Typical Details

Typical Detail #1 – Outlet Control Sewer

The outlet control sewer is designed to limit the flow rate from an inline storage facility/culvert to a rate that does not exceed the existing or designed capacity of the downstream sewer system or pumping station. The typical detail is shown in Figure 2.2. The allowable release rate at each location is discussed in subsequent sections.

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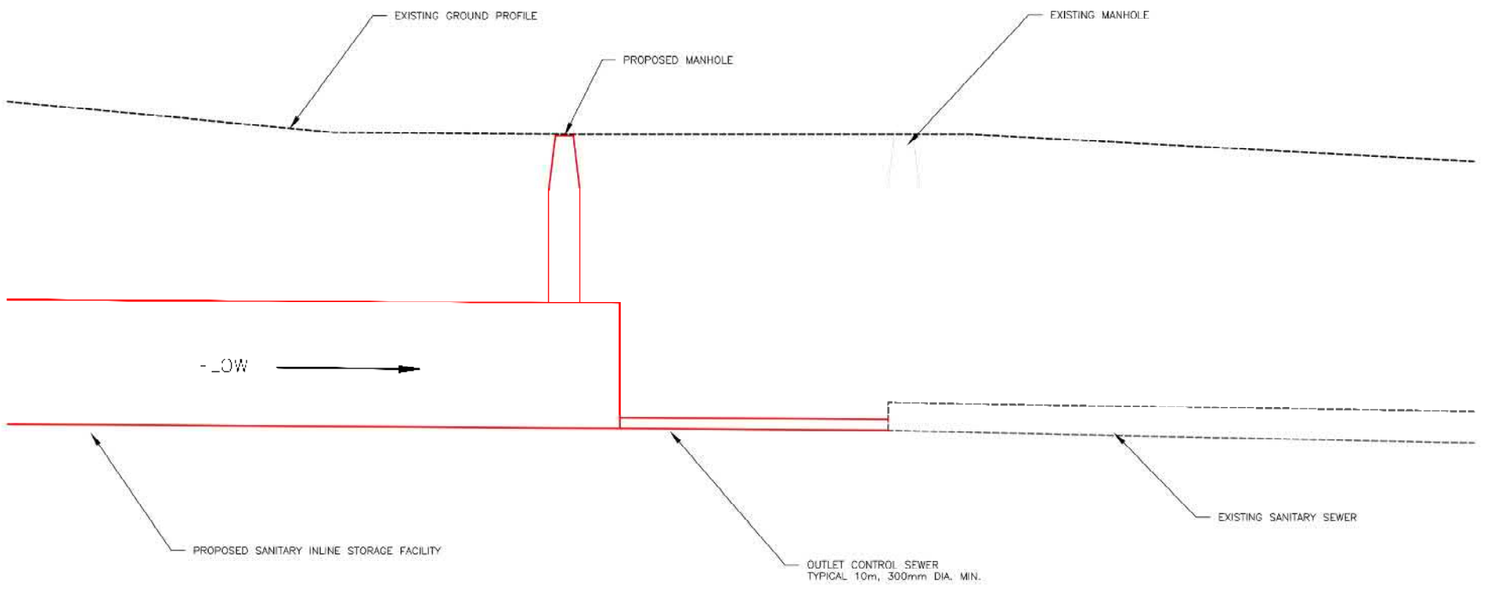

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

TYPICAL DETAIL #1
OUTLET CONTROL SEWER

NOTES:
- THE OUTLET CONTROL SEWER IS DESIGNED TO LIMIT THE FLOW RATE FROM THE STORAGE FACILITY TO A VALUE THAT CAN BE ACCEPTED BY THE DOWNSTREAM SEWER SYSTEM. THE MAXIMUM FLOW RATE WILL VARY FOR EACH LOCATION. SECTION 4.1 OF THE REPORT DEFINES THE LOCATIONS OF THE OUTLET CONTROL SEWER TOGETHER WITH THE MAXIMUM RELEASE RATE

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

PROJECT: 17-6638 STATUS: FINAL DATE: AUGUST 2020

Figure 2.2: Outlet Control Sewer (Typical Detail #1)

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Typical Detail #2 – Control Detail for In-line Storage Facilities, Transition Sewer

Locations where conflicts occur between the proposed inline storage facility/culvert and existing crossing sewer infrastructure are defined in subsequent sections. For each of these conflicts, a transition sewer must be provided to convey flows from the upstream cell of the in-line storage facility to the downstream cell and be of adequate size to mitigate excess heat loss as shown in Figure 2.3. Sizing of these transitions is to be defined at detailed design.

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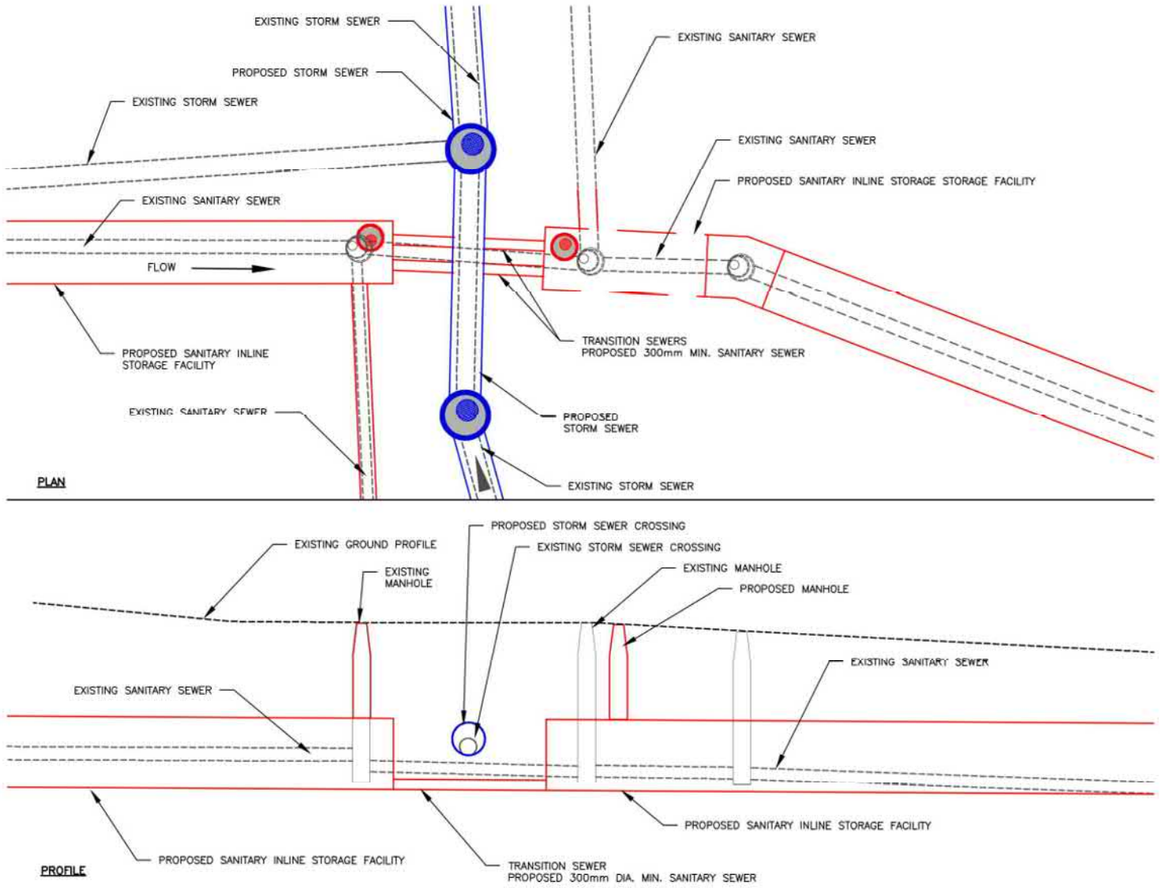

Figure 2.3: Transition Detail for Proposed Storage (Typical Detail #2)

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Typical Detail #3 – Conflict Detail for Proposed Conveyance Sewers

The functional designs identify locations where vertical conflicts between the proposed and/or existing conveyance sewer infrastructures occurs. In these instances where conventional design approaches could not resolve conflicts, smaller transition sewers are required to mitigate conflicts and still maintain conveyance of flows to the proposed downstream sewer. The transition sewer must be of adequate size (see Figure 2.4) to convey sufficient flow downstream without negatively impacting the upstream hydraulic grade line under dry weather conditions. The design flow rate (pipe full capacity) for the proposed sewer is defined at each location for the appropriate sizing.

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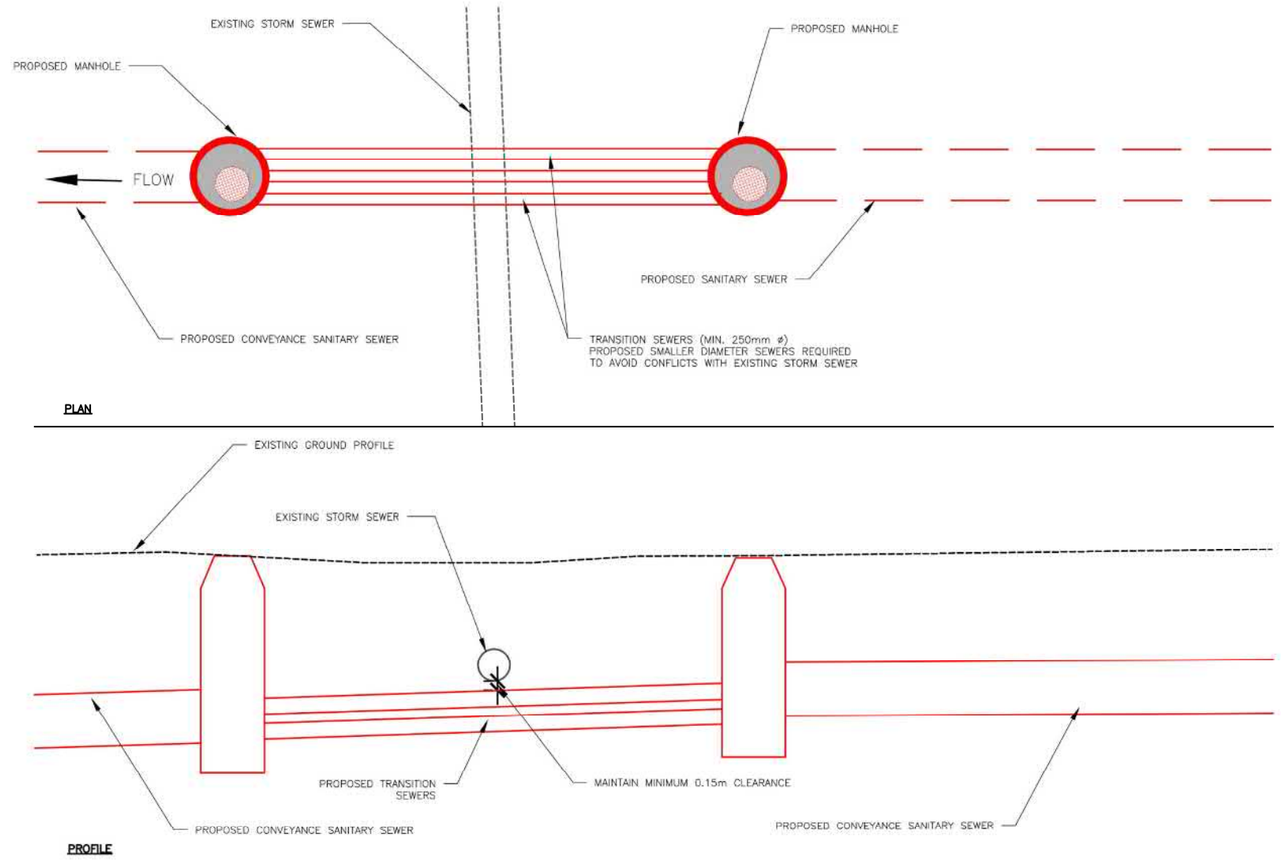

Figure 2.4: Conflict Detail for Sanitary Sewers (Typical Detail #3)

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2.6 Stormwater Management Facilities

The locations of the recommended stormwater management (SWM) facilities should generally follow the recommendations from the functional design but may be altered slightly to suit site conditions. The functional designs include inline storage as well as offline storage facilities.

Inline facilities generally consist of oversized sewers within the right-of-way to assist with lowering the hydraulic grade lines within the sewers to reduce the risk of basement flooding. Offline SWM facilities are either open water detention ponds or underground detention facilities. In general, the functional design of offline SWM facilities is proposed on lands that are currently privately owned. Discussions with the affected property owners will be required during detailed design to confirm easement requirements, potential property acquisition and City maintenance requirements.

The types of SWM facilities recommended as part of the functional design solutions may be altered during detailed design to better suit site conditions. Still, they must maintain the required storage volumes as detailed in Section 4.0 of this report. Tables 4.3 and Table 4.4 detail the required storage volumes for all the proposed SWM facilities along with the type of facility proposed, property impacts and related site constraints.

Geotechnical site investigations should be completed at all proposed SWM facility locations during detailed design to confirm if proposed facilities are suitable based on surface and subsurface conditions.

2.7 Low Impact Development Measures (LIDs)

To provide added resiliency to the City storm systems, low impact development (LID) measures were considered as a source and conveyance controls for the recommended functional design solutions. Low Impact Development (LID) is a stormwater management strategy that seeks to mitigate the impacts of increased runoff and stormwater pollution by managing runoff as close to its source as possible. LID comprises a set of landscape-based site design strategies that minimize runoff. These relatively small-scale structural practices mimic natural or pre-development hydrology through the processes of infiltration, evapotranspiration, re-use, filtration and detention of stormwater.

The adoption of LID features in stormwater management has been encouraged through studies over the last two decades that compare their ability to reduce runoff volumes and enhance water quality using LID vs the ability of traditional SWM infrastructure. Traditional infrastructure typically involves a storm sewer drainage network that quickly conveys runoff away from the site or neighbourhood.

As a result of increased runoff volumes and faster hydrologic response times, watersheds that include significant urban development are prone to an increase in the frequency and severity of flooding events. These events cause damage to both private property and municipal infrastructure. The increasing prevalence of urban flooding, sewer backup and water damage has become a significant concern for

Municipalities and the insurance industry. Water-related losses now account for approximately 32% of personal property insurance claims. In Ontario, the average cost of a personal water damage claim increased by 182% between 2000 and 2010 (Aviva, 2011). This can be attributed to Canada's aging municipal sewer infrastructure, intensification that increases design flows and risks, and homeowners investing in basement upgrades. LID practices may have the ability to reduce these costs by attenuating peak flow rates and decreasing the volume of urban stormwater conveyed to municipal storm sewers (it is noted that the City of Windsor will be undertaking a comprehensive monitoring program of LID systems to quantify anticipated local benefits). Reducing the volume and peak flows is especially important in older communities where development occurred prior to current SWM practices or where infrastructure deficiencies have been identified.

It should also be noted that LID practices may be beneficial in meeting objectives beyond the field of stormwater management such as energy/water conservation, reduce-reuse of materials, ozone protection and reduction of the effects of 'Urban Heat Island'.

LID infiltration trenches are intended to imitate the natural drainage process and provide relief for the recommended sewer solutions for the City of Windsor by allowing excess storm water to infiltrate the ground around the sewers. Bioretention, bioswales, and permeable pavements are alternatives measures.

2.7.1 Provincial Direction for LID

At present, stormwater management is guided by the 2003 Stormwater Management Planning and Design Manual (SWMPDM) (MOE, 2003). The focus of this document includes water quantity, water quality and erosion considerations and the provision of technical and procedural guidance for the planning, design, and review of stormwater management practices. The focus of the manual was broadened from its 1994 predecessor to incorporate the current multi-objective approach to stormwater facility planning to address targets related to hazards, water quality, fish habitat and recreation.

However, the 2003 SWMPDM has limitations as it relates to the LID. These limitations were noted by the Ministry with their release in February 2015 of the Interpretation Bulletin – Expectations Re: Stormwater Management. This bulletin detailed the Ministry's position, specifically that:

- "The natural hydrologic cycle should be maintained to the greatest extent possible."
- "Too often, preservation of the natural hydrologic cycle is not sufficiently addressed in stormwater management plans submitted to the Ministry for an Environmental Compliance Approval (ECA)."
- "Low Impact Development (LID) is relevant for all forms of development, including urban intensification and retrofit."

- "Going forward the Ministry expects that stormwater management plans will reflect the findings of the watershed, subwatershed, and environmental management plans, and will employ LID in order to maintain the natural hydrologic cycle to the greatest extent possible."

The Interpretation Bulletin is a precursor to the development of the Ministry Low Impact Development Planning and Design Guide (LID SWMGM), a companion document to the 2003 SWMPDM. The 2003 SWMPDM will still be used as the 'standard' for the end of pipe stormwater management criteria and design recommendations while the new LID SWMGM will provide volume control requirements for source and conveyance LID controls. The DLID SWMGM is anticipated for release in 2020-21. The current Draft Manual to date has not been released publically but has been released in Draft by the MECP for comment to the smaller Stakeholder Review Group (SRG). In its current version, the Draft LID SWMGM and is expected to provide volumetric control targets (Runoff Volume Control Target – RVCT) to consider where there are no local studies to set criteria. These voluntary targets (noted as voluntary in the current draft) and the use of LID approaches may be considered for new development, infill and redevelopment as well as linear (ROW) projects. Key elements of the LID SWMGM are detailed below:

- On-site control of runoff generated from the regionally specific 90th percentile rainfall event is expected to be the basis of the RVCT. The City of Windsor, in the absence of local study criteria, can be expected to have an RVCT of 30-32mm (based on the draft 2020 LID SWMGM **Figure 2.5**)
- The pre-development water balance (i.e., at the project onset or a natural undisturbed condition) should be maintained or restored (i.e., match the pre-development infiltration volume on an annual basis based on a site-specific assessment, acknowledging that evapotranspiration is variable pre to post-development and that full control may not always be possible).
- Quantity control may be managed partially on-site primarily through the use of LID stormwater controls via the hydrologic processes of infiltration and evapotranspiration as well as re-use and filtration, offsetting detention volume needs.
- Control is anticipated to be required using the hierarchical design process (**Figure 2.6**). Beginning with better site design practices, the hierarchical approach focuses on the application of measures to achieve the target. It begins with retention (infiltration, evapotranspiration and re-use), followed by LID filtration, and then conventional stormwater management.
- Projects which are composed of construction or reconstruction of only sanitary systems and that do not include a significant change to the right-of-way are not considered linear development for the purposes of the Draft LID manual.
- Retrofits involving retrofits of new and/or reconstructed municipal stormwater infrastructure within an existing urban area that is not considered a development, redevelopment or linear development project, are encouraged to achieve volume control to the maximum extent possible.

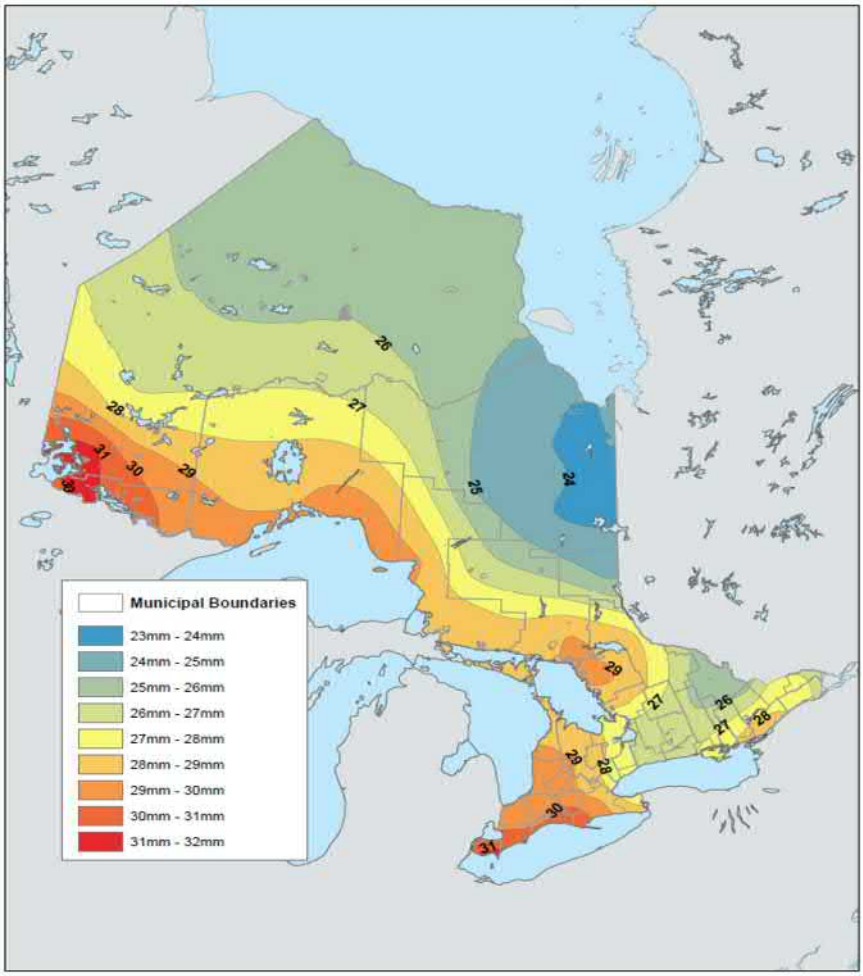


Figure 2.5: Draft Regionally Specific 90th Percentile Runoff Volume Control Target (source 2020 LID SWMGM)

- Control Hierarchy Approach 1 (Retention) – LID retention technologies which utilize the mechanisms of infiltration, evapotranspiration and or re-use to recharge shallow and/or deep groundwater; return collected rainwater to the atmosphere and/or re-use collected rainwater for internal or external uses respectively. The target volume is controlled and not later discharged to the municipal sewer networks (with the exception of internal water re-use activities) or surface waters and did not; therefore, become runoff. Water balance requirements can be met using retention technologies within Approach 1 of the mandatory control hierarchy. Approach 1 is suitable for high permeability soils.
- Control Hierarchy Approach 2 (LID Volume Capture and Release) – Low Impact Development filtration technologies which utilize filtration to filter runoff using LIDs with appropriate filter media per the LID Stormwater Planning and Design Guide (2010, v1.0 as amended from time to time). The controlled volume is filtered and released to the municipal sewer networks or surface waters at a reduced rate and volume (a portion of LID Volume Capture and Release may be infiltrated or evapotranspirated). Approach 2 is suitable for medium and low permeability soils.

- Control Hierarchy Approach 3 (Other Volume Detention and Release) – Other stormwater technologies which utilize filtration, hydrodynamic separation and or sedimentation (i.e. end-of-pipe facilities) to detain and treat runoff using an appropriate filter media per industry standard verification protocols; separate contaminates from runoff; and/or facilitate the sedimentation and removal of contaminants respectively. The controlled volume is treated and released to the municipal sewer networks or surface waters at a reduced rate. Approach 3 can be used for all soil types.

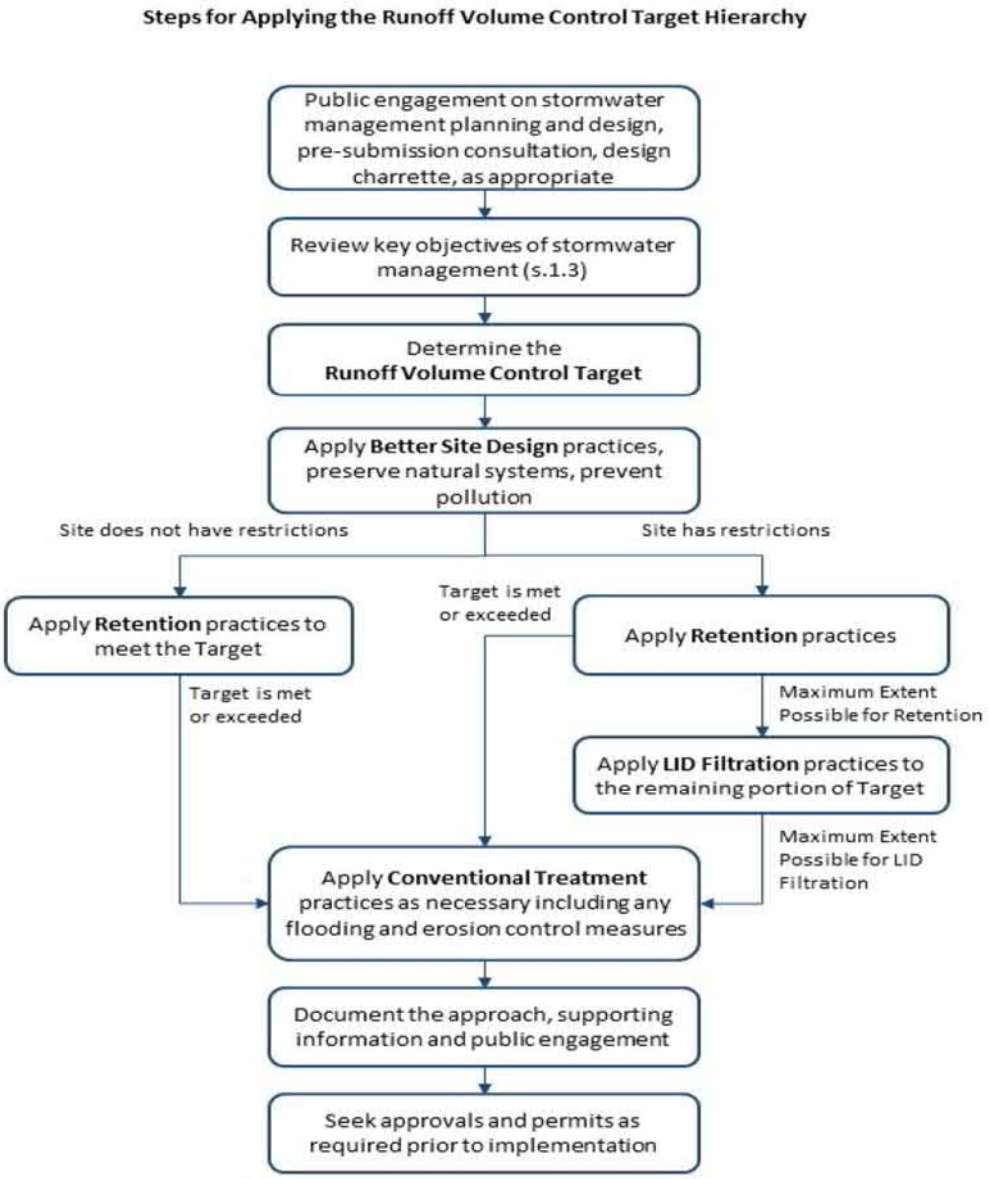


Figure 2.6: Basic Steps of the Runoff Volume Control Target Hierarchy (source 2020 LID SWMGM)

- It is also important to note that the LID SWMGM has been developed with flexibility, in that some sites may not be required to meet their respective RVCT volume depending on the

presence of specific constraints. Property constraints which may result in the permission to deviate from the above prescribed volume targets include but are not limited to the following (**Table 2.3**):

Table 2.3: Site Constraints that may result in the application of alternatives to the prescribed volume targets (source: 2020 Draft LID SWMGM)

Site Constraints
a) Shallow bedrock† and Karst;
b) High groundwater† or areas where increased infiltration will result in elevated groundwater levels which can be shown through an appropriate area specific study to impact critical utilities or property (e.g., susceptible to flooding);
c) Swelling clays or unstable sub-soils;
d) Contaminated soils (e.g., Brownfields);
e) High Risk Site Activities including spill prone areas;
f) Prohibitions and or restrictions per the approved Source Protection Plans and where impacts to private drinking water wells and/or Vulnerable Domestic Well Supply Areas cannot be appropriately mitigated;
g) Flood risk prone areas or structures and/or areas of high inflow and infiltration (I/I) where wastewater systems (storm and sanitary) have been shown through technical studies to be sensitive to groundwater conditions that contribute to extraneous flow rates that cause property flooding/sewer back-ups and where LID BMPs have been found to be ineffective;
h) For existing Linear infrastructure where reconstruction is proposed and where surface and subsurface areas are not available based on a site-specific assessment completed by a qualified person.
i) For developments within partially separated wastewater systems where reconstruction is proposed and where based on a site-specific assessment completed by a qualified person can be shown to: 1. Increase private property flood risk liabilities that cannot be mitigated through design, 2. Impact pumping and treatment cost that cannot be mitigated through design, 3. Increase risks of structural collapse of sewer and ground systems due to infiltration and the loss of pipe and/or pavement support that cannot be mitigated through design,
j) Surface water dominated or dependant features including, but not limited to, marshes and/or riparian forest wetlands which derive the all or a majority of their water from surface water, including streams, runoff, and overbank flooding. Surface water dominated or dependant features which are identified through approved site specific hydrologic or hydrogeologic studies, and/or Environmental Impact Statements (EIS) may be considered for a reduced volume control target. Pre-consultation with the MECP and local agencies is encouraged;
k) Existing urban areas where the risk to water distribution systems has been identified and substantiated by a qualified person through an appropriate area specific study and where the risk cannot be reasonably mitigated per the relevant design guidelines;
l) Existing urban areas where the risk to life, human health, property or infrastructure has been identified and substantiated by a qualified person through an appropriate area specific study and where the risk cannot be reasonably mitigated per the relevant design guidelines;
m) Water reuse feasibility study has been completed to determine non-potable reuse of stormwater for onsite or shared use. Potable reuse may be considered on case specific basis.

Footnote: † May limit infiltration capabilities if bedrock and groundwater are within 1m of the proposed facility invert per Table 3.4.1 of the LID Stormwater Planning and Design Guide (2010, V1.0 or most recent). Detailed assessment or studies are required to demonstrate infiltration effects and results may permit relaxation of the minimum 1m offset.

This change in provincial direction will require the consideration of LID source and conveyance controls for future developments including roads projects. The LID SWMGM encourages the development of holistic studies to assess LID implementation opportunities and constraints for linear infrastructure projects:

> "Owners (municipalities and agencies) are encouraged to comprehensively and holistically assess stormwater and LID implementation opportunities and constraints within their respective rights-of-way networks and public properties to improve cost effectiveness, environmental performance and overall benefit to the receiver and the community." The Draft LID SWMGM supports "planning level studies [which] align planned or forecasted capital or maintenance works within linear developments following a Class Environmental Assessment approach that transparently considers Social, Environmental, Financial, and Technical considerations" consistent with the manual and the supporting resources.

2.7.2 Potential LID Approaches

The following subsections summarize the typical LID features that can be adopted in both the right of way and park locations across the City of Windsor, including how they function and their typical application.

2.7.2.1 Right-of-Way LID Practices

Descriptions of the various LID options that may be feasible for the implemented in the Right of Way (ROW) within the City of Windsor are presented below. The sizing for any proposed LID measure will have to be reviewed during the detailed design stage to determine the amount of potential benefits that may be achieved from these measures. The results of the planned City LID pilot projects should be continuously reviewed to update local design criteria and provide a better understanding of the potential benefits and cost effectiveness.

Bioretention

As a stormwater filtration and infiltration practice, bioretention temporarily stores, treats and infiltrates runoff. The primary component of the practice is the bioretention soil media. This component is comprised of a specific ratio of sand, fines and organic material. Another important element of bioretention practices is vegetation, which can be either grass or a more elaborate planting arrangement. Depending on the native soil infiltration rate and site constraints, bioretention practices may be designed without an underdrain for full infiltration or with an underdrain for partial infiltration.

Bioretention Bump Outs

Bioretention bump outs are bioretention areas that extend into the roadway and are separated from the paved ROW by perimeter curbing. Bump outs can be used for traffic calming and can be arranged to allow for adjacent on street parking. They are a very flexible LID retrofit and can be constructed during road resurfacing, road construction, or road reduction projects. The location, size and spacing of

bioretention bump outs can be adjusted as needed to meet existing roadway conditions. It is possible to design these practices, so the existing curb and inlets remain in place or repurposed.

Bioretention bump out (Hamilton, ON)

Boulevard Bioretention

Boulevard bioretention consists of shallow vegetated depressions located immediately behind the curb. For streetscapes with sidewalks, these units are located between the curb and inside sidewalk edge. In residential areas that do not have sidewalks, these cells are located on the municipally owned portion of the boulevard. Curb cuts typically direct road drainage to a bioretention cell, though other inlet types, such as side inlets, can be configured to meet site needs. The size and shape of boulevard units are flexible to accommodate site specific constraints.

Boulevard Bioretention (Mississauga, ON)

Bioretention Planters

Bioretention planters have vertical sidewalls and are often narrow and rectangular in shape. The walls allow planters to maximize the amount of stormwater retention within a small footprint.

The self-contained structure of bioretention planters permits them to be installed in close proximity to utilities, driveways, trees, light standards and other urban features. They can be constructed immediately adjacent to the roadway, in the boulevard, or as a green feature within the pedestrian area (i.e., sidewalks and pathways). Given these characteristics, bioretention planters are ideal for integrating within highly urbanized streetscapes or within ROWs with space constraints. Planters are an ideal means

to address multiple objectives in urban streetscapes, including street greening, improved aesthetics, and stormwater management benefits.

Bioretention Planter (Kitchener, ON)

Bioswales

Bioswales are vegetated open channels designed to convey, filter, and attenuate stormwater runoff. Similar to bioretention units, they also promote infiltration to the native soil reducing stormwater contributions to the municipal storm sewer. A unique feature of bioswales, when compared to conventional vegetated swales, is the bioretention soil media, granular storage layer, and optional underdrain components (which can replace a traditional storm sewer). Depending on the desired neighbourhood aesthetic, bioswales can be vegetated with grass for a traditional streetscape or can be planted with a variety of shrubs, grasses and flowers for a garden-like visual.

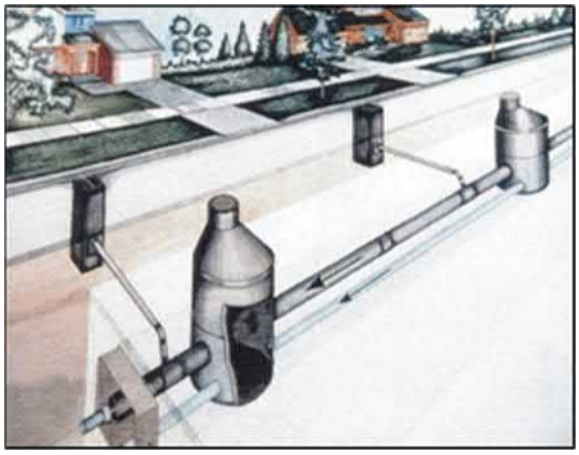
Bioswale (Newmarket, ON)

Perforated Pipe Systems

Perforated pipe systems are long infiltration trenches designed for both conveyance and infiltration of stormwater runoff. These stormwater conveyance systems are composed of perforated pipes installed in gently sloping granular stone beds lined with geotextile fabric that allows infiltration of runoff into the

gravel bed and underlying native soil. Perforated pipe systems can be used in place of conventional storm sewer pipes where topography, water table depth, and runoff quality conditions are suitable. The systems can be installed as a single larger diameter perforated pipe beneath the roadway surface or as two (2) parallel smaller diameter pipes beneath a shallow swale beneath the boulevard area (see typical layout below).

With most perforated pipe designs, the streetscape remains largely the same as conventional curb-and-gutter. Due to their simple design, perforated pipe systems require very little maintenance and have a proven track record in Ontario for over 25 years.



Exfiltration system (Etobicoke, ON)

Perforated pipe installation (Mississauga, ON)

Permeable Pavement

Permeable pavement includes pervious concrete, porous asphalt and permeable interlocking concrete pavers. Permeable pavement can be used in place of conventional asphalt or concrete pavement. These alternatives contain pore spaces or joints that allow stormwater to pass through to a stone base for infiltration into underlying native soil or temporarily detained. For best results in ROW applications,

permeable pavement should be limited to areas subject to light vehicle traffic, including parking lay-bys, shoulders, sidewalks, cycle paths, and pedestrian areas as well as laneways. Use in heavy traffic areas is not recommended—these materials don't currently wear as well as conventional asphalt or concrete. Given the need for the appropriate underlying infrastructure, permeable pavement cannot be incorporated into road resurfacing projects. Instead, permeable pavement retrofits are best suited for reconstruction projects.

Permeable Pavement Laneway

2.7.2.2 Park Spaces and LID Integration

Parks are essential components of any sustainable community. Parks offer opportunities for the public to interact with unique cultural and natural resources in a safe environment. LID stormwater practices can be implemented in parks of all shapes and sizes from complex urban trail systems to urban parkettes. Municipal parks can generally be broken down into areas of passive and active use. Passive areas emphasize the natural and open space components of the park. These areas may include trails, benches and picnic areas. Typical operations and maintenance activities in passive use areas are often limited to mowing and trash removal. Active use areas include sports fields, pools, splash pads, skate parks, skating rinks, and municipal beaches. It is possible to integrate LID stormwater practices into both passive and active use areas, though active use areas may require additional effort, including extensive consultation with stakeholder groups.

Municipal parks offer excellent opportunities for implementation of LID SWM measures. Hard surfaces such as parking lots and internal roadways and paths are the most obvious areas to target. On municipal park properties, hard surfaces are usually located adjacent to pervious areas such as lawns, gardens or naturalized areas. Where grading allows, bioswales and bioretention areas can be constructed in these areas. Parking surfaces and internal roadways can also be designed as infiltration systems utilizing permeable pavement above a granular reservoir. Paved pedestrian pathways may also be constructed of permeable pavement to reduce runoff volumes and encourage onsite infiltration. Perforated pipes are

another viable option on many park sites as an alternative to conventional conveyance systems and to encourage infiltration. These pipes can also be used as conveyance features between other LID features.

Compared to other land uses, parks present the fewest physical constraints to LID implementation. Underground utilities are rarely a problem, and the ponding of water on the surface of LID practices can be designed not to cause public safety concerns or interfere with site functions. As with all land uses, site specific constraints such as grading or a high groundwater table may exist. The following table summarizes typical park zones and the applicability of common LID practices within each.

The unique nature of each park in terms of their available space, layout of features, grading, and active uses requires site-specific LID solutions. Noting this, the following example illustrates the LID concept plan for Tranby Park in Windsor (Figure 2.7). The concept plan shows a typical approach that can be adapted to strategically implement LID practices without causing significant disruption to the active use areas and existing park features. The plan includes a LID permeable pavement parking lot, LID grass swales and a conventional Dry Pond with subsurface storage and infiltration.

Figure 2.7: Concept Plan of LID Layout for Tranby Park in the City of Windsor.

2.7.3 Implementation of LID Features

The following sections describe the various implementation considerations for LID features related to geotechnical considerations and design guidance.

2.7.3.1 Geotechnical Considerations

The Geotechnical Review of Selected Sites, City of Windsor Sewer Master Plan (Golder Assoc. Ltd, April 2020) was prepared to support the functional design for the City of Windsor Sewer and Coastal Flood Protection Master Plan. It has provided a high level overview of the geotechnical considerations for LID techniques as it relates to the suitability of the soils at various locations and the use of perforated pipes (or as referenced within exfiltration trenches). Relevant points are included below:

- The suitability of the soils at the various locations to provide drainage for exfiltration trenches is dependent on several soil properties, including the soil gradation, density, clay percentage, mineralogy of the clay portion, plasticity characteristics of the soil and organic content.
- The predominant silty clay soils encountered at the project locations will have low permeability are not well suited for exfiltration trenches
- Where encountered, sands will have a relatively medium permeability, with silty sands having a medium to low permeability and may be suitable depending on the required exfiltration rates.

Notwithstanding the foregoing, per the Interpretation Bulletin: Ontario Ministry of Environment and Climate Change Expectations Re: Stormwater Management (February 4, 2015), several areas of existing Ministry Guidance (including the 2003 SWMPDM) are identified as requiring improvement, including regarding the stated minimum infiltration rates for source and conveyance control LIDs. Rather than a set cut-off point for infiltration based LIDs, the current approaches recognize that provided LIDs incorporate the appropriate runoff storage volumes, empty within inter-event periods and are otherwise appropriately sited, designed, monitored and maintained (similar to all other stormwater management facilities), there should be no impediment to the application of infiltration technologies, in all soils type, for the realization of runoff volume reduction, water quality improvements and maintenance of the water balance. Effectively, there is no minimum native soil infiltration rate for the implementation of LID, provided the native soil infiltration rate is > 0mm/hr. Should the in-situ native soil infiltration rates be less than 15mm/hr, the Low Impact Development Stormwater Management Planning and Design Guide (wiki.sustainabletechnologies.ca) recommends that an underdrain be required and, the LID shall be a 'partial-infiltration' design. In the use of perforated pipe systems, an underdrain is not required as the perforated pipe acts ad both the conveyance system the underdrain.

Additional information related to geotechnical and field investigations is described below.

Geotechnical Investigations

These studies would be focused on the local soils information gathered through subsurface geotechnical investigations and undertaken for the purposes of the design of LID infiltration techniques. Geotechnical investigations are necessary to support the design of most LID practices. However, the scope of work will vary depending on the selected LID practice. The resolution of the investigation (i.e. quantity and spacing between boreholes) will vary from site to site and between LID practices. Resolution of the borehole investigations should be such that sufficient information is collected for

detailed design purposes. Table 2.4 below provides a summary of the geotechnical investigation activities which are necessary for the detailed design of select LID measures.

Table 2.4: Geotechnical Investigation Activities for LID Practices Implemented within the ICI Lands

LID Practice	Geotechnical Investigation Activities			
	Borehole	Piezometers/ Monitoring Wells	Laboratory Soil Testing	Soaked CBR Test or Resilient Modulus
Permeable Pavements	●	●	●	●
Bioretention	●	●	●	
Bioswales	●	●	●	
Soakaway Pits	●	●	●	
Infiltration Chambers	●	●	●	
Perforated Pipe Systems	●	●	●	
Rainwater Harvesting	●		●	
Prefabricated Sub-surface Infiltration systems or modules	●		●	

Piezometer/Monitoring Wells

Monitoring wells typically consist of 50mm diameter piezometers or wells installed to depths ranging from 2.5-4.5 meters and encased within a flush mount or above ground, lockable, steel housing. Monitoring wells are installed to determine the pre and post construction seasonal high-water table and groundwater flow direction. Monitoring wells may be implemented when available data from background documentation or previous investigation is not available. The Low Impact Development Stormwater Management Planning and Design Guide Version 1.0 (CVC, 2010) has design criteria regarding groundwater clearance requirements for LID practices.

Geotechnical Laboratory Soil Testing

Soils samples collected as part of geotechnical investigations characterize the soil properties, including natural moisture content, plasticity characteristics, particle size distribution, and analytical results for contaminates. It is beneficial if geotechnical investigations include recommendations regarding soil disposal alternatives.

- **Soaked California Bearing Ratio (CBR) or Resilient Modulus -** Soaked CBR or resilient modulus is only required for the design of permeable pavement. Geotechnical investigations must include a recommendation for base and sub-base requirements and other measures required to ensure adequate structural strength such as compaction or geosynthetic requirements. The Low Impact

Development Stormwater Management Planning and Design Guide Version 1.0 (CVC, 2010) provides detailed design requirements for permeable pavement.

In-Situ Hydraulic Conductivity Testing

In–situ infiltration testing characterizes the hydraulic conductivity properties of the existing native material on-site. On-site infiltration testing using the Guelph Permeameter test or another suitable approach to determine the in-situ field saturated hydraulic conductivity, and the design infiltration rate per the LID Stormwater Planning and Design Guide Version 1.0 (CVC, 2010) is required. Testing should be performed within the approximate location and invert of proposed LID practices and should include an appropriate safety factor.

2.7.3.2 Design Guidance

For the detailed design of the preferred LID practices within the City of Windsor, the following documents should be consulted:

- Windsor Essex Stormwater Management Standards Manual (December 2018)
- Low Impact Development Stormwater Management Planning and Design Manual, Version 1.0 (CVC/TRCA, 2010) or Wiki Document (wiki.sustainabletechnologies.ca)
- American Society of Civil Engineers (ASCE) has developed a guidance manual entitled ASCE/ T&DI/ ICPS 68-18 Permeable Interlocking Concrete Pavement (North American Standard) (2018)
- NSC/CSA W201 Construction of Bioretention Systems - Canadian Standards Association (CSA) (2018)
- NSC/CSA W200 Design of Bioretention Systems - (2018)
- Low Impact Development Planning and Design Guide (LID SWMGM) - Pending
- Stormwater Management Planning and Design Manual (MOE, March 2003).

2.7.4 Capital Costs

The most cost-effective means of implementing LID practices in the municipal right-of-way is to complete the construction concurrent with municipal road works projects. The opportunity to incorporate conveyance control measures often surfaces with redevelopment pressures (which require replacement of the infrastructure) or replacement due to deteriorating condition of the infrastructure. In the latter case, replacement of the drainage infrastructure may well occur as part of the overall reconstruction of the roadway.

The capital cost for the implementation of perforated pipe systems in the City of Windsor is estimated to be $400/ linear meter (Additional costs per lin.m for LIDs).

Table 2.5 summarizes the cost to construct various LID conveyance control measures as part of reconstruction projects in comparison to conventional storm sewer infrastructure. Costs are provided in both $/m2 and $/m of roadway.

Table 2.5: Estimated Construction Costs for Conveyance Control Measures

Treatment Measure	Unit Construction Cost ($/m² of facility)	Unit Cost per lin. m of roadway as part of Road Reconstruction* $/m²	$/m (5)
Road Surface	n/a	$325 [6]	$2,730
Conventional Storm Sewer System	n/a	$100-120 [4]	$840-1,008
Bioretention	$600 - $750	$135 [1]	$1,134
Bioswales	$300 - $375	$140-175 [2]	$1,176-1,470
Perforated Pipes (assumed 2m wide trench)	$400	$ 95 -120 [3]	$798-1,008

[1]Elm Dr., [2]Lakeview Road Retrofit, [3]Estimated from the Lakeview Road Retrofit, [4]Calculated conventional systems for Lakeview Road Retrofit, [5] Assumes an 8.4m road width, [6]City of Mississauga unit cost for road resurfacing and reconstruction – reconstruction unit costs ($325/m²) include the cost of installation or replacement of traditional storm sewers ($100-120/m²).
* Stormwater unit costs are interchangeable within the road reconstruction estimate of $325/m².
i.e. Reconstruction using perforated pipe system:
$325/m² – conventional storm sewer system cost (avg) + perforated pipe system cost (avg) = $323/m²

2.7.5 Operation and Maintenance Considerations and Costs

Routine maintenance, rehabilitation, and repairs are required through a project's lifecycle to keep LID practices performing their intended stormwater function. These lifecycle activities must be considered when determining if a LID practice can be sustainably integrated in a ROW or municipal park project.

A summary of Operation and Maintenance considerations for the aforementioned potential LID practices is provided in Table 2.6 below.

Table 2.6: Summary of Maintenance Requirements for Preferred LID practices

LID Technique	Maintenance Requirements	Notes:
Exfiltration Trench/Perforated Pipe	Regular Maintenance (Annual) Vacuum debris from catch basins Replace damaged or missing grates Long-term Perforated pipe clean out (if required)	To ensure perforated piping does not become clogged with sediment or debris, catch basins should be cleaned annually or a pre-treatment device (CB Shield™ or equivalent should be installed). Should clogging occur, clean debris from grating, catch basins, and perforated pipe using high pressure sprayers or vacuum

LID Technique	Maintenance Requirements	Notes:
Bioretention/ Bioswales	Post Installation (1st 6 months) Inspection after each storm >10mm or min. of twice Irrigate until established (weekly for 1st yr and bi-weekly for 2nd year; as needed based on rainfall) Annual Inspect each spring and events >60mm Replace mulch as required Reinforce planting as required Regular Integration into existing landscape maintenance program (additional training required)	Lost plants should be re-planted to maintain desired plant density Core aerating or deep tilling may be required to alleviate clogging due to fines accumulation
Permeable Pavement	Post Installation (1st 6 months) Inspection after each storm >10mm or min. of twice Regular Surface cleaning - Integration into existing street sweeping/vacuuming programs	Post signs the site identifying permeable pavement areas and discourage storage of soils, dumping, heavy vehicle use etc. (can compact debris into voids). No construction traffic or material storage on the finished surface). Use only HPB bedding stone as winter aggregate if necessary

2.7.5.1 Operation and Maintenance Costs

A summary of Operation and Maintenance cost for the aforementioned potential LID practices is provided in Table 2.7 below.

Table 2.7: Estimated 0&M Costs for LID Conveyance Control Measures

LID Technique	Maintenance Costs
Exfiltration Trench/Perforated Pipe	O&M costs for exfiltration trench/perforated pipe systems is comparable to the 0&M costs for conventional storm sewers. However, exfiltration trenches do not typically have the same service life expectancy as a traditional storm sewer. Annual catch-basin cleaning costs are estimated to range from $61 to $82 per CB (average $68/CB)
Bioretention/ Bioswales	O&M costs for turf covered bioretention facilities and or bioswales would be comparable to regular turf maintenance activities (mowing activities etc.) for the municipal undertaking at $250/ha O&M costs for bioretention facilities and or bioswales planted with ornamental perennials and grasses is comparable to medium to high level of standard Horticulture Bed maintenance costs including all labour and equipment costs of $7/m^2/visit

LID Technique	Maintenance Costs
	assuming a three (3) hour maintenance period. The level of maintenance can be divided into two (2) levels of service: • Minimum O&M – three (3) maintenance visits after contractor warranty and establishment corresponding to Spring Clean-up, Mid-season and Fall Clean-up which is estimated to have a cost of \$21.50/m^2/year • High O&M – ten (10) scheduled maintenance visits (every 3 weeks) which is estimated to have a cost of \$71.50/m^2/ year. Assuming a 3m wide facility, an annual maintenance cost of approximately \$7/linear meter and \$23/linear meter for the Minimum O&M and High O&M conditions respectively can be anticipated.
Permeable Pavement	O&M costs include annual inspections, replacement of selected pavers, and periodic cleaning and is estimated to cost on average \$0.43 to \$0.44/m^2 per year

3.0 Sanitary Sewer Functional Design Solutions

3.1 East Windsor Sanitary System Solutions

The recommended sanitary system solutions for East Windsor were warranted due to insufficient capacity of the existing sanitary sewer system and the high potential for basement flooding. Solutions for the areas with a higher potential for basement flooding are detailed in the following sections. It should be noted that each solution detailed below should be implemented in conjunction with the source control measures as identified in Section 7.0, where feasible.

In East Windsor, all sanitary flows are directed to the Little River Pollution Control Plant (LRPCP). The LRPCP also serves as the treatment plant for the majority of the Town of Tecumseh. Appendix E (Technical Report Volume II), Section 2.3.1 summarizes the constraints of the existing treatment capacity of the plant. The treatment capacity of the LRPCP is limited to 1.16 m^3/s with a pumping station capacity of 2.6 m^3/s. Much of the existing modelled wet weather flows into the LRPCP contain significant amounts of stormwater from the east combined area, and I&I from connected foundation drains and monitored I&I from newer developments in East Riverside. This combination of limited treatment capacity and significant amounts of Rainfall Derived Inflow and Infiltration (RDII) has resulted in multiple bypasses at the LRPCP (17 occurrences of overflows into Little River in 2017).

The preferred alternative addresses both the RDII component (sewer separation and reduction of I&I from private property under fully developed conditions) and the treatment plant capacity constraint through an increase in the PCP pumping and treatment capacity of 5.2 m^3/s.

The LRPCP drainage area contains five (5) sub-drainage areas where flows enter the LRPCP through five (5) locations and shown on the key plan per Figure 3.1. Each of the drainage areas represents sanitary flows plus wet weather flow I&I to the LRPCP.

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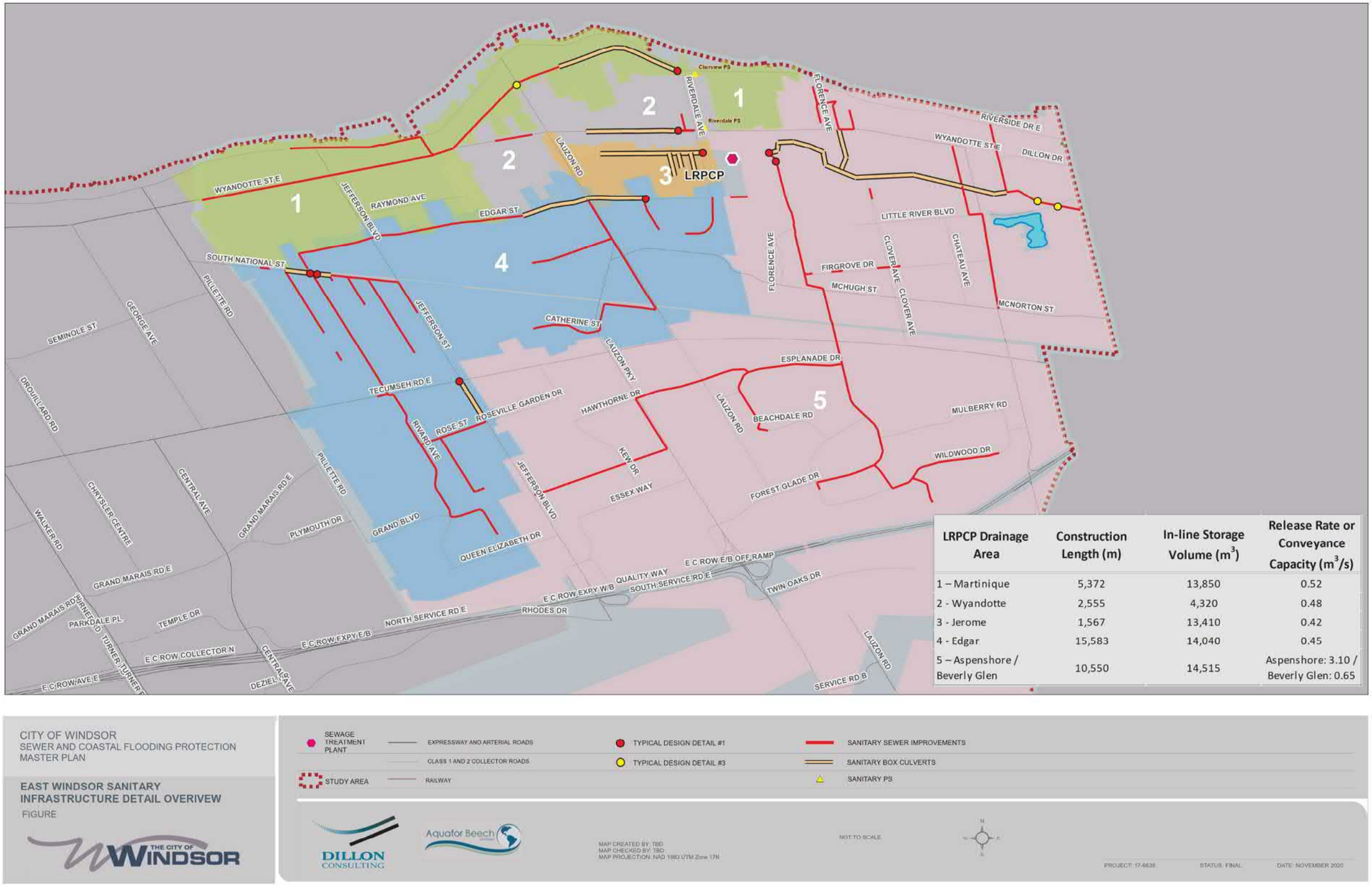

LRPCP Drainage Area	Construction Length (m)	In-line Storage Volume (m^3)	Release Rate or Conveyance Capacity (m^3/s)
1 – Martinique	5,372	13,850	0.52
2 - Wyandotte	2,555	4,320	0.48
3 - Jerome	1,567	13,410	0.42
4 - Edgar	15,583	14,040	0.45
5 – Aspenshore / Beverly Glen	10,550	14,515	Aspenshore: 3.10 / Beverly Glen: 0.65

Figure 3.1: East Windsor Sanitary Drainage Area and Infrastructure Location Key Map

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The preferred alternative comprises of in-line storage of wet weather flows upstream of the LRPCP and control of the release rates from each of the five (5) sub-drainage areas shown on Figure 3.1 per Typical Detail #1 (Figure 2.2). Other locations where potential conflicts between large conveyance-type sewers and existing infrastructure exist use Typical Detail #3 (Figure 2.4) as identified in Figure 3.1.

Table 3.1 below summarizes the location and preferred alternative release rates for each of the five (5) East Windsor drainage areas to the LRPCP.

Table 3.1: Preferred Release Rates to LRPCP from the 5 Sanitary Sub-drainage Areas

LRPCP Drainage Area	Location	US Node ID	Typical Detail	Release Rate or Conveyance Capacity (m^3/s)
1 – Martinique	Riveriside Dr. at Claireview PS wet well.	6SP9S990PS	#1 (outlet to existing pipe)	0.52
2 - Wyandotte	Wyandotte St. at Rholaine Dr.	6S501	#1 (outlet to existing pipe)	0.48
3 - Jerome	Jerome St. at Riverdale Ave.	6S2246	#1 (outlet to existing pipe)	0.42
4 - Edgar	Little River Rd. at Lexington Crt.	6S3429	#1 (outlet to existing pipe)	0.45
5 – Aspenshore / Beverly Glen plus Town of Tecumseh	Beverly Glen at the west side of North Neighbourhood Pond	6S2036_NSNP5	#1 (outlet to existing pipe)	0.65
	Aspenshore at the west side of North Neighbourhood Pond	6S2050	#1 (outlet to existing pipe)	3.10
LRPCP Total Flow				5.20

Within LRPCP Drainage Areas 1 (Martinique), 4 (Edgar) and 5 (Aspenshore / Beverly Glen), are additional functional design typical details associated with in-line storage tank outlets (Typical Detail #1), with associated release rates and conflict details (Typical Detail #3), where the equivalent upstream flow capacity is to be maintained through the conflict zone. The location and details are summarized in Table 3.2 below as well in the associated functional design drawings.

Table 3.2: Typical Details Associated with In-line Storage Outlet and Conflict Infrastructure

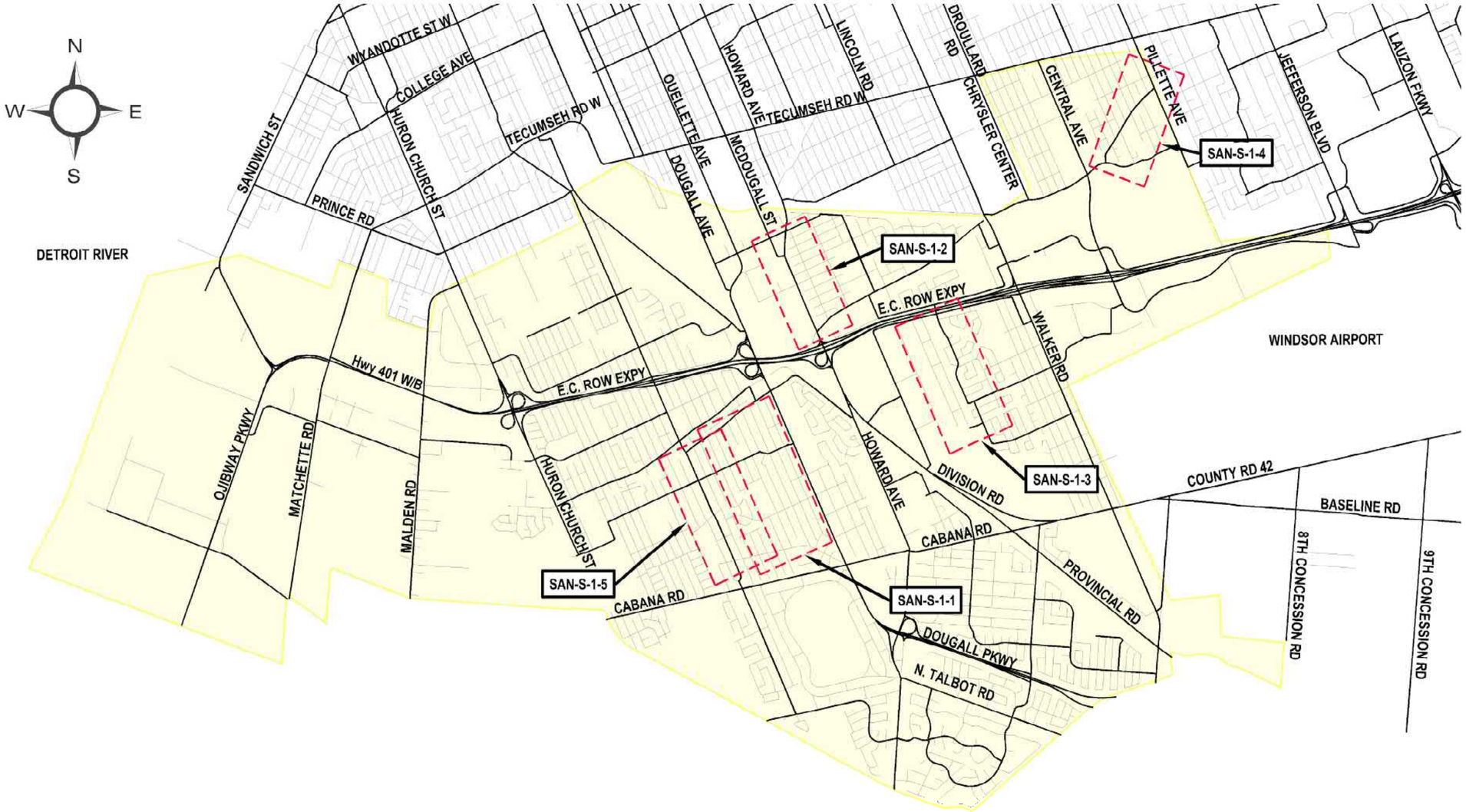
LRPCP Drainage Area	Location	US Node ID	Typical Detail	Release Rate or Conveyance Capacity (m^3/s)
1 – Martinique	Claireview Ave. at Lauzon Rd.	6S4158	#3 (Conflict Conveyance Connection)	1.67
4 - Edgar	South National west of Ferndale Dr.	7S8	#1 (outlet to existing pipe)	0.29
	South National east of Ford Blvd.	7S1271	#1 (outlet to existing pipe)	0.65
	Jefferson Blvd. and Tecumseh Rd.	7S5677	#1 (outlet to existing pipe)	0.29
5 – Aspenshore / Beverly Glen	Greenwood Dr.	6S2022	#3 (Conflict Conveyance Connection)	0.92
	Little River Blvd.	7S4225	#3 (Conflict Conveyance Connection)	0.92

Appendix F-1 provides functional design details for each of the proposed alternatives for all drainage areas as per the East Windsor Sanitary Key Map along with sewer size, length and total in-line storage volume for each drainage area. The tables at the beginning of Appendix F-1 references the functional design drawings associated with each alternative along with the drawing reference.

It should be noted that each solution detailed should be implemented in conjunction with the source control measures as identified in Section 7.0, where feasible.

3.2 South Windsor Sanitary System Solutions

In South Windsor, all sanitary flows are directed towards the Lou Romano Water Reclamation Plant (LRWRP). Appendix E (Technical Report Volume II), Section 2.3.2 summarizes the constraints of the existing treatment capacity of the plant. During extreme weather events, there is a significant amount of rainfall derived inflow and infiltration (RDII) within the existing sanitary system. The treatment plant does not have sufficient capacity to treat these excess flows during large rain events. Because of this, the inflow is throttled to prevent damage to the plant. This leads to backups within the existing sanitary system, which can contribute to basement flooding.



CITY OF WINDSOR
STORM AND SANITARY SEWER MASTER PLAN

SOUTH WINDSOR

SANITARY SEWER SOLUTION AREAS

Figure 3.2 - South Windsor Sanitary Infrastructure Key Plan

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CHECKED BY: CDP

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The recommended sanitary system solutions for South Windsor were warranted due to insufficient capacity of the existing sanitary sewer system and the high potential for basement flooding. Appendix F-1 provides functional design details for each of the proposed solutions, including label codes, sewer sizes, lengths, and description of works.

It should be noted that each solution detailed should be implemented in conjunction with the source control measures as identified in Section 7.0, where feasible.

3.3 Central Windsor Sanitary System Solutions

The majority of the sewers in the Central area are still combined systems or dual manhole systems. As such, storm and sanitary flows will combine under normal and/or high flow conditions. In order to comply with MECP guidelines regarding sewer separation and to reduce the risk of basement flooding, it is recommended that all combined and dual manhole systems be separated as a component of this study.

Figure 3.3 identifies the Central area and the approximate boundaries for dual manhole areas.

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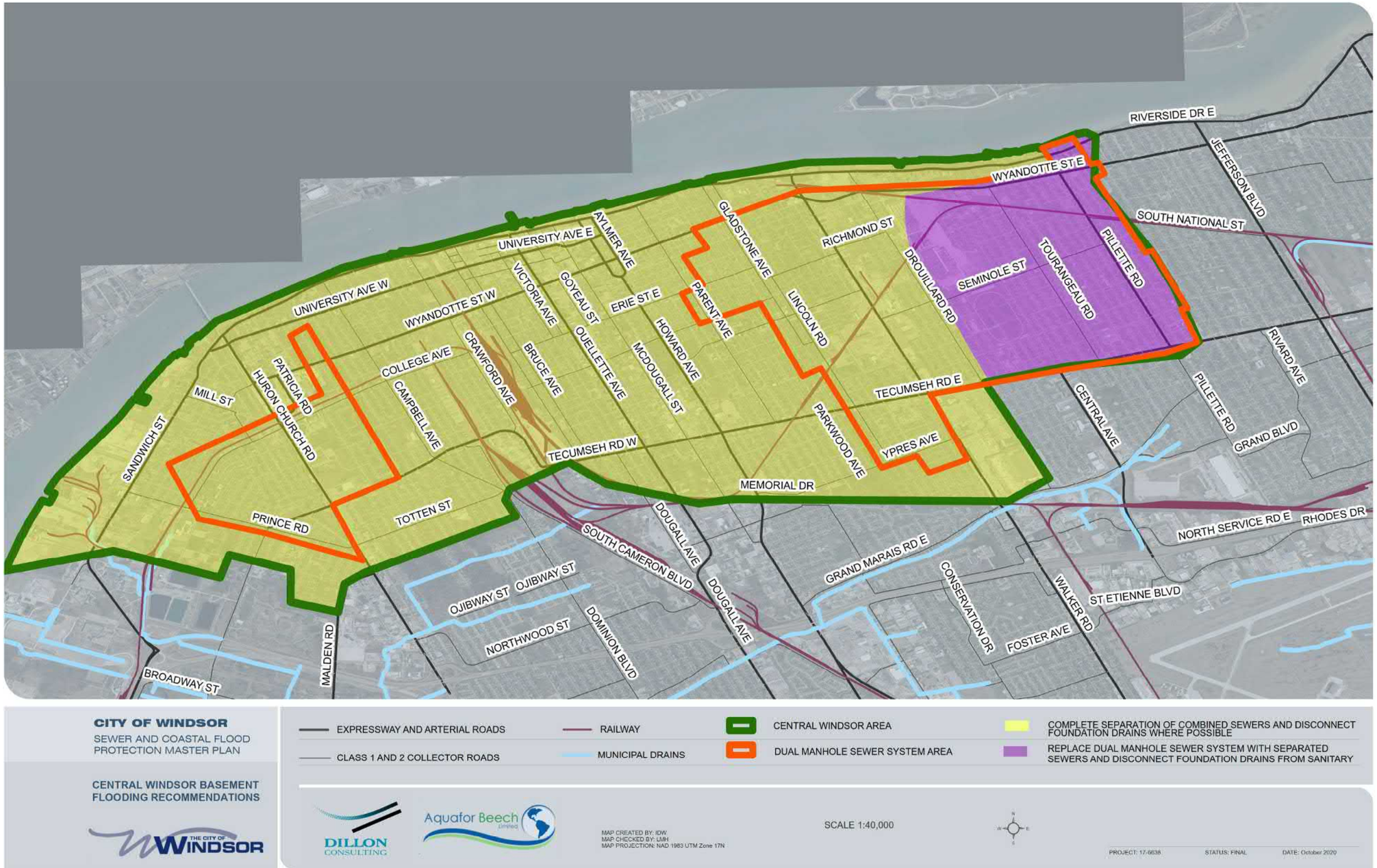

Figure 3.3: Combined and Dual Manhole Areas

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4.0 Storm Sewer Functional Design Solutions

The Preferred Alternatives for surface flooding solutions considers both the regional alternatives to satisfy the 1:100-year level of service and local solutions for major roads and sensitive infrastructure to satisfy the 1:100-year plus 40 % climate change level of service.

Storm solutions include a combination of sewer upgrades, in-line and off-line storage facilities (underground facility of SWM Pond), source control measures, and assume the incorporation of LID practices, such as swales, exfiltration systems, etc., that will be determined during detailed design.

As noted in the Volume II report, the local effectiveness of LID solutions is to be confirmed through pilot projects. In the South and Central Windsor areas, the potential reduction of flows as a result of LID measures are not required to achieve the required sewer LOS. LIDs in those areas are intended to provide additional resiliency to the sewer networks but are not required to achieve network functionality.

The East Windsor area solutions do account for an initial abstraction (removal) of 15mm of rainfall in proposed sewer improvement areas as a result of LID measures.

It is recommended that the City continue with the implementation of various LID pilot projects to test their effectiveness in various areas across the City. If the pilot projects identify that the assumed 15mm abstraction of runoff is not obtainable through LID measures, a review of East Windsor solutions should be undertaken to reconfirm the functional designs for that area to confirm that the desired LOS is being achieved.

4.1 East Windsor Storm Sewer Solutions:

The recommended storm system solutions for East Windsor were warranted due to the high potential for surface flooding exceeding 0.3 m above existing grade.

Figure 4.1 illustrates six (6) storm drainage areas with the locations of the proposed major outlets (i.e. pumping stations, pumping station upgrades, outfalls) and storage facilities.

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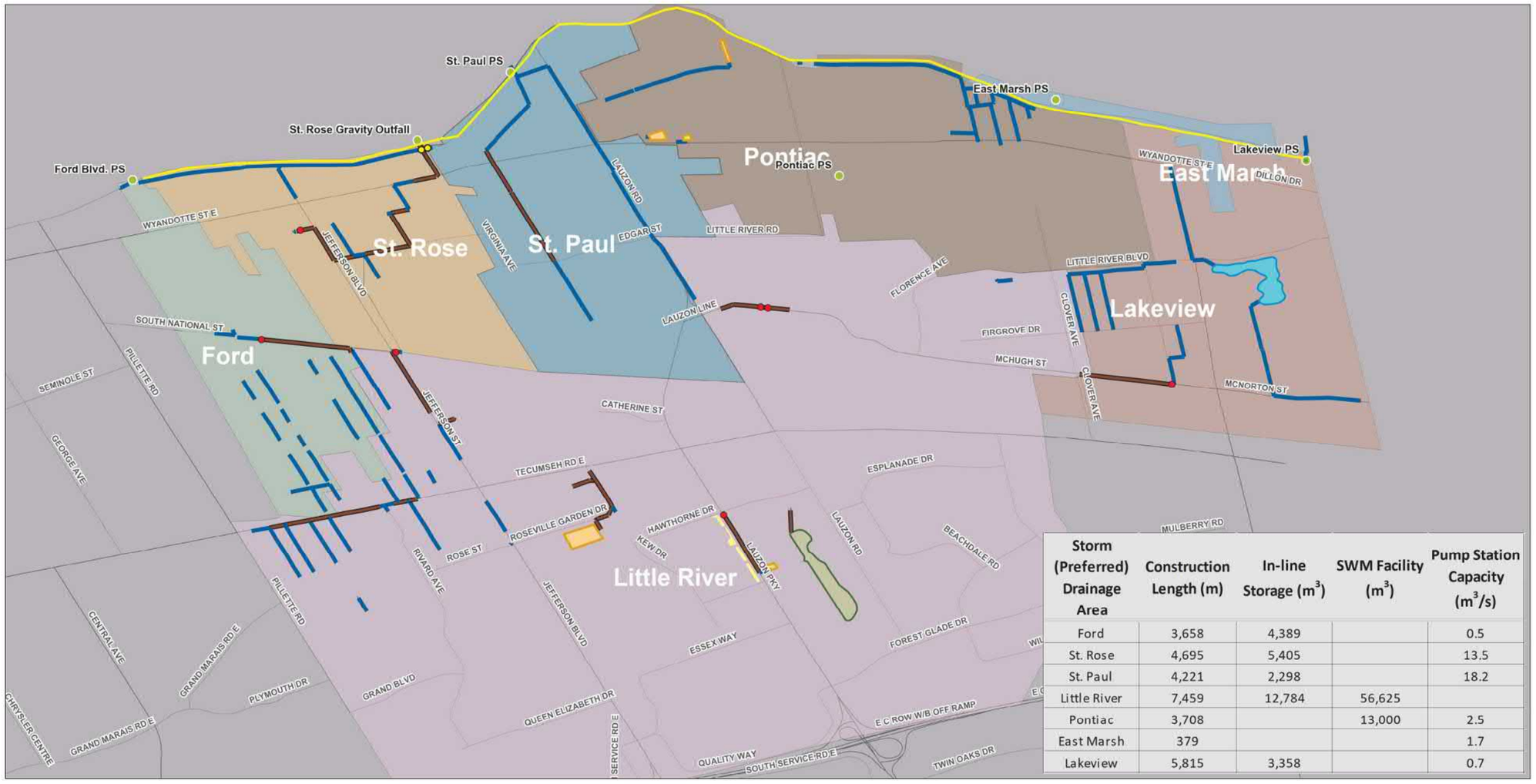

Storm (Preferred) Drainage Area	Construction Length (m)	In-line Storage (m^3)	SWM Facility (m^3)	Pump Station Capacity (m^3/s)
Ford	3,658	4,389		0.5
St. Rose	4,695	5,405		13.5
St. Paul	4,221	2,298		18.2
Little River	7,459	12,784	56,625	
Pontiac	3,708		13,000	2.5
East Marsh	379			1.7
Lakeview	5,815	3,358		0.7

CITY OF WINDSOR
SEWER AND COASTAL FLOODING PROTECTION MASTER PLAN

EAST WINDSOR STORM INFRASTRUCTURE DETAIL OVERVIEW
FIGURE

STUDY AREA
EXPRESSWAY AND ARTERIAL ROADS
CLASS 1 AND 2 COLLECTOR ROADS
RAILWAY
MUNICIPAL DRAINS
STORM SEWER IMPROVEMENTS
STORM BOX CULVERTS
LANDFORM BARRIER
STORM PS
TYPICAL DETAIL #1
TYPICAL DETAIL #3
STORMWATER STORAGE POND
LID
SURCHARGE/PARK STORAGE

MAP CREATED BY: TBD
MAP CHECKED BY: TBD
MAP PROJECTION: NAD 1983 UTM Zone 17N
NOT TO SCALE
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

Figure 4.1: East Windsor Stormwater Drainage Area and Infrastructure Location Key Map

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A general description of the proposed storm drainage infrastructure is provided below:

- 6.4 km of new storm sewers where none currently exist (partially separated area)
- 22.8 km of sewer upgrades
- 7.0 km In-line storage facilities with controlled release to downstream sewers providing a total of 28,234 m^3 of storage
- Off-line underground surcharge storage facilities at five (5) locations totalling 16,000 m^3
- Above-ground stormwater management facility in the Little River Golf Course with a capacity of 20,000 m^3

Additionally, pump station improvements include:

- Capacity improvements at the St. Paul, Pontiac and Lakeview pump stations
- New pumping facility to the Detroit River at the existing St. Rose gravity outfall
- Replacement of the existing Ford Pump Station pumps with increased capacity
- Replacement of the East Marsh pumping station pumps with similar capacity pumps.

The above infrastructure improvements are summarized in detail in Sections 4.1.2 and 4.1.3.

The pumping station functional design is discussed in Section 6.0

4.1.1 Typical Design Considerations

Table 4.1 below summarizes the proposed pump rates to the Detroit River and Little River and indicates the general details for each pump station facility. Section 6.0 provides details on the proposed pumping facilities and pump station improvements.

Table 4.1: Typical Detail Design Considerations - Pump Stations

Storm Drainage Area	Location	Description	Typical Detail	Pump Rate (m^3/s)
St. Paul	St. Paul Pump Station	Capacity upgrade of existing pumping station	Refer to Pump Detail in Section 6.0	18.2
St. Rose	St. Rose Pump Station	New pumping station servicing expanded St. Rose drainage area	Refer to Pump Detail in Section 6.0	13.5
Ford	Dewatering Pump	Replacement of existing pumps to increase capacity	Refer to Pump Detail in Section 6.0	0.5
Pontiac	Pontiac Pump Station / LRPCP Overflow	New pumping station utilizing existing pumping station discharge channel to Little River	Refer to Pump Detail in Section 6.0	2.5

Storm Drainage Area	Location	Description	Typical Detail	Pump Rate (m^3/s)
East Marsh	East Marsh Pump Station	Replacement of existing pumps	Refer to Pump Detail in Section 6.0	1.7
Lakeview	Lakeview Pump Station	Replace the existing pump station with a new PS with increased capacity	Refer to Pump Detail in Section 6.0	0.7

Within each of the storm drainage areas for East Windsor are several proposed in-line storage facilities, each with an outlet release rate to control flows downstream. Outflow shall be controlled via reduced pipes, as shown in Typical Detail #1 as well as Typical Detail #3. The required design criteria for each area is summarized in Figure 4.1 and Table 4.2 below:

Table 4.2: Typical Detail Design Considerations- In-Line Storage Facilities

Storm Drainage Area	Locations	US Node ID	Typical Detail	Release Rate (m^3/s)
St. Rose	Ontario St. and Glidden Ave.	6R3066	#1 (outlet to existing downstream sewer)	0.90
Little River	McHugh St. at Darfield Dr.	7R6397	#1 (outlet to existing downstream sewer)	0.3
Little River Pontiac	McHugh St. at Darfield Dr.	STM_NEW_MCH1	#1 (outlet to existing downstream sewer)	0.6
	Jefferson Blvd. at South National St.	7C67		1.7
	Lauzon Pkwy at Hawthorne Dr.	7R894		0.8
Lakeview	McHugh St. at Chateau Ave.		#1 (outlet to existing downstream sewer)	1.8

Additionally, some areas will require road regrading to mitigate surface flooding risk that will be addressed at a detailed design that includes:

- Jefferson Blvd. from Raymond Ave. to Ontario St. (260 m)
- McHugh St. from Lauzon Line to the east of Darfield Dr. (approximately 200 m)
- Lauzon Parkway from Cantelon Dr. to Hawthorne Dr. (approximately 300 m)

4.1.2 Stormwater Management Facilities

In order to develop robust surface flooding solutions that achieve the level of service (LOS) identified in Section 1.4, in addition to the proposed storm sewer improvements, multiple stormwater management (SWM) facilities were recommended for various solution areas throughout the City. Various types of SWM facilities were recommended, and they include wet ponds, dry ponds, and underground storage chambers.

A number of considerations were made in order to select the preferred type of SWM facility, including the availability of land, existing topography and surface composition, required storage volume, required depth of SWM facility, constructability and costs associated with construction.

Details regarding the types of SWM facilities recommended for various solution areas, and the related designs are summarized in Table 4.3 and Figure 4.1.

Table 4.3: Proposed Off-line Underground Storage and SWM Facilities

Location	Total Storage Volume	Facility Release Rate	Type	Property Acquisition	Constraints	Detail
Brumpton Park*	4,725 m^3	0.10 m^3/s	Underground surcharge storage facility	Public Park - No Private Property Acquisition	•Site grading restricts sizing and type facility • Trees located within the park.	Refer to Figure STM-E6
NE corner of Wyandotte St. E. and Watson Ave.	7,000 m^3	0.35 m^3/s	Underground surcharge storage facility	Undeveloped land acquisition required	No constraints	Refer to Figure ROAD-E9-2
8380 Wyandotte St. E.	5,000 m^3	0.03 m^3/s		Land acquisition/easement required	Property usage by the current owner	Refer to Figure ROAD-E9-2
Meadowbrook Park	5,000 m^3	0.36 m^3/s		Public Park - No Private Property Acquisition	•Public access •Re-instatement of basketball court	Refer to Figure ROAD-E4
Roseville Gardens Park	31,625 m^3	Detailed Design		Easement required for Roseville Public School property	•Public and school access •Re-instatement of the sports field	Refer to Figure ROAD-E11

Location	Total Storage Volume	Facility Release Rate	Type	Property Acquisition	Constraints	Detail
Little River Golf Course	20,000 m^3	1.5 m^3/s	Surface Stormwater Management Facility	Public golf course – No Private Property Acquisition	Little River 100 year High Water Level (178.3 m) and no increase inflows to Little River	Refer to Figure ROAD-E4

*recommendation was originally for an above ground facility; however, grades indicated the requirement for an underground facility

Sizing of all proposed storage facilities to be refined at detailed design.

4.1.3 Infrastructure Functional Design Details

Appendix F-2 provides functional design details for each of the recommended solutions for all areas within East Windsor as per the key map in Figure 4.1 along with sewer size, length, stormwater storage volumes and description of works for all recommended solutions for the East Windsor service area. The summary table at the front of the Appendix references the functional design drawings associated with each alternative label code along with the drawing reference.

4.2 Central Windsor Solutions

The recommended storm system solutions for Central Windsor were warranted due to the high potential for basement flooding during larger storm events. The existing combined and dual manhole systems throughout Central Windsor has the potential to surcharge during these events, which increases the risk of basement flooding in homes that are not equipped with backflow prevention measures. Complete sewer separation is required in the Central Windsor area to meet the basement flood risk objectives identified in Section 3.0 of Appendix E.

In addition to basement flooding risks in the Central Windsor service area, surface flooding risk areas have also been identified. The recommended solutions in these areas are intended to reduce the storm system HGL to below 0.30m above ground by providing additional capacity in the existing trunk sewer system in the Central Service area.

As mentioned in Appendix E Section 1.2, the storm and combined sewer systems within the Central Windsor service area ultimately outlet to the Detroit River. New or Improved outlets are required for a majority of the recommended solutions.

A general description of the proposed storm drainage infrastructure within the Central Windsor service area is provided below:

- Approximately 18 km of new storm sewers (excluding required sewer separations)

- 4 new outfalls;
- 2 improved outfall;
- Off-line underground surcharge storage facility at one (1) location totalling 3,000 m^3

Additionally, pump station improvements include:

- New pumping facility to the Detroit River at the existing Drouillard Road Pumping Station location within Cadillac Park; and,
- New Prince Road Pump Station for the Prince Road sewer system.

The pumping station functional design is discussed in Section 6.0 of this report.

Figure 4.2 illustrates the storm drainage areas within the Central Windsor service area.

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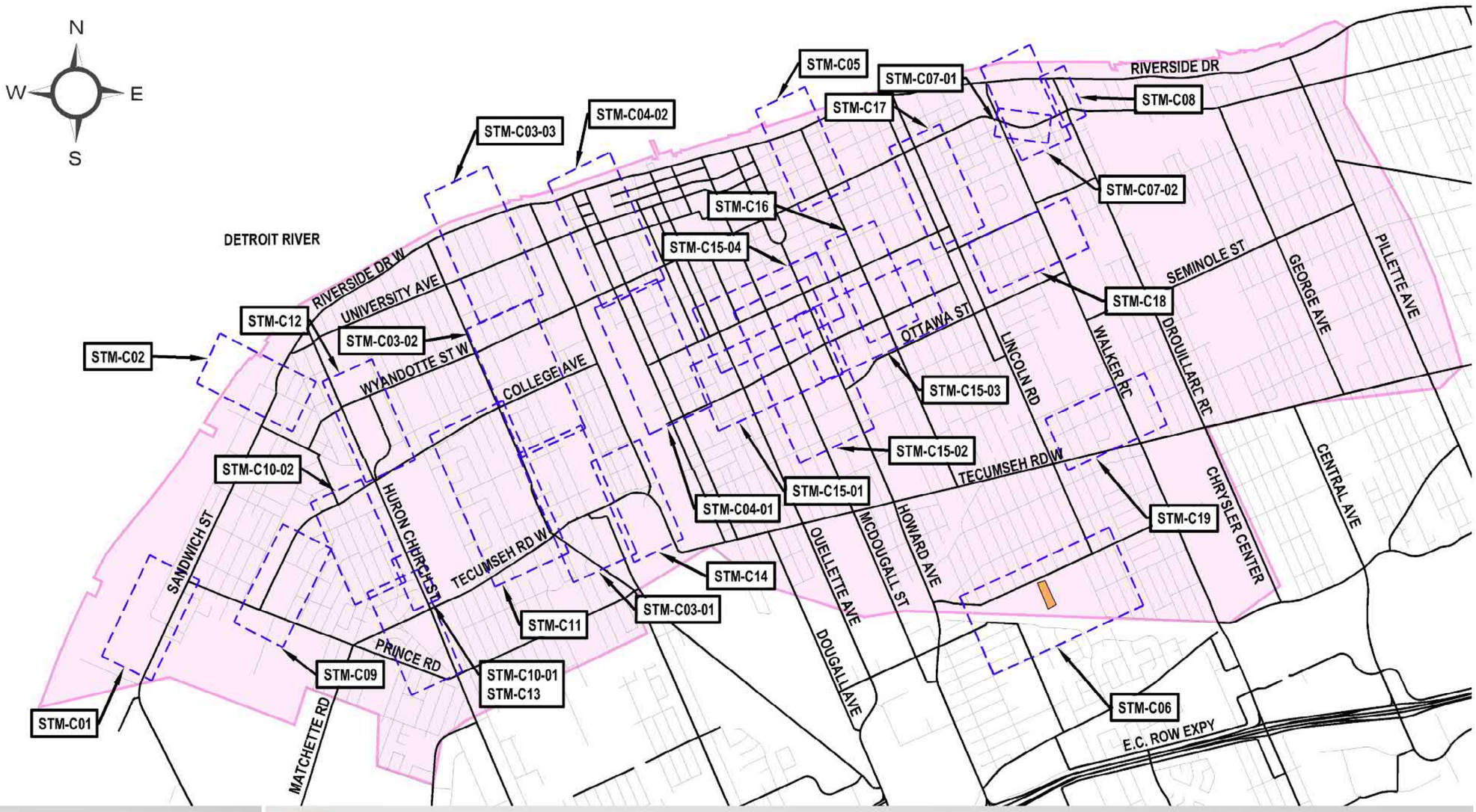

Figure 4.2 - Central Windsor Stormwater Infrastructure Key Plan

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A stormwater infrastructure key map is detailed in Figure 4.3 below. The key plan highlights solution areas and related label codes for the recommended solutions within the Central Windsor service area.

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Figure 4.3: Central Windsor Stormwater Infrastructure Key Plan

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4.2.1 Infrastructure Design Details

Appendix F-2 provides functional design details for each of the recommended solutions for all areas within Central Windsor as per the key map in Figure 4.1 along with sewer size, length, location of new outfalls, and description of works for all recommended solutions for the Central Windsor service area. The table also references the functional design drawings associated with each alternative label code along with the drawing reference.

4.2.2 Dual Manhole Sewers

In addition to the separation of the existing combined system within the Central Windsor service area, separation of the dual manhole system is also recommended. Similar to the combined system under heavy rainfall conditions, the dual manhole system can become surcharged. Sanitary sewage has the potential to enter the adjacent storm system as well as surcharge into basements. This recommended separation intends to eliminate the potential for sanitary sewage to enter the storm system and reduce the risk of basement flooding.

Due to the scope of this project, it was not feasible to provide regional solutions for the dual manhole system separation in Central Windsor. Costs have been developed to separate the dual manhole system based on an average sewer replacement size and length of the required improvements. High level costs to separate the dual manhole system can be found in Section 8.0 of this report.

4.3 South Windsor Solutions

The recommended storm system solutions for South Windsor were warranted due to the high potential for surface flooding exceeding 0.3m in depth. The solutions were developed to reduce flooding risks in regional areas as well as major roadways, and sensitive land uses.

As mentioned in Appendix E (Technical Report Volume II) Section 4.5.3, the storm sewer systems within the South Windsor service area outlet to municipal drains, including the Grand Marais Drain, Cahill Drain, Lennon Drain and Wolfe Drain. The majority of the recommended solutions that were developed are within the Grand Marais Drain drainage area.

A general description of the proposed storm drainage infrastructure within the South Windsor service area is provided below:

- 8.4 km of new storm sewers
- Off-line underground surcharge storage facility at one (1) location totalling 11,000 m³
- New above-ground stormwater management facilities at two (2) locations totalling 29,233m³
- Above-ground stormwater management facility expansion at one (1) location with a total expanded volume of 106,000m³ at 185.70m.

Figure 4.4 is the key plan highlights solution areas, stormwater management facility locations, and related label codes for the recommended solutions within the South Windsor service area.

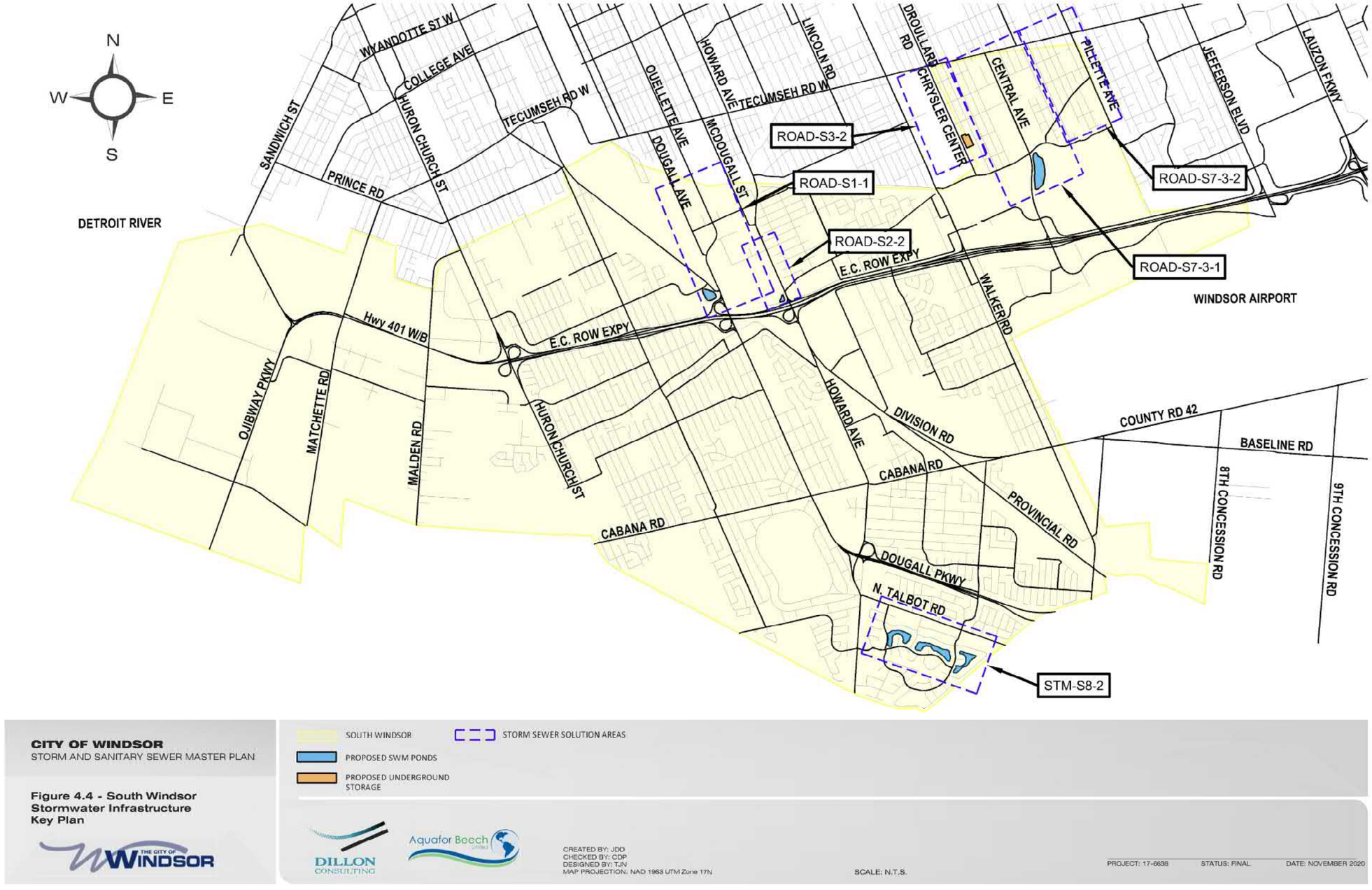

Figure 4.4: South Windsor Storm Drainage Key Map

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4.3.1 Infrastructure Design Details

Appendix F-2 provides functional design details for each of the recommended solutions for all areas as per the key map in Figure 4.4 along with sewer size, length, and description of works for all recommended solutions for the South Windsor service area. The table also references the functional design drawings associated with each alternative label code along with the drawing reference.

4.3.2 Stormwater Management Facilities

As mentioned in Section 4.1 of this report, various stormwater management (SWM) facilities were considered as part of the surface flooding solutions throughout the City in order to provide a robust surface flooding solution. The SWM facilities for South Windsor coupled with the storm sewer improvements were recommended to achieve the level of service (LOS) identified in Section 1.4 of this report.

Details regarding the SWM facilities recommended for the South Windsor solution area can be found in Table 4.4 below.

Table 4.4: Proposed Off-line Storage Facilities - South Windsor

Location	Total Storage Volume	Type	Property Impacts	Constraints	Detail
Dougall Ave. @ South Cameron	4,597m³ at 182.86m and 26,800 m³ at 185.10m	Surface Storage (Dry Pond)	Land acquisition at 0 Dougall Ave. required	Land availability	Refer to Figure ROAD-S1-1
Howard Ave. @ Grand Marais Rd E	2,433 m³	Surface Storage (Dry Pond)	Land acquisition at 2929 Howard Ave. required	Land availability	Refer to Figure ROAD-S2-2
Chrysler Centre	11,000 m³	Underground Storage Facility	Easement required	Existing private parking lot	Refer to Figure ROAD-S3-2
Central Ave. @ Grand Marais Rd E	82,000m³ at 185.10m and 106,000 m³ at 185.70m (Total Pond Volume after Expansion)	Surface Storage (Wet Pond Expansion)	Land acquisition/ easement required	Limited City right-of-way	Refer to Figure ROAD-S7-3
Southwood Lakes	25,000 m³ (Total Additional Volume)	Lowering of normal water levels in three existing Southwood Lakes detention ponds	None	None	Refer to Figure STM-S8-2

Sizing of all proposed storage facilities to be refined at detailed design.

4.3.3 Southwood Lakes Pond Network

The majority of stormwater storage solutions involve the construction of new underground storage facilities or stormwater ponds. The recommended solution for Southwood Lakes includes the adjustment of the normal water levels in three (3) of the four (4) existing stormwater ponds in the Southwood Lakes subdivision. The original stormwater management report for the Southwood Lakes was completed in 1990 by Hanna Ghobrial & Associates.

In order to decrease basement flooding risk, it is recommended to decrease the normal water levels of Lake Como, Lake Grande and Lake Laguna. This will provide additional storage in the ponds, and allow the normally submerged sewer system to flow to the lakes more efficiently during smaller rain events, or initially in larger events. No changes are recommended to the footprint of the ponds or the slopes of the banks.

Due to the age of the existing ponds, the current pond bottom elevations are unknown. Sedimentation over the past 30 years may have increased the design pond bottom elevations. As such, prior to undertaking the pond improvements, it is recommended that the bottom elevations of all three ponds are surveyed to determine if dredging or other methods will be required to be implemented to oxygenate the water properly.

As detailed surveys of the ponds and sewer system were not available during the course of the study, as-built documents, LiDAR information, and City sewer atlas were relied upon to develop a model of the current pond network. The review of the City sewer atlas has identified some inconsistencies (pipe sizes and slopes) with the approved stormwater management report. A detailed survey of these components should be completed during the development of the final pond improvement strategy.

The following improvements are recommended to provide the additional storage in the pond network:

- Lower the normal water level (NWL) for Lake Como from 185.9m to 185.75m
- Lower the NWL in Lake Grande from 186.3m to 185.8m
- Lower the NWL in Lake Grande from 186.4m to 185.9m
- Lower existing outlet structure (Structure #7RO3531) of Lake Como to match the lowered normal pond water level
- Sewer segments from Lake Grande (7RO6828) to Lake Como (7R06825) should be lowered to provide better flow between the ponds
- Sewer segments from Lake Laguna (7RO5302) and Lake Grande (7RO7417) may require lowering such that pond connection sewer inverts are 185.92m or lower
- Float elevations in existing Pump Station (7RO6090) west of Christina Crescent should be adjusted to match revised pond NWL and associated outlet sewer hydraulic grade lines
- The current maximum outflow rate from the existing Pump Station (7RO6090) is to remain unchanged.

Figure 4.5: Southwood Lake Ponds

5.0 Coastal Flood Protection Functional Design Solutions

Following the record high monthly mean water levels observed in the Detroit River and Lake St. Clair in 2019, the scope of the Sewer Master Plan was expanded to include the evaluation of long and short term solutions to mitigate risks of coastal flooding along Riverside Dr.. The functional design and analysis considered the recommendations from the study completed by Landmark Engineering Inc. for the East Riverside Flood Risk Assessment (2019).

The design criteria for the recommended coastal flood protection measures are to be implemented during detailed design. As identified in Technical Report Volume II, the recommended flood protection elevation for the East Windsor (Riverside Dr.) area is 176.50m. It is important to note that during the construction of the recommended landform barrier, the minimum flood protection elevation established must be achieved for the full length of improvements to provide continuous protection. If any section of the proposed landform barrier improvements is constructed below the required elevation, flood waters could be conveyed inland during high water events, rendering the whole system ineffective.

The functional design components of the coastal flood protection solutions include a landform barrier constructed to the target elevation, local sewers adjacent to the landform barrier to collect runoff from private properties that presently drain overland to Riverside Dr., and storm and sanitary system protection and separation. The landform barrier is intended to provide inland coastal flood protection for low lying areas in the East Windsor service area. However, the barrier will also effectively protect homes north of Riverside Dr. from overland flooding from the south.

Existing topography (i.e., existing road or private property grades that meet or exceed the target 176.50m elevation) may be utilized to form the landform barrier. It is likely that minor grading improvements will still be required to ensure existing ground elevations are continuous and any potential breaches or local low points are identified and filled in.

Typically, private property front yards slope towards the road right of way to permit runoff to be collected by the municipal sewer system(s). The installation of an elevated landform barrier will not permit private property yard runoff to drain overland to the right-of-way. Accordingly, a separate drainage/sewer system will be required to drain lands on the private side of the landform barrier. The local sewers proposed adjacent to the landform barrier may be altered to better suit site conditions, including changing pipe sizes and slopes. Minimum pipe sizes and slopes based on the City of Windsor Development Manual should be adhered to to ensure adequate capacity in the local sewers. As shown on the functional design drawings, the local sewers installed on the north side of Riverside Dr. must have

a new and isolated outlet to Detroit River. The local sewer cannot connect to the Riverside Dr. mainline sewer as this will permit potential flood waters to bypass the landform barrier via the sewer connection.

During detailed design, discussions will be required with the landowners that will be affected by the installation of the coastal flood protection measures. The City will require construction and maintenance easements to facilitate installation of these improvements. Agreements between the City and the individual landowners will need to be put in place to ensure no modifications to the coastal flood protection measure are completed.

Special consideration should be given to the emergency flood protection areas that do not meet the required flood protection elevation. These areas include where the landform barrier crosses Riverside Dr. East (east of Lauzon Road), and natural low areas such as entrances to below grade parking garages for apartment buildings west of Little River. In these locations, emergency infill is recommended, such as sand bags or engineered fill to close the gap in protection. The City will need to develop an emergency response plan to ensure these areas are protected during flooding events. Other measures, such as mechanical flood protection gates are a potential solution but were not assessed as a part of this study due to initial installation and maintenance costs.

During detailed design, sewer separation and protection measures should be confirmed for the storm and sanitary systems that cross the landform barrier. Sewer crossing locations requiring backflow preventers or sluice gates are identified on the recommended landform barrier functional design drawings but should be confirmed during detailed design.

5.1 Flood Protection Elevations

Currently, the established Essex Region Conservation Authority (ERCA) Regulatory High Water Level is 176.45m (nominally 176.50m) above sea level. Two elevations were considered when developing the functional design of the coastal flood protection measures. The elevations chosen to complete the analysis were based on the existing high water level and the urban stress test water elevation of 176.80m. Figure 5.1 details the extents of the flood protection barrier at the two elevations.

After discussions with the City and ERCA, it was determined that the existing high water level (176.50m) should be utilized as the preferred alternative when completing the functional design of the coastal flood protection barrier.

It should be noted that the minimum flood protection elevation of 176.50m must be maintained for the full length of the landform barrier improvements to provide continuous flood protection along Riverside Dr..

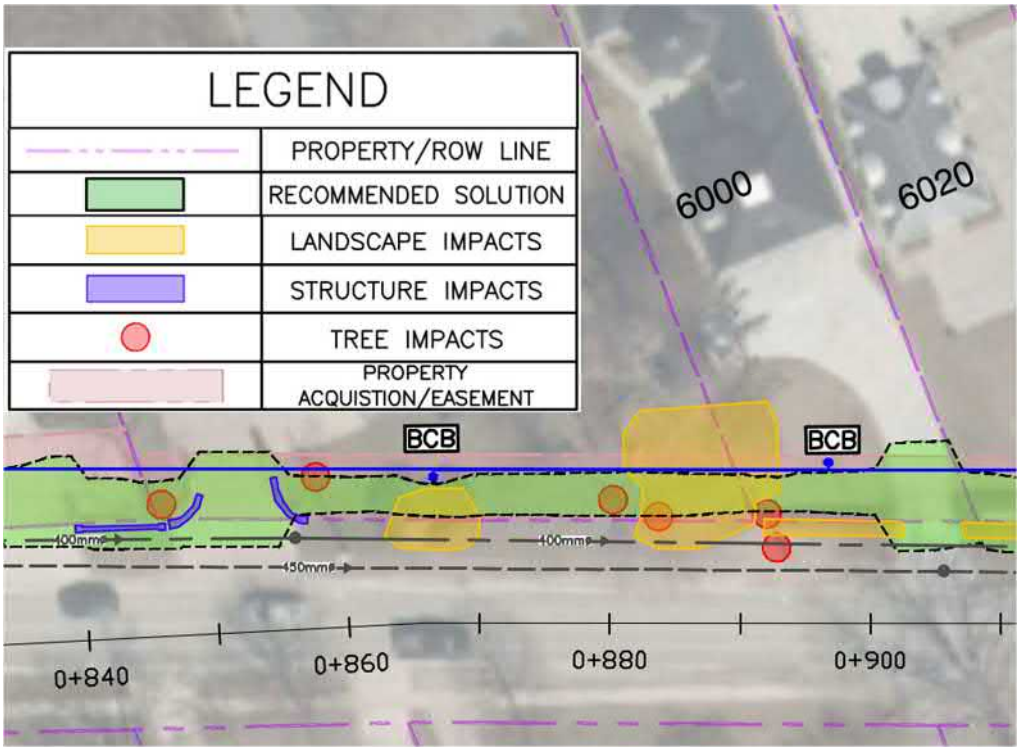


Figure 5.1: Coastal Flood Recommended Solution

5.2 Existing Information

5.2.1 Topographical Information

Due to the existing topography, a majority of the existing shoreline and/or inland elevations are below the recommended protection elevation. Approximately 7 km of Riverside Dr. East was identified as a potential coastal flooding risk. Riverside Dr. East, from approximately St. Louis St. to the Windsor/Tecumseh border was included in the coastal flood protection area.

The existing topography along Riverside Dr. East is relatively flat with a gradual slope towards the east. A majority of the overland flow from the inland portion of East Windsor is directed towards Riverside Dr.. This was confirmed by analyzing existing ground information sources, including topographic and LiDAR aerial survey.

By analyzing the topographic information, low lying areas and areas that met or were above the flood protection elevation could be identified. A continuous coastal flooding solution was then developed using a combination of existing topography, and development of an earthen berm/landform barrier.

Figure 5.2: Riverside Area Topographic Heat Map
[Source: Landmark Engineering Inc.]

5.2.2 Storm and Sanitary Sewer Infrastructure

As mentioned in Section 2.3.1 of this report, the existing sewer infrastructure information was provided by the City in the form of shapefiles, as-builts and the City Sewer Atlas. This information was utilized to determine the locations of the sewers crossing the berm and areas where backflow and protection measures are required.

5.2.3 As-Built Information (Vista Phase 1)

As-built information was reviewed for various locations along Riverside Dr. East, including the Vista Phase 1 project limits. The Vista Phase 1 limits are from Lauzon Road at the west limits to Riverdale Ave. at the east limits. A landform barrier was originally constructed in the 1980s and was reinstated on the south side of Riverside Dr. between Watson Ave. and 8555 Riverside Dr. during the construction of this project.

The landform barrier was designed and constructed to meet the flood protection elevation of 176.50m. In this location, it was determined that no additional works would need to be completed as part of the coastal flood protection solution.

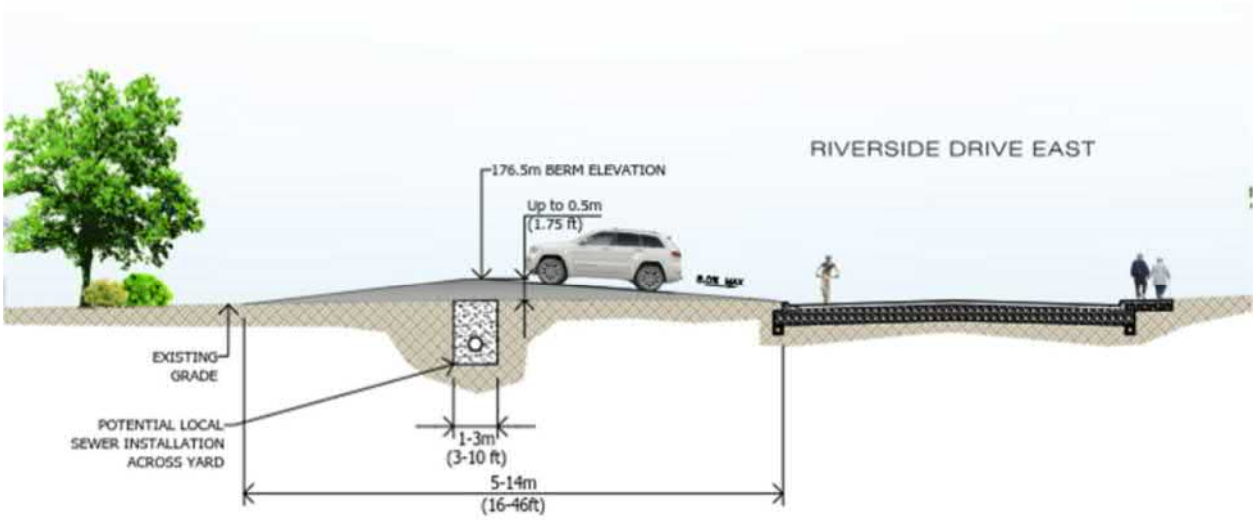
5.3 Design Criteria

5.3.1 Landform Barrier

The design criteria used to design the landform barrier was confirmed by the City and is included in Table 5.1 below.

Table 5.1: Landform Barrier Design Criteria

Landform Barrier	
Component	Design Criteria
Materials	Clay core Topsoil and manicured grass around the core
Berm Slopes	3H:1V side slopes
Widths	1.5m - 3m
Elevation	176.50m (Flood Protection Elevation)
Driveways	Maximum 8% slopes



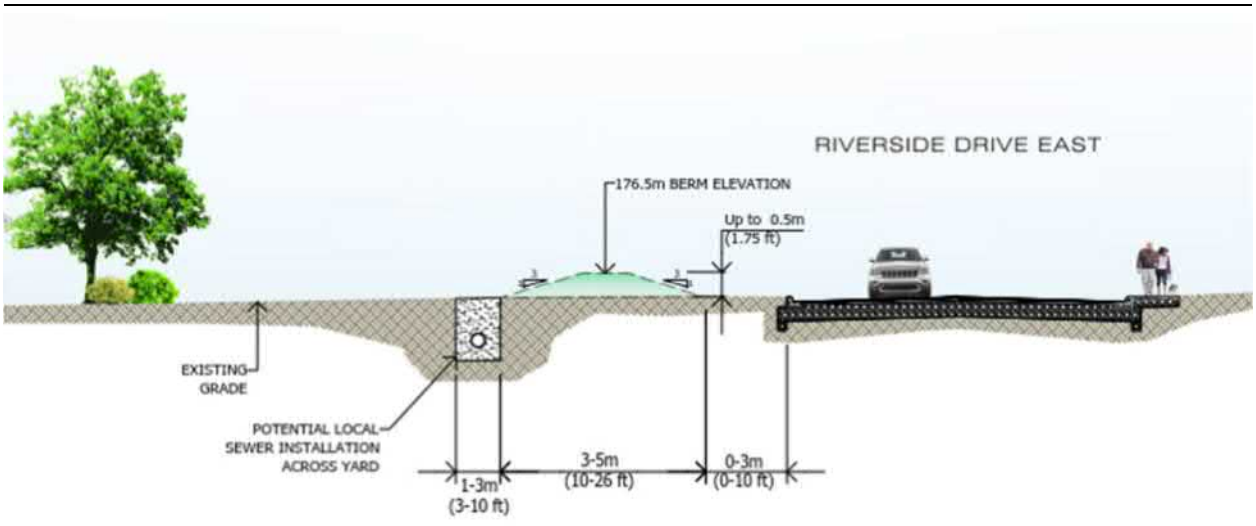


Figure 5.3: Landform Barrier Cross Section

As noted in Table 5.1, the berm is to be constructed with a clay core to prevent seepage of water inland. The design details for the berm and clay core are to be determined during detailed design in conjunction with a geotechnical engineer.

5.3.2 Local Sewers

As the landform barrier will prevent properties from naturally draining to the Riverside Dr. right-of-way, an additional local sewer system is required to collect flows from private property. The local sewer systems had to be designed to prevent flood waters from bypassing the berm to the sewer system on Riverside Dr.. As such, the local sewer for the north side of right-of-way landform barrier has a direct outlet to the Detroit River. Also, the local sewer for the south side of right-of-way landform barrier connects to the side street sewers with backflow preventers.

The proposed local sewers adjacent to the landform barrier are proposed to be 300mm to 525mm diameter in size. The sizes of the local sewers were determined based on the expected flow from the tributary drainage areas. It was determined that these sewer sizes would have adequate capacity to convey the expected flows to the designated outlets.

A catchbasin was provided to drain each property. Depending on the topography of individual lots, multiple catchbasins may be required to provide adequate drainage.

Due to the flat topography in the area, minimum slopes were used. This ensured that the furthest upstream pipe within the local sewer runs had a minimum of 1m of cover. The figure below shows an example of the local sewers adjacent to the landform barrier to collect the private property drainage.

Figure 5.4: Local Storm Sewers

5.4 Functional Design Process

After compiling background information, reviewing the East Riverside Flood Risk Assessment (Landmark, 2019), and establishing the design criteria for the coastal flood protection solutions, the functional design of the recommended solution was completed.

5.4.1 Modelling Software

The landform barrier component of the coastal flooding solution was modelled using AutoCAD Civil 3D design software. The software was utilized as a tool to aid in the design of the recommended landform barrier along Riverside Dr. The landform barrier component was modelled in three dimensions to give an accurate representation of the impacts (height/width) of constructing the landform barrier on the surrounding area.

By utilizing AutoCAD Civil 3D software, design data could be managed efficiently, and changes could be made quickly. This provided the opportunity to analyze multiple design alternatives more efficiently, which helped to develop the recommended solution that minimizes impacts to private properties.

5.4.2 Existing Surface Analysis

LiDAR Aerial survey and topographic survey were utilized to create a three dimensional surface of the existing topography. By creating an existing surface, low lying areas could be identified along with areas that meet or exceed the minimum landform barrier elevation. Areas that are below and above the minimum flood protection elevation are identified in Figure 5.2 in Section 5.2.1.

Areas that are below the minimum flood protection elevation would require a discernible landform barrier constructed to the minimum protection elevation. Areas with that met or exceeded the minimum protection elevation could utilize the existing topography to provide protection. Minor adjustments to these areas may be required to bring the existing lands up to the flood protection elevation.

5.4.3 Landform Barrier Design

To better manage the functional design of the landform barrier, the improvements were broken down into three areas along Riverside Dr.. The three areas are referred to as Riverside Areas 1, Riverside Area 2, and Riverside Area 3 in accordance with the East Riverside Flood Risk Assessment Report (Landmark, 2019). Details related to the functional design of the coastal flood protection solution can be found in the following sections. The functional design figures can be found in Appendix F-3.

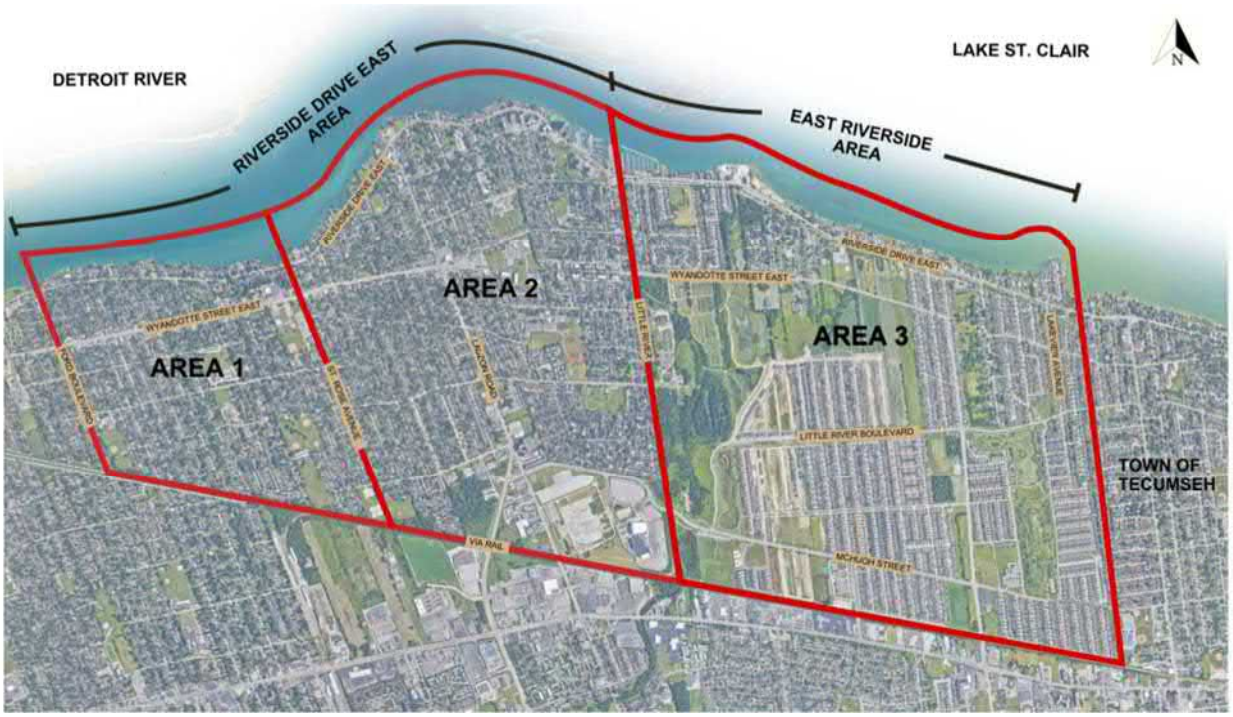


Figure 5.5: Riverside Dr. E. and East Riverside Coastal Flood Protection Area Map
[Source: Landmark Engineering Inc.]

5.4.3.1 Riverside Area 1

As mentioned in Section 5.4.2, locations where the existing topography meets the required flood protection elevations may not require a landform barrier. Based on LiDAR and field survey within Riverside Area 1, it was determined that some locations meet the required flood protection elevation. During detailed design, a detailed field survey should be completed to confirm if the existing topography in these locations meets the required elevation.

The first landform barrier solution area that was considered is bounded by Villaire Ave. to the west and the eastern property line at St. Rose Beach Park to the east and is referred to as Riverside Area 1. The existing topography for the area to the west of Villaire Ave. was determined to be at, or above, the required minimum flood protection level. Thus, no landform barrier improvements are recommended for this portion of Area 1.

The landform barrier alignment in Riverside Area 1 is recommended to be installed on the north side of Riverside Dr. The existing topography between Villaire Ave. and St. Rose Beach on the north side of Riverside Dr. is primarily below the required minimum flood protection elevation. In areas that are below the minimum flood protection elevation, a discernible landform barrier is recommended. Minor adjustments to the existing roadway/intersections in this area may be required to ensure overland flow is directed to the east.

Since the landform barrier proposed for this area is within the Riverside Dr. Vista 2A project limits, it is recommended that the barrier be installed during the construction of that project. Property acquisition or easements requirements should be confirmed during the detailed design of the Riverside Dr. Vista 2A improvements. The location of the proposed storm and sanitary sewers within the Vista 2A limits should be confirmed during detailed design.

5.4.3.2 Riverside Area 2

The second landform barrier project area that was considered is bounded by St. Rose Beach to the west and Lakeview Marina to the east and is referred to as Riverside Area 2.

The landform barrier alignment in Riverside Area 2 is recommended to be installed on the north side of Riverside Dr. from St. Rose Beach to the east of Frank Ave.. Due to the proximity of existing homes to the existing right-of-way line, the alignment of the barrier then shifts to the south side of Riverside Dr. from east of Frank Ave. to Lakeview Marina. It should be noted that during Vista Phase 1 construction, the existing landform barrier was reinstated on the south side of Riverside Dr. from Watson Ave. to 8575 Riverside Dr. E. In this location, no improvements are recommended.

Based on LiDAR and field survey, the existing topography on the north side of Riverside Dr. between St. Rose Beach and Lauzon Rd. is primarily at or above the minimum flood protection elevation. In this case, a discernible landform barrier would not be required unless it is determined during the detailed survey that flood protection elevations are not met.

Riverside Dr. from Lauzon Rd. to the east of Frank Ave. was determined to be below the minimum flood protection elevation. A landform barrier is proposed on the north side of Riverside Dr. in this stretch.

5.4.3.3 Riverside Area 3

The third landform barrier project area that was considered is bounded by Lakeview Marina to the west and the Windsor/Tecumseh border to the east and is referred to as Riverside Area 3. In this area, the Ganatchio Trail provides a natural high point/barrier.

The landform barrier alignment in Riverside Area 3 is recommended to remain on the existing Ganatchio Trail south of Riverside Dr.. Based on topographic and LiDAR aerial survey, the existing topography on the south side of Riverside Dr. along the Ganatchio Trail is primarily at or above the minimum flood protection elevation. Accordingly, the existing trail will be utilized to provide flood protection. In areas where the Ganatchio Trail does not meet the minimum flood protection elevation, minor adjustments to the trail are recommended to raise the trail higher to the required elevation.

Minor grading improvements to side streets crossing the trail may also be required to meet the flood protection elevation requirements. In these areas, roadway reconstruction should be extended on either side of the trail to not exceed maximum roadway grading.

5.4.4 Property Impacts

As part of the functional design process, existing property fabric information was utilized to determine if the recommended coastal flood protection solution would impact private properties. The existing private property limits, based on the GIS property fabric, on both sides of Riverside Dr., are fairly close to the existing roadway. Accordingly, it was not possible to design an earthen landform barrier solution within the City owned right-of-way without affecting the adjacent properties. It was determined that easements and property acquisition would need to take place in order to construct the proposed coastal flood protection solution.

A number of impacts to existing property amenities were noted in the three solution areas along Riverside Dr.. These include impacts to landscaping, trees, and structures adjacent to Riverside Dr.. In order to construct the landform barrier and related improvements, landscaping, trees, and structures will need to be removed or relocated.

The coastal flood protection figures detailed in Appendix F-3 highlight the related property impacts that were encountered when completing the functional design for the three solution areas along Riverside Dr..

5.4.5 Emergency Flood Protection Areas

In areas where it was not feasible to install the landform barrier and maintain the required flood protection elevation of 176.50m, temporary infill measures are recommended to provide protection during larger flooding events.

The following is a list of locations that would require temporary emergency closures during a larger storm and high water events:

- Riverside Dr E at Municipal #8040 and #8057 (City ROW). Emergency infill required for the full width of the road;
- Municipal # 8591 (private property). Emergency infill required at the underground parking garage entrance;
- Municipal #8885 (private property). Emergency infill required at both underground parking garage entrances;
- Additional locations where the landform barrier cannot be constructed may be determined during detailed.

It is recommended that an emergency response plan be implemented for the area mentioned above that is within the City right-of-way. Emergency measures identified on private property would be the responsibility of the individual property owners.

The emergency closure locations listed above can be found in Appendix F-3 within the landform barrier functional design figures.

5.4.6 Local Storm Sewers

5.4.6.1 Local Sewers North of the Proposed Landform Barrier

The local sewers that are recommended to be constructed on the north of the proposed landform barrier within Riverside Area 1. The intent of these sewers is to provide lot drainage for the homes along the north side of Riverside Dr. and eliminate surcharging from the Riverside Dr. trunk sewer. A minimum of one boulevard catch basins is recommended to be installed for every property north of the proposed landform barrier which will collect runoff that presently drains to the Riverside Dr. right-of-way and direct it to the local sewer system. Based on topography, additional catch basins may be required for properties with multiple low points.

These local sewers are recommended to be installed adjacent to the proposed landform barrier and will have a separate outlet to Detroit River. The outlet is recommended to be equipped with a backflow prevention device for surcharge protection against high water levels in the Detroit River. The outlet location of the proposed local sewer north of the landform barrier is recommended at St. Rose Beach. During detailed design, this outlet will be required to be reviewed to determine if a small dewatering pump is required at St. Rose Beach Park.

Construction and maintenance easements would be required to install and maintain the local sewer infrastructure. Agreements with the landowners should be put in place to ensure the local storm sewer infrastructure is not altered and that it may be accessed for periodic maintenance.

5.4.6.2 Local Sewers South of the Proposed Landform Barrier

The local sewers that are recommended to the south of the proposed landform barrier are located within Riverside Area 3. The intent of these sewers is similar to the local sewers proposed on the north side of the landform barrier in that they are recommended to provide lot drainage and eliminate surcharging from the Riverside Drive trunk sewer. The boulevard catch basins recommended will capture the runoff from the lots and direct it to the inland storm sewer system.

The local sewer outlet to the inland storm system is recommended to be equipped with a backflow prevention device to prevent floodwaters from bypassing the landform barrier.

5.4.7 Storm and Sanitary Sewer Protection

As detailed above, in order to eliminate the potential for flood waters to bypass the landform barrier and enter the inland sewer system, protection measures are required on sewers and catch basin leads crossing the landform barrier. The addition of protection measures, including backflow preventers and

sluice gates within these sewers and catch basins, is crucial in providing a coastal flood protection solution that prevents floodwaters from migrating inland via the City sewer system.

As part of the functional design process, storm and sanitary sewer crossing locations were reviewed to determine if protection measures would be required. A number of storm and sanitary sewer crossings were identified along Riverside Drive where protection would need to be implemented. These locations have been identified in the Riverside Drive Landform Barrier figures which can be found in Appendix F-3. Sewers that convey flow to the north and cross the landform barrier are recommended to be equipped with a backflow prevention device such as a duckbill or flap gate. Sewers that convey flow inland from the north were recommended to be equipped with a sluice gate or equivalent device on the south side of the barrier to prevent flow from entering the inland sewer systems during high water events.

Catchbasin locations are not identified on the landform barrier drawings. Similar to the storm and sanitary sewers, backflow prevention measures would be required for all leads crossing the barrier. As part of the East Riverside Flood Risk Assessment (Landmark, 2019), catchbasin locations are identified where protection measures are required. These locations should be reviewed during detailed design along with a detailed site investigation to confirm any locations that may be unaccounted for.

6.0 Pump Station Design and Analysis

As part of the functional design of the recommended solutions, new pump stations and existing pump station improvements were identified. The pump station functional design figures can be found in Appendix F-4. The sections below detail the pump station designs that were completed as part of this project.

6.1 St. Paul Pumping Station

6.1.1 Existing Conditions

The St. Paul Pumping Station (PS) was built in 1976. It is equipped with five (5) vertical mixed flow pumps and two (2) jockey pumps. The jockey pumps handle the low flows; vertical pumps are gradually switched on as inflow increases and water level in the wet well increases. The capacity of the pumps is:

- Two (2) Jockey pumps: 425 L/s each;
- Two (2) Small vertical pumps: 1,550 L/s each; and
- Three (3) Large vertical pumps: 3,100 L/s each.

The jockey pumps do not run when the vertical turbine pumps run. Total pump station capacity is 12.4 m^3/s, and the firm capacity is 9.3 m^3/s.

The vertical pumps have very little run hours and are considered to be in good mechanical condition. One of the large vertical pumps is equipped with a diesel motor drive. The hydraulic conditions, ON and OFF pump levels and pump curves were reviewed to confirm the pump duty point. Based on available information, the large vertical pumps are running out of the curve on the right side, particularly at the pump ON levels. The smaller vertical pumps are also close to running off the curve at high wet well water levels.

The pumps discharge directly to the pump station discharge channel.

6.1.2 Pump Station Upgrade

Based on modeling results the maximum required capacity of the pumping station to handle the runoff from a 100-year return period rain for the proposed alternatives is 18.5 m^3/s, which is 6.1 m^3/s more than the existing total capacity. The pump station improvement included in the functional design was based on the St. Paul and Pontiac Pump Station report (Dillon, 2018).

6.1.2.1 Upgrade the Existing Pumping Station

It was assumed that the existing pumps could be replaced with new pumps having a larger capacity than the existing pumps. Pump suppliers were approached to provide a selection for the largest capacity pumps, which would be possible to install into the existing concrete structures. Based on manufacturers' selection, the largest capacity units available are:

- Larger pumps (each):
  - Capacity 4.3 m^3/s
  - Motor size 500 kW
- Smaller pumps (each):
  - Capacity 2.8 m^3/s
  - Motor size 320 kW
  - Total capacity 18.5 m^3/s
  - Rated (firm) capacity 14.2 m^3/s

Based on the information provided, the total capacity of the pumping station could be increased to the required capacity of 18.5 m^3/s by replacing the existing pumps with new pumps. However, the firm capacity of the pumping station will be less than the required capacity. The pumps would fit into the existing structures. The pumps' discharge piping would require modification to match the size of the discharge flange of the replacement pump. The installation of the new pumps would also require an upgrade of the electrical service and complete replacement of the electrical installation in the pumping station.

It should be noted that the electrical installation in the existing pumping station is almost 40 years old and would have had to undergo a major upgrade in the near future. To determine the extent and timing of the upgrade, a condition assessment of the installation would have to be conducted.

6.1.2.2 Pumping Station Expansion

It was assumed that a new pumping station with 3 pumps (2 duty, 1 standby) would be built adjacent to the existing pumping station to provide the capacity in excess of the existing pumping station and include standby capacity for the system.

Each pump would have a capacity of 3.1 m^3/s; the total dynamic head is estimated at about 9.0 m. The pumps would require 350 kW motors. The pump discharge can be configured as individual discharges or a common discharge outfall.

The dimensions and configuration of the pumping station were determined by the ANSI Standard Pump Intake Design developed by the Hydraulic Institute.

Vertical, submersible propeller pumps are recommended to eliminate the need for a superstructure. It is estimated that the footprint of the pump station will be approximately 25.0 m x 16.0 m. Based on the depth of the inlet pipe to the existing pumping station, the depth of the pump station is estimated at about 8.0 m below grade.

6.2 St. Rose Gravity Outfall Improvements

6.2.1 Proposed Pump Station

Based on modeling results, Alternatives 1 through 3 identified the incorporation of a pump station to provide a hydraulic disconnect from the Detroit River. The maximum required capacity of the pumping station to discharge the runoff from a 100-year return period rain for the proposed alternatives is 13.5 m^3/s.

The EA has identified that the pump station would be constructed within the existing St. Rose Beach adjacent to the existing gravity outfall.

The dimensions and configuration of the pumping station were determined by the ANSI Standard Pump Intake Design developed by the Hydraulic Institute.

Vertical, submersible propeller pumps are recommended to eliminate the need for a superstructure. It is estimated that the footprint of the pump station will be approximately 32.0 m x 17.0 m:

- 3 Large pumps (2 duty, 1 standby):
  - Capacity 5.0 m^3/s (each)
  - Motor size 600 kW each, (approximately 800 HP)
- 2 Small pumps (2 duty, 0 standby)
  - Capacity 1.75 m^3/s (each)
  - Motor size 250 kW each, (approximately 340 HP)
  - Rated capacity 13.5 m^3/s

At this time, it has been assumed that hydro is available nearby and design includes the incorporation of a backup generator.

6.2.2 Additional Design Considerations

As noted in Appendix E (Technical Volume II), several locations were reviewed for the placement of the new pump station. The preferred location for the pump station in the St. Rose Ave. Park greenspace on the north side of Riverside Dr. East, within the existing sheet pile/break wall area of the park.

The existing park is generally fill material and is bounded on the west and north sides by a steel sheet pile breakwall. The pump station placement within the park is situated to avoid existing tie-backs from

the sheet pile wall. During detailed design, additional site assessments should be conducted to confirm the soils materials, location of sheet pile tie backs, and dewatering requirements (due to the required depth of excavation and the proximity to the Detroit River).

Alteration to the existing sheet pile wall will be required to install the new twin outlet pipe from the pump station through the wall and into the Detroit River. A structural review of the sheet pile wall will be required to develop a plan for installing the new infrastructure while maintaining the integrity of the existing breakwall. Additional geotechnical requirements may include the determination of unbalanced soil loading on the sheet wall during construction.

A review of the impacts to existing utilities, such as aerial hydro poles, will be required. Temporary relocations and/or temporary bracing may be required depending on the proximity to the open pump station excavations.

Due to the proximity of the pump station and associated electrical systems (including backup generators) to the Detroit River, provisions for providing a watertight system will be required. The designs should account for the potential of high water levels and wave action. Additionally, the pump station itself should be designed to prevent high water levels from inundating the pump station. Measures to prevent this could include backflow prevention devices and watertight hatches.

6.3 Little River Overflow to Pontiac Pumping Station

6.3.1 Existing Conditions

The sanitary trunk sewer directly upstream of the Little River Pollution Control Plant (LRPCP) is hydraulically connected by an overflow to the Pontiac Pumping Station at an overflow elevation of 170.38 m. The overflow is triggered by a sluice gate which is closed under dry weather minor storm conditions but opens when the water level in the Little River PCP wet well reaches 170.69 m. Under current operating conditions, the water levels in the Pontiac Pump Station inlet chamber are occasionally too high during larger storm events, and the overflow is required to provide significant release from the existing sanitary sewer system.

The operating water levels in the Pontiac Pump Station and corresponding pump capacities were evaluated under existing conditions. The design capacity of the screw pumps in the Pontiac Pump Station is currently at the “filling point” water level in the inlet chamber. If the water level in the inlet chamber is below the filling point, the capacity of the screw pump decreases. The filling point of the large screw pumps at Pontiac Pump Station is at 170.99 m; therefore, the inlet chamber has to fill up to 170.99 m to utilize the pump capacity fully.

Based on the operation of screw pumps, it is estimated that when the water level is at the top of overflow weir level (170.38 m), the capacity of the large pumps is approximately 70% of the design

capacity. Due to this decreased capacity, the pumps at the Pontiac Pump Station are unable to lower the water level in the inlet chamber to the sanitary sewer system overflow elevation to facilitate a controlled overflow. Accordingly, the functional design includes the upgrading of the existing PS.

6.3.2 Future Improvements – Little River PCP

The overflow rate from the Little River PCP is estimated at 2.5 m^3/s. This estimate is based on the surcharged conveyance capacity of the 1200 mm diameter overflow sewer. The pump station improvement included in the functional design was based on the St. Paul and Pontiac Pump Station report (Dillon, 2018).

Due to the existing physical characteristics of the existing pump station, and internal screw pumps, improving the capacity of the existing pump station is not feasible.

The 2018 St.Paul/Pontiac study determined that the LRPCP Bypass is not available during major rain events, due to the active hydraulic grade elevations in the City's storm system, as described above. It was recommended that the following improvements be implemented:

- Re-direct the existing bypass sewer that connects the sanitary sewer system to the Pontiac PS, to a new wet well structure proposed to be located south of the existing Pontiac PS;
- Construct a new wet well structure to house three 1.2 m^3/s pumps; and,
- Construct an outlet from new wet well structure to the Little River Drain adjacent to the existing Pontiac PS outlet.

In addition to improvements to the pumped bypass to following is also recommended:

- Including an upstream "gate controlled" connection between the existing Pontiac PS and the new by-pass. This would allow for more regular running of the new pumps for maintenance purposes;
- The new by-pass PS should have equipment for flow monitoring to help with by-pass recording and reporting;
- Consider sharing the existing discharge apron from the Pontiac PS with the new by-pass PS;
- Consider having back-up pumps for the new by-pass; this differs from the Pontiac/St. Paul Report (2018).

The new pump station would receive only flow from the Little River PCP overflow system. A new pipe would be constructed from Manhole 6R4071 to the new pump station to be constructed to the south of the existing station. The existing overflow connection from this manhole to the existing Pontiac Pump Station would be sealed off by a control gate installed in the manhole on the interconnecting pipe. The new pumping station would discharge to Little River through the existing Pontiac Pump Station discharge channel.

Due to the required capacity and head, vertical turbine pumps or mixed flow pumps would be the preferred pump type for the new pumping station. Vertical, submersible propeller pumps are

recommended to eliminate the need for a superstructure. The footprint of the pump station is estimated to be approximately 16.5 m x 10.0 m.

It is recommended that two duty pumps and one standby pump be installed to handle the overflow. Each pump would have a capacity of 1.25 m^3/s; the total dynamic head is estimated at about 9.0 m. Based on the depth of the overflow pipe from the Little River PCP, the depth of the pump station is estimated at about 8.0 m below grade.

The pumps would require 200 kW motors. The pump discharge can be configured as individual discharges or a common discharge header. Due to the infrequent operation and projected low operating hours, no standby pump is recommended. Power would be provided from the Little River PCP power supply. A diesel generator would be provided for emergency power supply.

The dimensions and configuration of the pumping station were determined by the ANSI Standard Pump Intake Design developed by the Hydraulic Institute.

6.4 Ford Blvd. Pumping Station

6.4.1 Existing Conditions

An evaluation of the proposed pumping station system at the Ford Blvd storm sewer outlet as part of Storm Alternative 2 for Riverside Dr. E. was conducted. The nature of the evaluation was to identify the cost benefit of implementing new infrastructure versus the overall benefit in flood reduction for the Ford Blvd drainage system and to accommodate concerns on the location and size of the proposed pumping station. According to record drawings, the existing Ford Blvd. outlet consists of two dewatering pumps with a total capacity 0.5 m^3/s, flap gate at the end of the 2,125 mm diameter trunk sewer and a 1,625 mm X 3,048 mm bar screen outfall. Under the 1:100 Year event and climate change scenarios, the reduction in peak flow with the preferred alternative utilizing the existing outlet indicates that an improvement to the dewatering facility at the Ford outlet should be considered prior to a large pumping station.

6.4.2 Proposed Pump Station Improvement

It was assumed that the existing pumps in the pump station which are approaching their life end would be replaced by new pumps having the capacity of 0.25 m^3/s each. As the pumps will be used only to empty the sewer system after rain events, no standby pump is proposed. In addition to the pump replacement, the pump discharge piping will be replaced as well to match the existing. It is also recommended to replace the electrical installation and add a standby generator. To improve station monitoring, it is recommended to install water level and pump monitoring equipment. No additional modifications are required in the pump station or on the existing gravity outfall.

Submersible sewage pumps in wet well configuration are recommended

- Submersible sewage pumps (2 duty, 0 standby):
  - Capacity 0.25 m^3/s (each)
  - Motor size 40 kW each

6.5 Lakeview Pumping Station

6.5.1 Existing Conditions

Presently, the Lakeview PS is serviced by 2 pumps of 0.35 m^3/s capacity each for a total capacity of 0.7 m^3/s assuming pumps could run in lead leg configuration. The firm capacity of the station is 0.35 m^3/s. Currently under the 1:100 year event, the modelling indicates that the peak flow through the pumping station is 0.3 m^3/s.

Several modelling iterations looking at the Blue Heron Pond levels were conducted, verifying the normal water level, applying the future high water mark at the Detroit River outfall, applying future development conditions, and identifying bottlenecks in the system to effectively convey flows to the Detroit River. Under present conditions, the draw downtime for the Blue Heron Pond (time for the sewer system to reduce the pond high water levels to normal pond water levels) is approximately 80 hours. Under some larger storm events, where downstream sewer have been inundated/surcharged, the Blue Heron Pond has experienced overtopping. The City design requirements for new stormwater detention facilities include a maximum drawdown time of 24 hours.

6.5.2 Proposed Pump Station Improvement

The final recommendation includes the following:

- It is recommended that the existing pumping station will be replaced with a new pump station with increased outlet capacity
- Upgrade of the existing outfall sewer and outfall structure to the Detroit River from 300 mm diameter to 600 mm diameter
- A diesel generator is recommended to provide emergency power supply

The functional design includes a new pump station that increases the outlet rate from 0.35 m^3/s to 0.7 m^3/s.

Prior to detailed design, the City shall confirm the preferred drawdown of the Blue Heron Pond to meet City of Windsor Municipal Standards. The pump station and outlet size may require adjustment to meet these criteria. Additionally, the storm sewer sewers between the Blue Heron Pond and the PS may require upsizing to meet the City drawdown criteria.

6.6 East Marsh Pumping Station

6.6.1 Existing Conditions

The East Marsh Pump Station is located on the north side of Riverside Dr. East and discharges to the Detroit River. The East Marsh PS is included in the same sewershed as the Pontiac pump Station. At present, the combined East Marsh and Pontiac Pump Stations do not have sufficient capacity to accommodate the volume of flows from the overall drainage area.

6.6.2 Proposed Pump Station Improvements

As noted in Appendix E, the functional designs identify the redirection of a majority of the existing East Marsh PS drainage area to the Pontiac PS drainage area and improvements to the Pontiac PS. As a result, the existing capacity of the pump station is sufficient to accommodate the revised drainage area tributary to the East Marsh PS.

The final recommendation includes the following:

- It is recommended that the existing pumping station will remain in service
- Replacing all pumps like for like at the existing pumping station
- A diesel generator is recommended to provide emergency power supply

6.7 Drouillard Rd. Pumping Station

6.7.1 Existing Conditions

The existing pump station is at the end of its life, and its capacity is not sufficient to accommodate existing or future flows. The Drouillard Rd. / Wyandotte St. E. intersection is an underpass below a rail line and is susceptible to roadway flooding greater than 0.3 m.

6.7.2 Proposed Pump Station Improvement

As noted in Appendix E, the functional design identifies that the existing pumping station would be replaced. The new pumping station will be constructed next to the existing pumping station. The pumping station will discharge to the existing trunk sewer and has a required pumping capacity of 1.20 m^3/s.

It is recommended that the new pumping station will use submersible axial flow pumps.

- Axial flow pumps (2 duty, 1 standby):
  - Capacity 0.65 m^3/s (each)
  - Motor size 60 kW each

The dimensions and configuration of the pumping station were determined by the ANSI Standard Pump Intake Design developed by the Hydraulic Institute. The dimensions of the pumping stations are estimated 15 m by 8 m.

6.8 Prince Rd. Pumping Station

6.8.1 Existing Conditions

Presently there is no pump station for the Prince Rd. trunk sewer which outlets into the McKee Creek.

6.8.2 Proposed Pump Station Improvement

A study previously completed for the Prince Rd. sewer network identified that a dewatering pump is to be installed to outlet into the McKee Creek (Stantec, 2000). The dewatering pump will be installed in conjunction with a new 2,400mm diameter sewer on Peter St. to Chappell Ave. and outlet to the McKee Creek. According to the report, the dewatering pump system would activate when a minimum of 1.0m of water (or 172.93m) is at the discharge pipe. The dewatering pump will reduce the standing water levels in the sewer system to increase the system's ability to accommodate storm flows.

The required pumping capacity is 0.085 m^3/s, and is anticipated to run for approximately 1.6 hours following a rain event to drawdown the system to the desired elevation.

The Peter St., Chappell Ave. and McKee Outlet improvements were identified in the Prince Rd. report to be installed as a part of Phase 8 of the recommended improvements.

7.0 Municipal Right-of-Way and Private Property Flood Mitigation Measures

The comprehensive solutions developed to mitigate the risk of basement, surface and coastal flooding include improvement recommendations for each component of the City's sewer system. Through the development of alternative and analysis of the City's sewer system, it was determined that other municipal ROW and private property measures are required to reduce excess rainwater entering the City's system. Sewer, storage facilities and treatment plant improvements are sized assuming that these measures are in place. Assumptions related to inflow reductions is explained in the Technical Report Volume II.

7.1 Private Property Measures

Private property source control improvements, homeowners should take necessary precautions to protect their properties from damage such as installing backflow preventers, sump pumps, and emergency backup for flood protection devices and improve lot grading.

The measures that should be taken to mitigate stress on the City's system and provide protection against flood damage are listed below.

- Downspout Disconnection
- Improve Lot Grading
- Low Impact Development (LID) measures, such as:
  - Rain Barrels and Rain Gardens
  - Seal window wells
  - Permeable pavements
- Foundation Drain Disconnection
- Correct Improper Connections
- Backflow Prevention Valves

In addition to the infrastructure improvements described in this report, the City intends to facilitate the necessary programs to encourage homeowners to complete necessary private property improvements. More information related to the recommended private property measures refer to the Short Term Solutions Report, Appendix C of the Windsor and Coastal Flood Protection Sewer Master Plan report.

7.2 Municipal Right-of-Way Improvements

Sources of inflow and infiltration in the municipal right of way include through manhole covers, cracks and leaks along sewers, inflow points from water courses and sanitary/storm sewer interconnections.

The following measures have been highlighted as critical measures to reduce the volume of rainwater entering the system.

A) Sanitary Manhole Covers

It is recommended that the City retrofit existing sanitary manholes with rain catchers to reduce the inflow of rainwater entering sanitary manholes through pick access holes in the covers. The first round of the manhole cover retrofit program includes 733 manholes (Short Term Recommendations report provides a map and list applicable manholes) to be completely sealed first as these manholes are either in low lying areas (lower than the existing ERCA flood protection levels- 176.40) or through the sewer model, they are observed to allow the highest volume of rainwater entering the system during various design events. The remainder of manholes in the City shall be completed as part of regular maintenance or road reconstruction projects.

B) Sealing Existing Sewer System

The City intends to continue the existing program to complete infill and infiltration investigation and associated sewers sealing and lining to reduce point of observed groundwater inflow into the sanitary sewers system.

C) Backflow at Sewer Interconnections

The City intends to install backflow prevention devices inflow points into the sanitary and/or storm system; these include:

- Sewers outlets to the Detroit River or Lake St. Clair, where high water levels cause back-up into the City's sewer outlets and compromise the outflow capacity at these locations; and
- At interconnection locations between the storm and sanitary sewer system. IIt is recommended that these interconnections remain in place to provide the intended relief; however, as sewer improvements in these areas are complete, it is recommended that these interconnections be removed.

8.0 Estimated Capital Construction Costs

In order to provide the City with a more detailed summary of the proposed works, estimated construction costs have been developed. The capital construction costs for the various recommended solutions are based on the year 2020 construction prices. Depending on the timing of implementation, costs could vary significantly. Due to the large scope of the project and that the designs are at the "pre-design" stage, detailed cost estimates were not completed. During detailed design, detailed cost estimates should be completed to more accurately estimate the construction costs for the proposed improvements. This section includes a summary of the high level costs related to the sewer improvements, public infrastructure improvements, surface works, private property improvements, coastal flood protection solutions, and downstream improvements.

A summary of the cost estimate assumptions is included in Appendix F-5. The assumptions detail what costs have and have not been included in the estimates, such as utility relocations and property acquisitions.

8.1 Costing Assumptions

The cost assumptions for all recommended improvements for each of the service areas include, but are not limited to, the following:

- Construction cost estimates, including labour, are based on 2020 unit prices and the accuracy of each estimate is +/- 30% and dependent on the timing of implementation;
- 30% contingency added for Capital Construction Costs;
- Future engineering costs calculated as 20% of capital construction costs; and

It should be noted that land acquisition costs required to construct recommended solutions on private property are not included in the cost estimates. Land acquisition requirements and the associated costs should be confirmed during detailed design.

Storm and Sanitary Infrastructure Improvements

Storm and sanitary construction cost estimates for works within the municipal right-of-way included full road right-of-way construction, including earth excavation, granular road base, asphalt or concrete pavement, curbs and gutters, sidewalks, restoration, street lighting, traffic signals (where required), and other typical surface works. Where required, costs for the inclusion of bike lanes have also been included in the costs. Potential gas, water, telecommunications and hydro costs have not been included in the estimated construction costs and should be determined during detailed design.

Additional costs included within the storm sewer improvement estimates were the costs to install and maintain the recommended stormwater management facilities.

Pump Station Improvements

The cost estimate assumptions for the recommended pump station improvements can be found in Section 6.0 of this report. An additional 20% for engineering has been added to be consistent with the storm and sanitary cost estimates.

A detailed list of cost estimate assumptions can be found in Appendix F-5.

8.2 Unit Prices

Approximate unit prices were developed based on 2020 average construction costs for similar projects. The unit prices were utilized to determine the total construction costs for the various recommended solutions throughout the City. To simplify the costs for the various proposed works for each solution, all unit prices were developed on a per metre basis.

Appendix F-5 details the unit costs for various line items that would potentially be included in the recommended storm and sanitary solutions. This table should be read in conjunction with the cost estimate assumptions and the individual street cost estimates identified in Appendix F-5.

8.3 Cost Estimates

8.3.1 Methodology

As noted in Section 8.2, the cost estimates were completed based on the unit prices developed and the proposed works for each solution. The costs developed for each solution include a 30% construction contingency and a 20% engineering fee contingency. Taxes have not been included in the estimates.

Cost estimates were completed for each street within a recommended solution area. The estimates for each street were then added together, and the total cost was calculated for the solution area. By completing estimates for individual streets, a more accurate calculation could be made for the whole solution area.

The costs to implement low impact development measures (LIDs) within each solution area were developed based on the total length of improvements identified for each area. A cost of $300/m was used to determine the total cost for LIDs within each solution area.

Solution area estimates for the East, South, and Central Windsor areas were combined, and a total construction cost for the entire City sewer and coastal flood protection improvements was calculated. Cost estimates for individual streets can be found in Appendix F-5 along with a summary of total construction costs for all solution areas throughout the City.

8.3.2 Capital Construction Costs and Implementation

Due to the scale of the proposed works and the implementation schedule, actual construction costs may vary significantly depending on the year of implementation. Priority projects recommended for implementation in the near future will have a higher degree of cost accuracy than works to be completed many years in the future.

The implementation plan detailed in Section 9.0 of this report identifies high priority projects to be completed in the next 8 years and lower priority projects that will be completed after the 8-year mark.

8.3.3 Sewer Separation Costs

Other costs that have been included in the total cost estimate are the costs to separate the combined sewer system in Central Windsor and the dual MH system east of the Albert Drainage Area. In total, there is approximately 400km of roads that will require reconstruction to separate the existing combined sewers, separate the existing dual manhole sewers, and reconstruct already separated areas once. This would also include the need to upsize existing storm sewers to accommodate additional private property surface drainage.

Estimates were completed for entire drainage areas based on the total length of roads within the drainage area, the average number of lanes and pavement type. The average number of lanes in each drainage area were rounded up to the nearest half of a lane to be conservative. In areas where specific detailed sewer sizing was not completed, a typical sewer size of 750mm was used to complete the storm and sanitary sewer cost sections of each drainage area. Actual sewer sizes should be confirmed during detailed design.

It was beyond the scope of this project to complete individual street estimates for the separation of the combined and dual manhole systems. Only the individual streets identified in the recommended solutions for Central Windsor were omitted from the costs to separate the combined system fully. Table 8.1 details the drainage areas within Central Windsor along with the average number of lanes, pavement composition, length of roads and separation costs within each drainage area.

Table 8.1: Central Windsor - Combined and Dual MH Information and Costs

Drainage Area	Total Length of Roads (m)	Average Number of Lanes	Typical Pavement Composition	Separation Costs
Prince Rd.	20,730	2.5	Asphalt	$137M
Brock St.	41,330	2.5	Asphalt	$260.1M
Detroit St.	10,820	2.5	Asphalt	$72.5M
Huron Church Rd	29,350	2.5	Asphalt	$179.8M

Drainage Area	Total Length of Roads (m)	Average Number of Lanes	Typical Pavement Composition	Separation Costs
Askin Ave.	9,980	2.5	Asphalt	$68.7M
Cameron Ave.	21,130	2.5	Asphalt	$98.9M
Wellington Ave.	13,360	2.5	Asphalt	$85.3M
Church St.	53,290	2.5	Asphalt	$312.8M
McDougall St.	14,010	2.5	Asphalt	$82.6M
Parent Ave.	64,990	2.5	Asphalt	$414.2M
Lincoln Rd.	45,590	2.5	Asphalt	$296.9M
Albert Rd.	9,980	2.5	Asphalt	$63.5M
Dual MH Area, East of Albert Rd.	73,000	2.5	Asphalt	$480.4M

8.3.4 Pump Station Costs

The costs for the recommended pump stations and pump station improvements in East and Central Windsor, as identified in Section 6.0 are detailed in the following sections:

8.3.4.1 St. Paul Pumping Station

The opinion of probable cost developed for the above upgrade options. The following assumptions were used to develop the costs:

- Accuracy of the estimate is +/- 30%;
- The cost for expansion of the pumping station includes the cost for replacing the electrical installation in the existing pump station and upgrades to the power supply system;
- New diesel generator is included for the additional load;
- The costs include 30% estimating contingency; and
- Include 20% for engineering.

The cost for a new pump station includes a diversion manhole from the existing inlet sewer, inlet pipe from the diversion manhole to the new Pump Station, pumping station and discharge pipes to the existing pump station discharge bay.

It is estimated that the cost to implement this option is approximately $8.2 million. Detailed cost estimates are provided in Appendix F-5.

8.3.4.2 St. Rose Pumping Station

The following assumptions were used to develop the cost of the proposed pump station:

- Accuracy of the estimate is +/- 30%;
- The cost for the station includes all electrical installation and power supply system required for the pump station;
- New diesel generator is included;
- The costs include 30% estimating contingency; and
- Include 20% for engineering.

The cost for a new pump station includes an outlet connection to the existing gravity outfall pipe and it is estimated that the cost to implement the pump station is $24.0 million.

8.3.4.3 Little River Pollution Control Plant Bypass Improvements at Pontiac Pumping Station

Cost estimates were developed for the new pumping station and follow the below assumptions:

- Accuracy of the estimate is +/- 30%;
- Costs for engineering, potential land acquisition and utility relocations for the upgrades are not included; and
- Power would be provided from the Little River PCP.
- New diesel generator for emergency power

The final cost includes the cost of the inlet pipe from the overflow manhole, the sluice isolation gate in the overflow manhole, the new pumping station and discharge pipes to the existing pumping station discharge channel and power supply from the existing power supply system as described above. The cost for the new pumping station is estimated at approximately $5.1 million and includes a 30% estimating contingency and a 20% engineering fee estimate.

8.3.4.4 Ford Blvd. Pumping Station Improvements

The following assumptions were used to develop the cost of the proposed pump station:

- Accuracy of the estimate is +/- 30%;
- The cost for the station includes all electrical installation and power supply system required for the pump station;
- New diesel generator is included;
- The costs include 30% estimating contingency; and
- Include 20% for engineering.

The cost for improvements to the pump station as described is $400,000.

8.3.4.5 Lakeview Pumping Station Improvements

The following assumptions were used to develop the cost of the proposed pump station:

- Accuracy of the estimate is +/- 30%;
- The cost for the station includes all electrical installation and power supply system required for the pump station;
- New diesel generator is included;
- The costs include 30% estimating contingency; and
- Include 20% for engineering.

The cost for improvements to the pump station as described, is $1.8 million.

8.3.4.6 East Marsh Pumping Station

The following assumptions were used to develop the cost of the proposed pump station:

- Accuracy of the estimate is +/- 30%;
- The cost for the station includes replacement pumps and electrical required for the pump station;
- New diesel generator is included;
- Costs associated with the design, approvals and construction of the East Marsh pump station upgrades were those used in the first round of DMAF funding application;
- The costs include 30% estimating contingency; and
- Include 20% for engineering.

The cost for improvements to the pump station as described, is $3.3 Million.

8.3.4.7 Drouillard Rd. Pumping Station

The following assumptions were used to develop the cost of the proposed pump station:

- Accuracy of the estimate is +/- 30%;
- The cost for the station includes all electrical installation and power supply system required for the pump station;
- New diesel generator is included;
- The costs include 30% estimating contingency; and
- Include 20% for engineering.

The cost for improvements to the pump station as described, is $2.4 Million.

8.3.4.8 Prince Rd. Pumping Station

The following assumptions were used to develop the cost of the proposed pump station:

- Accuracy of the estimate is +/- 30%;

- The cost for the station includes all electrical installation and power supply system required for the pump station;
- The costs include 30% estimating contingency; and
- Include 20% for engineering.

The cost for improvements to the pump station as described is $300,000.

8.4 Source Control and Private Property Measures Estimated Program Costs

Table 8.2: Private Property Source Control Estimated Program Costs

Solution Component	Central Windsor	South Windsor	East Windsor	Sub-Total Costs
Private Property Subsidy Programs:				
City-wide Foundation Drain and Enhanced Private Property Improvement Program	$480M	$220M	$250M	$950M
City-wide Downspout Disconnection Program	$15M	$21M	$14M	$50M
Sub-Total	$495M	$241M	$264M	$1,000M

Foundation drain disconnection and downspout disconnection costs (private property measures) assume that the City will develop mandatory programs to complete these measures in keeping with the findings of this study. It is assumed that the City will provide financial assistance to property owners via subsidy programs, similar to the existing Basement Flood Protection Subsidy and Free Downspout Disconnection programs. The costs are based on the number of residential homes in the City per the GIS data provided as a basis for this study (2018 Data). Detailed cost breakdown table entitled "Private Property Foundation Drain and Downspout High Level Cost Estimates" costs are included in Appendix F-5.

Table 8.3: Municipal Right-of-Way Source Control Estimated Costs

Solution Component	Central Windsor	South Windsor	East Windsor	Sub-Total Costs
Public Infrastructure Improvements				
Sanitary Manhole Sealing Program	N/A	$0.1M	$0.4M	$0.5M
Backflow Prevention Device Program Allowance	$4M	N/A	$4M	$8M
Sub-Total	$4M	$0.1M	$4.4M	$8.5M

The manhole sealing program cost represents the cost to complete the first round of manhole rain catcher retrofits for 733 manholes based on the recommendations of the Short Term Solutions Recommendation Report, Appendix F-5. The balance of sanitary manholes may be sealed upon completion of road and sewer improvement works. Cost for manhole rain catchers has been included in the detail cost estimate of each project.

An allowance for the installation of backflow prevention devices within the Central and East Areas has been allotted to cover the cost for the installation of these devices at locations where high lake/river water levels can back up into the City's sewer system and where interconnections between the sanitary/combined sewer and storm sewer exist.

8.5 Operation and Maintenance Costs

The costs to operate and maintain the various infrastructure improvements that have been recommended were not included apart from general LID maintenance costs detailed in Section 2.8.5. Due to the implementation time horizon, operation and maintenance costs could vary significantly. The City will need to include the recommended improvements to its operations and maintenance programs once they are constructed. As the improvements are constructed, the City should have a better idea of what the costs are to maintain the infrastructure.

The City will need to develop an operations and maintenance schedule for the coastal flood protection measures in the East Windsor service area if there is not one already in place. Because the flood protection components are critical in providing protection from inland flooding from the Detroit River, it is recommended that a conservative approach be taken when developing this operation and maintenance schedule. On-going monitoring and maintenance will need to take place to ensure the landform barrier, and related infrastructure is not altered in any way that could make the system vulnerable to failure. The costs for maintenance and inspection of the landform barrier and other related flood protection infrastructure may vary significantly from year to year, so it is important to be conservative when estimating this portion of the City's operation maintenance costs.

Costs to operate and maintain the proposed pump station improvements have not been included in this report. It is expected that the overall City wide pump station maintenance budget will increase due to the upgrades at existing facilities and the new additional pump stations.

8.6 Cost Estimate Summary

All construction estimates have been broken down into projects to provide a more accurate representation of what the costs are to complete infrastructure improvements in the South, East, and Central Windsor service areas. Pump station improvements and stormwater management facility costs are separated to identify better costs related to these types of improvements.

Total costs for all projects, including pump stations, and stormwater management facilities are detailed in Appendix F-5. The total construction costs have been rounded up to the nearest one hundred thousand dollars. Table 8.4 below summarizes the total infrastructure improvement costs within each service area along with the costs to separate the combined and dual manhole sewer systems.

Table 8.4: Infrastructure Improvement Costs

Solution Component	Central Windsor	South Windsor	East Windsor	Total
Public Infrastructure Improvements				
Storm Sewer Infrastructure	$232.2M	$152.7M	$363.7M	$748.6M
Sanitary Sewer Infrastructure	N/A	$30.1M	$459.3M	$489.4M
Coastal Flood Protection Measures	N/A	N/A	$9.3M	$9.3M
Combined and Dual Manhole Sewer Separation	$2,551.5M	N/A		$2,551.5M
Pump Stations	$2.7M	N/A	$42.8M	$45.5M
Low Impact Development Measures (LIDs)	$120.0M	$5.4M	$8.8M	$134.2M
TOTAL	$2,906.4M	$188.2M	$883.9M	$3,978.5M

9.0 Implementation Plan

In order to assist the City with the prioritization of projects across the City, the following implementation plan was developed. The project implementation priorities were based primarily on the goals of the Sewer Master Plan, including reducing the risk of basement flooding, managing surface flooding to meet the identified level of service and to protect against coastal flooding. The currently identified list of priority projects may be influenced by future infrastructure, socio-economic or political demands. The project prioritization identified below should be reviewed frequently and in conjunction with any other planned City infrastructure works. For instance, planned road improvements required to facilitate increased traffic demand would provide an opportunity to include required sewer improvements as well. When completing the detailed design of the recommended improvements, consideration should be given to the timing and coordination with adjacent private and public projects. There may be opportunities to coordinate adjacent projects to provide a more economical solution and eliminate potential reconstruction in the future.

9.1 Source Control Programs and Improvements

Projects that have been recommended to control the source of inflow and infiltration into the City's system using private property improvements or city/area wide public property improvements have been identified as immediate. It is recommended that the City proceed with the development of policies, procedures and obtain the resources necessary to implement these items as they provide the basis for long-term implementation and maintenance of the City's system. Proceeding immediately with the implementations of these source control programs/measures are a critical component in the reduction of flood risk. Using assumptions described in Appendix E (Technical Report Volume II), an estimated quantity of volume reduction inflow into the sewers systems has been quantified, and the recommended sewer infrastructure improvements have been sized accordingly. The construction of the sewer improvements alone will not be sufficient to meet the required LOS reduction to the overall risk of basement flooding.

It should be noted that reduction of Inflow and infiltration into the City's system will have other long-term benefits such as:

- Reduction in inflow to treatment plants reducing the volume of excess rainwater entering the sewer system,
- Providing guidance to residents to protect their properties and reduce the impact on the system will have benefits on maintenance and reduce insurance claims.

The following summarizes the recommended solutions and describes the next steps the City should take more immediately.

Table 9.1: Source Control Project Implementation Recommendations

Project	Sewer System	Comments
Public Infrastructure Inflow Prevention Measures		
Rain Catcher Installation First Priority: 733 manholes	Sanitary System	733 manholes have been identified as first priority as they are in low lying areas or through the sewer model have been observed to receive high volumes of rain water due to their location with the City's system and elevation. The remaining rain catchers are intended to be installed during identified road/sewer construction works, regular sewer maintenance and/or other regular annual programs.
Backflow Prevention		Placement of Backflow Prevention Devices, to protect the City's Sewer System from high river levels and reduce inflow from storm flows into the sanitary sewer system through existing interconnections.
Pilot Projects		
LID Measures	Storm System	Pilot projects and monitoring to measure the benefit of LIDs will be incorporated into the projects listed below that are being completed as part of the DMAF solutions.
Foundation Drain Disconnection	Sanitary System	Areas suitable for implementing a foundation drain disconnection pilot project is recommended (Technical Report Volume II).
Downspout Disconnection	Storm System	Areas suitable for implementing a downspout disconnection pilot project is recommended (Technical Report Volume II).
Subsidy Programs		
Foundation Drain Disconnection	Sanitary System	Pending results of the pilot projects recommended above, the City shall proceed with the implementation of the foundation drain disconnection bylaw to mandate and enforce disconnection.
Downspout Disconnection	Storm System	Pending results of the pilot projects recommended above, the City intends to continue to implement the existing downspout disconnection bylaw (By-law 26-2008) and to acquire the resources to mandate and enforce disconnection.
Basement Flood Prevention Subsidy	N/A	City shall continue to provide this subsidy to property owners.
Enhanced Educational Program		
Enhanced Educational Program	N/A	The city should develop materials and schedule interactive sessions to provide education and guidance to the public to protect their property and to reduce strain on the sewer systems.
Policy and Standards		
Development Manual Update		Update the existing development manual to include: • Revised new sewer design criteria and mechanisms to control excess inflow, including revised Inflow and Infiltration (I&I) allowances and mechanisms to monitor and control excess I&I from new development. • Mandate that new development must not impact downstream areas, including details on submissions and approvals required. • Mandate sewage ejector pumps for new development.

Project	Sewer System	Comments
		• Develop standards for the implementation of LIDs in keeping with the MECPs new guidelines.

9.2 Municipal Infrastructure Improvements

Numerous infrastructure projects have been identified through this Master Plan, in addition to several inflow and infiltration reduction programs for both private and public property. One of the objectives of this study is to provide a framework for the City administration to guide the implementation of recommended projects and initiatives and infrastructure improvements.

Recommended solutions have been separated into the following categories.

Table 9.2: Priority Categories for Municipal Infrastructure Projects

Recommended Solution Priority	Definition
Immediate Priority	Assigned to projects that have already received funding or include programs/initiatives that set the stage to reduce
High Priority	Projects are ranked as High, Medium and Low Priority based on a detailed ranking matrix.
Medium Priority	
Low Priority	

9.2.1 Immediate Priority Solutions

The City currently has an 8-year (2020-2028) capital works plan which provides the framework for sewer improvements that the City has identified through previous studies will provide relief to the City's system. The 2020 sewer construction priority list was provided for reference in the development of this implementation plan. This list was cross referenced with the list of recommended solutions. Where the storm sewer projects that have been included in the current capital works, budget are consistent with the recommendations of this study, those projects where assigned an Immediate Priority.

In 2018, the City received Disaster Mitigation and Adaptation Plan funding (DMAF) from the federal government to assist with the design and construction of a number of projects. Projects include storm sewer system relief improvements located in the Riverside Area that were recommended from the previous St. Paul/Pontiac Stormwater Management Report. The City is mandated to complete these projects by 2028 in order to receive this funding.

In 2020, The City applied for a third intake of DMAF funding which included additional projects that provide surface flooding and basement flooding relief within the Riverside Area. The City did not receive funding through this application; however, the City will fund projects that overlap with the project that received funding in 2018. Recommended solutions included in this submission are included in the table

below. These solutions coincide with areas that have been noted as a high priority area based on the detailed ranking exercise described further in the next section.

Table 9.3: Immediate Priority Municipal Infrastructure Projects

Project	Construction Timeline	Project Type	Area	System
Tranby Park Stormwater Improvements	Underway	DMAF	East	Storm System
Matthew Brady Improvements	2019-2022	DMAF	East	Storm System
Belle Isle View Improvements	2019-2021	DMAF	East	Storm System
Eastlawn Ave. Improvements	2021	DMAF	East	Storm System
East Marsh Pump Station Drainage Area - Medard, John M, Florence Reconstruction	2022	DMAF	East	Storm System
Riverside Dr. - Vista Phase 2A		DMAF		
Storm Trunk Sewer Improvements	2023-2024	DMAF	East	Storm System
Sanitary Trunk Sewer Improvements	2023-2024	DMAF	East	Sanitary System
Landform Barrier (Area 1)	2023-2024	DMAF	East	Coastal Flooding
East Marsh Pump Station Drainage Area - Clover Reconstruction	2023	DMAF	East	Storm System
East Marsh Pump Station Drainage Area - Elinor and Clairview Reconstruction	2024	DMAF	East	Storm System
St. Rose Ave. Pump Station Improvements	TBD	DMAF	East	Storm System
St. Rose Ave. storm and sanitary trunk storm sewers along St. Rose Ave., Wyandotte St. E., Janisse Ave. , Ontario St., St. Mary's St. and Raymond Ave.	TBD	DMAF	East	Storm/Sanitary System
Little River Pollution Control Plant Bypass Improvements	TBD	DMAF	East	Sanitary System
St. Paul Pump Station Improvements	2024	DMAF	East	Storm System
Cedarview Sewer Improvements	2024	DMAF	East	Storm System
Brumpton Park Improvements	2027	DMAF	East	Storm System
Ford Pump Station Improvements	TBD	DMAF	East	Storm System
Belleperche Storm Trunk Sewer	2023-2025	DMAF	East	Storm System
East Marsh Pump Station Upgrades	2025	DMAF	East	Storm System
Lauzon Rd. Reconstruction	TBD	City Capital Works	East	Storm/Sanitary System

Project	Construction Timeline	Project Type	Area	System
Prince Rd. Storm Relief System and Dewaterinng Pump Station - Chappell Ave. - West of Sandwich St. to McKee Creek (Detroit River Outlet)	2021	City Capital Works	Central	Combined System
Dorchester Rd. - Prince Rd. to Huron Church Rd. Sewer Separation Improvements.	2024	City Capital Works	Central	Combined System
Totten St. - Betts Ave. to East of Partington Rd. Sewer Separation Improvements.	2026+	City Capital Works	Central	Combined System
Felix/Marlborough Sewer Separation Improvements.	2025	City Capital Works	Central	Combined System
Ellis St. and Giles Blvd. - McDougall Ave. to Howard Ave. Sewer Separation Improvements.	2026+	City Capital Works	Central	Combined System
Lou Romano Water Reclamation Plant Retention Treatment Basin and Sandwich St. Sanitary Sewer	TBD	City Capital Works	Central	Combined System

9.2.2 High Priority, Medium Priority, and Low Priority Solutions

The balance of solutions recommended in this study is planned for future implementation. Priority has been assigned to these remaining projects based on various criteria which have been developed and reviewed with City Administration and the SAC (Stakeholder Advisory Committee). Refer to Table 9.4 for details regarding the priority ranking criteria. Additional weighting has been applied to ranking criteria that are most critical in the reduction of flood risk.

Table 9.4: Solutions Priority Rating Criteria and Weighting

Ranking Criteria	Methodology	Weighting
Level of Basement Flooding Risk	High priority is assigned to areas that have higher risk of basement flooding based on sewer model analysis. Higher priority will be assigned to areas that have a greater risk due to higher hydraulic grade line during a 1:5 year event.	x2
Reduction of wet weather flow to the Treatment Plant.	Priority is given to those solutions that reduce the volume and frequency of Combined Sewer Overflows (CSOs)	x2
Emergency Access for Vulnerable Areas	High priority is assigned to solutions that address surface flooding along roadways that are immediately adjacent to vulnerable land use sites, where alternative access routes are not available. Refer to Vulnerable Area map (Master Plan Report) for critical areas. (Hospitals, Long Term Care Centres, Emergency Shelters)	x2
Emergency Access for Major Roadways	High priority is assigned to solutions that address surface flooding along major arterial roadways that provide critical connections within the City's road network. Locations that provide below grade crossing points	x2

Ranking Criteria	Methodology	Weighting
	at the CPR Rail or EC ROW expressway. Minimal locations to cross the Rail and expressway exist; therefore, roadways that provide this connection are critical to providing emergency access to local hospitals for emergency responders.	
Average Condition of combined sewers	High priority is assigned to solutions that coincide with the sewer life cycle replacement.	x1
Cost Effectiveness	Higher priority will be assigned to solutions that have the least cost per unit of benefit.	x1

Using these criteria, projects have been separated into three groups, High, Medium and Low Priority, using a priority rating matrix. For each criteria, data was obtained from the completed calibrated model (Model Input) to represent the criteria. Summary lists of priority projects for the basement flood reduction and surface flood reduction are included in Appendix F-6. Using these tables, the City administration shall develop a plan to proceed with solution mitigation infrastructure construction planning based on how these recommendations fit into the City's road reconstruction projects and maintenance projects and other asset reconstruction costs.

This prioritization list is meant to provide guidance to the City to develop a long term infrastructure plan. It is recommended that the City continuously review and re-evaluate the prioritization list especially as it relates to future climate change projections, the effectiveness of source control measures and how it overlaps with other road projects or maintenance programs.

It is important to note that public infrastructure improvements are only one part of the comprehensive solution to mitigate flooding and that the implementation of private property source control and protection measures are critical in achieving the established level of service. Continuous sewer system monitoring and modelling analysis will be required to measure the benefit of infrastructure improvements.

The City will need to make modifications to the City's operations and maintenance and asset management programs to include new infrastructure as they are constructed.

9.2.3 Landform Barrier Implementation

The current high water levels in Lake St. Clair and the Detroit River are reaching record levels. Therefore, it has been identified that coastal flood protection solutions need to be a high priority. The City has scheduled the completion of the flood protection landform barrier in Area 1 as it coincides with the construction of the Riverside Vista Phase 2A. Therefore, this area is included in the immediate solutions priority list. The remaining construction and infill of the existing barrier have been assigned a high priority. Should external funding resources become available, it is recommended that the City proceed with these projects.

9.3 Approvals

During detailed design, relevant agency and municipal approvals will be required including, but not limited to, the Ministry of Environment and Climate Change (MECP) Environmental Compliance Approval, Essex Region Conservation Authority (ERCA) permits and approvals, and Windsor Utilities Commision (WUC) approvals for watermain separations.

Archaeological and Natural Environment Assessments completed as part of this project should be referenced to determine any additional studies or approvals that may be required for Schedule B projects.

Discussion with the City will be required during detailed design if any additional approvals are required to construct the recommended improvements.

10.0 Conclusions and Recommendations

Technical Report Volume III was completed to detail the functional design and analysis of the recommended sewer and coastal flood protection solutions developed as part of the City of Windsor Sewer and Coastal Flood Protection Master Plan. The recommended alternatives developed as part of the modelling process detailed in Technical Report Volume II infrastructure were designed to a functional level to achieve the level of service criteria established for surface, basement, and coastal flooding.

The design criteria applied to determine the functional designs were derived from road and sewer guidelines including, but not limited to, the City of Windsor Development Manual (dates vary) and the Ministry of the Environment Design Guidelines for Sewage Works (2008). The criteria were utilized to establish manhole sizes and spacing, sewer alignments, sewer sizes and slopes for the recommended functional design solutions. Design criteria established for the coastal flood protection measures detailed in Section 5.0 were utilized to determine the recommended coastal flooding functional design solutions.

The functional sewer design solutions were further analyzed to determine any potential conflicts with existing infrastructure and private properties. Potential conflicts were mitigated where feasible, including lowering or adjusting alignments of sewers, adjusting pipe slopes, adjusting pipe sizes and re-routing sewers down streets with less infrastructure. Minimum flow rates based on the InfoWorks model were maintained as adjustments were made to the recommended functional design solutions. The recommended storm, sanitary, and coastal flood protection solutions for the various solution areas are summarized below, and further detailed in Appendix F-1, Appendix F-2, and Appendix F-3:

Storm System Solutions

Central Windsor

- Construction of 18km of new storm sewers;
- Recommended sewer sizes range from 450mm dia. to 3300mm x 2400mm box culverts;
- Construction of four (4) new outfalls and replacement of one (1) outfall;
- Construction of a new 1.30 m^3/s pump station on Drouillard Rd.;
- Prince Rd. dewatering pump;
- Installation of a 3,000m^3 underground stormwater storage facility within the Optimist Park parking lot.

South Windsor

- Construction of 8.7km of new storm sewers;
- Recommended sewer sizes range from 300mm dia. to 2400mm x 1800mm box culverts;

- Construction of new stormwater surface storage dry ponds;
  - Dry pond on Howard Avenue @ Grand Marais Rd E with a volume of 2,433m^3
  - Dry pond on Dougall Avenue @ South Cameron with a volume of 14,000m^3
- Expansion of the existing Central Pond. Total volume of 106,000m^3;
- Installation of an 11,000m^3 underground stormwater storage facility within the Fiat Chrysler parking lot;
- Improvements to Southwood Lakes ponds to lower the Normal Water Level (NWL) of three (3) of the existing ponds.

East Windsor

- Construction of 40 km of new storm sewers;
- Recommended sewer sizes range from 300mm dia. to 4200mm x 1800mm box culverts;
- Installation of five (5) underground stormwater storage facilities:
  - 4,725m^3 within Brumpton Park
  - 7,000m^3 on Wyandotte St E. @ Watson Avenue;
  - 5,000m^3 @ 8380 Wyandotte St. E
  - 5,000m^3 within Meadowbrook Park
  - 31,625m^3 within Roseville Garden Park
- Construction of a new stormwater surcharge storage pond in the Little River Golf course with a volume of 20,000m^3.
- Construction of two (2) new pump stations:
  - St. Rose Pump Station with a pump rate of 13.5m^3/s
  - Pontiac Pump Station/ LRPCP Overflow with a pump rate of 2.5m^3/s
- Modifications to existing pump stations:
  - St. Paul Pump Station capacity upgrade. New pump rate of 18.2m^3/s
  - Ford Pump Station pump replacement. New pump rate of 0.5m^3/s
  - East Marsh Pump Station pump replacement. New pump rate of 1.7m^3/s
- Lakeview Pump Station pumping system and outlet pipe upgrades. Increase pump rate to 0.65 m^3/s. New 600mm dia. outlet pipe to Detroit River to replace existing 300mm dia. outlet pipe.

Sanitary System Solutions

East Windsor

- Construction of 41.7km of new sanitary sewers;
- Recommended sewer sizes range from 300mm dia. to 4200mm x 2700mm box culverts;

South Windsor

- Construction of 6.9km of new sanitary sewers;
- Recommended sewer sizes range from 600mm dia. to 825mm dia.

Coastal Flood Protection Solutions

- Construction of 2.7km of new landform barrier and improvements to the existing landform barrier along Riverside Dr. to meet the flood protection elevation of 176.50m;
- Backflow prevention measures for sewers crossing the landform barrier;
- Local storm sewers adjacent to the landform barrier ranging in size from 450mm to 525mm in diameter;
- Emergency infill areas where temporary flood protection measures are required to provide a continuous barrier.

The findings of this study and solutions are functional in nature and provide direction on the designs that would be effective in addressing surface and basement flooding concerns. Project prioritization and implementation plan has been identified for the recommended solutions within each service area and is detailed in Appendix F-6.

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Appendix F-1

Sanitary System Functional Design Solutions

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City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
SANITARY SEWER IMPROVEMENTS							
South Windsor	Lou Romano Water Reclemation Plant Sewershed Area	LRWRP Sewer Shed Area 1	SAN-S-1	Woodland Avenue	600 mm dia.	1510 m	•6914m of sanitary trunk sewer improvements •Road reconstruction •Connections to existing sanitary sewers •New private drain connections •Removal of existing sanitary sewer •Intersection reconstruction on Howard Ave •Potential boulevard reconstruction on Roselawn Drive
				Howard Avenue	825 mm dia.	1150 m	
				Parkwood Avenue	600 mm dia.	515 m	
				Sydney Avenue	600 mm dia.	106 m	
				Malcolm Avenue	600 mm dia.	106 m	
				Calderwood Avenue	750 mm dia.	210 m	
				Foster Avenue	750 mm dia.	67 m	
				Conservation Drive	750 mm dia.	359 m	
					825 mm dia.	355 m	
				EC Row Avenue East	600 mm dia.	141 m	
				Tourangeau Road	600 mm dia.	390 m	
				Grand Marais Road East	600 mm dia.	573 m	
				Dominion Boulevard	600 mm dia.	1245 m	
				Roselawn Drive	600 mm dia.	187 m	
East Windsor	Little River Pollution Control Plant Sewershed Area	LRPCP Sewershed Area 1 - Martenique	SAN-E-2	Riverside Drive East	900 mm dia.	1014 m	•3527m of sanitary trunk sewer improvements •Road reconstruction •Connections to existing sanitary sewers •New private drain connections •Removal of existing sanitary sewer •13,850m³ of in-line sanitary storage •Trail restoration •Private property easement/acquisition required
				Riverside Drive East Easement	4200 mm X 2400 mm	403 m	
					300 mm dia.	11 m	
				St. Rose Avenue	900 mm dia.	217 m	
				Ganatchio Trail	1500 mm dia.	364 m	
					4200 mm X 2400 mm	610 m	
				Clairview Avenue	1500 mm dia.	463 m	
					4200 mm X 2400 mm	361 m	
					300 mm dia.	84 m	
East Windsor	Little River Pollution Control Plant Sewershed Area	LRPCP Sewershed Area 2 - Wyandotte	SAN-E-2	Wyandotte Street East	300 mm dia.	251 m	•4399m of sanitary trunk sewer improvements •Road reconstruction •Connections to existing sanitary sewers •New private drain connections •Removal of existing sanitary sewer •Potential boulevard reconstruction •4320m³ of in-line sanitary storage
					375 mm dia.	205 m	
					750 mm dia.	117 m	
					900 mm dia.	1664 m	
					1500 mm dia.	160 m	
					525 mm dia.	513 m	
					450 mm dia.	515 m	
					600 mm dia.	169 m	
					675 mm dia.	64 m	
					3600 mm X 1800 mm	675 m	
				Carling Crescent	300 mm dia.	30 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

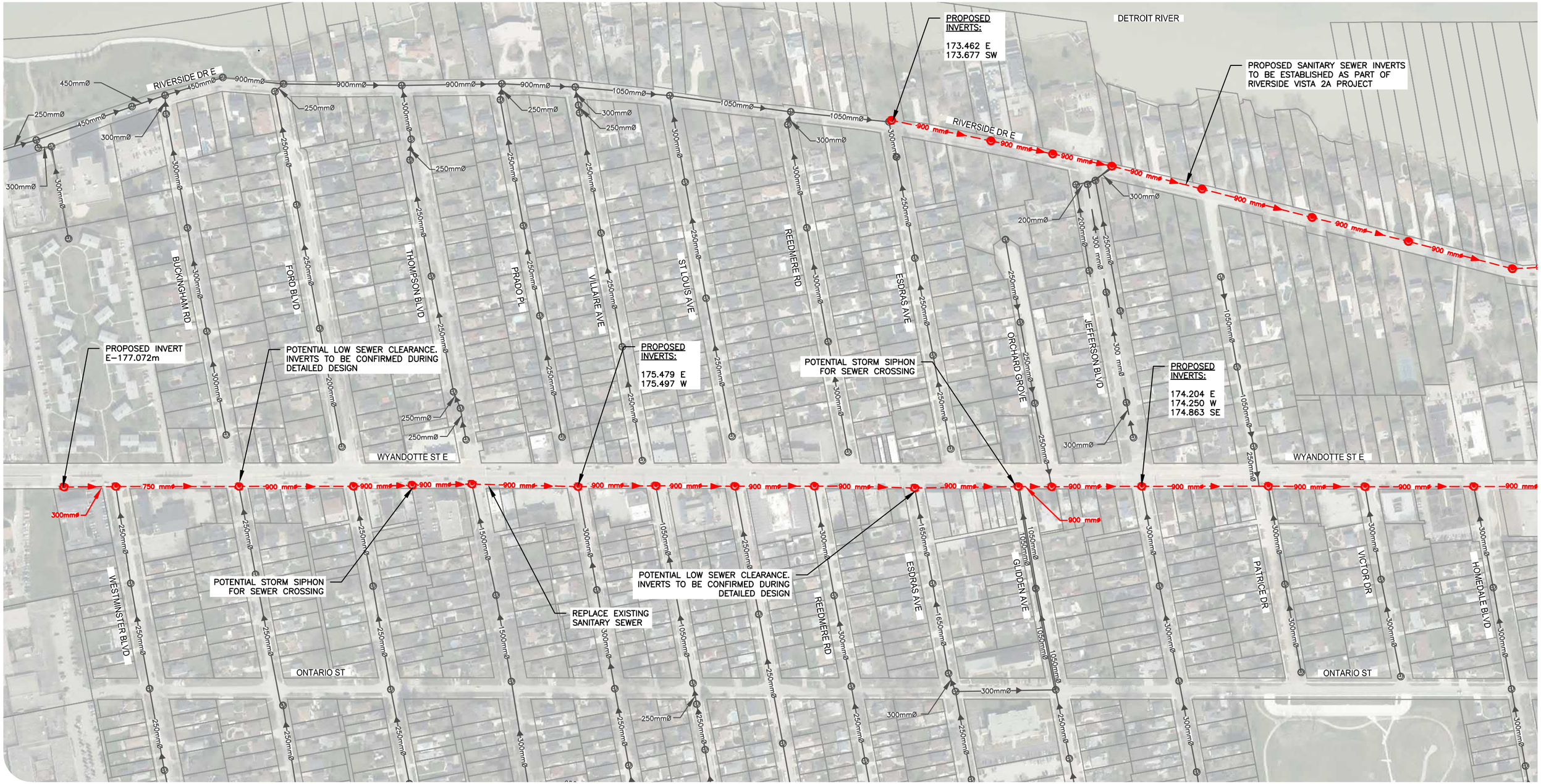
CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
SANITARY SEWER IMPROVEMENTS							
East Windsor	Little River Pollution Control Plant Sewershed Area	LRPCP Sewershed Area 3 - Jerome	SAN-E-2	Jerome Street	4200 mm X 2400 mm	759 m	•1567m of sanitary trunk sewer improvements •Road reconstruction •Connections to existing sanitary sewers •New private drain connections •Removal of existing sanitary sewer •13,410m³ of in-line sanitary storage
					300 mm dia.	10 m	
				Westchester Drive	3900 mm X 2400 mm	240 m	
				Rholaine Drive	3600 mm X 2400 mm	151 m	
				Greendale Drive	3900 mm X 2400 mm	236 m	
				Thompson Park	1800 mm dia.	172 m	
East Windsor	Little River Polluttion Control Plant Sewershed Area	LRPCP Sewershed Area 4 - Edgar	SAN-E-2	Edgar Street	1800 mm dia.	1771 m	•15583 m of sanitary trunk sewer improvements •Road reconstruction •Connections to existing sanitary sewers •New private drain connections •Removal of existing sanitary sewer and combined where applicable •Private property easments/acquisition required •14,040 m³ of in-line sanitary storage •Multiple intersections requiring reconstruction
					4200 mm X 2400 mm	519 m	
				Tranby Avenue	600 mm dia.	664 m	
				Little River Road	4200 mm X 2400 mm	422 m	
					300 mm dia.	10 m	
				Little River Acres Drive	375 mm dia.	347 m	
					450 mm dia.	466 m	
					525 mm dia.	61 m	
				Catherine Street	525 mm dia.	543 m	
				Lauzon Parkway	525 mm dia.	133 m	
					600 mm dia.	372 m	
					675 mm dia.	219 m	
					1200 mm dia.	570 m	
				Lauzon Road	900 mm dia.	61 m	
					1050 mm dia.	1186 m	
				South National Street	300 mm dia.	11 m	
					375 mm dia.	81 m	
					450 mm dia.	11 m	
					900 mm dia.	218 m	
					1200 mm dia.	144 m	
					1800 mm dia.	125 m	
					3000 mm X 2400 mm	191 m	
					3900 mm X 1800 mm	137 m	
				Jefferson Boulevard	250 mm dia.	6 m	
					300 mm dia.	10 m	
					825 mm dia.	350 m	
					2100 mm	17 m	
					4200 mm X 2400 mm	417 m	
				Balfour Boulevard	675 mm dia.	241 m	
					750 mm dia.	432 m	
				Glendale Avenue	450 mm dia.	570 m	
					750 mm dia.	92 m	
				Ferndale Avenue	450 mm dia.	413 m	
					525 mm dia.	141 m	
				Ford Boulevard	750 mm dia.	379 m	
				Tecumseh Road East	675 mm dia.	50 m	
					900 mm dia.	86 m	
				Rivard Avenue	675 mm dia.	1354 m	
				Grandview Street	600 mm dia.	532 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
SANITARY SEWER IMPROVEMENTS							
East Windsor	Little River Polluttion Control Plant Sewershed Area	LRPCP Sewershed Area 4 - Edgar	SAN-E-2	Courtland Crescent	1200 mm dia.	77 m	•15583 m of sanitary trunk sewer improvements •Road reconstruction •Connections to existing sanitary sewers •New private drain connections •Removal of existing sanitary sewer and combined where applicable •Private property easments/acquisition required •14,040 m³ of in-line sanitary storage •Multiple intersections requiring reconstruction
				Coronation School Yard/Pikes Park/ WECHC	1200 mm dia.	1294 m	
				Rose Street	1350 mm dia.	152 m	
					1500 mm dia.	81 m	
					1800 mm dia.	192 m	
					2100 mm dia.	110 m	
				Jos St. Louis Avenue	375 mm dia.	329 m	
					600 mm dia.	367 m	
East Windsor	Little River Pollution Control Plant Sewershed Area	LRPCP Sewershed Area 5 - Aspenshore/Beverly-Glen	SAN-E-2	Aspen Lake - Kiwanis Park	300 mm dia.	10 m	•16,784m of sanitary trunk sewer improvements •Road reconstruction •Connections to existing sanitary sewers •New private drain connections •Removal of existing sanitary sewer •Private property easements/acquisitions required •14,515m³ of in-line sanitary storage •Railway crossings •Multiple intersections requiring reconstruction
					1200 mm dia.	81 m	
					3000 mm dia.	2022 m	
					4200 mm X 2700 mm	915 m	
					4200 mm X 2400 mm	257 m	
				Cypress Avenue	3000 mm dia.	348 m	
				Forest Glade Dr (Tecumseh to Cypress - Private Property)	2700 mm dia.	186 m	
				Forest Glade Drive	2700 mm dia.	1758 m	
				Jefferson to Cantelon (Private Property)	450 mm dia.	175m	
				Cantelon Drive	525 mm dia.	288 m	
					675 mm dia.	99 m	
					750 mm dia.	183 m	
					825 mm dia.	373 m	
				Hawthorne Drive	1350 mm dia.	279 m	
					1500 mm dia.	652 m	
				Esplanade Drive	600 mm dia.	540 m	
					675 mm dia.	378 m	
					750 mm dia.	143 m	
					1800 mm dia.	637 m	
					1950 mm dia.	91 m	
				Elinor Street	4200 mm X 1800 mm	187 m	
					600 mm dia.	284 m	
				Florence Avenue	300 mm dia.	386 m	
				John M Street	300 mm dia.	138 m	
				Menard Street	300 mm dia.	47 m	
					600 mm dia.	100 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
SANITARY SEWER IMPROVEMENTS							
East Windsor	Little River Pollution Control Plant Sewershed Area	LRPCP Sewershed Area 5 - Aspenshore/Beverly-Glen	SAN-E-2	Clover Street	375 mm dia.	203 m	•16,784m of sanitary trunk sewer improvements •Road reconstruction •Connections to existing sanitary sewers •New private drain connections •Removal of existing sanitary sewer •Private property easements/acquisitions required •14,515m³ of in-line sanitary storage •Railway crossings •Multiple intersections requiring reconstruction
				Beverly Glen Street	4200 mm X 2700 mm	977 m	
				Whistler Cres to Beverly Glen	4200 mm X 2700 mm	212 m	
					4200 mm dia.	91 m	
				Whistler Crescent	2500 mm dia.	153 m	
				Cora Greenwood Park	2500 mm dia.	98 m	
				Rendezvous Crt to Cora Geenwood Park (Private Property)	1500 mm dia.	149 m	
					3x 900mm dia.	288 m	
				Core Greenwood Drive	3x 900mm dia.	90 m	
				Greenpark Boulevard	600 mm dia.	425 m	
					1050 mm dia.	298 m	
				Little River Blvd	1050 mm dia.	100 m	
				Jarvis Avenue	250 mm dia.	43 m	
					525 mm dia.	466 m	
					600 mm dia.	205 m	
				Banwell Road	900 mm dia.	492 m	
					825 mm dia.	247 m	
					750 mm dia.	244 m	
				Rosebriar Road	1050 mm dia.	46 m	
					975 mm dia.	234 m	
				Wildwood Drive	675 mm dia.	194 m	
					750 mm dia.	264 m	
					450 mm dia.	384 m	
				Deerbrook Drive	450 mm dia.	197 m	
					525 mm dia.	127 m	



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
WYANDOTTE STREET EAST - 1 (SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER
EXISTING COMBINED MANHOLE
EXISTING COMBINED SEWER

NOTES:
- EXISTING SANITARY AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-1
PROJECT: 17-6638
STATUS: FINAL
DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
WYANDOTTE STREET EAST - 2 (SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

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CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-2/SAN-E-2-3
PROJECT: 17-6638
STATUS: FINAL
DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
WYANDOTTE STREET EAST - 3 (SANITARY)

THE CITY OF WINDSOR

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:

- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING

Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N W E S

SAN-E-2-3/SAN-E-2-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

PROPOSED INVERTS:
171.337 W
171.312 E

PROPOSED INVERTS:
171.311 W
171.198 SE
171.296 E

PROPOSED INVERTS:
171.378 W
171.936 SE
171.372 E

PROPOSED INVERTS:
172.506 NW
170.058 W
172.349 SE
170.058 E

MENARD ST
WYANDOTTE ST E
JEROME ST
ST ROSE AVE
KINGSTON CRES
ALAN CRES
CHRISTOPHER DR
ISACK DR
RHOLAINE DR
SMEETON DR
WESTCHESTER DR
GREENDALE DR
BERTHA AVE
RIVERDALE AVE
FRANK AVE
LAPORTE AVE
WATSON AVE
LAUZON RD
GANATCHIO TRAIL
RIVERSIDE SECONDARY SCHOOL

REPLACE EXISTING SANITARY SEWER

IMPROVEMENT OF SANITARY SEWER GRADE MAY BE REQUIRED. EXISTING INVERTS TO BE CONFIRMED

REPLACE EXISTING SANITARY SEWER

PROPOSED CONNECTION AS PER DETAIL TYPICAL #1

EXISTING PUMP STATION

PROPOSED INVERTS:
168.316 W
168.316 NE

PROPOSED INVERTS:
170.784 W
170.762 E
171.116 S

PROPOSED INVERTS:
170.747 W
171.253 N
171.621 NE
170.729 E

PROPOSED INVERTS:
170.750 W
170.747 SE
171.250 SE

PROPOSED INVERTS:
170.717 NW
170.698 E

PROPOSED INVERTS:
169.259 SW
169.259 NE

PROPOSED INVERTS:
169.277 NE/SW

PROPOSED INVERTS:
170.163 N
172.110 E
172.409 S

PROPOSED INVERTS:
170.512 N
172.247 W

PROPOSED INVERT:
170.143 N

PROPOSED CONNECTION AS PER DETAIL TYPICAL #1

PROPOSED UPGRADE TO PONTIAC PUMP STATION. SEE FIGURE SAN–E–2, PONTIAC PUMP STATION IMPROVEMENTS

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
WYANDOTTE STREET AND JEROME STREET (SANITARY)

PROPOSED SANITARY MANHOLE
EXISTING SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

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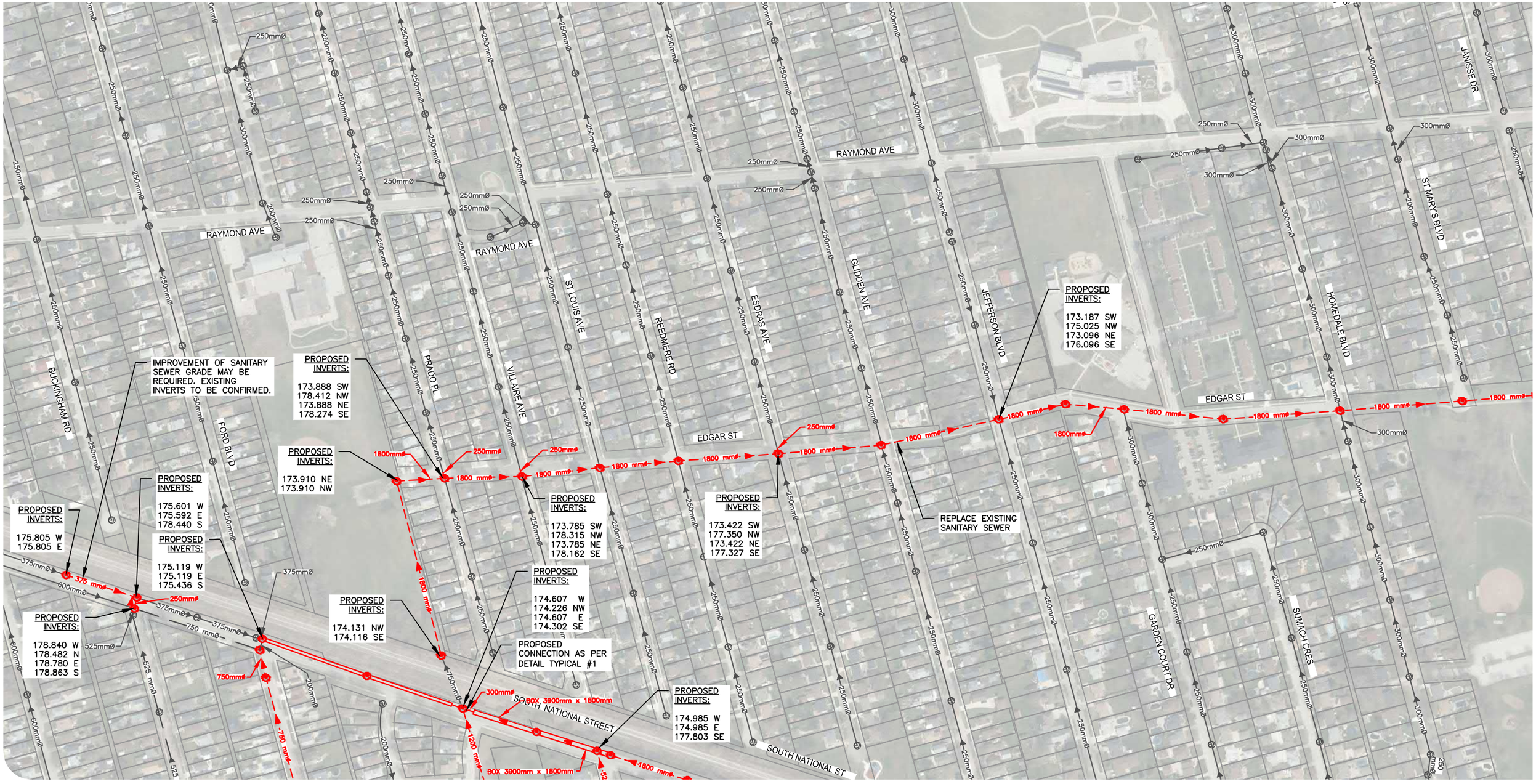
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-4
PROJECT: 17-6638
STATUS: FINAL
DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
EDGAR STREET
(SANITARY)

THE CITY OF WINDSOR

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER
EXISTING COMBINED MANHOLE
EXISTING COMBINED SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING

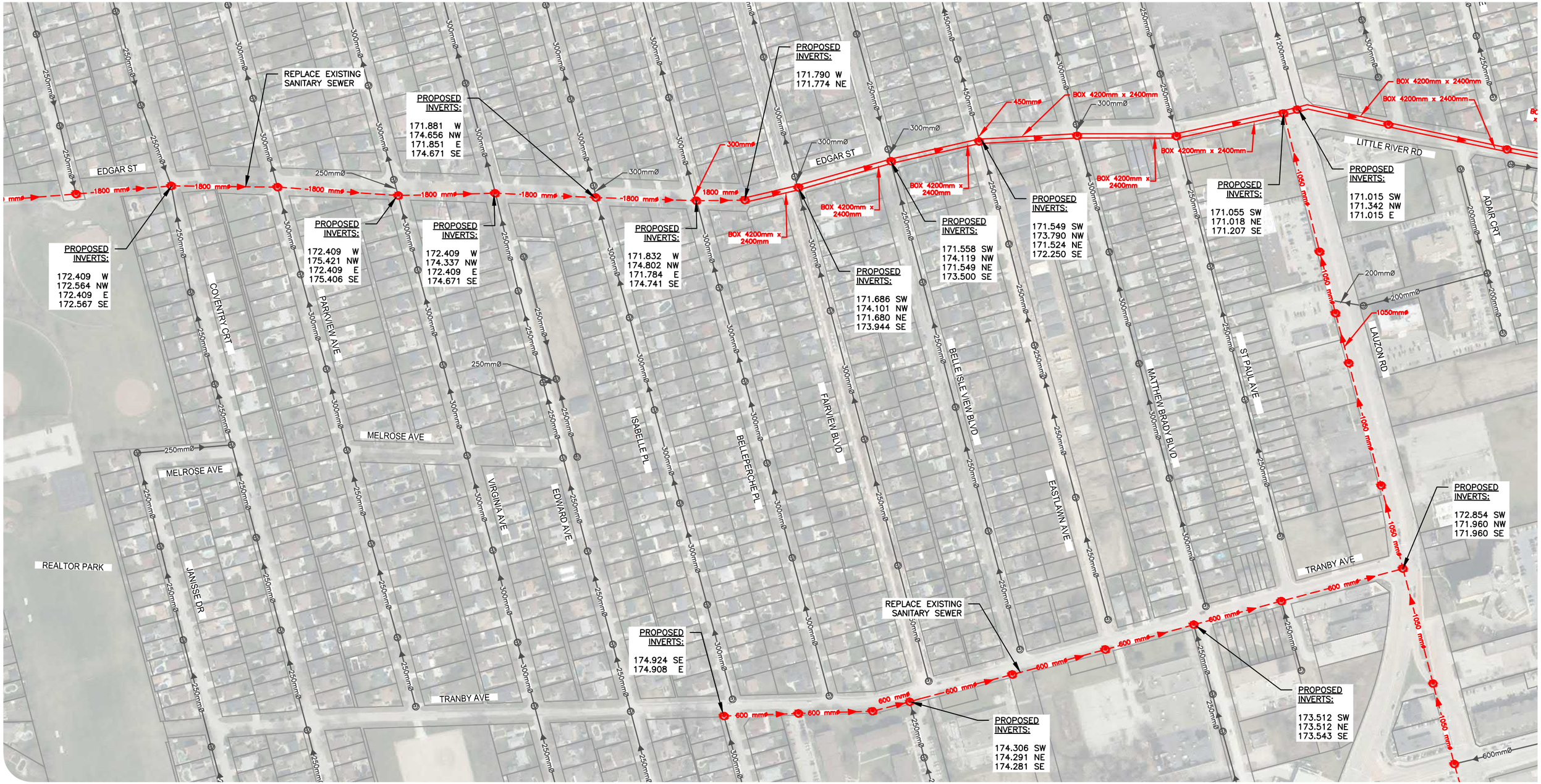
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N W E S

SAN-E-2-5/SAN-E-2-18/SAN-E-2-19
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
EDGAR STREET AND TRANBY AVE (SANITARY)

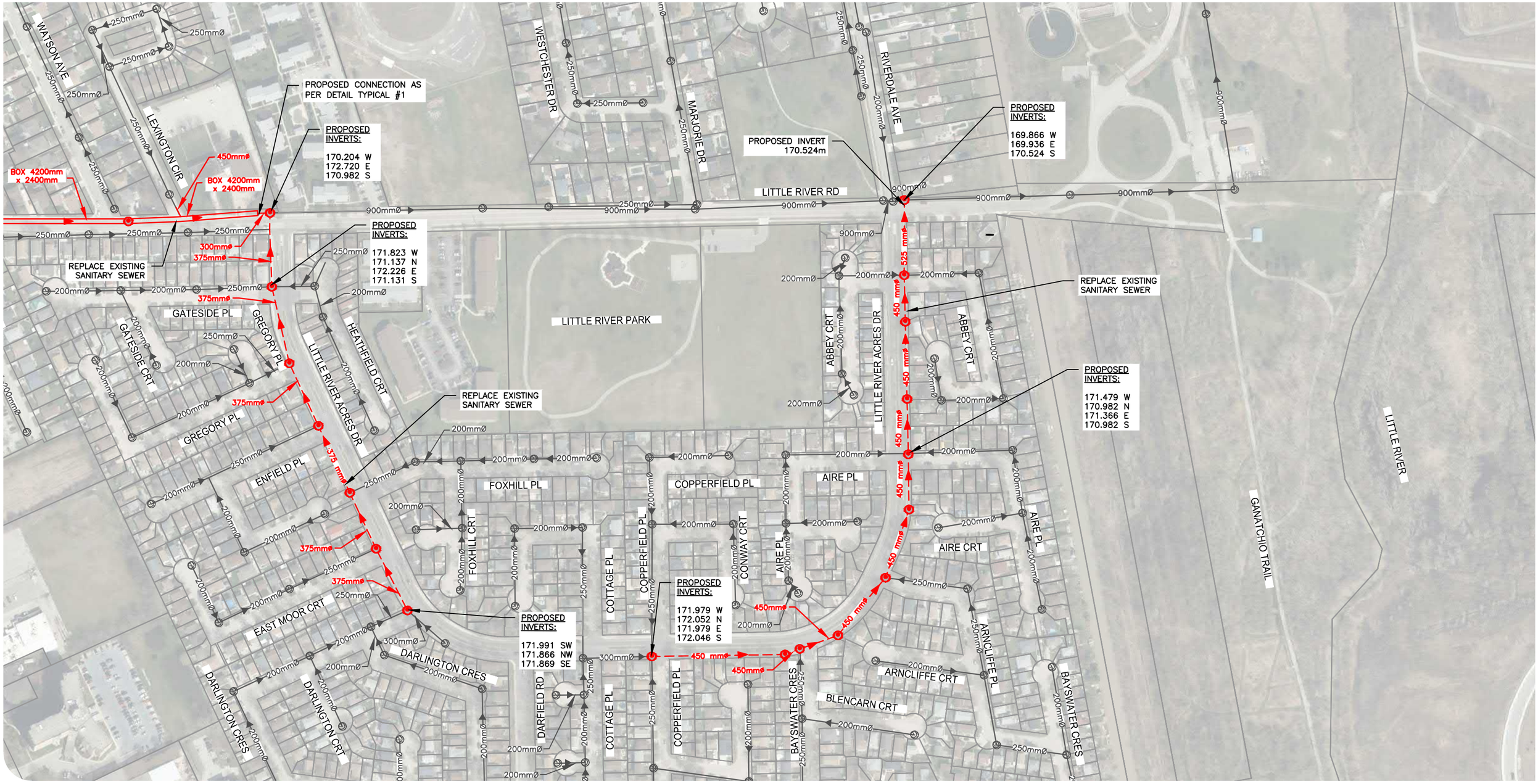
PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-6/SAN-E-2-7
PROJECT: 17-6638
STATUS: FINAL
DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
LITTLE RIVER ACRES DRIVE (SANITARY)

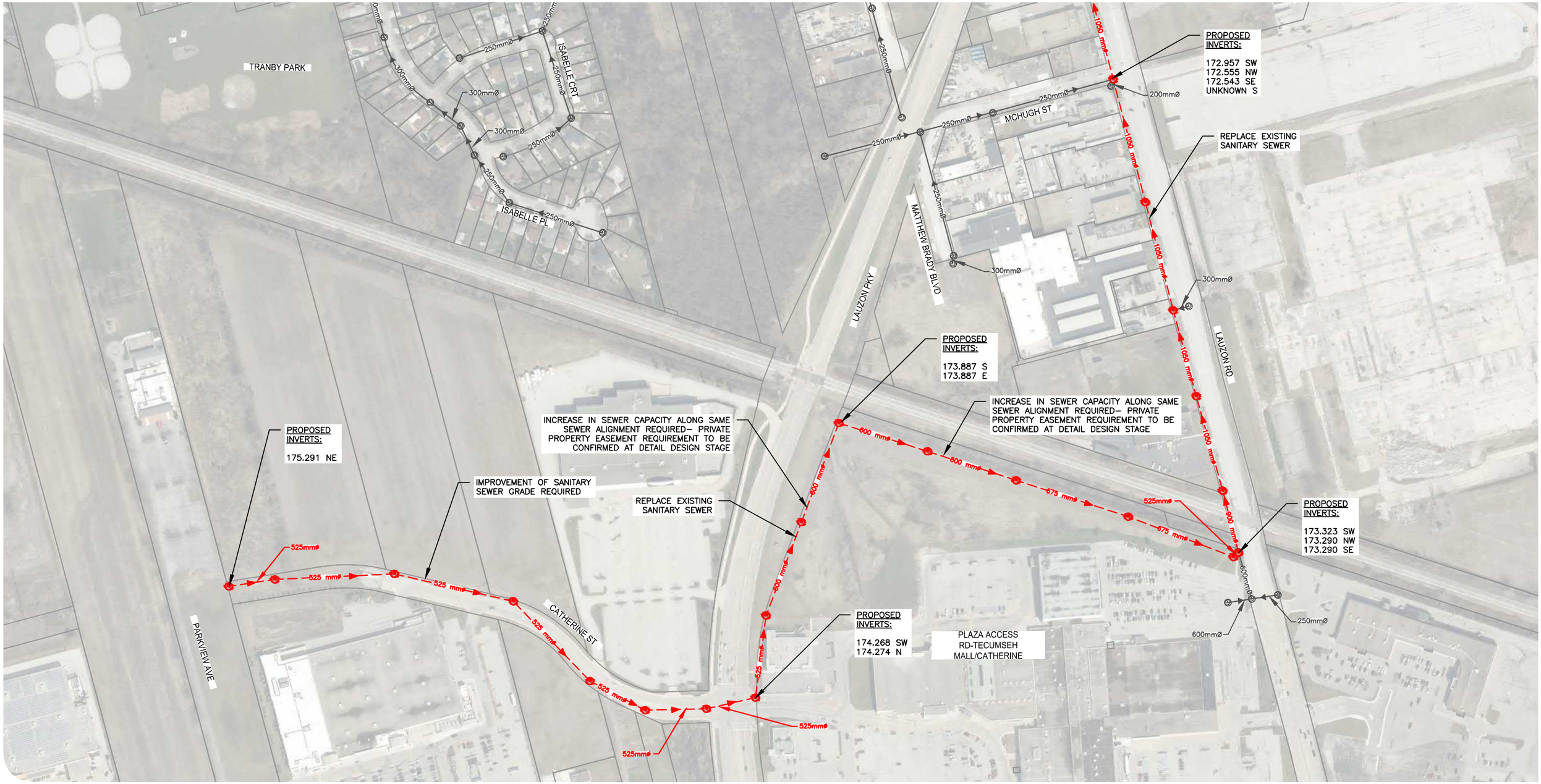
PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-7/SAN-E-2-6
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
CATHERINE STREET
(SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

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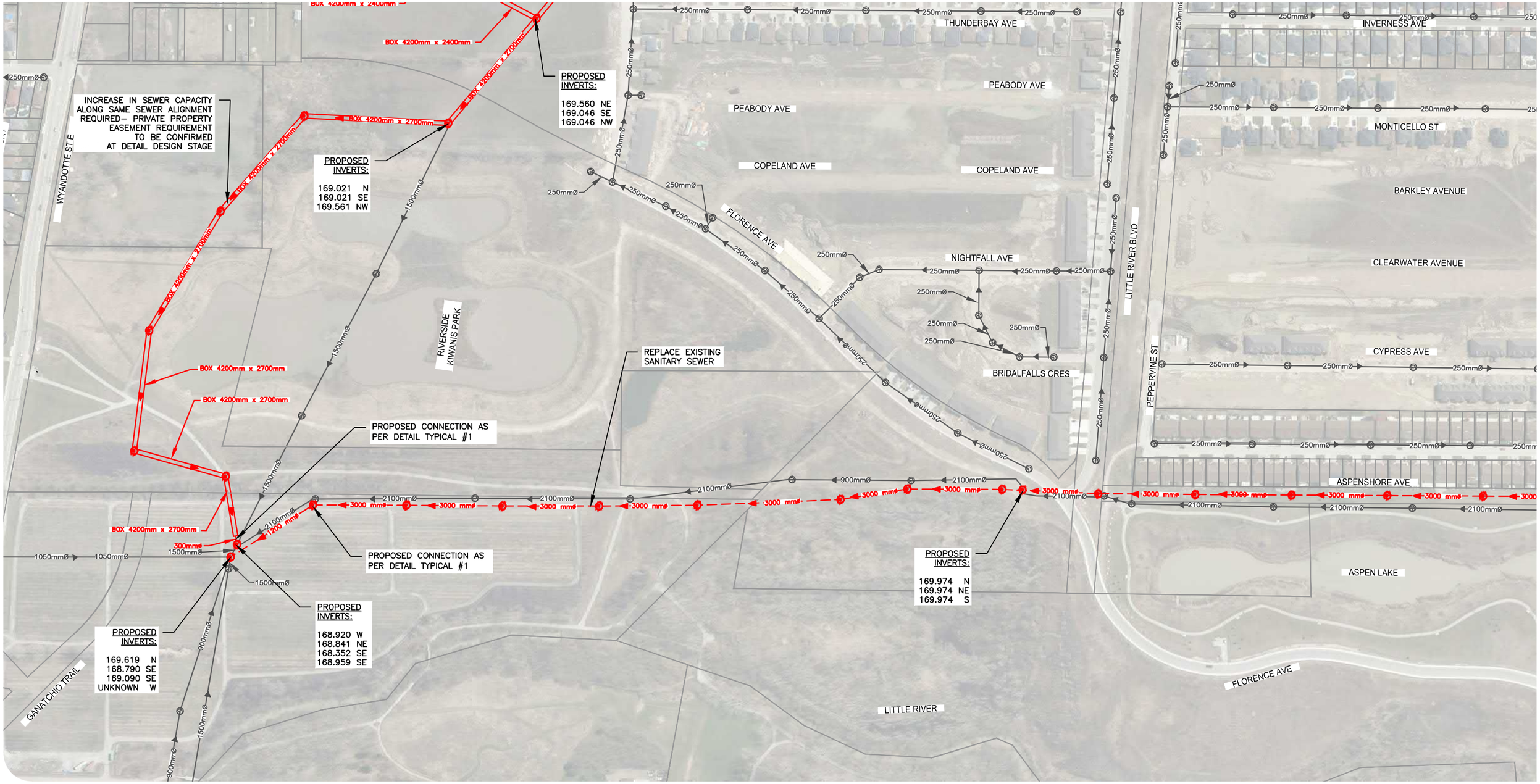
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N W E S

SAN-E-2-8
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
ASPENSHORE AVENUE
(SANITARY)

THE CITY OF WINDSOR

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:

- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING

Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N E S W

SAN-E-2-9/SAN-E-2-11/SAN-E-2-15
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
ELINOR STREET
(SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

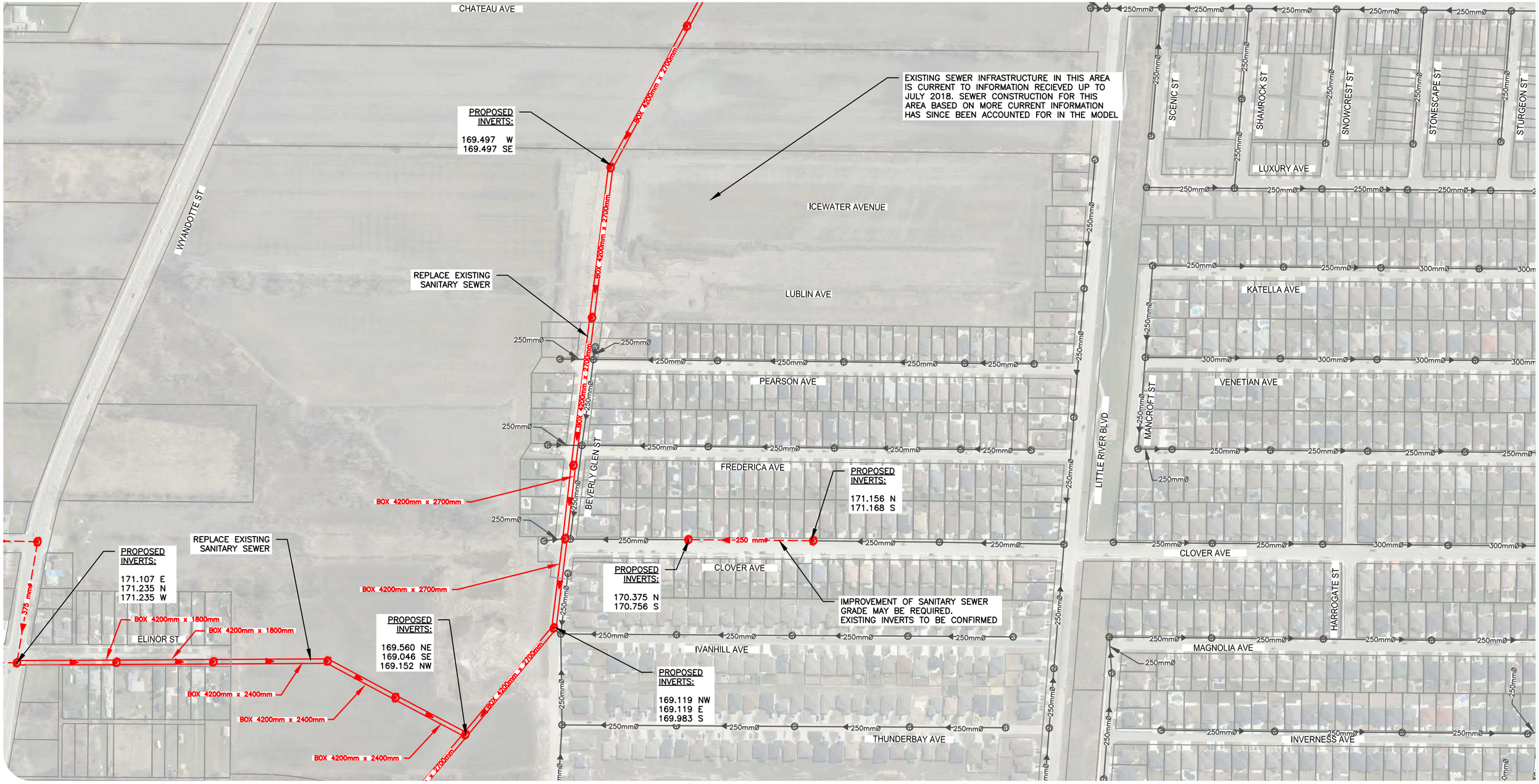
DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N W E S

SAN-E-2-10/SAN-E-2-11
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
BEVERLY GLEN STREET
(SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

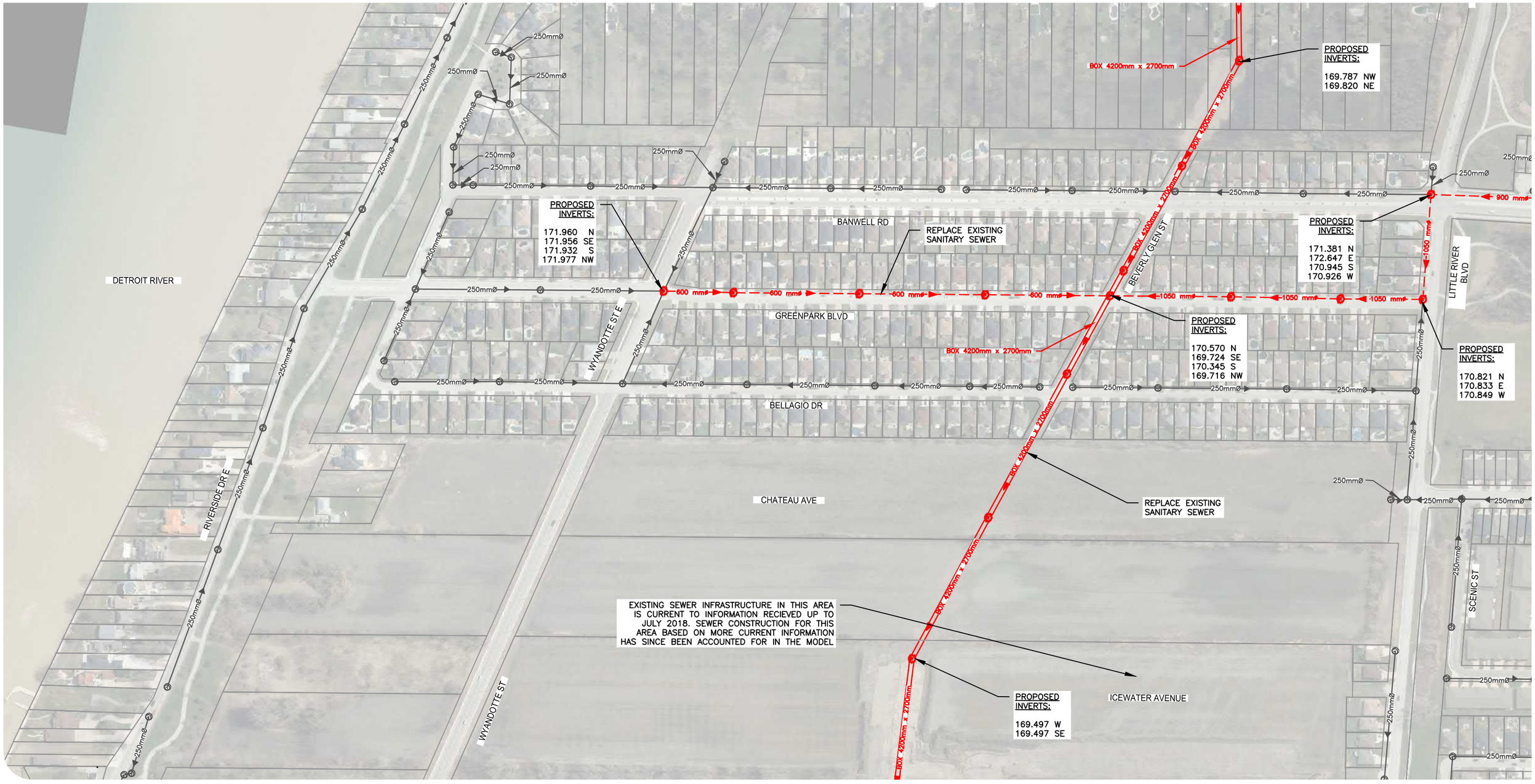
NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-11/SAN-E-2-12/SAN-E-2-10/SAN-E-2-9
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
BEVERLY GLEN STREET-2
(SANITARY)

THE CITY OF WINDSOR

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-12/SAN-E-2-13/SAN-E-2-14
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
BANWELL ROAD
(SANITARY)

THE CITY OF WINDSOR

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING

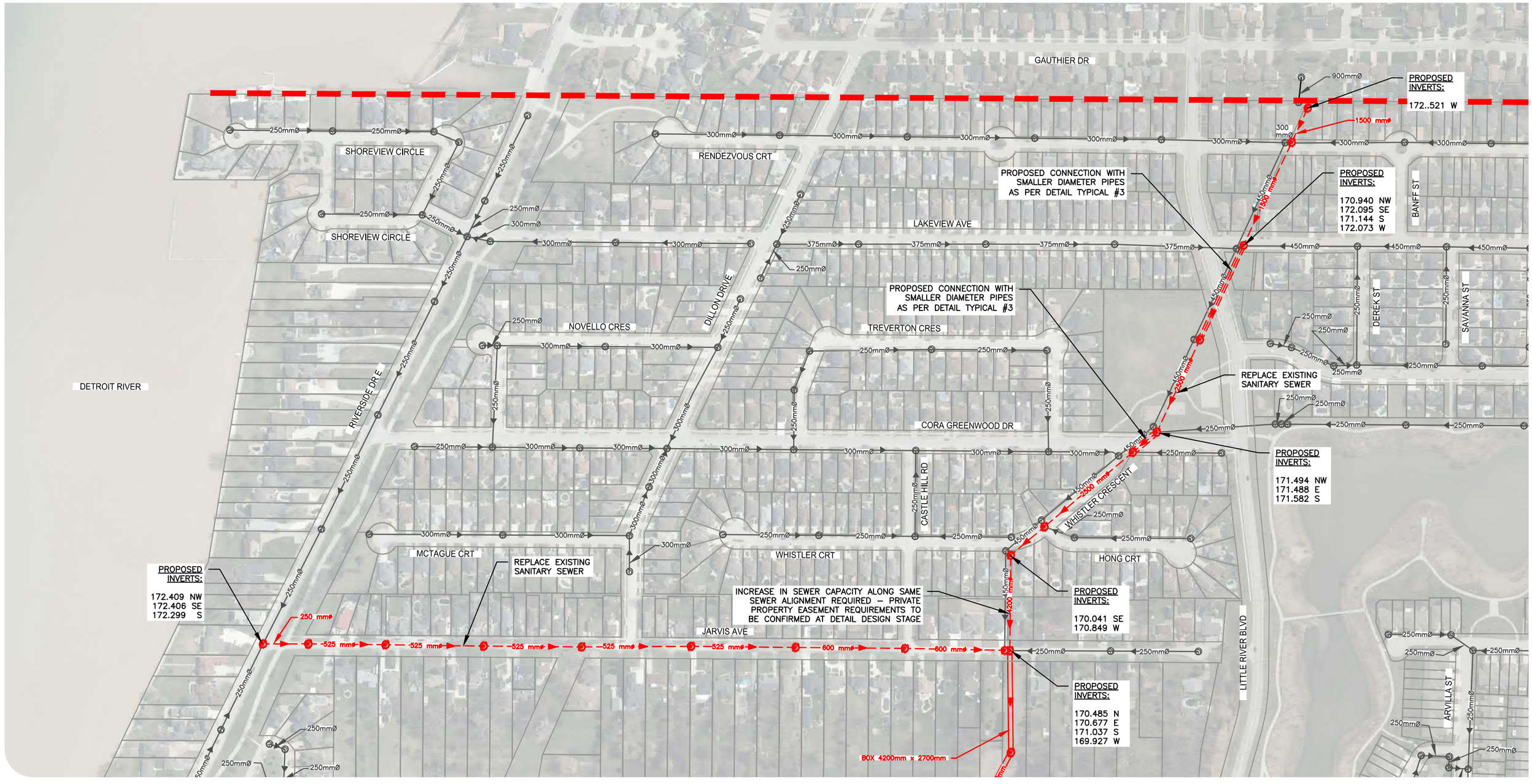
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N E S W

SAN-E-2-13/SAN-E-2-12
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
JARVIS AVENUE
(SANITARY)

THE CITY OF WINDSOR

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER
WINDSOR/TECUMSEH BOUNDARY

NOTES:

- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING

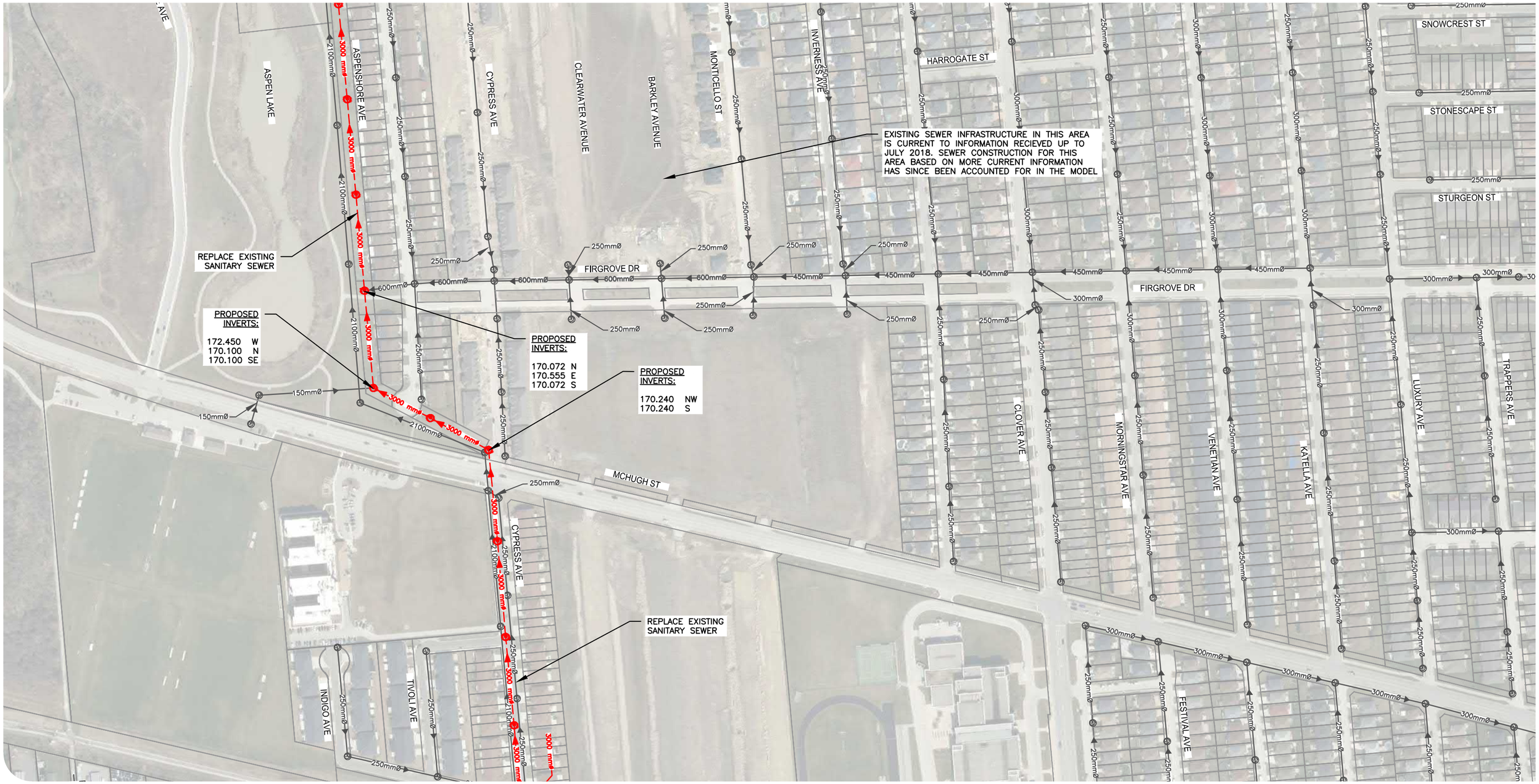
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N E S W

SAN-E-2-14/SAN-E-2-12
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
FIRGROVE DRIVE
(SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

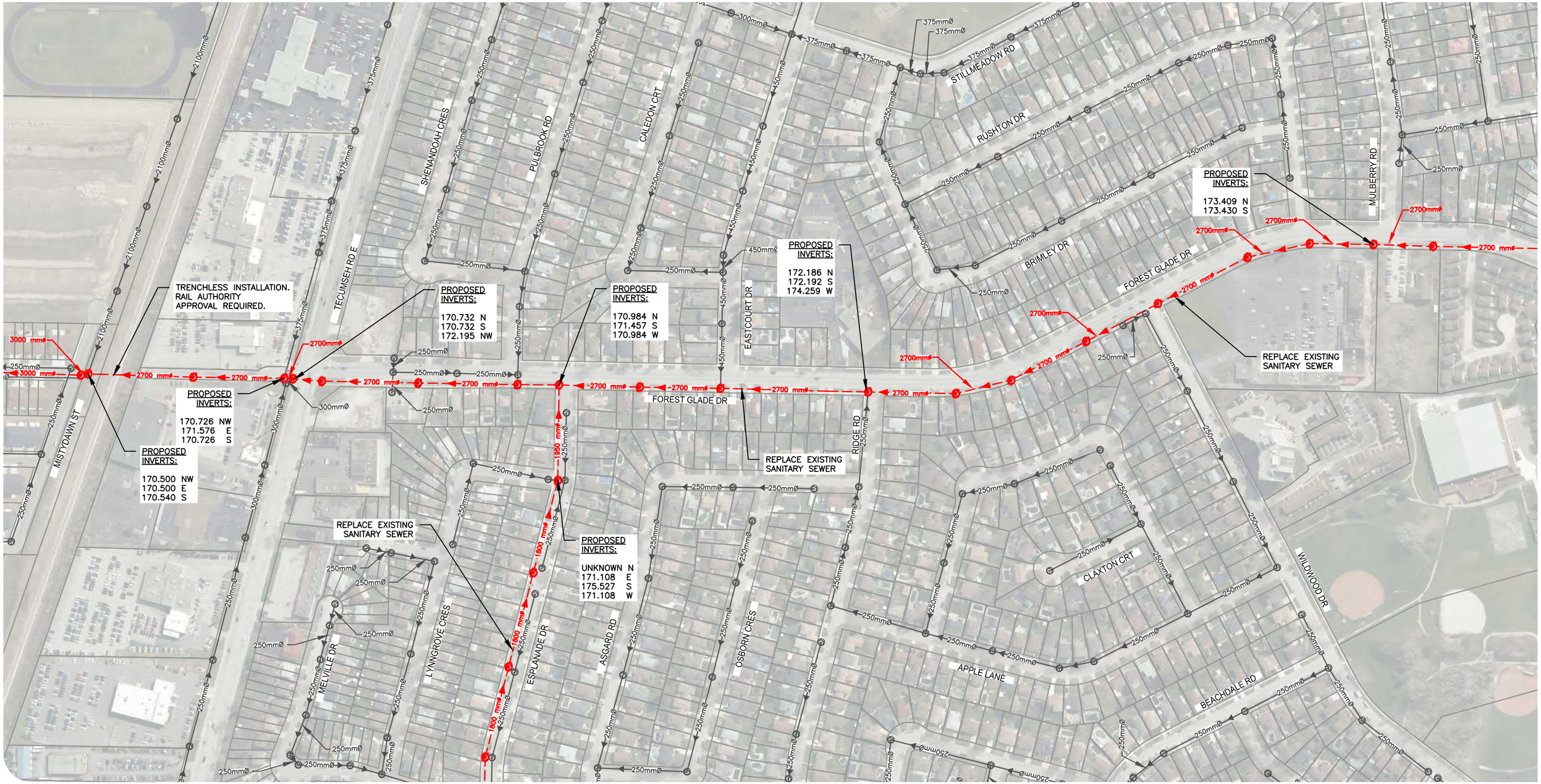
DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N W E S

SAN-E-2-15/SAN-E-2-9/SAN-E-2-16
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
FOREST GLADE ROAD-2
(SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-16/SAN-E-2-17/SAN-E-2-23
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
FOREST GLADE ROAD-1
(SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

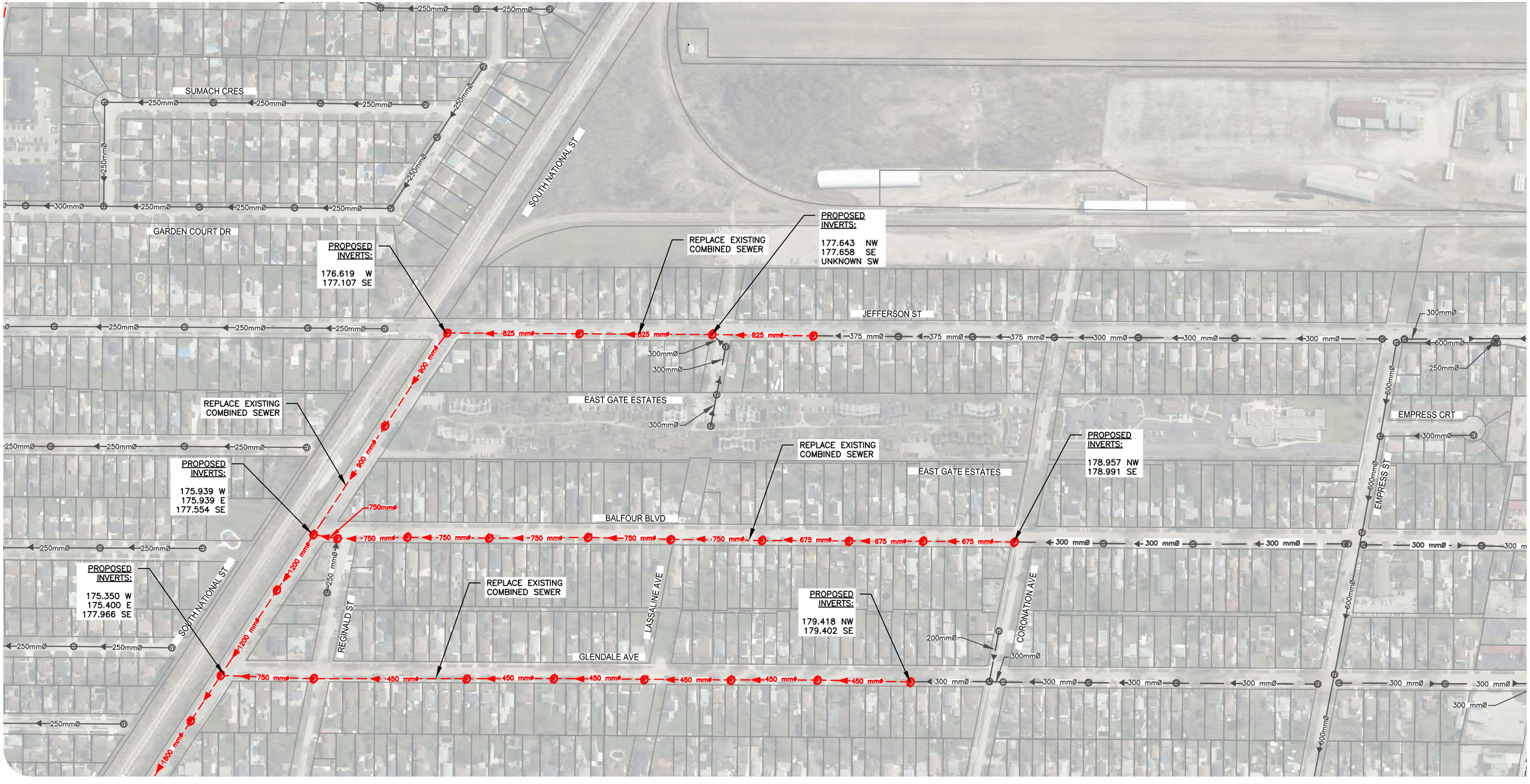
DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N W E S

SAN-E-2-17/SAN-E-2-16
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
BALFOUR BLVD & GLENDALE AVE (SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER
EXISTING COMBINED MANHOLE
EXISTING COMBINED SEWER

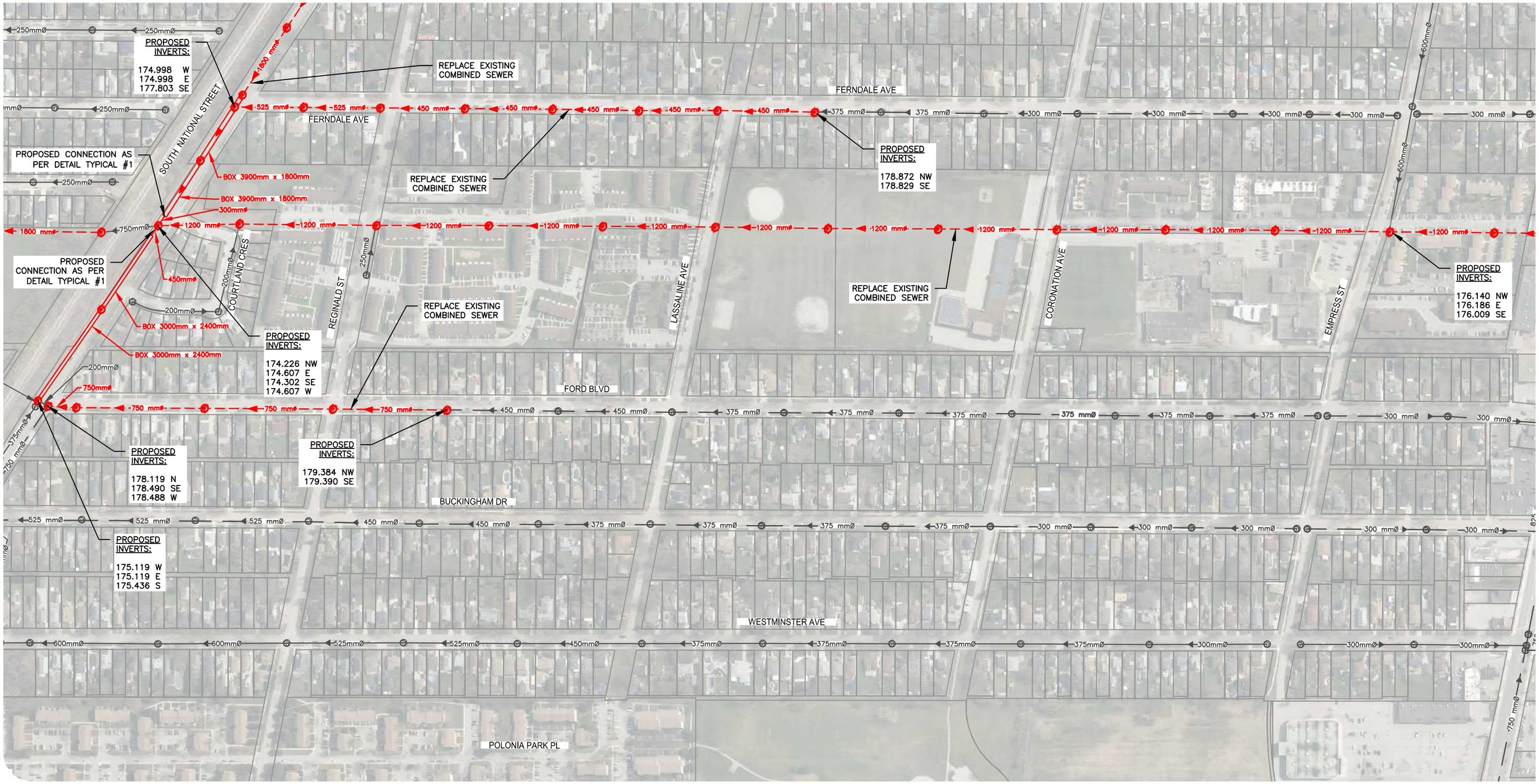
NOTES:

- EXISTING COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED COMBINED SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-18/SAN-E-2-19
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
FERNDALE AVE. AND FORD BLVD. (SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER
EXISTING COMBINED MANHOLE
EXISTING COMBINED SEWER

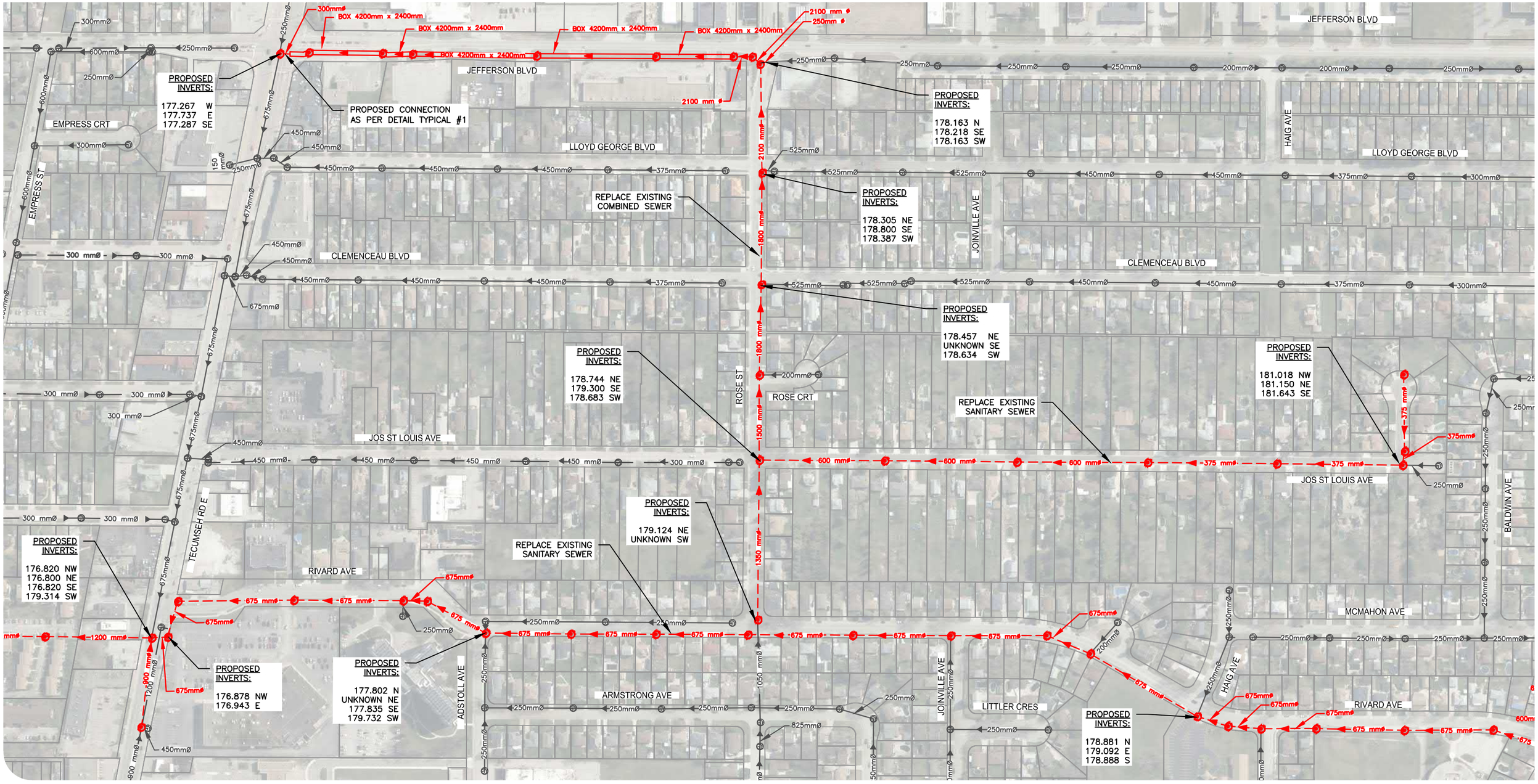
NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-19/SAN-E-2-18/SAN-E-2-20/SAN-E-2-5
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
RIVARD AVENUE
(SANITARY)

THE CITY OF WINDSOR

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
PROPOSED SANITARY INLINE STORAGE
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER
EXISTING COMBINED MANHOLE
EXISTING COMBINED SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.
- AT STORM SEWER CROSSINGS / PROPOSED SANITARY INLINE STORAGE, REFER TO DETAIL TYPICAL #2

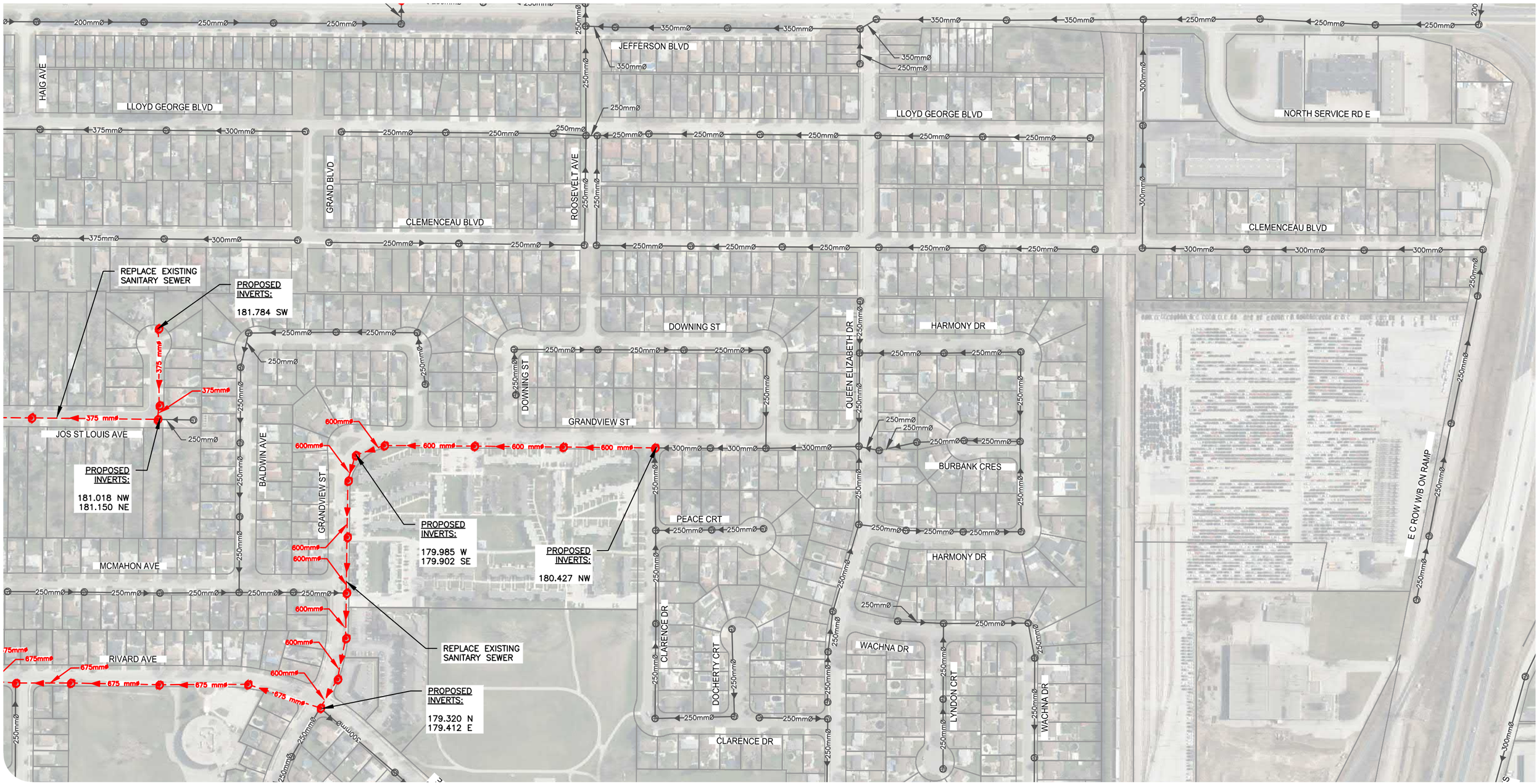
DILLON CONSULTING

Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-20/SAN-E-2-19/SAN-E-2-21
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
GRANDVIEW STREET
(SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-21/SAN-E-2-20
PROJECT: 17-6638
STATUS: FINAL
DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
CANTELON DRIVE
(SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

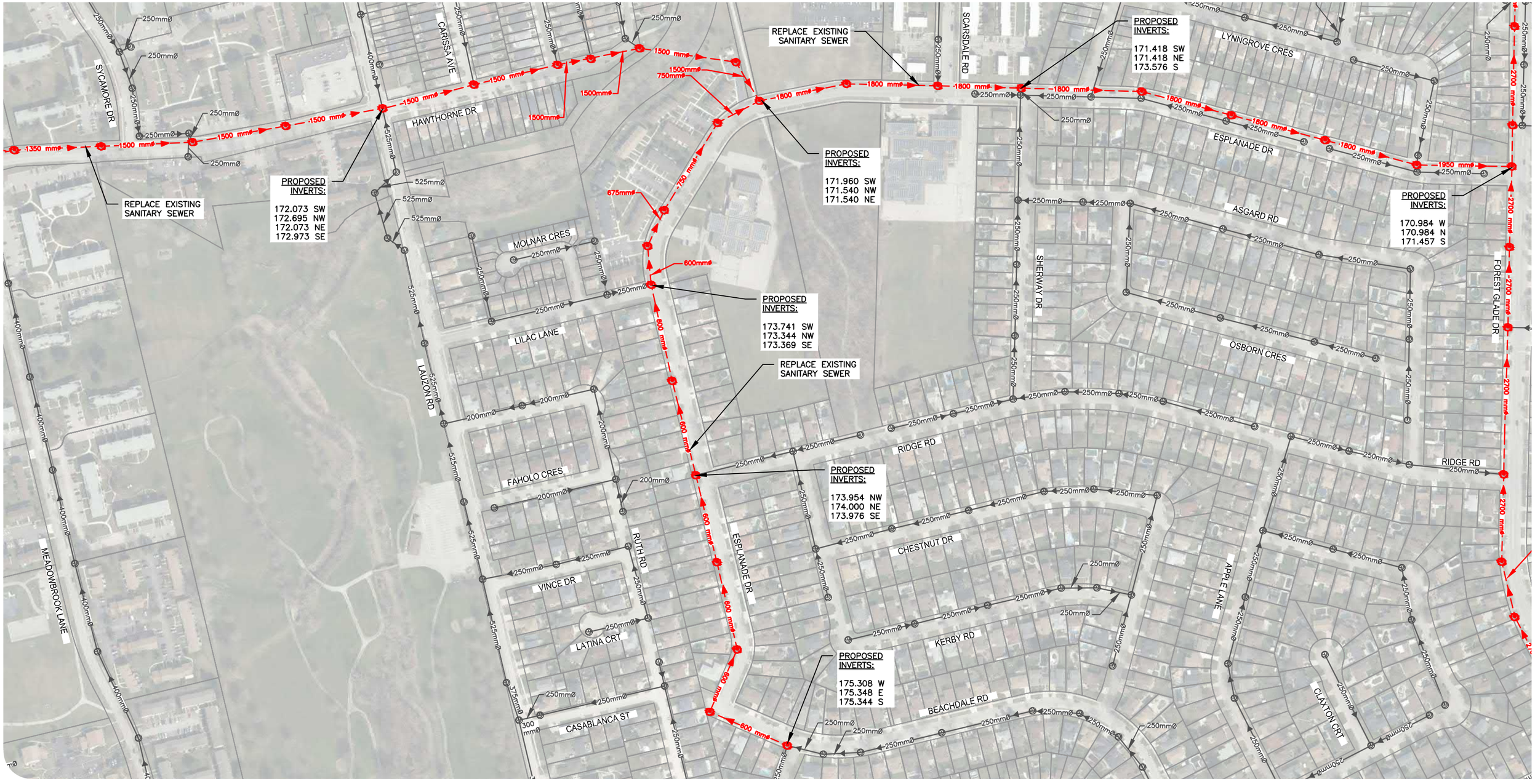
NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-22/SAN-E-2-23
PROJECT: 17-6638
STATUS: FINAL
DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
ESPLANADE DRIVE
(SANITARY)

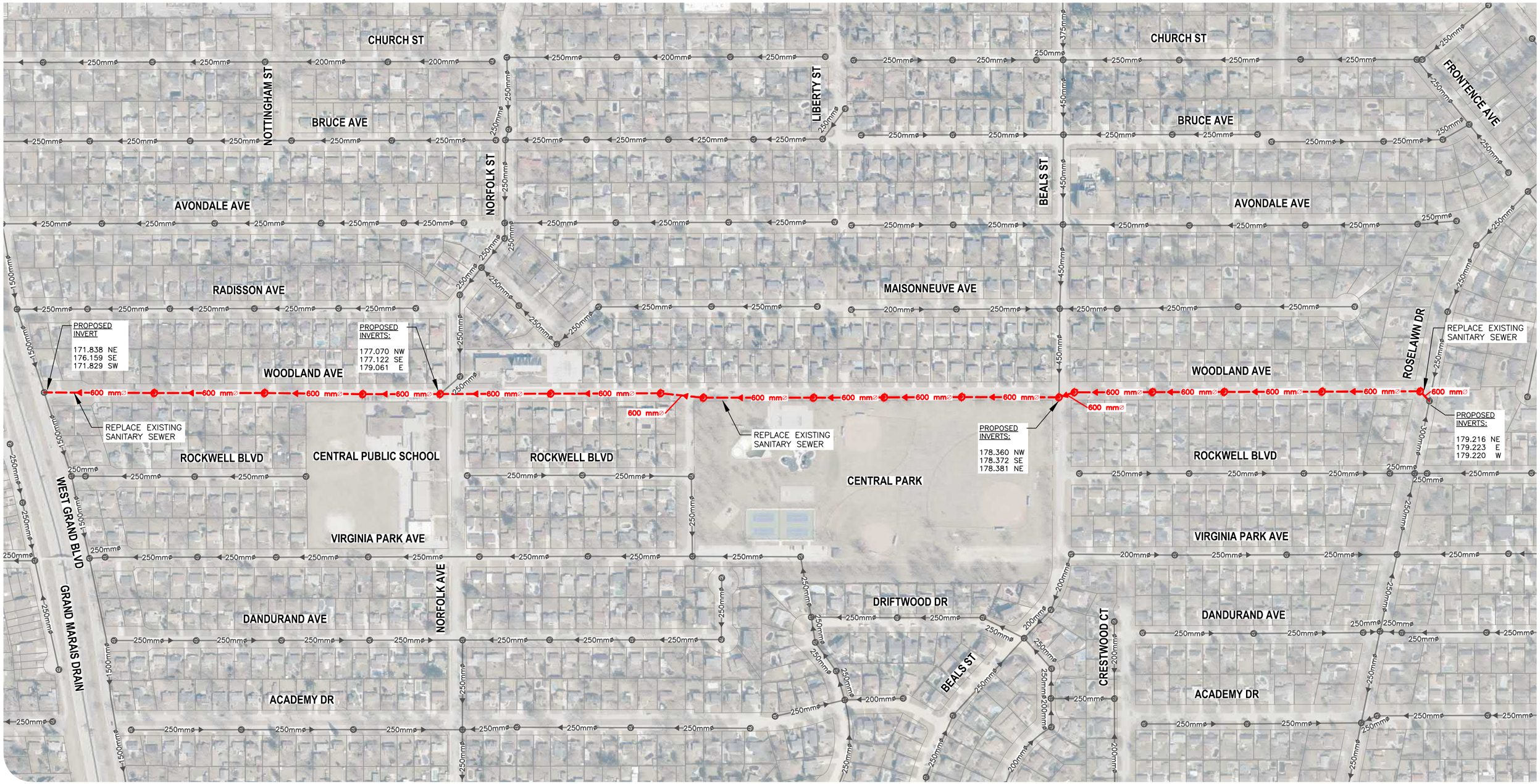
PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED SANITARY SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: PS
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-E-2-23/SAN-E-2-16/SAN-E-2-22
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER MASTER PLAN AND COASTAL FLOOD PROTECTION

PREFERRED SOLUTION:
WOODLAND AVENUE - (SANITARY)

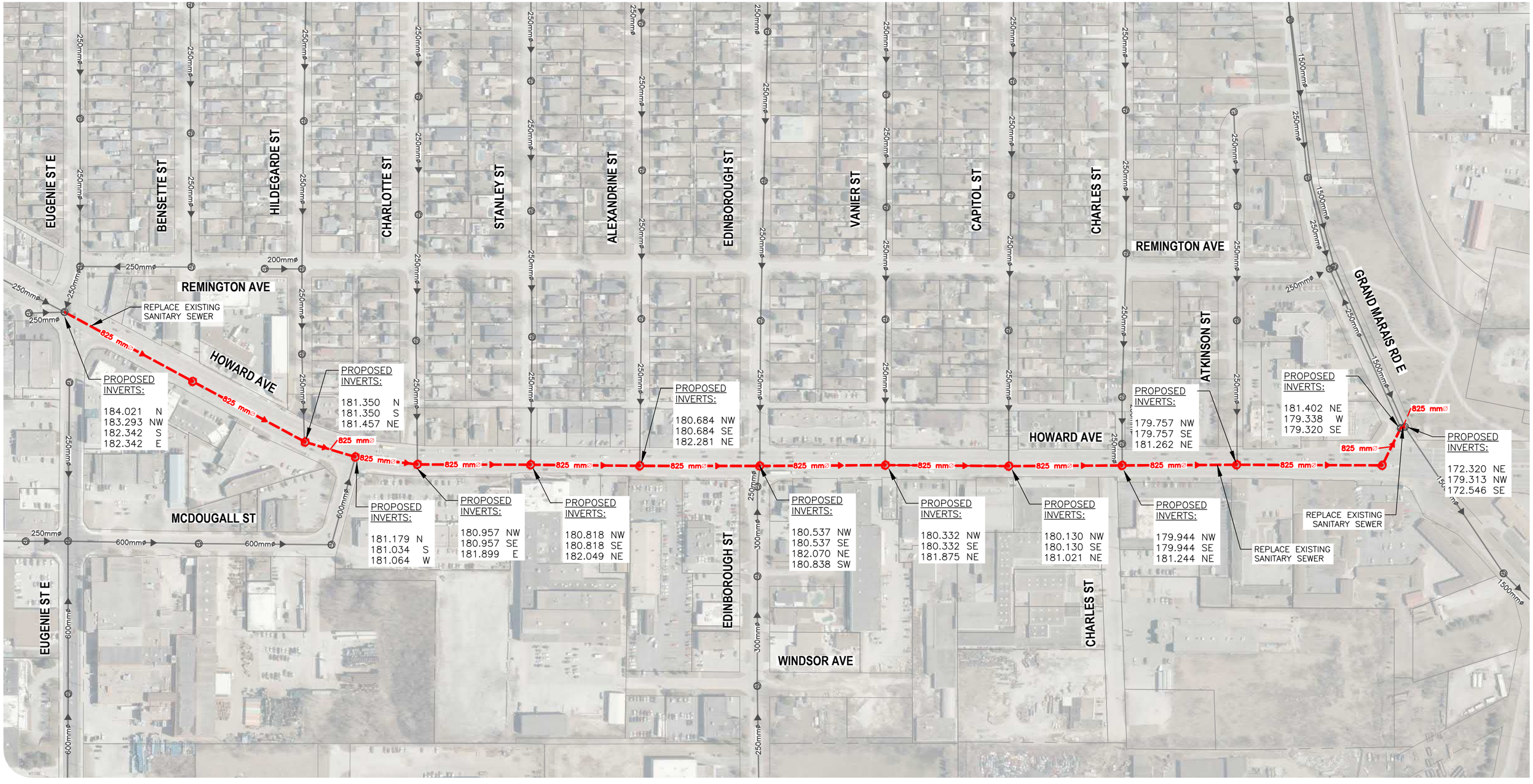
PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-S-1-1
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER MASTER PLAN AND COASTAL FLOOD PROTECTION

PREFERRED SOLUTION:
HOWARD AVE - (SANITARY)

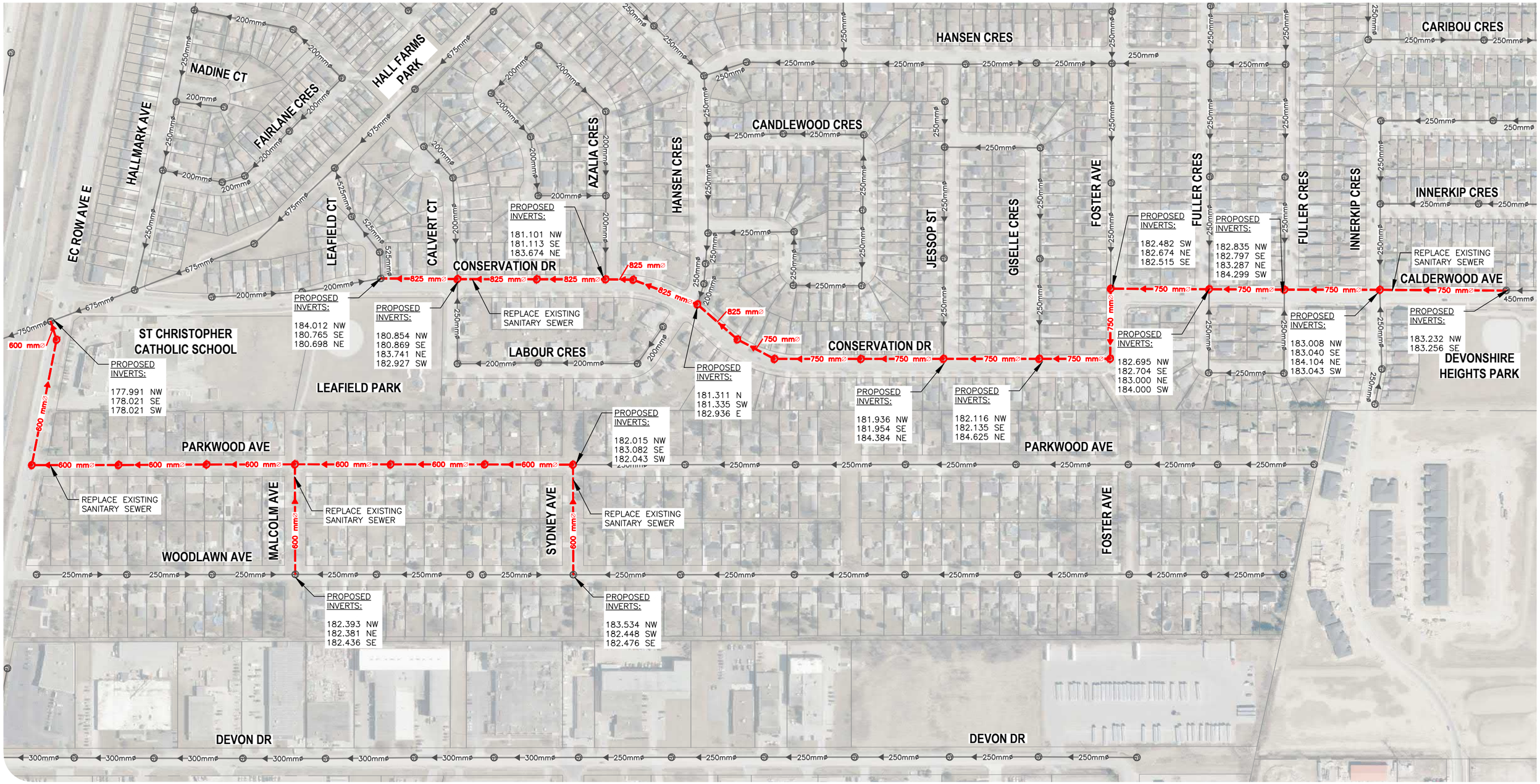
PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-S-1-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER MASTER PLAN AND COASTAL FLOOD PROTECTION

PREFERRED SOLUTION:
PARKWOOD AVENUE/ CONSERVATION DRIVE - (SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-S-1-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER MASTER PLAN AND COASTAL FLOOD PROTECTION

PREFERRED SOLUTION:
CENTRAL - (SANITARY)

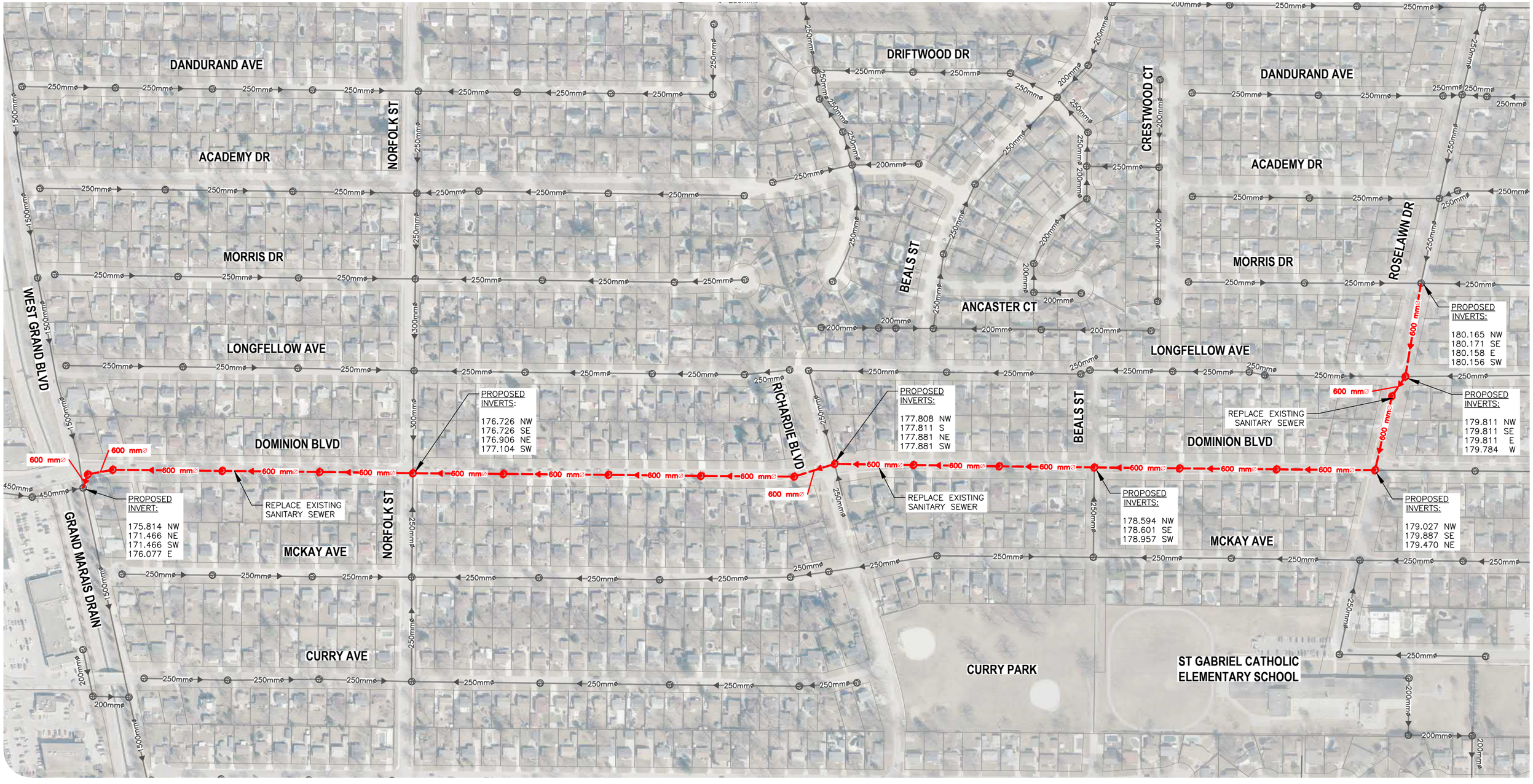
PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-S-1-4
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER MASTER PLAN AND COASTAL FLOOD PROTECTION

PREFERRED SOLUTION:
DOMINION BOULEVARD - (SANITARY)

PROPOSED SANITARY MANHOLE
PROPOSED SANITARY SEWER
EXISTING SANITARY MANHOLE
EXISTING SANITARY SEWER

NOTES:
- EXISTING SANITARY SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

SAN-S-1-5
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

Appendix F-2

Storm System Functional Design Solutions

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City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
Central Windsor	Detroit River	Prince Street Sewer Outlet	STM-C1	Chappell Avenue	2700 mm dia.	188 m	•188m of storm sewer improvements •New outlet to McKee Creek including a dewatering pump station. •Private property easement required •Relocation of security booth •Private railway crossing •Road reconstruction •Connect to existing storm trunk sewer •New private drain connections
Central Windsor	Detroit River	Detroit Street Sewer	STM-C2	Detroit Street	1200 mm dia.	300 m	•300m of storm sewer improvements •Improved outlet to Detroit River •Private property works •Road reconstruction •Separate proposed storm sewer from combined system •New private drain connections
Central Windsor	Detroit River	Cameron Street Sewer	STM-C3	South Cameron Blvd.	1050 mm dia.	148 m	•3050m of storm sewer improvements •New outlet to Detroit River with erosion protection measures •Road reconstruction •Railway crossing on Curry Ave •Replace existing combined sewers with sanitary sewers •Existing storm sewer connections •New private drain connections
				Curry Avenue	1350 mm dia.	218 m	
					1500 mm dia.	246 m	
					1650 mm dia.	120 m	
					1950 mm dia.	261 m	
					2100 mm dia.	102 m	
					2400 mm x 1800 mm	104 m	
					2800 mm x 2200 mm	137 m	
				Tecumseh Road West	1350 mm dia.	84 m	
				Everts Avenue	600 mm dia.	71 m	
					1350 mm dia.	41 m	
				Grove Avenue	900 mm dia.	96 m	
				College Avenue	1200 mm dia.	14 m	
				Rooney Street	2800 mm x 2200 mm	72 m	
				McKay Avenue	2800 mm x 2200 mm	164 m	
					3300 mm x 2200 mm	435 m	
				Martindale Street	3300 mm x 2200 mm	74 m	
				Cameron Avenue	3300 mm x 2200 mm	603 m	
					3300 mm x 2400 mm	60 m	
Central Windsor	Detroit River	Bruce Avenue Sewer	STM-C4	Giles Boulevard West	2700 mm dia.	106 m	•2144m of storm sewer improvements •New outlet to Detroit River with erosion protection measures •Road reconstruction •Replace existing combined sewers with sanitary sewers •Existing storm sewers tie-ins •Combined sewer over flow removal •New private drain connections
				Bruce Avenue	2700 mm dia.	1058 m	
					3300 mm dia.	360 m	
					3600 mm dia.	472 m	
				Elliot Street	1650 mm dia.	148 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
Central Windsor	Detroit River	Marentette Avenue Sewer	STM-C5	Parent Avenue	1500 mm dia.	218 m	•863m of storm sewer improvements •New outlet to Detroit River with erosion protection measures •Road reconstruction •Replace existing combined sewers with sanitary sewers •Connections to existing storm sewers •Replace combined sewers with sanitary sewers •New private drain connections
					1800 mm dia.	195 m	
				Assumption Street	1650 mm dia.	118 m	
				Chatham Street East	1800 mm dia.	145 m	
				Marenette Avenue	1800 mm dia.	187 m	
Central Windsor	Detroit River	Ypres Avenue	STM-C6	Ypres Avenue	825 mm dia.	40 m	•40m of proposed storm sewer •Installation of a 3000m³ underground storage facility •Parking lot reconstruction
Central Windsor	Detroit River	Albert Street	STM-C7	Albert Road	1650 mm dia.	192 m	• 546m of storm sewer improvements •Private property easement required •Railway crossing (trenchless installation recommended) •Connect to existing outlet at Detroit River •Removal of existing storm sewers •Road reconstruction
					1650 mm dia.	165 m	
				Wyandotte Street East	450 mm dia.	75 m	
					750 mm dia.	114 m	
Central Windsor	Detroit River	Drouillard Road	STM-C8	Wyandotte Street East	825 mm dia.	40 m	•352m of storm sewer improvements •Removal of existing storm sewers •Existing Drouillard pump station removal •Construction of new 1.25 cms pump station •Road reconstruction •Connections to existing storm sewers •Intersection reconstruction
				Drouillard Road	825 mm dia.	285 m	
					900 mm dia.	27 m	
Central Windsor	Detroit River	College Avenue	STM-C9	College Avenue	750 mm dia.	178 m	•390m of storm sewer improvements •Removal of existing storm sewers •Road reconstruction •Connection to Prince Rd trunk sewer •Backflow preventor required
					900 mm dia.	198 m	
					1050 mm dia.	14 m	
Central Windsor	Detroit River	Felix Avenue	STM-C10	Huron Church Road	1200 mm dia.	82 m	•1707m of storm sewer improvements •Removal of existing storm sewers •Removal and realignment of combined sewers •Connections to existing sewers •Removal of combined sewer overflows •Road reconstruction •New private drain connections •New traffic signals
				Dorchester Road	1800 mm X 1800 mm	96 m	
				Felix Avenue	600 mm dia.	28 m	
					900 mm dia.	27 m	
					1800 mm dia.	1227 m	
					1800 mm x 1800 mm	132 m	
				College Avenue	1500 mm dia.	44 m	
					1650 mm dia.	71 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
Central Windsor	Detroit River	Partington Avenue	STM-C11	Campbell Avenue	1050 mm dia.	59 m	•1614m of storm sewer improvements •Removal of existing storm sewers •Connections to existing sewers •Road reconstruction •Replace combined sewers with sanitary sewers •New private drain connections
				Tecumseh Road West	1050 mm dia.	237 m	
				Pelletier Street	750 mm dia.	12 m	
					900 mm dia.	236 m	
				Partington Avenue	1200 mm dia.	251 m	
					1500 mm dia.	599 m	
					1650 mm dia.	220 m	
Central Windsor	Detroit River	Patricia Road	STM-C12	Patricia Road	1200 mm dia.	406 m	•621m of storm sewer improvements •Removal of existing storm sewers •Connections to existing sewers •Road reconstruction •Replace combined sewers with sanitary sewers •New private drain connections
				Wyandotte Street West	1200 mm dia.	215 m	
Central Windsor	Detroit River	Huron Church Road	STM-C13	Huron Church Road	3000 mm x 2400 mm	68 m	•68m of storm sewer improvments •Removal of existing storm sewers •Road reconstruction
Central Windsor	Detroit River	Tecumseh Road West	STM-C14	Tecumseh Road West	1350 mm dia.	237 m	•555m of storm sewer improvements •removal of existing storm sewers •Road reconstruction •Connection to existing pump station •Replace combined sewers with sanitary sewers •New private drain connections
					1500 mm dia.	78 m	
				Tecumseh Blvd West	1500 mm dia.	240 m	
Central Windsor	Detroit River	Giles Boulevard	STM-C15	Shepherd Street	1650 mm dia.	234 m	•3722m of storm sewer improvements •Removal of existing storm sewers •road reconstruction •Combined sewer overflow removals •Connections to existing storm sewers •New private drain connections •Replace combined sewers with sanitary sewers
				McDougall Street	1650 mm dia.	1042 m	
				Howard Avenue	600 mm dia.	460 m	
				Giles Boulevard	1650 mm dia.	924 m	
					1800 mm x 1200 mm	327 m	
					2400 mm x 1200 mm	209 m	
				Erie Street East	1650 mm dia.	526 m	
Central Windsor	Detroit River	Parent Avenue	STM-C16	Parent Avenue	750 mm dia.	145 m	•448m of storm sewer imrovements •Removal of existing storm sewers •Road reconstruction •Roundabout reconstruction •New private drain connections •Replace combined sewers with sanitary sewers •Connections to existing storm sewers
					825 mm dia.	183 m	
				Erie Street East	1200 mm dia.	120 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
Central Windsor	Detroit River	Lincoln Road	STM-C17	Niagara Street	3600 mm dia.	103 m	•307m of storm sewer improvements •Removal of existing storm sewers •Road reconstruction •New private drain connections •Replace combined sewers with sanitary sewers •Connections to existing storm sewers
				Lincoln Road	3600 mm dia.	204 m	
Central Windsor	Detroit River	Ontario Street	STM-C18	Walker Road	1800 mm dia.	22 m	•444m of storm sewer improvements •Removal of existing storm sewers •New private drain connections •Replace combined sewers with sanitary sewers •Connections to existing storm sewers •Road reconstruction
				Ontario Street	1800 mm dia.	150 m	
					1950 mm dia.	272 m	
Central Windsor	Detroit River	Walker Road	STM-C19	Walker Road	1350 mm dia.	233 m	•637m of storm sewer improvments •Removal of existing storm sewers •New private drain connections •Connections to existing storm sewers •Replace combined sewers with sanitary sewers •Road reconstruction
				Mohawk Street	1350 mm dia.	404 m	
South Windsor	Grand Marais Drain	Dougall Avenue and Eugenie Street East	ROAD-S1-1	Eugenie Street East	825 mm dia.	288 m	•1445m of storm sewer improvements •Intersection reconstruction including new traffic signals •Removal of existing storm sewers •Connections to existing sewers •Installation of stormwater management pond at Dougall Ave and South Cameron Blvd. 4597m³ of storage at 182.861m and 26,800m³ of storage at 185.10m. •Private property easements/acquisition required •Road reconstruction
					1050 mm dia.	98 m	
				Ouellette Place	900 mm dia.	39 m	
					1350mm dia.	196 m	
					1800 mm dia.	298 m	
					2400 mm x 1200 mm	526 m	
South Windsor	Grand Marais Drain	Howard Avenue	ROAD-S2-2	Howard Avenue	900 mm dia.	1016 m	•1219m of storm sewer improvements •Intersection reconstruction including traffic signals •Road reconstruction •Removal of existing storm sewers •Connections to existing storm sewers • Installation of 2,433m³ stormwater management pond at 2929 Howard Avenue •New private drain connections •Private property easements/acquistion required
					1200 mm x 900 mm	203 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
South Windsor	Grand Marais Drain	Chrysler Centre	ROAD-S3-2	Chrysler Centre	600 mm dia.	111 m	•1185m of storm sewer improvements •Parking lot reconstruction •Removal of existing storm sewers •Road reconstruction •Private property works •Removal of existing storm sewers •Installation of 11,000m³ underground storage facility within Fiat Chrysler parking lot •Connections to existing storm sewers
					675 mm dia.	129 m	
					1050 mm dia.	497 m	
					1200 mm dia.	247 m	
					1500 mm dia.	201 m	
South Windsor	Grand Marais Drain	Central, Pillette and Regional	ROAD-S7-3	Pillette Road	825 mm dia.	182 m	•4591m of storm sewer improvements •Road reconstruction •Removal of existing storm sewers •Connections to existing storm sewers •New private drain connections •Expansion to existing central pond to 82,000m³ at 185.10m and 106,000m³ at 185.70m. •Private property easements/acquisition required
					900 mm dia.	335 m	
				Tourangeau Road	525 mm dia.	120 m	
					600 mm dia.	120 m	
					750 mm dia.	303 m	
				George	525 mm dia.	240 m	
					600 mm dia.	226 m	
				Central Avenue	600 mm dia.	98 m	
					750 mm dia.	150 m	
					825 mm dia.	151 m	
					900 mm dia.	541 m	
					1050 mm dia.	93 m	
					1200 mm dia.	140 m	
					1350 mm dia.	250 m	
					1500 mm dia.	421 m	
				Grand Marais Road East	300 mm dia.	18 m	
					1200 mm dia.	365 m	
					1500 mm dia.	343 m	
					1650 mm dia.	297 m	
				Plymouth Drive	1500 mm dia.	50 m	
					1650 mm dia.	91 m	
					1800 mm dia.	57 m	
South Windsor	Lennon Drain	Southwood Lakes	STM-S8-2	Southwood Lakes	300 mm dia.	131 m	•301m of storm sewer improvements •Lowering of the normal water level in Lake Grande, Lake Como, Lake Laguna •Remove existing sewers connecting the ponds •New storm sewers connecting the ponds •Pond bank restoration •Outlet modifications •Private property easements required
					525 mm dia.	49 m	
					600 mm dia.	121 m	
East Windsor	Detroit River	Ford	STM-E1-2	RIVERSIDE DR E	1050 mm dia.	65 m	•65m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
East Windsor	Detroit River	St. Rose	STM-E1-2	RIVERSIDE DR E	375 mm dia.	39 m	•3336 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Construction of a new 13.5 cms pump station within St. Rose Beach park •Landform Barrier along the north side of Riverside Drive •Local sewers adjacent to landform barrier with backflow prevention measures •New private drain connections •Backflow prevention measures implemented on sewers crossing the landform barrier. •Road reconstruction
					1050 mm dia.	52 m	
					2400 mm dia.	1596 m	
				ORCHARD GROVE	300 mm dia.	71 m	
					450 mm dia.	58 m	
				GLIDDEN AVE	750 mm dia.	139 m	
				ST MARY'S BLVD	1800 mm x 900 mm	270 m	
				JANISSE DR	1800 mm dia.	201 m	
				ST ROSE AVE	375 mm	90 m	
					3050 mm x 1830 mm	248 m	
				WYANDOTTE ST E	3050 mm x 1830 mm	126 m	
					1800 mm dia.	120 m	
					450 mm dia.	32 m	
				ONTARIO ST	4200 mm x 1800 mm	105 m	
					1800 mm x 900 mm	103 m	
					750 mm dia.	145 m	
East Windsor	Detroit River	St. Rose	ROAD-E2	PATRICE DR	450 mm dia.	135 m	•1627 m of storm sewer improvements in cluding in-line storage sewers on Jefferson Blvd •Removal of existing storm sewers •Connections to existing storm sewers •New private drain connections •Road reconstruction •Private property easements/acquisition required
					900 mm dia.	128 m	
				JEFFERSON BLVD	300 mm dia.	273 m	
					4200 mm x 1800 mm	265 m	
				GARDEN CT DR	900 mm dia.	201 m	
				RAYMOND AVE	1800 mm x 900 mm	260 m	
					2400 mm x 1200 mm	173 m	
					900 mm dia.	68 m	
East Windsor	Detroit River	St. Paul	ROAD-E5	LAUZON RD	2700 mm dia.	95 m	•2512m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •Private property easements/acquisition required •Trail improvements •Reconstruction of multiple roadway intersections
					2400 mm dia.	1227 m	
					2275 mm dia.	68 m	
					2100 mm dia.	528 m	
				CLAIRVIEW AVE	1800 mm dia.	406 m	
				CECILE ST	2700 mm dia.	188 m	
East Windsor	Detroit River	St. Paul	STM-E1-2	BELLEPERCHE PL	1800 mm x 900 mm	909 m	•1709m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Construction of a new 18.2 cms pump station adjacent to the existing St. Paul pump station •Potential rading improvements around pump stations to meet flood protection elevation •Road reconstruction •New private drain connections
					525 mm dia.	492 m	
				ST PAUL AVE	2400 mm x 1800 mm	191 m	
					1800 mm dia.	28 m	
					2700 mm dia.	89 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
East Windsor	Pontiac	Pontiac	ROAD-E9-2	WYANDOTTE ST E	750 mm dia.	62 m	•150m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction • Installation of 5,000m³ underground stormwater management facility at 8380 Wyandotte St. E •Installation of a 8,000m³ underground stormwater management facility at the NE corner of Wyandotte St. E and Watson Ave.
					450 mm dia.	25 m	
				WATSON ST	600 mm dia.	63 m	
East Windsor	East Marsh	Pontiac	STM-E6-1	CEDARVIEW ST	1050 mm dia.	645 m	•3691 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •Backflow prevention measures implemented on sewers crossing the landform barrier. •Potential grading modifications to existing landform barrier along the Ganatchio Trail to meet flood protection elevation •Installation of a 4,725m³ underground stormwater management facility in Brumpton Park
					375 mm dia.	36 m	
				RIVERSIDE DR E	600 mm dia.	218 m	
					900 mm dia.	644 m	
				CLAIRVIEW AVE	450 mm dia.	436 m	
				ADELAIDE AVE	450 mm dia.	95 m	
				CLOVER ST	450 mm dia.	329 m	
					975 mm dia.	36 m	
				ELINOR ST	450 mm dia.	391 m	
					750 mm dia.	39 m	
				JOHN M ST	450 mm dia.	130 m	
				MENARD ST	450 mm dia.	198 m	
				FLORENCE AVE	450 mm dia.	223 m	
					900 mm dia.	130 m	
					1050 mm dia.	141 m	
East Windsor	Blue Heron	Lakeview	ROAD-E10	BANWELL RD	1800 mm dia.	703 m	•703m of storm sewer improvements •Removal of existing storm sewers on Lauzon Rd •Connections to existing storm sewers •Road reconstruction •New private drain connections •Reconstruction of roadway intersections
East Windsor	Blue Heron	Lakeview	ROAD-E8	BLUE HERON DR	2400 mm dia.	62 m	•1232 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •Private property easement/acquisition required
					1650 mm dia.	79 m	
					1200 mm dia.	606 m	
				MCNORTON ST	1050 mm dia.	485 m	
East Windsor	Blue Heron	Lakeview	ROAD-E7	MCHUGH ST	4200 mm x 1500 mm	533 m	•1064m of storm ewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •Boulevard reconstruction on Questa Dr •In-line storage sewers along McHugh St
				QUESTA DR	1200 mm dia.	245 m	
				CHATEAU AVE	1200 mm dia.	199 m	
				LEATHORNE ST	1200 mm dia.	87 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

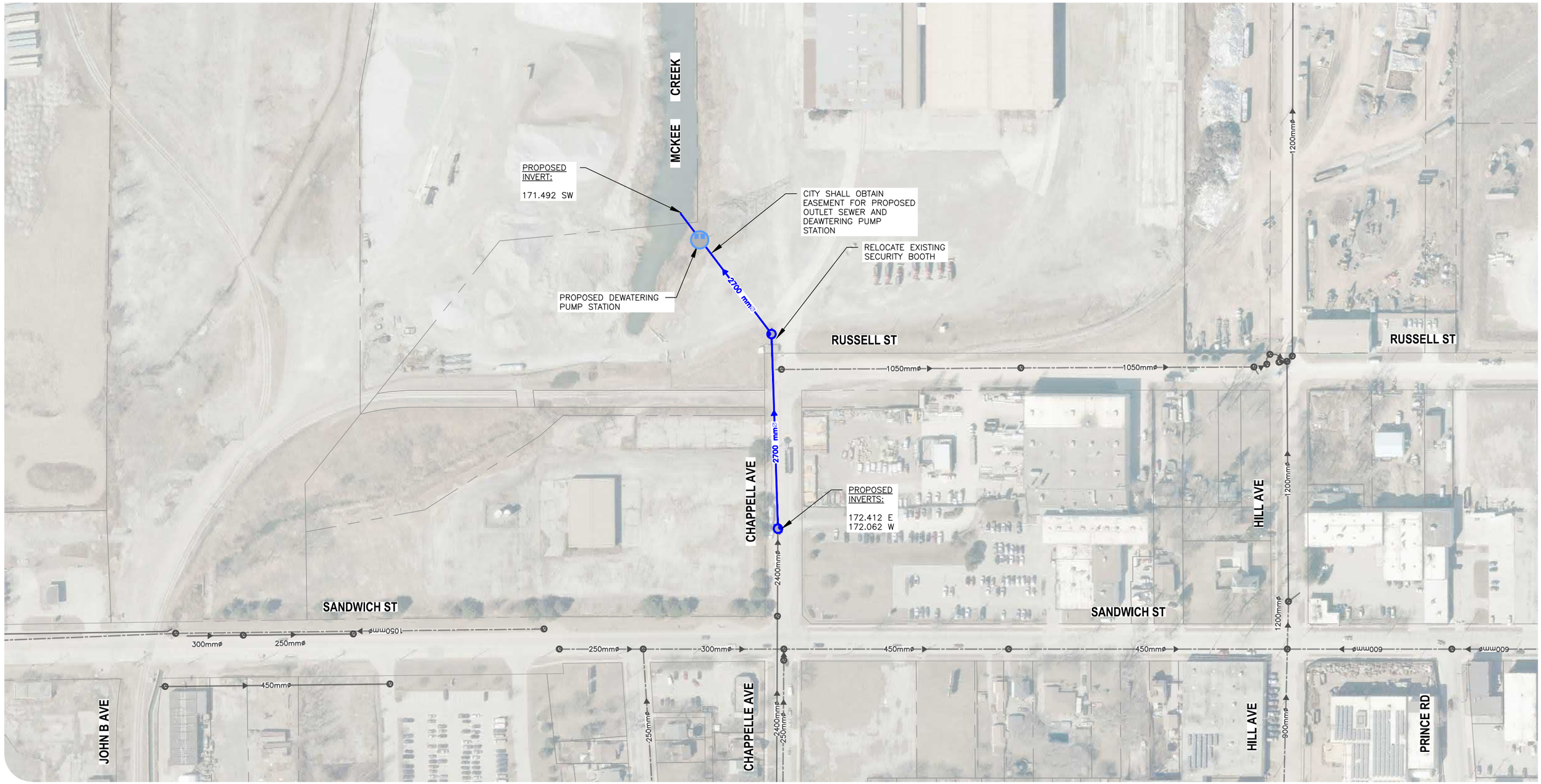
CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
East Windsor	Blue Heron	Lakeview	STM-E5-1	KATELLA AVE	375 mm dia.	13 m	•2212m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •Improved outlet to Detroit River adjacent to Rendezvous Shores subdivision
					600 mm dia.	107 m	
					675 mm dia.	223 m	
					750 mm dia.	93 m	
				VENETIAN AVE	375 mm dia.	12 m	
					600 mm dia.	116 m	
					675 mm dia.	202 m	
					750 mm dia.	109 m	
				MORNINGSTAR AVE	375 mm dia.	12 m	
					600 mm dia.	211 m	
					675 mm dia.	108 m	
					900 mm dia.	108 m	
				LITTLE RIVER BLVD	525 mm dia.	160 m	
					900 mm dia.	485 m	
					1800 mm dia.	63 m	
				RENDEZVOUS CRT	600 mm dia.	190 m	
East Windsor	Little River	Little River	STM-E6-2	PEPPERVINE ST	600 mm dia.	101 m	•101m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections
East Windsor	Little River	Little River	ROAD-E6-3	MCHUGH ST	3600 mm x 1800 mm	118 m	•388m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •In-line storage sewers on McHugh St
					4200 mm x 1200 mm	270 m	
East Windsor	Little River	Little River	ROAD-E4-3	LITTLE RIVER GOLF COURSE	2400 mm x 1200 mm	152 m	•705 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •In-line storage sewers on Lauzon Pkwy •Construction of a new 20,000m³ stormwater management pond within the Little River Golf Course •Installation of 5,000m³ underground storage facility within Meadowbrook Park
				LAUZON PKWY	4200 mm x 1800 mm	477 m	
					1800 mm dia.	66 m	
					375 mm dia.	10 m	
East Windsor	Little River	Little River	ROAD-E11	ROSEVILLE GARDEN DR	1800 mm x 900 mm	106 m	•659m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •Private property easements/acquisition required •Installation of 31,625m³ underground storage facility within Roseville Park
					2400 mm x 900 mm	433 m	
					4200 mm x 1800 mm	73 m	
					600 mm dia.	47 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
East Windsor	Little River	Little River	STM-E3-2-3	TECUMSEH RD E	525 mm dia.	26 m	•899 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •In-line storage sewers along Tecumseh Rd E. •Potential property easement/acquistion required
					1325 mm x 1200 mm	144 m	
				JEFFERSON BLVD	900 mm dia.	250 m	
				JOS ST LOUIS AVE	600 mm dia.	419 m	
				SOUTH NATIONAL ST	900 mm dia.	60 m	
East Windsor	Little River	Little River	STM-E3-2-2	TECUMSEH RD E	900 mm dia.	157 m	•2475 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •In-line storage sewers along Tecumseh Rd E.
					3000 mm x 1800 mm	530 m	
					2400 mm x 900 mm	102 m	
				BUCKINGHAM DR	600 mm dia.	99 m	
					675 mm dia.	129 m	
					750 mm dia.	57 m	
				FORD BLVD	525 mm dia.	135 m	
				WESTMINSTER BLVD	450 mm dia.	116 m	
					600 mm dia.	63 m	
					675 mm dia.	115 m	
					750 mm dia.	173 m	
				PRINCESS AVE	600 mm dia.	396 m	
				NORMAN RD	750 mm dia.	403 m	
East Windsor	Little River	Little River	STM-E3-2-4	BALFOUR BLVD	375 mm dia.	101 m	•2201 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •Private propert easement/acquisition required •Trenchless storm sewer installation from Coronation Ave on railway property •In-line storage sewers along Jefferson Blvd.
					450 mm dia.	82 m	
					675 mm dia.	83 m	
					750 mm dia.	52 m	
					825 mm dia.	137 m	
					900 mm dia.	127 m	
				CORONATION AVE	3600 mm x 1200 mm	97 m	
				GLENDALE AVE	600 mm dia.	203 m	
					900 mm dia.	309 m	
				FERNDALE AVE	600 mm dia.	205 m	
				JEFFERSON BLVD	1200 mm dia.	297 m	
					3800 mm x 1500 mm	437 m	
					2400 mm x 1200 mm	71 m	

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF FUNCTIONAL DESIGN SOLUTIONS - SOUTH, CENTRAL AND EAST WINDSOR AREAS

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	SEWER SIZES	SEWER LENGTHS	DESCRIPTION OF WORKS
STORM SEWER IMPROVEMENTS							
East Windsor	Little River (Future Detroit River Drainage Area)	Ford	STM-E3-2-1	FORD BLVD	450 mm dia.	91 m	•2013 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections
					525 mm dia.	275 m	
					600 mm dia.	279 m	
					675 mm dia.	78 m	
				BUCKINGHAM DR	525 mm dia.	197 m	
					600 mm dia.	634 m	
				EMPRESS ST	525 mm dia.	102 m	
					750 mm dia.	122 m	
				SOUTH NATIONAL ST	675 mm dia.	121 m	
					750 mm dia.	114 m	
		Ford	STM-E3-2-4	BALFOUR BLVD	3600 mm x 2400 mm	32 m	•1612 m of storm sewer improvements •Removal of existing storm sewers •Connections to existing storm sewers •Road reconstruction •New private drain connections •In-line storage sewers along Balfour Blvd. and South National St.
				GLENDALE AVE	825 mm dia.	630 m	
				FERNDALE AVE	525 mm dia.	90 m	
					600 mm dia.	352 m	
				SOUTH NATIONAL ST	3600 mm x 2400 mm	508 m	



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
PRINCE ROAD SEWER OUTLET
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

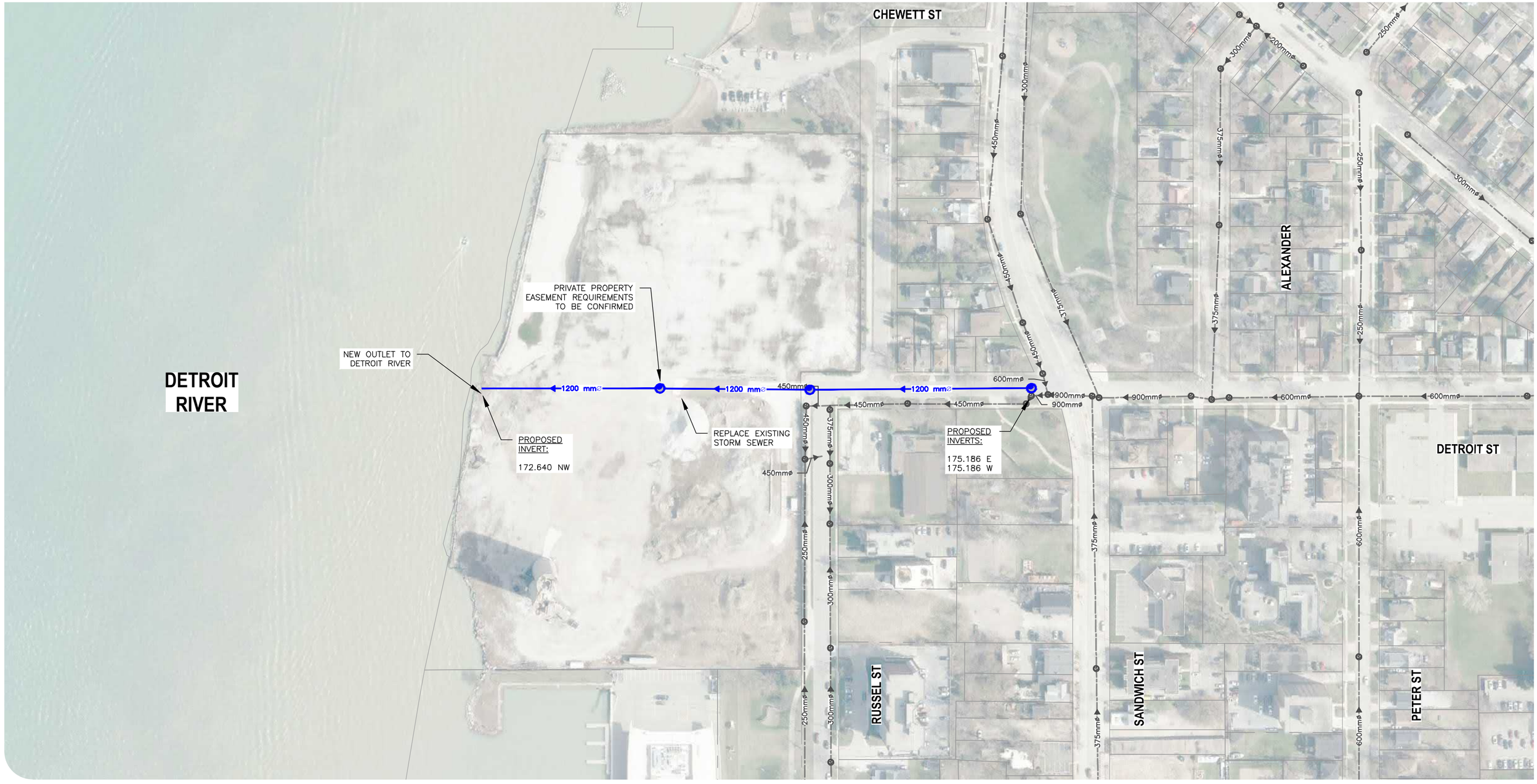
NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C1
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
DETROIT STREET SEWER
(STORM)

THE CITY OF WINDSOR

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
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MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C2

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

MATCH LINE SEE FIG STM-C3-2

MCKAY AVE

CURRY AVE

GROVE AVE

MCEWAN AVE

TAYLOR AVE

PELLETIER ST

TECUMSEH RD WEST

LEDUC ST

PROPOSED INVERTS:

175.398 N
175.700 S
179.348 E
178.471 W

REMOVE EXISTING 450mm DIA. SEWER

PROPOSED INVERTS:

178.660 E
178.450 W

PROPOSED INVERTS:

177.228 N
177.500 S
180.826 E
180.806 W

PROPOSED INVERTS:

181.640 S
181.628 NE
181.640 SW

PROPOSED INVERTS:

180.500 N
181.040 S
180.900 E

PROPOSED INVERTS:

180.738 NE
180.649 SW

PROPOSED INVERTS:

178.327 N
180.970 S
180.738 W

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
CAMERON AVENUE SEWER (STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:

- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING

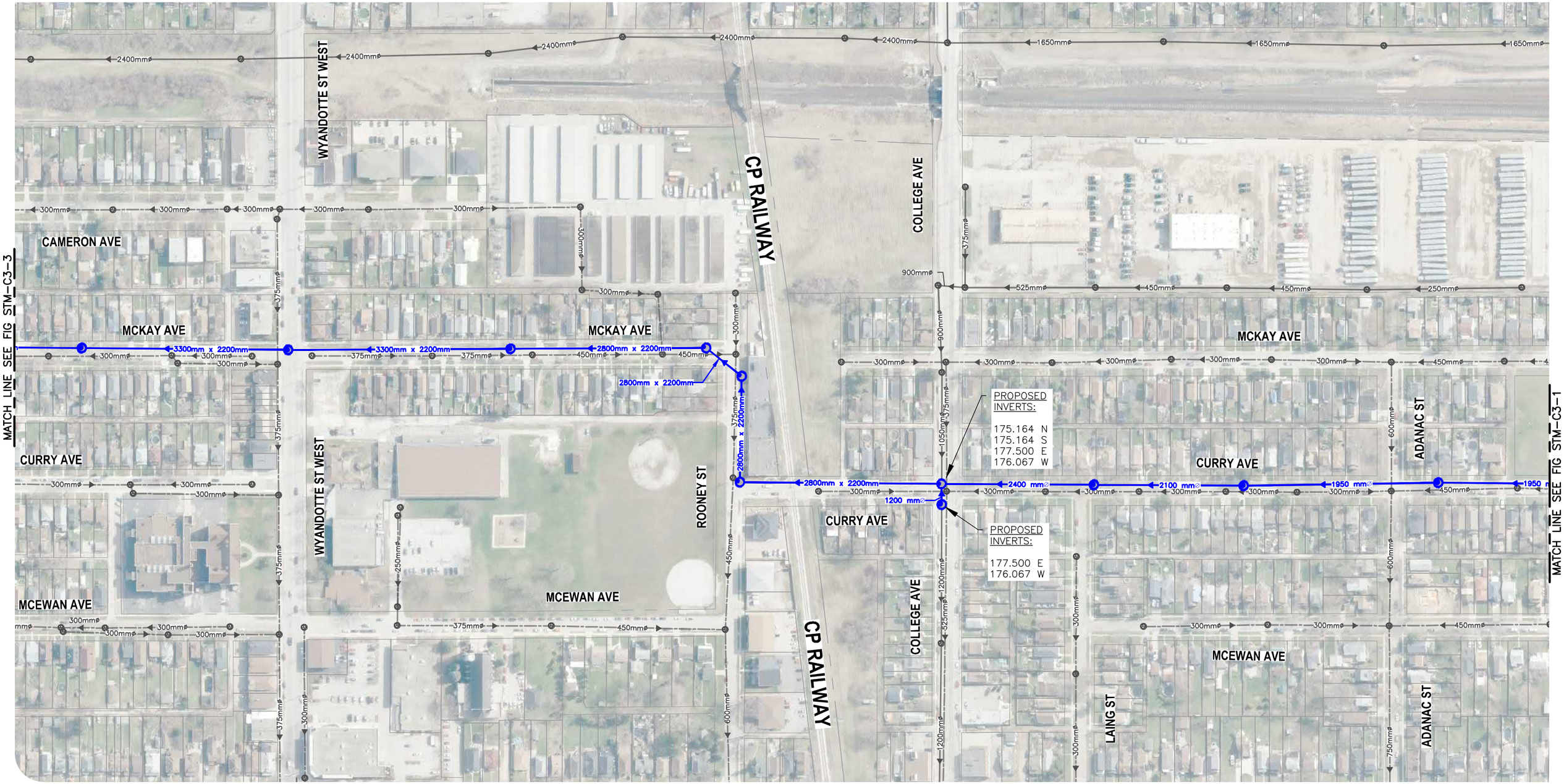
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C3-1

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
CAMERON AVENUE SEWER
(STORM)

THE CITY OF WINDSOR

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

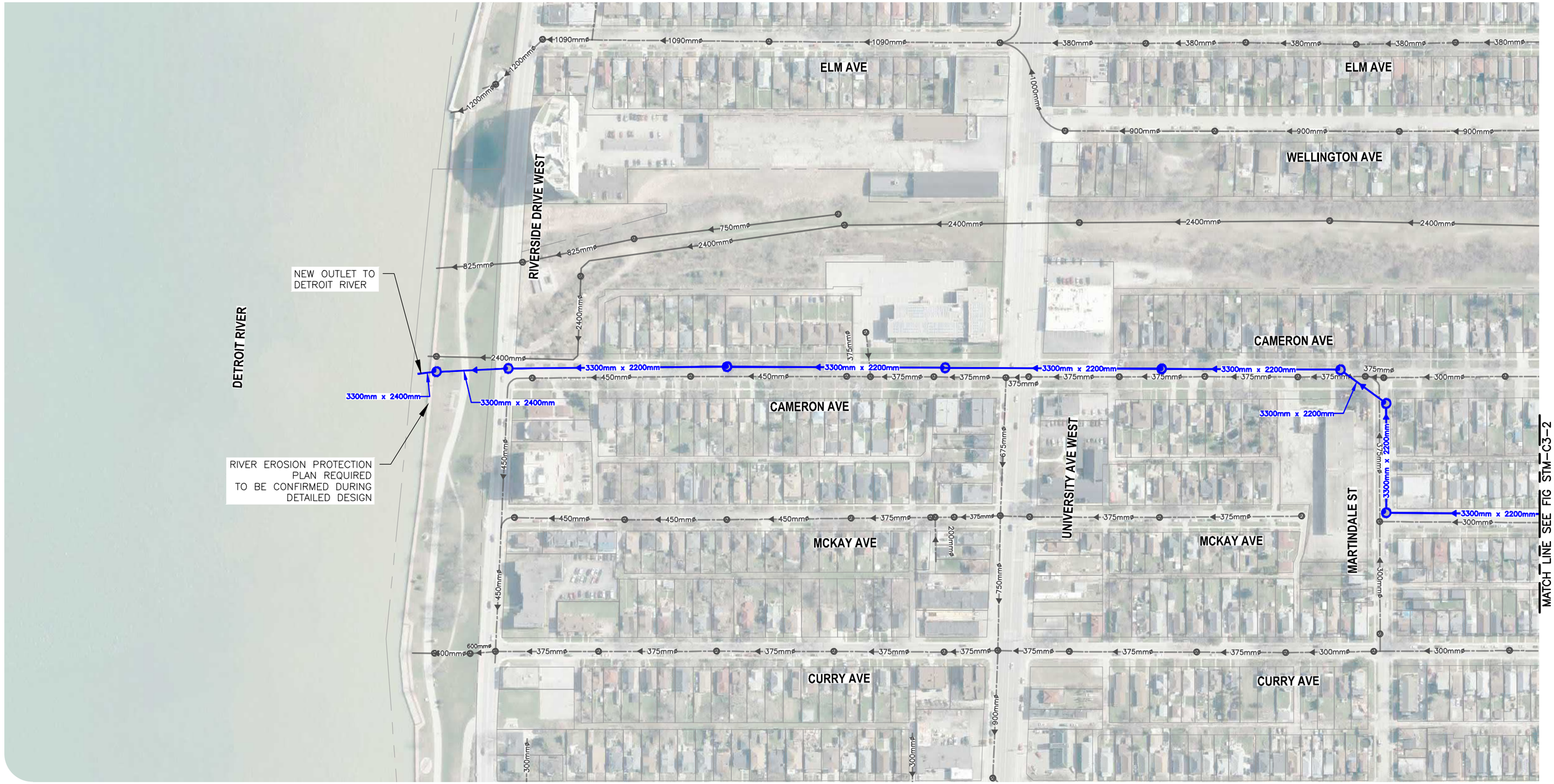
NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C3-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
CAMERON AVE TRUNK SEWER (STORM)

THE CITY OF WINDSOR

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C3-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

MATCH LINE SEE FIG STM-C4-2

CHURCH ST

ELLIOT ST

NEWBURY ST

CAROLINE ST

ERIE ST

DOUGALL AVE

CHURCH ST

PINE ST

GROVE AVE

GILES BLVD WEST

BRUCE AVE

BRUCE AVE

JANETTE AVE

JANETTE AVE

CARON AVE

CP RAIL

PROPOSED INVERTS:
173.960 N
173.976 S
176.784 NE
176.800 SW

PROPOSED INVERTS:
173.983 N
173.983 S
176.890 E
177.024 W

PROPOSED INVERTS:
174.405 NW
174.409 SE
176.827 NE

POTENTIAL LOW SEWER CLEARANCE. INVERTS TO BE CONFIRMED PRIOR TO DETAILED DESIGN

COMBINED SEWER OVERFLOW TO BE REMOVED

MOVE COMBINED MANHOLE NORTH

PROPOSED INVERTS:
176.004 N
175.500 W
175.495 E

PROPOSED INVERTS:
175.320 N
178.453 S
177.970 W
176.000 E

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
BRUCE AVENUE SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING

Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C4-1

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

DOUGALL AVE

CHURCH ST

JANETTE AVE

BRUCE AVE

CARON AVE

DETROIT RIVER

RIVERSIDE DR WEST

PITT ST WEST

CHATHAM ST WEST

UNIVERSITY AVE WEST

PARK ST WEST

KARL PL

VERA PL

WYANDOTTE ST WEST

NEW OUTLET TO DETROIT RIVER

RIVER EROSION PROTECTION PLAN REQUIRED

PROPOSED INVERT:
175.320 N

PROPOSED INVERT:

172.493 SE
172.190 NW
179.275 SW
179.275 NE

MATCH LINE SEE FIG STM-C4-1

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
BRUCE AVENUE SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:

- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING

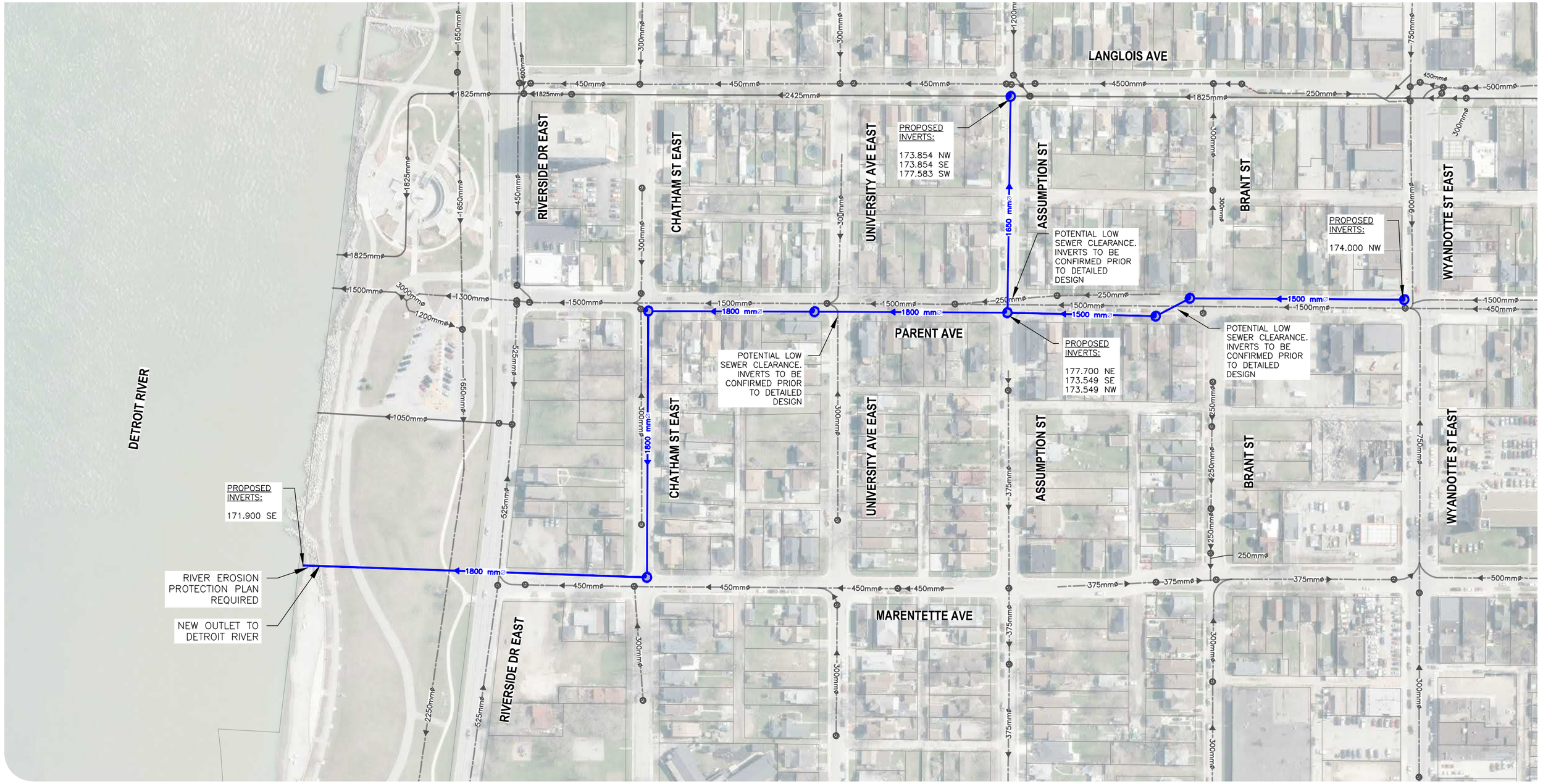
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C4-2

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
MARENTETTE AVE SEWER (STORM)

THE CITY OF WINDSOR

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:

- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING

Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N E S W

STM-C5

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
YPRES AVENUE SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY

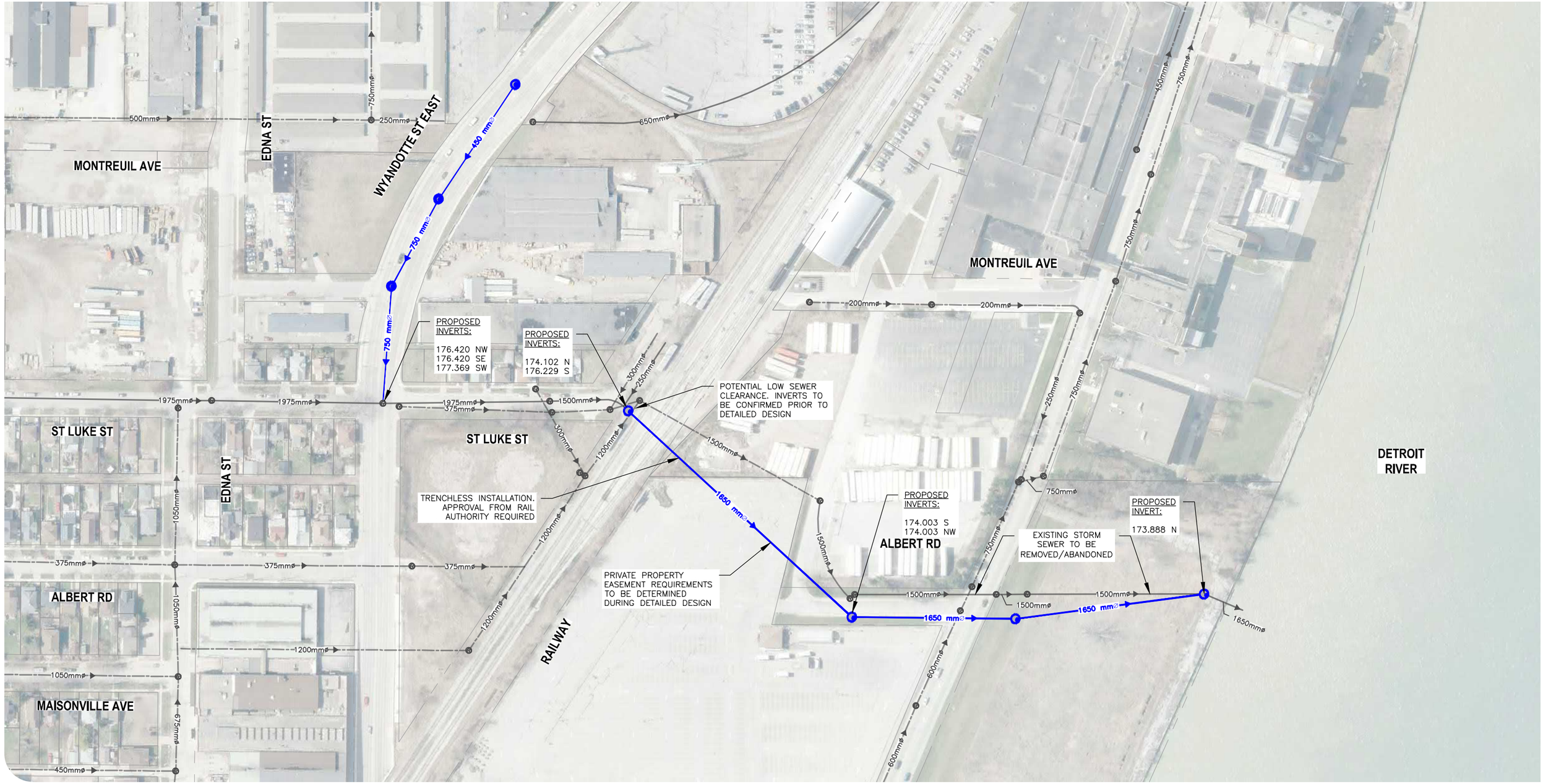
NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C6
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
ALBERT STREET SEWER (STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

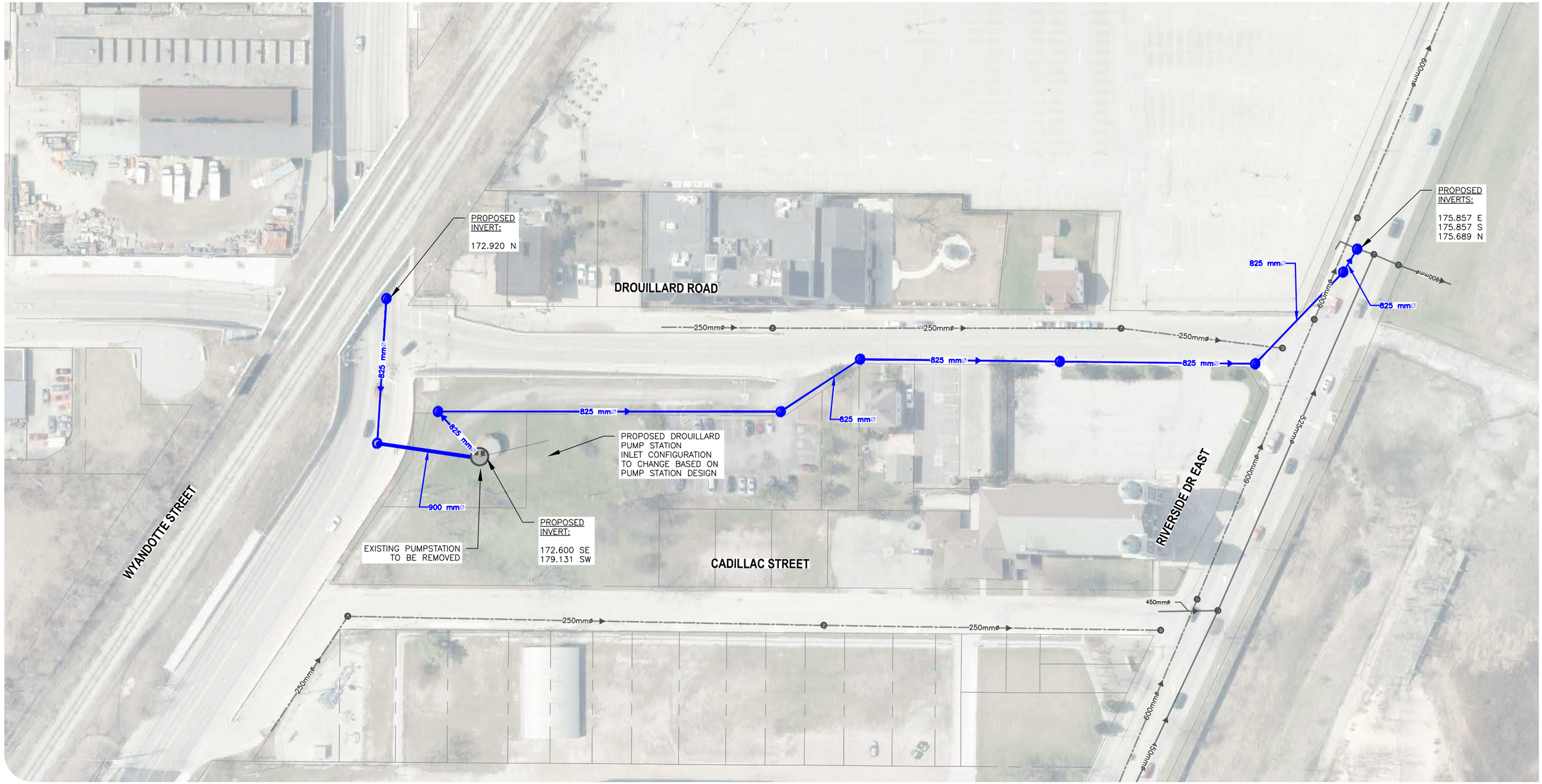
NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C7
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
DROUILLARD ROAD - PUMP STATION (STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER
EXISTING PUMP STATION

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C8

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
COLLEGE AVENUE SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C9
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

STM C13 – HURON CHURCH ROAD STORAGE SEWER

3000mm x 2400mm

EXTEND EXISTING 1800mm Dia. STORM SEWER TO PROPOSED MANHOLE

1200 mm⌀

1800 mm⌀

1800mm x 1800mm

PROPOSED INVERTS:

177.701 N
177.875 S
177.050 SW

PROPOSED INVERTS:

177.988 N
178.003 S
177.050 SW

COMBINED SEWER AND MANHOLES TO BE REMOVED

1800mm x 1800mm

CONNECT EXISTING 300mm Dia. STORM SEWER TO PROPOSED MANHOLE

CONNECT EXISTING STORM SERVICE TO PROPOSED SEWER

REALIGN COMBINED SEWER AND ADD MANHOLE

COMBINED SEWER TO BE REMOVED

PROPOSED INVERTS:

176.029 NW
176.029 SE
176.079 NE
176.079 SW

CONNECT EXISTING STORM SEWER TO PROPOSED SEWER

900mm⌀

900mm⌀

REALIGN 900mm STORM SEWER AND ADD MANHOLES

MATCH LINE SEE FIG STM-C10-2

HURON CHURCH ROAD

FELIX AVE

MANCHESTER RD

MELBOURNE RD

TECUMSEH RD WEST

MARLBOROUGH BLVD

HARRISON AVE

CONNAUGHT AVE

REDWOOD AVE

DORCHESTER

PRINCE RD

POPLAR AVE

BEECHWOOD ST

GRANVILLE

MYRTLE AVE

WHITNEY AVE

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
FELIX AVENUE SEWER/
HURON CHURCH ROAD SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
PROPOSED COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:

- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING

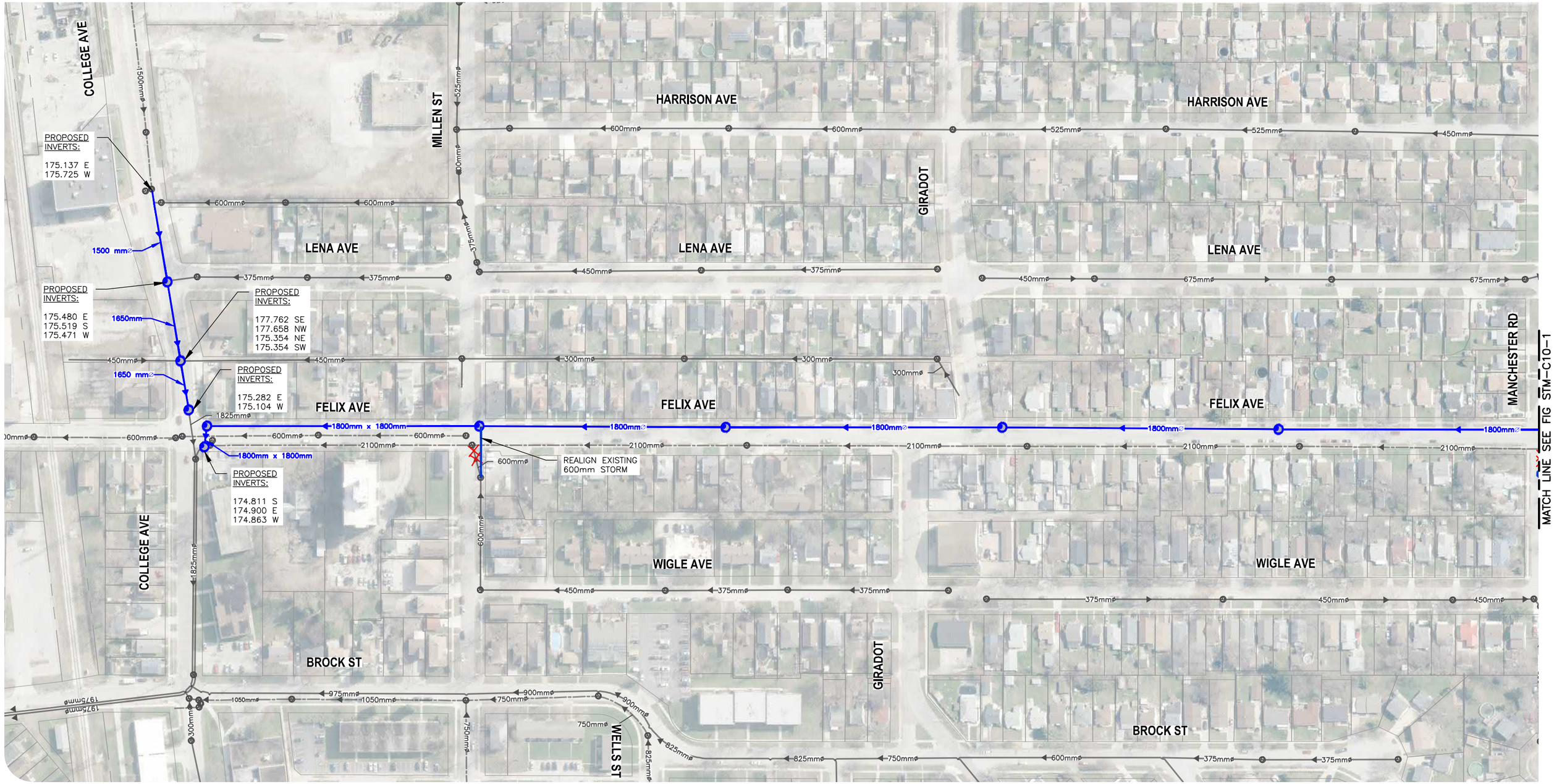
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C10-1
STM-C13

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
FELIX AVENUE SEWER
(STORM)

THE CITY OF WINDSOR

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

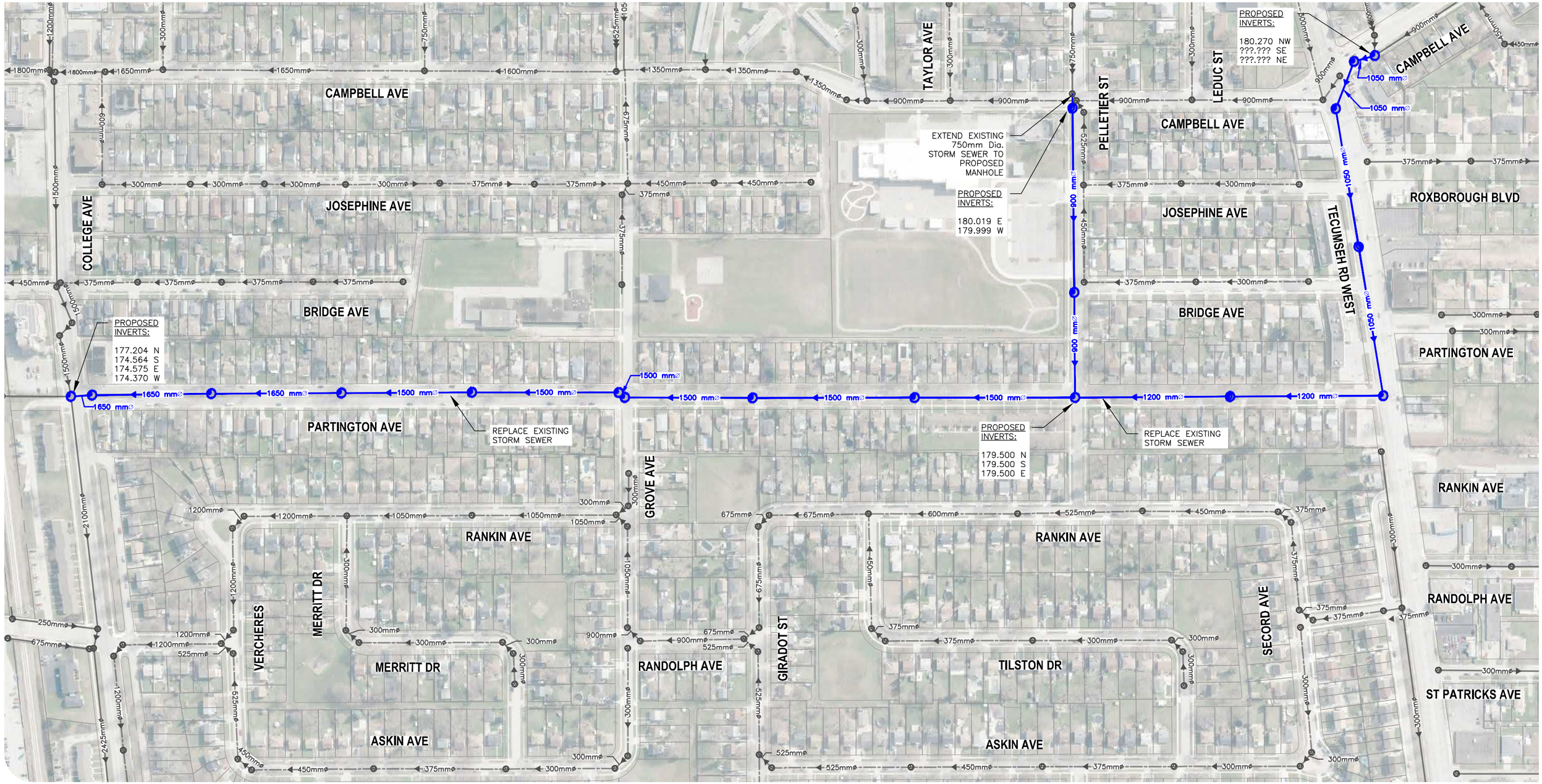
NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C10-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
PARTINGTON AVENUE SEWER (STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

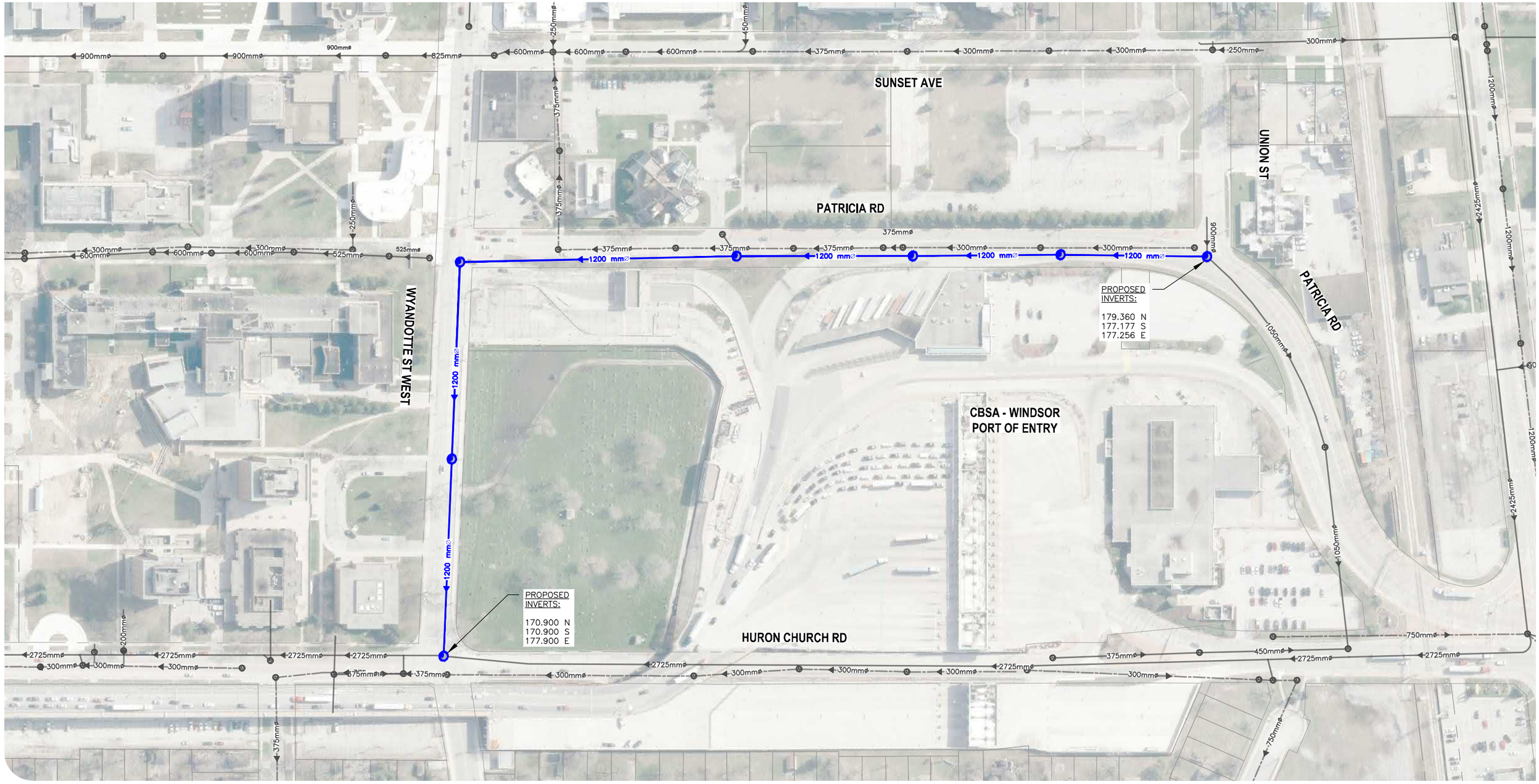
NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C11
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
PATRICIA ROAD SEWER
(STORM)

THE CITY OF WINDSOR

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

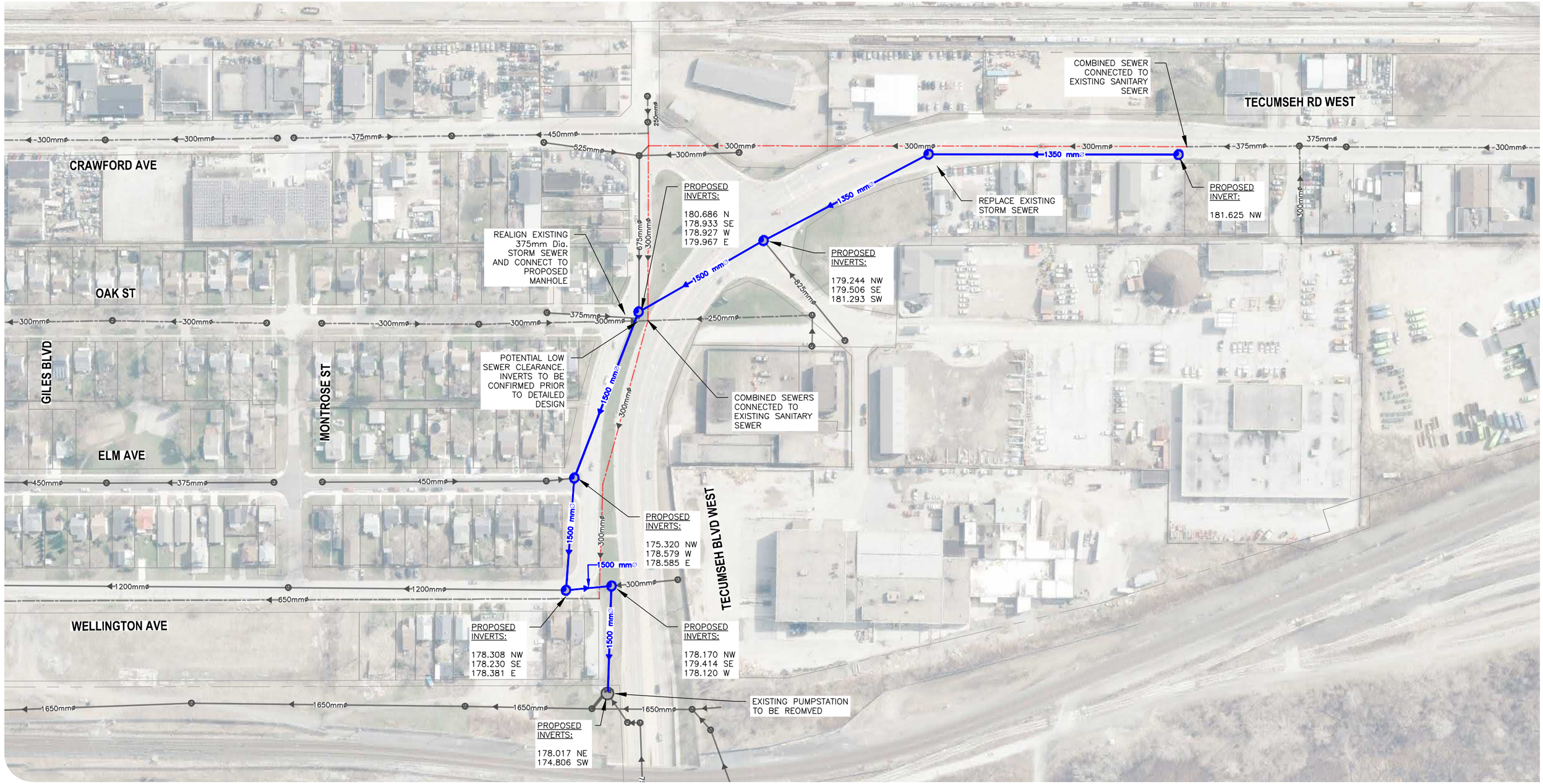
DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C12

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
TECUMSEH ROAD WEST SEWER (STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING SANITARY SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER
EXISTING PUMP STATION

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C14
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

MATCH LINE SEE FIG STM-C15-3

MATCH LINE SEE FIG STM-C15-2

DOUGALL AVE
PINE ST
GROVE AVE
VICTORIA AVE
PELISSIER ST
OUELLETTE AVE
GOYEAU ST
WINDSOR AVE
MCDOUGALL ST
MERCER ST
HIGHLAND AVE
HOWARD AVE
GILES BLVD WEST
GILES BLVD EAST
DUFFERIN PL
ALLENDALE ST
WINDSOR GROVE CEMETARY
MONTROSE ST

POTENTIAL LOW SEWER CLEARANCE. INVERTS TO BE CONFIRMED PRIOR TO DETAILED DESIGN

PROPOSED INVERTS:
178.351 NW
176.330 NE
176.330 SW

PROPOSED INVERTS:
176.377 SW
176.765 NE

COMBINED SEWER AND MANHOLE TO BE REMOVED

COMBINED SEWER TO BE REMOVED

POTENTIAL LOW SEWER CLEARANCE. INVERTS TO BE CONFIRMED DURING DETAILED DESIGN

PROPOSED INVERTS:
175.053 NW
175.060 SE
175.100 NE
176.000 SW

POTENTIAL LOW SEWER CLEARANCE. INVERTS TO BE CONFIRMED PRIOR TO DETAILED DESIGN

COMBINED SEWER TO BE REMOVED

PROPOSED INVERTS:
176.448 SE
177.400 NE
177.400 SW

POTENTIAL LOW SEWER CLEARANCE. INVERTS TO BE CONFIRMED DURING DETAILED DESIGN

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
GILES BOULEVARD SEWER (STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C15-1
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

MATCH LINE SEE FIG STM-C16

MATCH LINE SEE FIG STM-C15-2

MATCH LINE SEE FIG STM-C15-3

HIGHOLAND AVE

HOWARD AVE

LILLIAN AVE

LOUIS AVE

MARENTETTE AVE

ELSMERE AVE

PARENT AVE

LANGLOIS AVE

MARION AVE

PIERRE AVE

GILES BLVD EAST

ALLENDALE AVE

WINDSOR GROVE CEMETERY

LANSPEARY PARK

COMBINED SEWER TO BE REMOVED

EXISTING STORM SEWER TO BE REMOVED

PROPOSED INVERTS:
179.435 NW
176.448 SE
177.400 NE
177.400 SW

PROPOSED INVERTS:
176.428 SW
176.428 NE
178.978 SE

PROPOSED INVERTS:
176.337 SW
176.337 NE
179.013 NW
178.978 SE

PROPOSED INVERTS:
176.292 SW
176.291 NE
178.736 NW
178.788 SE

POTENTIAL LOW SEWER CLEARANCE. INVERTS TO BE CONFIRMED PRIOR TO DETAILED DESIGN

PROPOSED INVERTS:
176.368 NE
176.232 SW
176.232 S

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
GILES BOULEVARD SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING

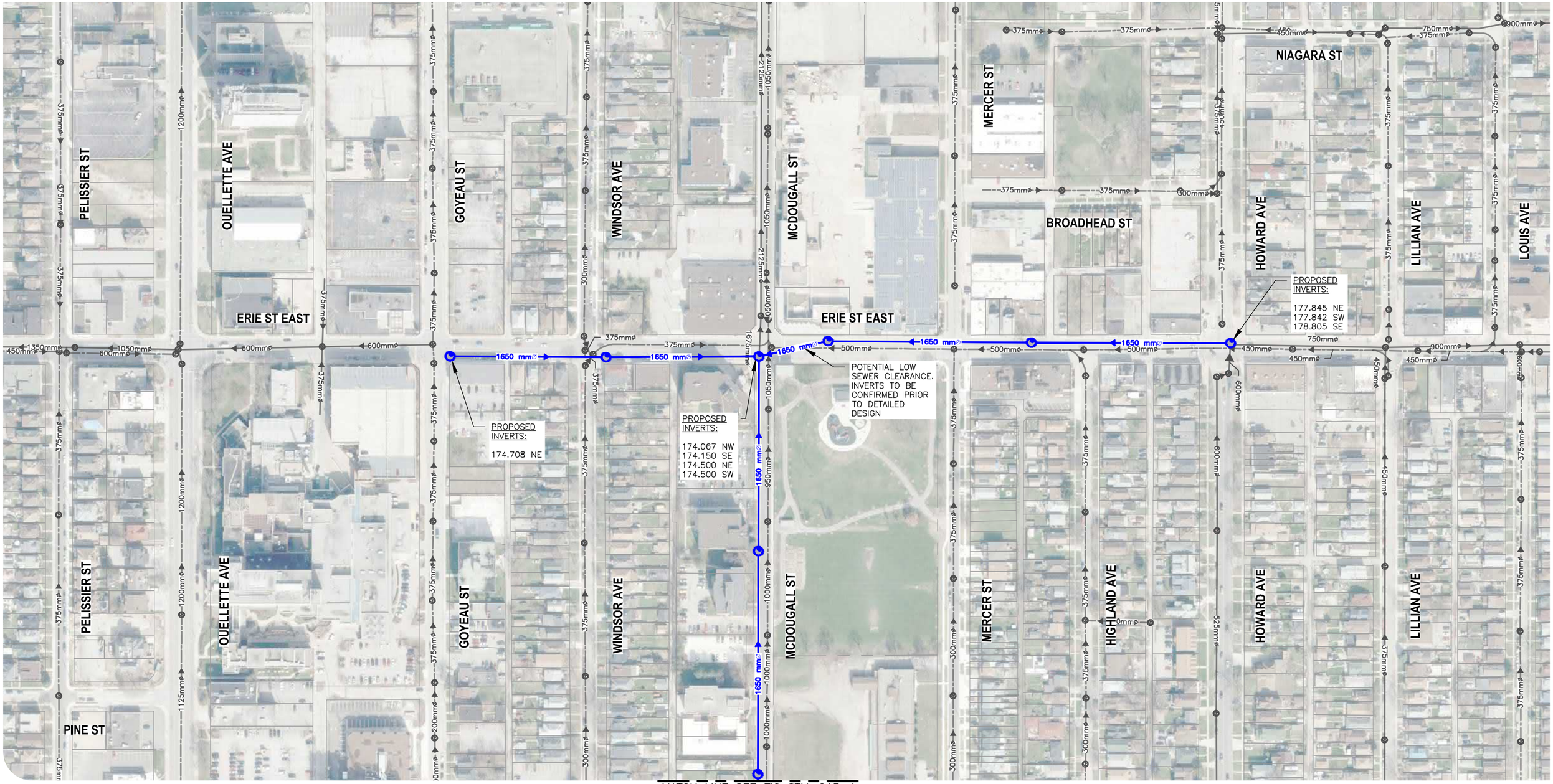
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C15-2

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
GILES BOULEVARD SEWER (STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C15-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

MATCH LINE SEE FIG STM-C16

PROPOSED INVERTS:

177.845 NE
177.842 SW
178.805 SE

HOWARD AVE

ALLENDALE ST

OTTAWA ST

HOWARD AVE

ERIE ST EAST

HIGHLAND AVE

COMBINED SEWER TO BE REMOVED

PROPOSED INVERTS:

179.435 NW
177.400 NE
177.400 SW
179.448 SE

PROPOSED INVERTS:

181.567 NW
182.301 SW
182.366 SE

PROPOSED INVERTS:

179.059 SW

MERCER ST

MERCER ST

POTENTIAL LOW SEWER CLEARANCE. INVERTS TO BE CONFIRMED PRIOR TO DETAILED DESIGN

GILES BLVD EAST

ELLIS ST

SHEPHERD ST E

MCDOUGALL ST

MCDOUGALL ST

PROPOSED INVERTS:

175.100 NE
176.000 SW
175.060 SE
175.053 NW

PROPOSED INVERTS:

178.501 NE
176.538 NW

ERIE ST EAST

WINDSOR AVE

WINDSOR AVE

POTENTIAL LOW SEWER CLEARANCE. INVERTS TO BE CONFIRMED PRIOR TO DETAILED DESIGN

PROPOSED INVERTS:

176.765 NE
176.377 SW
178.360 NW
178.360 SE

COMBINED SEWER TO BE REMOVED

COMBINED SEWER AND MANHOLE TO BE REMOVED

GOYEAU ST

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
GILES BOULEVARD SEWER (STORM)

THE CITY OF WINDSOR

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:

- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING

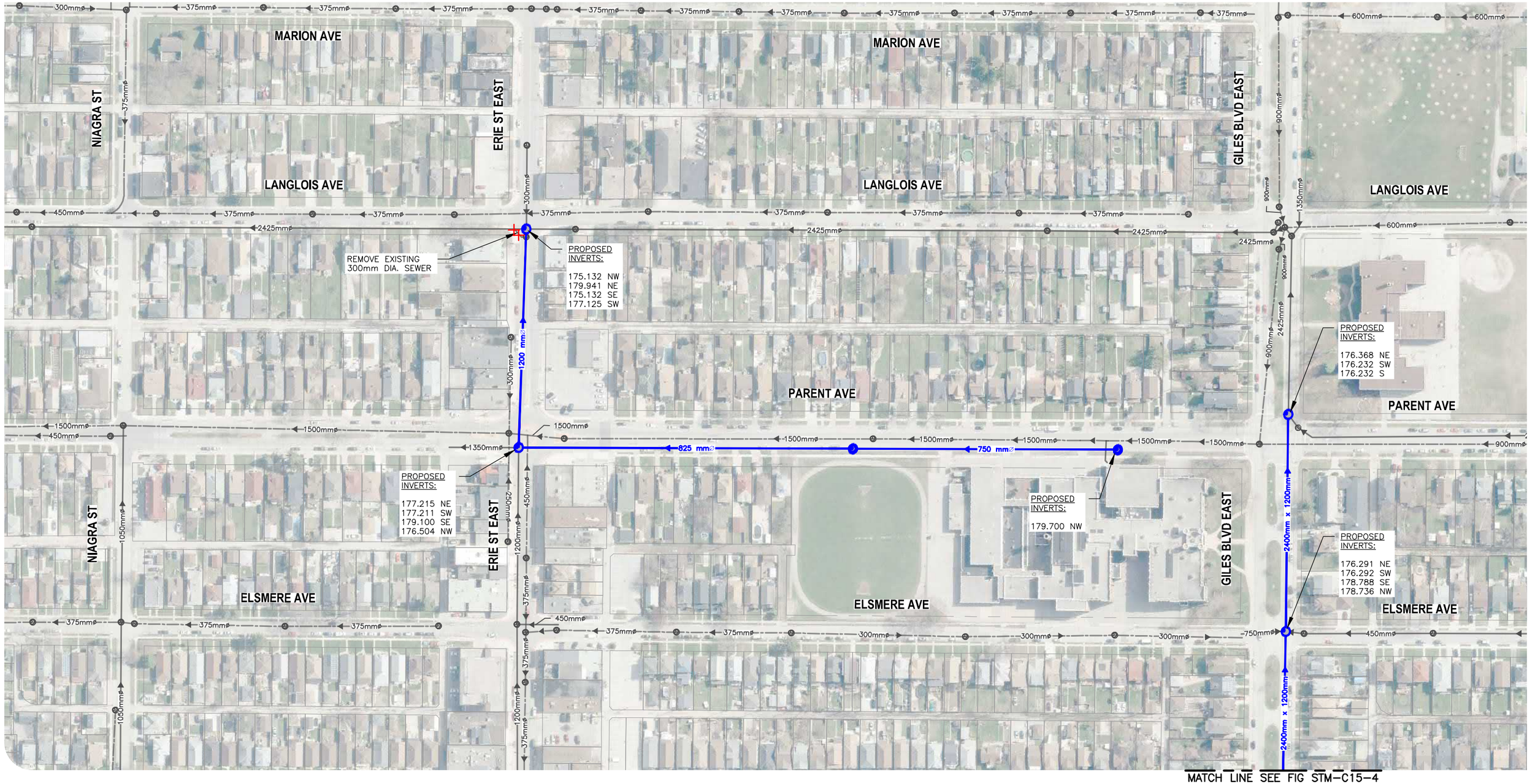
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C15-4

PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
PARENT AVENUE SEWER
(STORM)

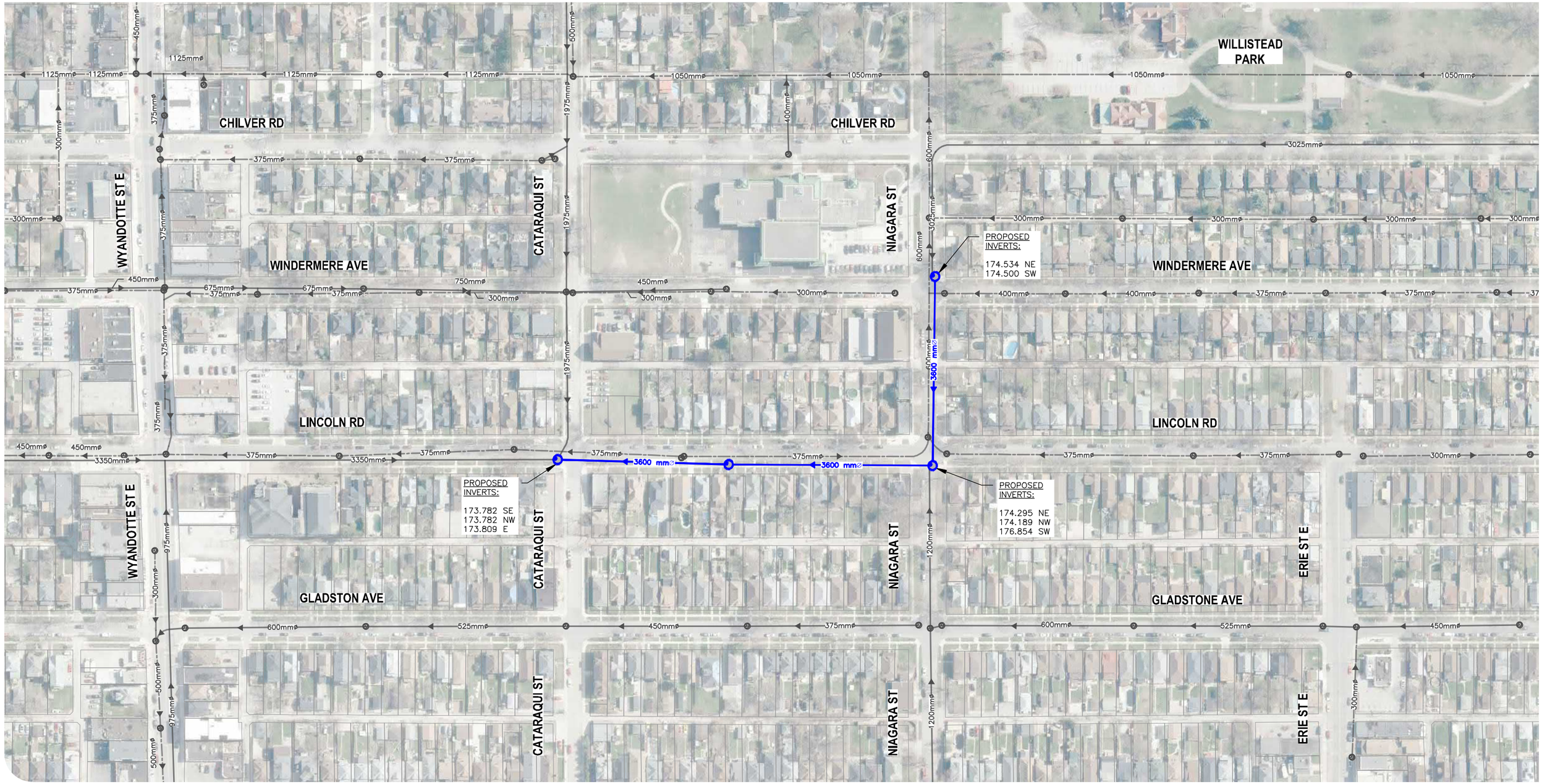
PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C16
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
LINCOLN ROAD SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C17
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
ONTARIO STREET SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
PROPOSED COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

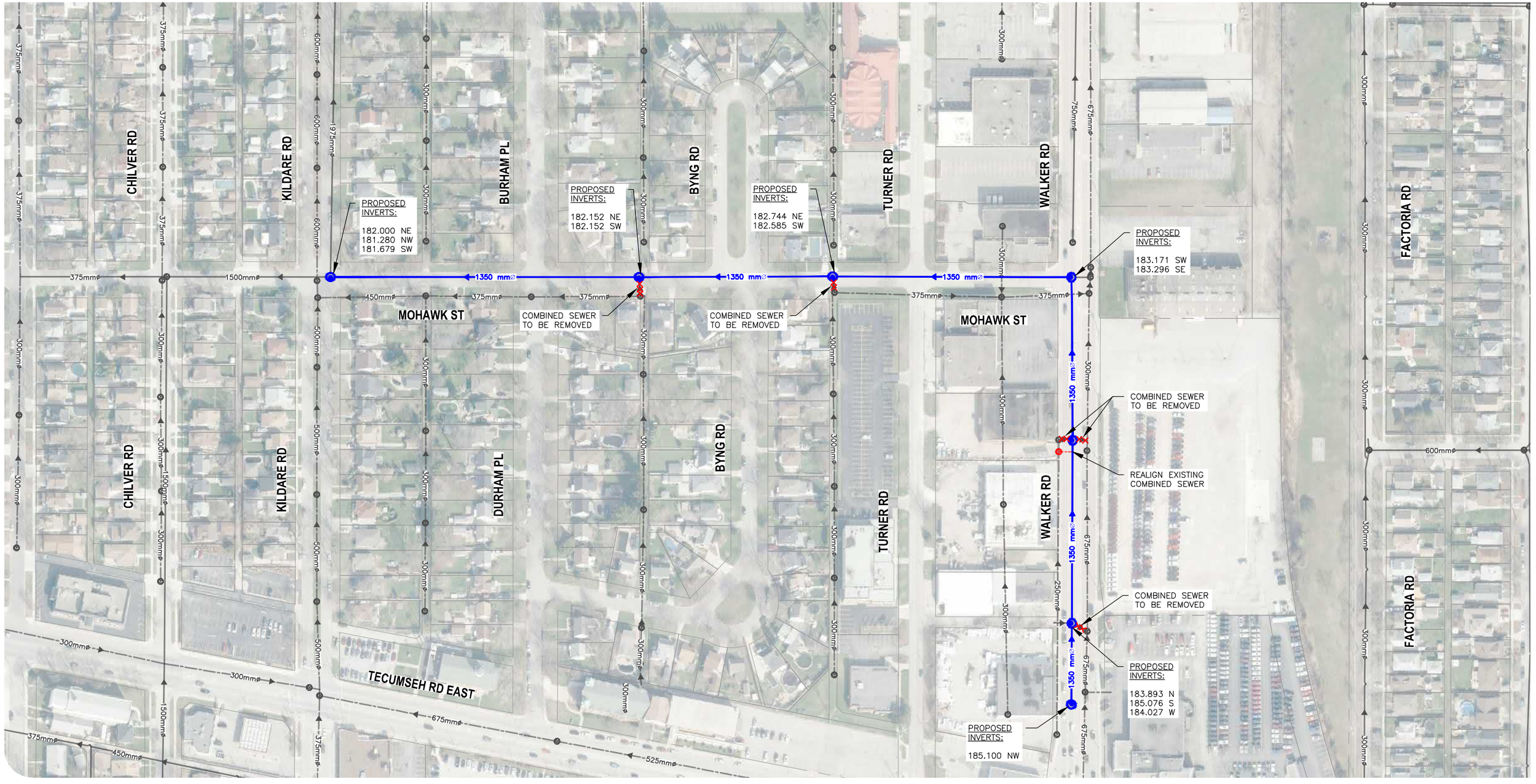
NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C18
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
WALKER ROAD SEWER
(STORM)

PROPOSED MANHOLE
PROPOSED PUMP STATION
PROPOSED STORM SEWER
EXISTING COMBINED SEWER MANHOLE
EXISTING COMBINED SEWER
EXISTING STORM SEWER MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM AND COMBINED SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN.
- PROPOSED STORM SEWER ALIGNMENT TO BE CONFIRMED DURING DETAILED DESIGN.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-C19
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREAS 1 AND 2 (RIVERSIDE-1) (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
EXISTING STORM MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

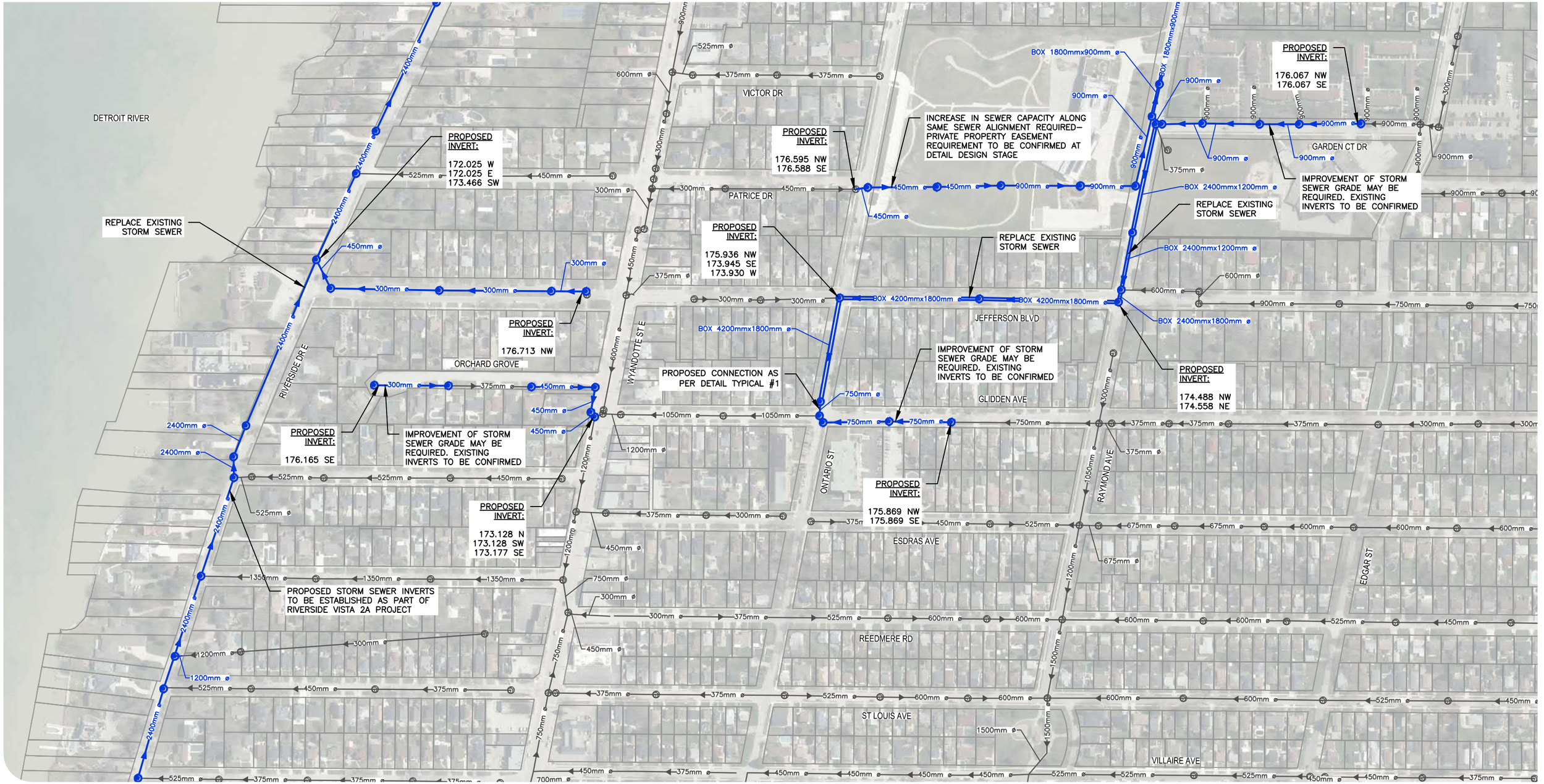
DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N W E S

STM-E1-2-1/ROAD-E2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
JEFFERSON BLVD.
(STORM)

THE CITY OF WINDSOR

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER

NOTES:

- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING

Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-E2/STM-E1-2-1/STM-E1-2-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

PROPOSED INVERT:
171.844 SW
171.844 NE
UNKNOWN N

FUTURE ST. ROSE PUMP STATION. SEE FIGURE PS-E1-ROSE 1, ST. ROSE PUMP STATION-RECOMMENDED SOLUTION

OUTLET TO DETROIT RIVER

PROPOSED CONNECTION AS PER DETAIL TYPICAL #3

BOX 3050mmx1830mm

DETROIT RIVER

PROPOSED INVERT:
168.450 NE
170.376 SW
172.600 SE

PROPOSED INVERT:
172.649 NW
171.939 NE
172.704 SE

REPLACE EXISTING STORM SEWER

PROPOSED INVERT:
173.445 NE
173.445 SW
174.406 SE

PROPOSED STORM SEWER INVERTS TO BE ESTABLISHED AS PART OF RIVERSIDE VISTA 2A PROJECT

PROPOSED INVERT:
174.271 W
173.711 E
173.711 SE

REPLACE EXISTING STORM SEWER

PROPOSED INVERT:
173.969 NW
175.133 W
175.540 E
175.100 SE

PROPOSED INVERT:
175.360 E
175.881 NW
175.479 SE

IMPROVEMENT OF STORM SEWER GRADE MAY BE REQUIRED. EXISTING INVERTS TO BE CONFIRMED

PROPOSED INVERT:
175.735 NW
175.735 W
175.726 E
175.887 SE

REPLACE EXISTING STORM SEWER

PROPOSED INVERT:
175.887 NW
175.899 W
175.899 E
176.021 SE

FUTURE ST. ROSE PUMP STATION.

PROPOSED INVERT:
171.930 SW
171.930 NE

PROPOSED CONNECTION AS PER DETAIL TYPICAL #3

PROPOSED INVERT:
168.450 NE
170.376 SW
172.600 SE

PROPOSED INVERT:
172.649 SE

PROPOSED INVERT:
172.600 NW
171.939 NE
172.704 SE

PROPOSED INVERT:
172.635 NW
172.635 SE

EDWARD AVE
VIRGINIA AVE
ST ROSE AVE
ONTARIO ST
RAYMOND AVE
PARKVIEW AVE
COVENTRY CRT
EDGAR ST
JANISSE DR
RIVERSIDE DR E
WYANDOTTE ST E
ST MARY'S BLVD
HOMEDALE BLVD
SUMACH CRES

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREAS 1 AND 2 (RIVERSIDE-2) (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER

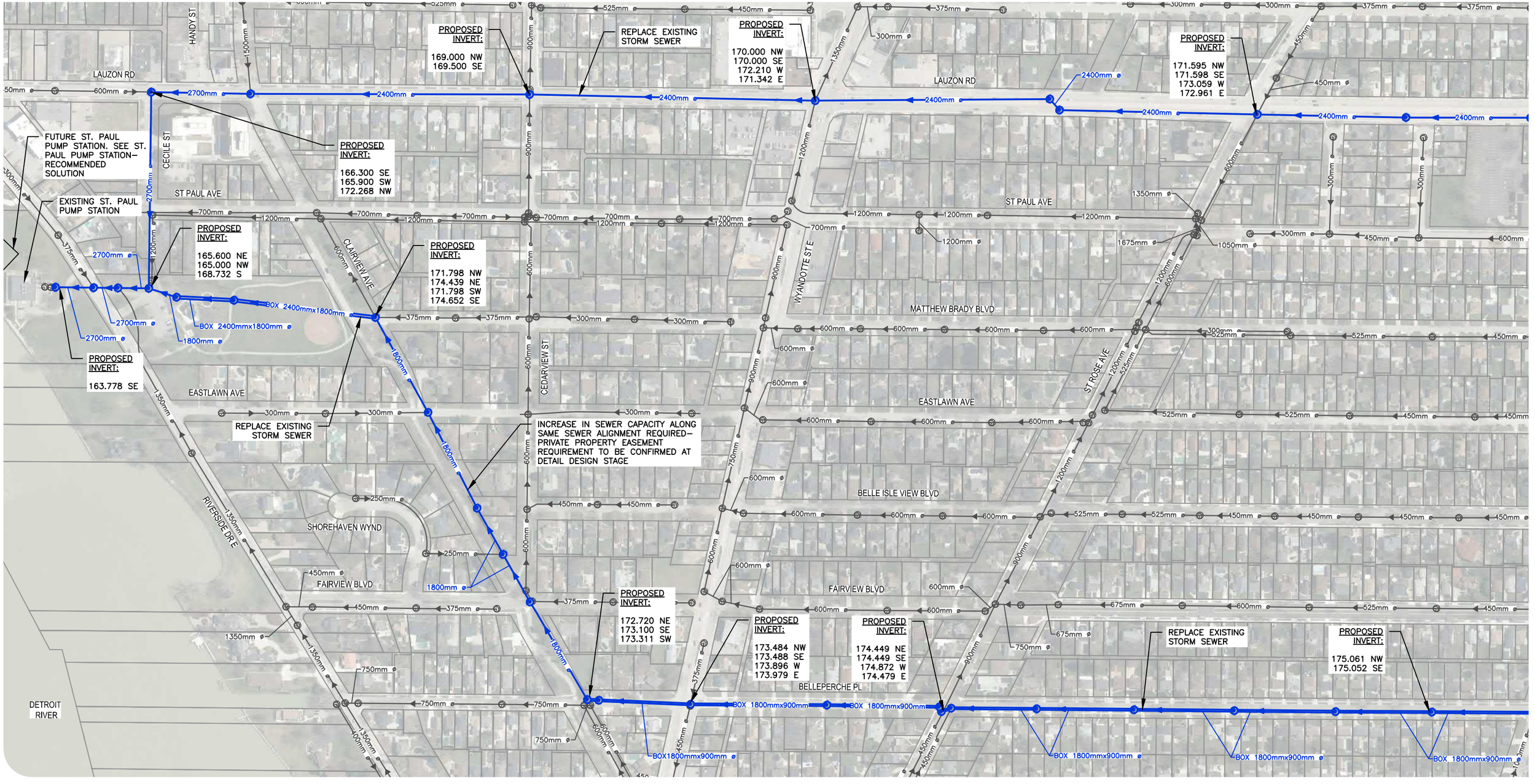
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E1-2-2/ROAD-E2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREAS 1 AND 2 (RIVERSIDE-3) (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER

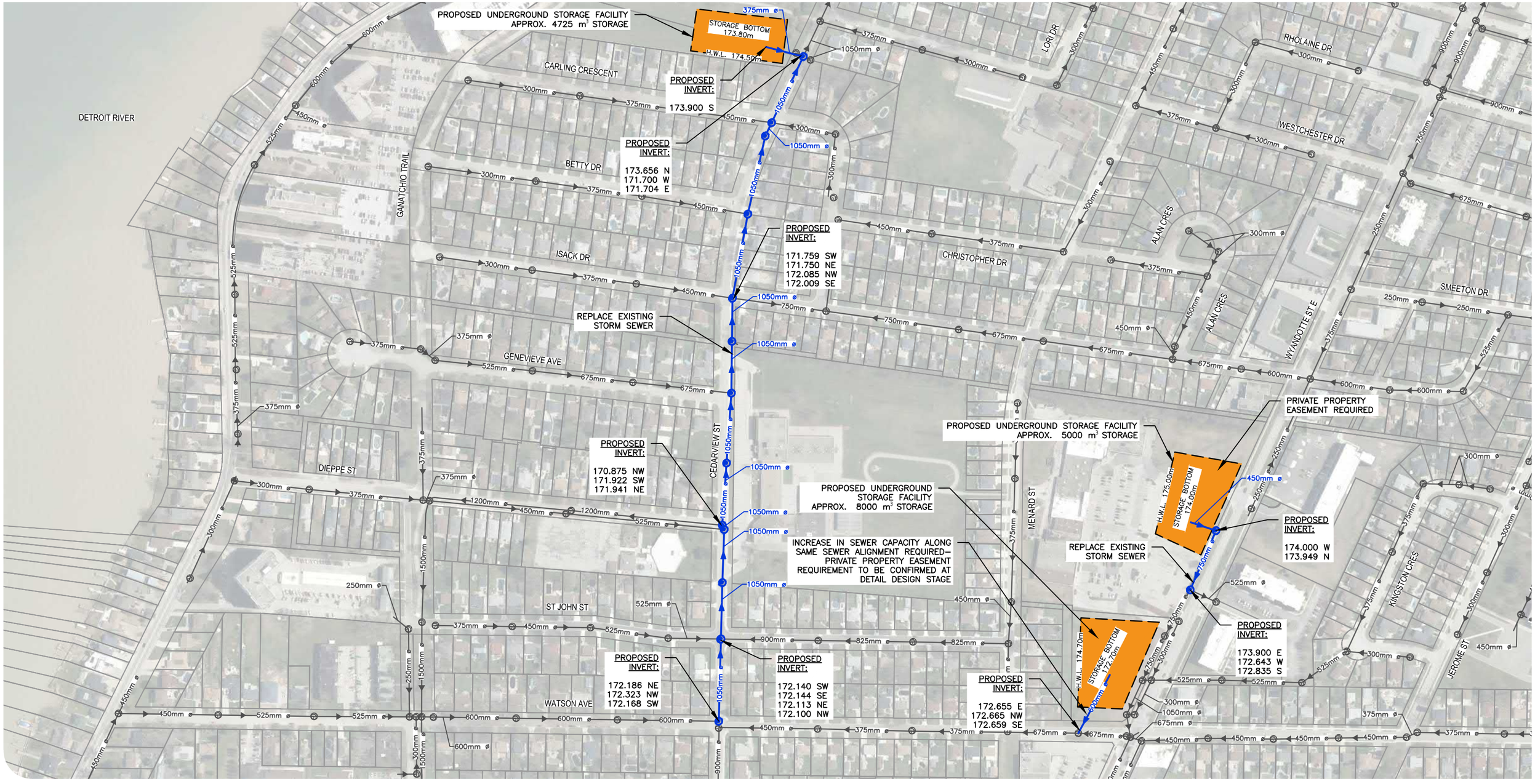
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E1-2-3/STM-E1-2-4/ROAD-E5
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 6 (ST JOHN ST) (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
EXISTING STORM MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY

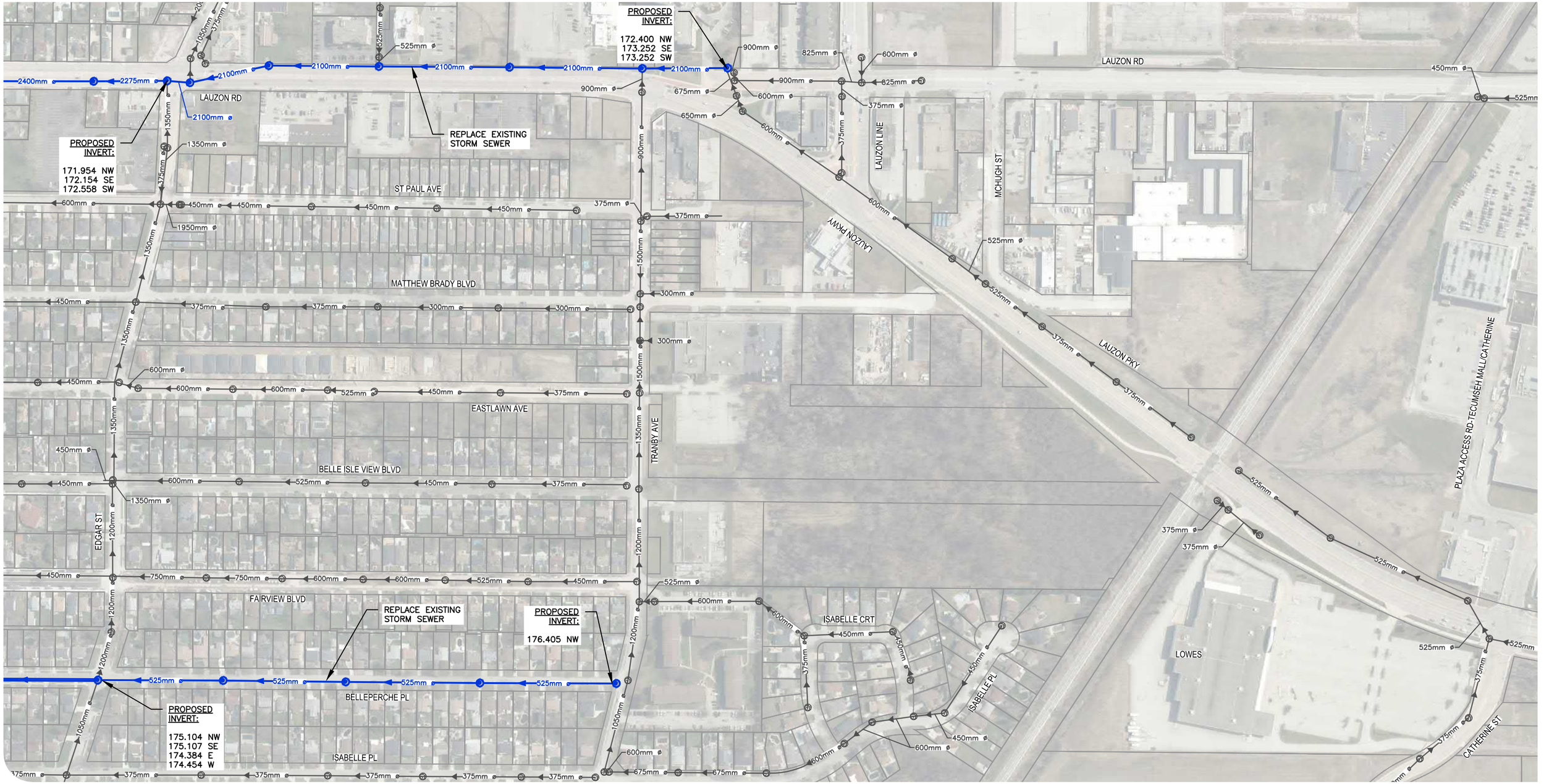
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E6-1
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREAS 1 AND 2 (RIVERSIDE-4) /LAUZON RD
(STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER

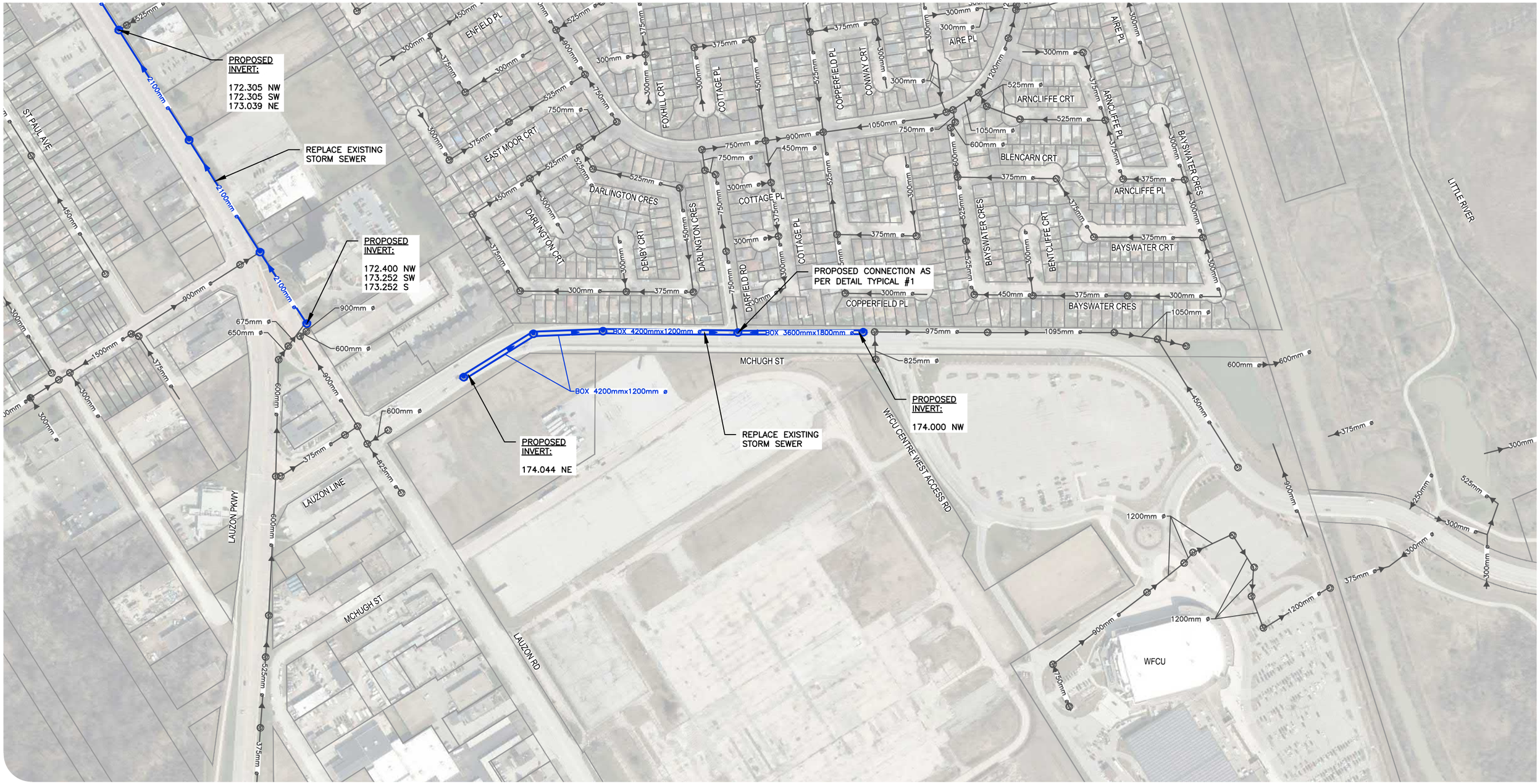
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E1-2-4 / ROAD-E5/STM-E1-2-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
MCHUGH, EAST OF LAUZON
(STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER

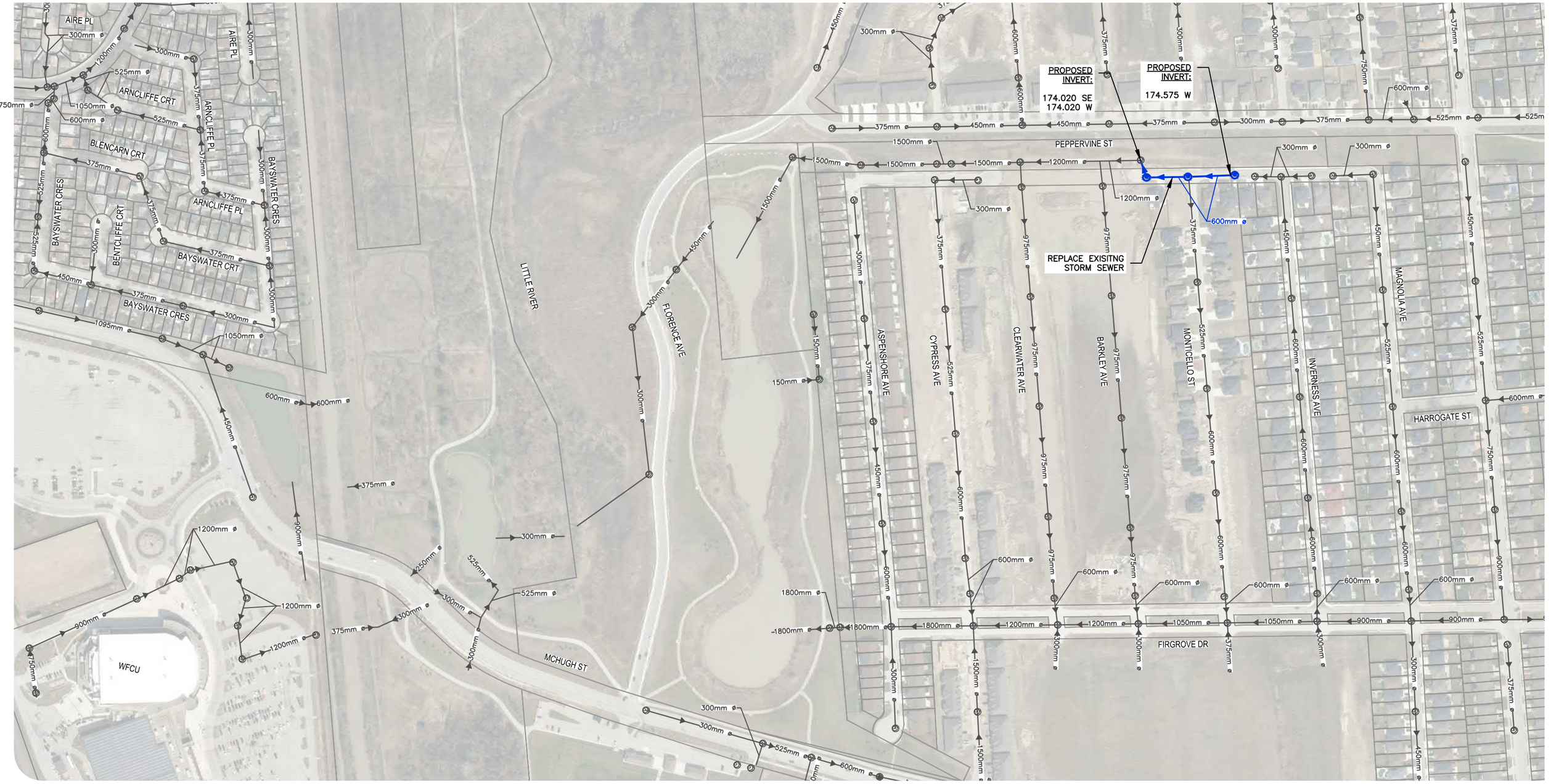
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-E6-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 6 (PERRERVINE ST) (STORM)

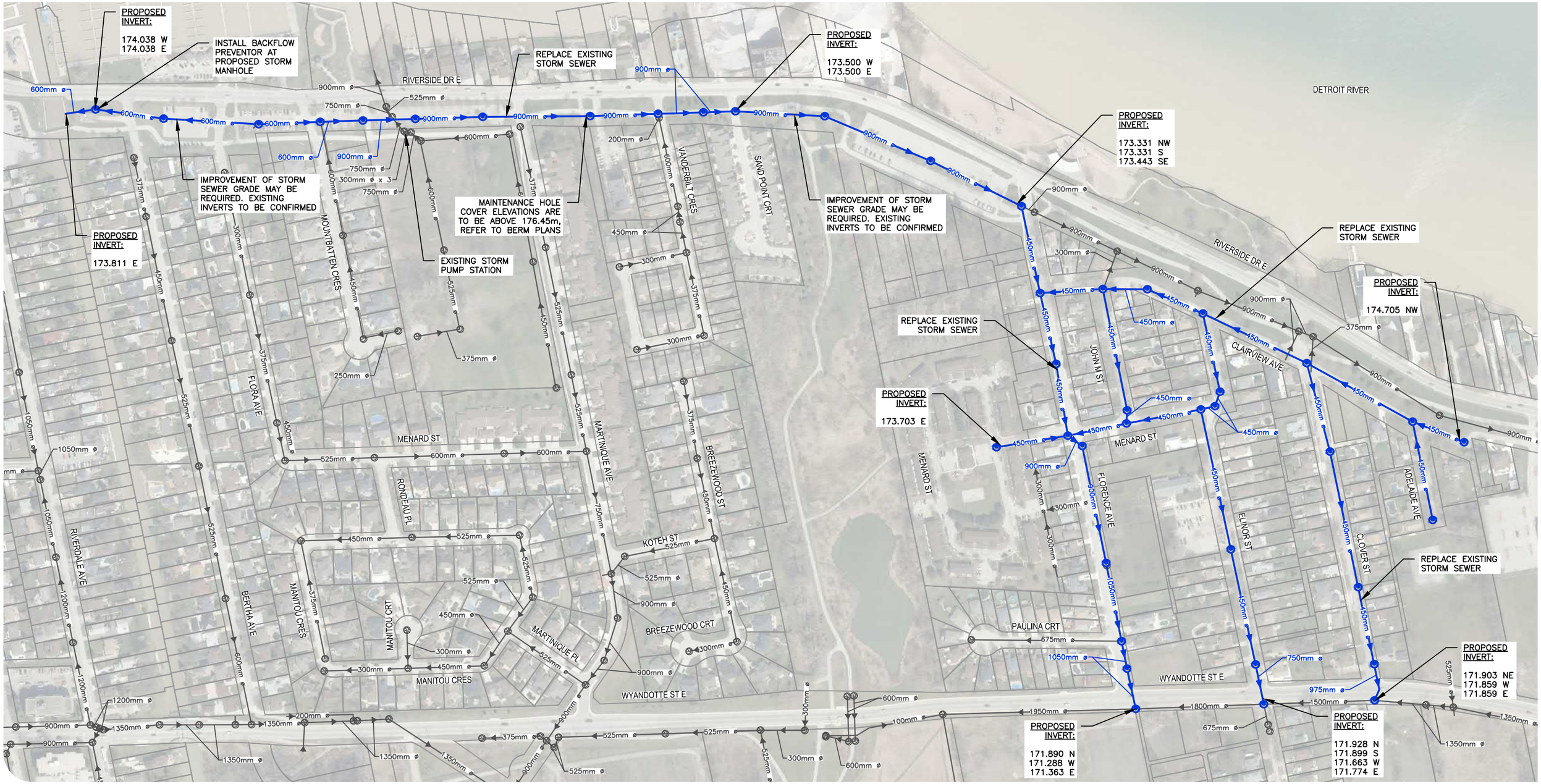
PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
EXISTING STORM MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E6-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 6 (RIVERSIDE) (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
EXISTING STORM MANHOLE
EXISTING STORM SEWER

NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

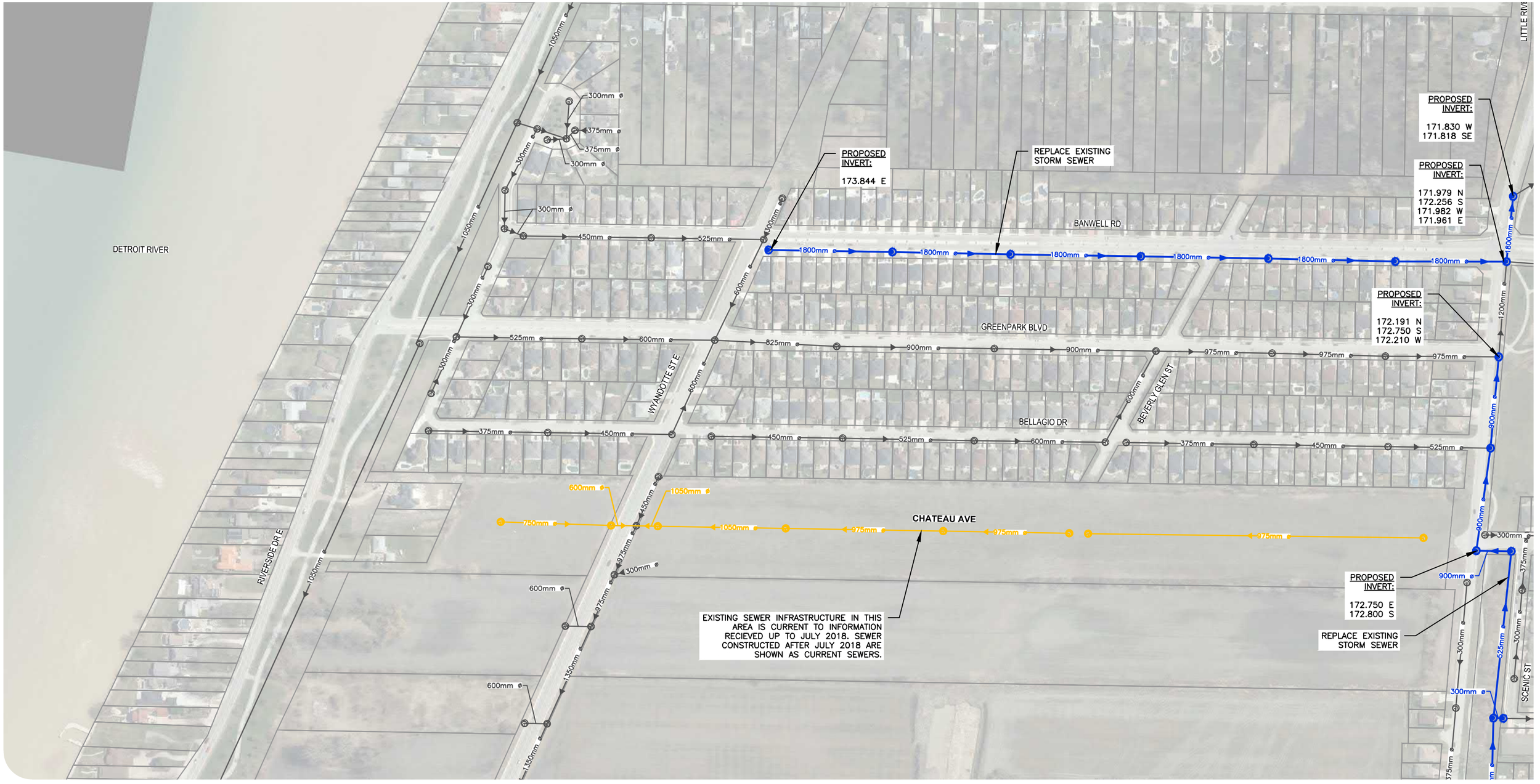
DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

N W E S

STM-E6-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
BANWELL RD
(STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
EXISTING STORM MANHOLE
EXISTING STORM SEWER
CURRENT STORM MANHOLE
CURRENT STORM SEWER

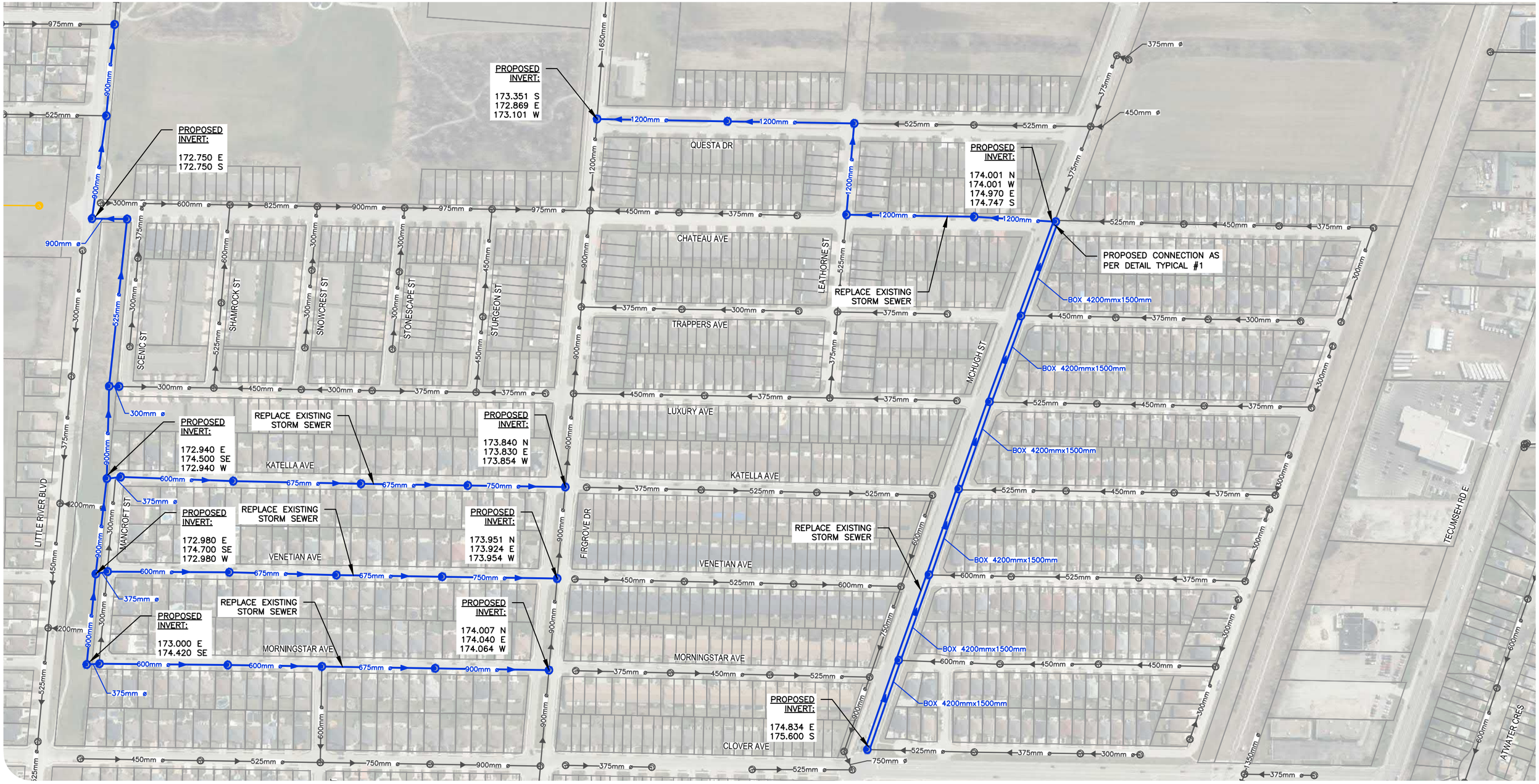
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-E10/STM-E5-1-1
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 5 (BLUE HERON POND-1) (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER

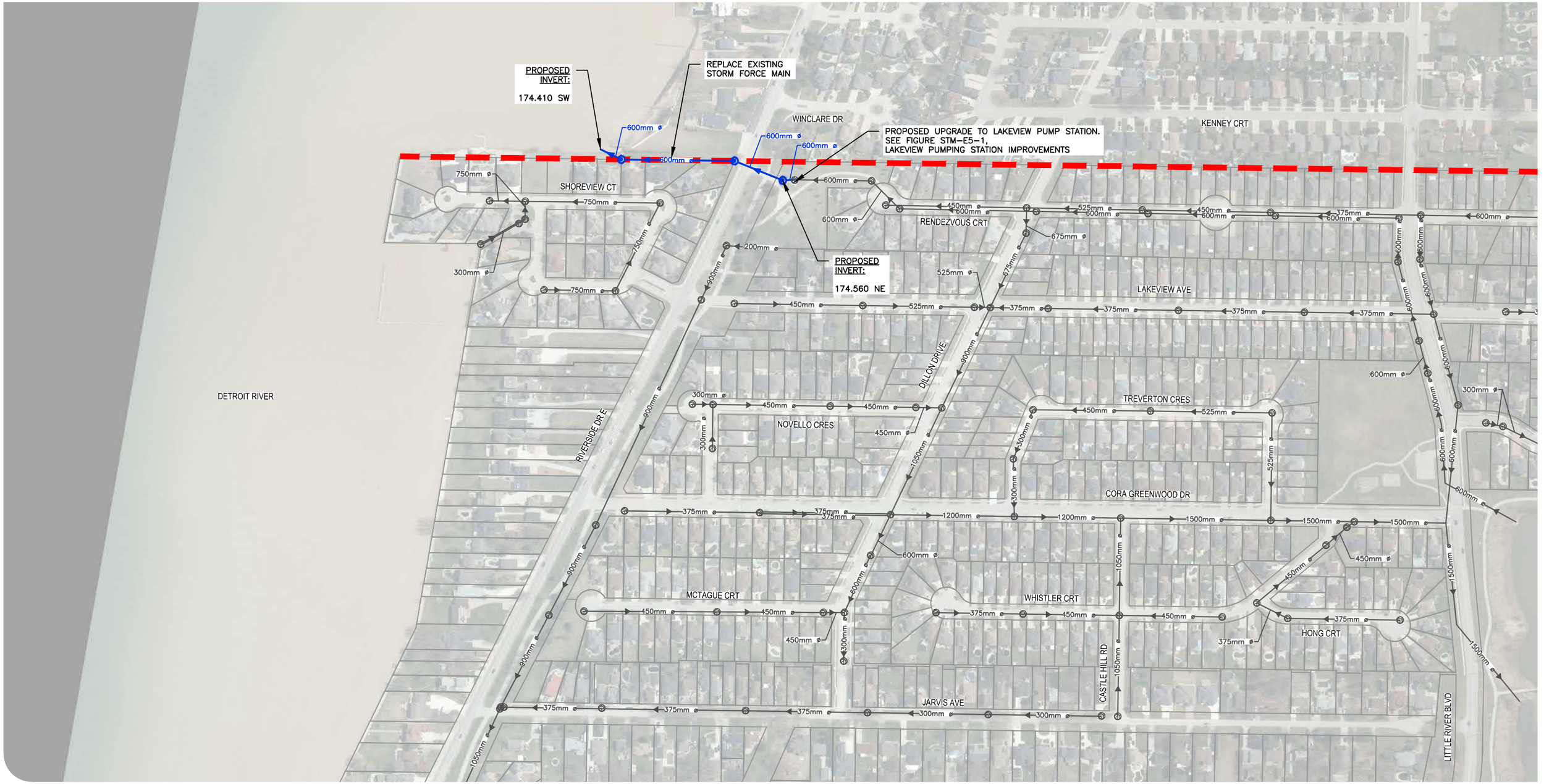
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E5-1-1
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 5 (SHOREVIEW CT) (STORM)

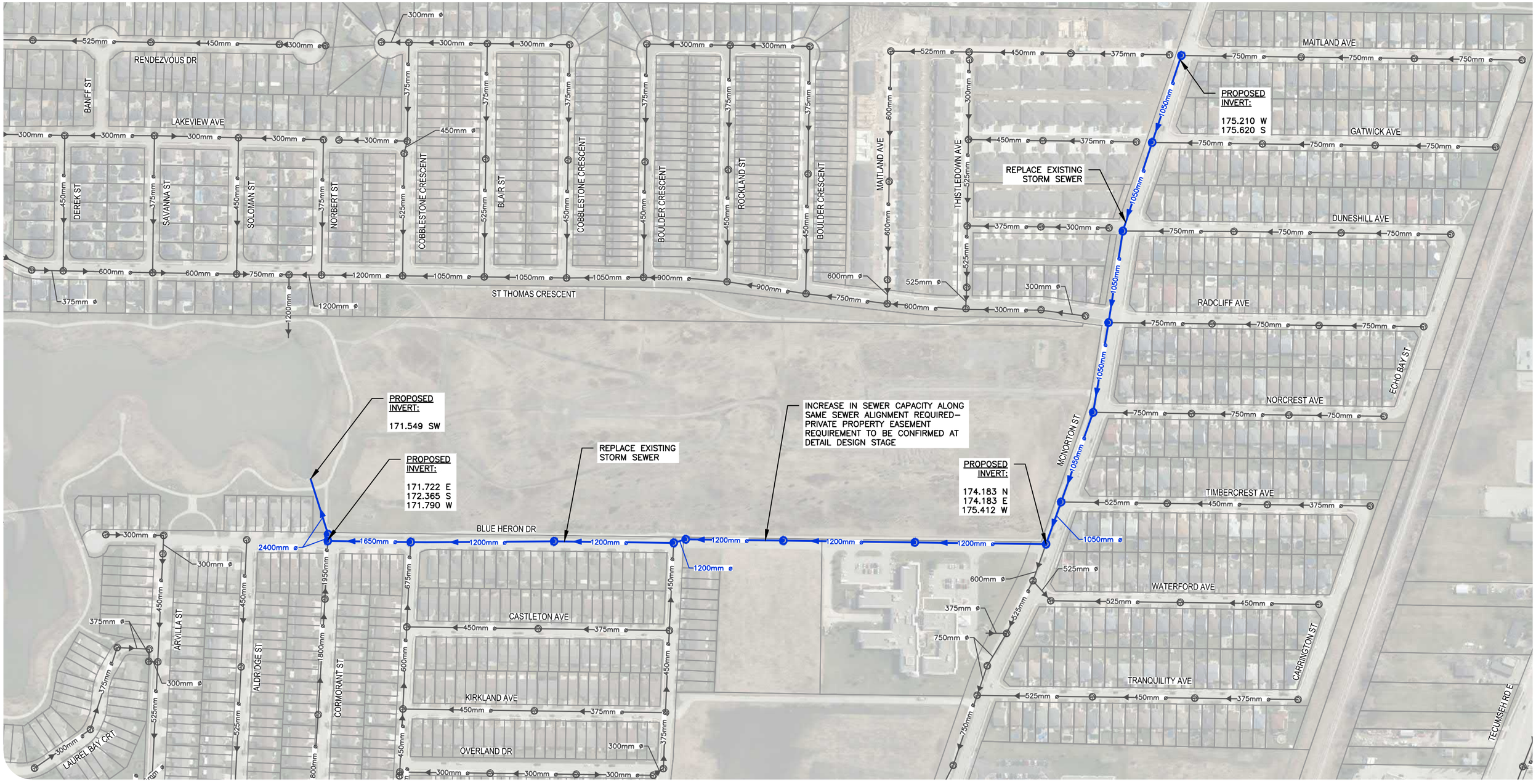
PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
EXISTING STORM MANHOLE
EXISTING STORM SEWER
WINDSOR/TECUMSEH BOUNDARY

NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E5-1-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 5 (BLUE HERON POND-2) (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
EXISTING STORM MANHOLE
EXISTING STORM SEWER

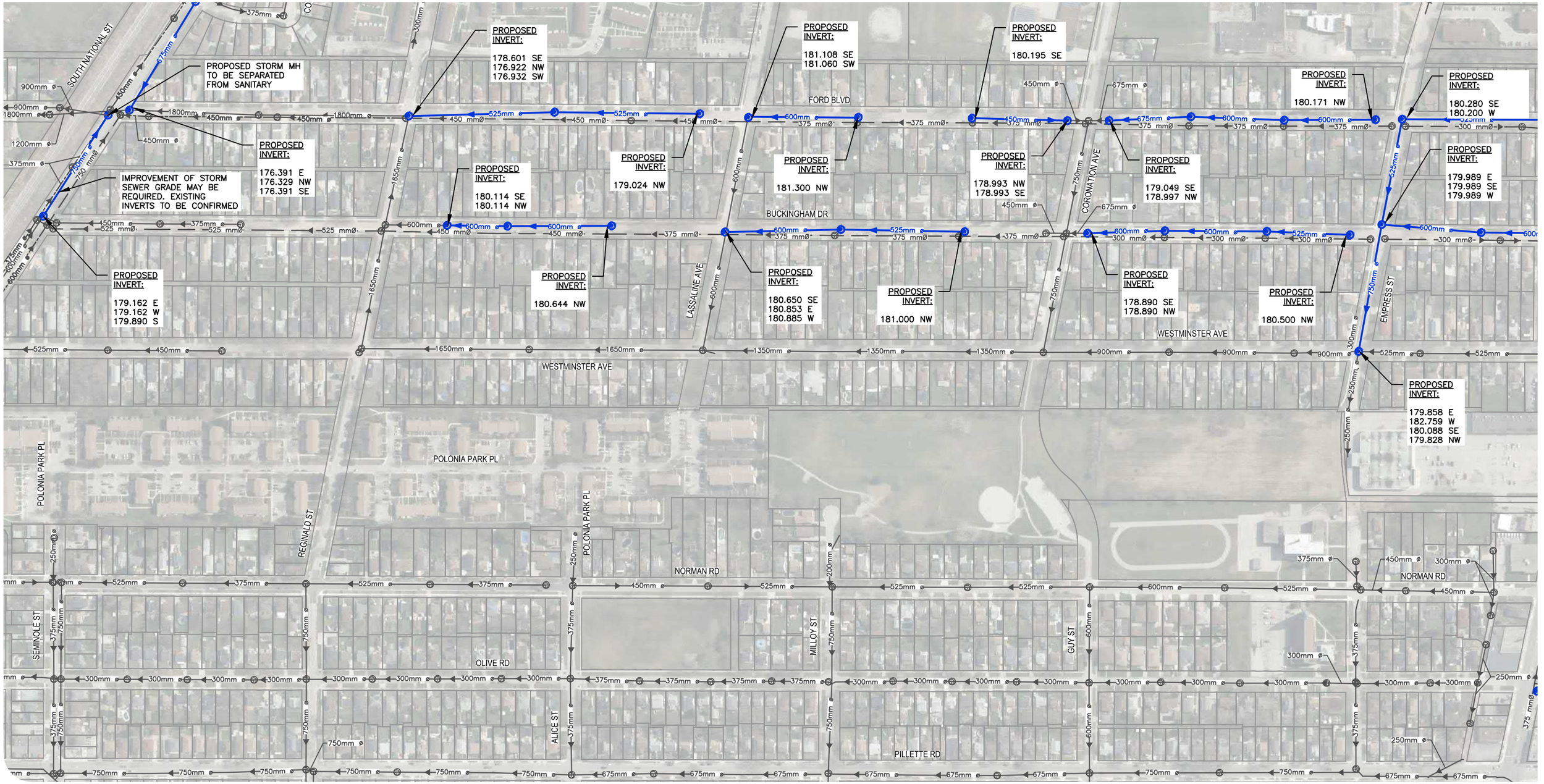
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E5-1-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 3/4 (FORD BLVD) (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
EXISTING SANITARY SEWER
EXISTING STORM MANHOLE
EXISTING STORM SEWER
EXISTING COMBINED SEWER

NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E3-2-1/STM-E3-2-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

PROPOSED INVERT:
180.300 NW

PROPOSED INVERT:
180.021 E
181.000 SE
180.021 W

PROPOSED INVERT:
181.700 NW

PROPOSED INVERT:
181.000 NW

REPLACE EXISTING STORM SEWER

PROPOSED INVERT:
181.821 NW

PROPOSED INVERT:
182.247 NE
181.934 SW
182.454 NW

PROPOSED INVERT:
182.542 NW

PROPOSED INVERT:
180.321 E
181.021 SE
180.321 W

EXISTING INVERTS TO BE CONFIRMED. IF THERE IS A CONFLICT THEN SANITARY AND STORM SEWERS TO BE RELOCATED SEPARATELY

PROPOSED INVERT:
180.621 E
181.562 SW
180.621 W

IMPROVEMENT OF STORM SEWER GRADE MAY BE REQUIRED. EXISTING INVERTS TO BE CONFIRMED

REPLACE EXISTING STORM SEWER

PROPOSED INVERT:
182.271 NW

PROPOSED INVERT:
180.921 E
181.137 SE
181.000 W

PROPOSED INVERT:
181.780 NW

PROPOSED INVERT:
181.421 E

FORD BLVD
ARMSTRONG AVE
LITTLER CRES
JOINVILLE AVE
RIVARD AVE
BUCKINGHAM DR
TECUMSEH RD E
WESTMINSTER BLVD
ROSE ST
HAIG AVE
IRIS PL
ADSTOLL AVE
ROYAL CRT
PRINCESS AVE
IDEL CRT
EDSEL CRT
ELYRIA CRT
MCDONALD CRT
PASADENA CRT
NORMAN RD
OLIVE RD
GRAND MARAIS COOPERATIVE HOUSING

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 3/4 (BUCKINGHAM DR) (STORM)

THE CITY OF WINDSOR

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER
EXISTING COMBINED SEWER

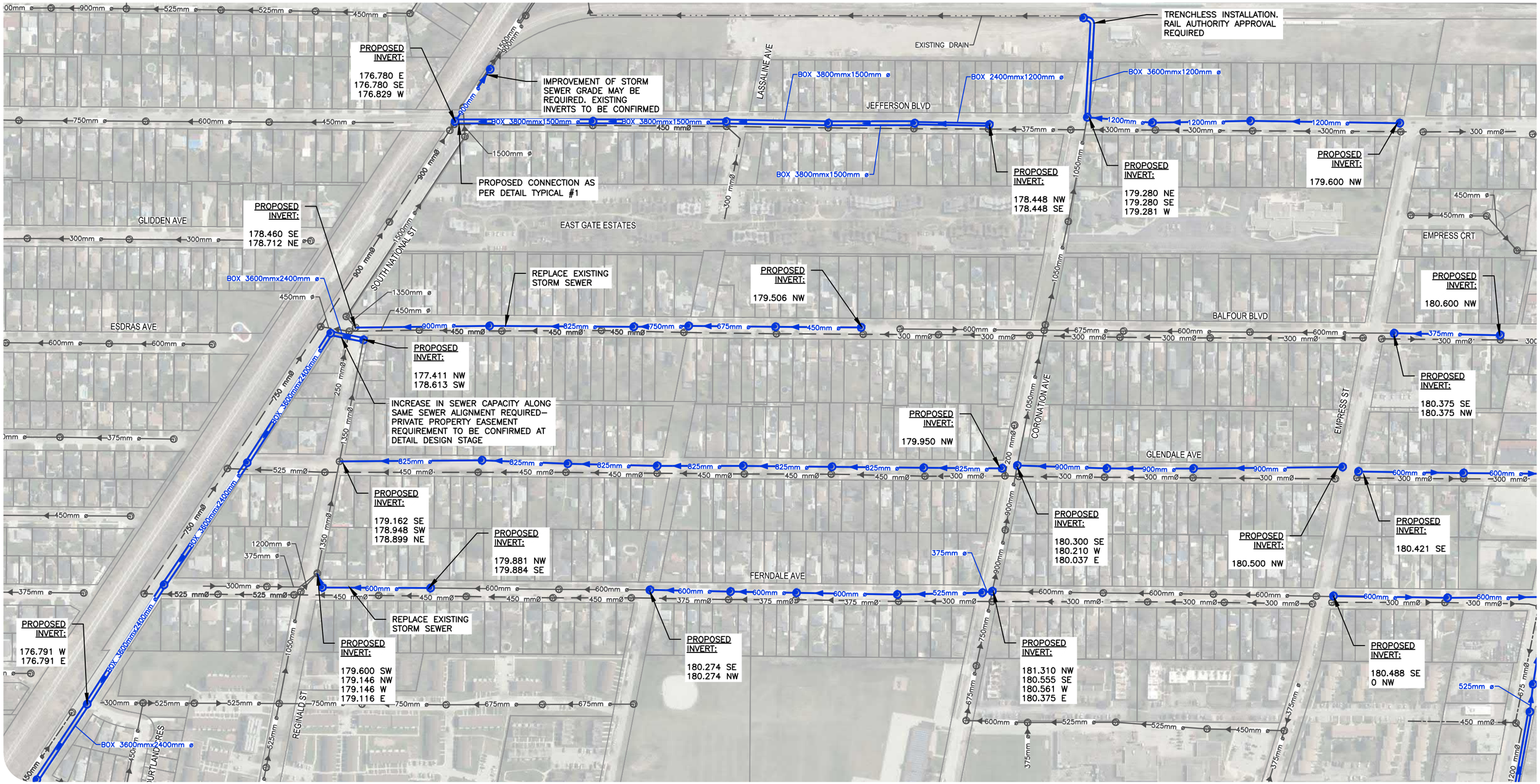
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E3-2-2/STM-E3-2-1/STM-E3-2-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
JEFFERSON BLVD. AND SOUTH NATIONAL (STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER
EXISTING COMBINED SEWER
EXISTING DRAIN

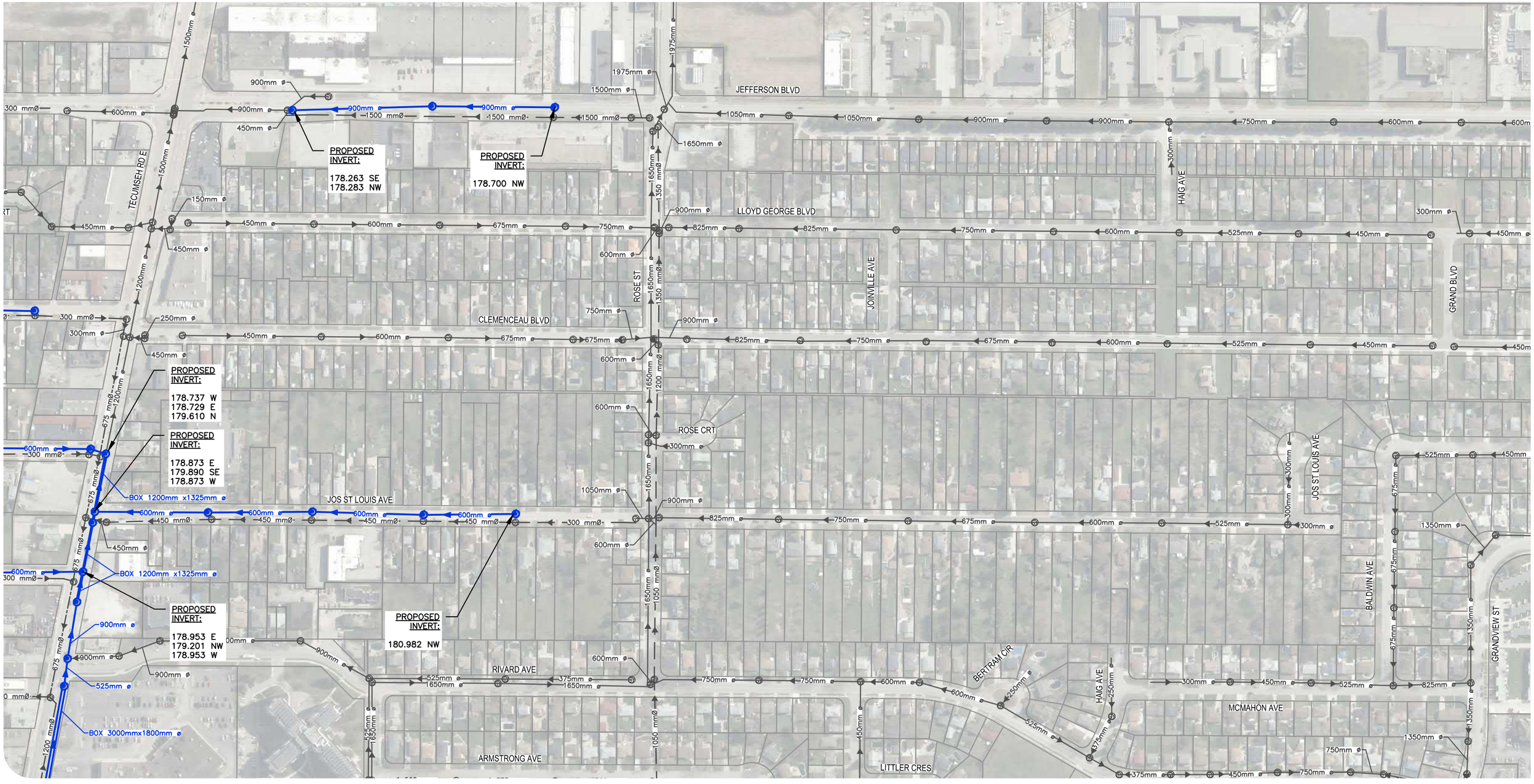
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-E3/STM-E3-2-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
STORM PROBLEM AREA 3/4 (FOUNTAINEBLEU AND LAUZON) (STORM)

THE CITY OF WINDSOR

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER
EXISTING COMBINED SEWER
EXISTING SANITARY SEWER

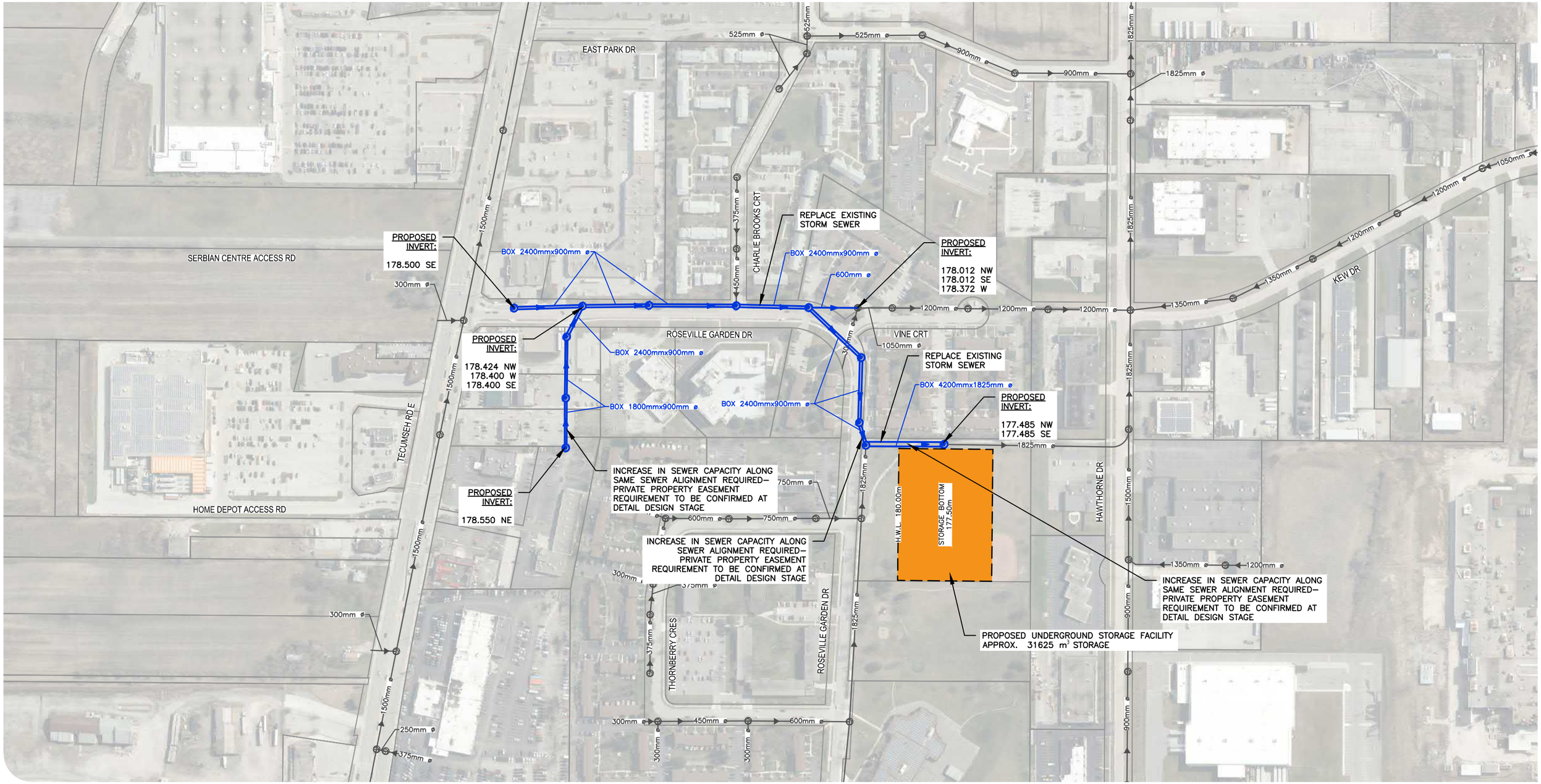
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-E3-2-3/ROAD-E3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
ROSEVILLE PUBLIC SCHOOL (STORM)

THE CITY OF WINDSOR

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY

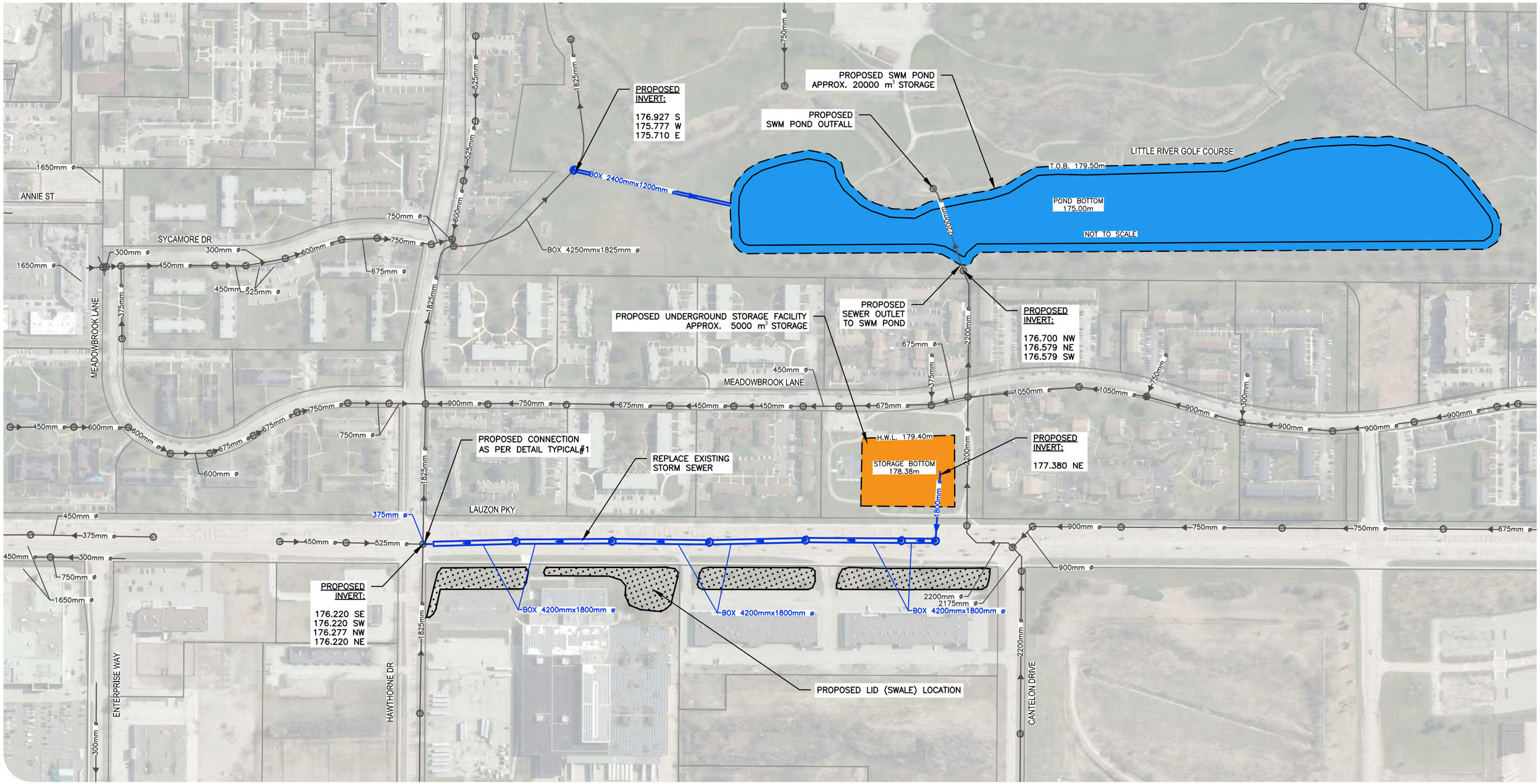
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-E11
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PREFERRED SOLUTION:
LAUZON PARKWAY
(STORM)

PROPOSED STORM MANHOLE
PROPOSED STORM SEWER
PROPOSED IN-LINE STORAGE
EXISTING STORM MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY
PROPOSED SWM POND
PROPOSED LID SWALE

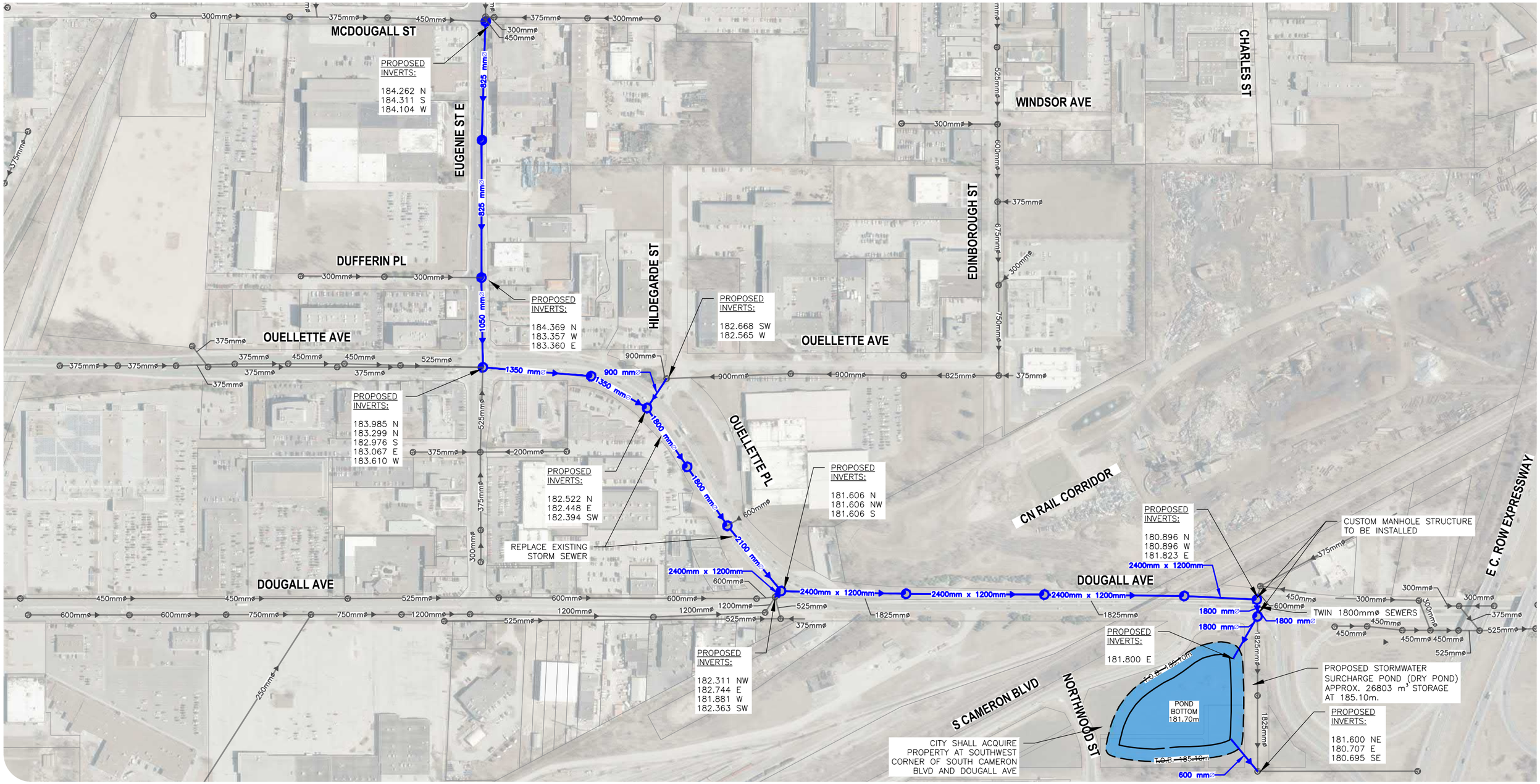
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN
- AT SANITARY OR COMBINED SEWER CROSSINGS / PROPOSED STORM INLINE STORAGE, REFER TO DETAIL TYPICAL #2

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: OC
CHECKED BY: DM
DESIGNED BY: SD
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-E4-3
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
DOUGALL AVENUE AND EUGENIE STREET EAST (STORM)

PROPOSED MANHOLE
PROPOSED STORM SEWER
EXISTING MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY
PROPOSED SWM POND

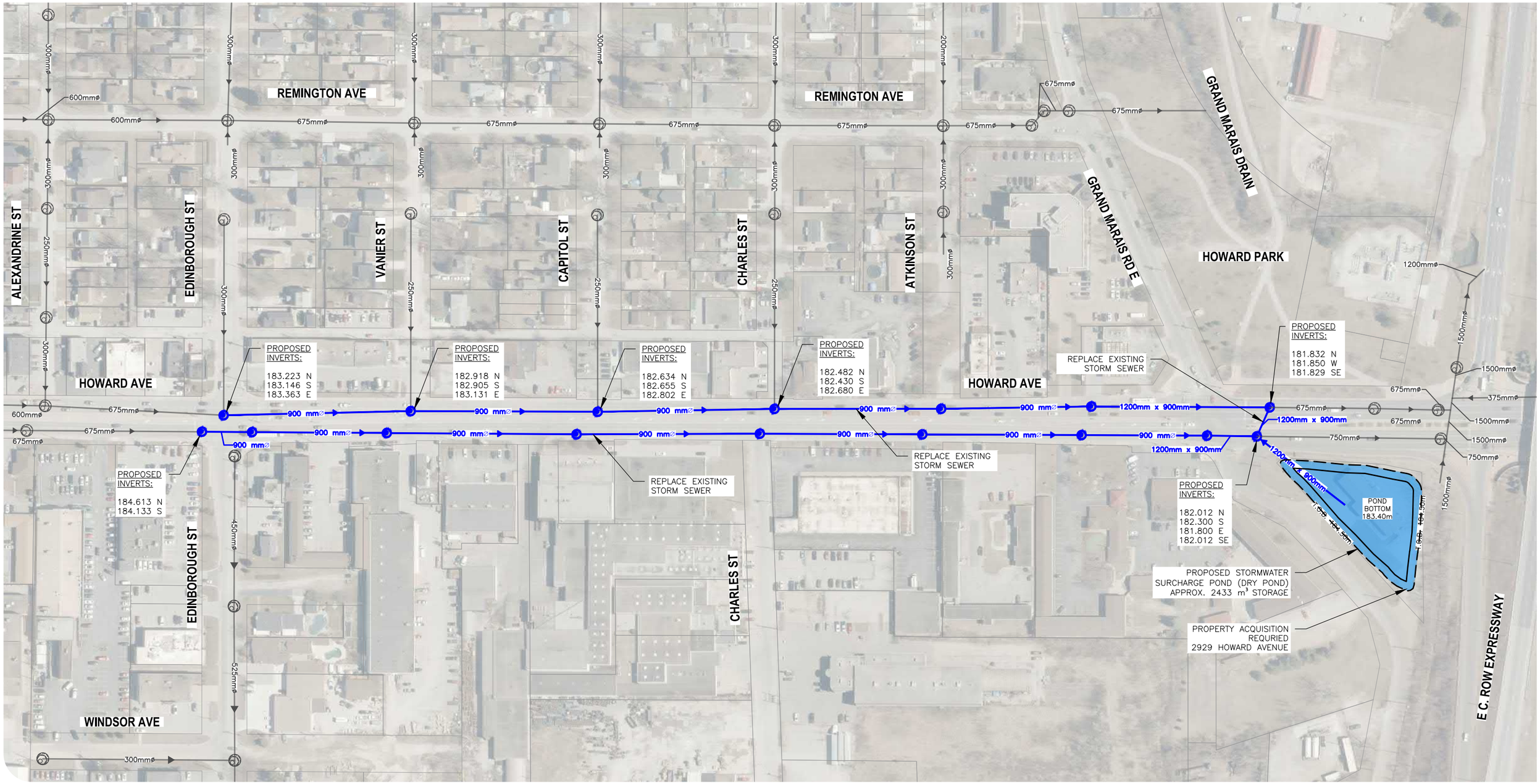
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-S1-1
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
HOWARD AVENUE
(STORM)

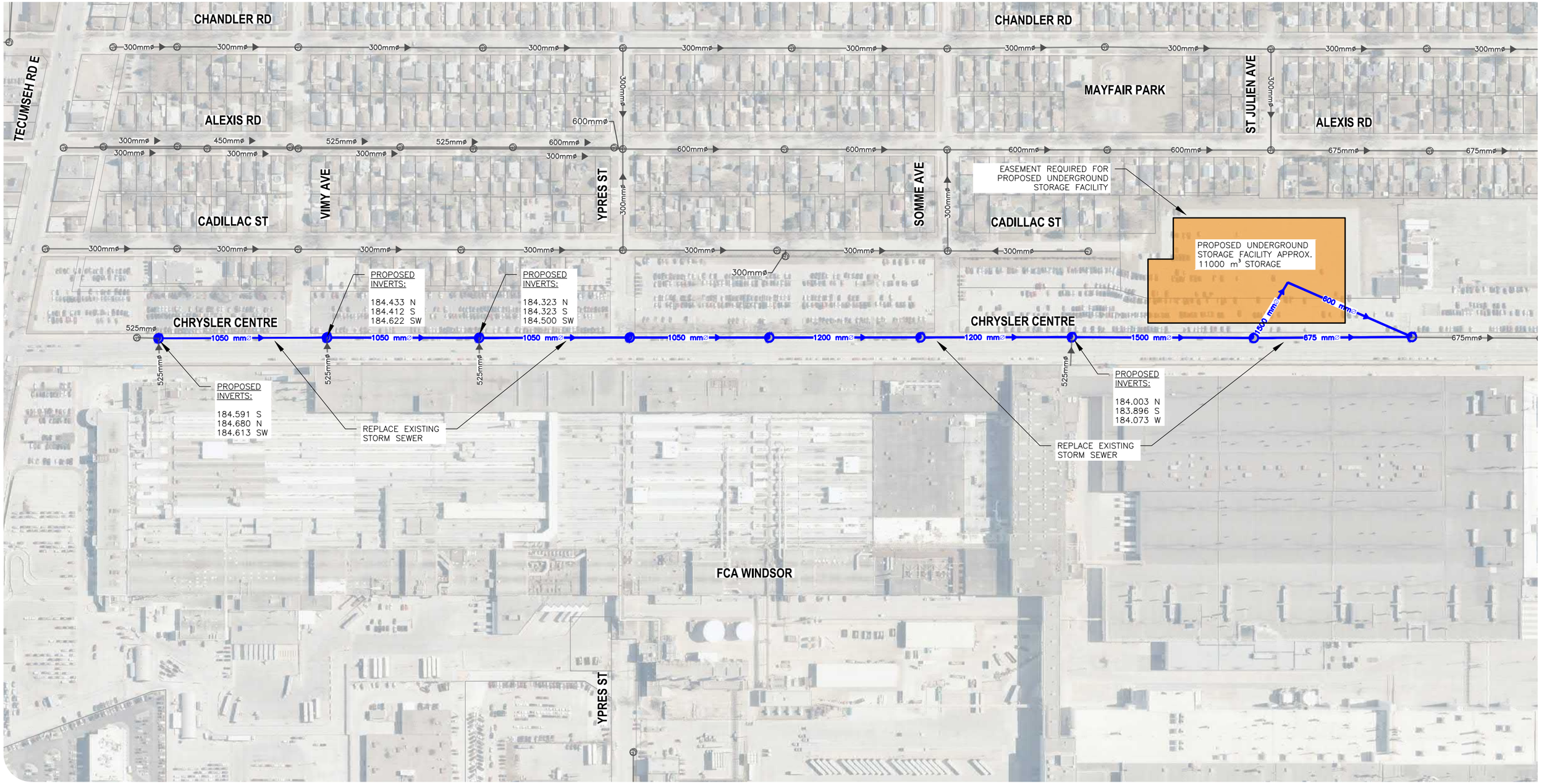
PROPOSED MANHOLE
PROPOSED STORM SEWER
EXISTING MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY
PROPOSED SWM POND

NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-S2-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
CHRYSLER CENTRE
(STORM)

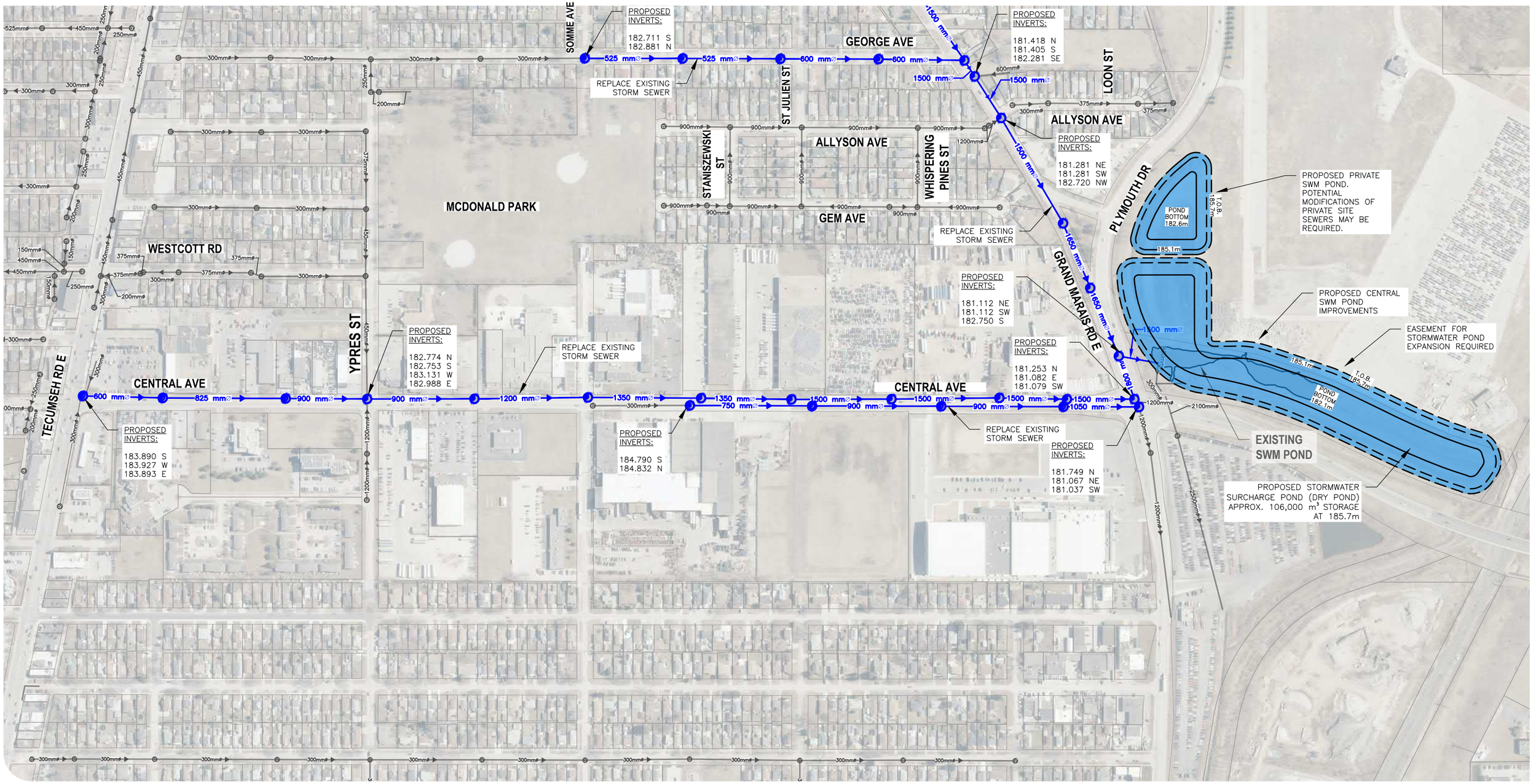
PROPOSED MANHOLE
PROPOSED STORM SEWER
EXISTING MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY
PROPOSED SWM POND

NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

ROAD-S3-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
CENTRAL, PILLETTE AND REGIONAL (STORM)

PROPOSED MANHOLE
PROPOSED STORM SEWER
EXISTING MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY
PROPOSED SWM POND
EXISTING SWM POND

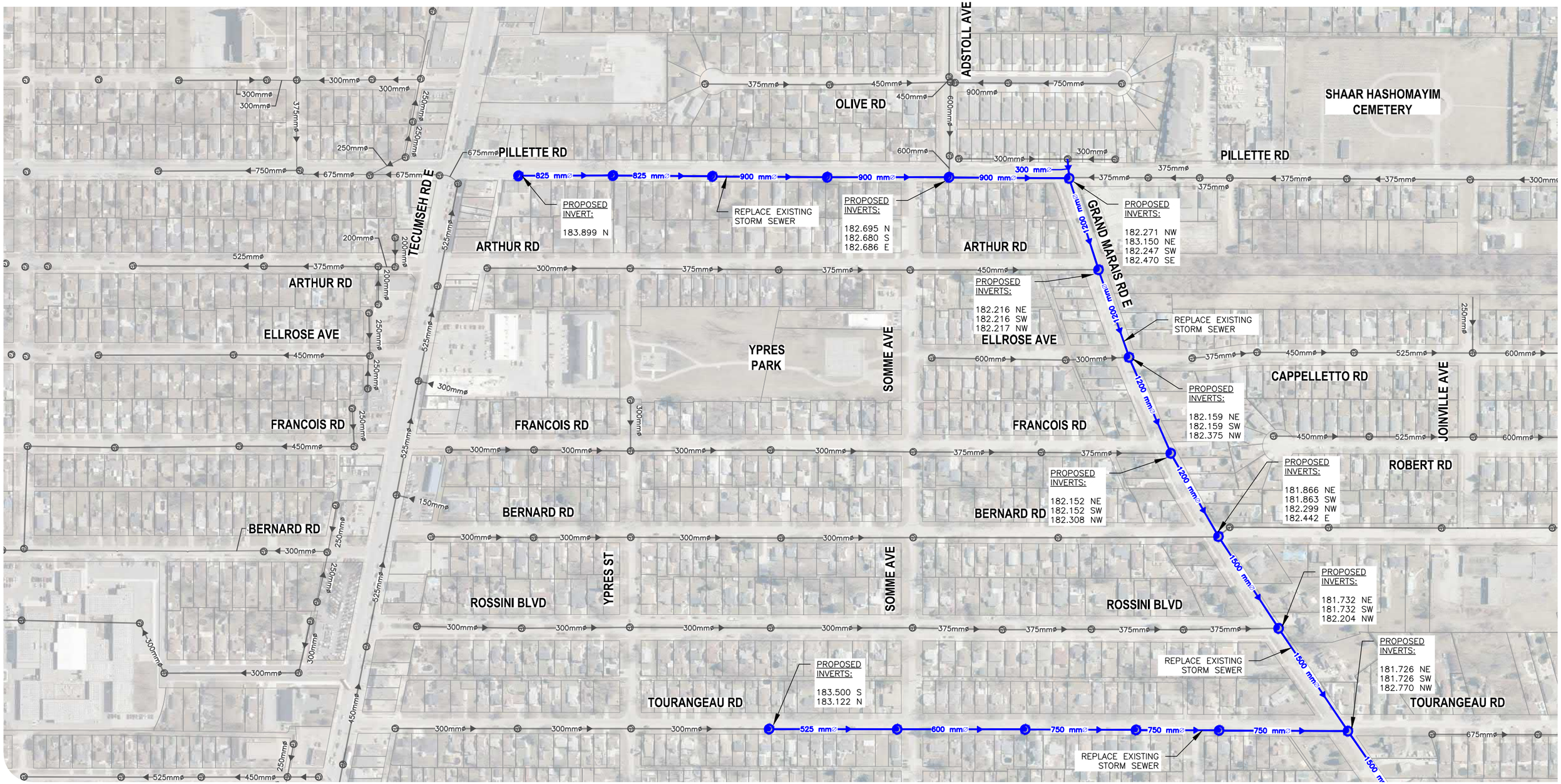
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-S7-3-1
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
CENTRAL, PILLETTE AND REGIONAL (STORM)

PROPOSED MANHOLE
PROPOSED STORM SEWER
EXISTING MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY
PROPOSED SWM POND

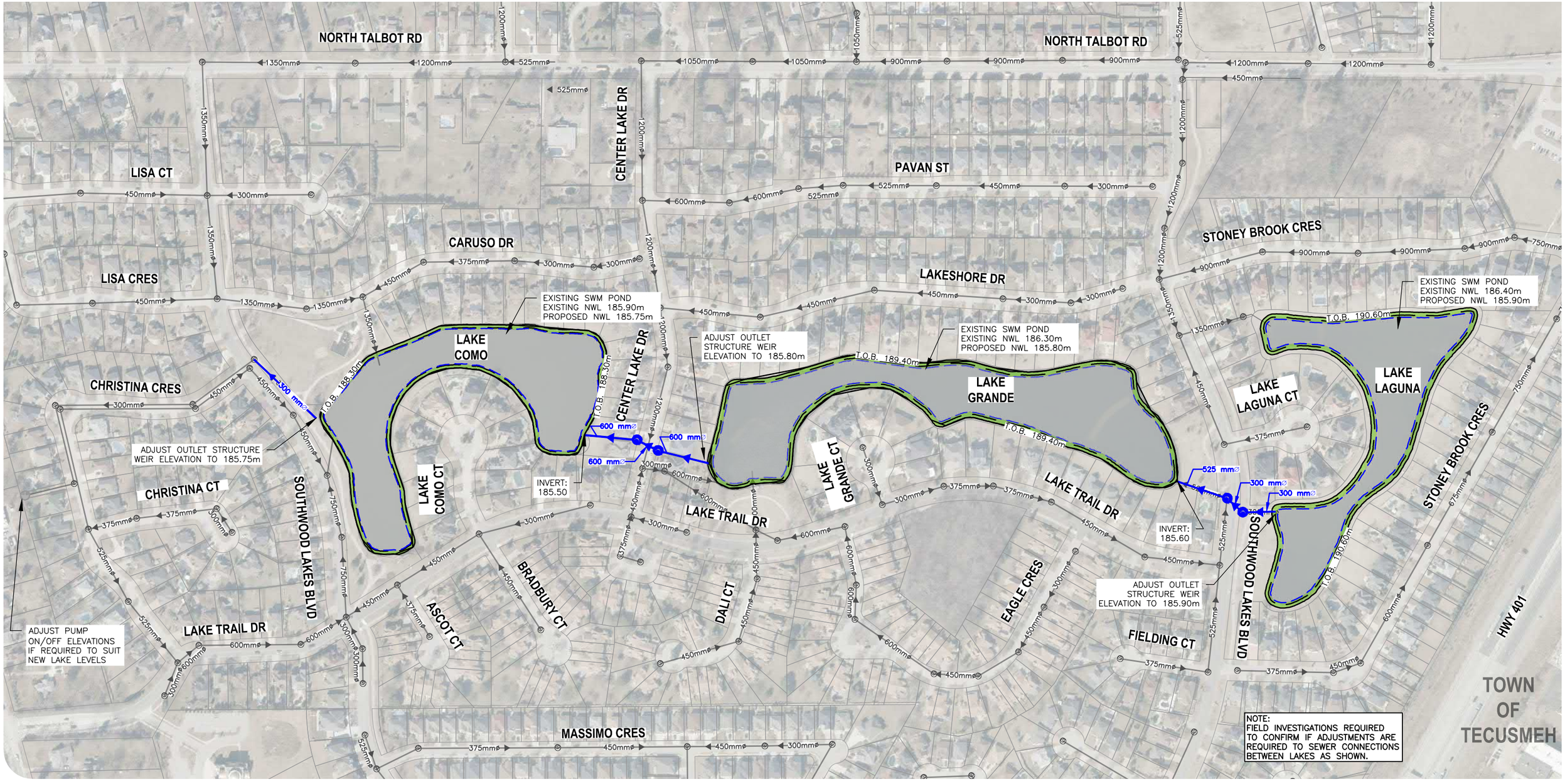
NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING DETAILED DESIGN
- PROPOSED STORM SEWER ALIGNMENTS TO BE CONFIRMED DURING DETAILED DESIGN

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-S7-3-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION:
SOUTHWOOD LAKES
(STORM)

PROPOSED MANHOLE
PROPOSED STORM SEWER
EXISTING PUMP STATION
EXISTING MANHOLE
EXISTING STORM SEWER
PROPOSED UNDERGROUND STORAGE FACILITY
PROPOSED SWM POND
EXISTING SWM POND
RESTORATION TO PROPOSED NWL
EXISTING NWL (NORMAL WATER LEVEL)
PROPOSED NWL (NORMAL WATER LEVEL)

NOTES:
- EXISTING STORM SEWER INVERTS TO BE CONFIRMED DURING TO DETAILED DESIGN

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: JTB
CHECKED BY: CDP
DESIGNED BY: TJN
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE: N.T.S.

STM-S8-2
PROJECT: 17-6638 STATUS: FINAL DATE: NOVEMBER 2020

Appendix F-3

Coastal Flood Protection Solutions

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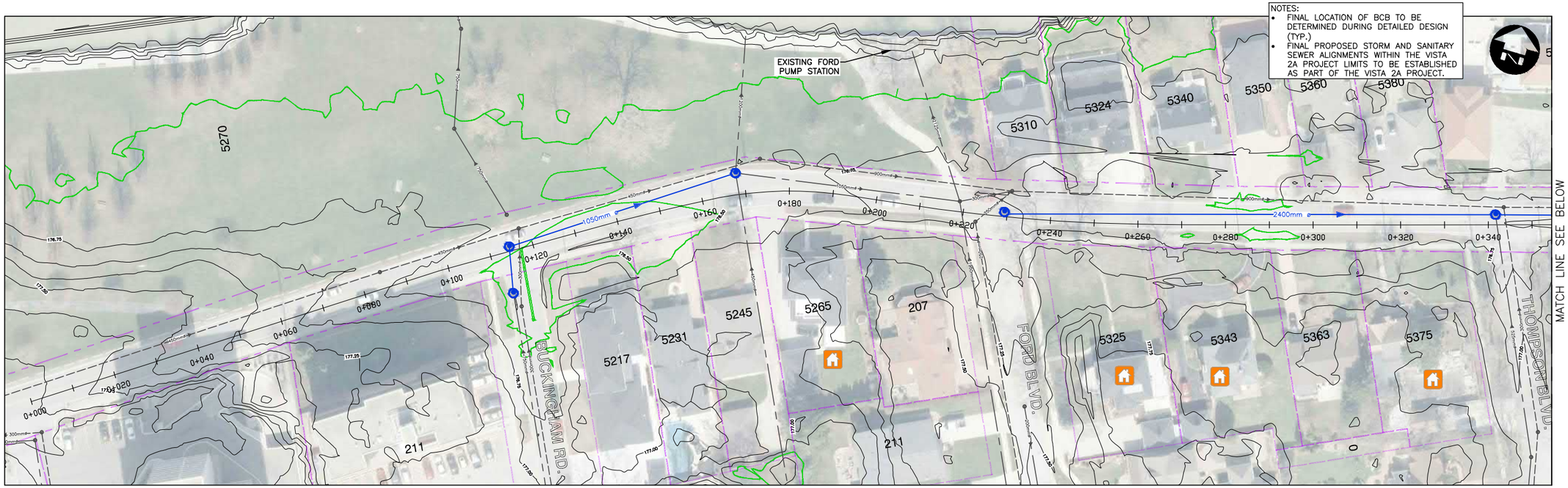
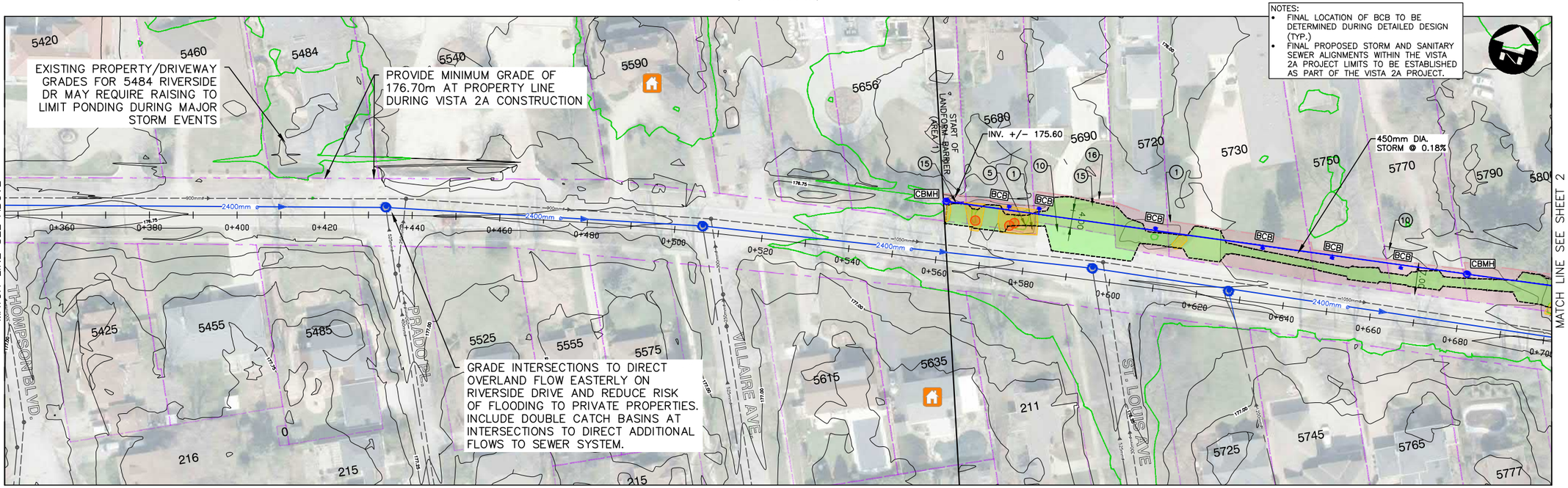


RIVERSIDE DRIVE
(STA. 0+000 TO 0+350)



RIVERSIDE DRIVE
(STA. 0+350 TO 0+700)

KEYED NOTES:

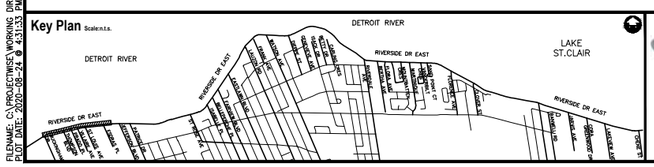
BELOW LEGEND IDENTIFIES REQUIRED SITE WORKS NOTED ON PLANS AS A PART OF THE LANDFORM BARRIER CONSTRUCTION WORKS.

1. RELOCATE EXISTING UTILITY POLE
2. RELOCATE EXISTING GUY WIRE/POLE
3. RELOCATE EXISTING FH
4. RELOCATE EXISTING WV
5. RELOCATE EXISTING BELL PEDESTAL
6. RELOCATE EXISTING GAS METER
7. RELOCATE EXISTING GAS VALVE
8. RELOCATE EXISTING TRAFFIC SIGNAL
9. RELOCATE EXISTING TEST STATION
10. RELOCATE/REPLACE EXISTING CB
11. RELOCATE EXISTING ROAD SIGN
12. REMOVE EXISTING TREE
13. REMOVE EXISTING SHRUB
14. REMOVE/RELOCATE EXISTING LANDSCAPING
15. REMOVE/RELOCATE EXISTING FENCE
16. REMOVE/RELOCATE EXISTING STONE/BRICK LANDSCAPE WALL
17. ADJUST EXISTING MH
18. ADJUST EXISTING CB
19. ADJUST EXISTING CO

LEGEND

	176.50m (CONTOUR)
	MAJOR CONTOURS (0.5m)
	MINOR CONTOURS (0.25m)
	PROPERTY/ROW LINE
	RECOMMENDED SOLUTION
	HERITAGE PROPERTY
	EXISTING STORM SEWER
	EXISTING SANITARY SEWER
	EXISTING COMBINED SEWER
	EXISTING MANHOLE
	PROPOSED LOCAL STORM SEWER
	PROPOSED CATCHBASIN MANHOLE
	PROPOSED BOULEVARD CATCHBASIN (BCB)
	PROPOSED STORM SEWER
	PROPOSED STORM MANHOLE
	PROPOSED SANITARY SEWER
	PROPOSED SANITARY MANHOLE
PROPERTY IMPACTS	
	LANDSCAPE IMPACTS
	STRUCTURE IMPACTS
	TREE IMPACTS
	PROPERTY ACQUISITION/EASEMENT

Key Plan Scale n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

DESIGN	TJN
REVIEWED BY	
DRAWN	JTB
CHECKED BY	CDP
DATE	NOVEMBER 2020
SCALE	1:500 (22X34) 1:1000 (11X17)

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PROJECT NO. 17-6638

RIVERSIDE DRIVE LANDFORM BARRIER
5270 to 5790 Riverside Drive

SHEET NO. 1

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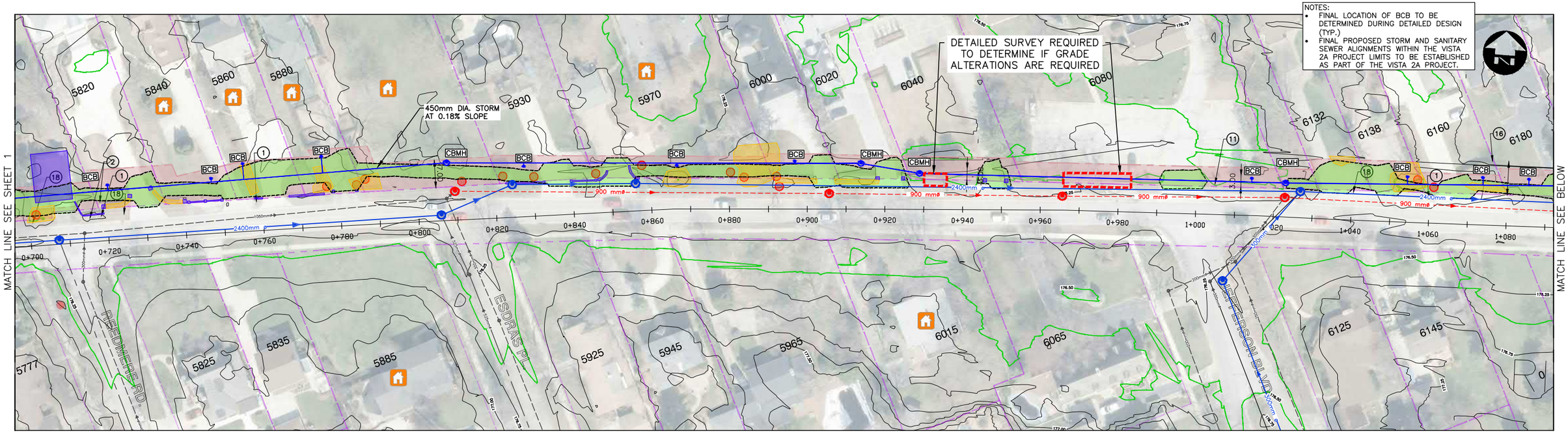
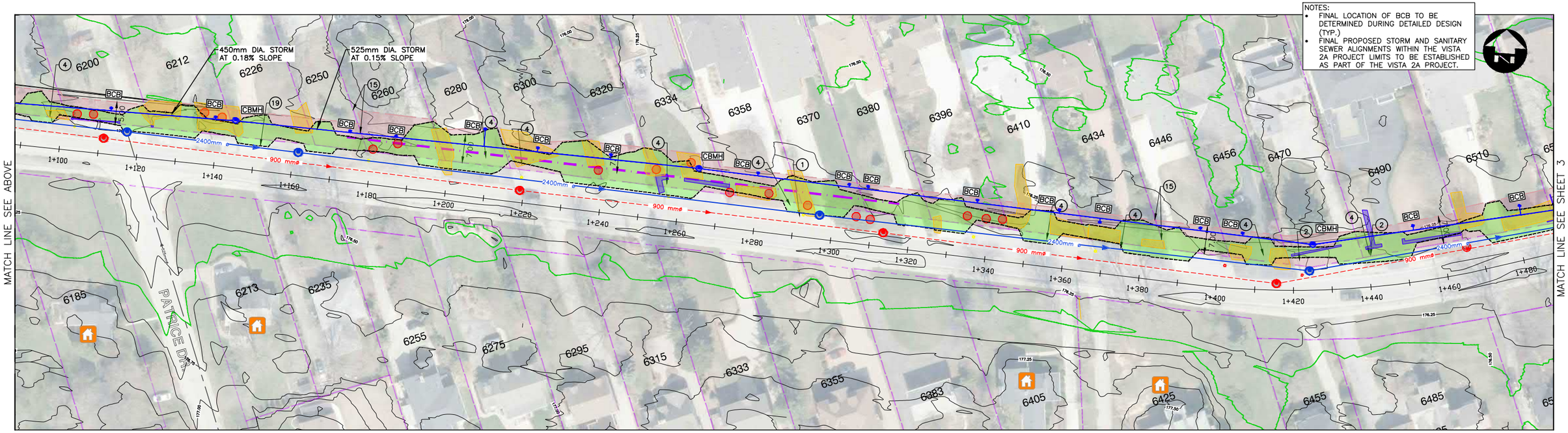
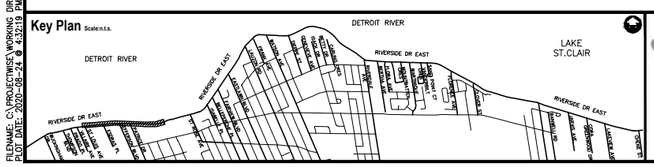




Key Plan Scale:n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

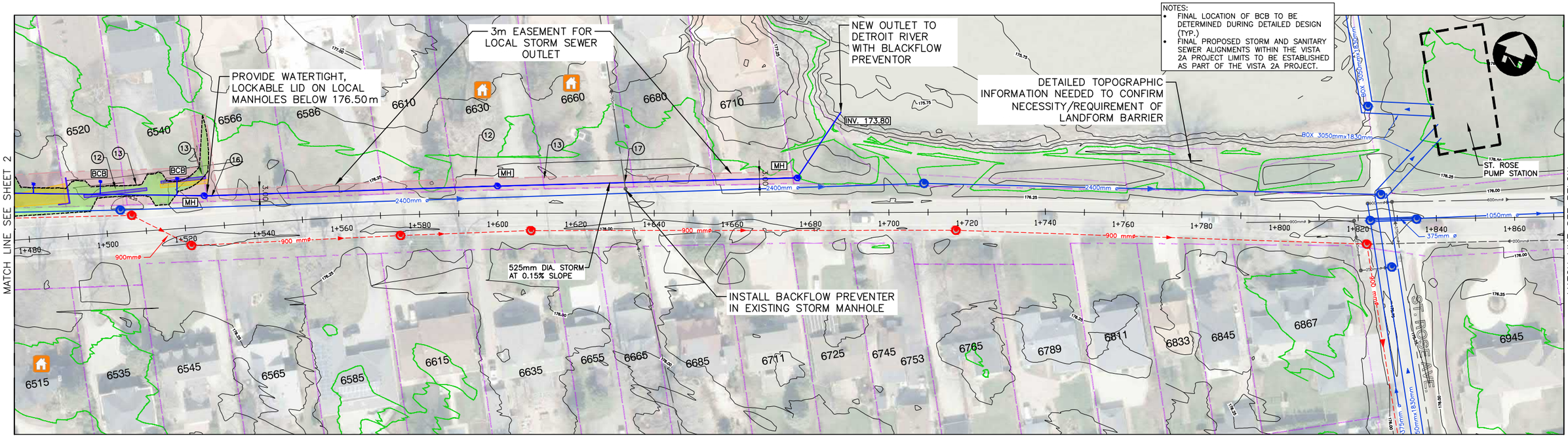
DESIGN	TJN
REVIEWED BY	
DRAWN	JTB
CHECKED BY	CDP
DATE	NOVEMBER 2020
SCALE	1:500 (22X34) 1:1000 (11X17)

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

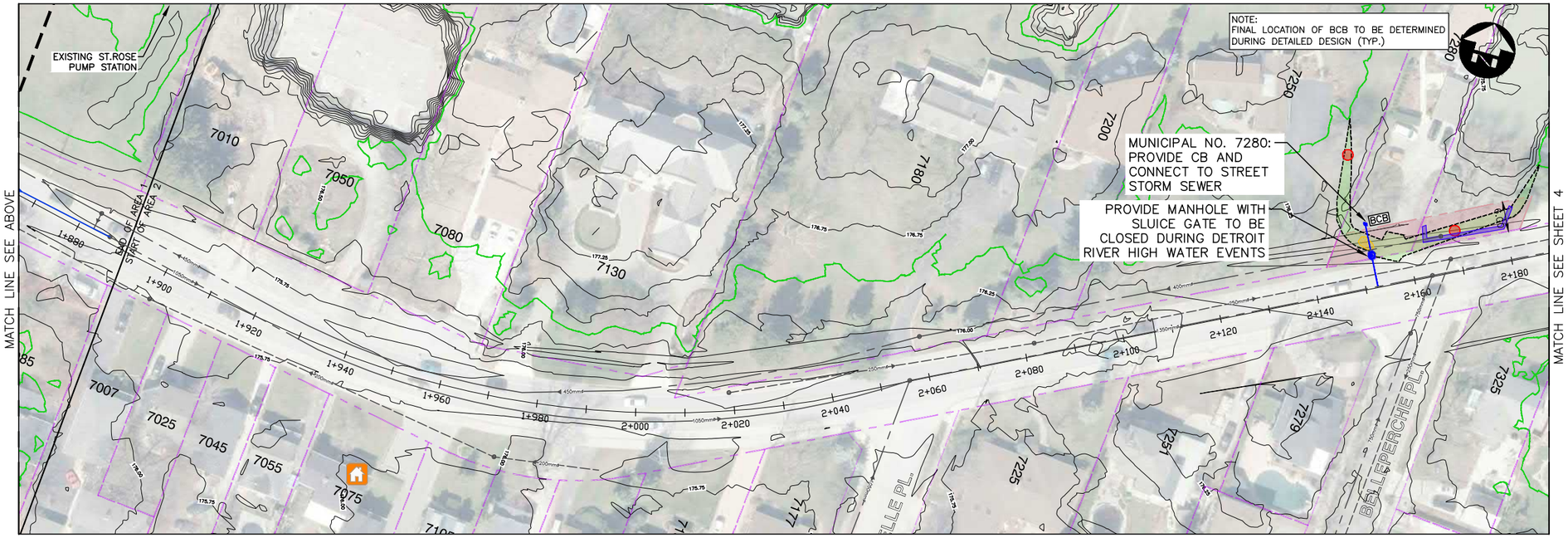
PROJECT NO. 17-6638

RIVERSIDE DRIVE LANDFORM BARRIER
5800 to 6510 Riverside Drive

SHEET NO. 2

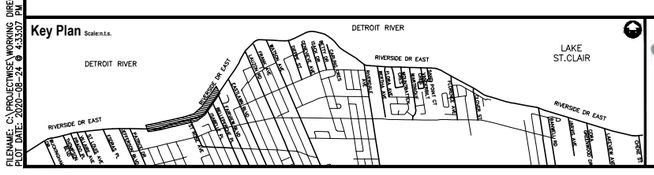


RIVERSIDE DRIVE
(STA. 1+480 TO 1+870)



RIVERSIDE DRIVE
(STA. 1+870 TO 2+180)

Key Plan Scale:n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

DESIGN: TJN | REVIEWED BY:
DRAWN: JTB | CHECKED BY: CDP
DATE: NOVEMBER 2020
SCALE: 1:500 (22X34) 1:1000 (11X17)

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PROJECT NO. 17-6638

RIVERSIDE DRIVE LANDFORM BARRIER
6520 to 7375 Riverside Drive

SHEET NO. 3

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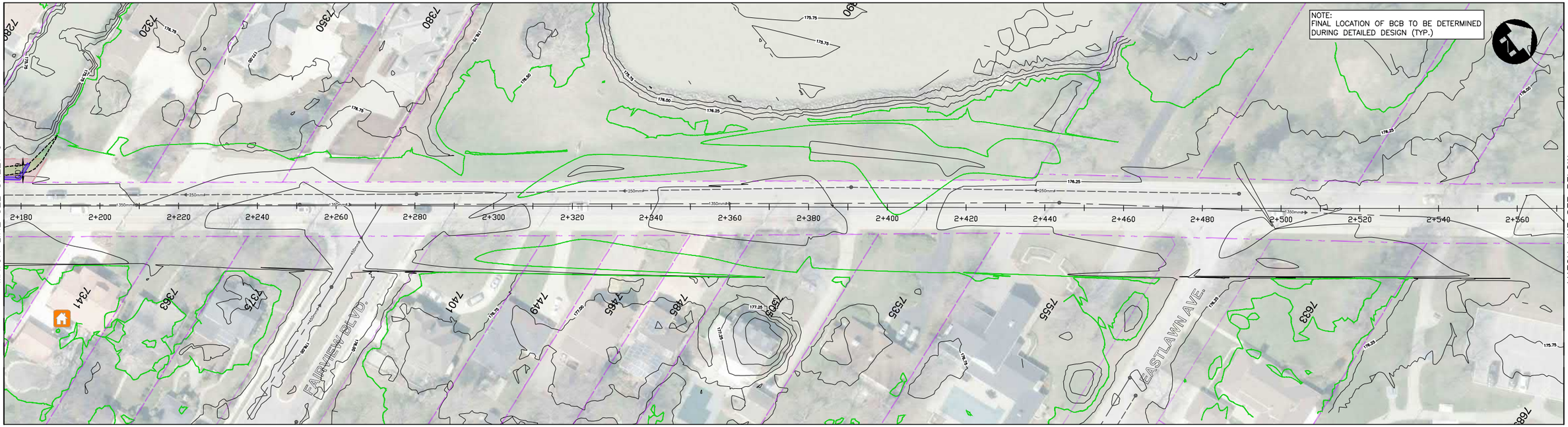
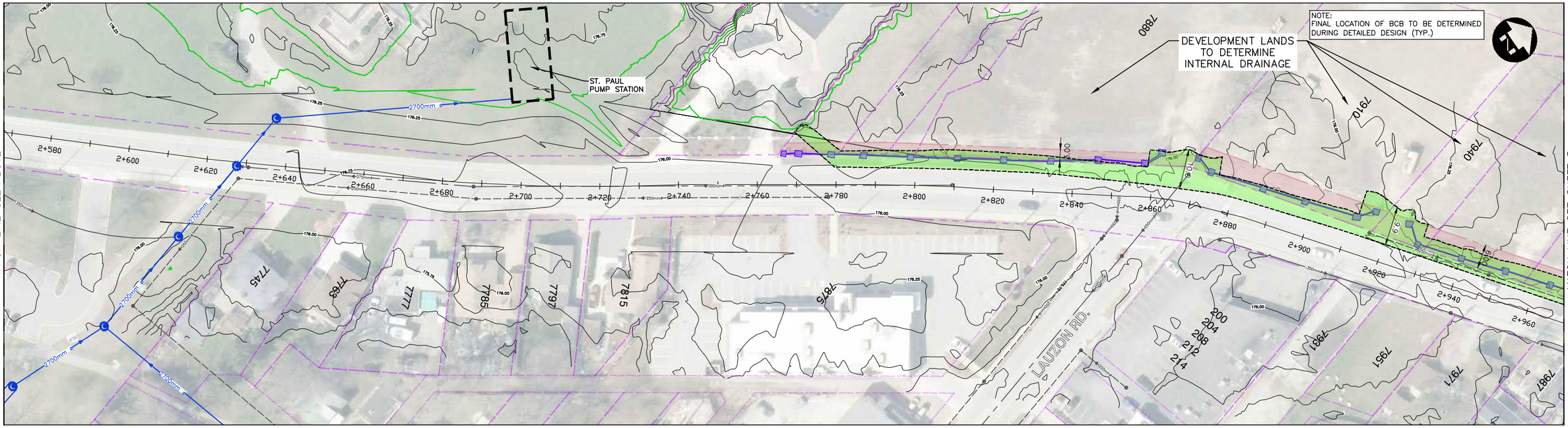
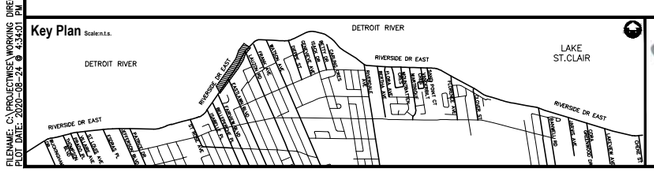


RIVERSIDE DRIVE
(STA. 2+180 TO 2+570)



RIVERSIDE DRIVE
(STA. 2+570 TO 2+970)

Key Plan Scale:n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

DESIGN	TJN
REVIEWED BY	
DRAWN	JTB
CHECKED BY	CDP
DATE	NOVEMBER 2020
SCALE	1:500 (22X34) 1:1000 (11X17)

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PROJECT NO. **17-6638**

RIVERSIDE DRIVE LANDFORM BARRIER
7280 to 7987 Riverside Drive

SHEET NO. **4**

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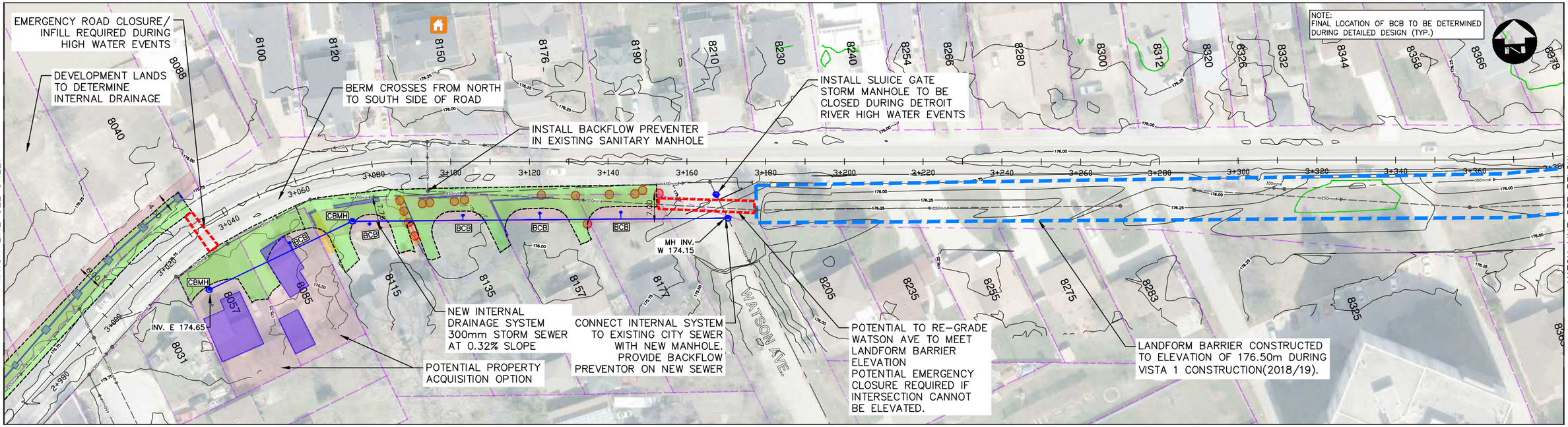
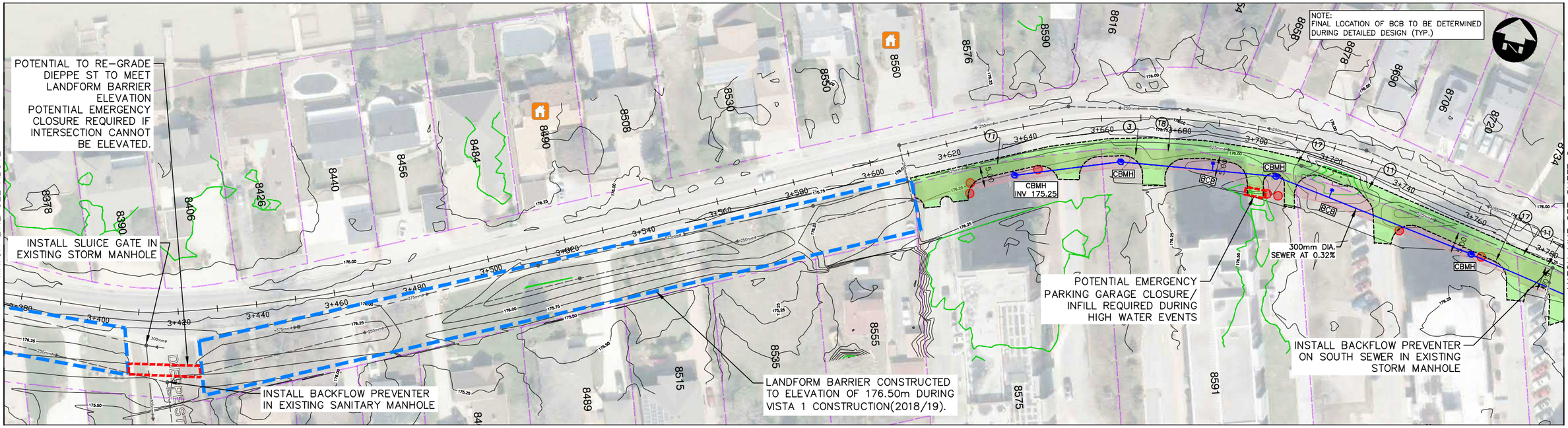
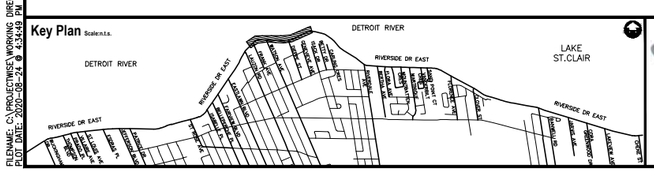


RIVERSIDE DRIVE
(STA. 2+970 TO 3+380)



RIVERSIDE DRIVE
(STA. 3+380 TO 3+780)

Key Plan Scale n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

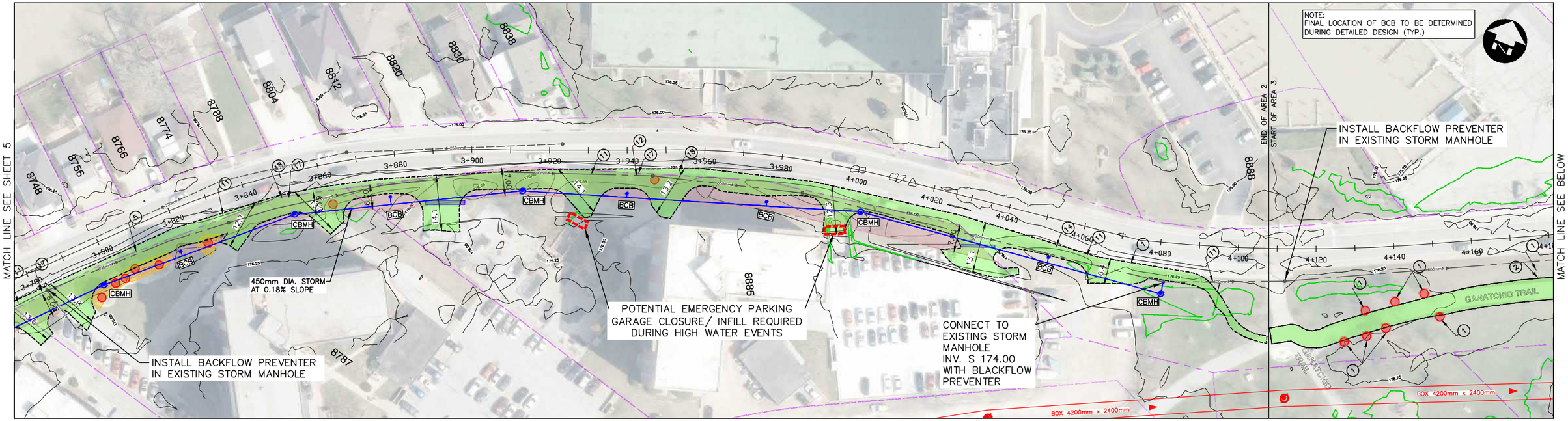
DESIGN	TJN
REVIEWED BY	
DRAWN	JTB
CHECKED BY	CDP
DATE	AUGUST 2020
SCALE	1:500 (22X34) 1:1000 (11X17)

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

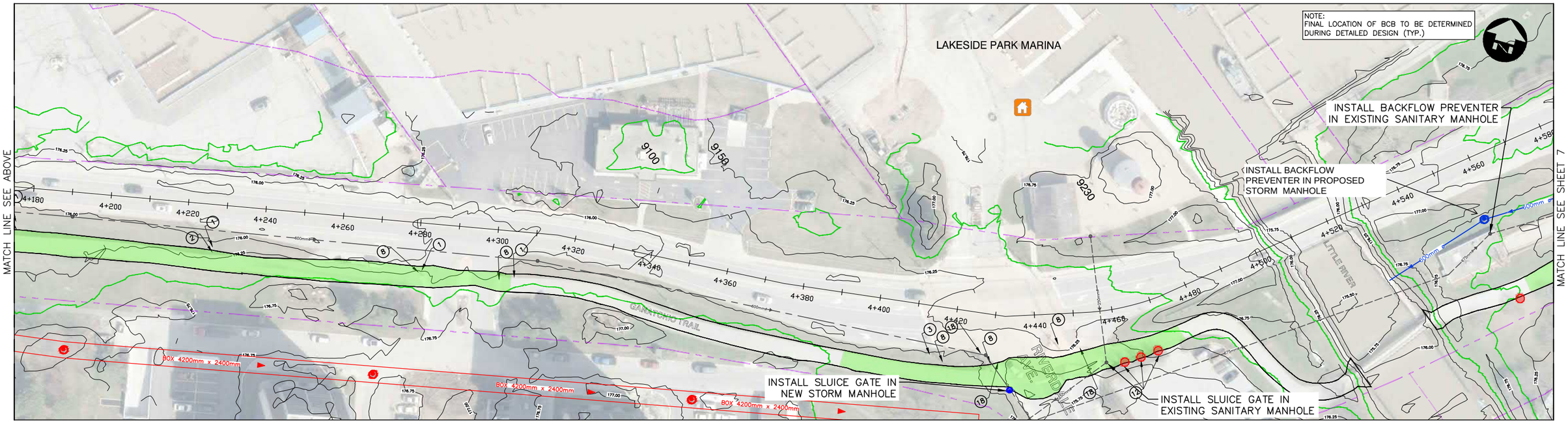
PROJECT NO. 17-6638

RIVERSIDE DRIVE LANDFORM BARRIER
8031 to 8734 Riverside Drive

SHEET NO. 5

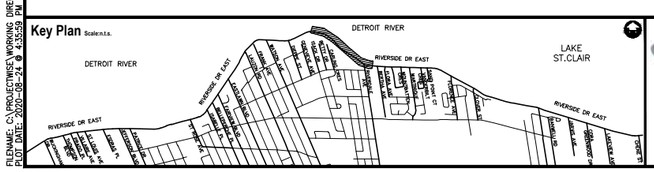


RIVERSIDE DRIVE
(STA. 3+780 TO 4+180)



RIVERSIDE DRIVE
(STA. 4+180 TO 4+580)

Key Plan Scale:n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

DESIGN: TJN	REVIEWED BY:
DRAWN: JTB	CHECKED BY: CDP
DATE: NOVEMBER 2020	
SCALE: 1:500 (22X34) 1:1000 (11X17)	

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PROJECT NO. 17-6638

RIVERSIDE DRIVE LANDFORM BARRIER
8748 Riverside Drive to Little River

SHEET NO. 6

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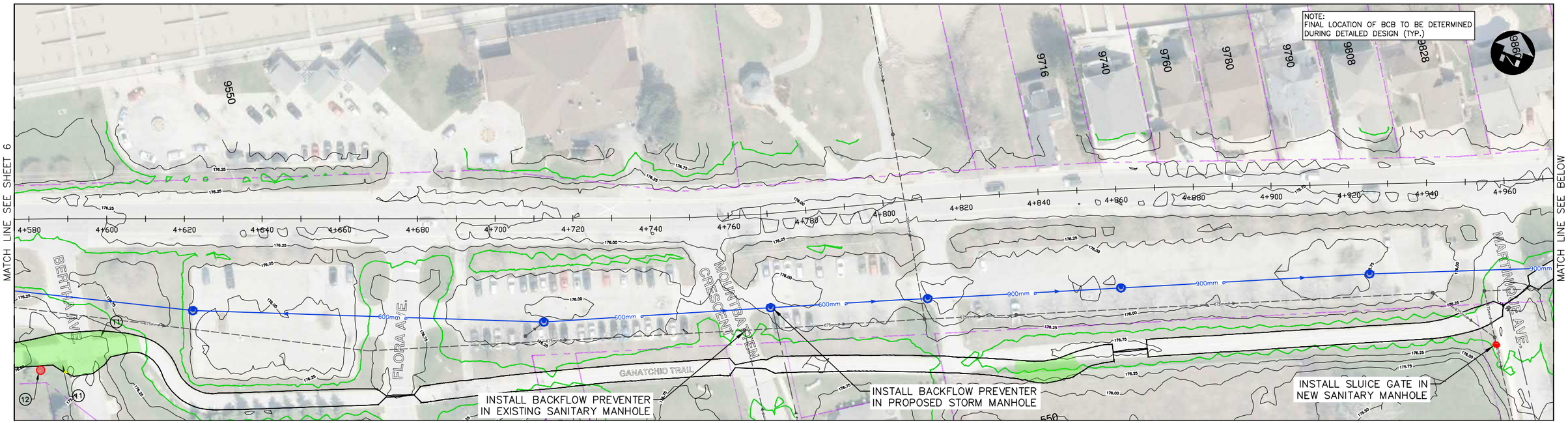
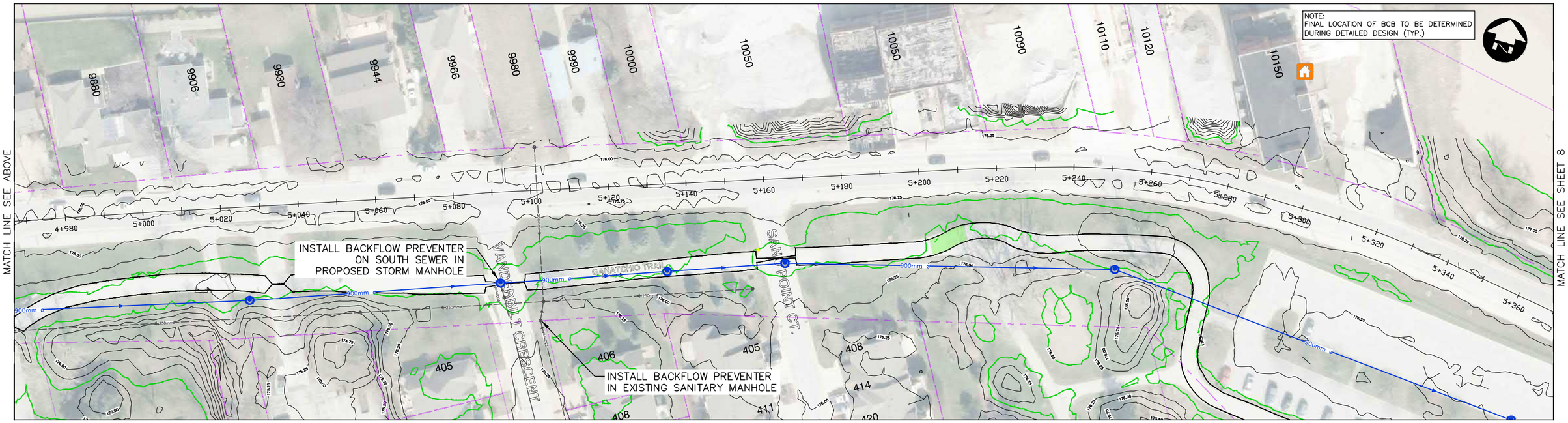
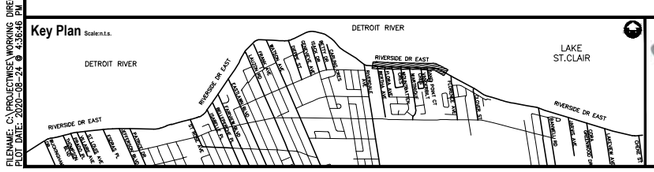


RIVERSIDE DRIVE
(STA. 4+580 TO 4+970)



RIVERSIDE DRIVE
(STA. 4+970 TO 5+370)

Key Plan Scale:n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

DESIGN: TJN	REVIEWED BY:
DRAWN: JTB	CHECKED BY: CDP
DATE: NOVEMBER 2020	
SCALE: 1:500 (22X34) 1:1000 (11X17)	

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PROJECT NO. 17-6638

RIVERSIDE DRIVE LANDFORM BARRIER
9550 to 10150 Riverside Drive

SHEET NO. 7

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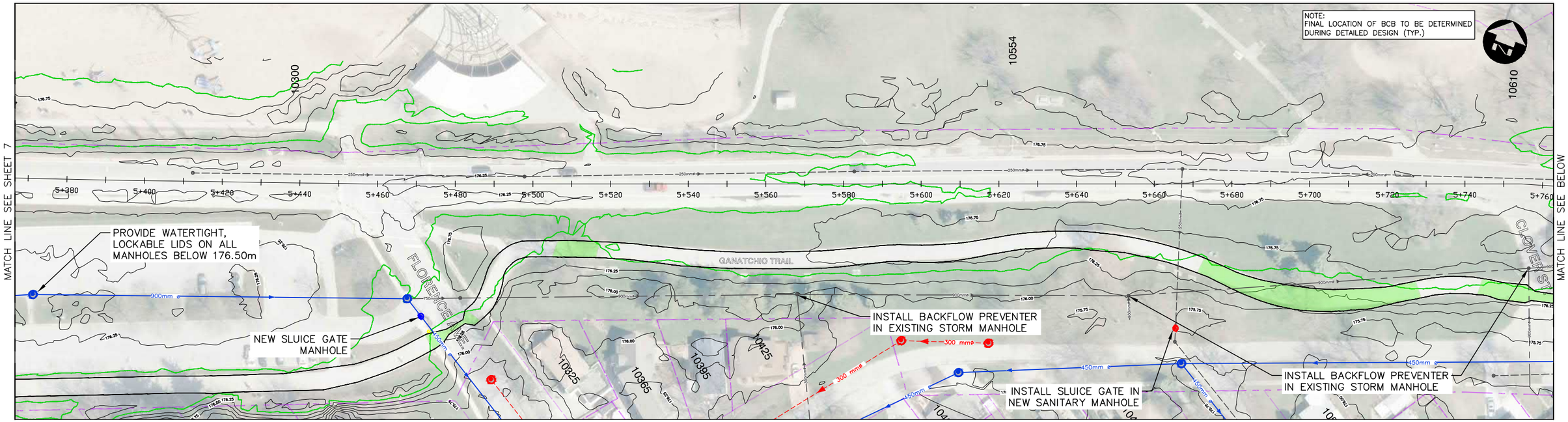
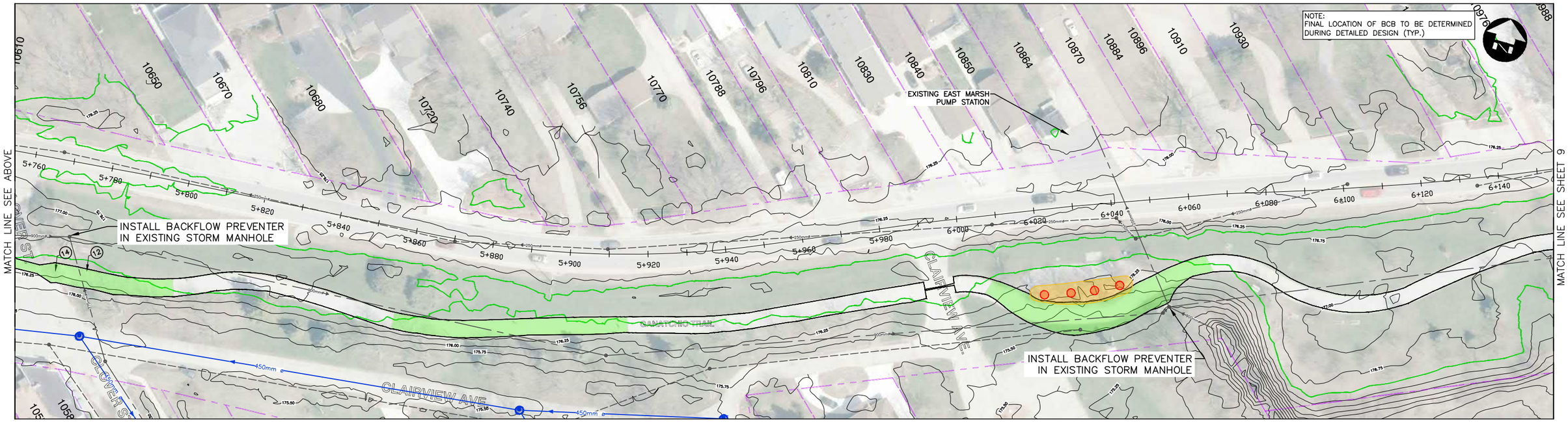
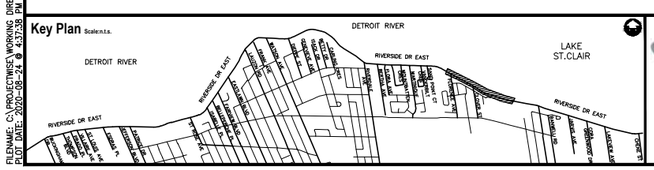


RIVERSIDE DRIVE
(STA. 5+370 TO 5+760)



RIVERSIDE DRIVE
(STA. 5+760 TO 6+150)

Key Plan Scale n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

DESIGN	TJN
REVIEWED BY	
DRAWN	JTB
CHECKED BY	CDP
DATE	NOVEMBER 2020
SCALE	1:500 (22X34) 1:1000 (11X17)

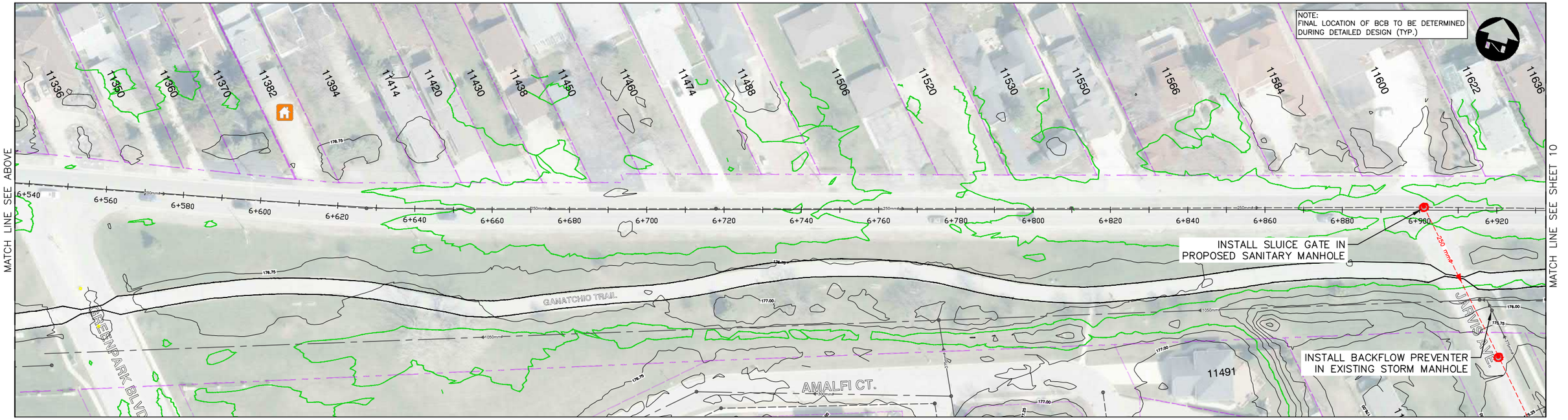
WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RIVERSIDE DRIVE LANDFORM BARRIER
10300 to 10976 Riverside Drive

PROJECT NO. 17-6638

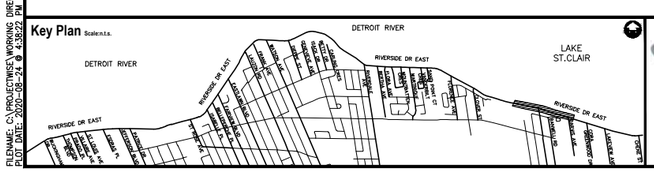
SHEET NO. 8

RIVERSIDE DRIVE
(STA. 6+150 TO 6+540)



RIVERSIDE DRIVE
(STA. 6+540 TO 6+930)

Key Plan Scale:n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

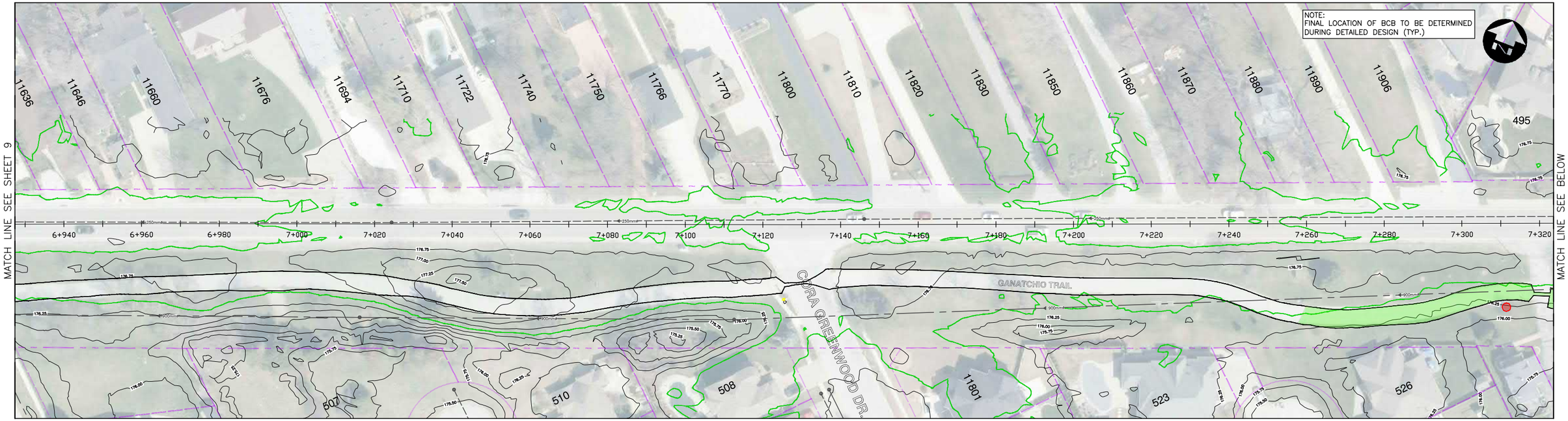
DESIGN: TJN	REVIEWED BY:
DRAWN: JTB	CHECKED BY: CDP
DATE: NOVEMBER 2020	
SCALE: 1:500 (22X34) 1:1000 (11X17)	

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

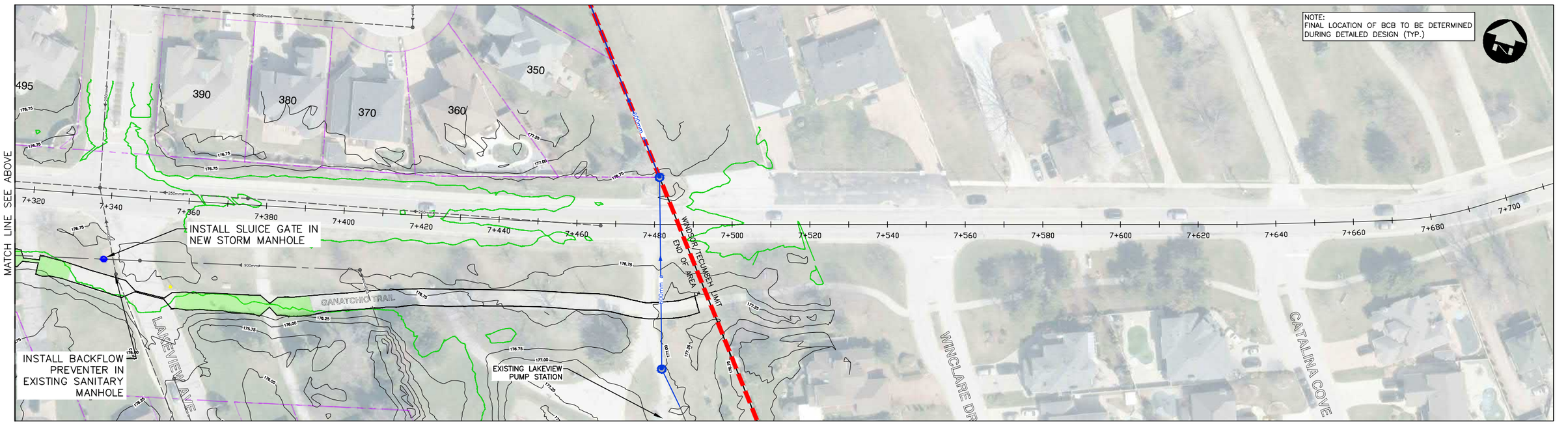
PROJECT NO. 17-6638

RIVERSIDE DRIVE LANDFORM BARRIER
10988 to 11622 Riverside Drive

SHEET NO. 9

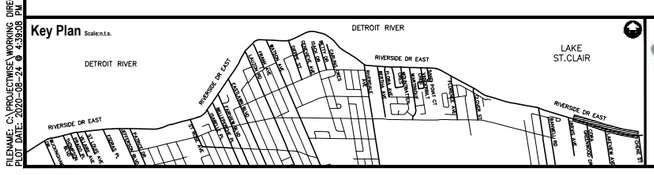


RIVERSIDE DRIVE
(STA. 6+930 TO 7+320)



RIVERSIDE DRIVE
(STA.7+320 TO 7+710)

Key Plan Scale:n.t.s.



THE CITY OF WINDSOR
ONTARIO, CANADA

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
C	CITY APPROVAL	NOV 2020	CDP
B	CITY REVIEW	AUG 2020	CDP
A	JUNE 2020 REVIEW	JUN 25/20	CDP

DESIGN: TJN	REVIEWED BY:
DRAWN: JTB	CHECKED BY: CDP
DATE: NOVEMBER 2020	
SCALE: 1:500 (22X34) 1:1000 (11X17)	

WINDSOR SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

PROJECT NO. **17-6638**

RIVERSIDE DRIVE LANDFORM BARRIER
11636 Riverside Drive to Windsor/Tecumseh Border

SHEET NO. **10**

Appendix F-4

Pump Station Functional Design Solutions

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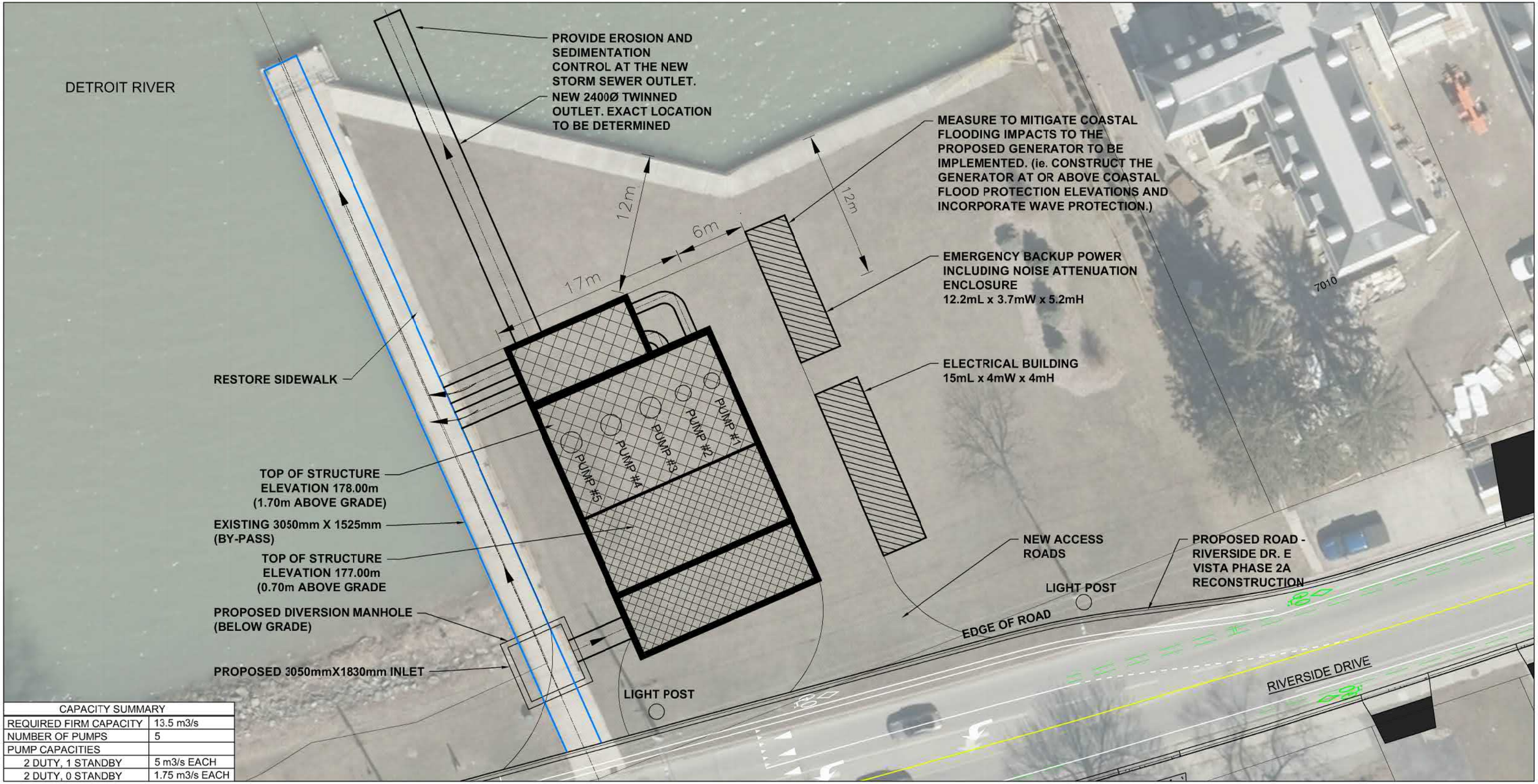


CAPACITY SUMMARY	
REQUIRED FIRM CAPACITY	13.5 m3/s
NUMBER OF PUMPS	5
PUMP CAPACITIES	
2 DUTY, 1 STANDBY	5 m3/s EACH
2 DUTY, 0 STANDBY	1.75 m3/s EACH

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION
ST. ROSE PUMP STATION LAYOUT SCHEMATIC

PROPERTY LINE
EXISTING STORM SEWER
EXISTING SANITARY SEWER
PROPOSED SEWER

NOTE:

THIS PUMP STATION FUNCTIONAL DESIGN REPRESENTS THE CONCEPTUAL LAYOUT OF THE PROPOSED PUMP STATION, CONTROL AND ELECTRICAL BUILDING AND EMERGENCY BACKUP POWER GENERATOR.

PRIOR TO DETAILED DESIGN OF THIS PUMP STATION THE CITY WILL NEED TO CONSULT STAKEHOLDERS ON THE LAYOUT AND TREATMENT OF THE PUMP STATION FACILITY AS WELL AS THE SURROUNDING PARK AREA.

THE RECOMMEND BACKUP POWER GENERATOR SIZE IS BASED ON A MAXIMUM SIZE TO PROVIDE BACK UP POWER FOR A 1:100 YEAR LEVEL OF SERVICE.

THE CITY OF WINDSOR
DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: SMZ
CHECKED BY: TC

N
W
E
S

PS-E1-ROSE 1
PROJECT: 17-6638 STATUS: FINAL DATE: November 2020

DETROIT RIVER

EXISTING OUTLET TO DETROIT RIVER TO REMAIN

PROPOSED PUMPING STATION IMPROVEMENTS

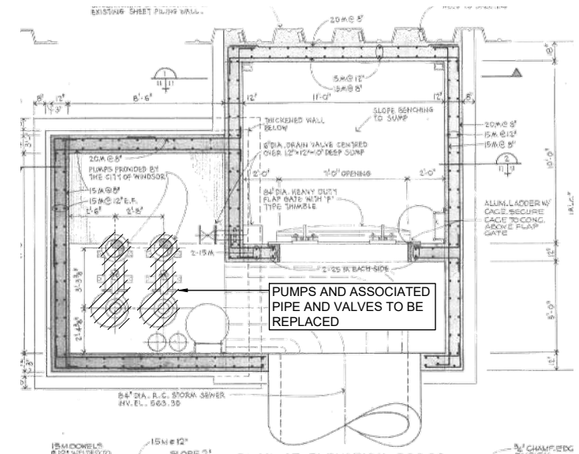
EXISTING PUMP STATION

NEW EMERGENCY BACKUP POWER 4.1mL x 1.3mW x 3.4mH

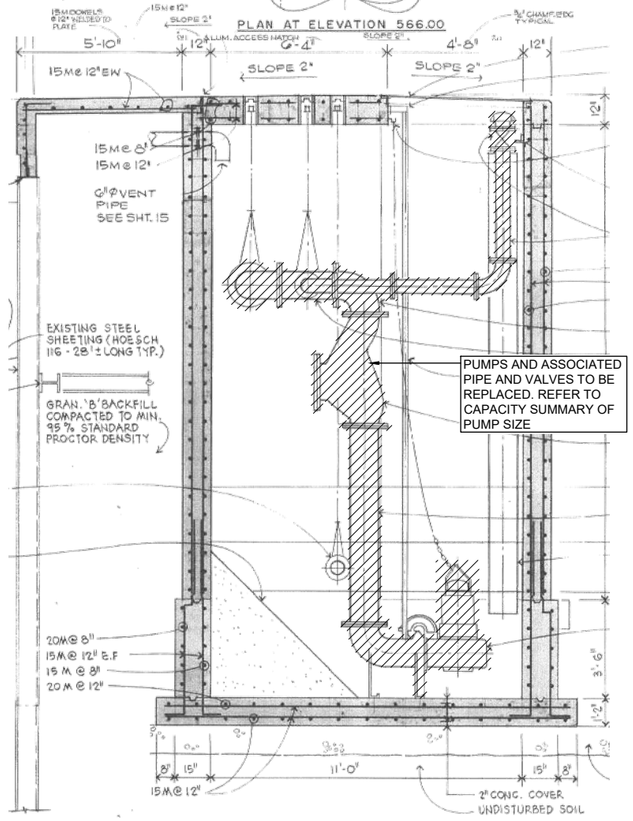
EXISTING SIDEWALK

2125Ø

CAPACITY SUMMARY	
REQUIRED FIRM CAPACITY	0.5 m3/s
NUMBER OF PUMPS	2
PUMP CAPACITIES	
3 DUTY, 1 STANDBY	0.25 m3/s EACH



PLAN AT ELEVATION 566.00



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION
FORD ST. PUMP STATION UPGRADES

PROPERTY LINE
EXISTING STORM SEWER
EXISTING SANITARY SEWER
PROPOSED SEWER

NOTE: DRAWINGS ARE CONCEPTUAL ONLY

DILLON CONSULTING

Aquafor Beech Limited

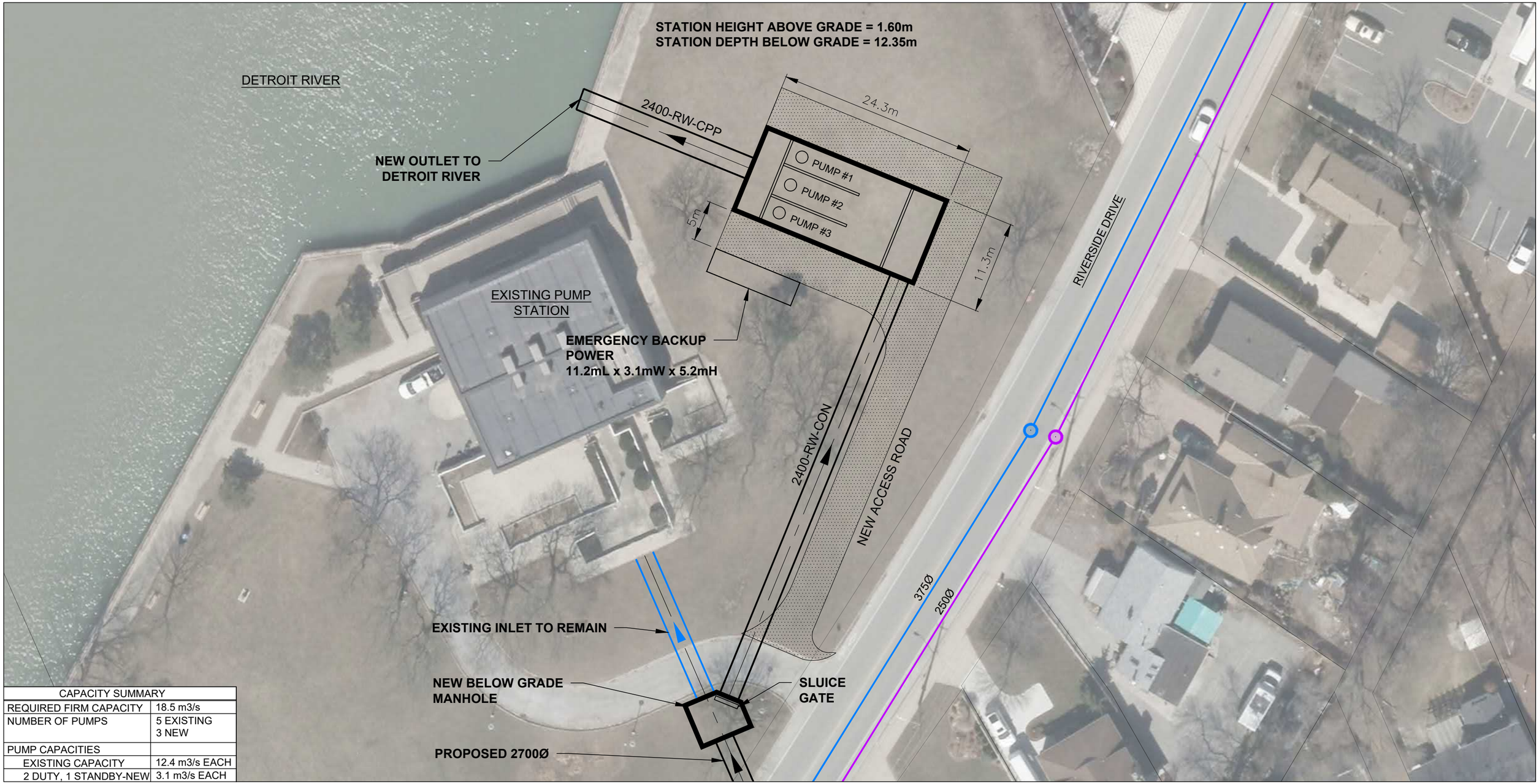
CREATED BY: SMZ
CHECKED BY: TC

0m 2.5m 5m

N W E S

PS-E1-FORD 1

PROJECT: 17-6638 STATUS: DRAFT DATE: July 2020



CAPACITY SUMMARY	
REQUIRED FIRM CAPACITY	18.5 m3/s
NUMBER OF PUMPS	5 EXISTING 3 NEW
PUMP CAPACITIES	
EXISTING CAPACITY	12.4 m3/s EACH
2 DUTY, 1 STANDBY-NEW	3.1 m3/s EACH

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION
ST. PAUL PUMP STATION

PROPERTY LINE
PROPOSED SEWER
EXISTING STORM SEWER
EXISTING SANITARY SEWER

NOTE:

THIS PUMP STATION FUNCTIONAL DESIGN REPRESENTS THE CONCEPTUAL LAYOUT OF THE PROPOSED PUMP STATION AND EMERGENCY BACKUP POWER GENERATOR.

PRIOR TO DETAILED DESIGN OF THIS PUMP STATION THE CITY WILL NEED TO CONSULT STAKEHOLDERS ON THE LAYOUT AND TREATMENT OF THE PUMP STATION FACILITY AS WELL AS THE SURROUNDING PARK AREA.

THE RECOMMEND BACKUP POWER GENERATOR SIZE IS BASED ON A MAXIMUM SIZE TO PROVIDE BACK UP POWER FOR A 1:100 YEAR LEVEL OF SERVICE.

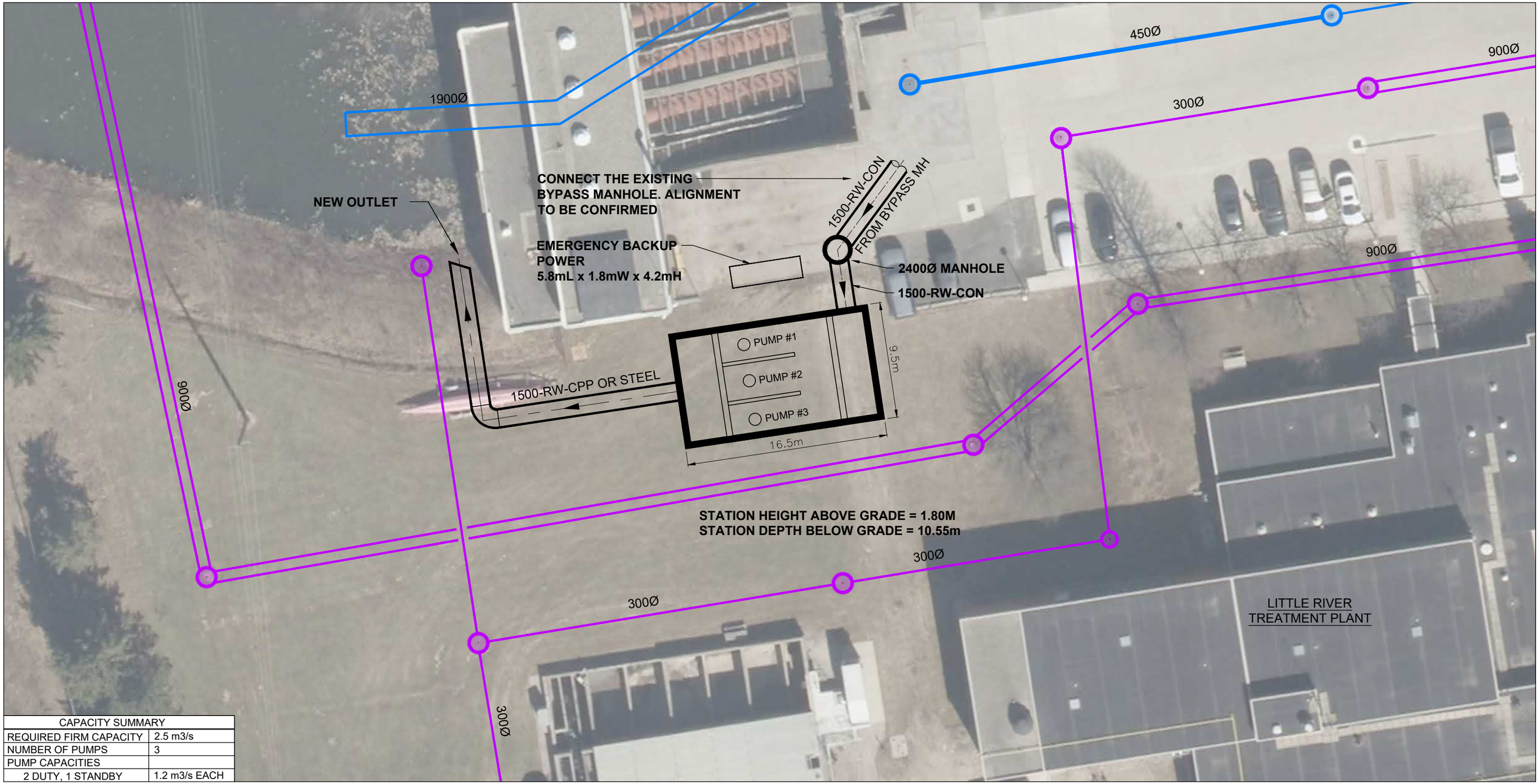
CREATED BY: SMZ
CHECKED BY: TC

0m 5m 10m

N W E S

PS-E1-STPAUL 1

PROJECT: 17-6638 STATUS: DRAFT DATE: July 2020



CAPACITY SUMMARY	
REQUIRED FIRM CAPACITY	2.5 m3/s
NUMBER OF PUMPS	3
PUMP CAPACITIES	
2 DUTY, 1 STANDBY	1.2 m3/s EACH

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION
PONTIAC PUMP STATION IMPROVEMENTS

PROPERTY LINE
EXISTING STORM SEWER
EXISTING SANITARY SEWER
PROPOSED SEWER

NOTE:

THIS PUMP STATION FUNCTIONAL DESIGN REPRESENTS THE CONCEPTUAL LAYOUT OF THE PROPOSED PUMP STATION AND EMERGENCY BACKUP POWER GENERATOR.

PRIOR TO DETAILED DESIGN OF THIS PUMP STATION THE CITY WILL NEED TO CONSULT STAKEHOLDERS ON THE LAYOUT AND TREATMENT OF THE PUMP STATION FACILITY AS WELL AS THE SURROUNDING PARK AREA.

THE RECOMMEND BACKUP POWER GENERATOR SIZE IS BASED ON A MAXIMUM SIZE TO PROVIDE BACK UP POWER FOR A 1:100 YEAR LEVEL OF SERVICE.

THE CITY OF WINDSOR
DILLON CONSULTING
Aquafor Beech Limited

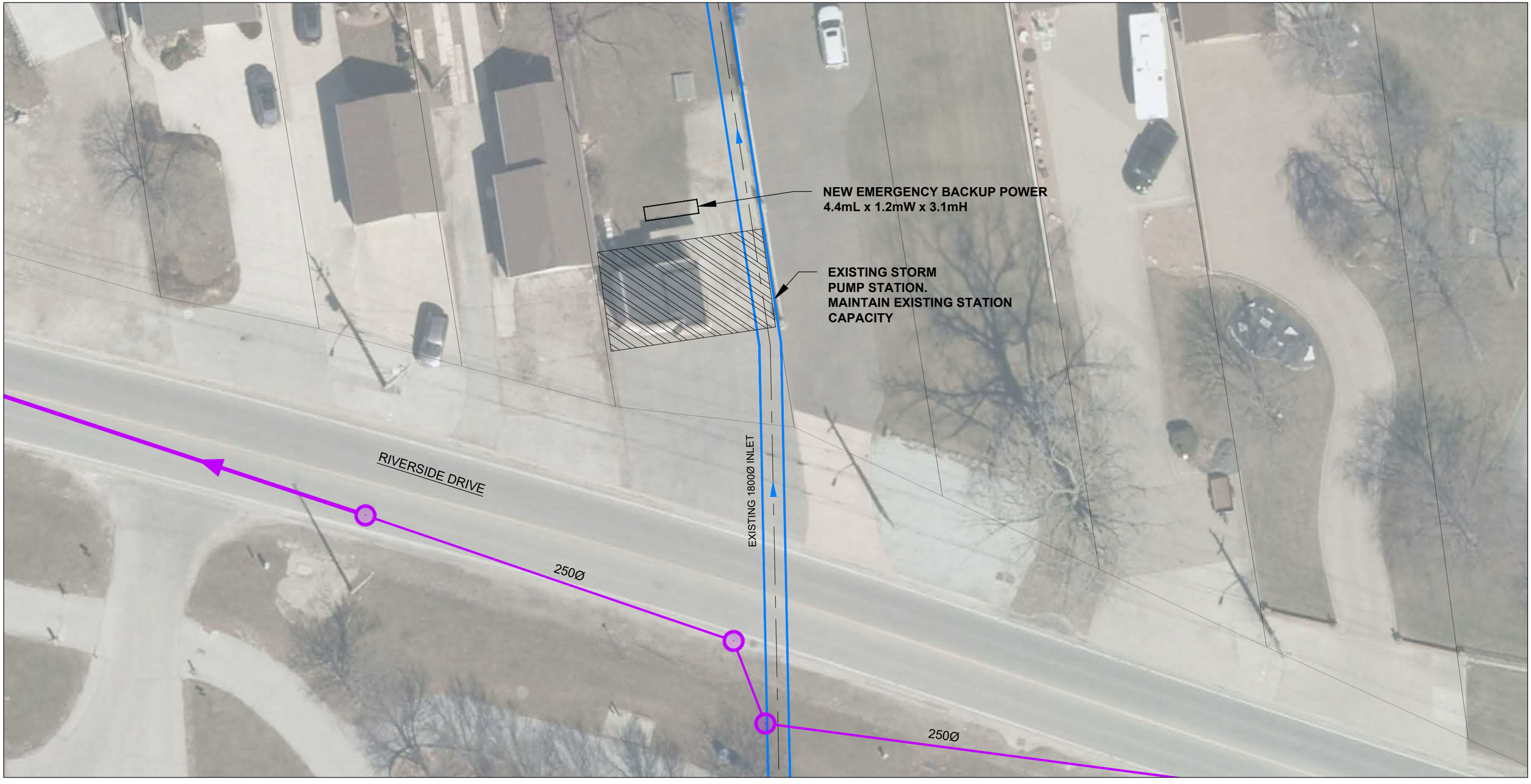
CREATED BY: SMZ
CHECKED BY: TC

0m 2.5m 5m

N W E S

SAN-E-2

PROJECT: 17-6638 STATUS: DRAFT DATE: July 2020



CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION
MASTER PLAN

RECOMMENDED SOLUTION
EAST MARSH PUMP STATION IMPROVEMENTS

PROPERTY LINE
EXISTING STORM SEWER
EXISTING SANITARY SEWER
PROPOSED SEWER

NOTE: DRAWINGS ARE CONCEPTUAL ONLY

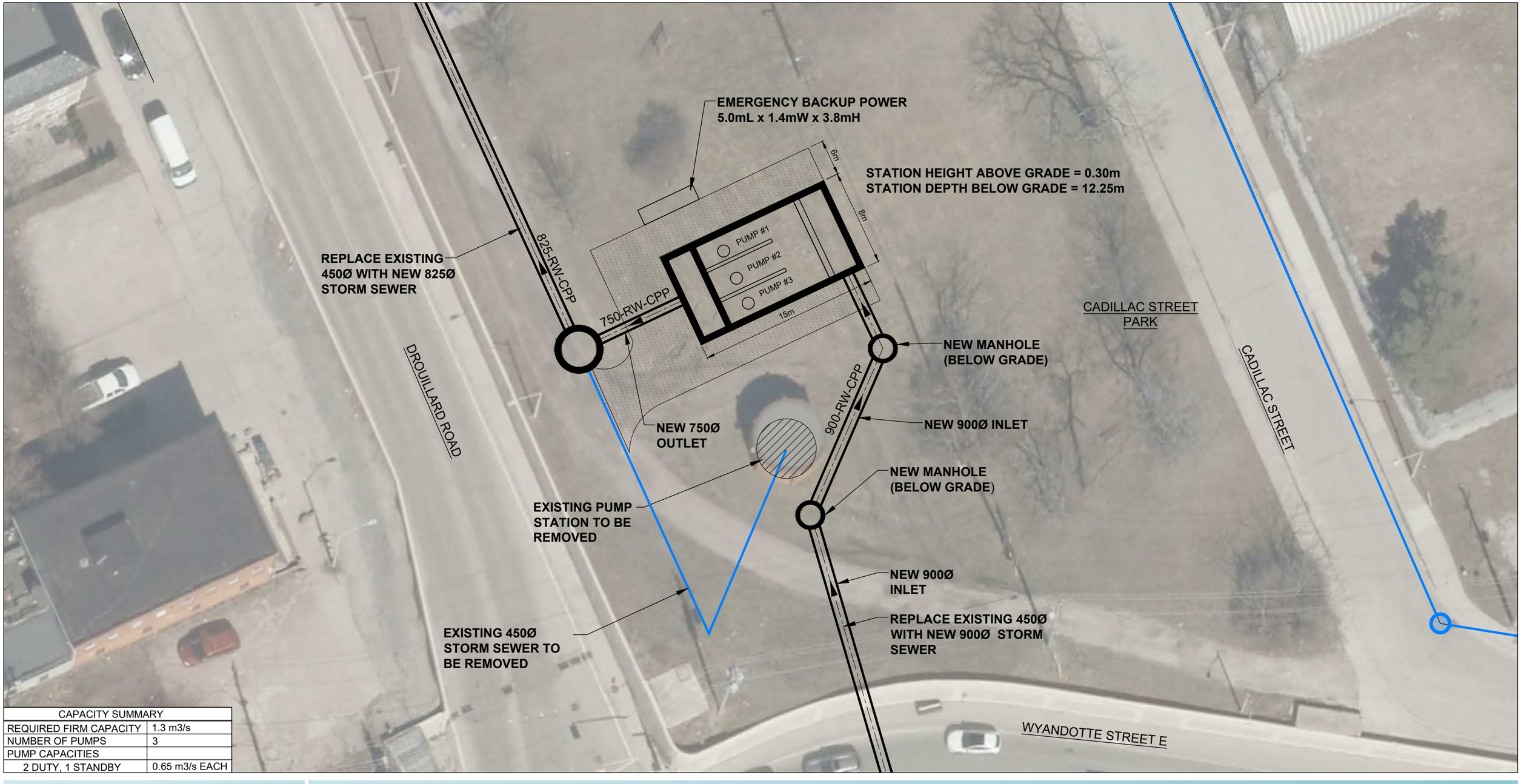
CREATED BY: SMZ
CHECKED BY: TC

0m 5m 10m

N W E S

STM-E6

PROJECT: 17-6638 STATUS: DRAFT DATE: July 2020



CAPACITY SUMMARY	
REQUIRED FIRM CAPACITY	1.3 m3/s
NUMBER OF PUMPS	3
PUMP CAPACITIES	
2 DUTY, 1 STANDBY	0.65 m3/s EACH

CITY OF WINDSOR
SEWER AND COASTAL FLOOD PROTECTION MASTER PLAN

RECOMMENDED SOLUTION
DROUILLARD PUMP STATION

PROPERTY LINE
EXISTING STORM SEWER
EXISTING SANITARY SEWER
PROPOSED SEWER

NOTE:

THIS PUMP STATION FUNCTIONAL DESIGN REPRESENTS THE CONCEPTUAL LAYOUT OF THE PROPOSED PUMP STATION AND EMERGENCY BACKUP POWER GENERATOR.

PRIOR TO DETAILED DESIGN OF THIS PUMP STATION THE CITY WILL NEED TO CONSULT STAKEHOLDERS ON THE LAYOUT AND TREATMENT OF THE PUMP STATION FACILITY AS WELL AS THE SURROUNDING PARK AREA.

THE RECOMMEND BACKUP POWER GENERATOR SIZE IS BASED ON A MAXIMUM SIZE TO PROVIDE BACK UP POWER FOR A 1:100 YEAR LEVEL OF SERVICE.

DILLON CONSULTING
Aquafor Beech Limited

CREATED BY: SMZ
CHECKED BY: TC

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N W E S

STM-C8

PROJECT: 17-6638 STATUS: DRAFT DATE: July 2020

Appendix F-5

Cost Estimates and Assumptions

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City of Windsor
Sewer and Coastal Flood Protection Master Plan

Cost Estimate Assumptions

The estimate of probable costs included in this report are based on the following overall project assumptions.

- Estimated construction costs are based on the improvements identified in the Preferred Solution Figures, which represent Preliminary Designs.
- Improvement concept plans are subject to change based on additional information determined/developed during the detailed design stages.
- Wherever a sewer improvement is identified, construction costs include full road reconstruction including, but not limited, to the following components:
    - Removal of existing road, curbs, sidewalks, sewers and service connections, roadway lighting and traffic signals (if any)
    - Earth Excavation
    - Full Granular 'A' base
    - Asphalt or Concrete road surface (depending on road classification)
    - Curbs
    - Sidewalks
    - Pavement Markings
    - Storm/Sanitary Sewers
    - Private Service Connections to Private Properties
    - Streetlighting
    - Traffic signals
    - Restoration
- Separate cost estimates are provided for the identified pump station improvements, pump station replacements, and any required offline storage facilities/ponds.
- Roads to be replaced matching the current number of lanes. No assessments of roadway improvements based on traffic demands were completed.
- Existing truck route roadways as identified on the City of Windsor Truck Route Map will be reconstructed with concrete. All other roads to be replaced with asphalt.
- Proposed road sections for concrete and asphalt roads were developed using the standard cross-sections identified in the City of Windsor Standard Drawings. All road sections will require verification by a geotechnical engineer during detailed design.
- Bike lanes were included in proposed road cross-sections as identified in the City of Windsor Bicycle Use Master Plan (BUMP), dated April 2001.
- No contact was made with the individual utility companies. Costs for relocating/abandoning utility infrastructure will be over and above the cost estimates provided herein. The following utility infrastructure is not included in the provided cost estimates:

    - EnWin Utilities Ltd. - Electrical (Aerial and Underground)
    - EnWin Utilities Ltd. (Windsor Utilities Commission) - Watermains and Site Servicing
    - Bell Canada – Telecommunications (Aerial and Underground)
    - Cogeco Connexion - Telecommunications (Aerial and Underground)
    - Enbridge/Union Gas – Natural Gas Mains and Site Servicing
    - MNSi Internet - Telecommunications (Aerial and Underground)
    - Essex Terminal Railway – Rail Company
    - Any other unknown third party infrastructure within the municipal right-of-ways
- An average cost for the construction of Low Impact Development (LIDs) has been included for all roads where storm sewer improvements are identified.
- Detailed topographic survey information was not available/used in the development of removal quantities and associated cost estimates. Estimate quantities are based on assumptions of existing road width and cross-sectional information and available information from the City of Windsor GIS (www.MappMyCity.ca), Google Maps, and other available open source data.
- Cost estimate do not include road and sewer construction costs for any future development areas.
- Costs for any required sewage treatment plant upgrades to treat additional development flows is not included.
- Legal survey information was not available/provided to assist in the development of quantities. City of Windsor GIS property line fabric was used to assist in the development of these cost estimates.
- Cost estimates do not include any costs associated with land acquisitions.
- There is a high potential for archaeological material within some project areas. Any costs and associated with archaeological assessment or construction delays as a result of any Stage 1, Stage 2, Stage 3 and Stage 4 archaeological works are not included.
- Costs associated with the demolition of existing buildings and houses within the project limits have not been included.
- Costs for any required Record of Site Condition (RSC) Assessments have not been included.
- Cost estimates are based on 2020 construction prices, excluding taxes. Timing of construction may have significant impacts on the estimated costs included herein.
- Cost estimates do not include any fees associated with any required outside agency reviews.
- Cost estimates are for construction costs only. Costs for annualized maintenance of identified improvements has not been included in the cost estimates.
- An allowance of 20% has been included for engineering. This includes the preparation of preliminary and detailed design plans, construction administration and onsite inspection. Costs for topographic and legal surveys, environmental site assessments and geotechnical investigations are also included in the 20% engineering allowance.
- Construction phasing and staging of the various components of this project could have a significant impact to the overall costs. Since the anticipated phasing/staging of these works is not currently known, any additional costs associated with the construction of multiple of phases have not been included in our estimates.

- A general allowance for traffic control has been included in the cost estimates for roads and infrastructure related works. Costs associated with maintaining traffic and access during construction will be highly dependent on the construction phasing/staging of the works.
- Construction cost estimates are Class D Estimates and a +30% contingency has been added. A Class "D" estimate is prepared when a project is at the "Conceptual Design" stage. Conceptual design is defined as the beginning of a project when preliminary spatial needs have been identified, and a space program is being developed. At this stage of a project, conceptual drawings of physical space layouts and elevations are being developed, and the remainder of the design team are developing and evaluating different ideas regarding the types of systems to be used in the project. Project development at this stage is approximately 30% complete.

Cost Estimate Variance Matrix

The following Cost Estimate Variance Matrix[1] has been developed to provide a range of estimate variance (plus or minus), based on the level of construction documents completion, in combination with an evaluation of the level of complexity of the project.

COST ESTIMATE VARIANCE MATRIX ± %				
Class of Estimates	Based On	Project Complexity LOW		HIGH
D	Concept sketch design	20	→	30
C	33% Design development	15	→	20
B	66% Design development	10	→	15
A	100% complete tender documents	5	→	10
Unique Projects, Circumstances, or Risks		Varies	→	Add to Above %

[1] "Guide to Cost Predictability in Construction" (November 2012) by Joint Canadian Federal Government/Industry Cost Predictability Taskforce

Windsor Sewer and Coastal Flood Protection Master Plan
Master Unit Price List

ROAD IMPROVEMENTS

Costs normalized per M

UNIT PRICES	UNIT	UNIT PRICE
Roadwork Removals		
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	$ 5.00
Full Depth Concrete Asphalt Removal	m	$ 125.00
Full Depth Asphalt Removal	m	$ 80.00
Driveway Removal (all types)	m	$ 30.00
Sidewalk Removal (all types)	m	$ 20.00
Concrete Median Removal	m	$ 10.00
Sawcutting Existing Pavement	m	$ 1.00
Curb and Gutter Removal	m	$ 20.00
Streetlighting Removal	m	$ 25.00
Signage Removal	m	$ 5.00
Typical Removals - Residential Roadways (2 Lanes Asphalt)	m	$ 186.00
Typical Removals - Residential Roadways (2 Lanes Concrete)	m	$ 231.00
Typical Removals - Arterial Roadways (4 Lanes)	m	$ 366.00
Concrete Repairs	m^2	$ 250.00
Traffic Signal Removal	LS	$ 15,000.00
Roadwork		
Earth Excavating and Grading	m	$ 120.00
Supply and Place Compacted Granular "A"	m	$ 350.00
Supply and Place Compacted Granular "A" for Temporary Lanes	m	$ 125.00
100mm Open Graded Drainage Layer	m	$ 225.00
Asphalt Pavement for Temporary Lanes (4m Wide - Asphalt)	m	$ 125.00
Asphalt Pavement (105mm)	m	$ 250.00
Asphalt Pavement (50mm Overlay)	m	$ 250.00
Concrete Pavement (305mm)	m	$ 575.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	$ 270.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	$ 392.00
Subdrains (2 lanes)	m	$ 60.00
Concrete Curb and Gutter (2 lanes)	m	$ 90.00
Concrete Median Islands (1m wide island)	m	$ 150.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning F	m	$ 75.00
Driveway Restoration a) Asphalt	m	$ 320.00
Driveway Restoration b) Concrete	m	$ 180.00
Topsoil, Hydraulic Seed and Mulch	m	$ 100.00
Temporary Pavement Markings	m	$ 1.00
Permananent Pavement Markings	m	$ 30.00
Traffic Control During Construction (Residential)	m	$ 100.00
Traffic Control During Construction (Arterial)	m	$ 200.00
Streetlighting (Residential)	m	$ 225.00
Streetlighting (Arterial)	m	$ 400.00
Street Trees (In Boulevard / 12m spacing each side)	m	$ 125.00
Traffic Signals (Minor Intersection)	LS	$ 150,000.00
Traffic Signals (Major Intersection)	LS	$ 200,000.00
Traffic Signals (Temporary)	LS	$ 80,000.00

Typical Roadwork - Residential Asphalt Roadways	m	$	2,688.00
Typical Roadwork - Residential Concrete Roadways	m	$	3,363.00
Typical Roadwork - Arterial Asphalt Roadways (2 Lanes)	m	$	3,213.00
Typical Roadwork - Arterial Concrete Roadways (2 Lanes)	m	$	3,913.00
Typical Roadwork - Arterial Asphalt Roadways (4 Lanes)	m	$	5,783.40
Typical Roadwork - Arterial Concrete Roadways (4 Lanes)	m	$	7,043.40
Sewer Removals			
Remove Existing Storm Sewers	m	$	100.00
Remove Existing Sanitary Sewers	m	$	100.00
Remove Existing Combined Sewers	m	$	75.00
Remove Existing Manholes	m	$	15.00
Remove Existing Catch Basins	m	$	12.50
Remove Existing Combined Private Drain Connection	m	$	100.00
Remove Existing Storm Private Drain Connection	m	$	25.00
Remove Existing Sanitary Private Drain Connection	m	$	25.00
Sewers			
Concrete Manholes - (1200mm to 1800mm)	m	$	75.00
Concrete Manholes - (2400mm to 3600mm)	m	$	130.00
Concrete Manholes - (Chamber)	m	$	200.00
Concrete Storm Precast Catchbasins and Leads	m	$	60.00
Sanitary Private Drain Connection	m	$	150.00
Sanitary Sewer - 250mm diameter PVC (DR-28)	m	$	350.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	$	400.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	$	450.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	$	450.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	$	475.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	$	525.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	$	625.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	$	700.00
Sanitary Sewer - 825mm diameter Concrete (100-D)	m	$	800.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	$	900.00
Sanitary Sewer - 1050mm diameter Concrete (100-D)	m	$	1,250.00
Sanitary Sewer - 1200mm diameter Concrete (100-D)	m	$	1,500.00
Sanitary Sewer - 1350mm diameter Concrete (100-D)	m	$	1,800.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	$	2,500.00
Sanitary Sewer - 1800mm diameter Concrete (100-D)	m	$	2,800.00
Sanitary Sewer - 1950mm diameter Concrete (100-D)	m	$	3,500.00
Sanitary Sewer - 2100mm diameter Concrete (100-D)	m	$	4,000.00
Sanitary Sewer - 2400mm diameter Concrete (100-D)	m	$	5,200.00
Sanitary Sewer - 2500mm diameter Concrete (100-D)	m	$	5,750.00
Sanitary Sewer - 2700mm diameter Concrete (100-D)	m	$	6,250.00
Sanitary Sewer - 3000mm diameter Concrete (100-D)	m	$	7,000.00
Sanitary Sewer - 4200mm diameter Concrete (100-D)	m	$	8,000.00
Sanitary Sewer - 3600mm x 1800mm Concrete Box Culvert	m	$	9,000.00
Sanitary Sewer - 3900mm x 1800mm Concrete Box Culvert	m	$	10,000.00
Sanitary Sewer - 4200mm x 1800mm Concrete Box Culvert	m	$	12,000.00
Sanitary Sewer - 4200mm x 1200mm Concrete Box Culvert	m	$	11,250.00
Sanitary Sewer - 3000mm x 2400mm Concrete Box Culvert	m	$	12,000.00
Sanitary Sewer - 3600mm x 2400mm Concrete Box Culvert	m	$	13,000.00
Sanitary Sewer - 3900mm x 2400mm Concrete Box Culvert	m	$	15,000.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	$	18,000.00
Sanitary Sewer - 4200mm x 2700mm Concrete Box Culvert	m	$	20,000.00

Sanitary Private Drain Connection	m	$	20.00
Manhole Rain Catchers	m	$	3.00
Storm Sewer - 300mm diameter PVC (DR-35)	m	$	325.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	$	385.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	$	400.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	$	450.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	$	500.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	$	550.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	$	600.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	$	700.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	$	850.00
Storm Sewer - 975mm diameter Concrete (100-D)	m	$	1,000.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	$	1,200.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	$	1,500.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	$	1,800.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	$	2,200.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	$	2,500.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	$	3,000.00
Storm Sewer - 1950mm diameter Concrete (100-D)	m	$	3,250.00
Storm Sewer - 2100mm diameter Concrete (100-D)	m	$	3,500.00
Storm Sewer - 2250mm diameter Concrete (100-D)	m	$	4,000.00
Storm Sewer - 2400mm diameter Concrete (100-D)	m	$	5,000.00
Storm Sewer - 2550mm diameter Concrete (100-D)	m	$	5,500.00
Storm Sewer - 2700mm diameter Concrete (100-D)	m	$	6,000.00
Storm Sewer - 3000mm diameter Concrete (100-D)	m	$	6,500.00
Storm Sewer - 3300mm diameter Concrete (100-D)	m	$	7,000.00
Storm Sewer - 3600mm diameter Concrete (100-D)	m	$	7,500.00
Storm Sewer - 1650mm diameter Concrete (Trenchless - Jacking Pipe)	m	$	5,000.00
Storm Sewer - 1200mm x 900mm Concrete Box Culvert	m	$	3,000.00
Storm Sewer - 1800mm x 900mm Concrete Box Culvert	m	$	3,250.00
Storm Sewer - 2400mm x 900mm Concrete Box Culvert	m	$	3,500.00
Storm Sewer - 1325mm x 1200mm Concrete Box Culvert	m	$	2,500.00
Storm Sewer - 1800mm x 1200mm Concrete Box Culvert	m	$	4,500.00
Storm Sewer - 2400mm x 1200mm Concrete Box Culvert	m	$	6,400.00
Storm Sewer - 3600mm x 1200mm Concrete Box Culvert	m	$	9,000.00
Storm Sewer - 4200mm x 1200mm Concrete Box Culvert	m	$	9,000.00
Storm Sewer - 3000mm x 1500mm Concrete Box Culvert	m	$	7,500.00
Storm Sewer - 3800mm x 1500mm Concrete Box Culvert	m	$	8,100.00
Storm Sewer - 4200mm x 1500mm Concrete Box Culvert	m	$	9,750.00
Storm Sewer - 1800mm x 1800mm Concrete Box Culvert	m	$	3,500.00
Storm Sewer - 2400mm x 1800mm Concrete Box Culvert	m	$	4,200.00
Storm Sewer - 3000mm x 1800mm Concrete Box Culvert	m	$	6,250.00
Storm Sewer - 3600mm x 1800mm Concrete Box Culvert	m	$	8,750.00
Storm Sewer - 4200mm x 1800mm Concrete Box Culvert	m	$	11,500.00
Storm Sewer - 2800mm x 2200mm Concrete Box Culvert	m	$	8,500.00
Storm Sewer - 3300mm x 2200mm Concrete Box Culvert	m	$	11,000.00
Storm Sewer - 3000mm x 2400mm Concrete Box Culvert	m	$	11,500.00
Storm Sewer - 3300mm x 2400mm Concrete Box Culvert	m	$	12,000.00
Storm Sewer - 3600mm x 2400mm Concrete Box Culvert	m	$	13,500.00
Storm Private Drain Connection	m	$	20.00
Ponds & Underground Storage			
Pond Excavation, Grading, Topsoil and Hydroseed	m^3		$300.00
Underground Storage	m^3		$1,000.00

City of Windsor Sewer and Coastal Flood Protection Master Plan
SUMMARY OF COSTING - SOUTH, CENTRAL AND EAST WINDSOR AREAS
Including 30% Contingency and 20% Engineering

CITY AREA	DRAINAGE AREA	SOLUTION AREA	PROJECT CODE	PROJECT NAME	CONSTRUCTION COST ESTIMATE BY STREET	TOTAL CONSTRUCTION COST ESTIMATE**
STORM SEWER IMPROVEMENTS						
South Windsor	Grand Marais Drain	Dougall Avenue and Eugenie Street East	ROAD-S1-1	Dougall Avenue and Eugenie St E	$20,904,000.00	$ 33,600,000.00
				Dougall Ave Pond (SWM Facility)	$12,636,000.00	
		Howard Avenue	ROAD-S2-2	Howard Avenue	$8,736,000.00	$ 9,900,000.00
				Howard Avenue (SWM Facility)	$1,138,800.00	
		Chrysler Centre	ROAD-S3-2	Chrysler Centre	$13,416,000.00	$ 30,600,000.00
				Chrysler Centre (SWM Facility)	$17,160,000.00	
		Central, Pillette and Regional	STM-S7-3	Pillette Rd	$3,500,000.00	$ 66,300,000.00
				Tourangeau Rd	$3,120,000.00	
				George St	$2,000,000.00	
				Central Ave	$14,100,000.00	
				Central Pond Expansion (SWM Facility)	$33,100,000.00	
				Grand Marais Rd E	$7,600,000.00	
				Plymouth Dr	$2,800,000.00	
	Lennon Drain	Southwood Lakes	STM-S8-2	Lake Como, Lake Grande, Lake Laguna NWL Lowering	$12,280,000.00	$ 12,300,000.00
Central Windsor	Detroit River	Prince Street	STM-C1	Chappell Ave	$2,880,000.00	$ 2,900,000.00
		Detroit Street	STM-C2	Detroit St	$2,040,000.00	$ 2,100,000.00
		Cameron Street Sewer	STM-C3	South Cameron Blvd	$990,000.00	$ 46,100,000.00
				Curry Ave	$11,800,000.00	
				Tecumseh Rd W	$1,440,000.00	
				Everts Ave	$560,000.00	
				Grove Ave	$468,000.00	
				College Ave	$110,000.00	
				Rooney St	$1,440,000.00	
				McKay Ave	$12,400,000.00	
				Martindale St	$1,800,000.00	
				Cameron Ave	$15,000,000.00	
		Bruce Avenue Sewer	STM-C4	Giles Blvd W	$2,040,000.00	$ 34,200,000.00
				Bruce Ave	$30,840,000.00	
				Elliot St.	$1,296,000.00	
		Parent (Marentette) Avenue Sewer	STM-C5	Parent Ave	$6,120,000.00	$ 10,400,000.00
				Assumption St	$870,000.00	
				Chatham St E	$1,440,000.00	
				Marentette Ave	$1,920,000.00	
		Ypres Avenue	STM-C6	Ypres Avenue	$5,040,000.00	$ 5,100,000.00
		Albert Road Sewer	STM-C7.2	Albert Road	$3,600,000.00	$ 5,200,000.00
				Wyandotte St E	$1,560,000.00	
		Drouillard PS	STM-C8	Wyandotte St E, Drouillard Rd	$630,000.00	$ 3,100,000.00
				Drouillard Rd	$2,400,000.00	
		College Aveune	STM-C9	College Avenue	$2,280,000.00	$ 2,300,000.00
		Felix Avenue	STM-C10	Huron Church Rd	$336,000.00	$ 23,500,000.00
				Dorchester Rd	$1,800,000.00	
				Felix Ave	$20,280,000.00	
				College Ave	$990,000.00	
		Partington Avenue	STM-C11	Campbell Ave	$492,000.00	$ 12,700,000.00
				Tecumseh Rd W	$3,000,000.00	
				Pelletier St	$1,440,000.00	
				Partington Ave	$7,700,000.00	
		Patricia Road	STM-C12	Patricia Rd	$3,960,000.00	$ 7,000,000.00
				Wyandotte St W	$3,000,000.00	
		Huron Church	STM-C13	Huron Church Road	$1,800,000.00	$ 1,800,000.00
		Tecumseh Road	STM-C14	Tecumseh Road W	$4,440,000.00	$ 6,500,000.00
				Tecumseh Blvd W	$2,040,000.00	
		Giles Boulevard	STM-C15	Giles Blvd	$21,200,000.00	$ 48,000,000.00
				Shepherd St	$2,520,000.00	
				McDougall St	$12,900,000.00	
				Howard Ave	$3,960,000.00	
				Erie St	$7,410,000.00	
		Parent Avenue between Erie St E and Giles Blvd	STM-C16	Parent Ave	$4,440,000.00	$ 5,400,000.00
				Erie St E	$870,000.00	
		Lincoln Road	STM-C17	Niagara St	$1,800,000.00	$ 5,400,000.00
				Lincoln Rd	$3,600,000.00	
		Ontario Street	STM-C18	Walker Rd	$228,000.00	$ 4,200,000.00
				Ontario St	$3,900,000.00	
		Walker Road	STM-C19	Walker Rd	$3,120,000.00	$ 6,300,000.00
				Mohawk St	$3,120,000.00	
		Prince Trunk Sewer	STM-C1	Prince Road Drainage Area Separation	$137,000,000.00	$ 137,000,000.00
		Brock Trunk Sewer	STM-C10	Brock Street Drainage Area Separation	$260,100,000.00	$ 260,100,000.00
		Detroit Trunk Sewer	STM-C2	Detroit Street Drainage Area Separation	$72,500,000.00	$ 72,500,000.00
		Huron Church Trunk Sewer	STM-C11	Huron Church Road Drainage Area Separation	$179,800,000.00	$ 179,800,000.00
		Askin Trunk Sewer	STM-C20	Askin Avenue Drainage Area Separation	$68,700,000.00	$ 68,700,000.00
		Cameron Trunk Sewer	STM-C3	Cameron Avenue Drainage Area Separation	$98,900,000.00	$ 98,900,000.00
		Wellington Trunk Sewer	STM-C14	Wellington Avenue Drainage Area Separation	$85,300,000.00	$ 85,300,000.00
		Chruch Trunk Sewer	STM-C4	Church Street Drainage Area Separation	$311,554,000.00	$ 311,600,000.00
		McDougall Trunk Sewer	STM-C22	McDougall Street Drainage Area Separation	$82,540,000.00	$ 82,600,000.00
		Parent Trunk Sewer	STM-C5	Parent Avenue Drainage Area Separation	$414,140,000.00	$ 414,200,000.00
		Lincoln Trunk Sewer	STM-C23	Lincoln Road Drainage Area Separation	$296,900,000.00	$ 296,900,000.00
		Albert Trunk Sewer	STM-C7.1	Albert Road Drainage Area Separation	$63,500,000.00	$ 63,500,000.00
		Dual MH Area	STM-C21	Dual Manhole Sewer Drainage Area	$480,400,000.00	$ 480,400,000.00

East Windsor	Ford Pump Station	Jefferson Boulevard	ROAD-E2	Jefferson Blvd	$8,100,000.00	$ 15,200,000.00
				Patrice Dr	$504,000.00	
				Garden Crt Dr	$980,000.00	
				Raymond Ave	$5,520,000.00	
	Little River	Lauzon Parkway	ROAD-E4	Little River Golf Course	$1,872,000.00	$ 33,700,000.00
				Little River Golf Course (SWM Facility)	$9,360,000.00	
				Lauzon Parkway	$14,664,000.00	
				Lauzon Parkway (SWM Facility)	$7,800,000.00	
		Lauzon Road	ROAD-E5	Lauzon Rd	$27,500,000.00	$ 33,200,000.00
				Clairview Ave	$3,120,000.00	
				Cecile St	$2,520,000.00	
		McHugh, East of Lauzon	ROAD-E6	McHugh St	$7,800,000.00	$ 7,800,000.00
		McHugh, West of Banwell	ROAD-E7	McHugh St	$12,300,000.00	$ 15,600,000.00
				Questa Dr	$1,560,000.00	
				Chateau Ave	$1,140,000.00	
				Leathorne St	$516,000.00	
		McNorton, East of Banwell	ROAD-E8	McNorton St	$2,760,000.00	$ 7,500,000.00
				Blue Heron Dr	$4,680,000.00	
	Pontiac Pump Station	Wyandotte St. East at Watson	ROAD-E9-2	Wyandotte St E	$764,400.00	$ 21,600,000.00
				Wyandotte St E (SWM Facility)	$7,800,000.00	
				Watson Ave	$468,000.00	
				Watson Ave (SWM Facility)	$12,480,000.00	
		Banwell Rd	ROAD-E10	Banwell Rd	$6,000,000.00	$ 6,000,000.00
	Little River	Roseland School	ROAD-E11	Roseville Garden Dr	$7,020,000.00	$ 56,600,000.00
				Rosevile Garden Dr (SWM Facility)	$49,560,000.00	
	Detroit River/Riverside	Storm Problem Areas 1 and 2 (Riverside)	STM-E1	Riverside Dr E	$20,300,000.00	$ 50,900,000.00
				Orchard Grove	$500,000.00	
				Glidden Ave	$600,000.00	
				St. Mary's Blvd	$2,760,000.00	
				Janisse Dr	$1,800,000.00	
				St. Rose Ave	$3,480,000.00	
				Wyandotte St E	$4,680,000.00	
				Ontario St	$3,960,000.00	
				Belleperche Pl	$9,900,000.00	
				St. Paul Ave (PS costs are included below)	$2,880,000.00	
	Little River	Storm Problem Areas 3/4 (Fountainebleu and Lauzon)	STM-E3	Balfour Blvd	$3,960,000.00	$ 82,900,000.00
				South National St	$14,300,000.00	
				Jefferson Blvd	$12,500,000.00	
				Tecumseh Rd E	$16,800,000.00	
				Glendale Ave	$6,500,000.00	
				Ferndale Ave	$4,080,000.00	
				Ford Blvd	$6,000,000.00	
				Buckingham Dr	$7,000,000.00	
				Jos St. Louis Ave	$2,520,000.00	
				Empress St	$870,000.00	
				Westminister Blvd	$2,280,000.00	
				Princess Ave	$1,800,000.00	
				Norman Rd	$2,400,000.00	
				Coronation Ave	$1,800,000.00	
	Blue Heron/Lakeview Pump Station	Storm Problem Area 5 (Blue Heron Pond)	STM-E5	Katella Ave	$1,920,000.00	$ 9,000,000.00
				Venetian Ave	$1,920,000.00	
				Morningstar Ave	$1,920,000.00	
				Rendesvous Crt	$456,000.00	
				Little River Blvd	$2,760,000.00	
	Pontiac Pump Station	Storm Problem Area 6	STM-E6	Cedarview St	$3,900,000.00	$ 23,700,000.00
				Cedarview St (Brumpton Park SWM Facility)	$7,488,000.00	
				Peppervine St	$444,000.00	
				Riverside Dr E	$3,360,000.00	
				Clairview Ave	$1,560,000.00	
				Adelaide Ave	$360,000.00	
				Clover St	$1,440,000.00	
				Elinor St	$1,560,000.00	
				John M St	$540,000.00	
				Menard St	$710,000.00	
				Florence Ave	$2,280,000.00	
TOTAL - STORM SEWER IMPROVMENTS						$ 3,300,100,000.00

LID IMPLEMENTATION						
East Windsor	East Windsor	East Windsor	N/A	East Windsor LID Implementation	$8,786,700.00	$8,800,000.00
South Windsor	South Windsor	South Windsor		South Windsor LID Implementation	$5,398,800.00	$5,400,000.00
Central Windsor	Central Windsor	Central Windsor		Central Windsor LID Implementation	$120,000,000.00	$120,000,000.00
TOTAL - LID IMPLEMENTATION						**$134,200,000.00**
SANITARY SEWER IMPROVEMENTS						
South Windsor	Lou Romano Water Reclamation Plant Sewer Shed Area	LRWRP Sewer Shed Area 1	SAN-S-1	Howard Ave	$4,680,000.00	
				Dominion Boulevard	$5,520,000.00	
				Roselawn Drive	$922,000.00	
				Woodland Ave	$7,600,000.00	
				Parkwood Ave	$2,340,000.00	
				Sydney Ave	$492,000.00	
				Malcom Ave	$500,000.00	$ 30,100,000.00
				Foster Ave	$324,000.00	
				Calderwood Ave	$990,000.00	
				EC Row Ave E	$624,000.00	
				Conservation Dr	$3,480,000.00	
				Grand Marais Rd E	$821,000.00	
				Tourangeau Rd	$1,800,000.00	
East Windsor	Little River Pollution Control Plant Sewer shed Area	LRPCP Sewer Shed Area 1	SAN-E-2	Riverside Dr E	$2,160,000.00	
				St. Rose Ave	$456,000.00	
				Ganatchio Trail	$20,000,000.00	$ 50,100,000.00
				Clairview Ave	$15,400,000.00	
				Riverside Dr Easement	$12,000,000.00	
		LRPCP Sewer Shed Area 2	SAN-E-2	Wyandotte St E	$45,600,000.00	$ 45,800,000.00
				Carling Cres	$132,000.00	
		LRPCP Sewer Shed Area 3	SAN-E-2	Jerome St	$24,300,000.00	
				Westchester Dr	$6,600,000.00	
				Rholaine Dr	$3,840,000.00	$ 42,300,000.00
				Greendale Dr	$6,600,000.00	
				Thompson Park	$880,000.00	
		LRPCP Sewer Shed Area 4	SAN-E-2	Edgar St	$34,100,000.00	
				Tranby Ave	$3,360,000.00	
				Little River Rd	$13,920,000.00	
				Little River Acres Dr	$4,080,000.00	
				Catherine St	$3,600,000.00	
				Lauzon Pkwy	$3,480,000.00	
				Lauzon Rd	$9,000,000.00	
				South National St	$7,800,000.00	
				Jefferson Blvd	$13,800,000.00	
				Balfour Blvd	$1,920,000.00	$ 126,000,000.00
				Glendale Ave	$1,080,000.00	
				Ferndale Ave	$2,520,000.00	
				Ford Blvd	$2,280,000.00	
				Tecumseh Rd E	$1,320,000.00	
				Rivard Ave	$6,000,000.00	
				Grandview St	$2,340,000.00	
				Courtland Cre	$456,000.00	
				Coronation School Yard/Pikes Park/WECHC	$7,200,000.00	
				Rose St	$4,700,000.00	
				Jos St. Louis	$3,000,000.00	
		LRPCP Sewer Shed Area 5	SAN-E-2	Aspen Lake - Riverside Kiwanis Park	$60,200,000.00	
				Cypress Ave	$5,640,000.00	
				Forest Glade Dr (Tecumseh to Cypress - Private Property)	$2,400,000.00	
				Forest Glade Dr	$25,800,000.00	
				Jefferson to Cantelon (Private Property)	$590,000.00	
				Cantelon Dr	$5,640,000.00	
				Hawthorne Dr	$8,100,000.00	
				Esplanade Dr	$10,700,000.00	
				Elinor St	$4,680,000.00	
				Florence Ave	$500,000.00	
				John M St	$180,000.00	
				Menard St	$228,000.00	
				Clover St	$280,000.00	
				Beverley Glen St	$34,400,000.00	$ 195,100,000.00
				Whistler Cres to Beverly Glen	$8,200,000.00	
				Whistler Cres	$2,280,000.00	
				Cora Greenwood Park	$1,120,000.00	
				Rendesvous Crt to Cora Greenwood Park (Private Property)	$1,560,000.00	
				Cora Greenwood Dr	$276,000.00	
				Greenpark Blvd	$3,600,000.00	
				Little River Blvd	$564,000.00	
				Jarvis Ave	$3,120,000.00	
				Banwell Rd	$8,300,000.00	
				Rosebriar Rd	$1,440,000.00	
				Wildwood Dr	$3,840,000.00	
				Deerbrook Dr	$1,440,000.00	
TOTAL - SANITARY SEWER IMPROVMENTS						$ 489,400,000.00
PUMP STATION IMPROVEMENTS						
Central Windsor	Detroit River	Drouillard PS	STM-C8	Drouillard Pump Station		$ 2,400,000.00
		Prince Road PS	STM-C1	Prince Road Dewatering Pump Station		$ 300,000.00
East Windsor	Detroit River/Riverside	East Windsor Sanitary System	SAN-E-1	Little River Pollution Control Plant Bypass Improvements at Pontiac Pump Station		$ 5,100,000.00
		Storm Problem Areas 1 and 2 (Riverside)	PS-E1-ROSE	St. Rose Pump Station		$ 24,000,000.00
			PS-E1-FORD	Ford Pump Station		$ 400,000.00
			PS-E1-STPAUL	St. Paul Pump Station		$ 8,200,000.00
	Blue Heron/Lakeview Pump Station	Storm Problem Area 5 (Blue Heron Pond)	STM-E5-1	Lakeview Pump Station		$ 1,800,000.00
	East Marsh Drainage Area	Storm Problem Area 6 (Pontiac and East Marsh Drainage Area)	STM-E6	East Marsh Pump Station Upgrades		$ 3,300,000.00
TOTAL - PUMP STATION IMPROVEMENTS						**$ 45,500,000.00**
COASTAL FLOOD PROTECTION IMPROVEMENTS						
Landform Barrier		Riverside Area 1	BERM-E1	Riverside Drive (Ford Blvd to St. Rose Ave)		$ 3,860,000.00
		Riverside Area 1	BERM-E2	Riverside Drive (St. Rose to Riverdale Ave)		$ 2,560,000.00
		Riverside Area 1	BERM-E3	Riverside Drive (Riverdale to East City Limits)		$ 2,880,000.00
TOTAL - COASTAL FLOOD PROTECTION IMPROVEMENTS						**$ 9,300,000.00**
TOTAL - ALL WORKS						**$ 3,978,500,000.00**

** Total construction costs are rounded to the nearest $100,000.00

RIVERSIDE DR E	STM-E1-2
Length of Road Improvements (m)	1700 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

RIVERSIDE DR E	STM-E1-2			
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1700	$ 5.00	$ 8,500.00
Full Depth Asphalt Removal	m	1700	$ 80.00	$ 136,000.00
Driveway Removal (all types)	m	1700	$ 30.00	$ 51,000.00
Sidewalk Removal (all types)	m	1700	$ 20.00	$ 34,000.00
Sawcutting Existing Pavement	m	1700	$ 1.00	$ 1,700.00
Curb and Gutter Removal	m	1700	$ 20.00	$ 34,000.00
Streetlighting Removal	m	1700	$ 25.00	$ 42,500.00
Signage Removal	m	1700	$ 5.00	$ 8,500.00
SUBTOTAL				**$ 320,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1700	$ 100.00	$ 170,000.00
Remove Existing Manholes	m	1700	$ 15.00	$ 25,500.00
Remove Existing Catch Basins	m	1700	$ 12.50	$ 21,250.00
Remove Existing Storm Private Drain Connection	m	1700	$ 25.00	$ 42,500.00
SUBTOTAL				**$ 260,000.00**
Roadwork				
Earth Excavating and Grading	m	1700	$ 120.00	$ 204,000.00
Supply and Place Compacted Granular "A"	m	1700	$ 350.00	$ 595,000.00
Asphalt Pavement (105mm)	m	1700	$ 250.00	$ 425,000.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	1700	$ 270.00	$ 459,000.00
Subdrains (2 lanes)	m	1700	$ 60.00	$ 102,000.00
Concrete Curb and Gutter (2 lanes)	m	1700	$ 90.00	$ 153,000.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1700	$ 75.00	$ 127,500.00
Driveway Restoration b) Concrete	m	1700	$ 180.00	$ 306,000.00
Topsoil, Hydraulic Seed and Mulch	m	1700	$ 100.00	$ 170,000.00
Temporary Pavement Markings	m	1700	$ 1.00	$ 1,700.00
Permananent Pavement Markings	m	1700	$ 30.00	$ 51,000.00
Traffic Control During Construction (Arterial)	m	1700	$ 200.00	$ 340,000.00
Streetlighting (Arterial)	m	1700	$ 400.00	$ 680,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	1700	$ 125.00	$ 212,500.00
SUBTOTAL				**$ 3,900,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	1700	$ 130.00	$ 221,000.00
Concrete Storm Precast Catchbasins and Leads	m	1700	$ 60.00	$ 102,000.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	39	$ 385.00	$ 15,015.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	65	$ 1,200.00	$ 78,000.00
Storm Sewer - 2400mm diameter Concrete (100-D)	m	1596	$ 5,000.00	$ 7,980,000.00
Storm Private Drain Connection	m	1700	$ 20.00	$ 34,000.00
SUBTOTAL				**$ 8,500,000.00**
Construction Cost Total				**$ 13,000,000.00**
Construction Cost Contingency (30%)				**$ 3,900,000.00**
Subtotal				**$ 16,900,000.00**
Engineering Fee Estimate (20%)				**$ 3,400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 20,300,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ORCHARD GROVE	STM-E1-2
Length of Road Improvements (m)	129 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ORCHARD GROVE		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	129	$ 5.00	$ 645.00
Full Depth Asphalt Removal	m	129	$ 80.00	$ 10,320.00
Driveway Removal (all types)	m	129	$ 30.00	$ 3,870.00
Sawcutting Existing Pavement	m	129	$ 1.00	$ 129.00
Curb and Gutter Removal	m	129	$ 20.00	$ 2,580.00
Streetlighting Removal	m	129	$ 25.00	$ 3,225.00
Signage Removal	m	129	$ 5.00	$ 645.00
SUBTOTAL				**$ 22,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	129	$ 100.00	$ 12,900.00
Remove Existing Manholes	m	129	$ 15.00	$ 1,935.00
Remove Existing Catch Basins	m	129	$ 12.50	$ 1,612.50
Remove Existing Storm Private Drain Connection	m	129	$ 25.00	$ 3,225.00
SUBTOTAL				**$ 20,000.00**
Roadwork				
Earth Excavating and Grading	m	129	$ 120.00	$ 15,480.00
Supply and Place Compacted Granular "A"	m	129	$ 350.00	$ 45,150.00
Asphalt Pavement (105mm)	m	129	$ 250.00	$ 32,250.00
Subdrains (2 lanes)	m	129	$ 60.00	$ 7,740.00
Concrete Curb and Gutter (2 lanes)	m	129	$ 90.00	$ 11,610.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	129	$ 75.00	$ 9,675.00
Driveway Restoration b) Concrete	m	129	$ 180.00	$ 23,220.00
Topsoil, Hydraulic Seed and Mulch	m	129	$ 100.00	$ 12,900.00
Traffic Control During Construction (Residential)	m	129	$ 100.00	$ 12,900.00
Streetlighting (Residential)	m	129	$ 225.00	$ 29,025.00
SUBTOTAL				**$ 200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	129	$ 75.00	$ 9,675.00
Concrete Storm Precast Catchbasins and Leads	m	129	$ 60.00	$ 7,740.00
Storm Sewer - 300mm diameter PVC (DR-35)	m	71	$ 325.00	$ 23,075.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	58	$ 400.00	$ 23,200.00
Storm Private Drain Connection	m	129	$ 20.00	$ 2,580.00
SUBTOTAL				**$ 67,000.00**
Construction Cost Total				**$ 310,000.00**
Construction Cost Contingency (30%)				**$ 100,000.00**
Subtotal				**$ 410,000.00**
Engineering Fee Estimate (20%)				**$ 90,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 500,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

GLIDDEN AVE	STM-E1-2
Length of Road Improvements (m)	139 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GLIDDEN AVE		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	139	$ 5.00	$ 695.00
Full Depth Asphalt Removal	m	139	$ 80.00	$ 11,120.00
Driveway Removal (all types)	m	139	$ 30.00	$ 4,170.00
Sidewalk Removal (all types)	m	139	$ 20.00	$ 2,780.00
Sawcutting Existing Pavement	m	139	$ 1.00	$ 139.00
Curb and Gutter Removal	m	139	$ 20.00	$ 2,780.00
Streetlighting Removal	m	139	$ 25.00	$ 3,475.00
Signage Removal	m	139	$ 5.00	$ 695.00
SUBTOTAL				**$ 26,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	139	$ 100.00	$ 13,900.00
Remove Existing Manholes	m	139	$ 15.00	$ 2,085.00
Remove Existing Catch Basins	m	139	$ 12.50	$ 1,737.50
Remove Existing Storm Private Drain Connection	m	139	$ 25.00	$ 3,475.00
SUBTOTAL				**$ 22,000.00**
Roadwork				
Earth Excavating and Grading	m	139	$ 120.00	$ 16,680.00
Supply and Place Compacted Granular "A"	m	139	$ 350.00	$ 48,650.00
Asphalt Pavement (105mm)	m	139	$ 250.00	$ 34,750.00
Subdrains (2 lanes)	m	139	$ 60.00	$ 8,340.00
Concrete Curb and Gutter (2 lanes)	m	139	$ 90.00	$ 12,510.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	139	$ 75.00	$ 10,425.00
Driveway Restoration b) Concrete	m	139	$ 180.00	$ 25,020.00
Topsoil, Hydraulic Seed and Mulch	m	139	$ 100.00	$ 13,900.00
Traffic Control During Construction (Residential)	m	139	$ 100.00	$ 13,900.00
Streetlighting (Residential)	m	139	$ 225.00	$ 31,275.00
SUBTOTAL				**$ 220,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	139	$ 75.00	$ 10,425.00
Concrete Storm Precast Catchbasins and Leads	m	139	$ 60.00	$ 8,340.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	139	$ 600.00	$ 83,400.00
Storm Private Drain Connection	m	139	$ 20.00	$ 2,780.00
SUBTOTAL				**$ 110,000.00**
Construction Cost Total				**$ 380,000.00**
Construction Cost Contingency (30%)				**$ 120,000.00**
Subtotal				**$ 500,000.00**
Engineering Fee Estimate (20%)				**$ 100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 600,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ST. MARYS BLVD	STM-E1-2
Length of Road Improvements (m)	270 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ST. MARYS BLVD		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	270	$ 5.00	$ 1,350.00
Full Depth Concrete Asphalt Removal	m	270	$ 125.00	$ 33,750.00
Driveway Removal (all types)	m	270	$ 30.00	$ 8,100.00
Sawcutting Existing Pavement	m	270	$ 1.00	$ 270.00
Curb and Gutter Removal	m	270	$ 20.00	$ 5,400.00
Streetlighting Removal	m	270	$ 25.00	$ 6,750.00
Signage Removal	m	270	$ 5.00	$ 1,350.00
SUBTOTAL				**$ 57,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	270	$ 100.00	$ 27,000.00
Remove Existing Manholes	m	270	$ 15.00	$ 4,050.00
Remove Existing Catch Basins	m	270	$ 12.50	$ 3,375.00
Remove Existing Storm Private Drain Connection	m	270	$ 25.00	$ 6,750.00
SUBTOTAL				**$ 42,000.00**
Roadwork				
Earth Excavating and Grading	m	270	$ 120.00	$ 32,400.00
Supply and Place Compacted Granular "A"	m	270	$ 350.00	$ 94,500.00
100mm Open Graded Drainage Layer	m	270	$ 225.00	$ 60,750.00
Concrete Pavement (305mm)	m	270	$ 575.00	$ 155,250.00
Subdrains (2 lanes)	m	270	$ 60.00	$ 16,200.00
Concrete Curb and Gutter (2 lanes)	m	270	$ 90.00	$ 24,300.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	270	$ 75.00	$ 20,250.00
Driveway Restoration b) Concrete	m	270	$ 180.00	$ 48,600.00
Topsoil, Hydraulic Seed and Mulch	m	270	$ 100.00	$ 27,000.00
Traffic Control During Construction (Residential)	m	270	$ 100.00	$ 27,000.00
Streetlighting (Residential)	m	270	$ 225.00	$ 60,750.00
SUBTOTAL				**$ 570,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	270	$ 130.00	$ 35,100.00
Concrete Storm Precast Catchbasins and Leads	m	270	$ 60.00	$ 16,200.00
Storm Sewer - 1800mm x 900mm Concrete Box Culvert	m	270	$ 3,250.00	$ 877,500.00
Storm Private Drain Connection	m	270	$ 20.00	$ 5,400.00
SUBTOTAL				**$ 940,000.00**
Construction Cost Total				**$ 1,700,000.00**
Construction Cost Contingency (30%)				**$ 510,000.00**
Subtotal				**$ 2,300,000.00**
Engineering Fee Estimate (20%)				**$ 460,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 2,760,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

JANISSE DR	STM-E1-2
Length of Road Improvements (m)	201 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

JANISSE DR		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	201	$ 5.00	$ 1,005.00
Full Depth Asphalt Removal	m	201	$ 80.00	$ 16,080.00
Driveway Removal (all types)	m	201	$ 30.00	$ 6,030.00
Sawcutting Existing Pavement	m	201	$ 1.00	$ 201.00
Curb and Gutter Removal	m	201	$ 20.00	$ 4,020.00
Streetlighting Removal	m	201	$ 25.00	$ 5,025.00
Signage Removal	m	201	$ 5.00	$ 1,005.00
SUBTOTAL				**$ 34,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	201	$ 100.00	$ 20,100.00
Remove Existing Manholes	m	201	$ 15.00	$ 3,015.00
Remove Existing Catch Basins	m	201	$ 12.50	$ 2,512.50
Remove Existing Storm Private Drain Connection	m	201	$ 25.00	$ 5,025.00
SUBTOTAL				**$ 31,000.00**
Roadwork				
Earth Excavating and Grading	m	201	$ 120.00	$ 24,120.00
Supply and Place Compacted Granular "A"	m	201	$ 350.00	$ 70,350.00
Asphalt Pavement (105mm)	m	201	$ 250.00	$ 50,250.00
Subdrains (2 lanes)	m	201	$ 60.00	$ 12,060.00
Concrete Curb and Gutter (2 lanes)	m	201	$ 90.00	$ 18,090.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	201	$ 75.00	$ 15,075.00
Driveway Restoration b) Concrete	m	201	$ 180.00	$ 36,180.00
Topsoil, Hydraulic Seed and Mulch	m	201	$ 100.00	$ 20,100.00
Traffic Control During Construction (Residential)	m	201	$ 100.00	$ 20,100.00
Streetlighting (Residential)	m	201	$ 225.00	$ 45,225.00
SUBTOTAL				**$ 320,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	201	$ 130.00	$ 26,130.00
Concrete Storm Precast Catchbasins and Leads	m	201	$ 60.00	$ 12,060.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	201	$ 3,000.00	$ 603,000.00
Storm Private Drain Connection	m	201	$ 20.00	$ 4,020.00
SUBTOTAL				**$ 650,000.00**
Construction Cost Total				**$ 1,100,000.00**
Construction Cost Contingency (30%)				**$ 330,000.00**
Subtotal				**$ 1,500,000.00**
Engineering Fee Estimate (20%)				**$ 300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 1,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ST. ROSE AVE	STM-E1-2
Length of Road Improvements (m)	210 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

ST. ROSE AVE		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	315	$ 5.00	$ 1,575.00
Full Depth Asphalt Removal	m	210	$ 80.00	$ 16,800.00
Driveway Removal (all types)	m	210	$ 30.00	$ 6,300.00
Sidewalk Removal (all types)	m	210	$ 20.00	$ 4,200.00
Sawcutting Existing Pavement	m	210	$ 1.00	$ 210.00
Curb and Gutter Removal	m	210	$ 20.00	$ 4,200.00
Streetlighting Removal	m	210	$ 25.00	$ 5,250.00
Signage Removal	m	210	$ 5.00	$ 1,050.00
SUBTOTAL				**$ 40,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	338	$ 100.00	$ 33,800.00
Remove Existing Manholes	m	338	$ 15.00	$ 5,070.00
Remove Existing Catch Basins	m	338	$ 12.50	$ 4,225.00
Remove Existing Storm Private Drain Connection	m	338	$ 25.00	$ 8,450.00
SUBTOTAL				**$ 52,000.00**
Roadwork				
Earth Excavating and Grading	m	210	$ 120.00	$ 25,200.00
Supply and Place Compacted Granular "A"	m	210	$ 350.00	$ 73,500.00
Asphalt Pavement (105mm)	m	210	$ 250.00	$ 52,500.00
Subdrains (2 lanes)	m	210	$ 60.00	$ 12,600.00
Concrete Curb and Gutter (2 lanes)	m	210	$ 90.00	$ 18,900.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	210	$ 75.00	$ 15,750.00
Driveway Restoration b) Concrete	m	210	$ 180.00	$ 37,800.00
Topsoil, Hydraulic Seed and Mulch	m	210	$ 100.00	$ 21,000.00
Traffic Control During Construction (Residential)	m	210	$ 100.00	$ 21,000.00
Streetlighting (Residential)	m	210	$ 225.00	$ 47,250.00
SUBTOTAL				**$ 330,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	338	$ 200.00	$ 67,600.00
Concrete Storm Precast Catchbasins and Leads	m	338	$ 60.00	$ 20,280.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	90	$ 385.00	$ 34,650.00
Storm Sewer - 3000mm x 1800mm Concrete Box Culvert	m	248	$ 6,250.00	$ 1,550,000.00
Storm Private Drain Connection	m	338	$ 20.00	$ 6,760.00
SUBTOTAL				**$ 1,700,000.00**
Construction Cost Total				**$ 2,200,000.00**
Construction Cost Contingency (30%)				**$ 660,000.00**
Subtotal				**$ 2,900,000.00**
Engineering Fee Estimate (20%)				**$ 580,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 3,480,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WYANDOTTE ST E	STM-E1-2
Length of Road Improvements (m)	278 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

WYANDOTTE ST E		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	278	$ 5.00	$ 1,390.00
Full Depth Concrete Asphalt Removal	m	278	$ 250.00	$ 69,500.00
Driveway Removal (all types)	m	278	$ 30.00	$ 8,340.00
Sidewalk Removal (all types)	m	278	$ 20.00	$ 5,560.00
Concrete Median Removal	m	278	$ 10.00	$ 2,780.00
Sawcutting Existing Pavement	m	278	$ 1.00	$ 278.00
Curb and Gutter Removal	m	278	$ 20.00	$ 5,560.00
Streetlighting Removal	m	278	$ 25.00	$ 6,950.00
Signage Removal	m	278	$ 5.00	$ 1,390.00
SUBTOTAL				**$ 102,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	278	$ 100.00	$ 27,800.00
Remove Existing Manholes	m	278	$ 15.00	$ 4,170.00
Remove Existing Catch Basins	m	278	$ 12.50	$ 3,475.00
Remove Existing Storm Private Drain Connection	m	278	$ 25.00	$ 6,950.00
SUBTOTAL				**$ 43,000.00**
Roadwork				
Earth Excavating and Grading	m	278	$ 240.00	$ 66,720.00
Supply and Place Compacted Granular "A"	m	278	$ 700.00	$ 194,600.00
100mm Open Graded Drainage Layer	m	278	$ 450.00	$ 125,100.00
Concrete Pavement (305mm)	m	278	$ 1,150.00	$ 319,700.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	278	$ 392.00	$ 108,976.00
Subdrains (2 lanes)	m	278	$ 60.00	$ 16,680.00
Concrete Curb and Gutter (2 lanes)	m	278	$ 90.00	$ 25,020.00
Concrete Median Islands (1m wide island)	m	278	$ 150.00	$ 41,700.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	278	$ 75.00	$ 20,850.00
Driveway Restoration b) Concrete	m	278	$ 180.00	$ 50,040.00
Topsoil, Hydraulic Seed and Mulch	m	278	$ 100.00	$ 27,800.00
Temporary Pavement Markings	m	278	$ 1.00	$ 278.00
Permananent Pavement Markings	m	278	$ 30.00	$ 8,340.00
Traffic Control During Construction (Arterial)	m	278	$ 200.00	$ 55,600.00
Streetlighting (Arterial)	m	278	$ 400.00	$ 111,200.00
Street Trees (In Boulevard / 12m spacing each side)	m	278	$ 125.00	$ 34,750.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 1,500,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	278	$ 200.00	$ 55,600.00
Concrete Storm Precast Catchbasins and Leads	m	278	$ 60.00	$ 16,680.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	32	$ 400.00	$ 12,800.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	120	$ 3,000.00	$ 360,000.00
Storm Sewer - 3000mm x 1800mm Concrete Box Culvert	m	126	$ 6,250.00	$ 787,500.00
Storm Private Drain Connection	m	278	$ 20.00	$ 5,560.00
SUBTOTAL				**$ 1,300,000.00**
Construction Cost Total				**$ 3,000,000.00**
Construction Cost Contingency (30%)				**$ 900,000.00**
Subtotal				**$ 3,900,000.00**
Engineering Fee Estimate (20%)				**$ 780,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 4,680,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ONTARIO ST	STM-E1-2
Length of Road Improvements (m)	353 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ONTARIO ST		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	353	$ 5.00	$ 1,765.00
Full Depth Asphalt Removal	m	353	$ 80.00	$ 28,240.00
Driveway Removal (all types)	m	353	$ 30.00	$ 10,590.00
Sidewalk Removal (all types)	m	353	$ 20.00	$ 7,060.00
Sawcutting Existing Pavement	m	353	$ 1.00	$ 353.00
Curb and Gutter Removal	m	353	$ 20.00	$ 7,060.00
Streetlighting Removal	m	353	$ 25.00	$ 8,825.00
Signage Removal	m	353	$ 5.00	$ 1,765.00
SUBTOTAL				**$ 66,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	353	$ 100.00	$ 35,300.00
Remove Existing Manholes	m	353	$ 15.00	$ 5,295.00
Remove Existing Catch Basins	m	353	$ 12.50	$ 4,412.50
Remove Existing Storm Private Drain Connection	m	353	$ 25.00	$ 8,825.00
SUBTOTAL				**$ 54,000.00**
Roadwork				
Earth Excavating and Grading	m	353	$ 120.00	$ 42,360.00
Supply and Place Compacted Granular "A"	m	353	$ 350.00	$ 123,550.00
Asphalt Pavement (105mm)	m	353	$ 250.00	$ 88,250.00
Subdrains (2 lanes)	m	353	$ 60.00	$ 21,180.00
Concrete Curb and Gutter (2 lanes)	m	353	$ 90.00	$ 31,770.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	353	$ 75.00	$ 26,475.00
Driveway Restoration b) Concrete	m	353	$ 180.00	$ 63,540.00
Topsoil, Hydraulic Seed and Mulch	m	353	$ 100.00	$ 35,300.00
Traffic Control During Construction (Residential)	m	353	$ 100.00	$ 35,300.00
Streetlighting (Residential)	m	353	$ 225.00	$ 79,425.00
SUBTOTAL				**$ 550,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	145	$ 130.00	$ 18,850.00
Concrete Manholes - (Chamber)	m	208	$ 200.00	$ 41,600.00
Concrete Storm Precast Catchbasins and Leads	m	329	$ 60.00	$ 19,740.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	145	$ 600.00	$ 87,000.00
Storm Sewer - 1800mm x 900mm Concrete Box Culvert	m	103	$ 3,250.00	$ 334,750.00
Storm Sewer - 4200mm x 1800mm Concrete Box Culvert	m	105	$ 11,500.00	$ 1,207,500.00
Storm Private Drain Connection	m	353	$ 20.00	$ 7,060.00
SUBTOTAL				**$ 1,800,000.00**
Construction Cost Total				**$ 2,500,000.00**
Construction Cost Contingency (30%)				**$ 750,000.00**
Subtotal				**$ 3,300,000.00**
Engineering Fee Estimate (20%)				**$ 660,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 3,960,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

BELLEPERCHE PL	STM-E1-2
Length of Road Improvements (m)	1401 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

BELLEPERCHE PL		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1401	$ 5.00	$ 7,005.00
Full Depth Asphalt Removal	m	1401	$ 80.00	$ 112,080.00
Driveway Removal (all types)	m	1401	$ 30.00	$ 42,030.00
Sidewalk Removal (all types)	m	1401	$ 20.00	$ 28,020.00
Sawcutting Existing Pavement	m	1401	$ 1.00	$ 1,401.00
Curb and Gutter Removal	m	1401	$ 20.00	$ 28,020.00
Streetlighting Removal	m	1401	$ 25.00	$ 35,025.00
Signage Removal	m	1401	$ 5.00	$ 7,005.00
SUBTOTAL				**$ 270,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1401	$ 100.00	$ 140,100.00
Remove Existing Manholes	m	1401	$ 15.00	$ 21,015.00
Remove Existing Catch Basins	m	1401	$ 12.50	$ 17,512.50
Remove Existing Storm Private Drain Connection	m	1401	$ 25.00	$ 35,025.00
SUBTOTAL				**$ 220,000.00**
Roadwork				
Earth Excavating and Grading	m	1401	$ 120.00	$ 168,120.00
Supply and Place Compacted Granular "A"	m	1401	$ 350.00	$ 490,350.00
Asphalt Pavement (105mm)	m	1401	$ 250.00	$ 350,250.00
Subdrains (2 lanes)	m	1401	$ 60.00	$ 84,060.00
Concrete Curb and Gutter (2 lanes)	m	1401	$ 90.00	$ 126,090.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1401	$ 75.00	$ 105,075.00
Driveway Restoration b) Concrete	m	1401	$ 180.00	$ 252,180.00
Topsoil, Hydraulic Seed and Mulch	m	1401	$ 100.00	$ 140,100.00
Traffic Control During Construction (Residential)	m	1401	$ 100.00	$ 140,100.00
Streetlighting (Residential)	m	1401	$ 225.00	$ 315,225.00
SUBTOTAL				**$ 2,200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	492	$ 75.00	$ 36,900.00
Concrete Manholes - (Chamber)	m	909	$ 200.00	$ 181,800.00
Concrete Storm Precast Catchbasins and Leads	m	1401	$ 60.00	$ 84,060.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	492	$ 450.00	$ 221,400.00
Storm Sewer - 1800mm x 900mm Concrete Box Culvert	m	909	$ 3,250.00	$ 2,954,250.00
Storm Private Drain Connection	m	1401	$ 20.00	$ 28,020.00
SUBTOTAL				**$ 3,600,000.00**
Construction Cost Total				**$ 6,300,000.00**
Construction Cost Contingency (30%)				**$ 1,900,000.00**
Subtotal				**$ 8,200,000.00**
Engineering Fee Estimate (20%)				**$ 1,700,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 9,900,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ST. PAUL AVE	STM-E1-2
Length of Road Improvements (m)	308 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ST. PAUL AVE		STM-E1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	308	$ 5.00	$ 1,540.00
Sidewalk Removal (all types)	m	308	$ 20.00	$ 6,160.00
Streetlighting Removal	m	308	$ 25.00	$ 7,700.00
SUBTOTAL				**$ 16,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	308	$ 100.00	$ 30,800.00
Remove Existing Manholes	m	308	$ 15.00	$ 4,620.00
Remove Existing Catch Basins	m	308	$ 12.50	$ 3,850.00
Remove Existing Storm Private Drain Connection	m	308	$ 25.00	$ 7,700.00
SUBTOTAL				**$ 47,000.00**
Roadwork				
Earth Excavating and Grading	m	308	$ 120.00	$ 36,960.00
Supply and Place Compacted Granular "A" for Temporary Lanes	m	308	$ 125.00	$ 38,500.00
Subdrains (2 lanes)	m	308	$ 60.00	$ 18,480.00
Concrete Curb and Gutter (2 lanes)	m	308	$ 90.00	$ 27,720.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	308	$ 75.00	$ 23,100.00
Streetlighting (Residential)	m	308	$ 225.00	$ 69,300.00
SUBTOTAL				**$ 220,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	28	$ 130.00	$ 3,640.00
Concrete Manholes - (Chamber)	m	280	$ 200.00	$ 56,000.00
Concrete Storm Precast Catchbasins and Leads	m	308	$ 60.00	$ 18,480.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	28	$ 3,000.00	$ 84,000.00
Storm Sewer - 2700mm diameter Concrete (100-D)	m	89	$ 6,000.00	$ 534,000.00
Storm Sewer - 2400mm x 1800mm Concrete Box Culvert	m	191	$ 4,200.00	$ 802,200.00
SUBTOTAL				**$ 1,500,000.00**
Construction Cost Total				**$ 1,800,000.00**
Construction Cost Contingency (30%)				**$ 540,000.00**
Subtotal				**$ 2,400,000.00**
Engineering Fee Estimate (20%)				**$ 480,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E1-2				**$ 2,880,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

BALFOUR BLVD	STM-E3-2
Length of Road Improvements (m)	614 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

BALFOUR BLVD		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	614	$ 5.00	$ 3,070.00
Full Depth Concrete Asphalt Removal	m	614	$ 125.00	$ 76,750.00
Driveway Removal (all types)	m	614	$ 30.00	$ 18,420.00
Sidewalk Removal (all types)	m	614	$ 20.00	$ 12,280.00
Sawcutting Existing Pavement	m	614	$ 1.00	$ 614.00
Curb and Gutter Removal	m	614	$ 20.00	$ 12,280.00
Streetlighting Removal	m	614	$ 25.00	$ 15,350.00
Signage Removal	m	614	$ 5.00	$ 3,070.00
SUBTOTAL				**$ 150,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	614	$ 100.00	$ 61,400.00
Remove Existing Manholes	m	614	$ 15.00	$ 9,210.00
Remove Existing Catch Basins	m	614	$ 12.50	$ 7,675.00
Remove Existing Storm Private Drain Connection	m	614	$ 25.00	$ 15,350.00
SUBTOTAL				**$ 94,000.00**
Roadwork				
Earth Excavating and Grading	m	614	$ 120.00	$ 73,680.00
Supply and Place Compacted Granular "A"	m	614	$ 350.00	$ 214,900.00
100mm Open Graded Drainage Layer	m	614	$ 225.00	$ 138,150.00
Concrete Pavement (305mm)	m	614	$ 575.00	$ 353,050.00
Subdrains (2 lanes)	m	614	$ 60.00	$ 36,840.00
Concrete Curb and Gutter (2 lanes)	m	614	$ 90.00	$ 55,260.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	614	$ 75.00	$ 46,050.00
Driveway Restoration b) Concrete	m	614	$ 180.00	$ 110,520.00
Topsoil, Hydraulic Seed and Mulch	m	614	$ 100.00	$ 61,400.00
Traffic Control During Construction (Residential)	m	614	$ 100.00	$ 61,400.00
Streetlighting (Residential)	m	614	$ 225.00	$ 138,150.00
SUBTOTAL				**$ 1,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	582	$ 75.00	$ 43,650.00
Concrete Manholes - (Chamber)	m	32	$ 200.00	$ 6,400.00
Concrete Storm Precast Catchbasins and Leads	m	614	$ 60.00	$ 36,840.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	101	$ 385.00	$ 38,885.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	82	$ 400.00	$ 32,800.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	83	$ 550.00	$ 45,650.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	52	$ 600.00	$ 31,200.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	137	$ 700.00	$ 95,900.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	127	$ 850.00	$ 107,950.00
Storm Sewer - 3600mm x 2400mm Concrete Box Culvert	m	32	$ 13,500.00	$ 432,000.00
Storm Private Drain Connection	m	614	$ 20.00	$ 12,280.00
SUBTOTAL				**$ 890,000.00**
Construction Cost Total				**$ 2,500,000.00**
Construction Cost Contingency (30%)				**$ 750,000.00**
Subtotal				**$ 3,300,000.00**
Engineering Fee Estimate (20%)				**$ 660,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-E3-2**		**$ 3,960,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

GLENDALE AVE	STM-E3-2
Length of Road Improvements (m)	1142 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GLENDALE AVE		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1142	$ 5.00	$ 5,710.00
Full Depth Concrete Asphalt Removal	m	1142	$ 125.00	$ 142,750.00
Driveway Removal (all types)	m	1142	$ 30.00	$ 34,260.00
Sidewalk Removal (all types)	m	1142	$ 20.00	$ 22,840.00
Sawcutting Existing Pavement	m	1142	$ 1.00	$ 1,142.00
Curb and Gutter Removal	m	1142	$ 20.00	$ 22,840.00
Streetlighting Removal	m	1142	$ 25.00	$ 28,550.00
SUBTOTAL				**$ 260,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	480	$ 75.00	$ 36,000.00
Remove Existing Manholes	m	480	$ 15.00	$ 7,200.00
Remove Existing Catch Basins	m	482	$ 12.50	$ 6,025.00
Remove Existing Combined Private Drain Connection	m	482	$ 100.00	$ 48,200.00
SUBTOTAL				**$ 98,000.00**
Roadwork				
Earth Excavating and Grading	m	1142	$ 120.00	$ 137,040.00
Supply and Place Compacted Granular "A"	m	1142	$ 350.00	$ 399,700.00
100mm Open Graded Drainage Layer	m	1142	$ 225.00	$ 256,950.00
Concrete Pavement (305mm)	m	1142	$ 575.00	$ 656,650.00
Subdrains (2 lanes)	m	1142	$ 60.00	$ 68,520.00
Concrete Curb and Gutter (2 lanes)	m	1142	$ 90.00	$ 102,780.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1142	$ 75.00	$ 85,650.00
Driveway Restoration b) Concrete	m	1142	$ 180.00	$ 205,560.00
Topsoil, Hydraulic Seed and Mulch	m	1142	$ 100.00	$ 114,200.00
Traffic Control During Construction (Residential)	m	1142	$ 100.00	$ 114,200.00
Streetlighting (Residential)	m	1142	$ 225.00	$ 256,950.00
SUBTOTAL				**$ 2,400,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1662	$ 75.00	$ 124,650.00
Concrete Storm Precast Catchbasins and Leads	m	1142	$ 60.00	$ 68,520.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	480	$ 400.00	$ 192,000.00
Sanitary Private Drain Connection	m	480	$ 150.00	$ 72,000.00
Manhole Rain Catchers	m	480	$ 3.00	$ 1,440.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	203	$ 500.00	$ 101,500.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	630	$ 700.00	$ 441,000.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	309	$ 850.00	$ 262,650.00
Storm Private Drain Connection	m	1142	$ 20.00	$ 22,840.00
SUBTOTAL				**$ 1,300,000.00**
Construction Cost Total				**$ 4,100,000.00**
Construction Cost Contingency (30%)				**$ 1,300,000.00**
Subtotal				**$ 5,400,000.00**
Engineering Fee Estimate (20%)				**$ 1,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 6,500,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

FERNDALE AVE	STM-E3-2
Length of Road Improvements (m)	647 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

FERNDALE AVE		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	647	$ 5.00	$ 3,235.00
Full Depth Concrete Asphalt Removal	m	647	$ 125.00	$ 80,875.00
Driveway Removal (all types)	m	647	$ 30.00	$ 19,410.00
Sidewalk Removal (all types)	m	647	$ 20.00	$ 12,940.00
Sawcutting Existing Pavement	m	647	$ 1.00	$ 647.00
Curb and Gutter Removal	m	647	$ 20.00	$ 12,940.00
Streetlighting Removal	m	647	$ 25.00	$ 16,175.00
Signage Removal	m	647	$ 5.00	$ 3,235.00
SUBTOTAL				**$ 150,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	647	$ 100.00	$ 64,700.00
Remove Existing Combined Sewers	m	524	$ 75.00	$ 39,300.00
Remove Existing Manholes	m	1171	$ 15.00	$ 17,565.00
Remove Existing Catch Basins	m	647	$ 12.50	$ 8,087.50
Remove Existing Combined Private Drain Connection	m	524	$ 100.00	$ 52,400.00
Remove Existing Storm Private Drain Connection	m	647	$ 25.00	$ 16,175.00
SUBTOTAL				**$ 200,000.00**
Roadwork				
Earth Excavating and Grading	m	647	$ 120.00	$ 77,640.00
Supply and Place Compacted Granular "A"	m	647	$ 350.00	$ 226,450.00
100mm Open Graded Drainage Layer	m	647	$ 225.00	$ 145,575.00
Concrete Pavement (305mm)	m	647	$ 575.00	$ 372,025.00
Subdrains (2 lanes)	m	647	$ 60.00	$ 38,820.00
Concrete Curb and Gutter (2 lanes)	m	647	$ 90.00	$ 58,230.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	647	$ 75.00	$ 48,525.00
Driveway Restoration b) Concrete	m	647	$ 180.00	$ 116,460.00
Topsoil, Hydraulic Seed and Mulch	m	647	$ 100.00	$ 64,700.00
Traffic Control During Construction (Residential)	m	647	$ 100.00	$ 64,700.00
Streetlighting (Residential)	m	647	$ 225.00	$ 145,575.00
SUBTOTAL				**$ 1,400,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1171	$ 75.00	$ 87,825.00
Concrete Storm Precast Catchbasins and Leads	m	647	$ 60.00	$ 38,820.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	200	$ 400.00	$ 80,000.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	324	$ 450.00	$ 145,800.00
Sanitary Private Drain Connection	m	524	$ 150.00	$ 78,600.00
Manhole Rain Catchers	m	524	$ 3.00	$ 1,572.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	90	$ 450.00	$ 40,500.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	557	$ 500.00	$ 278,500.00
Storm Private Drain Connection	m	647	$ 20.00	$ 12,940.00
SUBTOTAL				**$ 770,000.00**
Construction Cost Total				**$ 2,600,000.00**
Construction Cost Contingency (30%)				**$ 780,000.00**
Subtotal				**$ 3,400,000.00**
Engineering Fee Estimate (20%)				**$ 680,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 4,080,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

FORD BLVD	STM-E3-2
Length of Road Improvements (m)	858 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

FORD BLVD		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	858	$ 5.00	$ 4,290.00
Full Depth Concrete Asphalt Removal	m	858	$ 125.00	$ 107,250.00
Driveway Removal (all types)	m	858	$ 30.00	$ 25,740.00
Sidewalk Removal (all types)	m	858	$ 20.00	$ 17,160.00
Sawcutting Existing Pavement	m	858	$ 1.00	$ 858.00
Curb and Gutter Removal	m	858	$ 20.00	$ 17,160.00
Streetlighting Removal	m	858	$ 25.00	$ 21,450.00
Signage Removal	m	858	$ 5.00	$ 4,290.00
SUBTOTAL				**$ 200,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	275	$ 100.00	$ 27,500.00
Remove Existing Combined Sewers	m	858	$ 75.00	$ 64,350.00
Remove Existing Manholes	m	1133	$ 15.00	$ 16,995.00
Remove Existing Catch Basins	m	858	$ 12.50	$ 10,725.00
Remove Existing Combined Private Drain Connection	m	858	$ 100.00	$ 85,800.00
Remove Existing Storm Private Drain Connection	m	275	$ 25.00	$ 6,875.00
SUBTOTAL				**$ 220,000.00**
Roadwork				
Earth Excavating and Grading	m	858	$ 120.00	$ 102,960.00
Supply and Place Compacted Granular "A"	m	858	$ 350.00	$ 300,300.00
100mm Open Graded Drainage Layer	m	858	$ 225.00	$ 193,050.00
Concrete Pavement (305mm)	m	858	$ 575.00	$ 493,350.00
Subdrains (2 lanes)	m	858	$ 60.00	$ 51,480.00
Concrete Curb and Gutter (2 lanes)	m	858	$ 90.00	$ 77,220.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	858	$ 75.00	$ 64,350.00
Driveway Restoration b) Concrete	m	858	$ 180.00	$ 154,440.00
Topsoil, Hydraulic Seed and Mulch	m	858	$ 100.00	$ 85,800.00
Traffic Control During Construction (Arterial)	m	858	$ 200.00	$ 171,600.00
Streetlighting (Arterial)	m	858	$ 400.00	$ 343,200.00
SUBTOTAL				**$ 2,100,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1716	$ 75.00	$ 128,700.00
Concrete Storm Precast Catchbasins and Leads	m	858	$ 60.00	$ 51,480.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	244	$ 400.00	$ 97,600.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	508	$ 450.00	$ 228,600.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	106	$ 450.00	$ 47,700.00
Sanitary Private Drain Connection	m	858	$ 150.00	$ 128,700.00
Manhole Rain Catchers	m	858	$ 3.00	$ 2,574.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	91	$ 400.00	$ 36,400.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	410	$ 450.00	$ 184,500.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	279	$ 500.00	$ 139,500.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	78	$ 550.00	$ 42,900.00
Storm Private Drain Connection	m	858	$ 20.00	$ 17,160.00
SUBTOTAL				**$ 1,200,000.00**
Construction Cost Total				**$ 3,800,000.00**
Construction Cost Contingency (30%)				**$ 1,200,000.00**
Subtotal				**$ 5,000,000.00**
Engineering Fee Estimate (20%)				**$ 1,000,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 6,000,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

BUCKINGHAM DR	STM-E3-2
Length of Road Improvements (m)	1116 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

BUCKINGHAM DR		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1116	$ 5.00	$ 5,580.00
Full Depth Concrete Asphalt Removal	m	1116	$ 125.00	$ 139,500.00
Driveway Removal (all types)	m	1116	$ 30.00	$ 33,480.00
Sidewalk Removal (all types)	m	1116	$ 20.00	$ 22,320.00
Sawcutting Existing Pavement	m	1116	$ 1.00	$ 1,116.00
Curb and Gutter Removal	m	1116	$ 20.00	$ 22,320.00
Streetlighting Removal	m	1116	$ 25.00	$ 27,900.00
Signage Removal	m	1116	$ 5.00	$ 5,580.00
SUBTOTAL				**$ 260,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	60	$ 100.00	$ 6,000.00
Remove Existing Combined Sewers	m	1116	$ 75.00	$ 83,700.00
Remove Existing Manholes	m	1176	$ 15.00	$ 17,640.00
Remove Existing Catch Basins	m	1116	$ 12.50	$ 13,950.00
Remove Existing Combined Private Drain Connection	m	1116	$ 100.00	$ 111,600.00
Remove Existing Storm Private Drain Connection	m	60	$ 25.00	$ 1,500.00
SUBTOTAL				**$ 240,000.00**
Roadwork				
Earth Excavating and Grading	m	1116	$ 120.00	$ 133,920.00
Supply and Place Compacted Granular "A"	m	1116	$ 350.00	$ 390,600.00
100mm Open Graded Drainage Layer	m	1116	$ 225.00	$ 251,100.00
Concrete Pavement (305mm)	m	1116	$ 575.00	$ 641,700.00
Subdrains (2 lanes)	m	1116	$ 60.00	$ 66,960.00
Concrete Curb and Gutter (2 lanes)	m	1116	$ 90.00	$ 100,440.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1116	$ 75.00	$ 83,700.00
Driveway Restoration b) Concrete	m	1116	$ 180.00	$ 200,880.00
Topsoil, Hydraulic Seed and Mulch	m	1116	$ 100.00	$ 111,600.00
Traffic Control During Construction (Residential)	m	1116	$ 100.00	$ 111,600.00
Streetlighting (Residential)	m	1116	$ 225.00	$ 251,100.00
SUBTOTAL				**$ 2,400,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	2232	$ 75.00	$ 167,400.00
Concrete Storm Precast Catchbasins and Leads	m	1116	$ 60.00	$ 66,960.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	734	$ 400.00	$ 293,600.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	224	$ 450.00	$ 100,800.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	158	$ 450.00	$ 71,100.00
Sanitary Private Drain Connection	m	1116	$ 150.00	$ 167,400.00
Manhole Rain Catchers	m	1116	$ 3.00	$ 3,348.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	197	$ 450.00	$ 88,650.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	733	$ 500.00	$ 366,500.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	129	$ 550.00	$ 70,950.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	57	$ 600.00	$ 34,200.00
Storm Private Drain Connection	m	1116	$ 20.00	$ 22,320.00
SUBTOTAL				**$ 1,500,000.00**
Construction Cost Total				**$ 4,400,000.00**
Construction Cost Contingency (30%)				**$ 1,400,000.00**
Subtotal				**$ 5,800,000.00**
Engineering Fee Estimate (20%)				**$ 1,200,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 7,000,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

JOS ST. LOUIS AVE	STM-E3-2
Length of Road Improvements (m)	419 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

JOS ST. LOUIS AVE		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	419	$ 5.00	$ 2,095.00
Full Depth Concrete Asphalt Removal	m	319	$ 125.00	$ 39,875.00
Full Depth Asphalt Removal	m	100	$ 80.00	$ 8,000.00
Driveway Removal (all types)	m	419	$ 30.00	$ 12,570.00
Sidewalk Removal (all types)	m	419	$ 20.00	$ 8,380.00
Sawcutting Existing Pavement	m	419	$ 1.00	$ 419.00
Curb and Gutter Removal	m	419	$ 20.00	$ 8,380.00
Streetlighting Removal	m	419	$ 25.00	$ 10,475.00
Signage Removal	m	419	$ 5.00	$ 2,095.00
SUBTOTAL				**$ 93,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	419	$ 75.00	$ 31,425.00
Remove Existing Manholes	m	419	$ 15.00	$ 6,285.00
Remove Existing Catch Basins	m	419	$ 12.50	$ 5,237.50
Remove Existing Combined Private Drain Connection	m	419	$ 100.00	$ 41,900.00
SUBTOTAL				**$ 85,000.00**
Roadwork				
Earth Excavating and Grading	m	419	$ 120.00	$ 50,280.00
Supply and Place Compacted Granular "A"	m	419	$ 350.00	$ 146,650.00
100mm Open Graded Drainage Layer	m	319	$ 225.00	$ 71,775.00
Asphalt Pavement (105mm)	m	100	$ 250.00	$ 25,000.00
Concrete Pavement (305mm)	m	319	$ 575.00	$ 183,425.00
Subdrains (2 lanes)	m	419	$ 60.00	$ 25,140.00
Concrete Curb and Gutter (2 lanes)	m	419	$ 90.00	$ 37,710.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	419	$ 75.00	$ 31,425.00
Driveway Restoration b) Concrete	m	419	$ 180.00	$ 75,420.00
Topsoil, Hydraulic Seed and Mulch	m	419	$ 100.00	$ 41,900.00
Traffic Control During Construction (Residential)	m	419	$ 100.00	$ 41,900.00
Streetlighting (Residential)	m	419	$ 225.00	$ 94,275.00
SUBTOTAL				**$ 830,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	838	$ 75.00	$ 62,850.00
Concrete Storm Precast Catchbasins and Leads	m	419	$ 60.00	$ 25,140.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	419	$ 450.00	$ 188,550.00
Sanitary Private Drain Connection	m	419	$ 150.00	$ 62,850.00
Manhole Rain Catchers	m	419	$ 3.00	$ 1,257.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	17	$ 400.00	$ 6,800.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	402	$ 500.00	$ 201,000.00
Storm Private Drain Connection	m	419	$ 20.00	$ 8,380.00
SUBTOTAL				**$ 560,000.00**
Construction Cost Total				**$ 1,600,000.00**
Construction Cost Contingency (30%)				**$ 480,000.00**
Subtotal				**$ 2,100,000.00**
Engineering Fee Estimate (20%)				**$ 420,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 2,520,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

EMPRESS ST	STM-E3-2
Length of Road Improvements (m)	224 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

EMPRESS ST		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	224	$ 5.00	$ 1,120.00
Full Depth Asphalt Removal	m	224	$ 80.00	$ 17,920.00
Driveway Removal (all types)	m	224	$ 30.00	$ 6,720.00
Sidewalk Removal (all types)	m	224	$ 20.00	$ 4,480.00
Sawcutting Existing Pavement	m	224	$ 1.00	$ 224.00
Signage Removal	m	224	$ 5.00	$ 1,120.00
SUBTOTAL				**$ 32,000.00**
Roadwork				
Earth Excavating and Grading	m	224	$ 120.00	$ 26,880.00
Supply and Place Compacted Granular "A"	m	224	$ 350.00	$ 78,400.00
Asphalt Pavement (105mm)	m	224	$ 250.00	$ 56,000.00
Subdrains (2 lanes)	m	224	$ 60.00	$ 13,440.00
Concrete Curb and Gutter (2 lanes)	m	224	$ 90.00	$ 20,160.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	224	$ 75.00	$ 16,800.00
Driveway Restoration b) Concrete	m	224	$ 180.00	$ 40,320.00
Topsoil, Hydraulic Seed and Mulch	m	224	$ 100.00	$ 22,400.00
Traffic Control During Construction (Residential)	m	224	$ 100.00	$ 22,400.00
Streetlighting (Residential)	m	224	$ 225.00	$ 50,400.00
SUBTOTAL				**$ 350,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	224	$ 75.00	$ 16,800.00
Concrete Storm Precast Catchbasins and Leads	m	224	$ 60.00	$ 13,440.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	102	$ 450.00	$ 45,900.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	122	$ 600.00	$ 73,200.00
Storm Private Drain Connection	m	224	$ 20.00	$ 4,480.00
SUBTOTAL				**$ 160,000.00**
Construction Cost Total				**$ 550,000.00**
Construction Cost Contingency (30%)				**$ 170,000.00**
Subtotal				**$ 720,000.00**
Engineering Fee Estimate (20%)				**$ 150,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 870,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

WESTMINISTER BLVD	STM-E3-2
Length of Road Improvements (m)	467 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WESTMINISTER BLVD		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	467	$ 5.00	$ 2,335.00
Full Depth Concrete Asphalt Removal	m	116	$ 125.00	$ 14,500.00
Full Depth Asphalt Removal	m	351	$ 80.00	$ 28,080.00
Driveway Removal (all types)	m	467	$ 30.00	$ 14,010.00
Sidewalk Removal (all types)	m	367	$ 20.00	$ 7,340.00
Sawcutting Existing Pavement	m	467	$ 1.00	$ 467.00
Curb and Gutter Removal	m	467	$ 20.00	$ 9,340.00
Streetlighting Removal	m	467	$ 25.00	$ 11,675.00
Signage Removal	m	467	$ 5.00	$ 2,335.00
SUBTOTAL				**$ 91,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	116	$ 75.00	$ 8,700.00
Remove Existing Manholes	m	116	$ 15.00	$ 1,740.00
Remove Existing Catch Basins	m	116	$ 12.50	$ 1,450.00
Remove Existing Combined Private Drain Connection	m	116	$ 100.00	$ 11,600.00
SUBTOTAL				**$ 24,000.00**
Roadwork				
Earth Excavating and Grading	m	467	$ 120.00	$ 56,040.00
Supply and Place Compacted Granular "A"	m	467	$ 350.00	$ 163,450.00
100mm Open Graded Drainage Layer	m	116	$ 225.00	$ 26,100.00
Asphalt Pavement (105mm)	m	351	$ 250.00	$ 87,750.00
Concrete Pavement (305mm)	m	116	$ 575.00	$ 66,700.00
Subdrains (2 lanes)	m	467	$ 60.00	$ 28,020.00
Concrete Curb and Gutter (2 lanes)	m	467	$ 90.00	$ 42,030.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	467	$ 75.00	$ 35,025.00
Driveway Restoration b) Concrete	m	467	$ 180.00	$ 84,060.00
Topsoil, Hydraulic Seed and Mulch	m	467	$ 100.00	$ 46,700.00
Traffic Control During Construction (Residential)	m	467	$ 100.00	$ 46,700.00
Streetlighting (Residential)	m	467	$ 225.00	$ 105,075.00
SUBTOTAL				**$ 790,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	583	$ 75.00	$ 43,725.00
Concrete Storm Precast Catchbasins and Leads	m	467	$ 60.00	$ 28,020.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	116	$ 450.00	$ 52,200.00
Sanitary Private Drain Connection	m	116	$ 150.00	$ 17,400.00
Manhole Rain Catchers	m	116	$ 3.00	$ 348.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	116	$ 400.00	$ 46,400.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	63	$ 500.00	$ 31,500.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	115	$ 550.00	$ 63,250.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	173	$ 600.00	$ 103,800.00
Storm Private Drain Connection	m	467	$ 20.00	$ 9,340.00
SUBTOTAL				**$ 400,000.00**
Construction Cost Total				**$ 1,400,000.00**
Construction Cost Contingency (30%)				**$ 420,000.00**
Subtotal				**$ 1,900,000.00**
Engineering Fee Estimate (20%)				**$ 380,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 2,280,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

PRINCESS AVE	STM-E3-2
Length of Road Improvements (m)	396 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

PRINCESS AVE		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	396	$ 5.00	$ 1,980.00
Full Depth Asphalt Removal	m	396	$ 80.00	$ 31,680.00
Driveway Removal (all types)	m	396	$ 30.00	$ 11,880.00
Sawcutting Existing Pavement	m	396	$ 1.00	$ 396.00
Curb and Gutter Removal	m	396	$ 20.00	$ 7,920.00
Streetlighting Removal	m	396	$ 25.00	$ 9,900.00
Signage Removal	m	396	$ 5.00	$ 1,980.00
SUBTOTAL				**$ 66,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	396	$ 100.00	$ 39,600.00
Remove Existing Manholes	m	396	$ 15.00	$ 5,940.00
Remove Existing Catch Basins	m	396	$ 12.50	$ 4,950.00
Remove Existing Storm Private Drain Connection	m	396	$ 25.00	$ 9,900.00
SUBTOTAL				**$ 61,000.00**
Roadwork				
Earth Excavating and Grading	m	396	$ 120.00	$ 47,520.00
Supply and Place Compacted Granular "A"	m	396	$ 350.00	$ 138,600.00
Asphalt Pavement (105mm)	m	396	$ 250.00	$ 99,000.00
Subdrains (2 lanes)	m	396	$ 60.00	$ 23,760.00
Concrete Curb and Gutter (2 lanes)	m	396	$ 90.00	$ 35,640.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	396	$ 75.00	$ 29,700.00
Driveway Restoration b) Concrete	m	396	$ 180.00	$ 71,280.00
Topsoil, Hydraulic Seed and Mulch	m	396	$ 100.00	$ 39,600.00
Traffic Control During Construction (Residential)	m	396	$ 100.00	$ 39,600.00
Streetlighting (Residential)	m	396	$ 225.00	$ 89,100.00
SUBTOTAL				**$ 620,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	396	$ 75.00	$ 29,700.00
Concrete Storm Precast Catchbasins and Leads	m	396	$ 60.00	$ 23,760.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	396	$ 500.00	$ 198,000.00
Storm Private Drain Connection	m	396	$ 20.00	$ 7,920.00
SUBTOTAL				**$ 260,000.00**
Construction Cost Total				**$ 1,100,000.00**
Construction Cost Contingency (30%)				**$ 330,000.00**
Subtotal				**$ 1,500,000.00**
Engineering Fee Estimate (20%)				**$ 300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 1,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

NORMAN RD	STM-E3-2
Length of Road Improvements (m)	403 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

NORMAN RD		STM-E3-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	403	$ 5.00	$ 2,015.00
Full Depth Asphalt Removal	m	403	$ 80.00	$ 32,240.00
Driveway Removal (all types)	m	403	$ 30.00	$ 12,090.00
Sawcutting Existing Pavement	m	403	$ 1.00	$ 403.00
Curb and Gutter Removal	m	403	$ 20.00	$ 8,060.00
Signage Removal	m	403	$ 5.00	$ 2,015.00
SUBTOTAL				**$ 57,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	403	$ 75.00	$ 30,225.00
Remove Existing Manholes	m	403	$ 15.00	$ 6,045.00
Remove Existing Catch Basins	m	403	$ 12.50	$ 5,037.50
Remove Existing Combined Private Drain Connection	m	403	$ 100.00	$ 40,300.00
SUBTOTAL				**$ 82,000.00**
Roadwork				
Earth Excavating and Grading	m	403	$ 120.00	$ 48,360.00
Supply and Place Compacted Granular "A"	m	403	$ 350.00	$ 141,050.00
Asphalt Pavement (105mm)	m	403	$ 250.00	$ 100,750.00
Subdrains (2 lanes)	m	403	$ 60.00	$ 24,180.00
Concrete Curb and Gutter (2 lanes)	m	403	$ 90.00	$ 36,270.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	403	$ 75.00	$ 30,225.00
Driveway Restoration b) Concrete	m	403	$ 180.00	$ 72,540.00
Topsoil, Hydraulic Seed and Mulch	m	403	$ 100.00	$ 40,300.00
Traffic Control During Construction (Residential)	m	403	$ 100.00	$ 40,300.00
Streetlighting (Residential)	m	403	$ 225.00	$ 90,675.00
SUBTOTAL				**$ 630,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	806	$ 75.00	$ 60,450.00
Concrete Storm Precast Catchbasins and Leads	m	403	$ 60.00	$ 24,180.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	112	$ 625.00	$ 70,000.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	291	$ 700.00	$ 203,700.00
Sanitary Private Drain Connection	m	403	$ 150.00	$ 60,450.00
Manhole Rain Catchers	m	403	$ 3.00	$ 1,209.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	403	$ 600.00	$ 241,800.00
Storm Private Drain Connection	m	403	$ 20.00	$ 8,060.00
SUBTOTAL				**$ 670,000.00**
Construction Cost Total				**$ 1,500,000.00**
Construction Cost Contingency (30%)				**$ 450,000.00**
Subtotal				**$ 2,000,000.00**
Engineering Fee Estimate (20%)				**$ 400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 2,400,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CORONATION AVE	STM-E3-2
Length of Road Improvements (m)	97 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CORONATION AVE		STM-E3-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	97	$ 5.00	$ 485.00
Full Depth Asphalt Removal	m	60	$ 80.00	$ 4,800.00
Driveway Removal (all types)	m	60	$ 30.00	$ 1,800.00
Sawcutting Existing Pavement	m	60	$ 1.00	$ 60.00
Signage Removal	m	60	$ 5.00	$ 300.00
SUBTOTAL				**$ 8,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	97	$ 100.00	$ 9,700.00
Remove Existing Manholes	m	97	$ 15.00	$ 1,455.00
Remove Existing Catch Basins	m	97	$ 12.50	$ 1,212.50
Remove Existing Storm Private Drain Connection	m	97	$ 25.00	$ 2,425.00
SUBTOTAL				**$ 15,000.00**
Roadwork				
Earth Excavating and Grading	m	60	$ 120.00	$ 7,200.00
Supply and Place Compacted Granular "A"	m	60	$ 350.00	$ 21,000.00
Asphalt Pavement (105mm)	m	60	$ 250.00	$ 15,000.00
Subdrains (2 lanes)	m	60	$ 60.00	$ 3,600.00
Concrete Curb and Gutter (2 lanes)	m	60	$ 90.00	$ 5,400.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	60	$ 75.00	$ 4,500.00
Driveway Restoration b) Concrete	m	60	$ 180.00	$ 10,800.00
Topsoil, Hydraulic Seed and Mulch	m	60	$ 100.00	$ 6,000.00
Traffic Control During Construction (Arterial)	m	60	$ 200.00	$ 12,000.00
Streetlighting (Arterial)	m	60	$ 400.00	$ 24,000.00
SUBTOTAL				**$ 110,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	97	$ 200.00	$ 19,400.00
Concrete Storm Precast Catchbasins and Leads	m	97	$ 60.00	$ 5,820.00
Storm Sewer - 3600mm x 1200mm Concrete Box Culvert	m	97	$ 9,000.00	$ 873,000.00
Storm Private Drain Connection	m	97	$ 20.00	$ 1,940.00
SUBTOTAL				**$ 910,000.00**
Construction Cost Total				**$ 1,100,000.00**
Construction Cost Contingency (30%)				**$ 330,000.00**
Subtotal				**$ 1,500,000.00**
Engineering Fee Estimate (20%)				**$ 300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3-2				**$ 1,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

KATELLA AVE	STM-E5-1
Length of Road Improvements (m)	436 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

KATELLA AVE	STM-E5-1			
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	436	$ 5.00	$ 2,180.00
Full Depth Asphalt Removal	m	436	$ 80.00	$ 34,880.00
Driveway Removal (all types)	m	436	$ 30.00	$ 13,080.00
Sidewalk Removal (all types)	m	436	$ 20.00	$ 8,720.00
Sawcutting Existing Pavement	m	436	$ 1.00	$ 436.00
Curb and Gutter Removal	m	436	$ 20.00	$ 8,720.00
Streetlighting Removal	m	436	$ 25.00	$ 10,900.00
Signage Removal	m	436	$ 5.00	$ 2,180.00
SUBTOTAL				**$ 82,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	436	$ 100.00	$ 43,600.00
Remove Existing Manholes	m	436	$ 15.00	$ 6,540.00
Remove Existing Catch Basins	m	436	$ 12.50	$ 5,450.00
Remove Existing Storm Private Drain Connection	m	436	$ 25.00	$ 10,900.00
SUBTOTAL				**$ 67,000.00**
Roadwork				
Earth Excavating and Grading	m	436	$ 120.00	$ 52,320.00
Supply and Place Compacted Granular "A"	m	436	$ 350.00	$ 152,600.00
Asphalt Pavement (105mm)	m	436	$ 250.00	$ 109,000.00
Subdrains (2 lanes)	m	436	$ 60.00	$ 26,160.00
Concrete Curb and Gutter (2 lanes)	m	436	$ 90.00	$ 39,240.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	436	$ 75.00	$ 32,700.00
Driveway Restoration b) Concrete	m	436	$ 180.00	$ 78,480.00
Topsoil, Hydraulic Seed and Mulch	m	436	$ 100.00	$ 43,600.00
Traffic Control During Construction (Residential)	m	436	$ 100.00	$ 43,600.00
Streetlighting (Residential)	m	436	$ 225.00	$ 98,100.00
SUBTOTAL				**$ 680,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	436	$ 75.00	$ 32,700.00
Concrete Storm Precast Catchbasins and Leads	m	436	$ 60.00	$ 26,160.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	13	$ 385.00	$ 5,005.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	107	$ 500.00	$ 53,500.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	223	$ 550.00	$ 122,650.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	93	$ 600.00	$ 55,800.00
Storm Private Drain Connection	m	436	$ 20.00	$ 8,720.00
SUBTOTAL				**$ 310,000.00**
Construction Cost Total				**$ 1,200,000.00**
Construction Cost Contingency (30%)				**$ 360,000.00**
Subtotal				**$ 1,600,000.00**
Engineering Fee Estimate (20%)				**$ 320,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E5-1				**$ 1,920,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

VENETIAN AVE	STM-E5-1
Length of Road Improvements (m)	439 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

VENETIAN AVE		STM-E5-1		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	439	$ 5.00	$ 2,195.00
Full Depth Asphalt Removal	m	439	$ 80.00	$ 35,120.00
Driveway Removal (all types)	m	439	$ 30.00	$ 13,170.00
Sidewalk Removal (all types)	m	439	$ 20.00	$ 8,780.00
Sawcutting Existing Pavement	m	439	$ 1.00	$ 439.00
Curb and Gutter Removal	m	439	$ 20.00	$ 8,780.00
Streetlighting Removal	m	439	$ 25.00	$ 10,975.00
Signage Removal	m	439	$ 5.00	$ 2,195.00
SUBTOTAL				**$ 82,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	439	$ 100.00	$ 43,900.00
Remove Existing Manholes	m	439	$ 15.00	$ 6,585.00
Remove Existing Catch Basins	m	439	$ 12.50	$ 5,487.50
Remove Existing Storm Private Drain Connection	m	439	$ 25.00	$ 10,975.00
SUBTOTAL				**$ 67,000.00**
Roadwork				
Earth Excavating and Grading	m	439	$ 120.00	$ 52,680.00
Supply and Place Compacted Granular "A"	m	439	$ 350.00	$ 153,650.00
Asphalt Pavement (105mm)	m	439	$ 250.00	$ 109,750.00
Subdrains (2 lanes)	m	439	$ 60.00	$ 26,340.00
Concrete Curb and Gutter (2 lanes)	m	439	$ 90.00	$ 39,510.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	439	$ 75.00	$ 32,925.00
Driveway Restoration b) Concrete	m	439	$ 180.00	$ 79,020.00
Topsoil, Hydraulic Seed and Mulch	m	439	$ 100.00	$ 43,900.00
Traffic Control During Construction (Residential)	m	439	$ 100.00	$ 43,900.00
Streetlighting (Residential)	m	439	$ 225.00	$ 98,775.00
SUBTOTAL				**$ 690,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	439	$ 75.00	$ 32,925.00
Concrete Storm Precast Catchbasins and Leads	m	439	$ 60.00	$ 26,340.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	12	$ 385.00	$ 4,620.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	116	$ 500.00	$ 58,000.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	202	$ 550.00	$ 111,100.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	109	$ 600.00	$ 65,400.00
Storm Private Drain Connection	m	439	$ 20.00	$ 8,780.00
SUBTOTAL				**$ 310,000.00**
Construction Cost Total				**$ 1,200,000.00**
Construction Cost Contingency (30%)				**$ 360,000.00**
Subtotal				**$ 1,600,000.00**
Engineering Fee Estimate (20%)				**$ 320,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E5-1				**$ 1,920,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

MORNINGSTAR AVE	STM-E5-1
Length of Road Improvements (m)	439 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MORNINGSTAR AVE		STM-E5-1		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	439	$ 5.00	$ 2,195.00
Full Depth Asphalt Removal	m	439	$ 80.00	$ 35,120.00
Driveway Removal (all types)	m	439	$ 30.00	$ 13,170.00
Sidewalk Removal (all types)	m	439	$ 20.00	$ 8,780.00
Sawcutting Existing Pavement	m	439	$ 1.00	$ 439.00
Curb and Gutter Removal	m	439	$ 20.00	$ 8,780.00
Streetlighting Removal	m	439	$ 25.00	$ 10,975.00
Signage Removal	m	439	$ 5.00	$ 2,195.00
SUBTOTAL				**$ 82,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	439	$ 100.00	$ 43,900.00
Remove Existing Manholes	m	439	$ 15.00	$ 6,585.00
Remove Existing Catch Basins	m	439	$ 12.50	$ 5,487.50
Remove Existing Storm Private Drain Connection	m	439	$ 25.00	$ 10,975.00
SUBTOTAL				**$ 67,000.00**
Roadwork				
Earth Excavating and Grading	m	439	$ 120.00	$ 52,680.00
Supply and Place Compacted Granular "A"	m	439	$ 350.00	$ 153,650.00
Asphalt Pavement (105mm)	m	439	$ 250.00	$ 109,750.00
Subdrains (2 lanes)	m	439	$ 60.00	$ 26,340.00
Concrete Curb and Gutter (2 lanes)	m	439	$ 90.00	$ 39,510.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	439	$ 75.00	$ 32,925.00
Driveway Restoration b) Concrete	m	439	$ 180.00	$ 79,020.00
Topsoil, Hydraulic Seed and Mulch	m	439	$ 100.00	$ 43,900.00
Traffic Control During Construction (Residential)	m	439	$ 100.00	$ 43,900.00
Streetlighting (Residential)	m	439	$ 225.00	$ 98,775.00
SUBTOTAL				**$ 690,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	439	$ 75.00	$ 32,925.00
Concrete Storm Precast Catchbasins and Leads	m	439	$ 60.00	$ 26,340.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	12	$ 385.00	$ 4,620.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	211	$ 500.00	$ 105,500.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	108	$ 550.00	$ 59,400.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	108	$ 850.00	$ 91,800.00
Storm Private Drain Connection	m	439	$ 20.00	$ 8,780.00
SUBTOTAL				**$ 330,000.00**
Construction Cost Total				**$ 1,200,000.00**
Construction Cost Contingency (30%)				**$ 360,000.00**
Subtotal				**$ 1,600,000.00**
Engineering Fee Estimate (20%)				**$ 320,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E5-1				**$ 1,920,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

RENDEZVOUS CRT	STM-E5-1
Length of Road Improvements (m)	190 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

RENDEZVOUS CRT		STM-E5-1		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	190	$ 5.00	$ 950.00
Full Depth Asphalt Removal	m	10	$ 80.00	$ 800.00
Driveway Removal (all types)	m	190	$ 30.00	$ 5,700.00
Sidewalk Removal (all types)	m	30	$ 20.00	$ 600.00
Sawcutting Existing Pavement	m	30	$ 1.00	$ 30.00
Curb and Gutter Removal	m	10	$ 20.00	$ 200.00
Signage Removal	m	190	$ 5.00	$ 950.00
SUBTOTAL				**$ 10,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	190	$ 100.00	$ 19,000.00
Remove Existing Manholes	m	190	$ 15.00	$ 2,850.00
SUBTOTAL				**$ 22,000.00**
Roadwork				
Earth Excavating and Grading	m	190	$ 120.00	$ 22,800.00
Supply and Place Compacted Granular "A"	m	10	$ 350.00	$ 3,500.00
Asphalt Pavement for Temporary Lanes (4m Wide - Asphalt)	m	20	$ 125.00	$ 2,500.00
Asphalt Pavement (105mm)	m	30	$ 250.00	$ 7,500.00
Subdrains (2 lanes)	m	10	$ 60.00	$ 600.00
Concrete Curb and Gutter (2 lanes)	m	10	$ 90.00	$ 900.00
Topsoil, Hydraulic Seed and Mulch	m	190	$ 100.00	$ 19,000.00
Traffic Control During Construction (Residential)	m	190	$ 100.00	$ 19,000.00
Streetlighting (Residential)	m	190	$ 225.00	$ 42,750.00
SUBTOTAL				**$ 120,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	190	$ 75.00	$ 14,250.00
Concrete Storm Precast Catchbasins and Leads	m	190	$ 60.00	$ 11,400.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	190	$ 500.00	$ 95,000.00
Storm Private Drain Connection	m	190	$ 20.00	$ 3,800.00
SUBTOTAL				**$ 130,000.00**
Construction Cost Total				**$ 290,000.00**
Construction Cost Contingency (30%)				**$ 87,000.00**
Subtotal				**$ 380,000.00**
Engineering Fee Estimate (20%)				**$ 76,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-E5-1**		**$ 456,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

LITTLE RIVER BLVD	STM-E5-1
Length of Road Improvements (m)	708 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

LITTLE RIVER BLVD		STM-E5-1		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	708	$ 5.00	$ 3,540.00
Full Depth Asphalt Removal	m	290	$ 80.00	$ 23,200.00
Driveway Removal (all types)	m	290	$ 30.00	$ 8,700.00
Sidewalk Removal (all types)	m	708	$ 20.00	$ 14,160.00
Sawcutting Existing Pavement	m	290	$ 1.00	$ 290.00
Curb and Gutter Removal	m	290	$ 20.00	$ 5,800.00
Streetlighting Removal	m	290	$ 25.00	$ 7,250.00
Signage Removal	m	708	$ 5.00	$ 3,540.00
SUBTOTAL				**$ 67,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	240	$ 100.00	$ 24,000.00
Remove Existing Manholes	m	240	$ 15.00	$ 3,600.00
Remove Existing Catch Basins	m	240	$ 12.50	$ 3,000.00
Remove Existing Storm Private Drain Connection	m	240	$ 25.00	$ 6,000.00
SUBTOTAL				**$ 37,000.00**
Roadwork				
Earth Excavating and Grading	m	708	$ 120.00	$ 84,960.00
Supply and Place Compacted Granular "A"	m	290	$ 350.00	$ 101,500.00
Asphalt Pavement (105mm)	m	290	$ 250.00	$ 72,500.00
Subdrains (2 lanes)	m	290	$ 60.00	$ 17,400.00
Concrete Curb and Gutter (2 lanes)	m	290	$ 90.00	$ 26,100.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	708	$ 75.00	$ 53,100.00
Driveway Restoration b) Concrete	m	290	$ 180.00	$ 52,200.00
Topsoil, Hydraulic Seed and Mulch	m	708	$ 100.00	$ 70,800.00
Traffic Control During Construction (Residential)	m	708	$ 100.00	$ 70,800.00
Streetlighting (Residential)	m	708	$ 225.00	$ 159,300.00
SUBTOTAL				**$ 710,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	645	$ 75.00	$ 48,375.00
Concrete Manholes - (2400mm to 3600mm)	m	63	$ 130.00	$ 8,190.00
Concrete Storm Precast Catchbasins and Leads	m	708	$ 60.00	$ 42,480.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	160	$ 450.00	$ 72,000.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	485	$ 850.00	$ 412,250.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	63	$ 3,000.00	$ 189,000.00
Storm Private Drain Connection	m	708	$ 20.00	$ 14,160.00
SUBTOTAL				**$ 790,000.00**
Construction Cost Total				**$ 1,700,000.00**
Construction Cost Contingency (30%)				**$ 510,000.00**
Subtotal				**$ 2,300,000.00**
Engineering Fee Estimate (20%)				**$ 460,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E5-1				**$ 2,760,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CEDARVIEW ST	STM-E6
Length of Road Improvements (m)	681 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CEDARVIEW ST		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	681	$ 5.00	$ 3,405.00
Full Depth Asphalt Removal	m	681	$ 80.00	$ 54,480.00
Driveway Removal (all types)	m	681	$ 30.00	$ 20,430.00
Sidewalk Removal (all types)	m	681	$ 20.00	$ 13,620.00
Sawcutting Existing Pavement	m	681	$ 1.00	$ 681.00
Curb and Gutter Removal	m	681	$ 20.00	$ 13,620.00
Streetlighting Removal	m	681	$ 25.00	$ 17,025.00
Signage Removal	m	681	$ 5.00	$ 3,405.00
SUBTOTAL				**$ 130,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	681	$ 100.00	$ 68,100.00
Remove Existing Manholes	m	681	$ 15.00	$ 10,215.00
Remove Existing Catch Basins	m	681	$ 12.50	$ 8,512.50
Remove Existing Storm Private Drain Connection	m	681	$ 25.00	$ 17,025.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	681	$ 120.00	$ 81,720.00
Supply and Place Compacted Granular "A"	m	681	$ 350.00	$ 238,350.00
Asphalt Pavement (105mm)	m	681	$ 250.00	$ 170,250.00
Subdrains (2 lanes)	m	681	$ 60.00	$ 40,860.00
Concrete Curb and Gutter (2 lanes)	m	681	$ 90.00	$ 61,290.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	681	$ 75.00	$ 51,075.00
Driveway Restoration b) Concrete	m	681	$ 180.00	$ 122,580.00
Topsoil, Hydraulic Seed and Mulch	m	681	$ 100.00	$ 68,100.00
Traffic Control During Construction (Arterial)	m	681	$ 200.00	$ 136,200.00
Streetlighting (Arterial)	m	681	$ 400.00	$ 272,400.00
SUBTOTAL				**$ 1,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	681	$ 75.00	$ 51,075.00
Concrete Storm Precast Catchbasins and Leads	m	681	$ 60.00	$ 40,860.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	36	$ 385.00	$ 13,860.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	645	$ 1,200.00	$ 774,000.00
Storm Private Drain Connection	m	681	$ 20.00	$ 13,620.00
SUBTOTAL				**$ 900,000.00**
Ponds & Undergound Storage				
Underground Storage	m^3	4725	$ 1,000.00	$ 4,725,000.00
SUBTOTAL				**$ 4,800,000.00**
Construction Cost Total				**$ 7,300,000.00**
Construction Cost Contingency (30%)				**$ 2,200,000.00**
Subtotal				**$ 9,500,000.00**
Engineering Fee Estimate (20%)				**$ 1,900,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 11,400,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

RIVERSIDE DR E	STM-E6
Length of Road Improvements (m)	862 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

RIVERSIDE DR E		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	297	$ 5.00	$ 1,485.00
Full Depth Asphalt Removal	m	565	$ 80.00	$ 45,200.00
Sidewalk Removal (all types)	m	297	$ 20.00	$ 5,940.00
Sawcutting Existing Pavement	m	565	$ 1.00	$ 565.00
Curb and Gutter Removal	m	565	$ 20.00	$ 11,300.00
Signage Removal	m	862	$ 5.00	$ 4,310.00
SUBTOTAL				**$ 69,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	862	$ 100.00	$ 86,200.00
Remove Existing Manholes	m	862	$ 15.00	$ 12,930.00
Remove Existing Catch Basins	m	862	$ 12.50	$ 10,775.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	862	$ 120.00	$ 103,440.00
Supply and Place Compacted Granular "A"	m	565	$ 350.00	$ 197,750.00
Asphalt Pavement (105mm)	m	565	$ 250.00	$ 141,250.00
Subdrains (2 lanes)	m	565	$ 60.00	$ 33,900.00
Concrete Curb and Gutter (2 lanes)	m	565	$ 90.00	$ 50,850.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	297	$ 75.00	$ 22,275.00
Topsoil, Hydraulic Seed and Mulch	m	297	$ 100.00	$ 29,700.00
Traffic Control During Construction (Arterial)	m	862	$ 200.00	$ 172,400.00
Streetlighting (Arterial)	m	862	$ 400.00	$ 344,800.00
SUBTOTAL				**$ 1,100,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	862	$ 75.00	$ 64,650.00
Concrete Storm Precast Catchbasins and Leads	m	832	$ 60.00	$ 49,920.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	218	$ 500.00	$ 109,000.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	644	$ 850.00	$ 547,400.00
SUBTOTAL				**$ 780,000.00**
Construction Cost Total				**$ 2,100,000.00**
Construction Cost Contingency (30%)				**$ 630,000.00**
Subtotal				**$ 2,800,000.00**
Engineering Fee Estimate (20%)				**$ 560,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 3,360,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CLAIRVIEW AVE	STM-E6
Length of Road Improvements (m)	436 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CLAIRVIEW AVE		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	436	$ 5.00	$ 2,180.00
Full Depth Asphalt Removal	m	436	$ 80.00	$ 34,880.00
Driveway Removal (all types)	m	436	$ 30.00	$ 13,080.00
Sawcutting Existing Pavement	m	436	$ 1.00	$ 436.00
Signage Removal	m	436	$ 5.00	$ 2,180.00
SUBTOTAL				**$ 53,000.00**
Roadwork				
Earth Excavating and Grading	m	436	$ 120.00	$ 52,320.00
Supply and Place Compacted Granular "A"	m	436	$ 350.00	$ 152,600.00
Asphalt Pavement (105mm)	m	436	$ 250.00	$ 109,000.00
Subdrains (2 lanes)	m	436	$ 60.00	$ 26,160.00
Concrete Curb and Gutter (2 lanes)	m	436	$ 90.00	$ 39,240.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	436	$ 75.00	$ 32,700.00
Driveway Restoration b) Concrete	m	436	$ 180.00	$ 78,480.00
Topsoil, Hydraulic Seed and Mulch	m	436	$ 100.00	$ 43,600.00
Traffic Control During Construction (Residential)	m	436	$ 100.00	$ 43,600.00
Streetlighting (Residential)	m	436	$ 225.00	$ 98,100.00
SUBTOTAL				**$ 680,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	436	$ 75.00	$ 32,700.00
Concrete Storm Precast Catchbasins and Leads	m	436	$ 60.00	$ 26,160.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	436	$ 400.00	$ 174,400.00
Storm Private Drain Connection	m	436	$ 20.00	$ 8,720.00
SUBTOTAL				**$ 250,000.00**
Construction Cost Total				**$ 990,000.00**
Construction Cost Contingency (30%)				**$ 300,000.00**
Subtotal				**$ 1,300,000.00**
Engineering Fee Estimate (20%)				**$ 260,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 1,560,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ADELAIDE AVE	STM-E6
Length of Road Improvements (m)	95 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ADELAIDE AVE		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	95	$ 5.00	$ 475.00
Full Depth Asphalt Removal	m	95	$ 80.00	$ 7,600.00
Driveway Removal (all types)	m	95	$ 30.00	$ 2,850.00
Sawcutting Existing Pavement	m	95	$ 1.00	$ 95.00
Signage Removal	m	95	$ 5.00	$ 475.00
SUBTOTAL				**$ 12,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	95	$ 100.00	$ 9,500.00
Remove Existing Catch Basins	m	95	$ 12.50	$ 1,187.50
SUBTOTAL				**$ 11,000.00**
Roadwork				
Earth Excavating and Grading	m	95	$ 120.00	$ 11,400.00
Supply and Place Compacted Granular "A"	m	95	$ 350.00	$ 33,250.00
Asphalt Pavement (105mm)	m	95	$ 250.00	$ 23,750.00
Subdrains (2 lanes)	m	95	$ 60.00	$ 5,700.00
Concrete Curb and Gutter (2 lanes)	m	95	$ 90.00	$ 8,550.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	95	$ 75.00	$ 7,125.00
Driveway Restoration b) Concrete	m	95	$ 180.00	$ 17,100.00
Topsoil, Hydraulic Seed and Mulch	m	95	$ 100.00	$ 9,500.00
Traffic Control During Construction (Residential)	m	95	$ 100.00	$ 9,500.00
Streetlighting (Residential)	m	95	$ 225.00	$ 21,375.00
SUBTOTAL				**$ 150,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	95	$ 75.00	$ 7,125.00
Concrete Storm Precast Catchbasins and Leads	m	95	$ 60.00	$ 5,700.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	95	$ 400.00	$ 38,000.00
Storm Private Drain Connection	m	95	$ 20.00	$ 1,900.00
SUBTOTAL				**$ 53,000.00**
Construction Cost Total				**$ 230,000.00**
Construction Cost Contingency (30%)				**$ 69,000.00**
Subtotal				**$ 300,000.00**
Engineering Fee Estimate (20%)				**$ 60,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 360,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CLOVER ST	STM-E6
Length of Road Improvements (m)	365 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CLOVER ST		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	365	$ 5.00	$ 1,825.00
Full Depth Asphalt Removal	m	365	$ 80.00	$ 29,200.00
Driveway Removal (all types)	m	365	$ 30.00	$ 10,950.00
Sidewalk Removal (all types)	m	365	$ 20.00	$ 7,300.00
Sawcutting Existing Pavement	m	365	$ 1.00	$ 365.00
Curb and Gutter Removal	m	20	$ 20.00	$ 400.00
Streetlighting Removal	m	365	$ 25.00	$ 9,125.00
Signage Removal	m	365	$ 5.00	$ 1,825.00
SUBTOTAL				**$ 61,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	365	$ 100.00	$ 36,500.00
Remove Existing Manholes	m	365	$ 15.00	$ 5,475.00
Remove Existing Catch Basins	m	365	$ 12.50	$ 4,562.50
Remove Existing Storm Private Drain Connection	m	365	$ 25.00	$ 9,125.00
SUBTOTAL				**$ 56,000.00**
Roadwork				
Earth Excavating and Grading	m	365	$ 120.00	$ 43,800.00
Supply and Place Compacted Granular "A"	m	365	$ 350.00	$ 127,750.00
Asphalt Pavement (105mm)	m	365	$ 250.00	$ 91,250.00
Subdrains (2 lanes)	m	365	$ 60.00	$ 21,900.00
Concrete Curb and Gutter (2 lanes)	m	365	$ 90.00	$ 32,850.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	365	$ 75.00	$ 27,375.00
Driveway Restoration b) Concrete	m	365	$ 180.00	$ 65,700.00
Topsoil, Hydraulic Seed and Mulch	m	365	$ 100.00	$ 36,500.00
Traffic Control During Construction (Residential)	m	365	$ 100.00	$ 36,500.00
Streetlighting (Residential)	m	365	$ 225.00	$ 82,125.00
SUBTOTAL				**$ 570,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	365	$ 75.00	$ 27,375.00
Concrete Storm Precast Catchbasins and Leads	m	365	$ 60.00	$ 21,900.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	329	$ 400.00	$ 131,600.00
Storm Sewer - 975mm diameter Concrete (100-D)	m	36	$ 1,000.00	$ 36,000.00
Storm Private Drain Connection	m	365	$ 20.00	$ 7,300.00
SUBTOTAL				**$ 230,000.00**
Construction Cost Total				**$ 920,000.00**
Construction Cost Contingency (30%)				**$ 280,000.00**
Subtotal				**$ 1,200,000.00**
Engineering Fee Estimate (20%)				**$ 240,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 1,440,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ELINOR ST	STM-E6
Length of Road Improvements (m)	430 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ELINOR ST		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	430	$ 5.00	$ 2,150.00
Full Depth Asphalt Removal	m	430	$ 80.00	$ 34,400.00
Driveway Removal (all types)	m	430	$ 30.00	$ 12,900.00
Sidewalk Removal (all types)	m	430	$ 20.00	$ 8,600.00
Sawcutting Existing Pavement	m	430	$ 1.00	$ 430.00
Streetlighting Removal	m	430	$ 25.00	$ 10,750.00
Signage Removal	m	430	$ 5.00	$ 2,150.00
SUBTOTAL				**$ 72,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	35	$ 100.00	$ 3,500.00
Remove Existing Manholes	m	35	$ 15.00	$ 525.00
Remove Existing Catch Basins	m	35	$ 12.50	$ 437.50
SUBTOTAL				**$ 5,000.00**
Roadwork				
Earth Excavating and Grading	m	430	$ 120.00	$ 51,600.00
Supply and Place Compacted Granular "A"	m	430	$ 350.00	$ 150,500.00
Asphalt Pavement (105mm)	m	430	$ 250.00	$ 107,500.00
Subdrains (2 lanes)	m	430	$ 60.00	$ 25,800.00
Concrete Curb and Gutter (2 lanes)	m	430	$ 90.00	$ 38,700.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	430	$ 75.00	$ 32,250.00
Driveway Restoration b) Concrete	m	430	$ 180.00	$ 77,400.00
Topsoil, Hydraulic Seed and Mulch	m	430	$ 100.00	$ 43,000.00
Traffic Control During Construction (Residential)	m	430	$ 100.00	$ 43,000.00
Streetlighting (Residential)	m	430	$ 225.00	$ 96,750.00
SUBTOTAL				**$ 670,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	430	$ 75.00	$ 32,250.00
Concrete Storm Precast Catchbasins and Leads	m	430	$ 60.00	$ 25,800.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	391	$ 400.00	$ 156,400.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	39	$ 600.00	$ 23,400.00
Storm Private Drain Connection	m	430	$ 20.00	$ 8,600.00
SUBTOTAL				**$ 250,000.00**
Construction Cost Total				**$ 997,000.00**
Construction Cost Contingency (30%)				**$ 299,100.00**
Subtotal				**$ 1,300,000.00**
Engineering Fee Estimate (20%)				**$ 260,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 1,560,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ELINOR ST	STM-E6
Length of Road Improvements (m)	130 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ELINOR ST		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	130	$ 5.00	$ 650.00
Full Depth Asphalt Removal	m	130	$ 80.00	$ 10,400.00
Driveway Removal (all types)	m	130	$ 30.00	$ 3,900.00
Sidewalk Removal (all types)	m	130	$ 20.00	$ 2,600.00
Sawcutting Existing Pavement	m	130	$ 1.00	$ 130.00
Streetlighting Removal	m	130	$ 25.00	$ 3,250.00
Signage Removal	m	130	$ 5.00	$ 650.00
SUBTOTAL				**$ 22,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	130	$ 100.00	$ 13,000.00
Remove Existing Manholes	m	130	$ 15.00	$ 1,950.00
Remove Existing Catch Basins	m	130	$ 12.50	$ 1,625.00
Remove Existing Storm Private Drain Connection	m	130	$ 25.00	$ 3,250.00
SUBTOTAL				**$ 20,000.00**
Roadwork				
Earth Excavating and Grading	m	130	$ 120.00	$ 15,600.00
Supply and Place Compacted Granular "A"	m	130	$ 350.00	$ 45,500.00
Asphalt Pavement (105mm)	m	130	$ 250.00	$ 32,500.00
Subdrains (2 lanes)	m	130	$ 60.00	$ 7,800.00
Concrete Curb and Gutter (2 lanes)	m	130	$ 90.00	$ 11,700.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	130	$ 75.00	$ 9,750.00
Driveway Restoration a) Asphalt	m	130	$ 320.00	$ 41,600.00
Topsoil, Hydraulic Seed and Mulch	m	130	$ 100.00	$ 13,000.00
Traffic Control During Construction (Residential)	m	130	$ 100.00	$ 13,000.00
Streetlighting (Residential)	m	130	$ 225.00	$ 29,250.00
SUBTOTAL				**$ 220,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	130	$ 75.00	$ 9,750.00
Concrete Storm Precast Catchbasins and Leads	m	130	$ 60.00	$ 7,800.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	130	$ 400.00	$ 52,000.00
Storm Private Drain Connection	m	130	$ 20.00	$ 2,600.00
SUBTOTAL				**$ 73,000.00**
Construction Cost Total				**$ 340,000.00**
Construction Cost Contingency (30%)				**$ 110,000.00**
Subtotal				**$ 450,000.00**
Engineering Fee Estimate (20%)				**$ 90,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 540,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

MENARD ST	STM-E6
Length of Road Improvements (m)	198 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MENARD ST		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	198	$ 5.00	$ 990.00
Full Depth Asphalt Removal	m	198	$ 80.00	$ 15,840.00
Driveway Removal (all types)	m	70	$ 30.00	$ 2,100.00
Sawcutting Existing Pavement	m	198	$ 1.00	$ 198.00
Curb and Gutter Removal	m	198	$ 20.00	$ 3,960.00
Streetlighting Removal	m	198	$ 25.00	$ 4,950.00
Signage Removal	m	198	$ 5.00	$ 990.00
SUBTOTAL				**$ 30,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	70	$ 100.00	$ 7,000.00
Remove Existing Manholes	m	70	$ 15.00	$ 1,050.00
Remove Existing Catch Basins	m	70	$ 12.50	$ 875.00
Remove Existing Storm Private Drain Connection	m	70	$ 25.00	$ 1,750.00
SUBTOTAL				**$ 11,000.00**
Roadwork				
Earth Excavating and Grading	m	198	$ 120.00	$ 23,760.00
Supply and Place Compacted Granular "A"	m	198	$ 350.00	$ 69,300.00
Asphalt Pavement (105mm)	m	198	$ 250.00	$ 49,500.00
Subdrains (2 lanes)	m	198	$ 60.00	$ 11,880.00
Concrete Curb and Gutter (2 lanes)	m	198	$ 90.00	$ 17,820.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	198	$ 75.00	$ 14,850.00
Driveway Restoration b) Concrete	m	70	$ 180.00	$ 12,600.00
Topsoil, Hydraulic Seed and Mulch	m	198	$ 100.00	$ 19,800.00
Traffic Control During Construction (Residential)	m	198	$ 100.00	$ 19,800.00
Streetlighting (Residential)	m	198	$ 225.00	$ 44,550.00
SUBTOTAL				**$ 290,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	198	$ 75.00	$ 14,850.00
Concrete Storm Precast Catchbasins and Leads	m	198	$ 60.00	$ 11,880.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	198	$ 400.00	$ 79,200.00
Storm Private Drain Connection	m	198	$ 20.00	$ 3,960.00
SUBTOTAL				**$ 110,000.00**
Construction Cost Total				**$ 450,000.00**
Construction Cost Contingency (30%)				**$ 140,000.00**
Subtotal				**$ 590,000.00**
Engineering Fee Estimate (20%)				**$ 120,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 710,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

FLORENCE AVE	STM-E6
Length of Road Improvements (m)	494 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

FLORENCE AVE		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	494	$ 5.00	$ 2,470.00
Full Depth Asphalt Removal	m	494	$ 80.00	$ 39,520.00
Driveway Removal (all types)	m	494	$ 30.00	$ 14,820.00
Sidewalk Removal (all types)	m	494	$ 20.00	$ 9,880.00
Sawcutting Existing Pavement	m	494	$ 1.00	$ 494.00
Curb and Gutter Removal	m	494	$ 20.00	$ 9,880.00
Streetlighting Removal	m	494	$ 25.00	$ 12,350.00
Signage Removal	m	494	$ 5.00	$ 2,470.00
SUBTOTAL				**$ 92,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	494	$ 100.00	$ 49,400.00
Remove Existing Manholes	m	494	$ 15.00	$ 7,410.00
Remove Existing Catch Basins	m	494	$ 12.50	$ 6,175.00
Remove Existing Storm Private Drain Connection	m	494	$ 25.00	$ 12,350.00
SUBTOTAL				**$ 76,000.00**
Roadwork				
Earth Excavating and Grading	m	494	$ 120.00	$ 59,280.00
Supply and Place Compacted Granular "A"	m	494	$ 350.00	$ 172,900.00
Asphalt Pavement (105mm)	m	494	$ 250.00	$ 123,500.00
Subdrains (2 lanes)	m	494	$ 60.00	$ 29,640.00
Concrete Curb and Gutter (2 lanes)	m	494	$ 90.00	$ 44,460.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	494	$ 75.00	$ 37,050.00
Driveway Restoration b) Concrete	m	494	$ 180.00	$ 88,920.00
Topsoil, Hydraulic Seed and Mulch	m	494	$ 100.00	$ 49,400.00
Traffic Control During Construction (Residential)	m	494	$ 100.00	$ 49,400.00
Streetlighting (Residential)	m	494	$ 225.00	$ 111,150.00
SUBTOTAL				**$ 770,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	454	$ 75.00	$ 34,050.00
Concrete Manholes - (2400mm to 3600mm)	m	40	$ 130.00	$ 5,200.00
Concrete Storm Precast Catchbasins and Leads	m	494	$ 60.00	$ 29,640.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	223	$ 400.00	$ 89,200.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	130	$ 850.00	$ 110,500.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	141	$ 1,200.00	$ 169,200.00
Storm Private Drain Connection	m	494	$ 20.00	$ 9,880.00
SUBTOTAL				**$ 450,000.00**
Construction Cost Total				**$ 1,400,000.00**
Construction Cost Contingency (30%)				**$ 420,000.00**
Subtotal				**$ 1,900,000.00**
Engineering Fee Estimate (20%)				**$ 380,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 2,280,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

PATRICE DR	ROAD-E2
Length of Road Improvements (m)	263 m
Number of Lanes	0
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

PATRICE DR		ROAD-E2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	263	$ 5.00	$ 1,315.00
Full Depth Asphalt Removal	m	40	$ -	$ -
Sidewalk Removal (all types)	m	20	$ 20.00	$ 400.00
Sawcutting Existing Pavement	m	40	$ 1.00	$ 40.00
Curb and Gutter Removal	m	40	$ 20.00	$ 800.00
Signage Removal	m	263	$ 5.00	$ 1,315.00
SUBTOTAL				**$ 4,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	263	$ 100.00	$ 26,300.00
Remove Existing Manholes	m	263	$ 15.00	$ 3,945.00
Remove Existing Catch Basins	m	263	$ 12.50	$ 3,287.50
Remove Existing Storm Private Drain Connection	m	263	$ 25.00	$ 6,575.00
SUBTOTAL				**$ 41,000.00**
Roadwork				
Earth Excavating and Grading	m	263	$ -	$ -
Supply and Place Compacted Granular "A"	m	40	$ -	$ -
Asphalt Pavement (105mm)	m	40	$ -	$ -
Subdrains (2 lanes)	m	40	$ 60.00	$ 2,400.00
Concrete Curb and Gutter (2 lanes)	m	40	$ 90.00	$ 3,600.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	20	$ 75.00	$ 1,500.00
Topsoil, Hydraulic Seed and Mulch	m	263	$ 100.00	$ 26,300.00
Traffic Control During Construction (Residential)	m	263	$ 100.00	$ 26,300.00
SUBTOTAL				**$ 61,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	263	$ 75.00	$ 19,725.00
Concrete Storm Precast Catchbasins and Leads	m	263	$ 60.00	$ 15,780.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	135	$ 400.00	$ 54,000.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	128	$ 850.00	$ 108,800.00
Storm Private Drain Connection	m	263	$ 20.00	$ 5,260.00
SUBTOTAL				**$ 210,000.00**
Construction Cost Total				**$ 320,000.00**
Construction Cost Contingency (30%)				**$ 96,000.00**
Subtotal				**$ 420,000.00**
Engineering Fee Estimate (20%)				**$ 84,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E2				**$ 504,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

JEFFERSON BLVD	ROAD-E2
Length of Road Improvements (m)	538 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

JEFFERSON BLVD		ROAD-E2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	538	$ 5.00	$ 2,690.00
Full Depth Asphalt Removal	m	538	$ 80.00	$ 43,040.00
Driveway Removal (all types)	m	538	$ 30.00	$ 16,140.00
Sidewalk Removal (all types)	m	538	$ 20.00	$ 10,760.00
Sawcutting Existing Pavement	m	538	$ 1.00	$ 538.00
Curb and Gutter Removal	m	538	$ 20.00	$ 10,760.00
Streetlighting Removal	m	538	$ 25.00	$ 13,450.00
Signage Removal	m	538	$ 5.00	$ 2,690.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 120,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	400	$ 100.00	$ 40,000.00
Remove Existing Combined Sewers	m	273	$ 75.00	$ 20,475.00
Remove Existing Manholes	m	673	$ 15.00	$ 10,095.00
Remove Existing Catch Basins	m	538	$ 12.50	$ 6,725.00
Remove Existing Combined Private Drain Connection	m	273	$ 100.00	$ 27,300.00
Remove Existing Storm Private Drain Connection	m	538	$ 25.00	$ 13,450.00
SUBTOTAL				**$ 120,000.00**
Roadwork				
Earth Excavating and Grading	m	538	$ 120.00	$ 64,560.00
Supply and Place Compacted Granular "A"	m	538	$ 350.00	$ 188,300.00
Asphalt Pavement (105mm)	m	538	$ 250.00	$ 134,500.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	538	$ 270.00	$ 145,260.00
Subdrains (2 lanes)	m	538	$ 60.00	$ 32,280.00
Concrete Curb and Gutter (2 lanes)	m	538	$ 90.00	$ 48,420.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	538	$ 75.00	$ 40,350.00
Driveway Restoration b) Concrete	m	538	$ 180.00	$ 96,840.00
Topsoil, Hydraulic Seed and Mulch	m	538	$ 100.00	$ 53,800.00
Temporary Pavement Markings	m	538	$ 1.00	$ 538.00
Permananent Pavement Markings	m	538	$ 30.00	$ 16,140.00
Traffic Control During Construction (Arterial)	m	538	$ 200.00	$ 107,600.00
Streetlighting (Arterial)	m	538	$ 400.00	$ 215,200.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
SUBTOTAL				**$ 1,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	273	$ 75.00	$ 20,475.00
Concrete Manholes - (Chamber)	m	265	$ 200.00	$ 53,000.00
Concrete Storm Precast Catchbasins and Leads	m	538	$ 60.00	$ 32,280.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	273	$ 400.00	$ 109,200.00
Sanitary Private Drain Connection	m	273	$ 150.00	$ 40,950.00
Manhole Rain Catchers	m	273	$ 3.00	$ 819.00
Storm Sewer - 300mm diameter PVC (DR-35)	m	273	$ 325.00	$ 88,725.00
Storm Sewer - 4200mm x 1800mm Concrete Box Culvert	m	265	$ 11,500.00	$ 3,047,500.00
Storm Private Drain Connection	m	538	$ 20.00	$ 10,760.00
SUBTOTAL				**$ 3,500,000.00**
Construction Cost Total				**$ 5,100,000.00**
Construction Cost Contingency (30%)				**$ 1,600,000.00**
Subtotal				**$ 6,700,000.00**
Engineering Fee Estimate (20%)				**$ 1,400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E2				**$ 8,100,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

GARDEN CRT DR	ROAD-E2
Length of Road Improvements (m)	201 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GARDEN CRT DR	ROAD-E2			
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	201	$ 5.00	$ 1,005.00
Full Depth Asphalt Removal	m	201	$ 80.00	$ 16,080.00
Driveway Removal (all types)	m	201	$ 30.00	$ 6,030.00
Sidewalk Removal (all types)	m	201	$ 20.00	$ 4,020.00
Sawcutting Existing Pavement	m	201	$ 1.00	$ 201.00
Curb and Gutter Removal	m	201	$ 20.00	$ 4,020.00
Streetlighting Removal	m	201	$ 25.00	$ 5,025.00
Signage Removal	m	201	$ 5.00	$ 1,005.00
SUBTOTAL				**$ 38,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	201	$ 100.00	$ 20,100.00
Remove Existing Manholes	m	201	$ 15.00	$ 3,015.00
Remove Existing Catch Basins	m	201	$ 12.50	$ 2,512.50
Remove Existing Storm Private Drain Connection	m	201	$ 25.00	$ 5,025.00
SUBTOTAL				**$ 31,000.00**
Roadwork				
Earth Excavating and Grading	m	201	$ 120.00	$ 24,120.00
Supply and Place Compacted Granular "A"	m	201	$ 350.00	$ 70,350.00
Asphalt Pavement (105mm)	m	201	$ 250.00	$ 50,250.00
Subdrains (2 lanes)	m	201	$ 60.00	$ 12,060.00
Concrete Curb and Gutter (2 lanes)	m	201	$ 90.00	$ 18,090.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	201	$ 75.00	$ 15,075.00
Driveway Restoration a) Asphalt	m	201	$ 320.00	$ 64,320.00
Topsoil, Hydraulic Seed and Mulch	m	201	$ 100.00	$ 20,100.00
Traffic Control During Construction (Residential)	m	201	$ 100.00	$ 20,100.00
Streetlighting (Residential)	m	201	$ 225.00	$ 45,225.00
SUBTOTAL				**$ 340,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	201	$ 75.00	$ 15,075.00
Concrete Storm Precast Catchbasins and Leads	m	201	$ 60.00	$ 12,060.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	201	$ 850.00	$ 170,850.00
Storm Private Drain Connection	m	201	$ 20.00	$ 4,020.00
SUBTOTAL				**$ 210,000.00**
Construction Cost Total				**$ 620,000.00**
Construction Cost Contingency (30%)				**$ 190,000.00**
Subtotal				**$ 810,000.00**
Engineering Fee Estimate (20%)				**$ 170,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E2				**$ 980,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

RAYMOND AVE	ROAD-E2
Length of Road Improvements (m)	501 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

RAYMOND AVE		ROAD-E2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	501	$ 5.00	$ 2,505.00
Full Depth Concrete Asphalt Removal	m	501	$ 125.00	$ 62,625.00
Driveway Removal (all types)	m	501	$ 30.00	$ 15,030.00
Sidewalk Removal (all types)	m	501	$ 20.00	$ 10,020.00
Sawcutting Existing Pavement	m	501	$ 1.00	$ 501.00
Curb and Gutter Removal	m	501	$ 20.00	$ 10,020.00
Streetlighting Removal	m	501	$ 25.00	$ 12,525.00
Signage Removal	m	501	$ 5.00	$ 2,505.00
SUBTOTAL				**$ 120,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	501	$ 100.00	$ 50,100.00
Remove Existing Manholes	m	501	$ 15.00	$ 7,515.00
Remove Existing Catch Basins	m	501	$ 12.50	$ 6,262.50
Remove Existing Storm Private Drain Connection	m	501	$ 25.00	$ 12,525.00
SUBTOTAL				**$ 77,000.00**
Roadwork				
Earth Excavating and Grading	m	501	$ 120.00	$ 60,120.00
Supply and Place Compacted Granular "A"	m	501	$ 350.00	$ 175,350.00
100mm Open Graded Drainage Layer	m	501	$ 225.00	$ 112,725.00
Concrete Pavement (305mm)	m	501	$ 575.00	$ 288,075.00
Subdrains (2 lanes)	m	501	$ 60.00	$ 30,060.00
Concrete Curb and Gutter (2 lanes)	m	501	$ 90.00	$ 45,090.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	501	$ 75.00	$ 37,575.00
Driveway Restoration b) Concrete	m	501	$ 180.00	$ 90,180.00
Topsoil, Hydraulic Seed and Mulch	m	501	$ 100.00	$ 50,100.00
Traffic Control During Construction (Residential)	m	501	$ 100.00	$ 50,100.00
Streetlighting (Residential)	m	501	$ 225.00	$ 112,725.00
SUBTOTAL				**$ 1,100,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	501	$ 200.00	$ 100,200.00
Concrete Storm Precast Catchbasins and Leads	m	501	$ 60.00	$ 30,060.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	68	$ 850.00	$ 57,800.00
Storm Sewer - 1800mm x 900mm Concrete Box Culvert	m	260	$ 3,250.00	$ 845,000.00
Storm Sewer - 2400mm x 1200mm Concrete Box Culvert	m	173	$ 6,400.00	$ 1,107,200.00
Storm Private Drain Connection	m	501	$ 20.00	$ 10,020.00
SUBTOTAL				**$ 2,200,000.00**
Construction Cost Total				**$ 3,500,000.00**
Construction Cost Contingency (30%)				**$ 1,100,000.00**
Subtotal				**$ 4,600,000.00**
Engineering Fee Estimate (20%)				**$ 920,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E2				**$ 5,520,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

SOUTH NATIONAL ST	STM-E3
Length of Road Improvements (m)	803 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

SOUTH NATIONAL ST		STM-E3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	803	$ 5.00	$ 4,015.00
Full Depth Asphalt Removal	m	803	$ 80.00	$ 64,240.00
Sidewalk Removal (all types)	m	803	$ 20.00	$ 16,060.00
Sawcutting Existing Pavement	m	803	$ 1.00	$ 803.00
Streetlighting Removal	m	803	$ 25.00	$ 20,075.00
Signage Removal	m	803	$ 5.00	$ 4,015.00
SUBTOTAL				**$ 110,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	420	$ 100.00	$ 42,000.00
Remove Existing Manholes	m	420	$ 15.00	$ 6,300.00
Remove Existing Catch Basins	m	420	$ 12.50	$ 5,250.00
SUBTOTAL				**$ 54,000.00**
Roadwork				
Earth Excavating and Grading	m	803	$ 120.00	$ 96,360.00
Supply and Place Compacted Granular "A"	m	803	$ 350.00	$ 281,050.00
Asphalt Pavement (105mm)	m	803	$ 250.00	$ 200,750.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	803	$ 270.00	$ 216,810.00
Subdrains (2 lanes)	m	803	$ 60.00	$ 48,180.00
Concrete Curb and Gutter (2 lanes)	m	803	$ 90.00	$ 72,270.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	803	$ 75.00	$ 60,225.00
Topsoil, Hydraulic Seed and Mulch	m	803	$ 100.00	$ 80,300.00
Temporary Pavement Markings	m	803	$ 1.00	$ 803.00
Permananent Pavement Markings	m	803	$ 30.00	$ 24,090.00
Traffic Control During Construction (Arterial)	m	803	$ 200.00	$ 160,600.00
Streetlighting (Arterial)	m	803	$ 400.00	$ 321,200.00
SUBTOTAL				**$ 1,600,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	295	$ 75.00	$ 22,125.00
Concrete Manholes - (Chamber)	m	538	$ 200.00	$ 107,600.00
Concrete Storm Precast Catchbasins and Leads	m	803	$ 60.00	$ 48,180.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	121	$ 550.00	$ 66,550.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	114	$ 600.00	$ 68,400.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	60	$ 850.00	$ 51,000.00
Storm Sewer - 3600mm x 2400mm Concrete Box Culvert	m	508	$ 13,500.00	$ 6,858,000.00
Storm Private Drain Connection	m	803	$ 20.00	$ 16,060.00
SUBTOTAL				**$ 7,300,000.00**
Construction Cost Total				**$ 9,100,000.00**
Construction Cost Contingency (30%)				**$ 2,800,000.00**
Subtotal				**$ 11,900,000.00**
Engineering Fee Estimate (20%)				**$ 2,400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3				**$ 14,300,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

TECUMSEH RD E	STM-E3
Length of Road Improvements (m)	959 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

TECUMSEH RD E		STM-E3		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	959	$ 5.00	$ 4,795.00
Full Depth Asphalt Removal	m	959	$ 160.00	$ 153,440.00
Driveway Removal (all types)	m	959	$ 30.00	$ 28,770.00
Sidewalk Removal (all types)	m	959	$ 20.00	$ 19,180.00
Sawcutting Existing Pavement	m	959	$ 1.00	$ 959.00
Curb and Gutter Removal	m	959	$ 20.00	$ 19,180.00
Streetlighting Removal	m	959	$ 25.00	$ 23,975.00
Signage Removal	m	959	$ 5.00	$ 4,795.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 280,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	55	$ 100.00	$ 5,500.00
Remove Existing Combined Sewers	m	863	$ 75.00	$ 64,725.00
Remove Existing Manholes	m	863	$ 15.00	$ 12,945.00
Remove Existing Catch Basins	m	959	$ 12.50	$ 11,987.50
Remove Existing Combined Private Drain Connection	m	863	$ 100.00	$ 86,300.00
Remove Existing Storm Private Drain Connection	m	55	$ 25.00	$ 1,375.00
SUBTOTAL				**$ 190,000.00**
Roadwork				
Earth Excavating and Grading	m	959	$ 240.00	$ 230,160.00
Supply and Place Compacted Granular "A"	m	959	$ 700.00	$ 671,300.00
100mm Open Graded Drainage Layer	m	959	$ 450.00	$ 431,550.00
Concrete Pavement (305mm)	m	959	$ 1,150.00	$ 1,102,850.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	959	$ 392.00	$ 375,928.00
Subdrains (2 lanes)	m	959	$ 60.00	$ 57,540.00
Concrete Curb and Gutter (2 lanes)	m	959	$ 90.00	$ 86,310.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	959	$ 75.00	$ 71,925.00
Driveway Restoration b) Concrete	m	959	$ 180.00	$ 172,620.00
Topsoil, Hydraulic Seed and Mulch	m	959	$ 100.00	$ 95,900.00
Temporary Pavement Markings	m	959	$ 1.00	$ 959.00
Permananent Pavement Markings	m	959	$ 30.00	$ 28,770.00
Traffic Control During Construction (Arterial)	m	959	$ 200.00	$ 191,800.00
Streetlighting (Arterial)	m	959	$ 400.00	$ 383,600.00
Street Trees (In Boulevard / 12m spacing each side)	m	959	$ 125.00	$ 119,875.00
Traffic Signals (Minor Intersection)	LS	3	$ 150,000.00	$ 450,000.00
Traffic Signals (Temporary)	LS	3	$ 80,000.00	$ 240,000.00
SUBTOTAL				**$ 4,800,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	183	$ 75.00	$ 13,725.00
Concrete Manholes - (Chamber)	m	776	$ 200.00	$ 155,200.00
Concrete Storm Precast Catchbasins and Leads	m	959	$ 60.00	$ 57,540.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	123	$ 450.00	$ 55,350.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	90	$ 525.00	$ 47,250.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	150	$ 700.00	$ 105,000.00
Sanitary Sewer - 825mm diameter Concrete (100-D)	m	110	$ 800.00	$ 88,000.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	190	$ 900.00	$ 171,000.00
Sanitary Sewer - 1200mm diameter Concrete (100-D)	m	200	$ 1,500.00	$ 300,000.00
Sanitary Private Drain Connection	m	863	$ 150.00	$ 129,450.00
Manhole Rain Catchers	m	863	$ 3.00	$ 2,589.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	26	$ 450.00	$ 11,700.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	157	$ 850.00	$ 133,450.00
Storm Sewer - 2400mm x 900mm Concrete Box Culvert	m	102	$ 3,500.00	$ 357,000.00
Storm Sewer - 1325mm x 1200mm Concrete Box Culvert	m	144	$ 2,500.00	$ 360,000.00
Storm Sewer - 3000mm x 1800mm Concrete Box Culvert	m	530	$ 6,250.00	$ 3,312,500.00
Storm Private Drain Connection	m	959	$ 20.00	$ 19,180.00

SUBTOTAL		**$ 5,400,000.00**
Construction Cost Total		**$ 10,700,000.00**
Construction Cost Contingency (30%)		**$ 3,300,000.00**
Subtotal		**$ 14,000,000.00**
Engineering Fee Estimate (20%)		**$ 2,800,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-E3**	**$ 16,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

JEFFERSON BLVD	STM-E3
Length of Road Improvements (m)	1055 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

JEFFERSON BLVD		STM-E3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1055	$ 5.00	$ 5,275.00
Full Depth Asphalt Removal	m	1055	$ 80.00	$ 84,400.00
Driveway Removal (all types)	m	1055	$ 30.00	$ 31,650.00
Sidewalk Removal (all types)	m	1055	$ 20.00	$ 21,100.00
Sawcutting Existing Pavement	m	1055	$ 1.00	$ 1,055.00
Curb and Gutter Removal	m	1055	$ 20.00	$ 21,100.00
Streetlighting Removal	m	1055	$ 25.00	$ 26,375.00
Signage Removal	m	1055	$ 5.00	$ 5,275.00
SUBTOTAL				**$ 200,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	705	$ 75.00	$ 52,875.00
Remove Existing Manholes	m	705	$ 15.00	$ 10,575.00
Remove Existing Catch Basins	m	1055	$ 12.50	$ 13,187.50
Remove Existing Combined Private Drain Connection	m	705	$ 100.00	$ 70,500.00
SUBTOTAL				**$ 150,000.00**
Roadwork				
Earth Excavating and Grading	m	1055	$ 120.00	$ 126,600.00
Supply and Place Compacted Granular "A"	m	1055	$ 350.00	$ 369,250.00
Asphalt Pavement (105mm)	m	1055	$ 250.00	$ 263,750.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	1055	$ 270.00	$ 284,850.00
Subdrains (2 lanes)	m	1055	$ 60.00	$ 63,300.00
Concrete Curb and Gutter (2 lanes)	m	1055	$ 90.00	$ 94,950.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1055	$ 75.00	$ 79,125.00
Driveway Restoration b) Concrete	m	1055	$ 180.00	$ 189,900.00
Topsoil, Hydraulic Seed and Mulch	m	1055	$ 100.00	$ 105,500.00
Temporary Pavement Markings	m	1055	$ 1.00	$ 1,055.00
Permananent Pavement Markings	m	1055	$ 30.00	$ 31,650.00
Traffic Control During Construction (Arterial)	m	1055	$ 200.00	$ 211,000.00
Streetlighting (Arterial)	m	1055	$ 400.00	$ 422,000.00
SUBTOTAL				**$ 2,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	250	$ 75.00	$ 18,750.00
Concrete Manholes - (Chamber)	m	805	$ 200.00	$ 161,000.00
Concrete Storm Precast Catchbasins and Leads	m	1055	$ 60.00	$ 63,300.00
Sanitary Sewer - 250mm diameter PVC (DR-28)	m	315	$ 350.00	$ 110,250.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	390	$ 400.00	$ 156,000.00
Sanitary Private Drain Connection	m	705	$ 150.00	$ 105,750.00
Manhole Rain Catchers	m	705	$ 3.00	$ 2,115.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	250	$ 850.00	$ 212,500.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	297	$ 1,500.00	$ 445,500.00
Storm Sewer - 2400mm x 1200mm Concrete Box Culvert	m	71	$ 6,400.00	$ 454,400.00
Storm Sewer - 3800mm x 1500mm Concrete Box Culvert	m	437	$ 8,100.00	$ 3,539,700.00
Storm Private Drain Connection	m	1055	$ 20.00	$ 21,100.00
SUBTOTAL				**$ 5,300,000.00**
Construction Cost Total				**$ 8,000,000.00**
Construction Cost Contingency (30%)				**$ 2,400,000.00**
Subtotal				**$ 10,400,000.00**
Engineering Fee Estimate (20%)				**$ 2,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E3				**$ 12,500,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

LITTLE RIVER GOLF COURSE	ROAD-E4
Length of Road Improvements (m)	152 m
Number of Lanes	0
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

LITTLE RIVER GOLF COURSE		ROAD-E4		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	152	$ 5.00	$ 760.00
SUBTOTAL				**$ 1,000.00**
Roadwork				
Earth Excavating and Grading	m	152	$ -	$ -
Topsoil, Hydraulic Seed and Mulch	m	152	$ 100.00	$ 15,200.00
SUBTOTAL				**$ 16,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	152	$ 200.00	$ 30,400.00
Concrete Storm Precast Catchbasins and Leads	m	152	$ 60.00	$ 9,120.00
Storm Sewer - 2400mm x 1200mm Concrete Box Culvert	m	152	$ 6,400.00	$ 972,800.00
SUBTOTAL				**$ 1,100,000.00**
Ponds & Undergound Storage				
Pond Excavation, Grading, Topsoil and Hydroseed	m^3	20000	$ 300.00	$ 6,000,000.00
Underground Storage	m^3	0	$ 1,000.00	$ -
SUBTOTAL				**$ 6,000,000.00**
Construction Cost Total				**$ 7,200,000.00**
Construction Cost Contingency (30%)				**$ 2,160,000.00**
Subtotal				**$ 9,360,000.00**
Engineering Fee Estimate (20%)				**$ 1,872,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**ROAD-E4**		**$ 11,232,000.00**

LAUZON PKWY	ROAD-E4
Length of Road Improvements (m)	553 m
Number of Lanes	6
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

LAUZON PKWY		ROAD-E4		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	553	$ 5.00	$ 2,765.00
Full Depth Concrete Asphalt Removal	m	553	$ 375.00	$ 207,375.00
Driveway Removal (all types)	m	553	$ 30.00	$ 16,590.00
Sidewalk Removal (all types)	m	553	$ 20.00	$ 11,060.00
Concrete Median Removal	m	553	$ 10.00	$ 5,530.00
Sawcutting Existing Pavement	m	553	$ 1.00	$ 553.00
Curb and Gutter Removal	m	553	$ 20.00	$ 11,060.00
Streetlighting Removal	m	553	$ 25.00	$ 13,825.00
Signage Removal	m	553	$ 5.00	$ 2,765.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 290,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	553	$ 100.00	$ 55,300.00
Remove Existing Manholes	m	553	$ 15.00	$ 8,295.00
Remove Existing Catch Basins	m	553	$ 12.50	$ 6,912.50
Remove Existing Storm Private Drain Connection	m	553	$ 25.00	$ 13,825.00
SUBTOTAL				**$ 85,000.00**
Roadwork				
Earth Excavating and Grading	m	553	$ 360.00	$ 199,080.00
Supply and Place Compacted Granular "A"	m	553	$ 1,050.00	$ 580,650.00
100mm Open Graded Drainage Layer	m	553	$ 675.00	$ 373,275.00
Concrete Pavement (305mm)	m	553	$ 1,725.00	$ 953,925.00
Subdrains (2 lanes)	m	553	$ 60.00	$ 33,180.00
Concrete Curb and Gutter (2 lanes)	m	553	$ 90.00	$ 49,770.00
Concrete Median Islands (1m wide island)	m	553	$ 150.00	$ 82,950.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	553	$ 75.00	$ 41,475.00
Driveway Restoration b) Concrete	m	553	$ 180.00	$ 99,540.00
Topsoil, Hydraulic Seed and Mulch	m	553	$ 100.00	$ 55,300.00
Temporary Pavement Markings	m	553	$ 1.00	$ 553.00
Permananent Pavement Markings	m	553	$ 30.00	$ 16,590.00
Traffic Control During Construction (Arterial)	m	553	$ 200.00	$ 110,600.00
Streetlighting (Arterial)	m	553	$ 400.00	$ 221,200.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 3,100,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	76	$ 130.00	$ 9,880.00
Concrete Manholes - (Chamber)	m	477	$ 200.00	$ 95,400.00
Concrete Storm Precast Catchbasins and Leads	m	553	$ 60.00	$ 33,180.00
Storm Sewer - 375mm diameter PVC (DR-35)	m	10	$ 385.00	$ 3,850.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	66	$ 3,000.00	$ 198,000.00
Storm Sewer - 4200mm x 1800mm Concrete Box Culvert	m	477	$ 11,500.00	$ 5,485,500.00
Storm Private Drain Connection	m	553	$ 20.00	$ 11,060.00
SUBTOTAL				**$ 5,900,000.00**
Ponds & Undergound Storage				
Underground Storage	m^3	5000	$ 1,000.00	$ 5,000,000.00
SUBTOTAL				**$ 5,000,000.00**
Construction Cost Total				**$ 14,400,000.00**
Construction Cost Contingency (30%)				**$ 4,320,000.00**
Subtotal				**$ 18,720,000.00**
Engineering Fee Estimate (20%)				**$ 3,744,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E4				**$ 22,464,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

LAUZON RD	ROAD-E5
Length of Road Improvements (m)	1918 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

LAUZON RD		ROAD-E5		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1918	$ 5.00	$ 9,590.00
Full Depth Concrete Asphalt Removal	m	1278	$ 250.00	$ 319,500.00
Full Depth Asphalt Removal	m	640	$ 160.00	$ 102,400.00
Driveway Removal (all types)	m	1918	$ 30.00	$ 57,540.00
Sidewalk Removal (all types)	m	1918	$ 20.00	$ 38,360.00
Concrete Median Removal	m	90	$ 10.00	$ 900.00
Sawcutting Existing Pavement	m	1918	$ 1.00	$ 1,918.00
Curb and Gutter Removal	m	1918	$ 20.00	$ 38,360.00
Streetlighting Removal	m	1918	$ 25.00	$ 47,950.00
Signage Removal	m	1918	$ 5.00	$ 9,590.00
Traffic Signal Removal	LS	3	$ 15,000.00	$ 45,000.00
SUBTOTAL				**$ 680,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1918	$ 100.00	$ 191,800.00
Remove Existing Manholes	m	1918	$ 15.00	$ 28,770.00
Remove Existing Catch Basins	m	1918	$ 12.50	$ 23,975.00
Remove Existing Storm Private Drain Connection	m	1918	$ 25.00	$ 47,950.00
SUBTOTAL				**$ 300,000.00**
Roadwork				
Earth Excavating and Grading	m	1918	$ 240.00	$ 460,320.00
Supply and Place Compacted Granular "A"	m	1918	$ 700.00	$ 1,342,600.00
100mm Open Graded Drainage Layer	m	1278	$ 450.00	$ 575,100.00
Asphalt Pavement (105mm)	m	640	$ 500.00	$ 320,000.00
Concrete Pavement (305mm)	m	1278	$ 1,150.00	$ 1,469,700.00
Subdrains (2 lanes)	m	1918	$ 60.00	$ 115,080.00
Concrete Curb and Gutter (2 lanes)	m	1918	$ 90.00	$ 172,620.00
Concrete Median Islands (1m wide island)	m	90	$ 150.00	$ 13,500.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1918	$ 75.00	$ 143,850.00
Driveway Restoration b) Concrete	m	1918	$ 180.00	$ 345,240.00
Topsoil, Hydraulic Seed and Mulch	m	1918	$ 100.00	$ 191,800.00
Temporary Pavement Markings	m	1918	$ 1.00	$ 1,918.00
Permananent Pavement Markings	m	1918	$ 30.00	$ 57,540.00
Traffic Control During Construction (Arterial)	m	1918	$ 200.00	$ 383,600.00
Streetlighting (Arterial)	m	1918	$ 400.00	$ 767,200.00
Traffic Signals (Minor Intersection)	LS	2	$ 150,000.00	$ 300,000.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	3	$ 80,000.00	$ 240,000.00
SUBTOTAL				**$ 7,200,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	1918	$ 200.00	$ 383,600.00
Concrete Storm Precast Catchbasins and Leads	m	1918	$ 60.00	$ 115,080.00
Storm Sewer - 2100mm diameter Concrete (100-D)	m	528	$ 3,500.00	$ 1,848,000.00
Storm Sewer - 2250mm diameter Concrete (100-D)	m	68	$ 4,000.00	$ 272,000.00
Storm Sewer - 2400mm diameter Concrete (100-D)	m	1227	$ 5,000.00	$ 6,135,000.00
Storm Sewer - 2700mm diameter Concrete (100-D)	m	95	$ 6,000.00	$ 570,000.00
Storm Private Drain Connection	m	1918	$ 20.00	$ 38,360.00
SUBTOTAL				**$ 9,400,000.00**
Construction Cost Total				**$ 17,600,000.00**
Construction Cost Contingency (30%)				**$ 5,300,000.00**
Subtotal				**$ 22,900,000.00**
Engineering Fee Estimate (20%)				**$ 4,600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**ROAD-E5**		**$ 27,500,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CLAIRVIEW AVE	ROAD-E5
Length of Road Improvements (m)	406 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CLAIRVIEW AVE		ROAD-E5		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	406	$ 5.00	$ 2,030.00
Driveway Removal (all types)	m	406	$ 30.00	$ 12,180.00
Sidewalk Removal (all types)	m	406	$ 20.00	$ 8,120.00
Streetlighting Removal	m	406	$ 25.00	$ 10,150.00
Signage Removal	m	406	$ 5.00	$ 2,030.00
SUBTOTAL				**$ 35,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	406	$ 100.00	$ 40,600.00
Remove Existing Manholes	m	406	$ 15.00	$ 6,090.00
Remove Existing Catch Basins	m	406	$ 12.50	$ 5,075.00
Remove Existing Storm Private Drain Connection	m	406	$ 25.00	$ 10,150.00
SUBTOTAL				**$ 62,000.00**
Roadwork				
Earth Excavating and Grading	m	406	$ 120.00	$ 48,720.00
Subdrains (2 lanes)	m	406	$ 60.00	$ 24,360.00
Concrete Curb and Gutter (2 lanes)	m	406	$ 90.00	$ 36,540.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	406	$ 75.00	$ 30,450.00
Driveway Restoration a) Asphalt	m	406	$ 320.00	$ 129,920.00
Topsoil, Hydraulic Seed and Mulch	m	406	$ 100.00	$ 40,600.00
Traffic Control During Construction (Residential)	m	406	$ 100.00	$ 40,600.00
Streetlighting (Residential)	m	406	$ 225.00	$ 91,350.00
SUBTOTAL				**$ 450,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	406	$ 130.00	$ 52,780.00
Concrete Storm Precast Catchbasins and Leads	m	406	$ 60.00	$ 24,360.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	406	$ 3,000.00	$ 1,218,000.00
Storm Private Drain Connection	m	406	$ 20.00	$ 8,120.00
SUBTOTAL				**$ 1,400,000.00**
Construction Cost Total				**$ 2,000,000.00**
Construction Cost Contingency (30%)				**$ 600,000.00**
Subtotal				**$ 2,600,000.00**
Engineering Fee Estimate (20%)				**$ 520,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E5				**$ 3,120,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CECILE ST	ROAD-E5
Length of Road Improvements (m)	188 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

CECILE ST		ROAD-E5		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	188	$ 5.00	$ 940.00
Full Depth Asphalt Removal	m	188	$ 80.00	$ 15,040.00
Driveway Removal (all types)	m	188	$ 30.00	$ 5,640.00
Sidewalk Removal (all types)	m	188	$ 20.00	$ 3,760.00
Sawcutting Existing Pavement	m	188	$ 1.00	$ 188.00
Curb and Gutter Removal	m	188	$ 20.00	$ 3,760.00
Signage Removal	m	188	$ 5.00	$ 940.00
SUBTOTAL				**$ 31,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	188	$ 100.00	$ 18,800.00
Remove Existing Manholes	m	188	$ 15.00	$ 2,820.00
Remove Existing Catch Basins	m	188	$ 12.50	$ 2,350.00
Remove Existing Storm Private Drain Connection	m	188	$ 25.00	$ 4,700.00
SUBTOTAL				**$ 29,000.00**
Roadwork				
Earth Excavating and Grading	m	188	$ 120.00	$ 22,560.00
Supply and Place Compacted Granular "A"	m	188	$ 350.00	$ 65,800.00
Asphalt Pavement (105mm)	m	188	$ 250.00	$ 47,000.00
Subdrains (2 lanes)	m	188	$ 60.00	$ 11,280.00
Concrete Curb and Gutter (2 lanes)	m	188	$ 90.00	$ 16,920.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	188	$ 75.00	$ 14,100.00
Driveway Restoration a) Asphalt	m	188	$ 320.00	$ 60,160.00
Topsoil, Hydraulic Seed and Mulch	m	188	$ 100.00	$ 18,800.00
Traffic Control During Construction (Residential)	m	188	$ 100.00	$ 18,800.00
Streetlighting (Residential)	m	188	$ 225.00	$ 42,300.00
SUBTOTAL				**$ 320,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	188	$ 200.00	$ 37,600.00
Concrete Storm Precast Catchbasins and Leads	m	188	$ 60.00	$ 11,280.00
Storm Sewer - 2700mm diameter Concrete (100-D)	m	188	$ 6,000.00	$ 1,128,000.00
Storm Private Drain Connection	m	188	$ 20.00	$ 3,760.00
SUBTOTAL				**$ 1,200,000.00**
Construction Cost Total				**$ 1,600,000.00**
Construction Cost Contingency (30%)				**$ 480,000.00**
Subtotal				**$ 2,100,000.00**
Engineering Fee Estimate (20%)				**$ 420,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E5				**$ 2,520,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

MCHUGH ST	ROAD-E6
Length of Road Improvements (m)	388 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

MCHUGH ST		ROAD-E6		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	388	$ 5.00	$ 1,940.00
Full Depth Asphalt Removal	m	388	$ 160.00	$ 62,080.00
Driveway Removal (all types)	m	388	$ 30.00	$ 11,640.00
Sidewalk Removal (all types)	m	388	$ 20.00	$ 7,760.00
Sawcutting Existing Pavement	m	388	$ 1.00	$ 388.00
Curb and Gutter Removal	m	388	$ 20.00	$ 7,760.00
Streetlighting Removal	m	388	$ 25.00	$ 9,700.00
Signage Removal	m	388	$ 5.00	$ 1,940.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 120,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	388	$ 100.00	$ 38,800.00
Remove Existing Manholes	m	388	$ 15.00	$ 5,820.00
Remove Existing Catch Basins	m	388	$ 12.50	$ 4,850.00
Remove Existing Storm Private Drain Connection	m	388	$ 25.00	$ 9,700.00
SUBTOTAL				**$ 60,000.00**
Roadwork				
Earth Excavating and Grading	m	388	$ 240.00	$ 93,120.00
Supply and Place Compacted Granular "A"	m	388	$ 700.00	$ 271,600.00
Asphalt Pavement (105mm)	m	388	$ 500.00	$ 194,000.00
Subdrains (2 lanes)	m	388	$ 60.00	$ 23,280.00
Concrete Curb and Gutter (2 lanes)	m	388	$ 90.00	$ 34,920.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	388	$ 75.00	$ 29,100.00
Topsoil, Hydraulic Seed and Mulch	m	388	$ 100.00	$ 38,800.00
Temporary Pavement Markings	m	388	$ 1.00	$ 388.00
Permananent Pavement Markings	m	388	$ 30.00	$ 11,640.00
Traffic Control During Construction (Arterial)	m	388	$ 200.00	$ 77,600.00
Streetlighting (Arterial)	m	388	$ 400.00	$ 155,200.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 1,200,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	388	$ 200.00	$ 77,600.00
Concrete Storm Precast Catchbasins and Leads	m	388	$ 60.00	$ 23,280.00
Storm Sewer - 4200mm x 1200mm Concrete Box Culvert	m	270	$ 9,000.00	$ 2,430,000.00
Storm Sewer - 3600mm x 1800mm Concrete Box Culvert	m	118	$ 8,750.00	$ 1,032,500.00
Storm Private Drain Connection	m	388	$ 20.00	$ 7,760.00
SUBTOTAL				**$ 3,600,000.00**
Construction Cost Total				**$ 5,000,000.00**
Construction Cost Contingency (30%)				**$ 1,500,000.00**
Subtotal				**$ 6,500,000.00**
Engineering Fee Estimate (20%)				**$ 1,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E6				**$ 7,800,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

PEPPERVINE ST	STM-E6
Length of Road Improvements (m)	101 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

PEPPERVINE ST		STM-E6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	101	$ 5.00	$ 505.00
Full Depth Asphalt Removal	m	101	$ 80.00	$ 8,080.00
Driveway Removal (all types)	m	101	$ 30.00	$ 3,030.00
Sidewalk Removal (all types)	m	101	$ 20.00	$ 2,020.00
Sawcutting Existing Pavement	m	101	$ 1.00	$ 101.00
Curb and Gutter Removal	m	101	$ 20.00	$ 2,020.00
Streetlighting Removal	m	101	$ 25.00	$ 2,525.00
Signage Removal	m	101	$ 5.00	$ 505.00
SUBTOTAL				**$ 19,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	101	$ 100.00	$ 10,100.00
Remove Existing Manholes	m	101	$ 15.00	$ 1,515.00
Remove Existing Catch Basins	m	101	$ 12.50	$ 1,262.50
Remove Existing Storm Private Drain Connection	m	101	$ 25.00	$ 2,525.00
SUBTOTAL				**$ 16,000.00**
Roadwork				
Earth Excavating and Grading	m	101	$ 120.00	$ 12,120.00
Supply and Place Compacted Granular "A"	m	101	$ 350.00	$ 35,350.00
Asphalt Pavement (105mm)	m	101	$ 250.00	$ 25,250.00
Subdrains (2 lanes)	m	101	$ 60.00	$ 6,060.00
Concrete Curb and Gutter (2 lanes)	m	101	$ 90.00	$ 9,090.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	101	$ 75.00	$ 7,575.00
Driveway Restoration b) Concrete	m	101	$ 180.00	$ 18,180.00
Topsoil, Hydraulic Seed and Mulch	m	101	$ 100.00	$ 10,100.00
Traffic Control During Construction (Residential)	m	101	$ 100.00	$ 10,100.00
Streetlighting (Residential)	m	101	$ 225.00	$ 22,725.00
Street Trees (In Boulevard / 12m spacing each side)	m	101	$ 125.00	$ 12,625.00
SUBTOTAL				**$ 170,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	101	$ 75.00	$ 7,575.00
Concrete Storm Precast Catchbasins and Leads	m	101	$ 60.00	$ 6,060.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	101	$ 500.00	$ 50,500.00
Storm Private Drain Connection	m	101	$ 20.00	$ 2,020.00
SUBTOTAL				**$ 67,000.00**
Construction Cost Total				**$ 280,000.00**
Construction Cost Contingency (30%)				**$ 84,000.00**
Subtotal				**$ 370,000.00**
Engineering Fee Estimate (20%)				**$ 74,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-E6				**$ 444,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

MCHUGH ST	ROAD-E7
Length of Road Improvements (m)	533 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

MCHUGH ST		ROAD-E7		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	533	$ 5.00	$ 2,665.00
Full Depth Asphalt Removal	m	533	$ 160.00	$ 85,280.00
Sidewalk Removal (all types)	m	533	$ 20.00	$ 10,660.00
Sawcutting Existing Pavement	m	533	$ 1.00	$ 533.00
Curb and Gutter Removal	m	533	$ 20.00	$ 10,660.00
Streetlighting Removal	m	533	$ 25.00	$ 13,325.00
Signage Removal	m	533	$ 5.00	$ 2,665.00
SUBTOTAL				**$ 130,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	533	$ 100.00	$ 53,300.00
Remove Existing Manholes	m	533	$ 15.00	$ 7,995.00
Remove Existing Catch Basins	m	533	$ 12.50	$ 6,662.50
SUBTOTAL				**$ 68,000.00**
Roadwork				
Earth Excavating and Grading	m	533	$ 240.00	$ 127,920.00
Supply and Place Compacted Granular "A"	m	533	$ 700.00	$ 373,100.00
100mm Open Graded Drainage Layer	m	533	$ 450.00	$ 239,850.00
Concrete Pavement (305mm)	m	533	$ 1,150.00	$ 612,950.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	533	$ 392.00	$ 208,936.00
Subdrains (2 lanes)	m	533	$ 60.00	$ 31,980.00
Concrete Curb and Gutter (2 lanes)	m	533	$ 90.00	$ 47,970.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	533	$ 75.00	$ 39,975.00
Topsoil, Hydraulic Seed and Mulch	m	533	$ 100.00	$ 53,300.00
Temporary Pavement Markings	m	533	$ 1.00	$ 533.00
Permananent Pavement Markings	m	533	$ 30.00	$ 15,990.00
Traffic Control During Construction (Arterial)	m	533	$ 200.00	$ 106,600.00
Streetlighting (Arterial)	m	533	$ 400.00	$ 213,200.00
Street Trees (In Boulevard / 12m spacing each side)	m	533	$ 125.00	$ 66,625.00
SUBTOTAL				**$ 2,200,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	533	$ 200.00	$ 106,600.00
Concrete Storm Precast Catchbasins and Leads	m	533	$ 60.00	$ 31,980.00
Storm Sewer - 4200mm x 1500mm Concrete Box Culvert	m	533	$ 9,750.00	$ 5,196,750.00
SUBTOTAL				**$ 5,400,000.00**
Construction Cost Total				**$ 7,800,000.00**
Construction Cost Contingency (30%)				**$ 2,400,000.00**
Subtotal				**$ 10,200,000.00**
Engineering Fee Estimate (20%)				**$ 2,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E7				**$ 12,300,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

QUESTA DR	ROAD-E7
Length of Road Improvements (m)	245 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

QUESTA DR		ROAD-E7		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	245	$ 5.00	$ 1,225.00
Full Depth Asphalt Removal	m	245	$ 80.00	$ 19,600.00
Driveway Removal (all types)	m	245	$ 30.00	$ 7,350.00
Sidewalk Removal (all types)	m	245	$ 20.00	$ 4,900.00
Sawcutting Existing Pavement	m	245	$ 1.00	$ 245.00
Curb and Gutter Removal	m	245	$ 20.00	$ 4,900.00
Streetlighting Removal	m	245	$ 25.00	$ 6,125.00
Signage Removal	m	245	$ 5.00	$ 1,225.00
SUBTOTAL				**$ 46,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	245	$ 100.00	$ 24,500.00
Remove Existing Manholes	m	245	$ 15.00	$ 3,675.00
Remove Existing Catch Basins	m	245	$ 12.50	$ 3,062.50
Remove Existing Storm Private Drain Connection	m	245	$ 25.00	$ 6,125.00
SUBTOTAL				**$ 38,000.00**
Roadwork				
Earth Excavating and Grading	m	245	$ 120.00	$ 29,400.00
Supply and Place Compacted Granular "A"	m	245	$ 350.00	$ 85,750.00
Asphalt Pavement (105mm)	m	245	$ 250.00	$ 61,250.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	245	$ 270.00	$ 66,150.00
Subdrains (2 lanes)	m	245	$ 60.00	$ 14,700.00
Concrete Curb and Gutter (2 lanes)	m	245	$ 90.00	$ 22,050.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	245	$ 75.00	$ 18,375.00
Driveway Restoration b) Concrete	m	245	$ 180.00	$ 44,100.00
Topsoil, Hydraulic Seed and Mulch	m	245	$ 100.00	$ 24,500.00
Traffic Control During Construction (Residential)	m	245	$ 100.00	$ 24,500.00
Streetlighting (Residential)	m	245	$ 225.00	$ 55,125.00
Street Trees (In Boulevard / 12m spacing each side)	m	245	$ 125.00	$ 30,625.00
SUBTOTAL				**$ 480,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	245	$ 130.00	$ 31,850.00
Concrete Storm Precast Catchbasins and Leads	m	245	$ 60.00	$ 14,700.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	245	$ 1,500.00	$ 367,500.00
Storm Private Drain Connection	m	245	$ 20.00	$ 4,900.00
SUBTOTAL				**$ 420,000.00**
Construction Cost Total				**$ 1,000,000.00**
Construction Cost Contingency (30%)				**$ 300,000.00**
Subtotal				**$ 1,300,000.00**
Engineering Fee Estimate (20%)				**$ 260,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E7				**$ 1,560,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CHATEAU AVE	ROAD-E7
Length of Road Improvements (m)	199 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CHATEAU AVE		ROAD-E7		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	199	$ 5.00	$ 995.00
Full Depth Asphalt Removal	m	199	$ 80.00	$ 15,920.00
Driveway Removal (all types)	m	199	$ 30.00	$ 5,970.00
Sidewalk Removal (all types)	m	199	$ 20.00	$ 3,980.00
Sawcutting Existing Pavement	m	199	$ 1.00	$ 199.00
Curb and Gutter Removal	m	199	$ 20.00	$ 3,980.00
Streetlighting Removal	m	199	$ 25.00	$ 4,975.00
Signage Removal	m	199	$ 5.00	$ 995.00
SUBTOTAL				**$ 38,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	199	$ 100.00	$ 19,900.00
Remove Existing Manholes	m	199	$ 15.00	$ 2,985.00
Remove Existing Catch Basins	m	199	$ 12.50	$ 2,487.50
Remove Existing Storm Private Drain Connection	m	199	$ 25.00	$ 4,975.00
SUBTOTAL				**$ 31,000.00**
Roadwork				
Earth Excavating and Grading	m	199	$ 120.00	$ 23,880.00
Supply and Place Compacted Granular "A"	m	199	$ 350.00	$ 69,650.00
Asphalt Pavement (105mm)	m	199	$ 250.00	$ 49,750.00
Subdrains (2 lanes)	m	199	$ 60.00	$ 11,940.00
Concrete Curb and Gutter (2 lanes)	m	199	$ 90.00	$ 17,910.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	199	$ 75.00	$ 14,925.00
Driveway Restoration b) Concrete	m	199	$ 180.00	$ 35,820.00
Topsoil, Hydraulic Seed and Mulch	m	199	$ 100.00	$ 19,900.00
Traffic Control During Construction (Residential)	m	199	$ 100.00	$ 19,900.00
Streetlighting (Residential)	m	199	$ 225.00	$ 44,775.00
SUBTOTAL				**$ 310,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	199	$ 130.00	$ 25,870.00
Concrete Storm Precast Catchbasins and Leads	m	199	$ 60.00	$ 11,940.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	199	$ 1,500.00	$ 298,500.00
Storm Private Drain Connection	m	199	$ 20.00	$ 3,980.00
SUBTOTAL				**$ 350,000.00**
Construction Cost Total				**$ 730,000.00**
Construction Cost Contingency (30%)				**$ 220,000.00**
Subtotal				**$ 950,000.00**
Engineering Fee Estimate (20%)				**$ 190,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E7				**$ 1,140,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

LEATHORNE ST	ROAD-E7
Length of Road Improvements (m)	87 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

LEATHORNE ST		ROAD-E7		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	87	$ 5.00	$ 435.00
Full Depth Asphalt Removal	m	87	$ 80.00	$ 6,960.00
Driveway Removal (all types)	m	87	$ 30.00	$ 2,610.00
Sidewalk Removal (all types)	m	87	$ 20.00	$ 1,740.00
Sawcutting Existing Pavement	m	87	$ 1.00	$ 87.00
Curb and Gutter Removal	m	87	$ 20.00	$ 1,740.00
Streetlighting Removal	m	87	$ 25.00	$ 2,175.00
Signage Removal	m	87	$ 5.00	$ 435.00
SUBTOTAL				**$ 17,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	87	$ 100.00	$ 8,700.00
Remove Existing Manholes	m	87	$ 15.00	$ 1,305.00
Remove Existing Catch Basins	m	87	$ 12.50	$ 1,087.50
Remove Existing Storm Private Drain Connection	m	87	$ 25.00	$ 2,175.00
SUBTOTAL				**$ 14,000.00**
Roadwork				
Earth Excavating and Grading	m	87	$ 120.00	$ 10,440.00
Supply and Place Compacted Granular "A"	m	87	$ 350.00	$ 30,450.00
Asphalt Pavement (105mm)	m	87	$ 250.00	$ 21,750.00
Subdrains (2 lanes)	m	87	$ 60.00	$ 5,220.00
Concrete Curb and Gutter (2 lanes)	m	87	$ 90.00	$ 7,830.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	87	$ 75.00	$ 6,525.00
Driveway Restoration b) Concrete	m	87	$ 180.00	$ 15,660.00
Topsoil, Hydraulic Seed and Mulch	m	87	$ 100.00	$ 8,700.00
Traffic Control During Construction (Residential)	m	87	$ 100.00	$ 8,700.00
Streetlighting (Residential)	m	87	$ 225.00	$ 19,575.00
SUBTOTAL				**$ 140,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	87	$ 130.00	$ 11,310.00
Concrete Storm Precast Catchbasins and Leads	m	87	$ 60.00	$ 5,220.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	87	$ 1,500.00	$ 130,500.00
Storm Private Drain Connection	m	87	$ 20.00	$ 1,740.00
SUBTOTAL				**$ 150,000.00**
Construction Cost Total				**$ 330,000.00**
Construction Cost Contingency (30%)				**$ 99,000.00**
Subtotal				**$ 430,000.00**
Engineering Fee Estimate (20%)				**$ 86,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E7				**$ 516,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

BLUE HERON DR	ROAD-E8
Length of Road Improvements (m)	747 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

BLUE HERON DR		ROAD-E8		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	747	$ 5.00	$ 3,735.00
Full Depth Asphalt Removal	m	747	$ 80.00	$ 59,760.00
Driveway Removal (all types)	m	747	$ 30.00	$ 22,410.00
Sidewalk Removal (all types)	m	747	$ 20.00	$ 14,940.00
Sawcutting Existing Pavement	m	747	$ 1.00	$ 747.00
Curb and Gutter Removal	m	747	$ 20.00	$ 14,940.00
Streetlighting Removal	m	747	$ 25.00	$ 18,675.00
Signage Removal	m	747	$ 5.00	$ 3,735.00
SUBTOTAL				**$ 139,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	747	$ 100.00	$ 74,700.00
Remove Existing Manholes	m	747	$ 15.00	$ 11,205.00
Remove Existing Catch Basins	m	747	$ 12.50	$ 9,337.50
Remove Existing Storm Private Drain Connection	m	747	$ 25.00	$ 18,675.00
SUBTOTAL				**$ 114,000.00**
Roadwork				
Earth Excavating and Grading	m	747	$ 120.00	$ 89,640.00
Supply and Place Compacted Granular "A"	m	747	$ 350.00	$ 261,450.00
Asphalt Pavement (105mm)	m	747	$ 250.00	$ 186,750.00
Subdrains (2 lanes)	m	747	$ 60.00	$ 44,820.00
Concrete Curb and Gutter (2 lanes)	m	747	$ 90.00	$ 67,230.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	747	$ 75.00	$ 56,025.00
Driveway Restoration b) Concrete	m	747	$ 180.00	$ 134,460.00
Topsoil, Hydraulic Seed and Mulch	m	747	$ 100.00	$ 74,700.00
Traffic Control During Construction (Residential)	m	747	$ 100.00	$ 74,700.00
Streetlighting (Residential)	m	747	$ 225.00	$ 168,075.00
SUBTOTAL				**$ 1,160,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	747	$ 130.00	$ 97,110.00
Concrete Storm Precast Catchbasins and Leads	m	747	$ 60.00	$ 44,820.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	606	$ 1,500.00	$ 909,000.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	79	$ 2,500.00	$ 197,500.00
Storm Sewer - 2400mm diameter Concrete (100-D)	m	62	$ 5,000.00	$ 310,000.00
Storm Private Drain Connection	m	747	$ 20.00	$ 14,940.00
SUBTOTAL				**$ 1,580,000.00**
Construction Cost Total				**$ 3,000,000.00**
Construction Cost Contingency (30%)				**$ 900,000.00**
Subtotal				**$ 3,900,000.00**
Engineering Fee Estimate (20%)				**$ 780,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E8				**$ 4,680,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

MCNORTON ST	ROAD-E8
Length of Road Improvements (m)	485 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

MCNORTON ST		ROAD-E8		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	485	$ 5.00	$ 2,425.00
Full Depth Asphalt Removal	m	485	$ 80.00	$ 38,800.00
Sidewalk Removal (all types)	m	485	$ 20.00	$ 9,700.00
Sawcutting Existing Pavement	m	485	$ 1.00	$ 485.00
Curb and Gutter Removal	m	485	$ 20.00	$ 9,700.00
Streetlighting Removal	m	485	$ 25.00	$ 12,125.00
Signage Removal	m	485	$ 5.00	$ 2,425.00
SUBTOTAL				**$ 76,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	485	$ 100.00	$ 48,500.00
Remove Existing Manholes	m	485	$ 15.00	$ 7,275.00
Remove Existing Catch Basins	m	485	$ 12.50	$ 6,062.50
SUBTOTAL				**$ 62,000.00**
Roadwork				
Earth Excavating and Grading	m	485	$ 120.00	$ 58,200.00
Supply and Place Compacted Granular "A"	m	485	$ 350.00	$ 169,750.00
Asphalt Pavement (105mm)	m	485	$ 250.00	$ 121,250.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	485	$ 270.00	$ 130,950.00
Subdrains (2 lanes)	m	485	$ 60.00	$ 29,100.00
Concrete Curb and Gutter (2 lanes)	m	485	$ 90.00	$ 43,650.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	485	$ 75.00	$ 36,375.00
Topsoil, Hydraulic Seed and Mulch	m	485	$ 100.00	$ 48,500.00
Traffic Control During Construction (Residential)	m	485	$ 100.00	$ 48,500.00
Streetlighting (Residential)	m	485	$ 225.00	$ 109,125.00
Street Trees (In Boulevard / 12m spacing each side)	m	485	$ 125.00	$ 60,625.00
SUBTOTAL				**$ 860,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	485	$ 130.00	$ 63,050.00
Concrete Storm Precast Catchbasins and Leads	m	485	$ 60.00	$ 29,100.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	485	$ 1,200.00	$ 582,000.00
SUBTOTAL				**$ 680,000.00**
Construction Cost Total				**$ 1,700,000.00**
Construction Cost Contingency (30%)				**$ 510,000.00**
Subtotal				**$ 2,300,000.00**
Engineering Fee Estimate (20%)				**$ 460,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E8				**$ 2,760,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

WYANDOTTE ST E	ROAD-E9
Length of Road Improvements (m)	87 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

WYANDOTTE ST E		ROAD-E9		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	87	$ 5.00	$ 435.00
Full Depth Concrete Asphalt Removal	m	87	$ 250.00	$ 21,750.00
Driveway Removal (all types)	m	87	$ 30.00	$ 2,610.00
Sidewalk Removal (all types)	m	87	$ 20.00	$ 1,740.00
Concrete Median Removal	m	87	$ 10.00	$ 870.00
Sawcutting Existing Pavement	m	87	$ 1.00	$ 87.00
Curb and Gutter Removal	m	87	$ 20.00	$ 1,740.00
Streetlighting Removal	m	87	$ 25.00	$ 2,175.00
Signage Removal	m	87	$ 5.00	$ 435.00
SUBTOTAL				**$ 32,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	87	$ 100.00	$ 8,700.00
Remove Existing Manholes	m	87	$ 15.00	$ 1,305.00
Remove Existing Catch Basins	m	87	$ 12.50	$ 1,087.50
Remove Existing Storm Private Drain Connection	m	87	$ 25.00	$ 2,175.00
SUBTOTAL				**$ 14,000.00**
Roadwork				
Earth Excavating and Grading	m	87	$ 240.00	$ 20,880.00
Supply and Place Compacted Granular "A"	m	87	$ 700.00	$ 60,900.00
100mm Open Graded Drainage Layer	m	87	$ 450.00	$ 39,150.00
Concrete Pavement (305mm)	m	87	$ 1,150.00	$ 100,050.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	87	$ 392.00	$ 34,104.00
Subdrains (2 lanes)	m	87	$ 60.00	$ 5,220.00
Concrete Curb and Gutter (2 lanes)	m	87	$ 90.00	$ 7,830.00
Concrete Median Islands (1m wide island)	m	87	$ 150.00	$ 13,050.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	87	$ 75.00	$ 6,525.00
Driveway Restoration b) Concrete	m	87	$ 180.00	$ 15,660.00
Topsoil, Hydraulic Seed and Mulch	m	87	$ 100.00	$ 8,700.00
Temporary Pavement Markings	m	87	$ 1.00	$ 87.00
Permananent Pavement Markings	m	87	$ 30.00	$ 2,610.00
Traffic Control During Construction (Arterial)	m	87	$ 200.00	$ 17,400.00
Streetlighting (Arterial)	m	87	$ 400.00	$ 34,800.00
Street Trees (In Boulevard / 12m spacing each side)	m	87	$ 125.00	$ 10,875.00
SUBTOTAL				**$ 380,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	87	$ 75.00	$ 6,525.00
Concrete Storm Precast Catchbasins and Leads	m	87	$ 60.00	$ 5,220.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	25	$ 400.00	$ 10,000.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	62	$ 600.00	$ 37,200.00
Storm Private Drain Connection	m	87	$ 20.00	$ 1,740.00
SUBTOTAL				**$ 61,000.00**
Ponds & Undergound Storage				
Underground Storage	m^3	5000	$ 1,000.00	$ 5,000,000.00
SUBTOTAL				**$ 5,000,000.00**
Construction Cost Total				**$ 5,500,000.00**
Construction Cost Contingency (30%)				**$ 1,650,000.00**
Subtotal				**$ 7,150,000.00**
Engineering Fee Estimate (20%)				**$ 1,430,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E9				**$ 8,580,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

WATSON ST	ROAD-E9
Length of Road Improvements (m)	63 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WATSON ST		ROAD-E9		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	63	$ 5.00	$ 315.00
Full Depth Concrete Asphalt Removal	m	63	$ 125.00	$ 7,875.00
Driveway Removal (all types)	m	63	$ 30.00	$ 1,890.00
Sidewalk Removal (all types)	m	63	$ 20.00	$ 1,260.00
Concrete Median Removal	m	63	$ 10.00	$ 630.00
Sawcutting Existing Pavement	m	63	$ 1.00	$ 63.00
Curb and Gutter Removal	m	63	$ 20.00	$ 1,260.00
Streetlighting Removal	m	63	$ 25.00	$ 1,575.00
Signage Removal	m	63	$ 5.00	$ 315.00
SUBTOTAL				**$ 16,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	63	$ 100.00	$ 6,300.00
Remove Existing Manholes	m	63	$ 15.00	$ 945.00
Remove Existing Catch Basins	m	63	$ 12.50	$ 787.50
Remove Existing Storm Private Drain Connection	m	63	$ 25.00	$ 1,575.00
SUBTOTAL				**$ 10,000.00**
Roadwork				
Earth Excavating and Grading	m	63	$ 120.00	$ 7,560.00
Supply and Place Compacted Granular "A"	m	63	$ 350.00	$ 22,050.00
Asphalt Pavement (105mm)	m	63	$ 250.00	$ 15,750.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	63	$ 392.00	$ 24,696.00
Subdrains (2 lanes)	m	63	$ 60.00	$ 3,780.00
Concrete Curb and Gutter (2 lanes)	m	63	$ 90.00	$ 5,670.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	63	$ 75.00	$ 4,725.00
Driveway Restoration b) Concrete	m	63	$ 180.00	$ 11,340.00
Topsoil, Hydraulic Seed and Mulch	m	63	$ 100.00	$ 6,300.00
Temporary Pavement Markings	m	63	$ 1.00	$ 63.00
Permananent Pavement Markings	m	63	$ 30.00	$ 1,890.00
Traffic Control During Construction (Arterial)	m	63	$ 200.00	$ 12,600.00
Streetlighting (Arterial)	m	63	$ 400.00	$ 25,200.00
Street Trees (In Boulevard / 12m spacing each side)	m	63	$ 125.00	$ 7,875.00
SUBTOTAL				**$ 150,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	63	$ 75.00	$ 4,725.00
Concrete Storm Precast Catchbasins and Leads	m	63	$ 60.00	$ 3,780.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	63	$ 600.00	$ 37,800.00
Storm Private Drain Connection	m	63	$ 20.00	$ 1,260.00
SUBTOTAL				**$ 48,000.00**
Ponds & Undergound Storage				
Pond Excavation, Grading, Topsoil and Hydroseed	m^3	0	$ 300.00	$ -
Underground Storage	m^3	8000	$ 1,000.00	$ 8,000,000.00
SUBTOTAL				**$ 8,000,000.00**
Construction Cost Total				**$ 8,300,000.00**
Construction Cost Contingency (30%)				**$ 2,490,000.00**
Subtotal				**$ 10,800,000.00**
Engineering Fee Estimate (20%)				**$ 2,160,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**ROAD-E9**		**$ 12,960,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

BANWELL RD	ROAD-E10
Length of Road Improvements (m)	703 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

BANWELL RD		ROAD-E10		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	703	$ 5.00	$ -
Full Depth Asphalt Removal	m	703	$ 80.00	$ 56,240.00
Driveway Removal (all types)	m	703	$ 30.00	$ 21,090.00
Sidewalk Removal (all types)	m	703	$ 20.00	$ 14,060.00
Concrete Median Removal	m	703	$ 10.00	$ 7,030.00
Sawcutting Existing Pavement	m	703	$ 1.00	$ 703.00
Curb and Gutter Removal	m	703	$ 20.00	$ 14,060.00
Streetlighting Removal	m	703	$ 25.00	$ 17,575.00
Signage Removal	m	703	$ 5.00	$ 3,515.00
SUBTOTAL				**$ 140,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	703	$ 100.00	$ 70,300.00
Remove Existing Manholes	m	703	$ 15.00	$ 10,545.00
Remove Existing Catch Basins	m	703	$ 12.50	$ 8,787.50
Remove Existing Storm Private Drain Connection	m	703	$ 25.00	$ 17,575.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	703	$ 120.00	$ 84,360.00
Supply and Place Compacted Granular "A"	m	703	$ 350.00	$ 246,050.00
Asphalt Pavement (105mm)	m	703	$ 250.00	$ 175,750.00
Subdrains (2 lanes)	m	703	$ 60.00	$ 42,180.00
Concrete Curb and Gutter (2 lanes)	m	703	$ 90.00	$ 63,270.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	703	$ 75.00	$ 52,725.00
Driveway Restoration b) Concrete	m	703	$ 180.00	$ 126,540.00
Topsoil, Hydraulic Seed and Mulch	m	703	$ 100.00	$ 70,300.00
Permananent Pavement Markings	m	703	$ 30.00	$ 21,090.00
Traffic Control During Construction (Residential)	m	703	$ 100.00	$ 70,300.00
Streetlighting (Residential)	m	703	$ 225.00	$ 158,175.00
Street Trees (In Boulevard / 12m spacing each side)	m	703	$ 125.00	$ 87,875.00
SUBTOTAL				**$ 1,200,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	703	$ 130.00	$ 91,390.00
Concrete Storm Precast Catchbasins and Leads	m	703	$ 60.00	$ 42,180.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	703	$ 3,000.00	$ 2,109,000.00
Storm Private Drain Connection	m	703	$ 20.00	$ 14,060.00
SUBTOTAL				**$ 2,300,000.00**
Construction Cost Total				**$ 3,800,000.00**
Construction Cost Contingency (30%)				**$ 1,200,000.00**
Subtotal				**$ 5,000,000.00**
Engineering Fee Estimate (20%)				**$ 1,000,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-E10				**$ 6,000,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ROSEVILLE GARDEN DR	ROAD-E11
Length of Road Improvements (m)	659 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ROSEVILLE GARDEN DR		ROAD-E11		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	659	$ 5.00	$ 3,295.00
Full Depth Concrete Asphalt Removal	m	277	$ 125.00	$ 34,625.00
Full Depth Asphalt Removal	m	382	$ 80.00	$ 30,560.00
Driveway Removal (all types)	m	659	$ 30.00	$ 19,770.00
Sidewalk Removal (all types)	m	659	$ 20.00	$ 13,180.00
Sawcutting Existing Pavement	m	659	$ 1.00	$ 659.00
Curb and Gutter Removal	m	659	$ 20.00	$ 13,180.00
Streetlighting Removal	m	659	$ 25.00	$ 16,475.00
Signage Removal	m	659	$ 5.00	$ 3,295.00
SUBTOTAL				**$ 140,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	659	$ 100.00	$ 65,900.00
Remove Existing Manholes	m	659	$ 15.00	$ 9,885.00
Remove Existing Catch Basins	m	659	$ 12.50	$ 8,237.50
Remove Existing Storm Private Drain Connection	m	659	$ 25.00	$ 16,475.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	659	$ 120.00	$ 79,080.00
Supply and Place Compacted Granular "A"	m	659	$ 350.00	$ 230,650.00
100mm Open Graded Drainage Layer	m	277	$ 225.00	$ 62,325.00
Asphalt Pavement (105mm)	m	382	$ 250.00	$ 95,500.00
Concrete Pavement (305mm)	m	277	$ 575.00	$ 159,275.00
Subdrains (2 lanes)	m	659	$ 60.00	$ 39,540.00
Concrete Curb and Gutter (2 lanes)	m	659	$ 90.00	$ 59,310.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	659	$ 75.00	$ 49,425.00
Driveway Restoration a) Asphalt	m	659	$ 320.00	$ 210,880.00
Topsoil, Hydraulic Seed and Mulch	m	659	$ 100.00	$ 65,900.00
Traffic Control During Construction (Residential)	m	659	$ 100.00	$ 65,900.00
Streetlighting (Residential)	m	659	$ 225.00	$ 148,275.00
SUBTOTAL				**$ 1,270,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	659	$ 130.00	$ 85,670.00
Concrete Storm Precast Catchbasins and Leads	m	659	$ 60.00	$ 39,540.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	47	$ 500.00	$ 23,500.00
Storm Sewer - 1800mm x 900mm Concrete Box Culvert	m	106	$ 3,250.00	$ 344,500.00
Storm Sewer - 2400mm x 900mm Concrete Box Culvert	m	433	$ 3,500.00	$ 1,515,500.00
Storm Sewer - 4200mm x 1800mm Concrete Box Culvert	m	73	$ 11,500.00	$ 839,500.00
Storm Private Drain Connection	m	659	$ 20.00	$ 13,180.00
SUBTOTAL				**$ 2,900,000.00**
Ponds & Undergound Storage				
Underground Storage	m^3	31625	$ 1,000.00	$ 31,625,000.00
SUBTOTAL				**$ 31,700,000.00**
Construction Cost Total				**$ 36,200,000.00**
Construction Cost Contingency (30%)				**$ 10,900,000.00**
Subtotal				**$ 47,100,000.00**
Engineering Fee Estimate (20%)				**$ 9,500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**ROAD-E11**		**$ 56,600,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CHAPPELL AVE	STM-C1
Length of Road Improvements (m)	115 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

CHAPPELL AVE		STM-C1		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	115	$ 5.00	$ 575.00
Full Depth Asphalt Removal	m	115	$ 80.00	$ 9,200.00
Driveway Removal (all types)	m	115	$ 30.00	$ 3,450.00
Sawcutting Existing Pavement	m	115	$ 1.00	$ 115.00
Signage Removal	m	115	$ 5.00	$ 575.00
SUBTOTAL				**$ 14,000.00**
Roadwork				
Earth Excavating and Grading	m	115	$ 120.00	$ 13,800.00
Supply and Place Compacted Granular "A"	m	115	$ 350.00	$ 40,250.00
Concrete Pavement (305mm)	m	115	$ 575.00	$ 66,125.00
Subdrains (2 lanes)	m	115	$ 60.00	$ 6,900.00
Concrete Curb and Gutter (2 lanes)	m	115	$ 90.00	$ 10,350.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	115	$ 75.00	$ 8,625.00
Driveway Restoration b) Concrete	m	115	$ 180.00	$ 20,700.00
Permananent Pavement Markings	m	115	$ 30.00	$ 3,450.00
Traffic Control During Construction (Residential)	m	115	$ 100.00	$ 11,500.00
Streetlighting (Residential)	m	115	$ 225.00	$ 25,875.00
SUBTOTAL				**$ 210,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	188	$ 130.00	$ 24,440.00
Concrete Storm Precast Catchbasins and Leads	m	188	$ 60.00	$ 11,280.00
Storm Sewer - 2700mm diameter Concrete (100-D)	m	188	$ 6,000.00	$ 1,128,000.00
Storm Private Drain Connection	m	115	$ 20.00	$ 2,300.00
Outlet to Detroit River	Each	1	$ 300,000.00	$ 300,000.00
SUBTOTAL				**$ 1,500,000.00**
Construction Cost Total				**$ 1,800,000.00**
Construction Cost Contingency (30%)				**$ 540,000.00**
Subtotal				**$ 2,400,000.00**
Engineering Fee Estimate (20%)				**$ 480,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C1				**$ 2,880,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

DETROIT STREET	STM-C2
Length of Road Improvements (m)	135 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

DETROIT STREET		STM-C2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	135	$ 5.00	$ 675.00
Full Depth Asphalt Removal	m	135	$ 80.00	$ 10,800.00
Driveway Removal (all types)	m	135	$ 30.00	$ 4,050.00
Sidewalk Removal (all types)	m	135	$ 20.00	$ 2,700.00
Sawcutting Existing Pavement	m	135	$ 1.00	$ 135.00
Curb and Gutter Removal	m	135	$ 20.00	$ 2,700.00
Streetlighting Removal	m	135	$ 25.00	$ 3,375.00
Signage Removal	m	135	$ 5.00	$ 675.00
SUBTOTAL				**$ 26,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	300	$ 100.00	$ 30,000.00
Remove Existing Combined Sewers	m	135	$ 75.00	$ 10,125.00
Remove Existing Manholes	m	300	$ 15.00	$ 4,500.00
Remove Existing Catch Basins	m	135	$ 12.50	$ 1,687.50
Remove Existing Combined Private Drain Connection	m	135	$ 100.00	$ 13,500.00
Remove Existing Storm Private Drain Connection	m	135	$ 25.00	$ 3,375.00
SUBTOTAL				**$ 64,000.00**
Roadwork				
Earth Excavating and Grading	m	135	$ 120.00	$ 16,200.00
Supply and Place Compacted Granular "A"	m	135	$ 350.00	$ 47,250.00
Asphalt Pavement (105mm)	m	135	$ 250.00	$ 33,750.00
Subdrains (2 lanes)	m	135	$ 60.00	$ 8,100.00
Concrete Curb and Gutter (2 lanes)	m	135	$ 90.00	$ 12,150.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	135	$ 75.00	$ 10,125.00
Driveway Restoration b) Concrete	m	135	$ 180.00	$ 24,300.00
Topsoil, Hydraulic Seed and Mulch	m	135	$ 100.00	$ 13,500.00
Traffic Control During Construction (Residential)	m	135	$ 100.00	$ 13,500.00
Streetlighting (Residential)	m	135	$ 225.00	$ 30,375.00
SUBTOTAL				**$ 210,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	135	$ 75.00	$ 10,125.00
Concrete Manholes - (2400mm to 3600mm)	m	300	$ 130.00	$ 39,000.00
Concrete Storm Precast Catchbasins and Leads	m	300	$ 60.00	$ 18,000.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	135	$ 450.00	$ 60,750.00
Sanitary Private Drain Connection	m	135	$ 150.00	$ 20,250.00
Manhole Rain Catchers	m	135	$ 3.00	$ 405.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	300	$ 1,500.00	$ 450,000.00
Storm Private Drain Connection	m	135	$ 20.00	$ 2,700.00
Outlet to Detroit River	Each	1	$ 300,000.00	$ 300,000.00
SUBTOTAL				**$ 910,000.00**
Construction Cost Total				**$ 1,300,000.00**
Construction Cost Contingency (30%)				**$ 390,000.00**
Subtotal				**$ 1,700,000.00**
Engineering Fee Estimate (20%)				**$ 340,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C2				**$ 2,040,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

SOUTH CAMERON BLVD	STM-C3
Length of Road Improvements (m)	120 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

SOUTH CAMERON BLVD		STM-C3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	120	$ 5.00	$ 600.00
Full Depth Concrete Asphalt Removal	m	120	$ 125.00	$ 15,000.00
Driveway Removal (all types)	m	120	$ 30.00	$ 3,600.00
Sidewalk Removal (all types)	m	120	$ 20.00	$ 2,400.00
Sawcutting Existing Pavement	m	120	$ 1.00	$ 120.00
Curb and Gutter Removal	m	120	$ 20.00	$ 2,400.00
Streetlighting Removal	m	120	$ 25.00	$ 3,000.00
Signage Removal	m	120	$ 5.00	$ 600.00
SUBTOTAL				**$ 28,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	148	$ 100.00	$ 14,800.00
Remove Existing Combined Sewers	m	120	$ 75.00	$ 9,000.00
Remove Existing Manholes	m	148	$ 15.00	$ 2,220.00
Remove Existing Catch Basins	m	148	$ 12.50	$ 1,850.00
Remove Existing Combined Private Drain Connection	m	120	$ 100.00	$ 12,000.00
Remove Existing Storm Private Drain Connection	m	148	$ 25.00	$ 3,700.00
SUBTOTAL				**$ 44,000.00**
Roadwork				
Earth Excavating and Grading	m	120	$ 120.00	$ 14,400.00
Supply and Place Compacted Granular "A"	m	120	$ 350.00	$ 42,000.00
100mm Open Graded Drainage Layer	m	120	$ 225.00	$ 27,000.00
Asphalt Pavement (105mm)	m	120	$ 250.00	$ 30,000.00
Concrete Pavement (305mm)	m	120	$ 575.00	$ 69,000.00
Subdrains (2 lanes)	m	120	$ 60.00	$ 7,200.00
Concrete Curb and Gutter (2 lanes)	m	120	$ 90.00	$ 10,800.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	120	$ 75.00	$ 9,000.00
Driveway Restoration a) Asphalt	m	120	$ 320.00	$ 38,400.00
Topsoil, Hydraulic Seed and Mulch	m	120	$ 100.00	$ 12,000.00
Permananent Pavement Markings	m	120	$ 30.00	$ 3,600.00
Traffic Control During Construction (Arterial)	m	120	$ 200.00	$ 24,000.00
Streetlighting (Arterial)	m	120	$ 400.00	$ 48,000.00
SUBTOTAL				**$ 340,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	148	$ 130.00	$ 19,240.00
Concrete Storm Precast Catchbasins and Leads	m	148	$ 60.00	$ 8,880.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	148	$ 1,200.00	$ 177,600.00
Storm Private Drain Connection	m	148	$ 20.00	$ 2,960.00
SUBTOTAL				**$ 210,000.00**
Construction Cost Total				**$ 630,000.00**
Construction Cost Contingency (30%)				**$ 190,000.00**
Subtotal				**$ 820,000.00**
Engineering Fee Estimate (20%)				**$ 170,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C3				**$ 990,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CURRY AVE	STM-C3
Length of Road Improvements (m)	1188 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

CURRY AVE		STM-C3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1188	$ 5.00	$ 5,940.00
Full Depth Asphalt Removal	m	1188	$ 80.00	$ 95,040.00
Driveway Removal (all types)	m	1188	$ 30.00	$ 35,640.00
Sidewalk Removal (all types)	m	1188	$ 20.00	$ 23,760.00
Sawcutting Existing Pavement	m	1188	$ 1.00	$ 1,188.00
Curb and Gutter Removal	m	1188	$ 20.00	$ 23,760.00
Streetlighting Removal	m	1188	$ 25.00	$ 29,700.00
Signage Removal	m	1188	$ 5.00	$ 5,940.00
SUBTOTAL				**$ 230,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1188	$ 100.00	$ 118,800.00
Remove Existing Combined Sewers	m	150	$ 75.00	$ 11,250.00
Remove Existing Manholes	m	1388	$ 15.00	$ 20,820.00
Remove Existing Catch Basins	m	1188	$ 12.50	$ 14,850.00
Remove Existing Combined Private Drain Connection	m	150	$ 100.00	$ 15,000.00
Remove Existing Sanitary Private Drain Connection	m	1188	$ 25.00	$ 29,700.00
SUBTOTAL				**$ 220,000.00**
Roadwork				
Earth Excavating and Grading	m	1188	$ 120.00	$ 142,560.00
Supply and Place Compacted Granular "A"	m	1188	$ 350.00	$ 415,800.00
100mm Open Graded Drainage Layer	m	1188	$ 225.00	$ 267,300.00
Concrete Pavement (305mm)	m	1188	$ 575.00	$ 683,100.00
Subdrains (2 lanes)	m	1188	$ 60.00	$ 71,280.00
Concrete Curb and Gutter (2 lanes)	m	1188	$ 90.00	$ 106,920.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1188	$ 75.00	$ 89,100.00
Driveway Restoration b) Concrete	m	1188	$ 180.00	$ 213,840.00
Topsoil, Hydraulic Seed and Mulch	m	1188	$ 100.00	$ 118,800.00
Traffic Control During Construction (Residential)	m	1188	$ 100.00	$ 118,800.00
Streetlighting (Residential)	m	1188	$ 225.00	$ 267,300.00
SUBTOTAL				**$ 2,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	150	$ 75.00	$ 11,250.00
Concrete Manholes - (2400mm to 3600mm)	m	1051	$ 130.00	$ 136,630.00
Concrete Manholes - (Chamber)	m	137	$ 200.00	$ 27,400.00
Concrete Storm Precast Catchbasins and Leads	m	1188	$ 60.00	$ 71,280.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	150	$ 450.00	$ 67,500.00
Sanitary Private Drain Connection	m	150	$ 150.00	$ 22,500.00
Manhole Rain Catchers	m	150	$ 3.00	$ 450.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	218	$ 1,800.00	$ 392,400.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	246	$ 2,200.00	$ 541,200.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	120	$ 2,500.00	$ 300,000.00
Storm Sewer - 1950mm diameter Concrete (100-D)	m	261	$ 3,250.00	$ 848,250.00
Storm Sewer - 2100mm diameter Concrete (100-D)	m	102	$ 3,500.00	$ 357,000.00
Storm Sewer - 2400mm x 1800mm Concrete Box Culvert	m	104	$ 4,200.00	$ 436,800.00
Storm Sewer - 2800mm x 2200mm Concrete Box Culvert	m	137	$ 8,500.00	$ 1,164,500.00
Storm Private Drain Connection	m	1188	$ 20.00	$ 23,760.00
SUBTOTAL				**$ 4,500,000.00**
Construction Cost Total				**$ 7,500,000.00**
Construction Cost Contingency (30%)				**$ 2,300,000.00**
Subtotal				**$ 9,800,000.00**
Engineering Fee Estimate (20%)				**$ 2,000,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C3				**$ 11,800,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

TECUMSEH RD W	STM-C3
Length of Road Improvements (m)	84 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

TECUMSEH RD W		STM-C3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	84	$ 5.00	$ 420.00
Full Depth Concrete Asphalt Removal	m	84	$ 250.00	$ 21,000.00
Driveway Removal (all types)	m	84	$ 30.00	$ 2,520.00
Sidewalk Removal (all types)	m	84	$ 20.00	$ 1,680.00
Sawcutting Existing Pavement	m	84	$ 1.00	$ 84.00
Curb and Gutter Removal	m	84	$ 20.00	$ 1,680.00
Streetlighting Removal	m	84	$ 25.00	$ 2,100.00
Signage Removal	m	84	$ 5.00	$ 420.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 45,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	72	$ 75.00	$ 5,400.00
Remove Existing Manholes	m	72	$ 15.00	$ 1,080.00
Remove Existing Catch Basins	m	20	$ 12.50	$ 250.00
Remove Existing Combined Private Drain Connection	m	72	$ 100.00	$ 7,200.00
SUBTOTAL				**$ 14,000.00**
Roadwork				
Earth Excavating and Grading	m	84	$ 240.00	$ 20,160.00
Supply and Place Compacted Granular "A"	m	84	$ 700.00	$ 58,800.00
100mm Open Graded Drainage Layer	m	84	$ 450.00	$ 37,800.00
Concrete Pavement (305mm)	m	84	$ 1,150.00	$ 96,600.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	84	$ 392.00	$ 32,928.00
Subdrains (2 lanes)	m	84	$ 60.00	$ 5,040.00
Concrete Curb and Gutter (2 lanes)	m	84	$ 90.00	$ 7,560.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	84	$ 75.00	$ 6,300.00
Driveway Restoration b) Concrete	m	84	$ 180.00	$ 15,120.00
Topsoil, Hydraulic Seed and Mulch	m	84	$ 100.00	$ 8,400.00
Temporary Pavement Markings	m	84	$ 1.00	$ 84.00
Permananent Pavement Markings	m	84	$ 30.00	$ 2,520.00
Traffic Control During Construction (Arterial)	m	84	$ 200.00	$ 16,800.00
Streetlighting (Arterial)	m	84	$ 400.00	$ 33,600.00
Street Trees (In Boulevard / 12m spacing each side)	m	84	$ 125.00	$ 10,500.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 640,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	72	$ 75.00	$ 5,400.00
Concrete Manholes - (2400mm to 3600mm)	m	84	$ 130.00	$ 10,920.00
Concrete Storm Precast Catchbasins and Leads	m	84	$ 60.00	$ 5,040.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	72	$ 400.00	$ 28,800.00
Sanitary Private Drain Connection	m	72	$ 150.00	$ 10,800.00
Manhole Rain Catchers	m	72	$ 3.00	$ 216.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	84	$ 1,800.00	$ 151,200.00
Storm Private Drain Connection	m	84	$ 20.00	$ 1,680.00
SUBTOTAL				**$ 220,000.00**
Construction Cost Total				**$ 920,000.00**
Construction Cost Contingency (30%)				**$ 280,000.00**
Subtotal				**$ 1,200,000.00**
Engineering Fee Estimate (20%)				**$ 240,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C3				**$ 1,440,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

EVERTS AVE	STM-C3
Length of Road Improvements (m)	112 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

EVERTS AVE		STM-C3		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Full Depth Asphalt Removal	m	112	$ 80.00	$ 8,960.00
Driveway Removal (all types)	m	112	$ 30.00	$ 3,360.00
Sidewalk Removal (all types)	m	112	$ 20.00	$ 2,240.00
Sawcutting Existing Pavement	m	112	$ 1.00	$ 112.00
SUBTOTAL				**$ 15,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	112	$ 100.00	$ 11,200.00
Remove Existing Manholes	m	112	$ 15.00	$ 1,680.00
Remove Existing Catch Basins	m	112	$ 12.50	$ 1,400.00
Remove Existing Storm Private Drain Connection	m	112	$ 25.00	$ 2,800.00
SUBTOTAL				**$ 18,000.00**
Roadwork				
Earth Excavating and Grading	m	112	$ 120.00	$ 13,440.00
Supply and Place Compacted Granular "A"	m	112	$ 350.00	$ 39,200.00
Asphalt Pavement (105mm)	m	112	$ 250.00	$ 28,000.00
Subdrains (2 lanes)	m	112	$ 60.00	$ 6,720.00
Concrete Curb and Gutter (2 lanes)	m	112	$ 90.00	$ 10,080.00
Driveway Restoration a) Asphalt	m	112	$ 320.00	$ 35,840.00
Traffic Control During Construction (Residential)	m	112	$ 100.00	$ 11,200.00
Streetlighting (Residential)	m	112	$ 225.00	$ 25,200.00
SUBTOTAL				**$ 170,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	112	$ 130.00	$ 14,560.00
Concrete Storm Precast Catchbasins and Leads	m	112	$ 60.00	$ 6,720.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	0	$ 400.00	$ -
Storm Sewer - 600mm diameter Concrete (65-D)	m	71	$ 500.00	$ 35,500.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	41	$ 1,800.00	$ 73,800.00
Storm Private Drain Connection	m	112	$ 20.00	$ 2,240.00
SUBTOTAL				**$ 140,000.00**
Construction Cost Total				**$ 350,000.00**
Construction Cost Contingency (30%)				**$ 110,000.00**
Subtotal				**$ 460,000.00**
Engineering Fee Estimate (20%)				**$ 100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C3				**$ 560,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

GROVE AVE	STM-C3
Length of Road Improvements (m)	96 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GROVE AVE		STM-C3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	96	$ 5.00	$ 480.00
Full Depth Asphalt Removal	m	96	$ 80.00	$ 7,680.00
Driveway Removal (all types)	m	96	$ 30.00	$ 2,880.00
Sidewalk Removal (all types)	m	96	$ 20.00	$ 1,920.00
Sawcutting Existing Pavement	m	96	$ 1.00	$ 96.00
Curb and Gutter Removal	m	96	$ 20.00	$ 1,920.00
Streetlighting Removal	m	96	$ 25.00	$ 2,400.00
Signage Removal	m	96	$ 5.00	$ 480.00
SUBTOTAL				**$ 18,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	96	$ 100.00	$ 9,600.00
Remove Existing Manholes	m	96	$ 15.00	$ 1,440.00
Remove Existing Catch Basins	m	96	$ 12.50	$ 1,200.00
Remove Existing Storm Private Drain Connection	m	96	$ 25.00	$ 2,400.00
SUBTOTAL				**$ 15,000.00**
Roadwork				
Earth Excavating and Grading	m	96	$ 120.00	$ 11,520.00
Supply and Place Compacted Granular "A"	m	96	$ 350.00	$ 33,600.00
Asphalt Pavement (105mm)	m	96	$ 250.00	$ 24,000.00
Subdrains (2 lanes)	m	96	$ 60.00	$ 5,760.00
Concrete Curb and Gutter (2 lanes)	m	96	$ 90.00	$ 8,640.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	96	$ 75.00	$ 7,200.00
Driveway Restoration b) Concrete	m	96	$ 180.00	$ 17,280.00
Topsoil, Hydraulic Seed and Mulch	m	96	$ 100.00	$ 9,600.00
Traffic Control During Construction (Residential)	m	96	$ 100.00	$ 9,600.00
Streetlighting (Residential)	m	96	$ 225.00	$ 21,600.00
Street Trees (In Boulevard / 12m spacing each side)	m	96	$ 125.00	$ 12,000.00
SUBTOTAL				**$ 170,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	96	$ 75.00	$ 7,200.00
Concrete Storm Precast Catchbasins and Leads	m	96	$ 60.00	$ 5,760.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	96	$ 850.00	$ 81,600.00
Storm Private Drain Connection	m	96	$ 20.00	$ 1,920.00
SUBTOTAL				**$ 97,000.00**
Construction Cost Total				**$ 300,000.00**
Construction Cost Contingency (30%)				**$ 90,000.00**
Subtotal				**$ 390,000.00**
Engineering Fee Estimate (20%)				**$ 78,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-C3**		**$ 468,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

COLLEGE AVE	STM-C3
Length of Road Improvements (m)	14 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

COLLEGE AVE		STM-C3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	14	$ 5.00	$ 70.00
Full Depth Asphalt Removal	m	14	$ 80.00	$ 1,120.00
Driveway Removal (all types)	m	14	$ 30.00	$ 420.00
Sidewalk Removal (all types)	m	14	$ 20.00	$ 280.00
Sawcutting Existing Pavement	m	14	$ 1.00	$ 14.00
Curb and Gutter Removal	m	14	$ 20.00	$ 280.00
Streetlighting Removal	m	14	$ 25.00	$ 350.00
Signage Removal	m	14	$ 5.00	$ 70.00
SUBTOTAL				**$ 3,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	14	$ 100.00	$ 1,400.00
Remove Existing Manholes	m	14	$ 15.00	$ 210.00
Remove Existing Catch Basins	m	14	$ 12.50	$ 175.00
Remove Existing Storm Private Drain Connection	m	14	$ 25.00	$ 350.00
SUBTOTAL				**$ 3,000.00**
Roadwork				
Earth Excavating and Grading	m	14	$ 120.00	$ 1,680.00
Supply and Place Compacted Granular "A"	m	14	$ 350.00	$ 4,900.00
100mm Open Graded Drainage Layer	m	14	$ 225.00	$ 3,150.00
Concrete Pavement (305mm)	m	14	$ 575.00	$ 8,050.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	14	$ 392.00	$ 5,488.00
Subdrains (2 lanes)	m	14	$ 60.00	$ 840.00
Concrete Curb and Gutter (2 lanes)	m	14	$ 90.00	$ 1,260.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	14	$ 75.00	$ 1,050.00
Driveway Restoration b) Concrete	m	14	$ 180.00	$ 2,520.00
Topsoil, Hydraulic Seed and Mulch	m	14	$ 100.00	$ 1,400.00
Temporary Pavement Markings	m	14	$ 1.00	$ 14.00
Permananent Pavement Markings	m	14	$ 30.00	$ 420.00
Traffic Control During Construction (Arterial)	m	14	$ 200.00	$ 2,800.00
Streetlighting (Arterial)	m	14	$ 400.00	$ 5,600.00
SUBTOTAL				**$ 40,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	14	$ 130.00	$ 1,820.00
Concrete Storm Precast Catchbasins and Leads	m	14	$ 60.00	$ 840.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	14	$ 1,500.00	$ 21,000.00
Storm Private Drain Connection	m	14	$ 20.00	$ 280.00
SUBTOTAL				**$ 24,000.00**
Construction Cost Total				**$ 70,000.00**
Construction Cost Contingency (30%)				**$ 21,000.00**
Subtotal				**$ 91,000.00**
Engineering Fee Estimate (20%)				**$ 19,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C3				**$ 110,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ROONEY ST	STM-C3
Length of Road Improvements (m)	72 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

ROONEY ST		STM-C3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	72	$ 5.00	$ 360.00
Full Depth Asphalt Removal	m	72	$ 80.00	$ 5,760.00
Driveway Removal (all types)	m	72	$ 30.00	$ 2,160.00
Sidewalk Removal (all types)	m	72	$ 20.00	$ 1,440.00
Sawcutting Existing Pavement	m	72	$ 1.00	$ 72.00
Curb and Gutter Removal	m	72	$ 20.00	$ 1,440.00
Streetlighting Removal	m	72	$ 25.00	$ 1,800.00
Signage Removal	m	72	$ 5.00	$ 360.00
SUBTOTAL				**$ 14,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	97	$ 75.00	$ 7,275.00
Remove Existing Manholes	m	97	$ 15.00	$ 1,455.00
Remove Existing Catch Basins	m	72	$ 12.50	$ 900.00
Remove Existing Combined Private Drain Connection	m	97	$ 100.00	$ 9,700.00
SUBTOTAL				**$ 20,000.00**
Roadwork				
Earth Excavating and Grading	m	72	$ 120.00	$ 8,640.00
Supply and Place Compacted Granular "A"	m	72	$ 350.00	$ 25,200.00
Asphalt Pavement (105mm)	m	72	$ 250.00	$ 18,000.00
Subdrains (2 lanes)	m	72	$ 60.00	$ 4,320.00
Concrete Curb and Gutter (2 lanes)	m	72	$ 90.00	$ 6,480.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	72	$ 75.00	$ 5,400.00
Driveway Restoration a) Asphalt	m	72	$ 320.00	$ 23,040.00
Topsoil, Hydraulic Seed and Mulch	m	72	$ 100.00	$ 7,200.00
Traffic Control During Construction (Residential)	m	72	$ 100.00	$ 7,200.00
Streetlighting (Residential)	m	72	$ 225.00	$ 16,200.00
Street Trees (In Boulevard / 12m spacing each side)	m	72	$ 125.00	$ 9,000.00
SUBTOTAL				**$ 140,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	97	$ 75.00	$ 7,275.00
Concrete Manholes - (Chamber)	m	72	$ 200.00	$ 14,400.00
Concrete Storm Precast Catchbasins and Leads	m	72	$ 60.00	$ 4,320.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	97	$ 450.00	$ 43,650.00
Sanitary Private Drain Connection	m	97	$ 150.00	$ 14,550.00
Manhole Rain Catchers	m	97	$ 3.00	$ 291.00
Storm Sewer - 2800mm x 2200mm Concrete Box Culvert	m	72	$ 8,500.00	$ 612,000.00
Storm Private Drain Connection	m	72	$ 20.00	$ 1,440.00
SUBTOTAL				**$ 700,000.00**
Construction Cost Total				**$ 880,000.00**
Construction Cost Contingency (30%)				**$ 270,000.00**
Subtotal				**$ 1,200,000.00**
Engineering Fee Estimate (20%)				**$ 240,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C3				**$ 1,440,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

MCKAY AVE	STM-C3
Length of Road Improvements (m)	599 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MCKAY AVE		STM-C3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	599	$ 5.00	$ 2,995.00
Full Depth Asphalt Removal	m	599	$ 80.00	$ 47,920.00
Driveway Removal (all types)	m	599	$ 30.00	$ 17,970.00
Sidewalk Removal (all types)	m	599	$ 20.00	$ 11,980.00
Sawcutting Existing Pavement	m	599	$ 1.00	$ 599.00
Curb and Gutter Removal	m	599	$ 20.00	$ 11,980.00
Streetlighting Removal	m	599	$ 25.00	$ 14,975.00
Signage Removal	m	599	$ 5.00	$ 2,995.00
SUBTOTAL				**$ 120,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	302	$ 100.00	$ 30,200.00
Remove Existing Combined Sewers	m	525	$ 75.00	$ 39,375.00
Remove Existing Manholes	m	827	$ 15.00	$ 12,405.00
Remove Existing Catch Basins	m	599	$ 12.50	$ 7,487.50
Remove Existing Combined Private Drain Connection	m	525	$ 100.00	$ 52,500.00
Remove Existing Storm Private Drain Connection	m	302	$ 25.00	$ 7,550.00
SUBTOTAL				**$ 150,000.00**
Roadwork				
Earth Excavating and Grading	m	599	$ 120.00	$ 71,880.00
Supply and Place Compacted Granular "A"	m	599	$ 350.00	$ 209,650.00
Asphalt Pavement (105mm)	m	599	$ 250.00	$ 149,750.00
Subdrains (2 lanes)	m	599	$ 60.00	$ 35,940.00
Concrete Curb and Gutter (2 lanes)	m	599	$ 90.00	$ 53,910.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	599	$ 75.00	$ 44,925.00
Driveway Restoration b) Concrete	m	599	$ 180.00	$ 107,820.00
Topsoil, Hydraulic Seed and Mulch	m	599	$ 100.00	$ 59,900.00
Traffic Control During Construction (Residential)	m	599	$ 100.00	$ 59,900.00
Streetlighting (Residential)	m	599	$ 225.00	$ 134,775.00
SUBTOTAL				**$ 930,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	525	$ 75.00	$ 39,375.00
Concrete Manholes - (Chamber)	m	599	$ 200.00	$ 119,800.00
Concrete Storm Precast Catchbasins and Leads	m	599	$ 60.00	$ 35,940.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	387	$ 400.00	$ 154,800.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	138	$ 450.00	$ 62,100.00
Sanitary Private Drain Connection	m	525	$ 150.00	$ 78,750.00
Manhole Rain Catchers	m	525	$ 3.00	$ 1,575.00
Storm Sewer - 2800mm x 2200mm Concrete Box Culvert	m	164	$ 8,500.00	$ 1,394,000.00
Storm Sewer - 3300mm x 2200mm Concrete Box Culvert	m	435	$ 11,000.00	$ 4,785,000.00
Storm Private Drain Connection	m	599	$ 20.00	$ 11,980.00
SUBTOTAL				**$ 6,700,000.00**
Construction Cost Total				**$ 7,900,000.00**
Construction Cost Contingency (30%)				**$ 2,400,000.00**
Subtotal				**$ 10,300,000.00**
Engineering Fee Estimate (20%)				**$ 2,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C3				**$ 12,400,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

MARTINDALE ST	STM-C3
Length of Road Improvements (m)	74 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MARTINDALE ST		STM-C3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	74	$ 5.00	$ 370.00
Full Depth Asphalt Removal	m	74	$ 80.00	$ 5,920.00
Driveway Removal (all types)	m	74	$ 30.00	$ 2,220.00
Sidewalk Removal (all types)	m	74	$ 20.00	$ 1,480.00
Sawcutting Existing Pavement	m	74	$ 1.00	$ 74.00
Curb and Gutter Removal	m	74	$ 20.00	$ 1,480.00
Streetlighting Removal	m	74	$ 25.00	$ 1,850.00
Signage Removal	m	74	$ 5.00	$ 370.00
SUBTOTAL				**$ 14,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	98	$ 75.00	$ 7,350.00
Remove Existing Manholes	m	98	$ 15.00	$ 1,470.00
Remove Existing Catch Basins	m	74	$ 12.50	$ 925.00
Remove Existing Combined Private Drain Connection	m	98	$ 100.00	$ 9,800.00
SUBTOTAL				**$ 20,000.00**
Roadwork				
Earth Excavating and Grading	m	74	$ 120.00	$ 8,880.00
Supply and Place Compacted Granular "A"	m	74	$ 350.00	$ 25,900.00
Asphalt Pavement (105mm)	m	74	$ 250.00	$ 18,500.00
Subdrains (2 lanes)	m	74	$ 60.00	$ 4,440.00
Concrete Curb and Gutter (2 lanes)	m	74	$ 90.00	$ 6,660.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	74	$ 75.00	$ 5,550.00
Driveway Restoration b) Concrete	m	74	$ 180.00	$ 13,320.00
Topsoil, Hydraulic Seed and Mulch	m	74	$ 100.00	$ 7,400.00
Traffic Control During Construction (Residential)	m	74	$ 100.00	$ 7,400.00
Streetlighting (Residential)	m	74	$ 225.00	$ 16,650.00
Street Trees (In Boulevard / 12m spacing each side)	m	74	$ 125.00	$ 9,250.00
SUBTOTAL				**$ 130,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	98	$ 75.00	$ 7,350.00
Concrete Manholes - (Chamber)	m	74	$ 200.00	$ 14,800.00
Concrete Storm Precast Catchbasins and Leads	m	74	$ 60.00	$ 4,440.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	98	$ 450.00	$ 44,100.00
Sanitary Private Drain Connection	m	98	$ 150.00	$ 14,700.00
Manhole Rain Catchers	m	98	$ 3.00	$ 294.00
Storm Sewer - 3300mm x 2200mm Concrete Box Culvert	m	74	$ 11,000.00	$ 814,000.00
Storm Private Drain Connection	m	74	$ 20.00	$ 1,480.00
SUBTOTAL				**$ 910,000.00**
Construction Cost Total				**$ 1,100,000.00**
Construction Cost Contingency (30%)				**$ 330,000.00**
Subtotal				**$ 1,500,000.00**
Engineering Fee Estimate (20%)				**$ 300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C3				**$ 1,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CAMERON AVE	STM-C3
Length of Road Improvements (m)	663 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CAMERON AVE		STM-C3		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	623	$ 5.00	$ 3,115.00
Full Depth Asphalt Removal	m	623	$ 80.00	$ 49,840.00
Driveway Removal (all types)	m	623	$ 30.00	$ 18,690.00
Sidewalk Removal (all types)	m	623	$ 20.00	$ 12,460.00
Sawcutting Existing Pavement	m	623	$ 1.00	$ 623.00
Curb and Gutter Removal	m	623	$ 20.00	$ 12,460.00
Streetlighting Removal	m	623	$ 25.00	$ 15,575.00
Signage Removal	m	623	$ 5.00	$ 3,115.00
SUBTOTAL				**$ 120,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	591	$ 75.00	$ 44,325.00
Remove Existing Manholes	m	591	$ 15.00	$ 8,865.00
Remove Existing Catch Basins	m	591	$ 12.50	$ 7,387.50
Remove Existing Combined Private Drain Connection	m	591	$ 100.00	$ 59,100.00
SUBTOTAL				**$ 120,000.00**
Roadwork				
Earth Excavating and Grading	m	623	$ 120.00	$ 74,760.00
Supply and Place Compacted Granular "A"	m	623	$ 350.00	$ 218,050.00
Asphalt Pavement (105mm)	m	623	$ 250.00	$ 155,750.00
Subdrains (2 lanes)	m	623	$ 60.00	$ 37,380.00
Concrete Curb and Gutter (2 lanes)	m	623	$ 90.00	$ 56,070.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	623	$ 75.00	$ 46,725.00
Driveway Restoration b) Concrete	m	623	$ 180.00	$ 112,140.00
Topsoil, Hydraulic Seed and Mulch	m	623	$ 100.00	$ 62,300.00
Traffic Control During Construction (Residential)	m	623	$ 100.00	$ 62,300.00
Streetlighting (Residential)	m	623	$ 225.00	$ 140,175.00
SUBTOTAL				**$ 970,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	591	$ 75.00	$ 44,325.00
Concrete Manholes - (Chamber)	m	663	$ 200.00	$ 132,600.00
Concrete Storm Precast Catchbasins and Leads	m	663	$ 60.00	$ 39,780.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	345	$ 450.00	$ 155,250.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	246	$ 450.00	$ 110,700.00
Sanitary Private Drain Connection	m	591	$ 150.00	$ 88,650.00
Manhole Rain Catchers	m	591	$ 3.00	$ 1,773.00
Storm Sewer - 3300mm x 2200mm Concrete Box Culvert	m	603	$ 11,000.00	$ 6,633,000.00
Storm Sewer - 3300mm x 2400mm Concrete Box Culvert	m	60	$ 12,000.00	$ 720,000.00
Storm Private Drain Connection	m	663	$ 20.00	$ 13,260.00
Outlet to Detroit River	Each	1	$ 300,000.00	$ 300,000.00
SUBTOTAL				**$ 8,300,000.00**
Construction Cost Total				**$ 9,600,000.00**
Construction Cost Contingency (30%)				**$ 2,900,000.00**
Subtotal				**$ 12,500,000.00**
Engineering Fee Estimate (20%)				**$ 2,500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-C3**		**$ 15,000,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

GILES BLVD W	STM-C4
Length of Road Improvements (m)	106 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GILES BLVD W		STM-C4		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	106	$ 5.00	$ 530.00
Full Depth Asphalt Removal	m	106	$ 160.00	$ 16,960.00
Driveway Removal (all types)	m	106	$ 30.00	$ 3,180.00
Sidewalk Removal (all types)	m	106	$ 20.00	$ 2,120.00
Sawcutting Existing Pavement	m	106	$ 1.00	$ 106.00
Curb and Gutter Removal	m	106	$ 20.00	$ 2,120.00
Streetlighting Removal	m	106	$ 25.00	$ 2,650.00
Signage Removal	m	106	$ 5.00	$ 530.00
SUBTOTAL				**$ 29,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	106	$ 100.00	$ 10,600.00
Remove Existing Combined Sewers	m	106	$ 75.00	$ 7,950.00
Remove Existing Manholes	m	212	$ 15.00	$ 3,180.00
Remove Existing Catch Basins	m	106	$ 12.50	$ 1,325.00
Remove Existing Combined Private Drain Connection	m	106	$ 100.00	$ 10,600.00
Remove Existing Storm Private Drain Connection	m	106	$ 25.00	$ 2,650.00
SUBTOTAL				**$ 37,000.00**
Roadwork				
Earth Excavating and Grading	m	106	$ 240.00	$ 25,440.00
Supply and Place Compacted Granular "A"	m	106	$ 700.00	$ 74,200.00
100mm Open Graded Drainage Layer	m	106	$ 450.00	$ 47,700.00
Concrete Pavement (305mm)	m	106	$ 1,150.00	$ 121,900.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	106	$ 392.00	$ 41,552.00
Subdrains (2 lanes)	m	106	$ 60.00	$ 6,360.00
Concrete Curb and Gutter (2 lanes)	m	106	$ 90.00	$ 9,540.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	106	$ 75.00	$ 7,950.00
Driveway Restoration b) Concrete	m	106	$ 180.00	$ 19,080.00
Topsoil, Hydraulic Seed and Mulch	m	106	$ 100.00	$ 10,600.00
Traffic Control During Construction (Arterial)	m	106	$ 200.00	$ 21,200.00
Streetlighting (Arterial)	m	106	$ 400.00	$ 42,400.00
Street Trees (In Boulevard / 12m spacing each side)	m	106	$ 125.00	$ 13,250.00
SUBTOTAL				**$ 450,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	106	$ 75.00	$ 7,950.00
Concrete Manholes - (Chamber)	m	106	$ 200.00	$ 21,200.00
Concrete Storm Precast Catchbasins and Leads	m	106	$ 60.00	$ 6,360.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	106	$ 450.00	$ 47,700.00
Sanitary Private Drain Connection	m	106	$ 150.00	$ 15,900.00
Manhole Rain Catchers	m	106	$ 3.00	$ 318.00
Storm Sewer - 2700mm diameter Concrete (100-D)	m	106	$ 6,000.00	$ 636,000.00
Storm Private Drain Connection	m	106	$ 20.00	$ 2,120.00
SUBTOTAL				**$ 740,000.00**
Construction Cost Total				**$ 1,300,000.00**
Construction Cost Contingency (30%)				**$ 390,000.00**
Subtotal				**$ 1,700,000.00**
Engineering Fee Estimate (20%)				**$ 340,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C4				**$ 2,040,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

BRUCE AVE	STM-C4
Length of Road Improvements (m)	1890 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

BRUCE AVE		STM-C4		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1890	$ 5.00	$ 9,450.00
Full Depth Asphalt Removal	m	1835	$ 80.00	$ 146,800.00
Driveway Removal (all types)	m	900	$ 30.00	$ 27,000.00
Sidewalk Removal (all types)	m	1835	$ 20.00	$ 36,700.00
Sawcutting Existing Pavement	m	1835	$ 1.00	$ 1,835.00
Curb and Gutter Removal	m	1835	$ 20.00	$ 36,700.00
Streetlighting Removal	m	1835	$ 25.00	$ 45,875.00
Signage Removal	m	1890	$ 5.00	$ 9,450.00
Traffic Signal Removal	LS	3	$ 15,000.00	$ 45,000.00
SUBTOTAL				**$ 360,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	1713	$ 75.00	$ 128,475.00
Remove Existing Manholes	m	1713	$ 15.00	$ 25,695.00
Remove Existing Catch Basins	m	1713	$ 12.50	$ 21,412.50
Remove Existing Combined Private Drain Connection	m	1713	$ 100.00	$ 171,300.00
SUBTOTAL				**$ 350,000.00**
Roadwork				
Earth Excavating and Grading	m	1835	$ 120.00	$ 220,200.00
Supply and Place Compacted Granular "A"	m	1835	$ 350.00	$ 642,250.00
Asphalt Pavement (105mm)	m	1835	$ 250.00	$ 458,750.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	1835	$ 270.00	$ 495,450.00
Subdrains (2 lanes)	m	1835	$ 60.00	$ 110,100.00
Concrete Curb and Gutter (2 lanes)	m	1835	$ 90.00	$ 165,150.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1835	$ 75.00	$ 137,625.00
Driveway Restoration b) Concrete	m	900	$ 180.00	$ 162,000.00
Topsoil, Hydraulic Seed and Mulch	m	1890	$ 100.00	$ 189,000.00
Traffic Control During Construction (Arterial)	m	1835	$ 200.00	$ 367,000.00
Streetlighting (Arterial)	m	1835	$ 400.00	$ 734,000.00
Traffic Signals (Minor Intersection)	LS	2	$ 150,000.00	$ 300,000.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	3	$ 80,000.00	$ 240,000.00
SUBTOTAL				**$ 4,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1713	$ 75.00	$ 128,475.00
Concrete Manholes - (Chamber)	m	1890	$ 200.00	$ 378,000.00
Concrete Storm Precast Catchbasins and Leads	m	1890	$ 60.00	$ 113,400.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	370	$ 400.00	$ 148,000.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	791	$ 450.00	$ 355,950.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	390	$ 450.00	$ 175,500.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	161	$ 525.00	$ 84,525.00
Sanitary Private Drain Connection	m	1713	$ 150.00	$ 256,950.00
Manhole Rain Catchers	m	1713	$ 3.00	$ 5,139.00
Storm Sewer - 2700mm diameter Concrete (100-D)	m	1058	$ 6,000.00	$ 6,348,000.00
Storm Sewer - 3300mm diameter Concrete (100-D)	m	360	$ 7,000.00	$ 2,520,000.00
Storm Sewer - 3600mm diameter Concrete (100-D)	m	472	$ 7,500.00	$ 3,540,000.00
Storm Private Drain Connection	m	1890	$ 20.00	$ 37,800.00
Outlet to Detroit River	Each	1	$ 300,000.00	$ 300,000.00
SUBTOTAL				**$ 14,400,000.00**
Construction Cost Total				**$ 19,700,000.00**
Construction Cost Contingency (30%)				**$ 5,910,000.00**
Subtotal				**$ 25,700,000.00**
Engineering Fee Estimate (20%)				**$ 5,140,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C4				**$ 30,840,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ELLIOT ST	STM-C4
Length of Road Improvements (m)	148 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ELLIOT ST		STM-C4		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	148	$ 5.00	$ 740.00
Full Depth Asphalt Removal	m	148	$ 80.00	$ 11,840.00
Driveway Removal (all types)	m	148	$ 30.00	$ 4,440.00
Sidewalk Removal (all types)	m	148	$ 20.00	$ 2,960.00
Sawcutting Existing Pavement	m	148	$ 1.00	$ 148.00
Curb and Gutter Removal	m	148	$ 20.00	$ 2,960.00
Streetlighting Removal	m	148	$ 25.00	$ 3,700.00
Signage Removal	m	148	$ 5.00	$ 740.00
SUBTOTAL				**$ 28,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	148	$ 100.00	$ 14,800.00
Remove Existing Combined Sewers	m	148	$ 75.00	$ 11,100.00
Remove Existing Manholes	m	296	$ 15.00	$ 4,440.00
Remove Existing Catch Basins	m	148	$ 12.50	$ 1,850.00
Remove Existing Combined Private Drain Connection	m	148	$ 100.00	$ 14,800.00
Remove Existing Storm Private Drain Connection	m	148	$ 25.00	$ 3,700.00
SUBTOTAL				**$ 51,000.00**
Roadwork				
Earth Excavating and Grading	m	148	$ 120.00	$ 17,760.00
Supply and Place Compacted Granular "A"	m	148	$ 350.00	$ 51,800.00
Asphalt Pavement (105mm)	m	148	$ 250.00	$ 37,000.00
Subdrains (2 lanes)	m	148	$ 60.00	$ 8,880.00
Concrete Curb and Gutter (2 lanes)	m	148	$ 90.00	$ 13,320.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	148	$ 75.00	$ 11,100.00
Driveway Restoration b) Concrete	m	148	$ 180.00	$ 26,640.00
Topsoil, Hydraulic Seed and Mulch	m	148	$ 100.00	$ 14,800.00
Traffic Control During Construction (Residential)	m	148	$ 100.00	$ 14,800.00
Streetlighting (Residential)	m	148	$ 225.00	$ 33,300.00
SUBTOTAL				**$ 230,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	148	$ 75.00	$ 11,100.00
Concrete Manholes - (2400mm to 3600mm)	m	148	$ 130.00	$ 19,240.00
Concrete Storm Precast Catchbasins and Leads	m	148	$ 60.00	$ 8,880.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	148	$ 525.00	$ 77,700.00
Sanitary Private Drain Connection	m	148	$ 150.00	$ 22,200.00
Manhole Rain Catchers	m	148	$ 3.00	$ 444.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	148	$ 2,500.00	$ 370,000.00
Storm Private Drain Connection	m	148	$ 20.00	$ 2,960.00
SUBTOTAL				**$ 520,000.00**
Construction Cost Total				**$ 830,000.00**
Construction Cost Contingency (30%)				**$ 250,000.00**
Subtotal				**$ 1,080,000.00**
Engineering Fee Estimate (20%)				**$ 216,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C4				**$ 1,296,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

PARENT AVE	STM-C5
Length of Road Improvements (m)	413 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

PARENT AVE		STM-C5		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	413	$ 5.00	$ 2,065.00
Full Depth Asphalt Removal	m	413	$ 80.00	$ 33,040.00
Driveway Removal (all types)	m	413	$ 30.00	$ 12,390.00
Sidewalk Removal (all types)	m	413	$ 20.00	$ 8,260.00
Sawcutting Existing Pavement	m	413	$ 1.00	$ 413.00
Curb and Gutter Removal	m	413	$ 20.00	$ 8,260.00
Streetlighting Removal	m	413	$ 25.00	$ 10,325.00
Signage Removal	m	413	$ 5.00	$ 2,065.00
Traffic Signal Removal	LS	2	$ 15,000.00	$ 30,000.00
SUBTOTAL				**$ 110,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	420	$ 75.00	$ 31,500.00
Remove Existing Manholes	m	420	$ 15.00	$ 6,300.00
Remove Existing Catch Basins	m	420	$ 12.50	$ 5,250.00
Remove Existing Combined Private Drain Connection	m	420	$ 100.00	$ 42,000.00
SUBTOTAL				**$ 86,000.00**
Roadwork				
Earth Excavating and Grading	m	413	$ 120.00	$ 49,560.00
Supply and Place Compacted Granular "A"	m	413	$ 350.00	$ 144,550.00
Asphalt Pavement (105mm)	m	413	$ 250.00	$ 103,250.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	413	$ 270.00	$ 111,510.00
Subdrains (2 lanes)	m	413	$ 60.00	$ 24,780.00
Concrete Curb and Gutter (2 lanes)	m	413	$ 90.00	$ 37,170.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	413	$ 75.00	$ 30,975.00
Driveway Restoration b) Concrete	m	413	$ 180.00	$ 74,340.00
Topsoil, Hydraulic Seed and Mulch	m	413	$ 100.00	$ 41,300.00
Traffic Control During Construction (Arterial)	m	413	$ 200.00	$ 82,600.00
Streetlighting (Arterial)	m	413	$ 400.00	$ 165,200.00
Traffic Signals (Major Intersection)	LS	2	$ 200,000.00	$ 400,000.00
SUBTOTAL				**$ 1,300,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	833	$ 130.00	$ 108,290.00
Concrete Storm Precast Catchbasins and Leads	m	413	$ 60.00	$ 24,780.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	420	$ 2,500.00	$ 1,050,000.00
Sanitary Private Drain Connection	m	420	$ 150.00	$ 63,000.00
Manhole Rain Catchers	m	420	$ 3.00	$ 1,260.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	218	$ 2,200.00	$ 479,600.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	195	$ 3,000.00	$ 585,000.00
Storm Private Drain Connection	m	143	$ 20.00	$ 2,860.00
SUBTOTAL				**$ 2,400,000.00**
Construction Cost Total				**$ 3,900,000.00**
Construction Cost Contingency (30%)				**$ 1,200,000.00**
Subtotal				**$ 5,100,000.00**
Engineering Fee Estimate (20%)				**$ 1,020,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C5				**$ 6,120,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ASSUMPTION ST	STM-C5
Length of Road Improvements (m)	118 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ASSUMPTION ST		STM-C5		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	118	$ 5.00	$ 590.00
Full Depth Asphalt Removal	m	118	$ 80.00	$ 9,440.00
Driveway Removal (all types)	m	118	$ 30.00	$ 3,540.00
Sidewalk Removal (all types)	m	118	$ 20.00	$ 2,360.00
Sawcutting Existing Pavement	m	118	$ 1.00	$ 118.00
Curb and Gutter Removal	m	118	$ 20.00	$ 2,360.00
Streetlighting Removal	m	118	$ 25.00	$ 2,950.00
Signage Removal	m	118	$ 5.00	$ 590.00
SUBTOTAL				**$ 22,000.00**
Sewer Removals				
Remove Existing Catch Basins	m	40	$ 12.50	$ 500.00
SUBTOTAL				**$ 500.00**
Roadwork				
Earth Excavating and Grading	m	118	$ 120.00	$ 14,160.00
Supply and Place Compacted Granular "A"	m	118	$ 350.00	$ 41,300.00
Asphalt Pavement (105mm)	m	118	$ 250.00	$ 29,500.00
Subdrains (2 lanes)	m	118	$ 60.00	$ 7,080.00
Concrete Curb and Gutter (2 lanes)	m	118	$ 90.00	$ 10,620.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	118	$ 75.00	$ 8,850.00
Driveway Restoration b) Concrete	m	118	$ 180.00	$ 21,240.00
Topsoil, Hydraulic Seed and Mulch	m	118	$ 100.00	$ 11,800.00
Traffic Control During Construction (Residential)	m	118	$ 100.00	$ 11,800.00
Streetlighting (Residential)	m	118	$ 225.00	$ 26,550.00
Street Trees (In Boulevard / 12m spacing each side)	m	118	$ 125.00	$ 14,750.00
SUBTOTAL				**$ 200,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	118	$ 130.00	$ 15,340.00
Concrete Storm Precast Catchbasins and Leads	m	118	$ 60.00	$ 7,080.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	118	$ 2,500.00	$ 295,000.00
Storm Private Drain Connection	m	118	$ 20.00	$ 2,360.00
SUBTOTAL				**$ 320,000.00**
Construction Cost Total				**$ 550,000.00**
Construction Cost Contingency (30%)				**$ 170,000.00**
Subtotal				**$ 720,000.00**
Engineering Fee Estimate (20%)				**$ 150,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C5				**$ 870,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CHATHAM ST E	STM-C5
Length of Road Improvements (m)	145 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CHATHAM ST E		STM-C5		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	145	$ 5.00	$ 725.00
Full Depth Asphalt Removal	m	145	$ 80.00	$ 11,600.00
Driveway Removal (all types)	m	145	$ 30.00	$ 4,350.00
Sidewalk Removal (all types)	m	145	$ 20.00	$ 2,900.00
Sawcutting Existing Pavement	m	145	$ 1.00	$ 145.00
Curb and Gutter Removal	m	145	$ 20.00	$ 2,900.00
Signage Removal	m	145	$ 5.00	$ 725.00
SUBTOTAL				**$ 24,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	135	$ 75.00	$ 10,125.00
Remove Existing Manholes	m	135	$ 15.00	$ 2,025.00
Remove Existing Catch Basins	m	135	$ 12.50	$ 1,687.50
Remove Existing Combined Private Drain Connection	m	135	$ 100.00	$ 13,500.00
SUBTOTAL				**$ 28,000.00**
Roadwork				
Earth Excavating and Grading	m	145	$ 120.00	$ 17,400.00
Supply and Place Compacted Granular "A"	m	145	$ 350.00	$ 50,750.00
Asphalt Pavement (105mm)	m	145	$ 250.00	$ 36,250.00
Subdrains (2 lanes)	m	145	$ 60.00	$ 8,700.00
Concrete Curb and Gutter (2 lanes)	m	145	$ 90.00	$ 13,050.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	145	$ 75.00	$ 10,875.00
Driveway Restoration a) Asphalt	m	145	$ 320.00	$ 46,400.00
Topsoil, Hydraulic Seed and Mulch	m	145	$ 100.00	$ 14,500.00
Traffic Control During Construction (Residential)	m	145	$ 100.00	$ 14,500.00
Streetlighting (Residential)	m	145	$ 225.00	$ 32,625.00
SUBTOTAL				**$ 250,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	135	$ 75.00	$ 10,125.00
Concrete Manholes - (2400mm to 3600mm)	m	145	$ 130.00	$ 18,850.00
Concrete Storm Precast Catchbasins and Leads	m	145	$ 60.00	$ 8,700.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	135	$ 400.00	$ 54,000.00
Sanitary Private Drain Connection	m	135	$ 150.00	$ 20,250.00
Manhole Rain Catchers	m	135	$ 3.00	$ 405.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	145	$ 3,000.00	$ 435,000.00
Storm Private Drain Connection	m	145	$ 20.00	$ 2,900.00
SUBTOTAL				**$ 560,000.00**
Construction Cost Total				**$ 870,000.00**
Construction Cost Contingency (30%)				**$ 270,000.00**
Subtotal				**$ 1,200,000.00**
Engineering Fee Estimate (20%)				**$ 240,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C5				**$ 1,440,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

MARENTETTE AVE	STM-C5
Length of Road Improvements (m)	187 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MARENTETTE AVE		STM-C5		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	102	$ 5.00	$ 510.00
Full Depth Asphalt Removal	m	102	$ 80.00	$ 8,160.00
Driveway Removal (all types)	m	102	$ 30.00	$ 3,060.00
Sidewalk Removal (all types)	m	102	$ 20.00	$ 2,040.00
Sawcutting Existing Pavement	m	102	$ 1.00	$ 102.00
Curb and Gutter Removal	m	102	$ 20.00	$ 2,040.00
Signage Removal	m	102	$ 5.00	$ 510.00
SUBTOTAL				**$ 17,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	75	$ 75.00	$ 5,625.00
Remove Existing Manholes	m	75	$ 15.00	$ 1,125.00
Remove Existing Catch Basins	m	75	$ 12.50	$ 937.50
Remove Existing Combined Private Drain Connection	m	75	$ 100.00	$ 7,500.00
SUBTOTAL				**$ 16,000.00**
Roadwork				
Earth Excavating and Grading	m	102	$ 120.00	$ 12,240.00
Supply and Place Compacted Granular "A"	m	102	$ 350.00	$ 35,700.00
Asphalt Pavement (105mm)	m	102	$ 250.00	$ 25,500.00
Subdrains (2 lanes)	m	102	$ 60.00	$ 6,120.00
Concrete Curb and Gutter (2 lanes)	m	102	$ 90.00	$ 9,180.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	102	$ 75.00	$ 7,650.00
Driveway Restoration a) Asphalt	m	102	$ 320.00	$ 32,640.00
Topsoil, Hydraulic Seed and Mulch	m	187	$ 100.00	$ 18,700.00
Traffic Control During Construction (Residential)	m	102	$ 100.00	$ 10,200.00
Streetlighting (Residential)	m	102	$ 225.00	$ 22,950.00
SUBTOTAL				**$ 190,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	75	$ 75.00	$ 5,625.00
Concrete Manholes - (2400mm to 3600mm)	m	145	$ 130.00	$ 18,850.00
Concrete Storm Precast Catchbasins and Leads	m	145	$ 60.00	$ 8,700.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	75	$ 450.00	$ 33,750.00
Sanitary Private Drain Connection	m	75	$ 150.00	$ 11,250.00
Manhole Rain Catchers	m	75	$ 3.00	$ 225.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	187	$ 3,000.00	$ 561,000.00
Storm Private Drain Connection	m	102	$ 20.00	$ 2,040.00
Outlet to Detroit River	Each	1	$ 300,000.00	$ 300,000.00
SUBTOTAL				**$ 950,000.00**
Construction Cost Total				**$ 1,200,000.00**
Construction Cost Contingency (30%)				**$ 360,000.00**
Subtotal				**$ 1,600,000.00**
Engineering Fee Estimate (20%)				**$ 320,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C5				**$ 1,920,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

YPRES BLVD	STM-C6
Length of Road Improvements (m)	40 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

YPRES BLVD		STM-C6		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	40	$ 5.00	$ 200.00
Full Depth Asphalt Removal	m	40	$ 80.00	$ 3,200.00
Driveway Removal (all types)	m	40	$ 30.00	$ 1,200.00
Sidewalk Removal (all types)	m	40	$ 20.00	$ 800.00
Sawcutting Existing Pavement	m	40	$ 1.00	$ 40.00
Curb and Gutter Removal	m	40	$ 20.00	$ 800.00
Streetlighting Removal	m	40	$ 25.00	$ 1,000.00
Signage Removal	m	40	$ 5.00	$ 200.00
SUBTOTAL				**$ 8,000.00**
Sewer Removals				
Remove Existing Catch Basins	m	40	$ 12.50	$ 500.00
SUBTOTAL				**$ 500.00**
Roadwork				
Earth Excavating and Grading	m	40	$ 120.00	$ 4,800.00
Supply and Place Compacted Granular "A"	m	40	$ 350.00	$ 14,000.00
Asphalt Pavement (105mm)	m	40	$ 250.00	$ 10,000.00
Subdrains (2 lanes)	m	40	$ 60.00	$ 2,400.00
Concrete Curb and Gutter (2 lanes)	m	40	$ 90.00	$ 3,600.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	40	$ 75.00	$ 3,000.00
Driveway Restoration a) Asphalt	m	40	$ 320.00	$ 12,800.00
Topsoil, Hydraulic Seed and Mulch	m	40	$ 100.00	$ 4,000.00
Traffic Control During Construction (Residential)	m	40	$ 100.00	$ 4,000.00
Streetlighting (Residential)	m	40	$ 225.00	$ 9,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	40	$ 125.00	$ 5,000.00
SUBTOTAL				**$ 73,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	40	$ 75.00	$ 3,000.00
Concrete Storm Precast Catchbasins and Leads	m	40	$ 60.00	$ 2,400.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	40	$ 700.00	$ 28,000.00
SUBTOTAL				**$ 33,400.00**
Ponds & Undergound Storage				
Underground Storage	m^3	3000	$ 1,000.00	$ 3,000,000.00
SUBTOTAL				**$ 3,000,000.00**
Construction Cost Total				**$ 3,200,000.00**
Construction Cost Contingency (30%)				**$ 960,000.00**
Subtotal				**$ 4,200,000.00**
Engineering Fee Estimate (20%)				**$ 840,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C6				**$ 5,040,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ALBERT RD	STM-C7
Length of Road Improvements (m)	357 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

ALBERT RD	STM-C7			
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	235	$ 5.00	$ 1,175.00
Full Depth Asphalt Removal	m	190	$ 80.00	$ 15,200.00
Sawcutting Existing Pavement	m	190	$ 1.00	$ 190.00
Curb and Gutter Removal	m	190	$ 20.00	$ 3,800.00
SUBTOTAL				**$ 21,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	190	$ 100.00	$ 19,000.00
Remove Existing Combined Sewers	m	166	$ 75.00	$ 12,450.00
Remove Existing Manholes	m	356	$ 15.00	$ 5,340.00
Remove Existing Catch Basins	m	190	$ 12.50	$ 2,375.00
Remove Existing Combined Private Drain Connection	m	166	$ 100.00	$ 16,600.00
Remove Existing Storm Private Drain Connection	m	190	$ 25.00	$ 4,750.00
SUBTOTAL				**$ 61,000.00**
Roadwork				
Earth Excavating and Grading	m	357	$ 120.00	$ 42,840.00
Supply and Place Compacted Granular "A"	m	190	$ 350.00	$ 66,500.00
Asphalt Pavement (105mm)	m	190	$ 250.00	$ 47,500.00
Subdrains (2 lanes)	m	110	$ 60.00	$ 6,600.00
Concrete Curb and Gutter (2 lanes)	m	110	$ 90.00	$ 9,900.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	190	$ 75.00	$ 14,250.00
Topsoil, Hydraulic Seed and Mulch	m	235	$ 100.00	$ 23,500.00
Temporary Pavement Markings	m	20	$ 1.00	$ 20.00
Permananent Pavement Markings	m	20	$ 30.00	$ 600.00
Traffic Control During Construction (Residential)	m	190	$ 100.00	$ 19,000.00
Streetlighting (Residential)	m	190	$ 225.00	$ 42,750.00
SUBTOTAL				**$ 280,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	523	$ 130.00	$ 67,990.00
Concrete Storm Precast Catchbasins and Leads	m	357	$ 60.00	$ 21,420.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	166	$ 2,500.00	$ 415,000.00
Sanitary Private Drain Connection	m	166	$ 150.00	$ 24,900.00
Manhole Rain Catchers	m	166	$ 3.00	$ 498.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	192	$ 2,500.00	$ 480,000.00
Storm Sewer - 1650mm diameter Concrete (Trenchless - Jacking Pipe)	m	165	$ 5,000.00	$ 825,000.00
Storm Private Drain Connection	m	110	$ 20.00	$ 2,200.00
SUBTOTAL				**$ 1,900,000.00**
Construction Cost Total				**$ 2,300,000.00**
Construction Cost Contingency (30%)				**$ 690,000.00**
Subtotal				**$ 3,000,000.00**
Engineering Fee Estimate (20%)				**$ 600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C7				**$ 3,600,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WYANDOTTE ST E	STM-C7
Length of Road Improvements (m)	189 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WYANDOTTE ST E		STM-C7		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	189	$ 5.00	$ 945.00
Full Depth Concrete Asphalt Removal	m	189	$ 250.00	$ 47,250.00
Driveway Removal (all types)	m	189	$ 30.00	$ 5,670.00
Sawcutting Existing Pavement	m	189	$ 1.00	$ 189.00
Curb and Gutter Removal	m	189	$ 20.00	$ 3,780.00
Streetlighting Removal	m	189	$ 25.00	$ 4,725.00
Signage Removal	m	189	$ 5.00	$ 945.00
SUBTOTAL				**$ 64,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	189	$ 100.00	$ 18,900.00
Remove Existing Manholes	m	189	$ 15.00	$ 2,835.00
Remove Existing Catch Basins	m	189	$ 12.50	$ 2,362.50
Remove Existing Storm Private Drain Connection	m	189	$ 25.00	$ 4,725.00
SUBTOTAL				**$ 29,000.00**
Roadwork				
Earth Excavating and Grading	m	189	$ 240.00	$ 45,360.00
Supply and Place Compacted Granular "A"	m	189	$ 700.00	$ 132,300.00
100mm Open Graded Drainage Layer	m	189	$ 450.00	$ 85,050.00
Concrete Pavement (305mm)	m	189	$ 1,150.00	$ 217,350.00
Subdrains (2 lanes)	m	189	$ 60.00	$ 11,340.00
Concrete Curb and Gutter (2 lanes)	m	189	$ 90.00	$ 17,010.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	189	$ 75.00	$ 14,175.00
Driveway Restoration b) Concrete	m	189	$ 180.00	$ 34,020.00
Topsoil, Hydraulic Seed and Mulch	m	189	$ 100.00	$ 18,900.00
Temporary Pavement Markings	m	189	$ 1.00	$ 189.00
Permananent Pavement Markings	m	189	$ 30.00	$ 5,670.00
Traffic Control During Construction (Arterial)	m	189	$ 200.00	$ 37,800.00
Streetlighting (Arterial)	m	189	$ 400.00	$ 75,600.00
Street Trees (In Boulevard / 12m spacing each side)	m	189	$ 125.00	$ 23,625.00
SUBTOTAL				**$ 720,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	189	$ 75.00	$ 14,175.00
Concrete Storm Precast Catchbasins and Leads	m	189	$ 60.00	$ 11,340.00
Storm Sewer - 450mm diameter PVC (DR-35)	m	75	$ 400.00	$ 30,000.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	114	$ 600.00	$ 68,400.00
Storm Private Drain Connection	m	189	$ 20.00	$ 3,780.00
SUBTOTAL				**$ 130,000.00**
Construction Cost Total				**$ 950,000.00**
Construction Cost Contingency (30%)				**$ 290,000.00**
Subtotal				**$ 1,300,000.00**
Engineering Fee Estimate (20%)				**$ 260,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C7				**$ 1,560,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WYANDOTTE ST E	STM-C8
Length of Road Improvements (m)	40 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

WYANDOTTE ST E		STM-C8		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Full Depth Asphalt Removal	m	40	$ 160.00	$ 6,400.00
Sidewalk Removal (all types)	m	40	$ 20.00	$ 800.00
Sawcutting Existing Pavement	m	40	$ 1.00	$ 40.00
Curb and Gutter Removal	m	40	$ 20.00	$ 800.00
Streetlighting Removal	m	40	$ 25.00	$ 1,000.00
Signage Removal	m	40	$ 5.00	$ 200.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 25,000.00**
Sewer Removals				
Remove Existing Catch Basins	m	40	$ 12.50	$ 500.00
SUBTOTAL				**$ 500.00**
Roadwork				
Earth Excavating and Grading	m	40	$ 240.00	$ 9,600.00
Supply and Place Compacted Granular "A"	m	40	$ 700.00	$ 28,000.00
100mm Open Graded Drainage Layer	m	40	$ 450.00	$ 18,000.00
Concrete Pavement (305mm)	m	40	$ 1,150.00	$ 46,000.00
Subdrains (2 lanes)	m	40	$ 60.00	$ 2,400.00
Concrete Curb and Gutter (2 lanes)	m	40	$ 90.00	$ 3,600.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	40	$ 75.00	$ 3,000.00
Temporary Pavement Markings	m	40	$ 1.00	$ 40.00
Permananent Pavement Markings	m	40	$ 30.00	$ 1,200.00
Traffic Control During Construction (Arterial)	m	40	$ 200.00	$ 8,000.00
Streetlighting (Arterial)	m	40	$ 400.00	$ 16,000.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
SUBTOTAL				**$ 340,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	40	$ 75.00	$ 3,000.00
Concrete Storm Precast Catchbasins and Leads	m	40	$ 60.00	$ 2,400.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	40	$ 700.00	$ 28,000.00
SUBTOTAL				**$ 34,000.00**
Construction Cost Total				**$ 400,000.00**
Construction Cost Contingency (30%)				**$ 120,000.00**
Subtotal				**$ 520,000.00**
Engineering Fee Estimate (20%)				**$ 110,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C8				**$ 630,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

DROUILLARD RD	STM-C8
Length of Road Improvements (m)	312 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

DROUILLARD RD		STM-C8		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	312	$ 5.00	$ 1,560.00
Full Depth Asphalt Removal	m	217	$ 80.00	$ 17,360.00
Driveway Removal (all types)	m	312	$ 30.00	$ 9,360.00
Sidewalk Removal (all types)	m	312	$ 20.00	$ 6,240.00
Sawcutting Existing Pavement	m	312	$ 1.00	$ 312.00
Curb and Gutter Removal	m	312	$ 20.00	$ 6,240.00
Streetlighting Removal	m	312	$ 25.00	$ 7,800.00
Signage Removal	m	312	$ 5.00	$ 1,560.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 66,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	312	$ 100.00	$ 31,200.00
Remove Existing Combined Sewers	m	170	$ 75.00	$ 12,750.00
Remove Existing Manholes	m	312	$ 15.00	$ 4,680.00
Remove Existing Catch Basins	m	312	$ 12.50	$ 3,900.00
Remove Existing Combined Private Drain Connection	m	170	$ 100.00	$ 17,000.00
Remove Existing Storm Private Drain Connection	m	312	$ 25.00	$ 7,800.00
SUBTOTAL				**$ 78,000.00**
Roadwork				
Earth Excavating and Grading	m	312	$ 120.00	$ 37,440.00
Supply and Place Compacted Granular "A"	m	312	$ 350.00	$ 109,200.00
100mm Open Graded Drainage Layer	m	312	$ 225.00	$ 70,200.00
Concrete Pavement (305mm)	m	312	$ 575.00	$ 179,400.00
Subdrains (2 lanes)	m	312	$ 60.00	$ 18,720.00
Concrete Curb and Gutter (2 lanes)	m	312	$ 90.00	$ 28,080.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	312	$ 75.00	$ 23,400.00
Driveway Restoration b) Concrete	m	312	$ 180.00	$ 56,160.00
Topsoil, Hydraulic Seed and Mulch	m	312	$ 100.00	$ 31,200.00
Temporary Pavement Markings	m	312	$ 1.00	$ 312.00
Permananent Pavement Markings	m	312	$ 30.00	$ 9,360.00
Traffic Control During Construction (Arterial)	m	312	$ 200.00	$ 62,400.00
Streetlighting (Arterial)	m	312	$ 400.00	$ 124,800.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
SUBTOTAL				**$ 960,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	482	$ 75.00	$ 36,150.00
Concrete Storm Precast Catchbasins and Leads	m	312	$ 60.00	$ 18,720.00
Sanitary Sewer - 250mm diameter PVC (DR-28)	m	170	$ 350.00	$ 59,500.00
Sanitary Private Drain Connection	m	170	$ 150.00	$ 25,500.00
Manhole Rain Catchers	m	170	$ 3.00	$ 510.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	285	$ 700.00	$ 199,500.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	27	$ 850.00	$ 22,950.00
Storm Private Drain Connection	m	312	$ 20.00	$ 6,240.00
SUBTOTAL				**$ 370,000.00**
Construction Cost Total				**$ 1,500,000.00**
Construction Cost Contingency (30%)				**$ 450,000.00**
Subtotal				**$ 2,000,000.00**
Engineering Fee Estimate (20%)				**$ 400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C8				**$ 2,400,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

COLLEGE AVE	STM-C9
Length of Road Improvements (m)	390 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

COLLEGE AVE		STM-C9		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	390	$ 5.00	$ 1,950.00
Full Depth Asphalt Removal	m	390	$ 80.00	$ 31,200.00
Driveway Removal (all types)	m	390	$ 30.00	$ 11,700.00
Sidewalk Removal (all types)	m	390	$ 20.00	$ 7,800.00
Sawcutting Existing Pavement	m	390	$ 1.00	$ 390.00
Curb and Gutter Removal	m	390	$ 20.00	$ 7,800.00
Streetlighting Removal	m	390	$ 25.00	$ 9,750.00
Signage Removal	m	390	$ 5.00	$ 1,950.00
SUBTOTAL				**$ 73,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	390	$ 100.00	$ 39,000.00
Remove Existing Manholes	m	390	$ 15.00	$ 5,850.00
Remove Existing Catch Basins	m	390	$ 12.50	$ 4,875.00
Remove Existing Storm Private Drain Connection	m	390	$ 25.00	$ 9,750.00
SUBTOTAL				**$ 60,000.00**
Roadwork				
Earth Excavating and Grading	m	390	$ 120.00	$ 46,800.00
Supply and Place Compacted Granular "A"	m	390	$ 350.00	$ 136,500.00
Supply and Place Compacted Granular "A" for Temporary Lanes	m	390	$ 125.00	$ 48,750.00
Asphalt Pavement (105mm)	m	390	$ 250.00	$ 97,500.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	390	$ 270.00	$ 105,300.00
Subdrains (2 lanes)	m	390	$ 60.00	$ 23,400.00
Concrete Curb and Gutter (2 lanes)	m	390	$ 90.00	$ 35,100.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	390	$ 75.00	$ 29,250.00
Driveway Restoration b) Concrete	m	390	$ 180.00	$ 70,200.00
Topsoil, Hydraulic Seed and Mulch	m	390	$ 100.00	$ 39,000.00
Temporary Pavement Markings	m	390	$ 1.00	$ 390.00
Permananent Pavement Markings	m	390	$ 30.00	$ 11,700.00
Traffic Control During Construction (Residential)	m	390	$ 100.00	$ 39,000.00
Streetlighting (Residential)	m	390	$ 225.00	$ 87,750.00
Street Trees (In Boulevard / 12m spacing each side)	m	390	$ 125.00	$ 48,750.00
SUBTOTAL				**$ 820,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	376	$ 75.00	$ 28,200.00
Concrete Manholes - (Chamber)	m	14	$ 200.00	$ 2,800.00
Concrete Storm Precast Catchbasins and Leads	m	390	$ 60.00	$ 23,400.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	178	$ 600.00	$ 106,800.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	198	$ 850.00	$ 168,300.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	14	$ 1,200.00	$ 16,800.00
Storm Private Drain Connection	m	390	$ 20.00	$ 7,800.00
SUBTOTAL				**$ 360,000.00**
Construction Cost Total				**$ 1,400,000.00**
Construction Cost Contingency (30%)				**$ 420,000.00**
Subtotal				**$ 1,900,000.00**
Engineering Fee Estimate (20%)				**$ 380,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C9				**$ 2,280,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

HURON CHURCH RD	STM-C10
Length of Road Improvements (m)	82 m
Number of Lanes	6
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

HURON CHURCH RD		STM-C10		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	82	$ 5.00	$ 410.00
Sidewalk Removal (all types)	m	82	$ 20.00	$ 1,640.00
Streetlighting Removal	m	82	$ 25.00	$ 2,050.00
SUBTOTAL				**$ 5,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	82	$ 100.00	$ 8,200.00
Remove Existing Manholes	m	82	$ 15.00	$ 1,230.00
SUBTOTAL				**$ 10,000.00**
Roadwork				
Earth Excavating and Grading	m	82	$ 360.00	$ 29,520.00
Topsoil, Hydraulic Seed and Mulch	m	82	$ 100.00	$ 8,200.00
Traffic Control During Construction (Arterial)	m	82	$ 200.00	$ 16,400.00
SUBTOTAL				**$ 55,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	82	$ 130.00	$ 10,660.00
Concrete Storm Precast Catchbasins and Leads	m	82	$ 60.00	$ 4,920.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	82	$ 1,500.00	$ 123,000.00
SUBTOTAL				**$ 140,000.00**
Construction Cost Total				**$ 210,000.00**
Construction Cost Contingency (30%)				**$ 63,000.00**
Subtotal				**$ 280,000.00**
Engineering Fee Estimate (20%)				**$ 56,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C10				**$ 336,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

DORCHESTER RD	STM-C10
Length of Road Improvements (m)	96 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

DORCHESTER RD		STM-C10		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	96	$ 5.00	$ 480.00
Full Depth Concrete Asphalt Removal	m	96	$ 125.00	$ 12,000.00
Driveway Removal (all types)	m	96	$ 30.00	$ 2,880.00
Sidewalk Removal (all types)	m	96	$ 20.00	$ 1,920.00
Sawcutting Existing Pavement	m	96	$ 1.00	$ 96.00
Curb and Gutter Removal	m	96	$ 20.00	$ 1,920.00
Streetlighting Removal	m	96	$ 25.00	$ 2,400.00
Signage Removal	m	96	$ 5.00	$ 480.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 38,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	96	$ 75.00	$ 7,200.00
Remove Existing Manholes	m	96	$ 15.00	$ 1,440.00
Remove Existing Catch Basins	m	96	$ 12.50	$ 1,200.00
Remove Existing Combined Private Drain Connection	m	96	$ 100.00	$ 9,600.00
SUBTOTAL				**$ 19,440.00**
Roadwork				
Earth Excavating and Grading	m	96	$ 120.00	$ 11,520.00
Supply and Place Compacted Granular "A"	m	96	$ 350.00	$ 33,600.00
100mm Open Graded Drainage Layer	m	96	$ 225.00	$ 21,600.00
Concrete Pavement (305mm)	m	96	$ 575.00	$ 55,200.00
Subdrains (2 lanes)	m	96	$ 60.00	$ 5,760.00
Concrete Curb and Gutter (2 lanes)	m	96	$ 90.00	$ 8,640.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	96	$ 75.00	$ 7,200.00
Driveway Restoration b) Concrete	m	96	$ 180.00	$ 17,280.00
Topsoil, Hydraulic Seed and Mulch	m	96	$ 100.00	$ 9,600.00
Temporary Pavement Markings	m	96	$ 1.00	$ 96.00
Permananent Pavement Markings	m	96	$ 30.00	$ 2,880.00
Traffic Control During Construction (Residential)	m	96	$ 100.00	$ 9,600.00
Streetlighting (Residential)	m	96	$ 225.00	$ 21,600.00
Street Trees (In Boulevard / 12m spacing each side)	m	96	$ 125.00	$ 12,000.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
SUBTOTAL				**$ 420,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	192	$ 200.00	$ 38,400.00
Concrete Storm Precast Catchbasins and Leads	m	96	$ 60.00	$ 5,760.00
Sanitary Sewer - 1800mm diameter Concrete (100-D)	m	96	$ 2,800.00	$ 268,800.00
Sanitary Private Drain Connection	m	96	$ 150.00	$ 14,400.00
Manhole Rain Catchers	m	96	$ 3.00	$ 288.00
Storm Sewer - 1800mm x 1800mm Concrete Box Culvert	m	96	$ 3,500.00	$ 336,000.00
Storm Private Drain Connection	m	96	$ 20.00	$ 1,920.00
SUBTOTAL				**$ 670,000.00**
Construction Cost Total				**$ 1,150,000.00**
Construction Cost Contingency (30%)				**$ 350,000.00**
Subtotal				**$ 1,500,000.00**
Engineering Fee Estimate (20%)				**$ 300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-C10**		**$ 1,800,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

FELIX AVE	STM-C10
Length of Road Improvements (m)	1359 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

FELIX AVE		STM-C10		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1359	$ 5.00	$ 6,795.00
Full Depth Asphalt Removal	m	1359	$ 80.00	$ 108,720.00
Driveway Removal (all types)	m	1359	$ 30.00	$ 40,770.00
Sidewalk Removal (all types)	m	1359	$ 20.00	$ 27,180.00
Sawcutting Existing Pavement	m	1359	$ 1.00	$ 1,359.00
Curb and Gutter Removal	m	1359	$ 20.00	$ 27,180.00
Streetlighting Removal	m	1359	$ 25.00	$ 33,975.00
Signage Removal	m	1359	$ 5.00	$ 6,795.00
SUBTOTAL				**$ 260,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	196	$ 100.00	$ 19,600.00
Remove Existing Combined Sewers	m	1359	$ 75.00	$ 101,925.00
Remove Existing Manholes	m	1359	$ 15.00	$ 20,385.00
Remove Existing Catch Basins	m	1359	$ 12.50	$ 16,987.50
Remove Existing Combined Private Drain Connection	m	1359	$ 100.00	$ 135,900.00
Remove Existing Storm Private Drain Connection	m	196	$ 25.00	$ 4,900.00
SUBTOTAL				**$ 300,000.00**
Roadwork				
Earth Excavating and Grading	m	1359	$ 120.00	$ 163,080.00
Supply and Place Compacted Granular "A"	m	1359	$ 350.00	$ 475,650.00
Asphalt Pavement (105mm)	m	1359	$ 250.00	$ 339,750.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	1359	$ 270.00	$ 366,930.00
Subdrains (2 lanes)	m	1359	$ 60.00	$ 81,540.00
Concrete Curb and Gutter (2 lanes)	m	1359	$ 90.00	$ 122,310.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1359	$ 75.00	$ 101,925.00
Driveway Restoration b) Concrete	m	1359	$ 180.00	$ 244,620.00
Topsoil, Hydraulic Seed and Mulch	m	1359	$ 100.00	$ 135,900.00
Traffic Control During Construction (Residential)	m	1359	$ 100.00	$ 135,900.00
Streetlighting (Residential)	m	1359	$ 225.00	$ 305,775.00
SUBTOTAL				**$ 2,500,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	2718	$ 200.00	$ 543,600.00
Concrete Storm Precast Catchbasins and Leads	m	1414	$ 60.00	$ 84,840.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	77	$ 525.00	$ 40,425.00
Sanitary Sewer - 1800mm diameter Concrete (100-D)	m	300	$ 2,800.00	$ 840,000.00
Sanitary Sewer - 2100mm diameter Concrete (100-D)	m	982	$ 4,000.00	$ 3,928,000.00
Sanitary Private Drain Connection	m	1359	$ 150.00	$ 203,850.00
Manhole Rain Catchers	m	1359	$ 3.00	$ 4,077.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	28	$ 500.00	$ 14,000.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	27	$ 850.00	$ 22,950.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	1227	$ 3,000.00	$ 3,681,000.00
Storm Sewer - 1800mm x 1800mm Concrete Box Culvert	m	132	$ 3,500.00	$ 462,000.00
Storm Private Drain Connection	m	1414	$ 20.00	$ 28,280.00
SUBTOTAL				**$ 9,900,000.00**
Construction Cost Total				**$ 13,000,000.00**
Construction Cost Contingency (30%)				**$ 3,900,000.00**
Subtotal				**$ 16,900,000.00**
Engineering Fee Estimate (20%)				**$ 3,380,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-C10**		**$ 20,280,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

COLLEGE AVE	STM-C10
Length of Road Improvements (m)	115 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

COLLEGE AVE		STM-C10		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	115	$ 5.00	$ 575.00
Full Depth Concrete Asphalt Removal	m	44	$ 125.00	$ 5,500.00
Full Depth Asphalt Removal	m	71	$ 80.00	$ 5,680.00
Driveway Removal (all types)	m	115	$ 30.00	$ 3,450.00
Sidewalk Removal (all types)	m	115	$ 20.00	$ 2,300.00
Sawcutting Existing Pavement	m	115	$ 1.00	$ 115.00
Curb and Gutter Removal	m	115	$ 20.00	$ 2,300.00
Streetlighting Removal	m	115	$ 25.00	$ 2,875.00
Signage Removal	m	115	$ 5.00	$ 575.00
SUBTOTAL				**$ 24,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	140	$ 100.00	$ 14,000.00
Remove Existing Manholes	m	115	$ 15.00	$ 1,725.00
Remove Existing Catch Basins	m	115	$ 12.50	$ 1,437.50
Remove Existing Storm Private Drain Connection	m	115	$ 25.00	$ 2,875.00
SUBTOTAL				**$ 21,000.00**
Roadwork				
Earth Excavating and Grading	m	115	$ 120.00	$ 13,800.00
Supply and Place Compacted Granular "A"	m	115	$ 350.00	$ 40,250.00
100mm Open Graded Drainage Layer	m	44	$ 225.00	$ 9,900.00
Asphalt Pavement (105mm)	m	71	$ 250.00	$ 17,750.00
Concrete Pavement (305mm)	m	44	$ 575.00	$ 25,300.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	71	$ 270.00	$ 19,170.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	44	$ 392.00	$ 17,248.00
Subdrains (2 lanes)	m	115	$ 60.00	$ 6,900.00
Concrete Curb and Gutter (2 lanes)	m	115	$ 90.00	$ 10,350.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	115	$ 75.00	$ 8,625.00
Driveway Restoration b) Concrete	m	115	$ 180.00	$ 20,700.00
Topsoil, Hydraulic Seed and Mulch	m	115	$ 100.00	$ 11,500.00
Temporary Pavement Markings	m	44	$ 1.00	$ 44.00
Permananent Pavement Markings	m	44	$ 30.00	$ 1,320.00
Traffic Control During Construction (Arterial)	m	115	$ 200.00	$ 23,000.00
Streetlighting (Arterial)	m	115	$ 400.00	$ 46,000.00
SUBTOTAL				**$ 280,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	115	$ 130.00	$ 14,950.00
Concrete Storm Precast Catchbasins and Leads	m	115	$ 60.00	$ 6,900.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	44	$ 2,200.00	$ 96,800.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	71	$ 2,500.00	$ 177,500.00
Storm Private Drain Connection	m	115	$ 20.00	$ 2,300.00
SUBTOTAL				**$ 300,000.00**
Construction Cost Total				**$ 630,000.00**
Construction Cost Contingency (30%)				**$ 190,000.00**
				$ 820,000.00
				$ 170,000.00
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C10				**$ 990,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CAMPBELL AVE	STM-C11
Length of Road Improvements (m)	59 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

CAMPBELL AVE		STM-C11		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	59	$ 5.00	$ 295.00
Full Depth Asphalt Removal	m	59	$ 160.00	$ 9,440.00
Driveway Removal (all types)	m	59	$ 30.00	$ 1,770.00
Sidewalk Removal (all types)	m	59	$ 20.00	$ 1,180.00
Sawcutting Existing Pavement	m	59	$ 1.00	$ 59.00
Curb and Gutter Removal	m	59	$ 20.00	$ 1,180.00
Streetlighting Removal	m	59	$ 25.00	$ 1,475.00
Signage Removal	m	59	$ 5.00	$ 295.00
SUBTOTAL				**$ 16,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	59	$ 100.00	$ 5,900.00
Remove Existing Manholes	m	59	$ 15.00	$ 885.00
Remove Existing Catch Basins	m	59	$ 12.50	$ 737.50
Remove Existing Storm Private Drain Connection	m	59	$ 25.00	$ 1,475.00
SUBTOTAL				**$ 9,000.00**
Roadwork				
Earth Excavating and Grading	m	59	$ 240.00	$ 14,160.00
Supply and Place Compacted Granular "A"	m	59	$ 700.00	$ 41,300.00
Asphalt Pavement (105mm)	m	59	$ 500.00	$ 29,500.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	59	$ 270.00	$ 15,930.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	59	$ 392.00	$ 23,128.00
Subdrains (2 lanes)	m	59	$ 60.00	$ 3,540.00
Concrete Curb and Gutter (2 lanes)	m	59	$ 90.00	$ 5,310.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	59	$ 75.00	$ 4,425.00
Driveway Restoration a) Asphalt	m	59	$ 320.00	$ 18,880.00
Topsoil, Hydraulic Seed and Mulch	m	59	$ 100.00	$ 5,900.00
Temporary Pavement Markings	m	59	$ 1.00	$ 59.00
Permananent Pavement Markings	m	59	$ 30.00	$ 1,770.00
Traffic Control During Construction (Arterial)	m	59	$ 200.00	$ 11,800.00
Streetlighting (Arterial)	m	59	$ 400.00	$ 23,600.00
SUBTOTAL				**$ 200,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	59	$ 130.00	$ 7,670.00
Concrete Storm Precast Catchbasins and Leads	m	59	$ 60.00	$ 3,540.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	59	$ 1,200.00	$ 70,800.00
Storm Private Drain Connection	m	59	$ 20.00	$ 1,180.00
SUBTOTAL				**$ 84,000.00**
Construction Cost Total				**$ 310,000.00**
Construction Cost Contingency (30%)				**$ 93,000.00**
Subtotal				**$ 410,000.00**
Engineering Fee Estimate (20%)				**$ 82,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C11				**$ 492,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

TECUMSEH RD W	STM-C11
Length of Road Improvements (m)	237 m
Number of Lanes	5
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

TECUMSEH RD W		STM-C11		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	237	$ 5.00	$ 1,185.00
Full Depth Asphalt Removal	m	237	$ 200.00	$ 47,400.00
Driveway Removal (all types)	m	237	$ 30.00	$ 7,110.00
Sidewalk Removal (all types)	m	237	$ 20.00	$ 4,740.00
Sawcutting Existing Pavement	m	237	$ 1.00	$ 237.00
Curb and Gutter Removal	m	237	$ 20.00	$ 4,740.00
Streetlighting Removal	m	237	$ 25.00	$ 5,925.00
Signage Removal	m	237	$ 5.00	$ 1,185.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 88,000.00**
Sewer Removals				
Remove Existing Catch Basins	m	237	$ 12.50	$ 2,962.50
SUBTOTAL				**$ 3,000.00**
Roadwork				
Earth Excavating and Grading	m	237	$ 300.00	$ 71,100.00
Supply and Place Compacted Granular "A"	m	237	$ 875.00	$ 207,375.00
100mm Open Graded Drainage Layer	m	237	$ 562.50	$ 133,312.50
Concrete Pavement (305mm)	m	237	$ 1,437.50	$ 340,687.50
Additional Cost for Bicycle Lanes (2) - Concrete	m	237	$ 392.00	$ 92,904.00
Subdrains (2 lanes)	m	237	$ 60.00	$ 14,220.00
Concrete Curb and Gutter (2 lanes)	m	237	$ 90.00	$ 21,330.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	237	$ 75.00	$ 17,775.00
Driveway Restoration b) Concrete	m	237	$ 180.00	$ 42,660.00
Topsoil, Hydraulic Seed and Mulch	m	237	$ 100.00	$ 23,700.00
Temporary Pavement Markings	m	237	$ 1.00	$ 237.00
Permananent Pavement Markings	m	237	$ 30.00	$ 7,110.00
Traffic Control During Construction (Arterial)	m	237	$ 200.00	$ 47,400.00
Streetlighting (Arterial)	m	237	$ 400.00	$ 94,800.00
Street Trees (In Boulevard / 12m spacing each side)	m	237	$ 125.00	$ 29,625.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
SUBTOTAL				**$ 1,400,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	237	$ 130.00	$ 30,810.00
Concrete Storm Precast Catchbasins and Leads	m	237	$ 60.00	$ 14,220.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	237	$ 1,200.00	$ 284,400.00
Storm Private Drain Connection	m	237	$ 20.00	$ 4,740.00
SUBTOTAL				**$ 340,000.00**
Construction Cost Total				**$ 1,900,000.00**
Construction Cost Contingency (30%)				**$ 570,000.00**
Subtotal				**$ 2,500,000.00**
Engineering Fee Estimate (20%)				**$ 500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C11				**$ 3,000,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

PELLETIER ST	STM-C11
Length of Road Improvements (m)	248 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

PELLETIER ST		STM-C11		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	248	$ 5.00	$ 1,240.00
Full Depth Asphalt Removal	m	248	$ 80.00	$ 19,840.00
Driveway Removal (all types)	m	248	$ 30.00	$ 7,440.00
Sidewalk Removal (all types)	m	248	$ 20.00	$ 4,960.00
Sawcutting Existing Pavement	m	248	$ 1.00	$ 248.00
Curb and Gutter Removal	m	248	$ 20.00	$ 4,960.00
Streetlighting Removal	m	248	$ 25.00	$ 6,200.00
Signage Removal	m	248	$ 5.00	$ 1,240.00
SUBTOTAL				**$ 47,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	150	$ 75.00	$ 11,250.00
Remove Existing Manholes	m	150	$ 15.00	$ 2,250.00
Remove Existing Catch Basins	m	150	$ 12.50	$ 1,875.00
Remove Existing Combined Private Drain Connection	m	150	$ 100.00	$ 15,000.00
SUBTOTAL				**$ 31,000.00**
Roadwork				
Earth Excavating and Grading	m	248	$ 120.00	$ 29,760.00
Supply and Place Compacted Granular "A"	m	248	$ 350.00	$ 86,800.00
Asphalt Pavement (105mm)	m	248	$ 250.00	$ 62,000.00
Subdrains (2 lanes)	m	248	$ 60.00	$ 14,880.00
Concrete Curb and Gutter (2 lanes)	m	248	$ 90.00	$ 22,320.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	248	$ 75.00	$ 18,600.00
Driveway Restoration b) Concrete	m	248	$ 180.00	$ 44,640.00
Topsoil, Hydraulic Seed and Mulch	m	248	$ 100.00	$ 24,800.00
Traffic Control During Construction (Residential)	m	248	$ 100.00	$ 24,800.00
Streetlighting (Residential)	m	248	$ 225.00	$ 55,800.00
Street Trees (In Boulevard / 12m spacing each side)	m	248	$ 125.00	$ 31,000.00
SUBTOTAL				**$ 420,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	398	$ 75.00	$ 29,850.00
Concrete Storm Precast Catchbasins and Leads	m	248	$ 60.00	$ 14,880.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	77	$ 450.00	$ 34,650.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	73	$ 475.00	$ 34,675.00
Sanitary Private Drain Connection	m	150	$ 150.00	$ 22,500.00
Manhole Rain Catchers	m	150	$ 3.00	$ 450.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	12	$ 600.00	$ 7,200.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	236	$ 850.00	$ 200,600.00
Storm Private Drain Connection	m	248	$ 20.00	$ 4,960.00
SUBTOTAL				**$ 350,000.00**
Construction Cost Total				**$ 850,000.00**
Construction Cost Contingency (30%)				**$ 260,000.00**
Subtotal				**$ 1,200,000.00**
Engineering Fee Estimate (20%)				**$ 240,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C11				**$ 1,440,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

PARTINGTON AVE	STM-C11
Length of Road Improvements (m)	1070 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

PARTINGTON AVE		STM-C11		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1070	$ 5.00	$ 5,350.00
Full Depth Asphalt Removal	m	1070	$ 80.00	$ 85,600.00
Driveway Removal (all types)	m	1070	$ 30.00	$ 32,100.00
Sidewalk Removal (all types)	m	1070	$ 20.00	$ 21,400.00
Sawcutting Existing Pavement	m	1070	$ 1.00	$ 1,070.00
Curb and Gutter Removal	m	1070	$ 20.00	$ 21,400.00
Streetlighting Removal	m	1070	$ 25.00	$ 26,750.00
Signage Removal	m	1070	$ 5.00	$ 5,350.00
SUBTOTAL				**$ 200,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1070	$ 100.00	$ 107,000.00
Remove Existing Manholes	m	1070	$ 15.00	$ 16,050.00
Remove Existing Catch Basins	m	1070	$ 12.50	$ 13,375.00
Remove Existing Storm Private Drain Connection	m	1070	$ 25.00	$ 26,750.00
SUBTOTAL				**$ 170,000.00**
Roadwork				
Earth Excavating and Grading	m	1070	$ 120.00	$ 128,400.00
Supply and Place Compacted Granular "A"	m	1070	$ 350.00	$ 374,500.00
Asphalt Pavement (105mm)	m	1070	$ 250.00	$ 267,500.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	1070	$ 270.00	$ 288,900.00
Subdrains (2 lanes)	m	1070	$ 60.00	$ 64,200.00
Concrete Curb and Gutter (2 lanes)	m	1070	$ 90.00	$ 96,300.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	1070	$ 75.00	$ 80,250.00
Driveway Restoration b) Concrete	m	1070	$ 180.00	$ 192,600.00
Topsoil, Hydraulic Seed and Mulch	m	1070	$ 100.00	$ 107,000.00
Traffic Control During Construction (Residential)	m	1070	$ 100.00	$ 107,000.00
Streetlighting (Residential)	m	1070	$ 225.00	$ 240,750.00
SUBTOTAL				**$ 2,000,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	1053	$ 130.00	$ 136,890.00
Concrete Manholes - (Chamber)	m	17	$ 200.00	$ 3,400.00
Concrete Storm Precast Catchbasins and Leads	m	1070	$ 60.00	$ 64,200.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	251	$ 1,500.00	$ 376,500.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	599	$ 2,200.00	$ 1,317,800.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	220	$ 2,500.00	$ 550,000.00
Storm Private Drain Connection	m	1070	$ 20.00	$ 21,400.00
SUBTOTAL				**$ 2,500,000.00**
Construction Cost Total				**$ 4,870,000.00**
Construction Cost Contingency (30%)				**$ 1,500,000.00**
Subtotal				**$ 6,400,000.00**
Engineering Fee Estimate (20%)				**$ 1,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C11				**$ 7,700,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

PATRICIA RD	STM-C12
Length of Road Improvements (m)	406 m
Number of Lanes	3
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

PATRICIA RD		STM-C12		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	406	$ 5.00	$ 2,030.00
Full Depth Concrete Asphalt Removal	m	406	$ 187.50	$ 76,125.00
Driveway Removal (all types)	m	406	$ 30.00	$ 12,180.00
Sidewalk Removal (all types)	m	406	$ 20.00	$ 8,120.00
Sawcutting Existing Pavement	m	406	$ 1.00	$ 406.00
Curb and Gutter Removal	m	406	$ 20.00	$ 8,120.00
Streetlighting Removal	m	406	$ 25.00	$ 10,150.00
Signage Removal	m	406	$ 5.00	$ 2,030.00
SUBTOTAL				**$ 120,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	312	$ 100.00	$ 31,200.00
Remove Existing Combined Sewers	m	344	$ 75.00	$ 25,800.00
Remove Existing Manholes	m	312	$ 15.00	$ 4,680.00
Remove Existing Catch Basins	m	312	$ 12.50	$ 3,900.00
Remove Existing Combined Private Drain Connection	m	344	$ 100.00	$ 34,400.00
Remove Existing Storm Private Drain Connection	m	312	$ 25.00	$ 7,800.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	406	$ 180.00	$ 73,080.00
Supply and Place Compacted Granular "A"	m	406	$ 525.00	$ 213,150.00
100mm Open Graded Drainage Layer	m	406	$ 337.50	$ 137,025.00
Concrete Pavement (305mm)	m	406	$ 862.50	$ 350,175.00
Subdrains (2 lanes)	m	406	$ 60.00	$ 24,360.00
Concrete Curb and Gutter (2 lanes)	m	406	$ 90.00	$ 36,540.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	406	$ 75.00	$ 30,450.00
Driveway Restoration b) Concrete	m	406	$ 180.00	$ 73,080.00
Topsoil, Hydraulic Seed and Mulch	m	406	$ 100.00	$ 40,600.00
Temporary Pavement Markings	m	406	$ 1.00	$ 406.00
Permananent Pavement Markings	m	406	$ 30.00	$ 12,180.00
Traffic Control During Construction (Arterial)	m	406	$ 200.00	$ 81,200.00
Streetlighting (Arterial)	m	406	$ 400.00	$ 162,400.00
SUBTOTAL				**$ 1,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	344	$ 75.00	$ 25,800.00
Concrete Manholes - (2400mm to 3600mm)	m	406	$ 130.00	$ 52,780.00
Concrete Storm Precast Catchbasins and Leads	m	406	$ 60.00	$ 24,360.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	165	$ 400.00	$ 66,000.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	179	$ 450.00	$ 80,550.00
Sanitary Private Drain Connection	m	344	$ 150.00	$ 51,600.00
Manhole Rain Catchers	m	344	$ 3.00	$ 1,032.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	406	$ 1,500.00	$ 609,000.00
Storm Private Drain Connection	m	406	$ 20.00	$ 8,120.00
SUBTOTAL				**$ 920,000.00**
Construction Cost Total				**$ 2,500,000.00**
Construction Cost Contingency (30%)				**$ 750,000.00**
Subtotal				**$ 3,300,000.00**
Engineering Fee Estimate (20%)				**$ 660,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C12				**$ 3,960,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

WYANDOTTE ST W	STM-C12
Length of Road Improvements (m)	215 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

WYANDOTTE ST W		STM-C12		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	215	$ 5.00	$ 1,075.00
Full Depth Asphalt Removal	m	215	$ 160.00	$ 34,400.00
Driveway Removal (all types)	m	215	$ 30.00	$ 6,450.00
Sidewalk Removal (all types)	m	215	$ 20.00	$ 4,300.00
Sawcutting Existing Pavement	m	215	$ 1.00	$ 215.00
Curb and Gutter Removal	m	215	$ 20.00	$ 4,300.00
Streetlighting Removal	m	215	$ 25.00	$ 5,375.00
Signage Removal	m	215	$ 5.00	$ 1,075.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 73,000.00**
Sewer Removals				
Remove Existing Catch Basins	m	215	$ 12.50	$ 2,687.50
SUBTOTAL				**$ 3,000.00**
Roadwork				
Earth Excavating and Grading	m	215	$ 240.00	$ 51,600.00
Supply and Place Compacted Granular "A"	m	215	$ 700.00	$ 150,500.00
100mm Open Graded Drainage Layer	m	215	$ 450.00	$ 96,750.00
Concrete Pavement (305mm)	m	215	$ 1,150.00	$ 247,250.00
Subdrains (2 lanes)	m	215	$ 60.00	$ 12,900.00
Concrete Curb and Gutter (2 lanes)	m	215	$ 90.00	$ 19,350.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	215	$ 75.00	$ 16,125.00
Driveway Restoration b) Concrete	m	215	$ 180.00	$ 38,700.00
Topsoil, Hydraulic Seed and Mulch	m	215	$ 100.00	$ 21,500.00
Temporary Pavement Markings	m	215	$ 1.00	$ 215.00
Permananent Pavement Markings	m	215	$ 30.00	$ 6,450.00
Traffic Control During Construction (Arterial)	m	215	$ 200.00	$ 43,000.00
Streetlighting (Arterial)	m	215	$ 400.00	$ 86,000.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	2	$ 80,000.00	$ 160,000.00
SUBTOTAL				**$ 1,400,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	108	$ 130.00	$ 14,040.00
Concrete Manholes - (Chamber)	m	107	$ 200.00	$ 21,400.00
Concrete Storm Precast Catchbasins and Leads	m	215	$ 60.00	$ 12,900.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	215	$ 1,500.00	$ 322,500.00
Storm Private Drain Connection	m	215	$ 20.00	$ 4,300.00
SUBTOTAL				**$ 380,000.00**
Construction Cost Total				**$ 1,900,000.00**
Construction Cost Contingency (30%)				**$ 570,000.00**
Subtotal				**$ 2,500,000.00**
Engineering Fee Estimate (20%)				**$ 500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C12				**$ 3,000,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

HURON CHURCH RD	STM-C13
Length of Road Improvements (m)	68 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

HURON CHURCH RD			STM-C13	
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	68	$ 5.00	$ 340.00
Full Depth Concrete Asphalt Removal	m	68	$ 250.00	$ 17,000.00
Driveway Removal (all types)	m	68	$ 30.00	$ 2,040.00
Sidewalk Removal (all types)	m	68	$ 20.00	$ 1,360.00
Sawcutting Existing Pavement	m	68	$ 1.00	$ 68.00
Curb and Gutter Removal	m	68	$ 20.00	$ 1,360.00
Streetlighting Removal	m	68	$ 25.00	$ 1,700.00
Signage Removal	m	68	$ 5.00	$ 340.00
SUBTOTAL				**$ 25,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	68	$ 100.00	$ 6,800.00
Remove Existing Manholes	m	68	$ 15.00	$ 1,020.00
Remove Existing Catch Basins	m	68	$ 12.50	$ 850.00
Remove Existing Storm Private Drain Connection	m	68	$ 25.00	$ 1,700.00
SUBTOTAL				**$ 11,000.00**
Roadwork				
Earth Excavating and Grading	m	68	$ 240.00	$ 16,320.00
Supply and Place Compacted Granular "A"	m	68	$ 700.00	$ 47,600.00
100mm Open Graded Drainage Layer	m	68	$ 450.00	$ 30,600.00
Concrete Pavement (305mm)	m	68	$ 1,150.00	$ 78,200.00
Subdrains (2 lanes)	m	68	$ 60.00	$ 4,080.00
Concrete Curb and Gutter (2 lanes)	m	68	$ 90.00	$ 6,120.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	68	$ 75.00	$ 5,100.00
Driveway Restoration b) Concrete	m	68	$ 180.00	$ 12,240.00
Topsoil, Hydraulic Seed and Mulch	m	68	$ 100.00	$ 6,800.00
Temporary Pavement Markings	m	68	$ 1.00	$ 68.00
Permananent Pavement Markings	m	68	$ 30.00	$ 2,040.00
Traffic Control During Construction (Arterial)	m	68	$ 200.00	$ 13,600.00
Streetlighting (Arterial)	m	68	$ 400.00	$ 27,200.00
Street Trees (In Boulevard / 12m spacing each side)	m	68	$ 125.00	$ 8,500.00
SUBTOTAL				**$ 260,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	68	$ 200.00	$ 13,600.00
Concrete Storm Precast Catchbasins and Leads	m	68	$ 60.00	$ 4,080.00
Storm Sewer - 3000mm x 2400mm Concrete Box Culvert	m	68	$ 11,500.00	$ 782,000.00
SUBTOTAL				**$ 800,000.00**
Construction Cost Total				**$ 1,100,000.00**
Construction Cost Contingency (30%)				**$ 330,000.00**
Subtotal				**$ 1,500,000.00**
Engineering Fee Estimate (20%)				**$ 300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C13				**$ 1,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

TECUMSEH RD W	STM-C14
Length of Road Improvements (m)	315 m
Number of Lanes	5
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

TECUMSEH RD W		STM-C14		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	315	$ 5.00	$ 1,575.00
Full Depth Concrete Asphalt Removal	m	315	$ 312.50	$ 98,437.50
Driveway Removal (all types)	m	315	$ 30.00	$ 9,450.00
Sidewalk Removal (all types)	m	315	$ 20.00	$ 6,300.00
Concrete Median Removal	m	10	$ 10.00	$ 100.00
Sawcutting Existing Pavement	m	315	$ 1.00	$ 315.00
Curb and Gutter Removal	m	315	$ 20.00	$ 6,300.00
Streetlighting Removal	m	315	$ 25.00	$ 7,875.00
Signage Removal	m	315	$ 5.00	$ 1,575.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 150,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	315	$ 100.00	$ 31,500.00
Remove Existing Manholes	m	315	$ 15.00	$ 4,725.00
Remove Existing Catch Basins	m	315	$ 12.50	$ 3,937.50
Remove Existing Storm Private Drain Connection	m	315	$ 25.00	$ 7,875.00
SUBTOTAL				**$ 49,000.00**
Roadwork				
Earth Excavating and Grading	m	315	$ 300.00	$ 94,500.00
Supply and Place Compacted Granular "A"	m	315	$ 875.00	$ 275,625.00
100mm Open Graded Drainage Layer	m	315	$ 562.50	$ 177,187.50
Concrete Pavement (305mm)	m	315	$ 1,437.50	$ 452,812.50
Additional Cost for Bicycle Lanes (2) - Concrete	m	315	$ 392.00	$ 123,480.00
Subdrains (2 lanes)	m	315	$ 60.00	$ 18,900.00
Concrete Curb and Gutter (2 lanes)	m	315	$ 90.00	$ 28,350.00
Concrete Median Islands (1m wide island)	m	10	$ 150.00	$ 1,500.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	315	$ 75.00	$ 23,625.00
Driveway Restoration b) Concrete	m	315	$ 180.00	$ 56,700.00
Topsoil, Hydraulic Seed and Mulch	m	315	$ 100.00	$ 31,500.00
Temporary Pavement Markings	m	315	$ 1.00	$ 315.00
Permananent Pavement Markings	m	315	$ 30.00	$ 9,450.00
Traffic Control During Construction (Arterial)	m	315	$ 200.00	$ 63,000.00
Streetlighting (Arterial)	m	315	$ 400.00	$ 126,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	315	$ 125.00	$ 39,375.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 1,900,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	315	$ 130.00	$ 40,950.00
Concrete Storm Precast Catchbasins and Leads	m	315	$ 60.00	$ 18,900.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	237	$ 1,800.00	$ 426,600.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	78	$ 2,200.00	$ 171,600.00
Storm Private Drain Connection	m	315	$ 20.00	$ 6,300.00
SUBTOTAL				**$ 670,000.00**
Construction Cost Total				**$ 2,800,000.00**
Construction Cost Contingency (30%)				**$ 840,000.00**
Subtotal				**$ 3,700,000.00**
Engineering Fee Estimate (20%)				**$ 740,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-C14**		**$ 4,440,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

TECUMSEH BLVD W	STM-C14
Length of Road Improvements (m)	185 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

TECUMSEH BLVD W		STM-C14		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	185	$ 5.00	$ 925.00
Full Depth Asphalt Removal	m	185	$ 80.00	$ 14,800.00
Sidewalk Removal (all types)	m	185	$ 20.00	$ 3,700.00
Sawcutting Existing Pavement	m	185	$ 1.00	$ 185.00
Curb and Gutter Removal	m	185	$ 20.00	$ 3,700.00
Streetlighting Removal	m	185	$ 25.00	$ 4,625.00
Signage Removal	m	185	$ 5.00	$ 925.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 44,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	185	$ 100.00	$ 18,500.00
Remove Existing Manholes	m	185	$ 15.00	$ 2,775.00
Remove Existing Catch Basins	m	185	$ 12.50	$ 2,312.50
Remove Existing Storm Private Drain Connection	m	185	$ 25.00	$ 4,625.00
SUBTOTAL				**$ 29,000.00**
Roadwork				
Earth Excavating and Grading	m	185	$ 120.00	$ 22,200.00
Supply and Place Compacted Granular "A"	m	185	$ 350.00	$ 64,750.00
Asphalt Pavement (105mm)	m	185	$ 250.00	$ 46,250.00
Subdrains (2 lanes)	m	185	$ 60.00	$ 11,100.00
Concrete Curb and Gutter (2 lanes)	m	185	$ 90.00	$ 16,650.00
Concrete Median Islands (1m wide island)	m	10	$ 150.00	$ 1,500.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	185	$ 75.00	$ 13,875.00
Driveway Restoration b) Concrete	m	135	$ 180.00	$ 24,300.00
Topsoil, Hydraulic Seed and Mulch	m	185	$ 100.00	$ 18,500.00
Temporary Pavement Markings	m	185	$ 1.00	$ 185.00
Permananent Pavement Markings	m	185	$ 30.00	$ 5,550.00
Traffic Control During Construction (Residential)	m	185	$ 100.00	$ 18,500.00
Streetlighting (Residential)	m	185	$ 225.00	$ 41,625.00
Street Trees (In Boulevard / 12m spacing each side)	m	185	$ 125.00	$ 23,125.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 590,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	240	$ 130.00	$ 31,200.00
Concrete Storm Precast Catchbasins and Leads	m	240	$ 60.00	$ 14,400.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	240	$ 2,200.00	$ 528,000.00
Storm Private Drain Connection	m	25	$ 20.00	$ 500.00
SUBTOTAL				**$ 580,000.00**
Construction Cost Total				**$ 1,300,000.00**
Construction Cost Contingency (30%)				**$ 390,000.00**
Subtotal				**$ 1,700,000.00**
Engineering Fee Estimate (20%)				**$ 340,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C14				**$ 2,040,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

SHEPHERD ST	STM-C15
Length of Road Improvements (m)	234 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

SHEPHERD ST		STM-C15		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	234	$ 5.00	$ 1,170.00
Full Depth Asphalt Removal	m	234	$ 80.00	$ 18,720.00
Driveway Removal (all types)	m	234	$ 30.00	$ 7,020.00
Sidewalk Removal (all types)	m	234	$ 20.00	$ 4,680.00
Sawcutting Existing Pavement	m	234	$ 1.00	$ 234.00
Curb and Gutter Removal	m	234	$ 20.00	$ 4,680.00
Streetlighting Removal	m	234	$ 25.00	$ 5,850.00
Signage Removal	m	234	$ 5.00	$ 1,170.00
SUBTOTAL				**$ 44,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	234	$ 75.00	$ 17,550.00
Remove Existing Manholes	m	234	$ 15.00	$ 3,510.00
Remove Existing Catch Basins	m	234	$ 12.50	$ 2,925.00
Remove Existing Combined Private Drain Connection	m	234	$ 100.00	$ 23,400.00
SUBTOTAL				**$ 48,000.00**
Roadwork				
Earth Excavating and Grading	m	234	$ 120.00	$ 28,080.00
Supply and Place Compacted Granular "A"	m	234	$ 350.00	$ 81,900.00
100mm Open Graded Drainage Layer	m	234	$ 225.00	$ 52,650.00
Concrete Pavement (305mm)	m	234	$ 575.00	$ 134,550.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	234	$ 392.00	$ 91,728.00
Subdrains (2 lanes)	m	234	$ 60.00	$ 14,040.00
Concrete Curb and Gutter (2 lanes)	m	234	$ 90.00	$ 21,060.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	234	$ 75.00	$ 17,550.00
Driveway Restoration b) Concrete	m	234	$ 180.00	$ 42,120.00
Topsoil, Hydraulic Seed and Mulch	m	234	$ 100.00	$ 23,400.00
Permananent Pavement Markings	m	25	$ 30.00	$ 750.00
Traffic Control During Construction (Residential)	m	234	$ 100.00	$ 23,400.00
Streetlighting (Residential)	m	234	$ 225.00	$ 52,650.00
Street Trees (In Boulevard / 12m spacing each side)	m	234	$ 125.00	$ 29,250.00
SUBTOTAL				**$ 620,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	234	$ 75.00	$ 17,550.00
Concrete Manholes - (2400mm to 3600mm)	m	234	$ 130.00	$ 30,420.00
Concrete Storm Precast Catchbasins and Leads	m	234	$ 60.00	$ 14,040.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	95	$ 450.00	$ 42,750.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	139	$ 700.00	$ 97,300.00
Sanitary Private Drain Connection	m	234	$ 150.00	$ 35,100.00
Manhole Rain Catchers	m	234	$ 3.00	$ 702.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	234	$ 2,500.00	$ 585,000.00
Storm Private Drain Connection	m	234	$ 20.00	$ 4,680.00
SUBTOTAL				**$ 830,000.00**
Construction Cost Total				**$ 1,600,000.00**
Construction Cost Contingency (30%)				**$ 480,000.00**
Subtotal				**$ 2,100,000.00**
Engineering Fee Estimate (20%)				**$ 420,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-C15**		**$ 2,520,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

MCDOUGALL ST	STM-C15
Length of Road Improvements (m)	1042 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

MCDOUGALL ST		STM-C15		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1042	$ 5.00	$ 5,210.00
Full Depth Asphalt Removal	m	1042	$ 80.00	$ 83,360.00
Driveway Removal (all types)	m	1042	$ 30.00	$ 31,260.00
Sidewalk Removal (all types)	m	1042	$ 20.00	$ 20,840.00
Sawcutting Existing Pavement	m	1042	$ 1.00	$ 1,042.00
Curb and Gutter Removal	m	1042	$ 20.00	$ 20,840.00
Streetlighting Removal	m	1042	$ 25.00	$ 26,050.00
Signage Removal	m	1042	$ 5.00	$ 5,210.00
Traffic Signal Removal	LS	3	$ 15,000.00	$ 45,000.00
SUBTOTAL				**$ 240,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	20	$ 100.00	$ 2,000.00
Remove Existing Combined Sewers	m	1042	$ 75.00	$ 78,150.00
Remove Existing Manholes	m	1042	$ 15.00	$ 15,630.00
Remove Existing Catch Basins	m	1042	$ 12.50	$ 13,025.00
Remove Existing Combined Private Drain Connection	m	1042	$ 100.00	$ 104,200.00
SUBTOTAL				**$ 220,000.00**
Roadwork				
Earth Excavating and Grading	m	1042	$ 120.00	$ 125,040.00
Supply and Place Compacted Granular "A"	m	1042	$ 350.00	$ 364,700.00
100mm Open Graded Drainage Layer	m	1042	$ 225.00	$ 234,450.00
Concrete Pavement (305mm)	m	1042	$ 575.00	$ 599,150.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	1042	$ 392.00	$ 408,464.00
Subdrains (2 lanes)	m	1042	$ 60.00	$ 62,520.00
Concrete Curb and Gutter (2 lanes)	m	1042	$ 90.00	$ 93,780.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1042	$ 75.00	$ 78,150.00
Driveway Restoration b) Concrete	m	1042	$ 180.00	$ 187,560.00
Topsoil, Hydraulic Seed and Mulch	m	1042	$ 100.00	$ 104,200.00
Permananent Pavement Markings	m	25	$ 30.00	$ 750.00
Traffic Control During Construction (Arterial)	m	1042	$ 200.00	$ 208,400.00
Streetlighting (Arterial)	m	1042	$ 400.00	$ 416,800.00
Street Trees (In Boulevard / 12m spacing each side)	m	1042	$ 125.00	$ 130,250.00
Traffic Signals (Minor Intersection)	LS	2	$ 150,000.00	$ 300,000.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	3	$ 80,000.00	$ 240,000.00
SUBTOTAL				**$ 3,800,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1042	$ 75.00	$ 78,150.00
Concrete Manholes - (2400mm to 3600mm)	m	1042	$ 130.00	$ 135,460.00
Concrete Storm Precast Catchbasins and Leads	m	1042	$ 60.00	$ 62,520.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	260	$ 525.00	$ 136,500.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	376	$ 700.00	$ 263,200.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	220	$ 900.00	$ 198,000.00
Sanitary Sewer - 1050mm diameter Concrete (100-D)	m	186	$ 1,250.00	$ 232,500.00
Sanitary Private Drain Connection	m	1042	$ 150.00	$ 156,300.00
Manhole Rain Catchers	m	1042	$ 3.00	$ 3,126.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	1042	$ 2,500.00	$ 2,605,000.00
Storm Private Drain Connection	m	1042	$ 20.00	$ 20,840.00
SUBTOTAL				**$ 3,900,000.00**
Construction Cost Total				**$ 8,200,000.00**
Construction Cost Contingency (30%)				**$ 2,500,000.00**
Subtotal				**$ 10,700,000.00**
Engineering Fee Estimate (20%)				**$ 2,200,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C15				**$ 12,900,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

HOWARD AVE	STM-C15
Length of Road Improvements (m)	460 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

HOWARD AVE		STM-C15		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	460	$ 5.00	$ 2,300.00
Full Depth Asphalt Removal	m	460	$ 80.00	$ 36,800.00
Driveway Removal (all types)	m	460	$ 30.00	$ 13,800.00
Sidewalk Removal (all types)	m	460	$ 20.00	$ 9,200.00
Sawcutting Existing Pavement	m	460	$ 1.00	$ 460.00
Curb and Gutter Removal	m	460	$ 20.00	$ 9,200.00
Streetlighting Removal	m	460	$ 25.00	$ 11,500.00
Signage Removal	m	460	$ 5.00	$ 2,300.00
Traffic Signal Removal	LS	2	$ 15,000.00	$ 30,000.00
SUBTOTAL				**$ 120,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	460	$ 100.00	$ 46,000.00
Remove Existing Manholes	m	460	$ 15.00	$ 6,900.00
Remove Existing Catch Basins	m	460	$ 12.50	$ 5,750.00
Remove Existing Storm Private Drain Connection	m	460	$ 25.00	$ 11,500.00
SUBTOTAL				**$ 71,000.00**
Roadwork				
Earth Excavating and Grading	m	460	$ 120.00	$ 55,200.00
Supply and Place Compacted Granular "A"	m	460	$ 350.00	$ 161,000.00
100mm Open Graded Drainage Layer	m	460	$ 225.00	$ 103,500.00
Concrete Pavement (305mm)	m	460	$ 575.00	$ 264,500.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	460	$ 392.00	$ 180,320.00
Subdrains (2 lanes)	m	460	$ 60.00	$ 27,600.00
Concrete Curb and Gutter (2 lanes)	m	460	$ 90.00	$ 41,400.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	460	$ 75.00	$ 34,500.00
Driveway Restoration b) Concrete	m	460	$ 180.00	$ 82,800.00
Topsoil, Hydraulic Seed and Mulch	m	460	$ 100.00	$ 46,000.00
Temporary Pavement Markings	m	460	$ 1.00	$ 460.00
Permananent Pavement Markings	m	460	$ 30.00	$ 13,800.00
Traffic Control During Construction (Arterial)	m	460	$ 200.00	$ 92,000.00
Streetlighting (Arterial)	m	460	$ 400.00	$ 184,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	460	$ 125.00	$ 57,500.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	2	$ 80,000.00	$ 160,000.00
SUBTOTAL				**$ 1,900,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	460	$ 75.00	$ 34,500.00
Concrete Storm Precast Catchbasins and Leads	m	460	$ 60.00	$ 27,600.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	460	$ 500.00	$ 230,000.00
Storm Private Drain Connection	m	460	$ 20.00	$ 9,200.00
SUBTOTAL				**$ 310,000.00**
Construction Cost Total				**$ 2,500,000.00**
Construction Cost Contingency (30%)				**$ 750,000.00**
Subtotal				**$ 3,300,000.00**
Engineering Fee Estimate (20%)				**$ 660,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C15				**$ 3,960,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

GILES BLVD	STM-C15
Length of Road Improvements (m)	1460 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

GILES BLVD		STM-C15		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1460	$ 5.00	$ 7,300.00
Full Depth Asphalt Removal	m	1460	$ 160.00	$ 233,600.00
Driveway Removal (all types)	m	1460	$ 30.00	$ 43,800.00
Sidewalk Removal (all types)	m	1460	$ 20.00	$ 29,200.00
Sawcutting Existing Pavement	m	1460	$ 1.00	$ 1,460.00
Curb and Gutter Removal	m	1460	$ 20.00	$ 29,200.00
Streetlighting Removal	m	1460	$ 25.00	$ 36,500.00
Signage Removal	m	1460	$ 5.00	$ 7,300.00
Traffic Signal Removal	LS	3	$ 15,000.00	$ 45,000.00
SUBTOTAL				**$ 440,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	935	$ 100.00	$ 93,500.00
Remove Existing Combined Sewers	m	1010	$ 75.00	$ 75,750.00
Remove Existing Manholes	m	1945	$ 15.00	$ 29,175.00
Remove Existing Catch Basins	m	1460	$ 12.50	$ 18,250.00
Remove Existing Combined Private Drain Connection	m	1010	$ 100.00	$ 101,000.00
Remove Existing Storm Private Drain Connection	m	935	$ 25.00	$ 23,375.00
SUBTOTAL				**$ 350,000.00**
Roadwork				
Earth Excavating and Grading	m	1460	$ 240.00	$ 350,400.00
Supply and Place Compacted Granular "A"	m	1460	$ 700.00	$ 1,022,000.00
100mm Open Graded Drainage Layer	m	1460	$ 450.00	$ 657,000.00
Concrete Pavement (305mm)	m	1460	$ 1,150.00	$ 1,679,000.00
Subdrains (2 lanes)	m	1460	$ 60.00	$ 87,600.00
Concrete Curb and Gutter (2 lanes)	m	1460	$ 90.00	$ 131,400.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1460	$ 75.00	$ 109,500.00
Driveway Restoration b) Concrete	m	1460	$ 180.00	$ 262,800.00
Topsoil, Hydraulic Seed and Mulch	m	1460	$ 100.00	$ 146,000.00
Temporary Pavement Markings	m	1460	$ 1.00	$ 1,460.00
Permananent Pavement Markings	m	1460	$ 30.00	$ 43,800.00
Traffic Control During Construction (Arterial)	m	1460	$ 200.00	$ 292,000.00
Streetlighting (Arterial)	m	1460	$ 400.00	$ 584,000.00
Traffic Signals (Major Intersection)	LS	3	$ 200,000.00	$ 600,000.00
Traffic Signals (Temporary)	LS	3	$ 80,000.00	$ 240,000.00
SUBTOTAL				**$ 6,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1010	$ 75.00	$ 75,750.00
Concrete Manholes - (2400mm to 3600mm)	m	924	$ 130.00	$ 120,120.00
Concrete Manholes - (Chamber)	m	536	$ 200.00	$ 107,200.00
Concrete Storm Precast Catchbasins and Leads	m	1460	$ 60.00	$ 87,600.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	154	$ 400.00	$ 61,600.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	372	$ 525.00	$ 195,300.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	166	$ 700.00	$ 116,200.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	318	$ 900.00	$ 286,200.00
Sanitary Private Drain Connection	m	1010	$ 150.00	$ 151,500.00
Manhole Rain Catchers	m	1010	$ 3.00	$ 3,030.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	924	$ 2,500.00	$ 2,310,000.00
Storm Sewer - 1800mm x 1200mm Concrete Box Culvert	m	327	$ 4,500.00	$ 1,471,500.00
Storm Sewer - 2400mm x 1200mm Concrete Box Culvert	m	209	$ 6,400.00	$ 1,337,600.00
Storm Private Drain Connection	m	1460	$ 20.00	$ 29,200.00
SUBTOTAL				**$ 6,400,000.00**
Construction Cost Total				**$ 13,500,000.00**
Construction Cost Contingency (30%)				**$ 4,100,000.00**
Subtotal				**$ 17,600,000.00**
Engineering Fee Estimate (20%)				**$ 3,600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**STM-C15**		**$ 21,200,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ERIE ST E	STM-C15
Length of Road Improvements (m)	526 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

ERIE ST E		STM-C15		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	526	$ 5.00	$ 2,630.00
Full Depth Asphalt Removal	m	526	$ 160.00	$ 84,160.00
Driveway Removal (all types)	m	526	$ 30.00	$ 15,780.00
Sidewalk Removal (all types)	m	526	$ 20.00	$ 10,520.00
Sawcutting Existing Pavement	m	526	$ 1.00	$ 526.00
Curb and Gutter Removal	m	526	$ 20.00	$ 10,520.00
Streetlighting Removal	m	526	$ 25.00	$ 13,150.00
Signage Removal	m	526	$ 5.00	$ 2,630.00
Traffic Signal Removal	LS	2	$ 15,000.00	$ 30,000.00
SUBTOTAL				**$ 170,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	415	$ 75.00	$ 31,125.00
Remove Existing Manholes	m	415	$ 15.00	$ 6,225.00
Remove Existing Catch Basins	m	526	$ 12.50	$ 6,575.00
Remove Existing Combined Private Drain Connection	m	415	$ 100.00	$ 41,500.00
SUBTOTAL				**$ 86,000.00**
Roadwork				
Earth Excavating and Grading	m	526	$ 240.00	$ 126,240.00
Supply and Place Compacted Granular "A"	m	526	$ 700.00	$ 368,200.00
100mm Open Graded Drainage Layer	m	526	$ 450.00	$ 236,700.00
Concrete Pavement (305mm)	m	526	$ 1,150.00	$ 604,900.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	526	$ 392.00	$ 206,192.00
Subdrains (2 lanes)	m	526	$ 60.00	$ 31,560.00
Concrete Curb and Gutter (2 lanes)	m	526	$ 90.00	$ 47,340.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	526	$ 75.00	$ 39,450.00
Driveway Restoration b) Concrete	m	526	$ 180.00	$ 94,680.00
Topsoil, Hydraulic Seed and Mulch	m	526	$ 100.00	$ 52,600.00
Temporary Pavement Markings	m	526	$ 1.00	$ 526.00
Permananent Pavement Markings	m	526	$ 30.00	$ 15,780.00
Traffic Control During Construction (Arterial)	m	526	$ 200.00	$ 105,200.00
Streetlighting (Arterial)	m	526	$ 400.00	$ 210,400.00
Traffic Signals (Minor Intersection)	LS	2	$ 150,000.00	$ 300,000.00
Traffic Signals (Temporary)	LS	2	$ 80,000.00	$ 160,000.00
SUBTOTAL				**$ 2,600,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	415	$ 75.00	$ 31,125.00
Concrete Manholes - (2400mm to 3600mm)	m	526	$ 130.00	$ 68,380.00
Concrete Storm Precast Catchbasins and Leads	m	526	$ 60.00	$ 31,560.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	115	$ 400.00	$ 46,000.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	300	$ 475.00	$ 142,500.00
Sanitary Private Drain Connection	m	415	$ 150.00	$ 62,250.00
Manhole Rain Catchers	m	415	$ 3.00	$ 1,245.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	526	$ 2,500.00	$ 1,315,000.00
Storm Private Drain Connection	m	526	$ 20.00	$ 10,520.00
SUBTOTAL				**$ 1,800,000.00**
Construction Cost Total				**$ 4,700,000.00**
Construction Cost Contingency (30%)				**$ 1,410,000.00**
Subtotal				**$ 6,110,000.00**
Engineering Fee Estimate (20%)				**$ 1,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C15				**$ 7,410,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

PARENT AVE	STM-C16
Length of Road Improvements (m)	328 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

PARENT AVE		STM-C16		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	328	$ 5.00	$ 1,640.00
Full Depth Asphalt Removal	m	328	$ 160.00	$ 52,480.00
Driveway Removal (all types)	m	328	$ 30.00	$ 9,840.00
Sidewalk Removal (all types)	m	328	$ 20.00	$ 6,560.00
Concrete Median Removal	m	55	$ 10.00	$ 550.00
Sawcutting Existing Pavement	m	328	$ 1.00	$ 328.00
Curb and Gutter Removal	m	328	$ 20.00	$ 6,560.00
Streetlighting Removal	m	328	$ 25.00	$ 8,200.00
Signage Removal	m	328	$ 5.00	$ 1,640.00
SUBTOTAL				**$ 88,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	40	$ 100.00	$ 4,000.00
Remove Existing Combined Sewers	m	328	$ 75.00	$ 24,600.00
Remove Existing Manholes	m	328	$ 15.00	$ 4,920.00
Remove Existing Catch Basins	m	328	$ 12.50	$ 4,100.00
Remove Existing Combined Private Drain Connection	m	328	$ 100.00	$ 32,800.00
Remove Existing Storm Private Drain Connection	m	40	$ 25.00	$ 1,000.00
SUBTOTAL				**$ 72,000.00**
Roadwork				
Earth Excavating and Grading	m	328	$ 240.00	$ 78,720.00
Supply and Place Compacted Granular "A"	m	328	$ 700.00	$ 229,600.00
100mm Open Graded Drainage Layer	m	328	$ 450.00	$ 147,600.00
Concrete Pavement (305mm)	m	328	$ 1,150.00	$ 377,200.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	328	$ 392.00	$ 128,576.00
Subdrains (2 lanes)	m	328	$ 60.00	$ 19,680.00
Concrete Curb and Gutter (2 lanes)	m	328	$ 90.00	$ 29,520.00
Concrete Median Islands (1m wide island)	m	55	$ 150.00	$ 8,250.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	328	$ 75.00	$ 24,600.00
Driveway Restoration b) Concrete	m	328	$ 180.00	$ 59,040.00
Topsoil, Hydraulic Seed and Mulch	m	328	$ 100.00	$ 32,800.00
Temporary Pavement Markings	m	328	$ 1.00	$ 328.00
Permananent Pavement Markings	m	328	$ 30.00	$ 9,840.00
Traffic Control During Construction (Arterial)	m	328	$ 200.00	$ 65,600.00
Streetlighting (Arterial)	m	328	$ 400.00	$ 131,200.00
Street Trees (In Boulevard / 12m spacing each side)	m	328	$ 125.00	$ 41,000.00
SUBTOTAL				**$ 1,400,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	328	$ 75.00	$ 24,600.00
Concrete Manholes - (2400mm to 3600mm)	m	328	$ 130.00	$ 42,640.00
Concrete Storm Precast Catchbasins and Leads	m	328	$ 60.00	$ 19,680.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	328	$ 2,500.00	$ 820,000.00
Sanitary Private Drain Connection	m	328	$ 150.00	$ 49,200.00
Manhole Rain Catchers	m	328	$ 3.00	$ 984.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	145	$ 600.00	$ 87,000.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	183	$ 700.00	$ 128,100.00
Storm Private Drain Connection	m	328	$ 20.00	$ 6,560.00
SUBTOTAL				**$ 1,200,000.00**
Construction Cost Total				**$ 2,800,000.00**
Construction Cost Contingency (30%)				**$ 840,000.00**
Subtotal				**$ 3,700,000.00**
Engineering Fee Estimate (20%)				**$ 740,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C16				**$ 4,440,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ERIE ST E	STM-C16
Length of Road Improvements (m)	120 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

ERIE ST E		STM-C16		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	120	$ 5.00	$ 600.00
Full Depth Asphalt Removal	m	120	$ 80.00	$ 9,600.00
Driveway Removal (all types)	m	120	$ 30.00	$ 3,600.00
Sidewalk Removal (all types)	m	120	$ 20.00	$ 2,400.00
Concrete Median Removal	m	20	$ 10.00	$ 200.00
Sawcutting Existing Pavement	m	120	$ 1.00	$ 120.00
Curb and Gutter Removal	m	120	$ 20.00	$ 2,400.00
Streetlighting Removal	m	120	$ 25.00	$ 3,000.00
Signage Removal	m	120	$ 5.00	$ 600.00
SUBTOTAL				**$ 23,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	52	$ 100.00	$ 5,200.00
Remove Existing Combined Sewers	m	52	$ 75.00	$ 3,900.00
Remove Existing Manholes	m	104	$ 15.00	$ 1,560.00
Remove Existing Catch Basins	m	120	$ 12.50	$ 1,500.00
Remove Existing Combined Private Drain Connection	m	52	$ 100.00	$ 5,200.00
Remove Existing Storm Private Drain Connection	m	52	$ 25.00	$ 1,300.00
SUBTOTAL				**$ 19,000.00**
Roadwork				
Earth Excavating and Grading	m	120	$ 120.00	$ 14,400.00
Supply and Place Compacted Granular "A"	m	120	$ 350.00	$ 42,000.00
Asphalt Pavement (105mm)	m	120	$ 250.00	$ 30,000.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	120	$ 270.00	$ 32,400.00
Subdrains (2 lanes)	m	120	$ 60.00	$ 7,200.00
Concrete Curb and Gutter (2 lanes)	m	120	$ 90.00	$ 10,800.00
Concrete Median Islands (1m wide island)	m	20	$ 150.00	$ 3,000.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	120	$ 75.00	$ 9,000.00
Driveway Restoration b) Concrete	m	120	$ 180.00	$ 21,600.00
Topsoil, Hydraulic Seed and Mulch	m	120	$ 100.00	$ 12,000.00
Temporary Pavement Markings	m	120	$ 1.00	$ 120.00
Permananent Pavement Markings	m	120	$ 30.00	$ 3,600.00
Traffic Control During Construction (Arterial)	m	120	$ 200.00	$ 24,000.00
Streetlighting (Arterial)	m	120	$ 400.00	$ 48,000.00
SUBTOTAL				**$ 260,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	52	$ 75.00	$ 3,900.00
Concrete Manholes - (2400mm to 3600mm)	m	120	$ 130.00	$ 15,600.00
Concrete Storm Precast Catchbasins and Leads	m	120	$ 60.00	$ 7,200.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	52	$ 400.00	$ 20,800.00
Sanitary Private Drain Connection	m	52	$ 150.00	$ 7,800.00
Manhole Rain Catchers	m	52	$ 3.00	$ 156.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	120	$ 1,500.00	$ 180,000.00
Storm Private Drain Connection	m	120	$ 20.00	$ 2,400.00
SUBTOTAL				**$ 240,000.00**
Construction Cost Total				**$ 550,000.00**
Construction Cost Contingency (30%)				**$ 170,000.00**
Subtotal				**$ 720,000.00**
Engineering Fee Estimate (20%)				**$ 150,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C16				**$ 870,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

NIAGARA ST	STM-C17
Length of Road Improvements (m)	103 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

NIAGARA ST		STM-C17		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	103	$ 5.00	$ 515.00
Full Depth Asphalt Removal	m	103	$ 80.00	$ 8,240.00
Driveway Removal (all types)	m	103	$ 30.00	$ 3,090.00
Sidewalk Removal (all types)	m	103	$ 20.00	$ 2,060.00
Sawcutting Existing Pavement	m	103	$ 1.00	$ 103.00
Curb and Gutter Removal	m	103	$ 20.00	$ 2,060.00
Streetlighting Removal	m	103	$ 25.00	$ 2,575.00
Signage Removal	m	103	$ 5.00	$ 515.00
SUBTOTAL				**$ 20,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	103	$ 100.00	$ 10,300.00
Remove Existing Combined Sewers	m	103	$ 75.00	$ 7,725.00
Remove Existing Manholes	m	206	$ 15.00	$ 3,090.00
Remove Existing Catch Basins	m	103	$ 12.50	$ 1,287.50
Remove Existing Combined Private Drain Connection	m	103	$ 100.00	$ 10,300.00
Remove Existing Storm Private Drain Connection	m	103	$ 25.00	$ 2,575.00
SUBTOTAL				**$ 36,000.00**
Roadwork				
Earth Excavating and Grading	m	103	$ 120.00	$ 12,360.00
Supply and Place Compacted Granular "A"	m	103	$ 350.00	$ 36,050.00
Asphalt Pavement (105mm)	m	103	$ 250.00	$ 25,750.00
Subdrains (2 lanes)	m	103	$ 60.00	$ 6,180.00
Concrete Curb and Gutter (2 lanes)	m	103	$ 90.00	$ 9,270.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	103	$ 75.00	$ 7,725.00
Driveway Restoration b) Concrete	m	103	$ 180.00	$ 18,540.00
Topsoil, Hydraulic Seed and Mulch	m	103	$ 100.00	$ 10,300.00
Traffic Control During Construction (Residential)	m	103	$ 100.00	$ 10,300.00
Streetlighting (Residential)	m	103	$ 225.00	$ 23,175.00
SUBTOTAL				**$ 160,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	103	$ 75.00	$ 7,725.00
Concrete Manholes - (Chamber)	m	103	$ 200.00	$ 20,600.00
Concrete Storm Precast Catchbasins and Leads	m	103	$ 60.00	$ 6,180.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	103	$ 525.00	$ 54,075.00
Sanitary Private Drain Connection	m	103	$ 150.00	$ 15,450.00
Manhole Rain Catchers	m	103	$ 3.00	$ 309.00
Storm Sewer - 3600mm diameter Concrete (100-D)	m	103	$ 7,500.00	$ 772,500.00
Storm Private Drain Connection	m	103	$ 20.00	$ 2,060.00
SUBTOTAL				**$ 880,000.00**
Construction Cost Total				**$ 1,100,000.00**
Construction Cost Contingency (30%)				**$ 330,000.00**
Subtotal				**$ 1,500,000.00**
Engineering Fee Estimate (20%)				**$ 300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C17				**$ 1,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

LINCOLN RD	STM-C17
Length of Road Improvements (m)	204 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

LINCOLN RD		STM-C17		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	204	$ 5.00	$ 1,020.00
Full Depth Asphalt Removal	m	204	$ 80.00	$ 16,320.00
Driveway Removal (all types)	m	204	$ 30.00	$ 6,120.00
Sidewalk Removal (all types)	m	204	$ 20.00	$ 4,080.00
Sawcutting Existing Pavement	m	204	$ 1.00	$ 204.00
Curb and Gutter Removal	m	204	$ 20.00	$ 4,080.00
Streetlighting Removal	m	204	$ 25.00	$ 5,100.00
Signage Removal	m	204	$ 5.00	$ 1,020.00
SUBTOTAL				**$ 38,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	204	$ 100.00	$ 20,400.00
Remove Existing Combined Sewers	m	204	$ 75.00	$ 15,300.00
Remove Existing Manholes	m	408	$ 15.00	$ 6,120.00
Remove Existing Catch Basins	m	204	$ 12.50	$ 2,550.00
Remove Existing Combined Private Drain Connection	m	204	$ 100.00	$ 20,400.00
Remove Existing Storm Private Drain Connection	m	204	$ 25.00	$ 5,100.00
SUBTOTAL				**$ 70,000.00**
Roadwork				
Earth Excavating and Grading	m	204	$ 120.00	$ 24,480.00
Supply and Place Compacted Granular "A"	m	204	$ 350.00	$ 71,400.00
Asphalt Pavement (105mm)	m	204	$ 250.00	$ 51,000.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	204	$ 270.00	$ 55,080.00
Subdrains (2 lanes)	m	204	$ 60.00	$ 12,240.00
Concrete Curb and Gutter (2 lanes)	m	204	$ 90.00	$ 18,360.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	204	$ 75.00	$ 15,300.00
Driveway Restoration b) Concrete	m	204	$ 180.00	$ 36,720.00
Topsoil, Hydraulic Seed and Mulch	m	204	$ 100.00	$ 20,400.00
Traffic Control During Construction (Residential)	m	204	$ 100.00	$ 20,400.00
Streetlighting (Residential)	m	204	$ 225.00	$ 45,900.00
SUBTOTAL				**$ 380,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	204	$ 75.00	$ 15,300.00
Concrete Manholes - (Chamber)	m	204	$ 200.00	$ 40,800.00
Concrete Storm Precast Catchbasins and Leads	m	204	$ 60.00	$ 12,240.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	204	$ 450.00	$ 91,800.00
Sanitary Private Drain Connection	m	204	$ 150.00	$ 30,600.00
Manhole Rain Catchers	m	204	$ 3.00	$ 612.00
Storm Sewer - 3600mm diameter Concrete (100-D)	m	204	$ 7,500.00	$ 1,530,000.00
Storm Private Drain Connection	m	204	$ 20.00	$ 4,080.00
SUBTOTAL				**$ 1,800,000.00**
Construction Cost Total				**$ 2,300,000.00**
Construction Cost Contingency (30%)				**$ 690,000.00**
Subtotal				**$ 3,000,000.00**
Engineering Fee Estimate (20%)				**$ 600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C17				**$ 3,600,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WALKER RD	STM-C18
Length of Road Improvements (m)	22 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WALKER RD	STM-C18			
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	22	$ 5.00	$ 110.00
Full Depth Asphalt Removal	m	22	$ 80.00	$ 1,760.00
Driveway Removal (all types)	m	22	$ 30.00	$ 660.00
Sidewalk Removal (all types)	m	22	$ 20.00	$ 440.00
Sawcutting Existing Pavement	m	22	$ 1.00	$ 22.00
Curb and Gutter Removal	m	22	$ 20.00	$ 440.00
Streetlighting Removal	m	22	$ 25.00	$ 550.00
Signage Removal	m	22	$ 5.00	$ 110.00
SUBTOTAL				**$ 5,000.00**
Sewer Removals				
Remove Existing Catch Basins	m	22	$ 12.50	$ 275.00
SUBTOTAL				**$ 300.00**
Roadwork				
Earth Excavating and Grading	m	22	$ 120.00	$ 2,640.00
Supply and Place Compacted Granular "A"	m	22	$ 350.00	$ 7,700.00
100mm Open Graded Drainage Layer	m	22	$ 225.00	$ 4,950.00
Concrete Pavement (305mm)	m	22	$ 575.00	$ 12,650.00
Subdrains (2 lanes)	m	22	$ 60.00	$ 1,320.00
Concrete Curb and Gutter (2 lanes)	m	22	$ 90.00	$ 1,980.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	22	$ 75.00	$ 1,650.00
Driveway Restoration a) Asphalt	m	22	$ 320.00	$ 7,040.00
Topsoil, Hydraulic Seed and Mulch	m	22	$ 100.00	$ 2,200.00
Temporary Pavement Markings	m	22	$ 1.00	$ 22.00
Permananent Pavement Markings	m	22	$ 30.00	$ 660.00
Traffic Control During Construction (Arterial)	m	22	$ 200.00	$ 4,400.00
Streetlighting (Arterial)	m	22	$ 400.00	$ 8,800.00
Street Trees (In Boulevard / 12m spacing each side)	m	22	$ 125.00	$ 2,750.00
SUBTOTAL				**$ 59,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	22	$ 130.00	$ 2,860.00
Concrete Storm Precast Catchbasins and Leads	m	22	$ 60.00	$ 1,320.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	22	$ 3,000.00	$ 66,000.00
Storm Private Drain Connection	m	22	$ 20.00	$ 440.00
SUBTOTAL				**$ 71,000.00**
Construction Cost Total				**$ 140,000.00**
Construction Cost Contingency (30%)				**$ 42,000.00**
Subtotal				**$ 190,000.00**
Engineering Fee Estimate (20%)				**$ 38,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C18				**$ 228,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ONTARIO ST	STM-C18
Length of Road Improvements (m)	422 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ONTARIO ST		STM-C18		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	422	$ 5.00	$ 2,110.00
Full Depth Asphalt Removal	m	422	$ 80.00	$ 33,760.00
Driveway Removal (all types)	m	422	$ 30.00	$ 12,660.00
Sidewalk Removal (all types)	m	422	$ 20.00	$ 8,440.00
Sawcutting Existing Pavement	m	422	$ 1.00	$ 422.00
Curb and Gutter Removal	m	422	$ 20.00	$ 8,440.00
Streetlighting Removal	m	422	$ 25.00	$ 10,550.00
Signage Removal	m	422	$ 5.00	$ 2,110.00
SUBTOTAL				**$ 79,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	193	$ 75.00	$ 14,475.00
Remove Existing Manholes	m	193	$ 15.00	$ 2,895.00
Remove Existing Catch Basins	m	422	$ 12.50	$ 5,275.00
Remove Existing Combined Private Drain Connection	m	193	$ 100.00	$ 19,300.00
SUBTOTAL				**$ 42,000.00**
Roadwork				
Earth Excavating and Grading	m	422	$ 120.00	$ 50,640.00
Supply and Place Compacted Granular "A"	m	422	$ 350.00	$ 147,700.00
Asphalt Pavement (105mm)	m	422	$ 250.00	$ 105,500.00
Subdrains (2 lanes)	m	422	$ 60.00	$ 25,320.00
Concrete Curb and Gutter (2 lanes)	m	422	$ 90.00	$ 37,980.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	422	$ 75.00	$ 31,650.00
Driveway Restoration b) Concrete	m	422	$ 180.00	$ 75,960.00
Topsoil, Hydraulic Seed and Mulch	m	422	$ 100.00	$ 42,200.00
Traffic Control During Construction (Residential)	m	422	$ 100.00	$ 42,200.00
Streetlighting (Residential)	m	422	$ 225.00	$ 94,950.00
Street Trees (In Boulevard / 12m spacing each side)	m	422	$ 125.00	$ 52,750.00
SUBTOTAL				**$ 710,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	193	$ 75.00	$ 14,475.00
Concrete Manholes - (2400mm to 3600mm)	m	422	$ 130.00	$ 54,860.00
Concrete Storm Precast Catchbasins and Leads	m	422	$ 60.00	$ 25,320.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	193	$ 400.00	$ 77,200.00
Sanitary Private Drain Connection	m	193	$ 150.00	$ 28,950.00
Manhole Rain Catchers	m	193	$ 3.00	$ 579.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	150	$ 3,000.00	$ 450,000.00
Storm Sewer - 1950mm diameter Concrete (100-D)	m	272	$ 3,250.00	$ 884,000.00
Storm Private Drain Connection	m	422	$ 20.00	$ 8,440.00
SUBTOTAL				**$ 1,600,000.00**
Construction Cost Total				**$ 2,500,000.00**
Construction Cost Contingency (30%)				**$ 750,000.00**
Subtotal				**$ 3,250,000.00**
Engineering Fee Estimate (20%)				**$ 650,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C18				**$ 3,900,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WALKER RD	STM-C19
Length of Road Improvements (m)	233 m
Number of Lanes	5
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WALKER RD		STM-C19		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	233	$ 5.00	$ 1,165.00
Full Depth Concrete Asphalt Removal	m	233	$ 312.50	$ 72,812.50
Driveway Removal (all types)	m	233	$ 30.00	$ 6,990.00
Sidewalk Removal (all types)	m	233	$ 20.00	$ 4,660.00
Sawcutting Existing Pavement	m	233	$ 1.00	$ 233.00
Curb and Gutter Removal	m	233	$ 20.00	$ 4,660.00
Streetlighting Removal	m	233	$ 25.00	$ 5,825.00
Signage Removal	m	233	$ 5.00	$ 1,165.00
SUBTOTAL				**$ 98,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	233	$ 100.00	$ 23,300.00
Remove Existing Combined Sewers	m	233	$ 75.00	$ 17,475.00
Remove Existing Manholes	m	466	$ 15.00	$ 6,990.00
Remove Existing Catch Basins	m	233	$ 12.50	$ 2,912.50
Remove Existing Combined Private Drain Connection	m	233	$ 100.00	$ 23,300.00
Remove Existing Storm Private Drain Connection	m	233	$ 25.00	$ 5,825.00
SUBTOTAL				**$ 80,000.00**
Roadwork				
Earth Excavating and Grading	m	233	$ 300.00	$ 69,900.00
Supply and Place Compacted Granular "A"	m	233	$ 875.00	$ 203,875.00
100mm Open Graded Drainage Layer	m	233	$ 562.50	$ 131,062.50
Concrete Pavement (305mm)	m	233	$ 1,437.50	$ 334,937.50
Subdrains (2 lanes)	m	233	$ 60.00	$ 13,980.00
Concrete Curb and Gutter (2 lanes)	m	233	$ 90.00	$ 20,970.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	233	$ 75.00	$ 17,475.00
Driveway Restoration b) Concrete	m	233	$ 180.00	$ 41,940.00
Topsoil, Hydraulic Seed and Mulch	m	233	$ 100.00	$ 23,300.00
Temporary Pavement Markings	m	233	$ 1.00	$ 233.00
Permananent Pavement Markings	m	233	$ 30.00	$ 6,990.00
Traffic Control During Construction (Arterial)	m	233	$ 200.00	$ 46,600.00
Streetlighting (Arterial)	m	233	$ 400.00	$ 93,200.00
Street Trees (In Boulevard / 12m spacing each side)	m	233	$ 125.00	$ 29,125.00
SUBTOTAL				**$ 1,100,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	233	$ 75.00	$ 17,475.00
Concrete Manholes - (2400mm to 3600mm)	m	233	$ 130.00	$ 30,290.00
Concrete Storm Precast Catchbasins and Leads	m	233	$ 60.00	$ 13,980.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	233	$ 525.00	$ 122,325.00
Sanitary Private Drain Connection	m	233	$ 150.00	$ 34,950.00
Manhole Rain Catchers	m	233	$ 3.00	$ 699.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	233	$ 1,800.00	$ 419,400.00
Storm Private Drain Connection	m	233	$ 20.00	$ 4,660.00
SUBTOTAL				**$ 650,000.00**
Construction Cost Total				**$ 2,000,000.00**
Construction Cost Contingency (30%)				**$ 600,000.00**
Subtotal				**$ 2,600,000.00**
Engineering Fee Estimate (20%)				**$ 520,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C19				**$ 3,120,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

MOHAWK ST	STM-C19
Length of Road Improvements (m)	404 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MOHAWK ST		STM-C19		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	404	$ 5.00	$ 2,020.00
Full Depth Asphalt Removal	m	404	$ 80.00	$ 32,320.00
Driveway Removal (all types)	m	404	$ 30.00	$ 12,120.00
Sawcutting Existing Pavement	m	404	$ 1.00	$ 404.00
Curb and Gutter Removal	m	404	$ 20.00	$ 8,080.00
Streetlighting Removal	m	404	$ 25.00	$ 10,100.00
Signage Removal	m	404	$ 5.00	$ 2,020.00
SUBTOTAL				**$ 68,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	404	$ 100.00	$ 40,400.00
Remove Existing Combined Sewers	m	315	$ 75.00	$ 23,625.00
Remove Existing Manholes	m	719	$ 15.00	$ 10,785.00
Remove Existing Catch Basins	m	404	$ 12.50	$ 5,050.00
Remove Existing Combined Private Drain Connection	m	315	$ 100.00	$ 31,500.00
Remove Existing Storm Private Drain Connection	m	404	$ 25.00	$ 10,100.00
SUBTOTAL				**$ 130,000.00**
Roadwork				
Earth Excavating and Grading	m	404	$ 120.00	$ 48,480.00
Supply and Place Compacted Granular "A"	m	404	$ 350.00	$ 141,400.00
Asphalt Pavement (105mm)	m	404	$ 250.00	$ 101,000.00
Subdrains (2 lanes)	m	404	$ 60.00	$ 24,240.00
Concrete Curb and Gutter (2 lanes)	m	404	$ 90.00	$ 36,360.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	404	$ 75.00	$ 30,300.00
Driveway Restoration b) Concrete	m	404	$ 180.00	$ 72,720.00
Topsoil, Hydraulic Seed and Mulch	m	404	$ 100.00	$ 40,400.00
Traffic Control During Construction (Residential)	m	404	$ 100.00	$ 40,400.00
Streetlighting (Residential)	m	404	$ 225.00	$ 90,900.00
SUBTOTAL				**$ 630,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	315	$ 75.00	$ 23,625.00
Concrete Manholes - (2400mm to 3600mm)	m	404	$ 130.00	$ 52,520.00
Concrete Storm Precast Catchbasins and Leads	m	404	$ 60.00	$ 24,240.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	255	$ 450.00	$ 114,750.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	60	$ 450.00	$ 27,000.00
Sanitary Private Drain Connection	m	315	$ 150.00	$ 47,250.00
Manhole Rain Catchers	m	315	$ 3.00	$ 945.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	404	$ 1,800.00	$ 727,200.00
Storm Private Drain Connection	m	404	$ 20.00	$ 8,080.00
SUBTOTAL				**$ 1,100,000.00**
Construction Cost Total				**$ 2,000,000.00**
Construction Cost Contingency (30%)				**$ 600,000.00**
Subtotal				**$ 2,600,000.00**
Engineering Fee Estimate (20%)				**$ 520,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - STM-C19				**$ 3,120,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

DOUGALL AVENUE/EUGENIE ST E	ROAD-S1-1
Length of Road Improvements (m)	1459 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

DOUGALL AVENUE/EUGENIE ST E	ROAD-S1-1			
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1459	$ 5.00	$ 7,295.00
Full Depth Asphalt Removal	m	1459	$ 160.00	$ 233,440.00
Driveway Removal (all types)	m	1459	$ 30.00	$ 43,770.00
Sidewalk Removal (all types)	m	460	$ 20.00	$ 9,200.00
Concrete Median Removal	m	970	$ 10.00	$ 9,700.00
Sawcutting Existing Pavement	m	1459	$ 1.00	$ 1,459.00
Curb and Gutter Removal	m	1459	$ 20.00	$ 29,180.00
Streetlighting Removal	m	1459	$ 25.00	$ 36,475.00
Signage Removal	m	1459	$ 5.00	$ 7,295.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 400,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	900	$ 100.00	$ 90,000.00
Remove Existing Manholes	m	900	$ 15.00	$ 13,500.00
Remove Existing Catch Basins	m	900	$ 12.50	$ 11,250.00
Remove Existing Storm Private Drain Connection	m	900	$ 25.00	$ 22,500.00
SUBTOTAL				**$ 140,000.00**
Roadwork				
Earth Excavating and Grading	m	1459	$ 240.00	$ 350,160.00
Supply and Place Compacted Granular "A"	m	1459	$ 700.00	$ 1,021,300.00
100mm Open Graded Drainage Layer	m	1459	$ 450.00	$ 656,550.00
Concrete Pavement (305mm)	m	1459	$ 1,150.00	$ 1,677,850.00
Subdrains (2 lanes)	m	1459	$ 60.00	$ 87,540.00
Concrete Curb and Gutter (2 lanes)	m	1459	$ 90.00	$ 131,310.00
Concrete Median Islands (1m wide island)	m	970	$ 150.00	$ 145,500.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1459	$ 75.00	$ 109,425.00
Driveway Restoration a) Asphalt	m	1459	$ 320.00	$ 466,880.00
Topsoil, Hydraulic Seed and Mulch	m	1459	$ 100.00	$ 145,900.00
Temporary Pavement Markings	m	1459	$ 1.00	$ 1,459.00
Permananent Pavement Markings	m	1459	$ 30.00	$ 43,770.00
Traffic Control During Construction (Arterial)	m	1459	$ 200.00	$ 291,800.00
Streetlighting (Arterial)	m	1459	$ 400.00	$ 583,600.00
Street Trees (In Boulevard / 12m spacing each side)	m	1459	$ 125.00	$ 182,375.00
Traffic Signals (Minor Intersection)	LS	3	$ 150,000.00	$ 450,000.00
Traffic Signals (Major Intersection)	LS	3	$ 200,000.00	$ 600,000.00
Traffic Signals (Temporary)	LS	6	$ 80,000.00	$ 480,000.00
SUBTOTAL				**$ 7,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	414	$ 75.00	$ 31,050.00
Concrete Manholes - (2400mm to 3600mm)	m	465	$ 130.00	$ 60,450.00
Concrete Manholes - (Chamber)	m	525	$ 200.00	$ 105,000.00
Concrete Storm Precast Catchbasins and Leads	m	1459	$ 60.00	$ 87,540.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	288	$ 700.00	$ 201,600.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	39	$ 850.00	$ 33,150.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	98	$ 1,200.00	$ 117,600.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	196	$ 1,800.00	$ 352,800.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	298	$ 3,000.00	$ 894,000.00
Storm Sewer - 2400mm x 1200mm Concrete Box Culvert	m	526	$ 6,400.00	$ 3,366,400.00
Storm Private Drain Connection	m	969	$ 20.00	$ 19,380.00
SUBTOTAL				**$ 5,300,000.00**
Ponds & Undergound Storage				
Pond Excavation, Grading, Topsoil and Hydroseed	m^3	26800	$ 300.00	$ 8,040,000.00
SUBTOTAL				**$ 8,100,000.00**
Construction Cost Total				**$ 21,500,000.00**
Construction Cost Contingency (30%)				**$ 6,500,000.00**
Subtotal				**$ 28,000,000.00**
Engineering Fee Estimate (20%)				**$ 5,600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-S1-1				**$ 33,600,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

HOWARD AVE	ROAD-S2-2
Length of Road Improvements (m)	610 m
Number of Lanes	5
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

HOWARD AVE		ROAD-S2-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Full Depth Asphalt Removal	m	610	$ 200.00	$ 122,000.00
Driveway Removal (all types)	m	610	$ 30.00	$ 18,300.00
Sidewalk Removal (all types)	m	610	$ 20.00	$ 12,200.00
Concrete Median Removal	m	125	$ 10.00	$ 1,250.00
Sawcutting Existing Pavement	m	610	$ 1.00	$ 610.00
Curb and Gutter Removal	m	610	$ 20.00	$ 12,200.00
Streetlighting Removal	m	610	$ 25.00	$ 15,250.00
Signage Removal	m	610	$ 5.00	$ 3,050.00
Traffic Signal Removal	LS	2	$ 15,000.00	$ 30,000.00
SUBTOTAL				**$ 220,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1219	$ 100.00	$ 121,900.00
Remove Existing Manholes	m	1219	$ 15.00	$ 18,285.00
Remove Existing Catch Basins	m	1219	$ 12.50	$ 15,237.50
Remove Existing Storm Private Drain Connection	m	1219	$ 25.00	$ 30,475.00
SUBTOTAL				**$ 190,000.00**
Roadwork				
Earth Excavating and Grading	m	610	$ 300.00	$ 183,000.00
Supply and Place Compacted Granular "A"	m	610	$ 875.00	$ 533,750.00
100mm Open Graded Drainage Layer	m	610	$ 562.50	$ 343,125.00
Concrete Pavement (305mm)	m	610	$ 1,437.50	$ 876,875.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	85	$ 270.00	$ 22,950.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	525	$ 392.00	$ 205,800.00
Subdrains (2 lanes)	m	610	$ 60.00	$ 36,600.00
Concrete Curb and Gutter (2 lanes)	m	610	$ 90.00	$ 54,900.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	610	$ 75.00	$ 45,750.00
Driveway Restoration b) Concrete	m	610	$ 180.00	$ 109,800.00
Topsoil, Hydraulic Seed and Mulch	m	610	$ 100.00	$ 61,000.00
Temporary Pavement Markings	m	610	$ 1.00	$ 610.00
Permananent Pavement Markings	m	610	$ 30.00	$ 18,300.00
Traffic Control During Construction (Arterial)	m	610	$ 200.00	$ 122,000.00
Streetlighting (Arterial)	m	610	$ 400.00	$ 244,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	610	$ 125.00	$ 76,250.00
Traffic Signals (Major Intersection)	LS	2	$ 200,000.00	$ 400,000.00
SUBTOTAL				**$ 3,400,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1016	$ 75.00	$ 76,200.00
Concrete Manholes - (2400mm to 3600mm)	m	203	$ 130.00	$ 26,390.00
Concrete Storm Precast Catchbasins and Leads	m	1016	$ 60.00	$ 60,960.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	1016	$ 850.00	$ 863,600.00
Storm Sewer - 1200mm x 900mm Concrete Box Culvert	m	203	$ 3,000.00	$ 609,000.00
Storm Private Drain Connection	m	1219	$ 20.00	$ 24,380.00
SUBTOTAL				**$ 1,700,000.00**
Ponds & Undergound Storage				
Pond Excavation, Grading, Topsoil and Hydroseed	m^3	2433	$ 300.00	$ 729,900.00
SUBTOTAL				**$ 730,000.00**
Construction Cost Total				**$ 6,300,000.00**
Construction Cost Contingency (30%)				**$ 1,900,000.00**
Subtotal				**$ 8,200,000.00**
Engineering Fee Estimate (20%)				**$ 1,700,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-S2-2				**$ 9,900,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CHRYSLER CENTRE	ROAD-S3-2
Length of Road Improvements (m)	1185 m
Number of Lanes	6
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

CHRYSLER CENTRE		ROAD-S3-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1185	$ 5.00	$ 5,925.00
Full Depth Asphalt Removal	m	1185	$ 240.00	$ 284,400.00
Driveway Removal (all types)	m	1185	$ 30.00	$ 35,550.00
Sidewalk Removal (all types)	m	1185	$ 20.00	$ 23,700.00
Sawcutting Existing Pavement	m	1185	$ 1.00	$ 1,185.00
Curb and Gutter Removal	m	1185	$ 20.00	$ 23,700.00
Streetlighting Removal	m	1185	$ 25.00	$ 29,625.00
Signage Removal	m	1185	$ 5.00	$ 5,925.00
SUBTOTAL				**$ 420,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1185	$ 100.00	$ 118,500.00
Remove Existing Manholes	m	1185	$ 15.00	$ 17,775.00
Remove Existing Catch Basins	m	1185	$ 12.50	$ 14,812.50
Remove Existing Storm Private Drain Connection	m	1185	$ 25.00	$ 29,625.00
SUBTOTAL				**$ 190,000.00**
Roadwork				
Earth Excavating and Grading	m	1185	$ 360.00	$ 426,600.00
Supply and Place Compacted Granular "A"	m	1185	$ 1,050.00	$ 1,244,250.00
100mm Open Graded Drainage Layer	m	1185	$ 675.00	$ 799,875.00
Concrete Pavement (305mm)	m	1185	$ 1,725.00	$ 2,044,125.00
Subdrains (2 lanes)	m	1185	$ 60.00	$ 71,100.00
Concrete Curb and Gutter (2 lanes)	m	1185	$ 90.00	$ 106,650.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1185	$ 75.00	$ 88,875.00
Driveway Restoration b) Concrete	m	1185	$ 180.00	$ 213,300.00
Topsoil, Hydraulic Seed and Mulch	m	1185	$ 100.00	$ 118,500.00
Temporary Pavement Markings	m	1185	$ 1.00	$ 1,185.00
Permananent Pavement Markings	m	1185	$ 30.00	$ 35,550.00
Traffic Control During Construction (Arterial)	m	1185	$ 200.00	$ 237,000.00
Streetlighting (Arterial)	m	1185	$ 400.00	$ 474,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	1185	$ 125.00	$ 148,125.00
SUBTOTAL				**$ 6,100,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	737	$ 75.00	$ 55,275.00
Concrete Manholes - (2400mm to 3600mm)	m	448	$ 130.00	$ 58,240.00
Concrete Storm Precast Catchbasins and Leads	m	1185	$ 60.00	$ 71,100.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	111	$ 500.00	$ 55,500.00
Storm Sewer - 675mm diameter Concrete (65-D)	m	129	$ 550.00	$ 70,950.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	497	$ 1,200.00	$ 596,400.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	247	$ 1,500.00	$ 370,500.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	201	$ 2,200.00	$ 442,200.00
Storm Private Drain Connection	m	1185	$ 20.00	$ 23,700.00
SUBTOTAL				**$ 1,800,000.00**
Ponds & Undergound Storage				
Underground Storage	m^3	11000	$ 1,000.00	$ 11,000,000.00
SUBTOTAL				**$ 11,000,000.00**
Construction Cost Total				**$ 19,600,000.00**
Construction Cost Contingency (30%)				**$ 5,900,000.00**
Subtotal				**$ 25,500,000.00**
Engineering Fee Estimate (20%)				**$ 5,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**ROAD-S3-2**		**$ 30,600,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

PILLETTE RD	ROAD-S7-3
Length of Road Improvements (m)	517 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

PILLETTE RD		ROAD-S7-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	517	$ 5.00	$ 2,585.00
Full Depth Asphalt Removal	m	517	$ 80.00	$ 41,360.00
Driveway Removal (all types)	m	517	$ 30.00	$ 15,510.00
Sidewalk Removal (all types)	m	517	$ 20.00	$ 10,340.00
Sawcutting Existing Pavement	m	517	$ 1.00	$ 517.00
Curb and Gutter Removal	m	517	$ 20.00	$ 10,340.00
Streetlighting Removal	m	517	$ 25.00	$ 12,925.00
Signage Removal	m	517	$ 5.00	$ 2,585.00
SUBTOTAL				**$ 97,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	517	$ 100.00	$ 51,700.00
Remove Existing Manholes	m	517	$ 15.00	$ 7,755.00
Remove Existing Catch Basins	m	517	$ 12.50	$ 6,462.50
Remove Existing Storm Private Drain Connection	m	517	$ 25.00	$ 12,925.00
SUBTOTAL				**$ 79,000.00**
Roadwork				
Earth Excavating and Grading	m	517	$ 120.00	$ 62,040.00
Supply and Place Compacted Granular "A"	m	517	$ 350.00	$ 180,950.00
100mm Open Graded Drainage Layer	m	517	$ 225.00	$ 116,325.00
Concrete Pavement (305mm)	m	517	$ 575.00	$ 297,275.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	517	$ 392.00	$ 202,664.00
Subdrains (2 lanes)	m	517	$ 60.00	$ 31,020.00
Concrete Curb and Gutter (2 lanes)	m	517	$ 90.00	$ 46,530.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	517	$ 75.00	$ 38,775.00
Driveway Restoration b) Concrete	m	517	$ 180.00	$ 93,060.00
Topsoil, Hydraulic Seed and Mulch	m	517	$ 100.00	$ 51,700.00
Temporary Pavement Markings	m	517	$ 1.00	$ 517.00
Permananent Pavement Markings	m	517	$ 30.00	$ 15,510.00
Traffic Control During Construction (Arterial)	m	517	$ 200.00	$ 103,400.00
Streetlighting (Arterial)	m	517	$ 400.00	$ 206,800.00
SUBTOTAL				**$ 1,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	517	$ 75.00	$ 38,775.00
Concrete Storm Precast Catchbasins and Leads	m	517	$ 60.00	$ 31,020.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	182	$ 700.00	$ 127,400.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	335	$ 850.00	$ 284,750.00
Storm Private Drain Connection	m	517	$ 20.00	$ 10,340.00
SUBTOTAL				**$ 500,000.00**
Construction Cost Total				**$ 2,200,000.00**
Construction Cost Contingency (30%)				**$ 660,000.00**
Subtotal				**$ 2,900,000.00**
Engineering Fee Estimate (20%)				**$ 580,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**ROAD-S7-3**		**$ 3,500,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

TOURANGEAU RD	ROAD-S7-3
Length of Road Improvements (m)	543 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	Yes
Existing Street Lights	No
Traffic Signals	No

TOURANGEAU RD	ROAD-S7-3			
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	543	$ 5.00	$ 2,715.00
Full Depth Concrete Asphalt Removal	m	543	$ 125.00	$ 67,875.00
Driveway Removal (all types)	m	543	$ 30.00	$ 16,290.00
Sawcutting Existing Pavement	m	543	$ 1.00	$ 543.00
Curb and Gutter Removal	m	543	$ 20.00	$ 10,860.00
Signage Removal	m	543	$ 5.00	$ 2,715.00
SUBTOTAL				**$ 110,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	543	$ 100.00	$ 54,300.00
Remove Existing Manholes	m	543	$ 15.00	$ 8,145.00
Remove Existing Catch Basins	m	543	$ 12.50	$ 6,787.50
Remove Existing Storm Private Drain Connection	m	543	$ 25.00	$ 13,575.00
SUBTOTAL				**$ 90,000.00**
Roadwork				
Earth Excavating and Grading	m	543	$ 120.00	$ 65,160.00
Supply and Place Compacted Granular "A"	m	543	$ 350.00	$ 190,050.00
100mm Open Graded Drainage Layer	m	543	$ 225.00	$ 122,175.00
Concrete Pavement (305mm)	m	543	$ 575.00	$ 312,225.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	543	$ 392.00	$ 212,856.00
Subdrains (2 lanes)	m	543	$ 60.00	$ 32,580.00
Concrete Curb and Gutter (2 lanes)	m	543	$ 90.00	$ 48,870.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	543	$ 75.00	$ 40,725.00
Driveway Restoration b) Concrete	m	543	$ 180.00	$ 97,740.00
Topsoil, Hydraulic Seed and Mulch	m	543	$ 100.00	$ 54,300.00
Traffic Control During Construction (Residential)	m	543	$ 100.00	$ 54,300.00
Streetlighting (Residential)	m	543	$ 225.00	$ 122,175.00
SUBTOTAL				**$ 1,360,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	543	$ 75.00	$ 40,725.00
Concrete Storm Precast Catchbasins and Leads	m	543	$ 60.00	$ 32,580.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	120	$ 450.00	$ 54,000.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	120	$ 500.00	$ 60,000.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	303	$ 600.00	$ 181,800.00
Storm Private Drain Connection	m	543	$ 20.00	$ 10,860.00
SUBTOTAL				**$ 380,000.00**
Construction Cost Total				**$ 2,000,000.00**
Construction Cost Contingency (30%)				**$ 600,000.00**
Subtotal				**$ 2,600,000.00**
Engineering Fee Estimate (20%)				**$ 520,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-S7-3				**$ 3,120,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

GEORGE AVE	ROAD-S7-3
Length of Road Improvements (m)	466 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

GEORGE AVE		ROAD-S7-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	466	$ 5.00	$ 2,330.00
Full Depth Asphalt Removal	m	466	$ 80.00	$ 37,280.00
Driveway Removal (all types)	m	466	$ 30.00	$ 13,980.00
Sidewalk Removal (all types)	m	466	$ 20.00	$ 9,320.00
Sawcutting Existing Pavement	m	466	$ 1.00	$ 466.00
Curb and Gutter Removal	m	466	$ 20.00	$ 9,320.00
Signage Removal	m	466	$ 5.00	$ 2,330.00
SUBTOTAL				**$ 76,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	466	$ 100.00	$ 46,600.00
Remove Existing Manholes	m	466	$ 15.00	$ 6,990.00
Remove Existing Catch Basins	m	466	$ 12.50	$ 5,825.00
Remove Existing Storm Private Drain Connection	m	466	$ 25.00	$ 11,650.00
SUBTOTAL				**$ 72,000.00**
Roadwork				
Earth Excavating and Grading	m	466	$ 120.00	$ 55,920.00
Supply and Place Compacted Granular "A"	m	466	$ 350.00	$ 163,100.00
Asphalt Pavement (105mm)	m	466	$ 250.00	$ 116,500.00
Subdrains (2 lanes)	m	466	$ 60.00	$ 27,960.00
Concrete Curb and Gutter (2 lanes)	m	466	$ 90.00	$ 41,940.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	466	$ 75.00	$ 34,950.00
Driveway Restoration b) Concrete	m	466	$ 180.00	$ 83,880.00
Topsoil, Hydraulic Seed and Mulch	m	466	$ 100.00	$ 46,600.00
Traffic Control During Construction (Residential)	m	466	$ 100.00	$ 46,600.00
Streetlighting (Residential)	m	466	$ 225.00	$ 104,850.00
SUBTOTAL				**$ 730,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	466	$ 75.00	$ 34,950.00
Concrete Storm Precast Catchbasins and Leads	m	466	$ 60.00	$ 27,960.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	240	$ 450.00	$ 108,000.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	226	$ 500.00	$ 113,000.00
Storm Private Drain Connection	m	466	$ 20.00	$ 9,320.00
SUBTOTAL				**$ 300,000.00**
Construction Cost Total				**$ 1,200,000.00**
Construction Cost Contingency (30%)				**$ 360,000.00**
Subtotal				**$ 1,600,000.00**
Engineering Fee Estimate (20%)				**$ 320,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-S7-3				**$ 2,000,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

PLYMOUTH DR	ROAD-S7-3
Length of Road Improvements (m)	198 m
Number of Lanes	6
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

PLYMOUTH DR		ROAD-S7-3		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	198	$ 5.00	$ 990.00
Full Depth Concrete Asphalt Removal	m	198	$ 375.00	$ 74,250.00
Sidewalk Removal (all types)	m	198	$ 20.00	$ 3,960.00
Concrete Median Removal	m	83	$ 10.00	$ 830.00
Sawcutting Existing Pavement	m	198	$ 1.00	$ 198.00
Curb and Gutter Removal	m	198	$ 20.00	$ 3,960.00
Streetlighting Removal	m	198	$ 25.00	$ 4,950.00
Signage Removal	m	198	$ 5.00	$ 990.00
SUBTOTAL				**$ 91,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	198	$ 100.00	$ 19,800.00
Remove Existing Manholes	m	198	$ 15.00	$ 2,970.00
Remove Existing Catch Basins	m	198	$ 12.50	$ 2,475.00
SUBTOTAL				**$ 26,000.00**
Roadwork				
Earth Excavating and Grading	m	198	$ 360.00	$ 71,280.00
Supply and Place Compacted Granular "A"	m	198	$ 1,050.00	$ 207,900.00
100mm Open Graded Drainage Layer	m	198	$ 675.00	$ 133,650.00
Concrete Pavement (305mm)	m	198	$ 1,725.00	$ 341,550.00
Subdrains (2 lanes)	m	198	$ 60.00	$ 11,880.00
Concrete Curb and Gutter (2 lanes)	m	198	$ 90.00	$ 17,820.00
Concrete Median Islands (1m wide island)	m	83	$ 150.00	$ 12,450.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	198	$ 75.00	$ 14,850.00
Topsoil, Hydraulic Seed and Mulch	m	198	$ 100.00	$ 19,800.00
Temporary Pavement Markings	m	198	$ 1.00	$ 198.00
Permananent Pavement Markings	m	198	$ 30.00	$ 5,940.00
Traffic Control During Construction (Arterial)	m	198	$ 200.00	$ 39,600.00
Streetlighting (Arterial)	m	198	$ 400.00	$ 79,200.00
SUBTOTAL				**$ 960,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	198	$ 130.00	$ 25,740.00
Concrete Storm Precast Catchbasins and Leads	m	198	$ 60.00	$ 11,880.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	50	$ 2,200.00	$ 110,000.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	91	$ 2,500.00	$ 227,500.00
Storm Sewer - 1800mm diameter Concrete (100-D)	m	57	$ 3,000.00	$ 171,000.00
SUBTOTAL				**$ 550,000.00**
Construction Cost Total				**$ 1,700,000.00**
Construction Cost Contingency (30%)				**$ 510,000.00**
Subtotal				**$ 2,300,000.00**
Engineering Fee Estimate (20%)				**$ 460,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-S7-3				**$ 2,800,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

GRAND MARAIS RD E	ROAD-S7-3
Length of Road Improvements (m)	1041 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GRAND MARAIS RD E		ROAD-S7-3		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1041	$ 5.00	$ 5,205.00
Full Depth Asphalt Removal	m	1041	$ 80.00	$ 83,280.00
Driveway Removal (all types)	m	1041	$ 30.00	$ 31,230.00
Sidewalk Removal (all types)	m	1041	$ 20.00	$ 20,820.00
Sawcutting Existing Pavement	m	1041	$ 1.00	$ 1,041.00
Streetlighting Removal	m	1041	$ 25.00	$ 26,025.00
Signage Removal	m	1041	$ 5.00	$ 5,205.00
SUBTOTAL				**$ 180,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1041	$ 100.00	$ 104,100.00
Remove Existing Manholes	m	1041	$ 15.00	$ 15,615.00
Remove Existing Catch Basins	m	1041	$ 12.50	$ 13,012.50
Remove Existing Storm Private Drain Connection	m	1041	$ 25.00	$ 26,025.00
SUBTOTAL				**$ 160,000.00**
Roadwork				
Earth Excavating and Grading	m	1041	$ 120.00	$ 124,920.00
Supply and Place Compacted Granular "A"	m	1041	$ 350.00	$ 364,350.00
Asphalt Pavement (105mm)	m	1041	$ 250.00	$ 260,250.00
Subdrains (2 lanes)	m	1041	$ 60.00	$ 62,460.00
Concrete Curb and Gutter (2 lanes)	m	1041	$ 90.00	$ 93,690.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1041	$ 75.00	$ 78,075.00
Driveway Restoration a) Asphalt	m	1041	$ 320.00	$ 333,120.00
Topsoil, Hydraulic Seed and Mulch	m	1041	$ 100.00	$ 104,100.00
Temporary Pavement Markings	m	1041	$ 1.00	$ 1,041.00
Permananent Pavement Markings	m	1041	$ 30.00	$ 31,230.00
Traffic Control During Construction (Arterial)	m	1041	$ 200.00	$ 208,200.00
Streetlighting (Arterial)	m	1041	$ 400.00	$ 416,400.00
SUBTOTAL				**$ 2,100,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	18	$ 75.00	$ 1,350.00
Concrete Manholes - (2400mm to 3600mm)	m	1023	$ 130.00	$ 132,990.00
Concrete Storm Precast Catchbasins and Leads	m	1041	$ 60.00	$ 62,460.00
Storm Sewer - 300mm diameter PVC (DR-35)	m	18	$ 325.00	$ 5,850.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	365	$ 1,500.00	$ 547,500.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	343	$ 2,200.00	$ 754,600.00
Storm Sewer - 1650mm diameter Concrete (100-D)	m	297	$ 2,500.00	$ 742,500.00
Storm Private Drain Connection	m	1041	$ 20.00	$ 20,820.00
SUBTOTAL				**$ 2,300,000.00**
Construction Cost Total				**$ 4,800,000.00**
Construction Cost Contingency (30%)				**$ 1,500,000.00**
Subtotal				**$ 6,300,000.00**
Engineering Fee Estimate (20%)				**$ 1,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - ROAD-S7-3				**$ 7,600,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CENTRAL AVE	ROAD-S7-3
Length of Road Improvements (m)	1300 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

CENTRAL AVE		ROAD-S7-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1300	$ 5.00	$ 6,500.00
Full Depth Asphalt Removal	m	1300	$ 160.00	$ 208,000.00
Driveway Removal (all types)	m	1300	$ 30.00	$ 39,000.00
Sidewalk Removal (all types)	m	1300	$ 20.00	$ 26,000.00
Sawcutting Existing Pavement	m	1300	$ 1.00	$ 1,300.00
Curb and Gutter Removal	m	1300	$ 20.00	$ 26,000.00
Streetlighting Removal	m	1300	$ 25.00	$ 32,500.00
Signage Removal	m	1300	$ 5.00	$ 6,500.00
SUBTOTAL				**$ 400,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	1844	$ 100.00	$ 184,400.00
Remove Existing Manholes	m	1844	$ 15.00	$ 27,660.00
Remove Existing Catch Basins	m	1844	$ 12.50	$ 23,050.00
Remove Existing Storm Private Drain Connection	m	1844	$ 25.00	$ 46,100.00
SUBTOTAL				**$ 300,000.00**
Roadwork				
Earth Excavating and Grading	m	1300	$ 240.00	$ 312,000.00
Supply and Place Compacted Granular "A"	m	1300	$ 700.00	$ 910,000.00
100mm Open Graded Drainage Layer	m	1300	$ 450.00	$ 585,000.00
Concrete Pavement (305mm)	m	1300	$ 1,150.00	$ 1,495,000.00
Subdrains (2 lanes)	m	1300	$ 60.00	$ 78,000.00
Concrete Curb and Gutter (2 lanes)	m	1300	$ 90.00	$ 117,000.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1300	$ 75.00	$ 97,500.00
Driveway Restoration b) Concrete	m	1300	$ 180.00	$ 234,000.00
Topsoil, Hydraulic Seed and Mulch	m	1300	$ 100.00	$ 130,000.00
Temporary Pavement Markings	m	1300	$ 1.00	$ 1,300.00
Permananent Pavement Markings	m	1300	$ 30.00	$ 39,000.00
Traffic Control During Construction (Arterial)	m	1300	$ 200.00	$ 260,000.00
Streetlighting (Arterial)	m	1300	$ 400.00	$ 520,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	1300	$ 125.00	$ 162,500.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
Traffic Signals (Major Intersection)	LS	2	$ 200,000.00	$ 400,000.00
SUBTOTAL				**$ 5,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	940	$ 75.00	$ 70,500.00
Concrete Manholes - (2400mm to 3600mm)	m	904	$ 130.00	$ 117,520.00
Concrete Storm Precast Catchbasins and Leads	m	1844	$ 60.00	$ 110,640.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	98	$ 500.00	$ 49,000.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	150	$ 600.00	$ 90,000.00
Storm Sewer - 825mm diameter Concrete (100-D)	m	151	$ 700.00	$ 105,700.00
Storm Sewer - 900mm diameter Concrete (100-D)	m	541	$ 850.00	$ 459,850.00
Storm Sewer - 1050mm diameter Concrete (100-D)	m	93	$ 1,200.00	$ 111,600.00
Storm Sewer - 1200mm diameter Concrete (100-D)	m	140	$ 1,500.00	$ 210,000.00
Storm Sewer - 1350mm diameter Concrete (100-D)	m	250	$ 1,800.00	$ 450,000.00
Storm Sewer - 1500mm diameter Concrete (100-D)	m	421	$ 2,200.00	$ 926,200.00
Storm Private Drain Connection	m	1844	$ 20.00	$ 36,880.00
SUBTOTAL				**$ 2,800,000.00**
Ponds & Underground Storage				
Pond Excavation, Grading, Topsoil and Hydroseed	m^3	106000	$ 200.00	$ 21,200,000.00
SUBTOTAL				**$ 21,200,000.00**
Construction Cost Total				**$ 30,200,000.00**
Construction Cost Contingency (30%)				**$ 9,100,000.00**
Subtotal				**$ 39,300,000.00**
Engineering Fee Estimate (20%)				**$ 7,900,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**ROAD-S7-3**		**$ 47,200,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

SOUTHWOOD LAKES PONDS				
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	20	$ 5.00	$ 100.00
Full Depth Asphalt Removal	m	20	$ 100.00	$ 2,000.00
Driveway Removal (all types)	m	20	$ 30.00	$ 600.00
Sawcutting Existing Pavement	m	20	$ 1.00	$ 20.00
Curb and Gutter Removal	m	20	$ 20.00	$ 400.00
SUBTOTAL				**$ 10,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	301	$ 100.00	$ 30,100.00
Remove Existing Manholes	m	301	$ 15.00	$ 4,515.00
Remove Existing Catch Basins	m	301	$ 12.50	$ 3,762.50
Remove Existing Storm Private Drain Connection	m	301	$ 25.00	$ 7,525.00
SUBTOTAL				**$ 50,000.00**
Roadwork				
Earth Excavating and Grading	m	20	$ 150.00	$ 3,000.00
Supply and Place Compacted Granular "A"	m	20	$ 437.50	$ 8,750.00
Asphalt Pavement (105mm)	m	20	$ 312.50	$ 6,250.00
Subdrains (2 lanes)	m	20	$ 60.00	$ 1,200.00
Concrete Curb and Gutter (2 lanes)	m	20	$ 90.00	$ 1,800.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	95	$ 75.00	$ 7,125.00
Driveway Restoration b) Concrete	m	20	$ 180.00	$ 3,600.00
Topsoil, Hydraulic Seed and Mulch	m	20	$ 100.00	$ 2,000.00
Traffic Control During Construction (Residential)	m	20	$ 100.00	$ 2,000.00
SUBTOTAL				**$ 40,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	301	$ 75.00	$ 22,575.00
Concrete Storm Precast Catchbasins and Leads	m	301	$ 60.00	$ 18,060.00
Storm Sewer - 300mm diameter PVC (DR-35)	m	131	$ 325.00	$ 42,575.00
Storm Sewer - 525mm diameter Concrete (65-D)	m	49	$ 450.00	$ 22,050.00
Storm Sewer - 600mm diameter Concrete (65-D)	m	121	$ 500.00	$ 60,500.00
Storm Private Drain Connection	m	301	$ 20.00	$ 6,020.00
SUBTOTAL				**$ 180,000.00**
Ponds				
Pond Excavation, Grading, Topsoil and Hydroseed	m^3	25000	$ 300.00	$ 7,500,000.00
SUBTOTAL				**$ 7,500,000.00**
Construction Cost Total				**$ 7,780,000.00**
Construction Cost Contingency (30%)				**$ 2,400,000.00**
Subtotal				**$ 10,180,000.00**
Engineering Fee Estimate (20%)				**$ 2,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -				**$ 12,280,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WYANDOTTE ST E	SAN-E-2
Length of Road Improvements (m)	4333 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

WYANDOTTE ST E		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	3652	$ 5.00	$ 18,260.00
Full Depth Concrete Asphalt Removal	m	3177	$ 250.00	$ 794,250.00
Full Depth Asphalt Removal	m	975	$ 160.00	$ 156,000.00
Driveway Removal (all types)	m	4152	$ 30.00	$ 124,560.00
Sidewalk Removal (all types)	m	4152	$ 20.00	$ 83,040.00
Concrete Median Removal	m	3177	$ 10.00	$ 31,770.00
Sawcutting Existing Pavement	m	4152	$ 1.00	$ 4,152.00
Curb and Gutter Removal	m	4152	$ 20.00	$ 83,040.00
Streetlighting Removal	m	4152	$ 25.00	$ 103,800.00
Signage Removal	m	4152	$ 5.00	$ 20,760.00
Traffic Signal Removal	LS	5	$ 15,000.00	$ 75,000.00
SUBTOTAL				**$ 1,500,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	4333	$ 100.00	$ 433,300.00
Remove Existing Manholes	m	4333	$ 15.00	$ 64,995.00
Remove Existing Sanitary Private Drain Connection	m	4333	$ 25.00	$ 108,325.00
SUBTOTAL				**$ 610,000.00**
Roadwork				
Earth Excavating and Grading	m	4152	$ 240.00	$ 996,480.00
Supply and Place Compacted Granular "A"	m	4152	$ 700.00	$ 2,906,400.00
100mm Open Graded Drainage Layer	m	3177	$ 450.00	$ 1,429,650.00
Asphalt Pavement (105mm)	m	975	$ 500.00	$ 487,500.00
Concrete Pavement (305mm)	m	3177	$ 1,150.00	$ 3,653,550.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	4152	$ 392.00	$ 1,627,584.00
Subdrains (2 lanes)	m	4152	$ 60.00	$ 249,120.00
Concrete Curb and Gutter (2 lanes)	m	4152	$ 90.00	$ 373,680.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	4152	$ 75.00	$ 311,400.00
Driveway Restoration b) Concrete	m	4152	$ 180.00	$ 747,360.00
Topsoil, Hydraulic Seed and Mulch	m	3652	$ 100.00	$ 365,200.00
Temporary Pavement Markings	m	4152	$ 1.00	$ 4,152.00
Permananent Pavement Markings	m	4152	$ 30.00	$ 124,560.00
Traffic Control During Construction (Arterial)	m	4152	$ 200.00	$ 830,400.00
Streetlighting (Arterial)	m	4152	$ 400.00	$ 1,660,800.00
Traffic Signals (Minor Intersection)	LS	5	$ 150,000.00	$ 750,000.00
Traffic Signals (Temporary)	LS	5	$ 80,000.00	$ 400,000.00
SUBTOTAL				**$ 17,000,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	3542	$ 75.00	$ 265,650.00
Concrete Manholes - (2400mm to 3600mm)	m	160	$ 130.00	$ 20,800.00
Concrete Manholes - (Chamber)	m	667	$ 200.00	$ 133,400.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	251	$ 400.00	$ 100,400.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	205	$ 450.00	$ 92,250.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	515	$ 450.00	$ 231,750.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	513	$ 475.00	$ 243,675.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	169	$ 525.00	$ 88,725.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	64	$ 625.00	$ 40,000.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	117	$ 700.00	$ 81,900.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	1664	$ 900.00	$ 1,497,600.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	160	$ 2,500.00	$ 400,000.00
Sanitary Sewer - 3600mm x 1800mm Concrete Box Culvert	m	675	$ 9,000.00	$ 6,075,000.00
Sanitary Private Drain Connection	m	4333	$ 150.00	$ 649,950.00
Manhole Rain Catchers	m	4333	$ 3.00	$ 12,999.00
SUBTOTAL				**$ 10,000,000.00**
Construction Cost Total				**$ 29,200,000.00**
Construction Cost Contingency (30%)				**$ 8,800,000.00**
Subtotal				**$ 38,000,000.00**

Engineering Fee Estimate (20%)		**$ 7,600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**SAN-E-2**	**$ 45,600,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

RIVERSIDE DR E	SAN-E-2
Length of Road Improvements (m)	1014 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

RIVERSIDE DR E		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1014	$ 100.00	$ 101,400.00
Remove Existing Manholes	m	1014	$ 15.00	$ 15,210.00
Remove Existing Sanitary Private Drain Connection	m	1014	$ 25.00	$ 25,350.00
SUBTOTAL				**$ 150,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1014	$ 75.00	$ 76,050.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	1014	$ 900.00	$ 912,600.00
Sanitary Private Drain Connection	m	1014	$ 150.00	$ 152,100.00
Manhole Rain Catchers	m	1014	$ 3.00	$ 3,042.00
SUBTOTAL				**$ 1,200,000.00**
Construction Cost Total				**$ 1,350,000.00**
Construction Cost Contingency (30%)				**$ 410,000.00**
				$ 1,800,000.00
				$ 360,000.00
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 2,160,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

RIVERSIDE DR EASEMENT	SAN-E-2
Length of Road Improvements (m)	414 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

RIVERSIDE DR EASEMENT		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	414	$ 5.00	$ 2,070.00
Driveway Removal (all types)	m	20	$ 30.00	$ 600.00
Sidewalk Removal (all types)	m	414	$ 20.00	$ 8,280.00
SUBTOTAL				**$ 11,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	414	$ 100.00	$ 41,400.00
Remove Existing Manholes	m	414	$ 15.00	$ 6,210.00
Remove Existing Sanitary Private Drain Connection	m	414	$ 25.00	$ 10,350.00
SUBTOTAL				**$ 58,000.00**
Roadwork				
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	414	$ 75.00	$ 31,050.00
Driveway Restoration b) Concrete	m	20	$ 180.00	$ 3,600.00
Topsoil, Hydraulic Seed and Mulch	m	414	$ 100.00	$ 41,400.00
Traffic Control During Construction (Arterial)	m	414	$ 200.00	$ 82,800.00
SUBTOTAL				**$ 160,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	11	$ 75.00	$ 825.00
Concrete Manholes - (Chamber)	m	403	$ 200.00	$ 80,600.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	11	$ 400.00	$ 4,400.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	403	$ 18,000.00	$ 7,254,000.00
Sanitary Private Drain Connection	m	414	$ 150.00	$ 62,100.00
Manhole Rain Catchers	m	414	$ 3.00	$ 1,242.00
SUBTOTAL				**$ 7,410,000.00**
Construction Cost Total				**$ 7,639,000.00**
Construction Cost Contingency (30%)				**$ 2,300,000.00**
Subtotal				**$ 10,000,000.00**
Engineering Fee Estimate (20%)				**$ 2,000,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 12,000,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ST. ROSE AVE	SAN-E-2
Length of Road Improvements (m)	217 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

ST. ROSE AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Sewer Removals				
Remove Existing Sanitary Sewers	m	217	$ 100.00	$ 21,700.00
Remove Existing Manholes	m	217	$ 15.00	$ 3,255.00
Remove Existing Sanitary Private Drain Connection	m	217	$ 25.00	$ 5,425.00
SUBTOTAL				**$ 31,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	11	$ 75.00	$ 825.00
Concrete Manholes - (2400mm to 3600mm)	m	110	$ 130.00	$ 14,300.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	217	$ 900.00	$ 195,300.00
Sanitary Private Drain Connection	m	217	$ 150.00	$ 32,550.00
Manhole Rain Catchers	m	217	$ 3.00	$ 651.00
SUBTOTAL				**$ 250,000.00**
Construction Cost Total				**$ 290,000.00**
Construction Cost Contingency (30%)				**$ 87,000.00**
Subtotal				**$ 380,000.00**
Engineering Fee Estimate (20%)				**$ 76,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 456,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

GANATCHIO TRAIL	SAN-E-2
Length of Road Improvements (m)	974 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

GANATCHIO TRAIL		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	568	$ 5.00	$ 2,840.00
SUBTOTAL				**$ 2,900.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	974	$ 100.00	$ 97,400.00
Remove Existing Manholes	m	974	$ 15.00	$ 14,610.00
Remove Existing Sanitary Private Drain Connection	m	974	$ 25.00	$ 24,350.00
SUBTOTAL				**$ 140,000.00**
Roadwork				
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	568	$ 75.00	$ 42,600.00
Topsoil, Hydraulic Seed and Mulch	m	568	$ 100.00	$ 56,800.00
Traffic Control During Construction (Residential)	m	568	$ 100.00	$ 56,800.00
SUBTOTAL				**$ 160,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	364	$ 130.00	$ 47,320.00
Concrete Manholes - (Chamber)	m	610	$ 200.00	$ 122,000.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	364	$ 2,500.00	$ 910,000.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	610	$ 18,000.00	$ 10,980,000.00
Sanitary Private Drain Connection	m	974	$ 150.00	$ 146,100.00
Manhole Rain Catchers	m	974	$ 3.00	$ 2,922.00
SUBTOTAL				**$ 12,300,000.00**
Construction Cost Total				**$ 12,700,000.00**
Construction Cost Contingency (30%)				**$ 3,900,000.00**
				$ 16,600,000.00
				$ 3,400,000.00
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 20,000,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CLAIRVIEW AVE	SAN-E-2
Length of Road Improvements (m)	908 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CLAIRVIEW AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	908	$ 5.00	$ 4,540.00
Full Depth Asphalt Removal	m	908	$ 80.00	$ 72,640.00
Driveway Removal (all types)	m	908	$ 30.00	$ 27,240.00
Sidewalk Removal (all types)	m	908	$ 20.00	$ 18,160.00
Sawcutting Existing Pavement	m	908	$ 1.00	$ 908.00
Curb and Gutter Removal	m	908	$ 20.00	$ 18,160.00
Streetlighting Removal	m	908	$ 25.00	$ 22,700.00
Signage Removal	m	908	$ 5.00	$ 4,540.00
SUBTOTAL				**$ 170,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	908	$ 100.00	$ 90,800.00
Remove Existing Manholes	m	908	$ 15.00	$ 13,620.00
Remove Existing Sanitary Private Drain Connection	m	908	$ 25.00	$ 22,700.00
SUBTOTAL				**$ 130,000.00**
Roadwork				
Earth Excavating and Grading	m	908	$ 120.00	$ 108,960.00
Supply and Place Compacted Granular "A"	m	908	$ 350.00	$ 317,800.00
Asphalt Pavement (105mm)	m	908	$ 250.00	$ 227,000.00
Subdrains (2 lanes)	m	908	$ 60.00	$ 54,480.00
Concrete Curb and Gutter (2 lanes)	m	908	$ 90.00	$ 81,720.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	908	$ 75.00	$ 68,100.00
Driveway Restoration b) Concrete	m	908	$ 180.00	$ 163,440.00
Topsoil, Hydraulic Seed and Mulch	m	908	$ 100.00	$ 90,800.00
Traffic Control During Construction (Residential)	m	908	$ 100.00	$ 90,800.00
Streetlighting (Residential)	m	908	$ 225.00	$ 204,300.00
SUBTOTAL				**$ 1,500,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	463	$ 130.00	$ 60,190.00
Concrete Manholes - (Chamber)	m	445	$ 200.00	$ 89,000.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	84	$ 400.00	$ 33,600.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	463	$ 2,500.00	$ 1,157,500.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	361	$ 18,000.00	$ 6,498,000.00
Sanitary Private Drain Connection	m	908	$ 150.00	$ 136,200.00
Manhole Rain Catchers	m	908	$ 3.00	$ 2,724.00
SUBTOTAL				**$ 8,000,000.00**
Construction Cost Total				**$ 9,800,000.00**
Construction Cost Contingency (30%)				**$ 3,000,000.00**
Subtotal				**$ 12,800,000.00**
Engineering Fee Estimate (20%)				**$ 2,600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 15,400,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CARLING CRES.	SAN-E-2
Length of Road Improvements (m)	30 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

CARLING CRES.		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	30	$ 5.00	$ 150.00
Full Depth Asphalt Removal	m	30	$ 80.00	$ 2,400.00
Driveway Removal (all types)	m	30	$ 30.00	$ 900.00
Sawcutting Existing Pavement	m	30	$ 1.00	$ 30.00
Curb and Gutter Removal	m	30	$ 20.00	$ 600.00
SUBTOTAL				**$ 5,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	30	$ 100.00	$ 3,000.00
Remove Existing Manholes	m	30	$ 15.00	$ 450.00
Remove Existing Sanitary Private Drain Connection	m	30	$ 25.00	$ 750.00
SUBTOTAL				**$ 5,000.00**
Roadwork				
Earth Excavating and Grading	m	30	$ 120.00	$ 3,600.00
Supply and Place Compacted Granular "A"	m	30	$ 350.00	$ 10,500.00
Asphalt Pavement (105mm)	m	30	$ 250.00	$ 7,500.00
Subdrains (2 lanes)	m	30	$ 60.00	$ 1,800.00
Concrete Curb and Gutter (2 lanes)	m	30	$ 90.00	$ 2,700.00
Driveway Restoration b) Concrete	m	30	$ 180.00	$ 5,400.00
Topsoil, Hydraulic Seed and Mulch	m	30	$ 100.00	$ 3,000.00
Traffic Control During Construction (Residential)	m	30	$ 100.00	$ 3,000.00
Streetlighting (Residential)	m	30	$ 225.00	$ 6,750.00
Street Trees (In Boulevard / 12m spacing each side)	m	30	$ 125.00	$ 3,750.00
SUBTOTAL				**$ 48,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	30	$ 75.00	$ 2,250.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	30	$ 400.00	$ 12,000.00
Sanitary Private Drain Connection	m	30	$ 150.00	$ 4,500.00
Manhole Rain Catchers	m	30	$ 3.00	$ 90.00
SUBTOTAL				**$ 19,000.00**
Construction Cost Total				**$ 77,000.00**
Construction Cost Contingency (30%)				**$ 24,000.00**
Subtotal				**$ 110,000.00**
Engineering Fee Estimate (20%)				**$ 22,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 132,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

JEROME ST	SAN-E-2
Length of Road Improvements (m)	769 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

JEROME ST		SAN-E-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	769	$ 5.00	$ 3,845.00
Full Depth Asphalt Removal	m	769	$ 80.00	$ 61,520.00
Driveway Removal (all types)	m	769	$ 30.00	$ 23,070.00
Sidewalk Removal (all types)	m	769	$ 20.00	$ 15,380.00
Sawcutting Existing Pavement	m	769	$ 1.00	$ 769.00
Curb and Gutter Removal	m	769	$ 20.00	$ 15,380.00
Streetlighting Removal	m	769	$ 25.00	$ 19,225.00
Signage Removal	m	769	$ 5.00	$ 3,845.00
SUBTOTAL				**$ 150,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	769	$ 100.00	$ 76,900.00
Remove Existing Manholes	m	769	$ 15.00	$ 11,535.00
Remove Existing Sanitary Private Drain Connection	m	769	$ 25.00	$ 19,225.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	769	$ 120.00	$ 92,280.00
Supply and Place Compacted Granular "A"	m	769	$ 350.00	$ 269,150.00
Asphalt Pavement (105mm)	m	769	$ 250.00	$ 192,250.00
Subdrains (2 lanes)	m	769	$ 60.00	$ 46,140.00
Concrete Curb and Gutter (2 lanes)	m	769	$ 90.00	$ 69,210.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	769	$ 75.00	$ 57,675.00
Driveway Restoration b) Concrete	m	769	$ 180.00	$ 138,420.00
Topsoil, Hydraulic Seed and Mulch	m	769	$ 100.00	$ 76,900.00
Traffic Control During Construction (Residential)	m	769	$ 100.00	$ 76,900.00
Streetlighting (Residential)	m	769	$ 225.00	$ 173,025.00
SUBTOTAL				**$ 1,200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	10	$ 75.00	$ 750.00
Concrete Manholes - (Chamber)	m	759	$ 200.00	$ 151,800.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	10	$ 400.00	$ 4,000.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	759	$ 18,000.00	$ 13,662,000.00
Sanitary Private Drain Connection	m	769	$ 150.00	$ 115,350.00
Manhole Rain Catchers	m	769	$ 3.00	$ 2,307.00
SUBTOTAL				**$ 14,000,000.00**
Construction Cost Total				**$ 15,500,000.00**
Construction Cost Contingency (30%)				**$ 4,700,000.00**
Subtotal				**$ 20,200,000.00**
Engineering Fee Estimate (20%)				**$ 4,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 24,300,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WESTCHESTER DR	SAN-E-2
Length of Road Improvements (m)	240 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WESTCHESTER DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	240	$ 5.00	$ 1,200.00
Full Depth Asphalt Removal	m	240	$ 80.00	$ 19,200.00
Driveway Removal (all types)	m	240	$ 30.00	$ 7,200.00
Sawcutting Existing Pavement	m	240	$ 1.00	$ 240.00
Curb and Gutter Removal	m	240	$ 20.00	$ 4,800.00
Streetlighting Removal	m	240	$ 25.00	$ 6,000.00
Signage Removal	m	240	$ 5.00	$ 1,200.00
SUBTOTAL				**$ 40,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	240	$ 100.00	$ 24,000.00
Remove Existing Manholes	m	240	$ 15.00	$ 3,600.00
Remove Existing Sanitary Private Drain Connection	m	240	$ 25.00	$ 6,000.00
SUBTOTAL				**$ 34,000.00**
Roadwork				
Earth Excavating and Grading	m	240	$ 120.00	$ 28,800.00
Supply and Place Compacted Granular "A"	m	240	$ 350.00	$ 84,000.00
Asphalt Pavement (105mm)	m	240	$ 250.00	$ 60,000.00
Subdrains (2 lanes)	m	240	$ 60.00	$ 14,400.00
Concrete Curb and Gutter (2 lanes)	m	240	$ 90.00	$ 21,600.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	240	$ 75.00	$ 18,000.00
Driveway Restoration b) Concrete	m	240	$ 180.00	$ 43,200.00
Topsoil, Hydraulic Seed and Mulch	m	240	$ 100.00	$ 24,000.00
Traffic Control During Construction (Residential)	m	240	$ 100.00	$ 24,000.00
Streetlighting (Residential)	m	240	$ 225.00	$ 54,000.00
SUBTOTAL				**$ 380,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	240	$ 200.00	$ 48,000.00
Sanitary Sewer - 3900mm x 2400mm Concrete Box Culvert	m	240	$ 15,000.00	$ 3,600,000.00
Sanitary Private Drain Connection	m	240	$ 150.00	$ 36,000.00
Manhole Rain Catchers	m	240	$ 3.00	$ 720.00
SUBTOTAL				**$ 3,700,000.00**
Construction Cost Total				**$ 4,200,000.00**
Construction Cost Contingency (30%)				**$ 1,300,000.00**
Subtotal				**$ 5,500,000.00**
Engineering Fee Estimate (20%)				**$ 1,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 6,600,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

RHOLAINE DR	SAN-E-2
Length of Road Improvements (m)	151 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

RHOLAINE DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	151	$ 5.00	$ 755.00
Full Depth Asphalt Removal	m	151	$ 80.00	$ 12,080.00
Driveway Removal (all types)	m	151	$ 30.00	$ 4,530.00
Sawcutting Existing Pavement	m	151	$ 1.00	$ 151.00
Curb and Gutter Removal	m	151	$ 20.00	$ 3,020.00
Streetlighting Removal	m	151	$ 25.00	$ 3,775.00
Signage Removal	m	151	$ 5.00	$ 755.00
SUBTOTAL				**$ 26,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	151	$ 100.00	$ 15,100.00
Remove Existing Manholes	m	151	$ 15.00	$ 2,265.00
Remove Existing Sanitary Private Drain Connection	m	151	$ 25.00	$ 3,775.00
SUBTOTAL				**$ 22,000.00**
Roadwork				
Earth Excavating and Grading	m	151	$ 120.00	$ 18,120.00
Supply and Place Compacted Granular "A"	m	151	$ 350.00	$ 52,850.00
Asphalt Pavement (105mm)	m	151	$ 250.00	$ 37,750.00
Subdrains (2 lanes)	m	151	$ 60.00	$ 9,060.00
Concrete Curb and Gutter (2 lanes)	m	151	$ 90.00	$ 13,590.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	151	$ 75.00	$ 11,325.00
Driveway Restoration b) Concrete	m	151	$ 180.00	$ 27,180.00
Topsoil, Hydraulic Seed and Mulch	m	151	$ 100.00	$ 15,100.00
Traffic Control During Construction (Residential)	m	151	$ 100.00	$ 15,100.00
Streetlighting (Residential)	m	151	$ 225.00	$ 33,975.00
SUBTOTAL				**$ 240,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	151	$ 200.00	$ 30,200.00
Sanitary Sewer - 3600mm x 2400mm Concrete Box Culvert	m	151	$ 13,000.00	$ 1,963,000.00
Sanitary Private Drain Connection	m	151	$ 150.00	$ 22,650.00
Manhole Rain Catchers	m	151	$ 3.00	$ 453.00
SUBTOTAL				**$ 2,100,000.00**
Construction Cost Total				**$ 2,400,000.00**
Construction Cost Contingency (30%)				**$ 720,000.00**
Subtotal				**$ 3,200,000.00**
Engineering Fee Estimate (20%)				**$ 640,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 3,840,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

GREENDALE DR	SAN-E-2
Length of Road Improvements (m)	236 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GREENDALE DR		SAN-E-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	236	$ 5.00	$ 1,180.00
Full Depth Asphalt Removal	m	236	$ 80.00	$ 18,880.00
Driveway Removal (all types)	m	236	$ 30.00	$ 7,080.00
Sawcutting Existing Pavement	m	236	$ 1.00	$ 236.00
Curb and Gutter Removal	m	236	$ 20.00	$ 4,720.00
Streetlighting Removal	m	236	$ 25.00	$ 5,900.00
Signage Removal	m	236	$ 5.00	$ 1,180.00
SUBTOTAL				**$ 40,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	236	$ 100.00	$ 23,600.00
Remove Existing Manholes	m	236	$ 15.00	$ 3,540.00
Remove Existing Sanitary Private Drain Connection	m	236	$ 25.00	$ 5,900.00
SUBTOTAL				**$ 34,000.00**
Roadwork				
Earth Excavating and Grading	m	236	$ 120.00	$ 28,320.00
Supply and Place Compacted Granular "A"	m	236	$ 350.00	$ 82,600.00
Asphalt Pavement (105mm)	m	236	$ 250.00	$ 59,000.00
Subdrains (2 lanes)	m	236	$ 60.00	$ 14,160.00
Concrete Curb and Gutter (2 lanes)	m	236	$ 90.00	$ 21,240.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	236	$ 75.00	$ 17,700.00
Driveway Restoration b) Concrete	m	236	$ 180.00	$ 42,480.00
Topsoil, Hydraulic Seed and Mulch	m	236	$ 100.00	$ 23,600.00
Traffic Control During Construction (Residential)	m	236	$ 100.00	$ 23,600.00
Streetlighting (Residential)	m	236	$ 225.00	$ 53,100.00
SUBTOTAL				**$ 370,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	236	$ 200.00	$ 47,200.00
Sanitary Sewer - 3900mm x 2400mm Concrete Box Culvert	m	236	$ 15,000.00	$ 3,540,000.00
Sanitary Private Drain Connection	m	236	$ 150.00	$ 35,400.00
Manhole Rain Catchers	m	236	$ 3.00	$ 708.00
SUBTOTAL				**$ 3,700,000.00**
Construction Cost Total				**$ 4,200,000.00**
Construction Cost Contingency (30%)				**$ 1,300,000.00**
Subtotal				**$ 5,500,000.00**
Engineering Fee Estimate (20%)				**$ 1,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 6,600,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

THOMPSON PARK (GREENSPACE)	SAN-E-2
Length of Road Improvements (m)	172 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

THOMPSON PARK (GREENSPACE)		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	172	$ 5.00	$ 860.00
SUBTOTAL				**$ 900.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	172	$ 100.00	$ 17,200.00
Remove Existing Manholes	m	172	$ 15.00	$ 2,580.00
Remove Existing Sanitary Private Drain Connection	m	172	$ 25.00	$ 4,300.00
SUBTOTAL				**$ 25,000.00**
Roadwork				
Topsoil, Hydraulic Seed and Mulch	m	172	$ 100.00	$ 17,200.00
SUBTOTAL				**$ 18,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	172	$ 130.00	$ 22,360.00
Sanitary Sewer - 1800mm diameter Concrete (100-D)	m	172	$ 2,800.00	$ 481,600.00
Manhole Rain Catchers	m	172	$ 3.00	$ 516.00
SUBTOTAL				**$ 510,000.00**
Construction Cost Total				**$ 560,000.00**
Construction Cost Contingency (30%)				**$ 170,000.00**
Subtotal				**$ 730,000.00**
Engineering Fee Estimate (20%)				**$ 150,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 880,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

EDGAR ST	SAN-E-2
Length of Road Improvements (m)	2290 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	Yes
Existing Street Lights	No
Traffic Signals	Yes

EDGAR ST		SAN-E-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	2290	$ 5.00	$ 11,450.00
Full Depth Concrete Asphalt Removal	m	1710	$ 125.00	$ 213,750.00
Full Depth Asphalt Removal	m	580	$ 80.00	$ 46,400.00
Driveway Removal (all types)	m	2290	$ 30.00	$ 68,700.00
Sidewalk Removal (all types)	m	2290	$ 20.00	$ 45,800.00
Sawcutting Existing Pavement	m	2290	$ 1.00	$ 2,290.00
Curb and Gutter Removal	m	1710	$ 20.00	$ 34,200.00
Streetlighting Removal	m	1710	$ 25.00	$ 42,750.00
SUBTOTAL				**$ 470,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	2290	$ 100.00	$ 229,000.00
Remove Existing Manholes	m	2290	$ 15.00	$ 34,350.00
Remove Existing Sanitary Private Drain Connection	m	2290	$ 25.00	$ 57,250.00
SUBTOTAL				**$ 330,000.00**
Roadwork				
Earth Excavating and Grading	m	2290	$ 120.00	$ 274,800.00
Supply and Place Compacted Granular "A"	m	2290	$ 350.00	$ 801,500.00
100mm Open Graded Drainage Layer	m	1710	$ 225.00	$ 384,750.00
Asphalt Pavement (105mm)	m	580	$ 250.00	$ 145,000.00
Concrete Pavement (305mm)	m	1710	$ 575.00	$ 983,250.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	580	$ 270.00	$ 156,600.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	1710	$ 392.00	$ 670,320.00
Subdrains (2 lanes)	m	2290	$ 60.00	$ 137,400.00
Concrete Curb and Gutter (2 lanes)	m	2290	$ 90.00	$ 206,100.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	2290	$ 75.00	$ 171,750.00
Driveway Restoration b) Concrete	m	2290	$ 180.00	$ 412,200.00
Topsoil, Hydraulic Seed and Mulch	m	2290	$ 100.00	$ 229,000.00
Temporary Pavement Markings	m	100	$ 1.00	$ 100.00
Permananent Pavement Markings	m	100	$ 30.00	$ 3,000.00
Traffic Control During Construction (Arterial)	m	2290	$ 200.00	$ 458,000.00
Streetlighting (Arterial)	m	2290	$ 400.00	$ 916,000.00
SUBTOTAL				**$ 6,000,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	1771	$ 130.00	$ 230,230.00
Concrete Manholes - (Chamber)	m	519	$ 200.00	$ 103,800.00
Sanitary Sewer - 1800mm diameter Concrete (100-D)	m	1771	$ 2,800.00	$ 4,958,800.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	519	$ 18,000.00	$ 9,342,000.00
Sanitary Private Drain Connection	m	2290	$ 150.00	$ 343,500.00
Manhole Rain Catchers	m	2290	$ 3.00	$ 6,870.00
SUBTOTAL				**$ 15,000,000.00**
Construction Cost Total				**$ 21,800,000.00**
Construction Cost Contingency (30%)				**$ 6,600,000.00**
Subtotal				**$ 28,400,000.00**
Engineering Fee Estimate (20%)				**$ 5,700,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 34,100,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

TRANBY AVE	SAN-E-2
Length of Road Improvements (m)	664 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

TRANBY AVE		SAN-E-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	664	$ 5.00	$ 3,320.00
Full Depth Concrete Asphalt Removal	m	210	$ 125.00	$ 26,250.00
Full Depth Asphalt Removal	m	454	$ 80.00	$ 36,320.00
Driveway Removal (all types)	m	664	$ 30.00	$ 19,920.00
Sidewalk Removal (all types)	m	664	$ 20.00	$ 13,280.00
Sawcutting Existing Pavement	m	664	$ 1.00	$ 664.00
Curb and Gutter Removal	m	664	$ 20.00	$ 13,280.00
Streetlighting Removal	m	664	$ 25.00	$ 16,600.00
Signage Removal	m	664	$ 5.00	$ 3,320.00
SUBTOTAL				**$ 140,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	664	$ 100.00	$ 66,400.00
Remove Existing Manholes	m	664	$ 15.00	$ 9,960.00
Remove Existing Sanitary Private Drain Connection	m	664	$ 25.00	$ 16,600.00
SUBTOTAL				**$ 93,000.00**
Roadwork				
Earth Excavating and Grading	m	664	$ 120.00	$ 79,680.00
Supply and Place Compacted Granular "A"	m	664	$ 350.00	$ 232,400.00
100mm Open Graded Drainage Layer	m	210	$ 225.00	$ 47,250.00
Asphalt Pavement (105mm)	m	454	$ 250.00	$ 113,500.00
Concrete Pavement (305mm)	m	210	$ 575.00	$ 120,750.00
Subdrains (2 lanes)	m	664	$ 60.00	$ 39,840.00
Concrete Curb and Gutter (2 lanes)	m	664	$ 90.00	$ 59,760.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	664	$ 75.00	$ 49,800.00
Driveway Restoration b) Concrete	m	664	$ 180.00	$ 119,520.00
Topsoil, Hydraulic Seed and Mulch	m	664	$ 100.00	$ 66,400.00
Temporary Pavement Markings	m	100	$ 1.00	$ 100.00
Permananent Pavement Markings	m	100	$ 30.00	$ 3,000.00
Traffic Control During Construction (Residential)	m	664	$ 100.00	$ 66,400.00
Streetlighting (Residential)	m	664	$ 225.00	$ 149,400.00
Street Trees (In Boulevard / 12m spacing each side)	m	664	$ 125.00	$ 83,000.00
SUBTOTAL				**$ 1,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	664	$ 75.00	$ 49,800.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	664	$ 525.00	$ 348,600.00
Sanitary Private Drain Connection	m	664	$ 150.00	$ 99,600.00
Manhole Rain Catchers	m	664	$ 3.00	$ 1,992.00
SUBTOTAL				**$ 500,000.00**
Construction Cost Total				**$ 2,100,000.00**
Construction Cost Contingency (30%)				**$ 630,000.00**
Subtotal				**$ 2,800,000.00**
Engineering Fee Estimate (20%)				**$ 560,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 3,360,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

LITTLE RIVER BLVD	SAN-E-2
Length of Road Improvements (m)	432 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

LITTLE RIVER BLVD		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	432	$ 5.00	$ 2,160.00
Full Depth Asphalt Removal	m	432	$ 80.00	$ 34,560.00
Driveway Removal (all types)	m	432	$ 30.00	$ 12,960.00
Sidewalk Removal (all types)	m	432	$ 20.00	$ 8,640.00
Sawcutting Existing Pavement	m	432	$ 1.00	$ 432.00
Curb and Gutter Removal	m	432	$ 20.00	$ 8,640.00
Streetlighting Removal	m	432	$ 25.00	$ 10,800.00
Signage Removal	m	432	$ 5.00	$ 2,160.00
SUBTOTAL				**$ 81,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	432	$ 100.00	$ 43,200.00
Remove Existing Manholes	m	432	$ 15.00	$ 6,480.00
Remove Existing Sanitary Private Drain Connection	m	432	$ 25.00	$ 10,800.00
SUBTOTAL				**$ 61,000.00**
Roadwork				
Earth Excavating and Grading	m	432	$ 120.00	$ 51,840.00
Supply and Place Compacted Granular "A"	m	432	$ 350.00	$ 151,200.00
Asphalt Pavement (105mm)	m	432	$ 250.00	$ 108,000.00
Subdrains (2 lanes)	m	432	$ 60.00	$ 25,920.00
Concrete Curb and Gutter (2 lanes)	m	432	$ 90.00	$ 38,880.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	432	$ 75.00	$ 32,400.00
Driveway Restoration b) Concrete	m	432	$ 180.00	$ 77,760.00
Topsoil, Hydraulic Seed and Mulch	m	432	$ 100.00	$ 43,200.00
Temporary Pavement Markings	m	432	$ 1.00	$ 432.00
Permananent Pavement Markings	m	432	$ 30.00	$ 12,960.00
Traffic Control During Construction (Arterial)	m	432	$ 200.00	$ 86,400.00
Streetlighting (Arterial)	m	432	$ 400.00	$ 172,800.00
Street Trees (In Boulevard / 12m spacing each side)	m	432	$ 125.00	$ 54,000.00
SUBTOTAL				**$ 860,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	432	$ 200.00	$ 86,400.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	10	$ 400.00	$ 4,000.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	422	$ 18,000.00	$ 7,596,000.00
Sanitary Private Drain Connection	m	432	$ 150.00	$ 64,800.00
Manhole Rain Catchers	m	432	$ 3.00	$ 1,296.00
SUBTOTAL				**$ 7,800,000.00**
Construction Cost Total				**$ 8,900,000.00**
Construction Cost Contingency (30%)				**$ 2,700,000.00**
Subtotal				**$ 11,600,000.00**
Engineering Fee Estimate (20%)				**$ 2,320,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 13,920,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

LITTLE RIVER ACRES DR	SAN-E-2
Length of Road Improvements (m)	874 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

LITTLE RIVER ACRES DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	874	$ 5.00	$ 4,370.00
Full Depth Asphalt Removal	m	874	$ 80.00	$ 69,920.00
Sidewalk Removal (all types)	m	874	$ 20.00	$ 17,480.00
Concrete Median Removal	m	874	$ 10.00	$ 8,740.00
Sawcutting Existing Pavement	m	874	$ 1.00	$ 874.00
Curb and Gutter Removal	m	874	$ 20.00	$ 17,480.00
Streetlighting Removal	m	874	$ 25.00	$ 21,850.00
Signage Removal	m	874	$ 5.00	$ 4,370.00
SUBTOTAL				**$ 150,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	874	$ 100.00	$ 87,400.00
Remove Existing Manholes	m	874	$ 15.00	$ 13,110.00
Remove Existing Sanitary Private Drain Connection	m	874	$ 25.00	$ 21,850.00
SUBTOTAL				**$ 130,000.00**
Roadwork				
Earth Excavating and Grading	m	874	$ 120.00	$ 104,880.00
Supply and Place Compacted Granular "A"	m	874	$ 350.00	$ 305,900.00
Asphalt Pavement (105mm)	m	874	$ 250.00	$ 218,500.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	874	$ 270.00	$ 235,980.00
Subdrains (2 lanes)	m	874	$ 60.00	$ 52,440.00
Concrete Curb and Gutter (2 lanes)	m	874	$ 90.00	$ 78,660.00
Concrete Median Islands (1m wide island)	m	874	$ 150.00	$ 131,100.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	874	$ 75.00	$ 65,550.00
Topsoil, Hydraulic Seed and Mulch	m	874	$ 100.00	$ 87,400.00
Permananent Pavement Markings	m	874	$ 30.00	$ 26,220.00
Traffic Control During Construction (Residential)	m	874	$ 100.00	$ 87,400.00
Streetlighting (Residential)	m	874	$ 225.00	$ 196,650.00
Street Trees (In Boulevard / 12m spacing each side)	m	874	$ 125.00	$ 109,250.00
SUBTOTAL				**$ 1,700,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	874	$ 75.00	$ 65,550.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	347	$ 450.00	$ 156,150.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	466	$ 450.00	$ 209,700.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	61	$ 475.00	$ 28,975.00
Sanitary Private Drain Connection	m	874	$ 150.00	$ 131,100.00
Manhole Rain Catchers	m	874	$ 3.00	$ 2,622.00
SUBTOTAL				**$ 600,000.00**
Construction Cost Total				**$ 2,600,000.00**
Construction Cost Contingency (30%)				**$ 780,000.00**
Subtotal				**$ 3,400,000.00**
Engineering Fee Estimate (20%)				**$ 680,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 4,080,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CATHERINE ST	SAN-E-2
Length of Road Improvements (m)	543 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

CATHERINE ST		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	543	$ 5.00	$ 2,715.00
Full Depth Concrete Asphalt Removal	m	543	$ 125.00	$ 67,875.00
Driveway Removal (all types)	m	543	$ 30.00	$ 16,290.00
Sidewalk Removal (all types)	m	543	$ 20.00	$ 10,860.00
Concrete Median Removal	m	40	$ 10.00	$ 400.00
Sawcutting Existing Pavement	m	543	$ 1.00	$ 543.00
Curb and Gutter Removal	m	543	$ 20.00	$ 10,860.00
Streetlighting Removal	m	543	$ 25.00	$ 13,575.00
Signage Removal	m	543	$ 5.00	$ 2,715.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 150,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	543	$ 100.00	$ 54,300.00
Remove Existing Manholes	m	543	$ 15.00	$ 8,145.00
Remove Existing Sanitary Private Drain Connection	m	543	$ 25.00	$ 13,575.00
SUBTOTAL				**$ 77,000.00**
Roadwork				
Earth Excavating and Grading	m	543	$ 120.00	$ 65,160.00
Supply and Place Compacted Granular "A"	m	543	$ 350.00	$ 190,050.00
100mm Open Graded Drainage Layer	m	543	$ 225.00	$ 122,175.00
Concrete Pavement (305mm)	m	543	$ 575.00	$ 312,225.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	543	$ 392.00	$ 212,856.00
Subdrains (2 lanes)	m	543	$ 60.00	$ 32,580.00
Concrete Curb and Gutter (2 lanes)	m	543	$ 90.00	$ 48,870.00
Concrete Median Islands (1m wide island)	m	40	$ 150.00	$ 6,000.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	543	$ 75.00	$ 40,725.00
Topsoil, Hydraulic Seed and Mulch	m	543	$ 100.00	$ 54,300.00
Temporary Pavement Markings	m	543	$ 1.00	$ 543.00
Permananent Pavement Markings	m	543	$ 30.00	$ 16,290.00
Traffic Control During Construction (Residential)	m	543	$ 100.00	$ 54,300.00
Streetlighting (Residential)	m	543	$ 225.00	$ 122,175.00
Street Trees (In Boulevard / 12m spacing each side)	m	543	$ 125.00	$ 67,875.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 1,600,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	543	$ 75.00	$ 40,725.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	543	$ 475.00	$ 257,925.00
Sanitary Private Drain Connection	m	543	$ 150.00	$ 81,450.00
Manhole Rain Catchers	m	543	$ 3.00	$ 1,629.00
SUBTOTAL				**$ 390,000.00**
Construction Cost Total				**$ 2,300,000.00**
Construction Cost Contingency (30%)				**$ 690,000.00**
Subtotal				**$ 3,000,000.00**
Engineering Fee Estimate (20%)				**$ 600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 3,600,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

LAUZON PKWY	SAN-E-2
Length of Road Improvements (m)	895 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

LAUZON PKWY		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	325	$ 5.00	$ 1,625.00
Signage Removal	m	325	$ 5.00	$ 1,625.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 19,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	895	$ 100.00	$ 89,500.00
Remove Existing Manholes	m	895	$ 15.00	$ 13,425.00
Remove Existing Sanitary Private Drain Connection	m	895	$ 25.00	$ 22,375.00
SUBTOTAL				**$ 130,000.00**
Roadwork				
Earth Excavating and Grading	m	325	$ 240.00	$ 78,000.00
Traffic Control During Construction (Arterial)	m	325	$ 200.00	$ 65,000.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 380,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	325	$ 75.00	$ 24,375.00
Concrete Manholes - (2400mm to 3600mm)	m	570	$ 130.00	$ 74,100.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	133	$ 475.00	$ 63,175.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	372	$ 525.00	$ 195,300.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	219	$ 625.00	$ 136,875.00
Sanitary Sewer - 1200mm diameter Concrete (100-D)	m	570	$ 1,500.00	$ 855,000.00
Sanitary Private Drain Connection	m	1294	$ 150.00	$ 194,100.00
Manhole Rain Catchers	m	1294	$ 3.00	$ 3,882.00
SUBTOTAL				**$ 1,600,000.00**
Construction Cost Total				**$ 2,200,000.00**
Construction Cost Contingency (30%)				**$ 660,000.00**
Subtotal				**$ 2,900,000.00**
Engineering Fee Estimate (20%)				**$ 580,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 3,480,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

LAUZON RD	SAN-E-2
Length of Road Improvements (m)	1247 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

LAUZON RD		SAN-E-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	747	$ 5.00	$ 3,735.00
Full Depth Asphalt Removal	m	747	$ 160.00	$ 119,520.00
Driveway Removal (all types)	m	747	$ 30.00	$ 22,410.00
Sidewalk Removal (all types)	m	747	$ 20.00	$ 14,940.00
Sawcutting Existing Pavement	m	747	$ 1.00	$ 747.00
Curb and Gutter Removal	m	747	$ 20.00	$ 14,940.00
Streetlighting Removal	m	747	$ 25.00	$ 18,675.00
Signage Removal	m	747	$ 5.00	$ 3,735.00
Traffic Signal Removal	LS	2	$ 15,000.00	$ 30,000.00
SUBTOTAL				**$ 230,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1247	$ 100.00	$ 124,700.00
Remove Existing Manholes	m	1247	$ 15.00	$ 18,705.00
Remove Existing Sanitary Private Drain Connection	m	1247	$ 25.00	$ 31,175.00
SUBTOTAL				**$ 180,000.00**
Roadwork				
Earth Excavating and Grading	m	747	$ 240.00	$ 179,280.00
Supply and Place Compacted Granular "A"	m	747	$ 700.00	$ 522,900.00
100mm Open Graded Drainage Layer	m	747	$ 450.00	$ 336,150.00
Concrete Pavement (305mm)	m	747	$ 1,150.00	$ 859,050.00
Subdrains (2 lanes)	m	747	$ 60.00	$ 44,820.00
Concrete Curb and Gutter (2 lanes)	m	747	$ 90.00	$ 67,230.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	747	$ 75.00	$ 56,025.00
Driveway Restoration b) Concrete	m	747	$ 180.00	$ 134,460.00
Topsoil, Hydraulic Seed and Mulch	m	747	$ 100.00	$ 74,700.00
Temporary Pavement Markings	m	747	$ 1.00	$ 747.00
Permananent Pavement Markings	m	747	$ 30.00	$ 22,410.00
Traffic Control During Construction (Arterial)	m	747	$ 200.00	$ 149,400.00
Streetlighting (Arterial)	m	747	$ 400.00	$ 298,800.00
Traffic Signals (Minor Intersection)	LS	2	$ 150,000.00	$ 300,000.00
Traffic Signals (Temporary)	LS	2	$ 80,000.00	$ 160,000.00
SUBTOTAL				**$ 3,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	61	$ 75.00	$ 4,575.00
Concrete Manholes - (2400mm to 3600mm)	m	1186	$ 130.00	$ 154,180.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	61	$ 900.00	$ 54,900.00
Sanitary Sewer - 1050mm diameter Concrete (100-D)	m	1186	$ 1,250.00	$ 1,482,500.00
Sanitary Private Drain Connection	m	1247	$ 150.00	$ 187,050.00
Manhole Rain Catchers	m	1247	$ 3.00	$ 3,741.00
SUBTOTAL				**$ 1,900,000.00**
Construction Cost Total				**$ 5,700,000.00**
Construction Cost Contingency (30%)				**$ 1,800,000.00**
Subtotal				**$ 7,500,000.00**
Engineering Fee Estimate (20%)				**$ 1,500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 9,000,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ASPEN LAKE (PRIVATE PROPERTY EASEMENT)/ RIVERSIDE KIWANIS PARK	SAN-E-2
Length of Road Improvements (m)	3285 m
Number of Lanes	4
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

ASPEN LAKE (PRIVATE PROPERTY EASEMENT)/		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	3285	$ 5.00	$ 16,425.00
SUBTOTAL				**$ 17,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1803	$ 100.00	$ 180,300.00
Remove Existing Manholes	m	1803	$ 15.00	$ 27,045.00
SUBTOTAL				**$ 210,000.00**
Roadwork				
Topsoil, Hydraulic Seed and Mulch	m	3285	$ 100.00	$ 328,500.00
SUBTOTAL				**$ 330,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	10	$ 75.00	$ 750.00
Concrete Manholes - (2400mm to 3600mm)	m	81	$ 130.00	$ 10,530.00
Concrete Manholes - (Chamber)	m	3194	$ 200.00	$ 638,800.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	10	$ 400.00	$ 4,000.00
Sanitary Sewer - 1200mm diameter Concrete (100-D)	m	81	$ 1,500.00	$ 121,500.00
Sanitary Sewer - 3000mm diameter Concrete (100-D)	m	2022	$ 7,000.00	$ 14,154,000.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	257	$ 18,000.00	$ 4,626,000.00
Sanitary Sewer - 4200mm x 2700mm Concrete Box Culvert	m	915	$ 20,000.00	$ 18,300,000.00
Manhole Rain Catchers	m	3285	$ 3.00	$ 9,855.00
SUBTOTAL				**$ 37,900,000.00**
Construction Cost Total				**$ 38,500,000.00**
Construction Cost Contingency (30%)				**$ 11,600,000.00**
Subtotal				**$ 50,100,000.00**
Engineering Fee Estimate (20%)				**$ 10,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 60,200,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CYPRESS AVE	SAN-E-2
Length of Road Improvements (m)	348 m
Number of Lanes	4
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

CYPRESS AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	348	$ 5.00	$ 1,740.00
Full Depth Asphalt Removal	m	348	$ 160.00	$ 55,680.00
Driveway Removal (all types)	m	348	$ 30.00	$ 10,440.00
Sidewalk Removal (all types)	m	348	$ 20.00	$ 6,960.00
Sawcutting Existing Pavement	m	348	$ 1.00	$ 348.00
Curb and Gutter Removal	m	348	$ 20.00	$ 6,960.00
Streetlighting Removal	m	348	$ 25.00	$ 8,700.00
Signage Removal	m	348	$ 5.00	$ 1,740.00
SUBTOTAL				**$ 93,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	348	$ 100.00	$ 34,800.00
Remove Existing Manholes	m	348	$ 15.00	$ 5,220.00
Remove Existing Sanitary Private Drain Connection	m	348	$ 25.00	$ 8,700.00
SUBTOTAL				**$ 49,000.00**
Roadwork				
Earth Excavating and Grading	m	348	$ 240.00	$ 83,520.00
Supply and Place Compacted Granular "A"	m	348	$ 700.00	$ 243,600.00
Asphalt Pavement (105mm)	m	348	$ 500.00	$ 174,000.00
Subdrains (2 lanes)	m	348	$ 60.00	$ 20,880.00
Concrete Curb and Gutter (2 lanes)	m	348	$ 90.00	$ 31,320.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	348	$ 75.00	$ 26,100.00
Driveway Restoration b) Concrete	m	348	$ 180.00	$ 62,640.00
Topsoil, Hydraulic Seed and Mulch	m	348	$ 100.00	$ 34,800.00
Traffic Control During Construction (Residential)	m	348	$ 100.00	$ 34,800.00
Streetlighting (Residential)	m	348	$ 225.00	$ 78,300.00
Street Trees (In Boulevard / 12m spacing each side)	m	348	$ 125.00	$ 43,500.00
SUBTOTAL				**$ 840,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	348	$ 200.00	$ 69,600.00
Sanitary Sewer - 3000mm diameter Concrete (100-D)	m	348	$ 7,000.00	$ 2,436,000.00
Sanitary Private Drain Connection	m	348	$ 150.00	$ 52,200.00
Manhole Rain Catchers	m	348	$ 3.00	$ 1,044.00
SUBTOTAL				**$ 2,600,000.00**
Construction Cost Total				**$ 3,600,000.00**
Construction Cost Contingency (30%)				**$ 1,100,000.00**
Subtotal				**$ 4,700,000.00**
Engineering Fee Estimate (20%)				**$ 940,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 5,640,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

FOREST GLADE DR (TECUMSEH RD TO CYPRESS - PRIVATE PROPERTY)	SAN-E-2
Length of Road Improvements (m)	186 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	Yes

FOREST GLADE DR (TECUMSEH RD TO CYPRESS - PRIVATE PROPERTY)		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Full Depth Asphalt Removal	m	186	$ 80.00	$ 14,880.00
Sawcutting Existing Pavement	m	186	$ 1.00	$ 186.00
SUBTOTAL				**$ 16,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	186	$ 100.00	$ 18,600.00
Remove Existing Manholes	m	186	$ 15.00	$ 2,790.00
Remove Existing Sanitary Private Drain Connection	m	186	$ 25.00	$ 4,650.00
SUBTOTAL				**$ 27,000.00**
Roadwork				
Earth Excavating and Grading	m	186	$ 120.00	$ 22,320.00
Supply and Place Compacted Granular "A"	m	186	$ 350.00	$ 65,100.00
Asphalt Pavement (105mm)	m	186	$ 250.00	$ 46,500.00
SUBTOTAL				**$ 140,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	186	$ 200.00	$ 37,200.00
Sanitary Sewer - 2700mm diameter Concrete (100-D)	m	186	$ 6,250.00	$ 1,162,500.00
Sanitary Private Drain Connection	m	186	$ 150.00	$ 27,900.00
Manhole Rain Catchers	m	186	$ 3.00	$ 558.00
SUBTOTAL				**$ 1,300,000.00**
Construction Cost Total				**$ 1,500,000.00**
Construction Cost Contingency (30%)				**$ 450,000.00**
Subtotal				**$ 2,000,000.00**
Engineering Fee Estimate (20%)				**$ 400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 2,400,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

FOREST GLADE DR	SAN-E-2
Length of Road Improvements (m)	1758 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	No
Traffic Signals	Yes

FOREST GLADE DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1758	$ 5.00	$ 8,790.00
Full Depth Asphalt Removal	m	1758	$ 80.00	$ 140,640.00
Driveway Removal (all types)	m	1758	$ 30.00	$ 52,740.00
Sidewalk Removal (all types)	m	1758	$ 20.00	$ 35,160.00
Sawcutting Existing Pavement	m	1758	$ 1.00	$ 1,758.00
Curb and Gutter Removal	m	1758	$ 20.00	$ 35,160.00
Streetlighting Removal	m	1758	$ 25.00	$ 43,950.00
Signage Removal	m	1758	$ 5.00	$ 8,790.00
Traffic Signal Removal	LS	2	$ 15,000.00	$ 30,000.00
SUBTOTAL				**$ 360,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1758	$ 100.00	$ 175,800.00
Remove Existing Manholes	m	1758	$ 15.00	$ 26,370.00
Remove Existing Sanitary Private Drain Connection	m	1758	$ 25.00	$ 43,950.00
SUBTOTAL				**$ 250,000.00**
Roadwork				
Earth Excavating and Grading	m	1758	$ 120.00	$ 210,960.00
Supply and Place Compacted Granular "A"	m	1758	$ 350.00	$ 615,300.00
Asphalt Pavement (105mm)	m	1758	$ 250.00	$ 439,500.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	1758	$ 270.00	$ 474,660.00
Subdrains (2 lanes)	m	1758	$ 60.00	$ 105,480.00
Concrete Curb and Gutter (2 lanes)	m	1758	$ 90.00	$ 158,220.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1758	$ 75.00	$ 131,850.00
Driveway Restoration b) Concrete	m	1758	$ 180.00	$ 316,440.00
Topsoil, Hydraulic Seed and Mulch	m	1758	$ 100.00	$ 175,800.00
Temporary Pavement Markings	m	1758	$ 1.00	$ 1,758.00
Permananent Pavement Markings	m	1758	$ 30.00	$ 52,740.00
Traffic Control During Construction (Arterial)	m	1758	$ 200.00	$ 351,600.00
Streetlighting (Arterial)	m	1758	$ 400.00	$ 703,200.00
Traffic Signals (Minor Intersection)	LS	1	$ 150,000.00	$ 150,000.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
SUBTOTAL				**$ 4,100,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	1758	$ 200.00	$ 351,600.00
Sanitary Sewer - 2700mm diameter Concrete (100-D)	m	1758	$ 6,250.00	$ 10,987,500.00
Sanitary Private Drain Connection	m	1758	$ 150.00	$ 263,700.00
Manhole Rain Catchers	m	1758	$ 3.00	$ 5,274.00
SUBTOTAL				**$ 11,700,000.00**
Construction Cost Total				**$ 16,500,000.00**
Construction Cost Contingency (30%)				**$ 5,000,000.00**
Subtotal				**$ 21,500,000.00**
Engineering Fee Estimate (20%)				**$ 4,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 25,800,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

JEFFERSON TO CANTELON (PRIVATE PROPERTY)	SAN-E-2
Length of Road Improvements (m)	175 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

JEFFERSON TO CANTELON (PRIVATE PROPERTY)		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Full Depth Asphalt Removal	m	175	$ 80.00	$ 14,000.00
Driveway Removal (all types)	m	175	$ 30.00	$ 5,250.00
Sidewalk Removal (all types)	m	175	$ 20.00	$ 3,500.00
Sawcutting Existing Pavement	m	175	$ 1.00	$ 175.00
Curb and Gutter Removal	m	175	$ 20.00	$ 3,500.00
Streetlighting Removal	m	175	$ 25.00	$ 4,375.00
Signage Removal	m	175	$ 5.00	$ 875.00
Traffic Signal Removal	LS	2	$ 15,000.00	$ 30,000.00
SUBTOTAL				**$ 62,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	175	$ 100.00	$ 17,500.00
Remove Existing Manholes	m	175	$ 15.00	$ 2,625.00
Remove Existing Sanitary Private Drain Connection	m	175	$ 25.00	$ 4,375.00
SUBTOTAL				**$ 25,000.00**
Roadwork				
Earth Excavating and Grading	m	175	$ 120.00	$ 21,000.00
Supply and Place Compacted Granular "A"	m	175	$ 350.00	$ 61,250.00
Asphalt Pavement (105mm)	m	175	$ 250.00	$ 43,750.00
Subdrains (2 lanes)	0	175	$ 60.00	$ 10,500.00
Concrete Curb and Gutter (2 lanes)	m	175	$ 90.00	$ 15,750.00
SUBTOTAL				**$ 160,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	175	$ 75.00	$ 13,125.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	175	$ 450.00	$ 78,750.00
Sanitary Private Drain Connection	m	175	$ 150.00	$ 26,250.00
Manhole Rain Catchers	m	175	$ 3.00	$ 525.00
SUBTOTAL				**$ 120,000.00**
Construction Cost Total				**$ 370,000.00**
Construction Cost Contingency (30%)				**$ 120,000.00**
Subtotal				**$ 490,000.00**
Engineering Fee Estimate (20%)				**$ 98,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 590,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CANTELON DR	SAN-E-2
Length of Road Improvements (m)	943 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

CANTELON DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	943	$ 5.00	$ 4,715.00
Full Depth Asphalt Removal	m	943	$ 80.00	$ 75,440.00
Driveway Removal (all types)	m	943	$ 30.00	$ 28,290.00
Sawcutting Existing Pavement	m	943	$ 1.00	$ 943.00
Curb and Gutter Removal	m	943	$ 20.00	$ 18,860.00
Streetlighting Removal	m	943	$ 25.00	$ 23,575.00
Signage Removal	m	943	$ 5.00	$ 4,715.00
SUBTOTAL				**$ 160,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	943	$ 100.00	$ 94,300.00
Remove Existing Manholes	m	943	$ 15.00	$ 14,145.00
Remove Existing Sanitary Private Drain Connection	m	943	$ 25.00	$ 23,575.00
SUBTOTAL				**$ 140,000.00**
Roadwork				
Earth Excavating and Grading	m	943	$ 120.00	$ 113,160.00
Supply and Place Compacted Granular "A"	m	943	$ 350.00	$ 330,050.00
100mm Open Graded Drainage Layer	m	943	$ 225.00	$ 212,175.00
Concrete Pavement (305mm)	m	943	$ 575.00	$ 542,225.00
Subdrains (2 lanes)	m	943	$ 60.00	$ 56,580.00
Concrete Curb and Gutter (2 lanes)	m	943	$ 90.00	$ 84,870.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	943	$ 75.00	$ 70,725.00
Driveway Restoration b) Concrete	m	943	$ 180.00	$ 169,740.00
Topsoil, Hydraulic Seed and Mulch	m	943	$ 100.00	$ 94,300.00
Traffic Control During Construction (Arterial)	m	943	$ 200.00	$ 188,600.00
Streetlighting (Arterial)	m	943	$ 400.00	$ 377,200.00
Street Trees (In Boulevard / 12m spacing each side)	m	943	$ 125.00	$ 117,875.00
SUBTOTAL				**$ 2,400,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	943	$ 75.00	$ 70,725.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	288	$ 475.00	$ 136,800.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	99	$ 625.00	$ 61,875.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	183	$ 700.00	$ 128,100.00
Sanitary Sewer - 825mm diameter Concrete (100-D)	m	373	$ 800.00	$ 298,400.00
Sanitary Private Drain Connection	m	943	$ 150.00	$ 141,450.00
Manhole Rain Catchers	m	943	$ 3.00	$ 2,829.00
SUBTOTAL				**$ 850,000.00**
Construction Cost Total				**$ 3,600,000.00**
Construction Cost Contingency (30%)				**$ 1,100,000.00**
Subtotal				**$ 4,700,000.00**
Engineering Fee Estimate (20%)				**$ 940,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 5,640,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

HAWTHORNE DR	SAN-E-2
Length of Road Improvements (m)	931 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

HAWTHORNE DR	SAN-E-2			
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	931	$ 5.00	$ 4,655.00
Full Depth Asphalt Removal	m	931	$ 80.00	$ 74,480.00
Driveway Removal (all types)	m	931	$ 30.00	$ 27,930.00
Sawcutting Existing Pavement	m	931	$ 1.00	$ 931.00
Curb and Gutter Removal	m	931	$ 20.00	$ 18,620.00
Streetlighting Removal	m	931	$ 25.00	$ 23,275.00
Signage Removal	m	931	$ 5.00	$ 4,655.00
SUBTOTAL				**$ 160,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	931	$ 100.00	$ 93,100.00
Remove Existing Manholes	m	931	$ 15.00	$ 13,965.00
Remove Existing Sanitary Private Drain Connection	m	931	$ 25.00	$ 23,275.00
SUBTOTAL				**$ 140,000.00**
Roadwork				
Earth Excavating and Grading	m	931	$ 120.00	$ 111,720.00
Supply and Place Compacted Granular "A"	m	931	$ 350.00	$ 325,850.00
100mm Open Graded Drainage Layer	m	931	$ 225.00	$ 209,475.00
Concrete Pavement (305mm)	m	931	$ 575.00	$ 535,325.00
Additional Cost for Bicycle Lanes (2) - Concrete	m	931	$ 392.00	$ 364,952.00
Subdrains (2 lanes)	m	931	$ 60.00	$ 55,860.00
Concrete Curb and Gutter (2 lanes)	m	931	$ 90.00	$ 83,790.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	931	$ 75.00	$ 69,825.00
Driveway Restoration b) Concrete	m	931	$ 180.00	$ 167,580.00
Topsoil, Hydraulic Seed and Mulch	m	931	$ 100.00	$ 93,100.00
Traffic Control During Construction (Residential)	m	931	$ 100.00	$ 93,100.00
Streetlighting (Residential)	m	931	$ 225.00	$ 209,475.00
SUBTOTAL				**$ 2,400,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	943	$ 130.00	$ 122,590.00
Sanitary Sewer - 1350mm diameter Concrete (100-D)	m	279	$ 1,800.00	$ 502,200.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	652	$ 2,500.00	$ 1,630,000.00
Sanitary Private Drain Connection	m	931	$ 150.00	$ 139,650.00
Manhole Rain Catchers	m	931	$ 3.00	$ 2,793.00
SUBTOTAL				**$ 2,400,000.00**
Construction Cost Total				**$ 5,100,000.00**
Construction Cost Contingency (30%)				**$ 1,600,000.00**
Subtotal				**$ 6,700,000.00**
Engineering Fee Estimate (20%)				**$ 1,400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 8,100,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ESPLANADE DR	SAN-E-2
Length of Road Improvements (m)	1789 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ESPLANADE DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1789	$ 5.00	$ 8,945.00
Full Depth Asphalt Removal	m	1789	$ 80.00	$ 143,120.00
Driveway Removal (all types)	m	1789	$ 30.00	$ 53,670.00
Sidewalk Removal (all types)	m	1789	$ 20.00	$ 35,780.00
Sawcutting Existing Pavement	m	1789	$ 1.00	$ 1,789.00
Curb and Gutter Removal	m	1789	$ 20.00	$ 35,780.00
Streetlighting Removal	m	1789	$ 25.00	$ 44,725.00
Signage Removal	m	1789	$ 5.00	$ 8,945.00
SUBTOTAL				**$ 340,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1789	$ 100.00	$ 178,900.00
Remove Existing Manholes	m	1789	$ 15.00	$ 26,835.00
Remove Existing Sanitary Private Drain Connection	m	1789	$ 25.00	$ 44,725.00
SUBTOTAL				**$ 260,000.00**
Roadwork				
Earth Excavating and Grading	m	1789	$ 120.00	$ 214,680.00
Supply and Place Compacted Granular "A"	m	1789	$ 350.00	$ 626,150.00
Asphalt Pavement (105mm)	m	1789	$ 250.00	$ 447,250.00
Subdrains (2 lanes)	m	1789	$ 60.00	$ 107,340.00
Concrete Curb and Gutter (2 lanes)	m	1789	$ 90.00	$ 161,010.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1789	$ 75.00	$ 134,175.00
Driveway Restoration b) Concrete	m	1789	$ 180.00	$ 322,020.00
Topsoil, Hydraulic Seed and Mulch	m	1789	$ 100.00	$ 178,900.00
Traffic Control During Construction (Residential)	m	1789	$ 100.00	$ 178,900.00
Streetlighting (Residential)	m	1789	$ 225.00	$ 402,525.00
Street Trees (In Boulevard / 12m spacing each side)	m	1789	$ 125.00	$ 223,625.00
SUBTOTAL				**$ 3,000,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1061	$ 75.00	$ 79,575.00
Concrete Manholes - (2400mm to 3600mm)	m	728	$ 130.00	$ 94,640.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	540	$ 525.00	$ 283,500.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	378	$ 625.00	$ 236,250.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	143	$ 700.00	$ 100,100.00
Sanitary Sewer - 1800mm diameter Concrete (100-D)	m	637	$ 2,800.00	$ 1,783,600.00
Sanitary Sewer - 1950mm diameter Concrete (100-D)	m	91	$ 3,500.00	$ 318,500.00
Sanitary Private Drain Connection	m	1789	$ 150.00	$ 268,350.00
Manhole Rain Catchers	m	1789	$ 3.00	$ 5,367.00
SUBTOTAL				**$ 3,200,000.00**
Construction Cost Total				**$ 6,800,000.00**
Construction Cost Contingency (30%)				**$ 2,100,000.00**
Subtotal				**$ 8,900,000.00**
Engineering Fee Estimate (20%)				**$ 1,800,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 10,700,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ELINOR ST	SAN-E-2
Length of Road Improvements (m)	471 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ELINOR ST		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	187	$ 5.00	$ 935.00
Full Depth Asphalt Removal	m	187	$ 80.00	$ 14,960.00
Driveway Removal (all types)	m	187	$ 30.00	$ 5,610.00
Sidewalk Removal (all types)	m	187	$ 20.00	$ 3,740.00
Sawcutting Existing Pavement	m	187	$ 1.00	$ 187.00
Curb and Gutter Removal	m	187	$ 20.00	$ 3,740.00
Streetlighting Removal	m	187	$ 25.00	$ 4,675.00
Signage Removal	m	187	$ 5.00	$ 935.00
SUBTOTAL				**$ 35,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	471	$ 100.00	$ 47,100.00
Remove Existing Manholes	m	471	$ 15.00	$ 7,065.00
Remove Existing Sanitary Private Drain Connection	m	471	$ 25.00	$ 11,775.00
SUBTOTAL				**$ 66,000.00**
Roadwork				
Earth Excavating and Grading	m	187	$ 120.00	$ 22,440.00
Supply and Place Compacted Granular "A"	m	187	$ 350.00	$ 65,450.00
Asphalt Pavement (105mm)	m	187	$ 250.00	$ 46,750.00
Subdrains (2 lanes)	m	187	$ 60.00	$ 11,220.00
Concrete Curb and Gutter (2 lanes)	m	187	$ 90.00	$ 16,830.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	187	$ 75.00	$ 14,025.00
Driveway Restoration b) Concrete	m	187	$ 180.00	$ 33,660.00
Topsoil, Hydraulic Seed and Mulch	m	187	$ 100.00	$ 18,700.00
Traffic Control During Construction (Residential)	m	187	$ 100.00	$ 18,700.00
Streetlighting (Residential)	m	187	$ 225.00	$ 42,075.00
SUBTOTAL				**$ 290,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	284	$ 75.00	$ 21,300.00
Concrete Manholes - (Chamber)	m	187	$ 200.00	$ 37,400.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	284	$ 525.00	$ 149,100.00
Sanitary Sewer - 4200mm x 1800mm Concrete Box Culvert	m	187	$ 12,000.00	$ 2,244,000.00
Sanitary Private Drain Connection	m	471	$ 150.00	$ 70,650.00
Manhole Rain Catchers	m	471	$ 3.00	$ 1,413.00
SUBTOTAL				**$ 2,600,000.00**
Construction Cost Total				**$ 3,000,000.00**
Construction Cost Contingency (30%)				**$ 900,000.00**
Subtotal				**$ 3,900,000.00**
Engineering Fee Estimate (20%)				**$ 780,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 4,680,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

FLORENCE AVE	SAN-E-2
Length of Road Improvements (m)	386 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

FLORENCE AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Sewer Removals				
Remove Existing Sanitary Sewers	m	386	$ 100.00	$ 38,600.00
Remove Existing Manholes	m	386	$ 15.00	$ 5,790.00
Remove Existing Sanitary Private Drain Connection	m	386	$ 25.00	$ 9,650.00
SUBTOTAL				**$ 55,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	386	$ 75.00	$ 28,950.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	386	$ 400.00	$ 154,400.00
Sanitary Private Drain Connection	m	386	$ 150.00	$ 57,900.00
Manhole Rain Catchers	m	386	$ 3.00	$ 1,158.00
SUBTOTAL				**$ 250,000.00**
Construction Cost Total				**$ 310,000.00**
Construction Cost Contingency (30%)				**$ 93,000.00**
Subtotal				**$ 410,000.00**
Engineering Fee Estimate (20%)				**$ 82,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 500,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

JOHN M ST	SAN-E-2
Length of Road Improvements (m)	138 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

JOHN M ST		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Sewer Removals				
Remove Existing Sanitary Sewers	m	138	$ 100.00	$ 13,800.00
Remove Existing Manholes	m	138	$ 15.00	$ 2,070.00
Remove Existing Sanitary Private Drain Connection	m	138	$ 25.00	$ 3,450.00
SUBTOTAL				**$ 20,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	138	$ 75.00	$ 10,350.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	138	$ 400.00	$ 55,200.00
Sanitary Private Drain Connection	m	138	$ 150.00	$ 20,700.00
Manhole Rain Catchers	m	138	$ 3.00	$ 414.00
SUBTOTAL				**$ 87,000.00**
Construction Cost Total				**$ 110,000.00**
Construction Cost Contingency (30%)				**$ 33,000.00**
Subtotal				**$ 150,000.00**
Engineering Fee Estimate (20%)				**$ 30,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 180,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

MENARD ST	SAN-E-2
Length of Road Improvements (m)	147 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MENARD ST		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Sewer Removals				
Remove Existing Sanitary Sewers	m	147	$ 100.00	$ 14,700.00
Remove Existing Manholes	m	147	$ 15.00	$ 2,205.00
Remove Existing Sanitary Private Drain Connection	m	147	$ 25.00	$ 3,675.00
SUBTOTAL				**$ 21,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	147	$ 75.00	$ 11,025.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	47	$ 400.00	$ 18,800.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	100	$ 525.00	$ 52,500.00
Sanitary Private Drain Connection	m	147	$ 150.00	$ 22,050.00
Manhole Rain Catchers	m	147	$ 3.00	$ 441.00
SUBTOTAL				**$ 110,000.00**
Construction Cost Total				**$ 140,000.00**
Construction Cost Contingency (30%)				**$ 42,000.00**
Subtotal				**$ 190,000.00**
Engineering Fee Estimate (20%)				**$ 38,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 228,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CLOVER ST	SAN-E-2
Length of Road Improvements (m)	203 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

CLOVER ST		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Sewer Removals				
Remove Existing Sanitary Sewers	m	203	$ 100.00	$ 20,300.00
Remove Existing Manholes	m	203	$ 15.00	$ 3,045.00
Remove Existing Sanitary Private Drain Connection	m	203	$ 25.00	$ 5,075.00
SUBTOTAL				**$ 29,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	203	$ 75.00	$ 15,225.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	203	$ 450.00	$ 91,350.00
Sanitary Private Drain Connection	m	203	$ 150.00	$ 30,450.00
Manhole Rain Catchers	m	203	$ 3.00	$ 609.00
SUBTOTAL				**$ 140,000.00**
Construction Cost Total				**$ 170,000.00**
Construction Cost Contingency (30%)				**$ 51,000.00**
Subtotal				**$ 230,000.00**
Engineering Fee Estimate (20%)				**$ 46,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 280,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

BEVERLY GLEN	SAN-E-2
Length of Road Improvements (m)	977 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

BEVERLY GLEN		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	977	$ 5.00	$ 4,885.00
Full Depth Asphalt Removal	m	977	$ 80.00	$ 78,160.00
Driveway Removal (all types)	m	977	$ 30.00	$ 29,310.00
Sidewalk Removal (all types)	m	977	$ 20.00	$ 19,540.00
Sawcutting Existing Pavement	m	977	$ 1.00	$ 977.00
Curb and Gutter Removal	m	977	$ 20.00	$ 19,540.00
Streetlighting Removal	m	977	$ 25.00	$ 24,425.00
Signage Removal	m	977	$ 5.00	$ 4,885.00
SUBTOTAL				**$ 190,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	977	$ 100.00	$ 97,700.00
Remove Existing Manholes	m	977	$ 15.00	$ 14,655.00
Remove Existing Sanitary Private Drain Connection	m	977	$ 25.00	$ 24,425.00
SUBTOTAL				**$ 140,000.00**
Roadwork				
Earth Excavating and Grading	m	977	$ 120.00	$ 117,240.00
Supply and Place Compacted Granular "A"	m	977	$ 350.00	$ 341,950.00
Asphalt Pavement (105mm)	m	977	$ 250.00	$ 244,250.00
Subdrains (2 lanes)	m	977	$ 60.00	$ 58,620.00
Concrete Curb and Gutter (2 lanes)	m	977	$ 90.00	$ 87,930.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	977	$ 75.00	$ 73,275.00
Driveway Restoration b) Concrete	m	977	$ 180.00	$ 175,860.00
Topsoil, Hydraulic Seed and Mulch	m	977	$ 100.00	$ 97,700.00
Traffic Control During Construction (Residential)	m	977	$ 100.00	$ 97,700.00
Streetlighting (Residential)	m	977	$ 225.00	$ 219,825.00
Street Trees (In Boulevard / 12m spacing each side)	m	977	$ 125.00	$ 122,125.00
SUBTOTAL				**$ 1,700,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	977	$ 200.00	$ 195,400.00
Sanitary Sewer - 4200mm x 2700mm Concrete Box Culvert	m	977	$ 20,000.00	$ 19,540,000.00
Sanitary Private Drain Connection	m	977	$ 150.00	$ 146,550.00
Manhole Rain Catchers	m	977	$ 3.00	$ 2,931.00
SUBTOTAL				**$ 19,900,000.00**
Construction Cost Total				**$ 22,000,000.00**
Construction Cost Contingency (30%)				**$ 6,600,000.00**
Subtotal				**$ 28,600,000.00**
Engineering Fee Estimate (20%)				**$ 5,800,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 34,400,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WHISTLER CRESCENT TO BEVERLEY GLEN (PRIVATE PROPERTY EASEMENT)	SAN-E-2
Length of Road Improvements (m)	303 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

WHISTLER CRESCENT TO BEVERLEY GLEN		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	303	$ 5.00	$ 1,515.00
SUBTOTAL				**$ 2,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	303	$ 100.00	$ 30,300.00
Remove Existing Manholes	m	303	$ 15.00	$ 4,545.00
Remove Existing Sanitary Private Drain Connection	m	303	$ 25.00	$ 7,575.00
SUBTOTAL				**$ 43,000.00**
Roadwork				
Topsoil, Hydraulic Seed and Mulch	m	303	$ 100.00	$ 30,300.00
SUBTOTAL				**$ 31,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	303	$ 200.00	$ 60,600.00
Sanitary Sewer - 4200mm diameter Concrete (100-D)	m	91	$ 8,000.00	$ 728,000.00
Sanitary Sewer - 4200mm x 2700mm Concrete Box Culvert	m	212	$ 20,000.00	$ 4,240,000.00
Sanitary Private Drain Connection	m	303	$ 150.00	$ 45,450.00
Manhole Rain Catchers	m	303	$ 3.00	$ 909.00
SUBTOTAL				**$ 5,100,000.00**
Construction Cost Total				**$ 5,200,000.00**
Construction Cost Contingency (30%)				**$ 1,600,000.00**
Subtotal				**$ 6,800,000.00**
Engineering Fee Estimate (20%)				**$ 1,400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 8,200,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WHISTLER CRES	SAN-E-2
Length of Road Improvements (m)	153 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WHISTLER CRES		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	153	$ 5.00	$ 765.00
Full Depth Asphalt Removal	m	153	$ 80.00	$ 12,240.00
Driveway Removal (all types)	m	153	$ 30.00	$ 4,590.00
Sidewalk Removal (all types)	m	153	$ 20.00	$ 3,060.00
Curb and Gutter Removal	m	153	$ 20.00	$ 3,060.00
Streetlighting Removal	m	153	$ 25.00	$ 3,825.00
Signage Removal	m	153	$ 5.00	$ 765.00
SUBTOTAL				**$ 29,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	153	$ 100.00	$ 15,300.00
Remove Existing Manholes	m	153	$ 15.00	$ 2,295.00
Remove Existing Sanitary Private Drain Connection	m	153	$ 25.00	$ 3,825.00
SUBTOTAL				**$ 22,000.00**
Roadwork				
Earth Excavating and Grading	m	153	$ 120.00	$ 18,360.00
Supply and Place Compacted Granular "A"	m	153	$ 350.00	$ 53,550.00
Asphalt Pavement (105mm)	m	153	$ 250.00	$ 38,250.00
Subdrains (2 lanes)	m	153	$ 60.00	$ 9,180.00
Concrete Curb and Gutter (2 lanes)	m	153	$ 90.00	$ 13,770.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	153	$ 75.00	$ 11,475.00
Driveway Restoration b) Concrete	m	153	$ 180.00	$ 27,540.00
Topsoil, Hydraulic Seed and Mulch	m	153	$ 100.00	$ 15,300.00
Traffic Control During Construction (Residential)	m	153	$ 100.00	$ 15,300.00
Streetlighting (Residential)	m	153	$ 225.00	$ 34,425.00
Street Trees (In Boulevard / 12m spacing each side)	m	153	$ 125.00	$ 19,125.00
SUBTOTAL				**$ 260,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	153	$ 200.00	$ 30,600.00
Sanitary Sewer - 2500mm diameter Concrete (100-D)	m	153	$ 5,750.00	$ 879,750.00
Sanitary Private Drain Connection	m	153	$ 150.00	$ 22,950.00
Manhole Rain Catchers	m	153	$ 3.00	$ 459.00
SUBTOTAL				**$ 1,000,000.00**
Construction Cost Total				**$ 1,400,000.00**
Construction Cost Contingency (30%)				**$ 420,000.00**
Subtotal				**$ 1,900,000.00**
Engineering Fee Estimate (20%)				**$ 380,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 2,280,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

CORA GREENWOOD PARK	SAN-E-2
Length of Road Improvements (m)	98 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

CORA GREENWOOD PARK		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	98	$ 5.00	$ 490.00
SUBTOTAL				**$ 500.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	98	$ 100.00	$ 9,800.00
Remove Existing Manholes	m	98	$ 15.00	$ 1,470.00
Remove Existing Sanitary Private Drain Connection	m	98	$ 25.00	$ 2,450.00
SUBTOTAL				**$ 14,000.00**
Roadwork				
Earth Excavating and Grading	m	98	$ 120.00	$ 11,760.00
Supply and Place Compacted Granular "A"	m	98	$ 350.00	$ 34,300.00
Topsoil, Hydraulic Seed and Mulch	m	98	$ 100.00	$ 9,800.00
Traffic Control During Construction (Residential)	m	98	$ 100.00	$ 9,800.00
Streetlighting (Residential)	m	98	$ 225.00	$ 22,050.00
SUBTOTAL				**$ 88,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	98	$ 200.00	$ 19,600.00
Sanitary Sewer - 2500mm diameter Concrete (100-D)	m	98	$ 5,750.00	$ 563,500.00
Sanitary Private Drain Connection	m	98	$ 150.00	$ 14,700.00
Manhole Rain Catchers	m	98	$ 3.00	$ 294.00
SUBTOTAL				**$ 600,000.00**
Construction Cost Total				**$ 710,000.00**
Construction Cost Contingency (30%)				**$ 220,000.00**
Subtotal				**$ 930,000.00**
Engineering Fee Estimate (20%)				**$ 190,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 1,120,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

RENDEZVOUS TO CORA GREENWOOD PARK	SAN-E-2
Length of Road Improvements (m)	437 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

RENDEZVOUS TO CORA GREENWOOD PARK		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	437	$ 5.00	$ 2,185.00
Full Depth Asphalt Removal	m	40	$ 80.00	$ 3,200.00
Driveway Removal (all types)	m	40	$ 30.00	$ 1,200.00
Sidewalk Removal (all types)	m	40	$ 20.00	$ 800.00
Sawcutting Existing Pavement	m	40	$ 1.00	$ 40.00
Curb and Gutter Removal	m	40	$ 20.00	$ 800.00
Streetlighting Removal	m	40	$ 25.00	$ 1,000.00
SUBTOTAL				**$ 10,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	437	$ 100.00	$ 43,700.00
Remove Existing Manholes	m	437	$ 15.00	$ 6,555.00
Remove Existing Sanitary Private Drain Connection	m	437	$ 25.00	$ 10,925.00
SUBTOTAL				**$ 62,000.00**
Roadwork				
Earth Excavating and Grading	m	40	$ 120.00	$ 4,800.00
Supply and Place Compacted Granular "A"	m	40	$ 350.00	$ 14,000.00
Asphalt Pavement (105mm)	m	40	$ 250.00	$ 10,000.00
Subdrains (2 lanes)	m	40	$ 60.00	$ 2,400.00
Concrete Curb and Gutter (2 lanes)	m	40	$ 90.00	$ 3,600.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	40	$ 75.00	$ 3,000.00
Driveway Restoration b) Concrete	m	40	$ 180.00	$ 7,200.00
Topsoil, Hydraulic Seed and Mulch	m	437	$ 100.00	$ 43,700.00
Traffic Control During Construction (Residential)	m	40	$ 100.00	$ 4,000.00
Streetlighting (Residential)	m	40	$ 225.00	$ 9,000.00
SUBTOTAL				**$ 110,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	149	$ 130.00	$ 19,370.00
Concrete Manholes - (Chamber)	m	96	$ 200.00	$ 19,200.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	288	$ 900.00	$ 259,200.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	149	$ 2,500.00	$ 372,500.00
Sanitary Private Drain Connection	m	437	$ 150.00	$ 65,550.00
Manhole Rain Catchers	m	437	$ 3.00	$ 1,311.00
SUBTOTAL				**$ 740,000.00**
Construction Cost Total				**$ 930,000.00**
Construction Cost Contingency (30%)				**$ 280,000.00**
Subtotal				**$ 1,300,000.00**
Engineering Fee Estimate (20%)				**$ 260,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 1,560,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CORA GREENWOOD DR	SAN-E-2
Length of Road Improvements (m)	90 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	No
Traffic Signals	No

CORA GREENWOOD DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	30	$ 5.00	$ 150.00
Full Depth Asphalt Removal	m	30	$ 80.00	$ 2,400.00
Driveway Removal (all types)	m	30	$ 30.00	$ 900.00
Sidewalk Removal (all types)	m	30	$ 20.00	$ 600.00
Sawcutting Existing Pavement	m	30	$ 1.00	$ 30.00
Curb and Gutter Removal	m	30	$ 20.00	$ 600.00
Streetlighting Removal	m	30	$ 25.00	$ 750.00
Signage Removal	m	30	$ 5.00	$ 150.00
SUBTOTAL				**$ 6,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	30	$ 100.00	$ 3,000.00
Remove Existing Manholes	m	30	$ 15.00	$ 450.00
Remove Existing Sanitary Private Drain Connection	m	30	$ 25.00	$ 750.00
SUBTOTAL				**$ 5,000.00**
Roadwork				
Earth Excavating and Grading	m	30	$ 120.00	$ 3,600.00
Supply and Place Compacted Granular "A"	m	30	$ 350.00	$ 10,500.00
Asphalt Pavement (105mm)	m	30	$ 250.00	$ 7,500.00
Subdrains (2 lanes)	m	30	$ 60.00	$ 1,800.00
Concrete Curb and Gutter (2 lanes)	m	30	$ 90.00	$ 2,700.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	30	$ 75.00	$ 2,250.00
Driveway Restoration b) Concrete	m	30	$ 180.00	$ 5,400.00
Topsoil, Hydraulic Seed and Mulch	m	30	$ 100.00	$ 3,000.00
Traffic Control During Construction (Residential)	m	30	$ 100.00	$ 3,000.00
Streetlighting (Residential)	m	30	$ 225.00	$ 6,750.00
SUBTOTAL				**$ 47,000.00**
Sewers				
Concrete Manholes - (Chamber)	m	30	$ 200.00	$ 6,000.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	90	$ 900.00	$ 81,000.00
Sanitary Private Drain Connection	m	90	$ 150.00	$ 13,500.00
Manhole Rain Catchers	m	90	$ 3.00	$ 270.00
SUBTOTAL				**$ 110,000.00**
Construction Cost Total				**$ 170,000.00**
Construction Cost Contingency (30%)				**$ 51,000.00**
Subtotal				**$ 230,000.00**
Engineering Fee Estimate (20%)				**$ 46,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 276,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

GREENPARK BLVD	SAN-E-2
Length of Road Improvements (m)	723 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GREENPARK BLVD		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	723	$ 5.00	$ 3,615.00
Full Depth Asphalt Removal	m	723	$ 80.00	$ 57,840.00
Driveway Removal (all types)	m	723	$ 30.00	$ 21,690.00
Sidewalk Removal (all types)	m	723	$ 20.00	$ 14,460.00
Sawcutting Existing Pavement	m	723	$ 1.00	$ 723.00
Curb and Gutter Removal	m	723	$ 20.00	$ 14,460.00
Streetlighting Removal	m	723	$ 25.00	$ 18,075.00
Signage Removal	m	723	$ 5.00	$ 3,615.00
SUBTOTAL				**$ 140,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	723	$ 100.00	$ 72,300.00
Remove Existing Manholes	m	723	$ 15.00	$ 10,845.00
Remove Existing Sanitary Private Drain Connection	m	723	$ 25.00	$ 18,075.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	723	$ 120.00	$ 86,760.00
Supply and Place Compacted Granular "A"	m	723	$ 350.00	$ 253,050.00
Asphalt Pavement (105mm)	m	723	$ 250.00	$ 180,750.00
Subdrains (2 lanes)	m	723	$ 60.00	$ 43,380.00
Concrete Curb and Gutter (2 lanes)	m	723	$ 90.00	$ 65,070.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	723	$ 75.00	$ 54,225.00
Driveway Restoration b) Concrete	m	723	$ 180.00	$ 130,140.00
Topsoil, Hydraulic Seed and Mulch	m	723	$ 100.00	$ 72,300.00
Traffic Control During Construction (Residential)	m	723	$ 100.00	$ 72,300.00
Streetlighting (Residential)	m	723	$ 225.00	$ 162,675.00
SUBTOTAL				**$ 1,200,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	723	$ 130.00	$ 93,990.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	425	$ 525.00	$ 223,125.00
Sanitary Sewer - 1050mm diameter Concrete (100-D)	m	298	$ 1,250.00	$ 372,500.00
Sanitary Private Drain Connection	m	723	$ 150.00	$ 108,450.00
Manhole Rain Catchers	m	723	$ 3.00	$ 2,169.00
SUBTOTAL				**$ 810,000.00**
Construction Cost Total				**$ 2,300,000.00**
Construction Cost Contingency (30%)				**$ 690,000.00**
Subtotal				**$ 3,000,000.00**
Engineering Fee Estimate (20%)				**$ 600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 3,600,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

LITTLE RIVER BLVD	SAN-E-2
Length of Road Improvements (m)	100 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

LITTLE RIVER BLVD		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	100	$ 5.00	$ 500.00
Full Depth Asphalt Removal	m	100	$ 80.00	$ 8,000.00
Driveway Removal (all types)	m	100	$ 30.00	$ 3,000.00
Sidewalk Removal (all types)	m	100	$ 20.00	$ 2,000.00
Sawcutting Existing Pavement	m	100	$ 1.00	$ 100.00
Curb and Gutter Removal	m	100	$ 20.00	$ 2,000.00
Streetlighting Removal	m	100	$ 25.00	$ 2,500.00
Signage Removal	m	100	$ 5.00	$ 500.00
SUBTOTAL				**$ 19,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	100	$ 100.00	$ 10,000.00
Remove Existing Manholes	m	100	$ 15.00	$ 1,500.00
Remove Existing Sanitary Private Drain Connection	m	100	$ 25.00	$ 2,500.00
SUBTOTAL				**$ 14,000.00**
Roadwork				
Earth Excavating and Grading	m	100	$ 120.00	$ 12,000.00
Supply and Place Compacted Granular "A"	m	100	$ 350.00	$ 35,000.00
Asphalt Pavement (105mm)	m	100	$ 250.00	$ 25,000.00
Subdrains (2 lanes)	m	100	$ 60.00	$ 6,000.00
Concrete Curb and Gutter (2 lanes)	m	100	$ 90.00	$ 9,000.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	100	$ 75.00	$ 7,500.00
Driveway Restoration b) Concrete	m	100	$ 180.00	$ 18,000.00
Topsoil, Hydraulic Seed and Mulch	m	100	$ 100.00	$ 10,000.00
Traffic Control During Construction (Residential)	m	100	$ 100.00	$ 10,000.00
Streetlighting (Residential)	m	100	$ 225.00	$ 22,500.00
SUBTOTAL				**$ 160,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	100	$ 130.00	$ 13,000.00
Sanitary Sewer - 1050mm diameter Concrete (100-D)	m	100	$ 1,250.00	$ 125,000.00
Sanitary Private Drain Connection	m	100	$ 150.00	$ 15,000.00
Manhole Rain Catchers	m	100	$ 3.00	$ 300.00
SUBTOTAL				**$ 160,000.00**
Construction Cost Total				**$ 360,000.00**
Construction Cost Contingency (30%)				**$ 110,000.00**
Subtotal				**$ 470,000.00**
Engineering Fee Estimate (20%)				**$ 94,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 564,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

JARVIS AVE	SAN-E-2
Length of Road Improvements (m)	714 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

JARVIS AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	714	$ 5.00	$ 3,570.00
Full Depth Asphalt Removal	m	714	$ 80.00	$ 57,120.00
Driveway Removal (all types)	m	714	$ 30.00	$ 21,420.00
Sidewalk Removal (all types)	m	714	$ 20.00	$ 14,280.00
Sawcutting Existing Pavement	m	714	$ 1.00	$ 714.00
Streetlighting Removal	m	714	$ 25.00	$ 17,850.00
Signage Removal	m	714	$ 5.00	$ 3,570.00
SUBTOTAL				**$ 120,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	714	$ 100.00	$ 71,400.00
Remove Existing Manholes	m	714	$ 15.00	$ 10,710.00
Remove Existing Sanitary Private Drain Connection	m	714	$ 25.00	$ 17,850.00
SUBTOTAL				**$ 100,000.00**
Roadwork				
Earth Excavating and Grading	m	714	$ 120.00	$ 85,680.00
Supply and Place Compacted Granular "A"	m	714	$ 350.00	$ 249,900.00
Asphalt Pavement (105mm)	m	714	$ 250.00	$ 178,500.00
Subdrains (2 lanes)	m	714	$ 60.00	$ 42,840.00
Concrete Curb and Gutter (2 lanes)	m	714	$ 90.00	$ 64,260.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	714	$ 75.00	$ 53,550.00
Driveway Restoration b) Concrete	m	714	$ 180.00	$ 128,520.00
Topsoil, Hydraulic Seed and Mulch	m	714	$ 100.00	$ 71,400.00
Traffic Control During Construction (Residential)	m	714	$ 100.00	$ 71,400.00
Streetlighting (Residential)	m	714	$ 225.00	$ 160,650.00
SUBTOTAL				**$ 1,200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	714	$ 75.00	$ 53,550.00
Sanitary Sewer - 250mm diameter PVC (DR-28)	m	43	$ 350.00	$ 15,050.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	466	$ 475.00	$ 221,350.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	205	$ 525.00	$ 107,625.00
Sanitary Private Drain Connection	m	714	$ 150.00	$ 107,100.00
Manhole Rain Catchers	m	714	$ 3.00	$ 2,142.00
SUBTOTAL				**$ 510,000.00**
Construction Cost Total				**$ 2,000,000.00**
Construction Cost Contingency (30%)				**$ 600,000.00**
Subtotal				**$ 2,600,000.00**
Engineering Fee Estimate (20%)				**$ 520,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 3,120,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

BANWELL RD	SAN-E-2
Length of Road Improvements (m)	983 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

BANWELL RD		SAN-E-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	983	$ 5.00	$ 4,915.00
Full Depth Asphalt Removal	m	983	$ 160.00	$ 157,280.00
Sidewalk Removal (all types)	m	983	$ 20.00	$ 19,660.00
Sawcutting Existing Pavement	m	983	$ 1.00	$ 983.00
Curb and Gutter Removal	m	983	$ 20.00	$ 19,660.00
Streetlighting Removal	m	983	$ 25.00	$ 24,575.00
Signage Removal	m	983	$ 5.00	$ 4,915.00
Traffic Signal Removal	LS	1	$ 15,000.00	$ 15,000.00
SUBTOTAL				**$ 250,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	983	$ 100.00	$ 98,300.00
Remove Existing Manholes	m	983	$ 15.00	$ 14,745.00
Remove Existing Sanitary Private Drain Connection	m	983	$ 25.00	$ 24,575.00
SUBTOTAL				**$ 140,000.00**
Roadwork				
Earth Excavating and Grading	m	983	$ 240.00	$ 235,920.00
Supply and Place Compacted Granular "A"	m	983	$ 700.00	$ 688,100.00
100mm Open Graded Drainage Layer	m	983	$ 450.00	$ 442,350.00
Concrete Pavement (305mm)	m	983	$ 1,150.00	$ 1,130,450.00
Subdrains (2 lanes)	m	983	$ 60.00	$ 58,980.00
Concrete Curb and Gutter (2 lanes)	m	983	$ 90.00	$ 88,470.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	983	$ 75.00	$ 73,725.00
Topsoil, Hydraulic Seed and Mulch	m	983	$ 100.00	$ 98,300.00
Temporary Pavement Markings	m	983	$ 1.00	$ 983.00
Permananent Pavement Markings	m	983	$ 30.00	$ 29,490.00
Traffic Control During Construction (Arterial)	m	983	$ 200.00	$ 196,600.00
Streetlighting (Arterial)	m	983	$ 400.00	$ 393,200.00
Traffic Signals (Major Intersection)	LS	1	$ 200,000.00	$ 200,000.00
Traffic Signals (Temporary)	LS	1	$ 80,000.00	$ 80,000.00
SUBTOTAL				**$ 3,800,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	714	$ 75.00	$ 53,550.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	244	$ 700.00	$ 170,800.00
Sanitary Sewer - 825mm diameter Concrete (100-D)	m	247	$ 800.00	$ 197,600.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	492	$ 900.00	$ 442,800.00
Sanitary Private Drain Connection	m	983	$ 150.00	$ 147,450.00
Manhole Rain Catchers	m	983	$ 3.00	$ 2,949.00
SUBTOTAL				**$ 1,100,000.00**
Construction Cost Total				**$ 5,300,000.00**
Construction Cost Contingency (30%)				**$ 1,600,000.00**
Subtotal				**$ 6,900,000.00**
Engineering Fee Estimate (20%)				**$ 1,400,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-E-2**		**$ 8,300,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

ROSEBRIAR RD	SAN-E-2
Length of Road Improvements (m)	280 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ROSEBRIAR RD		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	280	$ 5.00	$ 1,400.00
Full Depth Asphalt Removal	m	280	$ 80.00	$ 22,400.00
Driveway Removal (all types)	m	280	$ 30.00	$ 8,400.00
Sidewalk Removal (all types)	m	280	$ 20.00	$ 5,600.00
Sawcutting Existing Pavement	m	280	$ 1.00	$ 280.00
Curb and Gutter Removal	m	280	$ 20.00	$ 5,600.00
Streetlighting Removal	m	280	$ 25.00	$ 7,000.00
Signage Removal	m	280	$ 5.00	$ 1,400.00
SUBTOTAL				**$ 53,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	280	$ 100.00	$ 28,000.00
Remove Existing Manholes	m	280	$ 15.00	$ 4,200.00
Remove Existing Sanitary Private Drain Connection	m	280	$ 25.00	$ 7,000.00
SUBTOTAL				**$ 40,000.00**
Roadwork				
Earth Excavating and Grading	m	280	$ 120.00	$ 33,600.00
Supply and Place Compacted Granular "A"	m	280	$ 350.00	$ 98,000.00
Asphalt Pavement (105mm)	m	280	$ 250.00	$ 70,000.00
Subdrains (2 lanes)	m	280	$ 60.00	$ 16,800.00
Concrete Curb and Gutter (2 lanes)	m	280	$ 90.00	$ 25,200.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	280	$ 75.00	$ 21,000.00
Driveway Restoration b) Concrete	m	280	$ 180.00	$ 50,400.00
Topsoil, Hydraulic Seed and Mulch	m	280	$ 100.00	$ 28,000.00
Traffic Control During Construction (Residential)	m	280	$ 100.00	$ 28,000.00
Streetlighting (Residential)	m	280	$ 225.00	$ 63,000.00
SUBTOTAL				**$ 440,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	234	$ 75.00	$ 17,550.00
Concrete Manholes - (2400mm to 3600mm)	m	46	$ 130.00	$ 5,980.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	234	$ 900.00	$ 210,600.00
Sanitary Sewer - 1050mm diameter Concrete (100-D)	m	46	$ 1,250.00	$ 57,500.00
Sanitary Private Drain Connection	m	280	$ 150.00	$ 42,000.00
Manhole Rain Catchers	m	280	$ 3.00	$ 840.00
SUBTOTAL				**$ 340,000.00**
Construction Cost Total				**$ 880,000.00**
Construction Cost Contingency (30%)				**$ 270,000.00**
Subtotal				**$ 1,200,000.00**
Engineering Fee Estimate (20%)				**$ 240,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 1,440,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WILDWOOD DR	SAN-E-2
Length of Road Improvements (m)	842 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WILDWOOD DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	842	$ 5.00	$ 4,210.00
Full Depth Asphalt Removal	m	842	$ 80.00	$ 67,360.00
Driveway Removal (all types)	m	842	$ 30.00	$ 25,260.00
Sidewalk Removal (all types)	m	842	$ 20.00	$ 16,840.00
Sawcutting Existing Pavement	m	842	$ 1.00	$ 842.00
Curb and Gutter Removal	m	842	$ 20.00	$ 16,840.00
Streetlighting Removal	m	842	$ 25.00	$ 21,050.00
Signage Removal	m	842	$ 5.00	$ 4,210.00
SUBTOTAL				**$ 160,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	842	$ 100.00	$ 84,200.00
Remove Existing Manholes	m	842	$ 15.00	$ 12,630.00
Remove Existing Sanitary Private Drain Connection	m	842	$ 25.00	$ 21,050.00
SUBTOTAL				**$ 120,000.00**
Roadwork				
Earth Excavating and Grading	m	842	$ 120.00	$ 101,040.00
Supply and Place Compacted Granular "A"	m	842	$ 350.00	$ 294,700.00
Asphalt Pavement (105mm)	m	842	$ 250.00	$ 210,500.00
Subdrains (2 lanes)	m	842	$ 60.00	$ 50,520.00
Concrete Curb and Gutter (2 lanes)	m	842	$ 90.00	$ 75,780.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	842	$ 75.00	$ 63,150.00
Driveway Restoration b) Concrete	m	842	$ 180.00	$ 151,560.00
Topsoil, Hydraulic Seed and Mulch	m	842	$ 100.00	$ 84,200.00
Traffic Control During Construction (Residential)	m	842	$ 100.00	$ 84,200.00
Streetlighting (Residential)	m	842	$ 225.00	$ 189,450.00
SUBTOTAL				**$ 1,400,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	842	$ 75.00	$ 63,150.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	384	$ 450.00	$ 172,800.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	194	$ 625.00	$ 121,250.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	264	$ 700.00	$ 184,800.00
Sanitary Private Drain Connection	m	842	$ 150.00	$ 126,300.00
Manhole Rain Catchers	m	842	$ 3.00	$ 2,526.00
SUBTOTAL				**$ 680,000.00**
Construction Cost Total				**$ 2,400,000.00**
Construction Cost Contingency (30%)				**$ 720,000.00**
Subtotal				**$ 3,200,000.00**
Engineering Fee Estimate (20%)				**$ 640,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 3,840,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

DEARBROOK DR	SAN-E-2
Length of Road Improvements (m)	324 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

DEARBROOK DR		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	324	$ 5.00	$ 1,620.00
Full Depth Asphalt Removal	m	324	$ 80.00	$ 25,920.00
Driveway Removal (all types)	m	324	$ 30.00	$ 9,720.00
Sidewalk Removal (all types)	m	324	$ 20.00	$ 6,480.00
Sawcutting Existing Pavement	m	324	$ 1.00	$ 324.00
Curb and Gutter Removal	m	324	$ 20.00	$ 6,480.00
Streetlighting Removal	m	324	$ 25.00	$ 8,100.00
Signage Removal	m	324	$ 5.00	$ 1,620.00
SUBTOTAL				**$ 61,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	324	$ 100.00	$ 32,400.00
Remove Existing Manholes	m	324	$ 15.00	$ 4,860.00
Remove Existing Sanitary Private Drain Connection	m	324	$ 25.00	$ 8,100.00
SUBTOTAL				**$ 46,000.00**
Roadwork				
Earth Excavating and Grading	m	324	$ 120.00	$ 38,880.00
Supply and Place Compacted Granular "A"	m	324	$ 350.00	$ 113,400.00
Asphalt Pavement (105mm)	m	324	$ 250.00	$ 81,000.00
Subdrains (2 lanes)	m	324	$ 60.00	$ 19,440.00
Concrete Curb and Gutter (2 lanes)	m	324	$ 90.00	$ 29,160.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	324	$ 75.00	$ 24,300.00
Driveway Restoration b) Concrete	m	324	$ 180.00	$ 58,320.00
Topsoil, Hydraulic Seed and Mulch	m	324	$ 100.00	$ 32,400.00
Traffic Control During Construction (Residential)	m	324	$ 100.00	$ 32,400.00
Streetlighting (Residential)	m	324	$ 225.00	$ 72,900.00
SUBTOTAL				**$ 510,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	324	$ 75.00	$ 24,300.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	197	$ 450.00	$ 88,650.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	127	$ 475.00	$ 60,325.00
Sanitary Private Drain Connection	m	324	$ 150.00	$ 48,600.00
Manhole Rain Catchers	m	324	$ 3.00	$ 972.00
SUBTOTAL				**$ 230,000.00**
Construction Cost Total				**$ 850,000.00**
Construction Cost Contingency (30%)				**$ 260,000.00**
Subtotal				**$ 1,200,000.00**
Engineering Fee Estimate (20%)				**$ 240,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 1,440,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

SOUTH NATIONAL STREET	SAN-E-2
Length of Road Improvements (m)	918 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

SOUTH NATIONAL STREET		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Sewer Removals				
Remove Existing Sanitary Sewers	m	918	$ 100.00	$ 91,800.00
Remove Existing Manholes	m	918	$ 15.00	$ 13,770.00
Remove Existing Sanitary Private Drain Connection	m	918	$ 25.00	$ 22,950.00
SUBTOTAL				**$ 130,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	321	$ 75.00	$ 24,075.00
Concrete Manholes - (2400mm to 3600mm)	m	269	$ 130.00	$ 34,970.00
Concrete Manholes - (Chamber)	m	328	$ 200.00	$ 65,600.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	11	$ 400.00	$ 4,400.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	81	$ 450.00	$ 36,450.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	11	$ 450.00	$ 4,950.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	218	$ 900.00	$ 196,200.00
Sanitary Sewer - 1200mm diameter Concrete (100-D)	m	144	$ 1,500.00	$ 216,000.00
Sanitary Sewer - 1800mm diameter Concrete (100-D)	m	125	$ 2,800.00	$ 350,000.00
Sanitary Sewer - 3900mm x 1800mm Concrete Box Culvert	m	137	$ 10,000.00	$ 1,370,000.00
Sanitary Sewer - 3000mm x 2400mm Concrete Box Culvert	m	191	$ 12,000.00	$ 2,292,000.00
Sanitary Private Drain Connection	m	918	$ 150.00	$ 137,700.00
Manhole Rain Catchers	m	918	$ 3.00	$ 2,754.00
SUBTOTAL				**$ 4,800,000.00**
Construction Cost Total				**$ 5,000,000.00**
Construction Cost Contingency (30%)				**$ 1,500,000.00**
Subtotal				**$ 6,500,000.00**
Engineering Fee Estimate (20%)				**$ 1,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 7,800,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

JEFFERSON BLVD	SAN-E-2
Length of Road Improvements (m)	800 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

JEFFERSON BLVD		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	200	$ 5.00	$ 1,000.00
Full Depth Asphalt Removal	m	200	$ 80.00	$ 16,000.00
Driveway Removal (all types)	m	200	$ 30.00	$ 6,000.00
Sidewalk Removal (all types)	m	200	$ 20.00	$ 4,000.00
Sawcutting Existing Pavement	m	200	$ 1.00	$ 200.00
Curb and Gutter Removal	m	200	$ 20.00	$ 4,000.00
Streetlighting Removal	m	200	$ 25.00	$ 5,000.00
Signage Removal	m	200	$ 5.00	$ 1,000.00
SUBTOTAL				**$ 38,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	102	$ 100.00	$ 10,200.00
Remove Existing Combined Sewers	m	698	$ 75.00	$ 52,350.00
Remove Existing Manholes	m	800	$ 15.00	$ 12,000.00
Remove Existing Combined Private Drain Connection	m	698	$ 100.00	$ 69,800.00
Remove Existing Sanitary Private Drain Connection	m	102	$ 25.00	$ 2,550.00
SUBTOTAL				**$ 150,000.00**
Roadwork				
Earth Excavating and Grading	m	200	$ 120.00	$ 24,000.00
Supply and Place Compacted Granular "A"	m	200	$ 350.00	$ 70,000.00
Asphalt Pavement (105mm)	m	200	$ 250.00	$ 50,000.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	200	$ 270.00	$ 54,000.00
Subdrains (2 lanes)	m	200	$ 60.00	$ 12,000.00
Concrete Curb and Gutter (2 lanes)	m	200	$ 90.00	$ 18,000.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	200	$ 75.00	$ 15,000.00
Driveway Restoration b) Concrete	m	200	$ 180.00	$ 36,000.00
Topsoil, Hydraulic Seed and Mulch	m	200	$ 100.00	$ 20,000.00
Traffic Control During Construction (Arterial)	m	200	$ 200.00	$ 40,000.00
Streetlighting (Arterial)	m	200	$ 400.00	$ 80,000.00
SUBTOTAL				**$ 420,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	360	$ 75.00	$ 27,000.00
Concrete Manholes - (Chamber)	m	440	$ 200.00	$ 88,000.00
Sanitary Sewer - 250mm diameter PVC (DR-28)	m	6	$ 350.00	$ 2,100.00
Sanitary Sewer - 300mm diameter PVC (DR-28)	m	10	$ 400.00	$ 4,000.00
Sanitary Sewer - 825mm diameter Concrete (100-D)	m	350	$ 800.00	$ 280,000.00
Sanitary Sewer - 2100mm diameter Concrete (100-D)	m	17	$ 4,000.00	$ 68,000.00
Sanitary Sewer - 4200mm x 2400mm Concrete Box Culvert	m	417	$ 18,000.00	$ 7,506,000.00
Sanitary Private Drain Connection	m	800	$ 150.00	$ 120,000.00
Manhole Rain Catchers	m	800	$ 3.00	$ 2,400.00
SUBTOTAL				**$ 8,100,000.00**
Construction Cost Total				**$ 8,800,000.00**
Construction Cost Contingency (30%)				**$ 2,700,000.00**
Subtotal				**$ 11,500,000.00**
Engineering Fee Estimate (20%)				**$ 2,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 13,800,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

BALFOUR BLVD	SAN-E-2
Length of Road Improvements (m)	673 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

BALFOUR BLVD		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	192	$ 5.00	$ 960.00
Full Depth Concrete Asphalt Removal	m	192	$ 125.00	$ 24,000.00
Driveway Removal (all types)	m	192	$ 30.00	$ 5,760.00
Sidewalk Removal (all types)	m	192	$ 20.00	$ 3,840.00
Sawcutting Existing Pavement	m	192	$ 1.00	$ 192.00
Curb and Gutter Removal	m	192	$ 20.00	$ 3,840.00
Streetlighting Removal	m	192	$ 25.00	$ 4,800.00
Signage Removal	m	192	$ 5.00	$ 960.00
SUBTOTAL				**$ 45,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	673	$ 75.00	$ 50,475.00
Remove Existing Manholes	m	673	$ 15.00	$ 10,095.00
Remove Existing Combined Private Drain Connection	m	673	$ 100.00	$ 67,300.00
SUBTOTAL				**$ 130,000.00**
Roadwork				
Earth Excavating and Grading	m	192	$ 120.00	$ 23,040.00
Supply and Place Compacted Granular "A"	m	192	$ 350.00	$ 67,200.00
100mm Open Graded Drainage Layer	m	192	$ 225.00	$ 43,200.00
Concrete Pavement (305mm)	m	192	$ 575.00	$ 110,400.00
Subdrains (2 lanes)	m	192	$ 60.00	$ 11,520.00
Concrete Curb and Gutter (2 lanes)	m	192	$ 90.00	$ 17,280.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	192	$ 75.00	$ 14,400.00
Driveway Restoration b) Concrete	m	192	$ 180.00	$ 34,560.00
Topsoil, Hydraulic Seed and Mulch	m	192	$ 100.00	$ 19,200.00
Traffic Control During Construction (Residential)	m	192	$ 100.00	$ 19,200.00
Streetlighting (Residential)	m	192	$ 225.00	$ 43,200.00
SUBTOTAL				**$ 410,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	673	$ 75.00	$ 50,475.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	241	$ 625.00	$ 150,625.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	432	$ 700.00	$ 302,400.00
Sanitary Private Drain Connection	m	673	$ 150.00	$ 100,950.00
Manhole Rain Catchers	m	673	$ 3.00	$ 2,019.00
SUBTOTAL				**$ 610,000.00**
Construction Cost Total				**$ 1,200,000.00**
Construction Cost Contingency (30%)				**$ 360,000.00**
Subtotal				**$ 1,600,000.00**
Engineering Fee Estimate (20%)				**$ 320,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 1,920,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

GLENDALE AVE	SAN-E-2
Length of Road Improvements (m)	662 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GLENDALE AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	32	$ 5.00	$ 160.00
Full Depth Concrete Asphalt Removal	m	32	$ 125.00	$ 4,000.00
Driveway Removal (all types)	m	32	$ 30.00	$ 960.00
Sidewalk Removal (all types)	m	32	$ 20.00	$ 640.00
Sawcutting Existing Pavement	m	32	$ 1.00	$ 32.00
Curb and Gutter Removal	m	32	$ 20.00	$ 640.00
Streetlighting Removal	m	32	$ 25.00	$ 800.00
Signage Removal	m	32	$ 5.00	$ 160.00
SUBTOTAL				**$ 8,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	662	$ 75.00	$ 49,650.00
Remove Existing Manholes	m	662	$ 15.00	$ 9,930.00
Remove Existing Combined Private Drain Connection	m	662	$ 100.00	$ 66,200.00
SUBTOTAL				**$ 130,000.00**
Roadwork				
Earth Excavating and Grading	m	32	$ 120.00	$ 3,840.00
Supply and Place Compacted Granular "A"	m	32	$ 350.00	$ 11,200.00
100mm Open Graded Drainage Layer	m	32	$ 225.00	$ 7,200.00
Concrete Pavement (305mm)	m	32	$ 575.00	$ 18,400.00
Subdrains (2 lanes)	m	32	$ 60.00	$ 1,920.00
Concrete Curb and Gutter (2 lanes)	m	32	$ 90.00	$ 2,880.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	32	$ 75.00	$ 2,400.00
Driveway Restoration b) Concrete	m	32	$ 180.00	$ 5,760.00
Topsoil, Hydraulic Seed and Mulch	m	32	$ 100.00	$ 3,200.00
Traffic Control During Construction (Residential)	m	32	$ 100.00	$ 3,200.00
Streetlighting (Residential)	m	32	$ 225.00	$ 7,200.00
SUBTOTAL				**$ 68,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	662	$ 75.00	$ 49,650.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	570	$ 450.00	$ 256,500.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	92	$ 700.00	$ 64,400.00
Sanitary Private Drain Connection	m	662	$ 150.00	$ 99,300.00
Manhole Rain Catchers	m	662	$ 3.00	$ 1,986.00
SUBTOTAL				**$ 480,000.00**
Construction Cost Total				**$ 690,000.00**
Construction Cost Contingency (30%)				**$ 210,000.00**
Subtotal				**$ 900,000.00**
Engineering Fee Estimate (20%)				**$ 180,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 1,080,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

FERNDALE AVE	SAN-E-2
Length of Road Improvements (m)	554 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

FERNDALE AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	439	$ 5.00	$ 2,195.00
Full Depth Concrete Asphalt Removal	m	439	$ 125.00	$ 54,875.00
Driveway Removal (all types)	m	439	$ 30.00	$ 13,170.00
Sidewalk Removal (all types)	m	439	$ 20.00	$ 8,780.00
Sawcutting Existing Pavement	m	439	$ 1.00	$ 439.00
Curb and Gutter Removal	m	439	$ 20.00	$ 8,780.00
Streetlighting Removal	m	439	$ 25.00	$ 10,975.00
Signage Removal	m	439	$ 5.00	$ 2,195.00
SUBTOTAL				**$ 110,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	554	$ 75.00	$ 41,550.00
Remove Existing Manholes	m	554	$ 15.00	$ 8,310.00
Remove Existing Combined Private Drain Connection	m	554	$ 100.00	$ 55,400.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	439	$ 120.00	$ 52,680.00
Supply and Place Compacted Granular "A"	m	439	$ 350.00	$ 153,650.00
100mm Open Graded Drainage Layer	m	439	$ 225.00	$ 98,775.00
Concrete Pavement (305mm)	m	439	$ 575.00	$ 252,425.00
Subdrains (2 lanes)	m	439	$ 60.00	$ 26,340.00
Concrete Curb and Gutter (2 lanes)	m	439	$ 90.00	$ 39,510.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	439	$ 75.00	$ 32,925.00
Driveway Restoration b) Concrete	m	439	$ 180.00	$ 79,020.00
Topsoil, Hydraulic Seed and Mulch	m	439	$ 100.00	$ 43,900.00
Traffic Control During Construction (Residential)	m	439	$ 100.00	$ 43,900.00
Streetlighting (Residential)	m	439	$ 225.00	$ 98,775.00
SUBTOTAL				**$ 930,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	554	$ 75.00	$ 41,550.00
Sanitary Sewer - 450mm diameter Concrete (65-D)	m	413	$ 450.00	$ 185,850.00
Sanitary Sewer - 525mm diameter Concrete (65-D)	m	141	$ 475.00	$ 66,975.00
Sanitary Private Drain Connection	m	554	$ 150.00	$ 83,100.00
Manhole Rain Catchers	m	554	$ 3.00	$ 1,662.00
SUBTOTAL				**$ 380,000.00**
Construction Cost Total				**$ 1,600,000.00**
Construction Cost Contingency (30%)				**$ 480,000.00**
Subtotal				**$ 2,100,000.00**
Engineering Fee Estimate (20%)				**$ 420,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 2,520,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

FORD BLVD	SAN-E-2
Length of Road Improvements (m)	379 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

FORD BLVD		SAN-E-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	379	$ 5.00	$ 1,895.00
Full Depth Concrete Asphalt Removal	m	379	$ 125.00	$ 47,375.00
Driveway Removal (all types)	m	379	$ 30.00	$ 11,370.00
Sidewalk Removal (all types)	m	379	$ 20.00	$ 7,580.00
Sawcutting Existing Pavement	m	379	$ 1.00	$ 379.00
Curb and Gutter Removal	m	379	$ 20.00	$ 7,580.00
Streetlighting Removal	m	379	$ 25.00	$ 9,475.00
Signage Removal	m	379	$ 5.00	$ 1,895.00
SUBTOTAL				**$ 88,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	279	$ 100.00	$ 27,900.00
Remove Existing Combined Sewers	m	100	$ 75.00	$ 7,500.00
Remove Existing Manholes	m	379	$ 15.00	$ 5,685.00
Remove Existing Combined Private Drain Connection	m	100	$ 100.00	$ 10,000.00
Remove Existing Sanitary Private Drain Connection	m	279	$ 25.00	$ 6,975.00
SUBTOTAL				**$ 59,000.00**
Roadwork				
Earth Excavating and Grading	m	379	$ 120.00	$ 45,480.00
Supply and Place Compacted Granular "A"	m	379	$ 350.00	$ 132,650.00
100mm Open Graded Drainage Layer	m	379	$ 225.00	$ 85,275.00
Concrete Pavement (305mm)	m	379	$ 575.00	$ 217,925.00
Subdrains (2 lanes)	m	379	$ 60.00	$ 22,740.00
Concrete Curb and Gutter (2 lanes)	m	379	$ 90.00	$ 34,110.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	379	$ 75.00	$ 28,425.00
Driveway Restoration b) Concrete	m	379	$ 180.00	$ 68,220.00
Topsoil, Hydraulic Seed and Mulch	m	379	$ 100.00	$ 37,900.00
Traffic Control During Construction (Residential)	m	379	$ 100.00	$ 37,900.00
Streetlighting (Residential)	m	379	$ 225.00	$ 85,275.00
SUBTOTAL				**$ 800,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	379	$ 75.00	$ 28,425.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	379	$ 700.00	$ 265,300.00
Sanitary Private Drain Connection	m	379	$ 150.00	$ 56,850.00
Manhole Rain Catchers	m	379	$ 3.00	$ 1,137.00
SUBTOTAL				**$ 360,000.00**
Construction Cost Total				**$ 1,400,000.00**
Construction Cost Contingency (30%)				**$ 420,000.00**
Subtotal				**$ 1,900,000.00**
Engineering Fee Estimate (20%)				**$ 380,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 2,280,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

TECUMSEH ROAD E	SAN-E-2
Length of Road Improvements (m)	136 m
Number of Lanes	4
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

TECUMSEH ROAD E		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	136	$ 5.00	$ 680.00
Full Depth Asphalt Removal	m	136	$ 160.00	$ 21,760.00
Driveway Removal (all types)	m	136	$ 30.00	$ 4,080.00
Sidewalk Removal (all types)	m	136	$ 20.00	$ 2,720.00
Sawcutting Existing Pavement	m	136	$ 1.00	$ 136.00
Curb and Gutter Removal	m	136	$ 20.00	$ 2,720.00
Streetlighting Removal	m	136	$ 25.00	$ 3,400.00
Signage Removal	m	136	$ 5.00	$ 680.00
SUBTOTAL				**$ 37,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	136	$ 100.00	$ 13,600.00
Remove Existing Manholes	m	136	$ 15.00	$ 2,040.00
Remove Existing Sanitary Private Drain Connection	m	136	$ 25.00	$ 3,400.00
SUBTOTAL				**$ 20,000.00**
Roadwork				
Earth Excavating and Grading	m	136	$ 240.00	$ 32,640.00
Supply and Place Compacted Granular "A"	m	136	$ 700.00	$ 95,200.00
100mm Open Graded Drainage Layer	m	136	$ 450.00	$ 61,200.00
Concrete Pavement (305mm)	m	136	$ 1,150.00	$ 156,400.00
Subdrains (2 lanes)	m	136	$ 60.00	$ 8,160.00
Concrete Curb and Gutter (2 lanes)	m	136	$ 90.00	$ 12,240.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	136	$ 75.00	$ 10,200.00
Driveway Restoration b) Concrete	m	136	$ 180.00	$ 24,480.00
Topsoil, Hydraulic Seed and Mulch	m	136	$ 100.00	$ 13,600.00
Traffic Control During Construction (Residential)	m	136	$ 100.00	$ 13,600.00
Traffic Control During Construction (Arterial)	m	136	$ 200.00	$ 27,200.00
Streetlighting (Arterial)	m	136	$ 400.00	$ 54,400.00
SUBTOTAL				**$ 510,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	136	$ 75.00	$ 10,200.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	50	$ 625.00	$ 31,250.00
Sanitary Sewer - 900mm diameter Concrete (100-D)	m	86	$ 900.00	$ 77,400.00
Sanitary Private Drain Connection	m	136	$ 150.00	$ 20,400.00
Manhole Rain Catchers	m	136	$ 3.00	$ 408.00
SUBTOTAL				**$ 140,000.00**
Construction Cost Total				**$ 800,000.00**
Construction Cost Contingency (30%)				**$ 240,000.00**
Subtotal				**$ 1,100,000.00**
Engineering Fee Estimate (20%)				**$ 220,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 1,320,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

RIVARD AVE	SAN-E-2
Length of Road Improvements (m)	1354 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

RIVARD AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1354	$ 5.00	$ 6,770.00
Full Depth Asphalt Removal	m	1354	$ 80.00	$ 108,320.00
Driveway Removal (all types)	m	1354	$ 30.00	$ 40,620.00
Sidewalk Removal (all types)	m	1354	$ 20.00	$ 27,080.00
Sawcutting Existing Pavement	m	1354	$ 1.00	$ 1,354.00
Curb and Gutter Removal	m	1354	$ 20.00	$ 27,080.00
Streetlighting Removal	m	1354	$ 25.00	$ 33,850.00
Signage Removal	m	1354	$ 5.00	$ 6,770.00
SUBTOTAL				**$ 260,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1354	$ 100.00	$ 135,400.00
Remove Existing Manholes	m	1354	$ 15.00	$ 20,310.00
Remove Existing Sanitary Private Drain Connection	m	1354	$ 25.00	$ 33,850.00
SUBTOTAL				**$ 190,000.00**
Roadwork				
Earth Excavating and Grading	m	1354	$ 120.00	$ 162,480.00
Supply and Place Compacted Granular "A"	m	1354	$ 350.00	$ 473,900.00
Asphalt Pavement (105mm)	m	1354	$ 250.00	$ 338,500.00
Subdrains (2 lanes)	m	1354	$ 60.00	$ 81,240.00
Concrete Curb and Gutter (2 lanes)	m	1354	$ 90.00	$ 121,860.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	1354	$ 75.00	$ 101,550.00
Driveway Restoration b) Concrete	m	1354	$ 180.00	$ 243,720.00
Topsoil, Hydraulic Seed and Mulch	m	1354	$ 100.00	$ 135,400.00
Traffic Control During Construction (Residential)	m	1354	$ 100.00	$ 135,400.00
Streetlighting (Residential)	m	1354	$ 225.00	$ 304,650.00
SUBTOTAL				**$ 2,100,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1354	$ 75.00	$ 101,550.00
Sanitary Sewer - 675mm diameter Concrete (65-D)	m	1354	$ 625.00	$ 846,250.00
Sanitary Private Drain Connection	m	1354	$ 150.00	$ 203,100.00
Manhole Rain Catchers	m	1354	$ 3.00	$ 4,062.00
SUBTOTAL				**$ 1,200,000.00**
Construction Cost Total				**$ 3,800,000.00**
Construction Cost Contingency (30%)				**$ 1,200,000.00**
Subtotal				**$ 5,000,000.00**
Engineering Fee Estimate (20%)				**$ 1,000,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 6,000,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

GRANDVIEW ST	SAN-E-2
Length of Road Improvements (m)	532 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GRANDVIEW ST		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	532	$ 5.00	$ 2,660.00
Full Depth Asphalt Removal	m	532	$ 80.00	$ 42,560.00
Driveway Removal (all types)	m	532	$ 30.00	$ 15,960.00
Sidewalk Removal (all types)	m	532	$ 20.00	$ 10,640.00
Sawcutting Existing Pavement	m	532	$ 1.00	$ 532.00
Curb and Gutter Removal	m	532	$ 20.00	$ 10,640.00
Streetlighting Removal	m	532	$ 25.00	$ 13,300.00
Signage Removal	m	532	$ 5.00	$ 2,660.00
SUBTOTAL				**$ 99,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	532	$ 100.00	$ 53,200.00
Remove Existing Manholes	m	532	$ 15.00	$ 7,980.00
Remove Existing Sanitary Private Drain Connection	m	532	$ 25.00	$ 13,300.00
SUBTOTAL				**$ 75,000.00**
Roadwork				
Earth Excavating and Grading	m	532	$ 120.00	$ 63,840.00
Supply and Place Compacted Granular "A"	m	532	$ 350.00	$ 186,200.00
Asphalt Pavement (105mm)	m	532	$ 250.00	$ 133,000.00
Subdrains (2 lanes)	m	532	$ 60.00	$ 31,920.00
Concrete Curb and Gutter (2 lanes)	m	532	$ 90.00	$ 47,880.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	532	$ 75.00	$ 39,900.00
Driveway Restoration b) Concrete	m	532	$ 180.00	$ 95,760.00
Topsoil, Hydraulic Seed and Mulch	m	532	$ 100.00	$ 53,200.00
Traffic Control During Construction (Residential)	m	532	$ 100.00	$ 53,200.00
Streetlighting (Residential)	m	532	$ 225.00	$ 119,700.00
SUBTOTAL				**$ 830,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	532	$ 75.00	$ 39,900.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	532	$ 525.00	$ 279,300.00
Sanitary Private Drain Connection	m	532	$ 150.00	$ 79,800.00
Manhole Rain Catchers	m	532	$ 3.00	$ 1,596.00
SUBTOTAL				**$ 410,000.00**
Construction Cost Total				**$ 1,500,000.00**
Construction Cost Contingency (30%)				**$ 450,000.00**
Subtotal				**$ 1,950,000.00**
Engineering Fee Estimate (20%)				**$ 390,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 2,340,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

COURTLAND CRES	SAN-E-2
Length of Road Improvements (m)	77 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

COURTLAND CRES		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	77	$ 5.00	$ 385.00
Full Depth Asphalt Removal	m	77	$ 80.00	$ 6,160.00
Driveway Removal (all types)	m	77	$ 30.00	$ 2,310.00
Sidewalk Removal (all types)	m	77	$ 20.00	$ 1,540.00
Sawcutting Existing Pavement	m	77	$ 1.00	$ 77.00
Curb and Gutter Removal	m	77	$ 20.00	$ 1,540.00
Streetlighting Removal	m	77	$ 25.00	$ 1,925.00
Signage Removal	m	77	$ 5.00	$ 385.00
SUBTOTAL				**$ 15,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	77	$ 100.00	$ 7,700.00
Remove Existing Manholes	m	77	$ 15.00	$ 1,155.00
Remove Existing Sanitary Private Drain Connection	m	77	$ 25.00	$ 1,925.00
SUBTOTAL				**$ 11,000.00**
Roadwork				
Earth Excavating and Grading	m	77	$ 120.00	$ 9,240.00
Supply and Place Compacted Granular "A"	m	77	$ 350.00	$ 26,950.00
Asphalt Pavement (105mm)	m	77	$ 250.00	$ 19,250.00
Subdrains (2 lanes)	m	77	$ 60.00	$ 4,620.00
Concrete Curb and Gutter (2 lanes)	m	77	$ 90.00	$ 6,930.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	77	$ 75.00	$ 5,775.00
Driveway Restoration b) Concrete	m	77	$ 180.00	$ 13,860.00
Topsoil, Hydraulic Seed and Mulch	m	77	$ 100.00	$ 7,700.00
Traffic Control During Construction (Residential)	m	77	$ 100.00	$ 7,700.00
Streetlighting (Residential)	m	77	$ 225.00	$ 17,325.00
SUBTOTAL				**$ 120,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	77	$ 75.00	$ 5,775.00
Sanitary Sewer - 1200mm diameter Concrete (100-D)	m	77	$ 1,500.00	$ 115,500.00
Sanitary Private Drain Connection	m	77	$ 150.00	$ 11,550.00
Manhole Rain Catchers	m	77	$ 3.00	$ 231.00
SUBTOTAL				**$ 140,000.00**
Construction Cost Total				**$ 290,000.00**
Construction Cost Contingency (30%)				**$ 87,000.00**
Subtotal				**$ 380,000.00**
Engineering Fee Estimate (20%)				**$ 76,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 456,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CORONATION SCHOOL	SAN-E-2
Length of Road Improvements (m)	1294 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CORONATION SCHOOL		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1294	$ 5.00	$ 6,470.00
Full Depth Asphalt Removal	m	974	$ 80.00	$ 77,920.00
Driveway Removal (all types)	m	974	$ 30.00	$ 29,220.00
Sidewalk Removal (all types)	m	974	$ 20.00	$ 19,480.00
Sawcutting Existing Pavement	m	974	$ 1.00	$ 974.00
Curb and Gutter Removal	m	974	$ 20.00	$ 19,480.00
Streetlighting Removal	m	974	$ 25.00	$ 24,350.00
Signage Removal	m	974	$ 5.00	$ 4,870.00
SUBTOTAL				**$ 190,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1294	$ 100.00	$ 129,400.00
Remove Existing Manholes	m	1294	$ 15.00	$ 19,410.00
Remove Existing Sanitary Private Drain Connection	m	1294	$ 25.00	$ 32,350.00
SUBTOTAL				**$ 190,000.00**
Roadwork				
Earth Excavating and Grading	m	1294	$ 120.00	$ 155,280.00
Supply and Place Compacted Granular "A"	m	974	$ 350.00	$ 340,900.00
Asphalt Pavement (105mm)	m	974	$ 250.00	$ 243,500.00
Subdrains (2 lanes)	m	974	$ 60.00	$ 58,440.00
Concrete Curb and Gutter (2 lanes)	m	974	$ 90.00	$ 87,660.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	974	$ 75.00	$ 73,050.00
Driveway Restoration a) Asphalt	m	974	$ 320.00	$ 311,680.00
Topsoil, Hydraulic Seed and Mulch	m	1294	$ 100.00	$ 129,400.00
Traffic Control During Construction (Residential)	m	974	$ 100.00	$ 97,400.00
Streetlighting (Residential)	m	974	$ 225.00	$ 219,150.00
SUBTOTAL				**$ 1,800,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	1294	$ 130.00	$ 168,220.00
Sanitary Sewer - 1200mm diameter Concrete (100-D)	m	1294	$ 1,500.00	$ 1,941,000.00
Sanitary Private Drain Connection	m	1294	$ 150.00	$ 194,100.00
Manhole Rain Catchers	m	1294	$ 3.00	$ 3,882.00
SUBTOTAL				**$ 2,400,000.00**
Construction Cost Total				**$ 4,600,000.00**
Construction Cost Contingency (30%)				**$ 1,400,000.00**
Subtotal				**$ 6,000,000.00**
Engineering Fee Estimate (20%)				**$ 1,200,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 7,200,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ROSE ST	SAN-E-2
Length of Road Improvements (m)	535 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

ROSE ST		SAN-E-2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	535	$ 5.00	$ 2,675.00
Full Depth Asphalt Removal	m	535	$ 80.00	$ 42,800.00
Driveway Removal (all types)	m	535	$ 30.00	$ 16,050.00
Sidewalk Removal (all types)	m	535	$ 20.00	$ 10,700.00
Sawcutting Existing Pavement	m	535	$ 1.00	$ 535.00
Curb and Gutter Removal	m	535	$ 20.00	$ 10,700.00
Streetlighting Removal	m	535	$ 25.00	$ 13,375.00
Signage Removal	m	535	$ 5.00	$ 2,675.00
SUBTOTAL				**$ 100,000.00**
Sewer Removals				
Remove Existing Combined Sewers	m	535	$ 75.00	$ 40,125.00
Remove Existing Manholes	m	535	$ 15.00	$ 8,025.00
Remove Existing Combined Private Drain Connection	m	535	$ 100.00	$ 53,500.00
SUBTOTAL				**$ 110,000.00**
Roadwork				
Earth Excavating and Grading	m	535	$ 120.00	$ 64,200.00
Supply and Place Compacted Granular "A"	m	535	$ 350.00	$ 187,250.00
Asphalt Pavement (105mm)	m	535	$ 250.00	$ 133,750.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	535	$ 270.00	$ 144,450.00
Subdrains (2 lanes)	m	535	$ 60.00	$ 32,100.00
Concrete Curb and Gutter (2 lanes)	m	535	$ 90.00	$ 48,150.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	535	$ 75.00	$ 40,125.00
Driveway Restoration b) Concrete	m	535	$ 180.00	$ 96,300.00
Topsoil, Hydraulic Seed and Mulch	m	535	$ 100.00	$ 53,500.00
Traffic Control During Construction (Residential)	m	535	$ 100.00	$ 53,500.00
Streetlighting (Residential)	m	535	$ 225.00	$ 120,375.00
SUBTOTAL				**$ 1,000,000.00**
Sewers				
Concrete Manholes - (2400mm to 3600mm)	m	535	$ 130.00	$ 69,550.00
Sanitary Sewer - 1350mm diameter Concrete (100-D)	m	152	$ 1,800.00	$ 273,600.00
Sanitary Sewer - 1500mm diameter Concrete (100-D)	m	81	$ 2,500.00	$ 202,500.00
Sanitary Sewer - 1800mm diameter Concrete (100-D)	m	192	$ 2,800.00	$ 537,600.00
Sanitary Sewer - 2100mm diameter Concrete (100-D)	m	110	$ 4,000.00	$ 440,000.00
Sanitary Private Drain Connection	m	535	$ 150.00	$ 80,250.00
Manhole Rain Catchers	m	535	$ 3.00	$ 1,605.00
SUBTOTAL				**$ 1,700,000.00**
Construction Cost Total				**$ 3,000,000.00**
Construction Cost Contingency (30%)				**$ 900,000.00**
Subtotal				**$ 3,900,000.00**
Engineering Fee Estimate (20%)				**$ 800,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 4,700,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

JOS ST. LOUIS AVE	SAN-E-2
Length of Road Improvements (m)	696 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

JOS ST. LOUIS AVE		SAN-E-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	696	$ 5.00	$ 3,480.00
Full Depth Asphalt Removal	m	696	$ 80.00	$ 55,680.00
Driveway Removal (all types)	m	696	$ 30.00	$ 20,880.00
Sidewalk Removal (all types)	m	696	$ 20.00	$ 13,920.00
Sawcutting Existing Pavement	m	696	$ 1.00	$ 696.00
Curb and Gutter Removal	m	696	$ 20.00	$ 13,920.00
Streetlighting Removal	m	696	$ 25.00	$ 17,400.00
Signage Removal	m	696	$ 5.00	$ 3,480.00
SUBTOTAL				**$ 130,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	696	$ 100.00	$ 69,600.00
Remove Existing Manholes	m	696	$ 15.00	$ 10,440.00
Remove Existing Sanitary Private Drain Connection	m	696	$ 25.00	$ 17,400.00
SUBTOTAL				**$ 98,000.00**
Roadwork				
Earth Excavating and Grading	m	696	$ 120.00	$ 83,520.00
Supply and Place Compacted Granular "A"	m	696	$ 350.00	$ 243,600.00
Asphalt Pavement (105mm)	m	696	$ 250.00	$ 174,000.00
Subdrains (2 lanes)	m	696	$ 60.00	$ 41,760.00
Concrete Curb and Gutter (2 lanes)	m	696	$ 90.00	$ 62,640.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	696	$ 75.00	$ 52,200.00
Driveway Restoration b) Concrete	m	696	$ 180.00	$ 125,280.00
Topsoil, Hydraulic Seed and Mulch	m	696	$ 100.00	$ 69,600.00
Traffic Control During Construction (Residential)	m	696	$ 100.00	$ 69,600.00
Streetlighting (Residential)	m	696	$ 225.00	$ 156,600.00
SUBTOTAL				**$ 1,100,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	696	$ 75.00	$ 52,200.00
Sanitary Sewer - 375mm diameter PVC (DR-28)	m	329	$ 450.00	$ 148,050.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	367	$ 525.00	$ 192,675.00
Sanitary Private Drain Connection	m	696	$ 150.00	$ 104,400.00
Manhole Rain Catchers	m	696	$ 3.00	$ 2,088.00
SUBTOTAL				**$ 500,000.00**
Construction Cost Total				**$ 1,900,000.00**
Construction Cost Contingency (30%)				**$ 570,000.00**
Subtotal				**$ 2,500,000.00**
Engineering Fee Estimate (20%)				**$ 500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-E-2				**$ 3,000,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

WOODLAND AVENUE	SAN-S-1-1
Length of Road Improvements (m)	1510 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	Yes

WOODLAND AVENUE		SAN-S-1-1		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1510	$ 5.00	$ 7,550.00
Full Depth Asphalt Removal	m	1510	$ 80.00	$ 120,800.00
Driveway Removal (all types)	m	1510	$ 30.00	$ 45,300.00
Sidewalk Removal (all types)	m	1510	$ 20.00	$ 30,200.00
Sawcutting Existing Pavement	m	1510	$ 1.00	$ 1,510.00
Curb and Gutter Removal	m	1510	$ 20.00	$ 30,200.00
Streetlighting Removal	m	1510	$ 25.00	$ 37,750.00
Signage Removal	m	1510	$ 5.00	$ 7,550.00
SUBTOTAL				**$ 290,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1510	$ 100.00	$ 151,000.00
Remove Existing Manholes	m	1510	$ 15.00	$ 22,650.00
Remove Existing Sanitary Private Drain Connection	m	1510	$ 25.00	$ 37,750.00
SUBTOTAL				**$ 220,000.00**
Roadwork				
Earth Excavating and Grading	m	1510	$ 120.00	$ 181,200.00
Supply and Place Compacted Granular "A"	m	1510	$ 350.00	$ 528,500.00
Asphalt Pavement (105mm)	m	1510	$ 250.00	$ 377,500.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	1510	$ 270.00	$ 407,700.00
Subdrains (2 lanes)	m	1510	$ 60.00	$ 90,600.00
Concrete Curb and Gutter (2 lanes)	m	1510	$ 90.00	$ 135,900.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	1510	$ 75.00	$ 113,250.00
Driveway Restoration b) Concrete	m	1510	$ 180.00	$ 271,800.00
Topsoil, Hydraulic Seed and Mulch	m	1510	$ 100.00	$ 151,000.00
Traffic Control During Construction (Residential)	m	1510	$ 100.00	$ 151,000.00
Streetlighting (Residential)	m	1510	$ 225.00	$ 339,750.00
Street Trees (In Boulevard / 12m spacing each side)	m	1510	$ 125.00	$ 188,750.00
SUBTOTAL				**$ 3,000,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1510	$ 75.00	$ 113,250.00
Sanitary Private Drain Connection	m	1510	$ 150.00	$ 226,500.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	1510	$ 525.00	$ 792,750.00
Manhole Rain Catchers	m	1510	$ 3.00	$ 4,530.00
SUBTOTAL				**$ 1,200,000.00**
Construction Cost Total				**$ 4,800,000.00**
Construction Cost Contingency (30%)				**$ 1,500,000.00**
Subtotal				**$ 6,300,000.00**
Engineering Fee Estimate (20%)				**$ 1,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-S-1-1				**$ 7,600,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

HOWARD AVENUE	SAN-S-1-2
Length of Road Improvements (m)	1150 m
Number of Lanes	2
Residential or Arterial/Collector Road	Arterial/Collector
Road Surface	Concrete
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	Yes

HOWARD AVENUE		SAN-S-1-2		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	540	$ 5.00	$ 2,700.00
Full Depth Concrete Asphalt Removal	m	540	$ 125.00	$ 67,500.00
Driveway Removal (all types)	m	540	$ 30.00	$ 16,200.00
Sidewalk Removal (all types)	m	540	$ 20.00	$ 10,800.00
Concrete Median Removal	m	100	$ 10.00	$ 1,000.00
Sawcutting Existing Pavement	m	540	$ 1.00	$ 540.00
Curb and Gutter Removal	m	540	$ 20.00	$ 10,800.00
Streetlighting Removal	m	540	$ 25.00	$ 13,500.00
Signage Removal	m	540	$ 5.00	$ 2,700.00
SUBTOTAL				**$ 130,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1150	$ 100.00	$ 115,000.00
Remove Existing Manholes	m	1150	$ 15.00	$ 17,250.00
Remove Existing Sanitary Private Drain Connection	m	1150	$ 25.00	$ 28,750.00
SUBTOTAL				**$ 170,000.00**
Roadwork				
Earth Excavating and Grading	m	540	$ 120.00	$ 64,800.00
Supply and Place Compacted Granular "A"	m	540	$ 350.00	$ 189,000.00
100mm Open Graded Drainage Layer	m	540	$ 225.00	$ 121,500.00
Asphalt Pavement for Temporary Lanes (4m Wide - Asphalt)	m	540	$ 125.00	$ 67,500.00
Concrete Pavement (305mm)	m	540	$ 575.00	$ 310,500.00
Subdrains (2 lanes)	m	540	$ 60.00	$ 32,400.00
Concrete Curb and Gutter (2 lanes)	m	540	$ 90.00	$ 48,600.00
Concrete Median Islands (1m wide island)	m	100	$ 150.00	$ 15,000.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	540	$ 75.00	$ 40,500.00
Driveway Restoration b) Concrete	m	540	$ 180.00	$ 97,200.00
Topsoil, Hydraulic Seed and Mulch	m	540	$ 100.00	$ 54,000.00
Temporary Pavement Markings	m	540	$ 1.00	$ 540.00
Permananent Pavement Markings	m	540	$ 30.00	$ 16,200.00
Traffic Control During Construction (Arterial)	m	540	$ 200.00	$ 108,000.00
Streetlighting (Arterial)	m	540	$ 400.00	$ 216,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	540	$ 125.00	$ 67,500.00
SUBTOTAL				**$ 1,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1150	$ 75.00	$ 86,250.00
Sanitary Private Drain Connection	m	1150	$ 150.00	$ 172,500.00
Sanitary Sewer - 825mm diameter Concrete (100-D)	m	1150	$ 800.00	$ 920,000.00
Manhole Rain Catchers	m	1150	$ 3.00	$ 3,450.00
SUBTOTAL				**$ 1,200,000.00**
Construction Cost Total				**$ 3,000,000.00**
Construction Cost Contingency (30%)				**$ 900,000.00**
Subtotal				**$ 3,900,000.00**
Engineering Fee Estimate (20%)				**$ 780,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-S-1-2				**$ 4,680,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

PARKWOOD AVENUE	SAN-S-1-3
Length of Road Improvements (m)	515 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

PARKWOOD AVENUE		SAN-S-1-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	515	$ 5.00	$ 2,575.00
Full Depth Asphalt Removal	m	515	$ 80.00	$ 41,200.00
Driveway Removal (all types)	m	515	$ 30.00	$ 15,450.00
Sidewalk Removal (all types)	m	515	$ 20.00	$ 10,300.00
Sawcutting Existing Pavement	m	515	$ 1.00	$ 515.00
Streetlighting Removal	m	515	$ 25.00	$ 12,875.00
Signage Removal	m	515	$ 5.00	$ 2,575.00
SUBTOTAL				**$ 90,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	515	$ 100.00	$ 51,500.00
Remove Existing Manholes	m	515	$ 15.00	$ 7,725.00
Remove Existing Sanitary Private Drain Connection	m	515	$ 25.00	$ 12,875.00
SUBTOTAL				**$ 80,000.00**
Roadwork				
Earth Excavating and Grading	m	515	$ 120.00	$ 61,800.00
Supply and Place Compacted Granular "A"	m	515	$ 350.00	$ 180,250.00
Asphalt Pavement (105mm)	m	515	$ 250.00	$ 128,750.00
Subdrains (2 lanes)	m	515	$ 60.00	$ 30,900.00
Concrete Curb and Gutter (2 lanes)	m	515	$ 90.00	$ 46,350.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	515	$ 75.00	$ 38,625.00
Driveway Restoration a) Asphalt	m	515	$ 320.00	$ 164,800.00
Topsoil, Hydraulic Seed and Mulch	m	515	$ 100.00	$ 51,500.00
Traffic Control During Construction (Residential)	m	515	$ 100.00	$ 51,500.00
Streetlighting (Residential)	m	515	$ 225.00	$ 115,875.00
Street Trees (In Boulevard / 12m spacing each side)	m	515	$ 125.00	$ 64,375.00
SUBTOTAL				**$ 940,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	515	$ 75.00	$ 38,625.00
Sanitary Private Drain Connection	m	515	$ 150.00	$ 77,250.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	515	$ 525.00	$ 270,375.00
Manhole Rain Catchers	m	515	$ 3.00	$ 1,545.00
SUBTOTAL				**$ 390,000.00**
Construction Cost Total				**$ 1,500,000.00**
Construction Cost Contingency (30%)				**$ 450,000.00**
Subtotal				**$ 1,950,000.00**
Engineering Fee Estimate (20%)				**$ 390,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-S-1-3				**$ 2,340,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

SYDNEY AVE	SAN-S-1-3
Length of Road Improvements (m)	106 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

SYDNEY AVE		SAN-S-1-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	106	$ 5.00	$ 530.00
Full Depth Asphalt Removal	m	106	$ 80.00	$ 8,480.00
Driveway Removal (all types)	m	106	$ 30.00	$ 3,180.00
Sidewalk Removal (all types)	m	106	$ 20.00	$ 2,120.00
Sawcutting Existing Pavement	m	106	$ 1.00	$ 106.00
Streetlighting Removal	m	106	$ 25.00	$ 2,650.00
Signage Removal	m	106	$ 5.00	$ 530.00
SUBTOTAL				**$ 18,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	106	$ 100.00	$ 10,600.00
Remove Existing Manholes	m	106	$ 15.00	$ 1,590.00
Remove Existing Sanitary Private Drain Connection	m	106	$ 25.00	$ 2,650.00
SUBTOTAL				**$ 15,000.00**
Roadwork				
Earth Excavating and Grading	m	106	$ 120.00	$ 12,720.00
Supply and Place Compacted Granular "A"	m	106	$ 350.00	$ 37,100.00
Asphalt Pavement (105mm)	m	106	$ 250.00	$ 26,500.00
Subdrains (2 lanes)	m	106	$ 60.00	$ 6,360.00
Concrete Curb and Gutter (2 lanes)	m	106	$ 90.00	$ 9,540.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	106	$ 75.00	$ 7,950.00
Driveway Restoration a) Asphalt	m	106	$ 320.00	$ 33,920.00
Topsoil, Hydraulic Seed and Mulch	m	106	$ 100.00	$ 10,600.00
Traffic Control During Construction (Residential)	m	106	$ 100.00	$ 10,600.00
Streetlighting (Residential)	m	106	$ 225.00	$ 23,850.00
Street Trees (In Boulevard / 12m spacing each side)	m	106	$ 125.00	$ 13,250.00
SUBTOTAL				**$ 200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	106	$ 75.00	$ 7,950.00
Sanitary Private Drain Connection	m	106	$ 150.00	$ 15,900.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	106	$ 525.00	$ 55,650.00
Manhole Rain Catchers	m	106	$ 3.00	$ 318.00
SUBTOTAL				**$ 80,000.00**
Construction Cost Total				**$ 313,000.00**
Construction Cost Contingency (30%)				**$ 94,000.00**
Subtotal				**$ 410,000.00**
Engineering Fee Estimate (20%)				**$ 82,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-S-1-3**		**$ 492,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

MALCOLM AVE	SAN-S-1-3
Length of Road Improvements (m)	106 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MALCOLM AVE		SAN-S-1-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	106	$ 5.00	$ 530.00
Full Depth Asphalt Removal	m	106	$ 80.00	$ 8,480.00
Driveway Removal (all types)	m	106	$ 30.00	$ 3,180.00
Sidewalk Removal (all types)	m	106	$ 20.00	$ 2,120.00
Sawcutting Existing Pavement	m	106	$ 1.00	$ 106.00
Streetlighting Removal	m	106	$ 25.00	$ 2,650.00
Signage Removal	m	106	$ 5.00	$ 530.00
SUBTOTAL				**$ 17,596.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	106	$ 100.00	$ 10,600.00
Remove Existing Manholes	m	106	$ 15.00	$ 1,590.00
Remove Existing Sanitary Private Drain Connection	m	106	$ 25.00	$ 2,650.00
SUBTOTAL				**$ 15,000.00**
Roadwork				
Earth Excavating and Grading	m	106	$ 120.00	$ 12,720.00
Supply and Place Compacted Granular "A"	m	106	$ 350.00	$ 37,100.00
Asphalt Pavement (105mm)	m	106	$ 250.00	$ 26,500.00
Subdrains (2 lanes)	m	106	$ 60.00	$ 6,360.00
Concrete Curb and Gutter (2 lanes)	m	106	$ 90.00	$ 9,540.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	106	$ 75.00	$ 7,950.00
Driveway Restoration a) Asphalt	m	106	$ 320.00	$ 33,920.00
Topsoil, Hydraulic Seed and Mulch	m	106	$ 100.00	$ 10,600.00
Traffic Control During Construction (Residential)	m	106	$ 100.00	$ 10,600.00
Streetlighting (Residential)	m	106	$ 225.00	$ 23,850.00
Street Trees (In Boulevard / 12m spacing each side)	m	106	$ 125.00	$ 13,250.00
SUBTOTAL				**$ 200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	106	$ 75.00	$ 7,950.00
Sanitary Private Drain Connection	m	106	$ 150.00	$ 15,900.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	106	$ 525.00	$ 55,650.00
Manhole Rain Catchers	m	106	$ 3.00	$ 318.00
SUBTOTAL				**$ 80,000.00**
Construction Cost Total				**$ 320,000.00**
Construction Cost Contingency (30%)				**$ 96,000.00**
Subtotal				**$ 416,000.00**
Engineering Fee Estimate (20%)				**$ 84,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-S-1-3**		**$ 500,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CALDERWOOD AVE	SAN-S-1-3
Length of Road Improvements (m)	210 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CALDERWOOD AVE		SAN-S-1-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	210	$ 5.00	$ 1,050.00
Full Depth Asphalt Removal	m	210	$ 80.00	$ 16,800.00
Driveway Removal (all types)	m	210	$ 30.00	$ 6,300.00
Sidewalk Removal (all types)	m	210	$ 20.00	$ 4,200.00
Sawcutting Existing Pavement	m	210	$ 1.00	$ 210.00
Curb and Gutter Removal	m	210	$ 20.00	$ 4,200.00
Streetlighting Removal	m	210	$ 25.00	$ 5,250.00
Signage Removal	m	210	$ 5.00	$ 1,050.00
SUBTOTAL				**$ 40,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	210	$ 100.00	$ 21,000.00
Remove Existing Manholes	m	210	$ 15.00	$ 3,150.00
Remove Existing Sanitary Private Drain Connection	m	210	$ 25.00	$ 5,250.00
SUBTOTAL				**$ 30,000.00**
Roadwork				
Earth Excavating and Grading	m	210	$ 120.00	$ 25,200.00
Supply and Place Compacted Granular "A"	m	210	$ 350.00	$ 73,500.00
Asphalt Pavement (105mm)	m	210	$ 250.00	$ 52,500.00
Subdrains (2 lanes)	m	210	$ 60.00	$ 12,600.00
Concrete Curb and Gutter (2 lanes)	m	210	$ 90.00	$ 18,900.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	210	$ 75.00	$ 15,750.00
Driveway Restoration b) Concrete	m	210	$ 180.00	$ 37,800.00
Topsoil, Hydraulic Seed and Mulch	m	210	$ 100.00	$ 21,000.00
Traffic Control During Construction (Residential)	m	210	$ 100.00	$ 21,000.00
Streetlighting (Residential)	m	210	$ 225.00	$ 47,250.00
Street Trees (In Boulevard / 12m spacing each side)	m	210	$ 125.00	$ 26,250.00
SUBTOTAL				**$ 360,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	210	$ 75.00	$ 15,750.00
Sanitary Private Drain Connection	m	210	$ 150.00	$ 31,500.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	210	$ 700.00	$ 147,000.00
Manhole Rain Catchers	m	210	$ 3.00	$ 630.00
SUBTOTAL				**$ 200,000.00**
Construction Cost Total				**$ 630,000.00**
Construction Cost Contingency (30%)				**$ 190,000.00**
Subtotal				**$ 820,000.00**
Engineering Fee Estimate (20%)				**$ 170,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-S-1-3**		**$ 990,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

FOSTER AVE	SAN-S-1-3
Length of Road Improvements (m)	67 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

FOSTER AVE		SAN-S-1-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	67	$ 5.00	$ 335.00
Full Depth Asphalt Removal	m	67	$ 80.00	$ 5,360.00
Driveway Removal (all types)	m	67	$ 30.00	$ 2,010.00
Sidewalk Removal (all types)	m	67	$ 20.00	$ 1,340.00
Sawcutting Existing Pavement	m	67	$ 1.00	$ 67.00
Curb and Gutter Removal	m	67	$ 20.00	$ 1,340.00
Streetlighting Removal	m	67	$ 25.00	$ 1,675.00
Signage Removal	m	67	$ 5.00	$ 335.00
SUBTOTAL				**$ 13,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	67	$ 100.00	$ 6,700.00
Remove Existing Manholes	m	67	$ 15.00	$ 1,005.00
Remove Existing Sanitary Private Drain Connection	m	67	$ 25.00	$ 1,675.00
SUBTOTAL				**$ 10,000.00**
Roadwork				
Earth Excavating and Grading	m	67	$ 120.00	$ 8,040.00
Supply and Place Compacted Granular "A"	m	67	$ 350.00	$ 23,450.00
Asphalt Pavement (105mm)	m	67	$ 250.00	$ 16,750.00
Subdrains (2 lanes)	m	67	$ 60.00	$ 4,020.00
Concrete Curb and Gutter (2 lanes)	m	67	$ 90.00	$ 6,030.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	67	$ 75.00	$ 5,025.00
Driveway Restoration b) Concrete	m	67	$ 180.00	$ 12,060.00
Topsoil, Hydraulic Seed and Mulch	m	67	$ 100.00	$ 6,700.00
Traffic Control During Construction (Residential)	m	67	$ 100.00	$ 6,700.00
Streetlighting (Residential)	m	67	$ 225.00	$ 15,075.00
Street Trees (In Boulevard / 12m spacing each side)	m	67	$ 125.00	$ 8,375.00
SUBTOTAL				**$ 120,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	67	$ 75.00	$ 5,025.00
Sanitary Private Drain Connection	m	67	$ 150.00	$ 10,050.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	67	$ 700.00	$ 46,900.00
Manhole Rain Catchers	m	67	$ 3.00	$ 201.00
SUBTOTAL				**$ 63,000.00**
Construction Cost Total				**$ 206,000.00**
Construction Cost Contingency (30%)				**$ 62,000.00**
Subtotal				**$ 270,000.00**
Engineering Fee Estimate (20%)				**$ 54,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-S-1-3				**$ 324,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

CONSERVATION DR	SAN-S-1-3
Length of Road Improvements (m)	714 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CONSERVATION DR		SAN-S-1-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	714	$ 5.00	$ 3,570.00
Full Depth Asphalt Removal	m	714	$ 80.00	$ 57,120.00
Driveway Removal (all types)	m	714	$ 30.00	$ 21,420.00
Sidewalk Removal (all types)	m	714	$ 20.00	$ 14,280.00
Sawcutting Existing Pavement	m	714	$ 1.00	$ 714.00
Curb and Gutter Removal	m	714	$ 20.00	$ 14,280.00
Streetlighting Removal	m	714	$ 25.00	$ 17,850.00
Signage Removal	m	714	$ 5.00	$ 3,570.00
SUBTOTAL				**$ 140,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	714	$ 100.00	$ 71,400.00
Remove Existing Manholes	m	714	$ 15.00	$ 10,710.00
Remove Existing Sanitary Private Drain Connection	m	714	$ 25.00	$ 17,850.00
SUBTOTAL				**$ 100,000.00**
Roadwork				
Earth Excavating and Grading	m	714	$ 120.00	$ 85,680.00
Supply and Place Compacted Granular "A"	m	714	$ 350.00	$ 249,900.00
Asphalt Pavement (105mm)	m	714	$ 250.00	$ 178,500.00
Subdrains (2 lanes)	m	714	$ 60.00	$ 42,840.00
Concrete Curb and Gutter (2 lanes)	m	714	$ 90.00	$ 64,260.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	714	$ 75.00	$ 53,550.00
Driveway Restoration b) Concrete	m	714	$ 180.00	$ 128,520.00
Topsoil, Hydraulic Seed and Mulch	m	714	$ 100.00	$ 71,400.00
Traffic Control During Construction (Residential)	m	714	$ 100.00	$ 71,400.00
Streetlighting (Residential)	m	714	$ 225.00	$ 160,650.00
Street Trees (In Boulevard / 12m spacing each side)	m	714	$ 125.00	$ 89,250.00
SUBTOTAL				**$ 1,200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	714	$ 75.00	$ 53,550.00
Sanitary Private Drain Connection	m	714	$ 150.00	$ 107,100.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	359	$ 700.00	$ 251,300.00
Sanitary Sewer - 825mm diameter Concrete (100-D)	m	355	$ 800.00	$ 284,000.00
Manhole Rain Catchers	m	714	$ 3.00	$ 2,142.00
SUBTOTAL				**$ 700,000.00**
Construction Cost Total				**$ 2,200,000.00**
Construction Cost Contingency (30%)				**$ 660,000.00**
Subtotal				**$ 2,900,000.00**
Engineering Fee Estimate (20%)				**$ 580,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-S-1-3**		**$ 3,480,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

EC ROW AVE E	SAN-S-1-3
Length of Road Improvements (m)	141 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

EC ROW AVE E		SAN-S-1-3		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	141	$ 5.00	$ 705.00
Full Depth Asphalt Removal	m	141	$ 80.00	$ 11,280.00
Driveway Removal (all types)	m	141	$ 30.00	$ 4,230.00
Sidewalk Removal (all types)	m	141	$ 20.00	$ 2,820.00
Sawcutting Existing Pavement	m	141	$ 1.00	$ 141.00
Streetlighting Removal	m	141	$ 25.00	$ 3,525.00
Signage Removal	m	141	$ 5.00	$ 705.00
SUBTOTAL				**$ 24,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	141	$ 100.00	$ 14,100.00
Remove Existing Manholes	m	141	$ 15.00	$ 2,115.00
Remove Existing Sanitary Private Drain Connection	m	141	$ 25.00	$ 3,525.00
SUBTOTAL				**$ 20,000.00**
Roadwork				
Earth Excavating and Grading	m	141	$ 120.00	$ 16,920.00
Supply and Place Compacted Granular "A"	m	141	$ 350.00	$ 49,350.00
Asphalt Pavement (105mm)	m	141	$ 250.00	$ 35,250.00
Subdrains (2 lanes)	m	141	$ 60.00	$ 8,460.00
Concrete Curb and Gutter (2 lanes)	m	141	$ 90.00	$ 12,690.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	141	$ 75.00	$ 10,575.00
Driveway Restoration b) Concrete	m	141	$ 180.00	$ 25,380.00
Topsoil, Hydraulic Seed and Mulch	m	141	$ 100.00	$ 14,100.00
Traffic Control During Construction (Residential)	m	141	$ 100.00	$ 14,100.00
Streetlighting (Residential)	m	141	$ 225.00	$ 31,725.00
Street Trees (In Boulevard / 12m spacing each side)	m	141	$ 125.00	$ 17,625.00
SUBTOTAL				**$ 240,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	141	$ 75.00	$ 10,575.00
Sanitary Private Drain Connection	m	141	$ 150.00	$ 21,150.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	141	$ 525.00	$ 74,025.00
Manhole Rain Catchers	m	141	$ 3.00	$ 423.00
SUBTOTAL				**$ 110,000.00**
Construction Cost Total				**$ 400,000.00**
Construction Cost Contingency (30%)				**$ 120,000.00**
Subtotal				**$ 520,000.00**
Engineering Fee Estimate (20%)				**$ 104,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-S-1-3**		**$ 624,000.00**

April 2020 - Cost Estimate Based on 2020 Construction Pricing

TOURANGEAU RD	SAN-S-1-4
Length of Road Improvements (m)	390 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

TOURANGEAU RD		SAN-S-1-4		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	390	$ 5.00	$ 1,950.00
Full Depth Asphalt Removal	m	390	$ 80.00	$ 31,200.00
Driveway Removal (all types)	m	390	$ 30.00	$ 11,700.00
Sawcutting Existing Pavement	m	390	$ 1.00	$ 390.00
Curb and Gutter Removal	m	390	$ 20.00	$ 7,800.00
Streetlighting Removal	m	390	$ 25.00	$ 9,750.00
Signage Removal	m	390	$ 5.00	$ 1,950.00
SUBTOTAL				**$ 70,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	390	$ 100.00	$ 39,000.00
Remove Existing Manholes	m	390	$ 15.00	$ 5,850.00
Remove Existing Sanitary Private Drain Connection	m	390	$ 25.00	$ 9,750.00
SUBTOTAL				**$ 60,000.00**
Roadwork				
Earth Excavating and Grading	m	390	$ 120.00	$ 46,800.00
Supply and Place Compacted Granular "A"	m	390	$ 350.00	$ 136,500.00
Asphalt Pavement (105mm)	m	390	$ 250.00	$ 97,500.00
Subdrains (2 lanes)	m	390	$ 60.00	$ 23,400.00
Concrete Curb and Gutter (2 lanes)	m	390	$ 90.00	$ 35,100.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	390	$ 75.00	$ 29,250.00
Driveway Restoration b) Concrete	m	390	$ 180.00	$ 70,200.00
Topsoil, Hydraulic Seed and Mulch	m	390	$ 100.00	$ 39,000.00
Traffic Control During Construction (Residential)	m	390	$ 100.00	$ 39,000.00
Streetlighting (Residential)	m	390	$ 225.00	$ 87,750.00
SUBTOTAL				**$ 610,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	390	$ 75.00	$ 29,250.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	390	$ 525.00	$ 204,750.00
Sanitary Private Drain Connection	m	390	$ 150.00	$ 58,500.00
Manhole Rain Catchers	m	390	$ 3.00	$ 1,170.00
SUBTOTAL				**$ 300,000.00**
Construction Cost Total				**$ 1,100,000.00**
Construction Cost Contingency (30%)				**$ 330,000.00**
Subtotal				**$ 1,500,000.00**
Engineering Fee Estimate (20%)				**$ 300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-S-1-4**		**$ 1,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

GRAND MARAIS RD E	SAN-S-1-4
Length of Road Improvements (m)	573 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

GRAND MARAIS RD E		SAN-S-1-4		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Sewer Removals				
Remove Existing Sanitary Sewers	m	573	$ 100.00	$ 57,300.00
Remove Existing Manholes	m	573	$ 15.00	$ 8,595.00
Remove Existing Sanitary Private Drain Connection	m	573	$ 25.00	$ 14,325.00
SUBTOTAL				**$ 81,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	573	$ 75.00	$ 42,975.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	573	$ 525.00	$ 300,825.00
Sanitary Private Drain Connection	m	573	$ 150.00	$ 85,950.00
Manhole Rain Catchers	m	573	$ 3.00	$ 1,719.00
SUBTOTAL				**$ 440,000.00**
Construction Cost Total				**$ 521,000.00**
Construction Cost Contingency (30%)				**$ 160,000.00**
Subtotal				**$ 681,000.00**
Engineering Fee Estimate (20%)				**$ 140,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-S-1-4				**$ 821,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

DOMINION BLVD	SAN-S-1-5
Length of Road Improvements (m)	1245 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

DOMINION BLVD		SAN-S-1-5		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	1245	$ 5.00	$ 6,225.00
Full Depth Asphalt Removal	m	1245	$ 80.00	$ 99,600.00
Driveway Removal (all types)	m	1245	$ 30.00	$ 37,350.00
Sidewalk Removal (all types)	m	1245	$ 20.00	$ 24,900.00
Sawcutting Existing Pavement	m	1245	$ 1.00	$ 1,245.00
Curb and Gutter Removal	m	1245	$ 20.00	$ 24,900.00
Streetlighting Removal	m	1245	$ 25.00	$ 31,125.00
Signage Removal	m	1245	$ 5.00	$ 6,225.00
SUBTOTAL				**$ 240,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	1245	$ 100.00	$ 124,500.00
Remove Existing Manholes	m	1245	$ 15.00	$ 18,675.00
Remove Existing Sanitary Private Drain Connection	m	1245	$ 25.00	$ 31,125.00
SUBTOTAL				**$ 180,000.00**
Roadwork				
Earth Excavating and Grading	m	1245	$ 120.00	$ 149,400.00
Supply and Place Compacted Granular "A"	m	1245	$ 350.00	$ 435,750.00
Asphalt Pavement (105mm)	m	1245	$ 250.00	$ 311,250.00
Subdrains (2 lanes)	m	1245	$ 60.00	$ 74,700.00
Concrete Curb and Gutter (2 lanes)	m	1245	$ 90.00	$ 112,050.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	1245	$ 75.00	$ 93,375.00
Driveway Restoration b) Concrete	m	1245	$ 180.00	$ 224,100.00
Topsoil, Hydraulic Seed and Mulch	m	1245	$ 100.00	$ 124,500.00
Traffic Control During Construction (Residential)	m	1245	$ 100.00	$ 124,500.00
Streetlighting (Residential)	m	1245	$ 225.00	$ 280,125.00
Street Trees (In Boulevard / 12m spacing each side)	m	1245	$ 125.00	$ 155,625.00
SUBTOTAL				**$ 2,100,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	1245	$ 75.00	$ 93,375.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	1245	$ 525.00	$ 653,625.00
Sanitary Private Drain Connection	m	1245	$ 150.00	$ 186,750.00
Manhole Rain Catchers	m	1245	$ 3.00	$ 3,735.00
SUBTOTAL				**$ 940,000.00**
Construction Cost Total				**$ 3,500,000.00**
Construction Cost Contingency (30%)				**$ 1,100,000.00**
Subtotal				**$ 4,600,000.00**
Engineering Fee Estimate (20%)				**$ 920,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -		**SAN-S-1-5**		**$ 5,520,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

ROSELAWN DR	SAN-S-1-5
Length of Road Improvements (m)	187 m
Number of Lanes	2
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	Yes
Existing Street Lights	Yes
Traffic Signals	No

ROSELAWN DR		SAN-S-1-5		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	187	$ 5.00	$ 935.00
Full Depth Asphalt Removal	m	187	$ 80.00	$ 14,960.00
Driveway Removal (all types)	m	187	$ 30.00	$ 5,610.00
Sidewalk Removal (all types)	m	187	$ 20.00	$ 3,740.00
Sawcutting Existing Pavement	m	187	$ 1.00	$ 187.00
Curb and Gutter Removal	m	187	$ 20.00	$ 3,740.00
Streetlighting Removal	m	187	$ 25.00	$ 4,675.00
Signage Removal	m	187	$ 5.00	$ 935.00
SUBTOTAL				**$ 35,000.00**
Sewer Removals				
Remove Existing Sanitary Sewers	m	187	$ 100.00	$ 18,700.00
Remove Existing Manholes	m	187	$ 15.00	$ 2,805.00
Remove Existing Sanitary Private Drain Connection	m	187	$ 25.00	$ 4,675.00
SUBTOTAL				**$ 27,000.00**
Roadwork				
Earth Excavating and Grading	m	187	$ 120.00	$ 22,440.00
Supply and Place Compacted Granular "A"	m	187	$ 350.00	$ 65,450.00
Asphalt Pavement (105mm)	m	187	$ 250.00	$ 46,750.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	187	$ 270.00	$ 50,490.00
Subdrains (2 lanes)	m	187	$ 60.00	$ 11,220.00
Concrete Curb and Gutter (2 lanes)	m	187	$ 90.00	$ 16,830.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA Warning Pads)	m	187	$ 75.00	$ 14,025.00
Driveway Restoration b) Concrete	m	187	$ 180.00	$ 33,660.00
Topsoil, Hydraulic Seed and Mulch	m	187	$ 100.00	$ 18,700.00
Traffic Control During Construction (Residential)	m	187	$ 100.00	$ 18,700.00
Streetlighting (Residential)	m	187	$ 225.00	$ 42,075.00
Street Trees (In Boulevard / 12m spacing each side)	m	187	$ 125.00	$ 23,375.00
SUBTOTAL				**$ 370,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	187	$ 75.00	$ 14,025.00
Sanitary Sewer - 600mm diameter Concrete (65-D)	m	187	$ 525.00	$ 98,175.00
Sanitary Private Drain Connection	m	187	$ 150.00	$ 28,050.00
Manhole Rain Catchers	m	187	$ 3.00	$ 561.00
SUBTOTAL				**$ 150,000.00**
Construction Cost Total				**$ 582,000.00**
Construction Cost Contingency (30%)				**$ 180,000.00**
Subtotal				**$ 762,000.00**
Engineering Fee Estimate (20%)				**$ 160,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR - SAN-S-1-5				**$ 922,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing				

PRINCE ROAD DRAINAGE AREA SEPARATION	STM-C1
Length of Road Improvements (m)	20730 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

PRINCE ROAD DRAINAGE AREA SEPARATION		STM-C1		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	20730	$ 5.00	$ 103,650.00
Full Depth Asphalt Removal	m	20730	$ 100.00	$ 2,073,000.00
Driveway Removal (all types)	m	20730	$ 30.00	$ 621,900.00
Sidewalk Removal (all types)	m	20730	$ 20.00	$ 414,600.00
Sawcutting Existing Pavement	m	20730	$ 1.00	$ 20,730.00
Curb and Gutter Removal	m	20730	$ 20.00	$ 414,600.00
Streetlighting Removal	m	20730	$ 25.00	$ 518,250.00
Signage Removal	m	20730	$ 5.00	$ 103,650.00
SUBTOTAL				**$ 4,300,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	20730	$ 100.00	$ 2,073,000.00
Remove Existing Sanitary Sewers	m	20730	$ 100.00	$ 2,073,000.00
Remove Existing Combined Sewers	m	20730	$ 75.00	$ 1,554,750.00
Remove Existing Manholes	m	20730	$ 15.00	$ 310,950.00
Remove Existing Catch Basins	m	20730	$ 12.50	$ 259,125.00
Remove Existing Combined Private Drain Connection	m	20730	$ 100.00	$ 2,073,000.00
Remove Existing Storm Private Drain Connection	m	20730	$ 25.00	$ 518,250.00
Remove Existing Sanitary Private Drain Connection	m	20730	$ 25.00	$ 518,250.00
SUBTOTAL				**$ 9,400,000.00**
Roadwork				
Earth Excavating and Grading	m	20730	$ 150.00	$ 3,109,500.00
Supply and Place Compacted Granular "A"	m	20730	$ 437.50	$ 9,069,375.00
Asphalt Pavement (105mm)	m	20730	$ 312.50	$ 6,478,125.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	20730	$ 270.00	$ 1,119,420.00
Subdrains (2 lanes)	m	20730	$ 60.00	$ 1,243,800.00
Concrete Curb and Gutter (2 lanes)	m	20730	$ 90.00	$ 1,865,700.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	20730	$ 75.00	$ 1,554,750.00
Driveway Restoration a) Asphalt	m	20730	$ 320.00	$ 6,633,600.00
Topsoil, Hydraulic Seed and Mulch	m	20730	$ 100.00	$ 2,073,000.00
Traffic Control During Construction (Residential)	m	20730	$ 100.00	$ 2,073,000.00
Streetlighting (Residential)	3	20730	$ 225.00	$ 4,664,250.00
Street Trees (In Boulevard / 12m spacing each side)	m	20730	$ 125.00	$ 2,591,250.00
SUBTOTAL				**$ 42,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	41460	$ 75.00	$ 3,109,500.00
Concrete Storm Precast Catchbasins and Leads	m	20730	$ 60.00	$ 1,243,800.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	20730	$ 700.00	$ 14,511,000.00
Sanitary Private Drain Connection	m	20730	$ 150.00	$ 3,109,500.00
Manhole Rain Catchers	m	20730	$ 3.00	$ 62,190.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	20730	$ 600.00	$ 12,438,000.00
Storm Private Drain Connection	m	20730	$ 20.00	$ 414,600.00

SUBTOTAL		**$ 34,900,000.00**
Construction Cost Total		**$ 91,100,000.00**
Construction Cost Contingency (30%)		**$ 27,400,000.00**
Subtotal		**$ 118,500,000.00**
Engineering Fee Estimate (20%)		**$ 23,700,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C1**	**$ 142,200,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

BROCK STREET DRAINAGE AREA SEPARATION	STM-C10
Length of Road Improvements (m)	41330 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

BROCK STREET DRAINAGE AREA SEPARATION		STM-C10		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	41330	$ 5.00	$ 206,650.00
Full Depth Asphalt Removal	m	41330	$ 100.00	$ 4,133,000.00
Driveway Removal (all types)	m	41330	$ 30.00	$ 1,239,900.00
Sidewalk Removal (all types)	m	41330	$ 20.00	$ 826,600.00
Sawcutting Existing Pavement	m	41330	$ 1.00	$ 41,330.00
Curb and Gutter Removal	m	41330	$ 20.00	$ 826,600.00
Streetlighting Removal	m	41330	$ 25.00	$ 1,033,250.00
Signage Removal	m	41330	$ 5.00	$ 206,650.00
SUBTOTAL				**$ 8,600,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	41330	$ 100.00	$ 4,133,000.00
Remove Existing Sanitary Sewers	m	41330	$ 100.00	$ 4,133,000.00
Remove Existing Combined Sewers	m	41330	$ 75.00	$ 3,099,750.00
Remove Existing Manholes	m	41330	$ 15.00	$ 619,950.00
Remove Existing Catch Basins	m	41330	$ 12.50	$ 516,625.00
Remove Existing Combined Private Drain Connection	m	41330	$ 100.00	$ 4,133,000.00
Remove Existing Storm Private Drain Connection	m	41330	$ 25.00	$ 1,033,250.00
Remove Existing Sanitary Private Drain Connection	m	41330	$ 25.00	$ 1,033,250.00
SUBTOTAL				**$ 18,800,000.00**
Roadwork				
Earth Excavating and Grading	m	41330	$ 150.00	$ 6,199,500.00
Supply and Place Compacted Granular "A"	m	41330	$ 437.50	$ 18,081,875.00
Asphalt Pavement (105mm)	m	41330	$ 312.50	$ 12,915,625.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	41330	$ 270.00	$ 2,231,820.00
Subdrains (2 lanes)	m	41330	$ 60.00	$ 2,479,800.00
Concrete Curb and Gutter (2 lanes)	m	41330	$ 90.00	$ 3,719,700.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	41330	$ 75.00	$ 3,099,750.00
Driveway Restoration a) Asphalt	m	41330	$ 320.00	$ 13,225,600.00
Topsoil, Hydraulic Seed and Mulch	m	41330	$ 100.00	$ 4,133,000.00
Traffic Control During Construction (Residential)	m	41330	$ 100.00	$ 4,133,000.00
Traffic Control During Construction (Arterial)	m	0	$ 200.00	$ -
Streetlighting (Residential)	3	41330	$ 225.00	$ 9,299,250.00
Street Trees (In Boulevard / 12m spacing each side)	m	41330	$ 125.00	$ 5,166,250.00
SUBTOTAL				**$ 84,700,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	82660	$ 75.00	$ 6,199,500.00
Concrete Storm Precast Catchbasins and Leads	m	41330	$ 60.00	$ 2,479,800.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	41330	$ 700.00	$ 28,931,000.00
Sanitary Private Drain Connection	m	41330	$ 150.00	$ 6,199,500.00
Manhole Rain Catchers	m	41330	$ 3.00	$ 123,990.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	41330	$ 600.00	$ 24,798,000.00
Storm Private Drain Connection	m	41330	$ 20.00	$ 826,600.00

SUBTOTAL		**$ 69,600,000.00**
Construction Cost Total		**$ 181,700,000.00**
Construction Cost Contingency (30%)		**$ 54,600,000.00**
Subtotal		**$ 236,300,000.00**
Engineering Fee Estimate (20%)		**$ 47,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C10**	**$ 283,600,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

DETROIT STREET DRAINAGE AREA SEPARATION	STM-C2
Length of Road Improvements (m)	10820 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

DETROIT STREET DRAINAGE AREA SEPARATION		STM-C2		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	10820	$ 5.00	$ 54,100.00
Full Depth Asphalt Removal	m	10820	$ 100.00	$ 1,082,000.00
Driveway Removal (all types)	m	10820	$ 30.00	$ 324,600.00
Sidewalk Removal (all types)	m	10820	$ 20.00	$ 216,400.00
Sawcutting Existing Pavement	m	10820	$ 1.00	$ 10,820.00
Curb and Gutter Removal	m	10820	$ 20.00	$ 216,400.00
Streetlighting Removal	m	10820	$ 25.00	$ 270,500.00
Signage Removal	m	10820	$ 5.00	$ 54,100.00
SUBTOTAL				**$ 2,300,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	10820	$ 100.00	$ 1,082,000.00
Remove Existing Sanitary Sewers	m	10820	$ 100.00	$ 1,082,000.00
Remove Existing Combined Sewers	m	10820	$ 75.00	$ 811,500.00
Remove Existing Manholes	m	10820	$ 15.00	$ 162,300.00
Remove Existing Catch Basins	m	10820	$ 12.50	$ 135,250.00
Remove Existing Combined Private Drain Connection	m	10820	$ 100.00	$ 1,082,000.00
Remove Existing Storm Private Drain Connection	m	10820	$ 25.00	$ 270,500.00
Remove Existing Sanitary Private Drain Connection	m	10820	$ 25.00	$ 270,500.00
SUBTOTAL				**$ 4,900,000.00**
Roadwork				
Earth Excavating and Grading	m	10820	$ 150.00	$ 1,623,000.00
Supply and Place Compacted Granular "A"	m	10820	$ 437.50	$ 4,733,750.00
Asphalt Pavement (105mm)	m	10820	$ 312.50	$ 3,381,250.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	10820	$ 270.00	$ 584,280.00
Subdrains (2 lanes)	m	10820	$ 60.00	$ 649,200.00
Concrete Curb and Gutter (2 lanes)	m	10820	$ 90.00	$ 973,800.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	10820	$ 75.00	$ 811,500.00
Driveway Restoration a) Asphalt	m	10820	$ 320.00	$ 3,462,400.00
Topsoil, Hydraulic Seed and Mulch	m	10820	$ 100.00	$ 1,082,000.00
Traffic Control During Construction (Residential)	m	10820	$ 100.00	$ 1,082,000.00
Streetlighting (Residential)	3	10820	$ 225.00	$ 2,434,500.00
Street Trees (In Boulevard / 12m spacing each side)	m	10820	$ 125.00	$ 1,352,500.00
SUBTOTAL				**$ 22,200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	21640	$ 75.00	$ 1,623,000.00
Concrete Storm Precast Catchbasins and Leads	m	10820	$ 60.00	$ 649,200.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	10820	$ 700.00	$ 7,574,000.00
Sanitary Private Drain Connection	m	10820	$ 150.00	$ 1,623,000.00
Manhole Rain Catchers	m	10820	$ 3.00	$ 32,460.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	10820	$ 600.00	$ 6,492,000.00
Storm Private Drain Connection	m	10820	$ 20.00	$ 216,400.00

SUBTOTAL		**$ 18,300,000.00**
Construction Cost Total		**$ 47,700,000.00**
Construction Cost Contingency (30%)		**$ 14,400,000.00**
Subtotal		**$ 62,100,000.00**
Engineering Fee Estimate (20%)		**$ 12,500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C2**	**$ 74,600,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

HURON CHURCH ROAD DRAINAGE AREA	STM-C11
Length of Road Improvements (m)	29350 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

HURON CHURCH ROAD DRAINAGE AREA		STM-C11		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	29350	$ 5.00	$ 146,750.00
Full Depth Asphalt Removal	m	29350	$ 100.00	$ 2,935,000.00
Driveway Removal (all types)	m	29350	$ 30.00	$ 880,500.00
Sidewalk Removal (all types)	m	29350	$ 20.00	$ 587,000.00
Sawcutting Existing Pavement	m	29350	$ 1.00	$ 29,350.00
Curb and Gutter Removal	m	29350	$ 20.00	$ 587,000.00
Streetlighting Removal	m	29350	$ 25.00	$ 733,750.00
Signage Removal	m	29350	$ 5.00	$ 146,750.00
SUBTOTAL				**$ 6,100,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	29350	$ 100.00	$ 2,935,000.00
Remove Existing Sanitary Sewers	m	29350	$ 100.00	$ 2,935,000.00
Remove Existing Combined Sewers	m	29350	$ 75.00	$ 2,201,250.00
Remove Existing Manholes	m	29350	$ 15.00	$ 440,250.00
Remove Existing Catch Basins	m	29350	$ 12.50	$ 366,875.00
Remove Existing Combined Private Drain Connection	m	29350	$ 100.00	$ 2,935,000.00
Remove Existing Storm Private Drain Connection	m	29350	$ 25.00	$ 733,750.00
Remove Existing Sanitary Private Drain Connection	m	29350	$ 25.00	$ 733,750.00
SUBTOTAL				**$ 13,300,000.00**
Roadwork				
Earth Excavating and Grading	m	29350	$ 150.00	$ 4,402,500.00
Supply and Place Compacted Granular "A"	m	29350	$ 437.50	$ 12,840,625.00
Asphalt Pavement (105mm)	m	29350	$ 312.50	$ 9,171,875.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	29350	$ 270.00	$ 1,584,900.00
Subdrains (2 lanes)	m	29350	$ 60.00	$ 1,761,000.00
Concrete Curb and Gutter (2 lanes)	m	29350	$ 90.00	$ 2,641,500.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	29350	$ 75.00	$ 2,201,250.00
Driveway Restoration a) Asphalt	m	29350	$ 320.00	$ 9,392,000.00
Topsoil, Hydraulic Seed and Mulch	m	29350	$ 100.00	$ 2,935,000.00
Traffic Control During Construction (Residential)	m	29350	$ 100.00	$ 2,935,000.00
Streetlighting (Residential)	3	29350	$ 225.00	$ 6,603,750.00
Street Trees (In Boulevard / 12m spacing each side)	m	29350	$ 125.00	$ 3,668,750.00
SUBTOTAL				**$ 60,200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	58700	$ 75.00	$ 4,402,500.00
Concrete Storm Precast Catchbasins and Leads	m	29350	$ 60.00	$ 1,761,000.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	29350	$ 700.00	$ 20,545,000.00
Sanitary Private Drain Connection	m	29350	$ 150.00	$ 4,402,500.00
Manhole Rain Catchers	m	29350	$ 3.00	$ 88,050.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	29350	$ 600.00	$ 17,610,000.00
Storm Private Drain Connection	m	29350	$ 20.00	$ 587,000.00

SUBTOTAL		**$ 49,400,000.00**
Construction Cost Total		**$ 129,000,000.00**
Construction Cost Contingency (30%)		**$ 38,700,000.00**
Subtotal		**$ 167,700,000.00**
Engineering Fee Estimate (20%)		**$ 33,600,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C11**	**$ 201,300,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

ASKIN AVENUE DRAINAGE AREA SEPARATION	STM-C20
Length of Road Improvements (m)	9980 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ASKIN AVENUE DRAINAGE AREA SEPARATION		STM-C20		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	9980	$ 5.00	$ 49,900.00
Full Depth Asphalt Removal	m	9980	$ 100.00	$ 998,000.00
Driveway Removal (all types)	m	9980	$ 30.00	$ 299,400.00
Sidewalk Removal (all types)	m	9980	$ 20.00	$ 199,600.00
Sawcutting Existing Pavement	m	9980	$ 1.00	$ 9,980.00
Curb and Gutter Removal	m	9980	$ 20.00	$ 199,600.00
Streetlighting Removal	m	9980	$ 25.00	$ 249,500.00
Signage Removal	m	9980	$ 5.00	$ 49,900.00
SUBTOTAL				**$ 2,100,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	9980	$ 100.00	$ 998,000.00
Remove Existing Sanitary Sewers	m	9980	$ 100.00	$ 998,000.00
Remove Existing Combined Sewers	m	9980	$ 75.00	$ 748,500.00
Remove Existing Manholes	m	9980	$ 15.00	$ 149,700.00
Remove Existing Catch Basins	m	9980	$ 12.50	$ 124,750.00
Remove Existing Combined Private Drain Connection	m	9980	$ 100.00	$ 998,000.00
Remove Existing Storm Private Drain Connection	m	9980	$ 25.00	$ 249,500.00
Remove Existing Sanitary Private Drain Connection	m	9980	$ 25.00	$ 249,500.00
SUBTOTAL				**$ 4,600,000.00**
Roadwork				
Earth Excavating and Grading	m	9980	$ 150.00	$ 1,497,000.00
Supply and Place Compacted Granular "A"	m	9980	$ 437.50	$ 4,366,250.00
Asphalt Pavement (105mm)	m	9980	$ 312.50	$ 3,118,750.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	9980	$ 270.00	$ 538,920.00
Subdrains (2 lanes)	m	9980	$ 60.00	$ 598,800.00
Concrete Curb and Gutter (2 lanes)	m	9980	$ 90.00	$ 898,200.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	9980	$ 75.00	$ 748,500.00
Driveway Restoration a) Asphalt	m	9980	$ 320.00	$ 3,193,600.00
Topsoil, Hydraulic Seed and Mulch	m	9980	$ 100.00	$ 998,000.00
Traffic Control During Construction (Residential)	m	9980	$ 100.00	$ 998,000.00
Streetlighting (Residential)	3	9980	$ 225.00	$ 2,245,500.00
Street Trees (In Boulevard / 12m spacing each side)	m	9980	$ 125.00	$ 1,247,500.00
SUBTOTAL				**$ 20,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	19960	$ 75.00	$ 1,497,000.00
Concrete Storm Precast Catchbasins and Leads	m	9980	$ 60.00	$ 598,800.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	9980	$ 700.00	$ 6,986,000.00
Sanitary Private Drain Connection	m	9980	$ 150.00	$ 1,497,000.00
Manhole Rain Catchers	m	9980	$ 3.00	$ 29,940.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	9980	$ 600.00	$ 5,988,000.00
Storm Private Drain Connection	m	9980	$ 20.00	$ 199,600.00

SUBTOTAL		**$ 16,800,000.00**
Construction Cost Total		**$ 44,000,000.00**
Construction Cost Contingency (30%)		**$ 13,200,000.00**
Subtotal		**$ 57,200,000.00**
Engineering Fee Estimate (20%)		**$ 11,500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C20**	**$ 68,700,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

CAMERON AVENUE DRAINAGE AREA SEPARATION	STM-C3
Length of Road Improvements (m)	21130 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CAMERON AVENUE DRAINAGE AREA SEPARATION		STM-C3		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	21130	$ 5.00	$ 105,650.00
Full Depth Asphalt Removal	m	21130	$ 100.00	$ 2,113,000.00
Driveway Removal (all types)	m	21130	$ 30.00	$ 633,900.00
Sidewalk Removal (all types)	m	21130	$ 20.00	$ 422,600.00
Sawcutting Existing Pavement	m	21130	$ 1.00	$ 21,130.00
Curb and Gutter Removal	m	21130	$ 20.00	$ 422,600.00
Streetlighting Removal	m	21130	$ 25.00	$ 528,250.00
Signage Removal	m	21130	$ 5.00	$ 105,650.00
SUBTOTAL				**$ 4,400,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	21130	$ 100.00	$ 2,113,000.00
Remove Existing Sanitary Sewers	m	21130	$ 100.00	$ 2,113,000.00
Remove Existing Combined Sewers	m	21130	$ 75.00	$ 1,584,750.00
Remove Existing Manholes	m	21130	$ 15.00	$ 316,950.00
Remove Existing Catch Basins	m	21130	$ 12.50	$ 264,125.00
Remove Existing Combined Private Drain Connection	m	21130	$ 100.00	$ 2,113,000.00
Remove Existing Storm Private Drain Connection	m	21130	$ 25.00	$ 528,250.00
Remove Existing Sanitary Private Drain Connection	m	21130	$ 25.00	$ 528,250.00
SUBTOTAL				**$ 9,600,000.00**
Roadwork				
Earth Excavating and Grading	m	21130	$ 150.00	$ 3,169,500.00
Supply and Place Compacted Granular "A"	m	21130	$ 437.50	$ 9,244,375.00
Asphalt Pavement (105mm)	m	21130	$ 312.50	$ 6,603,125.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	21130	$ 270.00	$ 1,141,020.00
Subdrains (2 lanes)	m	21130	$ 60.00	$ 1,267,800.00
Concrete Curb and Gutter (2 lanes)	m	21130	$ 90.00	$ 1,901,700.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	21130	$ 75.00	$ 1,584,750.00
Driveway Restoration a) Asphalt	m	21130	$ 320.00	$ 6,761,600.00
Topsoil, Hydraulic Seed and Mulch	m	21130	$ 100.00	$ 2,113,000.00
Traffic Control During Construction (Residential)	m	21130	$ 100.00	$ 2,113,000.00
Streetlighting (Residential)	3	21130	$ 225.00	$ 4,754,250.00
Street Trees (In Boulevard / 12m spacing each side)	m	21130	$ 125.00	$ 2,641,250.00
SUBTOTAL				**$ 43,300,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	42260	$ 75.00	$ 3,169,500.00
Concrete Storm Precast Catchbasins and Leads	m	21130	$ 60.00	$ 1,267,800.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	21130	$ 700.00	$ 14,791,000.00
Sanitary Private Drain Connection	m	21130	$ 150.00	$ 3,169,500.00
Manhole Rain Catchers	m	21130	$ 3.00	$ 63,390.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	21130	$ 600.00	$ 12,678,000.00
Storm Private Drain Connection	m	21130	$ 20.00	$ 422,600.00

SUBTOTAL		**$ 35,600,000.00**
Construction Cost Total		**$ 92,900,000.00**
Construction Cost Contingency (30%)		**$ 27,900,000.00**
Subtotal		**$ 120,800,000.00**
Engineering Fee Estimate (20%)		**$ 24,200,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C3**	**$ 145,000,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

WELLINGTON AVENUE DRAINAGE AREA	STM-C14
Length of Road Improvements (m)	13360 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

WELLINGTON AVENUE DRAINAGE AREA		STM-C14		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	13360	$ 5.00	$ 66,800.00
Full Depth Asphalt Removal	m	13360	$ 100.00	$ 1,336,000.00
Driveway Removal (all types)	m	13360	$ 30.00	$ 400,800.00
Sidewalk Removal (all types)	m	13360	$ 20.00	$ 267,200.00
Sawcutting Existing Pavement	m	13360	$ 1.00	$ 13,360.00
Curb and Gutter Removal	m	13360	$ 20.00	$ 267,200.00
Streetlighting Removal	m	13360	$ 25.00	$ 334,000.00
Signage Removal	m	13360	$ 5.00	$ 66,800.00
SUBTOTAL				**$ 2,800,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	13360	$ 100.00	$ 1,336,000.00
Remove Existing Sanitary Sewers	m	13360	$ 100.00	$ 1,336,000.00
Remove Existing Combined Sewers	m	13360	$ 75.00	$ 1,002,000.00
Remove Existing Manholes	m	13360	$ 15.00	$ 200,400.00
Remove Existing Catch Basins	m	13360	$ 12.50	$ 167,000.00
Remove Existing Combined Private Drain Connection	m	13360	$ 100.00	$ 1,336,000.00
Remove Existing Storm Private Drain Connection	m	13360	$ 25.00	$ 334,000.00
Remove Existing Sanitary Private Drain Connection	m	13360	$ 25.00	$ 334,000.00
SUBTOTAL				**$ 6,100,000.00**
Roadwork				
Earth Excavating and Grading	m	13360	$ 150.00	$ 2,004,000.00
Supply and Place Compacted Granular "A"	m	13360	$ 437.50	$ 5,845,000.00
Asphalt Pavement (105mm)	m	13360	$ 312.50	$ 4,175,000.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	13360	$ 270.00	$ 721,440.00
Subdrains (2 lanes)	m	13360	$ 60.00	$ 801,600.00
Concrete Curb and Gutter (2 lanes)	m	13360	$ 90.00	$ 1,202,400.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	13360	$ 75.00	$ 1,002,000.00
Driveway Restoration a) Asphalt	m	13360	$ 320.00	$ 4,275,200.00
Topsoil, Hydraulic Seed and Mulch	m	13360	$ 100.00	$ 1,336,000.00
Traffic Control During Construction (Residential)	m	13360	$ 100.00	$ 1,336,000.00
Streetlighting (Residential)	3	13360	$ 225.00	$ 3,006,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	13360	$ 125.00	$ 1,670,000.00
SUBTOTAL				**$ 27,400,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	26720	$ 75.00	$ 2,004,000.00
Concrete Storm Precast Catchbasins and Leads	m	13360	$ 60.00	$ 801,600.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	13360	$ 700.00	$ 9,352,000.00
Sanitary Private Drain Connection	m	13360	$ 150.00	$ 2,004,000.00
Manhole Rain Catchers	m	13360	$ 3.00	$ 40,080.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	13360	$ 600.00	$ 8,016,000.00
Storm Private Drain Connection	m	13360	$ 20.00	$ 267,200.00

SUBTOTAL		**$ 22,500,000.00**
Construction Cost Total		**$ 58,800,000.00**
Construction Cost Contingency (30%)		**$ 17,700,000.00**
Subtotal		**$ 76,500,000.00**
Engineering Fee Estimate (20%)		**$ 15,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C14**	**$ 91,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

CHURCH STREET DRAINAGE AREA SEPARATION	STM-C4
Length of Road Improvements (m)	53290 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

CHURCH STREET DRAINAGE AREA SEPARATION		STM-C4		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	53290	$ 5.00	$ 266,450.00
Full Depth Asphalt Removal	m	53290	$ 100.00	$ 5,329,000.00
Driveway Removal (all types)	m	53290	$ 30.00	$ 1,598,700.00
Sidewalk Removal (all types)	m	53290	$ 20.00	$ 1,065,800.00
Sawcutting Existing Pavement	m	53290	$ 1.00	$ 53,290.00
Curb and Gutter Removal	m	53290	$ 20.00	$ 1,065,800.00
Streetlighting Removal	m	53290	$ 25.00	$ 1,332,250.00
Signage Removal	m	53290	$ 5.00	$ 266,450.00
SUBTOTAL				**$ 11,000,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	53290	$ 100.00	$ 5,329,000.00
Remove Existing Sanitary Sewers	m	53290	$ 100.00	$ 5,329,000.00
Remove Existing Combined Sewers	m	53290	$ 75.00	$ 3,996,750.00
Remove Existing Manholes	m	53290	$ 15.00	$ 799,350.00
Remove Existing Catch Basins	m	53290	$ 12.50	$ 666,125.00
Remove Existing Combined Private Drain Connection	m	53290	$ 100.00	$ 5,329,000.00
Remove Existing Storm Private Drain Connection	m	53290	$ 25.00	$ 1,332,250.00
Remove Existing Sanitary Private Drain Connection	m	53290	$ 25.00	$ 1,332,250.00
SUBTOTAL				**$ 24,200,000.00**
Roadwork				
Earth Excavating and Grading	m	53290	$ 150.00	$ 7,993,500.00
Supply and Place Compacted Granular "A"	m	53290	$ 437.50	$ 23,314,375.00
Asphalt Pavement (105mm)	m	53290	$ 312.50	$ 16,653,125.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	53290	$ 270.00	$ 2,877,660.00
Subdrains (2 lanes)	m	53290	$ 60.00	$ 3,197,400.00
Concrete Curb and Gutter (2 lanes)	m	53290	$ 90.00	$ 4,796,100.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	53290	$ 75.00	$ 3,996,750.00
Driveway Restoration a) Asphalt	m	53290	$ 320.00	$ 17,052,800.00
Topsoil, Hydraulic Seed and Mulch	m	53290	$ 100.00	$ 5,329,000.00
Traffic Control During Construction (Residential)	m	53290	$ 100.00	$ 5,329,000.00
Streetlighting (Residential)	3	53290	$ 225.00	$ 11,990,250.00
Street Trees (In Boulevard / 12m spacing each side)	m	53290	$ 125.00	$ 6,661,250.00
SUBTOTAL				**$ 109,200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	106580	$ 75.00	$ 7,993,500.00
Concrete Storm Precast Catchbasins and Leads	m	53290	$ 60.00	$ 3,197,400.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	53290	$ 700.00	$ 37,303,000.00
Sanitary Private Drain Connection	m	53290	$ 150.00	$ 7,993,500.00
Manhole Rain Catchers	m	53290	$ 3.00	$ 159,870.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	53290	$ 600.00	$ 31,974,000.00
Storm Private Drain Connection	m	53290	$ 20.00	$ 1,065,800.00

SUBTOTAL		**$ 89,700,000.00**
Construction Cost Total		**$ 234,100,000.00**
Construction Cost Contingency (30%)		**$ 70,300,000.00**
Subtotal		**$ 304,400,000.00**
Engineering Fee Estimate (20%)		**$ 60,900,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C4**	**$ 365,300,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

MCDOUGALL STREET DRAINAGE AREA	STM-C22
Length of Road Improvements (m)	14010 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

MCDOUGALL STREET DRAINAGE AREA		STM-C22		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	14010	$ 5.00	$ 70,050.00
Full Depth Asphalt Removal	m	14010	$ 100.00	$ 1,401,000.00
Driveway Removal (all types)	m	14010	$ 30.00	$ 420,300.00
Sidewalk Removal (all types)	m	14010	$ 20.00	$ 280,200.00
Sawcutting Existing Pavement	m	14010	$ 1.00	$ 14,010.00
Curb and Gutter Removal	m	14010	$ 20.00	$ 280,200.00
Streetlighting Removal	m	14010	$ 25.00	$ 350,250.00
Signage Removal	m	14010	$ 5.00	$ 70,050.00
SUBTOTAL				**$ 2,900,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	14010	$ 100.00	$ 1,401,000.00
Remove Existing Sanitary Sewers	m	14010	$ 100.00	$ 1,401,000.00
Remove Existing Combined Sewers	m	14010	$ 75.00	$ 1,050,750.00
Remove Existing Manholes	m	14010	$ 15.00	$ 210,150.00
Remove Existing Catch Basins	m	14010	$ 12.50	$ 175,125.00
Remove Existing Combined Private Drain Connection	m	14010	$ 100.00	$ 1,401,000.00
Remove Existing Storm Private Drain Connection	m	14010	$ 25.00	$ 350,250.00
Remove Existing Sanitary Private Drain Connection	m	14010	$ 25.00	$ 350,250.00
SUBTOTAL				**$ 6,400,000.00**
Roadwork				
Earth Excavating and Grading	m	14010	$ 150.00	$ 2,101,500.00
Supply and Place Compacted Granular "A"	m	14010	$ 437.50	$ 6,129,375.00
Asphalt Pavement (105mm)	m	14010	$ 312.50	$ 4,378,125.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	14010	$ 270.00	$ 756,540.00
Subdrains (2 lanes)	m	14010	$ 60.00	$ 840,600.00
Concrete Curb and Gutter (2 lanes)	m	14010	$ 90.00	$ 1,260,900.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	14010	$ 75.00	$ 1,050,750.00
Driveway Restoration a) Asphalt	m	14010	$ 320.00	$ 4,483,200.00
Topsoil, Hydraulic Seed and Mulch	m	14010	$ 100.00	$ 1,401,000.00
Traffic Control During Construction (Residential)	m	14010	$ 100.00	$ 1,401,000.00
Streetlighting (Residential)	3	14010	$ 225.00	$ 3,152,250.00
Street Trees (In Boulevard / 12m spacing each side)	m	14010	$ 125.00	$ 1,751,250.00
SUBTOTAL				**$ 28,800,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	28020	$ 75.00	$ 2,101,500.00
Concrete Storm Precast Catchbasins and Leads	m	14010	$ 60.00	$ 840,600.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	14010	$ 700.00	$ 9,807,000.00
Sanitary Private Drain Connection	m	14010	$ 150.00	$ 2,101,500.00
Manhole Rain Catchers	m	14010	$ 3.00	$ 42,030.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	14010	$ 600.00	$ 8,406,000.00
Storm Private Drain Connection	m	14010	$ 20.00	$ 280,200.00

SUBTOTAL		**$ 23,600,000.00**
Construction Cost Total		**$ 61,700,000.00**
Construction Cost Contingency (30%)		**$ 18,600,000.00**
Subtotal		**$ 80,300,000.00**
Engineering Fee Estimate (20%)		**$ 16,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C22**	**$ 96,400,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

PARENT AVENUE DRAINAGE AREA SEPARATION	STM-C5
Length of Road Improvements (m)	64990 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

PARENT AVENUE DRAINAGE AREA SEPARATION		STM-C5		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	64990	$ 5.00	$ 324,950.00
Full Depth Asphalt Removal	m	64990	$ 100.00	$ 6,499,000.00
Driveway Removal (all types)	m	64990	$ 30.00	$ 1,949,700.00
Sidewalk Removal (all types)	m	64990	$ 20.00	$ 1,299,800.00
Sawcutting Existing Pavement	m	64990	$ 1.00	$ 64,990.00
Curb and Gutter Removal	m	64990	$ 20.00	$ 1,299,800.00
Streetlighting Removal	m	64990	$ 25.00	$ 1,624,750.00
Signage Removal	m	64990	$ 5.00	$ 324,950.00
SUBTOTAL				**$ 13,400,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	64990	$ 100.00	$ 6,499,000.00
Remove Existing Sanitary Sewers	m	64990	$ 100.00	$ 6,499,000.00
Remove Existing Combined Sewers	m	64990	$ 75.00	$ 4,874,250.00
Remove Existing Manholes	m	64990	$ 15.00	$ 974,850.00
Remove Existing Catch Basins	m	64990	$ 12.50	$ 812,375.00
Remove Existing Combined Private Drain Connection	m	64990	$ 100.00	$ 6,499,000.00
Remove Existing Storm Private Drain Connection	m	64990	$ 25.00	$ 1,624,750.00
Remove Existing Sanitary Private Drain Connection	m	64990	$ 25.00	$ 1,624,750.00
SUBTOTAL				**$ 29,500,000.00**
Roadwork				
Earth Excavating and Grading	m	64990	$ 150.00	$ 9,748,500.00
Supply and Place Compacted Granular "A"	m	64990	$ 437.50	$ 28,433,125.00
Asphalt Pavement (105mm)	m	64990	$ 312.50	$ 20,309,375.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	64990	$ 270.00	$ 3,509,460.00
Subdrains (2 lanes)	m	64990	$ 60.00	$ 3,899,400.00
Concrete Curb and Gutter (2 lanes)	m	64990	$ 90.00	$ 5,849,100.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	64990	$ 75.00	$ 4,874,250.00
Driveway Restoration a) Asphalt	m	64990	$ 320.00	$ 20,796,800.00
Topsoil, Hydraulic Seed and Mulch	m	64990	$ 100.00	$ 6,499,000.00
Traffic Control During Construction (Residential)	m	64990	$ 100.00	$ 6,499,000.00
Streetlighting (Residential)	3	64990	$ 225.00	$ 14,622,750.00
Street Trees (In Boulevard / 12m spacing each side)	m	64990	$ 125.00	$ 8,123,750.00
SUBTOTAL				**$ 133,200,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	129980	$ 75.00	$ 9,748,500.00
Concrete Storm Precast Catchbasins and Leads	m	64990	$ 60.00	$ 3,899,400.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	64990	$ 700.00	$ 45,493,000.00
Sanitary Private Drain Connection	m	64990	$ 150.00	$ 9,748,500.00
Manhole Rain Catchers	m	64990	$ 3.00	$ 194,970.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	64990	$ 600.00	$ 38,994,000.00
Storm Private Drain Connection	m	64990	$ 20.00	$ 1,299,800.00

SUBTOTAL		**$ 109,400,000.00**
Construction Cost Total		**$ 285,500,000.00**
Construction Cost Contingency (30%)		**$ 85,700,000.00**
Subtotal		**$ 371,200,000.00**
Engineering Fee Estimate (20%)		**$ 74,300,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C5**	**$ 445,500,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

LINCOLN ROAD DRAINAGE AREA SEPARATION	STM-C23
Length of Road Improvements (m)	45590 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

LINCOLN ROAD DRAINAGE AREA SEPARATION

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	45590	$ 5.00	$ 227,950.00
Full Depth Asphalt Removal	m	45590	$ 100.00	$ 4,559,000.00
Driveway Removal (all types)	m	45590	$ 30.00	$ 1,367,700.00
Sidewalk Removal (all types)	m	45590	$ 20.00	$ 911,800.00
Sawcutting Existing Pavement	m	45590	$ 1.00	$ 45,590.00
Curb and Gutter Removal	m	45590	$ 20.00	$ 911,800.00
Streetlighting Removal	m	45590	$ 25.00	$ 1,139,750.00
Signage Removal	m	45590	$ 5.00	$ 227,950.00
SUBTOTAL				**$ 9,400,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	45590	$ 100.00	$ 4,559,000.00
Remove Existing Sanitary Sewers	m	45590	$ 100.00	$ 4,559,000.00
Remove Existing Combined Sewers	m	45590	$ 75.00	$ 3,419,250.00
Remove Existing Manholes	m	45590	$ 15.00	$ 683,850.00
Remove Existing Catch Basins	m	45590	$ 12.50	$ 569,875.00
Remove Existing Combined Private Drain Connection	m	45590	$ 100.00	$ 4,559,000.00
Remove Existing Storm Private Drain Connection	m	45590	$ 25.00	$ 1,139,750.00
Remove Existing Sanitary Private Drain Connection	m	45590	$ 25.00	$ 1,139,750.00
SUBTOTAL				**$ 20,700,000.00**
Roadwork				
Earth Excavating and Grading	m	45590	$ 150.00	$ 6,838,500.00
Supply and Place Compacted Granular "A"	m	45590	$ 437.50	$ 19,945,625.00
Asphalt Pavement (105mm)	m	45590	$ 312.50	$ 14,246,875.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	45590	$ 270.00	$ 2,461,860.00
Subdrains (2 lanes)	m	45590	$ 60.00	$ 2,735,400.00
Concrete Curb and Gutter (2 lanes)	m	45590	$ 90.00	$ 4,103,100.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	45590	$ 75.00	$ 3,419,250.00
Driveway Restoration a) Asphalt	m	45590	$ 320.00	$ 14,588,800.00
Topsoil, Hydraulic Seed and Mulch	m	45590	$ 100.00	$ 4,559,000.00
Traffic Control During Construction (Residential)	m	45590	$ 100.00	$ 4,559,000.00
Streetlighting (Residential)	3	45590	$ 225.00	$ 10,257,750.00
Street Trees (In Boulevard / 12m spacing each side)	m	45590	$ 125.00	$ 5,698,750.00
SUBTOTAL				**$ 93,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	91180	$ 75.00	$ 6,838,500.00
Concrete Storm Precast Catchbasins and Leads	m	45590	$ 60.00	$ 2,735,400.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	45590	$ 700.00	$ 31,913,000.00
Sanitary Private Drain Connection	m	45590	$ 150.00	$ 6,838,500.00
Manhole Rain Catchers	m	45590	$ 3.00	$ 136,770.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	45590	$ 600.00	$ 27,354,000.00
Storm Private Drain Connection	m	45590	$ 20.00	$ 911,800.00

SUBTOTAL		**$ 76,800,000.00**
Construction Cost Total		**$ 200,400,000.00**
Construction Cost Contingency (30%)		**$ 60,200,000.00**
Subtotal		**$ 260,600,000.00**
Engineering Fee Estimate (20%)		**$ 52,200,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C23**	**$ 312,800,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

ALBERT ROAD DRAINAGE AREA SEPARATION	STM-C7
Length of Road Improvements (m)	9980 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

ALBERT ROAD DRAINAGE AREA SEPARATION		STM-C7		
DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	9980	$ 5.00	$ 49,900.00
Full Depth Asphalt Removal	m	9980	$ 100.00	$ 998,000.00
Driveway Removal (all types)	m	9980	$ 30.00	$ 299,400.00
Sidewalk Removal (all types)	m	9980	$ 20.00	$ 199,600.00
Sawcutting Existing Pavement	m	9980	$ 1.00	$ 9,980.00
Curb and Gutter Removal	m	9980	$ 20.00	$ 199,600.00
Streetlighting Removal	m	9980	$ 25.00	$ 249,500.00
Signage Removal	m	9980	$ 5.00	$ 49,900.00
SUBTOTAL				**$ 2,100,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	9980	$ 100.00	$ 998,000.00
Remove Existing Sanitary Sewers	m	9980	$ 100.00	$ 998,000.00
Remove Existing Combined Sewers	m	9980	$ 75.00	$ 748,500.00
Remove Existing Manholes	m	9980	$ 15.00	$ 149,700.00
Remove Existing Catch Basins	m	9980	$ 12.50	$ 124,750.00
Remove Existing Combined Private Drain Connection	m	9980	$ 100.00	$ 998,000.00
Remove Existing Storm Private Drain Connection	m	9980	$ 25.00	$ 249,500.00
Remove Existing Sanitary Private Drain Connection	m	9980	$ 25.00	$ 249,500.00
SUBTOTAL				**$ 4,600,000.00**
Roadwork				
Earth Excavating and Grading	m	9980	$ 150.00	$ 1,497,000.00
Supply and Place Compacted Granular "A"	m	9980	$ 437.50	$ 4,366,250.00
Asphalt Pavement (105mm)	m	9980	$ 312.50	$ 3,118,750.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	9980	$ 270.00	$ 538,920.00
Subdrains (2 lanes)	m	9980	$ 60.00	$ 598,800.00
Concrete Curb and Gutter (2 lanes)	m	9980	$ 90.00	$ 898,200.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	9980	$ 75.00	$ 748,500.00
Driveway Restoration a) Asphalt	m	9980	$ 320.00	$ 3,193,600.00
Topsoil, Hydraulic Seed and Mulch	m	9980	$ 100.00	$ 998,000.00
Traffic Control During Construction (Residential)	m	9980	$ 100.00	$ 998,000.00
Streetlighting (Residential)	3	9980	$ 225.00	$ 2,245,500.00
Street Trees (In Boulevard / 12m spacing each side)	m	9980	$ 125.00	$ 1,247,500.00
SUBTOTAL				**$ 20,500,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	19960	$ 75.00	$ 1,497,000.00
Concrete Storm Precast Catchbasins and Leads	m	9980	$ 60.00	$ 598,800.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	9980	$ 700.00	$ 6,986,000.00
Sanitary Private Drain Connection	m	9980	$ 150.00	$ 1,497,000.00
Manhole Rain Catchers	m	9980	$ 3.00	$ 29,940.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	9980	$ 600.00	$ 5,988,000.00
Storm Private Drain Connection	m	9980	$ 20.00	$ 199,600.00

SUBTOTAL		**$ 16,800,000.00**
Construction Cost Total		**$ 44,000,000.00**
Construction Cost Contingency (30%)		**$ 13,200,000.00**
Subtotal		**$ 57,200,000.00**
Engineering Fee Estimate (20%)		**$ 11,500,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C7**	**$ 68,700,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

DUEL MH DRAINAGE AREA SEPARATION	STM-C21
Length of Road Improvements (m)	73000 m
Number of Lanes	2.5
Residential or Arterial/Collector Road	Residential
Road Surface	Asphalt
Future Bike Lanes	No
Existing Street Lights	Yes
Traffic Signals	No

DUEL MH DRAINAGE AREA SEPARATION		STM-C21		
DESCRIPTION	**UNIT**	**EST. QTY.**	**UNIT PRICE**	**AMOUNT**
Roadwork Removals				
Clearing, Grubbing, Stripping of Topsoil and Tree Removal	m	73000	$ 5.00	$ 365,000.00
Full Depth Asphalt Removal	m	73000	$ 100.00	$ 7,300,000.00
Driveway Removal (all types)	m	73000	$ 30.00	$ 2,190,000.00
Sidewalk Removal (all types)	m	73000	$ 20.00	$ 1,460,000.00
Sawcutting Existing Pavement	m	73000	$ 1.00	$ 73,000.00
Curb and Gutter Removal	m	73000	$ 20.00	$ 1,460,000.00
Streetlighting Removal	m	73000	$ 25.00	$ 1,825,000.00
Signage Removal	m	73000	$ 5.00	$ 365,000.00
SUBTOTAL				**$ 15,100,000.00**
Sewer Removals				
Remove Existing Storm Sewers	m	73000	$ 100.00	$ 7,300,000.00
Remove Existing Sanitary Sewers	m	73000	$ 100.00	$ 7,300,000.00
Remove Existing Manholes	m	73000	$ 15.00	$ 1,095,000.00
Remove Existing Catch Basins	m	73000	$ 12.50	$ 912,500.00
Remove Existing Storm Private Drain Connection	m	73000	$ 25.00	$ 1,825,000.00
Remove Existing Sanitary Private Drain Connection	m	73000	$ 25.00	$ 1,825,000.00
SUBTOTAL				**$ 20,300,000.00**
Roadwork				
Earth Excavating and Grading	m	73000	$ 150.00	$ 10,950,000.00
Supply and Place Compacted Granular "A"	m	73000	$ 437.50	$ 31,937,500.00
Asphalt Pavement (105mm)	m	73000	$ 312.50	$ 22,812,500.00
Additional Cost for Bicycle Lanes (2) - Asphalt	m	73000	$ 270.00	$ 3,942,000.00
Subdrains (2 lanes)	m	73000	$ 60.00	$ 4,380,000.00
Concrete Curb and Gutter (2 lanes)	m	73000	$ 90.00	$ 6,570,000.00
Concrete Sidewalk (1.5m wide - Incl. Granular Base and AODA	m	73000	$ 75.00	$ 5,475,000.00
Driveway Restoration a) Asphalt	m	73000	$ 320.00	$ 23,360,000.00
Topsoil, Hydraulic Seed and Mulch	m	73000	$ 100.00	$ 7,300,000.00
Traffic Control During Construction (Residential)	m	73000	$ 100.00	$ 7,300,000.00
Streetlighting (Residential)	3	73000	$ 225.00	$ 16,425,000.00
Street Trees (In Boulevard / 12m spacing each side)	m	73000	$ 125.00	$ 9,125,000.00
SUBTOTAL				**$ 149,600,000.00**
Sewers				
Concrete Manholes - (1200mm to 1800mm)	m	146000	$ 75.00	$ 10,950,000.00
Concrete Storm Precast Catchbasins and Leads	m	73000	$ 60.00	$ 4,380,000.00
Sanitary Sewer - 750mm diameter Concrete (100-D)	m	73000	$ 700.00	$ 51,100,000.00
Sanitary Private Drain Connection	m	73000	$ 150.00	$ 10,950,000.00
Manhole Rain Catchers	m	73000	$ 3.00	$ 219,000.00
Storm Sewer - 750mm diameter Concrete (100-D)	m	73000	$ 600.00	$ 43,800,000.00
Storm Private Drain Connection	m	73000	$ 20.00	$ 1,460,000.00

SUBTOTAL		**$ 122,900,000.00**
Construction Cost Total		**$ 307,900,000.00**
Construction Cost Contingency (30%)		**$ 92,400,000.00**
Subtotal		**$ 400,300,000.00**
Engineering Fee Estimate (20%)		**$ 80,100,000.00**
TOTAL CONSTRUCTION COST ESTIMATE FOR -	**STM-C21**	**$ 480,400,000.00**
April 2020 - Cost Estimate Based on 2020 Construction Pricing		

Windsor Sewer and Coastal Flood Protection Master Plan
Coastal Flood Protection Recommended Solution
Landform Barrier Berm Budgetary Cost Estimates

	AREA 1	AREA 2	AREA 3	TOTALS
TOTAL SECTION 'A' - REMOVALS	$598,900.00	$443,000.00	$180,400.00	
TOTAL SECTION 'B' - SERVICING SEWERS	$746,300.00	$462,000.00	$895,000.00	
TOTAL SECTION 'C' - EARTH WORKS	$830,000.00	$660,600.00	$314,000.00	
TOTAL SECTION 'D' - DRIVEWAYS, PATHWAY & ROADWAY	$392,300.00	$139,250.00	$527,500.00	
CONSTRUCTION COST TOTAL	$2,567,500.00	$1,704,850.00	$1,916,900.00	
ENGINEERING FEES (20%)	$513,500.00	$340,970.00	$383,380.00	
CONSTRUCTION COST CONTINGENCY (30%)	$770,250.00	$511,455.00	$575,070.00	
TOTAL CONSTRUCTION COST ESTIMATE	$3,860,000.00	$2,560,000.00	$2,880,000.00	$9,300,000.00

Notes:
Costs include Engineering (20%) and Construction (30%) contingency.
Costs are based on 2020 construction costs.
Costs do not include applicable taxes.
Costs do not include easement, property acquisition, property appraisal, legal fees, expropriation costs.

Windsor Sewer and Coastal Flood Protection Master Plan
Coastal Flood Protection Recommended Solution
Landform Barrier Berm Budgetary Cost Estimates AREA 1: Villaire Ave. to St. Rose Ave.

NO.	DESCRIPTION	UNIT	QTY.	PRICE	AMOUNT
SECTION 'A' - REMOVALS					
1	DRIVEWAY REMOVALS	m^2	3500	$20.00	$70,000.00
2	STRIPPING/EXCAVATION (FOR CLAY KEY/CORE)	m^3	950	$30.00	$28,500.00
3	ADJUST EXISTING CATCHBASINS	EACH	1	$400.00	$400.00
4	ADJUST EXISTING MANHOLES	EACH	---	$400.00	-
5	PAVEMENT REMOVAL	m^2	---	$20.00	-
6	SAWCUTTING EX. PAVEMENT	l.m.	---	$15.00	-
7	PROPERTY GRADING ALLOWANCE	l.s.	---	---	$100,000.00
8	LANDSCAPE, TREE, FENCE REMOVAL	l.s.	---	---	$200,000.00
9	5790 BUILDING DEMO ALLOWANCE	l.s.	---	---	$200,000.00
TOTAL SECTION 'A' - REMOVALS					$598,900.00
SECTION 'B' - SERVICING SEWERS					
1	STORM SEWER (450mm)	l.m.	590	$400.00	$236,000.00
2	STORM SEWER (525mm)	l.m.	550	$450.00	$247,500.00
3	CATCH BASIN MANHOLES	EACH	9	$3,000	$27,000.00
4	MANHOLES	EACH	3	$7,500	$22,500.00
5	CATCH BASIN (BCB)	EACH	36	$2,000.00	$72,000.00
6	CATCH BASIN LEADS (200mm)	l.m.	50	$225.00	$11,300.00
7	BACKFLOW PREVENTION	EACH	2	$20,000.00	$40,000.00
8	DETROIT RIVER OUTLET	EACH	1	$90,000.00	$90,000.00
TOTAL SECTION 'B' - REMOVALS					$746,300.00
SECTION 'C' - EARTH WORKS AND LANDSCAPING					
1	GRANULAR 'A' FILL (DRIVEWAYS)	tonnes	500	$30.00	$15,000.00
3	CLAY FILL	m^3	495	$35.00	$17,400.00
3	TOPSOIL AND HYDROSEED	m^2	2200	$8.00	$17,600.00
4	LANDSCAPE, TREE, FENCE RESTORATION	EACH	52	$15,000.00	$780,000.00
TOTAL SECTION 'C' - EARTH WORKS AND LANDSCAPING					$830,000.00
SECTION 'D' - DRIVEWAYS, PATHWAY & ROADWAY					
1	ASPHALT (100mm HL4)	m^2	1900	$65.00	$123,500.00
2	CONCRETE (150mm)	m^2	1500	$80.00	$120,000.00
3	STAMPED CONCRETE	m^2	500	$85.00	$42,500.00
4	COLOURED CONCRETE	m^2	150	$85.00	$12,800.00
5	COLOURED STAMPED CONCRETE	m^2	1100	$85.00	$93,500.00
TOTAL SECTION 'D' - DRIVEWAYS, PATHWAY & ROADWAY					$392,300.00

SUBTOTAL	$2,567,500.00

Notes:
Costs do not include Engineering (20%) and Construction (30%) contingency, refer to summary sheet.
Costs are based on 2020 construction costs.
Costs do not include applicable taxes.
Costs do not include easement, property acquisition, property appraisal, legal fees, expropriation costs.
Assume traffic control will be part of the Riverside Vista Phase 2A project.

Windsor Sewer and Coastal Flood Protection Master Plan
Coastal Flood Protection Recommended Solution
Landform Barrier Berm Budgetary Cost Estimates: AREA 2: St. Rose Ave. to Riverdale Ave.

ITEM NO.	DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
SECTION 'A' - REMOVALS					
1	DRIVEWAY REMOVALS	m²	1900	$20.00	$38,000.00
2	STRIPPING/EXCAVATION (FOR CLAY KEY/CORE)	m³	900	$30.00	$27,000.00
3	ADJUST EXISTING CATCHBASINS	EACH	6	$400.00	$2,400.00
4	ADJUST EXISTING MANHOLES	EACH	---	$400.00	-
5	PAVEMENT REMOVAL	m²	---	$20.00	-
6	SAWCUTTING EX. PAVEMENT	l.m.	40	$15.00	$600.00
7	LANDSCAPE, TREE AND FENCE REMOVAL	l.s	---	---	$75,000.00
8	PROPERTY GRADING AND 8057/8085 DEMO ALLOWANCE	l.s	---	---	$300,000.00
TOTAL SECTION 'A' - REMOVALS					$443,000.00
SECTION 'B' - SERVICING SEWERS					
1	STORM SEWER (300mm)	l.m.	350	$300.00	$105,000.00
2	STORM SEWER (450mm)	l.m.	230	$400.00	$92,000.00
3	CATCH BASIN MANHOLE	EACH	11	$3,000	$33,000.00
4	MANHOLE	EACH	2	$7,500	$15,000.00
5	CATCH BASIN (BCB)	EACH	13	$2,000.00	$26,000.00
6	CATCH BASIN LEADS (200mm)	l.m.	31	$225.00	$7,000.00
7	CONNECTION TO EXISTING SEWER	EACH	2	$2,000.00	$4,000.00
8	BACKFLOW PREVENTION	EACH	9	$20,000.00	$180,000.00
TOTAL SECTION 'B' - REMOVALS					$462,000.00
SECTION 'C' - EARTH WORKS AND LANDSCAPING					
1	GRANULAR 'A' FILL (DRIVEWAYS)	tonnes	600	$30.00	$18,000.00
3	CLAY FILL	m³	1320	$35.00	$46,200.00
3	TOPSOIL AND HYDROSEED	m²	3300	$8.00	$26,400.00
4	LANDSCAPE, TREE, FENCE RESTORATION	EACH	18	$15,000.00	$270,000.00
5	INTERSECTION GRADING IMPROVEMENTS	EACH	2	$100,000.00	$200,000.00
6	CONSTRUCTION STAGING AND TRAFFIC CONTROL	LS	1	$100,000.00	$100,000.00
TOTAL SECTION 'C' - EARTH WORKS					$660,600.00
SECTION 'D' - DRIVEWAYS, PATHWAY & ROADWAY					
1	ASPHALT (100mm HL4)	m²	1200	$65.00	$78,000.00
2	CONCRETE (150mm)	m²	500	$80.00	$40,000.00
3	STAMPED CONCRETE	m²	100	$85.00	$8,500.00
4	COLOURED CONCRETE	m²	---	$85.00	-
5	COLOURED STAMPED CONCRETE	m²	150	$85.00	$12,750.00
TOTAL SECTION 'D' - DRIVEWAYS, PATHWAY & ROADWAY					$139,250.00
				SUBTOTAL	$1,704,850.00

Notes:
Costs do not include Engineering (20%) and Construction (30%) contingency, refer to summary sheet.
Costs are based on 2020 construction costs.
Costs do not include applicable taxes.
Costs do not include easement, property acquisition, property appraisal, legal fees, expropriation costs.

Windsor Sewer and Coastal Flood Protection Master Plan
Coastal Flood Protection Recommended Solution
Landform Barrier Berm Budgetary Cost Estimates: AREA 3- Riverdale Ave. to East City Limits

ITEM NO.	DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	AMOUNT
SECTION 'A' - REMOVALS					
1	DRIVEWAY & TRAIL REMOVALS	m²	3500	$20.00	$70,000.00
2	STRIPPING/EXCAVATION (FOR CLAY KEY/CORE)	Allowance	---	$50,000.00	$50,000.00
3	ADJUST EXISTING CATCHBASINS	EACH	8	$400.00	$3,200.00
4	ADJUST EXISTING MANHOLES	EACH	5	$400.00	$2,000.00
5	PAVEMENT REMOVAL	m²	700	$20.00	$14,000.00
6	SAWCUTTING EX. PAVEMENT	l.m.	80	$15.00	$1,200.00
7	LANDSCAPE, TREE AND FENCE REMOVAL	l.s.	---	---	$40,000.00
TOTAL SECTION 'A' - REMOVALS					$180,400.00
SECTION 'B' - SERVICING SEWERS					
1	STORM SEWER (300mm)	l.m.	---	$240.00	-
2	MANHOLES	EACH	6	$7,500	$45,000.00
3	CATCH BASIN (BCB)	EACH	---	$2,000.00	-
4	CATCH BASIN LEADS (200mm)	l.m.	---	$225.00	-
5	BACKFLOW PREVENTION	EACH	34	$25,000.00	$850,000.00
TOTAL SECTION 'B' - REMOVALS					$895,000.00
SECTION 'C' - EARTH WORKS AND LANDSCAPING					
1	GRANULAR 'A' FILL (pathway)	tonnes	1200.00	$30.00	$36,000.00
3	CLAY FILL	Allowance	---	$35.00	$60,000.00
4	TOPSOIL AND HYDROSEED	m²	1000	$8.00	$8,000.00
5	LANDSCAPING, TREE, FENCE RESTORATION	EACH	16	$10,000.00	$160,000.00
6	CONSTRUCTION STAGING AND TRAFFIC CONTROL	LS	1	$50,000.00	$50,000.00
TOTAL SECTION 'C' - EARTH WORKS					$314,000.00
SECTION 'D' - DRIVEWAYS, PATHWAY & ROADWAY					
1	ASPHALT (100mm HL4)	m²	3500.00	$65.00	$227,500.00
2	CONCRETE (150mm)	m²	---	$80.00	-
3	STAMPED CONCRETE	m²	---	$85.00	-
4	COLOURED CONCRETE	m²	---	$85.00	-
5	COLOURED STAMPED CONCRETE	m²	---	$85.00	-
6	INTERSECTION GRADING IMPROVEMENTS	EACH	3.00	$100,000.00	$300,000.00
TOTAL SECTION 'D' - DRIVEWAYS, PATHWAY & ROADWAY					$527,500.00

SUBTOTAL	$1,916,900.00

Notes:
Costs do not include Engineering (20%) and Construction (30%) contingency, refer to summary sheet.
Costs are based on 2020 construction costs.
Costs do not include applicable taxes.
Costs do not include easement, property acquisition, property appraisal, legal fees, expropriation costs.

Appendix F-6

Implementation Plan and Prioritization

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Windsor Sewer and Coastal Flood Protection Master Plan

Basement Flooding Solutions Prioritization (Central/Combined Area) - Ranking Matrix

Ranking Criteria	Methodology	Weighting	Score			Combined System Drainage Area:	Brock	Detroit	Huron Church	Askin
						Recommended Solution Trunk Infrastructure:	Felix Avenue	Detroit Street	Partington Avenue	
			0	5	10	Model Input	STM-C10	STM-C2	STM-C11	STM-C20
Level of Basement Flooding Risk	High priority is assigned to areas that have higher risk of basement flooding based on sewer model analysis. Higher priority will be assigned to areas that have a greater risk due to higher hydraulic Gradeline during a 1:5 year event.	x2	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is lower than 33%.	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is between 33% and 66%.	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is higher than 33%.	# OF NODES ABOVE 1.8 M BELOW GROUND DURING 1:5 YEAR EVENT / TOTAL NODES	18%	41%	50%	10%
						RATING	0	10	10	0
Average Condition of combined sewers	High priority is assigned to solutions that coincide with the sewer life cycle replacement.	x1	Where less than 10% average weighted condition rating is poor.	Where average weighted condition rating is poor for 30%-10%.	Where more than 30% average weighted condition rating is poor.	AVERAGE CONDITION RATING FOR ALL SEGMENTS OF SEWER BEING REPLACED. USE LENGTH TIMES CONDITION RATING DIVIDED BY TOTAL LENGTH.	10%	14%	8%	8%
						RATING	0	5	0	0
Cost Effectiveness	Higher priority will be assigned to solutions that have the least cost per unit of benefit.	x1	Where the costs normalized by improvement to the level of service is greater than $1M.	Where the costs normalized by improvement to the level of service is $0.8M to $1M.	Where the costs normalized by improvement to the level of service is lower than $0.8M.	COST OF PUBLIC INFRASTRUCTURE/(NUMBER OF SANITARY SEWER NODES ABOVE 1.8 M (EXISTING)-NUMBER OF NODES ABOVE 1.8 M (ULTIMATE))	$ 1,153,000	$ 969,000	$ 934,000	$ 2,974,000
						RATING	0	5	5	0
						TOTAL RATING	0	20	15	0
Drainage Area Solution Priority			Score							
			Low	Medium	High					
Priority	Drainage areas with higher rating scores will be assigned higher priority.		Score <15	Score 16-29	Score >30	Priority Level	Low	Medium	Low	Low

Assumptions:

Costs effectiveness considers the capital construction costs to implement the recommended solutions within each respective drainage area. Costs exclude source control, private property measures and/or operation

Conditions rating are based on available information provided by the City of Windsor.

The Prince Road drainage area separation and storm sewer outlet at Chappelle Ave. (STM-C1) was not included in this matrix. The sewer outlet construciton is an immeidate project and the associated drainage areas

Windsor Sewer and Coastal Flood Protection Master Plan

Basement Flooding Solutions Prioritization (Central/Combined Area) - Ranking Matrix

Ranking Criteria	Methodology	Weighting	Score			Combined System Drainage Area:	Cameron	Wellington	Church	McDougall
						Recommended Solution Trunk Infrastructure:	Cameron Street	Tecumseh Road	Bruce Avenue	
			0	5	10	Model Input	STM-C3	STM-C14	STM-C4	STM-C22
Level of Basement Flooding Risk	High priority is assigned to areas that have higher risk of basement flooding based on sewer model analysis. Higher priority will be assigned to areas that have a greater risk due to higher hydraulic Gradeline during a 1:5 year event.	x2	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is lower than 33%.	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is between 33% and 66%.	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is higher than 33%.	# OF NODES ABOVE 1.8 M BELOW GROUND DURING 1:5 YEAR EVENT / TOTAL NODES	92%	75%	57%	55%
						RATING	20	20	10	10
Average Condition of combined sewers	High priority is assigned to solutions that coincide with the sewer life cycle replacement.	x1	Where less than 10% average weighted condition rating is poor.	Where average weighted condition rating is poor for 30%-10%.	Where more than 30% average weighted condition rating is poor.	AVERAGE CONDITION RATING FOR ALL SEGMENTS OF SEWER BEING REPLACED. USE LENGTH TIMES CONDITION RATING DIVIDED BY TOTAL LENGTH.	10%	7%	18%	14%
						RATING	5	0	5	5
Cost Effectiveness	Higher priority will be assigned to solutions that have the least cost per unit of benefit.	x1	Where the costs normalized by improvement to the level of service is greater than $1M.	Where the costs normalized by improvement to the level of service is $0.8M to $1M.	Where the costs normalized by improvement to the level of service is lower than $0.8M.	COST OF PUBLIC INFRASTRUCTURE/(NUMBER OF SANITARY SEWER NODES ABOVE 1.8 M (EXISTING)-NUMBER OF NODES ABOVE 1.8 M (ULTIMATE))	$ 775,000	$ 1,070,000	$ 971,000	$ 699,000
						RATING	10	0	5	10
						TOTAL RATING	35	20	20	25
Drainage Area Solution Priority			Score							
			Low	Medium	High					
Priority	Drainage areas with higher rating scores will be assigned higher priority.		Score <15	Score 16-29	Score >30	Priority Level	High	Medium	Medium	Medium

Assumptions:

Costs effectiveness considers the capital construction costs to implement the recommended solutions within each respective drainage area. Cos and maintenance costs.

Conditions rating are based on available information provided by the City of Windsor.

The Prince Road drainage area separation and storm sewer outlet at Chappelle Ave. (STM-C1) was not included in this matrix. The sewer outlet has been separated.

Windsor Sewer and Coastal Flood Protection Master Plan

Basement Flooding Solutions Prioritization (Central/Combined Area) - Ranking Matrix

Ranking Criteria	Methodology	Weighting	Score			Combined System Drainage Area:	Parent	Lincoln	Albert	Dual MH Area, East of Albert
						Recommended Solution Trunk Infrastructure:	Parent Avenue		Albert Street	
			0	5	10	Model Input	STM-C5	STM-C23	STM-C7	STM-C21
Level of Basement Flooding Risk	High priority is assigned to areas that have higher risk of basement flooding based on sewer model analysis. Higher priority will be assigned to areas that have a greater risk due to higher hydraulic Gradeline during a 1:5 year event.	x2	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is lower than 33%.	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is between 33% and 66%.	Where the percent of nodes not meeting the Level of Service during a more frequent, 1:5 yea storm, is higher than 33%.	# OF NODES ABOVE 1.8 M BELOW GROUND DURING 1:5 YEAR EVENT / TOTAL NODES	45%	54%	37%	28%
						RATING	10	10	10	0
Average Condition of combined sewers	High priority is assigned to solutions that coincide with the sewer life cycle replacement.	x1	Where less than 10% average weighted condition rating is poor.	Where average weighted condition rating is poor for 30%-10%.	Where more than 30% average weighted condition rating is poor.	AVERAGE CONDITION RATING FOR ALL SEGMENTS OF SEWER BEING REPLACED. USE LENGTH TIMES CONDITION RATING DIVIDED BY TOTAL LENGTH.	14%	13%	4%	7%
						RATING	5	5	0	0
Cost Effectiveness	Higher priority will be assigned to solutions that have the least cost per unit of benefit.	x1	Where the costs normalized by improvement to the level of service is greater than $1M.	Where the costs normalized by improvement to the level of service is $0.8M to $1M.	Where the costs normalized by improvement to the level of service is lower than $0.8M.	COST OF PUBLIC INFRASTRUCTURE/(NUMBER OF SANITARY SEWER NODES ABOVE 1.8 M (EXISTING)-NUMBER OF NODES ABOVE 1.8 M (ULTIMATE))	$ 707,000	$ 608,000	$ 1,126,000	$ 949,000
						RATING	10	10	0	5
						TOTAL RATING	25	25	10	5
Drainage Area Solution Priority			Score							
			Low	Medium	High					
Priority	Drainage areas with higher rating scores will be assigned higher priority.		Score <15	Score 16-29	Score >30	Priority Level	Medium	Medium	Low	Low

Assumptions:

Costs effectiveness considers the capital construction costs to implement the recommended solutions within each respective drainage area. Cos

Conditions rating are based on available information provided by the City of Windsor.

The Prince Road drainage area separation and storm sewer outlet at Chappelle Ave. (STM-C1) was not included in this matrix. The sewer outlet

Windsor Sewer and Coastal Flood Protection Master Plan
Basement Flood Solution Prioritization (Separated South and East Windsor Areas) -Ranking Matrix

Ranking Criteria	Methodology	Weighting	Score			Model Input	SAN-S-1	SAN-E-2				
			0	5	10		South Windsor LRWRP Area 1	LRPCP Drainage Area 1 (Martinique Inlet)	LRPCP Drainage Area 2 (Wyandotte Inlet)	LRPCP Drainage Area 3 (Jerome Inlet)	LRPCP Drainage Area 4 (Edgar Inlet)	LRPCP Drainage Area 5 (East/South Inlet via Aspenshore and Beverly Glen)
Level of Basement Flooding Risk	High priority is assigned to areas that have higher risk of basement flooding based on sewer model analysis.	x2	Where the % of basement flood risk is lower that 10% for a 1:5 year storm event.	Where the % of basement flood risk is between 10% and 20% for a 1:5 year storm event.	Where the % of basement flood risk is greater than 20 % for a 1:5 year storm event.	# OF NODES ABOVE 1.8 M BELOW GROUND DURING / TOTAL NODES (1:5 YEAR EVENT)	5%	20%	8%	0%	14%	7%
						RATING	0	20	0	0	10	10
Average Condition of Sanitary Sewers	High priority is assigned to solutions that coincide with the sewer life cycle replacement.	x1	Where less than 10% average weighted condition rating is poor.	Where average weighted condition rating is poor for 30%-10%.	Where more than 30% average weighted condition rating is poor.	AVERAGE WEIGHTED CONDITION RATING FOR ALL SEGMENTS OF SEWER BEING REPLACED. LENGTH TIMES CONDITION RATING DIVIDED BY TOTAL LENGTH.	30.0%	10% poor structural condition *	38% poor structural condition *	30% poor structural condition *	6% poor structural condition *	N/A
						RATING	10	5	10	10	0	0
Reduction of wet weather flow to Treatment Plant.	Priority is given to those solutions that reduce the volume and frequency of Combined Sewer Overflows (CSOs)	x2	Where the existing sewer system is fully separated.	Where the existing sewer system is partially separated.	Where the existing sewer system is minimally separated.	Separated, Partially Separated, Combined	Separated	Separated	Separated	Separated	Partially Separated	Separated
						RATING	0	0	0	0	10	0
Cost Effectiveness	Higher priority is assigned to solutions that have lower cost per unit of flood reduction.	x1	Where the costs normalized by improvement to the level of service is greater than $2M.	Where the costs normalized by improvement to the level of service is $1M to $2M.	Where the costs normalized by improvement to the level of service is lower than $1M.	COST OF PUBLIC INFRASTRUCTURE/(NUMBER OF SANITARY SEWER NODES ABOVE 1.8 M (EXISTING)-NUMBER OF NODES ABOVE 1.8 M (ULTIMATE))	$544,000.00	$757,000.00	$797,000.00	$1,032,000.00	$2,329,000.00	$5,107,000.00
						RATING	10	10	10	5	0	0
						TOTAL RATING	20	35	20	15	20	10
Drainage Area Solution Priority			Priority									
			Low	Medium	High							
Priority	Drainage areas with higher rating scores will be assigned higher priority.		Score <15	Score 16-29	Score >30	Priority Level:	Medium	High	Medium	Low	Medium	Low

Assumptions:
Costs effectiveness considers the capital construction costs to implement the recommended solutions within each respective drainage area. Costs exclude source control, private property measures and/or operation and maintenance costs.
Conditions rating are based on available information provided by the City of Windsor.

Windsor Sewer Master Plan - Implementation Plan - Priority Ranking Scoring Matrix
Storm System Ranking - Regional Problem Area Surface Flooding Prioritization

Ranking Criteria	Methodology	Weighting	Score				**STM-E1-2**	STM-E3-2	STM-E5-1	STM-E6-2	STM-S7-3	STM-S8-2
			0	5	10	Model Input	Storm Problem Areas 1 and 2 (Riverside)	Storm Problem Area 3/4 (Fountainebleu and Lauzon)	Storm Problem Area 5 (Blue Heron Pond)	Storm Problem Area 6 (Pontiac and East Marsh Drainage Area)	Storm Problem Area 7 Central/Pillette/ Grand Marais	Storm Problem Area 8 Southwood Lakes
Extent of Flooding	Higher priority will be assigned to	x2	Lowest amount of road flooding/gross regional area. (Lower than 33)		Highest percentage of road flooding/gross regional area. (Higher than 33)	Total Area of red 1:100 year flooding being removed (i.e. existing model area - proposed area)/total area unit (m^2/ha)	68	22	7	11	47	36
						RATING	20	0	0	0	10	10
Presence of Combined Sewer Sy	Higher priority will be assigned to areas that has combined sewers. This is in keeping with the overall strategy to provide an enhanced sewer separation program throughout the City.	x2	Where the sewer system is full separated.	Where the sewer system is partially separated.	Where the sewer system is full combined.	Input "Yes or No"	NO	YES	NO	NO	No	No
						RATING	0	10	0	0	0	0
Average condition of sewers	High priority is assigned to	x1	Where less than 10%	Where average	Where more than 30%	AVERAGE CONDITION	7%	95%	0%	4%	24%	0%
						RATING	0	10	0	0	5	0
Cost Effectiveness	Higher priority is assigned to solutions that have lower cost per flood reduction.	x1	Where the costs normalized by reduction in surface flooding is greater than $10,000.	Where the costs normalized by reduction in surface flooding is between $5000-$10,000	Where the costs normalized by reduction in surface flooding is less than $5000.	COST OF PUBLIC INFRASTRUCTURE/ (Total Area of red nodes being removed (i.e. existing model area - proposed area)). USE 1:100 YEAR STORM	$3,000.00	$11,000.00	$11,000.00	$7,000.00	$14,000.00	$1,720.00
						RATING	10	0	0	5	0	10
						TOTAL RATING	30	20	0	5	15	20
Drainage Area Solution Priority			Score									
			Low	Medium	High							
Priority	Drainage areas with higher rating scores will be assigned higher priority.	N/A	Score <15	Score 16-29	Score >30	Priority Level	HIGH	MEDIUM	LOW	LOW	LOW	MEDIUM

Assumptions:

Costs effectiveness considers the capital construction costs to implement the recommended solutions within each respective drainage area. Costs exclude source control, private property measures and/or operation and maintenance costs.

Conditions rating are based on available information provided by the City of Windsor.

Windsor Sewer and Coastal Flood Protection Master Plan - Implementation Plan - Priority Ranking Scoring Matrix
Storm System Ranking - Road Surface Flooding Solutions Prioritization

Ranking Criteria	Methodology	Weighting	Score			Model Input	ROAD-S1-1	ROAD-S2-2	ROAD-S3-2	ROAD-E2	ROAD-E3	ROAD-E4-3	ROAD-E5	ROAD-E6-3	ROAD-E7	ROAD-E8	ROAD-E9-2
			0	5	10		Dougall Parkway and Eugenie Street East	Howard Ave.	Chrysler Centre	Jefferson Blvd.	Jefferson Blvd. and South National	Lauzon Parkway	Lauzon Road	Mc Hugh, East of Lauzon	Mc Hugh, West of Banwell	Mc Norton, East of Banwell	Wyandotte St. East at Watson
Access to Vulnerable Area	High priority is assigned to solutions that address surface flooding along roadways that are immediately adjacent to vulnerable land use sites, where alternative access routes are not available. Refer to Vulnerable Area map for critical areas. (Hospitals, Long Term Care Centres, Emergency Shelters)	x2	Road flooding segment does limit access/egress to a vulnerable land use site.	Road flooding segment partially limits access/egress to vulnerable land use site.	Road flooding segment limits immediate access/egress to vulnerable land use site.	Yes/No	No	No	No	No		No	No	No	No	No	No
						RATING	0	0	0	0		0	0	0	0	0	0
Roadway Classification	High priority is assigned to solutions that address surface flooding along major arterial roadways that provide critical connections within the City's road network. Locations that provide below grade crossing points at the CPR Rail or EC ROW expressway. Minimal locations to cross the Rail and expressway exist therefore roadways that provide this connection are critical to providing emergency access to local hospitals for emergency responders.	x2	Collector Roadways	Arterial Roadways that do not provide critical north/south connections at railways or ECRow Expressway.	Arterial Roadways that provide critical north/south connections at railways or the EC Row Expressway.	Critical Arterial/ Arterial/Collector	Critical Arterial	Critical Arterial	Collector	Arterial		Arterial	Arterial	Arterial	Arterial	Arterial	Arterial
						RATING	20	20	0	10		10	10	10	10	10	10
Extent of Surface Flooding	Higher priority is assigned to areas where greater length of road flooding is anticipated.	x1	Length of flooding is less than 100 meters in length along the Centreline of the Roadway.	Length of flooding is between 100-200 meters in length along the Centreline of the Roadway.	Length of flooding is greater than 200 meters in length along the Centreline of the Roadway.	Length of Surface Flooding Refer to road flooding matrix.	330 meters	140 meters	110 meters	131 meters	Refer to STM-E3	300 meters	110 meters	150 meters	70 meters	110 meters	98 meter
						RATING	10	5	5	5		10	5	5	0	10	0
Average condition of sewers	High priority is assigned to solutions that coinside with the sewer life cycle replacement.	x1	Where <33% average weighted condition rating is poor.	Where average weighted condition rating of poor accounts for 33-66% of sewers.	Where >66% average weighted condition rating is poor.	AVERAGE CONDITION RATING FOR ALL SEGMENTS OF SEWER BEING REPLACED. USE LENGTH TIMES CONDITION RATING DIVIDED BY TOTAL LENGTH.	0%	45%	62%	0%		7%	3%	0%	0%	0%	0%
						RATING	0	5	5	0		0	0	0	0	0	0
Cost Effectiveness	Higher priority is assigned to solutions that have lower cost per meter of flood reduction.	x1	Where the costs normalized by length of excess road flooding is greater than $200,000/length of road flooding.	Where the costs normalized by length of excess road flooding is between $100,000-$200,000/length of road flooding.	Where the costs normalized by length of excess road flooding is less than $100,000/length of road flooding.	COST OF PUBLIC INFRASTRUCTURE/LENGTH OF SURFACE FLOODING	$102,000.00	$71,000.00	$278,000.00	$116,000.00		$112,000.00	$302,000.00	$52,000.00	$223,000.00	$68,000.00	$220,000.00
						RATING	5	10	0	5		5	0	10	0	10	0
						TOTAL RATING	35	40	10	20		25	15	25	10	30	10
Drainage Area Solution Priority			Score														
			Low	Medium	High												
Priority	Drainage areas with higher rating scores will be assigned higher priority.		Score <15	Score 16-29	Score >30	Priority Level	High	High	Low	Medium		Medium	Medium	Medium	Low	Medium	Low

Assumptions:
Costs effectiveness considers the capital construction costs to implement the recommended solutions within each respective drainage area. Costs exclude source control, private property measures and/or operation and maintenance costs.
Conditions rating are based on available information provided by the City of Windsor.
"Separated Conditions Flooding" term denotes that those areas highlighted are anticipated to have surface flooding only after full sewer separation of the drainage area is completed. These projects are therefore asssigned a low priority because under existing conditions these areas meet the surface flood mitigation level of service.

Windsor Sewer and Coastal Flood Protection Master Plan - Implementation Plan - Priority Ranking Scoring Matrix
Storm System Ranking - Road Surface Flooding Solutions Prioritization

Ranking Criteria	Methodology	Weighting	Score			Model Input	ROAD-E11	ROAD-E10	STM-C6-1 & 2	STM-C8	STM-C9	STM-C12	STM-C13	STM-C14	STM-C15	STM-C17	STM-C18	STM-C19	STM-C16
			0	5	10		Roseville School	Banwell Ave.	Ypres Avenue	Drouillard Road	College Avenue	Patricia Road	Huron Church Road	Tecumseh Road West	Giles Boulevard	Lincoln Road	Ontario Street	Walker Road	Parent Ave.
Access to Vulnerable Area	High priority is assigned to solutions that address surface flooding along roadways that are immediately adjacent to vulnerable land use sites, where alternative access routes are not available. Refer to Vulnerable Area map for critical areas. (Hospitals, Long Term Care Centres, Emergency Shelters)	x2	Road flooding segment does limit access/egress to a vulnerable land use site.	Road flooding segment partially limits access/egress to vulnerable land use site.	Road flooding segment limits immediate access/egress to vulnerable land use site.	Yes/No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
						RATING	10	0	0	0	0	0	0	0	0	0	0	0	0
Roadway Classification	High priority is assigned to solutions that address surface flooding along major arterial roadways that provide critical connections within the City's road network. Locations that provide below grade crossing points at the CPR Rail or EC ROW expressway. Minimal locations to cross the Rail and expressway exist therefore roadways that provide this connection are critical to providing emergency access to local hospitals for emergency responders.	x2	Collector Roadways	Arterial Roadways that do not provide critical north/south connections at railways or ECRow Expressway.	Arterial Roadways that provide critical north/south connections at railways or the EC Row Expressway.	Critical Arterial/ Arterial/Collector	Collector	Arterial	Collector	Collector	Collector	Arterial	Arterial	Critical Arterial	Arterial	Collector	Collector	Collector	Collector
						RATING	0	10	0	0	0	10	10	20	10	0	0	0	0
Extent of Surface Flooding	Higher priority is assigned to areas where greater length of road flooding is anticipated.	x1	Length of flooding is less than 100 meters in length along the Centreline of the Roadway.	Length of flooding is between 100-200 meters in length along the Centreline of the Roadway.	Length of flooding is greater than 200 meters in length along the Centreline of the Roadway.	Length of Surface Flooding Refer to road flooding matrix.	527 meters	71 meters	110 meters	45 meters	Separated Conditions Flooding	Separated Conditions Flooding	50 meters	170 meters	770 meters	Separated Conditions Flooding	Separated Conditions Flooding	Separated Conditions Flooding	110 meters
						RATING	10	0	5	0	LOW PRIORITY	LOW PRIORITY	0	5	10	LOW PRIORITY	LOW PRIORITY	LOW PRIORITY	5
Average condition of sewers	High priority is assigned to solutions that coinside with the sewer life cycle replacement.	x1	Where <33% average weighted condition rating is poor.	Where average weighted condition rating of poor accounts for 33-66% of sewers.	Where >66% average weighted condition rating is poor.	AVERAGE CONDITION RATING FOR ALL SEGMENTS OF SEWER BEING REPLACED. USE LENGTH TIMES CONDITION RATING DIVIDED BY TOTAL LENGTH.	0%	0%	0%	63%	0%	10%	0%	52%	9%	95%	0%	0%	5%
						RATING	0	0	0	5	0	0	0	5	0	10	0	0	0
Cost Effectiveness	Higher priority is assigned to solutions that have lower cost per meter of flood reduction.	x1	Where the costs normalized by length of excess road flooding is greater than $200,000/length of road flooding.	Where the costs normalized by length of excess road flooding is between $100,000-$200,000/length of road flooding.	Where the costs normalized by length of excess road flooding is less than $100,000/length of road flooding.	COST OF PUBLIC INFRASTRUCTURE/LENGTH OF SURFACE FLOODING	$107,000.00	$85,000.00	$46,000.00	$122,000.00	N/A	N/A	$36,000.00	$38,000.00	$62,000.00	N/A	N/A	N/A	$49,000.00
						RATING	5	10	10	5	0	0	10	10	10	0	0	0	10
						TOTAL RATING	25	20	15	10	LOW PRIORITY	LOW PRIORITY	20	40	30	LOW PRIORITY	LOW PRIORITY	LOW PRIORITY	15
Drainage Area Solution Priority			Score																
			Low	Medium	High														
Priority	Drainage areas with higher rating scores will be assigned higher priority.		Score <15	Score 16-29	Score >30	Priority Level	Medium	Medium	Medium	Low	Low	Low	Medium	High	Medium	Low	Low	Low	Medium

Assumptions:
Costs effectiveness considers the capital construction costs to implement the recommended solutions within each respective drainage area. Costs exclude source control, priva
Conditions rating are based on available information provided by the City of Windsor.
"Separated Conditions Flooding" term denotes that those areas highlighted are anticipated to have surface flooding only after full sewer separation of the drainage area is com

City of Windsor Sewer and Coastal Flood Protection Master Plan:
Implementation Plan - Project Prioritization List
Immediate Project List

Immediate Public Infrastructure Source Control Solutions				
Project	Construction Timeline	Project Type/Source of Funding	System	Comments
Rain Catcher Installation - First Priority (1500 manholes)	2020	City Capital Works	Sanitary System	The remaining rain catchers shall be installed during identified road/sewer construction works, regular sewer maintenance and other regular annual program.
Monitoring Program for LID, Downspout and Foundation Drain Disconnection	2020-2021	City Capital Works	Storm/Sanitary	
Pilot Projects - Downspout Disconnection, Foundation Drain Disconnection, and LID Measures	Ongoing	City Capital Works	Storm System	Pilot projects and monitoring to measure benefit of LIDs will be incorporated into the projects listed below that are being completed as part of the DMAF solutions.
Immediate Infrastructure Projects				
Project	Construction Timeline	Project Type	System	Comments
Tranby Park Stormwater Improvements	Underway	DMAF-1	Storm System	
Matthew Brady Phase 2	2019	DMAF-1	Storm System	
Belle Isle View Phase 1	2019	DMAF-1	Storm System	
Belle Isle View Phase 2	2020	DMAF-1	Storm System	
Eastlawn Ave.	2021	DMAF-1	Storm System	
East Marsh Pump Station Drainage Area - Menard, John M, Florence Reconstruction	2021	DMAF-1	Storm System	
Riverside Drive - Vista Phase 2A				
Storm Trunk Sewer Improvements	2022	DMAF-2	Storm System	
Sanitary Trunk Sewer Improvements	2022	DMAF-2	Sanitary System	
Landform Barrier - Area 1	2022	DMAF-2	Coastal Flooding	
Matthew Brady Phase 3 Reconstruction	2022	DMAF-1	Storm System	
East Marsh Pump Station Drainage Area - Clover Reconstruction	2022	DMAF-1	Storm System	
East Marsh Pump Station Drainage Area - Elinor and Clairview Reconstruction	2023	DMAF-1	Storm System	
St. Rose Ave. Pump Station Improvements	2022	DMAF-2	Storm System	Timing to be confirmed based on available funding.
St. Rose Ave. storm and sanitary trunk storm sewers, between Riverside Drive and Wyandotte Street East.	TBD	DMAF-2	Storm/Sanitary System	
Little River Pollution Control Plant Overflow Improvements	2023	DMAF-1	Sanitary System	
St. Paul Pump Station Improvements	2024	DMAF-1	Storm System	
Cedarview Sewer Improvements	2024	DMAF-1	Storm System	
Brumpton Park Improvements	2027	DMAF-1	Storm System	
Ford Pump Station Improvements	2027	DMAF-2	Storm System	Timing to be confirmed based on available funding.
Belleperche Storm Trunk Sewer	2023-2025	DMAF-1	Storm System	
East Marsh Pump Station Upgrades	2025	DMAF-1	Storm System	

Lauzon Road Reconstruction	TBD	City Capital Works	Storm System	City to provide approximate timing. The City shall identify any other road reconstruction projects that may also overlap with recommended solutions.
Prince Rd. Storm Relief System - Chappell Ave. - West of Sandwich St. to McKee Creek (Detroit River Outlet)	TBD	City Capital Works	Combined System	This project has been identified as a Schedule C project and therefore will require additional consultation and field assessments prior to construction.
Dorchester Rd. - Prince Rd. to Huron Church Rd. Sewer Separation Improvements.	2024	City Capital Works	Combined System	Note: Projects listed on the City's sewer priority list that are not included in the current City Capital Work's Budget were excluded in this list and will be included in the High, Medium or Low categories.
Totten St. - Betts Ave. to East of Partington Road Sewer Separation Improvements	2026+	City Capital Works	Combined System	
Felix/Marlborough Sewer Separation Improvements	2025	City Capital Works	Combined System	
Ellis St. and Giles Blvd. - McDougall Ave. to Howard Ave. Sewer Separation Improvements	2026+	City Capital Works	Combined System	

City of Windsor Sewer and Coastal Flood Protection Master Plan:
Implementation Plan - Project Prioritization List
Central Area- Combined System Separation

High Priority - Long-Term Solutions						
	Drainage Area	Project Code	Project	Estimated Cost for Trunk Storm Sewers	Estimated Cost for Enhanced Sewer Separation of the Entire Drainage Area	Comments
1	Cameron	STM-C3	Cameron Street Sewer and Drainage Area Enhanced Sewer Separation	$ 46,100,000	$ 98,900,000	Includes project components that are not already on the "Immediate Priority" list.
Medium Priority - Long-Term Solutions						
	Drainage Area	Project Code	Project	Estimated Cost for Trunk Storm Sewers	Estimated Cost for Enhanced Sewer Separation of the Entire Drainage Area	Comments
2	Wellington	STM-C14	Tecumseh Road Storm Turnk Sewer and Drainage Area Enhanced Sewer Separation	N/A	$ 85,300,000	
	McDougall	STM-C22	Drainage Area Enhanced Sewer Separation	N/A	$ 82,600,000	
	Parent	STM-C5	Marentette Avenue Storm Trunk Sewer and Drainage Area Enhanced Sewer Separation	$ 10,400,000	$ 414,200,000	
	Lincoln	STM-C23	Lincoln Avenue Storm Trunk Sewer and Drainage Area Enhanced Sewer Separation	N/A	$ 296,900,000	
3	Church	STM-C4	Bruce Avenue Storm Trunk Sewer and Drainage Area Enhanced Sewer Separation	$ 34,200,000	$ 311,600,000	
	Detroit	STM-C2	Detroit Street Storm Trunk Sewer and Drainage Area Enhanced Sewer Separation	$ 2,100,000	$ 72,500,000	
Low Priority - Long-Term Solutions						
	Drainage Area	Project Code	Project	Estimated Cost for Trunk Storm Sewers	Estimated Cost for Enhanced Sewer Separation of the Entire Drainage Area	Comments
4	Huron Church	STM-C11	Partington Avenue Storm Trunk Sewer and Drainage Area Enhanced Sewer Separation	$ 12,700,000	$ 179,800,000	
5	Albert	STM-C7	Albert Street Storm Trunk Sewer and Drainage Area Enhanced Sewer Separation	$ 5,200,000	$ 63,500,000	
6	Dual MH Area, East of Albert	N/A	Drainage Area Enhanced Sewer Separation	N/A	$ 480,400,000	
	Askin	N/A	Drainage Area Enhanced Sewer Separation	N/A	$ 68,700,000	
	Brock	STM-C10	Felix Storm Trunk Sewer and Drainage Area Enhanced Sewer Separation	$ 23,500,000	$ 260,100,000	
7	Prince Road	STM-C1	Prince Road Drainage Area Enhanced Sewer Separation	$ 3,200,000	$ 137,000,000	Chappelle Ave. Outlet is a immediate project.

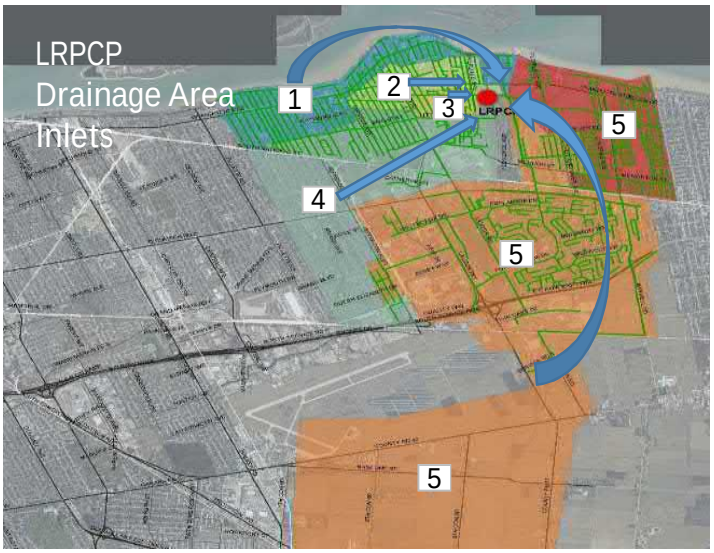
Note:
This priority list does not include the planned Retention Treatment Basin planned at the Lou Romano Water Reclamation Plant.

City of Windsor Sewer and Coastal Flood Protection Master Plan:
Implementation Plan - Project Prioritization List

Basement Flood Reduction Projects

High Priority - Long-Term Solutions					
Priority Group	Project Code	Project	Area	Estimated Project Cost	Comments
1	SAN-E-2	LRPCP Drainage Area 1 (Martinique Inlet)	East	$ 50,100,000	Costs include sanitary sewers included in DMAF 3 Funding Application along Riverside Drive and Wyandotte St. E.
2	SAN-E-3	LRPCP Bypass Improvements	East	$ 5,100,000	
Medium Priority - Long-Term Solutions					
		Project	Area	Cost	Comments
3	SAN-S-1	South Windsor LRWRP Area 1	South	$ 30,100,000	
	SAN-E-2	LRPCP Drainage Area 2 (Wyandotte Inlet)	East	$ 45,800,000	
	SAN-E-2	LRPCP Drainage Area 4 (Edgar Inlet)	East	$ 126,000,000	
Low Priority - Long-Term Solutions					
		Project	Area	Cost	Comments
4	SAN-E-2	LRPCP Drainage Area 3 (Jerome Inlet)	East	$ 42,300,000	
5	SAN-E-2	LRPCP Drainage Area 5 (East/South Inlet via Aspenshore and Beverly Glen)	East	$ 195,100,000	

Note:
This priority project list does not include expansion of the Little River Pollution Control Plant. Timing related to the plant expansion is dependent on population growth within the associated drainage area.



City of Windsor Sewer and Coastal Flood Protection Master Plan:
Implementation Plan - Project Prioritization List

Major Roadway Flood Reduction Projects

High Priority - Long-Term Solutions					
Priority Group	Project Code	Project	Area	Estimated Project Costs	Comments
1	ROAD-S1-1	Dougall Parkway and Eugenie Street East	South	$ 33,600,000.00	
	ROAD-S2-2	Howard Ave.	South	$ 9,900,000.00	
	STM-C14	Tecumseh Road West	Central	$ 6,500,000.00	
Medium Priority - Long-Term Solutions					
Priority Group	Project Code	Project	Area	Estimated Project Costs	Comments
2	ROAD-E8	Mc Norton, East of Banwell	East	$ 7,500,000.00	
	ROAD-E11	Roseville School	East	$ 56,600,000.00	
	STM-C15	Giles Boulevard	Central	$ 48,000,000.00	
3	ROAD-E6-3	Mc Hugh, East of Lauzon	East	$ 7,800,000.00	
	ROAD-E2	Jefferson Blvd.	East	$ 15,200,000.00	
	ROAD-E3	Jefferson Blvd. and South National	East	Costs included in STM-E3 Project within the Regional Problem Area table.	
	ROAD-E4-3	Lauzon Parkway	East	$ 33,700,000.00	
	ROAD-E10	Banwell Ave.	East	$ 6,000,000.00	
	STM-C13	Huron Church Road	Central	$ 1,800,000.00	
4	STM-C16	Parent Ave.	Central	$ 5,400,000.00	
	ROAD-E5	Lauzon Road	East	$ 33,200,000.00	
	STM-C6-1	Ypres Avenue	Central	$ 5,100,000.00	
Low Priority - Long-Term Solutions					
Priority Group	Project Code	Project	Area	Estimated Project Costs	Comments
5	ROAD-S3-2	Chrysler Centre	South	$ 30,600,000.00	
	ROAD-E7	Mc Hugh, West of Banwell	East	$ 15,600,000.00	
	ROAD-E9-2	Wyandotte St. East at Watson	East	$ 21,600,000.00	
	STM-C8	Drouillard Road	Central	$ 5,500,000.00	
6	STM-C9	College Avenue	Central	$ 2,300,000.00	
	STM-C12	Patricia Road	Central	$ 7,000,000.00	
	STM-C17	Lincoln Road	Central	$ 5,400,000.00	
	STM-C18	Ontario Street	Central	$ 4,200,000.00	
	STM-C19	Walker Road	Central	$ 6,300,000.00	

Note: Cost and implementation of municipal ROW LID Measures shall be evaluated and applied on a project by project bases and therefore are not included in the Estimated Project Costs.

City of Windsor Sewer and Coastal Flood Protection Master Plan:
Implementation Plan - Project Prioritization List

Regional Area Surface Flood Reduction Projects

High Priority - Long-Term Solutions					
Priority Group	Project Code	Project	Area	Cost	Comments
1	STM-E1-2	Storm Problem Areas 1 and 2 (Riverside)	East	$ 83,500,000.00	Costs are or project components that are not already on the "Immediate Project" List.
Medium Priority - Long-Term Solutions					
Priority Group	Project Code	Project	Area	Cost	Comments
2	STM-E3-2	Storm Problem Area 3/4 (Fountainebleu and Lauzon)	East	$ 82,900,000.00	
3	STM-S8-2	Storm Problem Area 8 Southwood Lakes	South	$ 12,300,000	
Low Priority - Long-Term Solutions					
Priority Group	Project Code	Project	Area	Cost	Comments
4	STM-S7-3	Storm Problem Area 7 Central/Pillette/ Grand Marais	South	$ 66,300,000	
5	STM-E5-1	Storm Problem Area 5 (Blue Heron Pond)	East	$ 10,800,000	
6	STM-E6-2	Storm Problem Area 6 (Pontiac and East Marsh Drainage Area)	East	$ 27,000,000	Costs are for project components that are not already on the "Immediate Priority" list.

City of Windsor Sewer and Coastal Flood Protection Master Plan:
Implementation Plan - Project Prioritization List

Coastal Flood Protection

High Priority - Long-Term Solutions					
Priority Group	Project Code	Project	Construction Timeline	Estimated Costs for Enhanced Sewer Sepearation of the Entire Drainage Area	Comments
1	Area 1	BERM-1	Riverside Drive (Ford Blvd. St. Rose Ave.)	$ 3,860,000.00	This is an immeidate project.
2	Area 2	BERM-2	Riverside Drive (St. Rose Ave. to Riverdale Ave.)	$ 2,560,000.00	
	Area 3	BERM-3	Riverside Drive (Riverdale Ave. to East City Limits)	$ 2,880,000.00	

Appendix F-7

Geotechnical Desktop Review

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REPORT

Geotechnical Review of Selected Sites

City of Windsor Sewer Master Plan, Windsor, Ontario

Submitted to:

Ms. Laura Herlehy, P.Eng.
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Submitted by:

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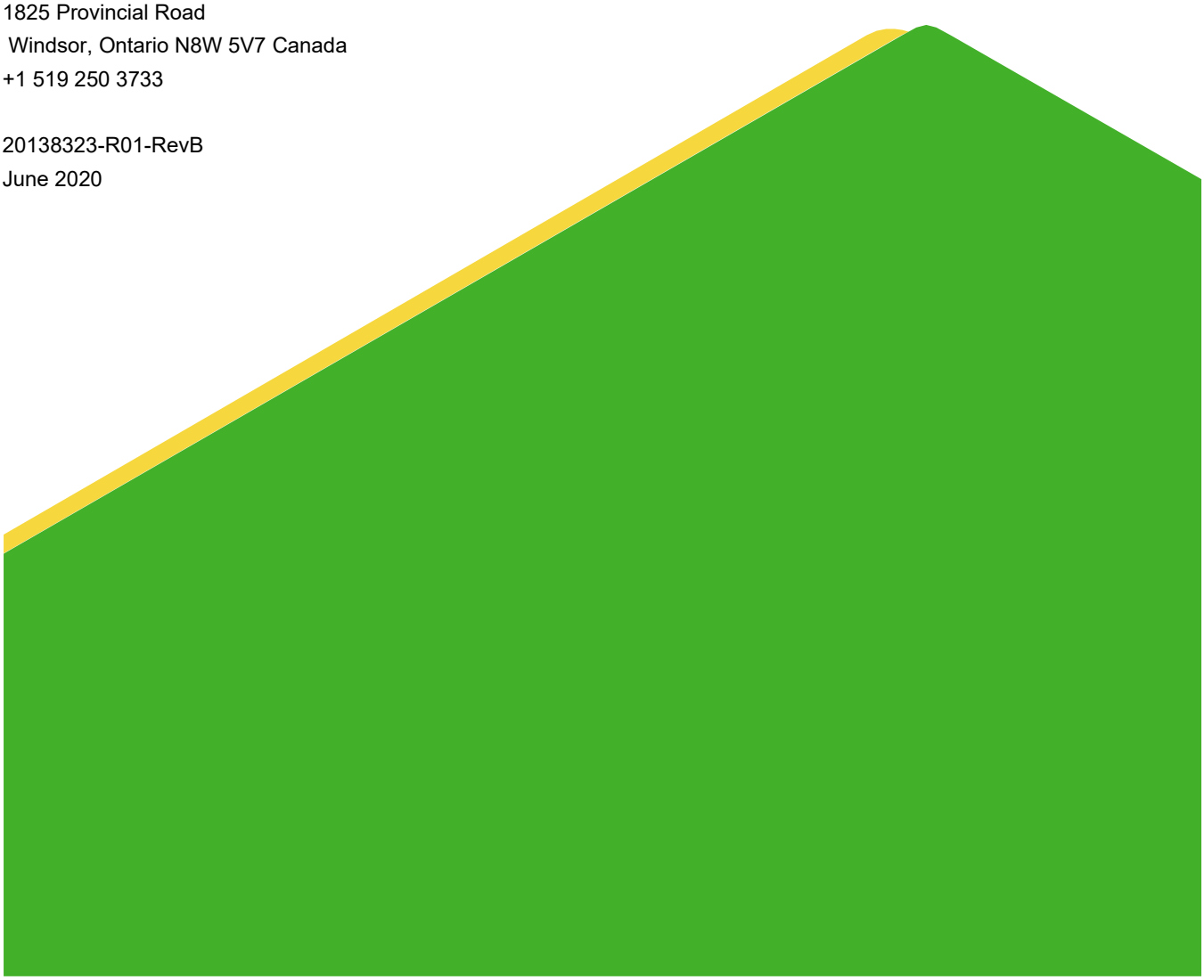
June 2020



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APPENDICES

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Previous Records of Boreholes and Test Pits by Golder Associates Ltd.

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Ontario Ministry of Environment, Conservation and Parks Well Records

1.0 INTRODUCTION

This report provides the results of a geotechnical assessment carried out to support the functional design being carried out by Dillon Consulting Limited (Dillon) for the City of Windsor Sewer Master Plan. As part of the functional design process, Dillon has requested that Golder carry out a geotechnical desktop review of several sites for proposed surcharge surface storage ponds, underground storage facilities, sewer outfalls, and pumping stations. It is understood that low impact development (LID) solutions such as exfiltration trenches are being considered for some of these locations.

The purpose of this geotechnical desktop review was to evaluate the subsurface soil and groundwater conditions, outline the general geotechnical conditions and delineate potential areas of geotechnical opportunities and constraints for the various project improvement areas consistent with the level of detailed required for functional design. These include comments on the geotechnical aspects of:

- anticipated subsurface groundwater conditions;
- anticipated soil conditions as they pertain to the functional design of surface storage ponds, underground storage facilities, sewer outfalls, pumping stations, and LID solutions;
- other potential geotechnical issues, as applicable; and
- recommended geotechnical explorations for the detailed design phase.

Authorization to proceed with the geotechnical desktop review, in accordance with our February 14, 2020 proposal, was provided by Mr. Flavio Forest, P.Eng. of Dillon via a work order dated February 24, 2020.

This report should be read in conjunction with the attached document “Important Information and Limitations of this Report”, which comprises an integral component hereof. The reader’s attention is specifically drawn to this material, as it is essential for proper use and interpretation of the information presented and discussed herein.

2.0 BACKGROUND

Golder Associates Ltd. (“Golder”) has previously carried out investigations in the general vicinity of several of the project improvement areas. The results of the previous geotechnical work were provided in the following reports:

- Golder Report No. 71509 titled “Subsurface Investigation, Proposed R.C.M.P. Detachment Building, Riverside Drive, Windsor, Ontario”, dated March 1971;
- Golder Report No. 764111 titled “Preliminary Geotechnical Investigation, Proposed Prince Road Storm Sewer, Windsor, Ontario”, dated November 1976;
- Golder Report No. 791-4012 titled “Subsurface Investigation, Proposed External Sanitary Services Interim Works, Walker Farms Industrial Park, Windsor, Ontario”, dated March 1979;
- Golder Report No. 991-4120 titled “Geotechnical Investigation, Proposed New Warehouse Building”, dated June 1999;
- Golder Report No. 001-4009 titled “Subsurface Investigation, Windsor Riverfront Lands, Moy Avenue and Langlois Avenue, Windsor, Ontario”, dated February 2000;
- Golder Report No. 001-4014 titled “Preliminary Geotechnical Investigation, Proposed 4-Storey Development, Existing Riverfront Property, 9150 Riverside Drive, Windsor, Ontario”, dated February 2000;

- Golder Report No. 001-4067 titled “Geotechnical Investigation, Rotary Gazebo, Lakeview Marina, Windsor, Ontario”, dated April 2000;
- Golder Report No. 001-4238 titled “Geotechnical Investigation, Proposed Rose City Ford Auto Dealership, Forest Glade Drive Area, Windsor, Ontario”, dated October 2000;
- Golder Report No. 001-4247 titled “Geotechnical Investigation, Proposed Beachview Villas, Townhouse Development, 10039/10049 Riverside Drive East, Windsor, Ontario”, dated October 2000;
- Golder Report No. 011-4128 titled “Geotechnical Investigation, Proposed Addition, St. Rose Elementary School, St. Rose Avenue, Windsor, Ontario”, dated June 12, 2001;
- Golder Letter No. 011-4136 titled “Riverfront Interceptor Project”, dated July 6, 2001;
- Golder Report No. 011-4205 titled “Geotechnical Investigation, Riverside Drive Interceptor Sewer Extension, Albert Road to George Avenue, Windsor, Ontario”, dated September 19, 2001;
- Golder Report No. 011-4226 titled “Geotechnical Investigation, Proposed Addition, Lajeunesse Ecole Catholique, Bruce Avenue, Windsor, Ontario”, dated October 17, 2001;
- Golder Report No. 011-4276 titled “Geotechnical Investigation, Proposed Condominium Structure, Wyandotte Street East, City of Windsor, Ontario”, dated January 3, 2002;
- Golder Report No. 021-4035 titled “Geotechnical Investigation, Grand Marais Drain Re-Alignment, Windsor, Ontario”, dated June 10, 2002;
- Golder Report No. 031-140060 titled “Geotechnical Investigation, Ypres Boulevard Trunk Sanitary Sewer, Turner Road to Gladstone Avenue, Windsor, Ontario”, dated April 29, 2003;
- Golder Report No. 031-140094 titled “Geotechnical Investigation, Proposed Classroom, Parking Lot and Athletic Track Addition, Lassaline School, Windsor, Ontario”, dated June 2, 2003;
- Golder Draft Report No. 031-145072 titled “Phase II Environmental Site Assessment, Riverfront Property, Southwest Corner of Mill Street and Russell Street, Windsor, Ontario”, dated June 17, 2003;
- Golder Report No. 031-140333 titled “Geotechnical Investigation, Proposed Bridge Over Little River, Wyandotte Street East Extension, City of Windsor, Ontario”, dated February 27, 2004;
- Golder Report No. 06-1140-020 titled “Geotechnical Investigation, Tecumseh Road East Improvements from Canadian National Railway East of Jefferson Boulevard to Lauzon Parkway, Windsor, Ontario”, dated June 16, 2006;
- Golder Report No. 06-1140-006 titled “Geotechnical Investigation, Walker-Wyandotte Intersection Improvements, Windsor, Ontario”, dated July 4, 2006;
- Golder Report No. 041-140048 titled “Foundation Investigation Report, Walker Road Grade Separation Project, Windsor, Ontario”, dated December 6, 2006;
- Golder Report No. 06-1140-142 titled “Geotechnical Investigation, Proposed Building Addition and New Material Recovery Facility, Central Avenue Transfer Station, Windsor, Ontario”, dated August 31, 2006;

- Golder Report No. 07-1140-0022 titled “Geotechnical Investigation, Sewer Replacement and Road Reconstruction, Lincoln Road, Memorial Avenue to Ypres Boulevard, Windsor, Ontario”, dated March 23, 2007;
- Golder Report No. 07-1140-0027 titled “Geotechnical Investigation, Riverside Drive Barrier Landform, Windsor, Ontario”, dated March 26, 2007;
- Golder Letter No. 07-1140-0098 titled “Factual Geotechnical Investigation, Proposed Sewer Upgrading and Road Reconstruction, Prado Place, Riverside Drive to Wyandotte Street, Windsor, Ontario”, dated July 4, 2007;
- Golder Report No. 08-1140-W028 titled “Geotechnical Investigation, Grand Marais Drain Improvements, Phase I, Windsor, Ontario”, dated May 12, 2008;
- Golder Report No. 08-1140-W054 titled “Geotechnical Investigation, Proposed Trunk Storm Sewer and Road Reconstruction, Parent Avenue and Lens Avenue, City of Windsor, Ontario”, dated June 4, 2008;
- Golder Report No. 09-1140-W011 titled “Geotechnical Investigation, Grand Marais Drain Improvements, Phase II, Windsor, Ontario”, dated March 11, 2009;
- Golder Report No. 09-1140-W091B-R01 titled “Geotechnical Investigation, Sandwich South Trunk Sanitary Sewer, Peppervine Street to Little River Pollution Control Plant, Windsor, Ontario”, dated October 2009;
- Golder Report No. 09-1140-W037 titled “Supplemental Geotechnical Investigation, Highway 401 Undercrossing, Proposed Steel Casing, Trunk Sanitary Sewer, North Talbot Road, Town of Tecumseh, Ontario”, dated December 2009;
- Golder Report No. 09-1140-W025-R01 titled “Geotechnical Design Report, Prince Road Storm Sewer Outlet, Prince Road Sewer, Phase 9, Outlet to Detroit River, City of Windsor, Ontario”, dated May 2010;
- Golder Report No. 09-1140-W025 Ph2000 R01 titled “Supplementary Geotechnical Investigation, Storm Sewer Outlet, Prince Road Sewer, Phase 9B, City of Windsor, Ontario”, dated June 2011;
- Golder Report 09-1140-W028 titled “Geotechnical Investigation, Proposed Wyandotte Street Extension, Florence Avenue to Bellagio Drive, Windsor, Ontario”, dated April 7, 2009;
- Golder Letter No. 10-1140-0090 PH1000-L02 titled “Supplementary Geotechnical Investigation, Retention Treatment Basin (RTB) Facility, Contract No. 1B, Tender 34-10, City of Windsor, Ontario”, dated July 6, 2010;
- Golder Report No. 11-1140-0200-R01 titled “Geotechnical Investigation, Parking Lot Reconstruction, St. Francis School, Windsor, Ontario”, dated March 2012;
- Golder Report No. 13-1140-0026-R01 titled “Geotechnical Investigation, Proposed Road Reconstruction, Fairview Boulevard, Wyandotte Street East to St. Rose Avenue, Windsor, Ontario”, dated March 2013;
- Golder Report No. 13-1140-0031-R01 titled “Geotechnical Investigation, Proposed Building Addition, St. John Vianney Catholic Elementary School, 8405 Cedarview Street, Windsor, Ontario”, dated March 2013;
- Golder Report No. 13-1140-0207-R01 titled “Geotechnical Investigation, Proposed Utility Installation and Road Reconstruction, Outer Drive, Moro Drive and Burke Street, Town of Tecumseh, Ontario”, dated December 2013;

- Golder Report No. 1400977-R01 titled “Geotechnical Investigation, Abars on the River, Proposed Building and Parking Lot, Windsor, Ontario”, dated April 2014;
- Golder Report No. 13-1140-0188-R01 titled “Geotechnical Investigation, Proposed Electrical Buildings, Elm Avenue and Dougall Avenue, CSO Interceptor Chambers, Windsor, Ontario”, dated May 2014;
- Golder Report No. 1405019-R01 titled “Subsurface Investigation, Banwell Road and McHugh Street, Windsor, Ontario”, dated October 2014;
- Golder Report No. 1405768-R01 titled “Geotechnical Investigation and Environmental Sampling, Roberts Pond Decommissioning and Storm Sewer Installation, City of Windsor, Ontario”, dated July 2014;
- Golder Report No. 1406552-R01 titled “Geotechnical Investigation, Proposed 4 Storey Apartment Building and 2 Storey Townhouse, 8475 Wyandotte Street East, Windsor, Ontario”, dated July 2014;
- Golder Report No. 1520407-2000-R03 titled “Supplemental Phase II Environmental Site Assessment, 75 Mill Street, Windsor, Ontario”, dated August 2015;
- Golder Report No. 1527635-1000-R01 titled “Preliminary Geotechnical and Hydrogeological Investigation, Parts of Lots 119 to 121, Concession 1, Geographic Township of Sandwich East, Windsor, Ontario”, dated May 2015;
- Golder Report No. 1546452-R01 titled “Geotechnical Investigation, Proposed EMS Station Reconstruction, 2620 Dougall Avenue, Windsor, Ontario”, dated May 2016;
- Golder Report No. 1660023-3000-R01 titled “Geotechnical Exploration, Proposed New Sandwich Library, 363 Mill Street, Windsor, Ontario”, dated December 2016; and
- Golder Report No. 1668632-R01 titled “Geotechnical Exploration, Proposed Multi-Use Trail Underpass, CN Railway at Dougall Avenue, Windsor, Ontario”, dated August 2017.

Relevant Record of Borehole and Test Pit Sheets from the above-listed Golder reports are attached in Appendix A and the approximate borehole and test pit locations are shown on Figures 2 to 20.

Relevant Ontario Ministry of the Environment, Conservation and Parks (MECP) well records are attached in Appendix B and the approximate well locations are shown on Figure 6. Well records were referenced where previous geotechnical exploration data was not available near the project area.

3.0 METHODOLOGY

The preliminary geotechnical assessment consisted of assembling and reviewing information from the following sources:

- topographic mapping;
- surficial soil and bedrock geological mapping;
- MECP well records; and
- existing Golder or publicly available geotechnical data for the improvement areas.

No new boreholes were drilled for this geotechnical assessment and it understood that intrusive exploration activities will be deferred to the detailed design phase. The available information referenced above was used to prepare this desktop geotechnical assessment report.

4.0 SITE DESCRIPTION

The subject sites are located throughout the City of Windsor. Based on the information provided by Dillon, geotechnical review has been requested for the following locations:

- Dougall Avenue Underpass New Surcharge Surface Storage Pond – New surcharge surface storage pond on vacant land south of Northwood Street, will have 26,800 cubic metres (m^3) of storage, a surface area of 15,000 square metres (m^2), and a maximum depth of 4 metres (m);
- Howard Avenue at E.C. Row Expressway New Surcharge Surface Storage Pond – New surcharge surface storage pond on land with existing building that will be removed, located at the north west corner of the Howard Avenue underpass at E.C. Row Expressway. The proposed pond will have 2,433 m^3 of storage, a surface area of 3,500 m^2, and a maximum depth of 3 to 4 m;
- Central Avenue, Pillette Road Expanded Central Pond – Expansion of Central pond to 105,300 m^3 of storage on vacant lands having a surface area of 40,000 m^2, and a maximum depth of between 4 to 5 m;
- Chrysler Center New Underground Surcharge Storage – New below grade surcharge storage with 11,000 m^3 of storage under the existing Chrysler parking lot, with open bottomed storage chambers to permit infiltration. The parking lot is to be reinstated following construction. A footprint of 13,200 m^2 and depth of 3 m are planned;
- Southwood Lakes Lowered Normal Water Level in Existing Ponds – Lowering of normal pond water levels by increasing depth of Lake Como, Lake Grande, and Lake Laguna by approximately 0.2 m, 0.5 m, and 0.5 m, respectively. The depth of the existing ponds will vary between 4.5 m and 7 m;
- Detroit Street Trunk Sewer Upgrade – Upgrade of 300-m length of existing 900-millimetre (mm) diameter storm outfall to Detroit River with 1,200-mm diameter storm sewer;
- Cameron Avenue Trunk Sewer Upgrade – New 2,700-mm diameter storm outfall to Detroit River with 2,400-mm by 3,300-mm box culvert;
- Bruce Avenue Trunk Sewer – New 3,600-mm diameter storm outfall to Detroit River;
- Marentette Avenue Trunk Sewer – New outfall to Detroit River with 1,800-mm diameter storm sewer at Marentette Avenue;
- Albert Road Trunk Sewer– New 1,650-mm diameter trunk sewer over a 350 m length. Existing 450-mm diameter to 600-mm diameter sewers to be replaced with new 450-mm and 750-mm diameter sewers over a 190 m length along Wyandotte Street East. A new outfall pipe will be constructed at Albert Road and the Detroit River;
- Droulliard Underpass Pump Station – New pump station within Cadillac Street Park, located north east of the Drouillard Road underpass at Wyandotte Street East. Upgrade 270 m of downstream sewer with 825-mm diameter sewer;

- Pontiac Pump Station – A new wet well pump station to be constructed directly adjacent to the existing Pontiac pump station with 2 new pumps having a 1.25 and 1.8 cubic metre per second (m^3/s) capacity, 7.3 m depth;
- St. Rose Pump Station – New St. Rose pump station having a proposed capacity of 11 m^3/s, and a depth of 11.5 m;
- St. Paul Pump Station - New St. Paul pump station having a proposed capacity of 15 m^3/s, and a depth of 13 m;
- Lakeview Pumping Station Capacity Increase – Lakeview pump station capacity increase from 0.7 m^3/s to 1.4 m^3/s by constructing a new pump station adjacent to the existing Lakeview pump station, with pump station depth of 10 m, outfall pipe size increase, and new outlet at Blue Heron Pond;
- Brumpton Park –New underground stormwater management facility at the southwest area of Brumpton Park. The underground facility will have a bottom elevation of 173.80 m measuring approximately 40 m by 100 m in plan with a storage volume capacity of 4,725 m^3;
- Hawthorne Avenue, Lauzon Parkway, Jefferson Boulevard Offline Storage Volumes/Improvements – New Lauzon golf course storm water management pond volume is 30,000 m^3, surface area of 25,000 m^2 and depth of 4 to 5 m, new Meadowbrook Park underground storage facility volume is 10,000 m^3, surface area of 2,200 m^2 with a depth of 3.5 m. Road regrading and low impact development (LID) swales are planned for Lauzon Parkway between Cantelon Avenue and Hawthorne Avenue;
- Wyandotte Street East, west of Little River, off-line storage – Two new off-line underground stormwater management facilities having capacities of 8,000 m^3 and 3,000 m^3, surface areas of 5,400 m^2 and 1,400 m^2 ,respectively, and depths of about 3 m;
- Roseville Garden Drive and Hawthorn Avenue/Kew Drive Underground Stormwater Detention System Improvements – New underground surcharge storage of 28,000 m^3 having a footprint of 21,850 m^2 and depth of 5 m and open bottomed storage chambers to permit infiltration;
- Ypres Avenue Underground Storage System – New below grade surcharge storage of 3,000 m^3 under the existing Optimist Memorial Park parking lot. A footprint of 3,360 m^2 and depth of about 3 m are planned;
- Prince Road outlet at Chappelle/Sandwich St. – This solution includes approximately 200 m of new storm sewer to the 2,700-mm diameter outlet to McKee Creek; and
- Proposed Earth Berm Along Riverside Drive between approximately Ford Boulevard and the east City Limits. The preferred solution is to construct the landform barrier crest to elevation 176.5 m. Existing property grading that meets or exceeds the target elevation will be utilized to limit the required new berm construction. Areas not meeting the target elevation will require new landform barriers to be constructed and localized improvements/grade alterations for areas of trail and road crossings.

It is understood that LID solutions such as exfiltration trenches are being considered for some of the project locations.

5.0 SUBSURFACE CONDITIONS DISCUSSION FOR PROJECT LOCATIONS

The subsurface conditions encountered in the previous boreholes and test pits within the general vicinity of the proposed project locations are detailed on the attached Record of Borehole and Record of Test Pit sheets in Appendix A, and MECP Well Records in Appendix B.

The soil boundaries indicated are inferred from non-continuous samples and observations of drilling and sampling resistance and typically represent transitions from one soil type to another rather than exact planes of geological change. Further, subsurface conditions may vary significantly between and beyond the borehole and test pit locations. It should be noted that the subsurface soil and groundwater conditions discussed in this report are based on previous boreholes and test pits from investigations dated as early as 1971 and may have been altered by subsequent development and infrastructure construction.

5.1 Dougall Underpass New Surcharge Surface Storage Pond

The proposed Dougall Avenue underpass surcharge surface storage pond will be located on vacant land south of Northwood Street. The pond will have a storage capacity of 26,800 m^3, a surface area of 15,000 m^2, side slope inclinations of 4 horizontal to 1 vertical, and a depth of 4 m. The pond location is shown on Figure 2.

5.1.1 Suburface Soil and Groundwater Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the vicinity of the storage pond encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill. To the west of the pond, one borehole encountered a surficial deposit of silty sand overlying the silty clay. A measurement carried out for one groundwater monitoring well installed to the west of the pond location, where the surficial silty sand was encountered, indicated a groundwater level about 0.8 m below ground surface. This may indicate a perched groundwater level where surficial granular soils are present overlying the lower permeability cohesive materials. In general, the borehole logs indicate that the boreholes in this area remained dry during drilling.

5.1.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pond will be approximately 4 m in depth, with side slopes having an inclination of 4 horizontal to 1 vertical. Pond side slopes having an inclination of 4 horizontal to 1 vertical are not anticipated to be problematic and can be used for functional design purposes for ponds excavated into the native soils in this area. In areas proposed for equipment access for periodic maintenance, an inclination of 6 horizontal to 1 vertical or flatter should be considered.

Erosion protection should be provided around the perimeter of the surcharge storage pond at the elevation of the normal operating level. The form of erosion protection should match with the requirements of aquatic vegetation to be planted and developed. Consideration could be given to protecting the active water line zone (i.e., from the low-water level to the high-water level) with a minimum 150-mm thick layer of Ontario Provincial Standard Specification (OPSS).PROV 1004 (Aggregates) R-10 rip-rap, constructed in accordance with OPSS 150 (Rip-Rap, Rock Protection); however, this may not be necessary if appropriate vegetation can be established in this zone. The pond slopes above the operating water level should be vegetated as soon as practical after construction to address the potential for erosion due to surface water run-off. Care should be taken to ensure filter compatibility between the native soils and any imported granular materials.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

All excavations for the surcharge surface storage pond should be carried out in accordance with the current Ontario Occupational Health & Safety Act (OHSA, the Act) criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

Based on the subsurface conditions anticipated for the project area, headwalls associated with the stormwater management pond may be founded on the native soils at a minimum depth of 1.2 m below finished grade. The geotechnical resistance/reaction used for the design of headwall foundations should be confirmed in the detailed design phase.

5.1.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the surcharge surface storage pond. Geotechnical explorations for the pond should consist of a minimum of 4 soil borings advanced within the stormwater pond footprint, extending a minimum of 1.5 m below the pond bottom elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.

5.2 Howard at E.C. Row New Surcharge Surface Storage Pond

The proposed new surcharge surface storage pond at the north west corner of the Howard Avenue underpass at E.C. Row Expressway will be located on the land currently occupied by a commercial building which will be removed. The pond will have a storage capacity of 2,433 m^3, a surface area of 3,500 m^2, side slope inclinations of 4 horizontal to 1 vertical, and a depth of 3 to 4 m. The pond location is shown on Figure 3.

5.2.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the storage pond encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill. One groundwater monitoring well installed to the east of the pond location indicated a groundwater level about 0.9 m below ground surface (see applicable Record of Borehole sheets). This may indicate a perched groundwater level where surficial granular soils are present overlying the lower permeability cohesive materials. In general, the borehole logs indicate that the boreholes in this area encountered groundwater seepage following drilling.

5.2.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pond will be approximately 3 to 4 m in depth, with side slopes having an inclination of 4 horizontal to 1 vertical. Pond side slopes having an inclination of 4 horizontal to 1 vertical are not anticipated to be problematic and can be used for functional design purposes for ponds excavated into the native soils in this area. In areas proposed for equipment access for periodic maintenance, an inclination of 6 horizontal to 1 vertical or flatter should be considered.

Erosion protection should be provided around the perimeter of the surcharge storage pond at the elevation of the normal operating level. The form of erosion protection should match with the requirements of aquatic vegetation to be planted and developed. Consideration could be given to protecting the active water line zone (i.e., from the low-water level to the high-water level) with a minimum 150-mm thick layer of OPSS.PROV 1004 (Aggregates) R-10 rip-rap, constructed in accordance with OPSS 150 (Rip-Rap, Rock Protection); however, this may not be necessary if appropriate vegetation can be established in this zone. The pond slopes above the operating water level should be vegetated as soon as practical after construction to address the potential for erosion due to surface water run-off. Care should be taken to ensure filter compatibility between the native soils and any imported granular materials.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

It is anticipated that the existing building, foundations, and surrounding pavement structures will be fully removed from within the pond footprint. All excavations for the surcharge surface storage pond should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that

might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

Based on the subsurface conditions anticipated for the project area, headwalls associated with the stormwater management pond may be founded on the native soils at a minimum depth of 1.2 m below finished grade. The geotechnical resistance/reaction used for the design of headwall foundations should be confirmed in the detailed design phase.

5.2.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the surcharge surface storage pond. Geotechnical explorations for the pond should consist of a minimum of 2 soil borings advanced within the stormwater pond footprint, extending a minimum of 1.5 m below the pond bottom elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.

5.3 Central Avenue, Pillette Road Expanded Central Pond

The existing Central Avenue and Pillette Road pond is proposed to be expanded to have a storage capacity of 105,300 m^3, a surface area of 40,000 m^2, side slope inclinations of 6 horizontal to 1 vertical and existing side slope inclinations, and a maximum depth of between 4 and 5 m. The pond location is shown on Figure 4.

5.3.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the storage pond encountered native soils generally consisting of clayey silt, sand, and silty sand, underlain by an extensive deposit of silty clay. The native soils were encountered below surficial organic soils (topsoil), fill, and silty sand (where present). Groundwater monitoring wells installed in previous boreholes west of the pond had measured groundwater levels between about 2.8 m and 3 m below ground surface. A monitoring well south of the pond location had a recorded water level about 0.9 m below ground surface. In general, the borehole logs indicate that the boreholes were dry upon completion of drilling.

5.3.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pond will be approximately 4 to 5 m in depth, with side slopes having an inclination of 6 horizontal to 1 vertical. Pond side slopes having an inclination of 6 horizontal to 1 vertical are not anticipated to be problematic and can be used for functional design purposes for ponds excavated into the native soils in this area, and would be suitable for equipment access for periodic maintenance.

Erosion protection should be provided around the perimeter of the surcharge storage pond at the elevation of the normal operating level. The form of erosion protection should match with the requirements of aquatic vegetation to be planted and developed. Consideration could be given to protecting the active water line zone (i.e., from the low-water level to the high-water level) with a minimum 150-mm thick layer of OPSS.PROV 1004 (Aggregates) R-10 rip-rap, constructed in accordance with OPSS 150 (Rip-Rap, Rock Protection); however, this may not be necessary if appropriate vegetation can be established in this zone. The pond slopes above the operating water level should be vegetated as soon as practical after construction to address the potential for erosion due to surface water run-off. Care should be taken to ensure filter compatibility between the native soils and any imported granular materials.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

All excavations for the surcharge surface storage pond should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any to firm silty clay/clayey silt and loose to compact sand encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay/clayey silt materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

Based on the subsurface conditions anticipated for the project area, headwalls associated with the stormwater management pond may be founded on the native soils at a minimum depth of 1.2 m below finished grade. The geotechnical resistance/reaction used for the design of headwall foundations should be confirmed in the detailed design phase.

5.3.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the expanded central pond. Geotechnical explorations for the pond should consist of a minimum of 6 soil borings advanced within the stormwater pond footprint, extending a minimum of 1.5 m below the pond bottom elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.

5.4 Chrysler Centre New Underground Surcharge Storage

The proposed Chrysler Center underground surcharge storage will consist of a 11,000 m^3 capacity tank under the existing Chrysler parking lot, with the possibility of having open bottomed storage chambers to permit infiltration. The parking lot will be reinstated following construction. The proposed tank will have a footprint of 13,200 m^2 and a depth of 3 m. The storage tank location is shown on Figure 5.

5.4.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the proposed underground surcharge storage tank encountered native soils generally consisting of silty clay/clayey silt, with occasional sand layers, below surficial organic soils (topsoil) and fill (where present). Many of the boreholes advanced within the area encountered groundwater seepage. Where encountered, water levels recorded in boreholes upon completion of drilling and in installed monitoring wells ranged between about 1.2 m and 16.5 m below ground surface (see Record of Borehole sheets for details).

5.4.2 Discussion on Geotechnical Aspects of Functional Design

It understood that the storage chamber planned in the Chrysler Centre parking lot will extend to a depth of approximately 3 m. The bearing resistance/reaction for the tank/chambers will be dependant on the soil conditions present at chamber location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed tank/chambers will probably encounter firm to hard brown or grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage chambers. Based on the anticipated cohesive nature of the soils at and below the tank/chamber base elevation, infiltration rates would be very low.

All excavations for the storage chamber should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.4.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the underground surcharge storage tank. Geotechnical explorations for underground storage chamber in should consist of at least 4 soil borings advanced within the chamber/tank footprint, extending a minimum of 3 m below the chamber base elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.

5.5 Southwood Lakes Existing Ponds

The normal water levels are proposed to be lowered in the existing Southwood Lakes subdivision ponds. Lowering of normal pond water levels will be achieved by increasing the depths of the Lake Como, Lake Grande, and Lake Laguna ponds by approximately 0.2 m, 0.5 m, and 0.5 m, respectively. The existing side slope inclinations of the ponds will not change. The depths of the ponds will vary between 4.5 m and 7 m in depth. The pond locations are shown on Figure 6.

5.5.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the storage pond encountered native soils generally consisting of an extensive deposit of silty clay. The native soils were encountered below surficial organic soils (topsoil), and fill, where present. One historical water well record for w well installed north of the ponds indicates an approximately 1.8 m thick sand layer extending to a depth of about 4.3 m. In general, the records for the boreholes east of the ponds indicate that the boreholes were dry upon completion of drilling.

5.5.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the existing pond depths will be marginally increased by up to 0.5 m, with the existing side slope inclinations remaining the same. If the existing pond side slopes have inclination of 3 horizontal to 1 vertical or flatter, the proposed deepening of the ponds are not anticipated to be problematic. Steeper side slopes may feasible, and can be analyzed for long term stability, if required.

At this time, it is anticipated that current erosion protection features will be kept in place; however, if instabilities and erosion of the existing pond side slopes are evident, additional erosion control measures should be considered to be incorporated with the pond deepening.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

All excavations for the surcharge surface storage ponds should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any to firm silty clay and loose to compact sand encountered in the project area and above the water table would be classified as Type 3 soils. Stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay/clayey silt materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.5.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. Due to the nominal increase of the pond depths being proposed, a site-specific geotechnical exploration for the ponds may not be warranted provided there have been no stability issues with the current pond slopes. During detailed design, the geotechnical consultant should undertake a review of the final design for the pond deepening, any existing site-specific geotechnical information from the pond's original construction, and carry out a site review. Following this detailed review, if a geotechnical exploration is not warranted, a site review of the subgrade soils should be carried out during construction by the geotechnical engineer.

Following the completion of the detailed design review, the recommendations in this report may be revised based on the new information.

5.6 Detroit Street Trunk Sewer Upgrade

West of the intersection of Detroit Street and Sandwich street, an approximately 300 m length of existing 900-mm diameter storm outfall to Detroit River will be upgraded to a 1,200-mm diameter storm sewer with an outfall to the Detroit River, having a hydraulic invert elevation of 172.6 m and a ground elevation of 176.3 m at the river. The Detroit River 100-Year high water level elevation is 176.15 m. The sewer and outfall location are shown on Figure 7.

5.6.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes and test pits previously advanced in the general vicinity of the proposed outfall encountered native soils generally consisting of silty clay/clayey silt, with occasional sand and silt layers, below surficial organic soils (topsoil/peat) and fill (where present). The fill thickness in the available boreholes and test pits south of the outfall were measured to be between about 1.7 m and 4.5 m. The encountered fill has been described as having a mixed composition, consisting of silty clay, sand, and silt, with debris including wood, brick, concrete, cinders and organic materials. Groundwater level observations made in the available test pits located south of the outfall location indicated seepage into the test pits at depths of between about 1.2 m and 2.7 m below ground surface.

5.6.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 3.7 m below existing ground elevation at the outfall location and about 3.6 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby boreholes, the outfall is expected to be located within fill or the underlying native silty clay/clayey silt. The existing fill is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall. If fill is present at the outfall founding elevation, consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level, with the steel sheeting extending into the underlying native silty clay/clayey silt. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. This approach would also require a cofferdam structure to reach the design invert elevations below the river level. The native silty clay encountered in the boreholes in the project vicinity are considered to be an acceptable founding medium to support the outfall pipe or associated headwall. Any excavations adjacent for the outfall at the river and extending below the river level would require a cofferdam structure to reach the design invert elevations. Further geotechnical exploration will be required to evaluate the thickness of fill in the area, and the depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA

criteria, the fill or firm silty clay or loose to compact silty encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.6.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Detroit Street Detroit River outfall. Geotechnical explorations for the outfall should consist of at least 4 soil borings advanced along the outfall alignment (west of Russell Street), extending a minimum of 5 m into the underlying native soils.

5.7 Cameron Avenue Trunk Sewer Upgrade

The construction of 2,700 m of new storm sewers is planned along Tecumseh Road, Curry Avenue, McKay Avenue, and Cameron Avenue to a new outfall at the Detroit River. The proposed new outfall will consist of a 2,400-mm by 3,300-mm box culvert, having a hydraulic invert elevation of 173.2 m and a ground elevation of 176.8 m at the river. The Detroit River 100 Year high water level elevation is 176.15 m. The location of the outfall and adjoining sewer are shown on Figure 8.

5.7.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of glaciolacustrine silty clay. A previous borehole advanced east of the proposed outfall location and north of Riverside Drive encountered a significant thickness of fill material, extending to the maximum boring depth of about 5 m. The encountered fill has been described as silty clay, including wood, brick, concrete, and organic materials. The borehole was observed to be dry upon completion of drilling.

5.7.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed box culvert outfall invert will be about 3.6 m below existing ground elevation at the outfall location and 3 m below the Detroit River 100-year high water level. The bearing resistance/reaction for the box culvert will be dependant on several factors including the soil conditions present and the culvert founding elevations. Based on the available soils information from the nearby borehole, the outfall is expected to be located within fill. The existing fill soils are not considered to be an acceptable founding medium to support the outfall or associated headwall. Consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level, assuming there are suitable underlying silty clay or clayey silt soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. This approach would also require a cofferdam structure to reach the design invert elevations below the river level. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. In either approach, further geotechnical exploration will be required to evaluate the thickness of fill in the area, and the depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction,

the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.7.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Cameron Avenue Detroit River outfall. Geotechnical explorations for the outfall should consist of at least 2 soil borings advanced along the outfall alignment (north of Riverside Drive), extending a minimum of 5 m into the underlying native soils.

5.8 Bruce Avenue Trunk Sewer

The construction of 2,000 m of new storm sewers are planned along Bruce Avenue to a proposed outlet to the Detroit River. The proposed outfall at the Detroit River will consist of a 3,600-mm diameter pipe, having a hydraulic invert elevation of 171.8 m and a ground elevation of 176.9 m at the river. The Detroit River 100 Year high water level elevation is 176.15 m. The outfall and adjoining sewer location are shown on Figure 9.

5.8.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of glaciolacustrine silty clay. A previous borehole advanced east of the proposed outfall location and north of Riverside Drive encountered a significant thickness of fill material, extending to the maximum boring depth of about 3.9 m. The encountered fill has been described as silty clay, silty sand, with pieces of wood, slag, and refuse debris consisting of concrete pieces and brick fragments. The borehole was terminated due to encountering an obstruction. Groundwater seepage was observed in the borehole at a depth of about 3 m during drilling.

5.8.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 5.1 m below existing ground elevation at the outfall location and 4.4 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby borehole, the outfall may be located within fill. The fill encountered nearby is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall. Consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level, and assumes there are suitable underlying silty clay or clay silt soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. This approach would also require a cofferdam structure to reach the design invert elevations below the river level. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. In either approach, further geotechnical exploration will be required to evaluate the thickness of fill in the area, and the depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction,

the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.8.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Bruce Avenue Detroit River outfall. Geotechnical explorations for outfall should consist of at least 2 soil borings advanced along the outfall alignment (north of Riverside Drive), extending a minimum of 5 m into the underlying native soils.

5.9 Marentette Avenue Trunk Sewer

The construction of the new Marentette Avenue trunk sewer will include an 1,800-mm diameter outfall at the Detroit River, having a hydraulic invert elevation of 171.9 m and a ground elevation of 176.2 m at the river. The Detroit River 100 Year high water level elevation is 176.15 m. The location of the outfall and adjoining sewer are shown on Figure 10.

5.9.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of glaciolacustrine silty clay. Previous borehole advanced east and west of the proposed outfall location and north of Riverside Drive encountered a significant thickness of fill material, extending to depths of between about 2.1 and 3.2 m. The encountered fill has been described as mixed, consisting of silty clay, sand, clayey silt, cinders, organics, and debris consisting of wood, metal and brick fragments. A layer of silty sand to sand and gravel was encountered under the fill, underlain by an extensive deposit of silty clay to clayey silt in borehole to the west (See Record of Borehole sheets for details). Groundwater seepage was observed in the boreholes at depths ranging between about 1.5 m and 3.1 m during drilling.

5.9.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 4.3 m below existing ground elevation at the outfall location and 4.3 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby boreholes, the outfall is expected to be located within fill or the underlying native silty clay to clayey silt. The existing fill is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall. If fill is present at the outfall founding elevation, consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level, and assumes there is suitable underlying silty clay or clayey silt soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. This approach would also require a cofferdam structure to reach the design invert elevations below the river level. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. In either approach, further geotechnical exploration will be required to evaluate the thickness of fill in the area, and the depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill or firm silty clay or loose to compact silty encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based

on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.9.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Marentette Avenue Detroit River outfall. Geotechnical explorations for outfall should consist of at least 2 soil borings advanced along the outfall alignment (north of Riverside Drive), extending a minimum of 5 m into the underlying native soils.

5.10 Albert Road Trunk Sewer

The construction of a new 1,650-mm diameter trunk sewer over 350 m length, and replacing the existing 450-mm diameter to 600-mm diameter sewers with new 450-mm and 750-mm diameter sewers over a 190 m length along Wyandotte Street East and includes the construction of a new outfall pipe at Albert Road and the Detroit River. The proposed outfall at the Detroit River will consist of a 1,650-mm diameter pipe, having a hydraulic invert elevation of 173.4 m and a ground elevation of 176.9 m at the river. The Detroit River 100 Year high water level elevation is 176.15 m. The location of the outfall and adjoining sewer are shown on Figure 11.

5.10.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the outfall encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill. One groundwater monitoring well was installed to the east of the outfall location on Riverside Drive and a water level about 2.8 m below ground surface was recorded at the time of reading (see Record of Borehole sheets). Two boreholes in the area encountered groundwater seepage at depths of about 0.8 m and 5.3 m below ground surface. This may indicate a perched groundwater level where surficial granular soils are present overlying the lower permeability cohesive materials. The remaining boreholes in the area were observed to be dry upon completion of drilling.

5.10.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 3.5 m below existing ground elevation at the outfall location and about 2.8 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby boreholes, the outfall is expected to be located within underlying native silty clay; however, due to previous experiences with projects located on the Detroit riverfront, it is expected that fill from previous site uses will be encountered overlying the native silty clay. Any existing uncontrolled fill is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall.

If fill is present at the outfall founding elevation, consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level into underlying silty clay soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick if present in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. The native silty clay encountered in the boreholes in the project vicinity are considered to be an acceptable founding medium to support the outfall pipe or associated headwall. Any excavations adjacent for the outfall at the river and extending below the river level would require a cofferdam structure to reach the design invert elevations. Further geotechnical exploration will be required to evaluate the thickness of fill in the area, depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations

extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow should be expected and may be significant for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.10.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Albert Road Detroit River outfall. Geotechnical explorations for outfall should consist of at least 2 soil borings advanced along the outfall alignment (north of Riverside Drive), extending a minimum of 5 m into the underlying native soils.

5.11 Drouillard Underpass Pump Station

The construction of a new pump station is proposed within Cadillac Street Park, located north east of the Drouillard Road underpass at Wyandotte Street East and includes the upgrading of 270 m of downstream sewer with 825-mm diameter sewer. It is understood that the new pump station will have a footprint of 20 m by 15 m, a ground elevation of 181.4 m and bottom of wet well elevation of 171.6 m. The pump station location is shown on Figure 11.

5.11.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the pump station encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill. One ground water monitoring well was installed to the north of the pump station on Riverside Drive and a water level about 2.8 m below ground surface was recorded at the time of reading (see Record of Borehole sheets). Two boreholes in the area encountered groundwater seepage at depths of about 0.8 m and 5.3 m below ground surface. This may indicate a perched groundwater level where surficial granular soils are present overlying the lower permeability cohesive materials. The remaining boreholes in the area were observed to be dry upon completion of drilling.

5.11.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pump station will measure about 20 m by 15 m in plan, with a wet well depth of 9.8 m. The soil bearing resistance/reaction for the pump station will be dependant on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the available soils information from the nearby boreholes, the pump station base is expected to be located within native silty clay. In general, the native silty clay soils are considered to be an acceptable founding medium to support a pump station. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the pumping station will be reduced by the construction of the station.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading of the soil around the perimeter of the excavation will have to be carried out.

If the excavation is carried out in a closed driven sheeted excavation, no major problems due to groundwater are anticipated. The seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that

might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

5.11.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Drouillard underpass pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the pump station foundation below the pump station invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata.

5.12 Pontiac Pump Station

A new wet well pump station is proposed to be constructed directly adjacent to the existing Pontiac pump station. The new wet well pump station will have a footprint of 13 m by 8m. The ground elevation is 175.9 m and the elevation of the bottom of wet well will be 168.6 m. The existing pump station is located north of the Little River Pollution Control Plant, as shown on Figure 12.

5.12.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the pump station encountered native soils generally consisting of silty clay/silty clay with sandy silt and sand layers, below surficial organic soils (topsoil) and fill where present. One ground water monitoring well installed east of pump station recorded a water level about 5.1 m below ground surface at the time of reading (see Record of Borehole sheets). Two boreholes recorded water levels at depths of about 5.1 m and 9.5 m upon completion of drilling. The remaining boreholes in the area were observed to be dry upon completion of drilling.

5.12.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the wet well pump station will measure about 13 m by 8 m in plan, with a depth of 7.3 m. The soil bearing resistance/reaction for the pump station will be dependant on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the available soils information from the nearby boreholes, the wet well base is expected to be located within native silty clay. In general, the native silty clay soils are considered to be an acceptable founding medium to support a wet well. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the wet well will be reduced by its construction. There is the potential for the base of the wet well to be located within or above a silty sand or sandy silt stratum, and exploration will be required to confirm whether such layers are present, and whether artesian groundwater conditions exist in them.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading of the soil around the perimeter of the excavation will have to be carried out.

In general, temporary excavations into the predominantly silty clay nearby Little River should not encounter significant groundwater inflow, however, it is possible that more permeable sand lenses, hydraulically connected to Little River may be present within the excavation area. It may be advantageous to carry out construction during at a time of the year when the Little River water level is at its lowest. Excavations for the wet well base extending to Little River's water edge will likely require a cofferdam to keep out river water. If the excavation is carried out in a closed driven sheeted excavation, no major problems due to groundwater are anticipated. The seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be

classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

5.12.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the new wet well at the Pontiac pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the wet well foundation below the wet well invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata.

5.13 St. Rose Pump Station

The proposed new St. Rose pump station is to be located north east of the intersection of St. Rose Avenue and Riverside Drive. The new pump station will have a footprint of 32 m by 21 m. The ground elevation is 176.5 m and bottom of wet well elevation will be 165.0 m. The location of the pump station is shown on Figure 13.

5.13.1 Suburface Conditions

Quaternary geology mapping in the area of the pump station indicates glaciolacustrine silty clay as the predominant soil deposit in the area. The available borehole data in this area is somewhat distant from the pump station location, however, the soil conditions encountered in the boreholes south and south east of the pump station were comprised mainly of silty clay, below surficial topsoil and fill (where present). These boreholes were observed to be dry upon completion of drilling.

5.13.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pump station will measure about 32 m by 21 m in plan, with a wet well depth of 11.5 m. The soil bearing resistance/reaction for the pump station will be dependant on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the available soils information from the nearby boreholes, the pump station base is expected to be located within native silty clay. In general, the native silty clay soils are considered to be an acceptable founding medium to support a pump station. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the pump station will be reduced by the construction of the station.

From aerial imaging of the pump station location, it appears that the west and north sides of the site fronting the Detroit river are lined with steel sheeting. Alterations to the site from its natural condition has likely resulted in fill placement, which should be expected to be encountered, the depth and extent of which will need to be explored.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading of the soil around the perimeter of the excavation will have to be carried out.

If the excavation is carried out in a closed driven sheeted excavation into underlying silty clay, no major problems due to groundwater are anticipated. The seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

For open excavations below the prevailing river elevation, groundwater inflow from soil layers hydraulically connected to the river should be expected to be significant. Careful planning will be required to control water levels and inflows.

5.13.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the St. Rose pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the pump station foundation below the pump station invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata. Several shallow boreholes should be advanced across the site to explore the possible variation of fill thicknesses across the site.

5.14 St. Paul Pump Station

The proposed expansion of the St. Paul pump station will be located east of the existing pump station building and will include new outlet sewers to the Detroit River from the proposed expansion. The new pump station will have a footprint of 23 m by 13 m. The ground elevation is 176.5 m and the bottom of wet well elevation will be 163.5 m. The location of the pump station is shown on Figure 13.

5.14.1 Suburface Conditions

Quaternary geology mapping in the area of the pump station indicates that glaciolacustrine silty clay is the predominant soil deposit in the area. Available borehole data east of the pump station on the riverfront encountered soils comprised mainly of native silty sand to sand, with underlying clayey silt to silty clay at depth, all below surficial topsoil and fill (where present). Where fully explored by the boreholes, the sand and silty sand deposit extended to depths of between about 11.6 m and 14 m blow ground surface. Ground water levels in the boreholes were observed between 1.2 m and 2.1 m below ground surface upon completion of drilling.

5.14.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pump station will measure about 23 m by 13 m in plan, with a wet well depth of 13 m. The soil bearing resistance/reaction for the pump station will be dependant on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the available soils information from the nearby boreholes, the pump station base is expected to be located within native sand or silty clay/clayey silt. In general, the native silty clay soils are considered to be an acceptable founding medium to support a pump station. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the pump station will be reduced by the construction of the station. Founding of the pump station on the underlying sand/silty sand if present at the foundation elevation may be feasible, however precautions will need to be taken to ensure the sand is not disturbed during construction and disturbance due to differential hydraulic head inside and surrounding the excavation.

From aerial imaging of the pump station locations, it appears that the north side of the site fronting the Detroit river are lined with steel sheeting. Alterations to the site from its natural condition has likely resulted in fill placement, which should be expected to be encountered, the depth and extent of which will need to be explored.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading/excavation of the soil around the perimeter of the excavation will have to be carried out.

If the excavation is carried out in a closed driven sheeted excavation into underlying silty clay, it is anticipated that groundwater seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA

soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

For open excavations below the prevailing river elevation, groundwater inflow from the sand layers hydraulically connected to the river should be expected to be significant. Careful planning will be required to control water levels and inflows.

5.14.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the St. Paul pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the pump station foundation below the pump station invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata. Several shallow boreholes should be advanced across the site to explore the possible variation of fill thicknesses.

5.15 Lakeview Pump Station

The proposed improvements to the Lakeview pump station will include outlet and pump station improvements, including increased pump station capacity by constructing a new pump station adjacent to the existing Lakeview pump station, larger outlet sewers to Lake St. Clair, and new outlet at Blue Heron Pond. The pump station will have a footprint of 8 m by 7 m. The ground elevation is 176.9 m and bottom of wet well elevation will be 167.0 m. The pump station location is shown on Figure 14.

5.15.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of glaciolacustrine silty clay, with modern beach deposits consisting of sand, gravel and cobbles present north of Riverside Drive. Shallow boreholes advanced south west of Blue Heron Pond encountered silty clay below surficial fill. No existing borehole data was available in the vicinity of the new pump station and the Detroit river.

5.15.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pump station will measure about 8 m by 7 m in plan, with a wet well depth of 9.9 m. The soil bearing resistance/reaction for the pump station will be dependant on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the limited available soils information, the pump station base is expected to be located within native silty clay. In general, the native silty clay soils are considered to be an acceptable founding medium to support a pump station. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the pump station will be reduced by the construction of the pump station.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading of the soil around the perimeter of the excavation will have to be carried out.

If the excavation is carried out in a closed driven sheeted excavation, no major problems due to groundwater are anticipated. The seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation. If open cut techniques are used, proactive dewatering may be required if saturated granular layers are present within the silty clay.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. Stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

5.15.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Lakeview pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the pump station foundation below the pump station invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata.

5.16 Brumpton Park Underground Stormwater Management Facility

The proposed Brumpton Park underground stormwater management facility will consist of a 4,725 m^3 capacity facility at the southwest area of Brumpton Park. The proposed tank/chambers will have a footprint of 4,000 m^2 and a depth of 2.2 m. The stormwater management facility location is shown on Figure 15.

5.16.1 Suburface Conditions

Based on our review of the available information, boreholes previously advanced in the general vicinity of the underground stormwater management facility encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill (where present). In general, boreholes advanced in the area were dry upon completion of drilling, with one borehole having a recorded water level at about 6.4 m depth below ground surface upon completion of drilling.

5.16.2 Discussion on Geotechnical Aspects of Functional Design

It understood that the underground storage facility planned in Brumpton Park will extend to a depth of approximately 2.2 m. The bearing resistance/reaction for the tank/chambers will be dependant on the soil conditions present at the tank/chamber location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed stormwater management facility tank/chambers will likely encounter firm to stiff brown or grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support underground stormwater storage tank/chambers.

All excavations for the underground stormwater management facility should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.16.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the underground surcharge storage facility. Geotechnical explorations for underground stormwater management facility should consist of at least 3 soil borings advanced within the stormwater management facility chamber/tank footprint, extending a minimum depth of 3 m below the base elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.

5.17 Hawthorne Avenue, Lauzon Parkway, Jefferson Boulevard Offline Storage Volumes

The proposed Hawthorne Avenue, Lauzon Parkway, Jefferson Boulevard Offline Storage Volumes/Improvements include a new stormwater management pond at Little River golf course having 30,000 m^3 of storage capacity, surface area of 25,000 m^2, side slope inclinations of 4 horizontal to 1 vertical, and depth of 4 to 5 m.

The proposed Meadowbrook Park underground surcharge storage will consist of a 10,000 m^3 capacity tank. The tank will have a footprint of 2,200 m^2 and depth of 3.5 m. Road regrading and low impact development (LID) swales are planned for Lauzon Parkway between Cantelon Avenue and Hawthorne Avenue. The pond and storage tank locations are shown on Figure 16.

5.17.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in previously boreholes advanced in the general vicinity of the storage pond encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill (where present). In general, boreholes advanced in the area were dry upon completion of drilling, however in two boreholes, groundwater seepage into the boreholes was encountered to depths of 2.3 m and 4 m below ground surface upon completion of drilling.

5.17.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pond will be approximately 4 to 5 m in depth, with side slopes having an inclination of 4 horizontal to 1 vertical. Pond side slopes having an inclination of 4 horizontal to 1 vertical are not anticipated to be problematic and can be used for functional design purposes for ponds excavated into the native soils in this area. In areas proposed for equipment access for periodic maintenance, an inclination of 6 horizontal to 1 vertical or flatter should be considered.

Erosion protection should be provided around the perimeter of the surcharge storage pond at the elevation of the normal operating level. The form of erosion protection should match with the requirements of aquatic vegetation to be planted and developed. Consideration could be given to protecting the active water line zone (i.e., from the low-water level to the high-water level) with a minimum 150-mm thick layer of OPSS.PROV 1004 (Aggregates) R-10 rip-rap, constructed in accordance with OPSS 150 (Rip-Rap, Rock Protection); however, this may not be necessary if appropriate vegetation can be established in this zone. The pond slopes above the operating water level should be vegetated as soon as practical after construction to address the potential for erosion due to surface water run-off. Care should be taken to ensure filter compatibility between the native soils and any imported granular materials.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

It understood that the storage tank planned in Meadowbrook Park will extend to a depth of approximately 3.5 m. The bearing resistance/reaction for the tank will be dependant on the soil conditions present at tank location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed tank will probably encounter stiff to very stiff brown or grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage tank.

All excavations for the surcharge surface storage pond and storage tank should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

Based on the subsurface conditions anticipated for the project area, headwalls associated with stormwater management ponds may be founded on the native soils at a minimum depth of 1.2 m below finished grade. The geotechnical resistance/reaction used for the design of headwall foundations should be confirmed in the detailed design phase.

5.17.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the surcharge surface storage pond. Geotechnical explorations for the pond should consist of a minimum of 6 soil boring carried out within the stormwater pond footprint, extending a minimum of 1.5 m below the pond bottom elevation.

Geotechnical explorations for underground storage tank in Meadowbrook Park should consist of at least 2 soil borings advanced within the tank footprint, extending a minimum of 3 m below the tank base elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.

5.18 Wyandotte Street East Off-Line Storage

The two proposed underground surcharge storage tanks on Wyandotte Street East, west of Little River have capacities of 8,000 m^3 and 3,000 m^3 and surface areas of 5,400 m^2 and 1,400 m^2, respectively, and depths of about 3 m. The locations of the storage tanks are shown on Figure 17.

5.18.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in previously boreholes advanced in the general vicinity of the proposed underground surcharge storage tanks encountered native soils generally consisting of silty clay, below surficial organic soils (topsoil) and fill (where present). The available boreholes advanced within the area were dry upon completion of drilling.

5.18.2 Discussion on Geotechnical Aspects of Functional Design

It understood that the storage tanks planned for Wyandotte Street East will extend to a depth of approximately 3 m. The bearing resistance/reaction for the tanks will be dependant on the soil conditions present at the tank locations. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed tanks will probably encounter stiff to very stiff grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage chambers.

All excavations for the storage tanks should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.18.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the underground surcharge storage tanks. Geotechnical explorations for underground storage chamber in should consist of at least 2 soil borings advanced within each of the tank footprints, extending a minimum of 3 m below the tank base elevation.

5.19 Roseville Garden Drive and Hawthorne Avenue/Kew Drive Underground Stormwater Detention System

The proposed Roseville Garden Drive and Hawthorn Avenue/Kew Drive underground surcharge storage will consist of a 28,000 m^3 tank. The tank will have a footprint of 21,850 m^2 and depth of 5 m and open bottomed storage chambers to permit infiltration. The location of the storage tank is shown on Figure 18.

5.19.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the proposed underground surcharge storage tank encountered native soils generally consisting of silty clay, below surficial organic soils (topsoil) and fill (where present). The available boreholes advanced within the area were dry upon completion of drilling.

5.19.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the storage chamber planned for Roseville Garden Drive and Hawthorn Avenue/Kew Drive will extend to a depth of approximately 5 m. The bearing resistance/reaction for the chamber will be dependant on the soil conditions present at the chamber location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed chamber will probably encounter stiff to very stiff grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage chambers. Based on the anticipated cohesive nature of the soils at and below the tank/chamber base elevation, infiltration rates would be very low.

All excavations for the storage chamber should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.19.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the underground surcharge storage tank. Geotechnical explorations for underground storage chamber in should consist of at least 6 soil borings advanced within the chamber footprint, extending a minimum of 3 m below the chamber base elevation.

5.20 Ypres Avenue Underground Stormwater Storage System

The proposed Ypres Avenue underground surcharge storage system will have a storage capacity of 3,000 m^3 under the existing Optimist Memorial Park parking lot. The proposed storage system will have a footprint of 3,360 m^2 and a depth of about 3 m. The storage system location is shown on Figure 19.

5.20.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the proposed underground surcharge storage tank encountered native soils generally consisting of silty clay, with occasional sand layers, below surficial organic soils (topsoil) and fill (where present). In general, boreholes advanced in the area were dry upon completion of drilling; however, in two boreholes, groundwater seepage into the boreholes was encountered to depths of 2.3 m and 4 m below ground surface upon completion of drilling. Many of the boreholes advanced within the area encountered groundwater seepage. Where encountered, water levels recorded in boreholes upon completion of drilling and in installed monitoring wells ranged between about 0.3 m and 0.6 m below ground surface (see Record of Borehole sheets for details).

5.20.2 Discussion on Geotechnical Aspects of Functional Design

It understood that the storage chambers planned in the Optimist Memorial Park parking lot will extend to a depth of approximately 3 m. The bearing resistance/reaction for the tank/chambers will be dependant on the soil conditions present at chamber location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the excavations for the foundations or base for the proposed tank/chambers will probably encounter very stiff to hard brown silty. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage chambers. Based on the anticipated cohesive nature of the soils at and below the tank/chamber base elevation, infiltration rates would be very low.

All excavations for the storage system should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to hard silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.20.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing

program should be carried out for the underground stormwater storage chamber. Geotechnical explorations for the underground storage chamber should consist of at least 3 soil borings advanced within the chamber footprint, extending a minimum of 3 m below the chamber base elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.

5.21 Prince Road Outlet at Chappelle/Sandwich Street

The proposed Prince Road outlet at Chappelle/Sandwich Street will consist of approximately 200 m of new storm sewer including the construction of a new outfall pipe to McKee Creek. The proposed outfall at McKee Creek will consist of a 2,700-mm diameter pipe, having a hydraulic invert elevation of 172.1 m and a ground elevation of 176.6 m at the river. The Detroit River 100-year high water level elevation is 176.15 m. The location of the outfall and adjoining sewer are shown on Figure 20.

5.21.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in previously boreholes advanced in the general vicinity of the outfall encountered native soils generally consisting of silty clay/clayey silt below surficial sand, organic soils (topsoil) and fill (where present). One borehole encountered seepage at a depth of about 1.5 m (see Record of Borehole sheets). The remaining boreholes in the area were observed to be dry upon completion of drilling.

5.21.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 4.5 m below existing ground elevation at the outfall location and about 4.1 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby boreholes, the outfall is expected to be located within underlying native silty clay/clayey silt, however, due to previous experiences with projects located on the Detroit Riverfront it is expected that fill from previous site uses will be encountered overlying the native silty clay. Any existing uncontrolled fill is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall.

If fill is present at the outfall founding elevation, consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level into underlying silty clay soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick if present in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. The native silty clay encountered in the boreholes in the project vicinity are considered to be an acceptable founding medium to support the outfall pipe or associated headwall. Any excavations for the outfall at the river and extending below the river level would require a cofferdam structure to reach the design invert elevations. Further geotechnical exploration will be required to evaluate the thickness of fill in the area, depth to competent native soil for steel sheeting or deep foundations.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay/clayey and loose to compact sand encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can

change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. However, water inflows due to perched groundwater or within surficial sands overlying the less permeable cohesive materials should be expected. Inflows from sand layers hydraulically connected to the river should be expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.21.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Prince Road McKee Creek outfall. Geotechnical explorations for the outfall should consist of at least 2 soil borings advanced along the outfall alignment (west of Russel Street), extending a minimum of 5 m into the underlying native soils.

5.22 Earth Berm Along Riverside Drive Between Ford Boulevard and East City Limits

The proposed landform barrier along Riverside Drive would extend between Ford Boulevard and the east City limits. The objective of constructing the landform barrier is to reduce the potential for inland flooding due to coastal high water levels. The preferred solution is to construct the landform barrier crest to elevation 176.5 m. Existing property grading that meets or exceeds the target elevation were utilized to limit the required berm construction. Areas not meeting the target elevation will require new landform barriers to be constructed and localized improvements/grade alterations for areas of trail and road crossings. The general areas along Riverside Drive between Ford Boulevard and the east City limits are shown on Figures 21A to 21D.

5.22.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of either glaciolacustrine silty clay or modern beach deposits consisting of sand, gravel and cobbles present north of Riverside Drive. In the area shown on Figure 21A, some of the glaciolacustrine silty clay deposits are indicated by geological mapping to be overlain by thin discontinuous sand and gravel deposits.

The subsurface soils encountered in previously boreholes advanced along the proposed land barrier length generally encountered native soils consisting of silty clay underlying organic soils (topsoil) and fill (where present). In some areas of Riverside Drive, sand to silty sand of varying thickness was encountered over the silty clay.

5.22.2 Discussion on Geotechnical Aspects of Functional Design

The proposed landform barrier is intended to use the existing Ganatchio trail and landform features meeting the target elevation to reduce the potential for inland flooding. The landform barrier being proposed will fill in gaps to create a nearly continuous barrier along the project length. In constructing the new landform barrier, existing topsoil and deleterious fill materials should be removed prior to soil placement for the embankment construction.

To optimize containment of water on the river side of the barrier, the new landform barrier should be constructed of silty clay/clayey silt free of organics. Where underlying silty clay material is present, the embankment soils should be keyed into the underlying materials. In areas where significant thicknesses of underlying sand are present, this approach may not be practical due to required depth of excavation to reach underlying silty clay. The landform barrier could also be constructed with other materials such as sand or granular fill; however, in this case, seepage through the barrier should be expected if it is containing flood waters on one side. More seepage should be expected the more permeable the landform barrier material is. During placement, the materials for the landform barrier should be placed in maximum loose lift thicknesses of 300 mm and uniformly compacted to at least 98 per cent standard Prcotor maximum dry density.

5.22.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the landform barrier. Geotechnical explorations should consist of relatively shallow boreholes approximately 1.5 m deep and spaced along the berm length to explore existing fill and topsoil thicknesses, and the presence of underlying native sand or silty clay.

5.23 Low Impact Development Measures

It is understood that low impact development (LID) measures such as exfiltration trenches are being considered for various project locations. The suitability of the soils at the various site locations to provide drainage for exfiltration trenches is dependent on several soil properties, including the soil gradation, density, clay percentage, mineralogy of clay portion, plasticity characteristics of the soil and orgainic content. For functional design purposes, the following table provides approximate coefficients of permeability and percolocation time ranges for the typical soils encountered at the project locations.

Table 1: Approximate Relationship of Permeability and Percolation Time by Soil Type[1]

Soil Type (Unified Soil Classification System)	Coefficient of Permeability, K – cm/sec	Percolation Time, T – mins/cm
SW – Well graded sands, gravelly sands little or no fines	10^{-1} – 10^{-4}	2-12
SP – Poorly graded sands, gravelly sand, little or no fines	10^{-1} – 10^{-3}	2-8
SM - Silty sands, sand-silt mixtures	10^{-3} – 10^{-5}	8-20
ML – Inorganic silts and very fine sands, rock flour, silty or clayey fine snads, clayey silts with slight plasticity	10^{-5} – 10^{-6}	20-50
CL – Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	10^{-6} and less	Over 50

The predominantly silty clay soils encountered at the project locations will have very low permeabilities. Where encountered, sands will have a relatively medium permeability, with silty sands having a medium to low permeability and may be suitable depending on the required exfiltration rates. The suitability of soils for exfiltration trenches will need to be evaluated on a site-by-site basis.

Geotechnical involvement is required to evaluate the actual permeability of the soils present at each site and at the proposed depth of the LIDs during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out to evaluate the permeability of the soils. Methods to evaluate soil permeability can include grain size analyses and Atterberg limits tests on samples of the site soils, laboratory permeability of a relatively undisturbed samples (Shelby tube samples) of the soil, or in situ percolation or permeability testing. In situ testing is recommended.

5.24 Environmental Contamination Considerations

Ontario Regulation (O.Reg.) 406/19 (which comes into effect January 1, 2021), will govern the management of excess soils that are anticipated to be generated during construction activities associated with the above-

[1] From 2012 Ontario Building Code Compendium, Volume 2, SB-6.

discussed projects. Specifically, O.Reg. 406/19 imposes new requirements on both generators and receivers of excess soil, outlines a defined process for assessing excess soil, and provides new standards for the assessment of excess soil quality *(including specific considerations for the management of excess soils and sediments from stormwater ponds).*

Central to O.Reg. 406/19, and the accompanying "Soil Rules", are prescribed planning and reporting requirements. Although many types of projects are exempt from certain regulatory requirements, proper characterization and documentation is still recommended, and in many cases, are ultimately required by O.Reg. 406/19. The sampling requirements (frequency and analytical parameters) and reporting requirements for the above-noted project sites will ultimately depend on a number of factors, including (but not necessarily limited to) the volume of excess soil (or sediment) to be removed from the site, the specific requirements of the intended receiver of the soil (the "Re-Use Site"), and on the results of the initial site characterization activities.

Understanding of Site Conditions

During the construction of the above-discussed projects, there is the possibility of encountering contaminants as a result of historical site use or placement of fill materials on the sites. Specific contaminants of concern may be identified through understanding the origin(s) of the fill (or sediment) material in consideration, and historical operations on and near the site where the fill was placed (or sediment has accumulated) (i.e., through completion of "Phase I Environmental Site Assessment" or "Assessment of Past Uses").

With respect to the above-discussed projects, we understand that there is a potential for these project sites to be situated near existing railways and/or in locations where foundry sand fill is likely to be encountered during constuction.

Typical contaminants of concern associated with general **rail activity** (rail corridors) include heavy metals and polycyclic aromatic hydrocarbons (PAHs) associated with rail ballast, as well as petroleum hydrocarbons associated with the use of diesel fuel. Additional contaminants of concern for areas where engine or rail car maintenance has been carried out include volatile organic compounds (VOCs) (i.e., related to solvent use).

Contaminants of concern associated with **foundry sand** vary, depending on the source of the foundry sand. Typical contaminants of concern for foundry sand include heavy metals and petroleum hydrocarbons. Where foundry sand has been re-used as fill material, and mixed in with other fill materials, there is also the potential for other contaminants (associated with general industrial activities at the originating property) to be present (e.g., VOCs, PAHs).

With respect to **storm water managment (SWM) ponds**, O.Reg. 406/19 sets out minimum sampling and analysis requirements based on the likelihood for various contaminants to be present (petroleum hydrocarbons, PAHs, metals and other inorganics). Due to the physical properties of SWM pond sediment (primarily high-water content silts and clays, potentially with significant organic content), beneficial reuse opportunities may be limited even if the material meets the applicable soil quality standards. O.Reg. 406/19, and the accompanying Soil Rules, outline specific requirements relating to dewatering or solidifying liquid soils (i.e., including, but not limited to, sediment).

6.0 CLOSURE

As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out to address design aspects relating to each of the proposed structures discussed in this report. Following the completion of the exploration and testing program, the comments provided in this report may be revised based on the new information.

The factual data, interpretation and recommendations presented in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation, or if the project is not initiated within eighteen months of the date of the report, Golder Associates Ltd. should be given an opportunity to confirm that the recommendations are still valid. The subject geotechnical assessment and this report address only the geotechnical aspects of the proposed project. Potential environmental impacts or related issues are beyond the defined scope of the work and have not been addressed.

We trust that this report provides the preliminary geotechnical information currently required. Should any point require further clarification, please contact this office.

Signature Page

Golder Associates Ltd.

Peter Giuliani, P.Eng.
Senior Geotechnical Engineer

Mark A. Swallow, P.E., P.Eng.
Principal and Senior Practice Leader

PG/MAS/vf

https://golderassociates.sharepoint.com/sites/122185/project files/6 deliverables/rev0/20138323-r01-rev0 aug 7 2020 (final) geo review dillon cow master sewer plan.docx

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

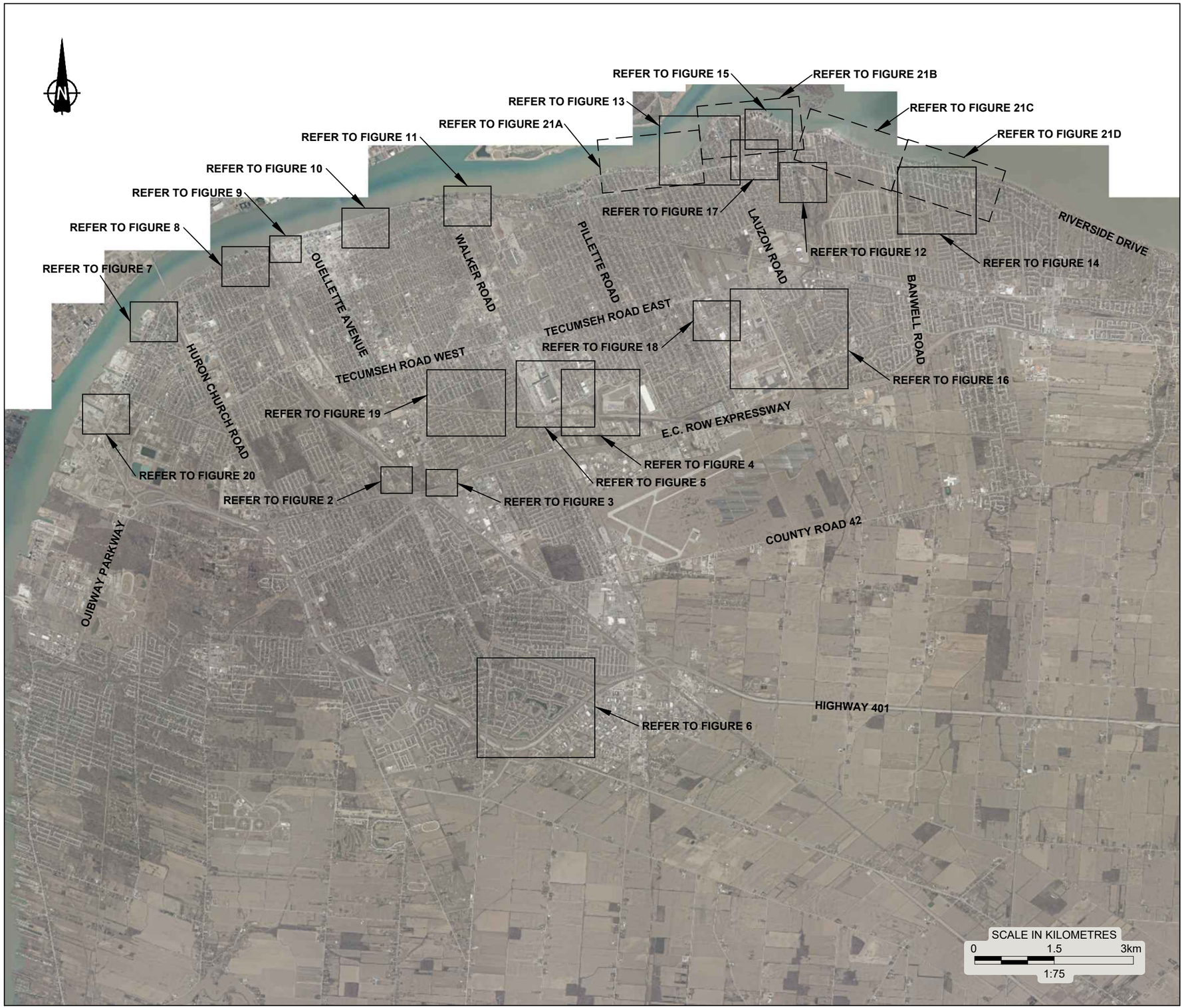
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION; AND
DATA PROVIDED BY DILLON CONSULTING.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
LOCATION PLAN

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01001
			SCALE AS SHOWN	REV.
CADD	ZJB	May 19/20		
CHECK				

FIGURE 1

LEGEND

PROPOSED SURCHARGE STORAGE POND OUTLINE

BOREHOLE PREVIOUS GOLDER REPORT:

- 1668632-R01
- 1546452-R01
- 011-4226

QUATERNARY GEOLOGY

(3) Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

DOUGALL UNDERPASS NEW SURCHARGE SURFACE STORAGE POND

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE	AS SHOWN
CADD	ZJB	Mar 23/20	REV.	
CHECK	PH			

FIGURE 2

LEGEND

PROPOSED SURCHARGE STORAGE POND OUTLINE

BOREHOLE PREVIOUS GOLDER REPORT:

021-4035

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

HOWARD AT E.C. ROW NEW SURCHARGE SURFACE STORAGE POND

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE	AS SHOWN
CADD	ZJB	Mar 23/20	REV.	
CHECK				

FIGURE 3

LEGEND

PROPOSED SURCHARGE STORAGE POND OUTLINE

EXISTING STORM RETENTION POND

BOREHOLE PREVIOUS GOLDER REPORT:

- 09-1140-W011
- 06-1140-142
- 1405768
- 791-4012

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

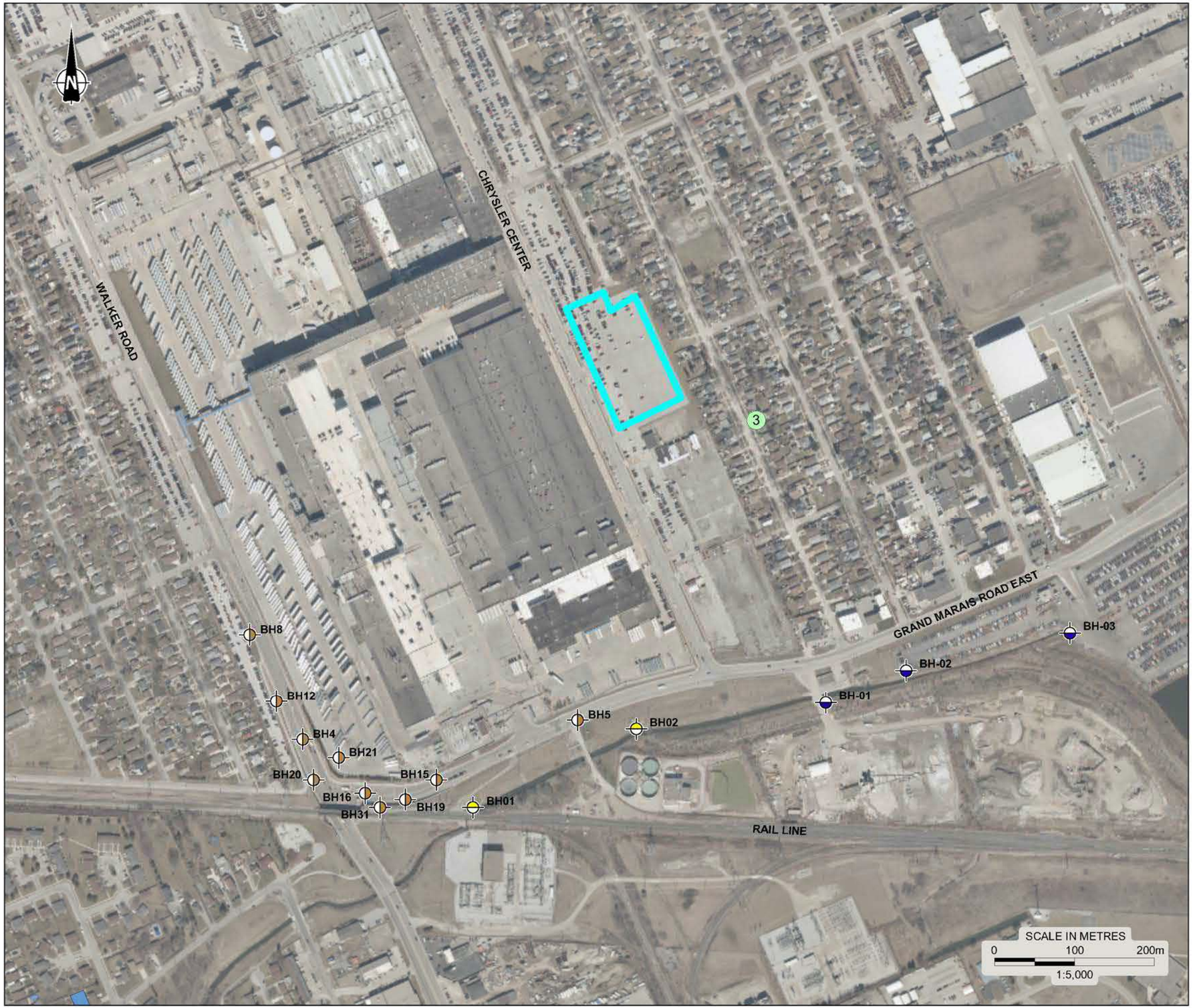
CENTRAL AVENUE, PILLETTE ROAD EXPANDED CENTRAL POND

GOLDER

PROJECT No.	20138323	FILE No.	20138323-R01002
		SCALE	AS SHOWN
CADD	ZJB	Mar 23/20	REV.
CHECK	P.H.		

FIGURE 4

Client: Dillon Consulting
Original Format is Tabloid 279mm x 432mm
0 25mm
Mar 23, 2020 - 10:52am
Drawing file: 20138323-R01002.dwg



LEGEND

PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:

- 09-1140-W011-R01
- 08-1140-W028-R01
- 041-140048

QUATERNARY GEOLOGY

(3) Glaciolacustrine Silty Clay

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

CHRYSLER CENTER NEW UNDERGROUND SURCHARGE STORAGE

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE AS SHOWN	REV.
CADD	Z.B	Apr 2/20		
CHECK	P.H.			

FIGURE 5

Client: Dillon Consulting

Original Format is Tabloid 279mm x 432mm

25mm 0

Apr 02, 2020 - 11:19am

Drawing file: 20138323-R01002.dwg

LEGEND

PROPOSED SURCHARGE STORAGE POND OUTLINE

EXISTING STORM RETENTION POND

WATER WELL AS LISTED IN MECP RECORDS

BOREHOLE PREVIOUS GOLDER REPORT:

13-1140-0207-R01

09-1140-W037-R01

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND
DATA PROVIDED BY DILLON CONSULTING; AND
WATER WELLS AS LISTED IN MECP RECORDS AS OF DECEMBER 2019.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

SOUTHWOOD LAKES LOWERED NORMAL WATER LEVEL IN EXISTING PONDS

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE	AS SHOWN
CADD	Z.B	Mar 25/20	REV.	
CHECK	P.H.			

FIGURE 6

LEGEND

PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:

1660023-3000-R01

1520407-2000-R03

11-1140-0200-R01

TEST PIT PREVIOUS GOLDER REPORT:

031-145072

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

DETROIT STREET TRUNK SEWER UPGRADE

GOLDER

PROJECT No.			20138323	FILE No.	20138323–R01002
				SCALE	AS SHOWN REV.
CADD	ZJB	Mar 25/20			
CHECK	PH			FIGURE 7	

Client: Dillon Consulting

Original Format is Tabloid 279mm x 432mm

0 25mm

Mar 25, 2020 – 3:01pm

Drawing file: 20138323–R01002.dwg

LEGEND

PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:

13-1140-0188-R01

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

CAMERON AVENUE TRUNK SEWER UPGRADE

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE AS SHOWN	REV.
CADD	ZJB	Mar 23/20		
CHECK	P.H.			

FIGURE 8

LEGEND

PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:

13-1140-0188-R01

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

BRUCE AVENUE TRUNK SEWER

GOLDER

PROJECT No.			20138323	FILE No. 20138323-R01002
				SCALE AS SHOWN REV.
CADD	Z.B	Mar 23/20		
CHECK	P.H.			FIGURE 9

Client: Dillon Consulting

Original Format is Tabloid 279mm x 432mm

25mm 0

Mar 23, 2020 – 2:04pm

Drawing file: 20138323-R01002.dwg

LEGEND

PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:

10-1140-0090-1000-L02

001-4009

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

MARENTETTE AVENUE TRUNK SEWER

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE	AS SHOWN
CADD	ZJB	Mar 23/20	REV.	
CHECK	P.H.			

FIGURE 10

LEGEND

- PROPOSED NEW OR UPGRADED STORM SEWER
- PROPOSED NEW STORM SEWER OUTFALL
- DROUILLARD UNDERPASS PUMP STATION

BOREHOLE PREVIOUS GOLDER REPORT:

- 08-1132-033-0-R01
- 06-1140-006
- 011-4205
- 011-4136

QUATERNARY GEOLOGY

- (3) Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
ALBERT ROAD TRUNK SEWER AND DROUILLARD UNDERPASS PUMP STATION

GOLDER

PROJECT No.			20138323	FILE No. 20138323–R01002
				SCALE AS SHOWN REV.
CADD	ZJB	May 29/20		
CHECK	PH			**FIGURE 11**

Client: Dillon Consulting
Original Format is Tabloid 279mm x 432mm
25mm 0
May 29, 2020 – 3:31pm
Drawing file: 20138323–R01002.dwg

LEGEND

- PONTIAC PUMP STATION

BOREHOLE PREVIOUS GOLDER REPORT:

- 09-1140-W091B
- 031-140318
- 031-140333

QUATERNARY GEOLOGY

- 3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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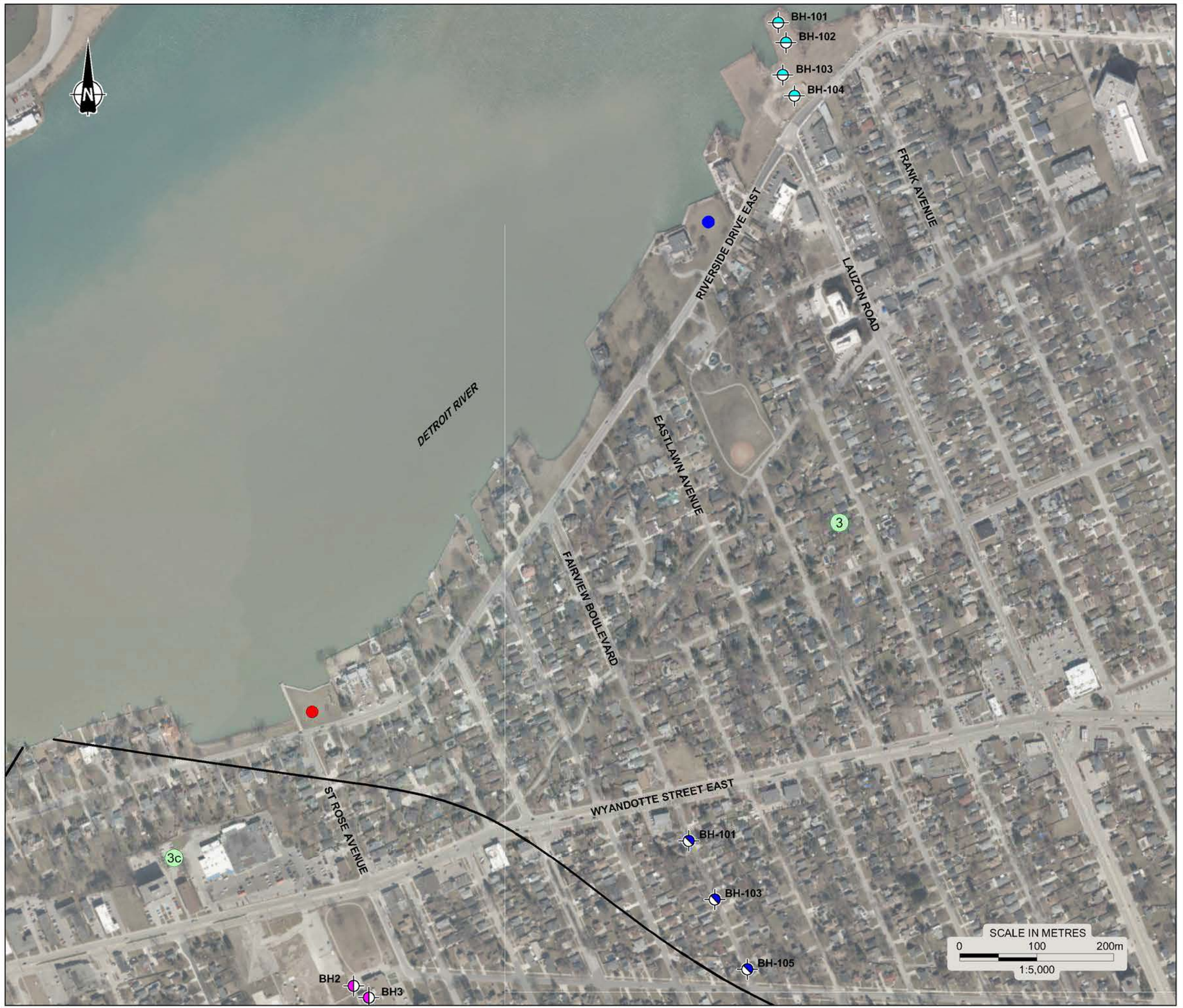
ALL LOCATIONS ARE APPROXIMATE.

PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
PONTIAC PUMP STATION

GOLDER

PROJECT No.			20138323	FILE No. 20138323-R01002
				SCALE AS SHOWN REV.
CADD	ZJB	Aug 6/20		**FIGURE 12**
CHECK	PH			



LEGEND

- ST. ROSE PUMP STATION
- ST. PAUL PUMP STATION

BOREHOLE PREVIOUS GOLDER REPORT:

- 1400977-R01
- 13-1140-0026-R01
- 011-4128

QUATERNARY GEOLOGY

(3) Glaciolacustrine Silty Clay:
3c. Glaciolacustrine: silty clay deposits overlain by thin, discontinuous sand and gravel deposits

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
ST. ROSE AND ST. PAUL PUMP STATIONS

GOLDER

PROJECT No.			20138323	FILE No. 20138323-R01002
				SCALE AS SHOWN REV.
CADD	ZJB	Apr 2/20		
CHECK	PH			**FIGURE 13**

Client: Dillon Consulting
Original Format is Tabloid 279mm x 432mm
0 25mm
Apr 02, 2020 – 11:22am
Drawing file: 20138323-R01002.dwg

LEGEND

- LAKEVIEW PUMP STATION
- PROPOSED NEW OR UPGRADED STORM SEWER
- EXISTING STORM RETENTION POND

BOREHOLE PREVIOUS GOLDER REPORT:

- 1405019-R01

QUATERNARY GEOLOGY

- (3) Glaciolacustrine Silty Clay
- (7) Modern Beach Deposits: sand, gravel and cobbles

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

LAKEVIEW PUMPING STATION CAPACITY INCREASE

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE	AS SHOWN
CADD	ZJB	Apr 2/20	REV.	
CHECK	PH			

FIGURE 14

LEGEND

PROPOSED UNDERGROUND STORMWATER MANAGEMENT FACILITY

BOREHOLE PREVIOUS GOLDER REPORT:

- 13-1140-0031-R01
- 001-4014

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
BRUMPTON PARK UNDERGROUND STORMWATER MANAGEMENT FACILITY

GOLDER

PROJECT No.		20138323	FILE No.	20138323–R01002
			SCALE AS SHOWN	REV.
CADD	ZJB	Aug 6/20		
CHECK	PH		**FIGURE 15**	

Client: Dillon Consulting
Original Format is Tabloid 279mm x 432mm
25mm 0
Aug 06, 2020 – 2:41pm
Drawing file: 20138323–R01002.dwg

LEGEND

PROPOSED SURCHARGE STORAGE POND OUTLINE

PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:

031-140094

001-4238

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

HAWTHORNE AVENUE, LAUZON PARKWAY, JEFFERSON BOULEVARD OFFLINE STORAGE VOLUMES/IMPROVEMENTS

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE AS SHOWN	REV.
CADD	ZJB	Apr 2/20		
CHECK	PH			

FIGURE 16

LEGEND

PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:

- 1406552-R01
- 13-1140-0031-R01
- 011-4276

QUATERNARY GEOLOGY

(3) Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

WYANDOTTE STREET EAST, WEST OF LITTLE RIVER, OFFLINE STORAGE

GOLDER

PROJECT No.		20138323	FILE No.	20138323-R01002
			SCALE	AS SHOWN
CADD	ZJB	Apr 2/20	REV.	
CHECK	P.H.			

FIGURE 17

LEGEND

PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:

1527635-1000-R01

06-1140-020

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

ROSEVILLE GARDEN DRIVE AND HAWTHORNE AVENUE/KEW DRIVE UNDERGROUND STORMWATER DETENTION SYSTEM

GOLDER

PROJECT No.		20138323	FILE No. 20138323-R01002
			SCALE AS SHOWN REV.
CADD	ZJB	Apr 2/20	
CHECK	P.H.		**FIGURE 18**

Client: Dillon Consulting

Original Format is Tabloid 279mm x 432mm

0 25mm

Apr 02, 2020 - 11:24am

Drawing file: 20138323-R01002.dwg

LEGEND

PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:

- 08-1140-W054
- 07-1140-0022
- 031-140060

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

YPRES AVENUE UNDERGROUND STORMWATER STORAGE SYSTEM

GOLDER

PROJECT No.		20138323	FILE No.	20138323–R01002
			SCALE	AS SHOWN REV.
CADD	ZJB	May 19/20		
CHECK				

FIGURE 19

Client: Dillon Consulting
Original Format is Tabloid 279mm x 432mm
25mm 0
Drawing file: 20138323–R01002.dwg May 25, 2020 – 11:34am

LEGEND

PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:

09-1140-W025-R01

764111

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay:
3c. Glaciolacustrine: silty clay deposits overlain by thin, discontinuous sand and gravel deposits

5 Lacustrine Beach, Bar and near shore deposits:
sand with minor gravel

10 Cultural Features: quarries, landfills, mine waste, aggregate excavations and sewage lagoons

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND
DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE

PRINCE ROAD OUTLET AT CHAPPELLE/SANDWICH STREET

GOLDER

PROJECT No.			20138323	FILE No. 20138323–R01002
				SCALE AS SHOWN REV.
CADD	ZJB	May 19/20		
CHECK	PH			**FIGURE 20**

LEGEND

- ST. ROSE PUMP STATION
- PROPOSED BERM ALIGNMENT

BOREHOLE PREVIOUS GOLDER REPORT:

- 07-1140-0098
- 011-4128
- 71509

QUATERNARY GEOLOGY

(3) Glaciolacustrine Silty Clay:
3c. Glaciolacustrine: silty clay deposits overlain by thin, discontinuous sand and gravel deposits

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
PROPOSED EARTH BERM ALONG RIVERSIDE DRIVE (FORD BOULEVARD TO EAST CITY LIMITS) (1 OF 4)

GOLDER

PROJECT No.			20138323	FILE No. 20138323-R01021
				SCALE AS SHOWN REV.
CADD	ZJB	May 25/20		
CHECK	PH			FIGURE 21A

Client: Dillon Consulting

Original Format is Tabloid 279mm x 432mm

0 25mm

Aug 06, 2020 – 2:42pm

Drawing file: 20138323-R01021.dwg

LEGEND

- ST. PAUL PUMP STATION
- PROPOSED UNDERGROUND STORMWATER MANAGEMENT FACILITY
- PROPOSED BERM ALIGNMENT

BOREHOLE PREVIOUS GOLDER REPORT:

- 1400977-R01
- 13-1140-0031-R01
- 001-4014

QUATERNARY GEOLOGY

- 3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
PROPOSED EARTH BERM ALONG RIVERSIDE DRIVE (FORD BOULEVARD TO EAST CITY LIMITS) (2 OF 4)

GOLDER

PROJECT No.	20138323	FILE No.	20138323-R01021
		SCALE	AS SHOWN
CADD	ZJB	Aug 6/20	REV.
CHECK			

FIGURE 21B

LEGEND

PROPOSED BERM ALIGNMENT

BOREHOLE PREVIOUS GOLDER REPORT:

- 09-1140-W028-R01
- 07-1140-0027
- 001-4247
- 001-4067

QUATERNARY GEOLOGY

(3) Glaciolacustrine Silty Clay

(7) Modern Beach Deposits: sand, gravel and cobbles

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

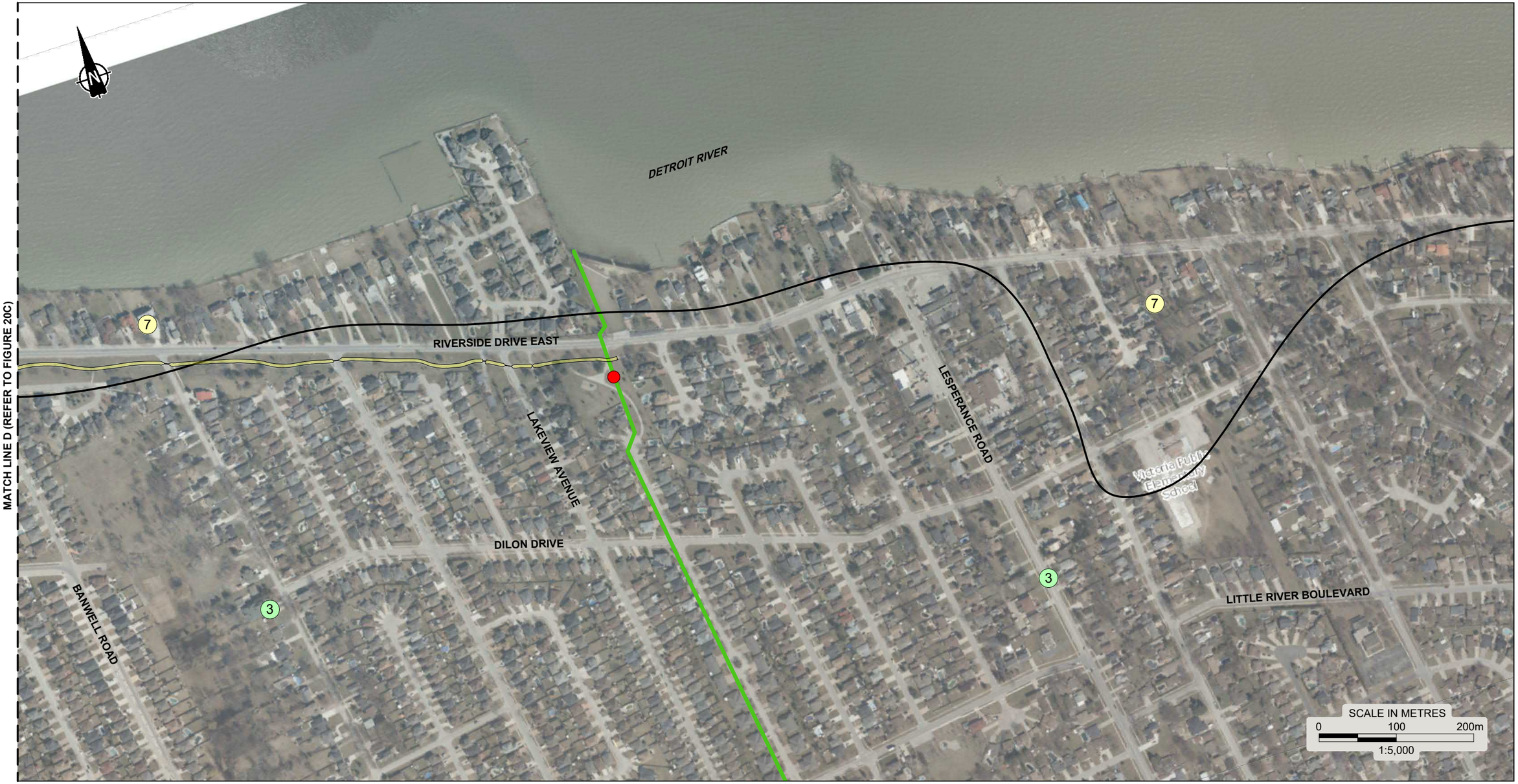
PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
PROPOSED EARTH BERM ALONG RIVERSIDE DRIVE (FORD BOULEVARD TO EAST CITY LIMITS) (3 OF 4)

GOLDER

PROJECT No.			20138323	FILE No.	20138323-R01021
				SCALE	AS SHOWN
CADD	ZJB	May 25/20		REV.	
CHECK	P.H.				

FIGURE 21C



LEGEND

- EXISTING PUMP STATION
- PROPOSED NEW OR UPGRADED STORM SEWER
- PROPOSED BERM ALIGNMENT

QUATERNARY GEOLOGY

- (3) Glaciolacustrine Silty Clay
- (7) Modern Beach Deposits: sand, gravel and cobbles

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT
GEOTECHNICAL REVIEW OF SELECTED SITES
CITY OF WINDSOR SEWER MASTER PLAN
WINDSOR, ONTARIO

TITLE
PROPOSED EARTH BERM ALONG RIVERSIDE DRIVE (FORD BOULEVARD TO EAST CITY LIMITS) (4 OF 4)

GOLDER

PROJECT No.			20138323	FILE No. 20138323-R01021
				SCALE AS SHOWN REV.
CADD	ZJB	May 25/20		
CHECK	P.H.			**FIGURE 21D**

APPENDIX A

Previous Records of Boreholes and Test Pits by Golder Associates Ltd.

Form G.A. - D - 1

Project No 71509

RECORD OF BOREHOLE 1

LOCATION See Figure 1 BORING DATE FEB. 5, 1971 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD: POWER AUGER 4.5" DIA. (UNCASED)

ELEV'N / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS/FT.
578.3 / 0	GROUND LEVEL				
	ASPHALT PAVEMENT				
576.8 / 1.5	SAND AND GRAVEL (FILL)				
	VERY STIFF BROWN SILTY CLAY (FILL)		1	2" DO.	18
573.8 / 4.5	FIRM BLACK CLAYEY SILT WITH ORGANICS		2	"	7
571.3 / 7.0	HARD BROWN SILTY CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)		3	"	30
			4	"	49
			5	"	37
564.3 / 14.0	FIRM TO VERY STIFF GREY SILTY CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)		6	"	25
			7	"	11
			8	3" T.O.	Ph
			9	2" DO.	6
545.8 / 32.5	END OF HOLE				

ELEVATION SCALE: 580, 575, 570, 565, 560, 555, 550, 545

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. 20 40 60 80

SHEAR STRENGTH Cu., LB./SQ.FT. NAT. V. - + Q. - ● REM. V. - ⊕ U. - O
500 1000 1500 2000

COEFFICIENT OF PERMEABILITY, K., CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT Wp W WL
10 20 30 40

ADDITIONAL LAB. TESTING: MH; MH; MH - CONS - U

PIEZOMETER OR STANDPIPE INSTALLATION: WATER LEVEL IN OPEN BOREHOLE AT ELEV. 577.8 FEB 19, 1971

(Golder Report No. 71509)

"Note: This Drawing has been Reduced and is in Imperial Units"

15 0 5 10 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN V. J. K.

CHECKED RB

Form G.A. - D - 1

Project No 71509

RECORD OF BOREHOLE 2

LOCATION See Figure 1 BORING DATE FEB. 5, 1971 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD: POWER AUGER 4.5" DIA. (UNCASED)

ELEV'N / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS/FT.
578.6 / 0.0	TOPSOIL / GROUND LEVEL				
578.4 / 0.2	FIRM TO STIFF BROWN SILTY CLAY, TRACE RUBBLE (FILL)		1	2" D.O.	12
			2	"	4
572.6 / 6.0	FIRM BLACK CLAYEY SILT WITH WOOD PIECES & ORGANICS		3	"	4
569.6 / 9.0	FIRM GREY SILTY CLAY (TILL-LIKE)		4	"	5
567.6 / 11.0	HARD BROWN SILTY CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)		5	"	51
			6	"	58
561.6 / 17.0	FIRM TO STIFF GREY SILTY CLAY, SOME SAND, OCC. GRAVEL (TILL-LIKE)		7	"	9
			8	"	7
			9	"	4
546.1 / 32.5	END OF HOLE				

ELEVATION SCALE: 580, 575, 570, 565, 560, 555, 550, 545

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. (20, 40, 60, 80)

SHEAR STRENGTH Cu., LB./SQ.FT. (500, 1000, 1500, 2000) NAT. V. - + C. - ● REM. V. - ⊕ U. - O

COEFFICIENT OF PERMEABILITY, K., CM./SEC. (1x10, 1x10, 1x10, 1x10)

WATER CONTENT, PERCENT (Wp, W, WL) (10, 20, 30, 40)

ADDITIONAL LAB. TESTING

(Golder Report No. 71509)

"Note: This Drawing has been Reduced and is in Imperial Units"

145%

MH

0
15 ◆ 5 Percent axial strain at failure
10

PIEZOMETER OR STANDPIPE INSTALLATION

PROTECTIVE PIPE & CAP
GROUND SURFACE
SURFACE SEAL
PLASTIC TUBING
CLAY BACKFILL
GRAVEL BACKFILL
STANDPIPE

WATER LEVEL IN STANDPIPE AT ELEV. 574.1 FEB. 26, 1971

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN V.J.K.
CHECKED PB

Form G.A. - D - 1

Project No 71509

RECORD OF BOREHOLE 3

LOCATION See Figure 1 BORING DATE FEB. 8, 1971 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD: POWER AUGER 4.5" DIA. (UNCASED)

ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/FT.
575.8 0.0	TOPSOIL GROUND LEVEL				
0.3	FIRM TO STIFF BROWN SILTY CLAY (FILL)		1	2" Dia	13
			2	"	5
572.3 6.5	FIRM BLACK CLAYEY SILT WITH ORGANICS		3	"	6
568.8 10.0	FIRM GREY SILTY CLAY (TILL-LIKE)		4	"	6
564.8 12.0	HARD BROWN SILTY CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)		5	"	27
			6	"	71
560.8 18.0	FIRM TO STIFF GREY SILTY CLAY, SOME SAND, OCC. GRAVEL (TILL-LIKE)		7	"	11
			8	"	8
			9	"	6
			10	"	7
			11	"	7
			12	"	8
530.8 48.0	END OF HOLE				

ELEVATION SCALE: 580, 575, 570, 565, 560, 555, 550, 545, 540, 535, 530

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. 20 40 60 80

SHEAR STRENGTH Cu., LB./SQ.FT. NAT. V. - + Q. - ● REM. V. - ⊕ U. - ○ 500 1000 1500 2000

COEFFICIENT OF PERMEABILITY, K., CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT Wp W WL 10 20 30 40

81%

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

WATER LEVEL IN OPEN BOREHOLE AT ELEV. 575.8 FEB. 26, 1971

(Golder Report No. 71509)

"Note: This Drawing has been Reduced and is in Imperial Units"

0 / 15 5 / 10 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN V.J.K.

CHECKED PB

Form G.A. - D - 1

Project No 71509

RECORD OF BOREHOLE 4

LOCATION See Figure 1 BORING DATE FEB. 9, 1971 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD: POWER AUGER 4.5" DIA (UNCASED)

ELEV'N / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FT.
578.7	GROUND LEVEL				
0.4	TOPSOIL				
574.2	STIFF BROWN SILTY CLAY WITH RUBBLE (FILL)		1	2" DO	9
4.5	SOFT TO FIRM BLACK CLAYEY SILT WITH SAND, GRAVEL AND ORGANIC		2	"	3
569.7			3	"	3
9.0	FIRM GREY SILTY CLAY (TILL-LIKE)		4	"	8
567.7					
11.0	HARD BROWN SILTY CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)		5	"	43
560.7			6	"	55
18.0	FIRM TO STIFF GREY SILTY CLAY, SOME OCC. GRAVEL (TILL-LIKE)		7	"	14
			8	"	6
			9	"	7
546.2					
32.5	END OF HOLE				

ELEVATION SCALE: 580, 575, 570, 565, 560, 555, 550, 545

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. — 20, 40, 60, 80

SHEAR STRENGTH Cu., LB./SQ.FT. — NAT. V. - + Q. - ● REM. V. - ⊕ U. - O — 500, 1000, 1500, 2000

COEFFICIENT OF PERMEABILITY, K., CM./SEC. — 1x10, 1x10, 1x10, 1x10

WATER CONTENT, PERCENT — Wp, W, WL — 10, 20, 30, 40

104.9%

68.3%

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

WATER LEVEL IN OPEN BOREHOLE AT ELEV. 575.7 FEB. 26, 1971

(Golder Report No. 71509)

"Note: This Drawing has been Reduced and is in Imperial Units"

0 / 15 — 5 / 10 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN V.J.K.

CHECKED RB

Form G.A. - D - 1

Project No 71509

RECORD OF BOREHOLE 5

LOCATION See Figure 1 BORING DATE FEB. 9 & 10, 1971 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD	ELEV'N / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FT.	ELEVATION SCALE
POWER AUGER 4.5" DIA. (UNCASED)	578.5 / 0.0	GROUND LEVEL					580
	578.2 / 0.3	TOPSOIL					
	574.0 / 4.5	VERY STIFF BROWN SILTY CLAY (FILL)		1	2" D.O.	17	575
	570.0 / 8.5	VERY LOOSE TO COMPACT BROWN SAND (FILL)		2	"	21	
	568.5 / 10.0	VERY STIFF BLACK CLAYEY SILT		3	"	2	570
	567.5 / 11.0	VERY STIFF GREY SILTY CLAY (TILL-LIKE)		4	"	20	
	560.5 / 18.0	HARD BROWN SILTY CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)		5	"	49	565
				6	"	66	
				7	"	11	560
		FIRM TO STIFF GREY SILTY CLAY, SOME SAND OCC. GRAVEL (TILL-LIKE)		8	"	5	555
	547.5 / 31.0	END OF HOLE		9	"	7	550
							545

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. 20 40 60 80

SHEAR STRENGTH Cu., LB./SQ.FT. NAT. V. - + Q. -● REM. V. - ⊕ U. -○ 500 1000 1500 2000

COEFFICIENT OF PERMEABILITY, K., CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT Wp W WL 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

WATER LEVEL IN OPEN BOREHOLE AT ELEV.-574.5 FEB 26, 1971

(Golder Report No. 71509)

"Note: This Drawing has been Reduced and is in Imperial Units"

15 ◆ 0 5 10 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN V.J.K.

CHECKED

Form G.A. - D - 1

Project No 71509

RECORD OF BOREHOLE 6

LOCATION See Figure 1 BORING DATE FEB. 10, 1971 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD: POWER AUGER 4.5" DIA (UNCASED)

ELEV'N / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/FT.
578.3 0.0	GROUND LEVEL			
	TOPSOIL			
573.0 5.3	STIFF BROWN SILTY CLAY (FILL)	1	2" O.D.	11
		2	"	14
568.3 10.0	VERY LOOSE TO COMPACT BROWN SAND (FILL)	3	"	3
		4	"	23
	VERY STIFF TO HARD BROWN SILTY CLAY, OCC. GRAVEL (TILL-LIKE)	5	"	62
560.3 18.0		6	"	67
	FIRM TO VERY STIFF GREY SILTY CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)	7	"	9
		8	"	16
547.3 31.0	END OF HOLE	9	"	8

ELEVATION SCALE: 580, 575, 570, 565, 560, 555, 550, 545

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. (20, 40, 60, 80)

SHEAR STRENGTH Cu., LB./SQ.FT. NAT. V. - + Q. - ● REM. V. - ⊕ U. - ○

COEFFICIENT OF PERMEABILITY, K., CM./SEC. (1x10, 1x10, 1x10, 1x10)

WATER CONTENT, PERCENT (Wp, W, WL)

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

(Golder Report No. 71509)

"Note: This Drawing has been Reduced and is in Imperial Units"

WATER LEVEL IN OPEN BOREHOLE AT ELEV. 576.3 FEB. 19, 1971

BOREHOLE CAVED TO ELEV. - 576.3 FEB. 26, 1971

0 / 15 / 10 / 5 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN V. J. K.

CHECKED

Form G.A. - D - 1

Project No 71509

RECORD OF BOREHOLE 7

LOCATION See Figure 1 BORING DATE FEB. 15, 1971 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD: POWER AUGER 7.5" DIA. (HOLLOW STEM)

ELEV'N / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/FT.
577.0	TOPSOIL			
0.3	GROUND LEVEL			
	VERY STIFF BROWN SILTY CLAY (FILL)	1	2" O.D.	19
572.0				
5.0	COMPACT BROWN SAND (FILL)	2	"	14
568.5				
8.5	FIRM GREY SILTY CLAY (TILL-LIKE)	3	"	8
566.0				
11.0	HARD BROWN SILTY CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)	4	"	52
		5	"	34
560.5				
16.5		6	"	11
		7	2" TO	PH
	FIRM TO STIFF GREY SILTY CLAY, SOME SAND, OCC. GRAVEL (TILL-LIKE)	8	2" O.D.	4
		9	"	8
		10	"	6
		11	"	7
530.0				
47.0	FIRM GREY SILTY CLAY	12	"	6
528.0				
49.0	END OF HOLE			

ELEVATION SCALE: 575, 570, 565, 560, 555, 550, 545, 540, 535, 530

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. (20, 40, 60, 80)

SHEAR STRENGTH Cu., LB./SQ.FT. (500, 1000, 1500, 2000) NAT. V. - + Q. - ● REM. V. - ⊕ U. - O

COEFFICIENT OF PERMEABILITY, K., CM./SEC. (1x10, 1x10, 1x10, 1x10)

WATER CONTENT, PERCENT (Wp, W, WL) (10, 20, 30, 40)

MH

0 / 15 ◆ 5 / 10 Percent axial strain at failure

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

WATER LEVEL IN OPEN BOREHOLE AT ELEV. - 575.0 FEB 19, 1971

BOREHOLE CAVED TO ELEV. - 575.0 FEB 26, 1971

(Golder Report No. 71509)

"Note: This Drawing has been Reduced and is in Imperial Units"

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN V. J. K.

CHECKED RE

Form G.A.-D-1.

Project No. 764111

RECORD OF BOREHOLE 101

LOCATION See Figure 1 BORING DATE OCT. 5, 1976 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD: POWER AUGER 4.5" DIA. (UNCASED)

ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS/FT.
584.0 / 0.0	GROUND SURFACE				
	STIFF BLACK CLAYEY TOPSOIL		1	2" D.O.	20
580.5 / 3.5	STIFF TO VERY STIFF GREY TO BROWN SILTY CLAY TRACE SAND		2	"	6
			3	3" T.O. P.H.	
576.0 / 8.0	STIFF BECOMING FIRM TO STIFF GREY WITH RED FLECKS SILTY CLAY SOME SAND TRACE GRAVEL (TILL-LIKE)		4	2" D.O.	3
			5	"	3
564.5 / 19.5	END OF HOLE				

ELEVATION SCALE: 585, 580, 575, 570, 565, 560

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT.: 20 40 60 80

SHEAR STRENGTH Cu., LB./SQ.FT. NAT. V. - + Q. - ● REM.V. - ⊕ U. - ○: 500 1000 1500 2000

COEFFICIENT OF PERMEABILITY, k, CM./SEC.: 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT: W_P W W_L; 10 20 30 40

ADDITIONAL LAB. TESTING: 2560 +

(Golder Report No. 764111)

"Note: This Drawing has been Reduced and is in Imperial Units"

PIEZOMETER OR STANDPIPE INSTALLATION

GROUND SURFACE

CLAYEY BACKFILL

PLASTIC TUBING

GRANULAR MATERIAL

PERFORATED STANDPIPE

SIDES OF UNLINED BOREHOLE STABLE DURING DRILLING

BOREHOLE DRY ON COMPLETION OF DRILLING OCTOBER 5, 1977

STANDPIPE DESTROYED

15 ← 0 / 10 → 5 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN A.K.D.

CHECKED brm

Form G.A.-D-1

Project No. 764111

RECORD OF BOREHOLE 102

LOCATION See Figure 1 BORING DATE OCT. 6 & 7, 1976 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD: POWER AUGER 4.5" DIA. (UNCASED)

ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS/FT.	ELEVATION SCALE
591.0 / 0.0	GROUND SURFACE					
589.5 / 1.5	BLACK TOPSOIL		1	2" D.O.	14	590
586.0 / 5.0	COMPACT BROWN FINE TO MEDIUM GRAINED SAND TRACE SILT		2	"	21	
584.0 / 7.0	COMPACT BROWN SILTY SAND (A)		3	"	19	585
			4	"	5	
579.5 / 11.5	(A) FIRM TO STIFF GREY WITH SOME BROWN CLAYEY SILT, OCCASIONAL THIN SAND SEAMS		5	"	2	580
	FIRM GREY WITH RED FLECKS SILTY CLAY SOME SAND TRACE GRAVEL (TILL-LIKE)		6	3" T.O.	P.H.	575
			7	2" D.O.	W.H.	570
565.0 / 26.0			8	"	W.H.	565
	FIRM TO STIFF GREY WITH RED FLECKS SILTY CLAY SOME SAND TRACE GRAVEL (TILL-LIKE)		9	"	W.H.	560
			10	3" T.O.	P.H.	555
551.0 / 40.0	END OF HOLE					550

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT.: 20 40 60 80

SHEAR STRENGTH Cu., LB./SQ.FT. NAT. V.-+ Q.-● REM.V.-⊕ U.-○: 500 1000 1500 2000

COEFFICIENT OF PERMEABILITY, k, CM./SEC.: 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT (Wp, W, WL): 10 20 30 40

ADDITIONAL LAB. TESTING: M; MH; MH; MH

PIEZOMETER OR STANDPIPE INSTALLATION: GROUND SURFACE; CLAYEY BACKFILL; PLASTIC TUBING; GRANULAR MATERIAL; PERFORATED STANDPIPE; CAVED MATERIAL; MINOR CAVING IN SIDES OF UNLINED BOREHOLE FROM 5 TO 8 FEET BELOW GROUND SURFACE; SLOW TO MEDIUM SEEPAGE AT ABOUT ELEV. 584.0 DURING DRILLING; STANDPIPE DESTROYED

0 / 15 5 / 10 Percent axial strain at failure

(Golder Report No. 764111)

"Note: This Drawing has been Reduced and is in Imperial Units"

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN A.V.D.

CHECKED DWE

Form G.A. -0-1

Project No. 764111

RECORD OF BOREHOLE 103

LOCATION See Figure 1 BORING DATE OCT. 5, 1976 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

(Golder Report No. 764111)

Note: This drawing has been reduced and is in Imperials units.

BORING METHOD	SOIL PROFILE ELEV.* / DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FT.	ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. (20 40 60 80) / SHEAR STRENGTH Cu, LB./SQ.FT. (500 1000 1500 2000) NAT. V. - + REM. V. - ⊕	COEFFICIENT OF PERMEABILITY, k, CM./SEC. (1x10 1x10 1x10 1x10) / WATER CONTENT, PERCENT (Wp W WL; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
POWER AUGER 7.5" DIA. HOLLOW STEM	576.0 0.0	GROUND SURFACE									
		(A)		1	2" D.O.	18	575	(A) COMPACT BROWN AND GREY STONE, ASH, CINDER AND TOPSOIL FILL MATERIALS			
	574.0 2.0	VERY LOOSE GREY TO BLACK SILTY SAND TRACE CLAY AND ORGANICS		2	"	5					
				3	"	3	570			MH	
				4	"	3					
	566.0 10.0	VERY LOOSE GREY FINE TO MEDIUM GRAINED SAND TRACE TO SOME SILT		5	"	1	565				WATER LEVEL AT ELEVATION 571.0 ON COMPLETION OF DRILLING OCTOBER 5, 1977
				6	"	1					
	561.5 14.5			7	"	W.H.	560				
		FIRM GREY WITH RED FLECKS SILTY CLAY SOME SAND TRACE FINE GRAVEL (TILL-LIKE)		8	3" T.O.	P.H.	555				
				9	2" D.O.	W.H.	550				
	546.5 29.5	END OF HOLE					545				

Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN AKD

CHECKED

NOT TO SCALE

Form G.A. - D - 1

Project No. 791-4012

RECORD OF BOREHOLE 3

LOCATION See Figure 1 BORING DATE FEB. 12, 1979 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FT.	ELEVATION SCALE
	610.9	ICE SURFACE					610
POWER AUGER 4.5" O.D. SOLID STEMS	0.0 609.9	ICE					
	1.0	VERY STIFF TO HARD BROWN **SILTY-CLAY** SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES **(TILL-LIKE)**		1	2" O.D.	22	
	603.9			2	"	39	605
	7.0	HARD TO VERY STIFF GREY **SILTY-CLAY** SOME SAND OCC. GRAVEL OCC. FISSURES AT ELEVATION 602.5 FEET **(TILL-LIKE)**		3	"	41	
				4	"	19	600
				5	"	22	
				6	"	24	595
				7	"	19	
				8	"	16	590
				9	"	17	
	584.4			10	"	16	585
	26.5	END OF BOREHOLE					580

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. — 20 40 60 80

SHEAR STRENGTH Cu., LB./SQ.FT. — NAT. V. - + Q. - ● REM.V. - ⊕ U. - ○ — 500 1000 1500 2000

COEFFICIENT OF PERMEABILITY, K., CM./SEC. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W WL — 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

BOREHOLE DRY DURING DRILLING FEB. 12, 1979.

(Golder Report No. 791-4012)

"Note: This Drawing has been Reduced and is in Imperial Units"

0 15 5 10 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN L. BORTOLUSSI

CHECKED JPH

Form G.A. - D - 1

Project No. 791-4012

RECORD OF BOREHOLE 4

LOCATION See Figure 1 BORING DATE FEB. 12, 1979. DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

(Golder Report No. 791-4012)

"Note: This Drawing has been Reduced and is in Imperial Units"

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FT.	ELEVATION SCALE
	610.5	ICE SURFACE					610
POWER AUGER 4.5" O.D. SOLID STEMS	0.0 609.6	ICE					
	0.9	VERY STIFF TO HARD BROWN **SILTY-CLAY** SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES **(TILL-LIKE)**		1	2" DO.	26	
				2	"	40	605
				3	"	51	
	599.0			4	"	39	600
	11.5	HARD TO STIFF GREY **SILTY-CLAY** SOME SAND OCC. GRAVEL **(TILL-LIKE)**		5	"	36	
				6	"	24	595
				7	"	21	
				8	"	18	590
				9	"	19	
				10	"	26	585
				11	"	24	
				12	"	24	580
				13	"	17	
	574.0			14	"	9	575
	36.5	END OF BOREHOLE					570

DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. 20 40 60 80

SHEAR STRENGTH Cu., LB./SQ.FT. NAT. V. - + Q. - ● REM.V. - ⊕ U. - ○ 500 1000 1500 2000

COEFFICIENT OF PERMEABILITY, K., CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT W_P W W_L 10 20 30 40

0 / 15 5 / 10 Percent axial strain at failure

ADDITIONAL LAB. TESTING: γ 141 p.c.f. ; MH.

PIEZOMETER OR STANDPIPE INSTALLATION: PLASTIC TUBING; CLAY BACKFILL; GRAVEL FILTER; STANDPIPE

BOREHOLE DRY DURING DRILLING FEB. 12, 1979.

WATER LEVEL IN STANDPIPE AT ELEVATION 606.7 FEET FEB. 19, 1979.

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN L. BORTOLUSSI

CHECKED

Form G.A. - D - 1

Project No. 791-4012

RECORD OF BOREHOLE 5, 6 & 7

LOCATION See Figure 1 BORING DATE FEB. 13, 1979 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS/FT.	ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/FT. (20 40 60 80) / SHEAR STRENGTH Cu., LB./SQ.FT. (500 1000 1500 2000) NAT. V.- + Q.- ● REM.V.- ⊕ U.- ○	COEFFICIENT OF PERMEABILITY, K., CM./SEC. (1x10 1x10 1x10 1x10) / WATER CONTENT, PERCENT (Wp W WL; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
								BOREHOLE 5			
								(Golder Report No. 791-4012)			
								"Note: This Drawing has been Reduced and is in Imperial Units"			
	613.0	GROUND SURFACE					615				
POWER AUGER 4.5" O.D. SOLID STEMS	611.5	BLACK CLAYEY **TOPSOIL**									
	1.5	STIFF MOTTLED BROWN AND GREY **SILTY-CLAY** SOME SAND OCC. GRAVEL **(TILL-LIKE)**		1	2" DO	9					
	608.0			2	"	12	610	HARD BROWN **SILTY-CLAY** SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES **(TILL-LIKE)**			BOREHOLE DRY DURING DRILLING FEB. 13, 1979.
	5.0 606.5			3	"	36					
	6.5	END OF BOREHOLE					605				
								BOREHOLE 6			
	611.3	GROUND SURFACE					615				
POWER AUGER 4.5" O.D. SOLID STEMS	0.0 610.3	BLACK CLAYEY **TOPSOIL**									
	1.0	VERY STIFF MOTTLED BROWN AND GREY **SILTY-CLAY** SOME SAND OCC. GRAVEL **(TILL-LIKE)**		1	2" DO.	15	610				PLASTIC TUBING; CLAY BACKFILL; GRAVEL FILTER; STANDPIPE
				2	"	17					
				3	"	23	605	HARD BROWN **SILTY-CLAY** SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES **(TILL-LIKE)**			BOREHOLE DRY DURING DRILLING FEB. 13, 1979. BOREHOLE DRY ON FEB. 19, 1979.
	604.3										
	7.0 602.3			4	"	48					
	9.0	END OF BOREHOLE					600				
								BOREHOLE 7			
	612.9	GROUND SURFACE					615				
POWER AUGER 4.5" O.D. SOLID STEMS	612.4							BLACK CLAYEY **TOPSOIL**			
	0.5	VERY STIFF TO HARD MOTTLED BROWN AND GREY **SILTY-CLAY** SOME SAND OCC. GRAVEL **(TILL-LIKE)**		1	2" DO.	18					
				2	"	16	610				BOREHOLE DRY DURING DRILLING FEB. 13, 1979
	607.9			3	"	40		HARD BROWN **SILTY-CLAY** SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES **(TILL-LIKE)**			
	5.0 606.4			4	"	57					
	6.5	END OF BOREHOLE					605				

0 / 15 ◆ 5 / 10 Percent axial strain at failure

VERTICAL SCALE 1 IN. TO 5 FT.

Golder Associates

DRAWN L. BORTOLUSSI

CHECKED JPM

PROJECT: 001-4009

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 25, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES	ELEVATION
0	POWER AUGER SOLID STEM	GROUND SURFACE		177.56				
		Black clayey topsoil (FILL)		0.09	1	AS		
		Compact granular (FILL)		177.17				
		Stiff to very stiff brown silty clay, mixed with topsoil, some sand and gravel (FILL)		0.40	2	50 DO	9	177
1					3	50 DO	19	
				176.34				
		Compact black fine to medium sand, mixed with slag and cinders (FILL)		1.22	4	50 DO	10	176
				175.73				
2		Firm brown silty clay, some sand, occ. gravel mixed with occ. topsoil pockets (FILL)		1.83	5	50 DO	7	
				175.28				
		Loose brown clayey silt, occ. pockets and lenses of sand (FILL)		2.29	6	50 DO	6	175
				174.82				
		Firm grey silty clay, some sand, layers of organic material (FILL)		2.74	7	50 DO	6	
3				174.36				
		END OF BOREHOLE		3.20				

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● rem V. ⊕ U - ○

20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl

10 20 30 40

(Golder Report No. 001-4009)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Water seepage encountered into borehole at elevation 175.8 m. during drilling on January 25, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: R.W.W.

CHECKED

LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4009

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 25, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES	ELEVATION
0	POWER AUGER SOLID STEM	GROUND SURFACE		177.03				
		Compact granular (FILL)		176.85				
		Very stiff brown silty clay, some sand, trace of gravel (FILL)		0.18	1	AS		
				176.45				
		Dense black slag and cinders (FILL)		0.58	2	50 DO	33	
1				176.12				176
		Compact brown fine to medium sand (FILL)		0.91	3	50 DO	10	
				175.81				
		Stiff brown to grey SILTY CLAY, some sand, trace of gravel with pockets and lenses of sand (FILL)		1.22	4	50 DO	8	
2					5	50 DO	9	175
				174.74				
		Very stiff grey SILTY CLAY, with occ. partings of black organic silt and peat (FILL)		2.29	6	50 DO	62	
				174.44				
		Dense brown medium to coarse SAND and GRAVEL		2.59	7	50 DO	34	174
3				173.83				
		END OF BOREHOLE		3.20				
4								
5								
6								
7								
8								
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● rem V. ⊕ U - ○ : 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl : 10 20 30 40

(Golder Report No. 001-4009)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Water seepage encountered into borehole at elevation 174.4 m. during drilling on January 25, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: R.W.W.

CHECKED:

LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4009

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 25, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, Q - ●; rem V. ⊕, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		177.11								
		Compact granular (FILL)		176.96								
		Brown SILTY CLAY, some sand, trace of gravel (FILL)		0.15	1	AS						
				176.50	2	50 DO	32					
1		Dense to compact black slag and cinders (FILL)		0.61	3	50 DO	10	176				
				175.89								
		Compact brown fine to medium sand, trace of slag (FILL)		175.74								
2		Firm brown to grey silty clay, some sand, trace of gravel with pockets and lenses of black peat (FILL)		1.37	4	50 DO	7					
					5	50 DO	6	175				
					6	50 DO	27					
				174.46								
		Compact brown SILTY SAND, and gravel		2.65	7	50 DO	27					
3				173.91				174				Water seepage encountered into borehole at elevation 174.4 m. during drilling on January 25, 2000
		END OF BOREHOLE		3.20								
4												
5												
6												
7												
8												
9												
10												

(Golder Report No. 001-4009)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: R.W.W.

CHECKED:

LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4009

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 25, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES:	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		177.29								
		Compact granular (FILL)		0.00 / 177.02	1	AS		177				
		Stiff brown silty clay, some sand, trace of gravel (FILL)		0.27 / 176.53	2	50 DO	33					
1		Dense to compact black slag and cinders (FILL)		0.76 / 176.07	3	50 DO	27					
		Compact brown fine to medium sand (FILL)		175.92				176				
		Stiff to firm to stiff brown to grey SILTY CLAY, some sand, trace of gravel, pockets and lenses of sand and peat (FILL)		1.37	4	50 DO	9					
2					5	50 DO	5					
					6	50 DO	12	175				
				174.55								
		Compact brown SILTY SAND, and gravel		2.74 / 174.09	7	50 DO	19					
3		END OF BOREHOLE		3.20								Water seepage encountered into borehole at elevation 174.2 m. during drilling on January 25, 2000
4												
5												
6												
7												
8												
9												
10												

(Golder Report No. 001-4009)

LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastroianni

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: R.W.W.
CHECKED:

PROJECT: 001-4009

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES	ELEVATION
0	POWER AUGER SOLID STEM	GROUND SURFACE		177.90				
		Black clayey topsoil (FILL)		0.09	1	AS		
		firm to stiff brown silty clay, some sand and gravel mixed with clayey topsoil (FILL)			2	50 DO	5	
1					3	50 DO	14	177
				176.62				
		Compact black slag and cinders (FILL)		1.28	4	50 DO	23	
				176.16				
		Compact brown to black fine to coarse sand, trace gravel (FILL)		1.74 175.95				
2		Firm to stiff brown SILTY CLAY, some sand and gravel mixed with occ. organic pockets (FILL)		1.95	5	50 DO	9	176
					6	50 DO	11	
				175.16				
		Very dense brown SILTY SAND and gravel		2.74	7	50 DO	53	175
3				174.70				
		END OF BOREHOLE		3.20				
4								
5								
6								
7								
8								
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○

20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp ⊢ W ⊣ Wl

10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 001-4009)

Water seepage encountered into borehole at elevation 175.2 m. during drilling on January 28, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: R.W.W.

CHECKED:

LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4009

RECORD OF BOREHOLE 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE		ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, Q - ●; rem V. ⊕, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		178.67								
		Brown clayey topsoil (FILL)										
		Brown silty clay, some sand and gravel (FILL)		178.43	1	AS						
		Compact granular (FILL)		0.24 178.21								
				0.46	2	50 DO	10	178				
1		Stiff to very stiff brown silty clay, some sand and gravel mixed with black clayey topsoil (FILL)			3	50 DO	11					
					4	50 DO	10	177				
2				176.60	5	50 DO	30					
		Compact black slag and cinders (FILL)		2.07 176.38								
		Compact brown SILTY SAND, and gravel		2.29	6	50 DO	13					
				176.02				176				
		Stiff brown SILTY CLAY, some sand, trace of gravel with pockets and lenses of sand		2.65	7	50 DO	10					
3				175.47								
		END OF BOREHOLE		3.20								
4												
5												
6												
7												
8												
9												
10												

(Golder Report No. 001-4009)

Water seepage encountered into borehole at elevation 175.9 m. during drilling on January 28, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: R.W.W.

CHECKED:

LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4009

RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES:	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER, SOLID STEM	GROUND SURFACE		177.61								
		Brown clayey topsoil (FILL)		0.06	1	AS						
		Stiff to very stiff brown silty clay, some sand and gravel mixed with topsoil (FILL)			2	50 DO	9	177				
1				176.54	3	50 DO	47					
		Dense to compact black slag and cinders (FILL)		1.07								
		Compact brown fine to medium sand, occ. gravel (FILL)		176.24 1.37	4	50 DO	14	176				
2				175.93 1.68	5	50 DO	6					
		Firm brown silty clay, some sand and gravel with pockets of topsoil, pieces of wood, metal and clay brick (FILL)			6	50 DO	7	175				
				174.71	7	50 DO						
3		Compact brown SILTY SAND, and gravel		2.90 174.41								
		END OF BOREHOLE AT REFUSAL TO AUGER		3.20								
4												
5												
6												
7												
8												
9												
10												

(Golder Report No. 001-4009)

Water seepage encountered into borehole at elevation 174.9 m. during drilling on January 28, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: R.W.W.

CHECKED:

LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4014

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JANUARY 27, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION
0	POWER AUGER HOLLOW STEM	PAVMENT SURFACE		100.16				100
		ASPHALT		0.09				
		Brown silty clay, some sand and gravel (FILL)		99.70				
				0.46	1	AS	35	
1		Black mould sand, some grey silty clay (FILL)			2	AS	42	99
				98.64				
				1.52	3	AS	10	
2		Black organic silty clay (FILL)		98.03				98
				2.13	4	AS	7	
3		Stiff mottled brown and grey SILTY CLAY, some sand, occ. gravel (TILL)			5	AS	10	97
				96.35				
4				3.81	6	AS	25	96
					7	AS	44	
5		Very stiff to hard brown SILTY CLAY, some sand, occ. gravel (TILL)			8	AS	18	95
6				94.06				
				6.10	9	50 DO	9	94
7		Very stiff to stiff grey SILTY CLAY, some sand, occ. gravel (TILL)						93
					10	50 DO	8	
8				92.08				
		END OF BOREHOLE		8.08				
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)

SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})

WATER CONTENT PERCENT (10 20 30 40) Wp W Wl

(Golder Report No. 001-4014)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry during drilling on January 27, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: P.N.

CHECKED: GAM

LDN_BHS 001-4014.GPJ GLDR_CAN.GDT 2/9/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4014

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JANUARY 27, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / HOLLOW STEM	PAVMENT SURFACE		100.03				100	*(Golder Report No. 001-4014)*			
		ASPHALT		99.85	1	AS						
		Granular base (FILL)		0.18								
		Brown silty clay (FILL)		99.57								
				0.46	2	50 DO	63					
1		Black sand and gravel, some silt, pieces of wood (FILL)			3	50 DO	21	99				
				98.66								
		Black organic clayey TOPSOIL		1.37								
				98.20	4	50 DO	10					
2				1.83				98				
		Stiff mottled brown and grey SILTY CLAY, some sand, occ. gravel (TILL)			5	50 DO	8					
3					6	50 DO	12	97				Backfill Material
				96.52								
				3.51								
		Very stiff brown SILTY CLAY, occ. sand and gravel (TILL)			7	50 DO	21	96				
4												
				95.46								
				4.57	8	50 DO	27					
5								95				
6								94				
		Very stiff to stiff grey SILTY CLAY, some sand, occ. gravel (TILL)			9	50 DO	15					Water level in borehole at elevation 93.9m during drilling on January 27, 2000
7								93				
					10	50 DO	9					
8				91.95				92				
		Grey medium to fine SILTY SAND		8.08	11	50 DO	PH					
				91.19								
9				8.84				91				
		Grey SANDY SILT, some gravel			12	50 DO	8					
				90.43								
		END OF BOREHOLE		9.60								
10												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: P.N.

CHECKED: GAM

LDN_BHS 001-4014.GPJ GLDR_CAN.GDT 2/8/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4014

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JANUARY 27, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, Q - ●; rem V. ⊕, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		PAVMENT SURFACE		99.89								
		ASPHALT										
		Granular base (FILL)		99.64								
				0.25	1	50 DO	12					
1					2	50 DO	16	99				
		Brown to grey silty clay, pockets of organic material (FILL)										
					3	50 DO	7					
2								98				
				97.45								
				2.44	4	50 DO	7					
3		Stiff mottled brown and grey SILTY CLAY, some sand, occ. gravel (TILL)						97				Borehole dry during drilling on January 27, 2000
					5	50 DO	15					
				96.23								
				3.66	6	50 DO	36					
4	POWER AUGER HOLLOW STEM							96				
		Very stiff to hard brown SILTY CLAY, some sand, occ. gravel (TILL)			7	50 DO	26					
5								95				
					8	50 DO	17					
				94.10								
				5.79								
6					9	50 DO	11	94				
		Stiff to very stiff grey SILTY CLAY, some sand, occ. gravel (TILL)										
7								93				
					10	50 DO	9					
8				91.81				92				
		END OF BOREHOLE		8.08								
9												
10												

(Golder Report No. 001-4014)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: P.N.

CHECKED: GAM

LDN_BHS 001-4014.GPJ GLDR_CAN.GDT 2/8/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4014

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JANUARY 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / HOLLOW STEM	PAVMENT SURFACE		100.00								
		ASPHALT		0.08								
		Granular base (FILL)		99.69								
				0.30	1	50 DO	15					
1		Brown to grey silty clay, some organic material and sand, occ. gravel (FILL)			2	50 DO	21	99				
					3	50 DO	50					
2				97.87				98				
		Grey fine SILTY SAND (ALLUVIAL)		2.13								
				97.49	4	50 DO	7					
				2.51								
3		Grey to brown SILTY CLAY, some sand, oc. gravel (TILL)						97				
				96.80	5	50 DO	15					Borehole dry during drilling on January 28, 2000
				3.20								
4		Very stiff to hard brown SILTY CLAY, some sand, occ. gravel (TILL)			6	50 DO	23	96				
					7	50 DO	23					
5				94.82				95				
				5.18								
					8	50 DO	12					
6								94				
					9	50 DO	8					
		Stiff to very stiff grey SILTY CLAY, some sand, occ. gravel (TILL)										
7								93				
					10	50 DO						
8				91.92				92				
		END OF BOREHOLE		8.08								
9												
10												

(Golder Report No. 001-4014)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: P.N.

CHECKED: GAM

LDN_BHS 001-4014.GPJ GLDR_CAN.GDT 2/8/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4014

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JANUARY 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION
0	POWER AUGER HOLLOW STEM	PAVMENT SURFACE		100.00				
		ASPHALT		0.08				
		Granular road base (FILL)		99.72				
				0.28	1	50 DO	19	
1		Brown silty clay with black mould sand layers (FILL)			2	50 DO	16	99
				98.17	3	50 DO	33	
2		Brown silty clay (FILL)		1.83				98
				97.71				
		Grey fine to medium SILTY SAND, some organic material (ALLUVIAL)		2.29	4	50 DO	4	
				97.26				
3		Stiff mottled brown and grey SILTY CLAY, some sand, occ. gravel (TILL)		2.74	5	50 DO	9	97
				96.34				
4		Very stiff to hard brown SILTY CLAY, some sand, occ. gravel (TILL)		3.66	6	50 DO	30	96
					7	50 DO	17	
5				94.82				95
		Stiff to very stiff grey SILTY CLAY, some sand, occ. gravel (TILL)		5.18	8	50 DO	11	
6								94
					9	50 DO	8	
7								93
8				91.92	10	50 DO	8	92
		END OF BOREHOLE		8.08				
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● rem V. ⊕ U - ○: 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl: 10 20 30 40

(Golder Report No. 001-4014)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry during drilling on January 28, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: P.N.

CHECKED: GAM

LDN_BHS 001-4014.GPJ GLDR_CAN.GDT 2/8/00 DATA INPUT: Tony Mastrojanni

PROJECT: 001-4067

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 29, 2000

DATUM: LOCAL

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION
0	POWER AUGER, HOLLOW STEM	GROUND SURFACE		100.41				100
		Black clayey topsoil (FILL)		0.00 / 100.18	1	50 DO	9	
		Stiff brown and grey silty clay, some organic topsoil pockets (FILL)		0.23 / 99.57	2	50 DO	22	99
1		Compact medium to coarse brown SAND, trace silt		0.84 / 98.43	3	50 DO	12	
2		Firm grey SILTY CLAY, some sand		1.98 / 97.51	4	50 DO	5	98
3		Hard to firm brown becoming grey SILTY CLAY, some sand, occ. gravel and sand pockets (TILL)		2.90	5	50 DO	17	97
4					6	50 DO	40	
5					7	50 DO	12	96
6					8	50 DO	9	95
		END OF BOREHOLE		93.86 / 6.55				94
7								
8								
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 001-4067)

▽ Water level in borehole at elevation 98.43m during drilling on March 29, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: A.P.

CHECKED:

LDN_BHS 001-4067.GPJ GLDR_CAN.GDT 4/4/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4067

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 29, 2000

DATUM: LOCAL

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: N	ELEVATION
0	POWER AUGER, HOLLOW STM	GROUND SURFACE		100.41				
		Black clayey topsoil (FILL)		100.23				
				0.18	1	50 DO	6	100
1		Mottled brown and grey SILTY CLAY, some organic topsoil pockets (FILL)			2	50 DO	16	
				98.89				99
				1.52	3	50 DO	25	
2		Compact to loose medium to coarse brown SAND, trace silt, some gravel			4	50 DO	4	98
3				97.29				
		Stiff grey SILTY CLAY, some sand trace gravel		3.12	5	50 DO	13	97
				96.75				
4		Hard to very stiff brown and grey SILTY CLAY, some sand, occ. gravel, some sand (TILL)		3.66	6	50 DO	39	96
					7	50 DO	17	
5				95.38				
		END OF BOREHOLE		5.03				
6								
7								
8								
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl (10 20 30 40)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 001-4067)

Water level in borehole at elevation 98.43m during drilling on March 29, 2000

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: AP

CHECKED:

LDN_BHS 001-4067.GPJ GLDR_CAN.GDT 4/4/00 DATA INPUT: Tony Mastroianni

PROJECT: 001-4238

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	NUMBER	TYPE	N	ELEVATION
0	POWER AUGER SOLID STEM	GROUND SURFACE		97.8				
		Black clayey TOPSOIL		0.0				
				0.7	1	2" DO	11	
		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, occ. gravel, fissured (TILL)			2	2" DO	22	
5								
					3	2" DO	14	
				90.8				
				7.0				
					4	2" DO	40	90
10		Hard to very stiff, brown SILTY CLAY, occ. gravel, fissured (TILL)			5	2" DO	37	
				84.3	6	2" DO	23	85
				13.5				
15								
					7	2" DO	18	
		Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)						80
20								
					8	2" DO	13	
				76.3				
		END OF BOREHOLE		21.5				
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ● rem V. ⊕ U - ○ : 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl : 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole remained dry during drilling on September 27, 2000

(Golder Report No. 001-4238)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: P.N.

CHECKED: GM

LDN_BHS 001-4238.GPJ GLDR_CAN.GDT 10/10/00 DATA INPUT: M. Napier

PROJECT: 001-4238

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES	ELEVATION
0		GROUND SURFACE		97.4				
		Stiff, black clayey TOPSOIL		0.0 / 96.6	1	2" DO	11	
				0.8				
		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, fissured, oxidized (TILL)			2	2" DO	16	
5				91.6	3	2" DO	20	
				5.8				
		Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)			4	2" DO	39	
10	POWER AUGER SOLID STEM				5	2" DO	37	
				85.4 / 12.0				
					6	2" DO	22	
15					7	2" DO	14	
		Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)						
20					8	2" DO	12	
				75.9				
		END OF BOREHOLE		21.5				
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ● rem V. ⊕ U - ○ : 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl : 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 001-4238)

"Note: This Drawing has been Reduced and is in Imperial Units"

95 90 85 80

Borehole remained dry during drilling on September 27, 2000

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: P.N.

CHECKED: GM

LDN_BHS 001-4238.GPJ GLDR_CAN.GDT 10/16/00 DATA INPUT: M. Napier

PROJECT: 001-4238

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES	ELEVATION
0	POWER AUGER SOLID STEM	GROUND SURFACE		96.9				
		Stiff, black clayey TOPSOIL		0.0 0.7	1	2" DO	10	
		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, tarce gravel, wet fissures, organic pockets (TILL)			2	2" DO	13	
5				90.9	3	2" DO	27	90
		Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)		6.0	4	2" DO	42	
10				87.4 9.5	5	2" DO	25	85
					6	2" DO	14	
15		Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)			7	2" DO	15	80
20				75.4	8	2" DO	13	
		END OF BOREHOLE		21.5				
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ● rem V. ⊕ U - ○ : 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl : 10 20 30 40

ADDITIONAL LAB TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 001-4238)

"Note: This Drawing has been Reduced and is in Imperial Units"

Borehole remained dry during drilling on September 27, 2000

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: P.N.

CHECKED: GM

LDN_BHS 001-4238.GPJ GLDR_CAN.GDT 10/10/00 DATA INPUT M. Napier

PROJECT: 001-4238

RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES:	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (400 800 1200 1600) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		97.1								
		Stiff, black clayey TOPSOIL		0.0	1	2" DO	10					
				0.7								
		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, fissured (TILL)			2	2" DO	12					
5					3	2" DO	15					
				90.6								
				6.5				90				
					4	2" DO	39					
		Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, fissured, oxidized (TILL)										Borehole remained dry during drilling on September 27, 2000
10					5	2" DO	34					
				84.1				85				
				13.0	6	2" DO	26					
15					7	2" DO	13					
		Stiff, grey SILTY CLAY, some sand, trace gravel, fissured, oxidized (TILL)						80				
20					8	2" DO	13					
				75.6								
		END OF BOREHOLE		21.5								
25												
30												
35												

(Golder Report No. 001-4238)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: P.N.

CHECKED: GM

LDN_BHS 001-4238.GPJ GLOR_CAN.GDT 10/10/00 DATA INPUT: M. Napier

PROJECT: 001-4238

RECORD OF BOREHOLE 10

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (nat V. + Q - ●, rem V. ⊕ U - ○; 400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER, SOLID STEM	GROUND SURFACE		97.8								
		Very stiff, black clayey TOPSOIL		0.0 97.0	1	2" DO	15					
				0.8								
5		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt pockets, fissured (TILL)			2	2" DO	16	95				
					3	2" DO	11					
				90.8 7.0								
10		Hard, brown SILTY CLAY, some sand, trace gravel, fissured, oxdized (TILL)			4	2" DO	37	90				Borehole remained dry during drilling on September 27, 2000
					5	2" DO	38					
				85.3 12.5								
					6	2" DO	17	85				
15		Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)			7	2" DO	14					
								80				
20					8	2" DO	14					
				76.3								
		END OF BOREHOLE		21.5								
25												
30												
35												

(Golder Report No. 001-4238)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: P.N.

CHECKED: GM

LDN_BHS 001-4238.GPJ GLDR_CAN.GDT 10/10/00 DATA INPUT: M. Napier

PROJECT: 001-4247

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (nat V. + Q - ● rem V. ⊕ U - ○) (400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		574.4								
	POWER AUGER SOLID STEM	Compact, black sandy TOPSOIL		0.0 / 572.4	1	2" DO	15					
		Compact, brown SAND, trace silt, occ. gravel, few grey silty fine sand seams		569.9	2	2" DO	11	570				
5		Firm grey SILTY CLAY, some sand, trace gravel (TILL)		4.5 / 567.4	3	2" DO	7					Borehole remained dry during drilling on September 28, 2000
		Hard, brown SILTY CLAY, some sand and gravel, fissured (TILL)		7.0	4	2" DO	44		>2000			
10					5	2" DO	52	565				
				562.4 / 12.0	6	2" DO	13					
15		Stiff to very stiff, grey SILTY CLAY, trace to some sand and gravel (TILL)			7	2" DO	11	560				
				556.4 / 18.0					>2000			
20		Very stiff grey CLAYEY SILT, some sand and gravel (TILL)			8	2" DO	18	555				
				552.9								
		END OF BOREHOLE		21.5								
25												
30												
35												

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/31/00 DATA INPUT: M. Napier

PROJECT: 001-4247

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ft	ELEVATION
0		GROUND SURFACE		576.8				
		Compact, black sandy topsoil (FILL)		0.0 575.3	1	2" DO	10	
		Stiff brown silty clay, some sand, trace gravel (FILL)		1.5 572.3	2	2" DO	13	
5		Stiff grey and black clayey silt, occ. sand seams, occ. peat inclusions (FILL)		4.5 570.6	3	2" DO	13	570
		Black PEATY ORGANIC MATERIAL, some clay		6.3 7.0				
		Stiff, grey SILTY CLAY,trace to some sand and gravel (TILL)		567.3	4	2" DO	12	
10	POWER AUGER SOLID STEM	Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)		9.5 562.3	5	2" DO	38	565
					6	2" DO	38	
15		Very stiff to hard, grey SILTY CLAY, trace to some sand and gravel (TILL)		14.5	7	2" DO	16	560
20				555.6	8	2" DO	33	
		Hard grey CLAYEY SILT, some sand and gravel (TILL)		21.3 21.5				
		END OF BOREHOLE						
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20, 40, 60, 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●, rem V. ⊕ U - ○; 400, 800, 1200, 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp, W, Wl; 10, 20, 30, 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

Minor water seepage into borehole encountered at 574.9 ft. during drilling on September 28, 2000

165.7

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/31/00 DATA INPUT: M. Napier

PROJECT: 001-4247

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ft	ELEVATION
0		GROUND SURFACE		574.2				
	POWER AUGER SOLID STEM	Stiff, brown silty clay and black clayey topsoil (FILL)		0.0	1	2" DO	14	
				572.2				
		Soft black clayey TOPSOIL, some peaty material		2.0	2	2" DO	4	
				570.4				570
5		Firm to stiff, grey SILTY CLAY, some sand, trace gravel (TILL)		3.8	3	2" DO	11	
				567.2				
		Hard to stiff brown SILTY CLAY, some sand and gravel, fissured (TILL)		7.0	4	2" DO	47	565
10					5	2" DO	38	
				561.2				
		Stiff, grey SILTY CLAY, trace to some sand and gravel (TILL)		13.0	6	2" DO	13	560
15					7	2" DO	12	
				557.7				
		END OF BOREHOLE		16.5				

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ● rem V. ⊕ U - ○ : 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl : 10 20 30 40

>2000

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

Minor water seepage into borehole encountered at about elevation 571.2 ft. during drilling on September 28, 2000

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/30/00 DATA INPUT: M. Napier

PROJECT: 001-4247

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET		DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	NUMBER	TYPE	BLOWS/ft
0		GROUND SURFACE		574.5			
		Loose, black sandy TOPSOIL		0.0 / 572.5	1	2" DO	9
		Loose, brown to grey SILTY SAND, trace gravel, occ. clayey zones		2.0 / 571.2	2	2" DO	4
5		Soft to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)		3.3 / 566.5	3	2" DO	12
	POWER AUGER SOLID STEM	Hard, brown SILTY CLAY, some sand and gravel, fissured (TILL)		8.0 / 562.5	4	2" DO	45
10					5	2" DO	52
		Very stiff, grey SILTY CLAY, trace to some sand and gravel, occ. sand partings/pokets (TILL)		12.0 / 560.0	6	2" DO	18
15		Dense, grey fine to medium SAND, trace gravel		14.5 / 558.7	7	2" DO	38
		Dense to compact grey SAND, some gravel, occ. fine sand seam		15.8 / 553.0	8	2" DO	27
20		END OF BOREHOLE		21.5			
25							
30							
35							

ELEVATION

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ● rem V. ⊕ U - ○ : 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl : 10 20 30 40

570

565

560

555

>2000

ADDITIONAL LAB TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

Minor water seepage into borehole encountered at about elevation 571.5 ft. during drilling on September 28, 2000

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/11/00 DATA INPUT M. Napier

PROJECT: 001-4247

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION
0	POWER AUGER SOLID STEM	GROUND SURFACE		576.6				575
		Compact, black sandy topsoil mixed with crushed gravel, some silt (FILL)		0.0 / 574.6	1	2" DO	13	
		Loose, brown fine to medium SAND, trace gravel		2.0 / 572.1	2	2" DO	6	
5		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, fissured, occ. silt pockets (TILL)		4.5 / 567.1	3	2" DO	8	570
					4	2" DO	9	
10		Very stiff grey SILTY CLAY, trace to some sand and gravel (TILL)		9.5 / 564.6	5	2" DO	15	565
		Hard to very stiff, brown SILTY CLAY, some sand and gravel, fissured (TILL)		12.0 / 560.1	6	2" DO	36	
15					7	2" DO	21	
		END OF BOREHOLE		16.5				
20								
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf — nat V. + Q - ● rem V. ⊕ U - ○: 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl; 10 20 30 40

>2000

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole remained dry during drilling on September 28, 2000

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/30/00 DATA INPUT: M. Napier

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

PROJECT: 001-4247

RECORD OF BOREHOLE 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION
0	GROUND SURFACE		574.5				
	Stiff black clayey TOPSOIL		0.0 / 572.5	1	2" DO	8	
	Soft grey and black ORGANIC CLAYEY SILT, some sand, occ. gravel and rootlets		2.0 / 570.8	2	2" DO	4	570
5	Firm to stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt pockets (TILL)		3.8 / 567.5	3	2" DO	11	
	Hard, brown SILTY CLAY, some sand and gravel, fissured (TILL)		7.0 / 562.5	4	2" DO	41	565
10				5	2" DO	44	
	Stiff, grey SILTY CLAY, trace to some sand and gravel (TILL)		12.0 / 558.0	6	2" DO	11	560
15				7	2" DO	13	
	END OF BOREHOLE		16.5				

POWER AUGER
SOLID STEM

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ● rem V. ⊕ U - ○ : 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl : 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole remained dry during drilling on September 28, 2000

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE
1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/11/00 DATA INPUT: M. Napier

PROJECT: 001-4247

RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES:	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (400 800 1200 1600) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GROUND SURFACE		575.7								
	Compact, black sandy TOPSOIL		0.0 / 574.6	1	2" DO	10					
	Stiff brown and grey CLAYEY SILT, some sand		1.1 / 573.7								
	Firm to stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, some sand seams/layers near surface (TILL)		2.0	2	2" DO	7					
5				3	2" DO	11	570				Borehole remained dry during drilling on September 28, 2000
	Very stiff to hard, brown SILTY CLAY, some sand and gravel fissured (TILL)		568.7 / 7.0	4	2" DO	28					
10				5	2" DO	40	565				
			562.2 / 13.5	6	2" DO	22					
15	Very stiff to stiff, grey SILTY CLAY, trace to some sand and gravel (TILL)			7	2" DO	13	560				
			559.2								
	END OF BOREHOLE		16.5								

POWER AUGER

SOLID STEM

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/11/00 DATA INPUT: M. Napier

PROJECT: 001-4247

RECORD OF BOREHOLE 8

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET		SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES:	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80); SHEAR STRENGTH Cu, psf (nat V. + Q - ●, rem V. ⊕ U - ○) (400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		575.9								
		Loose, black silty TOPSOIL		0.0 / 574.9	1	2" DO	6					
				1.0								
		Firm to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. sand seams/zones near surface (TILL)			2	2" DO	6					
5					3	2" DO	16	570	>2000			Borehole remained dry during drilling on September 28, 2000
				568.9 / 7.0								
		Very stiff to hard, brown SILTY CLAY, some sand and gravel, fissured (TILL)			4	2" DO	24					
10	POWER AUGER SOLID STEM				5	2" DO	49	565				
				563.9 / 12.0								
					6	2" DO	15					
15		Very stiff, grey SILTY CLAY, trace to some sand and gravel (TILL)			7	2" DO	17	560				
20					8	2" DO	23	555				
				554.4								
		END OF BOREHOLE		21.5								
25												
30												
35												

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/11/00 DATA INPUT: M. Napier

PROJECT: 001-4247

RECORD OF BOREHOLE 9

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/ft	ELEVATION
0	POWER AUGER, SOLID STEM	GROUND SURFACE		576.9				
		Loose, black sandy TOPSOIL		0.0 / 574.9	1	2" DO		
		Very stiff brown CLAYEY SILT, some sand, occ. sandier zones/pockets		2.0 / 572.4	2	2" DO	16	
5		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)		4.5 / 567.4	3	2" DO	12	570
					4	2" DO	17	
10		Hard, brown SILTY CLAY, some sand and gravel, fissured (TILL)		9.5 / 562.4	5	2" DO	41	565
					6	2" DO	50	
15		Very stiff, grey SILTY CLAY, trace to some sand and gravel (TILL)		14.5 / 560.4	7	2" DO	21	
		END OF BOREHOLE		16.5				

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20, 40, 60, 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●; rem V. ⊕ U - ○; 400, 800, 1200, 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10, 20, 30, 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole remained dry during drilling on September 28, 2000

(Golder Report No. 001-4247)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 001-4247.GPJ GLDR_CAN.GDT 10/31/00 DATA INPUT: M. Napier

PROJECT: 011-4009

RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: FEBRUARY 14, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES		SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		188.45								
		ASPHALT		0.00								
				188.12								
		CONCRETE		0.33								
				0.48				188				
1	POWER AUGER / HOLLOW STEM	Very stiff to stiff, mottled brown and grey silty clay mixed with some sand, gravel and pockets of topsoil (FILL)			1	50 DO	18			O		
								187				Borehole dry during drilling on February 14, 2001
2					2	50 DO	10			O		
					3	50 DO	12	186		O		
				185.71								
		END OF BOREHOLE		2.74								
3												
4												
5												
6												
7												
8												
9												
10												

(Golder Report No. 011-4009)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED: GM

LDN_BHS 011-4009.GPJ GLDR_CAN.GDT 3/2/01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4128

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 6, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (400 800 1200 1600) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		581.5								
		ASPHALT		0.1								
		Granular base (FILL)		0.8	1	AS	-					
		Very stiff mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)			2	2" DO	24					
				577.0								
5				4.5	3	2" DO	32	575				Borehole dry during drilling on June 6, 2001
		Hard to very stiff brown SILTY CLAY, some sand and gravel, some to occ. grey fissures (TILL)			4	2" DO	28					
10					5	2" DO	24	570				
					6	2" DO	27					
				567.2								
15				14.3								
		Very stiff brown SILTY CLAY, some sand and gravel (TILL)			7	2" DO	26					
				565.0				565				
		END OF BOREHOLE		16.5								
20												
25												
30												
35												

(Golder Report No. 011-4128)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 011-4128.GPJ GLDR_CAN.GDT 6/12/01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4128

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 6, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (400 800 1200 1600) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		580.5								
		ASPHALT		0.1								
		Granular base (FILL)		0.8				580				
		Black clayey TOPSOIL		578.5	1	AS	-					
		Stiff mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)		2.0	2	2" DO	14					
5				576.0	3	2" DO	28	575				Borehole dry during drilling on June 6, 2001
				4.5	4	2" DO	30					
10		Very stiff to hard brown SILTY CLAY, some sand and gravel, some to occ. grey fissures (TILL)			5	2" DO	21	570				
					6	2" DO	20					
15					7	2" DO	17	565				
				564.0								
		END OF BOREHOLE		16.5								
20												
25												
30												
35												

(Golder Report No. 011-4128)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 011-4128.GPJ GLDR_CAN.GDT 6/12/01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4128

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 6, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (nat V. + Q - ● rem V. ⊕ U - ○) (400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		581.4								
		ASPHALT		0.1								
		Granular base (FILL)		0.8	1	AS	-	580				
		Black to brown clayey topsoil and brown silty clay (FILL)		578.9								
		Firm mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)		2.5	2	2" DO	5					
				577.1					>2000			
5				4.3	3	2" DO	15	575				Borehole dry during drilling on June 6, 2001
		Very stiff brown SILTY CLAY, some sand and gravel, some to occ. grey fissures (TILL)			4	2" DO	26					
10					5	2" DO	24	570				
				569.9								
		END OF BOREHOLE		11.5								
15												
20												
25												
30												
35												

(Golder Report No. 011-4128)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 011-4128.GPJ GLDR_CAN.GDT 6/12/01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4136

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: 106m. W. centreline of Belleview and 5m. S. centerline of Riverside Dr. BORING DATE: June 6, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION
0		PAVEMENT SURFACE		179.30				179
		ASPHALT		0.00				
		Broken CONCRETE		0.18				
				0.37				
1	POWER AUGER SOLID STEM	Very stiff mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt and sand pockets, fissured (TILL)			1	50 DO	17	
				177.77				178
2				1.52	2	50 DO	31	
								177
3		Very stiff to hard brown SILTY CLAY, some sand, trace gravel, fissured (TILL)			3	50 DO	24	
					4	50 DO	22	176
				175.49				
4				3.81	5	50 DO	12	
								175
5		Stiff grey SILTY CLAY, some sand, trace gravel (TILL)			6	50 DO	10	
								174
6					7	50 DO	8	173
				172.75				
		END OF BOREHOLE		6.55				
7								
8								
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl (10 20 30 40)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 011-4136)

Borehole dry during drilling on June 6, 2001

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 011-4136.GPJ GLDR_CAN.GDT 9-7-01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4205

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: AUGUST 29, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (25 50 75 100) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	PAVEMENT SURFACE		177.15				177	*(Golder Report No. 011-4205)*			
		ASPHALT		0.00								
		CONCRETE		0.18 / 176.74								
		Mottled brown and grey silty clay, some sand, trace gravel, occ. sand and topsoil pockets (FILL)		0.41 / 176.24	1	50 DO	12					
1				0.91	2	50 DO	32	176				
					3	50 DO	42					
2		Hard to very stiff, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)			4	50 DO	47	175				
3					5	50 DO	22	174				
				173.49 / 3.66								
4					6	50 DO	17	173				Borehole dry during drilling on August 29, 2001
					7	50 DO	13					
5								172				
6		Very stiff to stiff, grey SILTY CLAY, some sand, trace gravel (TILL)			8	50 DO	9	171				
7								170	⊕ +			
8				169.07	9	50 DO	5		⊕ +			
		END OF BOREHOLE		8.08								
9												
10												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 011-4205.GPJ GLDR_CAN.GDT 9-17-01 DATA INPUT: Tony mastroianni

PROJECT: 011-4205

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: AUGUST 28, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (25 50 75 100)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / HOLLOW STEM	PAVEMENT SURFACE		178.45				178	*(Golder Report No. 011-4205)*			
		ASPHALT		0.00								
		CONCRETE with steel wire mesh at base		0.18 / 178.07								
		Firm, black clayey TOPSOIL		0.38 / 177.61	1	50 DO	7					
1		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, fissured, occ. silt pockets, intrusions (TILL)		0.84	2	50 DO	11	177				
					3	50 DO	16					Backfill Material
2				176.47 / 1.98	4	50 DO	53	176				
3		Hard to very stiff, brown SILTY CLAY, some sand, trace gravel (TILL)			5	50 DO	37					September 13, 2001
4					6	50 DO	18	175				
				174.06 / 4.39	7	50 DO	14	174				
5		Stiff, grey SILTY CLAY, trace gravel (TILL)										
6				172.13 / 6.32	8	50 DO	12	173				Bentonite Seal
		Compact, grey SILTY FINE SAND, trace gravel						172				August 28, 2001
7				171.35 / 7.10								Backfill Material
		Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)			9	50 DO	9	171				
8				170.37								Water seepage into borehole encountered at about elevation 172.0 m. during drilling on August 28, 2001
		END OF BOREHOLE		8.08								Water level in standpipe at elevation 175.7 m. on September 13, 2001
9												
10												

LDN_BHS 011-4205.GPJ GLDR_CAN.GDT 9-17-01 DATA INPUT: Tony mastroianni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

PROJECT: 011-4226

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 10, 2001

DATUM: GEODETIC

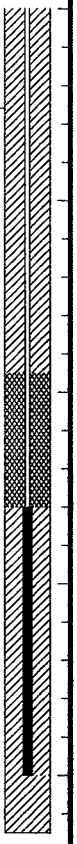
SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (400 800 1200 1600) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		606.3 / 0.0								
	POWER AUGER SOLID STEM	Black clayey TOPSOIL		604.9 / 1.4	1	AS	-					
		Loose brown, SILTY SAND, some clay, trace gravel			2	2" DO	6					
5				601.8 / 4.5	3	2" DO	23	600				
		Very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, some silt pockets and fissures (TILL)		598.3 / 8.0								
10					4	2" DO	42	595				
		Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, some oxidation and fissures (TILL)										
15					5	2" DO	19	590				
				589.3 / 17.0								
		Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)										
20					6	2" DO	9	585				
		END OF BOREHOLE		584.8 / 21.5								
25												
30												
35												

(Golder Report No. 011-4226)

"Note: This Drawing has been Reduced and is in Imperial Units"



Borehole dry during drilling on October 10, 2001

Water level in standpipe at elevation 603.7 ft. on October 12, 2001

LDN_BHS 011-4226.GPJ GLDR_CAN.GDT 10-17-01 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: J.S.

CHECKED:

PROJECT: 011-4226

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 10, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION
0		GROUND SURFACE		606.2 / 0.0				
		Black clayey TOPSOIL		605.0 / 1.2	1	AS	-	
	POWER AUGER SOLID STEM	Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel, occ. silt seams (TILL)			2	2" DO	18	
5					3	2" DO	18	600
				599.2 / 7.0				
					4	2" DO	27	
10		Very stiff to hard, brown and grey SILTY CLAY, some sand, occ. gravel, occ. fissures (TILL)			5	2" DO	45	595
					6	2" DO	31	
				592.2 / 14.0				
15					7	2" DO	15	590
		Very stiff to stiff, grey SILTY CLAY, some sand, trace gravel (TILL)						
20					8	2" DO	11	585
				584.7 / 21.5				
		END OF BOREHOLE						
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: 400 800 1200 1600 — nat V. + Q - ● — rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl — 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 011-4226)

"Note: This Drawing has been Reduced and is in Imperial Units"

Borehole dry during drilling on October 10, 2001

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: J.S.

CHECKED:

LDN_BHS 011-4226.GPJ GLDR_CAN.GDT 10-17-01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4226

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 10, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80); SHEAR STRENGTH Cu, psf (400 800 1200 1600); nat V. + Q - ●; rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		606.9								
		Black clayey TOPSOIL		0.0	1	AS	-					
				605.3								
		Hard, mottled brown and grey, SILTY CLAY, some sand, trace gravel, occ. silt pockets (TILL)		1.6	2	2" DO	42					
5					3	2" DO	36					
				600.4				600				
		Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, occ. silt pockets and sand partings, fissured (TILL)		6.5	4	2" DO	31					Borehole dry during drilling on October 10, 2001
10	POWER AUGER SOLID STEM				5	2" DO	49					
				592.9	6	2" DO	23	595				
		Very stiff, grey SILTY CLAY, some sand, trace gravel, occ. silt or sand layer (TILL)		14.0	7	2" DO	17					
15								590				
20					8	2" DO	15					
				585.4								
		END OF BOREHOLE		21.5								
25												
30												
35												

(Golder Report No. 011-4226)

"Note: This Drawing has been Reduced and is in Imperial Units"

LDN_BHS 011-4226.GPJ GLDR_CAN.GDT 10-17-01 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: J.S.

CHECKED: Qc

PROJECT: 011-4226

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 11, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80); SHEAR STRENGTH Cu, psf (nat V. + Q - ●, rem V. ⊕ U - ○; 400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		607.0								
		Black clayey TOPSOIL		0.0 606.0								
				1.0	1	AS	-					
		Very stiff, mottled brown and grey SILTY CLAY to CLAYEY SILT, some sand, trace gravel, occ. silt seams or pockets (TILL)			2	2" DO	26					
5					3	AS	-					
					4	2" DO	18					
				600.0				600				
				7.0								
10		Hard, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)			5	2" DO	58					Borehole dry during drilling on October 11, 2001
				593.0				595				
				14.0								
15					6	2" DO	27					
		Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)						590				
20					7	2" DO	16					
				585.5								
		END OF BOREHOLE		21.5								
25												
30												
35												

(Golder Report No. 011-4226)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: J.S.

CHECKED:

LDN_BHS 011-4226.GPJ GLDR_CAN.GDT 10-17-01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4226

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 10, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (nat V. + Q - ●, rem V. ⊕ U - ○; 400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		606.6								
		Black clayey TOPSOIL		0.0								
				605.2	1	AS	-					
				1.4								
		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt or sand pockets (TILL)			2	2" DO	8					
5					3	2" DO	26	600				
				599.1								
				7.5	4	2" DO	37					Borehole dry during drilling on October 10, 2001
	POWER AUGER	Hard, brown SILTY CLAY, some sand, trace gravel, fissures, some silt pockets (TILL)			5	2" DO	47					
10	SOLID STEM							595				
					6	2" DO	30					
				591.6								
15				15.0	7	2" DO	13					
		Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)						590				
20					8	2" DO	11					
				585.1								
		END OF BOREHOLE		21.5								
25												
30												
35												

(Golder Report No. 011-4226)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: J.S.

CHECKED:

LDN_BHS 011-4226.GPJ GLDR_CAN.GDT 10-17-01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4226

RECORD OF BOREHOLE 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 11, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80); SHEAR STRENGTH Cu, psf (400 800 1200 1600); nat V. + Q - ●; rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		607.2								
		Black clayey TOPSOIL		0.0 / 606.1								
				1.1	1	AS	-					
		Stiff to very stiff mottled brown and grey SILTY CLAY, some sand, trace gravel, some silt and sand pockets, fissures (TILL)			2	2" DO	14					
5					3	2" DO	20					
				599.2				600				
		Hard brown SILTY CLAY, some sand, trace gravel, fissures (TILL)		8.0	4	2" DO	43					Borehole dry during drilling on October 11, 2001
10					-							
				593.2				595				
		Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)		14.0	5	2" DO	17					
15								590				
					6	2" DO	12					
20				585.7								
		END OF BOREHOLE		21.5								
25												
30												
35												

(Golder Report No. 011-4226)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: J.S.

CHECKED:

LDN_BHS 011-4226.GPJ GLDR_CAN.GDT 10-17-01 DATA INPUT: Tony Mastroianni

PROJECT: 011-4276

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: NOVEMBER 21, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ft	ELEVATION
0		GROUND SURFACE		575.2				
		Black clayey TOPSOIL		0.0 / 573.2	1	AS	-	
		Stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt pockets and fissures (TILL)		2.0 / 568.7	2	2" DO	8	
5					3	2" DO	12	570
		Very stiff, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)		6.5 / 562.7	4	2" DO	26	
10	POWER AUGER SOLID STEM				5	2" DO	15	565
		Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)		12.5 / 548.7	6	2" DO	8	
15					7	2" DO	8	560
20					8	2" DO	6	555
25					9	2" DO	9	550
		END OF BOREHOLE		26.5				
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: 400 800 1200 1600 — nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl — 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 011-4276)

"Note: This Drawing has been Reduced and is in Imperial Units"

Borehole dry during drilling on November 21, 2001

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 011-4276.GPJ GLDR_CAN.GDT 1-3-02 DATA INPUT: Tony Mastroianni

PROJECT: 011-4276

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: NOVEMBER 22, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ft	ELEVATION
0	POWER AUGER, SOLID STEM	GROUND SURFACE		575.1 / 0.0				
		Black clayey TOPSOIL		573.1 / 2.0	1	AS	-	
		Firm to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt and sand pockets, topsoil intrusions (TILL)			2	2" DO	6	
5					3	2" DO	20	570
				568.6 / 6.5				
		Very stiff, brown SILTY CLAY, some sand, trace gravel, occ. fissures, silt pockets (TILL)			4	2" DO	26	
10					5	2" DO	21	565
				562.6 / 12.5				
					6	2" DO	10	
15					7	2" DO	8	560
		Very stiff to stiff, grey SILTY CLAY, some sand, trace gravel (TILL)						
20					8	2" DO	6	555
25					9	2" DO	10	550
				548.6 / 26.5				
		END OF BOREHOLE						
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20, 40, 60, 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●; rem V. ⊕ U - ○; 400, 800, 1200, 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp, W, Wl; 10, 20, 30, 40

>2000

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry during drilling on November 22, 2001

(Golder Report No. 011-4276)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 011-4276.GPJ GLDR_CAN.GDT 1-3-02 DATA INPUT: Tony Mastroianni

PROJECT: 011-4276

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: NOVEMBER 22, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ft	ELEVATION
0		GROUND SURFACE		575.1				
		Black clayey TOPSOIL		0.0 574.1				
	POWER AUGER SOLID STEM	Soft to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt and sand pockets, fissured (TILL)		1.0	1	AS	-	
					2	2" DO	4	
5					3	2" DO	6	570
				568.6				
		Stiff to very stiff, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)		6.5	4	2" DO	18	
10					5	2" DO	14	565
				563.1				
		Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)		12.0	6	2" DO	11	
15					7	2" DO	7	560
20					8	2" DO	8	555
25					9	2" DO	8	550
				548.6				
		END OF BOREHOLE		26.5				

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20, 40, 60, 80

SHEAR STRENGTH Cu, psf: 400, 800, 1200, 1600 — nat V. + Q - ● — rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10, 20, 30, 40

>2000

>2000

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Backfill Material

Bentonite Seal

Backfill Material

Borehole dry during drilling on November 22, 2001

(Golder Report No. 011-4276)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 011-4276.GPJ GLDR_CAN.GDT 1-3-02 DATA INPUT: Tony Mastroianni

PROJECT: 021-4035

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 9, 2002

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	GROUND SURFACE		183.96								
		Black clayey topsoil, mixed with gravel (FILL)		0.00 183.65								
		Stiff, brown silty clay, some sand, trace gravel, occ. topsoil pockets (FILL)		0.30	1	AS	-					
1				182.89	2	50 DO	12	183				
		Stiff, black clayey TOPSOIL		1.07 182.43								
		Stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)		1.52	3	50 DO	9					
2				181.98				182				
		Very stiff, brown SILTY CLAY, some sand, trace gravel, numerous silt/ sand pockets (TILL)		1.98	4	50 DO	26					
3					5	50 DO	26	181				
				180.30 3.66								
4		Very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)			6	50 DO	22	180				
					7	50 DO	16					
5				178.93				179				
		END OF BOREHOLE		5.03								
6												
7												
8												
9												
10												

(Golder Report No. 021-4035)

Backfill Material

Water level in borehole at about elevation 180.5 m. approximately 2 hrs. after completion of drilling on April 9, 2002

Water level in standpipe at about elevation 183.1 m. on April 23, 2002

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 021-4035.GPJ GLDR_CAN.GDT 6-10-02 DATA INPUT: Tony Mastroianni

PROJECT: 021-4035

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 9, 2002

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION
0	POWER AUGER HOLLOW STEM	GROUND SURFACE		184.07				184
		Granulated recycled asphalt and concrete (FILL)		0.00 / 183.87				
		Very stiff, brown, silty clay, some sand, trace gravel, occ. topsoil pockets (FILL)		0.20	1	AS	-	
1					2	50 DO	20	183
				182.85				
		Black clayey TOPSOIL		1.22 / 182.54				
		Stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. sand pockets (TILL)		1.52	3	50 DO	9	
2				182.09				
		Hard, brown SILTY CLAY, some sand, trace gravel (TILL)		1.98	4	50 DO	34	182
					5	50 DO	42	181
3				180.56				
		Very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)		3.51	6	50 DO	28	180
4					7	50 DO	23	
5				179.04				
		END OF BOREHOLE		5.03				
6								
7								
8								
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)

SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})

WATER CONTENT PERCENT Wp W Wl (10 20 30 40)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 021-4035)

Water Seepage

Water seepage into borehole encountered at about elevation 182.3 m. during drilling on April 9, 2002

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 021-4035.GPJ GLDR_CAN.GDT 6-10-02 DATA INPUT: Tony Mastroianni

PROJECT: 031-140094

RECORD OF BOREHOLE 9

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 14, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (nat V. + Q - ● rem V. ⊕ U - ○) (400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		594.0								
		ASPHALT		0.2								
		Granular base (FILL)		0.3								
		Firm, brown, silty clay, some sand, trace gravel, some topsoil (FILL)			1	AS	-					
					2	2" DO	5	590				
				589.5								
5		Firm, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		4.5	3	2" DO	7					
				587.0								
		Very stiff to hard, brown, SILTY CLAY to CLAYEY SILT, some sand, trace gravel, occ. silt pockets (TILL)		7.0	4	2" DO	20	585				
10					5	2" DO	35					
				582.5								
		Very stiff, brown to grey, SILTY CLAY, some sand, trace gravel (TILL)		11.5	6	2" DO	26	580				Water seepage into borehole encountered at about elevation 581.0 ft. during drilling on May 14, 2003
15					7	2" DO	17					
				577.5								
		END OF BOREHOLE		16.5								
20												
25												
30												
35												

(Golder Report No. 031-140094)

"Note: This Drawing has been Reduced and is in Imperial Units"

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 031-140094.GPJ GLDR_CAN.GDT 6/3/03 DATA INPUT: Tony Mastroianni

PROJECT: 031-140094

RECORD OF BOREHOLE 10

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 14, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (nat V. + Q - ● rem V. ⊕ U - ○) (400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		594.0								
		ASPHALT		0.2								
		Granular base (FILL)		0.6	1	AS	-					
		Firm, mottled brown and grey, silty clay mixed with topsoi, some sand, trace gravel (FILL)			2	2" DO	6	590				
5				589.0								
		Firm, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		5.0	3	2" DO	6					
				587.0								
				7.0	4	2" DO	22	585				
10		Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt pockets (TILL)			5	2" DO	30					
				581.5								
				12.5	6	2" DO	22					
15		Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)						580				
				577.5	7	2" DO	18					
		END OF BOREHOLE		16.5								
20												
25												
30												
35												

(Golder Report No. 031-140094)

"Note: This Drawing has been Reduced and is in Imperial Units"

Water seepage into borehole encountered at about elevation 586.5 ft. during drilling on May 14, 2003

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 031-140094.GPJ GLDR_CAN.GDT 6/3/03 DATA INPUT: Tony Mastroianni

PROJECT: 031-140318

RECORD OF BOREHOLE 113

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 1, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION
0	POWER AUGER HOLLOW STEM	GROUND SURFACE		175.83 / 0.00				
		Black, clayey topsoil (FILL)			1	AS	-	
				175.22 / 0.61				
1		Stiff dark brown silty clay, occasional pockets of topsoil (FILL)			2	50 DO	13	175
				174.69 / 1.14				
2		Stiff to very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel, fissured (TILL)			3	50 DO	17	174
					4	50 DO	30	
				173.09 / 2.74				173
3		Hard to very stiff, brown, **SILTY CLAY**, some sand, trace gravel, fissured (TILL)			5	50 DO	45	
					6	50 DO	30	172
4				171.26 / 4.57				
					7	50 DO	13	171
5								
6								170
		Stiff to very stiff, grey, **SILTY CLAY**, some sand, trace gravel (TILL)			8	50 DO	11	
7								169
8				167.75 / 8.08	9	50 DO	9	168
		END OF BOREHOLE						
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl; 10 20 30 40

>96+

>96+

(Golder Report No. 031-140318)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry during drilling on December 1, 2003

LDN_BHS 031-140318.GPJ GLDR_CAN.GDT 2/10/04 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C

CHECKED: GM

PROJECT: 031-140318

RECORD OF BOREHOLE 114

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 1, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION
0	POWER AUGER, HOLLOW STEM	GROUND SURFACE		175.37 / 0.00				175
		Black, clayey **TOPSOIL**		174.61 / 0.76	1	AS	-	
1		Stiff to very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (TILL)			2	50 DO	11	174
					3	50 DO	22	
2				173.27 / 2.10				
		Hard to very stiff, brown, **SILTY CLAY**, some sand, trace gravel, fissured (TILL)			4	50 DO	39	173
3				172.09 / 3.28	5	50 DO	20	
		Very stiff to firm, grey, **SILTY CLAY**, some sand, trace gravel (TILL)			6	50 DO	11	172
4								
					7	50 DO	8	171
5								
								170
6					8	50 DO	11	
								169
7				168.27 / 7.10				
		Compact, grey, **SILTY FINE SAND**, trace gravel, occ. clay pockets						168
8				167.29 / 8.08	9	50 DO	21	
		END OF BOREHOLE						
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80)

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● rem V. ⊕ U - ○ (20, 40, 60, 80)

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3})

WATER CONTENT PERCENT — Wp, W, Wl (10, 20, 30, 40)

(Golder Report No. 031-140318)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry during drilling on December 1, 2003

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C

CHECKED: GM

LDN_BHS 031-140318.GPJ GLDR_CAN.GDT 2/13/04 DATA INPUT: Tony Mastroianni

PROJECT: 031-140333

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	GROUND SURFACE		175.11				175	*(Golder Report No. 031-140333)*			
		Grey/ brown, granular base (**FILL**)		0.00								
		Black, clayey **TOPSOIL**		0.18	1	AS	-					
				174.35								
1		Stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		0.76	2	50 DO	10	174				
					3	50 DO	14					
2				172.97				173				Borehole dry during drilling on December 16, 2003
		Hard to very stiff, brown, **SILTY CLAY**, some sand and gravel, fissured (**TILL**)		2.13	4	50 DO	31					
3					5	50 DO	26	172				
				171.45								
4		Stiff, grey, **SILTY CLAY**, trace to some sand and gravel (**TILL**)		3.66	6	50 DO	13	171				
					7	50 DO	11					
5				170.08								
		END OF BOREHOLE		5.03								
6												
7												
8												
9												
10												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastroianni

PROJECT: 031-140333

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		176.43 / 0.00					*(Golder Report No. 031-140333)*			
		Black, clayey topsoil (**FILL**)		176.18 / 0.25	1	AS	-	176		○		
1		Stiff to firm, brown, silty clay, some sand, trace gravel, with some topsoil intermixing/ pockets and layers (**FILL**)			2	50 DO	12			○		
					3	50 DO	11	175		○		
2					4	50 DO	6	174		○		
3		Very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		173.53 / 2.90	5	50 DO	15			○		
				173.08 / 3.35				173				
4		Very stiff, brown, **SILTY CLAY**, some sand and gravel, fissured (**TILL**)			6	50 DO	27			○		
					7	50 DO	20	172		○		
5	POWER AUGER HOLLOW STEM			171.40 / 5.03								
6		Very stiff to firm, grey, **SILTY CLAY**, trace to some sand and gravel, occ. silty sand and sandy silt pockets/ seams (**TILL**)			8	50 DO	15	171		○		
								170		○		
7												
								169				
8					9	50 DO	9					
								168	⊕ +			Water seepage into borehole encountered at about 166.98m during drilling on Deember 16, 2003
9									⊕ +			
				166.98 / 9.45	10	50 DO	16	167		○		▽
		Compact, grey, **SANDY SILT** (**TILL**)		166.68								
10		END OF BOREHOLE		9.75								

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastrolanni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

PROJECT: 031-140333

RECORD OF BOREHOLE 3

SHEET 1 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16-17, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80): nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		177.06								
	POWER AUGER / HOLLOW STEM	Stiff to very stiff, brown, silty clay, some sand, trace gravel, with black topsoil, intermixing, pockets and layers (**FILL**)		0.00	1	AS	-	177	*(Golder Report No. 031-140333)*			
1					2	50 DO	14	176				
2					3	50 DO	21	175				
					4	50 DO	20					
3								174				
					5	50 DO	21					
4		Very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel, occ. fine sand partings (**TILL**)		173.25 3.81	6	50 DO	26	173				
				172.64								
5		Very stiff, brown, **SILTY CLAY**, some sand and gravel, fissured (**TILL**)		4.42	7	50 DO	27	172				Borehole dry during drilling on December 16, 2003 prior to commencing wash boring
				171.88								
6		Stiff, grey, **SILTY CLAY**, trace to some sand and gravel, occ. silty sand and sandy silt till pockets/ seams (**TILL**)		5.18	8	50 DO	13	171				
					9	50 DO	9					
7								170	⊕ +			
									⊕ +			
8	WASH BORING / HQ CASING				10	50 DO	9	169				
				168.53					>96+			
9	WASH BORING / UNCASED	Dense, grey, **SANDY SILT**, trace to some clay and gravel (**TILL**)		8.53	11	50 DO	35	168	>96+			
				167.76								
		Firm to stiff, grey, **SILTY CLAY**, trace sand and gravel, occ. silt and fine sand partings/ pockets (**TILL**)		9.30								
				167.31								
10				9.75								
		— CONTINUED NEXT PAGE —										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 27/2/04 DATA INPUT: Tony Mastroianni

PROJECT: 031-140333

RECORD OF BOREHOLE 3

SHEET 2 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16-17, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		— CONTINUED FROM PREVIOUS PAGE —										
10	WASH BORING UNCASED	Stiff to very stiff, grey, **SILTY CLAY**, trace to some sand and gravel, occ. silty sand and sandy silt till partings/ layers **(TILL)**			12	50 DO	5	167		○		
11								166				
12					13	50 DO	5	165		○		
13								164				
14					14	50 DO	5	163		○		
15					15	50 DO	4	162		○		
16								161				
17					16	50 DO	4	160	⊕ + ⊕ +	○		
18					17	50 DO	7	159				
19								158				
20		— CONTINUED NEXT PAGE —			18	50 DO	10			○		

(Golder Report No. 031-140333)

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: C.C.
CHECKED:

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastrolanni

PROJECT: 031-140333

RECORD OF BOREHOLE 3

SHEET 3 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16-17, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
20	WASH BORING UNCASED							157				
21					19	50 DO	10	156				
22								155				
					20	50 DO	17					
23								154				
		Stiff to very stiff, grey, **SILTY CLAY**, trace to some sand and gravel, occ. silty sand and sandy silt till partings/ layers **(TILL)**										
24					21	50 DO	17	153				
25								152				
					22	50 DO	10					
26								151				
27				150.09								
		Loose, grey, **SILTY FINE SAND**		26.97	23	50 DO	7	150				
				149.48								
28				27.58				149				
		Very stiff, grey, **SILTY CLAY**, trace to some sand and gravel **(TILL)**			24	50 DO	17					
29								148				
30		*--- CONTINUED NEXT PAGE ---*										

(Golder Report No. 031-140333)

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: C.C.
CHECKED:

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastroianni

PROJECT: 031-140333

RECORD OF BOREHOLE 3

SHEET 4 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16-17, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
30		*— CONTINUED FROM PREVIOUS PAGE —*										
	UNCASED	Very stiff, grey, **SILTY CLAY**, trace to some sand and gravel **(TILL)**		146.58	25	50 DO	25	147				
		END OF BOREHOLE		30.48								
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												

(Golder Report No. 031-140333)

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastrojanni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

PROJECT: 031-140333

RECORD OF BOREHOLE 4

SHEET 1 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 8-11, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / HOLLOW STEM	GROUND SURFACE		177.16								
		Black, clayey topsoil, occ. gravel and brick fragments (**FILL**)		0.00 / 176.40	1	AS	-	177				
1		Very stiff, brown to brown and grey, silty clay, some sand, trace gravel, some black topsoil intermixing (**FILL**)		0.76 / 175.03	2	50 DO	19	176				
					3	50 DO	15					
2		Stiff dark brown to black, clayey **TOPSOIL**		2.13 / 174.26	4	50 DO	14	175				
3		Stiff to very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		2.90	5	50 DO	10	174				
4					6	50 DO	19	173				
		Very stiff, brown, **SILTY CLAY**, some sand and gravel, fissured (**TILL**)		4.42 / 172.74	7	50 DO	28				MH	Borehole dry during drilling on December 8, 2003 prior to commencing washboring
5					8	50 DO	28	172				
6		Very stiff to stiff, grey, **SILTY CLAY**, trace to some sand and gravel (**TILL**)		5.94 / 171.22	9	50 DO	9	171	>96+			
7					10	50 DO	14	170				
	WASH BORING / HQ CASING	Compact, grey, **SILTY FINE SAND**		7.16 / 170.00								
8				7.47 / 169.69	11	50 DO	9	169				
9	WASH BORING / UNCASED	Stiff to very stiff, grey, **SILTY CLAY**, trace to some sand and gravel, occ. silty sand and sandy silt till pockets/ seams (**TILL**)			12	50 DO	8	168	>96+ / >96+			
10		*— CONTINUED NEXT PAGE —*							⊕ +			

(Golder Report No. 031-140333)

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: CC.

CHECKED:

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 27/2/04 DATA INPUT: Tony Mastroianni

PROJECT: 031-140333

RECORD OF BOREHOLE 4

SHEET 2 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 8-11, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		— CONTINUED FROM PREVIOUS PAGE —										
10		Compact, grey, **SANDY SILT (TILL)**		167.18 / 10.08	13	50 DO	20	167				
				166.64 / 10.52								
11								166				
12	WASH BORING				14	50 DO	8				MH	
13								165				
					15	50 DO	11	164				
14												
15	UNCASED	Firm to stiff, grey, **SILTY CLAY**, trace to some sand and gravel, with occ. silty sand and sandy silt till pockets/ seams **(TILL)**			16	50 DO	10	163				
								162				
16												
					17	50 DO	6	161				
17								160				
18					18	50 DO	8					
								159				
19												
					19	50 DO	9	158				
20		— CONTINUED NEXT PAGE —										

(Golder Report No. 031-140333)

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastroianni

PROJECT: 031-140333

RECORD OF BOREHOLE 4

SHEET 3 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 8-11, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		— CONTINUED FROM PREVIOUS PAGE —										
20	WASH BORING UNCASED	Firm to stiff, grey, **SILTY CLAY**, trace to some sand and gravel, with occ. silty sand and sandy silt till pockets/ seams **(TILL)**						157				
21					20	50 DO	8	156				
22								155				
23					21	50 DO	8	154				
24					22	50 DO	10	153				
25					23	50 DO	9	152				
26								151				
27					24	50 DO	7	150				
28								149				
29					25	50 DO	12	148				
30					26		14					
		— CONTINUED NEXT PAGE —										

(Golder Report No. 031-140333)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED: [illegible]

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastrolanni

PROJECT: 031-140333

RECORD OF BOREHOLE 4

SHEET 4 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 8-11, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
30					26	50 DO	14	147				
31	WASH BORING UNCASED	Firm to stiff, grey, **SILTY CLAY**, trace to some sand and gravel, with occ. silty sand and sandy silt till pockets/ seams **(TILL)**						146				
					27	50 DO	15					
32				144.85				145				
				32.31								
33		Very stiff to hard grey, **SILTY CLAY**, some sand, occ. gravel, with some silt partings **(TILL)**			28	50 DO	21	144				
34								143				
				142.26	29	50 DO	36					
35				34.90				142				
		Hard, grey, **SILTY CLAY**, occ. siltier/ sandier zones **(TILL)**										
				141.19								
36				35.97				141				
					30	50 DO	143					
37		Hard, grey, **CLAYEY SILT**, some sand and gravel, occ. cobbles/ boulders **(TILL)**						140				
38				139.09	31	50 DO	107					
	ROTARY DRILL ROCK CORE			38.07				139				
		Grey, highly fractured dolomitic, **LIMESTONE**			32	NX RC	PH					
39				137.87				138				
				39.29	33	NX RC	PH					
		Grey, **WEATHERED SHALE**		137.44								
		END OF BOREHOLE		39.72								
40												

(Golder Report No. 031-140333)

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastroianni

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

PROJECT: 031-140333

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 15, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		175.66 0.00								
	POWER AUGER HOLLOW STEM	Very stiff to stiff, brown, silty clay, some sand, trace gravel, with black topsoil intermixing pockets (**FILL**)			1	AS	-	175				
1					2	50 DO	17					
								174				
2					3	50 DO	12					
				173.37 2.29								
		Hard mottled, brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)			4	50 DO	30	173				
3				172.76 2.90								
		Hard to very stiff, brown, **SILTY CLAY**, some sand and gravel, fissured (**TILL**)			5	50 DO	32					
								172				
4				171.69 3.96	6	50 DO	15					
								171				Borehole dry during drilling on December 15, 2003
5					7	50 DO	7					
									>96+			
								170	+			
6					8	50 DO	6					
								169				
7		Very stiff to stiff, grey, **SILTY CLAY**, trace to some sand and gravel (**TILL**)							>96+			
									>96+			
								168				
8					9	50 DO	7					
									⊕ +			
								167	⊕ +			
9												
					10	50 DO	5					
				165.90				166				
10		END OF BOREHOLE		9.75								

(Golder Report No. 031-140333)

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

PROJECT: 031-140333

RECORD OF BOREHOLE 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 15, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION
0	POWER AUGER HOLLOW STEM	GROUND SURFACE		175.45				175
		Brown, silty clay, some sand, trace gravel, occ. topsoil pockets (**FILL**)		0.00 / 174.84	1	AS	-	
1		Stiff, black, clayey topsoil, with brown silty clay pockets (**FILL**)		0.61 / 174.08	2	50 DO	9	174
2		Very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		1.37 / 173.32	3	50 DO	15	
		Very stiff, brown, **SILTY CLAY**, some sand and gravel, fissured (**TILL**)		2.13 / 171.79	4	50 DO	27	173
3					5	50 DO	17	
4		Stiff to firm, grey, **SILTY CLAY**, trace to some sand and gravel (**TILL**)		3.66 / 170.42	6	50 DO	9	172
5		END OF BOREHOLE		5.03	7	50 DO	7	171
6								
7								
8								
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)

SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})

WATER CONTENT PERCENT Wp W Wl (10 20 30 40)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 031-140333)

Borehole dry during drilling on December 15, 2003

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: C.C.

CHECKED:

LDN_BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastroianni

PROJECT: 031-145072

RECORD OF TEST PIT 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	BACKHOE 0.60m x 1.80m	GROUND SURFACE						*(Golder Report No. 031-145072)*		
		Dark brown to black, silty topsoil, some clay, asphalt, concrete and brick fragments, cinders, some roots (FILL)		0.00	1	CS				
				0.28						
1		Mottled brown and grey, silty clay, some concrete and brick fragments (FILL)			2	CS				
					3	CS				
				1.73						
2		Black, fine sand and cinders (FILL)			4	CS			Chem	▽
		Black, clayey silt, some sand, some galss fragments, trace gravel some organics (FILL)		2.23						
		Grey, SILTY CLAY, some sand, trace gravel (TILL)		2.51	5	CS				Water seepage into Test pit encountered at about 2.2m depth, during digging on May 22, 2003
3		END OF TEST PIT		3.05						
4										
5										
6										
7										
8										
9										
10										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RSD

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

PROJECT: 031-145072

RECORD OF TEST PIT 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: MAY 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE									
	BACKHOE 0.60m x 2.13m	Dark brown, clayey TOPSOIL, some roots, some sand, occ. gravel (FILL)		0.00	1	CS					
		Mottled brown and grey, clayey silt, pieces of wood, concrete and brick, some slag, and roots (FILL)		0.30	2	CS					
1		Mottled brown and grey, silty clay, pieces of concrete and brick (FILL)		1.22	3	CS					
2		Dark brown to black, fine to medium sand, some oxidation staining, occ. gravel, some clay and silt (FILL)		1.98	4	CS				Chem	▽ Water seepage into Test pit encountered at about 2.2m depth, during digging on May 22, 2003
		Grey to black, ORGANIC SILT, some clay, trace sand and gravel		2.44	5	CS					
3		Grey, SILTY CLAY, some sand, trace gravel (TILL)			6	CS					
		END OF TEST PIT		3.05							
4											
5											
6											
7											
8											
9											
10											

(Golder Report No. 031-145072)

LDN_BHS 031-145072.GPJ GLDR_CAN.GDT 6/17/03 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RSD

PROJECT: 031-145072

RECORD OF TEST PIT 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	BACKHOE 0.60m x 2.13m	GROUND SURFACE						*(Golder Report No. 031-145072)*		
		Dark brown, clayey silt topsoil, some roots, sand, occ. gravel (FILL)		0.00						
				0.25	1	CS				
1		Mottled brown and grey, silty clay, some concrete and brick pieces, trace roots, trace gravel (FILL)			2	CS				
		Mottled brown and grey, silty clay, some sand, trace gravel, fissured, oxidized (FILL)		1.22	3	CS				
2		Black, sandy silt, some clay, trace gravel (FILL)		1.98	4	CS			Chem	
		Grey to black, silty clay, some organics, trace gravel (FILL)		2.29	5	CS				▽ Water seepage into Test pit at about 2.29m during digging on May 22, 2003
		Mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		2.51						
3		END OF TEST PIT		3.05						
4										
5										
6										
7										
8										
9										
10										

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RGD

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

PROJECT: 031-145072

RECORD OF TEST PIT 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	BACKHOE 0.60m x 2.44m	GROUND SURFACE		0.00				*(Golder Report No. 031-145072)*		
		Dark brown, clayey silt topsoil, some sand and gravel, occ. roots (FILL)		0.15	1	CS				
		Mottled brown and grey, silty clay, some concrete and brick pieces, trace gravel (FILL)		0.61	2	CS				
1		Mottled brown and grey, clayey silt, occ. sand and gravel (FILL)		1.37	3	CS			Chem	
2		Black, fine to medium sand, some clay, occ. gravel, pieces of brick (FILL)		2.13	4	CS				Water seepage into Test pit encountered at about 2.3m depth, during digging on May 22, 2003
		Mottled grey and black, silty clay, some sand, some organics (FILL)		2.44	5	CS				
3		Mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		3.05						
		END OF TEST PIT								
4										
5										
6										
7										
8										
9										
10										

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RBD

PROJECT: 031-145072

RECORD OF TEST PIT 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT PERCENT	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE								
	BACKHOE 0.60m x 2.13m	Dark brown, clayey topsoil, some sand, trace gravel, roots (FILL)		0.00	1	CS				
		Mottled brown and grey, clayey silt, some sand, trace gravel, some wood, concrete and brick fragments (FILL)		0.33	2	CS				
1		Dark brown, fine to medium sand, some silt, some gravel, trace clay, glass fragments (FILL)		1.22	3	CS			Chem	
2		Dark grey, silty clay, some sand, trace gravel, some organics (FILL)		1.83	4	CS				Water seepage into Test pit at about 2.44m during digging on May 22, 2003
					5	CS				
3					6	CS				
		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.35	7	CS				
4		END OF TEST PIT		3.96						
5										
6										
7										
8										
9										
10										

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10 20 30 40

(Golder Report No. 031-145072)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RED

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

PROJECT: 031-145072

RECORD OF TEST PIT 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE								
		Dark brown, clayey topsoil, some sand, silt and roots (FILL)		0.00						
		Mottled brown and grey, silty clay, some concrete and brick fragments, trace gravel (FILL)		0.15	1	CS				
1	BACKHOE 0.60m x 2.74m	Dark brown, fine to coarse sand, some pieces of concrete, brick and glass fragments, some slag and gravel, trace silt and clay (FILL)		0.81	2 3	CS CS			Chem	
2		Brown, medium to coarse sand and gravel, some shell fragments, trace silt, clay (FILL)		1.83	4	CS				Water seepage into Test pit at about 2.13m during digging on May 22, 2003
3		Dark grey, silty clay, some sand, trace organics (FILL)		2.59	5	CS				
		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.35	6	CS				
4		END OF TEST PIT		3.96						
5										
6										
7										
8										
9										
10										

(Golder Report No. 031-145072)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RED

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

PROJECT: 031-145072

RECORD OF TEST PIT 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	BACKHOE 0.60m x 2.74m	GROUND SURFACE		0.00				*(Golder Report No. 031-145072)*		
		Dark brown, clayey topsoil, some sand, some silt, trace to some roots, brick fragments (FILL)		0.08	1	CS				
1		Mottled brown and grey, silty clay, some concrete and brick pieces, some sand (FILL)			2	CS				
					3	CS				
2		Grey, silty clay, some organics, trace sand, pieces of wire (FILL)		1.98	4	CS				▽ Water seepage into Test pit encountered at about 2.0m depth, during digging on May 22, 2003
		Black, fine to coarse sand, some gravel, some wood, steel and glass fragments, trace clay (FILL)		2.59	5	CS			Chem	
3		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.05	6	CS				
					7	CS				
4		END OF TEST PIT		4.11						
5										
6										
7										
8										
9										
10										

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RJO

PROJECT: 031-145072

RECORD OF TEST PIT 8

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	BACKHOE 0.60m x 2.74m	GROUND SURFACE		0.00				*(Golder Report No. 031-145072)*		
		Dark brown, clayey topsoil, some sand, some silt and roots, trace gravel (FILL)		0.10	1	CS				
1					2	CS				
		Mottled brown and grey, silty clay, some concrete, brick pieces and wood fragments (FILL)			3	CS				
2					4	CS			Chem	▽ Water seepage into Test pit encountered at about 2.1m depth, during digging on May 22, 2003
				2.44	5	CS				
3		Grey, silty clay, some sand, some organics, trace brick fragments (FILL)			6	CS				
				3.66						
4		Grey, SILTY CLAY, some sand, trace gravel (TILL)			7	CS				
		END OF TEST PIT		4.27						
5										
6										
7										
8										
9										
10										

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: REO

PROJECT: 031-145072

RECORD OF TEST PIT 9

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	BACKHOE 0.60m x 2.44m	GROUND SURFACE						*(Golder Report No. 031-145072)*		
		Dark brown, clayey topsoil, some sand, silt and roots, trace gravel (FILL)		0.00						
				0.25	1	CS				
1		Mottled brown and grey, silty clay, some concrete and brick fragments, trace gravel (FILL)			2	CS				
		Concrete and brick debris (FILL)		1.37						
		Black, fine to medium sand, some silt, trace clay (FILL)		1.52	3	CS			Chem	
2		Brown PEAT		1.68	4	CS				
		Dark grey, ORGANIC SILT, some clay, some sand		2.13	5	CS				Water seepage into Test pit at about 2.13m during digging on May 22, 2003
3		Grey, SILTY CLAY, some sand, trace gravel (TILL)		2.74	6	CS				
		END OF TEST PIT		3.35						
4										
5										
6										
7										
8										
9										
10										

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: REJ

PROJECT: 031-145072

RECORD OF TEST PIT 10

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	BACKHOE 0.60m x 2.13m	GROUND SURFACE						*(Golder Report No. 031-145072)*		
		Dark brown, clayey topsoil, some sand, trace gravel(FILL)		0.00						
		Mottled brown and grey, silty clay, some topsoil, some sand, trace gravel (FILL)		0.30	1	CS				
1		Brown, fine to coarse sand, some glass and steel fragments (FILL)		0.76	2	CS			Chem	
		Mottled brown and grey, silty clay, some organics, some sand (FILL)		1.22	3	CS				
2		Grey, silty clay, some sand, some organics (FILL)		1.83	4	CS				Water seepage into Test pit encountered at about 1.8m depth, during digging on May 22, 2003
					5	CS				
3		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.05	6	CS				
		END OF TEST PIT		3.66						
4										
5										
6										
7										
8										
9										
10										

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RGA

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastrojanni

PROJECT: 031-145072

RECORD OF TEST PIT 11

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE								
	BACKHOE 0.60m x 2.13m	Granular base (FILL)		0.00						
		Mottled brown and grey, silty clay, some sand, occ. gravel (FILL)		0.15	1	CS				
		Brown, medium to coarse sand, some concrete, brick and glass fragments, some silt (FILL)		0.41					Chem	
1		Mottled brown and grey, clayey silt, some sand, trace gravel (FILL)		0.76	2	CS				▽ Water seepage into Test pit at about 1.22m during digging on May 22, 2003
					3	CS				
2		Grey, silty clay, some sand, trace organics (FILL)		1.83	4	CS				
		Grey, SILTY CLAY, some sand, trace gravel (TILL)		2.59	5	CS				
3		END OF TEST PIT		3.20						
4										
5										
6										
7										
8										
9										
10										

(Golder Report No. 031-145072)

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: K.B.

CHECKED:

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastroianni

PROJECT: 031-145072

RECORD OF TEST PIT 12

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE						*(Golder Report No. 031-145072)*		
	BACKHOE 0.60m x 2.13m	Mottled brown and grey, silty clay, some sand, trace gravel, trace rootlets (FILL)		0.00						
		Brown, medium to coarse silty sand, some gravel (FILL)		0.15	1	CS				
		Mottled brown and grey, silty clay, some sand, trace gravel, concrete and brick fragments (FILL)		0.56	2	CS				
1		Gravel (FILL)		0.91						
		Black, silty clay, some black and white fine sand (FILL) Solvent odour		1.22	3	CS			Chem	
2		Grey, SILTY CLAY, some organics, some sand		1.83	4	CS				
					5	CS				▽ Water seepage into Test pit at about 2.74m during digging on May 22, 2003
3		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.05	6	CS				
		END OF TEST PIT		3.66						
4										
5										
6										
7										
8										
9										
10										

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RED

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/17/03 DATA INPUT: Tony Mastroianni

PROJECT: 031-145072

RECORD OF TEST PIT 13

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

DEPTH SCALE METRES	METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	ELEVATION	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE						*(Golder Report No. 031-145072)*		
	BACKHOE 0.60m x 2.44m	Dark brown to black, clayey topsoil, some sand, occ. gravel (FILL)		0.00	1	CS				
1		Mottled brown and grey, clayey silt, some medium to coarse silty sand, occ. gravel, topsoil (FILL)		0.33	2	CS				
2		Mottled brown and grey, silty clay, some sand, occ. gravel, concrete and brick fragments (FILL)		1.22	3	CS				
		Black, fine to medium sand, some gravel, some clay (FILL)		2.13	4	CS			Chem	▽ Water seepage into Test pit at about 2.3m during digging on May 22, 2003
3		Brown and grey, clayey silt and sand, concrete, glass, steel and clay tile fragments (FILL)		2.44	5	CS				
					6	CS				
4		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.96	7	CS				
		END OF TEST PIT		4.27						
5										
6										
7										
8										
9										
10										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: K.B.

CHECKED: RGD

LDN_ENV 031-145072.GPJ GLDR_LDN.GDT 6/11/03 DATA INPUT: Tony Mastrojanni

PROJECT: 041-140048

RECORD OF BOREHOLE 4

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 14, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		188.21				188	*(Golder Report No. 041-140048)*			
		ASPHALT		0.00								
				0.18								
		CONCRETE		187.78	1	AS	-					
				0.43								
1		Stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**			2	50 DO	8	187				
					3	50 DO	11					
2				186.08								
				2.13				186				
					4	50 DO	34					
3		Hard, brown, **SILTY CLAY**, some sand, trace gravel, occ. sand and silt partings, oxidized, fissured **(TILL)**			5	50 DO	33	185				
				184.40								
4		Very stiff, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**			6	50 DO	28	184				
				183.59								Water seepage into borehole encountered at about elevation 183.59m during drilling on May 12, 2004
				4.62	7	50 DO	27					
5	POWER AUGER / HOLLOW STEM	Compact, grey, **SILTY FINE SAND**, trace gravel		183.03								
				5.18				183				
6												
					8	50 DO	11	182				
7									>96+			
								181				
		Very stiff, grey, **SILTY CLAY**, some sand, trace gravel, sand pockets **(TILL)**			9	50 DO	15				MH	
8												
								180				
9												
					10	50 DO	12	179				
10		*--- CONTINUED NEXT PAGE ---*										

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 4

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 14, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
10								178	>96+			
									(Golder Report No. 041-140048)			
11					11	50 DO	15			○		
								177				
12												
					12	50 DO	15	176		○		
13												
								175				
14	POWER AUGER HOLLOW STEM	Very stiff, grey, **SILTY CLAY**, some sand, trace gravel, sand pockets **(TILL)**			13	50 DO	13			○		
								174				
15												
								173				
					14	50 DO	15			○		
16												
								172				
17					15	50 DO	12			○		
								171				
18												
								170				
					16	50 DO	16			○		
				169.47								
19		END OF BOREHOLE		18.75								
20												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: S.P.
CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 18, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	PAVEMENT SURFACE		187.20				187	*(Golder Report No. 041-140048)*			
		ASPHALT		0.00								
		Granular road base (**FILL**)		0.18								
		Very dense, brown, fine to medium sand, some gravel, trace silt (**FILL**)		0.30	1	AS	-					
1					2	50 DO	64	186				
				185.83								
		Stiff, black, clayey topsoil, some sand trace gravel (**FILL**)		1.37								
				185.50								
2		Stiff, mottled brown and grey, silty clay, some sand, trace gravel, trace topsoil (**FILL**)		1.70	3	50 DO	12	185				
				184.91								
		Stiff, black, clayey topsoil, some sand, trace gravel (**FILL**)		2.29	4	50 DO	11					
				184.45								
3		Stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		2.74	5	50 DO	11	184				Borehole dry during drilling on May 18, 2004
				183.54								
		Hard, brown, **SILTY CLAY**, some sand, trace gravel, occ. silt partings, oxidized (**TILL**)		3.66	6	50 DO	34	183				
4												
5					7	50 DO	41					
				181.71				182				
		Stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		5.49								
6					8	50 DO	12	181				
				180.64								
		END OF BOREHOLE		6.55								
7												
8												
9												
10												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 8

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 18, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	PAVEMENT SURFACE		188.60								
		ASPHALT		0.00								
		CONCRETE		0.19								
				188.18	1	AS	-					
				0.42				188				
1		Very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel, occ. silt partings **(TILL)**			2	50 DO	16					
				187.23								
				1.37				187				
2					3	50 DO	28					
		Very stiff to hard, brown, **SILTY CLAY**, some sand, trace gravel, oxidized **(TILL)**			4	50 DO	41	186				
3					5	50 DO	39					Borehole dry during drilling on May 18, 2004
				184.94				185				
				3.66	6	50 DO	18					
4												
					7	50 DO	17	184				
5		Stiff to very stiff, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**										
								183				
6					8	50 DO	14					
				182.04								
		END OF BOREHOLE		6.55								
7												
8												
9												
10												

(Golder Report No. 041-140048)

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: S.P.
CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 12

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 18, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION
0	POWER AUGER HOLLOW STEM	PAVEMENT SURFACE		188.67				188
		ASPHALT		0.00				
		CONCRETE		0.18 / 188.26				
		Black, topsoil, some sand, trace gravel **(FILL)**		0.41 / 188.06				
				0.61				
1		Brown, silty fine to medium sand, trace gravel, trace clay **(FILL)**			1	AS	7	
				187.30				
		Compact, greyish brown, fine to coarse silty sand, trace gravel, trace silt **(FILL)**		1.37 / 186.94	2	50 DO	14	187
2		Stiff, brown to grey, **SILTY CLAY**, some sand, trace gravel, fissured, silt partings		1.73				
				186.23				
		Compact, grey, fine to medium **SAND**, trace gravel		2.44 / 185.77	3	50 DO	29	186
3				2.90				
					4	50 DO	26	
4					5	50 DO	28	185
					6	50 DO	30	184
5								
		Very stiff to hard, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**						183
6					7	50 DO	14	
								182
7								
					8	50 DO	15	181
8				180.59				
		END OF BOREHOLE		8.08				
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl; 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 041-140048)

Water seepage into borehole encountered at about elevation 187.45m during drilling on May 18, 2004

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 15

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 18, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	PAVEMENT SURFACE		186.49								
		ASPHALT		0.00								
		Granular road base (**FILL**)		0.14 / 186.09	1	AS	-					
1		Stiff, brown, silty clay, some sand, trace gravel, pockets of topsoil and silty sand (**FILL**)		0.41	2	AS	-	186				
					3	50 DO	8					
				184.92				185				
2		Firm, black, topsoil, some sand, roots, organics (**FILL**)		1.58	4	50 DO	7					
				184.36								
		Stiff, brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		2.13	5	50 DO	14	184				
				183.75								
3		Hard, brown, **SILTY CLAY**, some sand, trace gravel, occ. silt pockets, fissured (**TILL**)		2.74	6	50 DO	36					Borehole dry during drilling on May 18, 2004
								183				
4					7	50 DO	41					
								182				
5					8	50 DO	34					
								181				
6				180.35								
		Very stiff, grey, **SILTY CLAY**, some sand, trace gravel, silt pockets (**TILL**)		6.15	9	50 DO	19					
				179.94				180				
		END OF BOREHOLE		6.55								
7												
8												
9												
10												

(Golder Report No. 041-140048)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 16

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 18, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	PAVEMENT SURFACE		187.30				187				
		ASPHALT		0.00 / 187.09								
		Granular road base (**FILL**)		0.20 / 186.84	1	AS	-					
				0.46								
1		Very stiff, mottled brown and grey, silty clay, some sand, trace gravel, trace topsoil (**FILL**)			2	50 DO	15	186				
				185.77								
		Firm, mottled brown and grey, silty clay, some sand, trace gravel, topsoil pockets (**FILL**)		1.52	3	50 DO	7					
2				185.16								
				2.13								
					4	50 DO	24	185				
3		Very stiff to hard, brown, **SILTY CLAY**, some sand, trace gravel, silt partings, fissured (**TILL**)			5	50 DO	30	184				
4					6	50 DO	22					
				183.05				183				
				4.24								
					7	50 DO	10					Borehole dry during drilling on May 18, 2004
5								182	>96+			
6					8	50 DO	8	181				
7		Very stiff to stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)							⊕ +			
								180	⊕ +			
					9	50 DO	6					
8								179	⊕ +			
9									⊕ +			
					10	50 DO	6	178				
10		*--- CONTINUED NEXT PAGE ---*										

(Golder Report No. 041-140048)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 16

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 18, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
10		--- CONTINUED FROM PREVIOUS PAGE ---										
11	POWER AUGER / HOLLOW STEM	Very stiff to stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)			11	50 DO	WH	177				
12					12	50 DO	WH	176				
13								175				
14					13	50 DO	7	174				
15								173	>96+			
16					14	50 DO	8	172				
17					15	50 DO	7	171				
18								170				
19		END OF BOREHOLE		168.55 / 18.75	16	50 DO	8	169				
20												

(Golder Report No. 041-140048)

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: S.R.

CHECKED:

PROJECT: 041-140048

RECORD OF BOREHOLE 19

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 25, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		186.81								
		ASPHALT		0.00								
				0.15								
		Granular road base (FILL)		186.37	1	AS	-					
				0.43				186				
1		Stiff to hard, brown and grey, silty clay, some sand, trace gravel (FILL)			2	50 DO	9					
				185.13								
				1.68	3	50 DO	43	185				
2		Hard to stiff, brown and black, silty clay, some slag, some sand, trace gravel, trace organics (FILL)			4	50 DO	12					
				183.91				184				
3				2.90								
		Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)			5	50 DO	12					
				183.15								
				3.66				183				
4					6	50 DO	31					
					7	50 DO	29	182				
5	POWER AUGER HOLLOW STEM	Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, silt pockets (TILL)										
								181				
6					8	50 DO	17					
				179.80				180				
7				7.01								
					9	50 DO	8	179				
8												
		Firm to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)						178				
9					10	50 DO	6					
								177				
10		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 041-140048)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 19

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 25, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
10												
11	POWER AUGER HOLLOW STEM				11	50 DO	4	176				
12					12	50 DO	2	175				
13		Firm to very stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)						174	>96+			
14					13	50 DO	WH	173				
15								172				Water seepage into borehole encountered at about elevation 172.18m during drilling on May 25, 2004
					14	50 DO	WH					
16		END OF BOREHOLE		171.11 / 15.70								
17												
18												
19												
20												

(Golder Report No. 041-140048)

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 20

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 26, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		187.93								
		ASPHALT		0.00								
		CONCRETE		0.13								
				187.42								
				0.51								
1		Very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel, silty pockets **(TILL)**			1	50 DO	25	187				
				186.55								
				1.37								
2					2	50 DO	31	186				
					3	50 DO	30					
3		Hard, brown, **SILTY CLAY**, some sand, trace gravel, fissured, silt pockets and sand layers **(TILL)**						185				
		-70mm sand seam @ 4.0m			4	50 DO	34					
4					5	50 DO	36	184				
				183.51								
				4.42	6	50 DO	18					
5	POWER AUGER HOLLOW STEM							183				
6					7	50 DO	13	182			MH	
7		Hard to very stiff, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**						181	>96+			
8					8	50 DO	12	180				
									>96+			
9								179				
					9	50 DO	10					
10								178				
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 041-140048)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 20

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 26, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W Wl, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
10		--- CONTINUED FROM PREVIOUS PAGE ---							(Golder Report No. 041-140048)			
11	POWER AUGER HOLLOW STEM	Hard to very stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)			10	50 DO	7	177	>96+	○		
12					11	50 DO	6	176		○		
13								175	⊕ + >96+			
14					12	75 TO		174	>96+	○		
15								173				
16				171.77	13	50 DO	14	172		○		
17		Compact to loose, **SANDY SILT**, some clay, occ. sand seams and clayey layer		16.15	14	50 DO	12	171	>96+	○		Water seepage into borehole encountered at about elevation 171.48m on May 26, 2004
18								170				
19		END OF BOREHOLE		169.18 18.75	15	50 DO	2			○		
20												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

RECORD OF BOREHOLE 21

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 26, 2004

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	PAVEMENT SURFACE		187.76								
		ASPHALT		0.00								
		Granular road base (**FILL**)		0.13								
				187.41	1	AS	-					
		Brown, silty clay, some sand, trace gravel (**FILL**)		0.36								
				187.00				187				
1		Hard, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		0.76	2	50 DO	32					
				186.39								
				1.37	3	50 DO	28	186				
2		Hard, brown, **SILTY CLAY**, some sand, trace gravel, fissured, occ. silty sand partings (**TILL**)			4	50 DO	33					
								185				
3					5	50 DO	30					
				184.11								
				3.66				184				
4					6	50 DO	22				MH	
					7	50 DO	17					Borehole dry during drilling on May 26, 2004
5								183				
6								182				
					8	50 DO	14					
		Very stiff to very stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)						181				
7												
					9	50 DO	11	180				
8									>96+			
								179				
9					10	50 DO	8					
								178				
10		--- *CONTINUED NEXT PAGE* ---										

(Golder Report No. 041-140048)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 21

BORING DATE: MAY 26, 2004

SHEET 2 OF 2

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							(Golder Report No. 041-140048)			
10												
11					11	50 DO	6	177				
									>96+			
12					12	50 DO	5	176				
13								175	⊕ + >96+			
14	POWER AUGER HOLLOW STEM	Very stiff to very stiff, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**			13	50 DO	9	174				
									>96+			
15								173				
					14	50 DO	8					
16								172	>96+			
17					15	50 DO	7	171				
18								170	⊕ + ⊕ +			
					16	50 DO	4					
				169.02								
19		END OF BOREHOLE		18.75								
20												

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroianni

PROJECT: 041-140048

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 31

BORING DATE: JUNE 7, 2004

SHEET 1 OF 1

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

(Golder Report No. 041-140048)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		187.30 0.00				187				
1		Brown, silty clay, some sand, trace gravel (**FILL**)			1	AS	-					
2					2	50 DO	10	186				
				184.86 2.44				185				
3		Stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel, fissured (**TILL**)			3	50 DO	8	184				Borehole dry during drilling on June 7, 2004
				183.64 3.66								
4		Hard, brown, **SILTY CLAY**, some sand, trace gravel (**TILL**)			4	50 DO	33	183				
5								182				
				181.81 5.49								
6		Stiff to hard, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)			5	50 DO	32	181				
7								180				
8					6	50 DO	10					
		END OF BOREHOLE		179.22 8.08								
9												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.P.

CHECKED:

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 10/12/04 DATA INPUT: Tony Mastroianni

PROJECT: 06-1140-006

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 6, 2006

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		181.04				181	*(Golder Report No. 06-1140-006)*			
		ASPHALT		0.00								
		CONCRETE		0.09								
		Stiff, brown, silty clay, some sand and gravel, trace organics (**FILL**)		0.28	1	SS	10			○		
				180.28								
1		Very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		0.76	2	SS	17	180		○		
				179.52								
				1.52	3	SS	24			○		
2					4	SS	28	179		○		
3		Very stiff to hard, brown, **SILTY CLAY**, some sand, trace gravel (**TILL**)			5	SS	33	178		○		Borehole dry during drilling on June 6, 2006
4					6	SS	25	177		○		
				176.62								
				4.42	7	SS	13			○		
5								176				
6		Very stiff to stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)			8	SS	9	175		○		
7								174	>96+			
					9	SS	7			○		
8				172.96				173				
		END OF BOREHOLE		8.08								
9												
10												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: B.G.

CHECKED: BG

LDN_BHS 06-1140-006.GPJ GLDR_CAN.GDT 6/14/06 DATA INPUT: Tony Mastroianni

PROJECT: 06-1140-006

RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 7, 2006

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / SOLID STEM	PAVEMENT SURFACE		181.55 / 0.00								
		ASPHALT		181.35 / 0.20	1	AS	-					
		Grey, sand and gravel (**FILL**)		0.30	2	SS	4	181				
		Brown to black, silty clay, some organics, clay tile fragments (**FILL**)										Water seepage into borehole encountered at about a depth of 0.76m during drilling
1				180.48 / 1.07	3	SS	2					
		Firm to very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)			4	SS	23	180				
2				179.57 / 1.98	5	SS	26	179				
3		Very stiff, brown, **SILTY CLAY**, some sand, trace gravel (**TILL**)			6	SS	27	178				
4					7	SS	26					
				177.13 / 4.42				177				
5					8	SS	13					
								176				
6		Very stiff to stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)			9	SS	9					
								175				
7									>96+			
								174				Water level in borehole at about a depth of 7.32m upon completion of drilling on June 7, 2006
8				173.47	10	SS	7					
		END OF BOREHOLE		8.08								
9												
10												

(Golder Report No. 06-1140-006)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: B.G.

CHECKED: BG

LDN_BHS 06-1140-006.GPJ GLDR_CAN.GDT 6/14/06 DATA INPUT: Tony Mastroianni

PROJECT: 06-1140-020

RECORD OF BOREHOLE 9

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: FEBRUARY 20, 2006

DATUM:

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SHOULDER SURFACE							*(Golder Report No. 06-1140-020)*			
		Granular road base (**FILL**)		0.00	1	AS	-					
		Stiff, mottled brown and grey, silty clay, some sand, trace gravel (**FILL**)		0.30	2	SS	10					
1		Stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		0.76	3	SS	10					
					4	SS	9					
2		Hard, brown, **SILTY CLAY**, some sand, trace gravel (**TILL**)		2.13	5	SS	40					
					6	SS	38					Borehole dry during drilling on February 20, 2006
3												
4		Very stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		3.66	7	SS	29					
					8	SS	22					
5												
6					9	SS	15					
		END OF BOREHOLE		6.55								
7												
8												
9												
10												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: A.A.

CHECKED:

LDN_BHS 06-1140-020.GPJ GLDR_CAN.GDT 6/15/06 DATA INPUT: Tony Mastroianni

PROJECT: 06-1140-020

RECORD OF BOREHOLE 17

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: FEBRUARY 20, 2006

DATUM:

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		0.00								
		ASPHALT		0.15								
		CONCRETE		0.28	1	AS	-					
		Granular road base (**FILL**)		0.30	2	SS	14					
		Compact, brown, medium to coarse sand, some clay and silt, trace gravel (**FILL**)		0.76	3	SS	12					
1		Stiff, mottled brown, silty clay, some sand, trace gravel, sand pockets (**Possible FILL**)		1.22	4	SS	29					
2		Very stiff to hard, brown, **SILTY CLAY**, some sand, trace gravel (**TILL**)			5	SS	50					
3					6	SS	47					Borehole dry during drilling on February 20, 2006
4				3.66	7	SS	30					
5		Very stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)			8	SS	21					
6					9	SS	15					
		END OF BOREHOLE		6.55								
7												
8												
9												
10												

(Golder Report No. 06-1140-020)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: A.A.

CHECKED: NR

LDN_BHS 06-1140-020.GPJ GLDR_CAN.GDT 6/15/06 DATA INPUT: Tony Mastroianni

PROJECT: 06-1140-142

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JULY 13, 2006

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80); SHEAR STRENGTH Cu, psf (400 800 1200 1600); nat V. +, rem V. ⊕, Q - ●, U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER, SOLID STEM	GROUND SURFACE		614.7								
		Black, clayey **TOPSOIL**, rootlets		0.0								
				0.4	1	AS	-					
		Stiff to very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**			2	SS	11					
5								610				
				609.0	3	SS	22					
				5.8								Borehole dry durring drilling on July 13, 2006
					4	SS	37					
		Very stiff to hard, brown, **SILTY CLAY**, some sand, trace gravel, occ. oxidized, fissured **(TILL)**						605				
10					5	SS	34					
				601.5	6	SS	22					
				13.3								
		Very stiff, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**						600				
15					7	SS	16					
				598.2								
		END OF BOREHOLE		16.5								
20												
25												
30												
35												

(Golder Report No. 06-1140-142)

LDN_BHS 06-1140-142.GPJ GLDR_CAN.GDT 8/31/06 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: N.R.

CHECKED:

PROJECT: 06-1140-142

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JULY 13, 2006

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		614.2				
		ASPHALT		0.0				
		Brown, granular road base (**FILL**)		0.4 612.2	1	AS	-	
		Firm to very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		2.0	2	AS	-	
					3	SS	7	
5				608.5	4	SS	17	610
		Very stiff to hard, brown, **SILTY CLAY**, some sand, trace gravel, occ. oxidized, fissured (**TILL**)		5.7	5	SS	38	
10					6	SS	35	605
				600.7	7	SS	21	
		Very stiff to stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		13.5	8	SS	13	600
15				597.7				
		END OF BOREHOLE		16.5				
20								
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20, 40, 60, 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●, rem V. ⊕ U - ○; 400, 800, 1200, 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp, W, Wl; 10, 20, 30, 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 06-1140-142)

Borehole dry durring drilling on July 13, 2006

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: N.R.

CHECKED:

LDN_BHS 06-1140-142.GPJ GLDR_CAN.GDT 8/31/06 DATA INPUT: Tony Mastroianni

PROJECT: 06-1140-142

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JULY 13, 2006

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/ft	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (400 800 1200 1600) nat V. + Q - ● rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		613.8								
		ASPHALT		0.0								
		Brown, granular road base (**FILL**)		0.5 / 611.3	1	AS	-			○		
		Stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		2.5 / 609.3	2	SS	9	610		○		
5		Very stiff to hard, brown, **SILTY CLAY**, some sand, trace gravel, occ. silt seams, occ. fissures (**TILL**)		4.5 / 601.8	3	SS	16			○		Borehole dry durring drilling on July 13, 2006
					4	SS	35	605		○		
10					5	SS	30			○		
		Very stiff, grey, **SILTY CLAY**, some sand, trace gravel, occ. fissures (**TILL**)		12.0 / 597.3	6	SS	24	600		○		
15					7	SS	17					
		END OF BOREHOLE		16.5								
20												
25												
30												
35												

(Golder Report No. 06-1140-142)

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: N.R.

CHECKED:

LDN_BHS 06-1140-142.GPJ GLDR_CAN.GDT 8/31/06 DATA INPUT: Tony Mastroianni

PROJECT: 06-1140-142

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JULY 13, 2006

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION
0	POWER AUGER SOLID STEM	GROUND SURFACE		613.8				
		Black, clayey **TOPSOIL**		0.0				
		Stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**		0.8	1	AS	-	
					2	SS	13	610
5					3	SS	9	
				606.8				
		Hard, brown, **SILTY CLAY**, some sand, trace gravel **(TILL)**		7.0	4	SS	34	605
10					5	SS	39	
				599.8	6	SS	30	600
		Very stiff, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**		14.0	7	SS	20	
15				597.3				
		END OF BOREHOLE		16.5				
20								
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●; rem V. ⊕ U - ○; 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W WI; 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 06-1140-142)

Borehole dry durring drilling on July 13, 2006

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: N.R.

CHECKED:

LDN_BHS 06-1140-142.GPJ GLDR_CAN.GDT 8/31/06 DATA INPUT: Tony Mastroianni

PROJECT: 06-1140-142

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JULY 13, 2006

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ft	ELEVATION
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		614.4				
		ASPHALT		0.0				
		Brown, granular road base (FILL)		0.5 611.9	1	AS	-	
5		Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		2.5 608.1	2 3	SS SS	9 11	610
10		Stiff to hard, brown, SILTY CLAY, some sand, trace gravel (TILL)		6.3 600.6	4 5 6	SS SS SS	33 34 28	605
15		Very stiff to stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)		13.8 597.9	7	SS	13	600
		END OF BOREHOLE		16.5				

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●; rem V. ⊕ U - ○; 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W WI; 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 06-1140-142)

Borehole dry durring drilling on July 13, 2006

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: N.R.

CHECKED:

LDN_BHS 06-1140-142.GPJ GLDR_CAN.GDT 8/31/06 DATA INPUT: Tony Mastroianni

PROJECT: 07-1140-0027

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 1

BORING DATE: MARCH 7, 2007

SHEET 1 OF 2

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○; 20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		175.79				175						
		Compact, black, sandy topsoil, trace gravel and rootlets (FILL)		0.00										
				0.15										
		Compact, brown, sand and gravel (FILL)		0.25	1	SS	18							
		Compact, black, silty sand, some clay, trace gravel, cinders (FILL)		175.18										
1		Hard, black, silty clay, some sand, trace gravel, mixed with topsoil (FILL)		0.61	2	SS	33							Borehole dry during drilling on March 7, 2007
				174.72										
		Dense, black, sand, trace gravel, some cinders (FILL)		1.07										
		END OF BOREHOLE		1.22										
2														
3														

(Golder Report No. 07-1140-0027)

PROJECT: 07-1140-0027

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 2

BORING DATE: MARCH 7, 2007

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○; 20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	GROUND SURFACE		176.11				176						
		Stiff, black, sandy topsoil, trace gravel and rootlets (FILL)		0.00	1	SS	14							
				175.63										
		Compact, brown, sand and gravel (FILL)		0.48										
1		Stiff, black, silty clay, some sand, and gravel, mixed with topsoil (FILL)		0.61	2	SS	9	175						Borehole dry during drilling on March 7, 2007
				174.89										
		END OF BOREHOLE		1.22										
2														
3														

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: N.G.

CHECKED:

LDN_DBL 07-1140-0027.GPJ GLDR_LDN.GDT 20/3/07 DATA INPUT: Tony Mastroianni

PROJECT: 07-1140-0027

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MARCH 7, 2007

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / SOLID STEM	PAVEMENT SURFACE		175.91								
		ASPHALT		0.03								
		Compact, brown, granular road base (FILL)		175.43	1	SS	30					Borehole dry during drilling on March 7, 2007
		Hard, black, silty topsoil, some sand, trace gravel and clay (FILL)		0.48								
1		Firm, brown, silty clay, some sand, trace gravel, mixed with black topsoil (FILL)		0.63	2	SS	7	175				
				174.67								
		END OF BOREHOLE		1.24								
2												
3												

(Golder Report No. 07-1140-0027)

PROJECT: 07-1140-0027

RECORD OF BOREHOLE 4

LOCATION: SEE LOCATION PLAN

BORING DATE: MARCH 7, 2007

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / SOLID STEM	PAVEMENT SURFACE		175.87								
		ASPHALT		0.03								
		Compact, brown, granular road base (FILL)		175.62	1	SS	28					Borehole dry during drilling on March 7, 2007
				0.25								
1		Very stiff to stiff, black to brown, silty clay, some sand, trace gravel mixed with topsoil (FILL)			2	SS	9	175				
				174.63								
		END OF BOREHOLE		1.24								
2												
3												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: N.G.

CHECKED:

LDN_DBL 07-1140-0027.GPJ GLDR_LDN.GDT 23/3/07 DATA INPUT: Tony Mastroianni

PROJECT: 07-1140-0098

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 22, 2007

DATUM: LOCAL

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER SOLID STEM	PAVEMENT SURFACE		98.75								
		ASPHALT		0.00								
		CONCRETE		0.10								
		Very stiff, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel, occ. roots (**TILL**)		0.29	1	SS	15	98				
1					2	SS	20					
				97.37								
		Very stiff, brown, **SILTY CLAY**, some sand, trace gravel (**TILL**)		1.37	3	SS	28	97				Borehole dry during drilling on June 22, 2007
2					4	SS	28					
								96				
3					5	SS	19					
				95.09								
		Stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		3.66	6	SS	11	95				
4												
					7	SS	9	94				
5				93.72								
		END OF BOREHOLE		5.03								
6												
7												
8												
9												
10												

(Golder Report No. 07-1140-0098)

LDN_BHS 07-1140-0098.GPJ GLDR_CAN.GDT 27/6/07 DATA INPUT: Tony Mastroianni

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: B.G.

CHECKED:

PROJECT: 07-1140-0098

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 22, 2007

DATUM: LOCAL

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / SOLID STEM	PAVEMENT SURFACE		98.21								
		ASPHALT		0.00								
		CONCRETE		0.15								
		Firm, mottled brown and grey, **SILTY CLAY**, some sand, trace gravel, numerous to occ. organic pockets **(TILL)**		0.33	1	AS	-	98				
1					2	SS	5					
				96.84				97				
		Stiff to very stiff, brown, **SILTY CLAY**, some sand, trace gravel, occ. rootlets **(TILL)**		1.37	3	SS	13					
2								96				Borehole dry during drilling on June 22, 2007
					4	SS	20					
3												
					5	SS	12	95				
4					6	SS	13					
				93.79				94				
		Firm, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**		4.42	7	SS	6					
5				93.18								
		END OF BOREHOLE		5.03								
6												
7												
8												
9												
10												

(Golder Report No. 07-1140-0098)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: B.G.

CHECKED:

LDN_BHS 07-1140-0098.GPJ GLDR_CAN.GDT 29/6/07 DATA INPUT: Tony Mastroianni

PROJECT: 07-1140-0098

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 22, 2007

DATUM: LOCAL

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		98.15								
		CONCRETE		0.00 / 97.94				98				
		Mottled brown and grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		0.20 / 97.39	1	AS	-					
1	POWER AUGER			0.76	2	SS	17	97				
	SOLID STEM				3	SS	20					
2		Very stiff to stiff, brown, **SILTY CLAY**, some sand, trace gravel (**TILL**)			4	SS	21	96				Borehole dry during drilling on June 22, 2007
3					5	SS	21	95				
4				93.97	6	SS	14	94				
		Stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**)		4.18 / 93.12	7	SS	9					
5		END OF BOREHOLE		5.03								
6												
7												
8												
9												
10												

(Golder Report No. 07-1140-0098)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: B.G.

CHECKED:

LDN_BHS 07-1140-0098.GPJ GLDR_CAN.GDT 27/6/07 DATA INPUT: Tony Mastroianni

PROJECT: 08-1132-033-0

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 11, 2008

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
								(Golder Report No. 08-1132-033-0)			
0	PAVEMENT SURFACE		181.29				181				
	ASPHALT		0.00								
	CONCRETE		0.10 / 180.99								
			0.30								
1	Firm to stiff mottled brown and grey **SILTY CLAY**, some sand, trace gravel, with silt pockets and topsoil inclusions **(TILL)**			1	SS	7	180				
			179.46	2	SS	10					
2			1.83				179				
	Stiff to hard brown **CLAYEY SILT**, some sand, trace gravel **(TILL)**			3	SS	36					
3				4	SS	37	178			MH	Borehole dry during drilling on April 11, 2008
			177.63								
			3.66	5	SS	23					
4							177				
				6	SS	12					
5	Very stiff to firm grey **CLAYEY SILT**, some sand, trace gravel **(TILL)**						176				
				7	SS	8					
6											
				8	SS	6	175				
			174.74								
	END OF BOREHOLE		6.55								
7											
8											
9											

POWER AUGER, SOLID STEM

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: S.M.

CHECKED:

LDN_BHS_02 08-1132-033-0.GPJ GLDR_LDN.GDT 5/17/08 DATA INPUT: Jason Scott

PROJECT: 08-1132-033-0

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 11, 2008

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
	CONCRETE SURFACE		181.51								
0	**CONCRETE**		0.00 / 181.30								
	Grey granular **(FILL)**		0.21 / 180.81				181				
1	Black fine to coarse slag and cinders **(FILL)** (Hydrocarbon Odour)		0.70 / 180.14	1	SS	6					
	Firm mottled brown and grey **SILTY CLAY**, some sand, trace gravel, with rootlets **(TILL)**		1.37 / 179.38	2	SS	6	180				
2											
	Very stiff to hard brown **CLAYEY SILT**, some sand, trace gravel **(TILL)**		2.13 / 177.85	3	SS	22	179				
3				4	SS	35					
							178				
	Very stiff to stiff grey **CLAYEY SILT**, some sand, trace gravel **(TILL)**		3.66 / 174.96	5	SS	28				MH	
4											
				6	SS	11	177				
5											
				7	SS	10	176				Water seepage into borehole at about elev. 176.2m during drilling on April 11, 2008
6											
				8	SS	9					
	END OF BOREHOLE		6.55				175				Borehole dry upon completion of drilling on April 11, 2008
7											
8											
9											

POWER AUGER

SOLID STEM

(Golder Report No. 08-1132-033-0)

DEPTH SCALE

1 : 50

LOGGED: S.M.

CHECKED:

Golder Associates

LDN_BHS_02 08-1132-033-0.GPJ GLDR_LDN.GDT 5/17/08 DATA INPUT: Jason Scott

PROJECT: 08-1140-W028

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 2, 2008

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION
		GROUND SURFACE		186.84				
0	POWER AUGER HOLLOW STEM	Loose, black, sand and gravel with slag **(FILL)**		0.00 / 186.44	1	CS		
		Loose, brown, fine sand, some gravel, trace silt, clay and organic material **(FILL)**		0.41 / 185.14	2	SS	5	186
1					3	SS	4	
2		Loose, black, fine sand, some organic material, occ. clay pockets **(FILL)**		1.70 / 184.33	4	SS	4	185
					5	SS	6	
3		Firm, black, clayey silt, some organic material, some sand **(FILL)**		2.51 / 182.14	6	SS	6	184
4					7	SS	7	183
5		Very stiff, grey, **SILTY CLAY**, some sand, silt seams/partings		4.70 / 181.28	8	SS	8	182
6		Very stiff to stiff, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**		5.56	9	SS	8	181
7								180
8					10	SS	7	179
		END OF BOREHOLE		178.77 / 8.08				
9								
10								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W WI; 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 08-1140-W028)

>96+

>96+

51.48

Water seepage into borehole at about elevation 180.9m during drilling on April 2, 2008

Water level in borehole at about elevation 180.7m upon completion of drilling on April 2, 2008

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: S.M.

CHECKED:

LDN_BHS 08-1140-W028.GPJ GLDR_CAN.GDT 5/12/08 DATA INPUT: Jason Scott

PROJECT: 08-1140-W028

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 2, 2008

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W WI (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER HOLLOW STEM	GROUND SURFACE		184.97								
		Black, clayey topsoil, rootlets **(FILL)**		0.00 / 184.69	1	CS						
		Stiff to firm, brown, silty clay, mixed with sand and gravel **(FILL)**		0.28 / 184.00	2	SS	9					
1		Loose, black to brown, fine sand, trace gravel, occ. organics, trace clay **(FILL)**		0.96 / 183.60	3	SS	7	184				
		Firm, brown, silty clay, some sand and gravel, trace organics **(FILL)**		1.37 / 182.83	4	SS	7					
2		Loose, brown, **MEDIUM TO COARSE SAND**, trace silt		2.13 / 182.45	5	SS	7	183				Water seepage into borehole at about elevation 182.7m during drilling on April 2, 2008
		Firm, brown, **CLAYEY SILT**, numerous silt partings		2.51 / 181.31	6	SS	8	182				
3		Stiff, grey, **CLAYEY SILT**, numerous silt partings		3.66 / 179.94	7	SS	12	181				
					8	SS	12					
4		Very stiff to firm, grey, **SILTY CLAY**, some sand, trace gravel **(TILL)**		5.03 / 176.89	9	SS	12	180	>96+			
5								179	>96+			
6								178	>96+			Water level in borehole at about elevation 178.11m upon completion of drilling on April 2, 2008
7					10	SS	7	177	>96+			
8		END OF BOREHOLE		8.08								
9												
10												

(Golder Report No. 08-1140-W028)

DEPTH SCALE
1 : 50

LOGGED: S.M.
CHECKED:

Golder Associates

LDN_BHS 08-1140-W028.GPJ GLDR_CAN.GDT 5/12/08 DATA INPUT: Jason Scott

PROJECT: 09-1140-W011

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: February 19, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		185.30								Top of Pipe Elev. 185.76m
0		Concrete rubble **(FILL)**		0.00 / 184.92				185				
		Compact, dark brown silty sand, some clay lumps, some gravel mixed with topsoil, cinders **(FILL)**		0.38 / 183.93	1	SS	19					
1								184				
		Firm, black clayey topsoil, some sand **(FILL)**		1.37 / 183.17	2	SS	8					Cuttings
2								183				
		Firm, greenish grey **CLAYEY SILT**, some sand, topsoil intrusions - *faint petroleum odour*		2.13 / 182.40	3	SS	4					WL
3								182				
		Stiff, grey **CLAYEY SILT**, some sand, numerous sand partings		2.90 / 181.64	4	SS	10					
4	POWER AUGER HOLLOW STEM							181				Bentonite
		Loose to compact, grey, medium to coarse **SAND**, trace gravel		3.66 / 180.12	5	SS	7					
5					6	SS	22					
								180				
		Very stiff to stiff, grey **SILTY CLAY**, some sand, trace gravel, sand partings **(TILL)**		5.18 / 176.61	7	SS	7					Sand
6								179	>96 +			
									>96 +			
7					8	SS	9	178				
									⊕ + >96 +			Screen
8								177				
					9	SS	7					
		END OF BOREHOLE		8.69								
9												

(Golder Report No. 09-1140-W011)

Water level in stand pipe at about elevation 182.48m on February 20, 2009.

Stand pipe removed on February 20, 2009.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 091140W011.GPJ GLDR_LON.GDT 3/11/09 DATA INPUT: SJL

PROJECT: 09-1140-W011

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: February 20, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
									(Golder Report No. 09-1140-W011)			
		PAVEMENT SURFACE		185.12								
0	POWER AUGER HOLLOW STEM	**ASPHALT**		0.00				185				
		Brown, granular roadbase **(FILL)**		0.09	1	CS						
		Compact, brown sandy silt, clay lumps, trace gravel, cinders **(FILL)**		0.21	2	SS	12					
				184.36								
1		Stiff, brown clayey silt, some sand, trace gravel, sand partings mixed with topsoil **(FILL)**		0.76	3	SS	9	184				
					4	SS	8					
2				182.99				183				
		Very loose, grey **SILTY SAND**, trace gravel, numerous clay lumps		2.13	5	SS	3					
				182.22								
3		Compact, grey, medium to coarse **SAND**, trace silt and gravel		2.90	6	SS	12	182				Seepage ▽
				181.46								Groundwater seepage encountered at about elevation 182.07m during drilling on February 20, 2009.
4				3.66	7	SS	13	181				
					8	SS	14					
5								180				
6		Stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**			9	SS	5	179				
7								178				
					10	SS	4					
8				177.04								
		END OF BOREHOLE		8.08								
9												

LDN_BHS_02 091140W011.GPJ GLDR_LON.GDT 3/11/09 DATA INPUT: SJL

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

PROJECT: 09-1140-W011

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: February 20, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
									(Golder Report No. 09-1140-W011)			
0	POWER AUGER / HOLLOW STEM	PAVEMENT SURFACE		185.73								
		ASPHALT		0.00								
		Compact, brown granular roadbase **(FILL)**		0.11	1	CS						
					2	SS	17					
				184.97				185				
1		Stiff to firm, brown clayey silt, some sand, trace gravel, numerous sand partings **(FILL)**		0.76	3	SS	10					
					4	SS	6	184				
2				183.60								
		Firm, greenish grey **CLAYEY SILT**, some sand, topsoil intrusions, sand partings		2.13								
				183.37								
		Loose, grey **SILTY SAND**, some clay lumps		2.36	5	SS	7					
				182.99				183				
3		Compact, grey, fine to medium **SAND**, trace silt		2.74								WL ▽
					6	SS	20					
				182.07								Water level at about elevation 182.68m upon completion of drilling on February 20, 2009.
4				3.66	7	SS	14	182				
					8	SS	17	181				
5												
		Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, sand partings **(TILL)**						180				
6					9	SS	14					
								179				
7												
					10	SS	11	178				
8				177.65								
		END OF BOREHOLE		8.08								
9												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 091140W011.GPJ GLDR_LON.GDT 3/11/09 DATA INPUT: SJL

PROJECT: 09-1140-W025

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 1

BORING DATE: November 26, 2009

SHEET 1 OF 2

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

(Golder Report No. 09-1140-W025)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{0} 10^{1} 10^{2} 10^{3}); WATER CONTENT PERCENT (Wp W Wl; 5 10 15 20)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER; HOLLOW STEM	PAVEMENT SURFACE		179.85								
		ASPHALT		0.05								Asphalt patch
		CONCRETE		179.55								
		Brown granular roadbase, occ. clayey inclusions (FILL)		0.30								Bentonite
				179.29	1	AS						
		Brown clayey silt, some sand, trace gravel (FILL)		0.56								
				179.09								
		Loose brown fine **SAND**, trace to some silt		0.76								
1				178.89	2	SS	7	179				
		Loose brown **SAND**, some gravel, trace silt		0.96								
				178.15								
		Stiff brown **SILTY CLAY**, some sand, with silt partings		1.70	3	SS	9	178				Nov 27/09
2				177.71								
				2.14	4	SS	4					
								177				Cuttings
3		Soft to stiff grey **SILTY CLAY** to **CLAYEY SILT**, some sand with silt and fine sand partings, few scattered fine gravel			5	SS	3			27.68		
								176				
4					6	SS	3			29.08		
				175.43								
				4.42								
					7	SS	2	175		45.45		
5												Screen
								174				
6					8	SS	2			40.26 MH 39.7		Bentonite
								173				
7		Firm to soft grey **SILTY CLAY**, trace to some sand, occ. silty fine sand partings, few scattered fine gravel										
					9	SS	2	172		35.25		
8												Cuttings
								171				
9					10	SS	3			25.27		
		— CONTINUED NEXT PAGE —										

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED: NR

LDN_BHS_02 09-1140-W025.GPJ GLDR_LON.GDT 3/3/10 DATA INPUT: DMB

PROJECT: 09-1140-W025

RECORD OF BOREHOLE 1

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: November 26, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3); WATER CONTENT PERCENT (Wp W Wl) (5 10 15 20)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---						170	***(Golder Report No. 09-1140-W025)***			
10	POWER AUGER HOLLOW STEM	Firm to soft grey **SILTY CLAY**, trace to some sand, occ. silty fine sand partings, few scattered fine gravel			11	SS	2	169	⊕ +	34.53		Cuttings
11												
12								168	⊕ +	29.79		
					12	SS	2					
				167.05								
13		END OF BOREHOLE		12.80								Borehole dry during drilling on November 26, 2009. Water level in standpipe at about elev. 177.8m on November 27, 2009.
14												
15												
16												
17												
18												
19												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED: NP

LDN_BHS_02 09-1140-W025.GPJ GLDR_LON.GDT 3/3/10 DATA INPUT: DMB

PROJECT: 09-1140-W025

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 2

BORING DATE: November 26, 2009

SHEET 1 OF 2

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

(Golder Report No. 09-1140-W025)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-3} 10^{-2} 10^{-1} 10^{0}) / WATER CONTENT PERCENT (Wp W Wl; 5 10 15 20)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / HOLLOW STEM	PAVEMENT SURFACE		180.45				180				
		ASPHALT		0.00								
		Grey-brown granular roadbase (FILL)		0.10								
				180.10								
				0.35	1	AS						
1		Loose brown **SILTY SAND**, trace to some gravel, occ. fine sand/silt seams/layers			2	SS	5	179				
					3	SS	7					
2				178.32								
		Soft brown **SILTY CLAY**, some sand with silt/fine sand partings		2.13	4	SS	3	178		22.6		
				177.86								
3				2.59	5	SS	3			27.75		
		Soft grey **SILTY CLAY** to **CLAYEY SILT**, trace to some sand, with occ. silt/fine sand partings						177				
4												
								176				
					6	SS	1			47.59 MH 35.3		
5				175.42								
				5.03				175				
6												
					7	SS	1	174		48.94		
7		Soft grey **SILTY CLAY**, trace sand, occ. silt/fine sand partings, few scattered fine gravel										
								173				
8					8	SS	1			39.41		
								172				
9					9	SS	1			32.09		
								171				
		— CONTINUED NEXT PAGE —										

Borehole dry during drilling on November 26, 2009.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED: NP

LDN_BHS_02 09-1140-W025.GPJ GLDR_LON.GDT 3/3/10 DATA INPUT: DNB

PROJECT: 09-1140-W025

RECORD OF BOREHOLE 2

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: November 26, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3); WATER CONTENT PERCENT (Wp W Wl) (5 10 15 20)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		— CONTINUED FROM PREVIOUS PAGE —		170.55 / 9.90								
10	POWER AUGER HOLLOW STEM	Firm to soft grey **SILTY CLAY**, trace sand, occ. silt/fine sand partings, few scattered fine gravel			10	SS	1	170				
11										27.18		
								169				
12					11	SS	WH					
								168		37.9		
13												
								167				
14					12	SS	1			35.77		
								166				
15												
					13	SS	2	165		29.54		
				164.75 / 15.70								
		END OF BOREHOLE										
16												
17												
18												
19												

(Golder Report No. 09-1140-W025)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED: NR

LDN_BHS_02 09-1140-W025.GPJ GLDR_LON.GDT 3/3/10 DATA INPUT: DMB

PROJECT: 09-1140-W025

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 3

BORING DATE: November 25, 2009

SHEET 1 OF 2

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

(Golder Report No. 09-1140-W025)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp W Wl; 5 10 15 20)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / HOLLOW STEM	PAVEMENT SURFACE		176.90								
		ASPHALT		0.00 / 176.72								
		CONCRETE		0.18								
		Grey-brown granular roadbase(FILL)		0.38	1	AS						
1		Compact brown fine **SAND**, trace to some silt			2	SS	17	176				
				175.53								
2		Stiff brown and grey **SILTY CLAY**, trace to some sand, occ. silt partings, fissured		1.37	3	SS	11	175		28.79		
				174.77								
		Stiff grey **SILTY CLAY**, trace to some sand and gravel		2.13	4	SS	9			30.15		Bentonite
3				174.00				174				
				2.90	5	SS	6			38.61		
4					6	SS	2	173		39.01		
5					7	SS	2	172		43.54 MH 42.3		Screen
6		Firm soft grey **SILTY CLAY**, trace sand, few scattered fine gravel			8	SS	2	171		31.6		
7								170				
8					9	SS	2	169		32.79		Cuttings
9					10	SS	2	168		47.24		

— CONTINUED NEXT PAGE —

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED: NP

LDN_BHS_02_09-1140-W025.GPJ_GLDR_LON.GDT_3/3/10_DATA INPUT: DMB

PROJECT: 09-1140-W025

RECORD OF BOREHOLE 3

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: November 25, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-2} 10^{-1} 10^{0} 10^{1}) / WATER CONTENT PERCENT Wp W Wl (5 10 15 20)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							***(Golder Report No. 09-1140-W025)***			
				167.15	10	SS	2					Cuttings
		END OF BOREHOLE		9.75				167				Borehole dry after drilling on November 25, 2009. Standpipe dry on November 27, 2009.
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED: NR

LDN_BHS_02 09-1140-W025.GPJ GLDR_LON.GDT 3/3/10 DATA INPUT: DMB

PROJECT: 09-1140-W028

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 24, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		175.45								
0	POWER AUGER, SOLID STEM	Black clayey topsoil, silty clay, occasional sand seams and gravel **(FILL)**		0.00	1	SS	8	175				
				174.74								
1		Firm to stiff, mottled, brown and grey **SILTY CLAY**, some sand, trace gravel **(TILL)**		0.71	2	SS	4					Borehole dry during drilling on March 24, 2009.
					3	SS	14	174			MH	
2				173.32								
		Very stiff, brown **SILTY CLAY**, some sand, trace gravel **(TILL)**		2.13	4	SS	28	173				
3				172.10	5	SS	25					
		Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, some sand pockets/partings **(TILL)**		3.35	6	SS	20	172				
4												
					7	SS	17	171				
5												
								170				
6					8	SS	14					
								169				
7												
								168				
					9	SS	22					
8				167.37								
		END OF BOREHOLE		8.08								
9												

(Golder Report No. 09-1140-W028)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

LDN_BHS_02 091140W028.GPJ GLDR_LON.GDT 4/7/09 DATA INPUT: SJL

PROJECT: 09-1140-W028

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 24, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		174.61								
0	POWER AUGER, SOLID STEM	Black clayey topsoil, some dark grey silty clay, occasional sand seams **(FILL)**		0.00	1	SS	5	174				Borehole dry during drilling on March 24, 2009.
				173.74								
1		Firm, mottled, brown and grey **SILTY CLAY**, some sand, trace gravel, occasional topsoil pockets **(TILL)**		0.87	2	SS	6					
				173.24				173				
2		Very stiff, brown **SILTY CLAY**, some sand, trace gravel, some sand pockets **(TILL)**		1.37	3	SS	23					
					4	SS	27	172				
3					5	SS	21					
				170.95				171				
4		Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, some sand seams/pockets with depth **(TILL)**		3.66	6	SS	12					
					7	SS	9	170	>96 +			
5								169	>96 +			
6					8	SS	10					
								168	>96 +			
7									>96 +			
								167				
8				166.53	9	SS	20					
		END OF BOREHOLE		8.08								
9												

(Golder Report No. 09-1140-W028)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

LDN_BHS_02 091140W028.GPJ GLDR_LON.GDT 4/7/09 DATA INPUT: SJL

PROJECT: 09-1140-W028

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 24, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		(Golder Report No. 09-1140-W028)										
0	POWER AUGER, SOLID STEM	GROUND SURFACE		175.10 / 0.00				175				
		Black **CLAYEY TOPSOIL**		174.82 / 0.28								
1		Firm, mottled, brown and grey **SILTY CLAY**, some sand, trace gravel, some topsoil pockets **(TILL)**			1	SS	4					
					2	SS	6	174				Seepage ▽
				173.73 / 1.37								Minor groundwater seepage into borehole at about elevation 174.2m.
2		Very stiff to hard, brown **SILTY CLAY**, some sand, trace gravel **(TILL)**			3	SS	15	173				
					4	SS	32				MH	
3								172				
				171.72 / 3.38	5	SS	26					
4					6	SS	12	171				
					7	SS	12					
5								170	>96 +			
		Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional sand seams/pockets **(TILL)**							>96 +			
6					8	SS	8	169				Seepage ▽
												Groundwater seepage observed at about elevation 169.0m during drilling on March 24, 2009.
7								168	>96 +			
									>96 +			
8				167.02	9	SS	9					
		END OF BOREHOLE		8.08								
9												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

LDN_BHS_02 091140W028.GPJ GLDR_LON.GDT 4/7/09 DATA INPUT: SJL

PROJECT: 09-1140-W037

RECORD OF BOREHOLE 1

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: April 8, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		PAVEMENT SURFACE		197.77 0.00								
0	POWER AUGER / HOLLOW STEM	Auger through approach fill material (No samples taken)						197				Borehole dry during drilling on April 8, 2009.
1												
2								196				
3								195				
4								194				
5				193.20 4.57	1	SS	12	193				
					2	SS	12					
6		Stiff to firm grey silty clay, some sand, trace gravel **(Approach Fill Material)**			3	SS	13	192				
7					4	SS	5	191				
				190.15								
		Black **CLAYEY TOPSOIL**, trace sand and gravel		7.62 189.92	5	SS	14	190				
8		Stiff, mottled brown and grey **SILTY CLAY**, some sand, trace gravel, occasional sand pockets and organic pockets **(TILL)**		7.85	6	SS	9	189				
				188.78								
9		Very stiff to hard, brown **SILTY CLAY**, some sand, trace gravel, occasional sand partings, fissured **(TILL)**		8.99	7	SS	22		>96 +			
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 09-1140-W037)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 091140W037.GPJ GLDR_LON.GDT 7/2/09 DATA INPUT: SJL

PROJECT: 09-1140-W037

RECORD OF BOREHOLE 1

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: April 8, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							***(Golder Report No. 09-1140-W037)***			
10	POWER AUGER / HOLLOW STEM	Very stiff to hard, brown **SILTY CLAY**, some sand, trace gravel, occasional sand partings, fissured **(TILL)**			8	SS	34	188		○		
								187				
11				186.80 10.97	9	SS	31			○		
					10	SS	12	186		○		
12									>96 +			
					11	SS	10			○		
13		Hard to very stiff, grey **SILTY CLAY**, some sand, trace gravel **(TILL)**						185	>96 + >96 +			
								184				
14					12	SS	7			○		
									>96 +			
								183				
15									>96 +			
					13	SS	7			○		
				182.07								
		END OF BOREHOLE		15.70								
16												
17												
18												
19												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: SM
CHECKED:

LDN_BHS_02 091140W037.GPJ GLDR_LON.GDT 7/2/09 DATA INPUT: SJL

PROJECT: 09-1140-W037

RECORD OF BOREHOLE 10

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 12, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		189.69								
0	POWER AUGER / HOLLOW STEM	Dark grey **CLAYEY TOPSOIL**		0.00 189.46								
				0.23								
1		Firm, mottled brown and grey **SILTY CLAY**, some sand, trace gravel, occasional fissures with oxidation **(TILL)**			1	SS	6	189				Borehole dry during drilling on March 12, 2009.
				188.32								
2		Hard, brown **SILTY CLAY**, some sand, trace gravel, fissured **(TILL)**		1.37	2	SS	37	188				
					3	SS	69	187			MH	
3				186.62								
				3.07	4	SS	35					
4					5	SS	25	186				
					6	SS	17	185				
5												
								184				
6		Hard to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**			7	SS	15					
								183				
7												
								182				
8					8	SS	10					
								181	>96 + >96 +			
9					9	SS	12					
				180.09								
		END OF BOREHOLE		9.60								

(Golder Report No. 09-1140-W037)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: NG

CHECKED:

LDN_BHS_02 091140W037.GPJ GLDR_LON.GDT 7/2/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 9

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 1, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3); WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE										
0	POWER AUGER / HOLLOW STEM	Black clayey topsoil, trace rootlets **(FILL)**		0.00	1	CS						
		Firm, mottled brown and grey **SILTY CLAY**, some sand, trace gravel, occasional sand pockets **(TILL)**		0.30	2	SS	6					Borehole dry during drilling on September 1, 2009.
1					3	SS	6					
		Stiff to very stiff, brown **SILTY CLAY**, some sand, trace gravel, occasional silt seams/partings **(TILL)**		1.37	4	SS	15					
2					5	SS	18					
3					6	SS	13					
		Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**		3.28	7	SS	2					
4					8	SS	4					
5												
		Compact, grey **SILTY SAND**, some clay, trace to some gravel		5.94	9	SS	16					
6												
		Stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**		6.71	10	SS	3					
7												
8					11	SS	3					
9												
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 09-1140-W091B)

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TA
CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 9

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 1, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							***(Golder Report No. 09-1140-W091B)***			
10	POWER AUGER HOLLOW STEM	Stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**							⊕ + ⊕ +			
		Soft, grey **SILTY CLAY**		10.67	12	SS	3			○		
11		END OF BOREHOLE		11.13								
12												
13												
14												
15												
16												
17												
18												
19												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 10

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE										
	POWER AUGER / HOLLOW STEM	Stiff, black clayey topsoil, trace rootlets **(FILL)**		0.00	1	CS						
		Stiff, brown silty clay, some sand, trace gravel, topsoil pockets **(FILL)**		0.36	2	SS	13					Borehole dry during drilling on September 2, 2009.
1		Soft to firm, brown and grey silty clay, some sand, trace gravel, trace organics **(FILL)**		0.76	3	SS	6					
					4	SS	5					
2					5	SS	3					
3					6	SS	2					
		Soft, brown **SILTY CLAY**, some sand, trace gravel, trace organics **(TILL)**		3.40	7	SS	2					
4		Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**		4.42	8	SS	3					
5												
6					9	SS	3					
7		Compact, grey **SANDY SILT**, trace to some clay, trace gravel **(TILL)**		7.32	10	SS	24					
8		Stiff, grey **SILTY CLAY**, some sand, occasional gravel **(TILL)**		8.23	11	SS	8					
9		Dense, grey **SANDY SILT**, some clay **(TILL)**		9.14	12	SS	36					
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 09-1140-W091B)

>96

DEPTH SCALE

1 : 50

LOGGED: TA

CHECKED:

Golder Associates

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 10

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
10	POWER AUGER HOLLOW STEM	Dense, grey **SANDY SILT**, some clay **(TILL)**										
11		Firm, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**		10.74	13	SS	6					
		END OF BOREHOLE		11.13								

(Golder Report No. 09-1140-W091B)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 11

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE										
0	POWER AUGER HOLLOW STEM	Black clayey topsoil, trace rootlets **(FILL)**		0.00	1	CS						Cuttings
				0.25	2	SS	7					
1		Firm, brown silty clay, some sand, trace gravel, trace rootlets, trace organics **(FILL)**			3	SS	6					Bentonite
		Soft, brown and grey **SILTY CLAY**, some sand, trace gravel, trace to some organics **(TILL)**		1.52	4	SS	3					
2				2.13	5	SS	29					
3		Very stiff, brown **SILTY CLAY**, some sand, trace gravel, occasional silt seams/partings **(TILL)**			6	SS	21					Cuttings
4		Firm, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**		3.66	7	SS	7					
5		Compact, grey **SANDY SILT**, some clay, occasional silty clay layers **(TILL)**		4.57	8	SS	13					WL Sept. 3
6				5.49	9	SS	2					Bentonite
7		Firm to very stiff, grey **SILTY CLAY to CLAYEY SILT**, some sand, occasional silt pockets and seams **(TILL)**			10	SS	2					Cuttings
8												WL Sept. 2
9		*--- CONTINUED NEXT PAGE ---*										Screen

(Golder Report No. 09-1140-W091B)

>96

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 11

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3); WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							***(Golder Report No. 09-1140-W091B)***			
10	POWER AUGER HOLLOW STEM	Firm to very stiff, grey **SILTY CLAY to CLAYEY SILT**, some sand, occasional silt pockets and seams **(TILL)**			11	SS	9		>96 +	○		Screen
11		Soft, grey **SILTY CLAY**, occasional silt pockets		10.67	12	SS	3			○		
		END OF BOREHOLE		11.13								Water level in borehole at a depth of about 8.4m upon completion of drilling on September 2, 2009. Water level in standpipe at a depth of about 5.1m on September 3, 2009.
12												
13												
14												
15												
16												
17												
18												
19												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 12

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE										
0	POWER AUGER / HOLLOW STEM	Firm to stiff, black clayey topsoil **(FILL)**		0.00	1	CS						
		Firm, brown and grey silty clay, some topsoil **(FILL)**		0.30	2	SS	8					Borehole dry during drilling on September 2, 2009.
1					3	SS	6					
		Firm, mottled brown and grey **SILTY CLAY**, some sand, trace gravel, occasional sand pockets **(TILL)**		1.37	4	SS	6					
2		Very stiff, brown **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**		2.13	5	SS	20					
3		Stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silty partings **(TILL)**		3.05	6	SS	12					
		Stiff, grey **CLAYEY SILT**, some sand, trace gravel **(TILL)**		3.66	7	SS	10					
4												
		Firm to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt and sand partings at depth **(TILL)**		4.42	8	SS	8					
5									>96 +			
									>96 +			
6					9	SS	2					
7									⊕ +			
									⊕ +			
					10	SS	WH					
8									⊕ +			
									⊕ +			
9					11	SS	3					
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 09-1140-W091B)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 12

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
10	POWER AUGER HOLLOW STEM	Firm to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt and sand partings at depth **(TILL)**										
				10.67								
11		Very soft, grey **SILTY CLAY**			12	SS	WH					
		END OF BOREHOLE		11.13								
12												
13												
14												
15												
16												
17												
18												
19												

(Golder Report No. 09-1140-W091B)

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TA
CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 13

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 3, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER / HOLLOW STEM	GROUND SURFACE										
		Grey crushed limestone **(FILL)**		0.00	1	AS						
		Very stiff, black clayey topsoil, some sand, trace gravel **(FILL)**		0.15	2	SS	19					Borehole dry during drilling on September 3, 2009.
1		Firm to stiff, brown silty clay, some sand, trace gravel, occasional sand seams/pockets **(FILL)**		0.76	3	SS	8					
					4	SS	4					
2		Firm, mottled brown and grey **SILTY CLAY**, some sand, trace gravel **(TILL)**		2.13								
				2.44	5	SS	8					
3		Firm to stiff, brown **SILTY CLAY**, some sand, trace gravel, occasional silt seams/partings **(TILL)**			6	SS	15					
4					7	SS	7					
				4.42	8	SS	6					
5												
6					9	SS	3					
7		Stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**										
8					10	SS	5					
9												
		Compact, grey **SANDY SILT**, trace to some clay, trace gravel **(TILL)**		9.30	11	SS	23					
				9.75								
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 09-1140-W091B)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 13

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 3, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							***(Golder Report No. 09-1140-W091B)***			
10	POWER AUGER HOLLOW STEM	Stiff, grey **SILTY CLAY**, some sand, trace gravel **(TILL)**			12	SS	6			W ○		
11					13	SS	2			W ○		
		END OF BOREHOLE		11.13								
12												
13												
14												
15												
16												
17												
18												
19												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TA
CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 14

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 3, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3); WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE										
0	POWER AUGER / HOLLOW STEM	Black clayey topsoil, numerous rootlets **(FILL)**		0.00	1	CS						
		Firm, brown silty clay, some sand, trace gravel **(FILL)**		0.20	2	SS	7					Borehole dry during drilling on September 3, 2009.
1					3	SS	4					
		Firm, mottled brown and grey **SILTY CLAY**, some sand, trace gravel **(TILL)**		1.37	4	SS	4					
2		Stiff to very stiff, brown **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**		2.13	5	SS	19					
3					6	SS	14					
				3.66	7	SS	3					
4												
					8	SS	3					
5		Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings **(TILL)**										
6					9	SS	4					
				7.01								
7		Loose, grey **SANDY SILT**, some clay, trace gravel **(TILL)**			10	SS	9					
8				8.23								
		Very stiff to stiff, grey **CLAYEY SILT**, some sand and gravel **(TILL)**			11	SS	7					
9												
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 09-1140-W091B)

>96 +

>96 +

>96 +

>96 +

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: TA

CHECKED:

PROJECT: 09-1140-W091B

RECORD OF BOREHOLE 14

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 3, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^0 10^1 10^2 10^3) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
10	POWER AUGER HOLLOW STEM	Very stiff to stiff, grey **CLAYEY SILT**, some sand and gravel **(TILL)**							>96 +			
11		Soft, grey **SILTY CLAY**		10.82	12	SS	3					
		END OF BOREHOLE		11.13								
12												
13												
14												
15												
16												
17												
18												
19												

(Golder Report No. 09-1140-W091B)

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: TA
CHECKED:

LDN_BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

PROJECT: 10-1140-0090

RECORD OF BOREHOLE 1

SHEET 1 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		177.23 / 0.00								
0	POWER AUGER HOLLOW STEM	Compact to dense, dark brown sand, trace gravel, trace silt **(FILL)**			1	SS	25	177				Bentonite
1					2	SS	37					
2				175.10 / 2.13	3	SS	12	176				Seepage May 25/10
3		Stiff, brown and bluish grey **SILTY CLAY**, some sand, trace gravel, occasional sand layers/pockets, occasional trace organics **(LACUSTRINE)**			4	SS	4	175				
					5	SS	5	174				
4				173.57 / 3.66	6	SS	9		>96			Grout
					7	SS	4	173				
5	ROTARY DRILLING HQ ROCK CORE	Very stiff to stiff, grey **CLAYEY SILT to SILTY CLAY**, some sand, trace to some gravel, occasional to numerous sand layers/pockets						172				
6					8	SS	15		>96			
								171				
7					9	SS	7	170				
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 10-1140-0090-1000-L02)

WL in piezometer May 31/10

DEPTH SCALE 1 : 50

LOGGED: SM

CHECKED:

Golder Associates

LDN_BHS_02 1011400090.GPJ GLDR_LON.GDT 7/6/10 DATA INPUT: SJL

PROJECT: 10-1140-0090

RECORD OF BOREHOLE 1

SHEET 2 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●; rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
									(Golder Report No. 10-1140-0090-1000-L02)			
8								169				
9					10	SS	8	168				
10					11	SS	7	167				
11								166				
12	ROTARY DRILLING / HQ ROCK CORE				12	SS	6	165				Grout
13		Very stiff to stiff, grey **CLAYEY SILT to SILTY CLAY**, some sand, trace to some gravel, occasional to numerous sand layers/pockets			13	SS	8	164				
14								163				
15								162				
16								161				
17					14	SS	8	160				
		--- CONTINUED NEXT PAGE ---										

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: SM
CHECKED:

LDN_BHS_02 1011400090.GPJ GLDR_LON.GDT 7/6/10 DATA INPUT: SJL

PROJECT: 10-1140-0090

RECORD OF BOREHOLE 1

SHEET 3 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
		(Golder Report No. 10-1140-0090-1000-L02)										
18								159				
19								158				
					15	SS	11					
20								157				
21								156				
22								155				
	ROTARY DRILLING				16	SS	15					Grout
23	HQ ROCK CORE	Very stiff to stiff, grey **CLAYEY SILT to SILTY CLAY**, some sand, trace to some gravel, occasional to numerous sand layers/pockets						154				
24								153				
25								152				
					17	SS	27					
26								151				
27								150				
		--- CONTINUED NEXT PAGE ---										

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: SM
CHECKED:

LDN_BHS_02 1011400090.GPJ GLDR_LON.GDT 7/6/10 DATA INPUT: SJL

PROJECT: 10-1140-0090

RECORD OF BOREHOLE 1

SHEET 4 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
28	ROTARY DRILLING / HQ ROCK CORE	Very stiff to stiff, grey **CLAYEY SILT to SILTY CLAY**, some sand, trace to some gravel, occasional to numerous sand layers/pockets			18	SS	10	149				Grout
29								148				
30								147				
31				145.84				146				
		Very dense, grey **BOULDERS**		31.39 / 145.61	19	SS	>100					
32		Grey, **CLAYEY SILT to SILTY CLAY**, some sand, trace gravel, occasional boulders		31.62	20	NQ RC	DD	145				Bentonite (coated)
				144.69								
33		Very dense, grey **SANDY SILT**, some clay, some gravel **(TILL)**		32.54	21	SS	>100	144				
34				143.09								
				34.14	22	NQ RC	DD	143		*qu=107.9mPa*		
35										*qu=98.6mPa*		
					23	HQ RC	DD	142	T.C.R. (%) 69 / S.C.R. (%) 57 / R.Q.D. (%) 37			
36	ROTARY DRILLING / NQ ROCK CORE	Poor to excellent quality, grey **DOLOSTONE BEDROCK**, occasionally fractured, occasional sand seams - *occasional light petroleum odour*										Sand
					24	NQ RC	DD	141	T.C.R. (%) 80 / S.C.R. (%) 69 / R.Q.D. (%) 43			
37												Screen
					25	NQ RC	DD	140	T.C.R. (%) 93 / S.C.R. (%) 86 / R.Q.D. (%) 82	*qu=90.3mPa*		
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 10-1140-0090-1000-L02)

DEPTH SCALE

1 : 50

LOGGED: SM

CHECKED:

Golder Associates

LDN_BHS_02 1011400090.GPJ GLDR_LON.GDT 7/6/10 DATA INPUT: SJL

PROJECT: 10-1140-0090

RECORD OF BOREHOLE 1

SHEET 5 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
38	ROTARY DRILLING / NQ ROCK CORE	Poor to excellent quality, grey **DOLOSTONE BEDROCK**, occasionally fractured, occasional sand seams *- occasional light petroleum odour*			25	NQ RC	DD	139	T.C.R. (%) 93 / S.C.R. (%) 86 / R.Q.D. (%) 82	*qu=96.8mPa*		
39					26	NQ RC	DD	138	T.C.R. (%) 98 / S.C.R. (%) 97 / R.Q.D. (%) 96	*qu=74.3mPa*		
40					27	NQ RC	DD	137	T.C.R. (%) 94 / S.C.R. (%) 92 / R.Q.D. (%) 92	*qu=72.5mPa*		
				136.74								
		END OF BOREHOLE		40.49								

(Golder Report No. 10-1140-0090-1000-L02)

Groundwater seepage encountered at about elevation 175.7m during drilling on May 25, 2010.

Water level in piezometer at about elevation 179.2m on May 31, 2010.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: SM
CHECKED:

LDN_BHS_02 1011400090.GPJ GLDR_LON.GDT 7/6/10 DATA INPUT: SJL

PROJECT: 11-1140-0200

RECORD OF BOREHOLE 1

SHEET 1 OF 3

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 140mm OD SOLID STEM	PAVEMENT SURFACE		182.91										
		ASPHALT		0.05										
		(GM) SILTY GRAVEL and SAND, angular; grey, (GRANULAR BASE).		0.18										
		(ML) CLAYEY SILT, some sand, trace gravel; brown, some organic pockets, trace red brick, (FILL); firm.			1	SS	9							
1					2	SS	8	182						
				181.69										
		(ML) CLAYEY SILT, some sand, trace gravel; brown and grey, some organic pockets, sand pockets (possible FILL); cohesive, w~PL, firm to stiff.		1.22	3	SS	5							
2								181						
				180.78										
		(ML) CLAYEY SILT, trace sand; brown and grey, laminated with silt partings; cohesive, w>PL, firm.		2.13	4	SS	6							
				180.17										
		END OF BOREHOLE		2.74										
3														

(Golder Report No. 11-1140-0200-R01)

Borehole dry during and after drilling on February 10, 2012.

PROJECT: 11-1140-0200

RECORD OF BOREHOLE 2

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 140mm OD SOLID STEM	PAVEMENT SURFACE		181.54										
		ASPHALT		0.05										
		(GM) SILTY GRAVEL and SAND, angular; grey, (GRANULAR BASE).		0.20										
				181.16										
		(SW) SAND, trace to some gravel; brown, (FILL).		0.38	1	CS		181						
1		(ML) CLAYEY SILT, some sand, trace gravel; brown, trace organic pockets; cohesive, w>PL.			2	CS								
				180.02										
		END OF BOREHOLE		1.52										
2														
3														

Borehole dry during and after drilling on February 10, 2012.

DEPTH SCALE

1 : 50

LOGGED: SM

CHECKED:

Golder Associates

PROJECT: 11-1140-0200

RECORD OF BOREHOLE 3

SHEET 2 OF 3

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		181.13					SHEAR STRENGTH Cu, kPa: nat V. + Q - ● / rem V. ⊕ U - ○ (20 40 60 80)	WATER CONTENT PERCENT: Wp W WI (10 20 30 40)		
0	POWER AUGER 140mm OD SOLID STEM	(SW) SAND, some clay, trace gravel; black, trace organic pockets, (FILL); firm.		0.00 / 180.83				181				Borehole dry during and after drilling on February 10, 2012.
		(ML) CLAYEY SILT, some sand, trace gravel; grey, trace organic pockets, trace red brick, (FILL); firm to soft.		0.30 / 179.76	1	SS	6					
1					2	SS	4	180				
		(CL) SILTY CLAY, some sand, trace gravel; brown, silt partings; cohesive, w>PL, soft.		1.37 / 179.00	3	SS	3					
2		(CL) SILTY CLAY, trace sand; grey, trace silt partings; cohesive, w>PL, soft.		2.13 / 178.39	4	SS	2	179				
		END OF BOREHOLE		2.74								
3												

(Golder Report No. 11-1140-0200-R01)

PROJECT: 11-1140-0200

RECORD OF BOREHOLE 4

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		181.34					SHEAR STRENGTH Cu, kPa: nat V. + Q - ● / rem V. ⊕ U - ○ (20 40 60 80)	WATER CONTENT PERCENT: Wp W WI (10 20 30 40)		
0	POWER AUGER 140mm OD SOLID STEM	(SW/ML) SAND and SILT, some gravel, trace clay; brown and black, some organic material, trace red brick, (FILL).		0.00 / 180.90	1	CS		181				Borehole dry during and after drilling on February 10, 2012.
		(ML) CLAYEY SILT, some sand, trace gravel; mottled brown and grey; cohesive, w~PL.		0.44 / 180.29	2	CS						
1		(SM) SILTY SAND; brown; moist.		1.05 / 179.82	3	CS		180				
		END OF BOREHOLE		1.52								
2												
3												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_03 11-1140-0200.GPJ GLDR_LDN.GDT 06/03/12 DATA INPUT: DMB

PROJECT: 11-1140-0200

RECORD OF BOREHOLE 5

SHEET 3 OF 3

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 140mm OD SOLID STEM	PAVEMENT SURFACE		181.19				181						Borehole dry during and after drilling on February 10, 2012.
		ASPHALT		0.00										
		(GM) SILTY GRAVEL and SAND, angular; grey, (GRANULAR BASE).		0.10 / 180.73										
		(ML) CLAYEY SILT, some sand, trace gravel; mottled brown and grey, some silt partings; cohesive, firm.		0.46	1	SS	4							
1					2	SS	8	180						
				179.82										
		(CL) SILTY CLAY, trace sand; brown, silt partings; cohesive, w>PL, stiff.		1.37	3	SS	8						MH	
2				179.06				179						
		(CL) SILTY CLAY, trace sand; grey; cohesive, w>PL, firm.		2.13	4	SS	7							
		END OF BOREHOLE		178.45 / 2.74										
3														

(Golder Report No. 11-1140-0200-R01)

PROJECT: 11-1140-0200

RECORD OF BOREHOLE 6

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 140mm OD SOLID STEM	PAVEMENT SURFACE		181.45				181						Borehole dry during and after drilling on February 10, 2012.
		ASPHALT		0.05										
		(GM) SILTY GRAVEL and SAND, angular; grey, (GRANULAR BASE).		0.18										
		(SW/ML) SAND and SILT, some gravel; brown, trace red brick, (FILL).			1	CS								
1				180.08				180						
		(ML) CLAYEY SILT, some sand, trace gravel; brown; cohesive, w>PL.		1.37	2	CS								
		END OF BOREHOLE		1.52										
2														
3														

DEPTH SCALE

1 : 50

LOGGED: SM

CHECKED:

Golder Associates

LDN_BHS_03 11-1140-0200.GPJ GLDR_LDN.GDT 06/03/12 DATA INPUT: DMB

PROJECT: 13-1140-0026

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION
0	POWER AUGER 83mm ID HOLLOW STEM	ROAD SURFACE		175.85				176
		ASPHALT		0.00				
		CONCRETE		0.10 / 175.57				
		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, **(TILL)**; cohesive, w~PL, stiff.		0.28	1	SS	8	
1				174.84	2	SS	10	175
		(CL) sandy **SILTY CLAY**, trace gravel; brown, **(TILL)**, cohesive, w~PL, very stiff to stiff.		1.01	3	SS	18	
2					4	SS	17	174
3					5	SS	13	173
4				171.74	6	SS	12	172
		(CL) sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive, w~PL, stiff to firm.		4.11	7	SS	5	
5				170.82				171
		END OF BOREHOLE		5.03				
6								170
7								
8								
9								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● / rem V. ⊕ U - ○: 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl: 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 13-1140-0026-R01)

Borehole dry upon completion of drilling on March 13, 2013.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: LS

CHECKED:

LDN_BHS_02 1311400026.GPJ 22/03/13 DATA INPUT: DMB

PROJECT: 13-1140-0026

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION
0	POWER AUGER 83mm ID HOLLOW STEM	ROAD SURFACE		175.97				176
		ASPHALT		0.00				
		CONCRETE		0.06				
				0.22				
		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, with organic pockets, **(TILL)**; cohesive, w>PL, firm to stiff.			1	SS	6	
1					2	SS	8	175
				174.60				
				1.37				
					3	SS	19	
2								174
		(CL) sandy **SILTY CLAY**, trace gravel; brown, **(TILL)**, cohesive, w~PL, very stiff to stiff.			4	SS	14	
3					5	SS	11	173
				172.31				
				3.66				
					6	SS	6	172
4		(CL) sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive, w~PL, very stiff to firm.						
					7	SS	3	
				170.94				171
5		END OF BOREHOLE		5.03				
6								170
7								
8								
9								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)

SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})

WATER CONTENT PERCENT (10 20 30 40) Wp W WI

(Golder Report No. 13-1140-0026-R01)

>96

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry upon completion of drilling on March 13, 2013.

DEPTH SCALE

1 : 50

LOGGED: LS

CHECKED:

Golder Associates

LDN_BHS_02 1311400026.GPJ 22/03/13 DATA INPUT: DMB

PROJECT: 13-1140-0026

RECORD OF BOREHOLE BH-105

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION
0	POWER AUGER 83mm ID HOLLOW STEM	ROAD SURFACE		176.21				176
		ASPHALT		0.00				
		CONCRETE		0.10				
				0.25	1	SS	8	
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, layers/pockets of topsoil, **(TILL)**; cohesive, w>PL, stiff to firm.			2	SS	6	175
				174.84				
				1.37	3	SS	12	
2		(CL) sandy **SILTY CLAY**, trace gravel; brown, **(TILL)**, cohesive, w~PL, stiff to very stiff.			4	SS	15	174
3				172.86	5	SS	9	173
				3.35				
4		(CL) sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive, w~PL, very stiff to firm.			6	SS	5	172
					7	SS	4	
5				171.18				
		END OF BOREHOLE		5.03				171
6								
7								
8								
9								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● rem V. ⊕ U - ○: 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W WI; 10 20 30 40

(Golder Report No. 13-1140-0026-R01)

>96

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry upon completion of drilling on March 13, 2013.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: LS

CHECKED:

LDN_BHS_02 1311400026.GPJ 22/03/13 DATA INPUT: DMB

PROJECT: 13-1140-0031

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 lb; DROP, 760 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FT	ELEVATION
0	POWER AUGER 3/4" ID HOLLOW STEM	PAVEMENT SURFACE		574.8				575
		ASPHALT		0.0				
		(SW/GW) SAND AND GRAVEL, angular; brown, **(GRANULAR BASE)**; moist.		0.3 / 573.6 / 1.2	1	AS		
		(CL) SILTY CLAY, trace sand; black, **(TOPSOIL)**; cohesive, w>PL.			2	AS		
				571.3 / 3.5	3	SS	2	
5		(CL/CI) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, **(TILL)**; cohesive, w~PL, soft to very stiff.			4	SS	4	570
				567.8 / 7.0				
		(CL/CI) sandy **SILTY CLAY**, some gravel; brown, **(TILL)**; cohesive, w<PL, very stiff.			5	SS	22	
10					6	SS	19	565
				562.8 / 12.0				
		(CL/CI) sandy **SILTY CLAY**, trace to some gravel; grey, **(TILL)**; cohesive, w>PL, stiff to firm.			7	SS	6	
15					8	SS	5	560
				558.3				
		END OF BOREHOLE		16.5				
20								555
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20, 40, 60, 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●; rem V. ⊕ U - ○; 400, 800, 1200, 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp, W, Wl; 10, 20, 30, 40

(Golder Report No. 13-1140-0031-R01)

>2000

ADDITIONAL LAB. TESTING: MH

INSTALLATION AND GROUNDWATER OBSERVATIONS: Borehole dry upon completion of drilling on March 13, 2013.

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: LS

CHECKED:

LDN_BHS_02 1311400031.GPJ 21/03/13 DATA INPUT: DMB

PROJECT: 13-1140-0031

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 lb; DROP, 760 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	NUMBER	TYPE	BLOWS/FT	ELEVATION
0	POWER AUGER 3/4" ID HOLLOW STEM	PAVEMENT SURFACE		574.5				575
		ASPHALT		0.2	1	AS		
		(SW/GW) SAND AND GRAVEL, angular; brown, **(GRANULAR BASE)**; moist.		0.8	2	AS		
		(CL) SILTY CLAY, some sand; black, **(TOPSOIL)**; cohesive, w>PL.		572.5 2.0	3	SS	5	
5		(CL/CI) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, **(TILL)**; cohesive, w~PL, firm to very stiff.			4	SS	6	570
				567.5 7.0				
		(CL/CI) sandy **SILTY CLAY**, some gravel; brown, **(TILL)**; cohesive, w<PL, very stiff to stiff.			5	SS	25	565
10					6	SS	11	
				562.5 12.0				
		(CL/CI) sandy **SILTY CLAY**, trace to some gravel; grey, **(TILL)**; cohesive, w>PL, very stiff to firm.			7	SS	8	560
15					8	SS	4	
				558.0				
		END OF BOREHOLE		16.5				555
20								
25								
30								
35								

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20, 40, 60, 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●; rem V. ⊕ U - ○; 400, 800, 1200, 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp, W, Wl; 10, 20, 30, 40

>2000

>2000

(Golder Report No. 13-1140-0031-R01)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry about 2 hours after completion of drilling on March 13, 2013.

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: LS

CHECKED:

LDN_BHS_02 1311400031.GPJ 21/03/13 DATA INPUT: DMB

PROJECT: 13-1140-0188

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: May 01, 2014

DATUM: LOCAL

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		101.31								
0	POWER AUGER 152mm OD SOLID STEM	**FILL** - (CL) sandy clayey TOPSOIL		0.00 / 101.11	1	AS		102				
				0.20								
					2	SS	6					
1					3	SS	8	101				
		FILL - (CL) sandy SILTY CLAY, trace gravel; brown to grey, with pieces of wood, brick, concrete; cohesive, moist, soft to stiff			4	SS	5	100				
2												
					5	SS	5	99				
3					6	SS	4	98				
				97.65 / 3.66								
					7	SS	3					
4		**FILL** - (CL) sandy SILTY CLAY, trace gravel; black to dark grey, with sand seams, pieces of wood, brick, organic material; cohesive, soft						97				
					8	SS	3					
5				96.28								
		END OF BOREHOLE		5.03				96				
6												
7												
8												
9												

(Golder Report No. 13-1140-0188-R01)

Borehole dry upon completion of drilling on May 1, 2014.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: LS

CHECKED:

LDN_BHS_02 1311400188.GPJ 12/05/14 DATA INPUT: DMB

PROJECT: 13-1140-0188

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: May 01, 2014

DATUM: LOCAL

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
								101	***(Golder Report No. 13-1140-0188-R01)***			
0	POWER AUGER 152mm OD SOLID STEM	GROUND SURFACE		100.02				100				
		FILL, TOPSOIL - (CL) sandy SILTY CLAY; black		0.00	1	AS						
				99.36	2	SS	5					
1		**FILL** - (CL) sandy SILTY CLAY, trace gravel; brown to grey, with pieces of wood; cohesive, firm to stiff		0.66	3	SS	13	99				
				98.82								
		FILL - (SM) SILTY SAND; brown to black, with pieces of wood, slag, foundry sand, brick; non-cohesive, dry, compact to loose		1.20	4	SS	8					
2				97.89				98				
		FILL - (CL) sandy SILTY CLAY; grey-brown, with pieces of brick, sand pockets; cohesive, very stiff		2.13	5	SS	22					Groundwater seepage into borehole encountered at about elev. 97.0m during drilling on May 1, 2014.
				97.12								Seepage ▽
3		**FILL** - Refuse debris, brick fragments, concrete pieces; loose		2.90	6	SS	16	97				
				96.14	7	SS	50/75mm					May 1/14 ▼
4		END OF BOREHOLE Obstruction		3.88				96				Water level in borehole at about elev. 96.2m upon completion of drilling on May 1, 2014.
5												
6												
7												
8												
9												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: LS

CHECKED:

LDN_BHS_02 1311400188.GPJ 12/05/14 DATA INPUT: DMB

PROJECT: 13-1140-0207

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: November 25, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 184mm ID HOLLOW STEM	ROAD SURFACE		190.85				191	*(Golder Report No. 13-1140-0207-R01)*			
		ASPHALT		0.00								
		FILL - (SM/GW) SILTY SAND and GRAVEL, angular; grey, **(GRANULAR BASE)**; dry		0.13	1	AS						
				190.34	2	SS	14					
				0.51								
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, organic pockets, **(TILL)**; cohesive, w~PL, firm			3	SS	7	190				
					4	SS	4	189				
2				188.72								
				2.13	5	SS	24		>96 +			
		(CL) sandy **SILTY CLAY**, trace gravel; brown, fissured, **(TILL)**; cohesive, w<PL, very stiff						188				
3					6	SS	28					
				187.19								
				3.66	7	SS	21	187				
4												
					8	SS	12	186				
5												
								185				
6					9	SS	10					
		(CL) sandy **SILTY CLAY**, trace gravel; grey, fissured in upper portion, **(TILL)**; cohesive, w<PL, very stiff						184	>96 +			
7									>96 +			
					10	SS	10	183				
8												
									>96 +			
								182	>96 +			
9					11	SS	6					
				181.25								
		END OF BOREHOLE		9.60								

Borehole dry upon completion of drilling on November 25, 2013.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SG

CHECKED:

LDN_BHS_07 1311400207.GPJ GLDR_LON.GDT 05/12/13 DATA INPUT: DMB

PROJECT: 13-1140-0207

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: November 25, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 184mm ID HOLLOW STEM	ROAD SURFACE		190.75								
		ASPHALT		0.00								
		FILL - (SM/GW) SILTY SAND and GRAVEL, angular; grey, **(GRANULAR BASE)**; dry		0.08	1	AS						
		TOPSOIL - (ML) sandy CLAYEY SILT; black; cohesive, w~PL, stiff		0.25	2	SS	11					
				189.99				190				
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, organic pockets, **(TILL)**; cohesive, w~PL, firm		0.76	3	SS	6					
					4	SS	4	189				
2				188.62								
		(CL) sandy **SILTY CLAY**, trace gravel; brown, fissured, **(TILL)**; cohesive, w<PL, very stiff		2.13	5	SS	24					
								188				
3					6	SS	27					
				187.09								
				3.66	7	SS	16	187				
4												
					8	SS	12	186				
5												
								185				
6		(CL) sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive, w~PL, very stiff			9	SS	7					
								184	>96 +			
7												
					10	SS	6	183				
8				182.67								
		END OF BOREHOLE		8.08				182				
9												

(Golder Report No. 13-1140-0207-R01)

Borehole dry upon completion of drilling on November 25, 2013.

DEPTH SCALE

1 : 50

LOGGED: SG

CHECKED:

Golder Associates

LDN_BHS_07 1311400207.GPJ GLDR_LON.GDT 05/12/13 DATA INPUT: DMB

PROJECT: 13-1140-0207

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: November 25, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q- ●, U- ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 184mm ID HOLLOW STEM	ROAD SURFACE		190.50				190				
		ASPHALT		0.00								
		FILL - (SM/GW) SILTY SAND and GRAVEL, angular; grey, **(GRANULAR BASE)**; dry		0.15	1	AS						
				189.94	2	SS	30					
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, organic pockets, **(TILL)**; cohesive, w~PL, firm		0.56	3	SS	7	189				
					4	SS	4					
2				188.37					>96 +			
		(CL) sandy **SILTY CLAY**, trace gravel; brown, fissured, **(TILL)**; cohesive, w<PL, very stiff		2.13	5	SS	26	188				
3					6	SS	29	187				
				186.84								
		(CL) sandy **SILTY CLAY**, trace gravel; grey, fissured, **(TILL)**; cohesive, w<PL, very stiff to stiff		3.66	7	SS	17					
4								186				
					8	SS	12					
5				185.47								
		END OF BOREHOLE		5.03				185				

(Golder Report No. 13-1140-0207-R01)

Borehole dry upon completion of drilling on November 25, 2013.

6 7 8 9

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SG

CHECKED:

LDN_BHS_07 1311400207.GPJ GLDR_LON.GDT 05/12/13 DATA INPUT: DMB

PROJECT: 13-1140-0207

RECORD OF BOREHOLE BH-104

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: November 25, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 184mm ID HOLLOW STEM	ROAD SURFACE		190.30				190				
		ASPHALT		0.00								
		FILL - (SM/GW) SILTY SAND and GRAVEL, angular; grey, **(GRANULAR BASE)**; dry		0.13 189.92 0.38	1	AS						
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, organic pockets, **(TILL)**; cohesive, w~PL, very stiff to stiff			2 3	SS SS	16 8	189				
				188.78								
2		(CL) sandy **SILTY CLAY**, trace gravel; brown, fissured, **(TILL)**; cohesive, w<PL, very stiff		1.52	4 5	SS SS	18 28	188				
3					6	SS	27	187				
				186.64 3.66								
4					7	SS	13	186				
5		(CL) sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive, w<PL, stiff			8	SS	12	185				
6					9	SS	9	184				
				183.75								
		END OF BOREHOLE		6.55				183				
7												
8												
9												

(Golder Report No. 13-1140-0207-R01)

Borehole dry upon completion of drilling on November 25, 2013.

DEPTH SCALE

1 : 50

LOGGED: SG

CHECKED:

Golder Associates

LDN_BHS_07 1311400207.GPJ GLDR_LON.GDT 05/12/13 DATA INPUT: DMB

PROJECT: 1400977

RECORD OF BOREHOLE BH-101

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS/FT	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80) / SHEAR STRENGTH Cu, psf (nat V. + Q - ● rem V. ⊕ U - ○) (400 800 1200 1600)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 3/4" ID HOLLOW STEM	GROUND SURFACE		579.0								
		FILL - (SM) SILTY SAND mixed with clay and gravel; brown, organic pockets, asphalt and concrete fragments; moist, compact		0.0	1	AS						
				576.5	2	SS	25					
		FILL - (CL) sandy SILTY CLAY, trace gravel; brown, with concrete fragments; cohesive, w<PL, very stiff		2.5	3	SS	18					
5				574.5				575				
		FILL - (SW) SAND and CONCRETE; grey; non-cohesive, moist, compact		4.5	4	SS	23					
				572.0								
		FILL - (SM) SILTY SAND, trace gravel; black, with pockets of foundry sand, cemented; non-cohesive, wet, compact		7.0	5	SS	15					Mar. 27/14 ▼ Water level in borehole at about elev. 571.99 ft upon completion of drilling on March 27, 2014.
				570.5				570				
				8.5	6	SS	5					
					7	SS	2					
15					8	SS	2	565				
20		(SM) **SILTY SAND**; grey, with organic fibres, shells, rootlets; non-cohesive, wet, loose			9	SS	1	560				
25					10	SS	1	555				
30					11	SS	1	550				
				546.0								
				33.0								
35		(SW) **SAND**; grey, with organic fibres, shells, rootlets; non-cohesive, wet, compact			12	SS	5	545				
		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 1400977-R01)

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 1400977.GPJ 23/04/14 DATA INPUT: DMB

PROJECT: 1400977

RECORD OF BOREHOLE BH-101

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/FT	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80); SHEAR STRENGTH Cu, psf (400 800 1200 1600); nat V. + Q - ●; rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W WI; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
40	POWER AUGER 3/4" ID HOLLOW STEM	(SW) **SAND**; grey, with organic fibres, shells, rootlets; non-cohesive, wet, compact			13	SS	1	540				
45				533.0 / 46.0	14	SS	2	535				
		(ML) **CLAYEY SILT**, some sand; grey; cohesive, w>PL, soft		531.5 / 47.5								
50		(ML) **CLAYEY SILT**, some sand, trace gravel; grey, sand and gravel layers and pockets, **(TILL)**; cohesive, w>PL, stiff to very stiff			15	SS	12	530	⊕ >2000			
				527.5 / 51.5				525				
		END OF BOREHOLE										
55												
60												
65												
70												
75												

(Golder Report No. 1400977-R01)

LDN_BHS_02 1400977.GPJ 23/04/14 DATA INPUT: DMB

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: SM

CHECKED:

PROJECT: 1400977

RECORD OF BOREHOLE BH-102

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FT	ELEVATION
0	POWER AUGER 3/4" ID HOLLOW STEM	GROUND SURFACE		578.5				
		FILL - (SM) SILTY SAND and GRAVEL, angular; grey, **(GRANULAR BASE)**; non-cohesive, moist, compact		0.0 / 576.5	1	AS		
					2	SS	33	
		FILL - (SM) SILTY SAND, trace gravel; brown, with glass fragments; non-cohesive, moist, compact		2.0 / 574.0	3	SS	26	575
5		**FILL** - (SM) SILTY SAND, trace gravel; grey, with clay pockets, concrete fragments; non-cohesive, moist, compact		4.5 / 572.0	4	SS	15	
		(SW) **SAND**, some silt, trace gravel; grey to black, with shells; non-cohesive, wet, loose to compact		6.5 / 569.0	5	SS	6	570
10		(SM) **SILTY SAND**; grey, with organic fibres, shells, rootlets; non-cohesive, wet, loose to compact		9.5	6	SS	7	
					7	SS	7	565
15					8	SS	2	
								560
20					9	SS	1	
								555
25					10	SS	2	
				28.0 / 550.5				550
30		(SW) **SAND**; grey, with organic fibres and shells; non-cohesive, wet, loose to compact			11	SS	5	
								545
35					12	SS	5	
				540.5				

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf: nat V. + Q - ●; rem V. ⊕ U - ○; 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W WI; 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 1400977-R01)

Mar. 27/14 ▼

Water level in borehole at about elev. 571.52 ft upon completion of drilling on March 27, 2014.

--- CONTINUED NEXT PAGE ---

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 1400977.GPJ 23/04/14 DATA INPUT: DMB

PROJECT: 1400977

RECORD OF BOREHOLE BH-102

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/FT	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80); SHEAR STRENGTH Cu, psf (400 800 1200 1600); nat V. + Q - ●; rem V. ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W WI; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							***(Golder Report No. 1400977-R01)***			
40	POWER AUGER 3/4" ID HOLLOW STEM	(CL) **SILTY CLAY**, some sand, trace gravel; grey, with sand seams and shells; cohesive, w~PL, stiff to firm		38.0	13	SS	4	540				
45		(Cl) **SILTY CLAY**, trace sand; grey; cohesive, w>PL, firm to soft		534.0 44.5	14	SS	3	535				
50					15	SS	WH	530				
		END OF BOREHOLE		527.0 51.5				525				
55												
60												
65												
70												
75												

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 1400977.GPJ 23/04/14 DATA INPUT: DMB

PROJECT: 1400977

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FT	ELEVATION
0	POWER AUGER 3/4" ID HOLLOW STEM	PAVEMENT SURFACE		577.3				575
		ASPHALT		0.0 / 0.2	1	AS		
		FILL - (SM) SILTY SAND and GRAVEL, angular; grey, **(GRANULAR BASE)**; non-cohesive, moist		0.5	2	SS	10	
		FILL - (SP) SAND, some silt; brown, with red brick fragments; moist, compact		574.8 / 2.5				
		FILL - (SW) SAND and CONCRETE; grey; non-cohesive, moist, loose		574.1 / 3.3	3	SS	6	
5		(SW) **SAND**, trace silt; dark brown; non-cohesive, moist, compact		572.8 / 4.5	4	SS	9	570
		(SW) **SAND**, fine to coarse, trace silt; brown; non-cohesive, wet, compact		570.3 / 7.0	5	SS	4	
10		(SM) **SILTY SAND**, trace gravel; grey; non-cohesive, wet, compact to loose		565.8	6	SS	3	565
		END OF BOREHOLE		11.5				

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft: 20 40 60 80

SHEAR STRENGTH Cu, psf — nat V. + Q - ● rem V. ⊕ U - ○: 400 800 1200 1600

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl: 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 1400977-R01)

Mar. 27/14 ▼

Water level in borehole at about elev. 573.31 ft upon completion of drilling on March 27, 2014.

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 1400977.GPJ 23/04/14 DATA INPUT: DMB

PROJECT: 1400977

RECORD OF BOREHOLE BH-104

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS/FT	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft (20 40 60 80); SHEAR STRENGTH Cu, psf (400 800 1200 1600); nat V. +; rem V. ⊕; Q - ●; U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, WI; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 3/4" ID HOLLOW STEM	GROUND SURFACE		577.8								
		FILL, TOPSOIL - (CL) SILTY CLAY; brown, with wood and roots; moist		0.0 / 576.8	1	AS						
				1.0	2	SS	6					
		(SW) SAND, fine; trace gravel; brown; non-cohesive, dry, loose to compact			3	SS	13	575				
5				573.3								Mar. 27/14 ▼ Water level in borehole at about elev. 573.56 ft upon completion of drilling on March 27, 2014.
		(SM) **SILTY SAND**, some gravel; brown, with rootlets; non-cohesive, wet, compact		4.5 / 570.8	4	SS	26					
				7.0				570				
		(SM) **SILTY SAND**, trace clay; grey; non-cohesive, wet, loose			5	SS	7					
10					6	SS	3					
				566.3								
		END OF BOREHOLE		11.5				565				
15												
20												
25												
30												
35												

(Golder Report No. 1400977-R01)

DEPTH SCALE

1 inch to 5 feet

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 1400977.GPJ 23/04/14 DATA INPUT: DMB

PROJECT: 1405019

RECORD OF BOREHOLE BH-101

SHEET 1 OF 14

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 2, 2014

DATUM: NOT SURVEYED

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 6620 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE **ASPHALT**		0.00										
		FILL - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, moist		0.13	1	SC								
		FILL - (SP-GP) SAND and GRAVEL, angular; greyish brown, with asphalt, red brick, and concrete pieces, **(RECYCLED SUB-BASE)**; non-cohesive, moist		0.36	2	SC							M	
1		(CL) sandy **SILTY CLAY**; mottled brown and grey, **(TILL)**; cohesive, w~PL		0.66	3	SC								
		END OF BOREHOLE		1.22										
2														
3														

(Golder Report No. 1405019-R01)

Borehole dry upon completion of drilling on July 2, 2014.

PROJECT: 1405019

RECORD OF BOREHOLE BH-102

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 2, 2014

DATUM: NOT SURVEYED

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 6620 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE **ASPHALT**		0.00										
		FILL - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, dry		0.10	1	SC								
		FILL - (SP-GP) SAND and GRAVEL, angular; greyish brown, with asphalt, red brick, and concrete pieces, **(RECYCLED SUB-BASE)**; non-cohesive, moist		0.36	2	SC							M	
1		(CL) sandy **SILTY CLAY**; mottled brown and grey, **(TILL)**; cohesive, w~PL		0.61	3	SC								
		END OF BOREHOLE		1.22										
2														
3														

Borehole dry upon completion of drilling on July 2, 2014.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: LS

CHECKED:

PROJECT: 1405019

RECORD OF BOREHOLE BH-103

SHEET 2 OF 14

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 2, 2014

DATUM: NOT SURVEYED

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 6620 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE **ASPHALT**		0.00	1	SC								
		FILL - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, dry		0.10	2	SC								
		FILL - (SP-GP) SAND and GRAVEL, angular; greyish brown, with asphalt, red brick, and concrete pieces, **(RECYCLED SUB-BASE)**; non-cohesive, moist to wet		0.38	3	SC								
1		(CL) sandy **SILTY CLAY**; brown, **(TILL)**; cohesive, w~PL		0.58	4	SC								
		END OF BOREHOLE		1.22										
2														
3														

(Golder Report No. 1405019-R01)

Borehole dry upon completion of drilling on July 2, 2014.

PROJECT: 1405019

RECORD OF BOREHOLE BH-104

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 2, 2014

DATUM: NOT SURVEYED

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 6620 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE **ASPHALT**		0.00										
		FILL - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, dry		0.10	1	SC								
		FILL - (SP-GP) SAND and GRAVEL, angular; greyish brown, with asphalt, red brick, and concrete pieces, **(RECYCLED SUB-BASE)**; non-cohesive, moist		0.46	2	SC								
1		(CL) sandy **SILTY CLAY**; mottled brown and grey, **(TILL)**; cohesive, w~PL		0.71	3	SC								
		END OF BOREHOLE		1.22										
2														
3														

Water present in borehole from coring asphalt.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED:

CHECKED:

1405019.GPJ GLDR_LDN.GDT 03/10/14 DATA INPUT: DMB
LDN_BHS_03

PROJECT: 1405019

RECORD OF BOREHOLE BH-118

SHEET 9 OF 14

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 1, 2014

DATUM: NOT SURVEYED

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 7822 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE **ASPHALT**		0.00 0.13								
		FILL - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, moist			1	SC						
1		(CL) sandy **SILTY CLAY**; mottled brown and grey, **(TILL)**; cohesive, w~PL		0.69	2	SC						
		END OF BOREHOLE		1.52								Water level in borehole at about 1.5m depth upon completion of drilling on July 1, 2014.
2												
3												

(Golder Report No. 1405019-R01)

PROJECT: 1405019

RECORD OF BOREHOLE BH-119

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 1, 2014

DATUM: NOT SURVEYED

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 7822 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE **ASPHALT**		0.00 0.13								
		FILL - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, moist			1	SC						
1		(CL) sandy **SILTY CLAY**; mottled brown and grey, **(TILL)**; cohesive, w>PL to w~PL		0.69	2 3	SC SC						
		END OF BOREHOLE		1.52								Borehole dry upon completion of drilling on July 1, 2014.
2												
3												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: LS

CHECKED:

PROJECT: 1405019

RECORD OF BOREHOLE BH-120

SHEET 10 OF 14

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 1, 2014

DATUM: NOT SURVEYED

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
									(Golder Report No. 1405019-R01)			
0	GEOPROBE 7822 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE **ASPHALT**		0.00								
		FILL - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, moist		0.13	1	SC						
1		(CL) sandy **SILTY CLAY**; mottled brown and grey, **(TILL)**; cohesive, w~PL		0.56	2	SC						
		END OF BOREHOLE		1.52								
2												
3												

Borehole dry upon completion of drilling on July 1, 2014.

PROJECT: 1405019

RECORD OF BOREHOLE BH-121

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 1, 2014

DATUM: NOT SURVEYED

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 7822 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE **ASPHALT**		0.00								
		FILL - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, moist		0.10	1	SC						
					2	SC						
1		**FILL** - (CL) sandy SILTY CLAY; mottled brown and grey, with topsoil nodules; cohesive, w>PL		0.66	3	SC						
		END OF BOREHOLE		1.22								
2												
3												

Borehole dry upon completion of drilling on July 1, 2014.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED:

CHECKED:

LDN_BHS_03 1405019.GPJ GLDR_LDN.GDT 03/10/14 DATA INPUT: DMB

PROJECT: 1405768

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 16, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION
		GROUND SURFACE		185.59				186
0	POWER AUGER 83mm ID HOLLOW STEM	**TOPSOIL** - (SP) SAND, trace silt; brown; non-cohesive, moist		0.00 / 185.31	1	AS		
		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, with topsoil nodules, **(TILL)**; cohesive, w~PL, stiff		0.28	2	SS	8	185
1					3	SS	10	
				184.22				
		(CL) sandy **SILTY CLAY**, trace gravel; brown, oxidized, fissured, **(TILL)**; cohesive, w<PL, very stiff		1.37	4	SS	20	184
2								
					5	SS	20	183
3								
					6	SS	23	
				181.93				182
		(CL) sandy **SILTY CLAY**, trace gravel; grey, with silt partings, **(TILL)**; cohesive, w~PL, very stiff to firm		3.66	7	SS	12	
4								
					8	SS	9	181
5								
								180
6					9	SS	7	
				179.04				179
		END OF BOREHOLE		6.55				
7								
8								
9								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W WI; 10 20 30 40

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 1405768-R01)

>96 +

>96 +

Borehole dry during and on completion of drilling on July 16, 2014.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 1405768.GPJ 31/07/14 DATA INPUT: DMB

PROJECT: 1405768

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 16, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION
		GROUND SURFACE		185.27				
0	POWER AUGER 83mm ID HOLLOW STEM	**TOPSOIL, FILL** - (SP) SAND, trace silt; brown; non-cohesive, moist		0.00 / 184.97	1	AS		185
		FILL - (CL) sandy SILTY CLAY, trace gravel; brown, with topsoil pockets; cohesive, w<PL, stiff to firm		0.30 / 184.36	2	SS	9	
1		**TOPSOIL** - (CL) sandy SILTY CLAY; black; cohesive, w>PL, firm		0.91 / 183.90	3	SS	5	184
		(SM) clayey **SILTY SAND**, trace gravel; brown and grey; cohesive, w>PL, firm		1.37 / 183.14	4	SS	5	
2								183
					5	SS	18	
3					6	SS	16	182
4		(CL) sandy **SILTY CLAY**, trace gravel; grey, with sand pockets and partings, **(TILL)**; cohesive, w<PL to w>PL, very stiff to firm			7	SS	9	181
					8	SS	6	
5								180
6					9	SS	4	179
				178.72				
		END OF BOREHOLE		6.55				178
7								
8								
9								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W WI; 10 20 30 40

(Golder Report No. 1405768-R01)

>96 +

>96 +

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry during and on completion of drilling on July 16, 2014.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 1405768.GPJ 31/07/14 DATA INPUT: DMB

PROJECT: 1405768

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 16, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 83mm ID HOLLOW STEM	GROUND SURFACE		185.72				186				
		TOPSOIL, FILL - (SP) SAND, trace silt; brown; non-cohesive, moist		0.00	1	AS						
				0.15	2	SS	8					
1		**FILL** - (CL) sandy SILTY CLAY, trace gravel; brown and grey; cohesive, w~PL, stiff to firm			3	SS	6	185				
				184.35								
				1.37	4	SS	15	184			MH	
2		(CL) sandy **SILTY CLAY**, trace gravel; brown, oxidized, fissured, **(TILL)**; cohesive, w<PL, very stiff			5	SS	21					
3					6	SS	26	183				
				182.06								
				3.66	7	SS	21	182				
4												
					8	SS	11	181				
5		(CL) sandy **SILTY CLAY**, trace gravel; grey, with oxidized fissures, **(TILL)**; cohesive, w<PL to w>PL, very stiff to firm										
6					9	SS	6	180				
				179.17								
		END OF BOREHOLE		6.55				179				
7												
8												
9												

(Golder Report No. 1405768-R01)

Borehole dry during and on completion of drilling on July 16, 2014.

DEPTH SCALE

1 : 50

LOGGED: SM

CHECKED:

Golder Associates

LDN_BHS_02 1405768.GPJ 31/07/14 DATA INPUT: DMB

PROJECT: 1406552

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 03, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION
		GROUND SURFACE		175.48				
0	POWER AUGER 83mm ID HOLLOW STEM	**TOPSOIL, FILL** - (CL) sandy SILTY CLAY; black; cohesive, w>PL		0.00 / 175.18	1	AS		
		FILL - (CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, topsoil pockets, some sand pockets; cohesive, w>PL, firm		0.30 / 174.73	2	SS	5	175
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, trace sand pockets, **(TILL)**; cohesive, w>PL, firm		0.75 / 174.11	3	SS	6	
		(CL) sandy **SILTY CLAY**, trace gravel; brown, oxidized fissures, **(TILL)**; cohesive, w<PL, stiff to very stiff		1.37 / 172.58	4	SS	13	174
2					5	SS	20	173
3		(CL) sandy **SILTY CLAY**, trace gravel; brown to grey, **(TILL)**; cohesive, w<PL, stiff		2.90 / 171.82	6	SS	11	172
4				3.66	7	SS	9	
		(CL) sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive, w~PL, very stiff to firm			8	SS	5	171
5								170
6					9	SS	4	
		END OF BOREHOLE		168.93 / 6.55				169
7								
								168
8								
9								

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)

SHEAR STRENGTH Cu, kPa (20 40 60 80) nat V. + Q - ● rem V. ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})

WATER CONTENT PERCENT (10 20 30 40) Wp W WI

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

(Golder Report No. 1406552-R01)

>96

Borehole dry during drilling on July 3, 2014.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_02 1406552.GPJ 11/07/14 DATA INPUT: DMB

PROJECT: 1406552

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 03, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		175.41								
0	POWER AUGER 83mm ID HOLLOW STEM	**TOPSOIL, FILL** - (CL) sandy SILTY CLAY; black; cohesive, w>PL		0.00 / 175.11	1	AS		175				Borehole dry during drilling on July 3, 2014.
		FILL - (CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, topsoil pockets, some sand pockets; cohesive, w>PL, firm		0.30 / 174.80	2	SS	5					
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, sand pockets, **(TILL)**; cohesive, w>PL, firm to stiff		0.61	3	SS	5	174				
					4	SS	8					
2				173.28								
		(CL) sandy **SILTY CLAY**, trace gravel; brown, oxidized fissures, **(TILL)**; cohesive, w<PL, very stiff		2.13 / 172.51	5	SS	21	173				
3				2.90	6	SS	9	172				
4					7	SS	7					
								171				
		(CL) sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive, w~PL, very stiff to firm			8	SS	4		>96 +			
5												
								170	⊕ + ⊕ +			
6												
					9	SS	5	169				
				168.86								
		END OF BOREHOLE		6.55								
7												
								168				
8												
9												

(Golder Report No. 1406552-R01)

LDN_BHS_02 1406552.GPJ 11/07/14 DATA INPUT: DMB

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

PROJECT: 1406552

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 03, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		175.31								
0	POWER AUGER 83mm ID HOLLOW STEM	**TOPSOIL, FILL** - (CL) sandy SILTY CLAY; black; cohesive, w>PL		0.00 / 175.01	1	AS		175				Borehole dry during drilling on July 3, 2014.
		FILL - (CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, topsoil pockets, some sand pockets; cohesive, w>PL, firm		0.30 / 174.56	2	SS	6					
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, trace sand pockets, shale fragments, **(TILL)**; cohesive, w<PL, firm to stiff		0.75	3	SS	6	174				
					4	SS	8					
2				173.18				173				
		(CL) sandy **SILTY CLAY**, trace gravel; brown, oxidized fissures, **(TILL)**; cohesive, w<PL, very stiff		2.13 / 172.41	5	SS	20					
3				2.90	6	SS	11	172				
					7	SS	8					
4								171				
		(CL) sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive, w~PL, stiff to firm			8	SS	5					
5								170				
6					9	SS	4	169				
		END OF BOREHOLE		168.76 / 6.55								
7								168				
8												
9												

(Golder Report No. 1406552-R01)

DEPTH SCALE

1 : 50

LOGGED: SM

CHECKED:

Golder Associates

LDN_BHS_02 1406552.GPJ 11/07/14 DATA INPUT: DMB

PROJECT: 1527635 (1000)

RECORD OF BOREHOLE BH-103

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: April 27, 2015

DATUM: GEODETIC

DRILLING CONTRACTOR: London Soil Test Ltd.

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
				180.06								
0	POWER AUGER 152mm OD SOLID STEM	GROUND SURFACE						181				
		TOPSOIL - sandy SILTY CLAY; black		0.00 / 179.76	1	AS						
		sandy **SILTY CLAY**, trace gravel; mottled brown and grey, trace organic pockets and roots, **(TILL)**; firm		0.30	2	SS	5	180				Granular Bentonite
1					3	SS	6	179				
				178.38								
				1.68	4	SS	14					
2		sandy **SILTY CLAY**, trace gravel; brown, oxidized fissures, silt partings, **(TILL)**; stiff to hard			5	SS	30	178				
3					6	SS	27	177				
				176.40								
				3.66	7	SS	13	176				
4												
					8	SS	9					
5								175	>96 + >96 +			Cuttings/ Bentonite
6		sandy **SILTY CLAY**, trace gravel; grey, some sand seams/pockets with depth, **(TILL)**; very stiff to firm			9	SS	8	174				
7								173	⊕ + >96 +			
					10	SS	7					
8								172	⊕ + ⊕ +			
9		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 1527635-1000-R01)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_07 1527635.GPJ GLDR_LON.GDT 25/05/15 DATA INPUT: DMB

PROJECT: 1520407 (2000)

RECORD OF BOREHOLE BH-201

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

DATUM: LOCAL

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: RUN No.	NUMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ND = Not Detected (50, 100, 150, 200)	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected (20, 40, 60, 80)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
												MW-201

(Golder Report No. 1520407-2000-R01)

0	GEOPROBE 7822DT / DT SAMPLING SYSTEM	GROUND SURFACE		97.96				98				Top of Pipe Elev. 97.75m; Flushmount Protective Casing
		FILL - SILTY CLAY, some sand and gravel; brown to dark brown, trace ash, brick and organic material		0.00	1	1A	SC					Concrete
				97.15								
1		**FILL** - SAND, fine to coarse, with gravel; brown		0.81		1B	SC	97				Granular Bentonite
				96.59		2A	SC					
		FILL - SILTY CLAY, trace sand, trace gravel; grey to brown and black, mixed with glass, cinders and wood		1.37	2	2B	SC					
				96.13								
2		sandy **SILTY CLAY**, trace gravel; grey, **(TILL)**; cohesive		1.83		2C	SC	96				Sand
				95.52								
		SAND AND GRAVEL, fine to coarse; brown, mixed with grey-brown silty clay		2.44		3A	SC					
				95.22								
		sandy **SILTY CLAY**, trace gravel; grey, mixed with grey and black organics, **(TILL)**; w>PL		2.74	3	3B	SC	95				50mm Dia. Slot 10 Sch. 40 PVC Screen
3												
						4A	SC					
4					4			94				
				93.39		4B	SC					
		SILTY CLAY, trace sand, trace gravel; grey, **(TILL)**		4.57		4C	SC					
				93.08								
5		END OF BOREHOLE		4.88				93				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: KL
CHECKED:

LDN_ENV_11 1520407-2000.GPJ GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH

PROJECT: 1520407 (2000)

RECORD OF BOREHOLE BH-202

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

DATUM: LOCAL

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: RUN No.	NUMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ND = Not Detected (50, 100, 150, 200) ⊕ / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected (20, 40, 60, 80) □	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
									(Golder Report No. 1520407-2000-R01)		
0	GEOPROBE 7822DT DT SAMPLING SYSTEM	GROUND SURFACE		97.83				98			
		TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown		0.00 / 97.65	1	1A	SC				
		FILL - SILTY CLAY; grey, mixed with sand, gravel, glass, brick and cinders		0.18		1B	SC	97			
1				96.71		1C	SC				
		FILL - SAND; dark brown, with ash, cinders,brick, glass and organics		1.12		2A	SC				
				96.26	2						
		sandy **SILTY CLAY**, trace gravel; dark grey to light grey, mixed with ash, trace organics; w>PL		1.57		2B	SC	96			
2						3A	SC				
				94.96				95			
		sandy **SILTY CLAY**, trace sand; grey, mixed with ash and wood, with decaying wood at about elev. 93.5m		2.87	3	3B	SC				
3											
						4A	SC	94			
4				93.51	4						
		DECAYING WOOD; brown		4.32							
		SILTY CLAY, trace sand, trace gravel; grey, **(TILL)**		4.42		4B	SC				
				92.98				93			
5		**ORGANIC SILTY CLAY**; dark brown		4.88							
		END OF BOREHOLE									
6								92			
7											
8											
9											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: KL
CHECKED:

LDN_ENV_11 1520407-2000.GPJ GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH

PROJECT: 1520407 (2000)

RECORD OF BOREHOLE BH-203

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

DATUM: LOCAL

(Golder Report No. 1520407-2000-R01)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: RUN No.	NUMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ND = Not Detected (50, 100, 150, 200) ⊕	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected (20, 40, 60, 80) □	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 7822DT DT SAMPLING SYSTEM	GROUND SURFACE		98.08				98				
		TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown		0.00								
		FILL - SILTY CLAY, trace sand, trace gravel; brown, mixed with ash, glass, cinders, wood and concrete debris		0.13	1	1A	SC					
1								97				
						2A	SC					
				96.23	2							
2		**FILL** - DEBRIS; brown, black and grey, ash, cinders, wood, brick, glass, copper, porcelain, some silty clay		1.85		2B	SC	96				
					3	3	SC					
3								95				
						4A	SC					
				94.07								
4		**SILTY CLAY**, trace sand, trace gravel; grey, with shells and silt layers, **(TILL)**		4.01	4			94				
						4B	SC					
				93.20								
5		END OF BOREHOLE		4.88				93				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: KL
CHECKED:

LDN_ENV_11 1520407-2000.GPJ GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH

PROJECT: 1520407 (2000)

RECORD OF BOREHOLE BH-204

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

DATUM: LOCAL

(Golder Report No. 1520407-2000-R01)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: RUN No.	NUMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ND = Not Detected (50, 100, 150, 200) ⊕	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected (20, 40, 60, 80) □	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	GEOPROBE 7822DT DT SAMPLING SYSTEM	GROUND SURFACE		97.85				98				
		TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown		0.00 / 0.13								
		FILL - SILTY CLAY; brown, mixed with cinders, gravel and organics		97.30		1A	SC					
		FILL - SAND and GRAVEL, some silt and clay, medium to coarse; brown		0.55 / 96.99	1	1B	SC	97				
1		**FILL** - SILTY CLAY; brown-black, mixed with sand, ash, brick and porcelain		0.86								
						2A	SC					
				96.10								
		sandy **SILTY CLAY**; grey, mixed with wood; w>PL		1.75	2			96				
2						2B	SC					
				95.26								
		SILTY CLAY, trace sand, trace gravel; dark grey, with grey silty sand layers, with layer of organics at about elev. 93.7m		2.59	3			95				
3						3	SC					
								94				
4				93.63		4A	SC					
		ORGANIC SILTY CLAY; dark brown		4.22 / 93.43	4							
		SILTY CLAY, trace sand, trace gravel; grey, **(TILL)**		4.42		4B	SC					
				92.97				93				
5		END OF BOREHOLE		4.88								
								92				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: KL
CHECKED:

LDN_ENV_11 1520407-2000.GPJ GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH

PROJECT: 1520407 (2000)

RECORD OF BOREHOLE BH-205

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

DATUM: LOCAL

(Golder Report No. 1520407-2000-R01)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: RUN No.	NUMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] (ND = Not Detected) ⊕	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] (ND = Not Detected) □	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS: MW-205
0	GEOPROBE 7822DT DT SAMPLING SYSTEM	GROUND SURFACE		97.81				98				Top of Pipe Elev. 97.67m; Flushmount Protective Casing
		TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown		0.00 / 0.10								Concrete
		FILL - SILTY CLAY; brown-grey, mixed with gravel, sand and ash			1	1	SC					
1								97				Granular Bentonite
					2	2	SC					Sand
2				95.09				96				
		FILL - SILTY CLAY; brown, mixed with blue-grey silty clay, glass, brick and ash		2.72 / 94.76								
3		**FILL** - SILTY CLAY, trace sand, trace gravel; grey, mixed with ash, gravel brick, glass and concrete debris		3.05	3	3A	SC	95				50mm Dia. Slot 10 Sch. 40 PVC Screen
								94				
4					4	4A	SC					
				93.34		4B	SC					
		SILTY CLAY, trace sand, trace gravel; dark grey, with layers of organics at about elev. 97.1m		4.47 / 93.09 / 4.72				93				
5		**SILTY CLAY**, trace sand, trace gravel; grey		4.88								
		END OF BOREHOLE						92				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: KL
CHECKED:

LDN_ENV_11 1520407-2000.GPJ GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH

PROJECT: 1520407 (2000)

RECORD OF BOREHOLE BH-206

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

DATUM: LOCAL

(Golder Report No. 1520407-2000-R01)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: RUN No.	NUMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕ (ND = Not Detected; 50, 100, 150, 200) / HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □ (ND = Not Detected; 20, 40, 60, 80)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
											MW-206
0	GEOPROBE 7822DT DT SAMPLING SYSTEM	GROUND SURFACE		97.98				98			Top of Pipe Elev. 97.87m; Flushmount Protective Casing
		TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown		0.00							Concrete
		FILL - SILTY CLAY, some sand and gravel; brown-grey, with ash and brick		0.15	1	1	SC				
1		**FILL** - SAND, medium to coarse, with gravel; brown, with pockets of silty clay		97.09 0.89				97			Granular Bentonite
					2	2A	SC				Sand
2		**FILL** - SILTY CLAY; grey to grey-brown, mixed with grey-blue silty clay, sand, gravel, wood, ash, brick, cinders, concrete, glass, porcelain and copper		96.00 1.98		2B	SC	96			
				95.54							
		FILL - SAND, medium to coarse, with gravel, with pockets of silty clay		2.44	3	3A	SC	95			50mm Dia. Slot 10 Sch. 40 PVC Screen
4				93.86				94			
		SILTY CLAY, trace sand, trace gravel; dark grey, with organics		4.12	4	4A	SC				
				93.38							
		SILTY CLAY, trace sand, trace gravel; grey		4.60		4B	SC				
				93.10							
5		END OF BOREHOLE		4.88				93			
6											
7											
8											
9											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: KL
CHECKED:

LDN_ENV_11 1520407-2000.GPJ GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH

PROJECT: 1520407 (2000)

RECORD OF BOREHOLE BH-207

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

DATUM: LOCAL

(Golder Report No. 1520407-2000-R01)

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	RUN No.	NUMBER	TYPE	ELEVATION
0	GEOPROBE 7822DT DT SAMPLING SYSTEM	GROUND SURFACE		97.87				98
		TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown		0.00				
		FILL - SILTY CLAY; brown - grey, mixed with sand and gravel, trace glass		0.10 / 97.03	1	1A	SC	
1		**FILL** - SAND, medium to coarse, with gravel; brown, with pockets of silty clay		0.84 / 96.24		1B	SC	97
		FILL - SILTY CLAY; grey-brown, mottled, mixed with cinders and brick		1.63 / 95.89	2	2A	SC	
2		**FILL** - SILTY SAND; brown, with pockets of silty clay, cinders, ash and glass		1.98 / 94.87		2B	SC	96
3		**SILTY CLAY**, trace sand, trace gravel; dark grey, with rootlets, with organic silty clay at about elev. 93.6m		3.00 / 93.37	3	3A	SC	95
						3B	SC	
4					4	4A	SC	94
		SILTY CLAY, trace sand, trace gravel; grey-blue		4.50 / 92.99		4B	SC	
5		END OF BOREHOLE		4.88				93
6								92
7								
8								
9								

HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ⊕
ND = Not Detected
50 100 150 200

HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] □
ND = Not Detected
20 40 60 80

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

DEPTH SCALE
1 : 50

LOGGED: KL
CHECKED:

Golder Associates

LDN_ENV_11 1520407-2000.GPJ GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH

PROJECT: 1520407 (2000)

RECORD OF BOREHOLE BH-208

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

DATUM: LOCAL

(Golder Report No. 1520407-2000-R01)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: RUN No.	NUMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] (ND = Not Detected; 50, 100, 150, 200)	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] (ND = Not Detected)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
												MW-208
0	GEOPROBE 7822DT DT SAMPLING SYSTEM	GROUND SURFACE		97.76				98				Top of Pipe Elev. 97.87m; Flushmount Protective Casing; Concrete
		TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown		0.00 / 0.10	1	1						
1		**FILL** - SILTY CLAY; mottled brown and grey, mixed with sand and gravel						97				Granular Bentonite
2				95.80	2	2A	SC	96				Sand
		FILL - SAND; medium to coarse, with gravel; brown, with pockets of silty clay		1.96		2B	SC					
3				94.64	3	3A	SC	95				
		sandy **SILTY CLAY**, trace gravel; dark grey; w>PL at top to w~PL at bottom		3.12		3B	SC					50mm Dia. Slot 10 Sch. 40 PVC Screen
4						4A	SC	94				
				93.42	4							
		ORGANIC SILTY CLAY; dark brown		4.40								
		SILTY CLAY, trace sand, trace gravel; grey				4B	SC	93				
				92.88								
5		END OF BOREHOLE		4.88				92				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: KL
CHECKED:

LDN_ENV_11 1520407-2000.GPJ GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH

PROJECT: 1527635 (1000)

RECORD OF BOREHOLE BH-103

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: April 27, 2015

DATUM: GEODETIC

DRILLING CONTRACTOR: London Soil Test Ltd.

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
				180.06								
0	POWER AUGER 152mm OD SOLID STEM	GROUND SURFACE						181				
		TOPSOIL - sandy SILTY CLAY; black		0.00 / 179.76	1	AS		180				
				0.30	2	SS	5					
1		sandy **SILTY CLAY**, trace gravel; mottled brown and grey, trace organic pockets and roots, **(TILL)**; firm			3	SS	6	179				Granular Bentonite
				178.38								
				1.68	4	SS	14					
2								178				
		sandy **SILTY CLAY**, trace gravel; brown, oxidized fissures, silt partings, **(TILL)**; stiff to hard			5	SS	30					
3								177				
					6	SS	27					
				176.40								
				3.66								
4					7	SS	13	176				
					8	SS	9					
5								175	>96 + >96 +			Cuttings/ Bentonite
6		sandy **SILTY CLAY**, trace gravel; grey, some sand seams/pockets with depth, **(TILL)**; very stiff to firm			9	SS	8	174				
7								173	⊕ + >96 +			
					10	SS	7					
8								172	⊕ + ⊕ +			
9		--- CONTINUED NEXT PAGE ---										

(Golder Report No. 1527635-1000-R01)

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_07 1527635.GPJ GLDR_LON.GDT 25/05/15 DATA INPUT: DMB

PROJECT: 1527635 (1000)

RECORD OF BOREHOLE BH-103

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: April 27, 2015

DRILLING CONTRACTOR: London Soil Test Ltd.

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							*(Golder Report No. 1527635-1000-R01)*			
9	POWER AUGER 152mm OD SOLID STEM	sandy **SILTY CLAY**, trace gravel; grey, some sand seams/pockets with depth, **(TILL)**; very stiff to firm			11	SS	6	171				Cuttings/ Bentonite
10								170				May 12/15
11					12	SS	9	169				Granular Bentonite
12								168				
13					13	SS	6	167				
14					14	SS	5	166			MH	Screen
15					15	SS	7	165				Sand
		END OF BOREHOLE		164.36 / 15.70				164				Borehole dry during and upon completion of drilling on April 27, 2015. Water level in standpipe measured at elev. 170.06m on May 12, 2015.
16												
17												
18												
19												

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED:

LDN_BHS_07 1527635.GPJ GLDR_LON.GDT 25/05/15 DATA INPUT: DMB

PROJECT: 1546452

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: January 12, 2016
DRILLING CONTRACTOR: Henderson Drilling Inc.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		185.12				186				
0	POWER AUGER 83mm ID HOLLOW STEM	**ASPHALT**		0.00								
		FILL, gravelly sand, crushed; brown		0.11 184.79				185				
		FILL, sand, trace gravel; brown; compact		0.33 184.36	1	SS	13					
1		**TOPSOIL**, silty; black; firm		0.76 183.75	2	SS	4	184				Borehole dry during drilling on January 12, 2016.
		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, **TILL**; firm		1.37 182.99	3	SS	4					
2								183	>96 +			
				2.13	4	SS	19					
3		(CL) sandy **SILTY CLAY**, trace gravel; brown, silt partings, **TILL**; very stiff			5	SS	28	182				
4					6	SS	24	181				
				180.85								
		END OF BOREHOLE		4.27				180				
5												
6												
7												
8												
9												

(Golder Report No. 1546452-R01)

DEPTH SCALE
1 : 50

LOGGED: SM
CHECKED:

Golder Associates

LDN_BHS_07 1546452.GPJ GLDR_LON.GDT 05/02/16 DATA INPUT: LMK

PROJECT: 1546452

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: January 12, 2016
DRILLING CONTRACTOR: Henderson Drilling Inc.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
									(Golder Report No. 1546452-R01)			
0	POWER AUGER 83mm ID HOLLOW STEM	GROUND SURFACE		184.99				185				
		TOPSOIL, silty; brown		0.00								
		ASPHALT		0.15								
		FILL, gravelly sand, crushed; brown		0.23								
		FILL, sandy clayey silt; brown, gravel pockets, sand layers; stiff		0.33	1	SS	14					
				184.23								
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, **TILL**; stiff to firm		0.76	2	SS	9	184				Borehole dry during drilling on January 12, 2016.
					3	SS	7				MH	
2				182.86				183				
				2.13	4	SS	18					
3		(CL) sandy **SILTY CLAY**, trace gravel; brown, silt partings, **TILL**; very stiff to hard			5	SS	31	182				
4					6	SS	22	181				
				180.72								
		END OF BOREHOLE		4.27								
5								180				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: SM
CHECKED:

LDN_BHS_07 1546452.GPJ GLDR_LON.GDT 05/02/16 DATA INPUT: LMK

PROJECT: 1546452

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: January 12, 2016
DRILLING CONTRACTOR: Henderson Drilling Inc.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 83mm ID HOLLOW STEM	GROUND SURFACE		184.96				185				
		TOPSOIL, silty; brown		0.00								
		FILL, gravelly silty clay, some sand; brown; stiff		0.13 / 184.45	1	SS	11					
		TOPSOIL, silty; black; stiff		0.51 / 184.20								
1		(CL) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, **TILL**; stiff		0.76	2	SS	8	184				Borehole dry during drilling on January 12, 2016.
					3	SS	8					
2				182.83				183				
				2.13	4	SS	22					
3		(CL) sandy **SILTY CLAY**, trace gravel; brown, **TILL**; very stiff			5	SS	24	182				
4					6	SS	24	181				
				180.69								
		END OF BOREHOLE		4.27				180				
5												
6												
7												
8												
9												

(Golder Report No. 1546452-R01)

DEPTH SCALE
1 : 50

LOGGED: SM
CHECKED:

Golder Associates

LDN_BHS_07 1546452.GPJ GLDR_LON.GDT 05/02/16 DATA INPUT: LMK

PROJECT: 1660023

RECORD OF BOREHOLE BH-101

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 27, 2016
DRILLING CONTRACTOR: Henderson Drilling Inc.

DATUM: LOCAL

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION
0	POWER AUGER 171mm OD HOLLOW STEM	PAVEMENT SURFACE		99.58				100
		ASPHALT		0.00 0.10				
		FILL - sand and gravel; grey			1	AS		99
				98.82 0.76				
1		(SP) - gravelly **SAND**, coarse; brown; loose			2	SS	5	
					3	SS	9	98
				97.60 1.98				
2		(MI) - **CLAYEY SILT**, some sand, trace gravel; brown, **TILL**; firm			4	SS	7	97
				96.84 2.74				
3					5	SS	2	
								96
4					6	SS	1	
								95
					7	SS	WH	
5								
								94
6		(CH) - **SILTY CLAY**, some sand, trace gravel; grey, **TILL**; very soft to soft			8	SS	WH	
								93
7								
								92
8					9	SS	2	
								91
9		*--- CONTINUED NEXT PAGE ---*						

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa — nat V. + Q - ● — rem V. ⊕ U - ○: 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT — Wp W WI: 10 20 30 40

(Golder Report No. 1660023-R01)

ADDITIONAL LAB. TESTING

INSTALLATION AND GROUNDWATER OBSERVATIONS

Borehole dry during drilling on October 27, 2016

DEPTH SCALE
1 : 50

LOGGED: AP
CHECKED:

Golder Associates

LDN_BHS_07 1660023.GPJ GLDR_LON.GDT 13/12/16 DATA INPUT: ZJB

PROJECT: 1660023

RECORD OF BOREHOLE BH-101

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 27, 2016
DRILLING CONTRACTOR: Henderson Drilling Inc.

DATUM: LOCAL

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- *CONTINUED FROM PREVIOUS PAGE* ---							***(Golder Report No. 1660023-R01)***			
9	POWER AUGER 171mm OD HOLLOW STEM	(CH) - **SILTY CLAY**, some sand, trace gravel; grey, **TILL**; very soft to soft			10	SS	3	90				
10												
								89				
11					11	SS	4					
				88.45								
		END OF BOREHOLE		11.13				88				
12												
13												
14												
15												
16												
17												
18												
19												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: AP
CHECKED:

LDN_BHS_07 1660023.GPJ GLDR_LON.GDT 13/12/16 DATA INPUT: ZJB

PROJECT: 1668632

RECORD OF BOREHOLE BH-101

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 11, 2017

DATUM: GEODETIC

DRILLING CONTRACTOR: Direct Environmental Drilling Inc.

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		(Golder Report No. 1668632-R01)										
0	POWER AUGER 108mm ID HOLLOW STEM	GROUND SURFACE		189.60				190				
		FILL, gravel		0.05	1	AS						
1					2	SS	13	189				
								188				
2		**FILL**, gravelly sand, some silt; brown; compact			3	SS	11					
					4	SS	12	187				
3					5	SS	16					
				185.87				186				
		TOPSOIL, sandy clayey silt; black		3.73								
4				185.56	6	SS	7					
		(CI) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, **TILL**; firm to very stiff		4.04				185				
5					7	SS	7					
				183.96				184	>96 +			
				5.64					>96 +			
6					8	SS	30					
		(CL) sandy **SILTY CLAY**, trace gravel; brown, some oxidized fissures, some silt partings and pockets, **TILL**; hard to very stiff						183				
7												
								182				
				181.68	9	SS	24					
8				7.92								
		(CL-CI) sandy **SILTY CLAY**, trace gravel; grey, some silt pockets, **TILL**; very stiff to stiff						181				
9												
		--- CONTINUED NEXT PAGE ---										Borehole dry during drilling on July 11, 2017.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED: P.H.

LDN_BHS_07 1668632.GPJ GLDR_LON.GDT 28/07/17 DATA INPUT: ZJB

PROJECT: 1668632

RECORD OF BOREHOLE BH-101

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 11, 2017
DRILLING CONTRACTOR: Direct Environmental Drilling Inc.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							***(Golder Report No. 1668632-R01)***			
9	POWER AUGER 108mm ID HOLLOW STEM	(CL-CI) sandy **SILTY CLAY**, trace gravel; grey, some silt pockets, **TILL**; very stiff to stiff			10	SS	12	180				
10									⊕ 111			
									>144			
								179				
11					11	SS	9					
				178.32								
		END OF BOREHOLE		11.28				178				
12												
13												
14												
15												
16												
17												
18												
19												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: SM
CHECKED: P.H.

LDN_BHS_07 1668632.GPJ GLDR_LON.GDT 28/07/17 DATA INPUT: ZJB

PROJECT: 1668632

RECORD OF BOREHOLE BH-102

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 11, 2017

DATUM: GEODETIC

DRILLING CONTRACTOR: Direct Environmental Drilling Inc.

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 108mm ID HOLLOW STEM	GROUND SURFACE		189.56				190				
		FILL, gravel		0.05	1	AS						
1					2	SS	10	189				
		FILL, gravelly sand, some silt; brown; comapct to very loose			3	SS	13	188				
2					4	SS	15	187				
3				186.28	5	SS	2					
		FILL, gravelly sand, some silt, some coal, some wood; black; very loose to compact		3.28	6	SS	3	186				
4												
					7	SS	20	185			MH	
5				184.38								
		(ML-CL) sandy **SILTY CLAY**, trace gravel; brown, some silt pockets and partings; stiff to very stiff		5.18	8	SS	11	184				
6												
					9	SS	25	183				
7												
				181.71	10	SS	24	182				
8		(CL-CI) sandy **SILTY CLAY**, trace gravel; grey, some silt layers and pockets; very stiff to stiff		7.85								
								181				
9		*--- CONTINUED NEXT PAGE ---*										

(Golder Report No. 1668632-R01)

Borehole dry during drilling on July 11, 2017.

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: SM

CHECKED: P.H.

LDN_BHS_07 1668632.GPJ GLDR_LON.GDT 28/07/17 DATA INPUT: ZJB

PROJECT: 1668632

RECORD OF BOREHOLE BH-102

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 11, 2017
DRILLING CONTRACTOR: Direct Environmental Drilling Inc.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---							***(Golder Report No. 1668632-R01)***			
9	POWER AUGER 108mm ID HOLLOW STEM	(CL-CI) sandy **SILTY CLAY**, trace gravel; grey, some silt layers and pockets; very stiff to stiff			11	SS	13	180		W		
10								179				
11				178.43	12	SS	12			W		
		END OF BOREHOLE		11.13				178				
12												
13												
14												
15												
16												
17												
18												
19												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: SM
CHECKED: P.H.

LDN_BHS_07 1668632.GPJ GLDR_LON.GDT 28/07/17 DATA INPUT: ZJB

APPENDIX B

Ontario Ministry of Environment, Conservation and Parks Well Records

22

UTM 17 Z 313161214 10 E
19 R 4617181611 5 N
Elev. 19 R 0161110
Basin 213

ONTARIO

The Well Drillers Act
Department of Mines, Province of Ontario

21 No 2706

RECEIVED
JAN 25 1951
GEOLOGICAL BRANCH
DEPARTMENT OF MINES

Water Well Record

County or Territorial District ESSEX Township, ~~Village, Town or City.~~ Sandwich South WINDSOR

[redacted] own or City) Roseland

Date Completed (day) (month) (year) Cost of Well (excluding pump) 1 2 2 . 3

Pipe and Casing Record

Casing diameter(s) 2½ . 2
Length(s) of casing(s) 139
Type of screen —
Length of screen —
Distance from top of screen to ground level
Is well a gravel-wall type? Rock

Pumping Test

Date June 21 1950
Static level 30
Pumping level 35
Pumping rate 270 p.H
Duration of test
Distance from cylinder or bowls to ground level Ground

Water Record

Kind (fresh or mineral) fresh
Quality (hard, soft, contains iron, sulphur, etc.) Soft
Appearance (clear, cloudy, coloured) Clear
For what purpose(s) is the water to be used? Stock
How far is well from possible source of contamination? Drain
What is the source of contamination?
Enclose a copy of any mineral analysis that has been made of water

Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
142	fresh	112

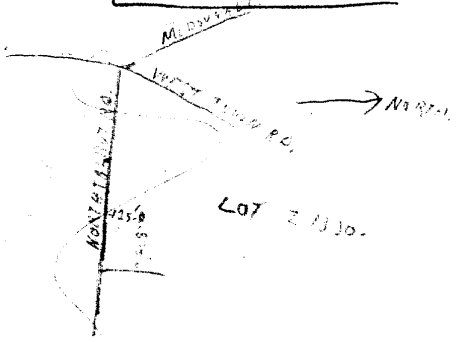
Well Log

Overburden and Bedrock Record	From 0 ft.	To ....ft.
Brown Clay	1	20
Blue Clay	20	55
Blue Sand Clay	55	75
Blue Clay	75	105
Sand	105	110
Blue Clay	110	136
Fine Sand	136	139
Rock	139	142

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.

1320' W.E.R.d
125' N.S.L.L.



Situation: Is well on upland, in valley, or on hillside? upland
Drilling Firm
Address
Name of Driller W. Ashley Johnson Address R.R. 2 Maidstone
Date Jan. 22/51 Licence Number 127

W. Johnson
Signature of Licensee

FORM 5

CSS.58

UTM 17 | 3131616 1415 E
19 | 4617818 141010 N
Elev. 19 | 0161210
Basin 23 | Talbot Rd. North
Lot 306

21 No. 2897

The Water-well Drillers Act, 1954
Department of Mines

405 2E

Water-Well Record

County or Territorial District. Essex Township, ~~Village, Town or City~~ Windsor Sandwich South
[redacted] Village, Town or City)
Address
(day) (month) (year)

Pipe and Casing Record		Pumping Test	
Casing diameter(s)	3"	Static level	34 ft.
Length(s)	126'	Pumping rate	40 G.P.M.
Type of screen		Pumping level	44'
Length of screen		Duration of test	

Well Log / **Water Record**

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
brown clay	0	28			
blue clay	28	122			
sand	122	126			
limestone rock	126	~~134~~ 133	133 ~~134~~	~~99~~	sulphur

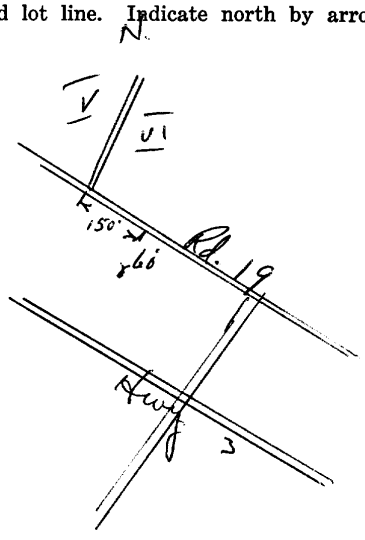
For what purpose(s) is the water to be used?
Small farm & House
Is water clear or cloudy? Clear
Is well on upland, in valley, or on hillside?
upland
Drilling firm
Address Tobias F. Heil
Tobias F. Russell St
Name of Driller
Address 61 Russell
Essex
Licence Number 1028

I certify that the foregoing statements of fact are true.

Date Tobias Heil
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

UTM 17 Z 13 16 12 75 E
19 R 41 61 78 14 91 0 N
Elev. 19 R 01 61 15
Basin Tributary 13 Rd West
Lot 307

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

RECEIVED
JUL 11 1955
GEOLOGICAL BRANCH
DEPARTMENT OF MINES

21 No. 2899

Water-Well Record

County or Territorial District Essex Township, Village, ~~Town or City~~ Windsor Sandwich South

[redacted] Village, Town or City

Address Oldcastle

(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 5"
Length(s) 135 ft
Type of screen
Length of screen

Pumping Test

Static level 35 ft.
Pumping rate 6 gal per min.
Pumping level 40
Duration of test 3 hours

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
yellow clay	0	8			
sand	8	14			
blue clay	14	135			
white ~~Granite~~ rock limestone	135	139	139	104	fresh

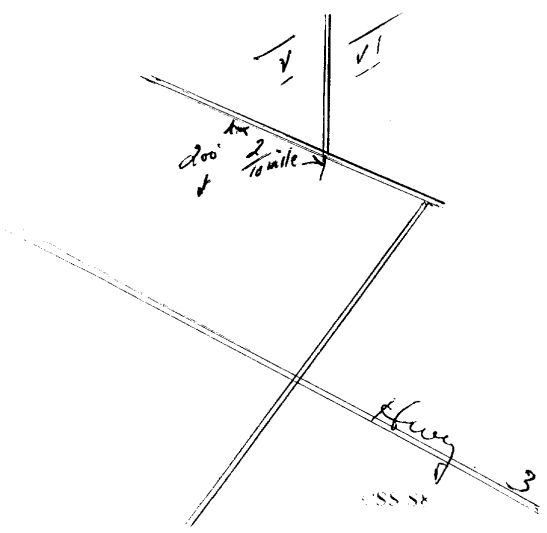
For what purpose(s) is the water to be used?
Home
Is water clear or cloudy? clear
Is well on upland, in valley, or on hillside?
upland
Drilling firm
Address
Name of Driller S. J. Lovegrove
Address 906 E. Westminster
Windsor
Licence Number 141

I certify that the foregoing statements of fact are true.

Date Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

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