SCS consulting group ltd

Saleville Property
Township of Uxbridge

Functional Servicing Report

May 2016

Submitted by:

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DEVELOPMENT SERVICES

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SUBMISSION HISTORY

Submission	Date	In Support Of	Distributed To
1st	May, 2016	Official Plan Amendment and Zoning By-law Amendment	Township of Uxbridge, Regional Municipality of Durham

1.0 INTRODUCTION

SCS Consulting Group Ltd. has been retained by Saleville Developments (IV) Ltd. to prepare a Functional Servicing Report for a proposed development located in the Township of Uxbridge.

The Functional Servicing Report (FSR) has been prepared in support of the Official Plan Amendment and Zoning By-Amendment for the proposed development. The Conceptual Development Plan is provided in **Appendix A**. The proposed development will consist of the following:

- 39 condominium townhouse units (distributed amongst 5 townhouse blocks; and
- Common element right-of-way (R.O.W.) area with 6.0 m wide private access roadway.

1.1 Purpose of the Functional Servicing Report

The purpose of this report is to demonstrate that the development can be graded and serviced in accordance with the Township of Uxbridge, Regional Muncipality of Durham, Lake Simcoe Region Conservation Authority and the Ministry of Environment and Climate Control (MOECC) development criteria.

1.2 Study Area

The subject lands are comprised of agricultural land and open space areas located within the Uxbridge Brook Tributary in the Township of Uxbridge. The study area is bound by Elgin Park Drive to the north, existing Wooden Sticks Golf Club to the south and east, and the Uxbridge Brook Tributary to the west (see **Figure 1.1**).

The proposed development is approximately 2.14 ha in size and consists of the following various land uses:

- low density residential (0.84 ha);
- open space and buffers (1.04); and
- proposed private roads (0.26 ha).

1.3 Background Servicing Information

In preparation of the site servicing and stormwater management strategies, the following design guidelines and standards were used:

- Design Criteria and Standard Detail Drawings for Subdivision Developments and Site Plans, Township of Uxbridge, 2013;
- Design Specifications for Regional Services, Regional Municipality of Durham, June 2014;
- Stormwater Management Criteria Lake Simcoe Region Conservation Authority, April 2012 Version 10; and

- Ministry of Environment (MOE) Stormwater Management Planning and Design Manual, March 2003.

The site servicing and SWM strategies are based on the following approved Engineering Drawing:

- Post-Construction Record Drawing P-203, Sanitary Easement, Estates at Wooden Sticks Phase II, Sernas Associates, September 2004.

The as-built engineering drawing for this existing sanitary sewer at Elgin Park Drive is included in **Appendix B**. Based on these documents, the following servicing approach and criteria has been established. Further details are provided within the report:

Storm Sewer

- Site to release stormwater at a rate that does not exceed the pre-development 2 through 100 year peak flow rates.

Sanitary Servicing

- Connect to existing sanitary infrastructure on the north side of Elgin Park Drive.

Water Supply and Distribution

- Water supply and distribution will be provided through the existing watermain on Elgin Park Drive.

Grading

- Match existing grades along all boundaries. Minimize use of retaining walls. Meet all municipal grading guidelines. Maintain a positive overland flow drainage route throughout the site to convey both internal and external flows to the site low point.

2.0 STORMWATER MANAGEMENT

2.1 Stormwater Runoff Control Criteria

The following stormwater runoff control criteria have been established based on the design guidelines and standards listed in **Section 1.3**. The stormwater runoff criteria are summarized below in **Table 2.1**:

Table 2.1 – Stormwater Runoff Control Criteria

Criteria	Control Measure
Quantity Control	Maximum control to pre-development peak flows for the 2 through 100 year storm events.
Quality Control	MOE Enhanced Level Protection (80% TSS Removal).
Erosion Control	Since the development area is less than 2 hectares erosion control is not required.
Water Budget	Where feasible, measures to minimize development impacts on the water balance to be incorporated into the development design (i.e. infiltration measures).

2.1.1 Allowable Release Rate

The allowable release rate for the site is the pre-development peak flows for the 2 through 100 year storm events.

The allowable release rate (for Modified Rational Method Calculations) is based on the following:

- Total area = 5.14 ha (2.14 ha plus 3.00 ha in external drainage)
- Runoff Coefficient = 0.25
- Time of Concentration = 23.4 minutes

The allowable release rates for the 5 year and 100 year design storm are therefore, 231.0 l/s and 427.1 l/s, respectively. Calculations are included in **Appendix C.**

At the Site Plan Application Stage, hydrology modelling (i.e. Visual Otthymo) will be used to confirm the target release rates for 2 through 100 year storm events.

2.2 Existing Drainage

As shown in **Figure 2.1**, the existing drainage boundaries were determined using topographic mapping of the existing development. Runoff from the existing site is generally contained within the subject development and flows overland to the west, where is it directed to the Uxbridge Brook Tributary. A portion of the site drains to the Uxbridge Brook Tributary via the Elgin Park Drive ditches.

Runoff from Catchment EXT1, adjacent development to the east (approximately 3.00 ha, **Figure 2.1**) drains overland through the subject site. Runoff from Catchment EXT2, adjacent development to the east (1.42 ha, **Figure 2.1**) drains overland through the subject site and into the Elgin Park Drive ditch.

Based on detailed topographic survey completed by J.D. Barnes in December 2015, there is no defined low point at the existing 650 mm diameter CSP culvert under Elgin Park Drive. At the Site Plan Application stage, the capacity of the existing culvert and ditches will be confirmed and if necessary, the Elgin Park Drive ditches may require regrading to convey drainage from the proposed development to the Uxbridge Brook Tributary.

2.3 Stormwater Best Management Practices Selection

In accordance with the Ministry of Environment Stormwater Management Planning and Design Manual (2003), and LSRCA Technical Guidelines for Stormwater Management (2013), a review of stormwater management best practices was completed using a treatment train approach, which evaluated lot level, conveyance system and end-of-pipe alternatives.

The following site characteristics were taken into consideration:

- The topography varies across the site, generally draining west towards Uxbridge Brook Tributary;
- The proposed development is approximately 2.14 ha and will consist of 0.84 ha condominium townhouses, 0.26 ha private roadway and 1.04 ha of private greenspace and park area;
- Based on the Hydrogeological Assessment prepared by Dillon Consulting (February 2016), the soils consist predominantly of sand and gravel and the estimated static water level depth ranges from 5 m to 9 m.
- Based on the inferred site soils, it is anticipated that infiltration on the site will be above 15 mm/hr and below 50 mm/hr, to be confirmed at the Site Plan Application stage, with site specific data.

2.3.1 Lot Level Controls

Lot-level controls are at-source measures that reduce runoff prior to stormwater entering the conveyance system. These controls are proposed on private properties. Incorporating controls that do not require maintenance can be an effective method in the treatment train approach to SWM; however, enforcement of controls that require ongoing maintenance can be more challenging for the municipality or the condominium corporation. The following lot level controls have been considered:

Reduced Lot Grading – Reducing lot grades from a maximum of 5% to a minimum of 2% is suggested wherever possible to maximize infiltration and evapotranspiration of stormwater runoff at the lot level. Since the development consists of low density residential development, the at-grade landscaped areas are relatively small; however, there may be opportunities for reduced lot grading at certain lots.

The increased lot level infiltration and evapotranspiration will provide quality and water balance control via retention of the volume of water infiltrated.

Increased Topsoil Depth – An increase in the restored topsoil depth on lots can be used to promote lot level infiltration and evapotranspiration. This practice would work well in conjunction with reduced lot grading. Similar to reduced lot grading, increased topsoil depth will contribute to lot level quality and water balance control. A minimum depth of 0.3 m is proposed in all landscaped areas.

Passive Landscaping/Bio-Retention/Rain Gardens – Planting of gardens and other vegetation designed to minimize local runoff or use rainwater as a watering source can be used to reduce rainwater runoff by increasing evaporation, transpiration, and infiltration. By promoting infiltration through passive landscaping, water quality and quantity control is provided for the volume of water retained. Passive landscaping can provide significant SWM benefits as part of the overall treatment train approach for the subject development.

Rain gardens are proposed within the landscaping of open space areas with a 2.0 m deep infiltration base. Given the anticipated high rate of infiltration, no subdrain is proposed. Rain gardens will be designed with overflows to the storm sewer system, via DICBs. To the extent feasible, drainage from the east lots and east half of the proposed ROW will be directed to the rain gardens via curb cuts or a modified catchbasin design. Design details will be provided at the Site Plan Application stage.

Roof Runoff to Soak-away Pits/Infiltration Trenches – Directing roof runoff to subsurface soak-away pits or infiltration trenches can be used to promote infiltration. By promoting infiltration water quality and quantity control is provided for the volume of water retained. Infiltration of roof runoff can provides a significant SWM benefits as part of the overall treatment train approach for the subject development. Infiltration techniques require loam or better soils with infiltration rates greater than approximately 15 mm/hr for optimal operation and are recommended for drainage areas less than 0.5 ha.

Roof runoff from rear yards of lots backing onto the Uxbridge Brook Tributary feature will be directed to infiltration trenches. Design details will be provided at the Site Plan Application Stage.

Roof Runoff to Retention Cisterns – Directing roof runoff to rainwater retention cisterns (i.e., rain barrels or greywater re-use) can contribute to water quality and water balance control. The retained rainwater can be harvested for re-use such as irrigation and/or greywater use.

Rain barrels could be recommended to home owners within the development. As a conservative estimate, they were not accounted for in the SWM solution at this stage.

Green Roofs – Best suited for flat roofs, greenroofs provide rainwater retention in the growing medium where it is evaporated, evapo-transpired, or slowly drains away after the rainfall event. The subject development will have peaked roofs and are therefore not suitable.

Rooftop and/or Parking Lot Detention Storage – Often employed with large rooftop or parking lot footprints, flow attenuation for quantity or extended detention control can be provided via a flow restriction with stormwater storage provided via ponding either on rooftops or parking lots. The subject development does not have any flat rooftops or large, flat parking lots, therefore this is not suitable.

Roof overflow to Grassed Areas – Directing roof leaders to grassed areas will contribute to water quality and water balance control by encouraging stormwater retention. Roof leaders will be directed to grassed areas throughout the subject development.

Pervious Pavement – By encouraging infiltration and filtration, pervious pavement can contribute to water quality, balance and erosion control. Pervious pavement is not proposed for the proposed development.

Vegetated Filter Strip – At source filtration and infiltration may be encouraged through the use of vegetated filter strips by directing sheet flow from impermeable areas to the strip prior to being collected via the storm system. Vegetated filter strips are best suited to parking lot areas with landscaped borders or islands. There are none of these areas on the subject development, therefore vegetated filter strips are not suitable.

A summary of the suitability of potential lot level controls for the subject developments is provided in **Table 2.2**.

2.3.2 Conveyance Controls

Conveyance controls provide treatment of stormwater during the transport of runoff from individual lots to the receiving watercourse or end-of-pipe facility and present opportunities to distribute stormwater management techniques throughout a development. The following conveyance controls have been considered:

Grassed Swales – A grassed swale can promote infiltration, filtration, and evapotranspiration, contributing to water quality and quantity control. Grassed swales need an unimpeded and relatively wide stretch of landscaped area, such as within a wide boulevard with no driveways, to function properly.

Swales are proposed to convey rear yard and external drainage to the proposed rain gardens.

Perforated Pipe Infiltration Rear Lot Catchbasin/ Conveyance System – Where rear lot catchbasins are required due to grading constraints, a perforated pipe system could be incorporated into the rear lot catchbasin design to promote infiltration of 'clean' stormwater runoff. By promoting infiltration, water quality and quantity control is provided for the volume of water retained. Infiltration can provide significant SWM benefits as part of the overall treatment train approach for the subject development. Infiltration techniques require loam or better soils with infiltration rates greater than approximately 15 mm/hr for optimal operation.

Perforated pipe infiltration rear lot catchbasin/ conveyance system is not proposed for the subject development.

Pervious Street Catchbasin System – Generally not accepted in the industry due to conflicts with municipal utilities and the possibility for groundwater contamination from street runoff (salts, hydrocarbons, etc.) these systems are not recommended.
A summary of the suitability of potential conveyance controls for the subject developments is provided in **Table 2.2**.

2.3.3 End-of-Pipe Controls

Stormwater management facilities at the end of pipe receive stormwater flows from a conveyance system and provide treatment of stormwater prior to discharging flows to the receiving watercourse. While lot level and conveyance system controls are valuable components of the overall SWM plan, on their own they are not sufficient to meet the quantity and quality control objectives for the subject development. The following end of pipe controls have been considered:

Stormwater Detention Facility – To meet quantity and/or erosion control targets, flow restrictors can be used to control stormwater release rates. To accommodate the reduced release rate, stormwater detention facilities are required to store stormwater runoff. End-of-pipe detention facilities storage can include oversized storm sewers or chambers and can be controlled with flow restrictors prior to discharging to the receiving infrastructure. An end-of-pipe oversized storm sewer is proposed to provide quantity control for the development.

Wet Ponds, Wetlands, Dry Ponds – Sized in accordance with the MOE criteria, these end-of-pipe facilities can provide water quality, quantity, and erosion control treatment. A dry pond with a 2.0 m deep infiltration bottom is proposed at the north end of the site.

Oil/Grit Separator – A properly sized oil-grit separator (OGS) can provide MOE Enhanced Level of treatment and contribute to the treatment train approach for water quality control. An OGS unit is not required for the proposed development. Water quality control will be provided through the above mentioned LID measures.

2.3.4 Selection of Low Impact Development Practices

Table 2.2 summarizes the suitability of the various stormwater management controls identified for the subject developments.

Table 2.2 - Potential Stormwater Management and LID Practices

STORMWATER MANAGEMENT PRACTICE	FEASIBLE (Yes/No)
Reduced Lot Grading	**Yes** (where possible)
Increased Topsoil Depth	**Yes**
Passive Landscaping/Bio-Retention/Rain Gardens	**Yes**
Roof Leader to Soak-away Pits/Infiltration Trenches	**Yes**
Roof Runoff to Retention Cisterns (Rain barrels)	**Yes** (independent of SWM solution)
Green Roofs	**No**
Rooftop and/or Parking Lot Detention Storage	**No**
Roof overflow to Grassed Areas	**Yes**
Pervious Pavement	**No**

STORMWATER MANAGEMENT PRACTICE	FEASIBLE (Yes/No)
Vegetated Filter Strips	**No**
Grassed Swales	**Yes**
Pervious Pipe Infiltration at Rear Lot Catchbasins	**No**
Pervious Street Catchbasin System	**No**
Stormwater Detention Facility	**Yes** (dry pond)
Oil/Grit Separator	**No**
Wet Pond, Wetland, Dry Pond	**No**

The above noted LID's have the potential to enhance the quality of storm runoff, provide additional at-source infiltration and decrease the overall impact on the downstream municipal infrastructure. At the detailed design stage, the potential LID's proposed in this report will be further refined and analysed.

2.4 Proposed Storm Drainage

The proposed storm drainage plan is shown on **Figure 2.2**. Runoff from Catchment 201 (1.80 ha, **Figure 2.2**) will be collected and conveyed via the minor system, directed to the SWM Facility (dry pond with infiltration). Within Catchment 201, approximately 0.46 ha of lots and ROW will be conveyed to the rain gardens, with overflow to the storm sewer system, ultimately to the dry pond facility. Approximately 0.97 ha of the open space area within this catchment will also drain to the rain gardens with overflow to the storm sewer system and dry pond facility. Runoff from Catchment 202 (0.24 ha **Figure 2.2**) will drain uncontrolled to proposed infiltration trenches and ultimately to the Uxbridge Brook Tributary. Drainage from the external Catchment EXT1 (3.00 ha, **Figure 2.2**) will be collected and conveyed via rain gardens, and ultimately to the SWM Facility (dry pond with infiltration). Based on the proposed grading, drainage from the Catchment 203 (0.10 ha, **Figure 2.2**) and external Catchment EXT2 (1.42 ha, **Figure 2.2**) will continue to be directed to the Elgin Park Drive ditch.

As noted in **Section 2.2**, the capacity of the existing culvert and ditches will be confirmed and if necessary, the Elgin Park Drive ditches may require regrading to convey drainage from the proposed development to the Uxbridge Brook Tributary.

2.5 On-Site Controls

2.5.1 Quantity Control

The proposed end-of-pipe SWM facility will control post-development flows from the site to pre-development flow rates for the 2 to 100 year storm events.

The proposed release rate and required storage volume was calculated using the modified rational method and the IDF rainfall curves from the Township of Uxbridge Design Standards. Calculations are included in **Appendix C**.

To accommodate the controlled release rate to the Uxbridge Brook Tributary, a dry pond with infiltration is proposed at the north end of the subject development as shown on **Figure 2.2**. An orifice plate located on the downstream face of the proposed control manhole and headwall will control the release rate from the subject development to the existing Elgin Park Drive ditch and existing culvert (**Figure 2.2**). A summary of the quantity control provided is listed in **Table 2.3**.

Table 2.3: Summary of 100 Year Release Rates and Storage Requirements

Catchment	Storm Event	Allowable Release Rate (L/s)	Proposed Site Release Rate (L/s)	Total Storage Requirements (m^3)
201	5 Year	231.0	215.2	79
201	100 Year	427.1	426.1	384.6

As shown in **Table 2.3**, the post-development flows for the proposed development are less than or equal to the allowable release rates for the 100 year storm event to the existing ditch. As shown in **Table 2.3**, the total 100 year storage volume provided (400.9 m^3) is greater than the required 100 year storage volume of 384.6 m^3.

As noted in **Section 2.1.1**, hydrology modelling (i.e. Visual Otthymo) will be used at the Site Plan Application stage to confirm the target release rates and required storage volumes.

2.5.2 Quality Control

To obtain an Enhanced level (80% TSS removal) of quality control per MOE criteria, the following practices are being utilized:

- Infiltration trenches;
- Rain garden infiltration system; and
- Dry pond facility with infiltration bottom

As shown on **Figure 2.2**, Catchment 201 and external Catchment EXT1 will be conveyed to the SWM Facility (dry pond with infiltration). Within Catchment 201, approximately 0.46 ha of lots and ROW will be conveyed to the rain gardens, with overflow to the storm sewer system, ultimately to the dry pond facility. Approximately 0.97 ha of the open space area within this catchment and all of Catchment EXT1 will also drain to the rain gardens with overflow to the storm sewer system and dry pond facility. Catchment 202 will be conveyed to infiltration trenches and ultimately to the Uxbridge Brook Tributary. Through the proposed treatment train, a TSS removal efficiency of 80% can be obtained. The proposed dry pond has a required water quality volume of 115 m^3 and has a provided water quality volume of 192.3 m^3. Calculations can be found in **Appendix C.**

2.6 Storm Servicing

The storm sewer system (minor system) will be designed for the 5 year return storm as per the Township of Uxbridge standards.

The major system flow drainage (up to the 100 year storm event) will generally be conveyed overland along the road right-of-ways.

The storm sewer system will typically be designed with grades between 0.5% and 2%. Throughout the site, the storm sewer will be constructed at a minimum depth of 1.2 m to provide frost protection. Should a minimum depth of 1.2 m not be provided, insulation above the storm sewer is required. The first townhouse blocks on the east side of the proposed road will require sump pumps. The first townhouse blocks on the west side of the proposed road will require sumps or FDC discharging directly to the valley. The preliminary layout for the proposed storm sewer within the subject lands is provided on **Figure 2.3**.

The storm drainage system will be designed in accordance with the Township of Uxbridge and MOE guidelines, including the following:

- Pipes to be sized to accommodate runoff from a 5 year storm event
- Minimum Pipe Size: 300 mm diameter
- Maximum Flow Velocity: 4.5 m/s
- Minimum Flow Velocity: 0.75 m/s
- Minimum Pipe Depth: 1.2 m to obvert

The following rainfall intensity will be calculated as follows, where 'i' is the rainfall intensity (mm/hour) and A, B, and C are as per **Table 2.4**:

Table 2.4: Rainfall Intensity Parameters

Return Period Storm	A	B	C
2 Year	648	5	0.786
5 Year	904	5	0.788
10 Year	1065	5	0.788
25 Year	1234	4	0.787
100 Year	1799	5	0.810

2.7 Overland Flow Calculations

Major system flows (greater than the 5 year up to the 100 year storm event) will be conveyed within the road right-of-ways, conveyed within the dry pond and then discharged to the existing Elign Park Drive ditch which ultimately outlets to the Uxbridge Brook Tributary.

As noted in **Section 2.2**, the capacity of the existing ditches will be confirmed and if necessary, regraded to convey drainage from the proposed development to the Uxbridge Brook Tributary.

2.8 Water Budget

As noted previously, rainfall will be captured and retained on-site through infiltration based LIDs. Based on the Conceptual Development Plan, the proposed LID measures can retain and infiltrate runoff from 25 mm of rainfall from the total impervious area. Refer to calculations provided in **Appendix C**. The site water balance will be confirmed at the

Site Plan Application Stage in conjunction with the detailed design of the infiltration facilities.

3.0 SANITARY SERVICING

3.1 Existing Sanitary Sewer System

An existing 200 mm diameter sanitary sewer extends from Button Cres., through a sanitary easement/pedestrian walkway, to an existing manhole (MH 16-161) on the north side of Elgin Park Drive. The existing sanitary sewer is part of the Estates at Wooden Sticks Subdivision. Design drawings for the existing sewer system are included in **Appendix B**.

Sanitary sewers within Uxbridge are under the jurisdiction of the Regional Municipality of Durham.

3.2 Proposed Sanitary Sewer System

Sanitary drainage from the entire site is proposed to connect into the existing sanitary sewer system at existing MH16-161 on the north side of Elgin Park Drive at the Estates at Wooden Sticks subdivision (**Figure 2.3** and **3.1**). The total drainage area contributing sanitary flows to the existing network is 1.16 ha, with a corresponding population of approximately 117 persons based on the current Concept Plan (**Appendix A**). The preliminary layout for the proposed sanitary sewer within the subject lands is provided on **Figure 2.3** and **3.1.**

Under the proposed development scenario of 39 townhouse units, the projected equivalent population for the proposed development is approximately 117 persons (based on a population density of 3.0 persons / townhouse unit as per the guidelines outlined in The Regional Municipality of Durham Design Specifications for Sanitary Sewers – April 2014).

The sanitary peak flow for the proposed development was calculated to be approximately 2.4 L/s (See **Appendix D**).

The sanitary sewer system will be designed in accordance with the Regional Municipality of Durham Design Specifications for Sanitary Sewers (April 2014) and MOE criteria, including but not limited to:

- Residential Sanitary Generation Rate: 364 l/p/d,
- Population Density: 3.0 people/unit (townhouses),
- Peaking Factor: Harmon (Max. 3.8),
- Infiltration Rate: 22.5 m^3 Gross ha/day (0.26 L/s/ha) – when foundation drains are not connected to the sanitary sewer, 22.5 m^3 Gross ha/day (0.52 L/s/ha) – when foundation drains are connected to sanitary sewers,
- Minimum Pipe Size: 200 mm,
- Minimum Pipe Cover: 2.75 m,
- Minimum Flow Velocity: 0.6 m/s, and
- Maximum Velocity: 3.65 m/s.

Further to our discussion with Jeff Almeida of the Regional Municipality of Durham, on February 17, 2016, and the Record of Pre-Consultation for Official Plan Amendment and Zoning By-Amendment, the Region has confirmed that municipal sanitary servicing for the proposed development can be provided via the existing 200 mm sanitary sewer at Elgin Park

Drive and the pedestrian walkway (on the north side of Elgin Park Drive) and that no sanitary capacity analysis is required at this time.

4.0 WATER SUPPLY AND DISTRIBUTION

4.1 Existing Water Distribution

An existing 300 mm diameter watermain is located on Elgin Park Dr. from Toronto St. South to Confederation Dr.

The water supply system is under the jurisdiction of the Regional Municipality of Durham. A figure illustrating the existing watermain system was provided by the Region and is provided in **Appendix E.**

The Record of Pre-Consultation for Official Plan Amendment and Zoning By-Amendment notes that municipal water supply is available from the existing watermain on Elgin Park Drive.

4.2 Proposed Water System

An analysis of the subdivision's water demands were estimated by WSP. The WSP Report (**Appendix E**) concluded that the site can be adequately serviced with 200 mm diameter watermain, with a connection to the existing watermain on Elgin Park Drive. The preliminary layout for the proposed watermain system is provided on **Figure 2.3**.

The watermain system will designed in accordance with the Region of Durham and MOECC criteria including:

- Residential water usage rate: 390 l/c/d
- Minimum required fire flow for single family, detached dwellings is 4,500 L/min.
- Population Density: 3.0 people/unit (Townhouses)
- Minimum Pipe Size: 150 mm diameter
- Minimum Pipe Depth: 1.8 m
- Maximum Hydrant Spacing: 150 m

A valve and meter chamber will be provided at Elgin Park Drive.

5.0 SITE GRADING

5.1 Existing Grading Conditions

Under existing conditions, the majority of the site slopes west towards the Uxbridge Brook tributary. The existing site topography has slopes in the range of 3% to 25%. The ground surface elevations through the study area range from approximately 291 m in the southeast corner to approximately 279 m in the northwest corner.

5.2 Proposed Grading Concept

In general, the site will be graded in a manner which will satisfy the following goals:

- Satisfy the Town of Uxbridge lot and road grading criteria for Site Grading Design (Section J6.01 and J6.02 of the Township of Uxbridge Design Criteria) including:
    - Minimum Road Grade: 1.0%
    - Maximum Road Grade: 5.0%
    - Grassed embankments to have a maximum slope of 3:1
    - Other grassed or landscaped areas shall have a maximum slope of 10% and a minimum slope of 1%
    - Minimum swale slope: 1.5%
    - Maximum swale slope such that velocity does not exceed 1.25 m/s
- Minimum lot grade: 2%
- Maximum lot grade: 5%
- Provide continuous road grades for overland flow conveyance;
- Minimize the need for retaining walls;
- Minimize the volume of earth to be moved and minimize cut/fill differential;
- Minimize the need for rear lot catchbasins; and,
- Achieve the stormwater management objectives required for the site.

A preliminary grading plan is provided on **Figure 5.1**.

At the detailed design stage, the preliminary grading shown on **Figure 5.1** will be subject to a more in-depth analysis in an attempt to balance the cut and fill volumes and minimize slopes and walls. Efforts will be made to preserve the undulating character of the site as much as possible.

6.0 PHOSPHORUS BUDGET

Under the Lake Simcoe Protection Plan, a stormwater management plan must demonstrate how phosphorus loadings are minimized between pre-development and post-development. LSRCA Technical Guidelines for Stormwater Management Submissions November 2010, page 8, states that:

> *"Best efforts shall be employed such that any increase in loading (post development compared to pre development) is kept to a minimum. The target is "zero" increase in loading."*

The MOE database application *Lake Simcoe Phosphorus Loading Development Tool* (v2, 01-April-2012 update) was used to complete the phosphorus budget for the proposed development.

6.1 Pre-Development Phosphorus Loadings

The pre-development phosphorus loading was calculated based on the existing conditions from satellite imagery. The pre-development land use consists of forested lands listed in **Table 6.1** and shown on **Figure 2.5**.

Table 6.1 - Pre-Development Land Use

Land Use	General Land Use in MOE Phosphorus Loading Tool	Area (ha)
Forest	Forest	1.77
Total		**1.77**

The pre-development phosphorus loading for the 1.77 ha area was calculated to be 0.05 kg/yr with no BMPs. Refer to **Appendix F** for the phosphorus loading tool output.

6.2 Post-Development Phosphorus Loadings

The post-development land use for the site consists of residential and landscaping as listed in **Table 6.2** and shown on **Figure 2.6**. The post-development phosphorus loading with no best management practices (BMPs) was calculated to be 1.55 kg/yr (**Appendix F**).

As discussed in **Section 2.5**, a treatment train approach is proposed for the subject development. Runoff from a portion of the proposed development (forest area of 0.90 ha and high intensity residential development area of 0.46 ha) will first have the opportunity to infiltrate through rain gardens, dry pond and the infiltration base of the dry pond prior to being released from the site. A compounded phosphorus removal efficiency was assigned for this area which multiplies the generic phosphorus removal efficiency for perforated pipe infiltration/exfiltration systems of 87% and the generic removal efficiency for a dry pond of 10% and the generic removal efficiency for perforated pipe infiltration/exfiltration systems of 87% for a total of 100% [87+(100-87)*10% =

88.3+(100-87)+87]. Based on the highly permeable soils, a subdrain for the rain gardens and dry pond are not proposed and the removal efficiency of 100% is suitable for the soils.

Runoff from a portion of the proposed development (0.25 ha) will be have the opportunity to infiltrate through the dry pond and the infiltration base of the dry pond prior to being released from the site. A compounded phosphorus removal efficiency was assigned for this area which multiplies the generic phosphorus removal efficiency for a dry pond of 10% and the generic removal efficiency for perforated pipe infiltration/exfiltration systems of 87% for a total of 88% [87+(100-87)*10%]. However, since the dry pond will have a 2 m deep infiltration base, no subdrain required and highly permeable soils, it is assumed that the 25 mm storm event will be retained and the removal efficiency has been increased to 100%.

Runoff from a portion of the proposed development (0.24 ha Catchment 202) will have the opportunity to infiltrate through infiltration trenches prior to being released from the site.

The dry pond, rain gardens and infiltration trenches have been preliminary sized based on the Credit Valley Conservation, Low Impact Development Stormwater Management Planning and Design guide to retain the 25 mm storm event. Based on the highly impermeable soils, a 2 m depth of the stone reservoir has been applied to each BMP.

Table 6.2 provides a summary of the land use, BMP and phosphorus removal efficiencies for the post-development condition. The post-development phosphorus loading with best management practices (BMPs) was calculated to be 0.04 kg/yr (**Appendix F**).

Table 6.2 - Post-Development Land Use and Best Management Practice Summary

Concept Plan Area	Post-Development Land Use (per MOE Tool)	Best Management Practice	Removal Efficiency	Area (ha)
Low Density Residential	High Density Residential	Rain Gardens + Dry Pond + Infiltration	100%	0.56
		Dry Pond + Infiltration	100%	0.25
		Infiltration Trenches	88%	0.24
Dry Pond and Landscaping	Forest	Dry Pond + Infiltration	100%	0.12
Landscaping	Forest	Rain Gardens + Dry Pond + Infiltration	100%	0.90
Total				**1.77**

Table 6.3 – Post-Development Phosphorus Loading

Phosphorus Loading (kg/yr)		
Post-Development without BMPs	**Post-Development with BMPs**	**Net Reduction from Pre-Development With BMPs**
1.55 kg/yr	0.04 kg/yr	0.01 kg/yr (24%)

Additional quality control may be provided through the treatment train of Low Impact Development (LID) techniques which are not quantified by the MOE Phosphorus Loading Tool, including but not limited to, additional topsoil depth on all grassed areas, shallow lot slopes where possible, storm runoff from roofs directed to grassed areas, etc. The phosphorus budget described above is a conservative estimate and any additional LID measures may result in further reduction in phosphorus loadings.

Through the proposed LID measures, the proposed development results in a net reduction in phosphorus loadings from existing conditions and the intent of the Lake Simcoe Protection Plan has been met.

7.0 RIGHT-OF-WAYS

The cross-section for the proposed 9.5 m wide private right-of-way is provided in **Appendix G**.

8.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

During the detailed design stage, erosion and sediment control measures will be designed with a focus on erosion control practices (such as stabilization, track walking, staged earthworks, etc.) as well as sediment controls (such as fencing, mud mats, catchbasin sediment control devices, rock check dams and temporary sediment control ponds). These measures will be designed and constructed as per the "Erosion and Sediment Control Guideline for Urban Construction" document (December 2006). A detailed erosion and sediment control plan will be prepared for review and approval by the Municipality and Conservation Authority prior to any site grading being undertaken. This plan will address phasing, inspection and monitoring aspects of erosion and sediment control. All reasonable measures will be taken to ensure sediment loading to the adjacent watercourses and properties are minimized both during and following construction.

9.0 SUMMARY

This Functional Servicing Plan has outlined the means by which:

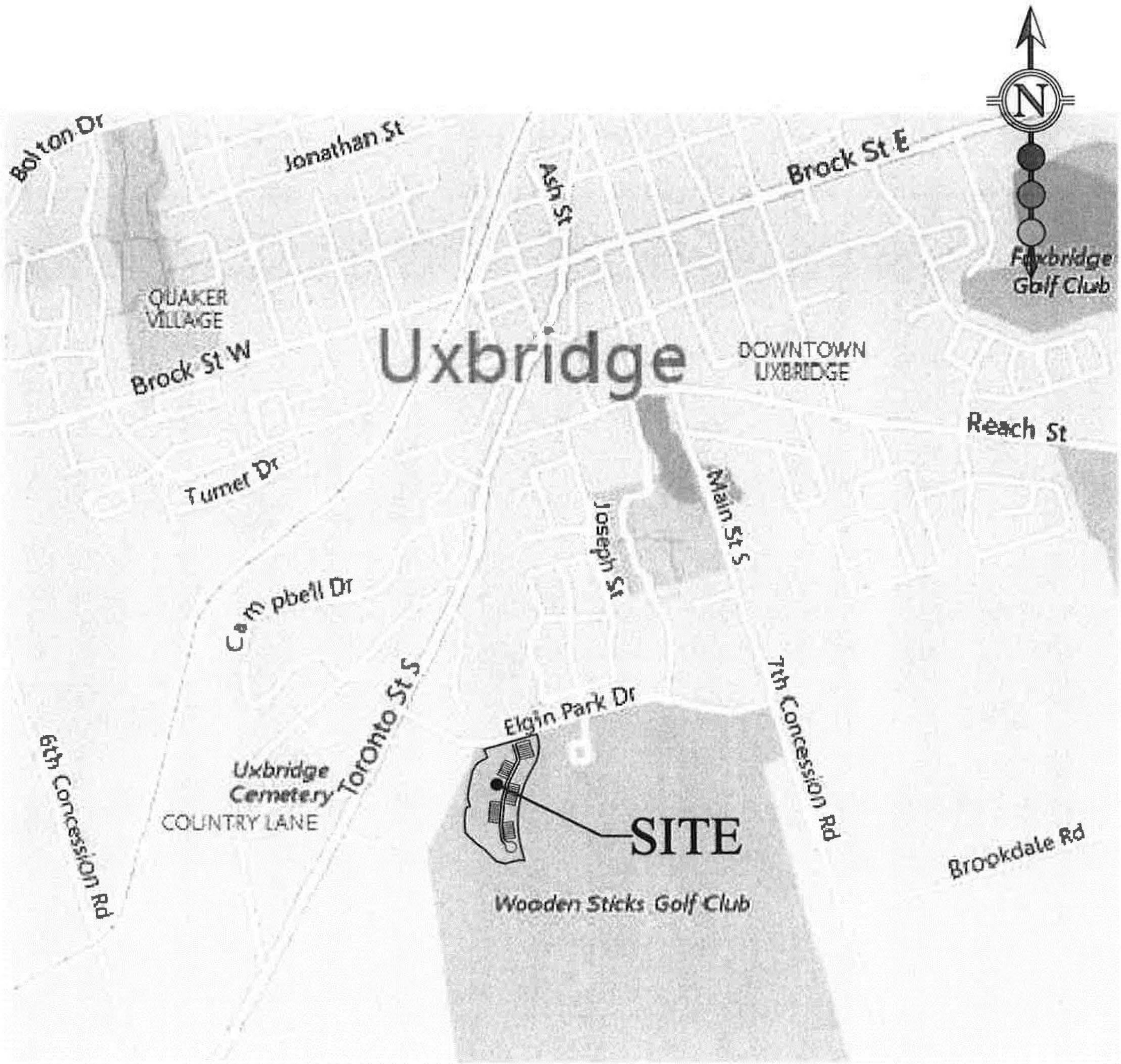
- The site can be serviced by municipal water and sanitary services;
- The Conceptual Development Plan layout can utilize a collection of Low Impact Development techniques in addition to traditional stormwater management techniques in achieving the stormwater management requirements;
- The proposed concept plan and stormwater management solutions will provide a net reduction in phosphorus loading.

Respectfully Submitted:

SCS Consulting Group Ltd.

LICENSED PROFESSIONAL ENGINEER
L Moore
L. C. MOORE
100111116
June 17, 2016
PROVINCE OF ONTARIO

Lindsay Moore, P.Eng
lmoore@scsconsultinggroup.com



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

SCS consulting group ltd

30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

LOCATION PLAN

DRAWN BY:	S.C.	CHECKED BY:	P.T.	PROJECT No:	FIGURE No:
SCALE:	N.T.S.	DATE:	MAY 2016	1715	1.1

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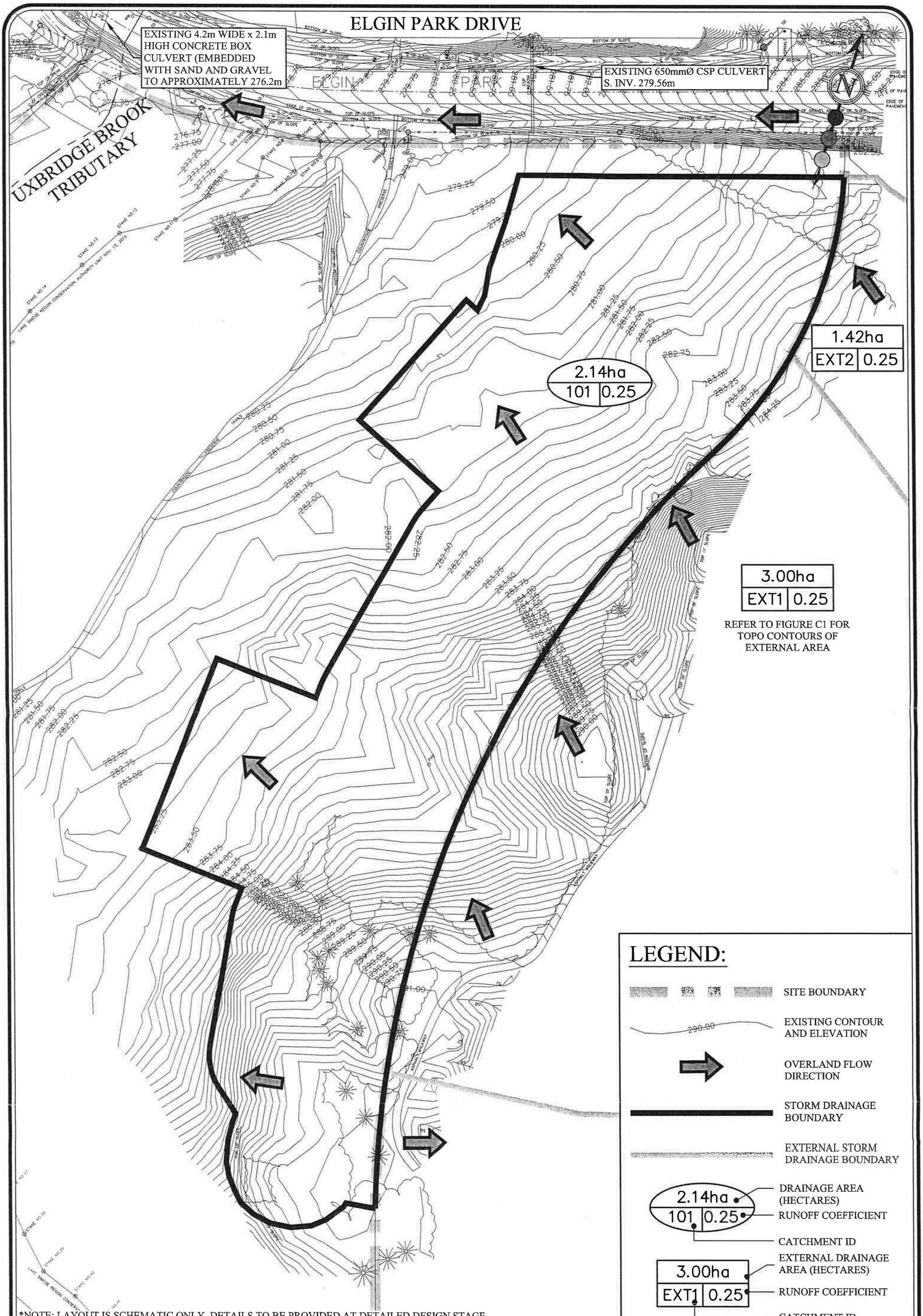

EXISTING 4.2m WIDE x 2.1m HIGH CONCRETE BOX CULVERT (EMBEDDED WITH SAND AND GRAVEL TO APPROXIMATELY 276.2m

EXISTING 650mmØ CSP CULVERT
S. INV. 279.56m

REFER TO FIGURE C1 FOR TOPO CONTOURS OF EXTERNAL AREA

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

SALEVILLE, UXBRIDGE

EXISTING DRAINAGE PLAN

SCS consulting group ltd

30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

DESIGNED BY: P.T.	CHECKED BY: L.C.M.	PROJECT No: 1715	FIGURE No: 2.1
SCALE: 1:1000	DATE: MAY 2016		

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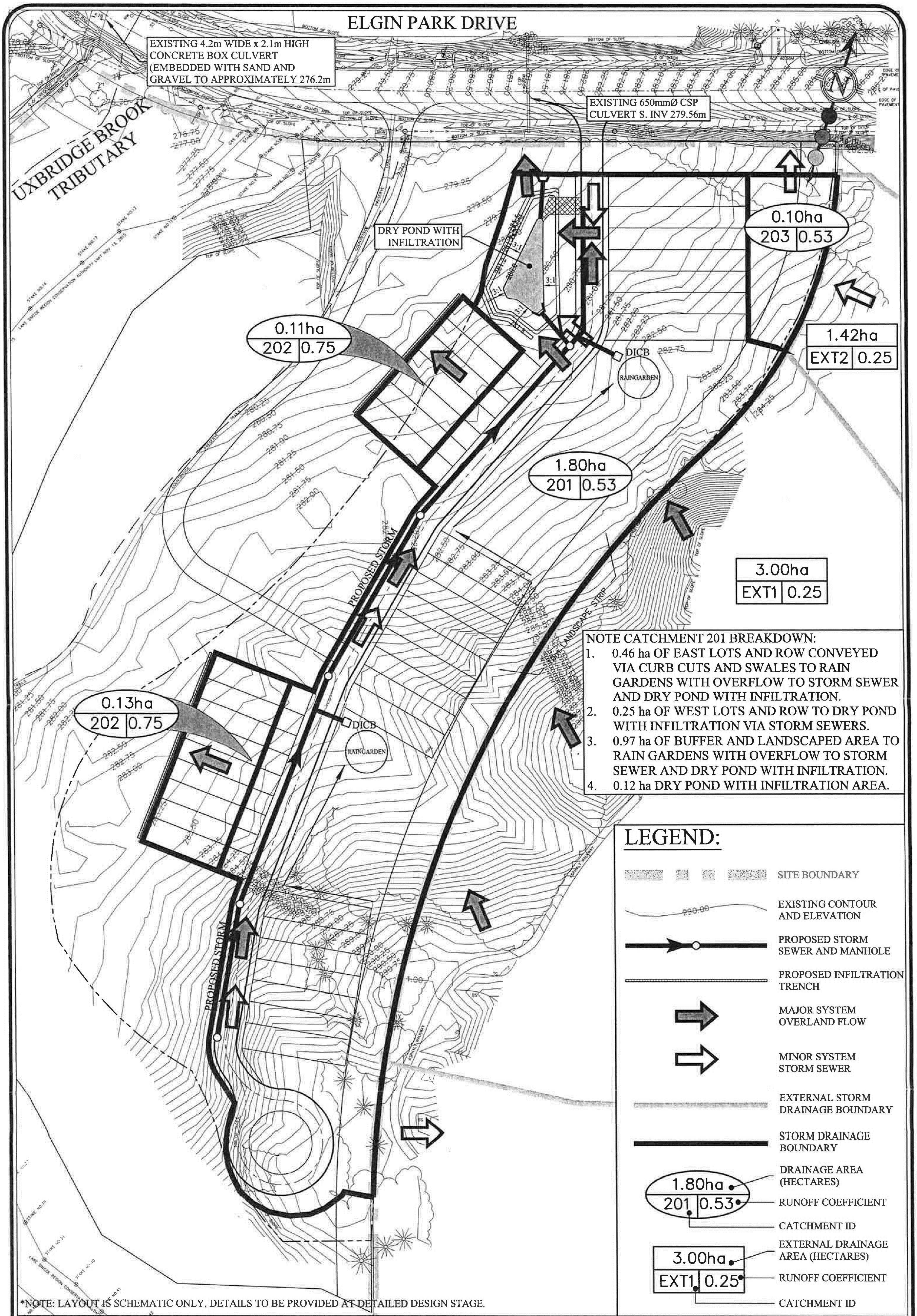


NOTE CATCHMENT 201 BREAKDOWN:

1. 0.46 ha OF EAST LOTS AND ROW CONVEYED VIA CURB CUTS AND SWALES TO RAIN GARDENS WITH OVERFLOW TO STORM SEWER AND DRY POND WITH INFILTRATION.
2. 0.25 ha OF WEST LOTS AND ROW TO DRY POND WITH INFILTRATION VIA STORM SEWERS.
3. 0.97 ha OF BUFFER AND LANDSCAPED AREA TO RAIN GARDENS WITH OVERFLOW TO STORM SEWER AND DRY POND WITH INFILTRATION.
4. 0.12 ha DRY POND WITH INFILTRATION AREA.

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

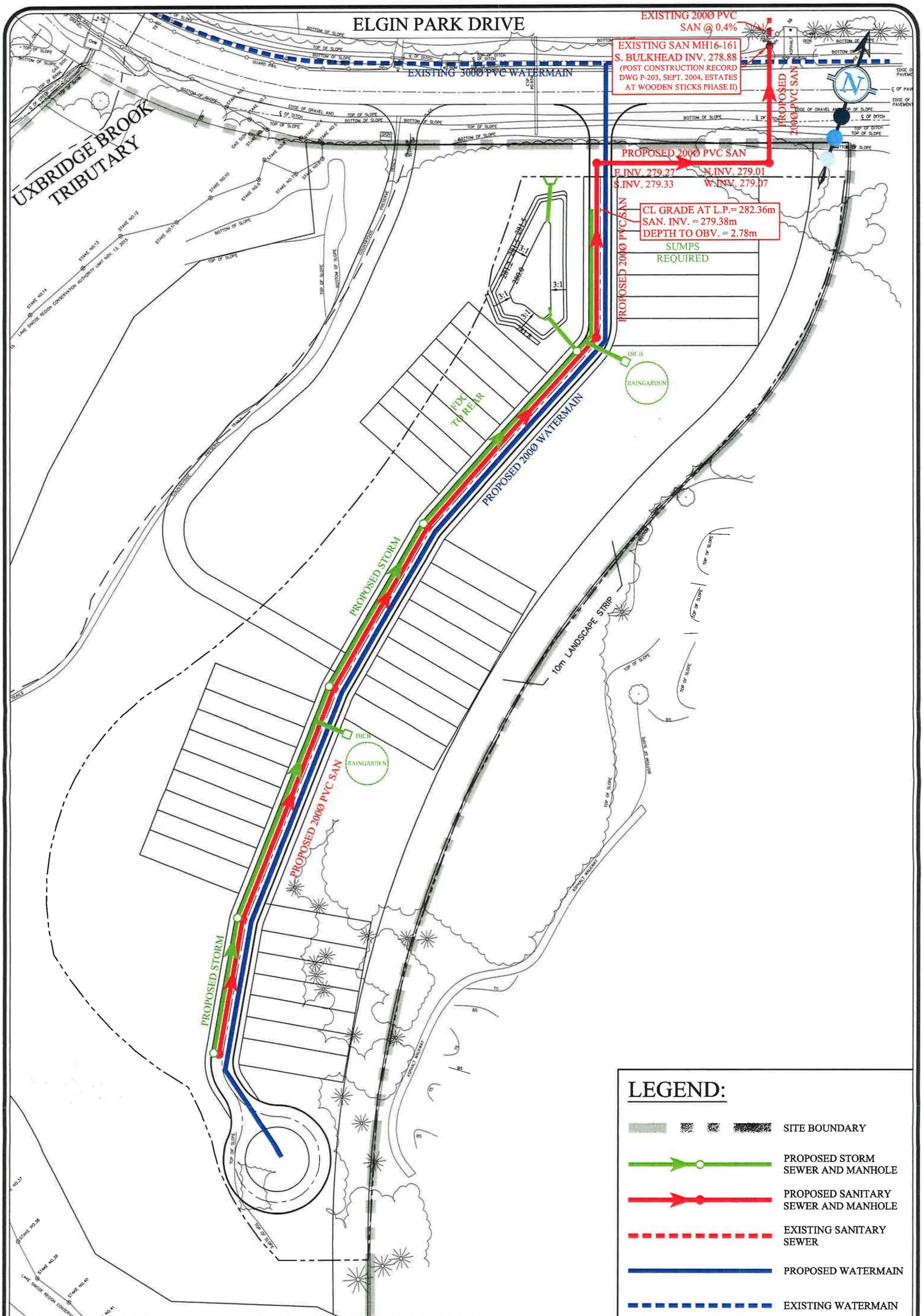
SALEVILLE, UXBRIDGE

POST-DEVELOPMENT DRAINAGE PLAN

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

DESIGNED BY: P.T.	CHECKED BY: L.C.M.	PROJECT No: 1715	FIGURE No: 2.2
SCALE: 1:1000	DATE: MAY 2016		

File: P:\1715 Saleville Uxbridge\Drawings\FSP\Fig\Report Figures\1715P-STRM-PROP-2.2.dwg — Revised by <PTURCHET> : Wed, Mar 02 2016 — 10:27am



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

SALEVILLE, UXBRIDGE

SERVICING PLAN

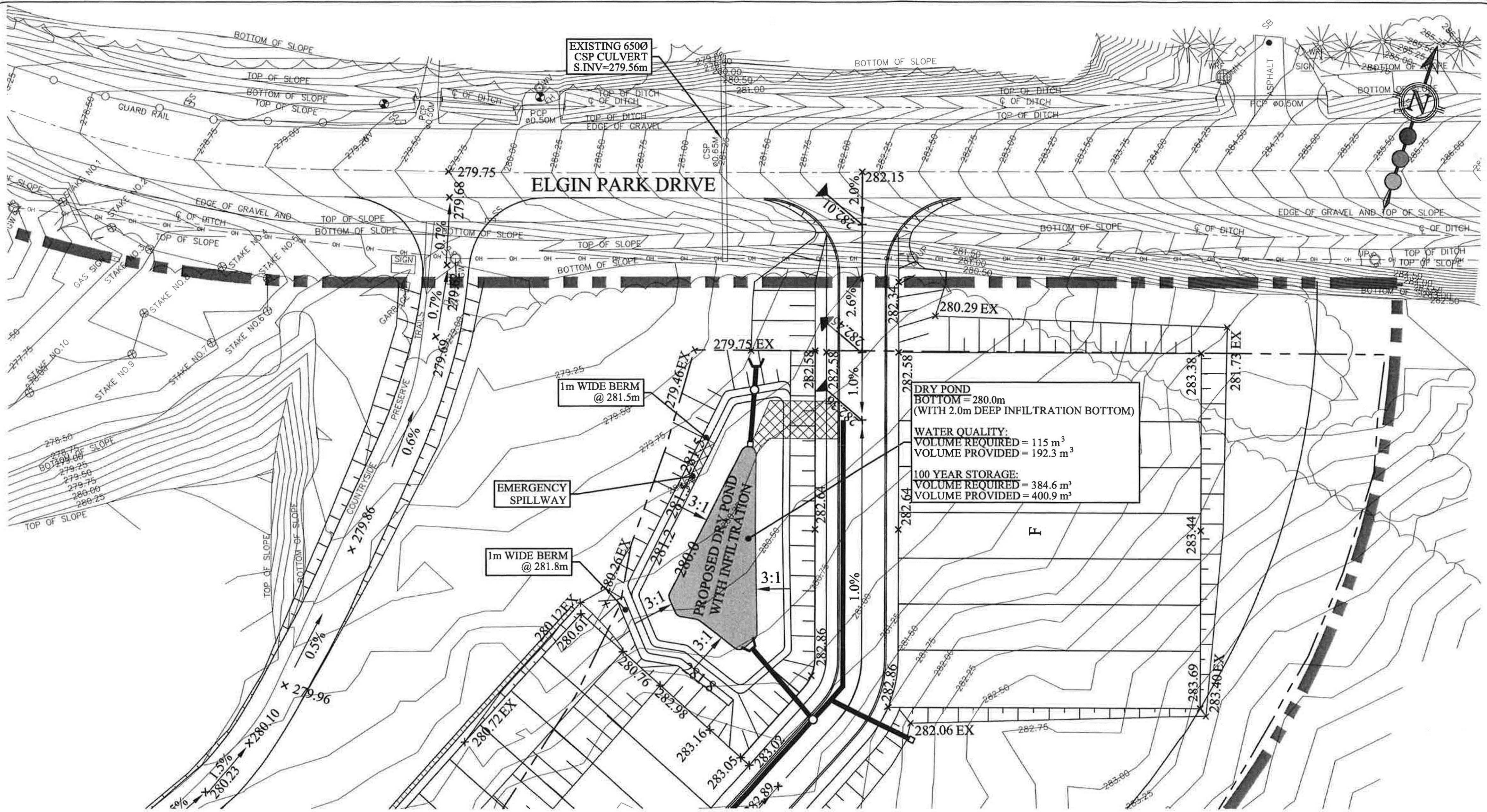
SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

DESIGNED BY:	P.T.	CHECKED BY: L.C.M.	
SCALE:	1:1000	DATE: MAY 2016	

PROJECT No: 1715

FIGURE No: 2.3

File: P:\1715 Saleville Uxbridge\Drawings\FSP\Fig\Report Figures\1715P-SERV-2.3.dwg - Revised by <PTURCHET> : Wed, Mar 02 2016 - 9:05am



DRY POND
BOTTOM = 280.0m
(WITH 2.0m DEEP INFILTRATION BOTTOM)

WATER QUALITY:
VOLUME REQUIRED = 115 m^3
VOLUME PROVIDED = 192.3 m^3

100 YEAR STORAGE:
VOLUME REQUIRED = 384.6 m^3
VOLUME PROVIDED = 400.9 m^3

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

▬ ▬ ▬	SITE BOUNDARY	┬┬┬┬	PROPOSED 3:1 SLOPING
290.00	EXISTING CONTOUR AND ELEVATION	×282.34	PROPOSED ELEVATION
──►──○	PROPOSED STORM SEWER AND MANHOLE	×280.29EX	EXISTING ELEVATION
		3.5% →	ROAD GRADE

SCS consulting group ltd

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MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

SALEVILLE, UXBRIDGE

STORMWATER MANAGEMENT DRY POND

DESIGNED BY: P.T.	CHECKED BY: L.C.M.	PROJECT No: 1715	FIGURE No: 2.4
SCALE: 1:500	DATE: MAY 2016		

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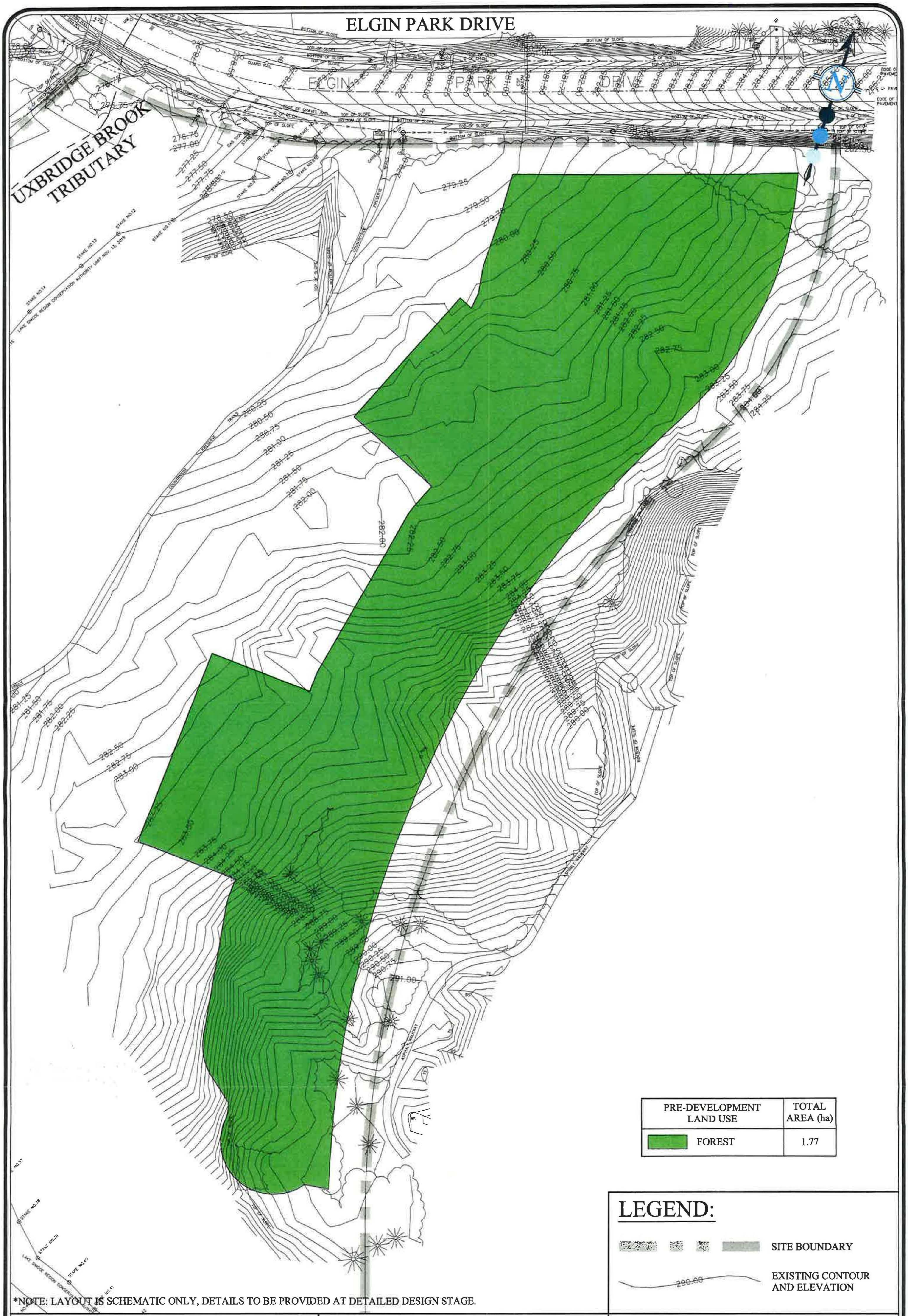


PRE-DEVELOPMENT LAND USE	TOTAL AREA (ha)
🟩 FOREST	1.77

LEGEND:

▨ SITE BOUNDARY

290.00 EXISTING CONTOUR AND ELEVATION

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

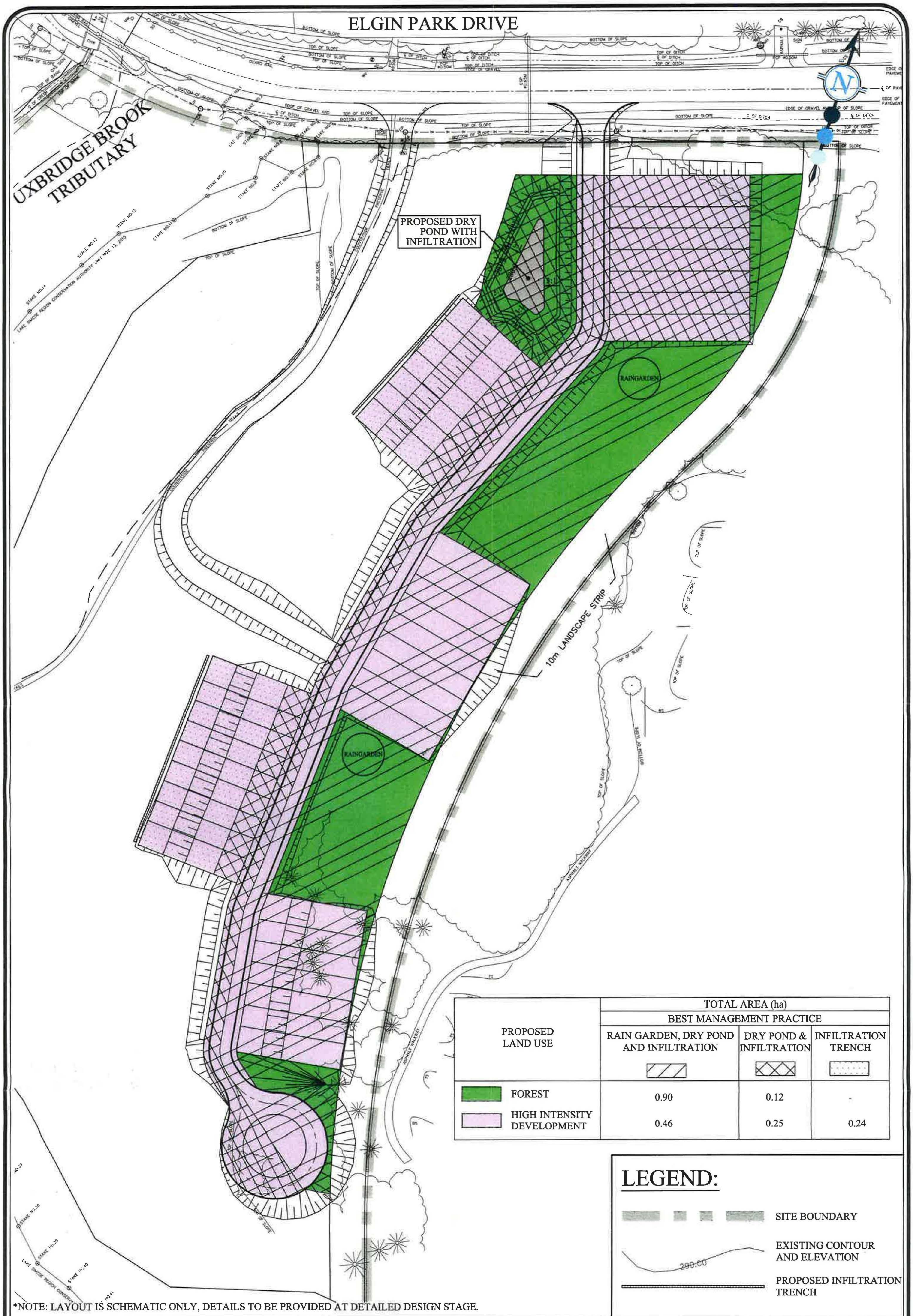
SALEVILLE, UXBRIDGE

EXISTING PHOSPHORUS BUDGET

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

DESIGNED BY: P.T.
CHECKED BY: L.C.M.
SCALE: 1:1000
DATE: MAY 2016
PROJECT No: 1715
FIGURE No: 2.5

File: P:\1715 Saleville Uxbridge\Drawings\FSP\Fig\Report Figures\1715P-PHSB-EXST-2.5.dwg - Revised by <SCRUTCHLEY> : Tue, Mar 01 2016 - 9:26am



PROPOSED LAND USE	TOTAL AREA (ha)		
	BEST MANAGEMENT PRACTICE		
	RAIN GARDEN, DRY POND AND INFILTRATION	DRY POND & INFILTRATION	INFILTRATION TRENCH
	▨	▩	⬚
🟩 FOREST	0.90	0.12	-
🟪 HIGH INTENSITY DEVELOPMENT	0.46	0.25	0.24

LEGEND:

SITE BOUNDARY

EXISTING CONTOUR AND ELEVATION

PROPOSED INFILTRATION TRENCH

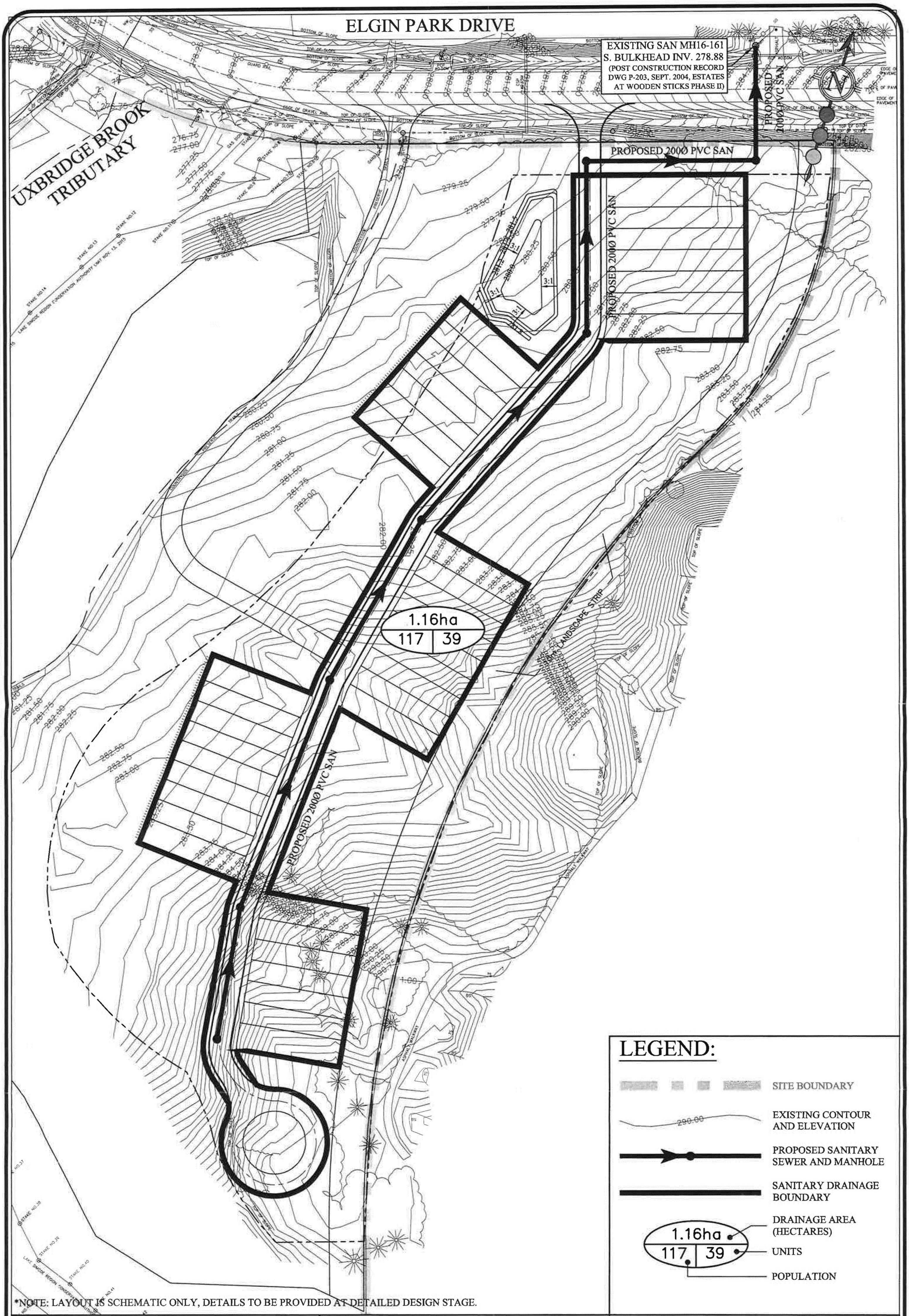
*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

SALEVILLE, UXBRIDGE

PROPOSED PHOSPHORUS BUDGET

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

DESIGNED BY: P.T.
CHECKED BY: L.C.M.
SCALE: 1:1000
DATE: MAY 2016
PROJECT No: 1715
FIGURE No: 2.6



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

SALEVILLE, UXBRIDGE

PROPOSED SANITARY DRAINAGE PLAN

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

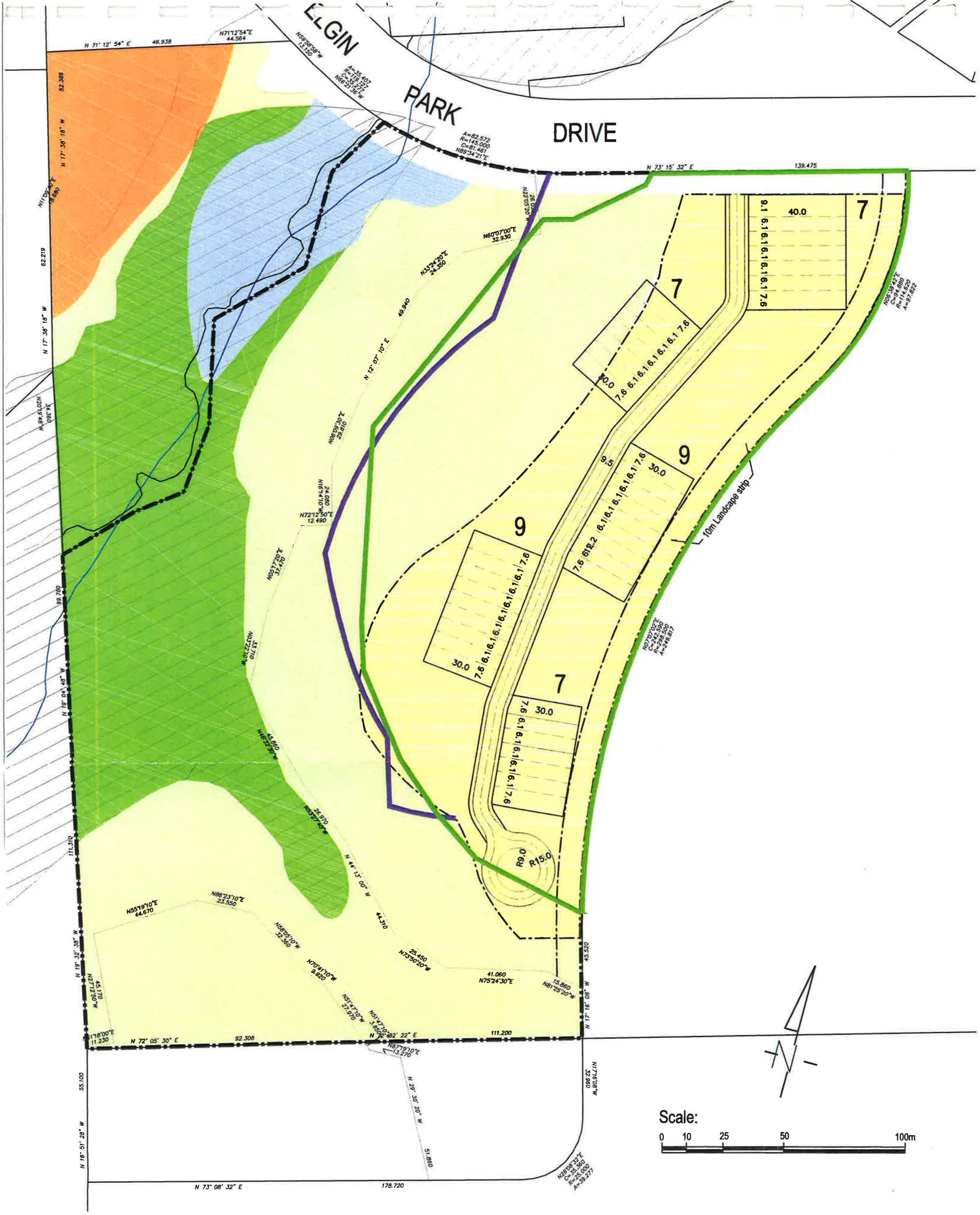
DESIGNED BY: P.T.	CHECKED BY: L.C.M.	PROJECT No: 1715	FIGURE No: 3.1
SCALE: 1:1000	DATE: MAY 2016		

File: P:\1715 Saleville Uxbridge\Drawings\FSP\Fig\Report Figures\1715P-SANI-PROP-3.1.dwg – Revised by <SCRUTCHLEY> : Tue, Mar 01 2016 – 9:37am

APPENDIX A

SITE PLAN

SCS consulting group ltd



LEGEND

▬ · ▬ Subject Lands - 8.25 ha

— Environmental Surveyed Area (2002) - 8.62 ha

— Fred Johnson Line (Developable Area) - 2.59 ha

Trail

— Watercourse

▨ Wetland

🟩 ELC Deciduous Swamp/Forest

🟨 ELC Naturalized Deciduous Plantation Site

🟨 ELC Sugar Maple Beech Deciduous Forest

🟦 ELC Mineralized Deciduous Swamp

🟧 ELC

— Recreational Mixed Use Area

DEVELOPMENT STATISTICS

Saleable Frontage = 214m

Condo Road Length @ 8.5m = 340m

Ratio 1: 0.63

MSAi
MICHAEL SPAZIANI ARCHITECT INC.
6 Helena Street North, Suite 100
ort Credit, Mississauga, ON, L5G 3B7
T 905 891 0691 F 905 891 0514

Saleville Property
Conceptual Development Plan
Uxbridge, Ontario

Option 1
39 - 6.1m Townhome Units
September 11, 2015

January 19, 2015

Matthew Cory
Malone Given Parsons Ltd
140 Renfrew Drive
Suite 201
Markham, ON
L3R 6B3

Dear Mr. Cory;

Re: **Record of Pre-Consultation for Official Plan Amendment and Zoning By-Amendment**
Property Location: Elgin Park Drive - Saleville
Municipality: Township of Uxbridge

The details of the meeting are as follows:

Pre-Consultation Date: January 16, 2015

Parties in Attendance:

Proponents
Matthew Cory
Rohan Sovig
Ian Roul
Paul Gingrich
Sonya Scarrow

Region of Durham representatives:
Karl Kiproff, Health Department
Lori Riviere-Doersam, Planning Department
Lino Trombino, Planning Department
John Molica, Works Department

Township of Uxbridge representatives:
Ingrid Svelnis, CAO
Ken Maynard, Fire Prevention Officer
Peter Middaugh, AECOM Engineer
Liz Howson, Planner
Emilia Gruyters, Planning Technician

Lake Simcoe Region Conservation Authority
Kevin Jarus, Development Planner

Description of Proposal:

The property is located immediately west of Wooden Sticks on Elgin Park Drive. They have been trying to realize a use for the property in keeping with current Recreational Mixed Use Area designation without success. Subsequent to undertaking recent environmental work, they believe they can propose an environmentally responsible residential development of portions of the site that is achievable and good planning, but would necessitate a reconsideration of the planned use of the property.

The key considerations that have driven the development of a concept plan have been:

1) Proposing development only in the portions of the site designated for development, and that to the extent supportable by our environmental consultant Ian Roul, Dillon Consulting (approximately 3 ha).
2) Providing a low intensity enclave style townhouse development using common element condominium roads, intermingling development in and amongst more mature wooded areas and naturalized amenity spaces. Townhomes allow for:
   a. Smaller clusters of houses that can at once provide immediate neighbours, while also providing spaces that preserve a sense of privacy between blocks;
   b. The provision of housing suitable for a wide demographic – including singles, couples and families.
3) The use of low impact development techniques and best practices to create a demonstration site for onsite stormwater management without reliance on stormwater management ponds. Currently being considered are the use of permeable pavement, bioswales, and multiple rain gardens.
4) Provision of a sufficient setback between the development and Wooden Sticks golf course to the east, and the trail to the west.

Concept Option 1 illustrates the development potential on the site using a single access from Elgin Park Drive. Concept Option 2 responds to initial comments received that a second access may be preferable for safety purposes. The conceptual low impact development and amenity plan illustrates the potential to use the intervening spaces between townhouse blocks to provide a variety of features.

Regional Services

The Regional Health Department provided the following comments;

Municipal Services require no further comments.

The Regional Planning Department provided the following comments;

- Planning Rationale including a historical summary of the site detailing how it became part of the Urban Area
- Site Screening Questionnaire signed by a Qualified Person or a Phase 1 Environmental Site Assessment (RSC Compliant), and the Regional Reliance Letter and Certificate of Insurance
- Archaeological Resource Assessment
- Environmental Impact Study

The Regional Works Department provided the following comments;

See attached email dated January 14, 2015 from John Molica to Jo Ann Merrick

The Lake Simcoe Region Conservation Authority provided the following comments;

- Property is regulated by the Conservation Authority and will require a permit.
- Updated Environmental Impact Study
- Planning Justification Report to deal with EIS and include a historical summary
- Hydrogeological Report
- Landform Conservation Category 1 Plan
- Topographic Survey
- Erosion & Sedimentation control
- Stormwater management plan including Water Balance & Phosphorus Budget
- Ecologist to complete a site visit

Township of Uxbridge

Township of Uxbridge Planning Consultant had the following comments;

- Allocation issue
- Parcel is neither in Phase 1 or Phase 2 of the OP
- Planning Justification Report to address whether in Phase 1 or 2.
- Concept Plan
- Elevation Plan
- Landscape Plan
- Tree Analysis
- Plans illustrating integration with NHS
- Landform Conservation Category 1 Plan

Township of Uxbridge Engineering had the following comments;

- Township Engineering requires conceptual grading and landscape plan to support an OPA
- Functional Servicing Report to support the OPA and Development Applications
- Storm water management plan to address quantity control (post to pre peaks), quality control to Level 1 MOE guidelines and phosphorous reduction requirements of the Township and LSRCA.
- Submittal packages for the design and approval of the development to meet Township of Uxbridge Engineering Design Criteria and
- Standards. Current copies are available at the Township for purchase.
- Existing path/walkway to be addressed for potential upgrades, location and the management of the path/walkway by the Township.
- Conveyance of the land for the path/walkway to be addressed in the development approvals
- Traffic Impact Study

Township of Uxbridge Fire Department had the following comments;

- Emergency access
- Hydrants
- Second access to be further discussed once a decision is made on the concept plan.

Emilia Gruyters
Planning Technician
Development Services

Encl:Township of Uxbridge Pre-consultation Form

cc: Ken Maynard, Fire Services, kmaynard@town.uxbridge.on.ca
Lori Riviere-Doersam, Regional Planner, loririviere-doersam@durham.ca
Peter Middaugh, Township Engineer, Peter.middaugh@aecom.com
Liz Howson, Township Planner, howson@mshplan.ca
Kevin Jarus, Development Planner, k.jarus@lsrca.on.ca

Jo Ann. Merrick

From:	John Molica <John.Molica@Durham.ca>
Sent:	Wednesday, January 14, 2015 8:41 AM
To:	Jo Ann. Merrick
Subject:	RE: Pre- Consultation Meeting

Hi Jo-Ann,

I will be able to attend the meeting on Friday January 16. The following are the Regional Works Department preliminary comments.

- Municipal water supply is available from the existing 300 mm watermain fronting the subject site.
- Municipal sanitary sewers are available from the 200 mm sewer at Elgin Park Drive and the pedestrian walkway (north side of Elgin Park Dr.)
- Limited sewage capacity is available in the Uxbridge WPCP.
- The Developer will be responsible for the extension of the sanitary sewer and installation of the water connections to his site.
- Regional Development Charges will be applicable at rates in effect when the building permits are applied for.

Additional comments will be provided as part of the Site Plan Application process.

John

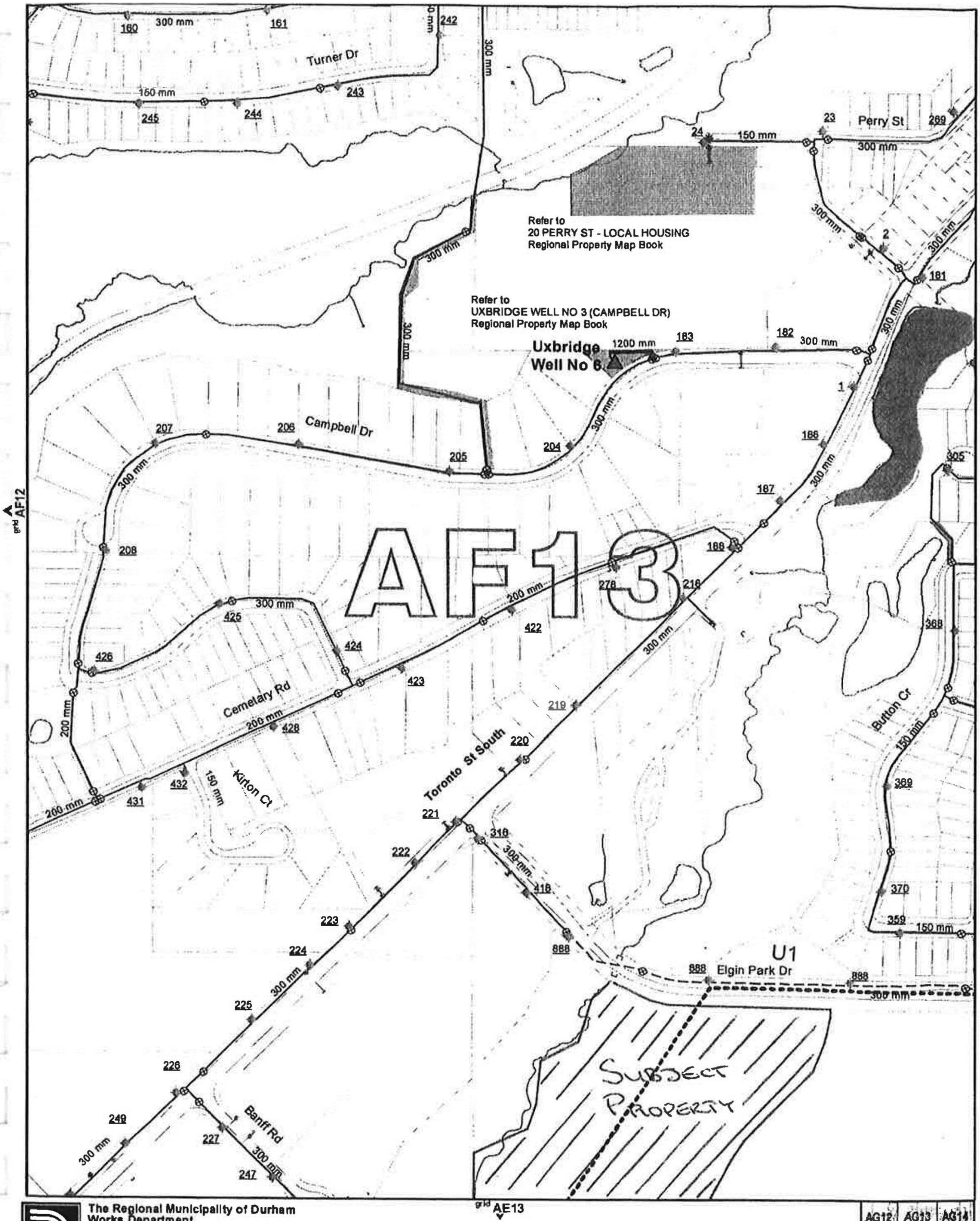
From: Jo Ann. Merrick [mailto:jmerrick@town.uxbridge.on.ca]
Sent: January-09-15 3:08 PM
To: Ingrid Svelnis; Gerri Lynn O'Connor; Gordon Highet; Fred Bryan; Brian Pigozzo; Emilia Gruyters; Ken Maynard; Lino Trombino; David Perkins; 'peter.middaugh@aecom.com'; 'Kevin Jarus'; John Molica; Mike Hubble; 'Liz Howson (howson@mshplan.ca)'; Karl Kiproff; 'Matthew Cory'
Cc: Kristen Sullivan
Subject: RE: Pre- Consultation Meeting

This meeting is confirmed for Fri. Jan 16 at 1:30 p.m.

Jo Ann Merrick
Administrative Assistant
Public Works & Operations/
Development Services
Township of Uxbridge
51 Toronto St. S.
Uxbridge, ON L9P 1T1

(t)905-852-9181 ext 202
(f) 905-852-9674

From: Jo Ann. Merrick
Sent: Wednesday, January 07, 2015 12:26 PM
To: Ingrid Svelnis; Gerri Lynn O'Connor; Gordon Highet; Fred Bryan; Brian Pigozzo; Emilia Gruyters; Ken Maynard; 'Lino Trombino'; 'David Perkins'; 'peter.middaugh@aecom.com'; 'Kevin Jarus'; 'John Molica'; 'mike.hubble@durham.ca'; 'Liz Howson (howson@mshplan.ca)'; 'karl.kiproff@durham.ca'; 'Matthew Cory'



Hydrant with anti-tampering device

Flushing Hydrant

Temporary Flushing Hydrant

Water mains and feeders shown dashed are issued for construction or on maintenance

The Regional Municipality of Durham
Works Department
Water Supply System

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UXBRIDGE (Uxbridge)

1:5,000

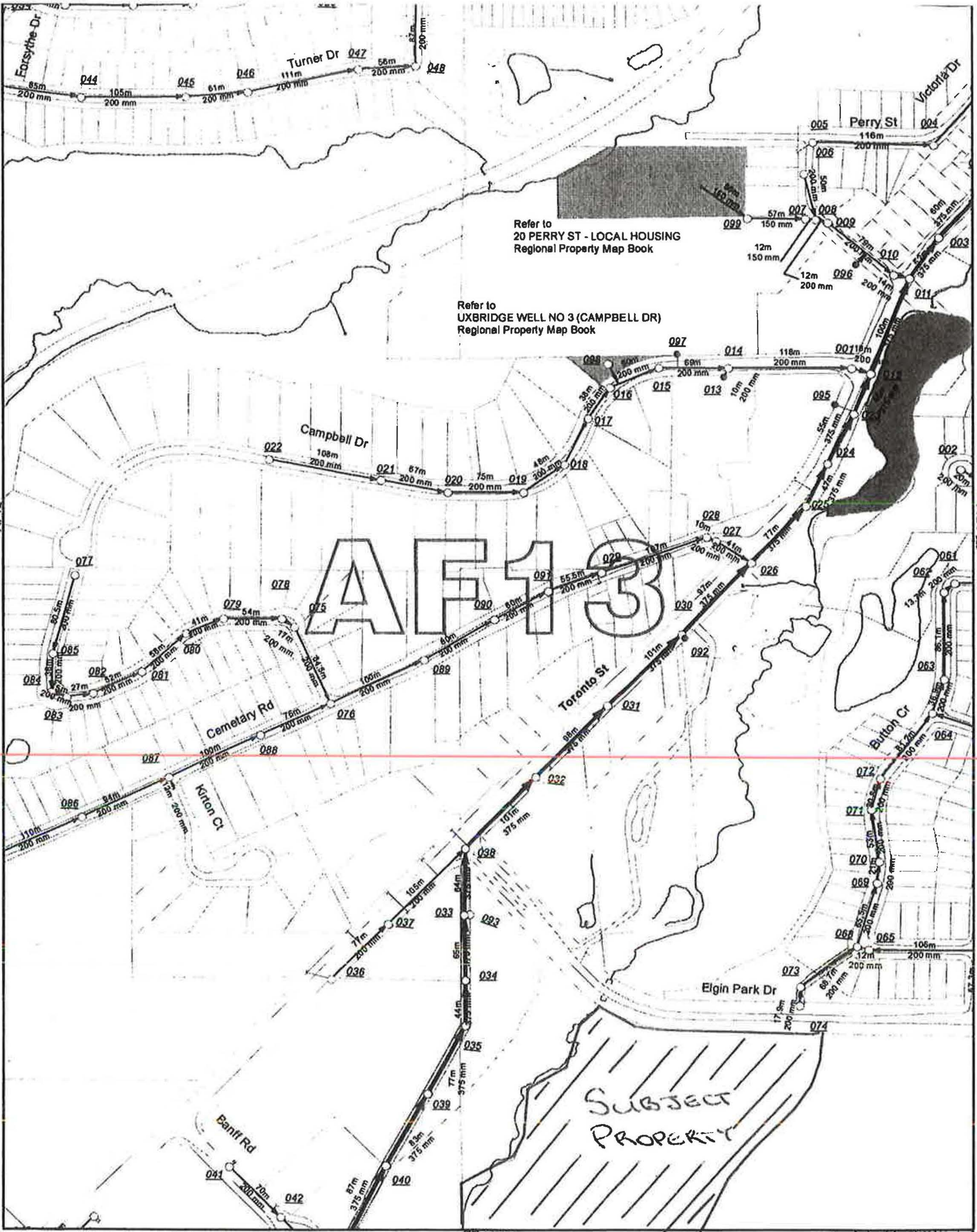
0 25 50 100 150 200 Meters

All dimensions are in mm unless otherwise noted.

March 13, 2015

Servicing Note:
THIS MAP DEPICTS LOCAL PROXIMITY OF SERVICES ONLY. IT IS NOT TO BE USED TO DETERMINE INDIVIDUAL SITE SERVICING AVAILABILITY OR AVAILABILITY OF CAPACITY WITHIN THE SYSTEM. FOR DETAILED SITE SERVICING INFORMATION PLEASE CONTACT THE DEVELOPMENT APPROVALS SECTION OF THE WORKS DEPARTMENT.

AG12	AG13	AG14
AF12	AF13	AF14
AE12	AE13	



Refer to
20 PERRY ST - LOCAL HOUSING
Regional Property Map Book

Refer to
UXBRIDGE WELL NO 3 (CAMPBELL DR)
Regional Property Map Book

SUBJECT
PROPERTY

sewers, trunks, forcemains shown dashed are
ied fo uction mainte

The Regional Municipality of Durham
Works Department
Sanitary Sewer System

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DURHAM
REGION

UXBRIDGE (Uxbridge)

1:5,000

0 25 50 100 150 200 Meters

All dimensions are in mm unless otherwise noted.

MARCH 16, 2016

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AG12	AG13	AG14
AF12	AF13	AF14
AE12	AE13	

APPENDIX B

AS-BUILT DRAWINGS

SCS consulting group ltd

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

SCS consulting group ltd

EXISTING WEIGHTED RUNOFF COEFFICIENT

Catchment 101

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
Grass	0.25	2.14	0.25
TOTAL		2.14	0.25

Catchment 102

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
Grass	0.25	3.00	0.25
TOTAL		3.00	0.25

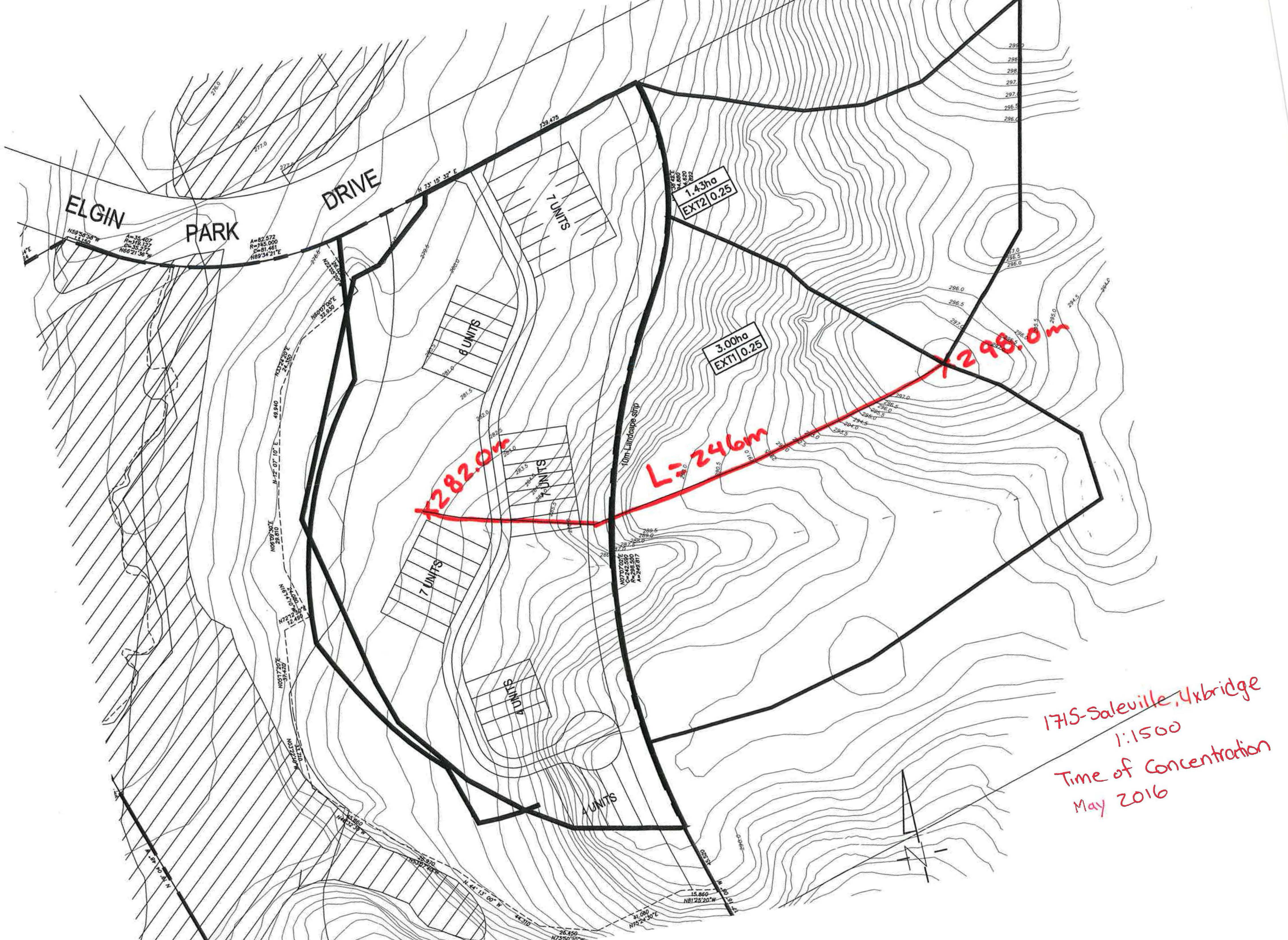
Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
101	0.25	2.14	0.10
102	0.25	3.00	0.15
TOTAL		5.14	0.25

Time to Peak Calculations Post-Development

Airport Method: (used for all catchments with a runoff coefficient of less than 0.4)

Catchment ID	High Elevation	Low Elevation	Length (m)	Slope (%)	Runoff Coefficient	Time of Concentration (minutes)	Time of Concentration (hr)	Time of Concentration (min)	Time to Peak (hr)
102	298.00	282.00	246	6.52	0.25	23.39	0.39	23.39	0.26



1715-Saleville, Uxbridge
1:1500
Time of Concentration
May 2016

DRAINAGE AREA CHARACTERISTICS

Development Type	Area (Ha)	% Imperviousness (TIMP)	Impervious Area (Ha)
Right-of-way	0.26	100%	0.26
Townhouses	0.84	79%	0.67
Dry Pond	0.13	50%	0.06
Park	0.91	8%	0.07
External Golf Course	3.00	8%	0.24
Total	5.14	**25%**	1.31

Dry Pond Infiltration

Development Type	Area (Ha)	% Imperviousness (TIMP)	Impervious Area (Ha)
Right-of-way	0.25	100%	0.25
Townhouses	0.21	79%	0.17
Total	0.46	**90%**	0.42

Rain Garden Infiltration

Development Type	Area (Ha)	% Imperviousness (TIMP)	Impervious Area (Ha)
Right-of-way	0.46	100%	0.46
Total	0.46	**100%**	0.46

Permanent Pool and Extended Detention Sizing

Saleville, Uxbridge
Project Number: 1715
Date: May 2016
Designer Initials: P.A.T.

WATER QUALITY

Level of Protection = Enhanced (Level 1)

Weighted Impervious = 25 %

Drainage Area = 5.14 ha

SWMP Type = 1. Infiltration

Required Water Quality = 23 m^3/ha

Required Water Quality = 117 m^3

TABLE 3.2 - WATER QUALITY STORAGE REQUIREMENTS (FROM MOE SWM PLANNING AND DESIGN MANUAL - 2003)

Protection Level	SWMP Type	Storage Volume (m^3/s) for Impervious Level			
		35%	55%	70%	85%
Enhanced (Level 1)	1. Infiltration	25	30	35	40
	2. Wetlands	80	105	120	140
	3. Hybrid Wet Pond/Wetland	110	150	175	195
	4. Wet Pond	140	190	225	250
Normal (Level 2)	1. Infiltration	20	20	25	30
	2. Wetlands	60	70	80	90
	3. Hybrid Wet Pond/Wetland	75	90	105	120
	4. Wet Pond	90	110	130	150
Basic (Level 3)	1. Infiltration	20	20	20	20
	2. Wetlands	60	60	60	60
	3. Hybrid Wet Pond/Wetland	60	70	75	80
	4. Wet Pond	60	75	85	95
	5. Dry Pond (Continuous Flow)	90	150	200	240

WATER QUALITY REQUIREMENT

Using the 25mm - 4 hour Chicago Storm

25mm Runoff Volume (V) = Runoff Depth (mm) x Impervious Drainage Area (ha) x 10 (m^3) / (mm)(ha)

25mm Runoff Volume (V) = 25 mm x 1.07 ha x 10 m^3 / mm·ha x

25mm Runoff Volume (V) = 266 m^3

Governing Volume (V) = 266 m^3

Therefore, since the 25mm storm event produces a larger water quality requirement than the Table 3.2 infiltration requirement, the 25mm storm event is the governing volume to be retained on site.
Refer to **Appendix F** for Water Quality Volume distribution between dry pond infiltration and rain garden infiltration.

SWM Dry Pond Stage-Storage Rating Table

Saleville, Uxbridge
Project Number: 1715
Date: May 2016
Designer Initials: P.A.T.

Elevation (m)	Area (m^2)	Area (m^2)	H (m)	Vol (m^3)	Volume (m^3)	Storage (m^3)	Depth (m)
280	184.125				0	0	0
		334	1.2	400.9			
281.2	484.1				400.9	400.9	1.2

PROPOSED WEIGHTED RUNOFF COEFFICIENT

Catchment 201

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
Townhouses	0.75	0.60	0.25
ROW	0.90	0.26	0.13
Dry Pond	0.55	0.13	0.04
Grass	0.25	0.81	0.11
TOTAL		1.80	0.53

Catchment 202

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
Townhouses	0.75	0.24	0.75
TOTAL		0.24	0.75

Catchment 203

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
Grass	0.25	0.10	0.25
TOTAL		0.10	0.25

Catchment 204

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
SWM Dry Pond	0.50	0.00	
TOTAL		0.00	0.00

Catchment EXT1*

	Runoff Coefficient	Area (ha)	Weighted Runoff Coefficient
Grass	0.25	3.00	0.25
TOTAL		3.00	0.25

Total

Catchment	Runoff Coefficient	Area	Weighted Runoff Coefficient
201	0.53	1.80	0.96
202	0.75	0.24	0.18
203	0.25	0.10	0.03
204	0.00	0.00	0.00
EXT1*	0.25	3.00	0.75
TOTAL		5.14	0.37

SUMMARY

Saleville Uxbridge
Job Number: 1715
Date: May 2016
Designer Initials: P.A.T.

			100 Year						
Catchment ID	**Runoff Coef.**	**Area (ha)**	**Release Rate (L/s) [2]**	**Storage Required (m^3) [2]**	**Storage Available (m^3) [3]**	**Draw Down Time (mins) [5]**	**Orifice Size (mm) [4]**	**Orifice Release Rate (L/s)**	**Uncontrolled Release Rate (L/s)**
201	0.53	1.80	310.1	385.4	400.9	21	408	310.1	
202	0.75	0.24	101.7	0.0	0.0	0	uncontrolled	-	102
203	0.25	0.10	13.9	0.0	0.0	0	uncontrolled	-	14
EXT1*	0.25	3.00	252.3	0.0	0.0	0	uncontrolled	-	252
Total		5.14	425.7	385.4	400.9	-	-	-	

Allowable Release Rate to Uxbridge Brook Tributary 427.1 L/s   Proposed Release Rate to Uxbridge Brook Tributary 425.7 L/s

Notes:

[2] Per Modified Rational Calculations (attached)

[4] See attached for orifice details

[5] Draw down time calculated based on surface storage only

*Included in Catchment 201 Release Rate

			5 Year						
Catchment ID	**Runoff Coef.**	**Area (ha)**	**Release Rate (L/s) [2]**	**Storage Required (m^3) [2]**	**Storage Available (m^3) [3]**	**Draw Down Time (mins) [5]**	**Orifice Size (mm) [4]**	**Orifice Release Rate (L/s)**	**Uncontrolled Release Rate (L/s)**
201	0.53	1.80	137.2	89.2	147.7	11	408	137.2	
202	0.75	0.24	54.2	0.0	0.0	0	uncontrolled	-	54
203	0.25	0.10	7.4	0.0	0.0	0	uncontrolled	-	7
EXT1*	0.25	3.00	136.4	0.0	0.0	0	uncontrolled	-	136
Total		5.14	198.8	89.2	147.7	-			

Allowable Release Rate to Uxbridge Brook Tributary 231.0 L/s   Proposed Release Rate to Uxbridge Brook Tributary 198.8 L/s

Notes:

[2] Per Modified Rational Calculations (attached)

[4] See attached for orifice details

[5] Draw down time calculated based on surface storage only

*Included in Catchment 201 Release Rate

SCS consulting group ltd

MODIFIED RATIONAL METHOD

Saleville Uxbridge
Job Number: 1715
Date: May 2016
Designer Initials: P.A.T.

Area ID: 201

Area = **1.800** ha
"C" = **0.53**
AC= **0.9609**
Tc = **10.0** min
Time Increment = **1.0** min
Release Rate = **310.11** l/s
Max.Storage = **385.4** m^3

Uxbridge 100 Year
a= 1799
b= 5
c= 0.810

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume* (m3)	Released Volume (m3)	Storage Volume (m3)	
10.0	200.6	535.96	321.6	186.1	135.5	
11.0	190.4	508.66	335.7	204.7	131.0	
12.0	181.3	484.29	348.7	223.3	125.4	
13.0	173.1	462.38	360.7	241.9	118.8	
14.0	165.7	442.57	371.8	260.5	111.3	
15.0	158.9	424.55	382.1	279.1	103.0	
16.0	152.8	408.10	391.8	297.7	94.1	
17.0	147.1	393.01	400.9	316.3	84.6	
18.0	141.9	379.11	409.4	334.9	74.5	
19.0	137.1	366.27	417.5	353.5	64.0	
20.0	132.6	354.35	425.2	372.1	53.1	
21.0	128.5	343.27	432.5	390.7	41.8	
22.0	124.6	332.94	439.5	409.3	30.1	
23.0	121.0	323.27	794.3	428.0	366.4	
24.0	117.6	314.21	815.8	446.6	369.2	
25.0	114.4	305.70	837.0	465.2	371.9	
26.0	111.4	297.69	858.0	483.8	374.2	
27.0	108.6	290.13	878.8	502.4	376.4	
28.0	105.9	282.99	899.3	521.0	378.3	
29.0	103.4	276.23	919.7	539.6	380.1	
30.0	101.0	269.82	939.8	558.2	381.6	
31.0	98.7	263.73	959.8	576.8	383.0	
32.0	96.6	257.94	979.7	595.4	384.3	
33.0	94.5	252.43	999.4	614.0	385.4	<<<<

*EXT1 Released Volume is routed through Catchment 201 Runoff Volume at a time of 23 minutes.

MODIFIED RATIONAL METHOD

Area ID: 201

Area = **1.800** ha
"C" = **0.53**
AC= **0.9609**
Tc = **10.0** min
Time Increment = **1.0** min
Release Rate = **137.19** l/s
Max.Storage = **89.2** m^3

Uxbridge 5 Year
a= 904
b= 5
c= 0.788

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
10.0	107.0	285.85	171.5	82.3	89.2	<<<<
11.0	101.7	271.68	179.3	90.5	88.8	
12.0	97.0	259.01	186.5	98.8	87.7	
13.0	92.7	247.60	193.1	107.0	86.1	
14.0	88.8	237.27	199.3	115.2	84.1	
15.0	85.3	227.87	205.1	123.5	81.6	
16.0	82.1	219.28	210.5	131.7	78.8	
17.0	79.1	211.39	215.6	139.9	75.7	
18.0	76.4	204.11	220.4	148.2	72.3	
19.0	73.9	197.38	225.0	156.4	68.6	
20.0	71.5	191.13	229.4	164.6	64.7	
21.0	69.4	185.31	233.5	172.9	60.6	
22.0	67.3	179.88	237.4	181.1	56.4	
23.0	65.4	174.80	241.2	189.3	51.9	
24.0	63.7	170.03	244.8	197.6	47.3	
25.0	62.0	165.55	248.3	205.8	42.5	
26.0	60.4	161.33	251.7	214.0	37.7	
27.0	58.9	157.34	254.9	222.3	32.6	
28.0	57.5	153.57	258.0	230.5	27.5	
29.0	56.2	150.00	261.0	238.7	22.3	
30.0	54.9	146.62	263.9	246.9	17.0	
31.0	53.7	143.40	266.7	255.2	11.5	
32.0	52.5	140.33	269.4	263.4	6.0	
33.0	51.4	137.42	272.1	271.6	0.4	

ON-SITE DETENTION AND ORIFICE DETAILS

Area ID 201

Orifice Equation: $Q = C_d A(2gh)^{1/2}$

Type of Control: vertical
Location: 1

Orifice Diameter:	408	mm
Area:	0.131	m^2
g =	9.81	m/sec^2
C_d =	0.62	

Dry Pond Storage

Volume = 400.9 m^3

	Stage (m)	Head (m)	Storage (m^3)	Discharge (m^3/s)
Invert E.L.	280.25	0.00	0.0	0.00
Ground E.L.	281.20	0.75	0.0	0.310
5 Year WL	280.60	0.15	147.7	0.137
100 Year WL	281.20	0.75	400.9	0.310

MODIFIED RATIONAL METHOD

Area ID: 202

Area = **0.243** ha
"C" = **0.75**
AC= **0.1823**
Tc = **10.0** min
Time Increment = **1.0** min
Release Rate = **101.65** l/s
Max.Storage = **0.0** m3

Uxbridge 100 Year
a= 1799
b= 5
c= 0.810

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
10.0	200.6	101.65	61.0	61.0	0.0	<<<<
11.0	190.4	96.47	63.7	67.1	-3.4	
12.0	181.3	91.85	66.1	73.2	-7.1	
13.0	173.1	87.69	68.4	79.3	-10.9	
14.0	165.7	83.94	70.5	85.4	-14.9	
15.0	158.9	80.52	72.5	91.5	-19.0	
16.0	152.8	77.40	74.3	97.6	-23.3	
17.0	147.1	74.54	76.0	103.7	-27.7	
18.0	141.9	71.90	77.7	109.8	-32.1	
19.0	137.1	69.47	79.2	115.9	-36.7	
20.0	132.6	67.21	80.6	122.0	-41.3	
21.0	128.5	65.11	82.0	128.1	-46.0	
22.0	124.6	63.14	83.4	134.2	-50.8	
23.0	121.0	61.31	84.6	140.3	-55.7	
24.0	117.6	59.59	85.8	146.4	-60.6	
25.0	114.4	57.98	87.0	152.5	-65.5	
26.0	111.4	56.46	88.1	158.6	-70.5	
27.0	108.6	55.03	89.1	164.7	-75.5	
28.0	105.9	53.67	90.2	170.8	-80.6	
29.0	103.4	52.39	91.2	176.9	-85.7	
30.0	101.0	51.17	92.1	183.0	-90.9	
31.0	98.7	50.02	93.0	189.1	-96.0	
32.0	96.6	48.92	93.9	195.2	-101.2	
33.0	94.5	47.88	94.8	201.3	-106.5	

MODIFIED RATIONAL METHOD

Area ID: 202

Area =	**0.243** ha			
"C" =	**0.75**			
AC=	**0.1823**			
Tc =	**10.0** min			
Time Increment =	**1.0** min			
Release Rate =	**54.22** l/s		Uxbridge	5 Year
Max.Storage =	**0.0** m3		a=	904
			b=	5
			c=	0.788

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
10.0	107.0	54.22	32.5	32.5	0.0	<<<<
11.0	101.7	51.53	34.0	35.8	-1.8	
12.0	97.0	49.12	35.4	39.0	-3.7	
13.0	92.7	46.96	36.6	42.3	-5.7	
14.0	88.8	45.00	37.8	45.5	-7.7	
15.0	85.3	43.22	38.9	48.8	-9.9	
16.0	82.1	41.59	39.9	52.0	-12.1	
17.0	79.1	40.09	40.9	55.3	-14.4	
18.0	76.4	38.71	41.8	58.6	-16.7	
19.0	73.9	37.43	42.7	61.8	-19.1	
20.0	71.5	36.25	43.5	65.1	-21.6	
21.0	69.4	35.15	44.3	68.3	-24.0	
22.0	67.3	34.12	45.0	71.6	-26.5	
23.0	65.4	33.15	45.8	74.8	-29.1	
24.0	63.7	32.25	46.4	78.1	-31.6	
25.0	62.0	31.40	47.1	81.3	-34.2	
26.0	60.4	30.60	47.7	84.6	-36.8	
27.0	58.9	29.84	48.3	87.8	-39.5	
28.0	57.5	29.13	48.9	91.1	-42.1	
29.0	56.2	28.45	49.5	94.3	-44.8	
30.0	54.9	27.81	50.1	97.6	-47.5	
31.0	53.7	27.20	50.6	100.8	-50.3	
32.0	52.5	26.62	51.1	104.1	-53.0	
33.0	51.4	26.06	51.6	107.3	-55.7	

MODIFIED RATIONAL METHOD

Area ID: 203

Area = **0.100** ha
"C" = **0.25**
AC= **0.0250**
Tc = **10.0** min
Time Increment = **1.0** min
Release Rate = **13.94** l/s
Max.Storage = **0.0** m3

Uxbridge 100 Year
a= 1799
b= 5
c= 0.810

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
10.0	200.6	13.94	8.4	8.4	0.0	<<<<
11.0	190.4	13.23	8.7	9.2	-0.5	
12.0	181.3	12.60	9.1	10.0	-1.0	
13.0	173.1	12.03	9.4	10.9	-1.5	
14.0	165.7	11.51	9.7	11.7	-2.0	
15.0	158.9	11.05	9.9	12.5	-2.6	
16.0	152.8	10.62	10.2	13.4	-3.2	
17.0	147.1	10.22	10.4	14.2	-3.8	
18.0	141.9	9.86	10.7	15.1	-4.4	
19.0	137.1	9.53	10.9	15.9	-5.0	
20.0	132.6	9.22	11.1	16.7	-5.7	
21.0	128.5	8.93	11.3	17.6	-6.3	
22.0	124.6	8.66	11.4	18.4	-7.0	
23.0	121.0	8.41	11.6	19.2	-7.6	
24.0	117.6	8.17	11.8	20.1	-8.3	
25.0	114.4	7.95	11.9	20.9	-9.0	
26.0	111.4	7.74	12.1	21.8	-9.7	
27.0	108.6	7.55	12.2	22.6	-10.4	
28.0	105.9	7.36	12.4	23.4	-11.1	
29.0	103.4	7.19	12.5	24.3	-11.8	
30.0	101.0	7.02	12.6	25.1	-12.5	
31.0	98.7	6.86	12.8	25.9	-13.2	
32.0	96.6	6.71	12.9	26.8	-13.9	
33.0	94.5	6.57	13.0	27.6	-14.6	

MODIFIED RATIONAL METHOD

Saleville Uxbridge
Job Number: 1715
Date: May 2016
Designer Initials: P.A.T.

Area ID: 203

Area = **0.100** ha
"C" = **0.25**
AC= **0.0250**
Tc = **10.0** min
Time Increment = **1.0** min
Release Rate = **7.44** l/s
Max.Storage = **0.0** m3

Uxbridge 5 Year
a= 904
b= 5
c= 0.788

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
10.0	107.0	7.44	4.5	4.5	0.0	<<<<
11.0	101.7	7.07	4.7	4.9	-0.2	
12.0	97.0	6.74	4.9	5.4	-0.5	
13.0	92.7	6.44	5.0	5.8	-0.8	
14.0	88.8	6.17	5.2	6.2	-1.1	
15.0	85.3	5.93	5.3	6.7	-1.4	
16.0	82.1	5.70	5.5	7.1	-1.7	
17.0	79.1	5.50	5.6	7.6	-2.0	
18.0	76.4	5.31	5.7	8.0	-2.3	
19.0	73.9	5.14	5.9	8.5	-2.6	
20.0	71.5	4.97	6.0	8.9	-3.0	
21.0	69.4	4.82	6.1	9.4	-3.3	
22.0	67.3	4.68	6.2	9.8	-3.6	
23.0	65.4	4.55	6.3	10.3	-4.0	
24.0	63.7	4.42	6.4	10.7	-4.3	
25.0	62.0	4.31	6.5	11.2	-4.7	
26.0	60.4	4.20	6.5	11.6	-5.1	
27.0	58.9	4.09	6.6	12.0	-5.4	
28.0	57.5	4.00	6.7	12.5	-5.8	
29.0	56.2	3.90	6.8	12.9	-6.1	
30.0	54.9	3.81	6.9	13.4	-6.5	
31.0	53.7	3.73	6.9	13.8	-6.9	
32.0	52.5	3.65	7.0	14.3	-7.3	
33.0	51.4	3.58	7.1	14.7	-7.6	

MODIFIED RATIONAL METHOD

Area ID: EXT1*

Area =	**3.000** ha
"C" =	**0.25**
AC=	**0.7500**
Tc =	**23.0** min
Time Increment =	**1.0** min
Release Rate =	**252.31** l/s
Max.Storage =	**0.0** m3

Uxbridge 100 Year
a= 1799
b= 5
c= 0.810

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
23.0	121.0	252.31	348.2	348.2	0.0	<<<<
24.0	117.6	245.24	353.1	363.3	-10.2	
25.0	114.4	238.60	357.9	378.5	-20.6	
26.0	111.4	232.35	362.5	393.6	-31.1	
27.0	108.6	226.45	366.8	408.7	-41.9	
28.0	105.9	220.87	371.1	423.9	-52.8	
29.0	103.4	215.60	375.1	439.0	-63.9	
30.0	101.0	210.59	379.1	454.2	-75.1	
31.0	98.7	205.84	382.9	469.3	-86.4	
32.0	96.6	201.32	386.5	484.4	-97.9	
33.0	94.5	197.02	390.1	499.6	-109.5	
34.0	92.5	192.92	393.6	514.7	-121.2	
35.0	90.6	189.00	396.9	529.9	-133.0	
36.0	88.9	185.26	400.2	545.0	-144.8	
37.0	87.1	181.68	403.3	560.1	-156.8	
38.0	85.5	178.25	406.4	575.3	-168.9	
39.0	83.9	174.96	409.4	590.4	-181.0	
40.0	82.4	171.80	412.3	605.6	-193.2	
41.0	80.9	168.77	415.2	620.7	-205.5	
42.0	79.5	165.86	418.0	635.8	-217.9	
43.0	78.2	163.05	420.7	651.0	-230.3	
44.0	76.9	160.35	423.3	666.1	-242.8	
45.0	75.7	157.75	425.9	681.2	-255.3	
46.0	74.5	155.24	428.5	696.4	-267.9	

*EXT1 Released Volume is routed through Catchment 201 Runoff Volume at a time of 23 minutes.

SCS consulting group ltd

MODIFIED RATIONAL METHOD

Saleville Uxbridge
Job Number: 1715
Date: May 2016
Designer Initials: P.A.T.

Area ID: EXT1*

Area = **3.000** ha
"C" = **0.25**
AC= **0.7500**
Tc = **23.0** min
Time Increment = **1.0** min
Release Rate = **136.43** l/s
Max.Storage = **0.0** m3

Uxbridge 5 Year
a= 904
b= 5
c= 0.788

Time (min)	Rainfall Intensity (mm/hr)	Storm Runoff (l/s)	Runoff Volume (m3)	Released Volume (m3)	Storage Volume (m3)	
23.0	65.4	136.43	188.3	188.3	0.0	<<<<
24.0	63.7	132.71	191.1	196.5	-5.4	
25.0	62.0	129.21	193.8	204.6	-10.8	
26.0	60.4	125.92	196.4	212.8	-16.4	
27.0	58.9	122.81	198.9	221.0	-22.1	
28.0	57.5	119.86	201.4	229.2	-27.8	
29.0	56.2	117.08	203.7	237.4	-33.7	
30.0	54.9	114.43	206.0	245.6	-39.6	
31.0	53.7	111.92	208.2	253.8	-45.6	
32.0	52.5	109.53	210.3	261.9	-51.7	
33.0	51.4	107.25	212.4	270.1	-57.8	
34.0	50.4	105.08	214.4	278.3	-64.0	
35.0	49.4	103.00	216.3	286.5	-70.2	
36.0	48.5	101.02	218.2	294.7	-76.5	
37.0	47.5	99.12	220.0	302.9	-82.8	
38.0	46.7	97.30	221.8	311.1	-89.2	
39.0	45.8	95.55	223.6	319.2	-95.7	
40.0	45.0	93.87	225.3	327.4	-102.1	
41.0	44.3	92.26	227.0	335.6	-108.7	
42.0	43.5	90.71	228.6	343.8	-115.2	
43.0	42.8	89.22	230.2	352.0	-121.8	
44.0	42.1	87.78	231.7	360.2	-128.4	
45.0	41.4	86.39	233.3	368.4	-135.1	
46.0	40.8	85.06	234.8	376.6	-141.8	

Subject Sizing BMPs for Water Quality
Project Saleville, Uxbridge
File No. 1715
Calculated by PAT
Checked by
Date Feb 25/16
Page 1 of 2

Using the CVC Low Impact Development Stormwater Management Planning and Design Guide BMP Sizing calculations for the proposed dry pond, two(2) rain gardens and two(2) infiltration trenches.

→ Since no infiltration rate specified in geotech/hydro G' report, the CVC guide specifies that highly permeable soils can have a maximum stone reservoir depth (dr) of 2m.
*Refer to Equation 1.

Dry Pond

(2) $A_f = \frac{WQV}{d_r \times V_r}$; where $d_r = 2m$

$V_r = 0.4$

$WQV = 0.46 ha \times 25mm \times 90\%$

$= 103.5 m^3$.

$= \frac{103.5 m^3}{(2m)(0.4)}$

$= 129.38 m^2$.

∴ The dry pond requires a minimum footprint surface area of 129.4 m² providing a water quality volume of 103.5 m³ (retention of full 25mm storm) The dry pond bottom (elevation of 280.0 has a footprint surface area of 240.4 m².

North infiltration Trench

(2) $A_f = \frac{WQV}{d_r V_r}$; where $d_r = 2m$

$V_r = 0.4$

$WQV = 0.11 ha \times 25mm \times 79\%$

$= 21.73 m^3$.

$= \frac{21.73 m^3}{(2m)(0.4)}$

$= 27.16 m^2$.

∴ The north infiltration requires a footprint of 27.2 m³, 45.5m L x 0.6m W x 2m deep to retain the full 25mm storm event.

SCS consulting group ltd

Subject Sizing BMP's for Water Quality.
Project Saleville, Uxbridge

File No.	Calculated by PAT Checked by	Date	Page
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South Infiltration Trench

(2) $A_f = \frac{WQV}{d_r V_r}$; where $d_r = 2m$

$V_r = 0.4$

$WQV = 0.13\,ha \times 25mm \times 79\%$

$= 25.68m^3$

$$= \frac{25.68m^3}{(2m)(0.4)}$$

$$= 32.09m^2$$

∴ The south infiltration trench requires a footprint of 32.09m², 57mL x 0.6mW x 2m Deep to retain the full 25mm storm event.

Rain Gardens.

(2) $A_f = \frac{WQV}{d_r V_r}$; where $d_r = 2m$

$V_r = 0.4$

$WQV = 3.82ha \times 25mm \times 19\%$

$= 181.45\,m^3.$

$$= \frac{181.45m^3}{(2m)(0.4)}$$

$$= 226.81m^2.$$

∴ The two(2) rain garden's require a total footprint of 226.8m². Therefore, each rain garden will have a footprint of 113.5m³ to retain the full 25mm storm event.

Other Design Resources

Several other manuals that provide useful design guidance for soakaways, infiltration trenches and infiltration chambers are:

Ontario Ministry of the Environment (OMOE). 2003. Stormwater Management Planning and Design Manual. Toronto, Ontario.

Center for Watershed Protection (CWP). 2007b. Urban Stormwater Retrofit Manual. Ellicott City, MD.

Greater Vancouver Regional District (GVRD). 2005. Stormwater Source Control Guidelines 2005.

New York State Stormwater Management Design Manual. http://www.dec.ny.gov/chemical/29072.html

Pennsylvania Department of Environmental Protection (PDEP). 2006. Stormwater Best Management Practices Manual.

BMP Sizing

The depth of the soakaway or infiltration trench is dependent on the native soil infiltration rate, porosity (void space ratio) of the gravel storage layer media (i.e, aggregate material used in the stone reservoir) and the targeted time period to achieve complete drainage between storm events. The maximum allowable depth of the stone reservoir for designs without an underdrain can be calculated using the following equation:

$$d_{r\,max} = i * t_s / V_r \quad — (1).$$

Where:

$d_{r\,max}$ = Maximum stone reservoir depth (mm)
i = Infiltration rate for native soils (mm/hr)
V_r = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)
t_s = Time to drain (design for 48 hour time to drain is recommended)

The value for native soil infiltration rate (i) used in the above equation should be the design infiltration rate that incorporates a safety correction factor based on the ratio of the mean value at the proposed bottom elevation of the practice to the mean value in the least permeable soil horizon within 1.5 metres of the proposed bottom elevation (see Appendix C, Table C2). On highly permeable soils (e.g., infiltration rate of 45 mm/hr or greater), a maximum stone reservoir depth of 2 metres is recommended to prevent soil compaction and loss of permeability from the mass of overlying stone and stored water.

For designs that include an underdrain, the above equation can be used to determine the maximum depth of the stone reservoir below the invert of the underdrain pipe.

Once the depth of the stone reservoir is determined the water quality volume, computed using the methods in the relevant CVC and TRCA stormwater management criteria documents (CVC, 2010; TRCA, 2010), can be used to determine the footprint needed using the following equation:

$A_f = WQV / (d_r * V_r)$ —(2).

Where:

A_f = Footprint surface area (m^2)
WQV = Water quality volume (m^3)
d_r = Stone reservoir depth (m)
V_r = Void space ratio for aggregate used (typically 0.4 for 50 mm clear stone)

The ratio of impervious drainage area to footprint surface area of the practice should be between 5:1 and 20:1 to limit the rate of accumulation of fine sediments and thereby prevent clogging.

Design Specifications

Recommended design specifications for soakaways and infiltration trenches are provided in Table 4.4.4 below. Infiltration chambers are typically proprietary designs with material specifications provided by the manufacturers.

Table 4.4.4 Design specifications for soakaways and infiltration trenches

Component	Specification	Quantity
Inlet/Overflow Pipe	Pipe should be continuously perforated, smooth interior, HDPE or equivalent material, with a minimum inside diameter of 100 millimetres.	Perforated pipe inlet/outlet should run lengthwise through the facility. Non-perforated pipe should be used for conveyance to the facility.
Stone	The facility should be filled with 50 mm clear stone with a 40% void ratio.	Volume of the facility is calculated by method in the previous section of this guide.
Geotextile	Material specifications should conform to Ontario Provincial Standard Specification (OPSS) 1860 for Class II geotextile fabrics. Should be woven monofilament or non-woven needle punched fabrics. Woven slit film and non-woven heat bonded fabrics should not be used as they are prone to clogging. Primary considerations are: - Suitable apparent opening size (AOS) for non-woven fabrics, or percent open area (POA) for woven fabrics, to maintain water flow even with sediment and microbial film build-up; - Maximum forces that will be exerted on the fabric (*i.e.*, what tensile, tear and	Based on the volume of the facility.

APPENDIX D

SANITARY FLOW CALCULATIONS

SCS consulting group ltd

Minimum Dia. = 200 mm
Mannings "n"= 0.013
Minimum Velocity = 0.6 m/s
Minimum Grade = 0.5 %
Avg. Domestic Flow = 364 l/c/d
Infiltration = 0.26 l/s/ha
Max. Peaking Factor= 0.0
Min. Peaking Factor= 2.0
Maximum Velocity = 3.65 m/s

SANITARY SEWER DESIGN SHEET
Saleville, Uxbridge
Township of Uxbridge

Project:
Project No:
Date:
Designed by:
NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	RESIDENTIAL							COMMERCIAL/INDUSTRIAL/INSTITUTIONAL					FLOW CALCULATIONS						
			AREA (ha)	ACC. AREA (ha)	UNITS (#)	DENISTY (P/ha)	DENSITY (P/unit)	POP	ACC. RES. POP.	AREA (ha)	ACC. AREA (ha)	EQUIV. POP. (p/ha)	FLOW RATE (l/s/ha)	ACC. EQUIV. POP.	INFILTRATION (l/s)	TOTAL ACC. POP.	PEAKING FACTOR	RES. FLOW (l/s)	COMM. FLOW (l/s)	TOTAL FLOW (l/s)	DIA. (mm)
PROPOSED DEVELOPMENT	MH 1A	EX MH	1.16	1.16	39		3	117	117	0	0	0	0	0	0.3	117	4.22	2.1	0.0	2.4	200

APPENDIX E

WATER DISTRIBUTION ANALYSIS

SCS consulting group ltd

Project No. 161-02428-00

March 4, 2016

Ms. Lindsay Moore. P.Eng.
SCS Consulting Group Ltd.
30 Centurian Drive, Suite 100
Markham, Ontario, L3R 8B8

Subject: Elgin Park Drive Development- Water Distribution Analysis

Dear Ms. Moore,

We are pleased to present the results of our water distribution analysis for the proposed development located off Elgin Park Drive in the Town of Uxbridge (Durham Region). The modelling for this development is based on static pressures provided by the Region in February 2016. A hydrant test should be performed on Elgin Park Drive to verify the available fire flow for the development.

We trust this meets your needs at this time. If you have any questions, please do not hesitate to call.

Yours truly,

WSP Canada Inc.

Kristin St-Jean, P.Eng.
Project Engineer

/ksj

WSP Canada Inc.
600 Cochrane Drive, Suite 500
Markham, ON L3R

Phone: +1 905-475-7270
Fax: +1 905-475-5994
www.wspgroup.com

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TABLES

IMAGES

APPENDICES

1 INTRODUCTION

WSP Canada Inc. was retained by SCS Consulting Group Ltd. to conduct a water distribution analysis of the proposed development located off Elgin Park Drive, east of Toronto Street South in the Town of Uxbridge (Durham Region).

The proposed development is comprised of 39 townhouses and will be serviced from the existing 300 mm watermain on Elgin Park Drive. The proposed development is shown on Figure 1.

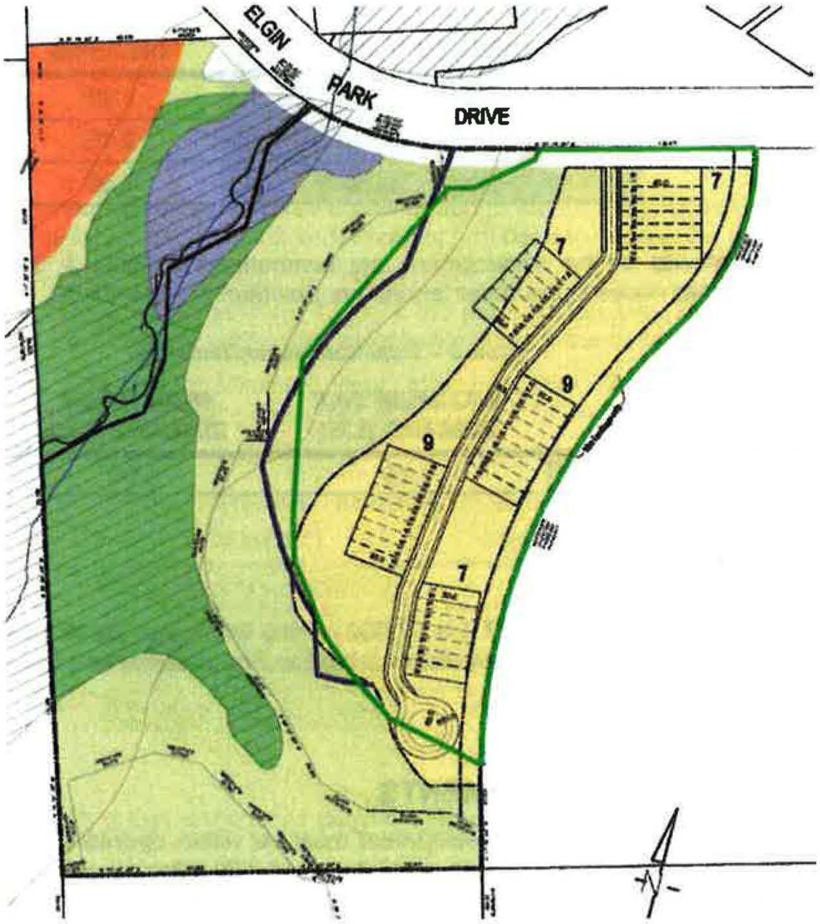


Figure 1 - Proposed Development

To complete this analysis, a model of the development was created in WaterGEMS using static pressure information provided by the Region.

2 DESIGN CRITERIA AND DEMANDS

2.1 DEVELOPMENT DEMANDS

The design criteria used to determine water demands were based on the Durham Region's Design Specifications (April 2014) and the Ministry of the Environment (MOE) Watermain Design Criteria (2008), as appropriate.

3.3 FIRE FLOW

The minimum required fire flow of 117 L/s is available at a minimum pressure of 140 kPa at all points within the development. As previously stated, a hydrant test should be performed to confirm available fire flows. Fire Flows are summarized below in Table 6.

Table 6 – Modelled Fire Flow

SCENARIO	REQUIRED FIRE FLOW	AVAILABLE FIRE FLOW	AVAILABLE PRESSURE
Maximum Day + Fire	117 L/s	119 L/s	140 kPa (20 psi)

A Fire Flow report is attached in Appendix B.

4 CONCLUSIONS

The proposed watermain layout for the development located off Elgin Park Drive can achieve the hydraulic requirements prescribed by the Region of Durham and the MOE watermain design criteria as summarized below.

- The service pressures are expected to range between 375 kPa and 482 kPa.
- The available fire flow meets the required fire flow demands at the minimum pressure of 140 kPa based on the proposed watermain configuration.
- A hydrant test should be performed on Elgin Park Drive to verify the available fire flow for the development.

Appendix A

CRITERIA, DEMANDS, LAYOUT

Durham Region Design Criteria

Average Day Consumption Rates	Litre/Capita/Day
Residential	450

Equivalent Population by Unit

Type of Development	Equivalent Population Density
	(Person/Unit)
Single Family or Semi-Detached	3.5
Townhouse	3.0
Apartment	2.5

Water Design Factors

Peaking Factor	Residential
Average Daily Demand (m3/capita)	1.00
Minimum Hour Demand	0.60
Maximum Daily Demand	1.90
Maximum Hourly Demand	2.85

Cofficient of Roughness

Size of Pipe (mm Dia.)	Coefficient of Roughness (C)
150	100
200-300	110
350-600	120
Over 600	130

Minimum Pipe Size

Type of Development	Size of Pipe (mm Dia.)
Residential	150
Industrial/Commercial	300

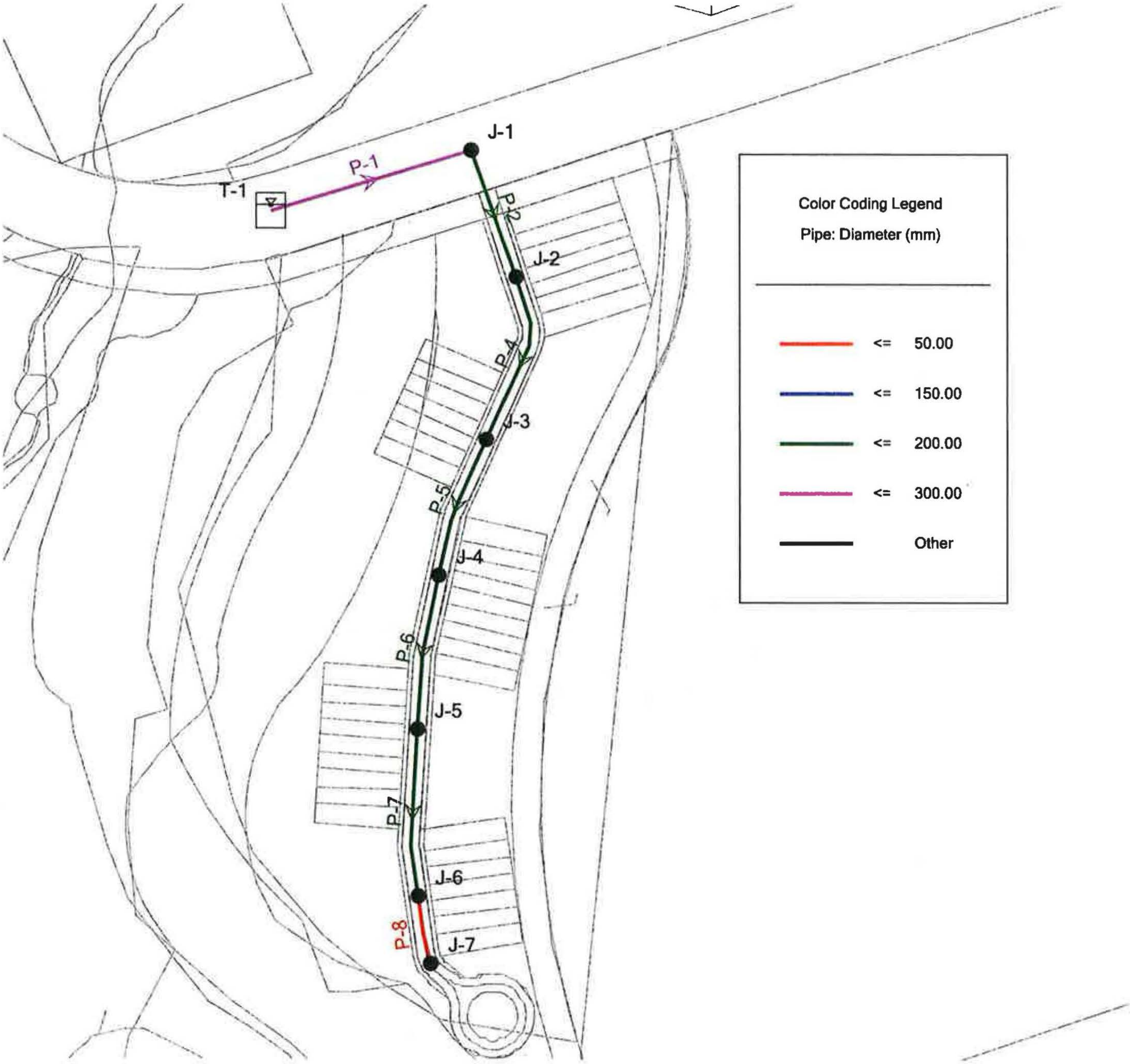
Working Pressures

Parameter	Pressure
Normal Condition	
Minimum Pressure	275 kPa (40 psi)
Target Pressure Range	350 - 550 kPa (50 - 80 psi)
Maximum (Building Code)	550 kPa (80 psi)
Acceptable Maximum	700 kPa (100 psi)
Fire Flow Conditions	
Minimum Pressure	140 kPa (20 psi)
Minimum Residential Fire Flow	4,500 L/min (75 L/s)

Hydraulic Analysis - Water Demand Calculations
Elgin Park Drive, Uxbridge
Revision Date: March 2016

Node	Elevation	Area by Type of Development	Equivalent Population	Water Demands				Fire Flow Demands
		Townhouse	Total Population	Average Day	Minimum Hour	Maximum Day	Peak Hour	
	(m)	*(units)*	*(Residential)*	*(L/s)*	*(L/s)*	*(L/s)*	*(L/s)*	*(L/s)*
J-2	282.51	7	21	0.11	0.07	0.21	0.31	(L/s)
J-3	283.12	7	21	0.11	0.07	0.21	0.31	117
J-4	284.11	9	27	0.14	0.08	0.27	0.40	117
J-5	285.26	9	27	0.14	0.08	0.27	0.40	117
J-6	286.55	7	21	0.11	0.07	0.21	0.31	117
TOTAL		**39**	**117**	**0.61**	**0.37**	**1.16**	**1.74**	

System Layout
Pipe and Node ID



Appendix B

MODEL RESULTS

Hydraulic Analysis - Model Results
Altona Road Development
Revision Date: March 2016

Minimum Hour

Node Table

Label	Elevation (m)	Demand (L/s)	Head (m)	Pressure (kPa)
J-1	282.15	0.00	331.38	481.81
J-2	282.51	0.07	331.38	478.28
J-3	283.12	0.07	331.38	472.31
J-4	284.11	0.08	331.38	462.62
J-5	285.26	0.08	331.38	451.37
J-6	286.55	0.07	331.38	438.74
J-7	288.12	0.00	331.38	423.38

Pipe Table

Label	Start Node	Stop Node	Length (m)	Diameter (mm)	Roughness (C)	Flow (L/s)	Velocity (m/s)
P-1	T-1	J-1	74.97	300.00	120.00	0.37	0.01
P-2	J-1	J-2	48.75	200.00	110.00	0.37	0.01
P-4	J-2	J-3	63.47	200.00	110.00	0.30	0.01
P-5	J-3	J-4	52.42	200.00	110.00	0.23	0.01
P-6	J-4	J-5	56.59	200.00	110.00	0.15	0.00
P-7	J-5	J-6	60.79	200.00	110.00	0.07	0.00
P-8	J-6	J-7	24.85	50.00	100.00	0.00	0.00

Maximum Day

Node Table

ID	Elevation (m)	Demand (L/s)	Head (m)	Pressure (kPa)
J-1	282.15	0.00	326.45	433.56
J-2	282.51	0.21	326.45	430.03
J-3	283.12	0.21	326.45	424.05
J-4	284.11	0.27	326.45	414.36
J-5	285.26	0.27	326.45	403.10
J-6	286.55	0.21	326.45	390.47
J-7	288.12	0.00	326.45	375.11

Pipe Table

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness (C)	Flow (L/s)	Velocity (m/s)
P-1	T-1	J-1	74.97	300.00	120.00	1.17	0.02
P-2	J-1	J-2	48.75	200.00	110.00	1.17	0.04
P-4	J-2	J-3	63.47	200.00	110.00	0.96	0.03
P-5	J-3	J-4	52.42	200.00	110.00	0.75	0.02
P-6	J-4	J-5	56.59	200.00	110.00	0.48	0.02
P-7	J-5	J-6	60.79	200.00	110.00	0.21	0.01
P-8	J-6	J-7	24.85	50.00	100.00	0.00	0.00

Peak Hour

Node Table

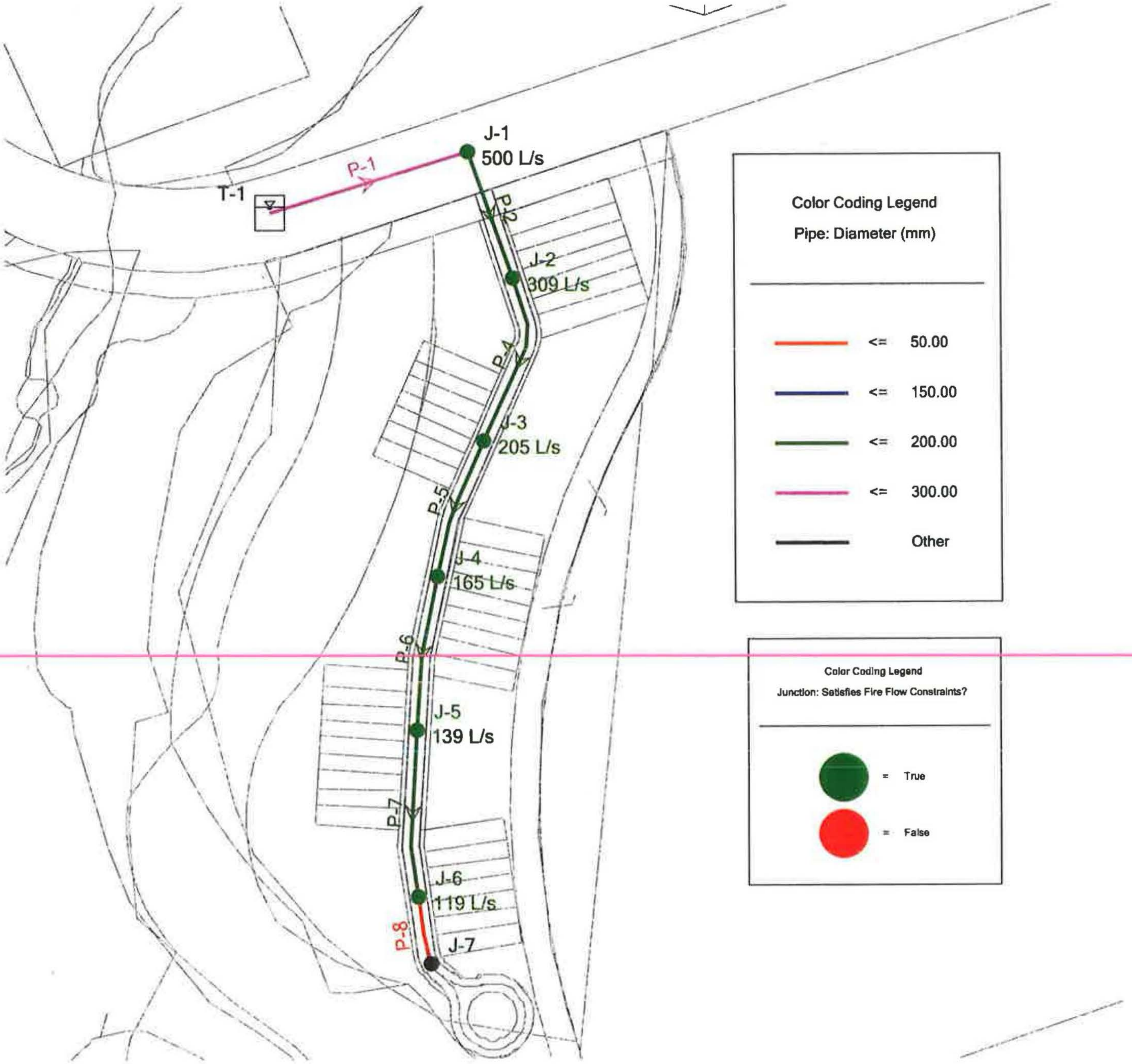
ID	Elevation (m)	Demand (L/s)	Head (m)	Pressure (kPa)
J-1	282.15	0.00	326.45	433.55
J-2	282.51	0.31	326.45	430.02
J-3	283.12	0.31	326.45	424.03
J-4	284.11	0.40	326.45	414.33
J-5	285.26	0.40	326.45	403.08
J-6	286.55	0.31	326.45	390.45
J-7	288.12	0.00	326.45	375.08

Pipe Table

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness (C)	Flow (L/s)	Velocity (m/s)
P-1	T-1	J-1	74.97	300.00	120.00	1.73	0.02
P-2	J-1	J-2	48.75	200.00	110.00	1.73	0.06
P-4	J-2	J-3	63.47	200.00	110.00	1.42	0.05
P-5	J-3	J-4	52.42	200.00	110.00	1.11	0.04
P-6	J-4	J-5	56.59	200.00	110.00	0.71	0.02
P-7	J-5	J-6	60.79	200.00	110.00	0.31	0.01
P-8	J-6	J-7	24.85	50.00	100.00	0.00	0.00

Fire Flow Table					
ID	Demand	Needed Flow	Available Flow	Pressure	**Fire Flow Met?**
	(L/s)	*(L/s)*	*(L/s)*	*(kPa)*	
J-1	0.00	117.00	500.00	325.35	TRUE
J-2	0.21	117.00	309.33	140.00	TRUE
J-3	0.21	117.00	204.53	140.00	TRUE
J-4	0.27	117.00	165.18	140.00	TRUE
J-5	0.27	117.00	138.62	140.00	TRUE
J-6	0.21	117.00	118.94	140.03	TRUE

Scenario: Maximum Day
Available Fire Flow



Appendix C

BACKGROUND INFORMATION

St. Jean, Kristin

From: Glen Severn <Glen.Severn@Durham.ca>
Sent: Wednesday, February 24, 2016 9:35 AM
To: St. Jean, Kristin
Cc: Jeff Almeida; Aaron Christie
Subject: RE: Elgin Park Drive - Water Model Info (Uxbridge)
Attachments: Water & San System Maps-Elgin Park Drive-Uxbridge-Feb 2016.pdf

Hi Kristin,

We have reviewed the servicing for the subject property and provide the following preliminary comments:

Water Supply:

The subject property is located within the Zone 1 Water Pressure District of the water supply system for Uxbridge. The estimated static water pressure for this area ranges between 437 kpa (63 psi) to 486 kpa (70 psi).

Water supply to the subject property is available from the existing 300 mm watermain on Elgin Park Drive. We have reviewed our files for available fire flow tests and we have no tests conducted in this area.

Sanitary Servicing:

Sanitary servicing to the subject property is available from the existing 200 mm sanitary sewer located on an existing easement on the north side of Elgin Park Drive.

Summary:

The above noted comments are preliminary and are subject to change. Detailed servicing comments will be provided upon a submission of a development application.

Please contact me at your convenience if you wish to discuss further.

Thanks,
Glen Severn
Region of Durham – Works Department
Engineering Planning & Studies Division
(905) 668-4113 extension 3529

From: St. Jean, Kristin [mailto:Kristin.St.Jean@wspgroup.com]
Sent: February-18-16 12:11 PM
To: Glen Severn
Subject: Elgin Park Drive - Water Model Info (Uxbridge)

Hi Glen,
The property is off Elgin Park Drive, east of Toronto St. South in Uxbridge (at the western limit of Wooden Sticks), I've attached a plan. We would connect to the Elgin Park watermain. Could you please confirm the available pressure, as well as the size of the Elgin Park watermain. If possible the maximum day, minimum hour and peak hour pressures would be helpful if you have them. Otherwise a recent hydrant test in the area would also work.
Thank you! Please let me know if you need any additional info.

Kristin

Kristin St-Jean, P. Eng.
Project Engineer

WSP Canada Inc.
600 Cochrane Drive, 4th Floor
Markham, Ontario, L3R 5K3
Cell 416-993-7356

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APPENDIX F

PHOSPHOROUS BUDGET CALCULATIONS

SCS consulting group ltd

Ontario

MINISTRY OF THE ENVIRONMENT

Database Version: **V 2.0 Release Update**
Update Date: **30-Mar-12**

Project DEVELOPMENT Summary

DEVELOPMENT: **Saleville**
Subwatershed: **Pefferlaw-Uxbridge Brook**

Total Pre-Development Area (ha):	**1.77**	Total Pre-Development Phosphorus Load (kg/yr):	**0.05**

Pre-Development Land Use	**Area (ha)**	**P coeff. (kg/ha)**	**P Load (kg/yr)**
Forest	1.77	0.03	0.05

DEVELOPMENT: **Saleville**
Subwatershed: **Pefferlaw-Uxbridge Brook**

POST-DEVELOPMENT LOAD

Post-Development Land Use	**Area (ha)**	**P coeff. (kg/ha)**	**Best Management Practice applied with P Removal Efficiency**		**P Load (kg/yr)**
Forest	0.12	0.03	Dry Detention Ponds	**100%**	0.00
			Drainage to be directed to a dry pond with an infilatrion bottom		
NOTE: BMP efficiency has been adjusted from the reference provided value by 90% (from 10% to 100%)					
Forest	0.49	0.03	Other	100%	0.00
			Drainage to be directed to a rain garden, then a dry pond with an infiltration bottom.		
High Intensity - Residential	0.24	1.32	Vegetated Filter Strips/Stream Buffers	**88%**	0.04
			Uncontrolled drainage to landscaped area		
NOTE: BMP efficiency has been adjusted from the reference provided value by 23% (from 65% to 88%)					
High Intensity - Residential	0.46	1.32	Dry Detention Ponds	**100%**	0.00
			Drainageto be directed to a dry pond with an infilatrion bottom		
NOTE: BMP efficiency has been adjusted from the reference provided value by 90% (from 10% to 100%)					
High Intensity - Residential	0.46	1.32	Other	100%	0.00
			Drainage to be directed to a rain garden, then a dry pond with an infiltration bottom.		

Post-Development Area Altered:	**1.77**
Total Pre-Development Area:	**1.77**
Unaffected Area:	0

	P Load (kg/yr)
Pre-Development:	**0.05**
Post-Development:	**1.55**
Change (Pre - Post):	**-1.50**
	2818% Net Increase in Load
Post-Development (with BMPs):	**0.04**
Change (Pre - Post):	**0.01**
	24% Net Reduction in Load

DEVELOPMENT: **Saleville**
Subwatershed: **Pefferlaw-Uxbridge Brook**

CONSTRUCTION PHASE LOAD

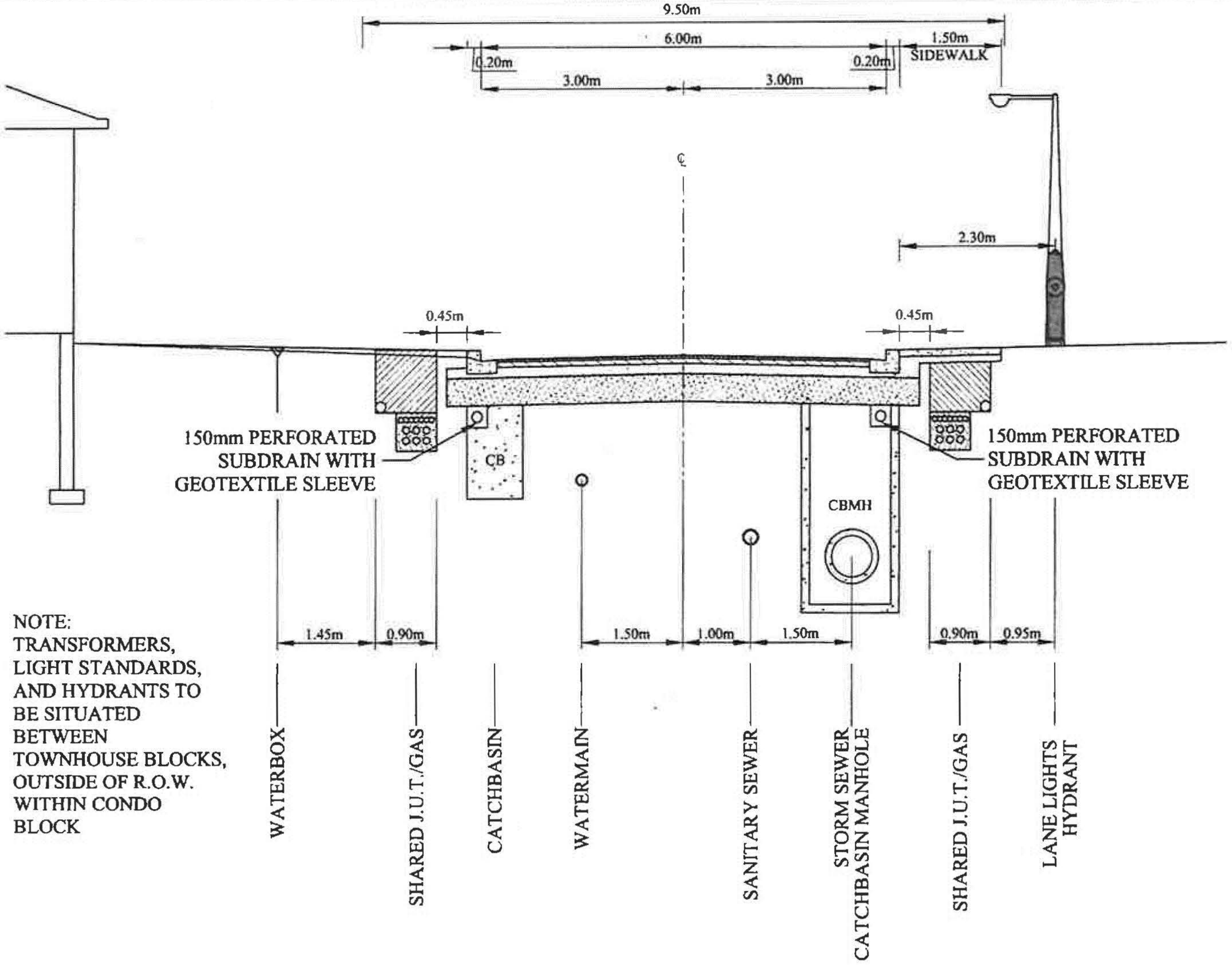
SUMMARY WITH IMPLEMENTATION OF BMPs	**P Load (kg/yr)**
Pre-Development:	**0.05**
Construction Phase Amortized Over 8 Years :	to be determined
Post-Development:	**0.04**
Post-Development + Amortized Construction:	**to be determined**
Pre-Development Load - Post-Development Load:	**0.01**
Conclusion:	**24% Reduction in Load**
Pre-Development Load - (Post-Development + Amortized Construction Load):	**to be determined**
Conclusion:	**to be determined**

Based on a comparison of Pre-Development and Post-Development loads, and in consideration of Construction Phase loads, the Ministry would encourage the Municipality to:

APPENDIX G

RIGHT-OF-WAY CONCEPT

SCS consulting group ltd



NOTE:
TRANSFORMERS, LIGHT STANDARDS, AND HYDRANTS TO BE SITUATED BETWEEN TOWNHOUSE BLOCKS, OUTSIDE OF R.O.W. WITHIN CONDO BLOCK

9.5 m RESIDENTIAL PRIVATE R.O.W.

SCALE 1:100