# Functional Servicing and Stormwater Management Report

## Losani Homes
## Fifth Wheel Development
## Town of Grimsby


**R.J. Burnside & Associates Limited**
**1465 Pickering Parkway Suite 200**
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**October 2019**
**300040159.0000**

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| 0 | Yes | Shoreplan Engineering Limited |

## Record of Revisions

| Revision | Date | Description |
|---|---|---|
| 0 | June 1, 2018 | Issued for Draft Plan Application |
| 1 | October 2019 | Re-issued 2nd Submission Draft Plan Application |

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# 1.0 Introduction and Planning Context

R.J. Burnside & Associates Limited (Burnside) has been retained by Losani Homes (Losani) to prepare a Functional Servicing and Stormwater Management Report (FSR/SWM) in support of the proposed residential development.

The Losani plan of subdivision is proposed to be located on Lot 16 of Part of Broken Front Concession, and Lot 17 of Concession 1, in the Town of Grimsby, Regional Municipality of Niagara. This subject site, generally located east of Casablanca Boulevard and north of the North Service Road, is approximately 6.9 hectares (ha) in area and is bounded by the North Service Road to the south and west, an existing residential lot to the east, and Lake Ontario to the north. Refer to Figure 1 in Appendix A for the site location. The proposed development includes 1,276 units consisting of a combination of back to back townhomes, on-street townhouses, and multi-story apartment style condominiums with 7500 $m^2$ employment/commercial space located on the first floor.

Portions of the site will be dedicated to the Town including Wintston Road and the open spaces associated with the watercourses and Lake Ontario shoreline. The Lake Ontario shoreline will be improved with revetment walls and public amenities. The proposed Site Plan is included in Appendix A.

## 1.1 Existing Site Conditions

The site is located approximately 2 km north of the Niagara Escarpment and is generally flat, gently draining northward towards Lake Ontario. The site is situated in the former location of the Fifth Wheel Truck Stop. Two existing buildings located within the subject lands will be demolished. A watercourse roughly bisects the site and outlets to Lake Ontario. The east portion of the site is vacant. Much of the site has been cleared, and the remainder is predominantly landscaped or naturally vegetated.

## 1.2 Site Soils

Soil-Mat Engineering & Consultants Ltd. completed a geotechnical investigation for the subject site, dated January 15, 2016. The Geotechnical Report can be made available if necessary.

A total of 14 boreholes were drilled on site as part of the geotechnical investigation, and an additional 17 boreholes as part of a Phase II Environmental Site Assessment.

Topsoil with an approximate thickness of 0.6 m was observed in formerly landscaped areas of the site. Silty clay or silty sand fill was observed beneath the pavement structure, at depths ranging from 1.1 to 1.8 m. In general, the site is comprised of native silty clay proven to depths ranging from 3.5 to 11.3 m below grade. Static groundwater depth was reported from 3 to 6 m below grade, fluctuating up to 1.5 m between summer and winter.

Queenston Shale was encountered beneath the silty clay in several boreholes at varying depths from 3.6 to 10.7 m below grade. The report notes that the Shale is shallowest along the south and west areas of the site, stepping down to the east and north.

## 2.0 Water Distribution

The proposed water network will be designed to current Region of Niagara, Town of Grimsby and MECP (formerly MOECC) criteria and specifications. In the absence of Town of Grimsby Design Standards, the domestic water and fire flow demands will be calculated using the MECP guidelines subject to the approval of the Town of Grimsby. The anticipated water demand based on 300 L/cap/day is 1.012 MLD.

The site will be serviced by a new looped watermain that will be connected in two locations to an existing 300 mm watermain situated on the North Service Road. The proposed water distribution system is depicted on Drawing C101 (Appendix B). Appropriate valving and hydrant placement will be determined at the detailed design stage.

# 3.0 Wastewater Servicing

## 3.1 Local Servicing

The proposed wastewater collection system will be designed and constructed to current Region of Niagara, Town of Grimsby and MOECC criteria and specifications. Preliminary sewer sizing has carried out based on the following assumptions:

- Residential flow rate – 275 litres per capita per day
- Infiltration – 0.286 litres per second per hectare
- Peaking Factor – Harmon Peaking Factor Formula
- Population Densities
  - Townhouse Units – 3.1 people per unit
  - Condo Apartment Units-2.0 people per unit (1-3 bedroom units)
  - Retail/Commercial Space – 200 people/ha

The preliminary design sheet is provided in Appendix C. The peak dry weather flow leaving the site is estimated to be 30.3 L/s and the peak wet weather flow is estimated to be 31.7 L/s. The site will be serviced by a network of local sewers that will outlet in several locations to an existing 525 mm trunk sewer located with the North Service Road right of way. The site is designed such that all of the units can be serviced by gravity. Drawing C301(Appendix B) presents the preliminary sanitary servicing scheme for the site and drainage areas.

## 3.2 Regional Servicing

The Niagara Region Master Servicing Plan (2016) outlines Regional sanitary serving requirements through 2041. The site is tributary to the following Regional infrastructure:

1. Roberts Road Sanitary Pumping Station (SPS)

2. The Lake Street SPS

3. The Baker Road Wastewater Treatment Plant (WWTP)

An excerpt from the 2016 Master Servicing Plan (MSP) showing a schematic of the collection system has been included in Appendix C.

### 3.2.1 Roberts Road SPS

The MSP concluded that the Roberts Road SPS did not require upgrades although there is a very minor theoretical deficiency (2.2 L/s) in the 2041 timeframe. The Roberts Road SPS has a capacity of 256 L/s. In 2014, the existing peak wet weather flow in the Roberts Road SPS was 187.2 L/s. The MSP assumes a population growth of 5,560 (residential and non-residential combined) for the Roberts Road catchment. This project estimates to contribute ~2,750 in population which depends on the combination of 1,2 and 3 bedroom unit types. The current operating data for the Roberts Road pumping station was not readily available at the time this report was prepared.

### 3.2.2 Lake Street SPS

The MSP identifies required improvements to the Lake Street SPS. In 2014, the MSP reported a current peak wet weather flow of 404 L/s compared to the design capacity of 325 L/s. Through discussions with Niagara Region staff it is understood that the Lake Street SPS is currently planned to be upgraded in 2021.

### 3.2.3 Baker Street WWTP

The MSP identifies upgrades to the Baker Road WWTP before 2041. The MSP identified an average daily flow of 20.5 MLD and a capacity of 32.5 MLD in 2014. The proposed development is expected to increase the average daily flow to the WWTP by about 0.82 MLD.

### 3.2.4 MSP Update

In July 2019, Niagara Region issued and RFP for updates to the 2009 Pollution Prevention and Control Plan and the 2016 Waste Water Master Plan specifically relating to the Baker Road WWTP. This new study will revisit and update the findings of the previous studies as it relates to extraneous flows, accommodation of future growth and capital needs. These studies will input to an update to the 10-year capital plan in support of the 2020 capital works budget.

# 4.0 Storm Drainage

## 4.1 Existing Drainage Conditions

The subject lands are located within the Lake Ontario South Shore Watershed and the Niagara Peninsula Conservation Authority's (NPCA) Grimsby Watershed Planning Area. Although the topography of the site is relatively flat outside of the shoreline area, onsite overland drainage is generally directed northward, towards Lake Ontario.

The subject lands contain an unnamed watercourse which bisects the site. The watercourse is a direct tributary to Lake Ontario. It conveys flows from approximately 105.6 ha of external lands to the southern property boundary via a series of culverts under the South Service Road, the Queen Elizabeth Way and the North Service Road. The existing culvert locations are shown on Figure 2 (See Appendix A) and summarized in Table 1. The 100-year peak discharge in the watercourse is 6.04 $m^3/s$ (Odan/Detech Group, 2005).

**Table 1: Existing Culverts**

| Road Crossing | Existing Culvert Size and Type |
|---|---|
| South Service Road | 2.44 x 1.22 m concrete box |
| QEW | 3.35 x 1.22 m concrete box |
| North Service Road | 2.44 x 1.22 m concrete box |

Local runoff from the site sheet drains either directly to Lake Ontario or to the existing watercourse.

## 4.2 Proposed Drainage

### 4.2.1 Stormwater Quantity Control

The site is directly adjacent to Lake Ontario and therefore onsite quantity controls are not required.

### 4.2.2 Stormwater Quality Control

Stormwater quality control will be provided for the site to Enhanced Level Control as defined by the MOECC guidelines to achieve a total suspended solids removal rate of 80%.

Quality control for the majority of the site will be accomplished through the use of Oil Grit Separators (OGS). Five oil grit separators are proposed in locations indicated on Drawing C302 (Appendix B). Preliminary OGS sizing calculations are provided in Appendix D.

Several areas within the site will discharge untreated/uncontrolled runoff as the flows are deemed clean. These areas are:

- The 1.56 ha Open Space Block Adjacent to Lake Ontario (Areas 8.1, 8.2, 8.3)
- The 0.21 ha Open Space Channel Block that bisects the site (Area 8.4)
- 1.62 ha of rooftops and landscaped amenity areas (Areas 2.4, 2.5, 6.1, 6.2, 7.1, 7.2)

Table 2 summarizes the OGS sizing and describes the roof, open space, and amenity areas which are not treated by an OGS as the runoff has been deemed clean.

**Table 2: Oil and Grit Separator Sizing and TSS Removal**

| Catchment IDs | Drainage Area (ha) | Runoff Coefficient | Imperviousness (%) | Treatment | OGS Type |
|---|---|---|---|---|---|
| 1.1, 1.2, 1.3 | 1.37 | 0.74 | 77.1 | OGS1 | STC 4000 |
| 2.1, 2.2, 2.3 | 1.39 | 0.90 | 100.0 | OGS2 | STC 5000 |
| 2.4, 2.5 | 0.58 | 0.67 | 100.0 | Roof and Amenity Area | N/A |
| 3.1, 3.2 | 0.88 | 0.90 | 100.0 | OGS3 | STC 3000 |
| 4.1, 4.2 | 0.69 | 0.90 | 100.0 | OGS4 | STC 2000 |
| 5.1, 5.2, 5.3 | 0.6 | 0.90 | 100.0 | OGS5 | STC 2000 |
| 6.1, 6.2 | 0.5 | 0.90 | 100.0 | Roof | N/A |
| 7.1, 7.2 | 0.54 | 0.90 | 100.0 | Roof | N/A |
| 8.1, 8.2, 8.3, 8.4 | 1.77 | 0.67 | 67.8 | Open Space | N/A |
| **TOTAL** | 8.32 | 0.81 | 87.1 | | |

### 4.2.3 Minor System Drainage

The local on-site storm sewers will be sized to convey the 5-year storm. Drawing C302 (Appendix B) presents the drainage areas and proposed storm sewer network.

A design sheet for storm drainage system is provided in Appendix C.

Minor runoff from the majority of the site will be conveyed by a series of storm sewers to four (4) local inlets to the watercourse located in the centre of the site.

Runoff from the remainder of the site and the North Service Road will be conveyed within a 600 mm diameter sewer located within the proposed public road that will outlet directly to Lake Ontario.

#### 4.2.4 External Drainage

**External Area 1**

Drainage from this 105.1 ha area is conveyed through the existing 3.35 x 1.22 m culvert under the QEW and will be conveyed to the site via proposed twin 2.44 x 1.22 m box culverts under the North Service Road. There is currently only a single 2.44 x 1.22 box crossing the North Service Road.

The twin 2.44 x 1.22 culverts have been sized to convey the 100-year peak flow rate of 6.04 $m^3/s$. This peak flow was documented in a 2005 report prepared by the Odan/Detech Group (Refer to Figure 2 for external drainage area details).

A hydraulic grade line analysis of the twin culverts was conducted in HEC-RAS to determine water levels during the 100-year event. The analysis, summarized in Section 4.2.5 and detailed in Appendix E, confirms that the proposed twin 2.44 x 1.22 m culverts do not cause any backwater effects on the existing QEW culvert (refer to Appendix E).

**External Area 2**

This drainage area consists of a 4.65 ha undeveloped parcel located west of the site and across from North Service Road. Runoff from this area is captured by a drainage ditch running north along the west side of North Service Road and is conveyed under the road by an existing 750 mm diameter culvert which discharges into Lake Ontario. Based on the Town of Grimsby improvement plans for North Service Road (Plan Reference No. PWC1-02-320102), the ditch along the road will be improved and the existing culvert will be replaced by an 800 mm diameter CSP culvert and the drainage pattern will be maintained. Refer to Drawing C302 (Appendix B).

**External Area 3**

This 1.64 ha area consists of the portion of North Service Road fronting the project. The storm sewer system for the site has been designed to convey runoff from this area to the site's outfalls, which discharge the flows to Lake Ontario after being treated by the oil grit separators. Refer to Drawing C302 (Appendix B).

#### 4.2.5 Watercourse

The existing watercourse is proposed to be modified to a trapezoidal channel with a 7.5 m base width and 3:1 side slopes and bed slopes ranging from 0.5% to 1.5%. It will have sufficient capacity to convey the major runoff from the site and the 6.04 $m^3/s$ 100-year runoff from the External Drainage Area 1.

Hydraulic capacity calculations for the proposed channel are included in Appendix E. A low flow channel is proposed to convey runoff from frequent storm events. The low flow channel will have a base width of 0.5 m, 2:1 side slopes and a depth of 0.4 m.

Twin 1.80 x 0.90 m culverts are proposed at a local road crossing approximately halfway along the longitudinal length of the watercourse.

A hydraulic grade line analysis of the watercourse during the 100-year event was performed in HEC-RAS from the downstream end of the watercourse to the upstream end of the existing 3.35 x 1.22 m culvert under the QEW. The analysis included the two proposed culvert crossings (twin 2.44 x 1.22 m box culverts under North Service Road and twin 1.80 x 0.90 m box culverts at the local proposed watercourse crossing) as well as the existing crossing under the QEW. Results of the analysis confirmed that there is no impact on the 3.35 x 1.22 m culvert under the QEW at the outlet south of North Service Road. The 100-year peak flow can be conveyed with no surcharge of the existing QEW culvert or the proposed 2.44 x 1.22 m culverts. Details of the hydraulic grade line analysis are included in Appendix E.

At the downstream end of the watercourse at the location of the revetment wall, an approximate 2 m elevation drop is required to reach the lake elevation. To accommodate this, the revetment wall will be integrated with a series armourstone drops and plunge pools, designed to dissipate the energy from the watercourse flow and eliminate scour as the watercourse discharges to Lake Ontario. A conceptual design of the armourstone step outfall is included on drawing 203.

At the detailed design stage, a functional design of the open channel will be provided to confirm final details of the open channel and connection to the lake.

#### 4.2.6 Major System Drainage

Major system flows from the site will be conveyed overland within the public right of way and will outlet to Lake Ontario via the modified watercourse traversing the site.

The direction of major system flows are shown on the Grading and Storm Drainage Area plans C201 and C302 located in Appendix B.

It is not anticipated that any major system flows will originate from the QEW as the highway ditches will convey flows away from the site.

### 4.2.7 Foundation Drainage

The site design can provide for the gravity drainage of foundations to at least the P1 level (first sub surface parking level) or elevation 279.70. The average water surface elevation of the lake is approximately 275 m. The extent of sub surface parking is yet to be determined, as such, foundation drainage and groundwater impacts are yet to be assessed.

## 5.0 Site Grading

Site grading design is depicted on Drawing C201 (Appendix B) and sections are provided on Drawing C202 (Appendix B), and addresses the following constraints:

- Conforms to Town of Grimsby's grading criteria.
- Matches existing boundary grading conditions (interim condition).
- Considers shoreline setbacks and grading as outlined in Shoreline Hazards Assessment by Shoreplan Engineering (Jan 14, 2016).
- Provides urbanization of the North Service Road along the frontage of the site as well as Winston Road.
- Provides overland flow route to discharge major flows to Lake Ontario.
- Provides minimum cover to allow the installation of a storm sewer network which discharges to Lake Ontario as well as the sanitary sewer network which discharges to the trunk sewer on North Service Road.
- Provides an open channel with stable 3:1 side slopes and 7.0 m buffers for conveyance of external drainage.

# 6.0 Road Design

The site will be serviced by a combination of private roads and driveways as well as public roads. A new public road (Winston Road) is proposed to loop through the site and connect to the North Service Road in two locations. The road pattern is depicted on Drawing C101 (Appendix B).

## 6.1 Public Roads

Winston Road is proposed to be constructed with three unique cross sections.

The public road cross sections have the following design elements:

- Crowned or super-elevated with a minimum 2% cross fall
- Curb and Gutter as per OPSD 600.040
- 1.5 m wide sidewalk on at least one side
- Two driving lanes with a minimum of 6.0 m of total pavement
- Layby parking with a minimum width of 2.5 m or perpendicular parking with a depth of 6 m.

Typical sections for the Winston Road right-of-way are provided on Drawing C202 (Appendix B).

## 6.2 Private Roads

The proposed private roads will be designed in conjunction with the Site Plan Application. The traffic study that accompanies this application addresses intersection spacing for the key driveway accesses that will serve the condominium development.

## 6.3 North Service Road

The Town of Grimsby has provided design drawings showing an urbanization of the North Service Road to the west of this project. It is anticipated that a portion of the North Service Road along the site frontage will be urbanized. The proposed grading design makes accommodation for urbanization of the north side of the north Service Road.

The ultimate improvements to the North Service Road will likely be determined as part of a traffic study supporting this application.

Accommodation for drainage improvements for the entire width of the North Service Road right of way (now 22.5 m) across the site frontage have been made in the drainage design for the development.

## 7.0 Erosion and Sediment Control Plan

The Erosion and Sediment Control Plan for the site will be designed in conformance with the Town of Grimsby and NPCA guidelines. Erosion and sediment control will be implemented for all construction activities including topsoil stripping, foundation excavation and stockpiling of material.

The following erosion and sediment control measures will be installed and maintained during construction:

- Prior to grading, a temporary sediment control fence will be placed around perimeter of all areas that will be disturbed.
- Sediment traps will be provided.
- Gravel mud mats will be provided at all construction access points to minimize off site tracking of sediments.
- Sediment control ponds may be required depending on the total area of the disturbed site and number of natural outlets.
- All temporary erosion and sediment control measures will be routinely inspected and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable.

A preliminary Erosion and Sediment Control Design is included as Drawing C401 (Appendix B).

# 8.0 Operations and Maintenance

Required operation and maintenance activities for the oil grit separators are identified in this section as per Table 6.2 from the MECP SWM Manual. Once the storm system has been approved for operation, the inspection and maintenance procedures described in this section must be followed. Initially, this will entirely be the responsibility of the developer until OGS-X, OGS-Y, and OGS-Z are assume by the Town of Grimsby. OGS-A and OGS-B are to remain privately owned, and maintenance will remain the responsibility of the owner.

Inspections should occur at regular intervals, and the oil grit separators must be cleaned out as recommended by the manufacturer. Cleanout frequency will be based on site conditions, for example, during construction and post-construction when the soils are initially unstable there is likely to be more suspended solids that end up in the oil grit separators, requiring more frequent cleanout. Similarly, the application of road sand in the winter may cause additional sediment build-up, which would lead to a higher cleanout frequency.

All outfalls (to Lake Ontario and to the watercourse) should be inspected for signs of erosion. Inspections should be carried out during construction and on an annual basis or following large rainfall events. Any problems should be identified and mitigated immediately.

## 9.0 Conclusions

This report has presented a functional design of site servicing and grading at the proposed development. Further refinement will be performed at the detailed design stage. Functional design for the proposed development can be summarized as follows:

- The proposed storm drainage system will be designed in compliance with the NPCA guidelines, MECP guidelines, and the Town of Grimsby Design Standards.
- Stormwater quantity control is not required as the site is adjacent to Lake Ontario.
- Stormwater quality control will be provided to an enhanced level of control through five oil and grit separators.
- Two outlets to Lake Ontario are proposed to provide local drainage of the internal lands, and conveyance of runoff from external lands.
- External drainage will be conveyed through the re-engineered watercourse. A functional design of the open channel will be provided to the agencies for review to confirm final details at the detailed design stage.
- Water servicing will be accomplished by connection to the existing 300 mm diameter watermain along North Service Road.
- Sanitary servicing will be accomplished by connection to an existing 525 mm diameter sanitary trunk sewer located within the North Service Road.
- The site is tributary to the Roberts Road SPS, the Lake Street SPS and the Baker Street WWTP. An MSP update has been commissioned by Niagara Region for lands that are tributary to the Bake Street WWTP.
- The site will be accessed by public roads and private driveways site entrances from North Service Road and Winston Road.
- Winston Road will be developed as a public road with layby and perpendicular parking.

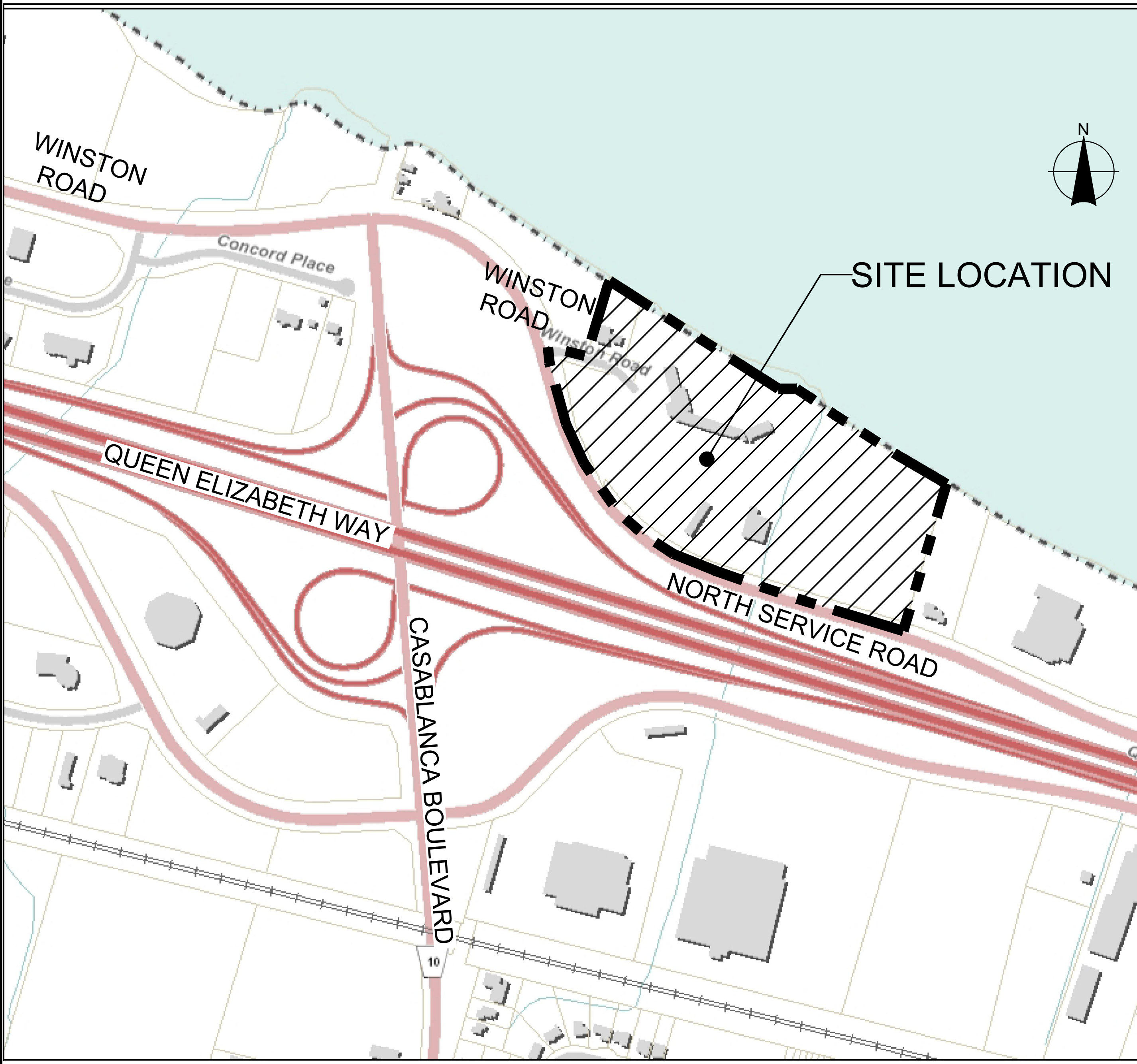
## 10.0 References


- "Stormwater Management Study Q.E.W. From Fifty Road to East of Casablanca Boulevard", prepared for Ontario Ministry of Transportation by Marshall Macklin Monaghan Limited, September 1994
- "Stormwater Management Guidelines", prepared for Niagara Peninsula Conservation Authority by AECOM, March 2010
- "Stormwater Management Planning and Design Manual", prepared by Ministry of the Environment, 2003
- "Shoreline Hazard Assessment: Fifth Wheel Truck Stop Property", prepared by Shoreplan Engineering Limited, January 2016
- "Geotechnical Investigation: Proposed Residential Development, Fifth Wheel – 398 North Service Road", prepared for Losani Homes by Soil-Mat Engineers & Consultants Limited, January 2016
- "Loblaw Properties Ltd. Casablanca Blvd and South Service Rd, Commercial Development, Final Engineering Report", prepared for Loblaw Properties Ltd. by The Odan/Detech Group Inc., November 2005

# Appendix A

# Figures

Site Plan
Figure 1: Site Location
Figure 2: External Drainage Area Plan




BURNSIDE

Figure Title TOWNSHIP OF NORTH GRIMSBY

**FIFTH WHEEL REDEVELOPMENT**

LOCATION MAP

| Client | Drawn | Checked | Date | Figure No. |
|---|---|---|---|---|
| **LOSANI HOMES** | AH | SH | 2017/07/24 | **FIG-1** |
| | Scale | | Project No. | |
| | N.T.S. | | 300040159 | |

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BURNSIDE

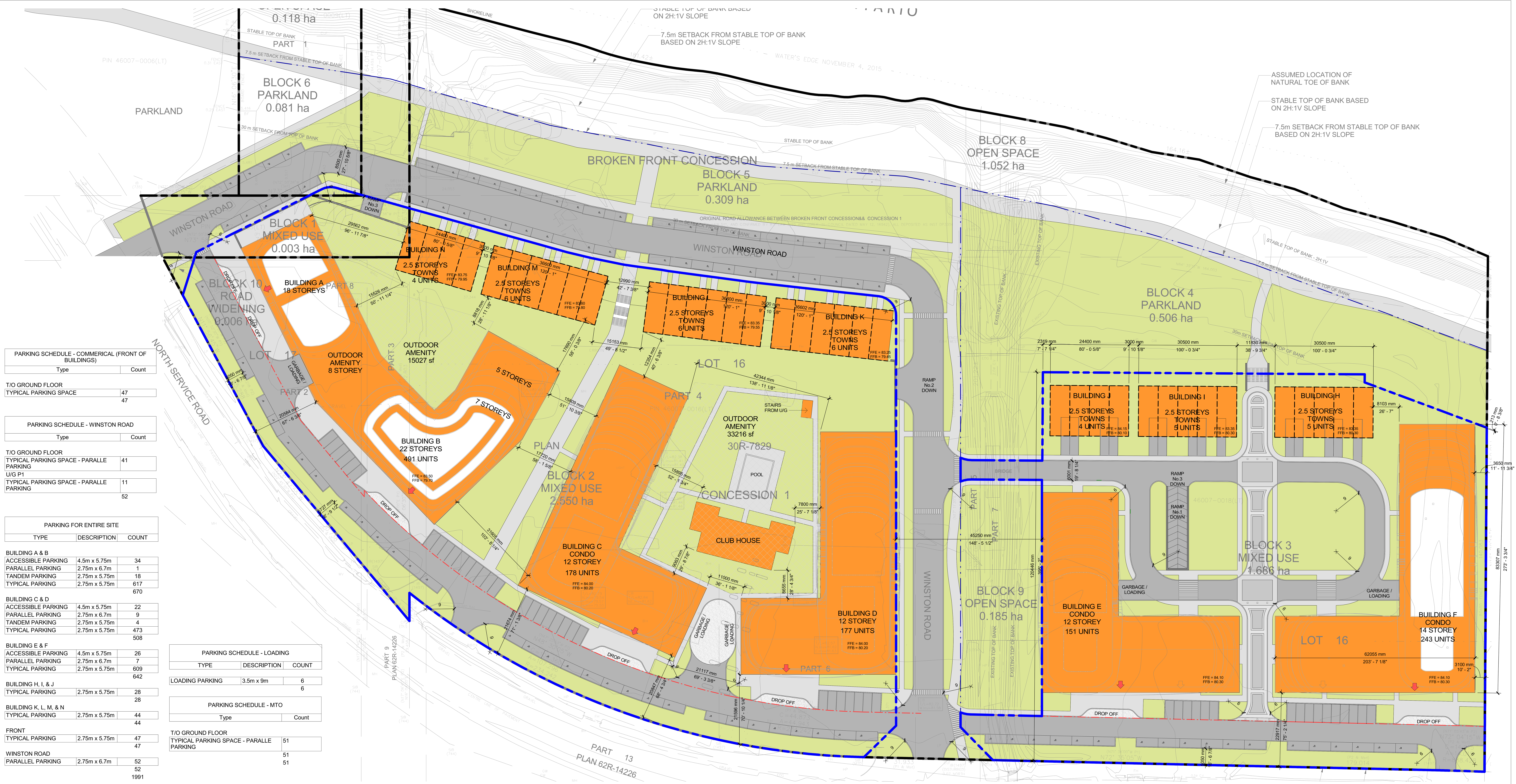
Figure Title

**FIFTH WHEEL REDEVELOPMENT**

EXISTING DRAINAGE

| Client | Drawn | Checked | Date | Figure No. |
|---|---|---|---|---|
| **LOSANI HOMES** | AC | JS | 17/07/24 | **FIG-2** |
| | Scale: 1:10000 | | Project No.: 300040159 | |

File: \\192.168.71.100\Shared Work Areas\040159 - Losani Fifth Wheel\Drawings\06_Figures\FIG 2 - EXISTING DRNG.dwg Date Plotted: July 24, 2017 - 3:08 PM




| PARKING SCHEDULE - COMMERICAL (FRONT OF BUILDINGS) | |
|---|---|
| Type | Count |
| T/O GROUND FLOOR | |
| TYPICAL PARKING SPACE | 47 |
| | 47 |

| PARKING SCHEDULE - WINSTON ROAD | |
|---|---|
| Type | Count |
| T/O GROUND FLOOR | |
| TYPICAL PARKING SPACE - PARALLE PARKING | 41 |
| U/G P1 | |
| TYPICAL PARKING SPACE - PARALLE PARKING | 11 |
| | 52 |

| PARKING FOR ENTIRE SITE | | |
|---|---|---|
| TYPE | DESCRIPTION | COUNT |
| BUILDING A & B | | |
| ACCESSIBLE PARKING | 4.5m x 5.75m | 34 |
| PARALLEL PARKING | 2.75m x 6.7m | 1 |
| TANDEM PARKING | 2.75m x 5.75m | 18 |
| TYPICAL PARKING | 2.75m x 5.75m | 617 |
| | | 670 |
| BUILDING C & D | | |
| ACCESSIBLE PARKING | 4.5m x 5.75m | 22 |
| PARALLEL PARKING | 2.75m x 6.7m | 9 |
| TANDEM PARKING | 2.75m x 5.75m | 4 |
| TYPICAL PARKING | 2.75m x 5.75m | 473 |
| | | 508 |
| BUILDING E & F | | |
| ACCESSIBLE PARKING | 4.5m x 5.75m | 26 |
| PARALLEL PARKING | 2.75m x 6.7m | 7 |
| TYPICAL PARKING | 2.75m x 5.75m | 609 |
| | | 642 |
| BUILDING H, I, & J | | |
| TYPICAL PARKING | 2.75m x 5.75m | 28 |
| | | 28 |
| BUILDING K, L, M, & N | | |
| TYPICAL PARKING | 2.75m x 5.75m | 44 |
| | | 44 |
| FRONT | | |
| TYPICAL PARKING | 2.75m x 5.75m | 47 |
| | | 47 |
| WINSTON ROAD | | |
| PARALLEL PARKING | 2.75m x 6.7m | 52 |
| | | 52 |
| | | 1991 |

| PARKING SCHEDULE - LOADING | | |
|---|---|---|
| TYPE | DESCRIPTION | COUNT |
| LOADING PARKING | 3.5m x 9m | 6 |
| | | 6 |

| PARKING SCHEDULE - MTO | |
|---|---|
| Type | Count |
| T/O GROUND FLOOR | |
| TYPICAL PARKING SPACE - PARALLE PARKING | 51 |
| | 51 |
| | 51 |

## PARKING STATISTICS

| PARKING SCHEDULE - BUILDING A & B | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 182 |
| TYPICAL PARKING SPACE - TANDEM | 8 |
| | 201 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 192 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 1 |
| TYPICAL PARKING SPACE - TANDEM | 8 |
| | 212 |
| U/G P3 | |
| 4.5 m with transfer space- Accessible | 12 |
| TYPICAL PARKING SPACE | 243 |
| TYPICAL PARKING SPACE - TANDEM | 2 |
| | 257 |
| | 670 |

**BUILDING A & B**
**491 UNITS (22 STOREYS) = 491 TOTAL**

**PARKING REQUIREMENTS**
**1.25 SPACES FOR DWELLING UNIT**

**491 x 1.25 = 613.75**

**614 PARKING SPACES REQUIRED IN TOTAL**

**ONE ACCESSIBLE PARKING SPACE SHALL BE PROVIDED PER 20 PARKING SPACES (COUNT TOWARDS PARKING REQUIRED)**

**614 / 20 =30.70 (31) ACCESSIBLE PARKING**

**COMMERCIAL / EMPLOYMENT= 1 SPACE FOR EACH 28 SQUARE METERS**

**COMMERCIAL = 1035.23sm / 28 = 37 PARKING REQUIRED IN TOTAL**

**EMPLOYMENT = 530.49sm / 28 = 19 PARKING REQUIRED IN TOTAL**

**TOTAL REQUIRED**
**614+37+19= 670**

| PARKING SCHEDULE - BUILDING C & D | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 240 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 5 |
| TYPICAL PARKING SPACE - TANDEM | 3 |
| | 259 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 233 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 4 |
| TYPICAL PARKING SPACE - TANDEM | 1 |
| | 249 |
| | 508 |

**BUILDING C**
**178 UNITS (12 STOREYS) = 178 TOTAL**

**PARKING REQUIREMENTS**
**1.25 SPACES FOR DWELLING UNIT**

**178 x 1.25 = 222.5**

**223 PARKING SPACES REQUIRED IN TOTAL**

**ONE ACCESSIBLE PARKING SPACE SHALL BE PROVIDED PER 20 PARKING SPACES (COUNT TOWARDS PARKING REQUIRED)**

**223 / 20 =11.15 (11) ACCESSIBLE PARKING**

**COMMERCIAL= 1 SPACE FOR EACH 28 SQUARE METERS**

**COMMERCIAL = 960.72sm / 28 = 34 PARKING SPACES REQUIRED**

**TOTAL REQUIRED**
**223+34 = 257**

**BUILDING D**
**177 UNITS (12 STOREYS) = 177 TOTAL**

**PARKING REQUIREMENTS**
**1.25 SPACES FOR DWELLING UNIT**

**177 x 1.25 = 221.25**

**221 PARKING SPACES REQUIRED IN TOTAL**

**ONE ACCESSIBLE PARKING SPACE SHALL BE PROVIDED PER 20 PARKING SPACES (COUNT TOWARDS PARKING REQUIRED)**

**221 / 20 =11.05 (11) ACCESSIBLE PARKING**

**COMMERCIAL= 1 SPACE FOR EACH 28 SQUARE METERS**

**COMMERCIAL = 850.29sm / 28 = 30 PARKING SPACES REQUIRED**

**TOTAL REQUIRED**
**221+30 = 251**

**TOTAL REQUIRED**
**257 + 251 = 508**

| PARKING SCHEDULE - BUILDING E & F | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 13 |
| TYPICAL PARKING SPACE | 270 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 3 |
| | 286 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 13 |
| TYPICAL PARKING SPACE | 270 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 3 |
| | 286 |
| U/G P3 | |
| TYPICAL PARKING SPACE | 69 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 1 |
| | 70 |
| | 642 |

**BUILDING E**
**151 UNITS (12 STOREYS) = 151 TOTAL**

**PARKING REQUIREMENTS**
**1.25 SPACES FOR DWELLING UNIT**

**151 x 1.25 = 188.75**

**189 PARKING SPACES REQUIRED IN TOTAL**

**ONE ACCESSIBLE PARKING SPACE SHALL BE PROVIDED PER 20 PARKING SPACES (COUNT TOWARDS PARKING REQUIRED)**

**189 / 20 =9.45 (10) ACCESSIBLE PARKING**

**EMPLOYMENT= 1 SPACE FOR EACH 28 SQUARE METERS**

**EMPLOYMENT = 2035sm / 28 = 73 PARKING SPACES REQUIRED**

**TOTAL REQUIRED**
**189 + 73 = 262**

**BUILDING F**
**243 UNITS (14 STOREYS) = 243 TOTAL**

**PARKING REQUIREMENTS**
**1.25 SPACES FOR DWELLING UNIT**

**243 x 1.25 = 303.75**

**304 PARKING SPACES REQUIRED IN TOTAL**

**ONE ACCESSIBLE PARKING SPACE SHALL BE PROVIDED PER 20 PARKING SPACES (COUNT TOWARDS PARKING REQUIRED)**

**304 / 20 =15.2 (15) ACCESSIBLE PARKING**

**EMPLOYMENT= 1 SPACE FOR EACH 28 SQUARE METERS**

**EMPOLYMENT= 2127 / 28 = 76 PARKING SPACES REQUIRED**

**TOTAL REQUIRED**
**304+76 = 380**

**TOTAL REQUIRED**
**262 + 380 = 642**

| PARKING SCHEDULE - BUILDING H, I, & J | |
|---|---|
| Type | Count |
| T/O GROUND FLOOR | |
| TYPICAL PARKING SPACE | 28 |
| | 28 |
| | 28 |

BUILDING H, I & J
14 UNITS = 14

PARKING REQUIREMENTS
2 SPACES FOR DWELLING UNIT

14 x 2 = 28
=
28 PARKING SPACES

BUILDING AREA FOR BUILDINGS H, I, & J

PER UNIT = 2709 sf
FLOOR 1 = 655 sf
FLOOR 2 = 1027 sf
FLOOR 3 = 1027 sf

| PARKING SCHEDULE - BUILDING K, L, M & N | |
|---|---|
| Type | Count |
| U/G P1 | |
| TYPICAL PARKING SPACE | 44 |
| | 44 |
| | 44 |

BUILDING K, L, M & N
22 UNITS = 22

PARKING REQUIREMENTS
2 SPACES FOR DWELLING UNIT

22 x 2 = 44
=
44 PARKING SPACES

BUILDING AREA FOR BUILDINGS K, L, M, & N

PER UNIT = 2580 sf
FLOOR 1 = 526 sf
FLOOR 2 = 1027 sf
FLOOR 3 = 1027 sf

## SITE STATISTICS

| SITE STATISTICS - BLOCK 3 | | | |
|---|---|---|---|
| DESCRIPTION | AREA (SM) | AREA (SF) | PERCENTAGE |
| BUILDING FOOTPRINT | | | |
| BUILDING A & B | 3365.53 m² | 36226 ft² | 12.7% |
| BUILDING C | 2484.15 m² | 26739 ft² | 9.4% |
| BUILDING D | 2356.53 m² | 25366 ft² | 8.9% |
| CLUB HOUSE | 379.90 m² | 4089 ft² | 1.4% |
| EXTERIOR STAIRS | 17.43 m² | 188 ft² | 0.1% |
| TOWNHOUSES K,L,M,N | 2104.27 m² | 22650 ft² | 8.0% |
| | 10707.81 m² | 115258 ft² | 40.5% |
| HARD LANDSCAPE | | | |
| ASPHALT | 3139.03 m² | 33788 ft² | 11.9% |
| CURB | 138.23 m² | 1488 ft² | 0.5% |
| SIDEWALK | 2576.26 m² | 27731 ft² | 9.7% |
| | 5853.52 m² | 63007 ft² | 22.1% |
| SOFT LANDSCAPE | | | |
| GRASS | 9484.17 m² | 102087 ft² | 35.8% |
| PAVERS | 410.62 m² | 4420 ft² | 1.6% |
| | 9894.79 m² | 106507 ft² | 37.4% |
| | 26456.12 m² | 284771 ft² | 100.0% |
| SITE TOTAL | 26456.34 m² | 284774 ft² | 100.0% |

| SITE STATISTICS - BLOCK 4 | | | |
|---|---|---|---|
| DESCRIPTION | AREA (SM) | AREA (SF) | PERCENTAGE |
| BUILDING FOOTPRINT | | | |
| BUILDING E | 2370.38 m² | 25515 ft² | 14.0% |
| BUILDING F | 2877.86 m² | 30977 ft² | 17.1% |
| TOWNHOUSES H,I,J | 1339.07 m² | 14414 ft² | 7.9% |
| | 6587.32 m² | 70905 ft² | 39.0% |
| HARD LANDSCAPE | | | |
| ASPHALT | 3565.92 m² | 38383 ft² | 21.1% |
| CURB | 199.16 m² | 2144 ft² | 1.2% |
| SIDEWALK | 1129.50 m² | 12158 ft² | 6.7% |
| | 4894.58 m² | 52685 ft² | 29.0% |
| SOFT LANDSCAPE | | | |
| GRASS | 4552.36 m² | 49001 ft² | 27.0% |
| PAVERS | 81.12 m² | 873 ft² | 0.5% |
| PAVERS | 100.74 m² | 1084 ft² | 0.6% |
| PAVERS | 121.53 m² | 1308 ft² | 0.7% |
| PAVERS | 306.81 m² | 3302 ft² | 1.8% |
| PAVERS | 228.11 m² | 2455 ft² | 1.4% |
| | 5390.67 m² | 58025 ft² | 31.9% |
| | 16872.57 m² | 181615 ft² | 100.0% |
| SITE TOTAL | 16872.53 m² | 181614 ft² | 100.0% |

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|---|---|---|
| | CLIENT REVIEW | FEB, 21 2018 |
| | CLIENT REVIEW | MARCH 13 2018 |
| | CLIENT REVIEW | MARCH 21 2018 |
| | CLIENT MEETING | MARCH 26 2018 |
| | CLIENT REVIEW | MAY 4TH 2018 |
| | PARKING DRAWINGS | MAY 11 2018 |
| | SITE PLAN OPTION | MAY 15 2019 |
| | REVISED SITE PLAN | MAY 12 2019 |
| | REVISED SITE PLAN | JULY 16 2019 |
| | CLIENT REVIEW | AUG, 26 2019 |



CLIENT
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CONSTRUCTION NORTH TRUE NORTH

PROJECT
LOSANI HOMES

GRIMBSY, ONTARIO

SHEET NAME
SITE PLAN

| | |
|---|---|
| START DATE | Issue Date |
| DRAWN BY | CMC / ME |
| CHECKED BY | JM |
| SCALE | 1 : 500 |
| PROJECT NO. | 118004 |

DRAWING
A001

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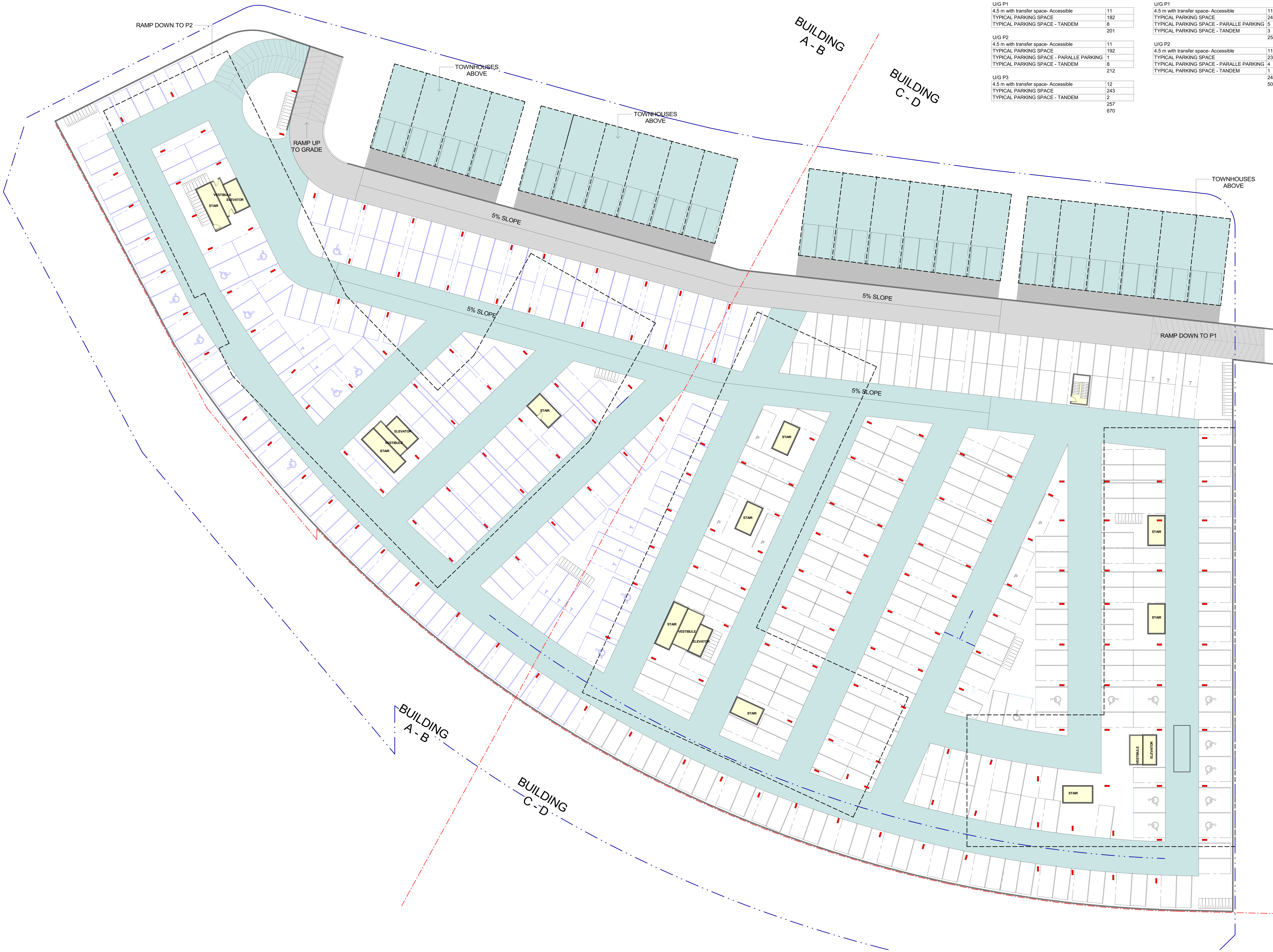
2019-09-20 4:24:39 PM




| PARKING SCHEDULE - BUILDING A & B | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 182 |
| TYPICAL PARKING SPACE - TANDEM | 8 |
| | 201 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 192 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 1 |
| TYPICAL PARKING SPACE - TANDEM | 8 |
| | 212 |
| U/G P3 | |
| 4.5 m with transfer space- Accessible | 12 |
| TYPICAL PARKING SPACE | 243 |
| TYPICAL PARKING SPACE - TANDEM | 2 |
| | 257 |
| | 670 |

| PARKING SCHEDULE - BUILDING C & D | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 240 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 5 |
| TYPICAL PARKING SPACE - TANDEM | 3 |
| | 259 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 233 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 4 |
| TYPICAL PARKING SPACE - TANDEM | 1 |
| | 249 |
| | 508 |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| | PARKING DRAWINGS | MAY 11 2018 |
| | CLIENT REVIEW | SEPT, 20 2019 |



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Owner

SEAL

PROJECT

LOSANI HOMES

GRIMSBY, ONTARIO

SHEET NAME

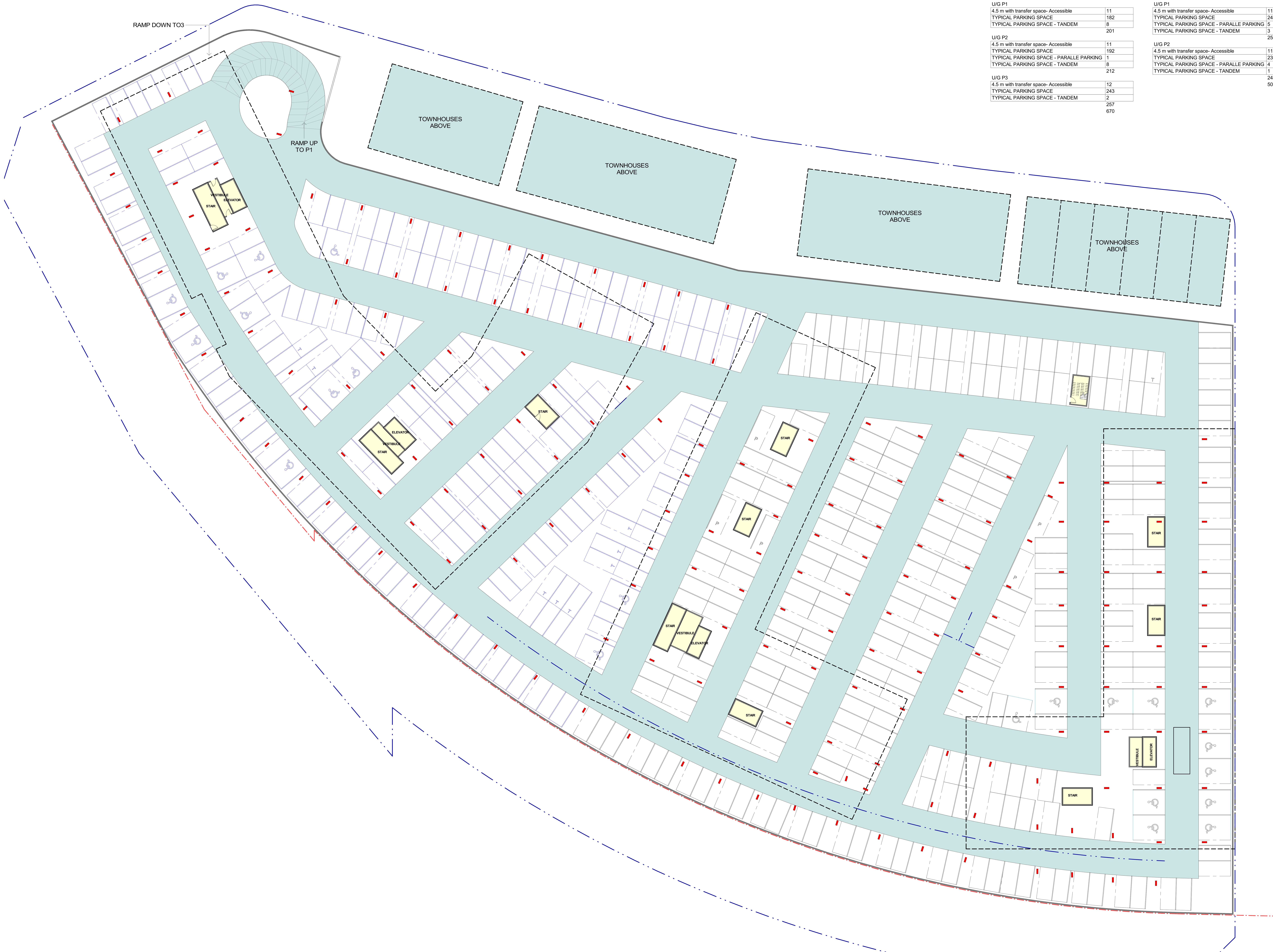
UNDERGROUND P1 BUILDING A, B, C, & D

| | |
|---|---|
| START DATE | Issue Date |
| DRAWN BY | CMC / ME |
| CHECKED BY | JM |
| SCALE | 1 : 250 |
| PROJECT NO. | 118004 |

DRAWING

# A100a

1 A100a P1 - UNDERGROUND FLOOR PLAN - BUILDING A, B, C, & D
1 : 250




1 A100b P2 - UNDERGROUND FLOOR PLAN - BUILDING A, B, C & D
1 : 250

| PARKING SCHEDULE - BUILDING A & B | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 182 |
| TYPICAL PARKING SPACE - TANDEM | 8 |
| | 201 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 192 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 1 |
| TYPICAL PARKING SPACE - TANDEM | 8 |
| | 212 |
| U/G P3 | |
| 4.5 m with transfer space- Accessible | 12 |
| TYPICAL PARKING SPACE | 243 |
| TYPICAL PARKING SPACE - TANDEM | 2 |
| | 257 |
| | 670 |

| PARKING SCHEDULE - BUILDING C & D | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 240 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 5 |
| TYPICAL PARKING SPACE - TANDEM | 3 |
| | 259 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 233 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 4 |
| TYPICAL PARKING SPACE - TANDEM | 1 |
| | 249 |
| | 508 |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| | CLIENT REVIEW | MARCH 21 2018 |
| | PARKING DRAWINGS | MAY 11 2018 |
| | CLIENT REVIEW | SEPT, 20 2019 |



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Owner

SEAL

PROJECT
LOSANI HOMES
GRIMSBY, ONTARIO

SHEET NAME
UNDERGROUND P2
BUILDING A, B, C & D

START DATE: Issue Date
DRAWN BY: CMC / ME
CHECKED BY: JM
SCALE: 1 : 250
PROJECT NO.: 118004
DRAWING: A100b

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2019-09-20 4:24:46 PM


| PARKING SCHEDULE - BUILDING A & B | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 182 |
| TYPICAL PARKING SPACE - TANDEM | 8 |
| | 201 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 192 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 1 |
| TYPICAL PARKING SPACE - TANDEM | 8 |
| | 212 |
| U/G P3 | |
| 4.5 m with transfer space- Accessible | 12 |
| TYPICAL PARKING SPACE | 243 |
| TYPICAL PARKING SPACE - TANDEM | 2 |
| | 257 |
| | 670 |

| PARKING SCHEDULE - BUILDING C & D | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 240 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 5 |
| TYPICAL PARKING SPACE - TANDEM | 3 |
| | 259 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 11 |
| TYPICAL PARKING SPACE | 233 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 4 |
| TYPICAL PARKING SPACE - TANDEM | 1 |
| | 249 |
| | 508 |

1 A100c P3 - UNDERGROUND FLOOR PLAN - BUILDING A, B, C & D
1 : 250


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|---|---|---|
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| | CLIENT REVIEW | SEPT, 20 2019 |



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GRIMBSY, ONTARIO

SHEET NAME

UNDERGROUND P3
BUILDING A, B, C & D

START DATE: Issue Date
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SCALE: 1 : 250
PROJECT NO.: 118004
DRAWING: A100c


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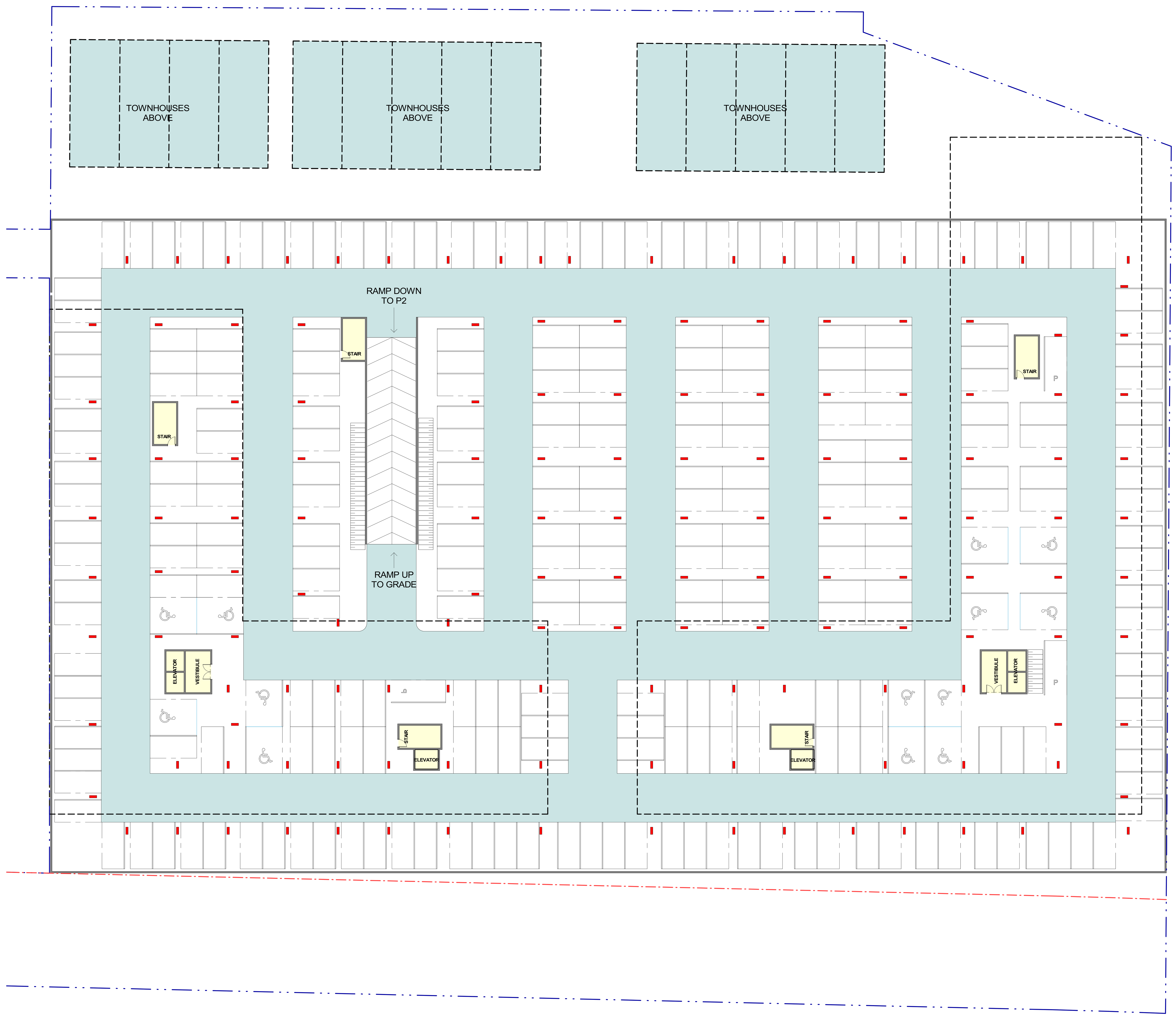
2019-09-20 4:24:49 PM

| PARKING SCHEDULE - BUILDING E & F | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 13 |
| TYPICAL PARKING SPACE | 270 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 3 |
| | 286 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 13 |
| TYPICAL PARKING SPACE | 270 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 3 |
| | 286 |
| U/G P3 | |
| TYPICAL PARKING SPACE | 69 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 1 |
| | 70 |
| | 642 |




1 A100d P1 - UNDERGROUND FLOOR PLAN - BUILDING E & F
1 : 250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SHEET NAME

UNDERGROUND P1
BUILDING E & F

| | |
|---|---|
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| SCALE | 1 : 250 |
| PROJECT NO. | 118004 |

DRAWING

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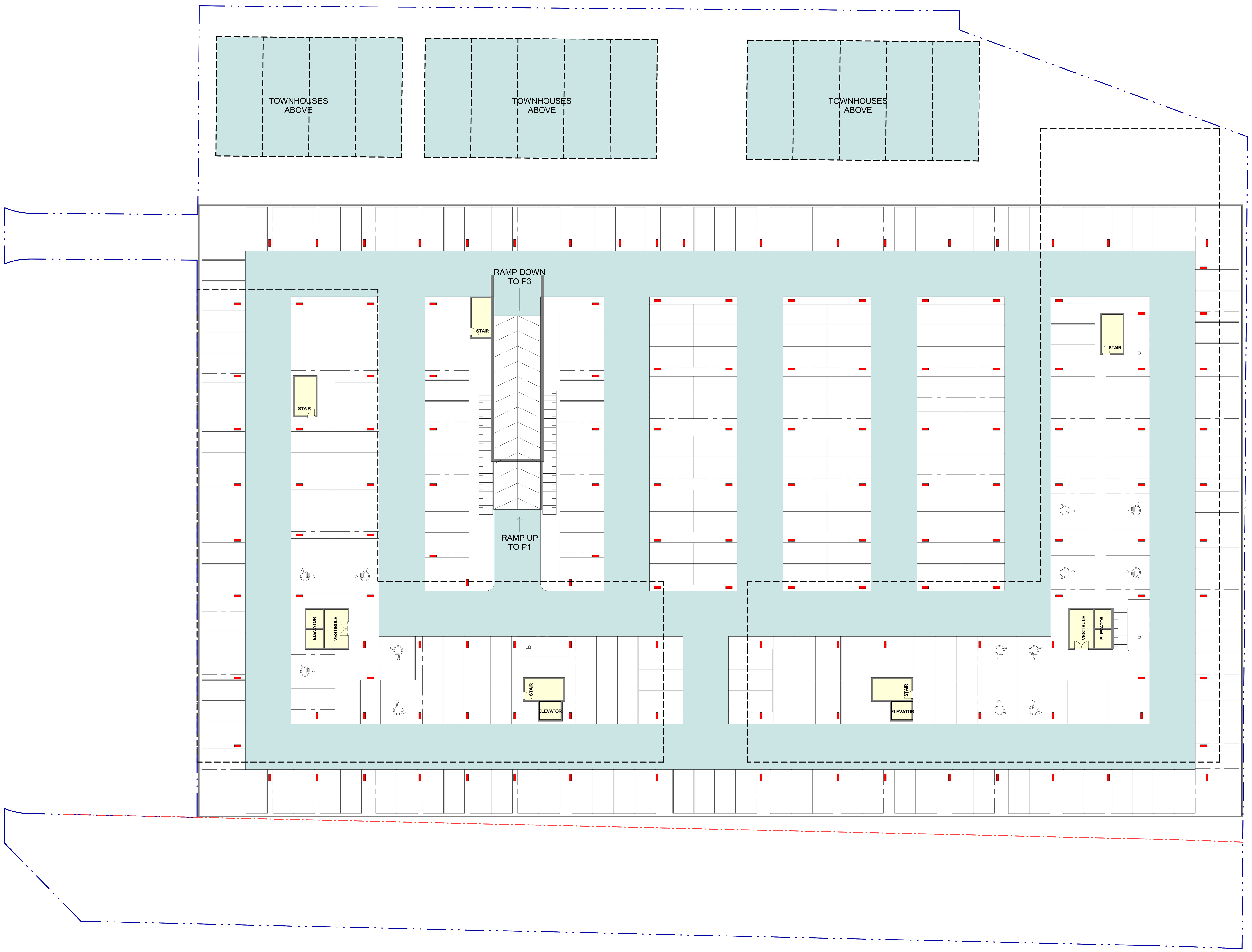
| PARKING SCHEDULE - BUILDING E & F | |
|---|---|
| Type | Count |
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 13 |
| TYPICAL PARKING SPACE | 270 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 3 |
| | 286 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 13 |
| TYPICAL PARKING SPACE | 270 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 3 |
| | 286 |
| U/G P3 | |
| TYPICAL PARKING SPACE | 69 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 1 |
| | 70 |
| | 642 |




P2 - UNDERGROUND FLOOR PLAN - BUILDING E & F
1 : 250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| | CLIENT REVIEW | MARCH 21 2018 |
| | PARKING DRAWINGS | MAY 11 2018 |
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UNDERGROUND P2
BUILDING E & F

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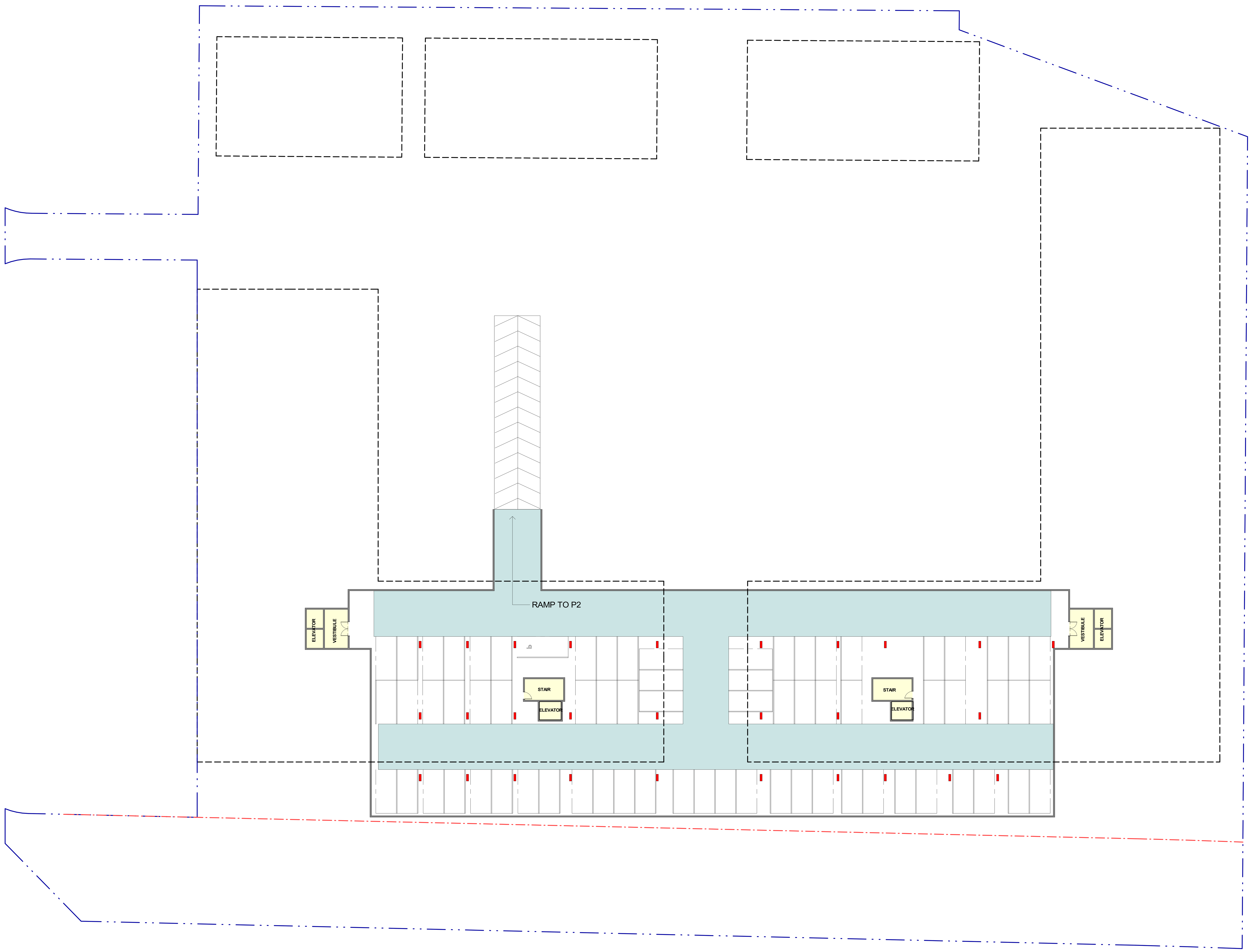
SCALE: 1 : 250
PROJECT NO.: 118004

DRAWING
A100e

PARKING SCHEDULE - BUILDING E & F

| Type | Count |
|---|---|
| U/G P1 | |
| 4.5 m with transfer space- Accessible | 13 |
| TYPICAL PARKING SPACE | 270 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 3 |
| | 286 |
| U/G P2 | |
| 4.5 m with transfer space- Accessible | 13 |
| TYPICAL PARKING SPACE | 270 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 3 |
| | 286 |
| U/G P3 | |
| TYPICAL PARKING SPACE | 69 |
| TYPICAL PARKING SPACE - PARALLE PARKING | 1 |
| | 70 |
| | 642 |




1 A100f P3 - UNDERGROUND FLOOR PLAN - BUILDING E & F
1 : 250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|---|---|---|
| | CLIENT REVIEW | SEPT, 20 2019 |



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LOSANI HOMES

GRIMBSY, ONTARIO

SHEET NAME

P3 - UNDERGROUND FLOOR PLAN - BUILDING E & F

START DATE Issue Date

DRAWN BY CMC

CHECKED BY JM

SCALE 1 : 250

PROJECT NO. 118004

DRAWING

A100f

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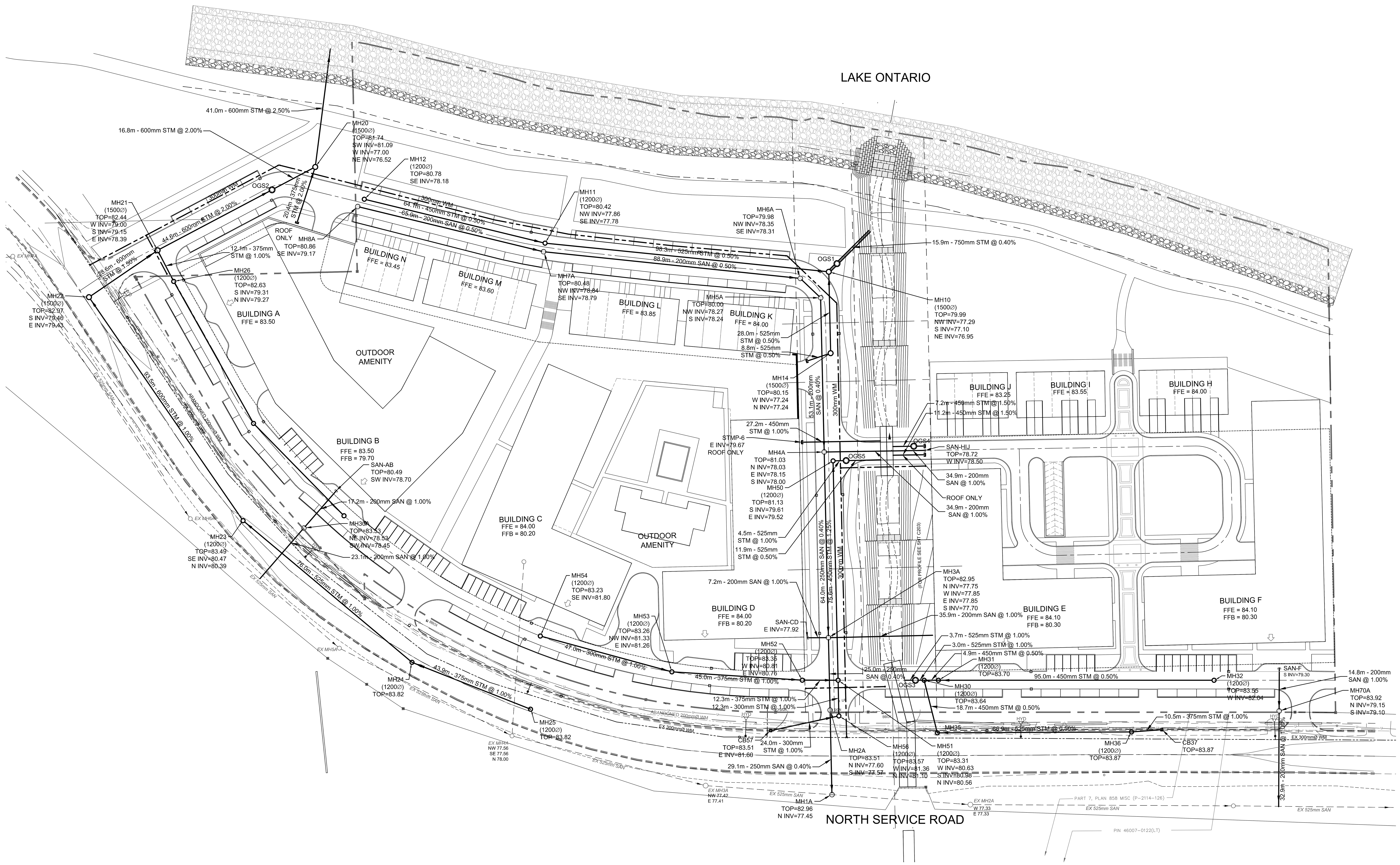
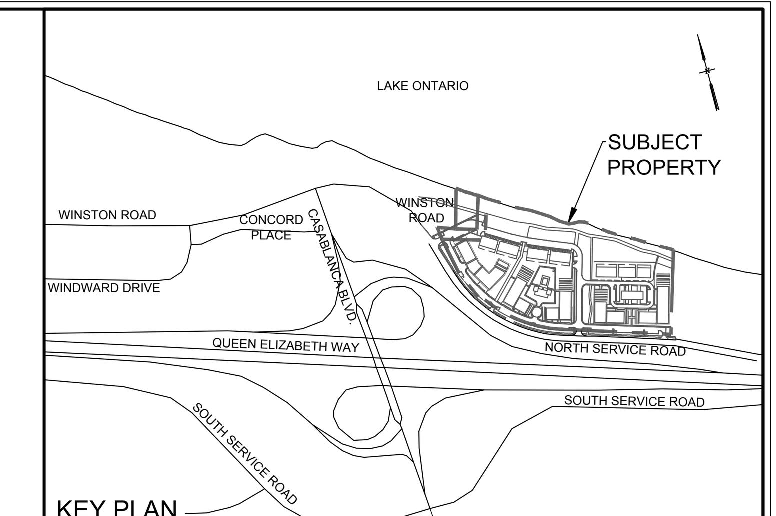
# Appendix B

# Drawings




KEY PLAN
SCALE: N.T.S.

## LEGEND

- PROPERTY BOUNDARY
- PROPOSED SEWER/MANHOLE
- OGS
- PROPOSED SANITARY SEWER/MANHOLE
- WATERMAIN
- EXISTING SANITARY/SEWER MANHOLE
- EXISTING STORM/SEWER MANHOLE
- EXISTING WATERMAIN
- UNDERGROUND PARKING

| No. | Issue / Revision | Date | Auth. |
|---|---|---|---|
| 1 | ISSUED FOR DRAFT PLAN APPLICATION | 6/1/2018 | SH |
| 2 | 2nd SUBMISSION DRAFT PLAN APPLICATION | 10/4/2019 | SH |
| | | | |
| | | | |
| | | | |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**fax** (905) 821-1809
**web** www.rjburnside.com


Client
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430 MCNEILLY ROAD, SUITE 203
STONEY CREEK, ON
L8E 5E3

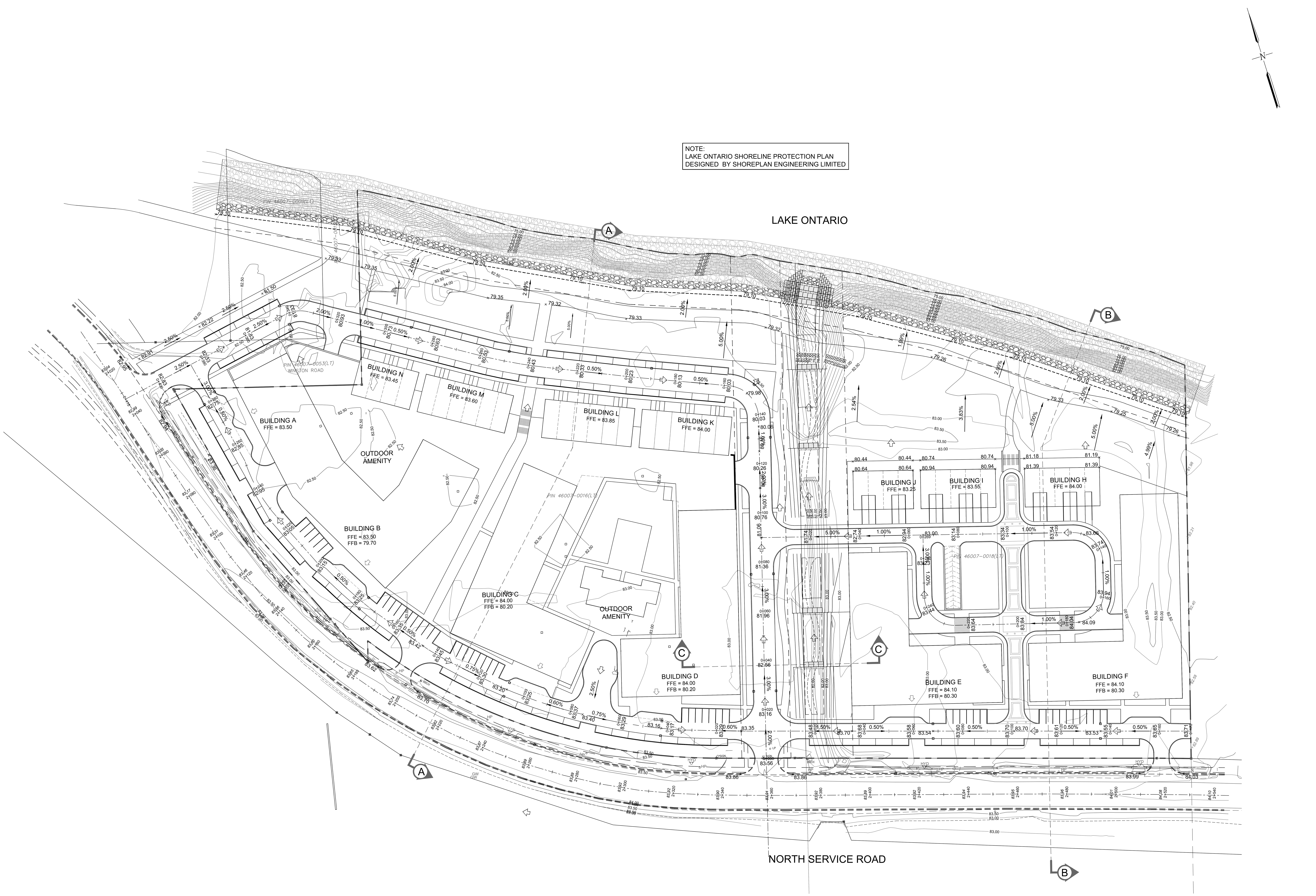
LOSANI HOMES

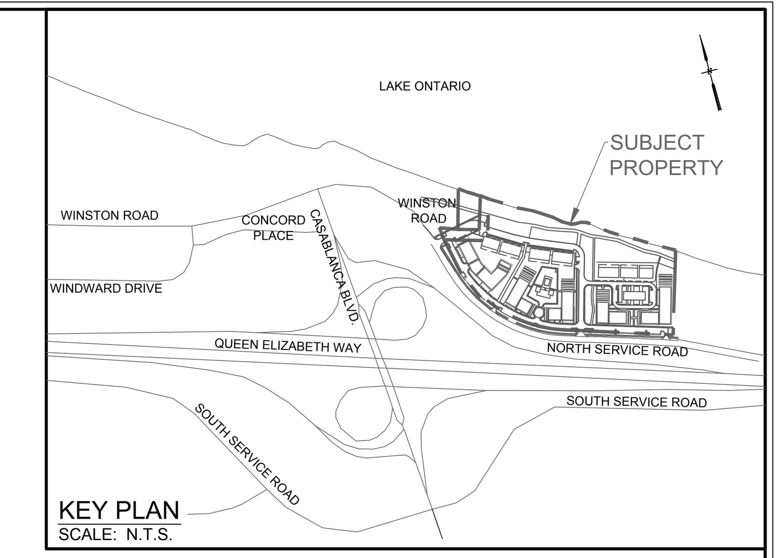
Drawing Title
**LOSANI FIFTH WHEEL**
TOWN OF GRIMSBY

SERVICING PLAN

| Drawn | Checked | Designed | Checked | Date | Drawing No. |
|---|---|---|---|---|---|
| AH | SH | EL | SH | 6/1/2018 | C101 |
| Project No. 040159 | | Contract No. ---- | | Revision No. 0 | |
| Scale 1:750 | | 0 10 20 40m | | | |

File: G:\040159 - Losani Fifth Wheel\Drawings\03_ProductionDwg\040159 - C101 SERVICING.dwg Date Plotted: October 4, 2019 - 5:23 PM




KEY PLAN
SCALE: N.T.S.

## LEGEND

| | |
|---|---|
| | PROPERTY BOUNDARY |
| 83.00 | PROPOSED FINISHED GROUND |
| 83.00 | EXISTING GROUND ELEVATION |
| 83.00 | EXISTING GROUND CONTOUR |
| | PROPOSED SWALE |
| 1.50% | DIRECTION OF FLOW/PROPOSED SLOPE |
| | PROPOSED OVERLAND FLOW DIRECTION |
| | PROPOSED RETAINING WALL |
| | PROPOSED 3:1 SLOPE |

NOTES:

1. FOR DETAILED SECTIONS REFER TO DWG C202

| No. | Issue / Revision | Date | Auth. |
|---|---|---|---|
| 1 | ISSUED FOR DRAFT PLAN APPLICATION | 6/1/2018 | SH |
| 2 | 2nd SUBMISSION DRAFT PLAN APPLICATION | 10/4/2019 | SH |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Client
**LOSANI HOMES LTD.**
430 MCNEILLY ROAD, SUITE 203
STONEY CREEK, ON
L8E 5E3

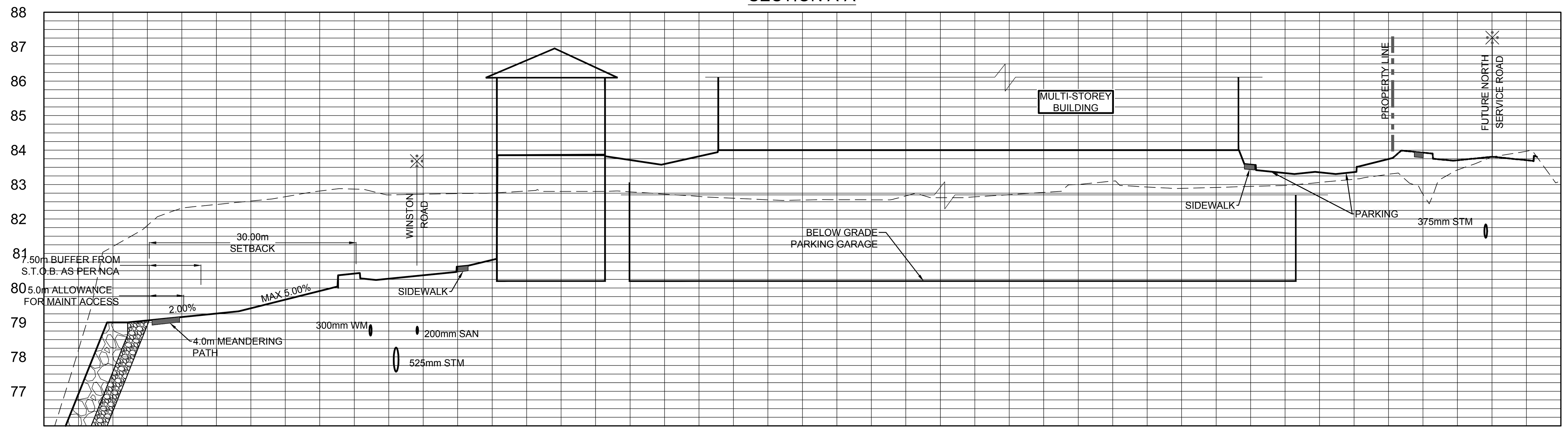
LOSANI HOMES

Drawing Title
**LOSANI FIFTH WHEEL**
TOWN OF GRIMSBY

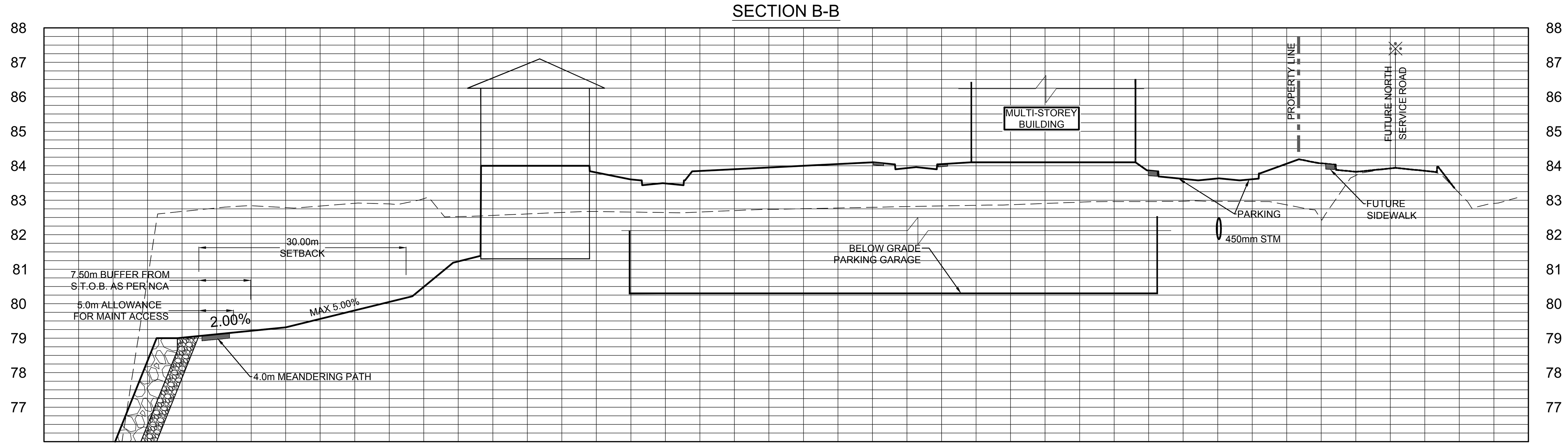
GRADING PLAN

| Drawn | Checked | Designed | Checked | Date | Drawing No. |
|---|---|---|---|---|---|
| AH | SH | EL | SH | 6/1/2018 | C201 |
| Project No. | | Contract No. | | Revision No. | |
| 040159 | | ---- | | 0 | |
| Scale | | | | | |
| 1:750 | | 0 10 20 | | 40m | |

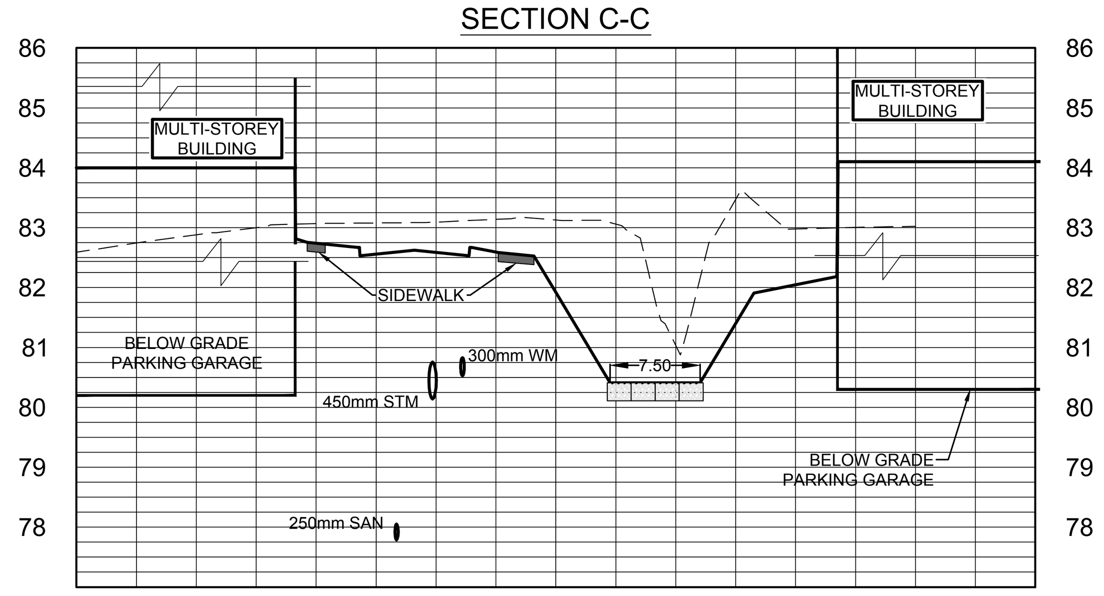
## SECTION A-A

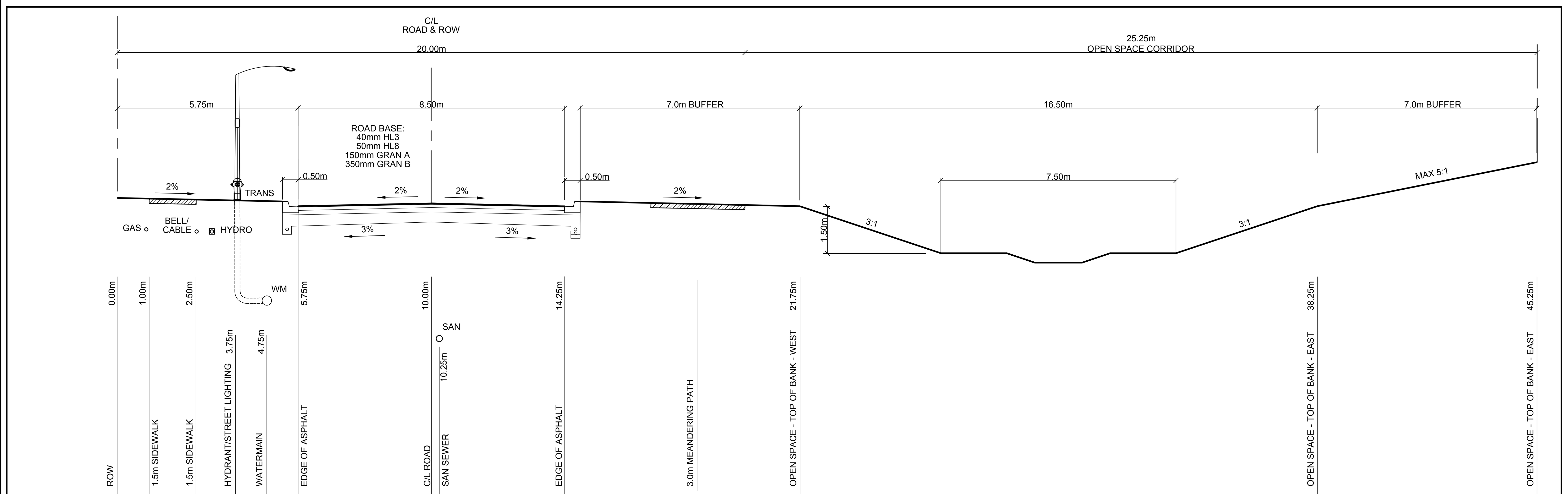



## SECTION B-B



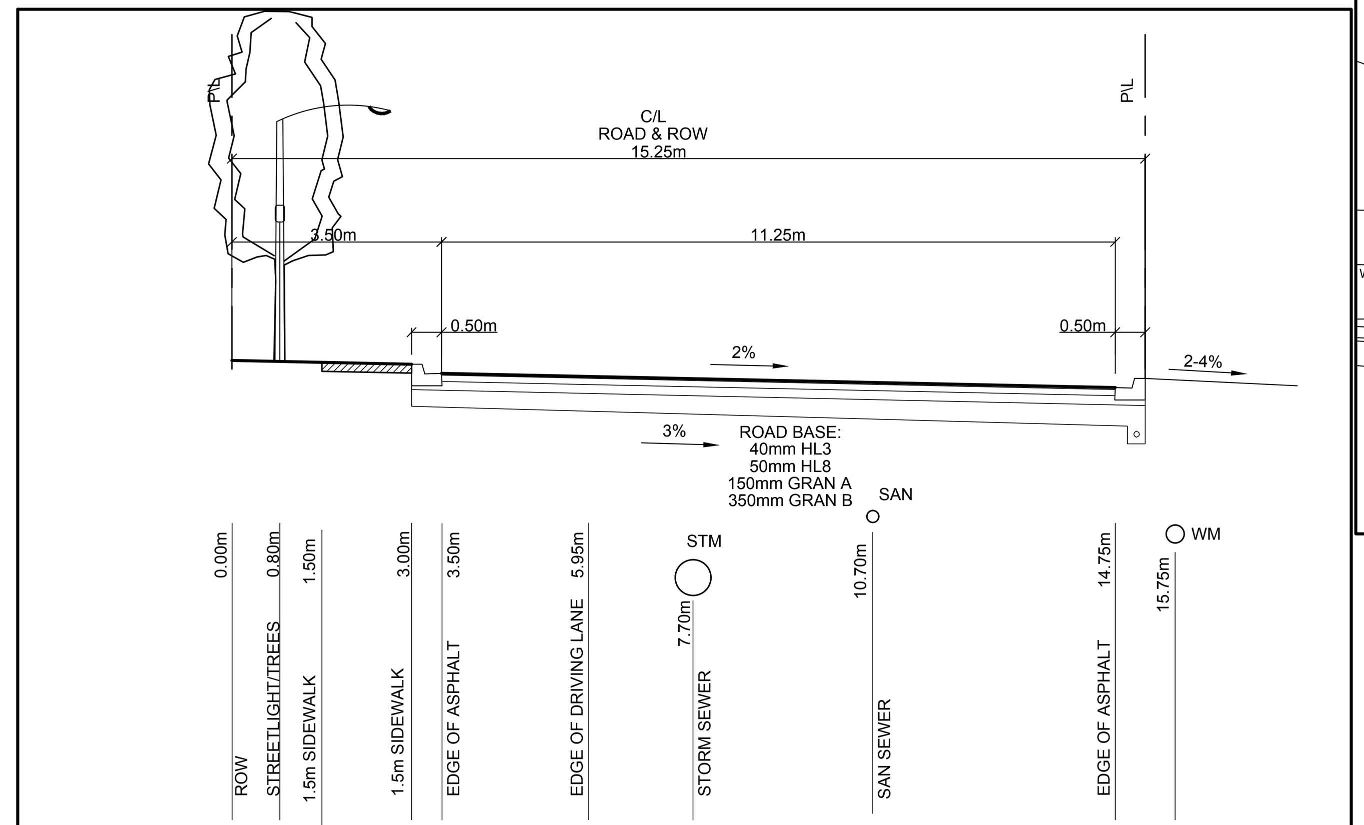

## SECTION C-C



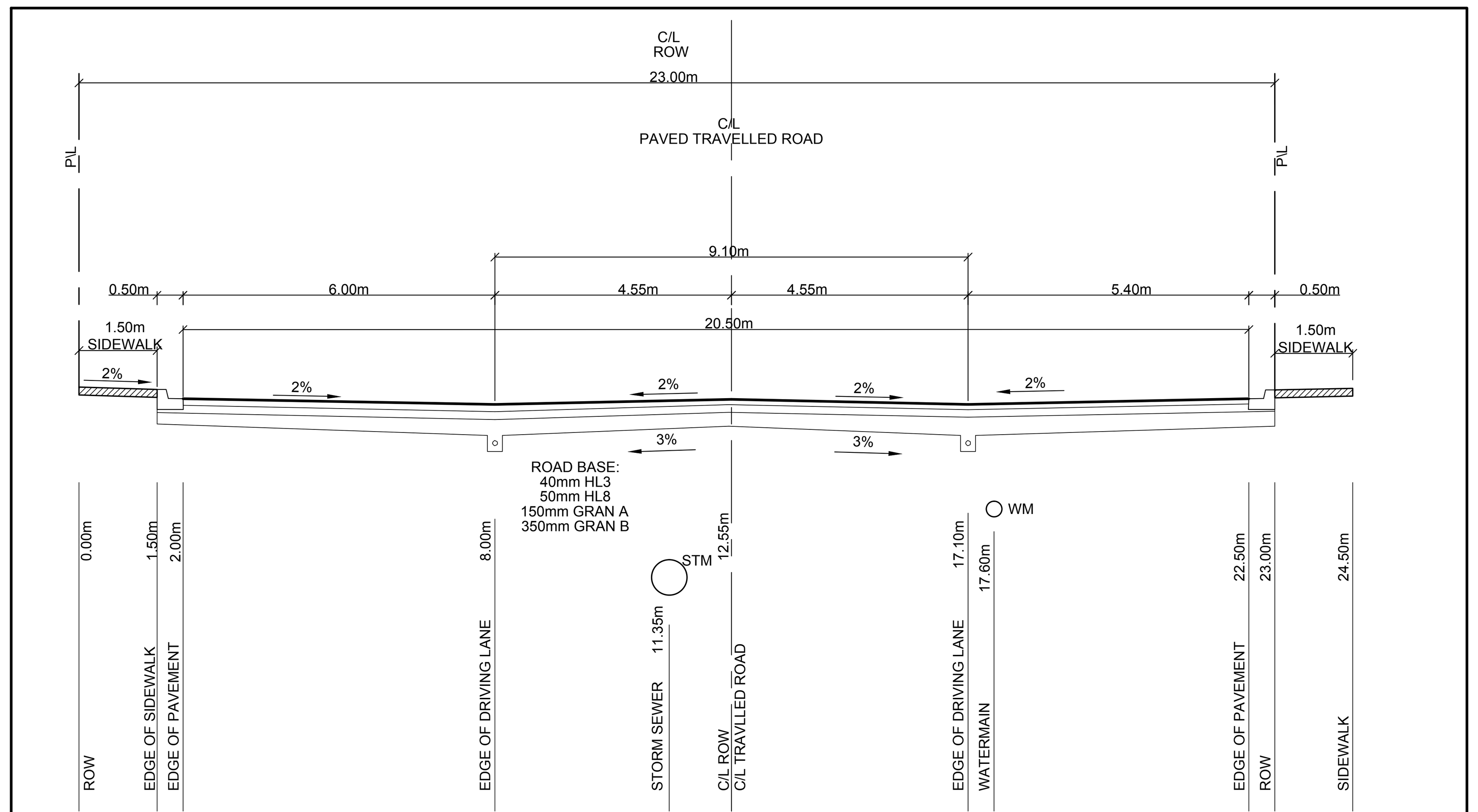

WINSTON ROAD/OPEN SPACE CORRIDOR
20.0m ROW (STA 0+020 TO 0+175)
8.5m DRIVING LANE

FIGURE 1
SCALE 1:100



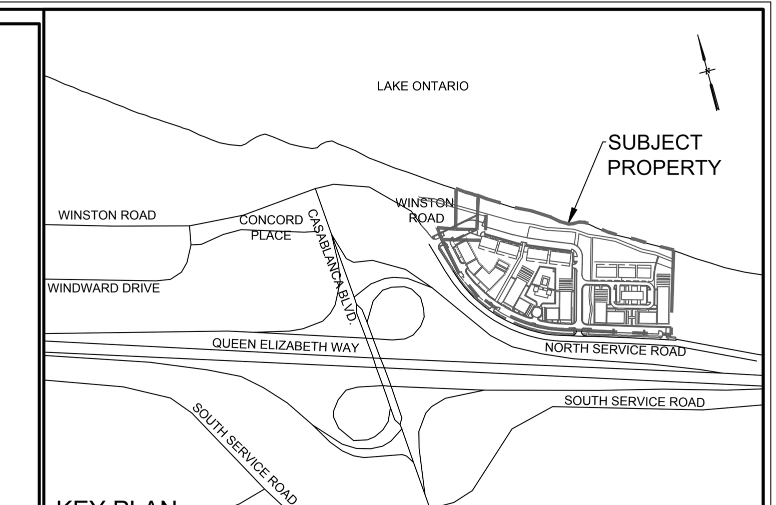

WINSTON ROAD
6.0m DRIVING LANE WITH 2.5m PARKING LANE
(STA 0+157 TO 0+315)

FIGURE 2
SCALE 1:100




WINSTON ROAD
20.0m ROW (STA 0+350 TO STA 0+380)
6.0m DRIVING LANE WITH 2.50m PARKING LANE

FIGURE 3
SCALE 1:100




KEY PLAN
SCALE: N.T.S.

| No. | Issue / Revision | Date | Auth. |
|---|---|---|---|
| 1 | ISSUED FOR DRAFT PLAN APPLICATION | 6/1/2018 | SH |
| 2 | 2nd SUBMISSION DRAFT PLAN APPLICATION | 10/4/2019 | SH |

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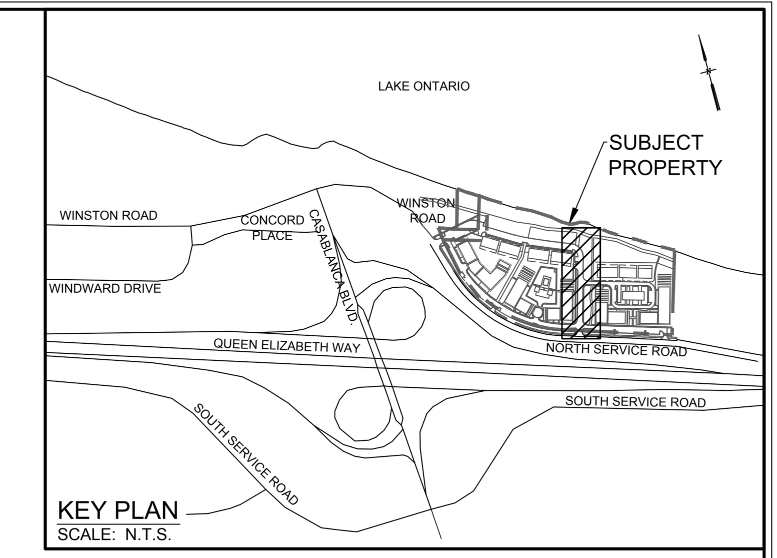
STONEY CREEK, ON
L8E 5E3

LOSANI HOMES

Drawing Title
LOSANI FIFTH WHEEL
TOWN OF GRIMSBY

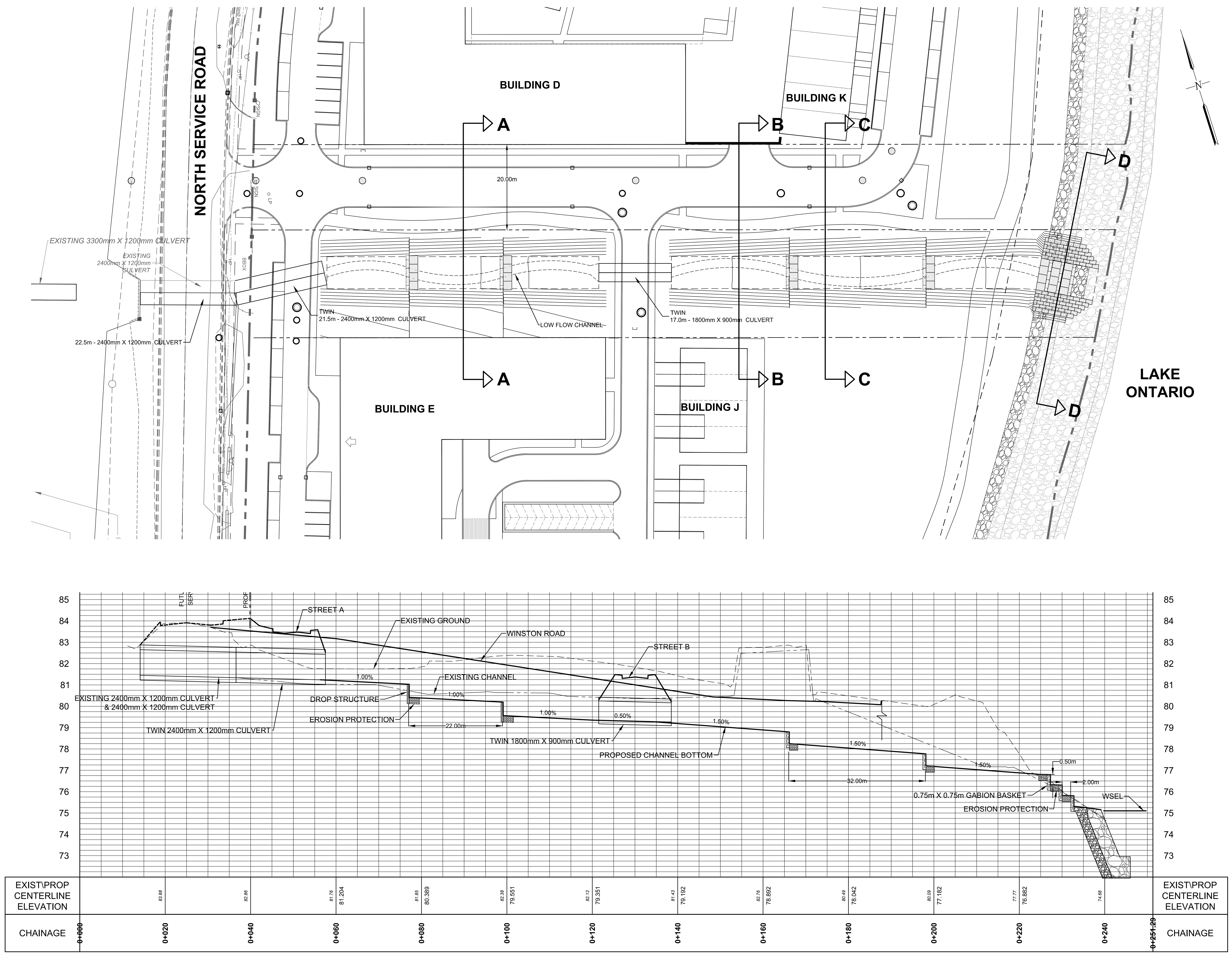
CROSS SECTIONS

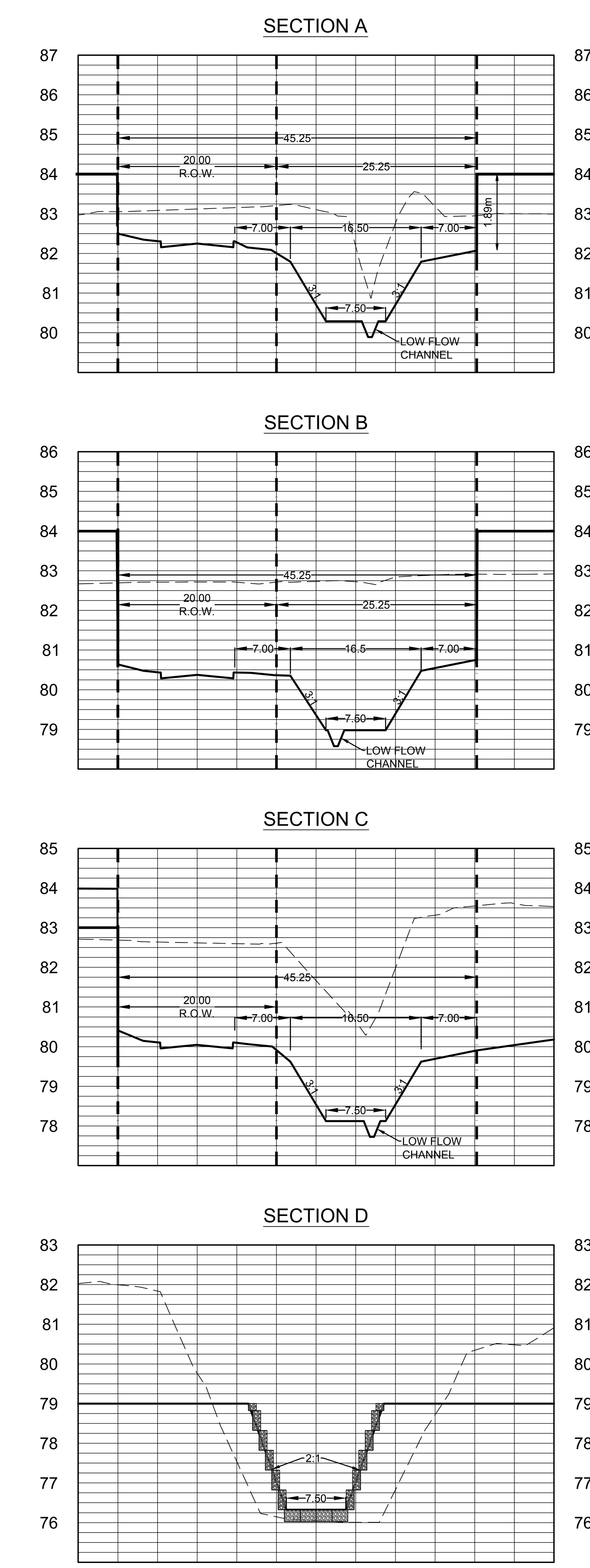
| Drawn | Checked | Designed | Checked | Date | Drawing No. |
|---|---|---|---|---|---|
| AH | SH | EL | SH | 6/1/2018 | C202 |
| Project No. 040159 | | Contract No. ---- | | Revision No. 0 | |
| Scale AS NOTED | | | | | |




LEGEND

PROPERTY BOUNDARY




NOTES

1. FOR SLOPE STABILITY OF REVETMENT WALL, REFER TO SOIL-MAT MARCH 3, 2016 REPORT.
2. FOR SLOPE STABILITY OF EARTHEN CHANNEL, REFER TO SOIL-MAT OCTOBER 2019 REPORT.

| No. | Issue / Revision | Date | Auth. |
|---|---|---|---|
| 1 | 2nd SUBMISSION DRAFT PLAN APPLICATION | 10/4/2019 | SH |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L8E 5E3

LOSANI HOMES

Drawing Title
**LOSANI FIFTH WHEEL**
TOWN OF GRIMSBY

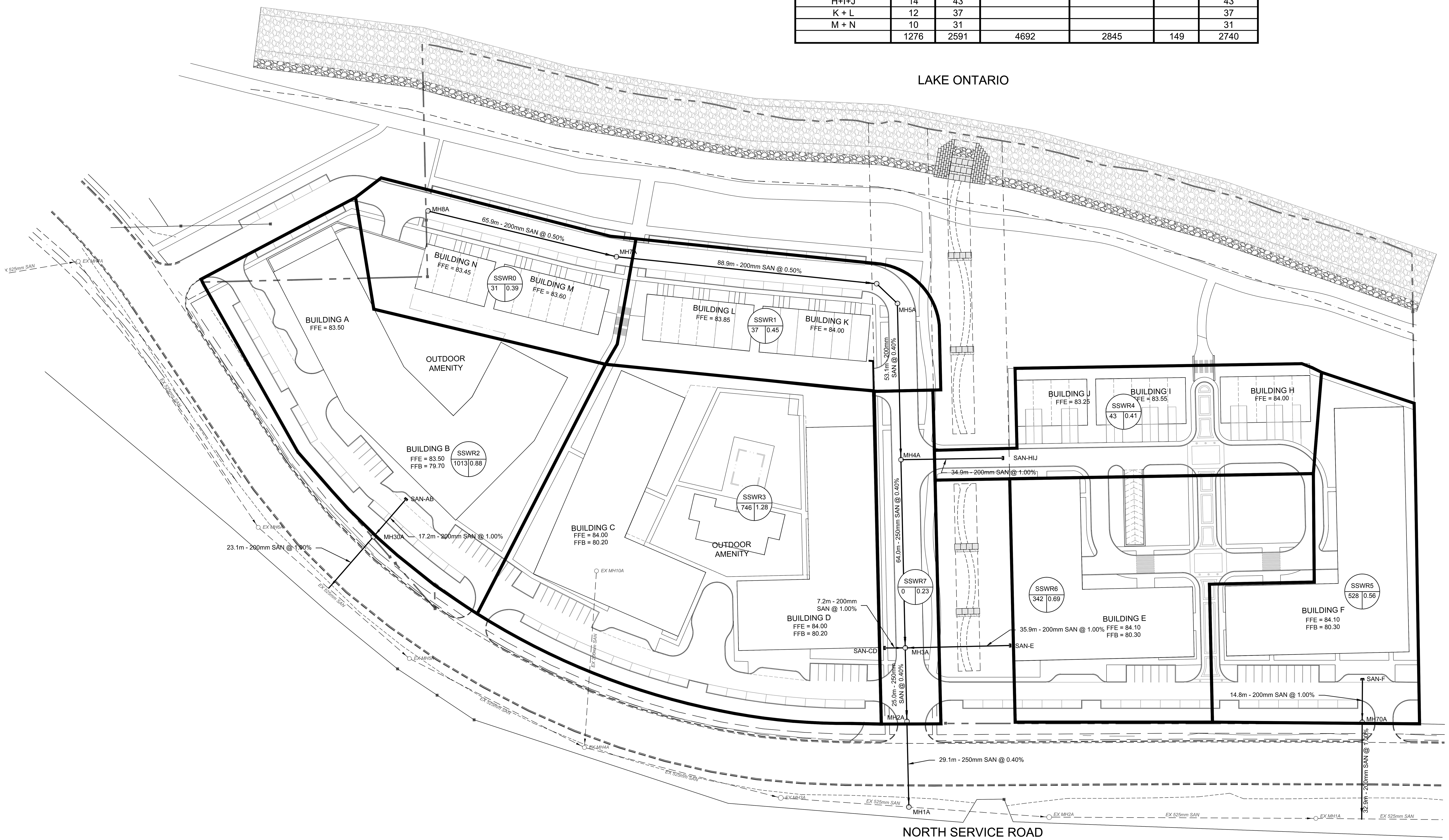
PLAN AND PROFILE

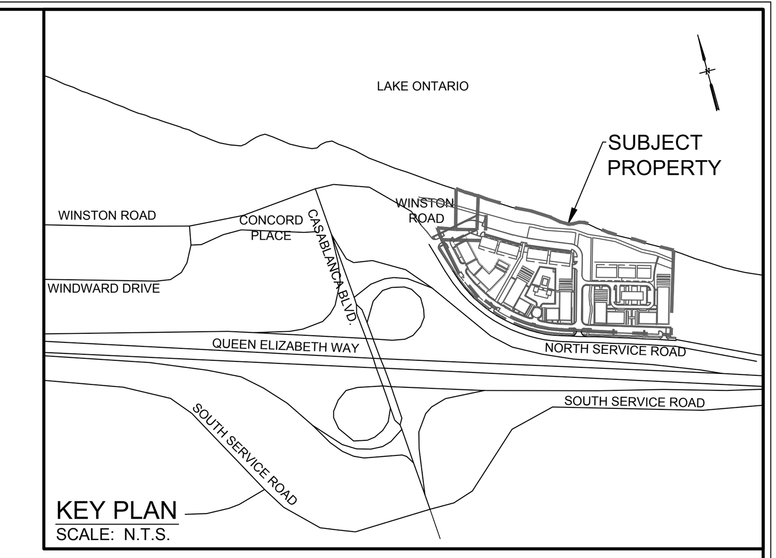
| Drawn | Checked | Designed | Checked | Date | Drawing No. |
|---|---|---|---|---|---|
| AH | SH | EL | SH | 6/1/2018 | C203 |
| Project No. 040159 | | Contract No. ---- | | Revision No. 0 | |
| Scale H 1:500 V 1:100 | | | | | |

**EQUIVALENT POPULATIONS**

| | | |
|---|---|---|
| Condo Unit | 2.00 | Persons/Unit |
| Townhome | 3.10 | Persons/Unit |
| Commercial/Retail | 0.02 | Persons/$m^2$ |

| Residential | | | Non-Residential | | | |
|---|---|---|---|---|---|---|
| **BLDG No.** | **Units** | **Pop** | **Employment ($m^2$)** | **Commercial ($m^2$)** | **Pop** | **Total Pop** |
| **Condo Towers** | | | | | | |
| A and B | 491 | 982 | 530 | 1035 | 31 | 1013 |
| C and D | 355 | 710 | 0 | 1810 | 36 | 746 |
| E | 151 | 302 | 2035 | 0 | 40 | 342 |
| F | 243 | 486 | 2127 | 0 | 42 | 528 |
| **Towns** | | | | | | |
| H+I+J | 14 | 43 | | | | 43 |
| K + L | 12 | 37 | | | | 37 |
| M + N | 10 | 31 | | | | 31 |
| | 1276 | 2591 | 4692 | 2845 | 149 | 2740 |




**LEGEND**

- PROPERTY BOUNDARY
- SSWR1 — DRAINAGE AREA
- 0.45 — AREA IN HECTARES
- 130 — POPULATION
- SANITARY SEWER / MANHOLE
- SANITARY SEWER TRIBUTARY BOUNDARY

| No. | Issue / Revision | Date | Auth. |
|---|---|---|---|
| 1 | ISSUED FOR DRAFT PLAN APPLICATION | 6/1/2018 | SH |
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L8E 5E3

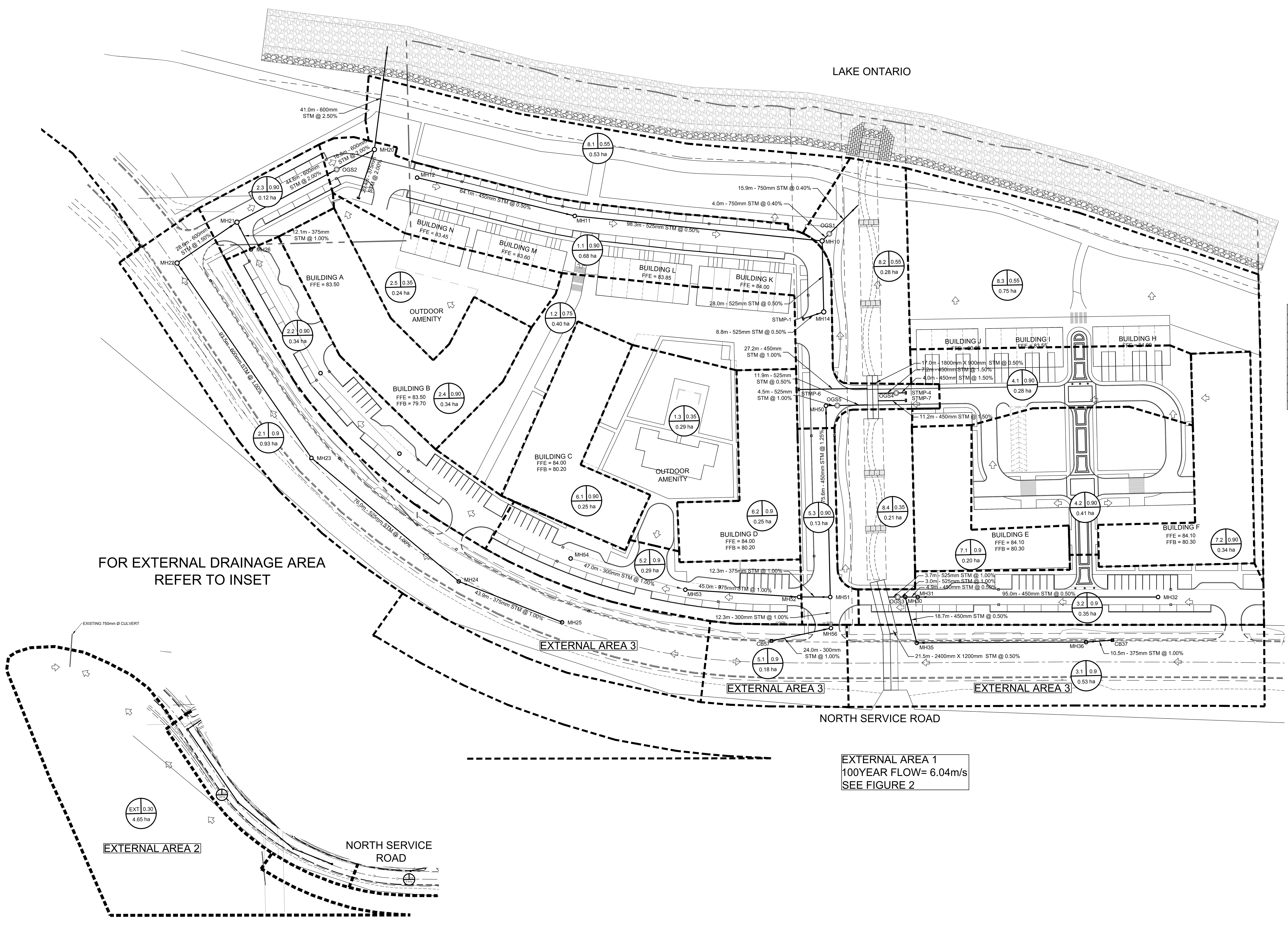
LOSANI HOMES

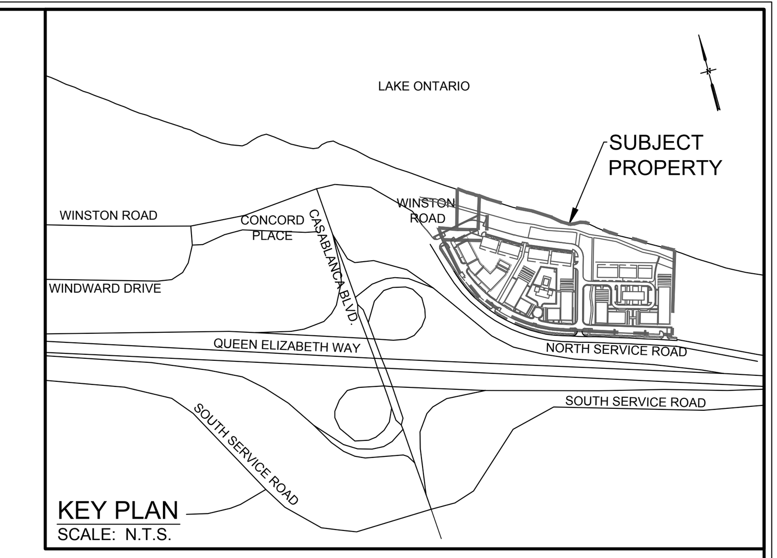
Drawing Title
**LOSANI FIFTH WHEEL**
TOWN OF GRIMSBY

SANITARY DRAINAGE AREA PLAN

| Drawn | Checked | Designed | Checked | Date | Drawing No. |
|---|---|---|---|---|---|
| AH | SH | EL | SH | 6/1/2018 | **C301** |
| Project No. 040159 | | Contract No. ---- | | Revision No. 0 | |
| Scale 1:750 | | 0 10 20 40m | | | |

File: G:\040159 - Losani Fifth Wheel\Drawings\03_ProductionDwg\040159 - C301 SANDR.dwg Date Plotted: October 7, 2019 - 3:08 PM




LEGEND

- PROPERTY BOUNDARY
- AREA ID NUMBER
- RUNOFF COEFFICIENT
- DRAINAGE AREA IN HECTARES
- STORM SEWER / MANHOLE
- OGS
- STORM SEWER TRIBUTARY BOUNDARY
- OVERLAND FLOW DIRECTION
- SINGLE CATCHBASIN
- DOUBLE CATCHBASIN

| OGS SIZING/WATER QUALITY | | | | |
|---|---|---|---|---|
| AREA ID | OGS # | AREA (Ha) | 'C' | OGS TYPE |
| 1.1 TO 1.3 | OGS1 | 1.37 | 0.74 | STC 4000 |
| 2.1 TO 2.3 | OGS2 | 1.39 | 0.90 | STC 5000 |
| 3.1 TO 3.2 | OGS3 | 0.88 | 0.90 | STC 3000 |
| 4.1 TO 4.2 | OGS4 | 0.70 | 0.90 | STC 2000 |
| 5.1 TO 5.3 | OGS5 | 0.60 | 0.90 | STC 2000 |
| 2.4 TO 2.5 | ROOFTOP/AMENITY | 0.58 | 0.67 | N/A |
| 6.1 TO 6.2 | ROOFTOP | 0.50 | 0.90 | N/A |
| 7.1 TO 7.2 | ROOFTOP | 0.54 | 0.90 | N/A |
| 8.1 TO 8.4 | OPEN SPACE | 1.77 | 0.53 | NA |
| | TOTAL | 8.33 | | |

| No. | Issue / Revision | Date | Auth. |
|---|---|---|---|
| 1 | ISSUED FOR DRAFT PLAN SUBMISSION | 6/1/2018 | SH |
| 2 | 2nd SUBMISSION DRAFT PLAN APPLICATION | 10/4/2019 | SH |

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L8E 5E3

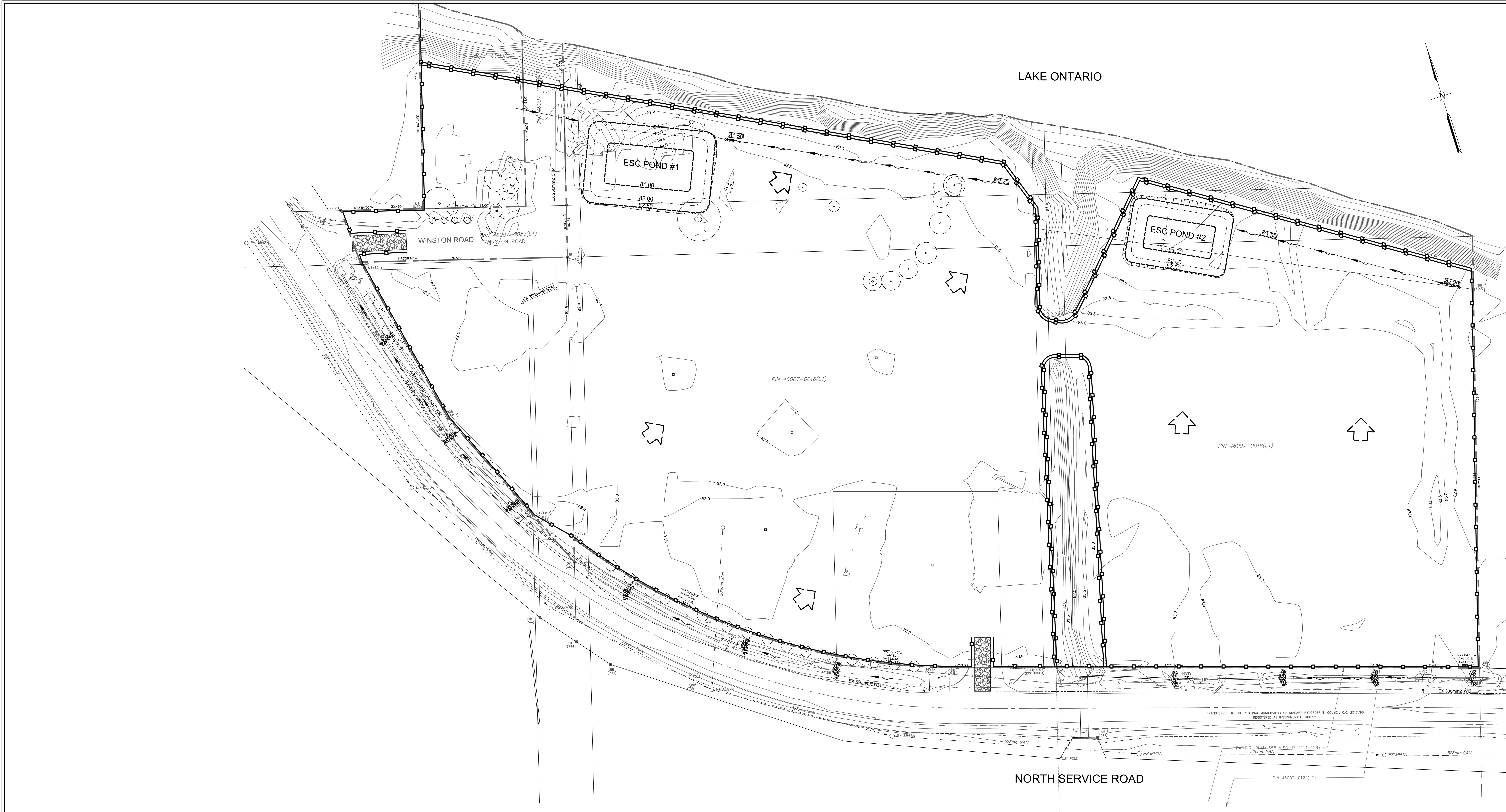
LOSANI HOMES

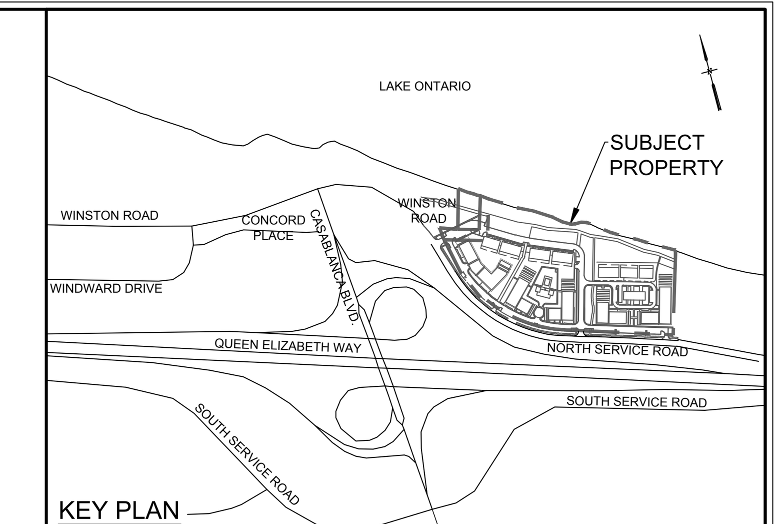
Drawing Title
**LOSANI FIFTH WHEEL**
TOWN OF GRIMSBY

STORM DRAINAGE AREA PLAN

| Drawn | Checked | Designed | Checked | Date | Drawing No. |
|---|---|---|---|---|---|
| AH | SH | EL | SH | 6/1/2018 | C302 |
| Project No. 040159 | | Contract No. ---- | | Revision No. 0 | |
| Scale 1:750 | | 0 10 20 40m | | | |

File: G:\040159 - Losani Fifth Wheel\Drawings\03_ProductionDwg\040159 - C302 STMDR.dwg Date Plotted: October 4, 2019 - 5:16 PM

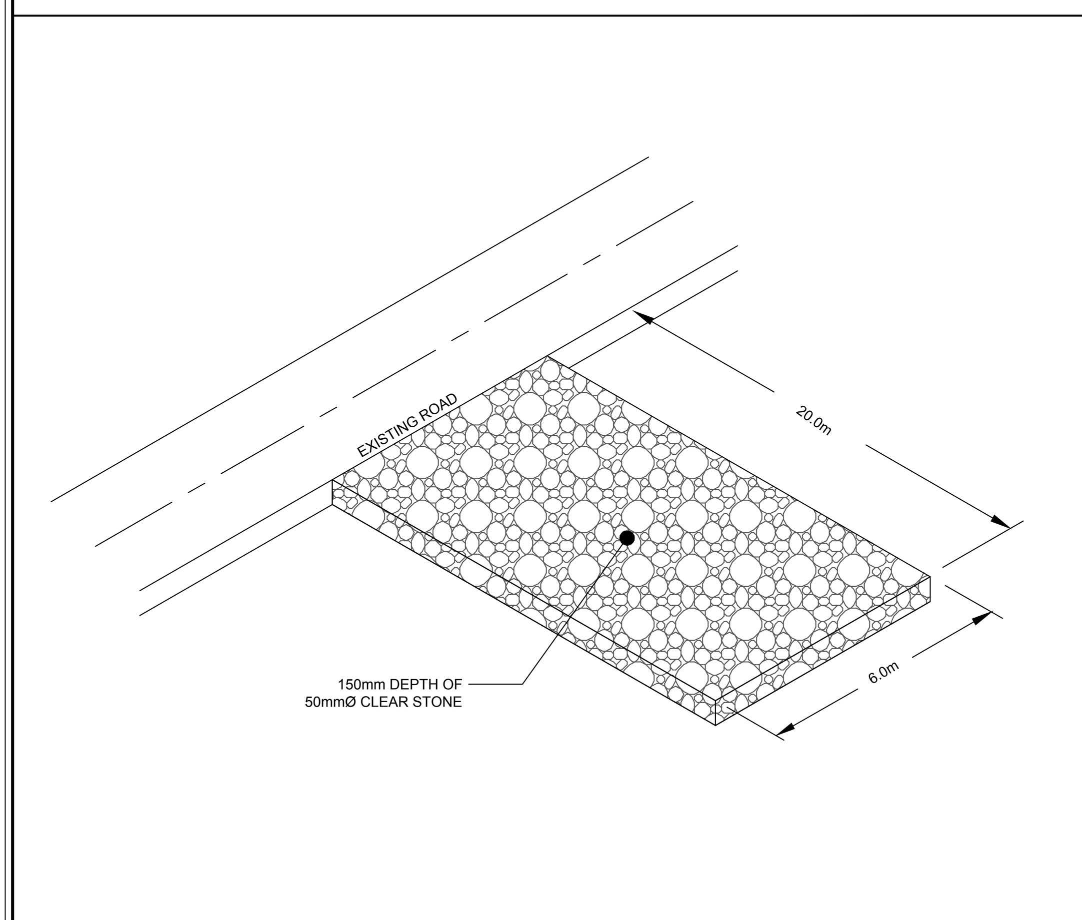


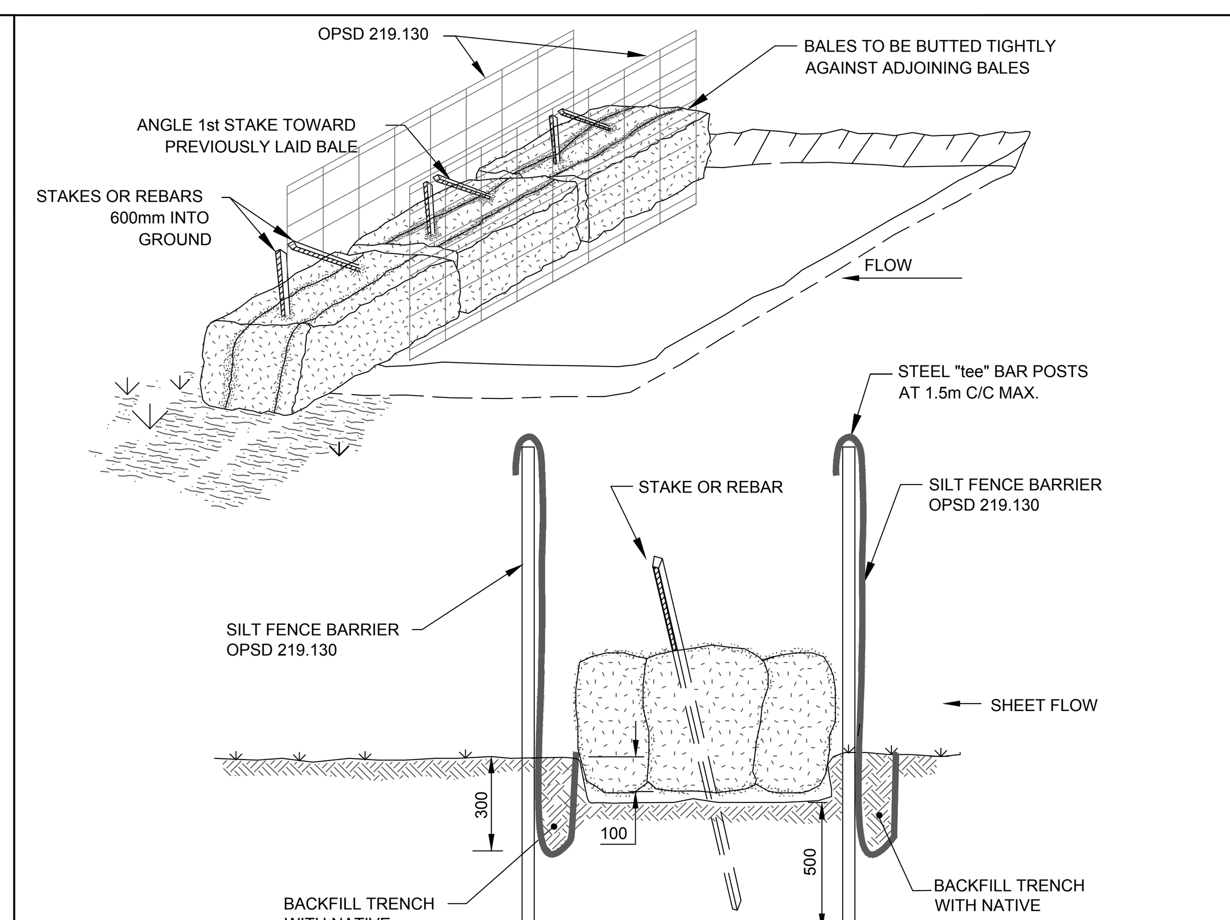

KEY PLAN
SCALE: N.T.S.

LEGEND

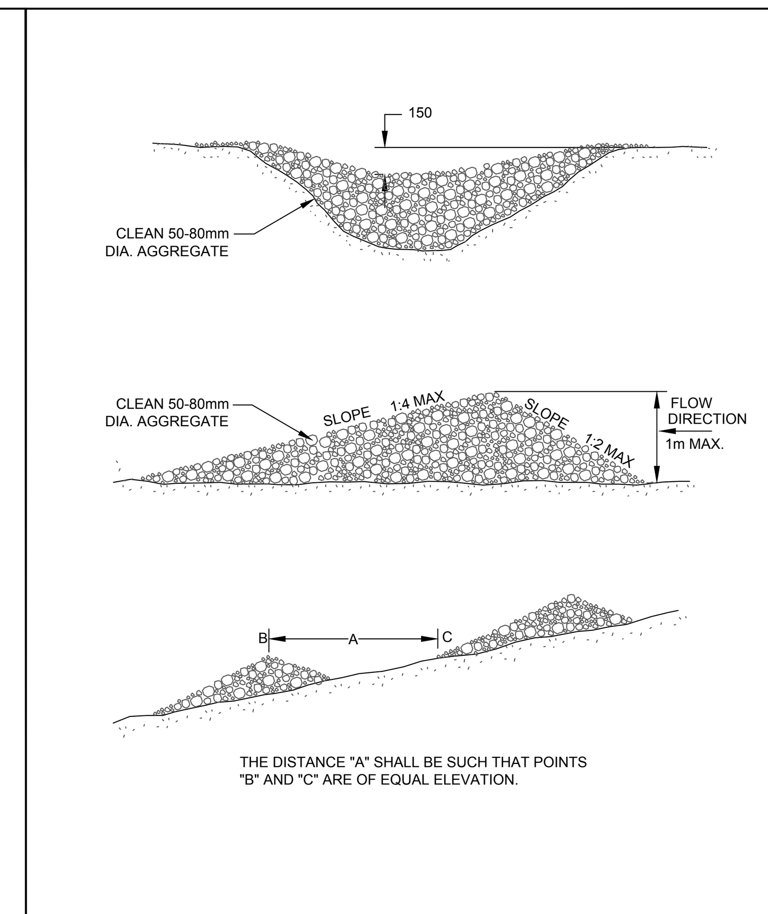
- PROPERTY BOUNDARY
- DOUBLE RUN EROSION CONTROL FENCE
- EROSION CONTROL FENCE
- PROPOSED CONTOUR
- MUDMAT
- DRAINAGE FLOW ARROW
- SWALE
- PROPOSED ELEATION
- EXISTING ELEVATION
- CHECKDAM
- EXISTING DITCH
- EXISTING CONTOUR
- EXISTING CULVERT



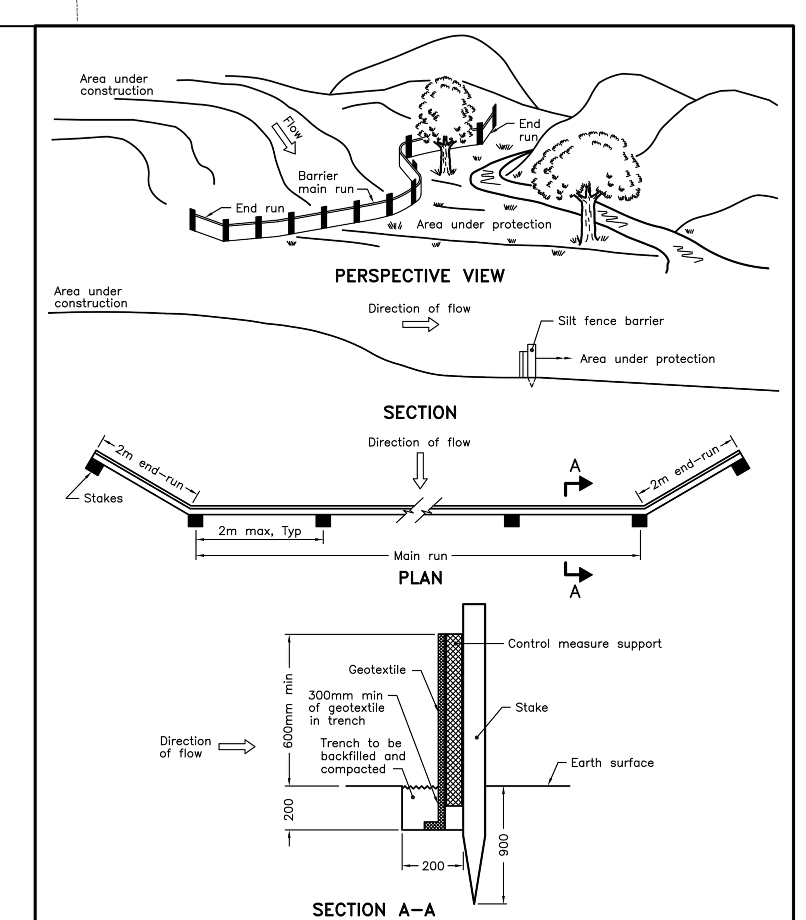

MUD MAT CONSTRUCTION ACCESS
NTS
BURNSIDE RJB 7.08




DOUBLE RUN SEDIMENT FENCE
NTS
BURNSIDE RJB 7.15




ROCK CHECK - DAMS FOR ROADSIDE DITCHES
NTS
BURNSIDE RJB 7.10




NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev 1
HEAVY-DUTY SILT FENCE BARRIER
OPSD 219.130

| No. | Issue / Revision | Date | Auth. |
|---|---|---|---|
| 1 | ISSUED FOR DRAFT PLAN APPLICATION | 6/1/2018 | SH |
| 2 | 2nd SUBMISSION DRAFT PLAN APPLICATION | 10/4/2019 | SH |

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430 MCNEILLY ROAD, SUITE 203
STONEY CREEK, ON
L8E 5E3

LOSANI HOMES

Drawing Title
**LOSANI FIFTH WHEEL**
TOWN OF GRIMSBY

EROSION & SEDIMENT CONTROL PLAN

| Drawn | Checked | Designed | Checked | Date | Drawing No. |
|---|---|---|---|---|---|
| AH | SH | EL | SH | 6/1/2018 | C303 |
| Project No. 040159 | | Contract No. ---- | | Revision No. 0 | |
| Scale 1:750 | | | | | |

File: G:\040159 - Losani Fifth Wheel\Drawings\03_ProductionDwg\040159 - C303 EROSION CONTROL.dwg Date Plotted: October 4, 2019 - 2:55 PM

# Appendix C

## Sanitary and Storm Sewer Design Sheets
## Regional Sewer Infrastructure

## STORM SEWER DESIGN SHEET: (5 Year Storm)

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

**Losani Homes**
**Fifth Wheel Development, Grimsby, ON**

Project #: 300 040159
Date: 4-Oct-19
Designed: E.L.
Checked: S.A.H.

Min. Diameter = 250 mm
Mannings 'n'= 0.013
Starting Tc = 10 min
Factor of Safety = 5 %

Rainfall Intensity = $\frac{A}{(Tc+B)^c}$ *where Tc is in hours*

A = 785.59
B = 6
C = 0.79
*(5 Yr)*

NOMINAL PIPE SIZE USED

| DESCRIPTION | FROM MH | TO MH | AREA (ha) | RUNOFF COEFFICIENT "R" | 'AR' | ACCUM. 'AR' | RAINFALL INTENSITY (mm/hr) | FLOW (m3/s) | CONSTANT FLOW (m3/s) | ACCUM. CONSTANT FLOW (m3/s) | TOTAL FLOW ($m^3/s$) | LENGTH (m) | SLOPE (%) | PIPE DIAMETER (mm) | FULL FLOW CAPACITY ($m^3/s$) | FULL FLOW VELOCITY (m/s) | INITIAL Tc (min) | TIME OF CONCENTRATION (min) | ACC. TIME OF CONCENTRATION (min) | PERCENT FULL (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WINSTON RD/BDG M, N | MH12 | MH11 | 0.27 | 0.90 | 0.24 | 0.24 | 186.7 | 0.126 | | | 0.126 | 64.1 | 0.50 | 450 | 0.202 | 1.27 | 10.00 | 0.84 | 10.84 | 62% |
| WINSTON RD/BDG K, L | MH11 | MH10 | 0.29 | 0.90 | 0.26 | 0.50 | 186.3 | 0.261 | | | 0.261 | 98.3 | 0.50 | 525 | 0.304 | 1.40 | 10.84 | 1.17 | 12.01 | 86% |
| | | | | | | | | | | | | | | | | | | | | |
| | P1 | MH14 | 0.69 | 0.58 | 0.40 | 0.40 | 186.7 | 0.208 | | | 0.208 | 8.8 | 0.50 | 525 | 0.304 | 1.40 | 10.00 | 0.10 | 10.10 | 68% |
| | MH14 | MH10 | 0.12 | 0.90 | 0.11 | 0.51 | 186.6 | 0.263 | | | 0.263 | 28.0 | 0.50 | 525 | 0.304 | 1.40 | 10.10 | 0.33 | 10.44 | 87% |
| | | | | | | | | | | | | | | | | | | | | |
| OGS1 | MH10 | OGS1 | | | | 1.01 | 185.9 | 0.523 | | | 0.523 | 4.0 | 0.40 | 750 | 0.704 | 1.59 | 12.01 | 0.04 | 12.05 | 74% |
| OUTLET 1 | OGS1 | OUT1 | | | | 1.01 | 185.8 | 0.523 | | | 0.523 | 15.9 | 0.40 | 750 | 0.704 | 1.59 | 12.05 | 0.17 | 12.22 | 74% |
| | | | | | | | | | | | | | | | | | | | | |
| N. SERVICE RD | MH25 | MH24 | 0.31 | 0.90 | 0.28 | 0.28 | 186.7 | 0.145 | | | 0.145 | 55.1 | 1.00 | 375 | 0.175 | 1.59 | 10.00 | 0.58 | 10.58 | 83% |
| N. SERVICE RD | MH24 | MH23 | 0.31 | 0.90 | 0.28 | 0.56 | 186.4 | 0.289 | | | 0.289 | 76.0 | 1.00 | 525 | 0.430 | 1.99 | 10.58 | 0.64 | 11.22 | 67% |
| N. SERVICE RD | MH23 | MH22 | 0.31 | 0.90 | 0.28 | 0.84 | 186.2 | 0.433 | | | 0.433 | 93.5 | 1.00 | 600 | 0.614 | 2.17 | 11.22 | 0.72 | 11.93 | 70% |
| N. SERVICE RD | MH22 | MH21 | | | | 0.84 | 185.9 | 0.432 | | | 0.432 | 28.6 | 1.00 | 600 | 0.614 | 2.17 | 11.93 | 0.22 | 12.15 | 70% |
| | | | | | | | | | | | | | | | | | | | | |
| STREET C | MH28 | MH27 | 0.11 | 0.90 | 0.10 | 0.10 | 186.7 | 0.051 | | | 0.051 | 44.5 | 1.00 | 300 | 0.097 | 1.37 | 10.00 | 0.54 | 10.54 | 53% |
| | MH27 | MH26 | 0.11 | 0.90 | 0.10 | 0.20 | 186.4 | 0.103 | | | 0.103 | 56.1 | 1.00 | 375 | 0.175 | 1.59 | 10.54 | 0.59 | 11.13 | 58% |
| STREET C | MH26 | MH21 | 0.12 | 0.90 | 0.11 | 0.31 | 186.2 | 0.158 | | | 0.158 | 12.1 | 1.00 | 375 | 0.175 | 1.59 | 11.13 | 0.13 | 11.26 | 90% |
| | | | | | | | | | | | | | | | | | | | | |
| WINSTON RD | MH21 | OGS2 | 0.12 | 0.90 | 0.11 | 1.25 | 185.8 | 0.646 | | | 0.646 | 44.6 | 2.00 | 600 | 0.868 | 3.07 | 12.15 | 0.24 | 12.40 | 74% |
| OGS2 | OGS2 | MH20 | | | | 1.25 | 185.7 | 0.645 | | | 0.645 | 16.8 | 2.00 | 600 | 0.868 | 3.07 | 12.40 | 0.09 | 12.49 | 74% |
| | | | | | | | | | | | | | | | | | | | | |
| BLDG A & B, AMENITY | P2 | MH20 | 0.58 | 0.67 | 0.39 | 0.39 | 186.7 | 0.201 | | | 0.201 | 20.4 | 2.00 | 375 | 0.248 | 2.25 | 10.00 | 0.15 | 10.15 | 81% |
| | | | | | | | | | | | | | | | | | | | | |
| OUTLET 2 | MH20 | OUT2 | | | | 1.64 | 185.7 | 0.846 | | | 0.846 | 41.0 | 2.50 | 600 | 0.971 | 3.43 | 12.49 | 0.20 | 12.69 | 87% |
| | | | | | | | | | | | | | | | | | | | | |
| N. SERVICE RD | CB37 | MH36 | 0.19 | 0.90 | 0.17 | 0.17 | 186.7 | 0.089 | | | 0.089 | 10.5 | 1.00 | 300 | 0.097 | 1.37 | 10.00 | 0.13 | 10.13 | 92% |
| N. SERVICE RD | MH36 | MH35 | 0.34 | 0.90 | 0.31 | 0.48 | 186.6 | 0.247 | | | 0.247 | 66.9 | 0.50 | 525 | 0.304 | 1.40 | 10.13 | 0.79 | 10.92 | 81% |
| N. SERVICE RD | MH35 | MH30 | | | | 0.48 | 186.3 | 0.247 | | | 0.247 | 18.7 | 0.50 | 525 | 0.304 | 1.40 | 10.92 | 0.22 | 11.14 | 81% |
| | | | | | | | | | | | | | | | | | | | | |
| STREET A | MH32 | MH31 | 0.35 | 0.90 | 0.32 | 0.32 | 186.7 | 0.163 | | | 0.163 | 95.0 | 0.50 | 450 | 0.202 | 1.27 | 10.00 | 1.25 | 11.25 | 81% |
| STREET A | MH31 | MH30 | | | | 0.32 | 186.2 | 0.163 | | | 0.163 | 4.9 | 0.50 | 450 | 0.202 | 1.27 | 11.25 | 0.06 | 11.31 | 81% |
| | | | | | | | | | | | | | | | | | | | | |
| OGS3 | MH30 | OGS3 | | | | 0.79 | 186.1 | 0.410 | | | 0.410 | 3.0 | 1.00 | 525 | 0.430 | 1.99 | 11.31 | 0.03 | 11.34 | 95% |
| OUTLET 3 | OGS3 | CULV1 | | | | 0.79 | 186.1 | 0.409 | | | 0.409 | 3.7 | 1.00 | 525 | 0.430 | 1.99 | 11.34 | 0.03 | 11.37 | 95% |
| | | | | | | | | | | | | | | | | | | | | |
| STREET B | P4 | OGS4 | 0.70 | 0.90 | 0.63 | 0.63 | 186.7 | 0.327 | | | 0.327 | 4.0 | 1.50 | 450 | 0.349 | 2.20 | 10.00 | 0.03 | 10.03 | 94% |
| OUTLET 4 | OGS4 | CULV2 | | | | 0.63 | 186.6 | 0.327 | | | 0.327 | 7.2 | 1.50 | 450 | 0.349 | 2.20 | 10.03 | 0.05 | 10.09 | 94% |

## STORM SEWER DESIGN SHEET: (5 Year Storm)

**Losani Homes**
**Fifth Wheel Development, Grimsby, ON**

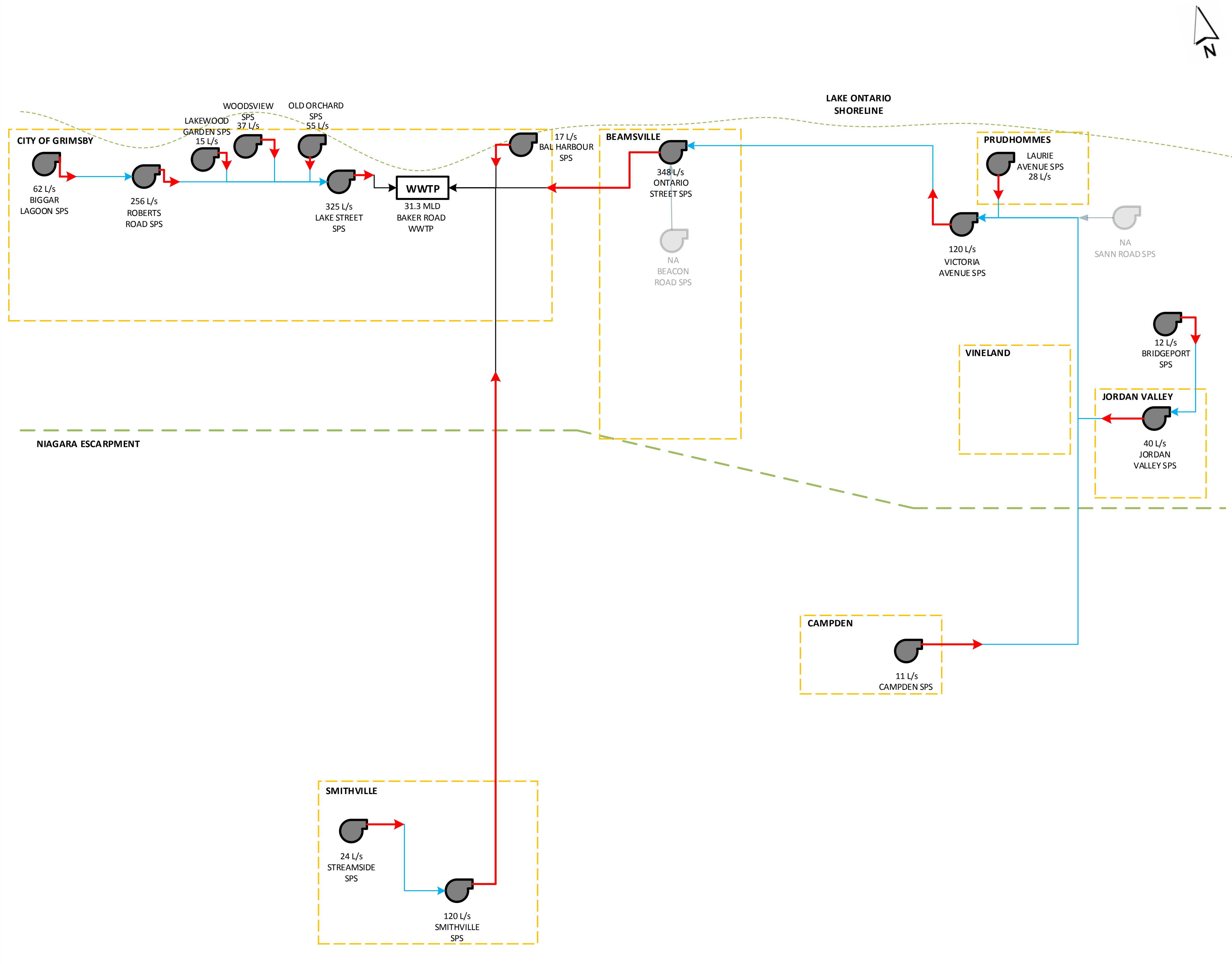
BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Rainfall Intensity = $\dfrac{A}{(Tc+B)^c}$ *where Tc is in hours*

| | | | | | |
|---|---|---|---|---|---|
| **Project #:** | **300 040159** | **Min. Diameter =** | **250 mm** | **A =** | **785.59** |
| **Date:** | **4-Oct-19** | **Mannings 'n'=** | **0.013** | **B =** | **6** *(5 Yr)* |
| **Designed:** | **E.L.** | **Starting Tc =** | **10 min** | **C =** | **0.79** |
| **Checked:** | **S.A.H.** | **Factor of Safety =** | **5 %** | | |

**NOMINAL PIPE SIZE USED**

| DESCRIPTION | FROM MH | TO MH | AREA (ha) | RUNOFF COEFFICIENT "R" | 'AR' | ACCUM. 'AR' | RAINFALL INTENSITY (mm/hr) | FLOW (m3/s) | CONSTANT FLOW (m3/s) | ACCUM. CONSTANT FLOW (m3/s) | TOTAL FLOW ($m^3/s$) | LENGTH (m) | SLOPE (%) | PIPE DIAMETER (mm) | FULL FLOW CAPACITY ($m^3/s$) | FULL FLOW VELOCITY (m/s) | INITIAL Tc (min) | TIME OF CONCENTRATION (min) | ACC. TIME OF CONCENTRATION (min) | PERCENT FULL (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N. SERVICE RD | CB57 | MH56 | 0.18 | 0.90 | 0.16 | 0.16 | 186.7 | 0.084 | | | 0.084 | 24.0 | 1.00 | 300 | 0.097 | 1.37 | 10.00 | 0.29 | 10.29 | 87% |
| | MH56 | MH51 | | | | 0.16 | 186.5 | 0.084 | | | 0.084 | 12.3 | 1.00 | 300 | 0.097 | 1.37 | 10.29 | 0.15 | 10.44 | 87% |
| STREET C | MH54 | MH53 | 0.14 | 0.90 | 0.13 | 0.13 | 186.7 | 0.065 | | | 0.065 | 47.0 | 1.00 | 300 | 0.097 | 1.37 | 10.00 | 0.57 | 10.57 | 68% |
| STREET C | MH53 | MH52 | 0.15 | 0.90 | 0.14 | 0.26 | 186.4 | 0.135 | | | 0.135 | 45.0 | 1.00 | 375 | 0.175 | 1.59 | 10.57 | 0.47 | 11.05 | 77% |
| STREET C | MH52 | MH51 | | | | 0.26 | 186.2 | 0.135 | | | 0.135 | 12.3 | 1.00 | 375 | 0.175 | 1.59 | 11.05 | 0.13 | 11.17 | 77% |
| WINSTON ST | MH51 | MH50 | 0.13 | 0.90 | 0.12 | 0.54 | 186.2 | 0.279 | | | 0.279 | 68.0 | 1.30 | 450 | 0.325 | 2.04 | 11.17 | 0.55 | 11.73 | 86% |
| OGS5 | MH50 | OGS5 | | | | 0.54 | 186.0 | 0.279 | | | 0.279 | 4.0 | 1.00 | 525 | 0.430 | 1.99 | 11.73 | 0.03 | 11.76 | 65% |
| | OGS5 | CULV2 | | | | 0.54 | 186.0 | 0.279 | | | 0.279 | 17.2 | 0.50 | 525 | 0.304 | 1.40 | 11.76 | 0.20 | 11.97 | 92% |
| BLDG E, F | P6 | CULV2 | 0.54 | 0.90 | 0.49 | 0.49 | 186.7 | 0.252 | | | 0.252 | 11.2 | 1.50 | 450 | 0.349 | 2.20 | 10.00 | 0.09 | 10.09 | 72% |
| BLD C, E | P5 | CULV2 | 0.50 | 0.90 | 0.45 | 0.45 | 186.7 | 0.233 | | | 0.233 | 27.2 | 1.00 | 450 | 0.285 | 1.79 | 10.00 | 0.25 | 10.25 | 82% |




# 2016 Master Servicing Plan

Baker Road WWTP

## EXISTING COLLECTION SCHEMATIC

**Legend**

| | |
|---|---|
| WWTP (RATED CAPACITY) | Wastewater Treatment Plant |
| FIRM CAPACITY | Sewage Pumping Station |
| | Forcemain |
| | Connection from SPS to SPS |
| | Connection from SPS to WWTP |

June 2017
Figure 4.A.2
Not to Scale

## SANITARY SEWER DESIGN SHEET

**Losani Homes**
**Fifth Wheel Development, Grimsby, ON**

BURNSIDE
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Project #: 300 040159
Date: 7-Oct-19
Designed: E.L.
Checked: S.A.H.

Min Diameter = 200 mm
Mannings 'n'= 0.013
Min. Velocity = 0.60 m/s
Max. Velocity = 3.65 m/s

Avg. Domestic Flow = 275.0 l/c/d
Infiltration = 0.286 l/s/ha
Max. Peaking Factor = 4.00
Min. Peaking Factor= 1.50

Factor of Safety = 10

NOMINAL PIPE SIZE USED

| | | | RESIDENTIAL and NON-RESIDENTIAL | | | | | | | COMMERCIAL/INDUSTRIAL/INSTITUTIONAL | | | | | | FLOW CALCULATIONS | | | | | PIPE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESCRIPTION | FROM MH | TO MH | AREA (ha) | ACC. AREA (ha) | UNITS (#) | DENSITY (P/ha) | DENSITY (P/unit) | POP | ACCUM. RES. POP. | AREA (ha) | ACC. AREA (ha) | EQUIV. POP. (p/ha) | FLOW RATE (l/s/ha) | EQUIV. POP. | ACCUM. EQUIV. POP. | INFILTRATION (l/s) | TOTAL ACCUM. POP. | PEAKING FACTOR | POP. FLOW (l/s) | TOTAL FLOW (l/s) | SLOPE (%) | PIPE DIAMETER (mm) | FULL FLOW CAPACITY (l/s) | FULL FLOW VELOCITY (m/s) | ACTUAL VELOCITY (m/s) | PERCENT FULL (%) |
| BLDG N & M | MH7A | MH6A | 0.39 | 0.39 | | | | 31 | 31 | | | | | | | 0.1 | 31 | 4.00 | 0.4 | 0.5 | 0.50 | 200 | 23.2 | 0.74 | 0.30 | 2% |
| BLDG L & K | MH6A | MH5A | 0.45 | 0.84 | | | | 37 | 68 | | | | | | | 0.2 | 68 | 4.00 | 0.9 | 1.1 | 0.50 | 200 | 23.2 | 0.74 | 0.38 | 5% |
| ROUTE | MH5A | MH4A | | 0.84 | | | | | 68 | | | | | | | 0.2 | 68 | 4.00 | 0.9 | 1.1 | 0.40 | 200 | 20.7 | 0.66 | 0.35 | 5% |
| BLDG H, I, & J | SSWR4 | MH8A | 0.41 | 0.41 | | | | 43 | 43 | | | | | | | 0.1 | 43 | 4.00 | 0.5 | 0.7 | 0.50 | 200 | 23.2 | 0.74 | 0.33 | 3% |
| | MH8A | MH4A | | 0.41 | | | | | 43 | | | | | | | 0.1 | 43 | 4.00 | 0.5 | 0.7 | 1.00 | 200 | 32.8 | 1.04 | 0.41 | 2% |
| ROUTE | MH4A | MH3A | 0.23 | 1.48 | | | | | 111 | | | | | | | 0.4 | 111 | 4.00 | 1.4 | 1.8 | 0.40 | 200 | 20.7 | 0.66 | 0.41 | 9% |
| BLDG C & D | SSWR3 | MH3A | 1.28 | 1.28 | | | | 746 | 746 | | | | | | | 0.4 | 746 | 3.88 | 9.2 | 9.6 | 0.50 | 200 | 23.2 | 0.74 | 0.70 | 41% |
| BLDG E | SSWR6 | MH3A | 0.69 | 0.69 | | | | 342 | 342 | | | | | | | 0.2 | 342 | 4.00 | 4.4 | 4.6 | 0.50 | 200 | 23.2 | 0.74 | 0.57 | 20% |
| ROUTE | MH3A | MH2A | | 3.45 | | | | | 1199 | | | | | | | 1.0 | 1199 | 3.75 | 14.3 | 15.3 | 0.40 | 250 | 37.6 | 0.77 | 0.73 | 41% |
| MUNICIPAL SSWR | MH2A | MH1A | | 3.45 | | | | | 1199 | | | | | | | 1.0 | 1199 | 3.75 | 14.3 | 15.3 | 0.40 | 250 | 37.6 | 0.77 | 0.73 | 41% |
| | MH1A | EX | | 3.45 | | | | | 1199 | | | | | | | 1.0 | 1199 | 3.75 | 14.3 | 15.3 | | 250 | | | | |
| BLDG A & B | SSWR2 | MH30A | 0.88 | 0.88 | | | | 1013 | 1013 | | | | | | | 0.3 | 1013 | 3.80 | 12.2 | 12.5 | 1.00 | 200 | 32.8 | 1.04 | 0.97 | 38% |
| | MH30A | EX | | 0.88 | | | | | 1013 | | | | | | | 0.3 | 1013 | 3.80 | 12.2 | 12.5 | 1.00 | 200 | 32.8 | 1.04 | 0.97 | 38% |
| BLDG F | SSWR5 | MH70A | 0.56 | 0.56 | | | | 528 | 528 | | | | | | | 0.2 | 528 | 3.96 | 6.7 | 6.8 | 1.00 | 200 | 32.8 | 1.04 | 0.82 | 21% |
| | MH70A | EX | | 0.56 | | | | | 528 | | | | | | | 0.2 | 528 | 3.96 | 6.7 | 6.8 | 1.00 | 200 | 32.8 | 1.04 | 0.82 | 21% |
| | EX | MUN | | 4.89 | | | | | 2740 | | | | | | | 1.4 | 2740 | 3.48 | 30.3 | 31.7 | 0.40 | 525 | 272.0 | 1.26 | 0.84 | 12% |

FOR DETAILED POPULATION INFORMATION REFER TO DRAWING C301

# Appendix D

# Oil and Grit Separator Design

# Brief Stormceptor Sizing Report - OGS1

| Project Information & Location | | | |
|---|---|---|---|
| **Project Name** | Losani Fifth Wheel | **Project Number** | 300040159 |
| **City** | Town of Grimsby | **State/ Province** | Ontario |
| **Country** | Canada | **Date** | 10/3/2019 |
| **Designer Information** | | **EOR Information (optional)** | |
| **Name** | Erick Lopez | **Name** | |
| **Company** | R.J. Burnside | **Company** | |
| **Phone #** | 905-821-5933 | **Phone #** | |
| **Email** | erick.lopez@rjburnside.com | **Email** | |

**Stormwater Treatment Recommendation**

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

| | |
|---|---|
| **Site Name** | OGS1 |
| **Target TSS Removal (%)** | 80 |
| **TSS Removal (%) Provided** | 82 |
| **Recommended Stormceptor Model** | STC 4000 |

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

| Stormceptor Sizing Summary | |
|---|---|
| **Stormceptor Model** | **% TSS Removal Provided** |
| STC 300 | 59 |
| STC 750 | 71 |
| STC 1000 | 72 |
| STC 1500 | 73 |
| STC 2000 | 76 |
| STC 3000 | 78 |
| STC 4000 | 82 |
| STC 5000 | 83 |
| STC 6000 | 85 |
| STC 9000 | 88 |
| STC 10000 | 88 |
| STC 14000 | 91 |
| StormceptorMAX | Custom |

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## Sizing Details

| Drainage Area | |
|---|---|
| Total Area (ha) | 1.37 |
| Imperviousness % | 77.00 |

| Water Quality Objective | |
|---|---|
| TSS Removal (%) | 80.0 |
| Runoff Volume Capture (%) | |
| Oil Spill Capture Volume (L) | |
| Peak Conveyed Flow Rate (L/s) | |
| Water Quality Flow Rate (L/s) | |

| Rainfall | |
|---|---|
| Station Name | ST CATHARINES A |
| State/Province | Ontario |
| Station ID # | 7287 |
| Years of Records | 33 |
| Latitude | 43°12'N |
| Longitude | 79°10'W |

| Up Stream Storage | |
|---|---|
| Storage (ha-m) | Discharge (cms) |
| 0.000 | 0.000 |

| Up Stream Flow Diversion | |
|---|---|
| Max. Flow to Stormceptor (cms) | |

| Particle Size Distribution (PSD)<br>The selected PSD defines TSS removal | | |
|---|---|---|
| Fine Distribution | | |
| Particle Diameter (microns) | Distribution % | Specific Gravity |
| 20.0 | 20.0 | 1.30 |
| 60.0 | 20.0 | 1.80 |
| 150.0 | 20.0 | 2.20 |
| 400.0 | 20.0 | 2.65 |
| 2000.0 | 20.0 | 2.65 |

## Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

**For Stormceptor Specifications and Drawings Please Visit:**
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# Brief Stormceptor Sizing Report - OGS2

| Project Information & Location | | | |
|---|---|---|---|
| **Project Name** | Losani Fifth Wheel | **Project Number** | 300040159 |
| **City** | Town of Grimsby | **State/ Province** | Ontario |
| **Country** | Canada | **Date** | 10/3/2019 |
| **Designer Information** | | **EOR Information (optional)** | |
| **Name** | Erick Lopez | **Name** | |
| **Company** | R.J. Burnside | **Company** | |
| **Phone #** | 905-821-5933 | **Phone #** | |
| **Email** | erick.lopez@rjburnside.com | **Email** | |

**Stormwater Treatment Recommendation**

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

| | |
|---|---|
| **Site Name** | OGS2 |
| **Target TSS Removal (%)** | 80 |
| **TSS Removal (%) Provided** | 80 |
| **Recommended Stormceptor Model** | STC 5000 |

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

| Stormceptor Sizing Summary | |
|---|---|
| **Stormceptor Model** | **% TSS Removal Provided** |
| STC 300 | 55 |
| STC 750 | 68 |
| STC 1000 | 69 |
| STC 1500 | 69 |
| STC 2000 | 74 |
| STC 3000 | 75 |
| STC 4000 | 79 |
| STC 5000 | 80 |
| STC 6000 | 83 |
| STC 9000 | 87 |
| STC 10000 | 86 |
| STC 14000 | 89 |
| StormceptorMAX | Custom |

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## Sizing Details

| Drainage Area | |
|---|---|
| Total Area (ha) | 1.39 |
| Imperviousness % | 99.00 |

| Water Quality Objective | |
|---|---|
| TSS Removal (%) | 80.0 |
| Runoff Volume Capture (%) | |
| Oil Spill Capture Volume (L) | |
| Peak Conveyed Flow Rate (L/s) | |
| Water Quality Flow Rate (L/s) | |

| Rainfall | |
|---|---|
| Station Name | ST CATHARINES A |
| State/Province | Ontario |
| Station ID # | 7287 |
| Years of Records | 33 |
| Latitude | 43°12'N |
| Longitude | 79°10'W |

| Up Stream Storage | |
|---|---|
| Storage (ha-m) | Discharge (cms) |
| 0.000 | 0.000 |

| Up Stream Flow Diversion | |
|---|---|
| Max. Flow to Stormceptor (cms) | |

| Particle Size Distribution (PSD)<br>The selected PSD defines TSS removal | | |
|---|---|---|
| Fine Distribution | | |
| Particle Diameter (microns) | Distribution % | Specific Gravity |
| 20.0 | 20.0 | 1.30 |
| 60.0 | 20.0 | 1.80 |
| 150.0 | 20.0 | 2.20 |
| 400.0 | 20.0 | 2.65 |
| 2000.0 | 20.0 | 2.65 |

## Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

**For Stormceptor Specifications and Drawings Please Visit:**
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# Brief Stormceptor Sizing Report - OGS3

| Project Information & Location | | | |
|---|---|---|---|
| **Project Name** | Losani Fifth Wheel | **Project Number** | 300040159 |
| **City** | Town of Grimsby | **State/ Province** | Ontario |
| **Country** | Canada | **Date** | 10/3/2019 |
| **Designer Information** | | **EOR Information (optional)** | |
| **Name** | Erick Lopez | **Name** | |
| **Company** | R.J. Burnside | **Company** | |
| **Phone #** | 905-821-5933 | **Phone #** | |
| **Email** | erick.lopez@rjburnside.com | **Email** | |

**Stormwater Treatment Recommendation**

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

| | |
|---|---|
| **Site Name** | OGS3 |
| **Target TSS Removal (%)** | 80 |
| **TSS Removal (%) Provided** | 80 |
| **Recommended Stormceptor Model** | STC 3000 |

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

| Stormceptor Sizing Summary | |
|---|---|
| **Stormceptor Model** | **% TSS Removal Provided** |
| STC 300 | 62 |
| STC 750 | 73 |
| STC 1000 | 74 |
| STC 1500 | 75 |
| STC 2000 | 78 |
| STC 3000 | 80 |
| STC 4000 | 83 |
| STC 5000 | 84 |
| STC 6000 | 86 |
| STC 9000 | 90 |
| STC 10000 | 90 |
| STC 14000 | 92 |
| StormceptorMAX | Custom |

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## Sizing Details

| Drainage Area | |
|---|---|
| Total Area (ha) | 0.88 |
| Imperviousness % | 99.00 |

| Rainfall | |
|---|---|
| Station Name | ST CATHARINES A |
| State/Province | Ontario |
| Station ID # | 7287 |
| Years of Records | 33 |
| Latitude | 43°12'N |
| Longitude | 79°10'W |

| Water Quality Objective | |
|---|---|
| TSS Removal (%) | 80.0 |
| Runoff Volume Capture (%) | |
| Oil Spill Capture Volume (L) | |
| Peak Conveyed Flow Rate (L/s) | |
| Water Quality Flow Rate (L/s) | |

| Up Stream Storage | |
|---|---|
| Storage (ha-m) | Discharge (cms) |
| 0.000 | 0.000 |

| Up Stream Flow Diversion | |
|---|---|
| Max. Flow to Stormceptor (cms) | |

| Particle Size Distribution (PSD)<br>The selected PSD defines TSS removal | | |
|---|---|---|
| Fine Distribution | | |
| Particle Diameter (microns) | Distribution % | Specific Gravity |
| 20.0 | 20.0 | 1.30 |
| 60.0 | 20.0 | 1.80 |
| 150.0 | 20.0 | 2.20 |
| 400.0 | 20.0 | 2.65 |
| 2000.0 | 20.0 | 2.65 |

## Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

**For Stormceptor Specifications and Drawings Please Visit:**
**http://www.imbriumsystems.com/technical-specifications**

# Brief Stormceptor Sizing Report - OGS4

| Project Information & Location | | | |
|---|---|---|---|
| **Project Name** | Losani Fifth Wheel | **Project Number** | 300040159 |
| **City** | Town of Grimsby | **State/ Province** | Ontario |
| **Country** | Canada | **Date** | 10/3/2019 |
| **Designer Information** | | **EOR Information (optional)** | |
| **Name** | Erick Lopez | **Name** | |
| **Company** | R.J. Burnside | **Company** | |
| **Phone #** | 905-821-5933 | **Phone #** | |
| **Email** | erick.lopez@rjburnside.com | **Email** | |

**Stormwater Treatment Recommendation**

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

| | |
|---|---|
| **Site Name** | OGS4 |
| **Target TSS Removal (%)** | 80 |
| **TSS Removal (%) Provided** | 81 |
| **Recommended Stormceptor Model** | STC 2000 |

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

| Stormceptor Sizing Summary | |
|---|---|
| **Stormceptor Model** | **% TSS Removal Provided** |
| STC 300 | 65 |
| STC 750 | 76 |
| STC 1000 | 77 |
| STC 1500 | 77 |
| STC 2000 | 81 |
| STC 3000 | 82 |
| STC 4000 | 85 |
| STC 5000 | 86 |
| STC 6000 | 88 |
| STC 9000 | 91 |
| STC 10000 | 91 |
| STC 14000 | 93 |
| StormceptorMAX | Custom |

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## Sizing Details

| Drainage Area | |
|---|---|
| Total Area (ha) | 0.70 |
| Imperviousness % | 99.00 |

| Water Quality Objective | |
|---|---|
| TSS Removal (%) | 80.0 |
| Runoff Volume Capture (%) | |
| Oil Spill Capture Volume (L) | |
| Peak Conveyed Flow Rate (L/s) | |
| Water Quality Flow Rate (L/s) | |

| Rainfall | |
|---|---|
| Station Name | ST CATHARINES A |
| State/Province | Ontario |
| Station ID # | 7287 |
| Years of Records | 33 |
| Latitude | 43°12'N |
| Longitude | 79°10'W |

| Up Stream Storage | |
|---|---|
| Storage (ha-m) | Discharge (cms) |
| 0.000 | 0.000 |

| Up Stream Flow Diversion | |
|---|---|
| Max. Flow to Stormceptor (cms) | |

| Particle Size Distribution (PSD)<br>The selected PSD defines TSS removal | | |
|---|---|---|
| Fine Distribution | | |
| Particle Diameter (microns) | Distribution % | Specific Gravity |
| 20.0 | 20.0 | 1.30 |
| 60.0 | 20.0 | 1.80 |
| 150.0 | 20.0 | 2.20 |
| 400.0 | 20.0 | 2.65 |
| 2000.0 | 20.0 | 2.65 |

## Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

**For Stormceptor Specifications and Drawings Please Visit:**
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# Brief Stormceptor Sizing Report - OGS5

| Project Information & Location | | | |
|---|---|---|---|
| **Project Name** | Losani Fifth Wheel | **Project Number** | 300040159 |
| **City** | Town of Grimsby | **State/ Province** | Ontario |
| **Country** | Canada | **Date** | 10/3/2019 |
| **Designer Information** | | **EOR Information (optional)** | |
| **Name** | Erick Lopez | **Name** | |
| **Company** | R.J. Burnside | **Company** | |
| **Phone #** | 905-821-5933 | **Phone #** | |
| **Email** | erick.lopez@rjburnside.com | **Email** | |

**Stormwater Treatment Recommendation**
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

| | |
|---|---|
| **Site Name** | OGS5 |
| **Target TSS Removal (%)** | 80 |
| **TSS Removal (%) Provided** | 82 |
| **Recommended Stormceptor Model** | STC 2000 |

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

| Stormceptor Sizing Summary | |
|---|---|
| **Stormceptor Model** | **% TSS Removal Provided** |
| STC 300 | 67 |
| STC 750 | 77 |
| STC 1000 | 78 |
| STC 1500 | 79 |
| STC 2000 | 82 |
| STC 3000 | 84 |
| STC 4000 | 87 |
| STC 5000 | 87 |
| STC 6000 | 89 |
| STC 9000 | 92 |
| STC 10000 | 92 |
| STC 14000 | 94 |
| StormceptorMAX | Custom |

Stormceptor®

FORTERRA™

## Sizing Details

| Drainage Area | |
|---|---|
| Total Area (ha) | 0.60 |
| Imperviousness % | 99.00 |

| Water Quality Objective | |
|---|---|
| TSS Removal (%) | 80.0 |
| Runoff Volume Capture (%) | |
| Oil Spill Capture Volume (L) | |
| Peak Conveyed Flow Rate (L/s) | |
| Water Quality Flow Rate (L/s) | |

| Rainfall | |
|---|---|
| Station Name | ST CATHARINES A |
| State/Province | Ontario |
| Station ID # | 7287 |
| Years of Records | 33 |
| Latitude | 43°12'N |
| Longitude | 79°10'W |

| Up Stream Storage | |
|---|---|
| Storage (ha-m) | Discharge (cms) |
| 0.000 | 0.000 |

| Up Stream Flow Diversion | |
|---|---|
| Max. Flow to Stormceptor (cms) | |

### Particle Size Distribution (PSD)
### The selected PSD defines TSS removal

| Fine Distribution | | |
|---|---|---|
| Particle Diameter (microns) | Distribution % | Specific Gravity |
| 20.0 | 20.0 | 1.30 |
| 60.0 | 20.0 | 1.80 |
| 150.0 | 20.0 | 2.20 |
| 400.0 | 20.0 | 2.65 |
| 2000.0 | 20.0 | 2.65 |

## Notes

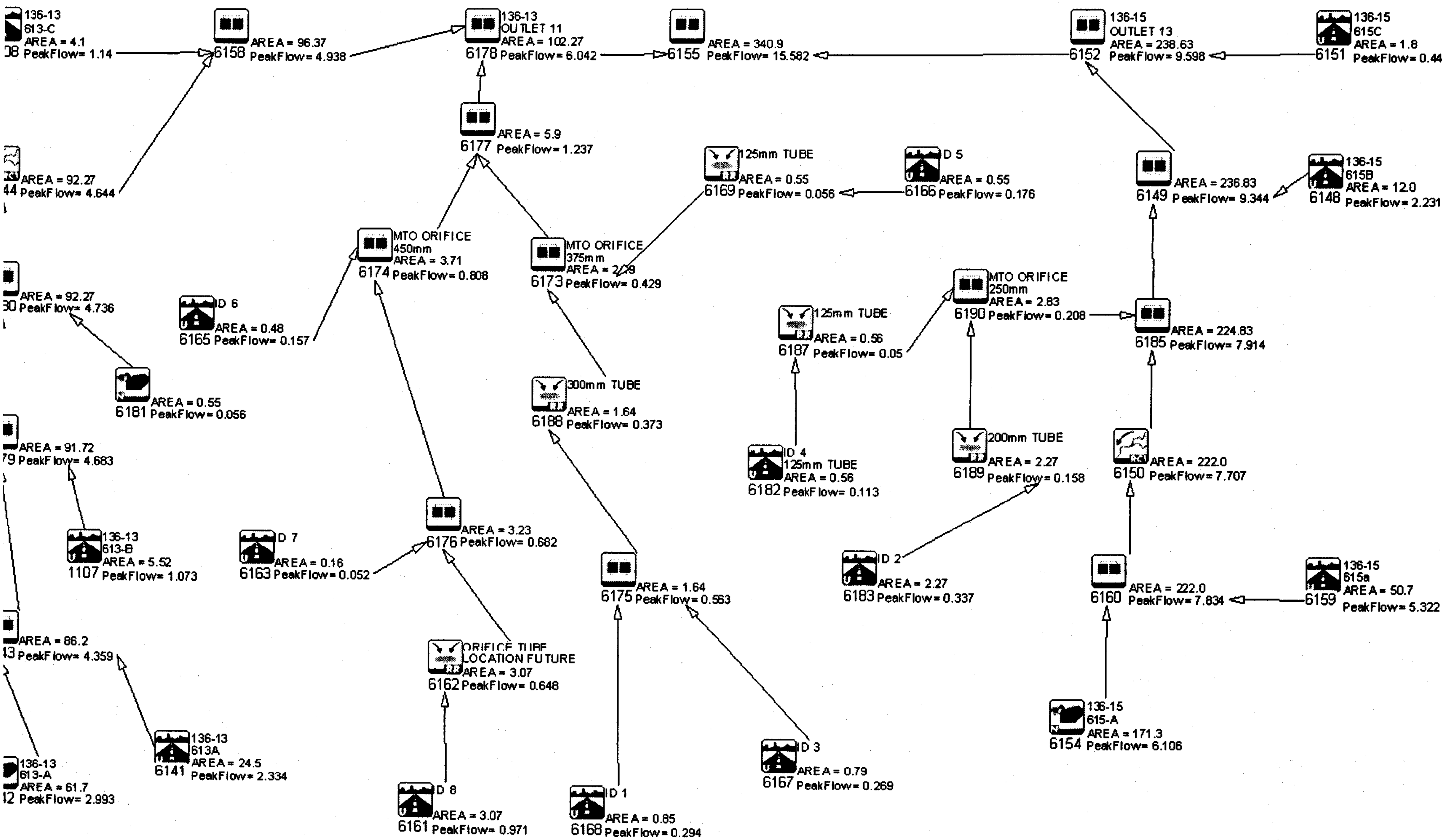
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

**For Stormceptor Specifications and Drawings Please Visit:**
**http://www.imbriumsystems.com/technical-specifications**

# Appendix E

# Watercourse Hydraulic Analysis

# EXCERPTS FROM ODAN-DETECH (2005)



136-13
613-C
AREA = 4.1
PeakFlow= 1.14
6158
AREA = 96.37
PeakFlow= 4.938
136-13
OUTLET 11
6178
AREA = 102.27
PeakFlow= 6.042
6155
AREA = 340.9
PeakFlow= 15.582
136-15
OUTLET 13
6152
AREA = 238.63
PeakFlow= 9.598
136-15
615C
6151
AREA = 1.8
PeakFlow= 0.44
AREA = 92.27
PeakFlow= 4.644
6177
AREA = 5.9
PeakFlow= 1.237
125mm TUBE
6169
AREA = 0.55
PeakFlow= 0.056
D 5
6166
AREA = 0.55
PeakFlow= 0.176
6149
AREA = 236.83
PeakFlow= 9.344
136-15
615B
6148
AREA = 12.0
PeakFlow= 2.231
MTO ORIFICE
450mm
6174
AREA = 3.71
PeakFlow= 0.808
MTO ORIFICE
375mm
6173
PeakFlow= 0.429
AREA = 92.27
PeakFlow= 4.736
ID 6
6165
AREA = 0.48
PeakFlow= 0.157
125mm TUBE
6187
AREA = 0.56
PeakFlow= 0.05
MTO ORIFICE
250mm
6190
AREA = 2.83
PeakFlow= 0.208
6185
AREA = 224.83
PeakFlow= 7.914
6181
AREA = 0.55
PeakFlow= 0.056
300mm TUBE
6188
AREA = 1.64
PeakFlow= 0.373
ID 4
125mm TUBE
6182
AREA = 0.56
PeakFlow= 0.113
200mm TUBE
6189
AREA = 2.27
PeakFlow= 0.158
6150
AREA = 222.0
PeakFlow= 7.707
AREA = 91.72
PeakFlow= 4.683
136-13
613-B
1107
AREA = 5.52
PeakFlow= 1.073
D 7
6163
AREA = 0.16
PeakFlow= 0.052
6176
AREA = 3.23
PeakFlow= 0.682
ID 2
6183
AREA = 2.27
PeakFlow= 0.337
6175
AREA = 1.64
PeakFlow= 0.553
6160
AREA = 222.0
PeakFlow= 7.834
136-15
615a
6159
AREA = 50.7
PeakFlow= 5.322
AREA = 86.2
PeakFlow= 4.359
ORIFICE TUBE
LOCATION FUTURE
6162
AREA = 3.07
PeakFlow= 0.648
136-13
613A
6141
AREA = 24.5
PeakFlow= 2.334
136-15
615-A
6154
AREA = 171.3
PeakFlow= 6.106
ID 3
6167
AREA = 0.79
PeakFlow= 0.269
136-13
613-A
AREA = 61.7
PeakFlow= 2.993
D 8
6161
AREA = 3.07
PeakFlow= 0.971
ID 1
6168
AREA = 0.85
PeakFlow= 0.294

```
================================================================================================

      V     V   I    SSSSS  U   U    A    L
      V     V   I    SS     U   U   A A   L
       V   V    I     SS    U   U  AAAAA  L
       V   V    I      SS   U   U  A   A  L
        VV      I    SSSSS  UUUUU  A   A  LLLLL

       OOO    TTTTT  TTTTT  H   H  Y   Y  M   M   OOO     TM, Version 2.0
      O   O     T      T    H   H   Y Y   MM MM  O   O
      O   O     T      T    H   H    Y    M   M  O   O    Licensed To: Odan-Detech Group
       OOO      T      T    H   H    Y    M   M   OOO                  V02-0059
```

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***** D E T A I L E D   O U T P U T *****

Input filename: C:\Program Files\Visual OTTHYMO v2.0\voin.dat
Output filename: F:\2002\02223\OTTHYMO MTO\LPL SITE DEVELOPED 100yr.out
Summary filename: F:\2002\02223\OTTHYMO MTO\LPL SITE DEVELOPED 100yr.sum

DATE: 11/11/2005                    TIME: 2:04:24 PM

USER:

COMMENTS: ____________________________________________

---

```
****************************
** SIMULATION NUMBER:   6 **
****************************
```

```
--------------------
|    READ STORM    |    Filename: F:\2002\02223\OTTHYMO MTO\Grim-100s12.STM
| Ptotal= 89.01 mm |    Comments: Grimsby 100 year 12 hour SCS
--------------------
```

| TIME hrs | RAIN mm/hr | TIME hrs | RAIN mm/hr | TIME hrs | RAIN mm/hr | TIME hrs | RAIN mm/hr |
|---|---|---|---|---|---|---|---|
| .20 | 1.84 | 3.20 | 3.68 | 6.20 | 22.22 | 9.20 | 3.68 |
| .40 | 1.84 | 3.40 | 3.68 | 6.40 | 13.15 | 9.40 | 3.68 |
| .60 | 1.84 | 3.60 | 3.68 | 6.60 | 9.67 | 9.60 | 3.68 |
| .80 | 1.84 | 3.80 | 3.68 | 6.80 | 9.21 | 9.80 | 3.68 |
| 1.00 | 1.84 | 4.00 | 3.68 | 7.00 | 6.45 | 10.00 | 3.68 |
| 1.20 | 1.84 | 4.20 | 6.45 | 7.20 | 5.53 | 10.20 | 1.84 |
| 1.40 | 1.84 | 4.40 | 6.45 | 7.40 | 5.53 | 10.40 | 1.84 |
| 1.60 | 1.84 | 4.60 | 6.45 | 7.60 | 5.53 | 10.60 | 1.84 |
| 1.80 | 1.84 | 4.80 | 6.45 | 7.80 | 5.53 | 10.80 | 1.84 |
| 2.00 | 1.84 | 5.00 | 6.45 | 8.00 | 5.53 | 11.00 | 1.84 |
| 2.20 | 3.68 | 5.20 | 8.29 | 8.20 | 3.68 | 11.20 | 1.84 |
| 2.40 | 3.68 | 5.40 | 11.97 | 8.40 | 3.68 | 11.40 | 1.84 |
| 2.60 | 3.68 | 5.60 | 26.50 | 8.60 | 3.68 | 11.60 | 1.84 |
| 2.80 | 3.68 | 5.80 | 42.13 | 8.80 | 3.68 | 11.80 | 1.84 |
| 3.00 | 3.68 | 6.00 | 125.18 | 9.00 | 3.68 | 12.00 | 1.84 |

---

```
--------------------
| CALIB            |
| NASHYD    (6181) |   Area    (ha)=    .55   Curve Number   (CN)= 69.0
|ID= 1 DT= 2.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20
```

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

---- TRANSFORMED HYETOGRAPH ----

| TIME hrs | RAIN mm/hr | TIME hrs | RAIN mm/hr | TIME hrs | RAIN mm/hr | TIME hrs | RAIN mm/hr |
|---|---|---|---|---|---|---|---|
| .033 | 1.84 | 3.033 | 3.68 | 6.033 | 22.23 | 9.03 | 3.68 |
| .067 | 1.84 | 3.067 | 3.68 | 6.067 | 22.22 | 9.07 | 3.68 |
| .100 | 1.84 | 3.100 | 3.68 | 6.100 | 22.22 | 9.10 | 3.68 |
| .133 | 1.84 | 3.133 | 3.68 | 6.133 | 22.22 | 9.13 | 3.68 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| .167 | 1.84 | 3.167 | 3.68 | 6.167 | 22.22 | 9.17 | 3.68 |
| .200 | 1.84 | 3.200 | 3.68 | 6.200 | 22.22 | 9.20 | 3.68 |
| .233 | 1.84 | 3.233 | 3.68 | 6.233 | 13.15 | 9.23 | 3.68 |
| .267 | 1.84 | 3.267 | 3.68 | 6.267 | 13.15 | 9.27 | 3.68 |
| .300 | 1.84 | 3.300 | 3.68 | 6.300 | 13.15 | 9.30 | 3.68 |
| .333 | 1.84 | 3.333 | 3.68 | 6.333 | 13.15 | 9.33 | 3.68 |
| .367 | 1.84 | 3.367 | 3.68 | 6.367 | 13.15 | 9.37 | 3.68 |
| .400 | 1.84 | 3.400 | 3.68 | 6.400 | 13.15 | 9.40 | 3.68 |
| .433 | 1.84 | 3.433 | 3.68 | 6.433 | 9.67 | 9.43 | 3.68 |
| .467 | 1.84 | 3.467 | 3.68 | 6.467 | 9.67 | 9.47 | 3.68 |
| .500 | 1.84 | 3.500 | 3.68 | 6.500 | 9.67 | 9.50 | 3.68 |
| .533 | 1.84 | 3.533 | 3.68 | 6.533 | 9.67 | 9.53 | 3.68 |
| .567 | 1.84 | 3.567 | 3.68 | 6.567 | 9.67 | 9.57 | 3.68 |
| .600 | 1.84 | 3.600 | 3.68 | 6.600 | 9.67 | 9.60 | 3.68 |
| .633 | 1.84 | 3.633 | 3.68 | 6.633 | 9.21 | 9.63 | 3.68 |
| .667 | 1.84 | 3.667 | 3.68 | 6.667 | 9.21 | 9.67 | 3.68 |
| .700 | 1.84 | 3.700 | 3.68 | 6.700 | 9.21 | 9.70 | 3.68 |
| .733 | 1.84 | 3.733 | 3.68 | 6.733 | 9.21 | 9.73 | 3.68 |
| .767 | 1.84 | 3.767 | 3.68 | 6.767 | 9.21 | 9.77 | 3.68 |
| .800 | 1.84 | 3.800 | 3.68 | 6.800 | 9.21 | 9.80 | 3.68 |
| .833 | 1.84 | 3.833 | 3.68 | 6.833 | 6.45 | 9.83 | 3.68 |
| .867 | 1.84 | 3.867 | 3.68 | 6.867 | 6.45 | 9.87 | 3.68 |
| .900 | 1.84 | 3.900 | 3.68 | 6.900 | 6.45 | 9.90 | 3.68 |
| .933 | 1.84 | 3.933 | 3.68 | 6.933 | 6.45 | 9.93 | 3.68 |
| .967 | 1.84 | 3.967 | 3.68 | 6.967 | 6.45 | 9.97 | 3.68 |
| 1.000 | 1.84 | 4.000 | 3.68 | 7.000 | 6.45 | 10.00 | 3.68 |
| 1.033 | 1.84 | 4.033 | 6.45 | 7.033 | 5.53 | 10.03 | 1.84 |
| 1.067 | 1.84 | 4.067 | 6.45 | 7.067 | 5.53 | 10.07 | 1.84 |
| 1.100 | 1.84 | 4.100 | 6.45 | 7.100 | 5.53 | 10.10 | 1.84 |
| 1.133 | 1.84 | 4.133 | 6.45 | 7.133 | 5.53 | 10.13 | 1.84 |
| 1.167 | 1.84 | 4.167 | 6.45 | 7.167 | 5.53 | 10.17 | 1.84 |
| 1.200 | 1.84 | 4.200 | 6.45 | 7.200 | 5.53 | 10.20 | 1.84 |
| 1.233 | 1.84 | 4.233 | 6.45 | 7.233 | 5.53 | 10.23 | 1.84 |
| 1.267 | 1.84 | 4.267 | 6.45 | 7.267 | 5.53 | 10.27 | 1.84 |
| 1.300 | 1.84 | 4.300 | 6.45 | 7.300 | 5.53 | 10.30 | 1.84 |
| 1.333 | 1.84 | 4.333 | 6.45 | 7.333 | 5.53 | 10.33 | 1.84 |
| 1.367 | 1.84 | 4.367 | 6.45 | 7.367 | 5.53 | 10.37 | 1.84 |
| 1.400 | 1.84 | 4.400 | 6.45 | 7.400 | 5.53 | 10.40 | 1.84 |
| 1.433 | 1.84 | 4.433 | 6.45 | 7.433 | 5.53 | 10.43 | 1.84 |
| 1.467 | 1.84 | 4.467 | 6.45 | 7.467 | 5.53 | 10.47 | 1.84 |
| 1.500 | 1.84 | 4.500 | 6.45 | 7.500 | 5.53 | 10.50 | 1.84 |
| 1.533 | 1.84 | 4.533 | 6.45 | 7.533 | 5.53 | 10.53 | 1.84 |
| 1.567 | 1.84 | 4.567 | 6.45 | 7.567 | 5.53 | 10.57 | 1.84 |
| 1.600 | 1.84 | 4.600 | 6.45 | 7.600 | 5.53 | 10.60 | 1.84 |
| 1.633 | 1.84 | 4.633 | 6.45 | 7.633 | 5.53 | 10.63 | 1.84 |
| 1.667 | 1.84 | 4.667 | 6.45 | 7.667 | 5.53 | 10.67 | 1.84 |
| 1.700 | 1.84 | 4.700 | 6.45 | 7.700 | 5.53 | 10.70 | 1.84 |
| 1.733 | 1.84 | 4.733 | 6.45 | 7.733 | 5.53 | 10.73 | 1.84 |
| 1.767 | 1.84 | 4.767 | 6.45 | 7.767 | 5.53 | 10.77 | 1.84 |
| 1.800 | 1.84 | 4.800 | 6.45 | 7.800 | 5.53 | 10.80 | 1.84 |
| 1.833 | 1.84 | 4.833 | 6.45 | 7.833 | 5.53 | 10.83 | 1.84 |
| 1.867 | 1.84 | 4.867 | 6.45 | 7.867 | 5.53 | 10.87 | 1.84 |
| 1.900 | 1.84 | 4.900 | 6.45 | 7.900 | 5.53 | 10.90 | 1.84 |
| 1.933 | 1.84 | 4.933 | 6.45 | 7.933 | 5.53 | 10.93 | 1.84 |
| 1.967 | 1.84 | 4.967 | 6.45 | 7.967 | 5.53 | 10.97 | 1.84 |
| 2.000 | 1.84 | 5.000 | 6.45 | 8.000 | 5.53 | 11.00 | 1.84 |
| 2.033 | 3.68 | 5.033 | 8.29 | 8.033 | 3.68 | 11.03 | 1.84 |
| 2.067 | 3.68 | 5.067 | 8.29 | 8.067 | 3.68 | 11.07 | 1.84 |
| 2.100 | 3.68 | 5.100 | 8.29 | 8.100 | 3.68 | 11.10 | 1.84 |
| 2.133 | 3.68 | 5.133 | 8.29 | 8.133 | 3.68 | 11.13 | 1.84 |
| 2.167 | 3.68 | 5.167 | 8.29 | 8.167 | 3.68 | 11.17 | 1.84 |
| 2.200 | 3.68 | 5.200 | 8.29 | 8.200 | 3.68 | 11.20 | 1.84 |
| 2.233 | 3.68 | 5.233 | 11.97 | 8.233 | 3.68 | 11.23 | 1.84 |
| 2.267 | 3.68 | 5.267 | 11.97 | 8.267 | 3.68 | 11.27 | 1.84 |
| 2.300 | 3.68 | 5.300 | 11.97 | 8.300 | 3.68 | 11.30 | 1.84 |
| 2.333 | 3.68 | 5.333 | 11.97 | 8.333 | 3.68 | 11.33 | 1.84 |
| 2.367 | 3.68 | 5.367 | 11.97 | 8.367 | 3.68 | 11.37 | 1.84 |
| 2.400 | 3.68 | 5.400 | 11.97 | 8.400 | 3.68 | 11.40 | 1.84 |
| 2.433 | 3.68 | 5.433 | 26.50 | 8.433 | 3.68 | 11.43 | 1.84 |
| 2.467 | 3.68 | 5.467 | 26.50 | 8.467 | 3.68 | 11.47 | 1.84 |
| 2.500 | 3.68 | 5.500 | 26.50 | 8.500 | 3.68 | 11.50 | 1.84 |
| 2.533 | 3.68 | 5.533 | 26.50 | 8.533 | 3.68 | 11.53 | 1.84 |
| 2.567 | 3.68 | 5.567 | 26.50 | 8.567 | 3.68 | 11.57 | 1.84 |
| 2.600 | 3.68 | 5.600 | 26.50 | 8.600 | 3.68 | 11.60 | 1.84 |
| 2.633 | 3.68 | 5.633 | 42.13 | 8.633 | 3.68 | 11.63 | 1.84 |
| 2.667 | 3.68 | 5.667 | 42.13 | 8.667 | 3.68 | 11.67 | 1.84 |
| 2.700 | 3.68 | 5.700 | 42.13 | 8.700 | 3.68 | 11.70 | 1.84 |
| 2.733 | 3.68 | 5.733 | 42.13 | 8.733 | 3.68 | 11.73 | 1.84 |
| 2.767 | 3.68 | 5.767 | 42.13 | 8.767 | 3.68 | 11.77 | 1.84 |
| 2.800 | 3.68 | 5.800 | 42.13 | 8.800 | 3.68 | 11.80 | 1.84 |
| 2.833 | 3.68 | 5.833 | 125.17 | 8.833 | 3.68 | 11.83 | 1.84 |

```
             2.867    3.68 | 5.867  125.18 | 8.867    3.68 | 11.87    1.84
             2.900    3.68 | 5.900  125.18 | 8.900    3.68 | 11.90    1.84
             2.933    3.68 | 5.933  125.18 | 8.933    3.68 | 11.93    1.84
             2.967    3.68 | 5.967  125.18 | 8.967    3.68 | 11.97    1.84
             3.000    3.68 | 6.000  125.18 | 9.000    3.68 | 12.00    1.84

     Unit Hyd Qpeak  (cms)=    .105

     PEAK FLOW        (cms)=    .056 (i)
     TIME TO PEAK     (hrs)=   6.100
     RUNOFF VOLUME     (mm)=  36.965
     TOTAL RAINFALL    (mm)=  89.014
     RUNOFF COEFFICIENT   =     .415

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD    (6142) |   Area     (ha)=  61.70   Curve Number   (CN)= 69.0
|ID= 1 DT= 2.0 min |   Ia       (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .60

     Unit Hyd Qpeak  (cms)=   3.928

     PEAK FLOW        (cms)=   2.993 (i)
     TIME TO PEAK     (hrs)=   6.533
     RUNOFF VOLUME     (mm)=  36.968
     TOTAL RAINFALL    (mm)=  89.014
     RUNOFF COEFFICIENT   =     .415

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (6141) |   Area     (ha)=  24.50
|ID= 1 DT= 2.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=   5.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      7.35        17.15
     Dep. Storage      (mm)=      1.00         5.00
     Average Slope      (%)=      1.00         1.00
     Length             (m)=    150.00        40.00
     Mannings n            =      .013         .250

     Max.Eff.Inten.(mm/hr)=     125.18        81.10
                over (min)       5.00        14.00
     Storage Coeff.  (min)=      2.98 (ii)   12.43 (ii)
     Unit Hyd. Tpeak (min)=      4.00        14.00
     Unit Hyd. peak  (cms)=       .33          .09
                                                          *TOTALS*
     PEAK FLOW        (cms)=       .42         2.22          2.334 (iii)
     TIME TO PEAK     (hrs)=      6.00         6.13           6.13
     RUNOFF VOLUME     (mm)=     88.01        35.52          38.14
     TOTAL RAINFALL    (mm)=     89.01        89.01          89.01
     RUNOFF COEFFICIENT   =       .99          .40            .43

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  61.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (6143) |
|   1 + 2 = 3      |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (6142):     61.70    2.993      6.53     36.97
        + ID2= 2 (6141):     24.50    2.334      6.13     38.14
          ===============================================
          ID = 3 (6143):     86.20    4.359      6.20     37.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

```
--------------------
| CALIB             |
| STANDHYD  (1107)  |   Area     (ha)=    5.52
|ID= 1 DT= 2.0 min  |   Total Imp(%)=  60.00   Dir. Conn.(%)=  60.00
--------------------
                               IMPERVIOUS     PERVIOUS (i)
     Surface Area      (ha)=       3.31          2.21
     Dep. Storage      (mm)=       1.00          5.00
     Average Slope      (%)=       1.00          1.00
     Length             (m)=     350.00        350.00
     Mannings n            =       .013          .250

     Max.Eff.Inten.(mm/hr)=      125.18         15.78
               over (min)          5.00         72.00
     Storage Coeff.   (min)=       4.95 (ii)    71.77 (ii)
     Unit Hyd. Tpeak  (min)=       4.00         72.00
     Unit Hyd. peak   (cms)=        .24           .02
                                                            *TOTALS*
     PEAK FLOW        (cms)=       1.06           .05         1.073 (iii)
     TIME TO PEAK     (hrs)=       6.00          7.13          6.00
     RUNOFF VOLUME     (mm)=      88.01         28.64         64.26
     TOTAL RAINFALL    (mm)=      89.01         89.01         89.01
     RUNOFF COEFFICIENT    =        .99           .32           .72

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  61.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD    (6179) |
|   1 + 2 = 3       |           AREA    QPEAK    TPEAK     R.V.
--------------------            (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (6143):       86.20    4.359     6.20    37.30
        + ID2= 2 (1107):        5.52    1.073     6.00    64.26
          ===============================================
          ID = 3 (6179):       91.72    4.683     6.17    38.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD    (6180) |
|   1 + 2 = 3       |           AREA    QPEAK    TPEAK     R.V.
--------------------            (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (6181):         .55     .056     6.10    36.97
        + ID2= 2 (6179):       91.72    4.683     6.17    38.92
          ===============================================
          ID = 3 (6180):       92.27    4.736     6.17    38.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| ROUTE CHN (6144)  |
| IN= 2---> OUT= 1  |     Routing time step (min)'=  2.00
--------------------
                  <------ DATA FOR SECTION (    1.0) ------>
                 Distance       Elevation        Manning
                      .00          1.50           .0500
                     4.50           .00           .0500
                     7.50          1.00       .0500 / .0300  Main Channel
                    16.50          1.00       .0300 / .0500  Main Channel
                    19.50           .00           .0500
                    24.00          1.50           .0500

       <--------------------- TRAVEL TIME TABLE --------------------->
       DEPTH     ELEV       VOLUME     FLOW RATE      VELOCITY    TRAV.TIME
        (m)       (m)      (cu.m.)       (cms)          (m/s)       (min)
        .08       .08     .107E+02        .0             .23        22.07
        .15       .15     .426E+02        .1             .36        13.90
        .23       .23     .959E+02        .2             .47        10.61
        .31       .31     .170E+03        .3             .57         8.76
        .38       .38     .266E+03        .6             .66         7.55
        .46       .46     .383E+03       1.0             .75         6.68
        .54       .54     .522E+03       1.4             .83         6.03
```

```
        .62       .62     .682E+03      2.1            .91       5.52
        .69       .69     .863E+03      2.8            .98       5.10
        .77       .77     .107E+04      3.7           1.05       4.76
        .85       .85     .129E+04      4.8           1.12       4.46
        .92       .92     .153E+04      6.1           1.19       4.21
       1.00      1.00     .180E+04      7.5           1.25       3.99
       1.08      1.08     .233E+04     10.0           1.29       3.89
       1.17      1.17     .287E+04     13.3           1.38       3.61
       1.25      1.25     .343E+04     17.2           1.50       3.33
       1.33      1.33     .400E+04     21.7           1.63       3.07
       1.42      1.42     .458E+04     26.8           1.76       2.85
       1.50      1.50     .517E+04     32.5           1.88       2.66

                                     <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
     INFLOW : ID= 2 (6180)   92.27     4.74    6.17  38.91      .84      1.12
     OUTFLOW: ID= 1 (6144)   92.27     4.64    6.23  38.91      .83      1.11

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (1108)  |   Area     (ha)=   4.10
|ID= 1 DT= 2.0 min  |   Total Imp(%)=  85.00   Dir. Conn.(%)=  85.00
--------------------
                             IMPERVIOUS   PERVIOUS (i)
     Surface Area      (ha)=      3.49         .61
     Dep. Storage      (mm)=      1.00        5.00
     Average Slope      (%)=      1.00        1.00
     Length             (m)=    300.00      300.00
     Mannings n            =      .013        .250

     Max.Eff.Inten.(mm/hr)=     125.18       15.78
                over (min)        5.00       66.00
     Storage Coeff.  (min)=       4.51 (ii)   65.43 (ii)
     Unit Hyd. Tpeak (min)=       4.00       66.00
     Unit Hyd. peak  (cms)=        .26         .02
                                                          *TOTALS*
     PEAK FLOW        (cms)=      1.14         .02          1.140 (iii)
     TIME TO PEAK     (hrs)=      6.00        7.03          6.00
     RUNOFF VOLUME     (mm)=     88.01       28.64         79.10
     TOTAL RAINFALL    (mm)=     89.01       89.01         89.01
     RUNOFF COEFFICIENT    =       .99         .32           .89

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  61.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (6158) |
|   1 + 2 = 3      |           AREA     QPEAK     TPEAK      R.V.
--------------------           (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (6144):      92.27    4.644      6.23     38.91
        + ID2= 2 (1108):       4.10    1.140      6.00     79.10
          ==============================================
          ID = 3 (6158):      96.37    4.938      6.20     40.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (6163)  |   Area     (ha)=    .16
|ID= 1 DT= 2.0 min  |   Total Imp(%)=  85.00   Dir. Conn.(%)=  85.00
--------------------
                             IMPERVIOUS   PERVIOUS (i)
     Surface Area      (ha)=       .14         .02
     Dep. Storage      (mm)=      1.00        7.50
     Average Slope      (%)=      1.00        2.00
     Length             (m)=     32.70       40.00
     Mannings n            =      .013        .250

     Max.Eff.Inten.(mm/hr)=     125.18       79.71
                over (min)        5.00        6.00
     Storage Coeff.  (min)=       1.19 (ii)    4.42 (ii)
```

```
     Unit Hyd. Tpeak (min)=        4.00          6.00
     Unit Hyd. peak  (cms)=         .49           .23
                                                              *TOTALS*
     PEAK FLOW        (cms)=         .05           .00          .052 (iii)
     TIME TO PEAK     (hrs)=        6.00          6.00          6.00
     RUNOFF VOLUME     (mm)=       88.01         45.82         81.67
     TOTAL RAINFALL    (mm)=       89.01         89.01         89.01
     RUNOFF COEFFICIENT    =         .99           .51           .92

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (6161) |   Area     (ha)=    3.07
|ID= 1 DT= 2.0 min |   Total Imp(%)=  85.00    Dir. Conn.(%)=  85.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       2.61           .46
     Dep. Storage      (mm)=       1.00          7.50
     Average Slope      (%)=       1.00          2.00
     Length             (m)=     143.10         40.00
     Mannings n            =       .013          .250

     Max.Eff.Inten.(mm/hr)=     125.18         79.71
                over (min)        5.00          8.00
     Storage Coeff.   (min)=       2.90 (ii)     6.12 (ii)
     Unit Hyd. Tpeak  (min)=       4.00          8.00
     Unit Hyd. peak   (cms)=        .34           .17
                                                              *TOTALS*
     PEAK FLOW        (cms)=         .89           .08          .971 (iii)
     TIME TO PEAK     (hrs)=        6.00          6.03          6.00
     RUNOFF VOLUME     (mm)=       88.01         45.82         81.68
     TOTAL RAINFALL    (mm)=       89.01         89.01         89.01
     RUNOFF COEFFICIENT    =         .99           .51           .92

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
--------------------
| RESERVOIR (6162) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min      |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------        (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000    |   .7000      .0500

                                 AREA     QPEAK      TPEAK       R.V.
                                 (ha)     (cms)      (hrs)       (mm)
     INFLOW : ID= 2 (6161)       3.07       .97       6.00      81.68
     OUTFLOW: ID= 1 (6162)       3.07       .65       6.07      81.68

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 66.77
                  TIME SHIFT OF PEAK FLOW         (min)=  4.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  .0470

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

--------------------
| ADD HYD   (6176) |
|   1 + 2 = 3      |          AREA    QPEAK    TPEAK      R.V.
--------------------          (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (6163):       .16    .052     6.00     81.67
        + ID2= 2 (6162):      3.07    .648     6.07     81.68
          ==============================================
          ID = 3 (6176):      3.23    .682     6.03     81.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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```
| CALIB              |
| STANDHYD  (6165) |   Area     (ha)=     .48
|ID= 1 DT= 2.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  85.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=       .41          .07
     Dep. Storage       (mm)=      1.00         1.50
     Average Slope       (%)=      1.00         2.00
     Length              (m)=     56.60        40.00
     Mannings n             =      .013         .250

     Max.Eff.Inten.(mm/hr)=      125.18        84.50
                over (min)         5.00         6.00
     Storage Coeff.   (min)=       1.66 (ii)    4.88 (ii)
     Unit Hyd. Tpeak  (min)=       4.00         6.00
     Unit Hyd. peak   (cms)=        .44          .21
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .14          .01          .157 (iii)
     TIME TO PEAK     (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME     (mm)=      88.01        50.72         82.41
     TOTAL RAINFALL    (mm)=      89.01        89.01         89.01
     RUNOFF COEFFICIENT   =         .99          .57           .93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (6174) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 1 (6176):      3.23      .682      6.03     81.68
        + ID2= 2 (6165):       .48      .157      6.00     82.41
          ================================================
          ID = 3 (6174):      3.71      .808      6.03     81.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (6167) |   Area     (ha)=     .79
|ID= 1 DT= 2.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=       .75          .04
     Dep. Storage       (mm)=      1.00         1.50
     Average Slope       (%)=      1.00         2.00
     Length              (m)=     72.60        40.00
     Mannings n             =      .013         .250

     Max.Eff.Inten.(mm/hr)=      125.18        84.50
                over (min)         5.00         4.00
     Storage Coeff.   (min)=       1.93 (ii)    3.91 (ii)
     Unit Hyd. Tpeak  (min)=       4.00         4.00
     Unit Hyd. peak   (cms)=        .41          .28
                                                          *TOTALS*
     PEAK FLOW        (cms)=        .26          .01          .269 (iii)
     TIME TO PEAK     (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME     (mm)=      88.01        50.71         86.15
     TOTAL RAINFALL    (mm)=      89.01        89.01         89.01
     RUNOFF COEFFICIENT   =         .99          .57           .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD  (6168) |   Area     (ha)=     .85
```

```
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=        .84          .01
    Dep. Storage      (mm)=       1.00         1.50
    Average Slope      (%)=       1.00         2.00
    Length             (m)=      75.30        40.00
    Mannings n            =       .013         .250

    Max.Eff.Inten.(mm/hr)=      125.18        95.86
               over (min)         5.00         4.00
    Storage Coeff.  (min)=        1.97 (ii)    3.00 (ii)
    Unit Hyd. Tpeak (min)=        4.00         4.00
    Unit Hyd. peak  (cms)=         .41          .33
                                                          *TOTALS*
    PEAK FLOW       (cms)=         .29          .00          .294 (iii)
    TIME TO PEAK    (hrs)=        6.00         6.00          6.00
    RUNOFF VOLUME    (mm)=       88.01        57.87         87.71
    TOTAL RAINFALL   (mm)=       89.01        89.01         89.01
    RUNOFF COEFFICIENT   =         .99          .65           .99

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  85.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD   (6175) |
|   1 +  2 =  3    |           AREA    QPEAK     TPEAK      R.V.
--------------------           (ha)    (cms)     (hrs)      (mm)
          ID1= 1 (6167):        .79     .269      6.00     86.15
        + ID2= 2 (6168):        .85     .294      6.00     87.71
          ==================================================
          ID = 3 (6175):       1.64     .563      6.00     86.96

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (6188) |
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |      OUTFLOW     STORAGE    |  OUTFLOW     STORAGE
--------------------       (cms)     (ha.m.)     |   (cms)      (ha.m.)
                           .0000       .0000     |   .3694       .0094
                           .3511       .0028     |   .3782       .0175
                           .3604       .0039     |   .0000       .0000

                                AREA      QPEAK       TPEAK         R.V.
                                (ha)      (cms)       (hrs)         (mm)
    INFLOW : ID= 2 (6175)       1.64        .56        6.00        86.96
    OUTFLOW: ID= 1 (6188)       1.64        .37        6.03        86.96

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)= 66.24
                 TIME SHIFT OF PEAK FLOW         (min)=  2.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  .0132

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (6166) |   Area     (ha)=     .55
|ID= 1 DT= 2.0 min |   Total Imp(%)=  81.00   Dir. Conn.(%)=  81.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=        .45          .10
    Dep. Storage      (mm)=       1.00         1.50
    Average Slope      (%)=       1.00         2.00
    Length             (m)=      60.60        40.00
    Mannings n            =       .013         .250

    Max.Eff.Inten.(mm/hr)=      125.18        84.50
               over (min)         5.00         6.00
    Storage Coeff.  (min)=        1.73 (ii)    5.34 (ii)
    Unit Hyd. Tpeak (min)=        4.00         6.00
    Unit Hyd. peak  (cms)=         .43          .20
                                                          *TOTALS*
    PEAK FLOW       (cms)=         .15          .02          .176 (iii)
```

```
     TIME TO PEAK     (hrs)=       6.00          6.00           6.00
     RUNOFF VOLUME     (mm)=      88.01         50.71          80.92
     TOTAL RAINFALL    (mm)=      89.01         89.01          89.01
     RUNOFF COEFFICIENT   =         .99           .57            .91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*   =  80.0      Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------
--------------------
| RESERVOIR  (6169) |
| IN= 2---> OUT= 1  |
| DT=   2.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------        (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000    |   .0558      .0069
                            .0522      .0007    |   .0576      .0145
                            .0540      .0017    |   .0000      .0000

                                   AREA    QPEAK     TPEAK       R.V.
                                   (ha)    (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (6166)          .55      .18      6.00      80.92
     OUTFLOW: ID= 1 (6169)          .55      .06      6.10      80.92

                  PEAK    FLOW    REDUCTION [Qout/Qin](%)= 32.03
                  TIME SHIFT OF PEAK FLOW         (min)=  6.00
                  MAXIMUM  STORAGE   USED        (ha.m.)=  .0091

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

--------------------
| ADD HYD    (6173) |
|   1 +  2 =  3     |          AREA    QPEAK    TPEAK      R.V.
--------------------           (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (6188):       1.64     .373     6.03     86.96
        + ID2= 2 (6169):        .55     .056     6.10     80.92
          ==================================================
          ID = 3 (6173):       2.19     .429     6.03     85.44

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD    (6177) |
|   1 +  2 =  3     |          AREA    QPEAK    TPEAK      R.V.
--------------------           (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (6174):       3.71     .808     6.03     81.77
        + ID2= 2 (6173):       2.19     .429     6.03     85.44
          ==================================================
          ID = 3 (6177):       5.90    1.237     6.03     83.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD    (6178) |
|   1 +  2 =  3     |          AREA    QPEAK    TPEAK      R.V.
--------------------           (ha)    (cms)    (hrs)      (mm)
          ID1= 1 (6158):      96.37    4.938     6.20     40.62
        + ID2= 2 (6177):       5.90    1.237     6.03     83.14
          ==================================================
          ID = 3 (6178):     102.27    6.042     6.03     43.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD   (6151) |   Area     (ha)=    1.80
|ID= 1 DT= 2.0 min  |   Total Imp(%)=   72.00   Dir. Conn.(%)=   72.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.30          .50
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
```

100-yr PEAK FLOW
TO QEW CULVERT

| | |
|---|---|
| Project: | **Losani - Fifth Wheel** |
| Project #: | PEB17500 |
| Designed By: | A. Crookes |
| Checked By: | |
| Date: | 4-Oct-2019 |

BURNSIDE

100-year Watercourse Flow = 6.040 $m^3/s$

Manning's Equation for Open Channel Flow:

$$Q = VA = \frac{AR^{2/3}S^{1/2}}{n}$$

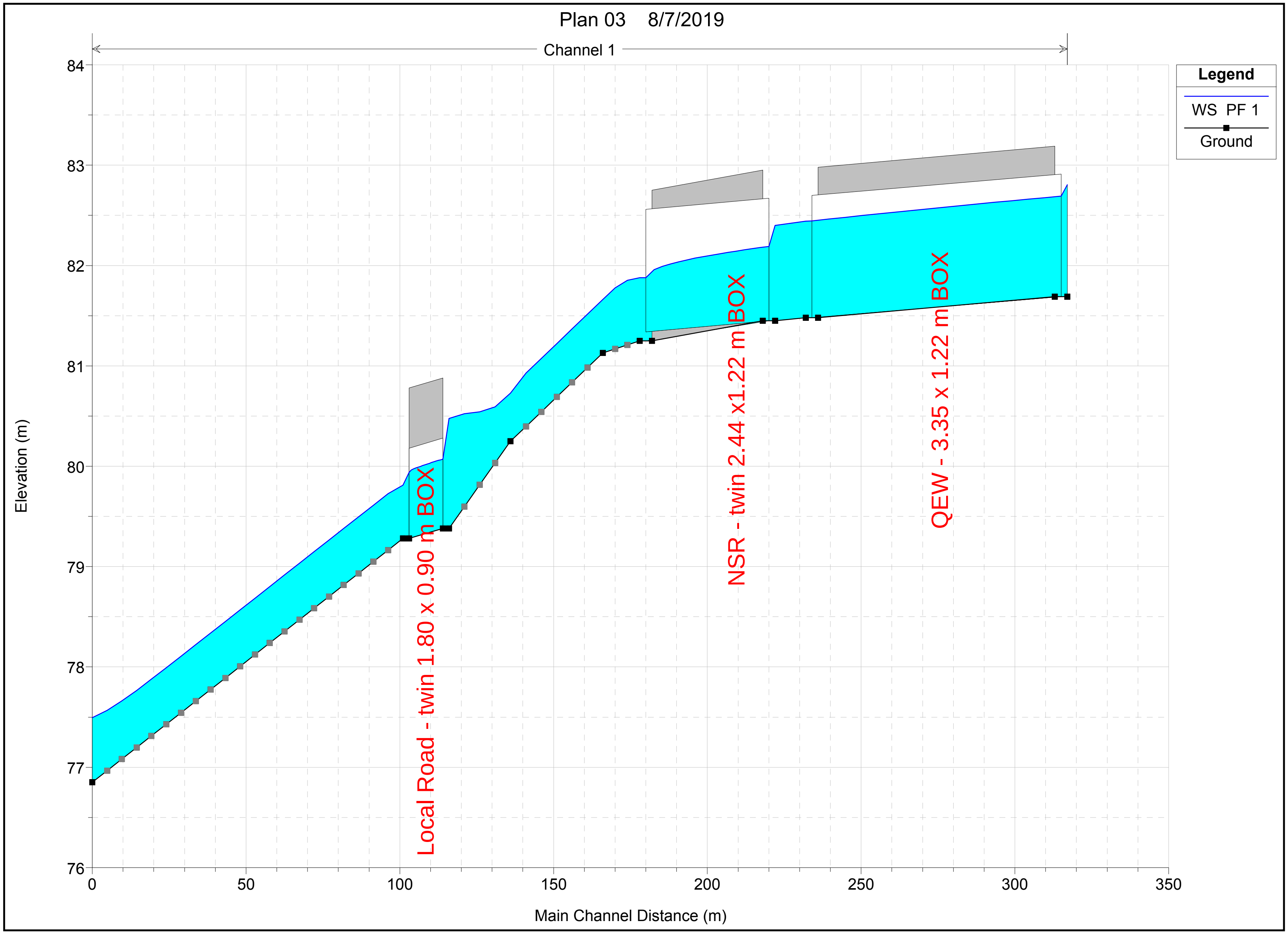
where: $Q$ = Flow Rate ($m^3/s$)
$V$ = Velocity (m/s)
$A$ = Flow Area (m2)
$R$ = Hydraulic Radius (m)
$S$ = Channel Slope (m/m)
$n$ = Manning's Roughness Coefficient

Side Slope Ratio (H:V) = 3 :1
Manning's 'n' = 0.08 (dense, unmaintained vegetation)

| Channel Bottom Width (m) | Channel Bed Slope | Wetted Perimeter (m) | Area ($m^2$) | Flow Depth (m) | Minimum Channel Depth (m) | Minimum Top Width (m) | Q ($m^3/s$) | Velocity (m/s) |
|---|---|---|---|---|---|---|---|---|
| **7.5** | **1.0** | 12.06 | 6.97 | **0.72** | **1.02** | **13.63** | 6.04 | 0.87 |
| **7.5** | **1.5** | 11.57 | 6.07 | **0.64** | **0.94** | **13.16** | 6.04 | 1.00 |

HEC-RAS Plan: Plan 02 River: Channel Reach: 1 Profile: PF 1

| Reach | River Sta | Profile | Q Total | Min Ch El | W.S. Elev | Crit W.S. | E.G. Elev | E.G. Slope | Vel Chnl | Flow Area | Top Width | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (m3/s) | (m) | (m) | (m) | (m) | (m/m) | (m/s) | (m2) | (m) | |
| 1 | 317 | PF 1 | 6.04 | 81.69 | 82.81 | 82.38 | 82.94 | 0.014561 | 1.62 | 3.72 | 14.19 | 0.49 |
| 1 | 315 | | Culvert | | | | | | | | | |
| 1 | 232 | PF 1 | 6.04 | 81.48 | 82.44 | 82.17 | 82.62 | 0.023823 | 1.88 | 3.21 | 13.27 | 0.61 |
| 1 | 222 | PF 1 | 6.04 | 81.45 | 82.40 | 81.92 | 82.46 | 0.007838 | 1.07 | 5.65 | 13.20 | 0.35 |
| 1 | 220 | | Culvert | | | | | | | | | |
| 1 | 178 | PF 1 | 6.04 | 81.25 | 81.88 | 81.72 | 82.01 | 0.031200 | 1.62 | 3.73 | 11.27 | 0.65 |
| 1 | 174.* | PF 1 | 6.04 | 81.21 | 81.85 | | 81.90 | 0.015142 | 1.00 | 6.05 | 11.35 | 0.44 |
| 1 | 170.* | PF 1 | 6.04 | 81.17 | 81.78 | | 81.84 | 0.018436 | 1.07 | 5.66 | 11.14 | 0.48 |
| 1 | 166 | PF 1 | 6.04 | 81.13 | 81.66 | | 81.74 | 0.029435 | 1.25 | 4.83 | 10.69 | 0.59 |
| 1 | 161.* | PF 1 | 6.04 | 80.98 | 81.52 | | 81.59 | 0.029223 | 1.25 | 4.84 | 10.69 | 0.59 |
| 1 | 156.* | PF 1 | 6.04 | 80.84 | 81.37 | | 81.45 | 0.029386 | 1.25 | 4.83 | 10.69 | 0.59 |
| 1 | 151.* | PF 1 | 6.04 | 80.69 | 81.22 | | 81.30 | 0.029378 | 1.25 | 4.84 | 10.69 | 0.59 |
| 1 | 146.* | PF 1 | 6.04 | 80.54 | 81.08 | | 81.15 | 0.029239 | 1.25 | 4.84 | 10.69 | 0.59 |
| 1 | 141.* | PF 1 | 6.04 | 80.40 | 80.93 | | 81.01 | 0.029526 | 1.25 | 4.83 | 10.69 | 0.59 |
| 1 | 136 | PF 1 | 6.04 | 80.25 | 80.73 | | 80.83 | 0.042301 | 1.41 | 4.28 | 10.37 | 0.70 |
| 1 | 131.* | PF 1 | 6.04 | 80.03 | 80.59 | | 80.66 | 0.024569 | 1.18 | 5.13 | 10.86 | 0.55 |
| 1 | 126.* | PF 1 | 6.04 | 79.81 | 80.54 | | 80.58 | 0.009690 | 0.86 | 7.04 | 11.86 | 0.36 |
| 1 | 121.* | PF 1 | 6.04 | 79.60 | 80.52 | | 80.54 | 0.004028 | 0.63 | 9.54 | 13.06 | 0.24 |
| 1 | 116 | PF 1 | 6.04 | 79.38 | 80.48 | 79.85 | 80.52 | 0.004866 | 0.93 | 6.51 | 14.08 | 0.28 |
| 1 | 114 | | Culvert | | | | | | | | | |
| 1 | 101 | PF 1 | 6.04 | 79.28 | 79.81 | 79.75 | 80.00 | 0.054257 | 1.91 | 3.16 | 10.69 | 0.84 |
| 1 | 96.19* | PF 1 | 6.04 | 79.16 | 79.73 | | 79.80 | 0.023955 | 1.17 | 5.18 | 10.88 | 0.54 |
| 1 | 91.38* | PF 1 | 6.04 | 79.05 | 79.61 | | 79.68 | 0.024092 | 1.17 | 5.17 | 10.88 | 0.54 |
| 1 | 86.57* | PF 1 | 6.04 | 78.93 | 79.50 | | 79.57 | 0.024129 | 1.17 | 5.17 | 10.87 | 0.54 |
| 1 | 81.76* | PF 1 | 6.04 | 78.82 | 79.38 | | 79.45 | 0.024088 | 1.17 | 5.17 | 10.88 | 0.54 |
| 1 | 76.95* | PF 1 | 6.04 | 78.70 | 79.26 | | 79.33 | 0.023950 | 1.17 | 5.18 | 10.88 | 0.54 |
| 1 | 72.14* | PF 1 | 6.04 | 78.59 | 79.15 | | 79.22 | 0.024084 | 1.17 | 5.17 | 10.88 | 0.54 |
| 1 | 67.33* | PF 1 | 6.04 | 78.47 | 79.03 | | 79.10 | 0.024094 | 1.17 | 5.17 | 10.88 | 0.54 |
| 1 | 62.52* | PF 1 | 6.04 | 78.35 | 78.92 | | 78.99 | 0.023964 | 1.17 | 5.18 | 10.88 | 0.54 |
| 1 | 57.71* | PF 1 | 6.04 | 78.24 | 78.80 | | 78.87 | 0.024136 | 1.17 | 5.17 | 10.87 | 0.54 |
| 1 | 52.90* | PF 1 | 6.04 | 78.12 | 78.69 | | 78.76 | 0.024115 | 1.17 | 5.17 | 10.87 | 0.54 |
| 1 | 48.10* | PF 1 | 6.04 | 78.01 | 78.57 | | 78.64 | 0.024047 | 1.17 | 5.17 | 10.88 | 0.54 |
| 1 | 43.29* | PF 1 | 6.04 | 77.89 | 78.45 | | 78.52 | 0.023961 | 1.17 | 5.18 | 10.88 | 0.54 |
| 1 | 38.48* | PF 1 | 6.04 | 77.78 | 78.34 | | 78.41 | 0.024125 | 1.17 | 5.17 | 10.87 | 0.54 |
| 1 | 33.67* | PF 1 | 6.04 | 77.66 | 78.22 | | 78.29 | 0.024079 | 1.17 | 5.17 | 10.88 | 0.54 |
| 1 | 28.86* | PF 1 | 6.04 | 77.54 | 78.11 | | 78.18 | 0.023918 | 1.17 | 5.18 | 10.88 | 0.54 |
| 1 | 24.05* | PF 1 | 6.04 | 77.43 | 77.99 | | 78.06 | 0.023988 | 1.17 | 5.18 | 10.88 | 0.54 |
| 1 | 19.24* | PF 1 | 6.04 | 77.31 | 77.88 | | 77.95 | 0.023754 | 1.16 | 5.19 | 10.89 | 0.54 |
| 1 | 14.43* | PF 1 | 6.04 | 77.20 | 77.77 | | 77.83 | 0.023099 | 1.15 | 5.24 | 10.92 | 0.53 |
| 1 | 9.62* | PF 1 | 6.04 | 77.08 | 77.66 | | 77.73 | 0.021551 | 1.13 | 5.37 | 10.98 | 0.51 |
| 1 | 4.81* | PF 1 | 6.04 | 76.97 | 77.57 | | 77.63 | 0.018948 | 1.08 | 5.61 | 11.11 | 0.48 |
| 1 | 0 | PF 1 | 6.04 | 76.85 | 77.49 | 77.23 | 77.54 | 0.015004 | 1.00 | 6.07 | 11.36 | 0.43 |



Plan 03 8/7/2019
Channel 1
Legend
WS PF 1
Ground
Elevation (m)
Main Channel Distance (m)
84
83
82
81
80
79
78
77
76
0
50
100
150
200
250
300
350
Local Road - twin 1.80 x 0.90 m BOX
NSR - twin 2.44 x1.22 m BOX
QEW - 3.35 x 1.22 m BOX