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36 Years

# Fernbank Crossing – Block 135

## Servicing Design Brief

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# SERVICING DESIGN BRIEF – BLOCK 135

REGIONAL
THE REGIONAL GROUP


Prepared By:

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March 22, 2019
Revised: June 12, 2019

Novatech File: 117089
Ref: R-2019-053

Engineers, Planners & Landscape Architects

June 12, 2019

City of Ottawa
Infrastructure Services and Community Sustainability
110 Laurier Avenue West, 4th Floor
Ottawa, ON K1P 1J1

**Attention: Mr. Eric Surprenant**

Dear Mr. Surprenant:

**Reference: Fernbank Crossing – Block 135**
**Servicing Design Brief**
**Our File No.: 117089**

---

Enclosed for your review and approval are two (2) copies of the Servicing Design Brief for the proposed development of Block 135 in the Fernbank Crossing Subdivision.

If you have any questions or comments, please do not hesitate to contact us.

Sincerely,

**NOVATECH**

Lucas Wilson, P.Eng.
Project Coordinator



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# 1.0 INTRODUCTION

## 1.1 Background

The Abbott-Fernbank Lands are located within the new Fernbank Community on the north side of Fernbank Road west of Terry Fox Drive. **Figure 1** shows the location of the Fernbank Community, the Fernbank Crossing Subdivision, and Block 135.

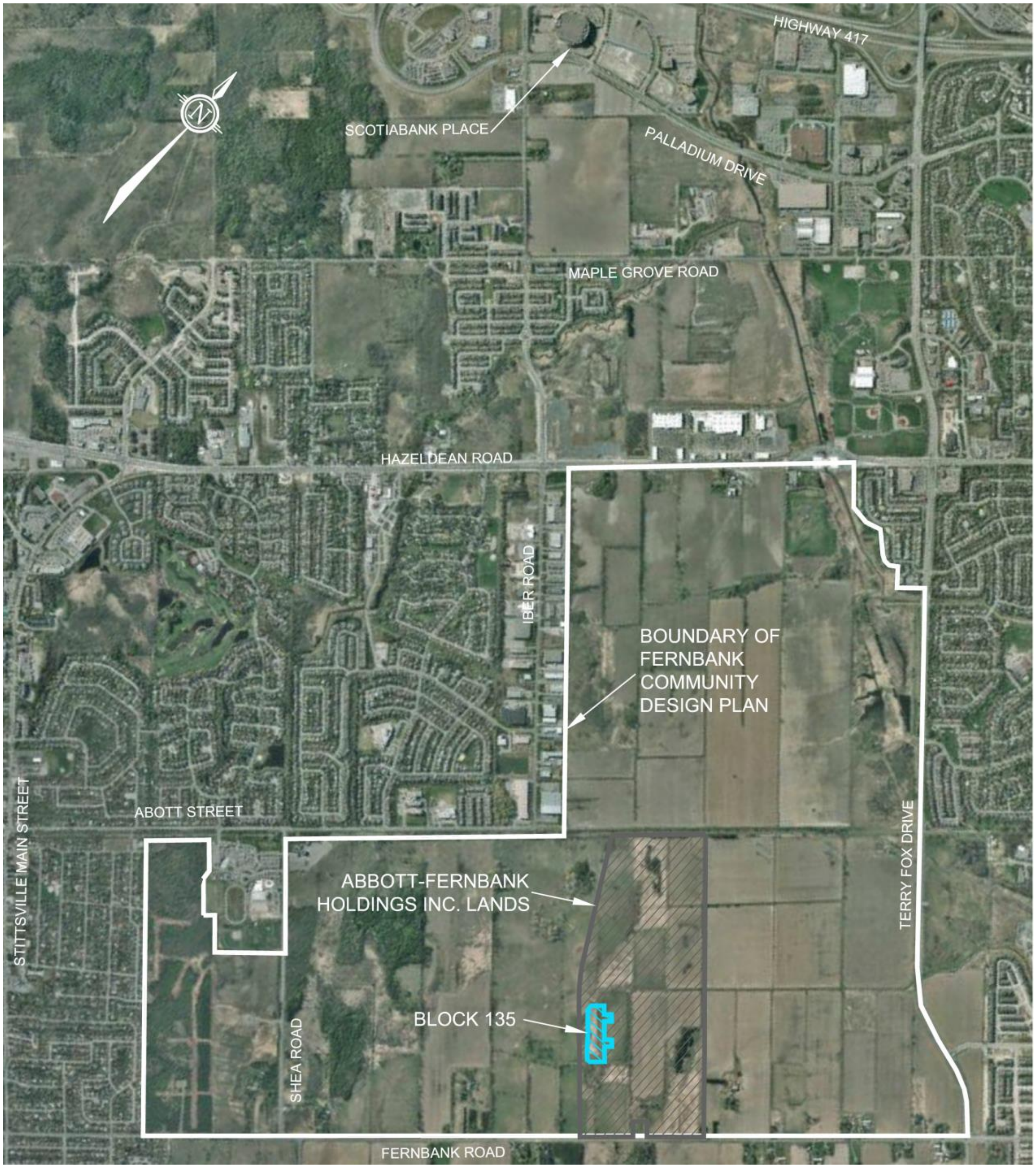


**Figure 1: Key Plan**

The proposed site is approximately 1.26ha and will be bordered by Robert Grant Way and future residential lands to the west (CRT Developments Inc.), Cope Drive to the north, Shinny Avenue to the east, and Haliburton Heights to the south.

This Servicing Design Brief provides information on the considerations and approach by which Novatech has analyzed the existing site information for the Fernbank Crossing Subdivision, and details how the development lands will be serviced while meeting the City requirements and all other relevant regulations. This brief builds upon the recently completed works for the Fernbank Crossing Subdivision including the Servicing Design Brief – Phase 3 prepared by Novatech **[1]**, the Fernbank Community Design Plan **[2]** prepared by Walker, Nott, Dragicevic Associates Limited, the Fernbank Master Servicing Study **[3]** prepared by Novatech, and the Fernbank Environmental Management Plan also prepared by Novatech **[4]**.

This report should be read in conjunction with the following:

- Geotechnical Investigation, Fernbank Crossing Residential Subdivision, Block 135 Ottawa, Ontario prepared by Gemtec, dated March 20, 2019 (Project:64153.74). **[5]**

## 1.2 Land Use

Block 135 will consist of six back-to-back townhome buildings (58 units total), two 12-unit buildings, two 10-unit buildings, one 8-unit building and one 6-unit building. The proposed Site Plan is shown below in **Figure 2**.

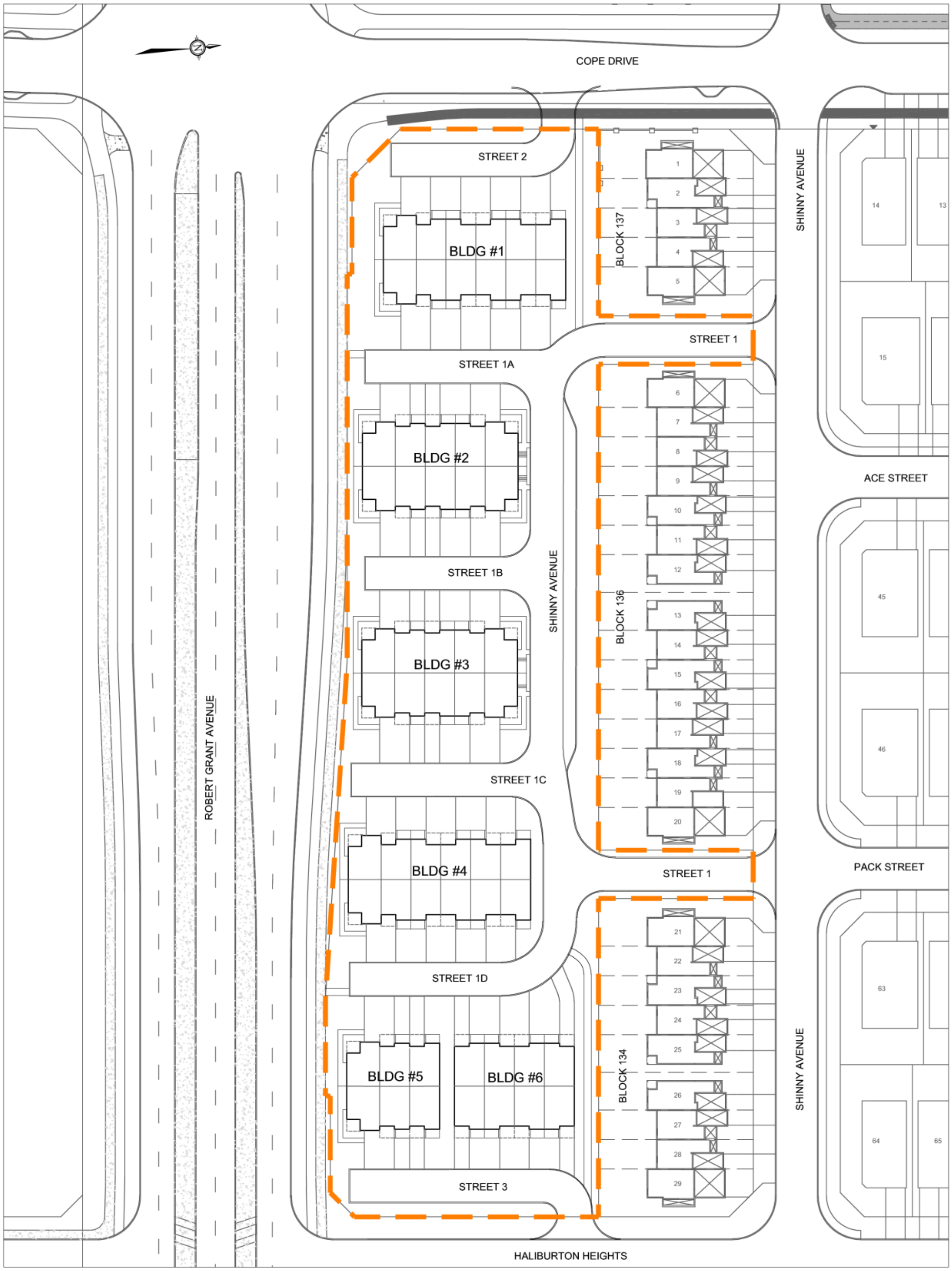


**Figure 2: Site Plan**

# 2.0 ROADWAYS

## 2.1 Existing Conditions

Currently there is access to Block 135 via Cope Drive, Shinny Avenue and Haliburton Heights. Shinny Avenue and Haliburton Heights are classified as Local Roads and Cope Drive is classified as a Major Collector in the 2013 City of Ottawa Transportation Master Plan **[6]**.

## 2.2 Proposed Conditions

The development will be accessed from two entrances along Shinny Avenue, one entrance along Cope Drive and one entrance along Haliburton Heights. The site contains a series of 6.7m private roads.

## 2.3 Roadway Design

Gemtec has prepared a Geotechnical Investigation report for the development (March 20th, 2019) that provides recommendations for roadway structure, servicing and foundations. The recommended roadway structure is as follows:

**Table 2.1: Roadway Structure**

| Roadway Material Description | Pavement Structure Layer Thickness (mm) |
|---|---|
| **Private Road** | |
| Asphalt Wear Course: Superpave 12.5 (Class B) | 40 |
| Asphalt Binder Course: Superpave 19.0 (Class B) | 60 |
| Base: Granular A | 150 |
| Sub-Base: Granular B – Type II | 400 |
| **Total** | **650** |

# 3.0 GRADING

## 3.1 Existing Conditions

The existing site generally slopes to the northeast at approximately 2.5%. The maximum grade of approximately 106.49 metres in the southwest corner and a minimum elevation of approximately 103.50 metres in the northeast corner give a total elevation differential of approximately 3.00 metres across the site.

Geotechnical investigations were carried out by Gemtec **[**5**]**, and bedrock was encountered approximately 0.60 to 4.3 metres below the existing ground surface.

## 3.2 Proposed Conditions

The design grades will tie into existing elevations along Robert Grant Way, Cope Drive, Haliburton Heights and the adjacent residential lands in Phase 3. For detailed grading refer to drawing 117089-GR.

The proposed grading will fall within these ranges:

- Landscaped Area: Minimum 2% - Maximum 7%
- Rearyard Swales: Minimum 1.5% (1.0% with subdrain)
- Maximum Terracing Grade of 3H:1V

## 3.3 Offsite Requirements

The proposed grading will not impede existing major system flow paths (See the grading plan drawing 117089-GR for detailed information).

# 4.0 EROSION AND SEDIMENT CONTROL

The following erosion and sediment control measures will be implemented during construction in accordance with the “Guidelines on Erosion and Sediment Control for Urban Construction Sites” (Government of Ontario, May 1987). Details are provided on the Grading Plan.

- A qualified inspector should conduct regular visits to ensure the contractor is working in accord with the drawings and that mitigation measures are implemented as specified.
- Terrafix Siltsoxx are to be placed under all new catchbasins and storm manhole covers.
- Pond 6 is now functional and will provide quality control of any sediment runoff that gets into the storm sewers.
- After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.

# 5.0 SANITARY SEWERS

## 5.1 Existing Conditions

An existing 200mm diameter sanitary sewer runs along Shinny Avenue, with an existing 200mm diameter cap located at both private entrances along Shinny Avenue.

## 5.2 Proposed Conditions

The peak design flow parameters in **Table 5.1** have been used in the sewer capacity analysis.

Unit and population densities and all other design parameters are specified in the City of Ottawa Sewer Design Guidelines **[8]**.

Sanitary flow from Block 135 of the Fernbank Crossing Subdivision is proposed to connect into the downstream sewer system in Shinny Avenue. The sanitary sewer layout is shown on 117089-GP (**Appendix C**), and the design sheet is attached in **Appendix A**. The site (approx. 1.26ha) will outlet at MH 756 (south entrance) with a peak design flow of 1.5 L/s and outlet at MH 754 (north entrance) with a peak design flow of 1.3 L/s. The wastewater flow is routed through the Fernbank Crossing Subdivision and Blackstone Lands to the Fernbank Trunk, directing flow to the Hazeldean Pump Station.

Technical bulletin ISTB-2018-01 outlines recent changes to the sanitary sewer design criteria in the City of Ottawa. Existing infrastructure has been designed and constructed before the release of this bulletin, and for reasons of consistency we elected to maintain the same sanitary sewer design parameters used in the design of the existing sewers.

**Table 5.1: Sanitary Sewer Design Parameters**

| Parameter | Design Parameter |
|---|---|
| Town Unit Population | 2.7 people/unit |
| Residential Flow Rate, Average Daily | 350 L/cap/day |
| Residential Peaking Factor | Harmon Equation (min=2.0, max=4.0) |
| Infiltration Rate | 0.28 L/s/ha |
| Minimum Pipe Size | 200 mm |
| Minimum Velocity | 0.6 m/s |
| Maximum Velocity | 3.0 m/s |

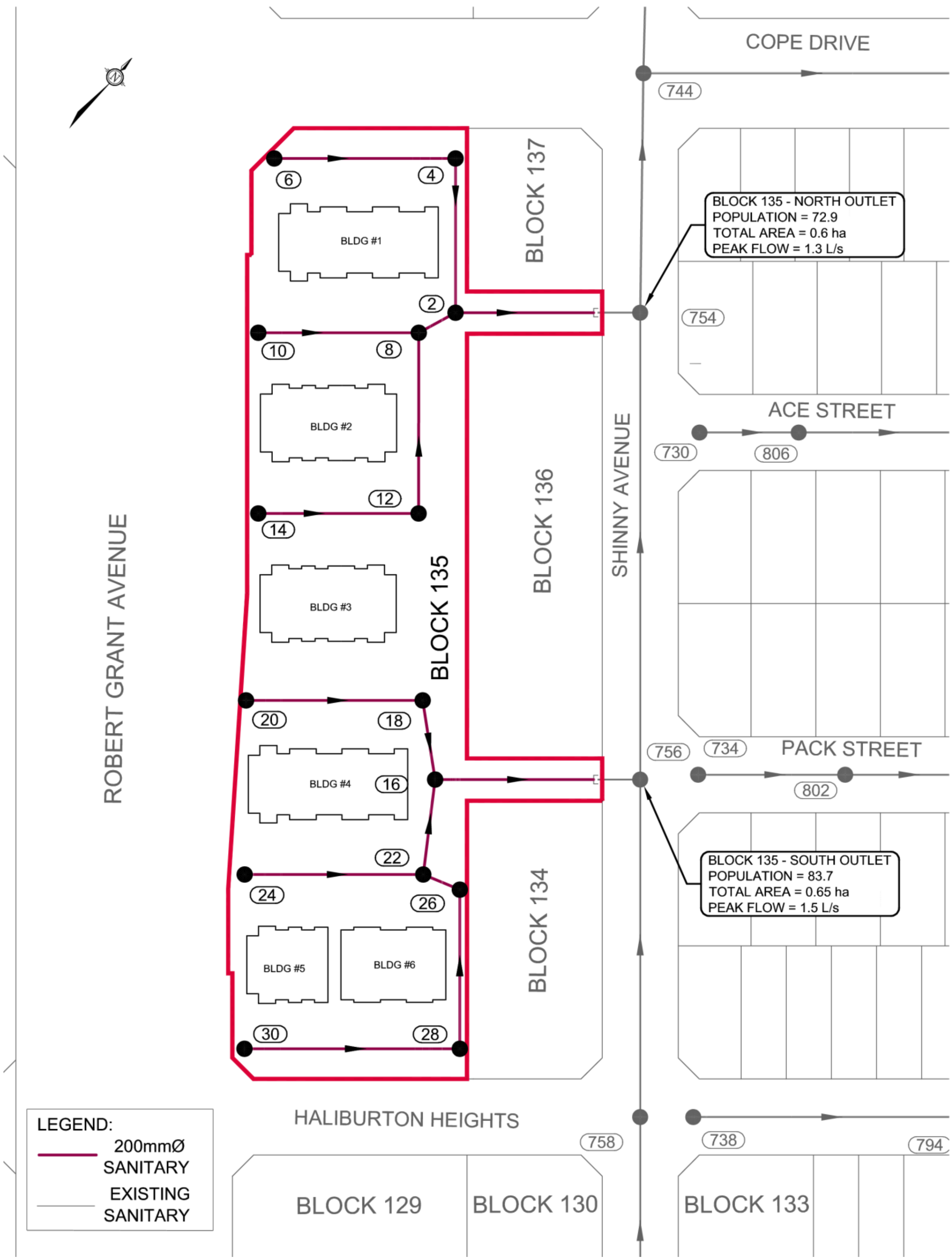


**Figure 3: Sanitary Sewer Network**

## 5.3 Offsite Requirements

For the design of Phase 3 of Fernbank Crossing, an initial peak design flow of 3.5 L/s was used in the calculations for Block 135, which is higher than the calculated peak design flow of 2.8 L/s for the combined flows outletting to MH 754 and MH 756. Therefore, there will be sufficient capacity offsite to service the proposed development of Block 135.

# 6.0 STORMWATER MANAGEMENT

## 6.1 Existing Conditions

Existing 1200mm and 1350mm diameter storm sewers run along Shinny Avenue adjacent to the proposed development. These sewers outlet to an existing SWM Facility (Fernbank Pond 6) and have been sized to accommodate runoff from the proposed development of Block 135. An existing 600mm cap is located at the northern entrance and an existing 450mm cap is located at the southern entrance.

## 6.2 Proposed Conditions

Runoff from Block 135 will be routed to the storm sewer system in Shinny Avenue, where it will then be directed to a stormwater pond (Pond 6) that provides both quantity and quality control for the Fernbank Crossing development. The stormwater management facility outlets to the realigned Monahan Drain, which drains into the Monahan Constructed Wetlands Facility. **Figure 5** outlines the proposed storm sewer system layout, and how it will connect to the existing network along Shinny Avenue.

Technical Bulletin PIETB-2016-01 outlines recent changes to sewer design criteria in the City of Ottawa. We have incorporated these criteria, except for the minimum storm sewer sizing. The existing infrastructure was designed and constructed before the release of this bulletin, and for reasons of consistency we elected to maintain the minimum 5-year storm sewer sizing criteria. Our approach is conservative and will offer a slightly improved margin of safety against storm sewer back-up.

### *6.2.1 Minor System Design*

The storm sewers comprising the minor system have been designed based on the criteria outlined in the Ottawa Sewer Design Guidelines **[8]** using the principles of dual drainage. The design criteria used in sizing the storm sewers are summarized in **Table 6.1** and **Table 6.2**.

The proposed storm sewers have been designed using the Rational Method to convey peak flow associated with a 5-year rainfall event. The storm sewer design sheets are provided in **Appendix A**. The corresponding Storm Drainage Area Plan (Drawing 117089-STM) is provided in **Appendix C**.

The Phase 3 Stormwater Management Report **[10]** outlines that “inflows from all future development have been accounted for based on the 5-year peak flow”. As such, all inlet control devices (ICDs) within Block 135 will be installed in all road catchbasins to limit inflows to the minor system during large (>1:5 year) storm events. Inlet control devices shall be CB lead plate-type and are to be sizes listed in Section 13.1.19 of the Ottawa Sewer Materials Specifications.

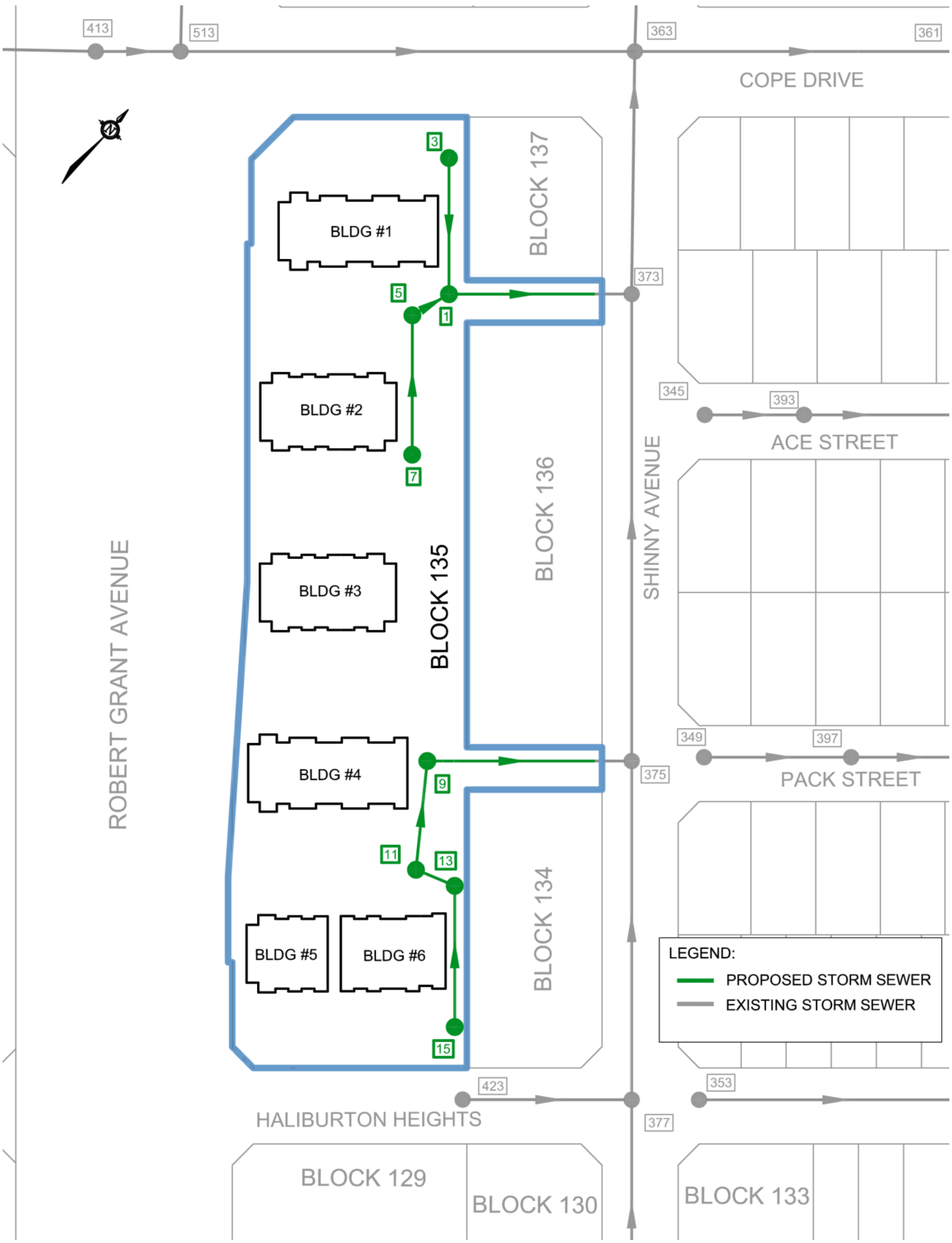


**Figure 4: Storm Sewer Network**

**Table 6.1: Storm Sewer Design Parameters**

| Parameter | Design Criteria |
|---|---|
| Private Roads | 5 Year Return Period |
| Storm Sewer Design | Rational Method/AutoDesk Storm Analysis |
| IDF Rainfall Data | Ottawa Sewer Design Guidelines |
| Initial Time of Concentration ($T_c$) | 10 min |
| Minimum Velocity | 0.8 m/s |
| Maximum Velocity | 3.0 m/s |
| Minimum Diameter | 250 mm |

**Table 6.2: Runoff Coefficients**

| Land Use | Runoff Coefficient |
|---|---|
| Hard Surface | 0.90 |
| Soft Surface | 0.30 |

### *6.2.2 Major System Design*

The site has been designed to convey runoff from storms that exceed the minor system capacity to Shinny Avenue. The roadway and parking areas have been graded to ensure that the 100-year peak overland flows are confined within the parking area at a maximum flow depth of 300mm.

## 6.3 Hydrologic & Hydraulic Modeling

The *City of Ottawa Sewer Design Guidelines* (October 2012) require hydrologic modeling for all dual drainage systems. The performance of the proposed storm drainage system for Block 135 was evaluated using the *Autodesk Storm and Sanitary Analysis* (SSA) hydrologic/hydraulic modeling software in order to maintain compatibility with the previously developed Phase 1-5 models (each of which were built in SSA).

The modeling files and model schematics are provided in **Appendix C**. For review purposes, a 'standalone' PCSWMM model of Block 135 has also been provided on CD included at the back of this report.

*Design Storms*

The hydrologic analysis was completed using the following synthetic design storms and historical storms. The IDF parameters used to generate the design storms were taken from the Sewer Design Guidelines **[8]**.

*4 Hour Chicago Storms*:
25mm 4-hr Chicago storm
2-year 4hr Chicago storm
5-year 4hr Chicago storm
100-year 4hr Chicago storm

*12 Hour SCS Storms*:
2-year 12-hr SCS storm
5-year 24hr Chicago storm
100-year 24hr Chicago storm

The 4-hour Chicago distribution generates the highest peak flows for both the minor and major systems and was determined to be the critical storm distribution for the design of the storm drainage system.

The proposed drainage system has also been stress tested using a 4-hour Chicago design storm that has a 20% higher intensity and total volume compared to the 100-year event.

*Model Development*

The SSA model accounts for both minor and major system flows *(dual drainage),* including the routing of flows through the storm sewer network *(minor system),* and overland along the road network *(major system).* The results of the analysis were used to:

- Ensure no ponding in the rights-of-way following a 5-year event;
- Calculate the storm sewer hydraulic grade line for the 100-year storm event;
- Evaluate overland flow depths and ponding volumes in the rights-of-way during the 100-year event; and
- Determine the total major and minor system runoff from the site to Pond 6.

The model is capable of accounting for both static and dynamic storage within the private roadways and parking areas, including the overland flow across all high points and capture/bypass curves for inlets on continuous grade. The 100-year flow depths computed by the model represent the total (static + dynamic) ponding depths at low points for areas in road sags, or the gutter flow depth where the inlets are on a continuous grade.

*Storm Drainage Area Plan & Subcatchment Parameters*

The Block 135 development has been divided into subcatchments based on the drainage areas tributary to each inlet of the proposed storm sewer system. The catchment areas are shown on the Storm Drainage Area Plan provided as drawing **117089-STM** in **Appendix C**.

The hydrologic parameters for each subcatchment were developed based on the Site Plan (**Figure 2**) and the Storm Drainage Area Plan specified above. Subcatchment parameters are outlined in **Table 6.3**.

**Table 6.3: Subcatchment Model Parameters**

| Area ID | Catchment Area (ha) | Runoff Coefficient (C) | Percent Impervious (%) | No Depression (%) | Flow Path Length (m) | Equivalent Width (m) | Average Slope (%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.133 | 0.70 | 71% | 37% | 35.20 | 37.79 | 0.90% |
| 2 | 0.220 | 0.74 | 77% | 41% | 25.40 | 86.60 | 1.00% |
| 3a | 0.187 | 0.77 | 81% | 38% | 38.60 | 48.44 | 0.85% |
| 3b | 0.066 | 0.65 | 64% | 0% | 9.41 | 70.12 | 0.85% |
| 4a | 0.266 | 0.74 | 77% | 34% | 38.50 | 69.10 | 0.90% |
| 4b | 0.041 | 0.63 | 61% | 0% | 7.92 | 51.75 | 0.90% |
| 5 | 0.172 | 0.76 | 80% | 54% | 25.78 | 66.71 | 0.75% |
| 6 | 0.149 | 0.70 | 71% | 35% | 29.27 | 50.91 | 0.70% |
| 7 | 0.013 | 0.84 | 91% | 0% | 11.08 | 11.73 | 1.80% |
| 8 | 0.012 | 0.84 | 91% | 0% | 10.35 | 11.60 | 2.00% |
| **TOTAL:** | **1.26** | | | | | | |

*Infiltration*

Infiltration losses for all catchment areas were modeled using Horton's infiltration equation, which defines the infiltration capacity of the soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The default values for the Sewer Design Guidelines **[8]** were used for all catchments.

| | | |
|---|---|---|
| Horton's Equation: | Initial infiltration rate: | $f_o = 76.2$ mm/hr |
| $f(t) = f_c + (f_o - f_c)e^{-k(t)}$ | Final infiltration rate: | $f_c = 13.2$ mm/hr |
| | Decay Coefficient: | $k = 4.14$/hr |

*Depression Storage*

The default values for depression storage in the Sewer Design Guidelines **[8]** were used for all catchments. Residential rooftops were assumed to provide no depression storage.

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

*Equivalent Width*

Equivalent Width' refers to the width of the sub-catchment flow path. This parameter is calculated as described in the Sewer Design Guidelines **[8]**, Section 5.4.5.6.

*Impervious Values*

Impervious (TIMP) values for each subcatchment area were calculated based on the proposed land use plan (Figure 2) and correspond to the Runoff Coefficients used in the Rational Method calculations using the equation:

$$\%imp = \frac{C - 0.2}{0.7}$$

### ***6.3.1 Minor System***

Inflows to the storm sewer were modeled based on the characteristics of each inlet;

- For areas where catchbasins are located at low points *(represented as junctions),* inflows to the storm sewer are based on the ICD specified for the inlet and the maximum depth of ponding. Storage volumes within the right-of-way are based on the grading design.
- For areas where catchbasins are located on a continuous grade, the capture rate is based on the type of grate, the geometry of the road, and the approach flow. Rating curves for approach flow vs. capture rate were input into the model using the appropriate tables from the *Ottawa Design Guidelines – Sewer*:
  - Design Chart 4.04: Gutter Flow Rate for Barrier Curb with Gutter.
  - Design Chart 4.06: Gutter Flow Rate for Mountable Curb with Gutter.
  - Design Chart 4.14: Inlet Capacity for Barrier Curb.
  - Design Chart 4.15: Inlet Capacity for Mountable Curb.
  - Appendix 7-A. Type S22 Curb Inlet Catchbasin with Cross Fall fixed at 3%

### *6.3.2 Major System*

The proposed road network was input into the SSA model to calculate the total inflow into the storm sewers (minor system), and to calculate the overland flows and flow depths within the rights-of-way (major system).

The roads are represented in the model as open channels. Model input includes:

- Right-of-way cross-sections;
- Length and slope of the road between each high and low point;
- The location of all storm inlets and whether the inlets are in a sag or on-grade.

The elevations used to define the road network are based on the gutter elevations, as opposed to the centerline of road elevations shown on the Grading Plans.

## 6.4 Results of Hydrologic/ Hydraulic Analysis

The model was used to evaluate the performance of the proposed storm drainage system for the Phase 5 lands and specifically to determine the 100-year hydraulic grade line. Both the SSA model and the stand-alone PCSWMM model have been provided on the attached CD at the back of this report.

### *6.4.1 Minor System*

The proposed inlet control devices (ICDs) have been sized to capture the approximate 5-year peak flow at each inlet to the storm sewer, as well as to reduce the 100-year HGL elevation in the storm sewers. Consequently, there will be little to no ponding within the rights-of-way during the 5-year event. The selection of ICDs takes into account the overland flow that bypasses catchbasins on-grade by providing additional capacity at the downstream inlets. The list of ICD sizes and performance is provided in **Table 6.4**.

**Table 6.4: Inlet Control Devices & Design Flows**

| Structure | ICD Size & Inlet Rate | | | | Approach Flow** (L/s) |
|---|---|---|---|---|---|
| | Diameter 1 (mm) | Max Head (m) | Calculated 5-yr Capture Rate (L/s) | 5-yr Capture Rate** (L/s) | |
| CB50 | 108 | 1.35 | 29.19 | 28.80 | 30.05 |
| CB51 | 152 | 1.32 | 57.34 | 50.56 | 51.18 |
| CB52 | 83 | 1.36 | 17.32 | 13.44 | 14.64 |
| CB53 | 152 | 1.32 | 57.34 | 44.88 | 45.32 |
| CB54 | 83 | 1.36 | 17.32 | 8.44 | 9.01 |
| CB55 | 178 | 1.31 | 78.25 | 78.47 | 79.76 |
| CB56 | 152 | 1.32 | 57.34 | 22.45 | 41.11 |
| CB57 | 127 | 1.34 | 40.22 | 32.38 | 33.14 |

***From PCSWMM Model, 5-year 4-hour Chicago storm distribution*

The Rational Method design sheets (**Appendix B**) were used to calculate the required storm sewer sizes based on capturing the peak flow at each inlet to the storm sewer for a 5-year design return period.

### 6.4.2 Major System

During the 100-year event, stormwater runoff that exceeds the available static storage within road sags will flow overland within the rights-of-way and/or defined drainage easements to Shinny Avenue. Major system network was evaluated using the model to ensure that the flow depths and velocities conform to City standards. The results of the 100-year modelling indicate that the overland flow depths on all streets will be less than 0.30m and major system flows will be confined to the rights-of-way. Generally, major system flow will be contained within the Block 135 development, for all storm events.

**Table 6.5: Overland Flow Results (100-year Event)**

| Structure | T/G | Max. Static Ponding (Spill Depth) | | 100-yr Event (4hr) | | | |
|---|---|---|---|---|---|---|---|
| | (m) | Elev. (m) | Depth (m) | Elev. (m) | Depth (m) | Cascading Flow? | Cascade Depth (m) |
| CB50 | 104.75 | 104.88 | 0.13 | 104.89 | 0.14 | Y | 0.01 |
| CB51 | 104.40 | 104.50 | 0.10 | 104.51 | 0.11 | Y | 0.01 |
| CB52 | 104.44 | 104.65 | 0.21 | 104.58 | 0.14 | N | 0.00 |
| CB53 | 104.49 | 104.65 | 0.16 | 104.59 | 0.10 | N | 0.00 |
| CB54 | 104.64 | 104.79 | 0.15 | 104.78 | 0.14 | N | 0.00 |
| CB55 | 104.64 | 104.79 | 0.15 | 104.78 | 0.14 | N | 0.00 |
| CB57 | 105.20 | 105.34 | 0.14 | 105.31 | 0.11 | N | 0.00 |

An expanded table of the ponding depths at low points in the roadway (including the stress-test event) is provided in **Appendix B**. Based on these results, the proposed storm drainage system will not experience any adverse flooding even with a 20% increase to the 100-year event. These results are from the SSA model, however the stand-alone PCSWMM model gives very similar results.

### 6.4.3 Hydraulic Grade Line

The Block 135 model has been integrated with the existing Fernbank Phase 1-5 SSA model. By integrating the models, the HGL elevations within the proposed Block 135 development and downstream in Phase 3 and along Cope Drive can be accurately determined.

The results of the HGL analysis were used to ensure that a minimum freeboard of 0.30m is provided between the 100-year HGL and the designed underside of footing elevations. The 100-year HGL elevations at each storm manhole with respect to the lowest adjacent underside of footing elevation are provided in **Table 6.6**.

**Table 6.6: 100-year HGL Elevations**

| Manhole ID | MH Invert Elevation (m) | T/G Elevation (m) | HGL Elevation - 100yr4hr (m) | Design USF (m) | Clearance (100yr) (m) |
|---|---|---|---|---|---|
| **HGL - Block 135** | | | | | |
| MH01 | 101.42 | 104.53 | 102.10 | 103.72 | 1.62 |
| MH03 | 101.81 | 104.96 | 102.25 | 103.57 | 1.32 |
| MH05 | 102.19 | 105.11 | 102.13 | 103.57 | 1.44 |
| MH07 | 101.60 | 104.55 | 102.30 | 103.57 | 1.27 |
| MH09 | 101.99 | 104.88 | 102.67 | 103.77 | 1.10 |
| MH11 | 101.79 | 104.58 | 102.77 | 104.13 | 1.36 |
| MH13 | 102.13 | 104.78 | 102.78 | 104.13 | 1.35 |
| MH15 | 101.77 | 104.70 | 102.88 | 104.13 | 1.25 |

An expanded table showing the results of the stress test (100-year +20% event) and the HGL elevations for Phase 3 and Cope Drive is provided in **Appendix B**. The stress test indicates that the HGL elevations will be below the USF elevations for this event.

While the results in the table above are from the SSA model, the stand-alone PCSWMM model has been assigned outlet boundary conditions to give a close approximation of the results from the SSA model. 100-year boundary conditions are as follows:

- STM373 = 102.26m
- STM375 = 102.00m

These boundary conditions have also been provided in the ‘Description’ of each of the outfalls from the PCSWMM model for easy reference.

# 7.0 WATER

## 7.1 Existing Conditions

The proposed development is located inside the 3W Pressure Zone. An existing 300mm diameter watermain runs along Shinny Avenue and Haliburton Heights as well as an existing 200mm diameter watermain that runs along Cope Drive. Existing 200mm diameter caps are located at both private entrances off Shinny Avenue.

## 7.2 Proposed Conditions

Block 135 will be connected to the existing watermain network by way of four separate feed points. Two connections are proposed to the existing 200mm diameter caps located at the private entrances off Shinny Avenue, one connection to the 300mm diameter watermain in Haliburton Heights and one connection to the 200mm diameter watermain in Cope Drive.

Block 135 will be serviced by a combination of 150mm and 200mm diameter watermains and will provide sufficient capacity to maintain appropriate pressures and fire flows throughout the development. **Figure 5** provides a high level schematic of the proposed water distribution system.

The watermain boundary condition below was obtained from the City of Ottawa and has been included in **Appendix A**:

<u>Boundary Condition</u> – Located north of the Trans Canada Trail at the existing 300mm x 400mm diameter watermain connection (Shown in Figure 6 in **Appendix A**)
Max Day + FF of 167 L/s = 152.9m
Max Day + FF of 217 L/s = 151.2m
Minimum Pressure during Peak Hour = 155.5m
Max Pressure Check = 162.4m

City of Ottawa watermain design criteria and Fernbank Community Design Parameters are outlined in **Table 7.1**.

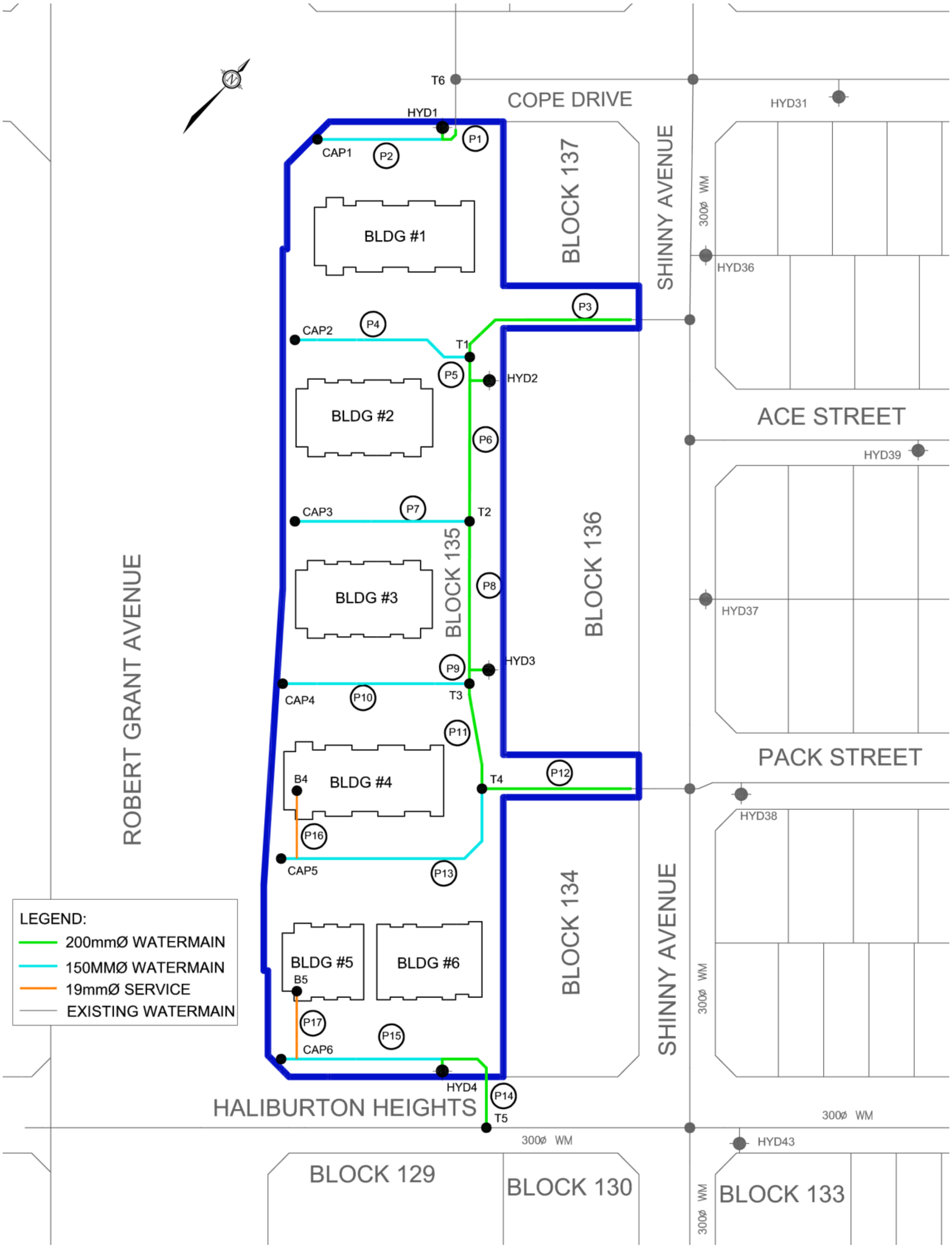


**Figure 5: Watermain Layout**

**Table 7.1: Watermain Design Criteria**

| Design Parameter | Design Criteria |
|---|---|
| Town Population | 2.7 people/unit |
| Residential Demand | 350 L/c/d |
| Maximum Day Demand | 2.5 x Average Day |
| Peak Hour Demand | 2.2 x Maximum Day |
| Fire Demand | 200, 233, 250 L/s |
| Maximum Pressure | 690 kPa (100psi) unoccupied areas |
| Maximum Pressure | 552 kPa (80psi) occupied areas outside of ROW |
| Minimum Pressure | 275 kPa (40 psi) except during fire flow |
| Minimum Pressure | 140 kPa (20 psi) fire flow conditions |

**Table 7.2: Water Flow Summary**

| | Units | Population | Average Day Demand (L/s) | Maximum Day Demand (L/s) | Peak Hour Demand (L/s) |
|---|---|---|---|---|---|
| **Back-to-Back Towns** | 58 | 156.6 | 0.634 | 1.586 | 3.489 |
| **Total** | **58** | **156.6** | **0.634** | **1.586** | **3.489** |

Based on the fire underwriters survey, the fire flows were calculated as 200 L/s (building 5), 233 L/s (buildings 2 and 3) and 250 L/s (buildings 1, 4 and 6). Calculations are provided in **Appendix A**.

The proposed watermain was modeled using EPANET 2 (See 115049-GP for detailed watermain layout).

A summary of the model results are shown below in **Table 7.3**, **Table 7.4** and **Table 7.5**. Full model results are included in **Appendix A**.

**Table 7.3: Summary of Hydraulic Model Results - Maximum Day + Fire Flow**

| Operating Condition | Minimum Pressure |
|---|---|
| 250 L/s at Building 1 | 230.54 kPa (CAP1) |
| 233 L/s at Building 3 | 240.15 kPa (CAP4) |
| 250 L/s at Building 4 | 213.76 kPa (CAP6) |
| 250 L/s at Building 6 | 210.62 kPa (CAP6) |

**Table 7.4: Summary of Hydraulic Model Results - Peak Hour Demand**

| Operating Condition | Maximum Pressure | Minimum Pressure |
|---|---|---|
| 3.489 L/s through system | 500.31 kPa (T2) | 489.13 kPa (CAP6) |

The hydraulic modeling summarized above highlights the maximum and minimum system pressures during Peak Hour conditions, and the minimum system pressures during the Maximum Day + Fire condition. Since the Maximum Day + Fire Flow pressures are above the minimum 140 kPa, and the Peak Hour Pressures onsite fall within the normal operating pressure range (345 kPa to 552 kPa) we conclude the proposed water design will adequately service the development.

**Table 7.5: Summary of Hydraulic Model Results – Maximum Pressure Check**

| Operating Condition | Maximum Pressure | Minimum Pressure |
|---|---|---|
| 0.634 L/s through system | 560.15 kPa (CAP5, CAP6) | 531.70 kPa (B6) |

The average day pressures at CAP1 through CAP4 are below or equal to 552 kPa. Average day pressures at CAP5 and CAP6 are slightly above 552 kPa and are both at 560.15 kPa. Since the average day pressures are modelled within the watermain and not the services to the units, lower pressures will be encountered at the upper levels. Pressures at the first floor were modelled at Buildings 4 and 5 (nodes B4 and B5) adjacent to CAP5 and CAP6. The average day pressures within the units at both B4 and B6 are below 552 KPa. We conclude that pressure reducing valves are not necessary to reduce the modelled pressures below 552 kPa within the watermain as the modelled average day pressures within the services to the units are within the required range.

## 7.3 Offsite Requirements

As specified in the Fernbank Master Servicing Study **[3]**, additional firm pumping capacity at the Glen Cairn Pumping Station and one of the Zone 2W pumping stations is required to meet additional demands associated with the Fernbank Community. The timing of these upgrades is related to the overall rate of growth in the entire Zone 3W (Kanata and Stittsville area). Growth within the Fernbank Crossing Subdivision plays only a small part in determining when these upgrades are required; the City of Ottawa will determine when these water supply upgrades occur. No direct costs associated with the offsite upgrades are attributable to the developer.

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

The report conclusions are as follows:

1) The servicing design generally conforms to the conclusions and recommendations outlined in the Fernbank Master Servicing Study and the Fernbank Environmental Management Plan both of which were approved by Council on June 24, 2009.

2) There is adequate capacity in the offsite infrastructure (sanitary, storm and water) to service Block 135, with note to the following:

    a) Pond 6 is operational, and provides both quality and quantity control of stormwater runoff;

    b) The water distribution network can adequately provide both domestic and fire suppression needs;

    c) The Glen Carin Pumping Station (water distribution) will be upgraded by the City of Ottawa as-and-when required based on overall growth rates within the entire Zone 3W Area;

    d) Wastewater is routed east through the Fernbank Crossing Subdivision and the Blackstone Lands to the Fernbank Trunk, directing flow to the Hazeldean Pump Station.

3) The proposed infrastructure (sanitary, storm and water) complies with City of Ottawa design standards.

This report is respectfully submitted for review and approval. Please contact the undersigned should you have questions or require additional information.

Sincerely,

**NOVATECH**

Prepared By:


Lucas Wilson, P.Eng.
Project Coordinator

Prepared By:


Kallie Auld, P.Eng.
Project Coordinator | Water Resources

# References


1. “Fernbank Crossing Servicing Design Brief – Phase 3, Novatech [July 13, 2015]

2. “Fernbank Community Design Plan, Walker, Nott, Dragicevic Associates Ltd. [June 24, 2009]

3. “Fernbank Master Servicing Study”, Novatech Engineering Consultants Ltd. [June 24, 2009]

4. “Fernbank Environmental Management Plan”, Novatech Engineering Consultants Ltd. [June 24, 2009]

5. “Geotechnical Investigation Fernbank Crossing Residential Subdivision Block 135, Ottawa, Ontario” Gemtec. [Report No. 64153.74, March 20, 2019]

6. “Transportation Master Plan”, City of Ottawa [November 2013]

7. “Fernbank Transportation Master Plan”, Delcan [June 24, 2009]

8. “Sewer Design Guidelines”, Department of Public Works and Services, City of Ottawa [October 2012]

9. “Standard Tender Documents, Material Specifications and Standard Detail Drawings” City of Ottawa, Department of Infrastructure Services and Community Sustainability [March, 2014]

10. “Abbott-Fernbank Holdings Inc. Fernbank Crossing – Phase 3 Stormwater Management Report”, Novatech [July 13, 2015]

## APPENDIX A: Design Sheets

Storm Sewer Design Sheet (Rational Method)
Sanitary Sewer Design Sheets
Watermain Boundary Conditions and Correspondence
Watermain Modelling
Fire Flow Calculations
Figure 6: Watermain Plan - Overview

# Fernbank Crossing (Block 135)- Storm Sewer Design Sheet ( Traditional Rational Method )

| LOCATION | | | AREA | | | | | | | | | FLOW | | | | | | | PROPOSED SEWER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | From node | To node | Park N' Ride Paramedic Post Medium Block | Hard Surface | Soft Surface | Singles Front Yards | Singles Rear Yard | Towns Front Yard | Towns Rear Yard | Total Area | Weighted Runoff Coefficient | Indivi 2.78 AR | Accum 2.78 AR | Time of Concentration | Rain Intensity (mm/hr) 5yr | Rain Intensity (mm/hr) 10yr | Peak Flow | **Total Peak Flow (Q)** | Pipe | Size | Grade | Length | Capacity | Full Flow Velocity | Time of Flow | Q/Qfull | d/D |
| | | | 0.80 | 0.90 | 0.30 | 0.65 | 0.55 | 0.70 | 0.60 | (ha) | | | | | | | (L/s) | **(L/s)** | Type | (mm) | (%) | (m) | (l/s) | (m/s) | (min.) | (%) | |
| **Phase 3** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 643 | 389 | 387 | | | | 0.46 | | | | 0.46 | 0.65 | 0.83 | 0.83 | 10.00 | 104.2 | | 86.6 | **86.6** | PVC | 450 | 0.19 | 123.5 | 129.6 | 0.79 | 2.61 | 66.8% | 0.666 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| 645 | 505 | 509 | | | | | | 0.24 | | 0.24 | 0.70 | 0.47 | 0.47 | 10.00 | 104.2 | | 48.7 | **48.7** | PVC | 375 | 0.30 | 69.5 | 100.2 | 0.88 | 1.32 | 48.6% | 0.552 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| 644 | 507 | 509 | | | | | | 0.17 | | 0.17 | 0.70 | 0.33 | 0.33 | 10.00 | 104.2 | | 34.5 | **34.5** | PVC | 300 | 0.40 | 30.5 | 63.8 | 0.87 | 0.58 | 54.0% | 0.590 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| | 509 | CBMH15 | | | | | | | | 0.00 | 0.00 | 0.00 | 0.80 | 11.32 | 97.7 | | 78.0 | **78.0** | PVC | 450 | 0.20 | 46.1 | 133.0 | 0.81 | 0.95 | 58.6% | 0.616 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 11.32 | | | 0.0 | | | | | | | | | | |
| 633 | CAP | CBMH15 | 1.78 | | | | | | | 1.78 | 0.80 | 3.96 | 3.96 | 10.00 | 104.2 | | 412.5 | **412.5** | CONC | 750 | 0.30 | 5.5 | 636.1 | 1.39 | 0.07 | 64.8% | 0.653 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| 658, 659, 730, 739 | CBMH15 | 387 | | | | | 0.18 | | 0.45 | 0.63 | 0.59 | 1.03 | 5.78 | 12.27 | 93.6 | | 541.1 | **541.1** | CONC | 900 | 0.20 | 44.3 | 844.6 | 1.29 | 0.57 | 64.1% | 0.653 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 12.27 | | | 0.0 | | | | | | | | | | |
| 642 | 387 | 385 | | | | 0.43 | | | | 0.43 | 0.65 | 0.78 | 7.39 | 12.84 | 91.3 | | 674.4 | **674.4** | CONC | 900 | 0.20 | 51.8 | 844.6 | 1.29 | 0.67 | 79.8% | 0.748 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 12.84 | | | 0.0 | | | | | | | | | | |
| | 385 | 383 | | | | | | | | 0.00 | 0.00 | 0.00 | 7.39 | 13.51 | 88.7 | | 655.5 | **655.5** | CONC | 900 | 0.20 | 10.9 | 844.6 | 1.29 | 0.14 | 77.6% | 0.735 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 13.51 | | | 0.0 | | | | | | | | | | |
| 634 | 383 | 419 | | | | | | | 0.14 | 0.14 | 0.60 | 0.23 | 7.62 | 13.65 | 88.2 | | 672.3 | **672.3** | CONC | 900 | 0.25 | 9.3 | 944.3 | 1.44 | 0.11 | 71.2% | 0.697 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 13.65 | | | 0.0 | | | | | | | | | | |
| 641 | 419 | 381 | | | | | | 0.39 | 0.13 | 0.52 | 0.68 | 0.98 | 8.60 | 13.76 | 87.8 | | 755.0 | **755.0** | CONC | 900 | 0.25 | 66.9 | 944.3 | 1.44 | 0.78 | 79.9% | 0.748 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 13.76 | | | 0.0 | | | | | | | | | | |
| 666 | 359 | 381 | | | | 0.35 | | | | 0.35 | 0.65 | 0.63 | 0.63 | 10.00 | 104.2 | | 65.9 | **65.9** | PVC | 375 | 0.25 | 93.3 | 91.5 | 0.80 | 1.94 | 72.1% | 0.704 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| 639 | 381 | 379 | | | | | | | | 0.00 | 0.00 | 0.00 | 9.23 | 14.54 | 85.1 | | 785.5 | **785.5** | CONC | 975 | 0.24 | 25.9 | 1145.4 | 1.49 | 0.29 | 68.6% | 0.678 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 14.54 | | | 0.0 | | | | | | | | | | |
| 627 | 379A | 379 | 1.09 | | | | | | | 1.09 | 0.80 | 2.42 | 2.42 | 10.00 | 104.2 | | 252.6 | **252.6** | CONC | 600 | 0.25 | 7.5 | 320.3 | 1.10 | 0.11 | 78.9% | 0.742 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| 667 | 379 | 377 | | | | | | 0.35 | | 0.35 | 0.70 | 0.68 | 12.34 | 14.83 | 84.1 | | 1037.9 | **1037.9** | CONC | 1050 | 0.25 | 55.3 | 1424.4 | 1.59 | 0.58 | 72.9% | 0.704 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 14.83 | | | 0.0 | | | | | | | | | | |
| 625, 638, 630 | 423 | 377 | | | | | | 0.16 | 0.18 | 0.34 | 0.65 | 0.61 | 0.61 | 10.00 | 104.2 | | 63.7 | **63.7** | PVC | 300 | 1.00 | 40.0 | 100.9 | 1.38 | 0.48 | 63.2% | 0.647 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| 673 | 377 | 375 | | | | | | 0.28 | | 0.28 | 0.70 | 0.54 | 13.49 | 15.41 | 82.3 | | 1110.2 | **1110.2** | CONC | 1200 | 0.17 | 80.1 | 1677.0 | 1.44 | 0.93 | 66.2% | 0.666 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 15.41 | | | 0.0 | | | | | | | | | | |

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Engineers, Planners & Landscape Architects

# Fernbank Crossing (Block 135)- Storm Sewer Design Sheet ( Traditional Rational Method )

| LOCATION | | | AREA | | | | | | | | | FLOW | | | | | | | PROPOSED SEWER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | From node | To node | Park N' Ride Paramedic Post Medium Block | Hard Surface | Soft Surface | Singles Front Yards | Singles Rear Yard | Towns Front Yard | Towns Rear Yard | Total Area | Weighted Runoff Coefficient | Indivi 2.78 AR | Accum 2.78 AR | Time of Concentration | Rain Intensity (mm/hr) 5yr | Rain Intensity (mm/hr) 10yr | Peak Flow | Total Peak Flow (Q) | Pipe | Size | Grade | Length | Capacity | Full Flow Velocity | Time of Flow | Q/Qfull | d/D |
| | | | 0.80 | 0.90 | 0.30 | 0.65 | 0.55 | 0.70 | 0.60 | (ha) | | | | | | | (L/s) | (L/s) | Type | (mm) | (%) | (m) | (l/s) | (m/s) | (min.) | (%) | |
| **Block 135 (South Outlet)** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 15 | 13 | | 0.10 | 0.05 | | | | | 0.15 | 0.70 | 0.29 | 0.29 | 10.00 | 104.2 | | 30.4 | **30.4** | PVC | 300 | 0.50 | 33.4 | 71.3 | 0.98 | 0.57 | 42.6% | 0.512 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| | 13 | 11 | | | | | | | | 0.00 | 0.00 | 0.00 | 0.29 | 10.57 | 101.3 | | 29.6 | **29.6** | PVC | 375 | 0.30 | 9.9 | 100.2 | 0.88 | 0.19 | 29.5% | 0.419 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.57 | | | 0.0 | | | | | | | | | | |
| 5 | 11 | 9 | | 0.13 | 0.04 | | | | | 0.17 | 0.76 | 0.36 | 0.65 | 10.76 | 100.4 | | 65.3 | **65.3** | PVC | 375 | 0.85 | 25.8 | 168.6 | 1.48 | 0.29 | 38.7% | 0.485 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 10.76 | | | 0.0 | | | | | | | | | | |
| 4 | 9 | 375 | | 0.22 | 0.09 | | | | | 0.31 | 0.73 | 0.63 | 1.28 | 11.05 | 99.0 | | 126.3 | **126.3** | PVC | 450 | 0.20 | 48.3 | 133.0 | 0.81 | 0.99 | 94.9% | 0.853 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 11.05 | | | 0.0 | | | | | | | | | | |
| 674, 629 | 375 | 373 | | | | | | 0.30 | 0.16 | 0.46 | 0.67 | 0.85 | 15.62 | 16.33 | 79.5 | | 1241.5 | **1241.5** | CONC | 1200 | 0.18 | 110.5 | 1725.6 | 1.48 | 1.25 | 71.9% | 0.697 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 16.33 | | | 0.0 | | | | | | | | | | |
| **Block 135 (North Outlet)** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 7 | 5 | | 0.19 | 0.07 | | | | | 0.26 | 0.74 | 0.53 | 0.53 | 10.00 | 104.2 | | 55.6 | **55.6** | PVC | 375 | 0.30 | 33.0 | 100.2 | 0.88 | 0.63 | 55.5% | 0.597 |
| | | | | | | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| | 5 | 1 | | | | | | | | 0.00 | 0.00 | 0.00 | 0.53 | 10.63 | 101.0 | | 53.9 | **53.9** | PVC | 450 | 0.25 | 10.0 | 148.7 | 0.91 | 0.18 | 36.2% | 0.471 |
| | | | | | | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 10.63 | | | 0.0 | | | | | | | | | | |
| 1 | 3 | 1 | | 0.09 | 0.04 | | | | | 0.13 | 0.70 | 0.25 | 0.25 | 10.00 | 104.2 | | 26.2 | **26.2** | PVC | 375 | 0.50 | 32.2 | 129.3 | 1.13 | 0.47 | 20.3% | 0.345 |
| | | | | | | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 10.00 | | | 0.0 | | | | | | | | | | |
| 2 | 1 | 373 | | 0.16 | 0.06 | | | | | 0.22 | 0.74 | 0.45 | 1.24 | 10.81 | 100.1 | | 123.7 | **123.7** | CONC | 600 | 0.21 | 43.2 | 293.5 | 1.01 | 0.72 | 42.1% | 0.512 |
| | | | | | | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 10.81 | | | 0.0 | | | | | | | | | | |
| 723, 628 | 373 | 363 | | | | | | 0.31 | 0.06 | 0.37 | 0.68 | 0.70 | 17.56 | 17.58 | 76.1 | | 1335.5 | **1335.5** | CONC | 1350 | 0.20 | 58.9 | 2490.2 | 1.69 | 0.58 | 53.6% | 0.584 |
| | | | | | | | | | | 0.00 | | 0.00 | 0.00 | 17.58 | | | 0.0 | | | | | | | | | | |

Q = 2.78 AIR WHERE :

Q = (1/n) A R(2/3)So(1/2) WHERE :

Q = CAPACITY (L/s)
n = MANNING COEFFICIENT OF ROUGHNESS (0.013)
A = FLOW AREA (m2)

Project: Fernbank Crossing - Block 135 (117089)
Designed: LRW
Checked: MAB
Date: June 7 2019




NOVATECH
Engineers, Planners & Landscape Architects

## Fernbank Crossing, Block 135 - Sanitary Sewer Design Sheet

| AREA | | | RESIDENTIAL | | | | | INFILTRATION | | | | PIPE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Towns | | | | | | | | | | | | | | | | |
| ID | From | To | Units | Pop. | Accum. Pop. | Peak Factor | Peak Flow (l/s) | Total Area (ha) | Accum. Area (ha) | Infilt. Flow (l/s) | **Total Flow (l/s)** | Size (mm) | Slope (%) | Length (m) | Capacity (l/s) | Full Flow Vel. (m/s) | Actual Vel. (m/s) | $Q/Q_{full}$ (%) | d/D |
| **North Outlet** | | | | | | | | | | | | | | | | | | | |
| | **14** | **12** | 10 | 27.0 | 27.0 | 4.0 | 0.4 | 0.19 | 0.19 | 0.1 | 0.5 | 200 | 0.75 | 38.0 | 29.6 | 0.91 | 0.28 | 1.7% | 0.077 |
| | **12** | **8** | 0 | 0.0 | 27.0 | 4.0 | 0.4 | 0.06 | 0.25 | 0.1 | 0.5 | 200 | 1.50 | 42.7 | 41.9 | 1.29 | 0.37 | 1.2% | 0.077 |
| | **10** | **8** | 10 | 27.0 | 27.0 | 4.0 | 0.4 | 0.16 | 0.16 | 0.0 | 0.5 | 200 | 1.50 | 38.0 | 41.9 | 1.29 | 0.37 | 1.2% | 0.077 |
| | **8** | **2** | 1 | 2.7 | 56.7 | 4.0 | 0.9 | 0.01 | 0.42 | 0.1 | 1.0 | 200 | 1.50 | 9.9 | 41.9 | 1.29 | 0.47 | 2.5% | 0.108 |
| | **6** | **4** | 6 | 16.2 | 16.2 | 4.0 | 0.3 | 0.12 | 0.12 | 0.0 | 0.3 | 200 | 0.75 | 42.9 | 29.6 | 0.91 | 0.24 | 1.0% | 0.077 |
| | **4** | **2** | 0 | 0.0 | 16.2 | 4.0 | 0.3 | 0.02 | 0.14 | 0.0 | 0.3 | 200 | 1.50 | 36.5 | 41.9 | 1.29 | 0.31 | 0.7% | 0.077 |
| | **2** | **754** | 0 | 0.0 | 72.9 | 4.0 | 1.2 | 0.04 | 0.60 | 0.2 | 1.3 | 200 | 0.32 | 43.7 | 19.4 | 0.60 | 0.29 | 7.0% | 0.187 |
| **South Outlet** | | | | | | | | | | | | | | | | | | | |
| | **20** | **18** | 11 | 29.7 | 29.7 | 4.0 | 0.5 | 0.20 | 0.20 | 0.1 | 0.5 | 200 | 0.75 | 41.8 | 29.6 | 0.91 | 0.30 | 1.8% | 0.077 |
| | **18** | **16** | 0 | 0.0 | 29.7 | 4.0 | 0.5 | 0.02 | 0.22 | 0.1 | 0.5 | 200 | 1.50 | 19.0 | 41.9 | 1.29 | 0.37 | 1.3% | 0.077 |
| | **24** | **22** | 11 | 29.7 | 29.7 | 4.0 | 0.5 | 0.18 | 0.18 | 0.1 | 0.5 | 200 | 0.75 | 42.3 | 29.6 | 0.91 | 0.30 | 1.8% | 0.077 |
| | **30** | **28** | 7 | 18.9 | 18.9 | 4.0 | 0.3 | 0.14 | 0.14 | 0.0 | 0.3 | 200 | 0.75 | 50.9 | 29.6 | 0.91 | 0.26 | 1.2% | 0.077 |
| | **28** | **26** | 0 | 0.0 | 18.9 | 4.0 | 0.3 | 0.02 | 0.16 | 0.0 | 0.4 | 200 | 0.50 | 37.6 | 24.2 | 0.75 | 0.23 | 1.5% | 0.077 |
| | **26** | **22** | 2 | 5.4 | 24.3 | 4.0 | 0.4 | 0.02 | 0.18 | 0.1 | 0.4 | 200 | 0.75 | 9.3 | 29.6 | 0.91 | 0.28 | 1.5% | 0.077 |
| | **22** | **16** | 0 | 0.0 | 54.0 | 4.0 | 0.9 | 0.03 | 0.39 | 0.1 | 1.0 | 200 | 1.60 | 22.6 | 43.3 | 1.33 | 0.46 | 2.3% | 0.108 |
| | **16** | **756** | 0 | 0.0 | 83.7 | 4.0 | 1.4 | 0.04 | 0.65 | 0.2 | 1.5 | 200 | 0.32 | 48.5 | 19.4 | 0.60 | 0.30 | 7.9% | 0.202 |

**Design Parameters:**

| | | | | | |
|---|---|---|---|---|---|
| Avg Flow/Person = | 350 | l/day | | ppl/unit | units/net ha |
| Comm./Inst. Flow = | 35000 | l/ha/day | Apartment | 1.80 | 90 |
| Infiltration = | 0.28 | l/s/ha | Singles | 3.40 | |
| Pipe Friction n = | 0.013 | | Towns | 2.70 | 60 |

**Population Density:**

Residential Peaking Factor = Harmon Equation (max 4, min 2)

**Project: Block 135 (117089)**
Designed: LRW
Checked: MAB
Date: June 7, 2019


M:\2017\117089\DATA\Calculations\Sewer Calcs\SAN\20190607 - SAN Design Sheet.xlsx

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## Lucas Wilson

**From:** Surprenant, Eric <Eric.Surprenant@ottawa.ca>
**Sent:** Friday, February 27, 2015 2:05 PM
**To:** Lucas Wilson
**Cc:** Mark Bissett
**Subject:** RE: D07-16-09-0034 - Phase 3
**Attachments:** Boundary Conditions at Fernbank-Abbott.docx

Lucas,

Please see my responses below.

Thanks

Eric S.

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**From:** Lucas Wilson [mailto:l.wilson@novatech-eng.com]
**Sent:** February 25, 2015 11:27 AM
**To:** Surprenant, Eric
**Cc:** Mark Bissett
**Subject:** RE: D07-16-09-0034 - Phase 3

**Eric** – I had a couple questions regarding the comments for Fernbank Crossing – Phase 3.

1) Comment #4 was asking for a table showing the HGL plus freeboard vs USF. Are you looking for a complete table of all USF's or is it possible to show an HGL plus Freeboard profile in Profile drawings?
As long as it is clear and easy to reference on the profile drawings as it relates to HGL + freeboard and USF's, that will be acceptable.
2) Comment #70 requested sidewalks along Haliburton and Slapshot adjacent the park lands, are both sidewalks required or is the switch along Haliburton adequate?
Both streets require sidewalks, however the choice between a) and b) is available along Haliburton.

I'm also wondering on the status of the boundary conditions for the hydraulic analysis.

Thanks,
**Lucas Wilson** | EIT, B.Eng.
**NOVATECH**
**Engineers, Planners & Landscape Architects** | 200-240 Michael Cowpland Drive, Ottawa, ON K2M 1P6
**Office** 613.254.9643 x282 | **Fax** 613.254.5867 | **Email** l.wilson@novatech-eng.com


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**From:** Lucas Wilson
**Sent:** February-24-15 1:02 PM
**To:** eric.surprenant@ottawa.ca
**Cc:** Mark Bissett
**Subject:** D07-16-09-0034 - Phase 3, Revised Boundary Conditions

**Eric** – As per our phone conversation, please find attached Water Demand for Fernbank Crossing and locations 1 & 2 for Boundary Conditions.
If you need any further information do not hesitate to contact me.

Thanks,
**Lucas Wilson** | EIT, B.Eng.
**NOVATECH**
**Engineers, Planners & Landscape Architects** | 200-240 Michael Cowpland Drive, Ottawa, ON K2M 1P6
**Office** 613.254.9643 x282 | **Fax** 613.254.5867 | **Email** l.wilson@novatech-eng.com

# BOUNDARY CONDITIONS

## Boundary Conditions For: Fernbank Crossing Block 135

**Date of Boundary Conditions: 2019-Mar-18**

**Provided Information:**

| Scenario | Demand | |
|---|---|---|
| | L/min | L/s |
| **Average Daily Demand** | 38.0 | 0.6 |
| **Maximum Daily Demand** | 95.2 | 1.6 |
| **Peak Hour** | 209.3 | 3.5 |
| **Fire Flow #1 Demand** | 15,000 | 250.0 |

**Number Of Connections:** 1

**Location:**

## BOUNDARY CONDITIONS

**Results:**

**Connection #: 1**

| Demand Scenario | Head (m) | Pressure[1] (psi) |
|---|---|---|
| Maximum HGL | 161.3 | 84.9 |
| Peak Hour | 157.3 | 79.1 |
| Max Day Plus Fire (15,000) L/min | 155.3 | 76.4 |

[1]Elevation: **94.640 m**

**Notes:**

**1)** As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

**2) City of Ottawa requires two connections to this subdivision from two different mains in order to provide uninterrupted water service to the subdivision in the event of required maintenance to one of the mains.**

**3)** Click or tap here to enter text.

# Disclaimer

*The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.*

## Fernbank Crossing - Block 135
## Water Demand

| | Area (ha) | Units | Population | Average Day Demand (L/s) | Maximum Day Demand (L/s) | Peak Hour Demand (L/s) |
|---|---|---|---|---|---|---|
| **Towns** | N/A | 58 | 157 | 0.634 | 1.586 | 3.489 |
| **Total** | **0.00** | **58** | **157** | **0.634** | **1.586** | **3.489** |

**Water Demand Parameters**

| | | |
|---|---|---|
| Towns | 2.7 | ppl/unit |
| Residential Demand | 350 | L/c/day |
| Residential Max Day | 2.5 | x Avg Day |
| Residential Peak Hour | 2.2 | x Max Day |
| Residential Fire Flow | 200 - 250 | L/s |

# Fernbank Crossing (Block 135) - Watermain Demand

| Node | Towns | Total Population | Average Day Residential Demand (L/s) | Maximum Day Residential Demand (L/s) | Peak Hour Residential Demand (L/s) |
|---|---|---|---|---|---|
| HYD1 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| HYD2 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| HYD3 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| HYD4 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| CAP1 | 6 | 16 | 0.066 | 0.164 | 0.361 |
| CAP2 | 11 | 30 | 0.120 | 0.301 | 0.662 |
| CAP3 | 10 | 27 | 0.109 | 0.273 | 0.602 |
| CAP4 | 11 | 30 | 0.120 | 0.301 | 0.662 |
| CAP5 | 13 | 35 | 0.142 | 0.355 | 0.782 |
| CAP6 | 7 | 19 | 0.077 | 0.191 | 0.421 |
| T1 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| T2 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| T3 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| T4 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| T5 | 0 | 0 | 0.000 | 0.000 | 0.000 |
| **Total** | **58** | **157** | **0.634** | **1.586** | **3.489** |

**Water Demand Parameters**

| | | | | | |
|---|---|---|---|---|---|
| Singles | 3.4 | ppl/unit | Residential Max Day | 2.5 | x Avg Day |
| Towns | 2.7 | ppl/unit | Residential Peak Hour | 2.2 | x Max Day |
| Residential Demand | 350 | L/c/day | Residential Fire Flow | 200 - 250 | L/s |

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M:\2017\117089\DATA\Calculations\Sewer Calcs\Water\20190322 - Water Demand.xlsx

# Fernbank Crossing (Block 135) - Watermain Analysis

**Network Table - Nodes - (Peak Hour)**

| Node ID | Elevation m | Demand LPS | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc HYD1 | 104.82 | 0 | 155.68 | 50.86 | 498.94 | 72.36 |
| Junc HYD2 | 104.66 | 0 | 155.62 | 50.96 | 499.92 | 72.51 |
| Junc HYD3 | 104.77 | 0 | 155.6 | 50.83 | 498.64 | 72.32 |
| Junc HYD4 | 105.28 | 0 | 155.57 | 50.29 | 493.34 | 71.55 |
| Junc CAP1 | 105.15 | 0.36 | 155.68 | 50.53 | 495.70 | 71.90 |
| Junc CAP2 | 105.03 | 0.66 | 155.62 | 50.59 | 496.29 | 71.98 |
| Junc CAP3 | 104.92 | 0.6 | 155.61 | 50.69 | 497.27 | 72.12 |
| Junc CAP4 | 105.07 | 0.66 | 155.6 | 50.53 | 495.70 | 71.90 |
| Junc CAP5 | 105.24 | 0.78 | 155.6 | 50.36 | 494.03 | 71.65 |
| Junc CAP6 | 105.71 | 0.42 | 155.57 | 49.86 | 489.13 | 70.94 |
| Junc T1 | 104.65 | 0 | 155.62 | 50.97 | 500.02 | 72.52 |
| Junc T2 | 104.61 | 0 | 155.61 | 51 | 500.31 | 72.56 |
| Junc T3 | 104.75 | 0 | 155.6 | 50.85 | 498.84 | 72.35 |
| Junc T4 | 104.76 | 0 | 155.6 | 50.84 | 498.74 | 72.34 |
| Junc T5 | 105.32 | 0 | 155.57 | 50.25 | 492.95 | 71.50 |
| Junc T6 | 104.85 | 0 | 155.68 | 50.83 | 498.64 | 72.32 |
| Resvr RES1 | 157.3 | -84.52 | 157.3 | 0 | 0.00 | 0.00 |

**Network Table - Links - (Peak Hour)**

| Link ID | Length m | Diameter mm | Roughness | Flow LPS | Velocity m/s | Headloss m/km | Friction Factor |
|---|---|---|---|---|---|---|---|
| Pipe P1 | 17 | 204 | 110 | 0.36 | 0.01 | 0.00 | 0.054 |
| Pipe P2 | 30 | 155 | 100 | 0.36 | 0.02 | 0.01 | 0.064 |
| Pipe P3 | 56 | 204 | 110 | 5.57 | 0.17 | 0.27 | 0.038 |
| Pipe P4 | 42 | 155 | 100 | 0.66 | 0.04 | 0.02 | 0.059 |
| Pipe P5 | 8 | 204 | 110 | 4.91 | 0.15 | 0.22 | 0.038 |
| Pipe P6 | 33 | 204 | 110 | 4.91 | 0.15 | 0.22 | 0.038 |
| Pipe P7 | 41 | 155 | 100 | 0.60 | 0.03 | 0.02 | 0.060 |
| Pipe P8 | 35 | 204 | 110 | 4.31 | 0.13 | 0.17 | 0.039 |
| Pipe P9 | 3 | 204 | 110 | 4.31 | 0.13 | 0.17 | 0.039 |
| Pipe P10 | 44 | 155 | 100 | 0.66 | 0.04 | 0.02 | 0.059 |
| Pipe P11 | 25 | 204 | 110 | 3.65 | 0.11 | 0.12 | 0.040 |
| Pipe P12 | 49 | 204 | 110 | 2.87 | 0.09 | 0.08 | 0.041 |
| Pipe P13 | 61 | 155 | 100 | 0.78 | 0.04 | 0.03 | 0.058 |
| Pipe P14 | 25 | 204 | 110 | -0.42 | 0.01 | 0.00 | 0.054 |
| Pipe P15 | 38 | 155 | 100 | 0.42 | 0.02 | 0.01 | 0.064 |



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# Fernbank Crossing (Block 135) - Watermain Analysis

**Network Table - Nodes - (Max Pressure Check)**

| Node ID | Elevation m | Demand LPS | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc HYD1 | 104.82 | 0 | 161.21 | 56.39 | 553.19 | 80.23 |
| Junc HYD2 | 104.66 | 0 | 161.21 | 56.55 | 554.76 | 80.46 |
| Junc HYD3 | 104.77 | 0 | 161.21 | 56.44 | 553.68 | 80.30 |
| Junc HYD4 | 105.28 | 0 | 161.21 | 55.93 | 548.67 | 79.58 |
| Junc B4 | 106.5 | 0.01 | 161.2 | 54.7 | 536.61 | 77.83 |
| Junc B6 | 107 | 0.01 | 161.2 | 54.2 | 531.70 | 77.12 |
| Junc CAP1 | 105.15 | 0.07 | 161.21 | 56.06 | 549.95 | 79.76 |
| Junc CAP2 | 105.03 | 0.12 | 161.21 | 56.18 | 551.13 | 79.93 |
| Junc CAP3 | 104.92 | 0.11 | 161.21 | 56.29 | 552.20 | 80.09 |
| Junc CAP4 | 105.07 | 0.12 | 161.21 | 56.14 | 550.73 | 79.88 |
| Junc CAP5 | 105.24 | 0.13 | 161.21 | 55.97 | 560.15 | 81.24 |
| Junc CAP6 | 105.71 | 0.07 | 161.21 | 55.5 | 560.15 | 81.24 |
| Junc T1 | 104.65 | 0 | 161.21 | 56.56 | 554.85 | 80.47 |
| Junc T2 | 104.61 | 0 | 161.21 | 56.6 | 555.25 | 80.53 |
| Junc T3 | 104.75 | 0 | 161.21 | 56.46 | 553.87 | 80.33 |
| Junc T4 | 104.76 | 0 | 161.21 | 56.45 | 553.77 | 80.32 |
| Junc T5 | 105.32 | 0 | 161.21 | 55.89 | 559.07 | 81.09 |
| Junc T6 | 104.85 | 0 | 161.21 | 56.36 | 552.89 | 80.19 |
| Resvr RES1 | 161.3 | -17.45 | 161.3 | 0 | 0.00 | 0.00 |

**Network Table - Links - (Max Pressure Check)**

| Link ID | Length m | Diameter mm | Roughness | Flow LPS | Velocity m/s | Headloss m/km | Friction Factor |
|---|---|---|---|---|---|---|---|
| Pipe P1 | 17 | 204 | 110 | 0.07 | 0.00 | 0.00 | 0.000 |
| Pipe P2 | 30 | 155 | 100 | 0.07 | 0.00 | 0.00 | 0.000 |
| Pipe P3 | 56 | 204 | 110 | 1.13 | 0.03 | 0.01 | 0.048 |
| Pipe P4 | 42 | 155 | 100 | 0.12 | 0.01 | 0.00 | 0.067 |
| Pipe P5 | 8 | 204 | 110 | 1.01 | 0.03 | 0.01 | 0.049 |
| Pipe P6 | 33 | 204 | 110 | 1.01 | 0.03 | 0.01 | 0.047 |
| Pipe P7 | 41 | 155 | 100 | 0.11 | 0.01 | 0.00 | 0.083 |
| Pipe P8 | 35 | 204 | 110 | 0.90 | 0.03 | 0.01 | 0.050 |
| Pipe P9 | 3 | 204 | 110 | 0.90 | 0.03 | 0.01 | 0.033 |
| Pipe P10 | 44 | 155 | 100 | 0.12 | 0.01 | 0.00 | 0.095 |
| Pipe P11 | 25 | 204 | 110 | 0.78 | 0.02 | 0.01 | 0.052 |
| Pipe P12 | 49 | 204 | 110 | 0.63 | 0.02 | 0.00 | 0.054 |
| Pipe P13 | 61 | 155 | 100 | 0.15 | 0.01 | 0.00 | 0.071 |
| Pipe P14 | 25 | 204 | 110 | -0.09 | 0.00 | 0.00 | 0.000 |
| Pipe P15 | 38 | 155 | 100 | 0.09 | 0.00 | 0.00 | 0.137 |
| Pipe P16 | 16 | 19 | 100 | -0.01 | 0.04 | 0.33 | 0.083 |
| Pipe P17 | 16 | 19 | 100 | -0.01 | 0.04 | 0.33 | 0.083 |

# Fernbank Crossing (Block 135) - Watermain Analysis

**Network Table - Nodes - (Fire Flow Summary)**

| Fire Flow | | Minimum Pressure | | |
|---|---|---|---|---|
| LOCATION | Flow (L/s) | Pressure (kPa) | Pressure (PSI) | Node |
| B1 | 250 | 230.54 | 33.44 | CAP1 |
| B3 | 233 | 240.15 | 34.83 | CAP4 |
| B4 | 250 | 213.76 | 31.00 | CAP6 |
| B6 | 250 | 210.62 | 30.55 | CAP6 |

# Fernbank Crossing (Block 135) - Watermain Analysis

**Network Table - Nodes (Max Day + FF 'Bldg 1')**

| Node ID | Elevation m | Demand LPS | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc HYD1 | 104.82 | 95 | 128.65 | 23.83 | 233.77 | 33.91 |
| Junc HYD2 | 104.66 | 95 | 130.47 | 25.81 | 253.20 | 36.72 |
| Junc HYD3 | 104.77 | 0 | 131.08 | 26.31 | 258.10 | 37.43 |
| Junc HYD4 | 105.28 | 0 | 131.83 | 26.55 | 260.46 | 37.78 |
| Junc HYD36 | 104.46 | 60.14 | 131.9 | 27.44 | 269.19 | 39.04 |
| Junc CAP1 | 105.15 | 0.16 | 128.65 | 23.5 | 230.54 | 33.44 |
| Junc CAP2 | 105.03 | 0.3 | 130.63 | 25.6 | 251.14 | 36.42 |
| Junc CAP3 | 104.92 | 0.27 | 130.77 | 25.85 | 253.59 | 36.78 |
| Junc CAP4 | 105.07 | 0.3 | 131.11 | 26.04 | 255.45 | 37.05 |
| Junc CAP5 | 105.24 | 0.35 | 131.34 | 26.1 | 256.04 | 37.14 |
| Junc CAP6 | 105.71 | 0.19 | 131.83 | 26.12 | 256.24 | 37.16 |
| Junc T1 | 104.65 | 0 | 130.63 | 25.98 | 254.86 | 36.96 |
| Junc T2 | 104.61 | 0 | 130.77 | 26.16 | 256.63 | 37.22 |
| Junc T3 | 104.75 | 0 | 131.11 | 26.36 | 258.59 | 37.51 |
| Junc T4 | 104.76 | 0 | 131.34 | 26.58 | 260.75 | 37.82 |
| Junc T5 | 105.32 | 0 | 131.83 | 26.51 | 260.06 | 37.72 |
| Junc T6 | 104.85 | 0 | 129.52 | 24.67 | 242.01 | 35.10 |
| Resvr RES1 | 155.3 | -289.2 | 155.3 | 0 | 0.00 | 0.00 |

**Network Table - Links (Max Day + FF 'Bldg 1')**

| Link ID | Length m | Diameter mm | Roughness | Flow LPS | Velocity m/s | Headloss m/km | Friction Factor |
|---|---|---|---|---|---|---|---|
| Pipe P1 | 17 | 204 | 110 | -95.16 | 2.91 | 52.27 | 0.025 |
| Pipe P2 | 30 | 155 | 100 | 0.16 | 0.01 | 0.00 | 0.076 |
| Pipe P3 | 56 | 204 | 110 | 58.65 | 1.79 | 21.33 | 0.027 |
| Pipe P4 | 42 | 155 | 100 | 0.30 | 0.02 | 0.01 | 0.067 |
| Pipe P5 | 8 | 204 | 110 | 58.34 | 1.79 | 21.12 | 0.027 |
| Pipe P6 | 33 | 204 | 110 | -36.66 | 1.12 | 8.93 | 0.028 |
| Pipe P7 | 41 | 155 | 100 | 0.27 | 0.01 | 0.00 | 0.066 |
| Pipe P8 | 35 | 204 | 110 | 36.93 | 1.13 | 9.06 | 0.028 |
| Pipe P9 | 3 | 204 | 110 | 36.93 | 1.13 | 9.05 | 0.028 |
| Pipe P10 | 44 | 155 | 100 | 0.30 | 0.02 | 0.01 | 0.066 |
| Pipe P11 | 25 | 204 | 110 | 37.23 | 1.14 | 9.19 | 0.028 |
| Pipe P12 | 49 | 204 | 110 | 37.58 | 1.15 | 9.36 | 0.028 |
| Pipe P13 | 61 | 155 | 100 | 0.35 | 0.02 | 0.01 | 0.065 |
| Pipe P14 | 25 | 204 | 110 | 0.19 | 0.01 | 0.00 | 0.087 |
| Pipe P15 | 95 | 155 | 100 | 0.19 | 0.01 | 0.00 | 0.070 |

# Fernbank Crossing (Block 135) - Watermain Analysis

**Network Table - Nodes (Max Day + FF 'Bldg 3')**

| Node ID | Elevation m | Demand LPS | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc HYD1 | 104.82 | 0 | 135.13 | 30.31 | 297.34 | 43.13 |
| Junc HYD2 | 104.66 | 95 | 129.46 | 24.8 | 243.29 | 35.29 |
| Junc HYD3 | 104.77 | 95 | 129.41 | 24.64 | 241.72 | 35.06 |
| Junc HYD4 | 105.28 | 0 | 132.84 | 27.56 | 270.36 | 39.21 |
| Junc HYD38 | 104.54 | 43.11 | 132.35 | 27.81 | 272.82 | 39.57 |
| Junc CAP1 | 105.15 | 0.16 | 135.13 | 29.98 | 294.10 | 42.66 |
| Junc CAP2 | 105.03 | 0.3 | 129.95 | 24.92 | 244.47 | 35.46 |
| Junc CAP3 | 104.92 | 0.27 | 129.43 | 24.51 | 240.44 | 34.87 |
| Junc CAP4 | 105.07 | 0.3 | 129.55 | 24.48 | 240.15 | 34.83 |
| Junc CAP5 | 105.24 | 0.35 | 130.62 | 25.38 | 248.98 | 36.11 |
| Junc CAP6 | 105.71 | 0.19 | 132.84 | 27.13 | 266.15 | 38.60 |
| Junc T1 | 104.65 | 0 | 129.95 | 25.3 | 248.19 | 36.00 |
| Junc T2 | 104.61 | 0 | 129.43 | 24.82 | 243.48 | 35.31 |
| Junc T3 | 104.75 | 0 | 129.55 | 24.8 | 243.29 | 35.29 |
| Junc T4 | 104.76 | 0 | 130.63 | 25.87 | 253.78 | 36.81 |
| Junc T5 | 105.32 | 0 | 132.84 | 27.52 | 269.97 | 39.16 |
| Junc T6 | 104.85 | 0 | 135.13 | 30.28 | 297.05 | 43.08 |
| Resvr RES1 | 155.3 | -272.2 | 155.3 | 0 | 0.00 | 0.00 |

**Network Table - Links (Max Day + FF 'Bldg 3')**

| Link ID | Length m | Diameter mm | Roughness | Flow LPS | Velocity m/s | Headloss m/km | Friction Factor |
|---|---|---|---|---|---|---|---|
| Pipe P1 | 17 | 204 | 110 | -0.16 | 0.01 | 0.00 | 0.089 |
| Pipe P2 | 30 | 155 | 100 | 0.16 | 0.01 | 0.00 | 0.063 |
| Pipe P3 | 56 | 204 | 110 | 105.03 | 3.21 | 62.76 | 0.024 |
| Pipe P4 | 42 | 155 | 100 | 0.30 | 0.02 | 0.01 | 0.067 |
| Pipe P5 | 8 | 204 | 110 | 104.73 | 3.20 | 62.42 | 0.024 |
| Pipe P6 | 33 | 204 | 110 | 9.73 | 0.30 | 0.77 | 0.035 |
| Pipe P7 | 41 | 155 | 100 | 0.27 | 0.01 | 0.00 | 0.069 |
| Pipe P8 | 35 | 204 | 110 | -9.46 | 0.29 | 0.73 | 0.035 |
| Pipe P9 | 3 | 204 | 110 | 85.54 | 2.62 | 42.91 | 0.025 |
| Pipe P10 | 44 | 155 | 100 | 0.30 | 0.02 | 0.01 | 0.066 |
| Pipe P11 | 25 | 204 | 110 | 85.84 | 2.63 | 43.19 | 0.025 |
| Pipe P12 | 49 | 204 | 110 | 86.20 | 2.64 | 43.52 | 0.025 |
| Pipe P13 | 61 | 155 | 100 | 0.35 | 0.02 | 0.01 | 0.065 |
| Pipe P14 | 25 | 204 | 110 | 0.19 | 0.01 | 0.00 | 0.087 |
| Pipe P15 | 95 | 155 | 100 | 0.19 | 0.01 | 0.00 | 0.070 |

# Fernbank Crossing (Block 135) - Watermain Analysis

**Network Table - Nodes (Max Day + FF 'Bldg 4')**

| Node ID | Elevation m | Demand LPS | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc HYD1 | 104.82 | 0 | 132.74 | 27.92 | 273.90 | 39.73 |
| Junc HYD2 | 104.66 | 0 | 129.71 | 25.05 | 245.74 | 35.64 |
| Junc HYD3 | 104.77 | 95 | 128.44 | 23.67 | 232.20 | 33.68 |
| Junc HYD4 | 105.28 | 95 | 127.5 | 22.22 | 217.98 | 31.62 |
| Junc HYD38 | 104.54 | 60.11 | 128.5 | 23.96 | 235.05 | 34.09 |
| Junc CAP1 | 105.15 | 0.16 | 132.74 | 27.59 | 270.66 | 39.26 |
| Junc CAP2 | 105.03 | 0.3 | 129.86 | 24.83 | 243.58 | 35.33 |
| Junc CAP3 | 104.92 | 0.27 | 129.09 | 24.17 | 237.11 | 34.39 |
| Junc CAP4 | 105.07 | 0.3 | 128.48 | 23.41 | 229.65 | 33.31 |
| Junc CAP5 | 105.24 | 0.35 | 128.75 | 23.51 | 230.63 | 33.45 |
| Junc CAP6 | 105.71 | 0.19 | 127.5 | 21.79 | 213.76 | 31.00 |
| Junc T1 | 104.65 | 0 | 129.86 | 25.21 | 247.31 | 35.87 |
| Junc T2 | 104.61 | 0 | 129.09 | 24.48 | 240.15 | 34.83 |
| Junc T3 | 104.75 | 0 | 128.48 | 23.73 | 232.79 | 33.76 |
| Junc T4 | 104.76 | 0 | 128.75 | 23.99 | 235.34 | 34.13 |
| Junc T5 | 105.32 | 0 | 128.81 | 23.49 | 230.44 | 33.42 |
| Junc T6 | 104.85 | 0 | 132.74 | 27.89 | 273.60 | 39.68 |
| Resvr RES1 | 155.3 | -289.2 | 155.3 | 0 | 0.00 | 0.00 |

**Network Table - Links (Max Day + FF 'Bldg 4')**

| Link ID | Length m | Diameter mm | Roughness | Flow LPS | Velocity m/s | Headloss m/km | Friction Factor |
|---|---|---|---|---|---|---|---|
| Pipe P1 | 17 | 204 | 110 | -0.16 | 0.01 | 0.00 | 0.089 |
| Pipe P2 | 30 | 155 | 100 | 0.16 | 0.01 | 0.00 | 0.063 |
| Pipe P3 | 56 | 204 | 110 | 54.99 | 1.68 | 18.93 | 0.027 |
| Pipe P4 | 42 | 155 | 100 | 0.30 | 0.02 | 0.01 | 0.067 |
| Pipe P5 | 8 | 204 | 110 | 54.69 | 1.67 | 18.74 | 0.027 |
| Pipe P6 | 33 | 204 | 110 | 54.69 | 1.67 | 18.74 | 0.027 |
| Pipe P7 | 41 | 155 | 100 | 0.27 | 0.01 | 0.00 | 0.066 |
| Pipe P8 | 35 | 204 | 110 | -54.42 | 1.66 | 18.57 | 0.027 |
| Pipe P9 | 3 | 204 | 110 | 40.58 | 1.24 | 10.78 | 0.028 |
| Pipe P10 | 44 | 155 | 100 | 0.30 | 0.02 | 0.01 | 0.066 |
| Pipe P11 | 25 | 204 | 110 | 40.88 | 1.25 | 10.93 | 0.028 |
| Pipe P12 | 49 | 204 | 110 | 41.24 | 1.26 | 11.11 | 0.028 |
| Pipe P13 | 61 | 155 | 100 | 0.35 | 0.02 | 0.01 | 0.065 |
| Pipe P14 | 25 | 204 | 110 | 95.19 | 2.91 | 52.30 | 0.025 |
| Pipe P15 | 95 | 155 | 100 | 0.19 | 0.01 | 0.00 | 0.073 |

# Fernbank Crossing (Block 135) - Watermain Analysis

**Network Table - Nodes (Max Day + FF 'Bldg 6')**

| Node ID | Elevation m | Demand LPS | Head m | Pressure m | Pressure kPa | Pressure psi |
|---|---|---|---|---|---|---|
| Junc HYD1 | 104.82 | 0 | 132.76 | 27.94 | 274.09 | 39.75 |
| Junc HYD2 | 104.66 | 0 | 129.77 | 25.11 | 246.33 | 35.73 |
| Junc HYD3 | 104.77 | 95 | 128.5 | 23.73 | 232.79 | 33.76 |
| Junc HYD4 | 105.28 | 95 | 127.18 | 21.9 | 214.84 | 31.16 |
| Junc HYD43 | 104.97 | 60 | 128.83 | 23.86 | 234.07 | 33.95 |
| Junc CAP1 | 105.15 | 0.16 | 132.76 | 27.61 | 270.85 | 39.28 |
| Junc CAP2 | 105.03 | 0.3 | 129.91 | 24.88 | 244.07 | 35.40 |
| Junc CAP3 | 104.92 | 0.27 | 129.15 | 24.23 | 237.70 | 34.47 |
| Junc CAP4 | 105.07 | 0.3 | 128.54 | 23.47 | 230.24 | 33.39 |
| Junc CAP5 | 105.24 | 0.35 | 128.82 | 23.58 | 231.32 | 33.55 |
| Junc CAP6 | 105.71 | 0.19 | 127.18 | 21.47 | 210.62 | 30.55 |
| Junc T1 | 104.65 | 0 | 129.91 | 25.26 | 247.80 | 35.94 |
| Junc T2 | 104.61 | 0 | 129.15 | 24.54 | 240.74 | 34.92 |
| Junc T3 | 104.75 | 0 | 128.54 | 23.79 | 233.38 | 33.85 |
| Junc T4 | 104.76 | 0 | 128.82 | 24.06 | 236.03 | 34.23 |
| Junc T5 | 105.32 | 0 | 128.49 | 23.17 | 227.30 | 32.97 |
| Junc T6 | 104.85 | 0 | 132.76 | 27.91 | 273.80 | 39.71 |
| Resvr RES1 | 155.3 | -289.2 | 155.3 | 0 | 0.00 | 0.00 |

**Network Table - Links (Max Day + FF 'Bldg 6')**

| Link ID | Length m | Diameter mm | Roughness | Flow LPS | Velocity m/s | Headloss m/km | Friction Factor |
|---|---|---|---|---|---|---|---|
| Pipe P1 | 17 | 204 | 110 | -0.16 | 0.01 | 0.00 | 0.089 |
| Pipe P2 | 30 | 155 | 100 | 0.16 | 0.01 | 0.00 | 0.076 |
| Pipe P3 | 56 | 204 | 110 | 54.74 | 1.67 | 18.77 | 0.027 |
| Pipe P4 | 42 | 155 | 100 | 0.30 | 0.02 | 0.01 | 0.067 |
| Pipe P5 | 8 | 204 | 110 | 54.44 | 1.67 | 18.58 | 0.027 |
| Pipe P6 | 33 | 204 | 110 | 54.44 | 1.67 | 18.58 | 0.027 |
| Pipe P7 | 41 | 155 | 100 | 0.27 | 0.01 | 0.00 | 0.066 |
| Pipe P8 | 35 | 204 | 110 | -54.16 | 1.66 | 18.41 | 0.027 |
| Pipe P9 | 3 | 204 | 110 | 40.84 | 1.25 | 10.91 | 0.028 |
| Pipe P10 | 44 | 155 | 100 | 0.30 | 0.02 | 0.01 | 0.068 |
| Pipe P11 | 25 | 204 | 110 | 41.14 | 1.26 | 11.06 | 0.028 |
| Pipe P12 | 49 | 204 | 110 | 41.49 | 1.27 | 11.24 | 0.028 |
| Pipe P13 | 61 | 155 | 100 | 0.35 | 0.02 | 0.01 | 0.065 |
| Pipe P14 | 25 | 204 | 110 | 95.19 | 2.91 | 52.30 | 0.025 |
| Pipe P15 | 95 | 155 | 100 | 0.19 | 0.01 | 0.00 | 0.070 |



Engineers, Planners & Landscape Architects

# FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

| | |
|---|---|
| **Novatech Project #:** | 117089 |
| **Project Name:** | Block 135 |
| **Date:** | 3/22/2019 |
| **Input By:** | Lucas Wilson |
| **Reviewed By:** | Project Manager |

Legend: Input by User; No Information or Input Required

**Building Description:** Back-2-Back Towns (Bldg 1)
**Wood frame**

| Step | | | Input | | Value Used | Total Fire Flow (L/min) |
|---|---|---|---|---|---|---|
| **Base Fire Flow** | | | | | | |
| 1 | **Construction Material** | | | **Multiplier** | | |
| | **Coefficient related to type of construction C** | Wood frame | Yes | 1.5 | 1.5 | |
| | | Ordinary construction | | 1 | | |
| | | Non-combustible construction | | 0.8 | | |
| | | Modified Fire resistive construction (2 hrs) | | 0.6 | | |
| | | Fire resistive construction (> 3 hrs) | | 0.6 | | |
| 2 | **Floor Area** | | | | | |
| | **A** | Building Footprint ($m^2$) | 600 | | | |
| | | Number of Floors/Storeys | 3 | | | |
| | | Area of structure considered ($m^2$) | | | **1,800** | |
| | **F** | **Base fire flow without reductions** | | | | **14,000** |
| | | $F = 220\ C\ (A)^{0.5}$ | | | | |
| **Reductions or Surcharges** | | | | | | |
| 3 | **Occupancy hazard reduction or surcharge** | | | **Reduction/Surcharge** | | |
| | (1) | Non-combustible | | -25% | -15% | **11,900** |
| | | Limited combustible | Yes | -15% | | |
| | | Combustible | | 0% | | |
| | | Free burning | | 15% | | |
| | | Rapid burning | | 25% | | |
| 4 | **Sprinkler Reduction** | | | **Reduction** | | |
| | (2) | Adequately Designed System (NFPA 13) | | -30% | | **0** |
| | | Standard Water Supply | | -10% | | |
| | | Fully Supervised System | | -10% | | |
| | | | | **Cumulative Total** | **0%** | |
| 5 | **Exposure Surcharge (cumulative %)** | | | | **Surcharge** | |
| | (3) | North Side | > 45.1m | | 0% | **2,975** |
| | | East Side | 10.1 - 20 m | | 15% | |
| | | South Side | 20.1 - 30 m | | 10% | |
| | | West Side | > 45.1m | | 0% | |
| | | | | **Cumulative Total** | **25%** | |
| **Results** | | | | | | |
| 6 | (1) + (2) + (3) | **Total Required Fire Flow, rounded to nearest 1000L/min** | | | **L/min** | **15,000** |
| | | (2,000 L/min < Fire Flow < 45,000 L/min) | | or | L/s | **250** |
| | | | | or | USGPM | 3,963 |
| 7 | **Storage Volume** | Required Duration of Fire Flow (hours) | | | Hours | 3 |
| | | Required Volume of Fire Flow ($m^3$) | | | $m^3$ | 2700 |

# FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

**Novatech Project #:** 117089
**Project Name:** Block 135
**Date:** 3/22/2019
**Input By:** Lucas Wilson
**Reviewed By:** Project Manager

Legend: Input by User | No Information or Input Required

**Building Description:** Back-2-Back Towns (Bldg 3)
**Wood frame**

| Step | | | Input | | Value Used | Total Fire Flow (L/min) |
|---|---|---|---|---|---|---|
| **Base Fire Flow** | | | | | | |
| 1 | **Construction Material** | | | **Multiplier** | | |
| | **Coefficient related to type of construction C** | Wood frame | Yes | 1.5 | 1.5 | |
| | | Ordinary construction | | 1 | | |
| | | Non-combustible construction | | 0.8 | | |
| | | Modified Fire resistive construction (2 hrs) | | 0.6 | | |
| | | Fire resistive construction (> 3 hrs) | | 0.6 | | |
| 2 | **Floor Area** | | | | | |
| | A | Building Footprint ($m^2$) | 545 | | | |
| | | Number of Floors/Storeys | 3 | | | |
| | | Area of structure considered ($m^2$) | | | **1,635** | |
| | F | **Base fire flow without reductions** | | | | **13,000** |
| | | $F = 220\ C\ (A)^{0.5}$ | | | | |
| **Reductions or Surcharges** | | | | | | |
| 3 | **Occupancy hazard reduction or surcharge** | | | **Reduction/Surcharge** | | |
| | (1) | Non-combustible | | -25% | -15% | **11,050** |
| | | Limited combustible | Yes | -15% | | |
| | | Combustible | | 0% | | |
| | | Free burning | | 15% | | |
| | | Rapid burning | | 25% | | |
| 4 | **Sprinkler Reduction** | | | **Reduction** | | |
| | (2) | Adequately Designed System (NFPA 13) | | -30% | | **0** |
| | | Standard Water Supply | | -10% | | |
| | | Fully Supervised System | | -10% | | |
| | | | | **Cumulative Total** | **0%** | |
| 5 | **Exposure Surcharge (cumulative %)** | | | | **Surcharge** | |
| | (3) | North Side | 20.1 - 30 m | | 10% | **3,315** |
| | | East Side | 20.1 - 30 m | | 10% | |
| | | South Side | 20.1 - 30 m | | 10% | |
| | | West Side | > 45.1m | | 0% | |
| | | | | **Cumulative Total** | **30%** | |
| **Results** | | | | | | |
| 6 | (1) + (2) + (3) | **Total Required Fire Flow, rounded to nearest 1000L/min** | | | **L/min** | **14,000** |
| | | (2,000 L/min < Fire Flow < 45,000 L/min) | | or | L/s | **233** |
| | | | | or | USGPM | 3,699 |
| 7 | **Storage Volume** | Required Duration of Fire Flow (hours) | | | Hours | 3 |
| | | Required Volume of Fire Flow ($m^3$) | | | $m^3$ | 2520 |

# FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

Engineers, Planners & Landscape Architects

**Novatech Project #:** 117089
**Project Name:** Block 135
**Date:** 3/22/2019
**Input By:** Lucas Wilson
**Reviewed By:** Project Manager

Legend: Input by User; No Information or Input Required

**Building Description:** Back-2-Back Towns (Bldg 5 + 6)
**Wood frame**

| Step | | | Input | | Value Used | Total Fire Flow (L/min) |
|---|---|---|---|---|---|---|
| **Base Fire Flow** | | | | | | |
| 1 | **Construction Material** | | | **Multiplier** | | |
| | **Coefficient related to type of construction C** | Wood frame | Yes | 1.5 | 1.5 | |
| | | Ordinary construction | | 1 | | |
| | | Non-combustible construction | | 0.8 | | |
| | | Modified Fire resistive construction (2 hrs) | | 0.6 | | |
| | | Fire resistive construction (> 3 hrs) | | 0.6 | | |
| 2 | **Floor Area** | | | | | |
| | **A** | Building Footprint ($m^2$) | 600 | | | |
| | | Number of Floors/Storeys | 3 | | | |
| | | Area of structure considered ($m^2$) | | | **1,800** | |
| | **F** | **Base fire flow without reductions** | | | | **14,000** |
| | | $F = 220\ C\ (A)^{0.5}$ | | | | |
| **Reductions or Surcharges** | | | | | | |
| 3 | **Occupancy hazard reduction or surcharge** | | | **Reduction/Surcharge** | | |
| | (1) | Non-combustible | | -25% | -15% | **11,900** |
| | | Limited combustible | Yes | -15% | | |
| | | Combustible | | 0% | | |
| | | Free burning | | 15% | | |
| | | Rapid burning | | 25% | | |
| 4 | **Sprinkler Reduction** | | | **Reduction** | | |
| | (2) | Adequately Designed System (NFPA 13) | | -30% | | **0** |
| | | Standard Water Supply | | -10% | | |
| | | Fully Supervised System | | -10% | | |
| | | | | **Cumulative Total** | **0%** | |
| 5 | **Exposure Surcharge (cumulative %)** | | | | **Surcharge** | |
| | (3) | North Side | 20.1 - 30 m | | 10% | **3,570** |
| | | East Side | 20.1 - 30 m | | 10% | |
| | | South Side | 20.1 - 30 m | | 10% | |
| | | West Side | > 45.1m | | 0% | |
| | | | | **Cumulative Total** | **30%** | |
| **Results** | | | | | | |
| 6 | (1) + (2) + (3) | **Total Required Fire Flow, rounded to nearest 1000L/min** | | | **L/min** | **15,000** |
| | | (2,000 L/min < Fire Flow < 45,000 L/min) | | or | L/s | **250** |
| | | | | or | USGPM | 3,963 |
| 7 | **Storage Volume** | Required Duration of Fire Flow (hours) | | | Hours | 3 |
| | | Required Volume of Fire Flow ($m^3$) | | | $m^3$ | 2700 |

# FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

Novatech — Engineers, Planners & Landscape Architects

| | |
|---|---|
| **Novatech Project #:** | 117089 |
| **Project Name:** | Block 135 |
| **Date:** | 3/22/2019 |
| **Input By:** | Lucas Wilson |
| **Reviewed By:** | Project Manager |

Legend: Input by User; No Information or Input Required

**Building Description:** Back-2-Back Towns (Bldg 5)
**Wood frame**

| Step | | | Input | | Value Used | Total Fire Flow (L/min) |
|---|---|---|---|---|---|---|
| | **Base Fire Flow** | | | | | |
| 1 | **Construction Material** | | | **Multiplier** | | |
| | **Coefficient related to type of construction C** | Wood frame | Yes | 1.5 | 1.5 | |
| | | Ordinary construction | | 1 | | |
| | | Non-combustible construction | | 0.8 | | |
| | | Modified Fire resistive construction (2 hrs) | | 0.6 | | |
| | | Fire resistive construction (> 3 hrs) | | 0.6 | | |
| 2 | **Floor Area** | | | | | |
| | **A** | Building Footprint ($m^2$) | 325 | | | |
| | | Number of Floors/Storeys | 3 | | | |
| | | Area of structure considered ($m^2$) | | | **975** | |
| | **F** | **Base fire flow without reductions** | | | | **10,000** |
| | | $F = 220\, C\, (A)^{0.5}$ | | | | |
| | **Reductions or Surcharges** | | | | | |
| 3 | **Occupancy hazard reduction or surcharge** | | | **Reduction/Surcharge** | | |
| | **(1)** | Non-combustible | | -25% | -15% | **8,500** |
| | | Limited combustible | Yes | -15% | | |
| | | Combustible | | 0% | | |
| | | Free burning | | 15% | | |
| | | Rapid burning | | 25% | | |
| 4 | **Sprinkler Reduction** | | | **Reduction** | | |
| | **(2)** | Adequately Designed System (NFPA 13) | | -30% | | **0** |
| | | Standard Water Supply | | -10% | | |
| | | Fully Supervised System | | -10% | | |
| | | | | **Cumulative Total** | **0%** | |
| 5 | **Exposure Surcharge (cumulative %)** | | | | **Surcharge** | |
| | **(3)** | North Side | 10.1 - 20 m | | 15% | **3,825** |
| | | East Side | 0 - 3 m | | 25% | |
| | | South Side | 30.1- 45 m | | 5% | |
| | | West Side | > 45.1m | | 0% | |
| | | | | **Cumulative Total** | **45%** | |
| | **Results** | | | | | |
| 6 | **(1) + (2) + (3)** | **Total Required Fire Flow, rounded to nearest 1000L/min** | | | **L/min** | **12,000** |
| | | (2,000 L/min < Fire Flow < 45,000 L/min) | | or | L/s | **200** |
| | | | | or | USGPM | 3,170 |
| 7 | **Storage Volume** | Required Duration of Fire Flow (hours) | | | Hours | 2.5 |
| | | Required Volume of Fire Flow ($m^3$) | | | $m^3$ | 1800 |

# FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

Novatech — Engineers, Planners & Landscape Architects

| | |
|---|---|
| **Novatech Project #:** | 117089 |
| **Project Name:** | Block 135 |
| **Date:** | 3/22/2019 |
| **Input By:** | Lucas Wilson |
| **Reviewed By:** | Project Manager |

Legend: Input by User; No Information or Input Required

**Building Description:** Back-2-Back Towns (Bldg 6)
**Wood frame**

| Step | | | Input | | Value Used | Total Fire Flow (L/min) |
|---|---|---|---|---|---|---|
| | **Base Fire Flow** | | | | | |
| 1 | **Construction Material** | | | **Multiplier** | | |
| | **Coefficient related to type of construction C** | Wood frame | Yes | 1.5 | 1.5 | |
| | | Ordinary construction | | 1 | | |
| | | Non-combustible construction | | 0.8 | | |
| | | Modified Fire resistive construction (2 hrs) | | 0.6 | | |
| | | Fire resistive construction (> 3 hrs) | | 0.6 | | |
| 2 | **Floor Area** | | | | | |
| | **A** | Building Footprint ($m^2$) | 425 | | | |
| | | Number of Floors/Storeys | 3 | | | |
| | | Area of structure considered ($m^2$) | | | **1,275** | |
| | **F** | **Base fire flow without reductions** $F = 220\ C\ (A)^{0.5}$ | | | | **12,000** |
| | **Reductions or Surcharges** | | | | | |
| 3 | **Occupancy hazard reduction or surcharge** | | | **Reduction/Surcharge** | | |
| | **(1)** | Non-combustible | | -25% | -15% | **10,200** |
| | | Limited combustible | Yes | -15% | | |
| | | Combustible | | 0% | | |
| | | Free burning | | 15% | | |
| | | Rapid burning | | 25% | | |
| 4 | **Sprinkler Reduction** | | | **Reduction** | | |
| | **(2)** | Adequately Designed System (NFPA 13) | | -30% | | **0** |
| | | Standard Water Supply | | -10% | | |
| | | Fully Supervised System | | -10% | | |
| | | | | **Cumulative Total** | **0%** | |
| 5 | **Exposure Surcharge (cumulative %)** | | | | **Surcharge** | |
| | **(3)** | North Side | 20.1 - 30 m | | 10% | **5,100** |
| | | East Side | 10.1 - 20 m | | 15% | |
| | | South Side | 30.1- 45 m | | 5% | |
| | | West Side | 3.1 - 10 m | | 20% | |
| | | | | **Cumulative Total** | **50%** | |
| | **Results** | | | | | |
| 6 | **(1) + (2) + (3)** | **Total Required Fire Flow, rounded to nearest 1000L/min** | | | **L/min** | **15,000** |
| | | (2,000 L/min < Fire Flow < 45,000 L/min) | | or | L/s | **250** |
| | | | | or | USGPM | 3,963 |
| 7 | **Storage Volume** | Required Duration of Fire Flow (hours) | | | Hours | 3 |
| | | Required Volume of Fire Flow ($m^3$) | | | $m^3$ | 2700 |


M:\2017\117089\CAD\Design\Figures\Servicing\Water - Overall.dwg, FIG1, Mar 18, 2019 - 1:52pm, lwilson

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CITY of OTTAWA
FERNBANK CROSSING - BLOCK 135

WATERMAIN PLAN - OVERVIEW

| | |
|---|---|
| PROJECT No. | 117089 |
| REV | REV # 1 |
| DRAWING No. | FIGURE 6 |

# APPENDIX B

SWM Calculations

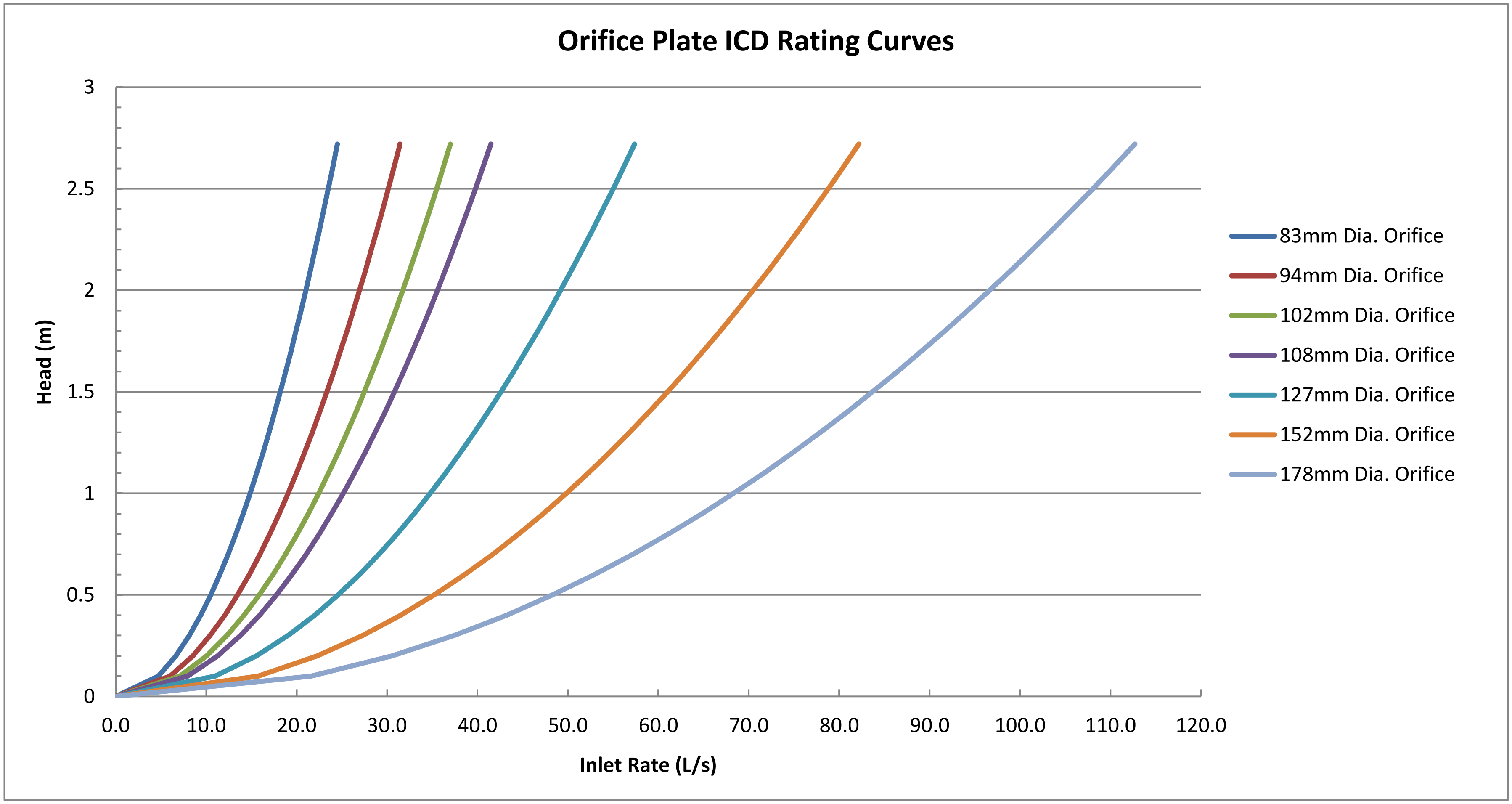
# Fernbank Crossing - Block 135
## Inlet Control Device Parameters

| Structure | ICD Size & Inlet Rate | | | | Approach Flow** (L/s) |
|---|---|---|---|---|---|
| | Diameter 1 (mm) | Max Head (m) | Calculated 5-yr Capture Rate (L/s) | 5-yr Capture Rate** (L/s) | |
| CB50 | 108 | 1.35 | 29.19 | 28.80 | 30.05 |
| CB51 | 152 | 1.32 | 57.34 | 50.56 | 51.18 |
| CB52 | 83 | 1.36 | 17.32 | 13.44 | 14.64 |
| CB53 | 152 | 1.32 | 57.34 | 44.88 | 45.32 |
| CB54 | 83 | 1.36 | 17.32 | 8.44 | 9.01 |
| CB55 | 178 | 1.31 | 78.25 | 78.47 | 79.76 |
| CB56 | 152 | 1.32 | 57.34 | 22.45 | 41.11 |
| CB57 | 127 | 1.34 | 40.22 | 32.38 | 33.14 |

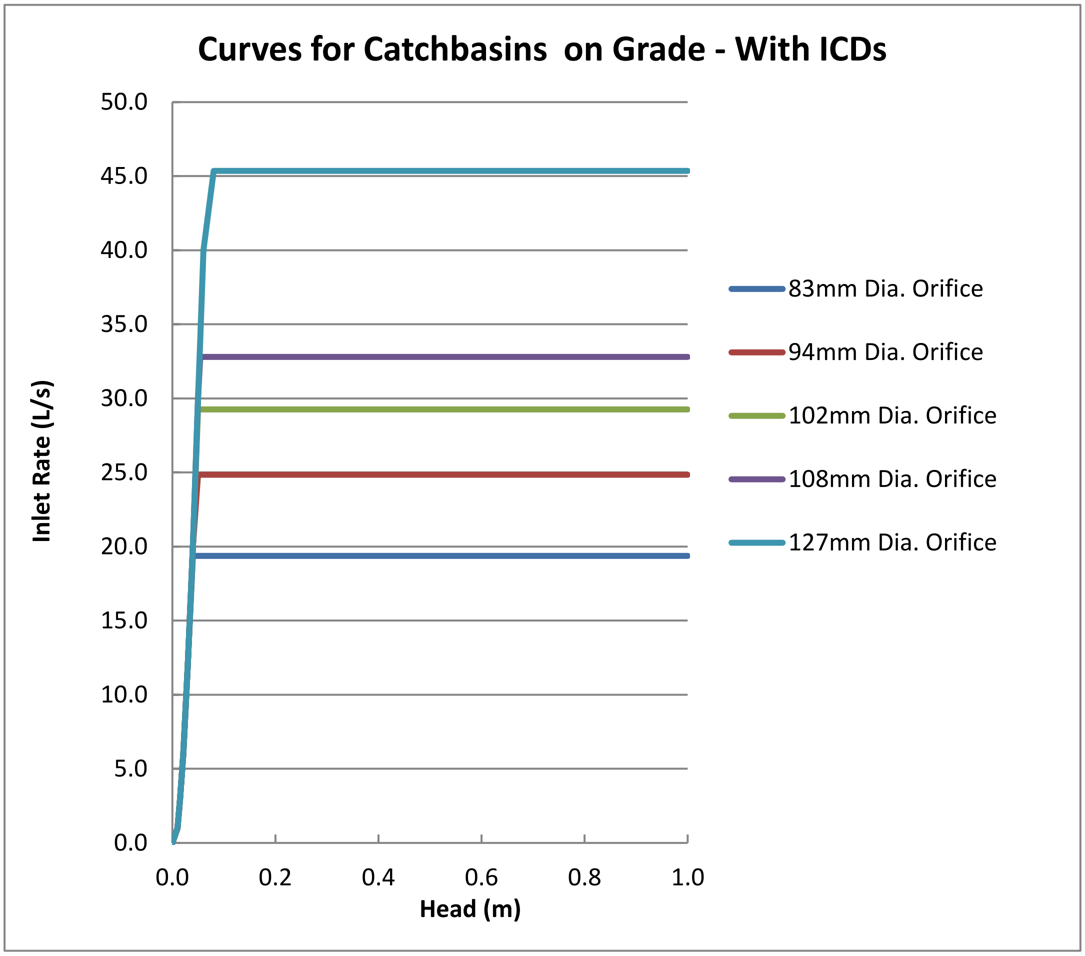
**Diameter 2 only specified where catchbasins are not interconnected*

***From PCSWMM Model, 5-year 4-hour Chicago storm distribution*

## Fernbank Crossing - Block 135
### ICD Rating Curves



## Fernbank Crossing - Block 135
### Catchbasin (On-Grade) with ICD Curves




**Curb Inlet Catchbasins on Continuous Grade**

Depth vs. Captured Flow Curve

A standard depth vs. captured flow curve for catch basins on a continuous grade was provided to Novatech by City staff for use in a dual-drainage model of an existing residential neighbourhood. This standard curve was derived using the inlet curves in Appendix 7A of the Ottawa Sewer Design Guidelines.

Novatech reviewed the methodology used to create this standard curve (described below) and determined that it was suitable for general use in other dual-drainage models.

- MTO Design Chart 4.04 provides the relationship between the gutter flow rate ($Q_t$) and flow spread (T) for Barrier Curb.
- MTO Design Chart 4.12 provides the relationship between flow spread (T) and flow depth (D).
- The relationship between the gutter flow rate ($Q_t$) and flow depth (D) was determined for different road slopes using the above charts and Manning's equation (refer to pages 58-60 of the MTO Drainage Management Manual – Part 2);
- The relationship between approach flow ($Q_t$) and captured flow ($Q_c$) was determined for different road slopes using the design chart for Barrier Curb with Gutter (Appendix 7-A.2).
- Using the above information, a family of curves was developed to characterize the relationship between flow depth and captured flow for curb inlet catchbasins on different road slopes. The results of this exercise can be summarized as follows:
    - For a given flow depth, the gutter flow rate ($Q_t$) increases as the road slope increases.
    - The capture efficiency ($Q_c$) of curb inlet catchbasins decrease as the road slope increases.
    - The net result is that the relationship between flow depth and capture rate is largely independent of road slope: While approach flow vs. captured flow ($Q_t$ vs. $Q_c$) varies significantly with road grade, flow depth vs. captured flow (D vs. $Q_c$) does not.

Since there was very little difference in the flow depth vs. captured flow curves for different road slopes, this family of curves was averaged to create a single standard curve for use in dual-drainage models.

Inlet Control Devices

The standard depth vs. capture flow curve was modified to account for the installation of ICDs in curb inlet catchbasins on continuous grade. Separate inlet curves were created for each standard ICD orifice size by capping the inlet rate on the depth vs. capture flow curve at the maximum flow rate through the ICD at a head of 1.2m (depth from centerline of CB lead to top of CICB frame).

## Fernbank Crossing - Block 135
### HGL Elevations

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| Manhole ID | MH Invert Elevation (m) | T/G Elevation (m) | HGL Elevation - 100yr4hr (m) | HGL Elevation - 100yr4hr+20% (m) | Design USF (m) | Clearance (100yr) (m) | Clearance (100yr+20%) (m) |
|---|---|---|---|---|---|---|---|
| **HGL - Block 135** | | | | | | | |
| MH01 | 101.42 | 104.53 | 102.10 | 102.11 | 103.72 | 1.62 | 1.61 |
| MH03 | 101.81 | 104.96 | 102.25 | 102.25 | 103.57 | 1.32 | 1.32 |
| MH05 | 102.19 | 105.11 | 102.13 | 102.14 | 103.57 | 1.44 | 1.43 |
| MH07 | 101.60 | 104.55 | 102.30 | 102.30 | 103.57 | 1.27 | 1.27 |
| MH09 | 101.99 | 104.88 | 102.67 | 102.70 | 103.77 | 1.10 | 1.07 |
| MH11 | 101.79 | 104.58 | 102.77 | 102.81 | 104.13 | 1.36 | 1.32 |
| MH13 | 102.13 | 104.78 | 102.78 | 102.82 | 104.13 | 1.35 | 1.31 |
| MH15 | 101.77 | 104.70 | 102.88 | 102.91 | 104.13 | 1.25 | 1.22 |
| **HGL - Phase 3** | | | | | | | |
| 343 | 98.71 | 103.09 | 100.62 | 100.76 | 101.36 | 0.74 | 0.60 |
| 345 | 101.15 | 104.26 | 101.47 | 101.47 | 102.24 | 0.77 | 0.77 |
| 347 | 98.78 | 103.46 | 101.08 | 101.24 | 101.68 | 0.60 | 0.44 |
| 349 | 100.46 | 104.47 | 101.38 | 101.55 | 102.47 | 1.09 | 0.92 |
| 351 | 99.23 | 104.05 | 101.33 | 101.48 | 102.05 | 0.72 | 0.57 |
| 353 | 101.12 | 104.86 | 101.47 | 101.63 | 102.71 | 1.24 | 1.08 |
| 357 | 101.60 | 104.65 | 102.28 | 102.31 | 102.85 | 0.57 | 0.54 |
| 359 | 102.24 | 105.24 | 102.80 | 102.57 | 103.25 | 0.45 | 0.68 |
| 373 | 101.88 | 104.40 | 101.92 | 101.99 | 102.75 | 0.83 | 0.76 |
| 375 | 101.22 | 104.76 | 102.17 | 102.22 | 103.04 | 0.87 | 0.82 |
| 377 | 101.37 | 104.98 | 102.30 | 102.34 | 103.17 | 0.87 | 0.83 |
| 379 | 101.66 | 104.99 | 102.49 | 102.53 | 103.07 | 0.58 | 0.54 |
| 381 | 101.80 | 105.14 | 102.60 | 102.63 | 103.18 | 0.58 | 0.55 |
| 383 | 102.06 | 105.23 | 102.85 | 102.87 | 103.61 | 0.76 | 0.74 |
| 385 | 102.08 | 105.26 | 102.92 | 102.94 | 103.61 | 0.69 | 0.67 |
| 387 | 102.19 | 105.17 | 103.02 | 103.05 | 103.44 | 0.42 | 0.39 |
| 389 | 102.87 | 105.46 | 103.16 | 103.17 | 103.64 | 0.48 | 0.47 |
| 391 | 100.71 | 103.19 | 102.44 | 102.46 | - | - | - |
| 393 | 101.13 | 103.91 | 101.47 | 101.47 | 101.88 | 0.41 | 0.41 |
| 395 | 98.90 | 103.18 | 100.76 | 100.90 | 101.44 | 0.68 | 0.54 |
| 397 | 100.09 | 103.94 | 101.39 | 101.55 | 102.05 | 0.66 | 0.50 |
| 399 | 100.71 | 104.22 | 101.46 | 101.63 | 102.34 | 0.88 | 0.71 |
| 417 | 99.89 | 103.87 | 101.40 | 101.56 | 102.12 | 0.72 | 0.56 |
| 419 | 102.04 | 104.86 | 102.77 | 102.79 | 103.30 | 0.53 | 0.51 |

## Fernbank Crossing - Block 135
### HGL Elevations

| Manhole ID | MH Invert Elevation (m) | T/G Elevation (m) | HGL Elevation - 100yr4hr (m) | HGL Elevation - 100yr4hr+20% (m) | Design USF (m) | Clearance (100yr) (m) | Clearance (100yr+20%) (m) |
|---|---|---|---|---|---|---|---|
| **HGL - Cope Drive** | | | | | | | |
| 301 | 96.94 | 101.51 | 98.90 | 98.95 | 99.86 | 0.96 | 0.91 |
| 335 | 96.66 | 101.86 | 99.27 | 99.34 | 100.05 | 0.78 | 0.71 |
| 337 | 96.79 | 102.14 | 99.54 | 99.62 | 100.30 | 0.76 | 0.68 |
| 339 | 96.90 | 102.43 | 99.77 | 99.87 | 100.55 | 0.78 | 0.68 |
| 341 | 97.32 | 102.85 | 100.20 | 100.32 | 101.23 | 1.03 | 0.91 |
| 361 | 99.03 | 103.65 | 101.01 | 101.18 | 101.87 | 0.86 | 0.69 |
| 363 | 100.40 | 104.46 | 101.62 | 101.74 | 102.41 | 0.79 | 0.67 |
| 365 | 101.02 | 104.46 | 101.95 | 101.97 | 102.50 | 0.55 | 0.53 |
| 367 | 101.34 | 104.59 | 102.08 | 102.09 | 102.67 | 0.59 | 0.58 |
| 369 | 101.59 | 104.55 | 102.18 | 102.19 | 102.77 | 0.59 | 0.58 |
| 371 | 102.04 | 104.86 | 102.54 | 102.54 | 102.95 | 0.41 | 0.41 |
| 391 | 100.71 | 104.40 | 102.44 | 102.46 | - | - | - |
| M97 | 96.25 | 101.00 | 98.47 | 98.49 | 99.86 | 1.39 | 1.37 |
| M98 | 95.80 | 100.75 | 98.16 | 98.17 | 99.86 | 1.70 | 1.69 |

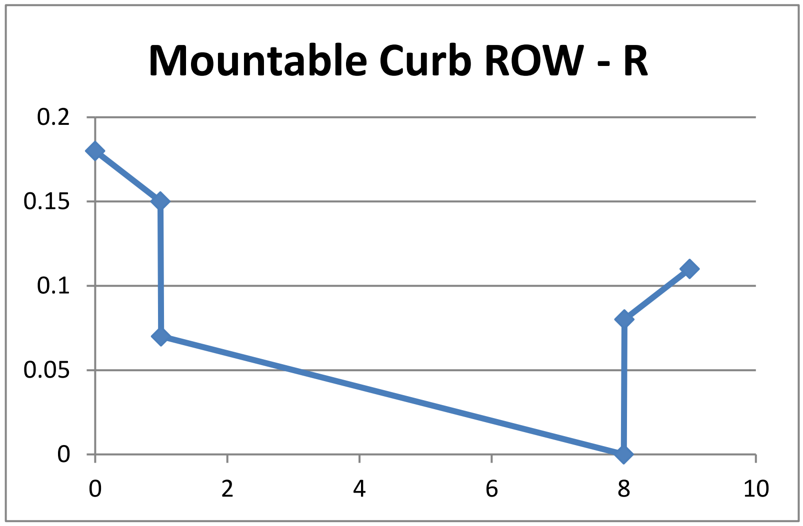
## Fernbank Crossing - Block 135
### Ponding in Road Calculations

| Structure | T/G (m) | Max. Static Ponding (Spill Depth) | | 2-yr Event (4hr) | | | | 5-yr Event (4hr) | | | | 100-yr Event (4hr) | | | | 100-yr Event (+20%) (4hr) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Elev. (m) | Depth (m) | Elev. (m) | Depth (m) | Cascading Flow? | Cascade Depth (m) | Elev. (m) | Depth (m) | Cascading Flow? | Cascade Depth (m) | Elev. (m) | Depth (m) | Cascading Flow? | Cascade Depth (m) | Elev. (m) | Depth (m) | Cascading Flow? | Cascade Depth (m) |
| CB50 | 104.75 | 104.88 | 0.13 | 104.04 | 0.00 | N | 0.00 | 104.71 | 0.00 | N | 0.00 | 104.89 | 0.14 | Y | 0.01 | 104.90 | 0.15 | Y | 0.02 |
| CB51 | 104.40 | 104.50 | 0.10 | 103.60 | 0.00 | N | 0.00 | 104.10 | 0.00 | N | 0.00 | 104.51 | 0.11 | Y | 0.01 | 104.54 | 0.14 | Y | 0.04 |
| CB52 | 104.44 | 104.65 | 0.21 | 103.45 | 0.00 | N | 0.00 | 103.90 | 0.00 | N | 0.00 | 104.58 | 0.14 | N | 0.00 | 104.62 | 0.18 | N | 0.00 |
| CB53 | 104.49 | 104.65 | 0.16 | 103.58 | 0.00 | N | 0.00 | 104.52 | 0.03 | N | 0.00 | 104.59 | 0.10 | N | 0.00 | 104.62 | 0.13 | N | 0.00 |
| CB54 | 104.64 | 104.79 | 0.15 | 103.41 | 0.00 | N | 0.00 | 103.60 | 0.00 | N | 0.00 | 104.78 | 0.14 | N | 0.00 | 104.83 | 0.19 | Y | 0.04 |
| CB55 | 104.64 | 104.79 | 0.15 | 103.99 | 0.00 | N | 0.00 | 104.65 | 0.01 | N | 0.00 | 104.78 | 0.14 | N | 0.00 | 104.83 | 0.19 | Y | 0.04 |
| CB57 | 105.20 | 105.34 | 0.14 | 104.28 | 0.00 | N | 0.00 | 104.73 | 0.00 | N | 0.00 | 105.31 | 0.11 | N | 0.00 | 105.35 | 0.15 | Y | 0.01 |

# Fernbank Crossing - Block 135
## Roadway Cross-Sections

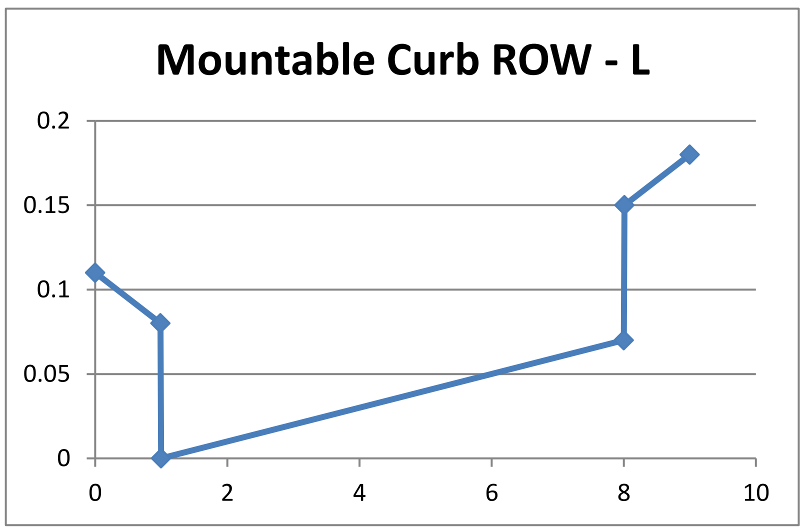
**Mountable Curb and Gutter**

| Distance | Elevation |
|---|---|
| 0 | 0.18 |
| 0.99 | 0.15 |
| 1 | 0.07 |
| 8 | 0 |
| 8.01 | 0.08 |
| 9 | 0.11 |



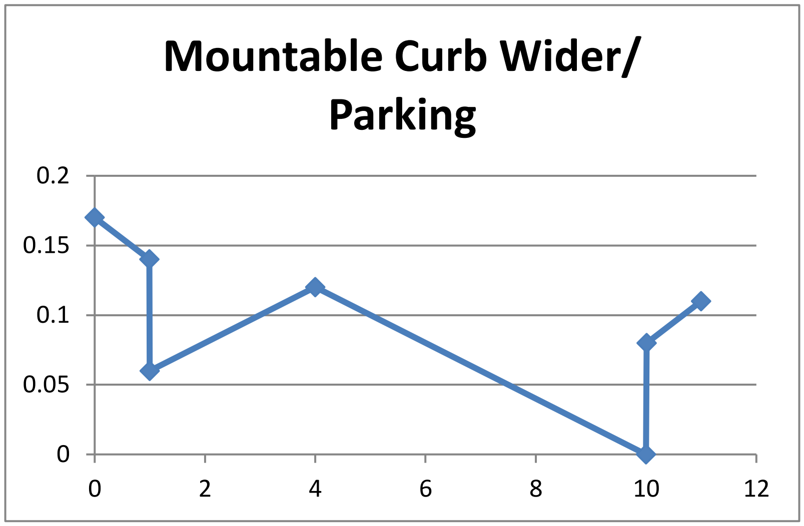

**Mountable Curb and Gutter**

| Distance | Elevation |
|---|---|
| 0 | 0.11 |
| 0.99 | 0.08 |
| 1 | 0 |
| 8 | 0.07 |
| 8.01 | 0.15 |
| 9 | 0.18 |



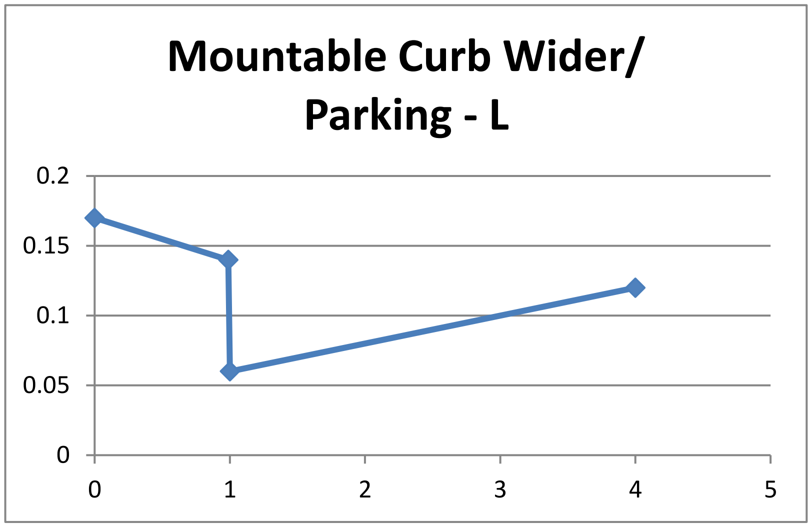
**Mountable Curb and Gutter**

| Distance | Elevation |
|---|---|
| 0 | 0.17 |
| 0.99 | 0.14 |
| 1 | 0.06 |
| 4 | 0.12 |
| 10 | 0 |
| 10.01 | 0.08 |
| 11 | 0.11 |



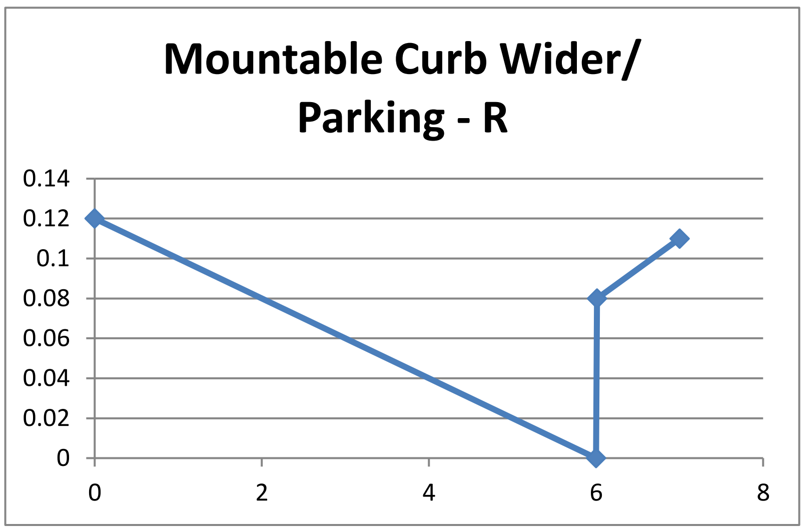
**Mountable Curb and Gutter**

| Distance | Elevation |
|---|---|
| 0 | 0.17 |
| 0.99 | 0.14 |
| 1 | 0.06 |
| 4 | 0.12 |




**Mountable Curb and Gutter**

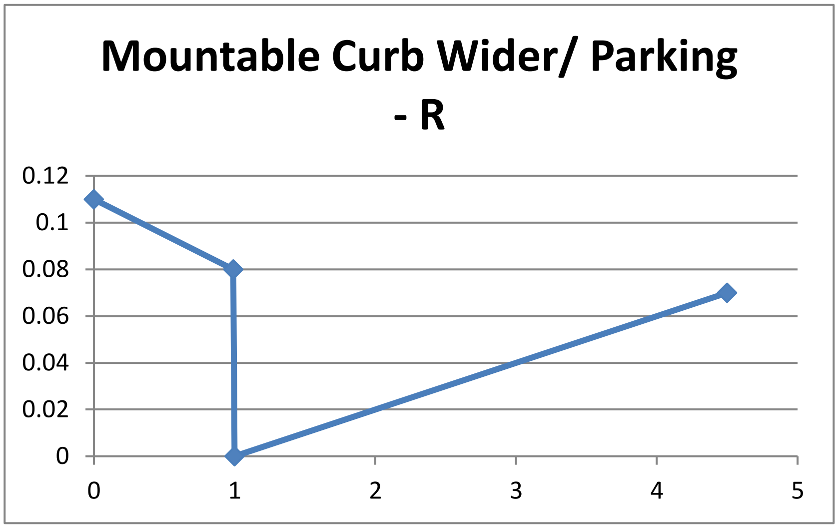
| Distance | Elevation |
|---|---|
| 0 | 0.12 |
| 6 | 0 |
| 6.01 | 0.08 |
| 7 | 0.11 |



## Fernbank Crossing - Block 135
### Roadway Cross-Sections

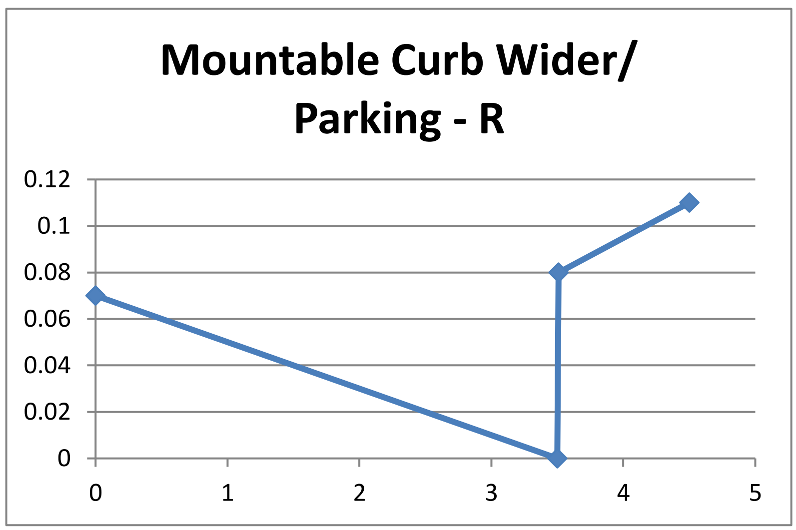
**Mountable Curb and Gutter**

| Distance | Elevation |
|---|---|
| 0 | 0.11 |
| 0.99 | 0.08 |
| 1 | 0 |
| 4.5 | 0.07 |




**Mountable Curb and Gutter**

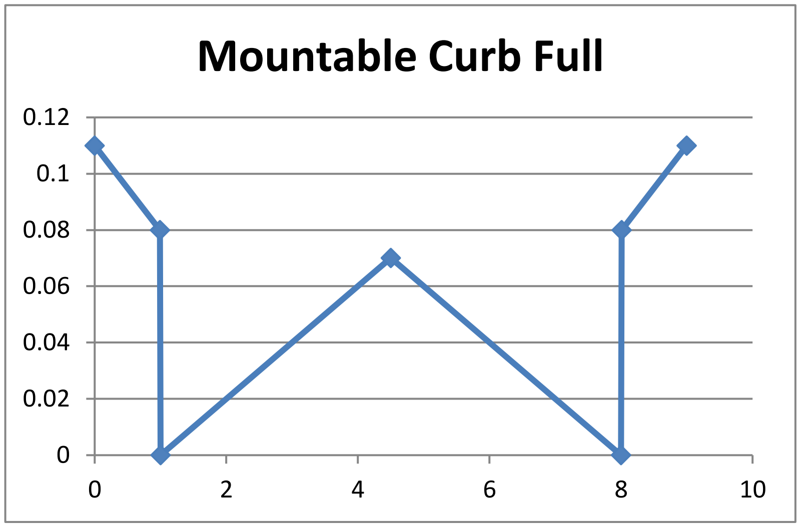
| Distance | Elevation |
|---|---|
| 0 | 0.07 |
| 3.5 | 0 |
| 3.51 | 0.08 |
| 4.5 | 0.11 |



Engineers, Planners & Landscape Architects

**Mountable Curb and Gutter**

| Distance | Elevation |
|---|---|
| 0 | 0.11 |
| 0.99 | 0.08 |
| 1 | 0 |
| 4.5 | 0.07 |
| 8 | 0 |
| 8.01 | 0.08 |
| 9 | 0.11 |

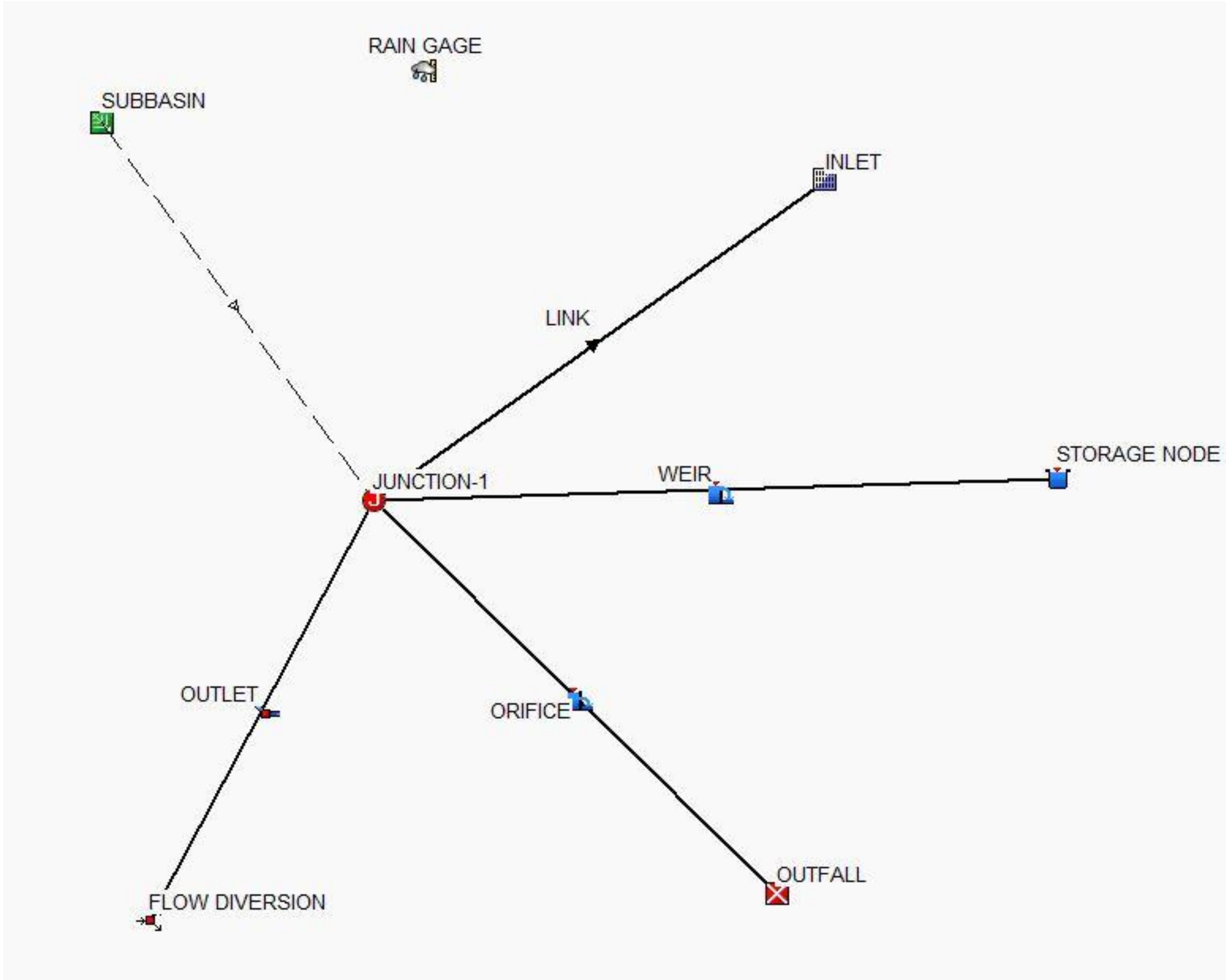


**Fernbank Crossing - Block 135**
**Standalone Model Schematic - PCSWMM**

NOVATECH
Engineers, Planners & Landscape Architects


6/11/2019
PREPARED BY: NOVATECH

M:\2017\117089\DATA\Calculations\Sewer Calcs\SWM\117089-ModelParams_R1.xlsx


RAIN GAGE
SUBBASIN
INLET
LINK
STORAGE NODE
WEIR
JUNCTION-1
OUTLET
ORIFICE
OUTFALL
FLOW DIVERSION

# Fernbank Crossing - Block 135
## Overall Model Schematic (SSA)

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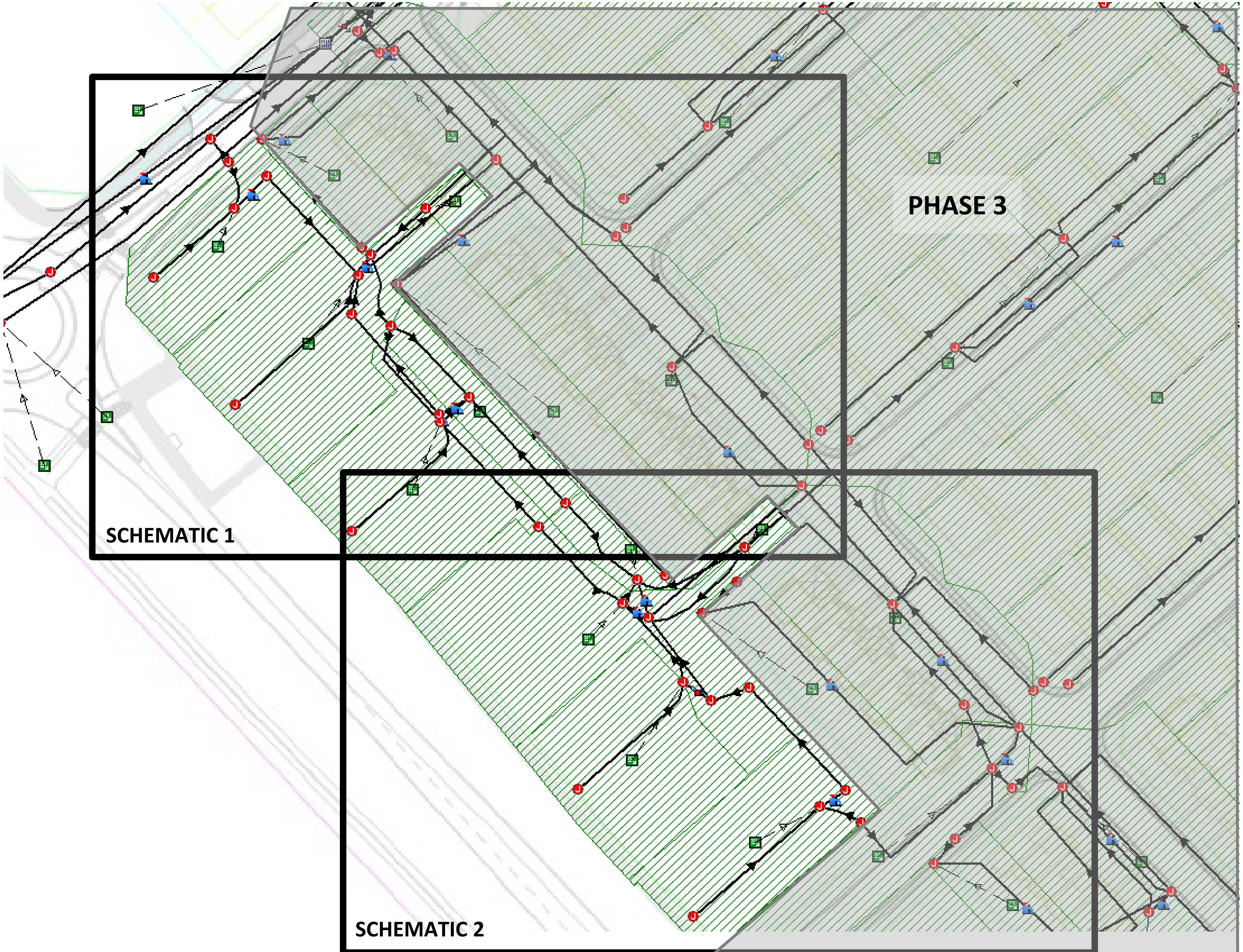
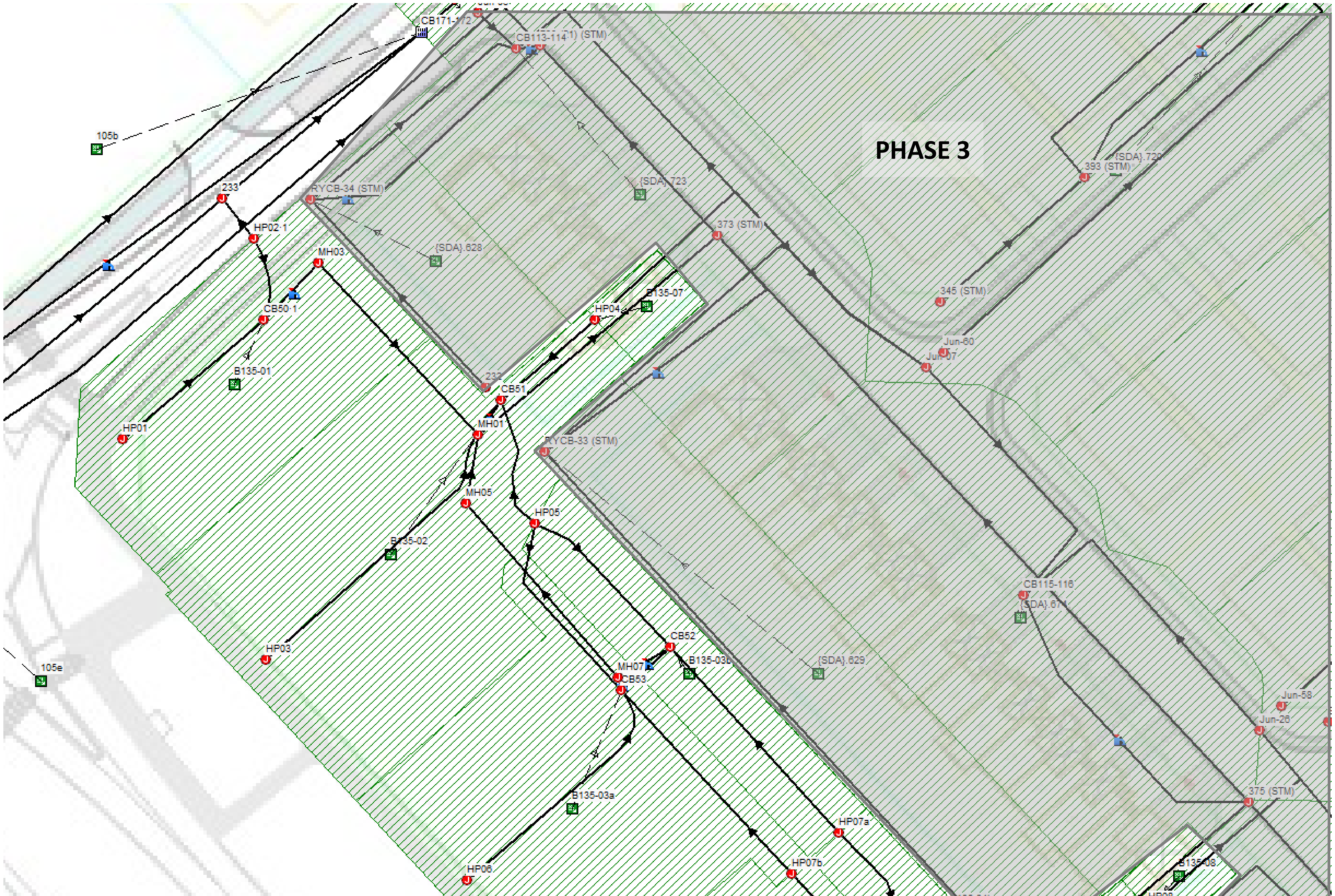



6/12/2019
PREPARED BY: NOVATECH

M:\2017\117089\DATA\Calculations\Sewer Calcs\SWM\117089-ModelParams_R1.xlsx

**Fernbank Crossing - Block 135**
**Schematic 1 (SSA)**

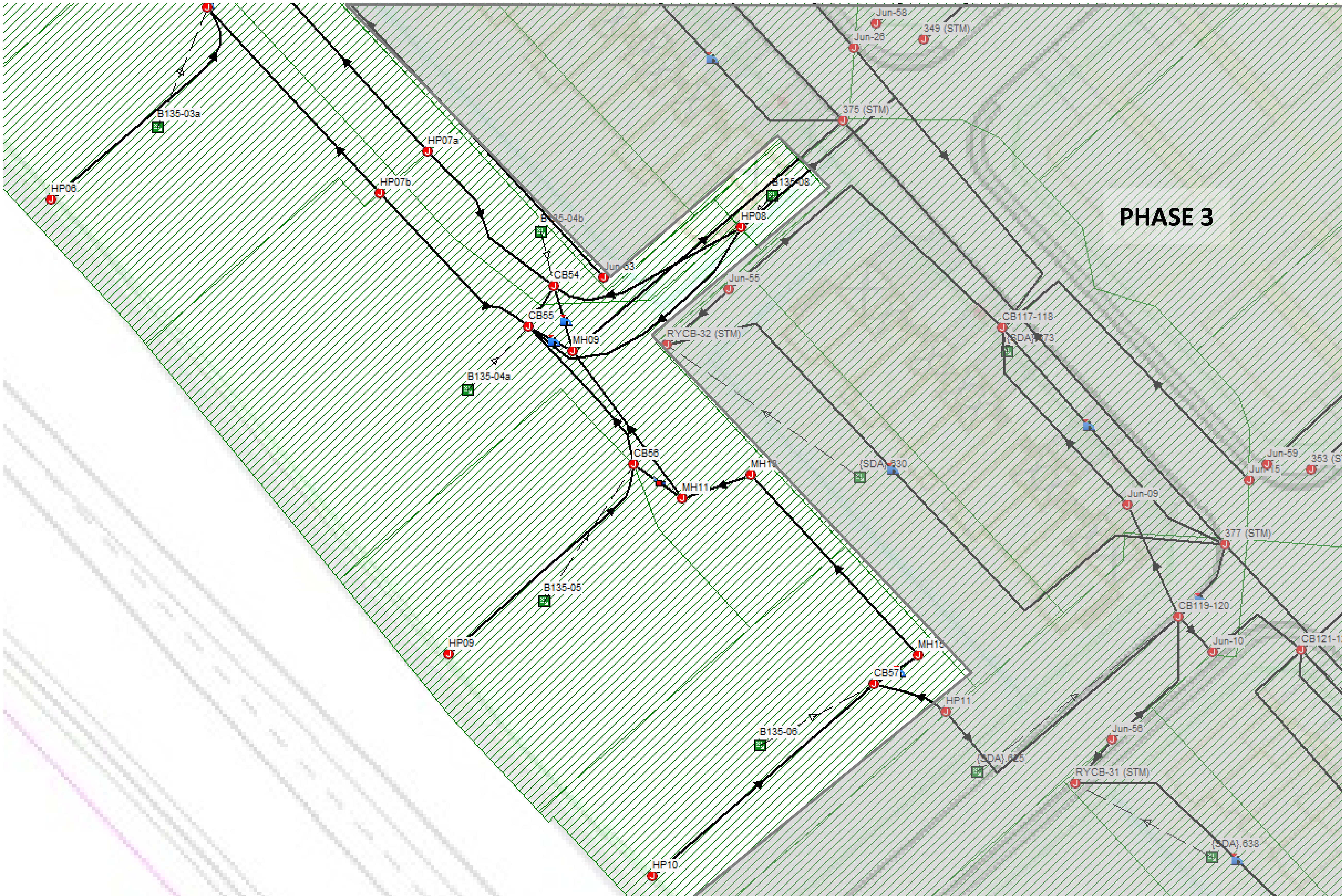



6/11/2019
PREPARED BY: NOVATECH

M:\2017\117089\DATA\Calculations\Sewer Calcs\SWM\117089-ModelParams_R1.xlsx

**Fernbank Crossing - Block 135**
**Schematic 1 (SSA)**

NOVATECH
Engineers, Planners & Landscape Architects



# Fernbank Crossing - Block 135
## Design Storm Time Series Data
## 4-hour Chicago Design Storms

Engineers, Planners & Landscape Architects

| C25mm-4.stm | | C2-4.stm | | C5-4.stm | |
|---|---|---|---|---|---|
| Duration | Intensity | Duration | Intensity | Duration | Intensity |
| min | mm/hr | min | mm/hr | min | mm/hr |
| 0:00 | 0 | 0:00 | 0 | 0:00 | 0 |
| 0:10 | 1.34 | 0:10 | 1.98 | 0:10 | 2.49 |
| 0:20 | 1.49 | 0:20 | 2.23 | 0:20 | 2.77 |
| 0:30 | 1.69 | 0:30 | 2.58 | 0:30 | 3.14 |
| 0:40 | 1.96 | 0:40 | 3.06 | 0:40 | 3.62 |
| 0:50 | 2.33 | 0:50 | 3.81 | 0:50 | 4.31 |
| 1:00 | 2.91 | 1:00 | 5.1 | 1:00 | 5.37 |
| 1:10 | 3.91 | 1:10 | 7.91 | 1:10 | 7.19 |
| 1:20 | 6.1 | 1:20 | 19.04 | 1:20 | 11.14 |
| 1:30 | 14.53 | 1:30 | 76.81 | 1:30 | 26.25 |
| 1:40 | 58.72 | 1:40 | 23.64 | 1:40 | 104.19 |
| 1:50 | 17.11 | 1:50 | 11.91 | 1:50 | 30.86 |
| 2:00 | 8.32 | 2:00 | 7.98 | 2:00 | 15.15 |
| 2:10 | 5.5 | 2:10 | 6.03 | 2:10 | 10.07 |
| 2:20 | 4.13 | 2:20 | 4.87 | 2:20 | 7.58 |
| 2:30 | 3.32 | 2:30 | 4.1 | 2:30 | 6.11 |
| 2:40 | 2.79 | 2:40 | 3.55 | 2:40 | 5.14 |
| 2:50 | 2.41 | 2:50 | 3.14 | 2:50 | 4.45 |
| 3:00 | 2.12 | 3:00 | 2.82 | 3:00 | 3.93 |
| 3:10 | 1.9 | 3:10 | 2.57 | 3:10 | 3.53 |
| 3:20 | 1.73 | 3:20 | 2.35 | 3:20 | 3.21 |
| 3:30 | 1.58 | 3:30 | 2.18 | 3:30 | 2.94 |
| 3:40 | 1.46 | 3:40 | 2.03 | 3:40 | 2.72 |
| 3:50 | 1.36 | 3:50 | 1.9 | 3:50 | 2.53 |
| 4:00 | 1.27 | 4:00 | 1.79 | 4:00 | 2.37 |

# Fernbank Crossing - Block 135
## Design Storm Time Series Data
## 4-hour Chicago Design Storms

| C100-4.stm | | C100-4+20%.stm | |
|---|---|---|---|
| Duration | Intensity | Duration | Intensity |
| min | mm/hr | min | mm/hr |
| 0:00 | 0 | 0:00 | 0 |
| 0:10 | 4.07 | 0:10 | 4.88 |
| 0:20 | 4.54 | 0:20 | 5.45 |
| 0:30 | 5.14 | 0:40 | 7.14 |
| 0:40 | 5.95 | 0:50 | 8.51 |
| 0:50 | 7.09 | 1:00 | 10.62 |
| 1:00 | 8.85 | 1:10 | 14.28 |
| 1:10 | 11.9 | 1:20 | 22.25 |
| 1:20 | 18.54 | 1:30 | 53.03 |
| 1:30 | 44.19 | 1:40 | 214.27 |
| 1:40 | 178.56 | 1:50 | 62.45 |
| 1:50 | 52.04 | 2:00 | 30.37 |
| 2:00 | 25.31 | 2:10 | 20.08 |
| 2:10 | 16.73 | 2:20 | 15.07 |
| 2:20 | 12.56 | 2:30 | 12.11 |
| 2:30 | 10.09 | 2:40 | 10.16 |
| 2:40 | 8.47 | 2:50 | 8.78 |
| 2:50 | 7.32 | 3:00 | 7.75 |
| 3:00 | 6.46 | 3:10 | 6.95 |
| 3:10 | 5.79 | 3:20 | 6.3 |
| 3:20 | 5.25 | 3:30 | 5.78 |
| 3:30 | 4.82 | 3:40 | 5.34 |
| 3:40 | 4.45 | 3:50 | 4.97 |
| 3:50 | 4.14 | 4:00 | 4.66 |
| 4:00 | 3.88 | | |

# Fernbank Crossing - Block 135
## Design Storm Time Series Data
## SCS Design Storms

Novatech
Engineers, Planners & Landscape Architects

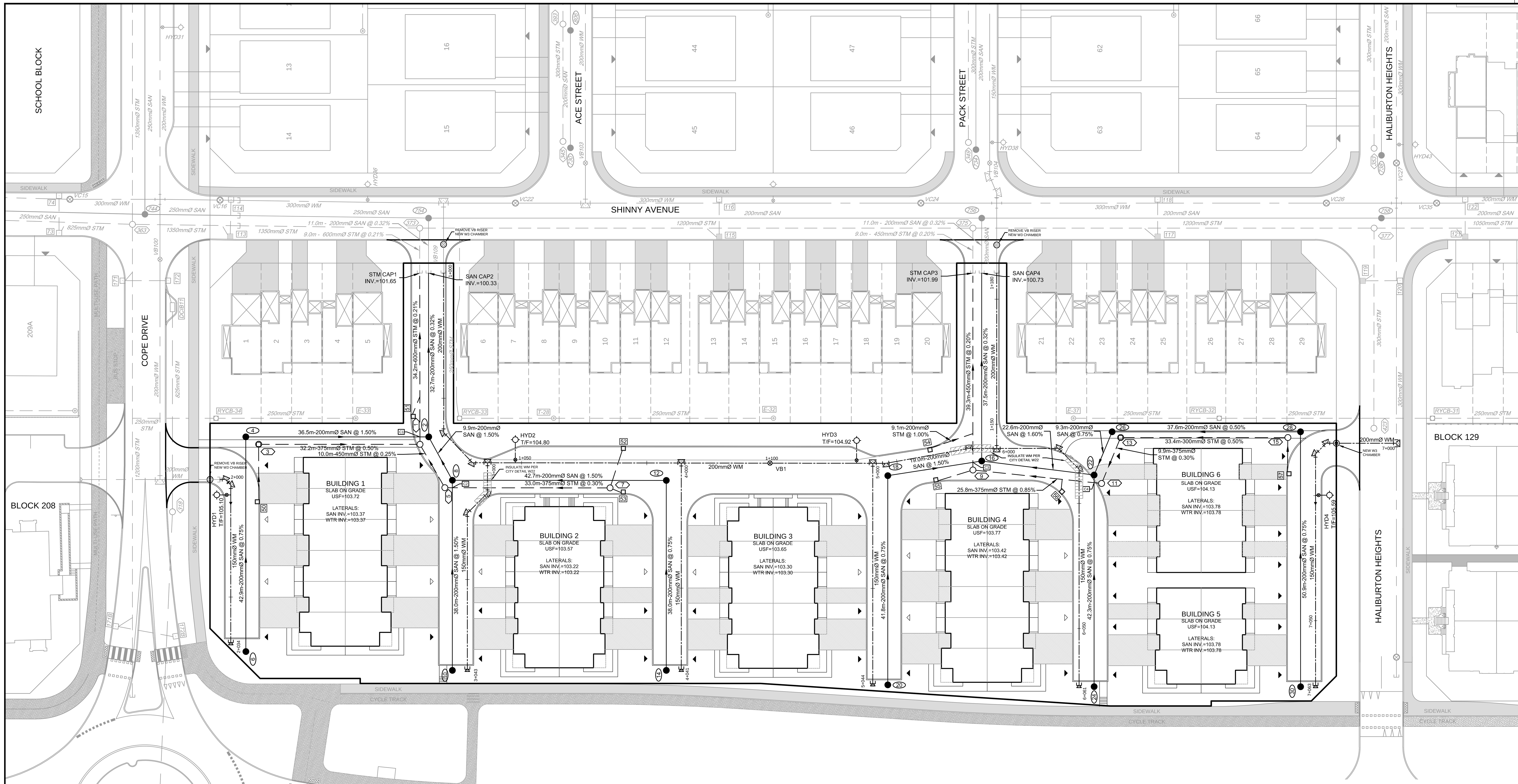
| S2-12.stm | | S5-12.stm | | S100-12.stm | |
|---|---|---|---|---|---|
| Duration | Intensity | Duration | Intensity | Duration | Intensity |
| min | mm/hr | min | mm/hr | min | mm/hr |
| 0:00 | 0.00 | 0:00 | 0 | 0:00 | 0 |
| 0:30 | 1.27 | 0:30 | 1.69 | 0:30 | 2.82 |
| 1:00 | 0.59 | 1:00 | 0.79 | 1:00 | 1.31 |
| 1:30 | 1.10 | 1:30 | 1.46 | 1:30 | 2.44 |
| 2:00 | 1.10 | 2:00 | 1.46 | 2:00 | 2.44 |
| 2:30 | 1.44 | 2:30 | 1.91 | 2:30 | 3.19 |
| 3:00 | 1.27 | 3:00 | 1.69 | 3:00 | 2.82 |
| 3:30 | 1.69 | 3:30 | 2.25 | 3:30 | 3.76 |
| 4:00 | 1.69 | 4:00 | 2.25 | 4:00 | 3.76 |
| 4:30 | 2.29 | 4:30 | 3.03 | 4:30 | 5.07 |
| 5:00 | 2.88 | 5:00 | 3.82 | 5:00 | 6.39 |
| 5:30 | 4.57 | 5:30 | 6.07 | 5:30 | 10.14 |
| 6:00 | 36.24 | 6:00 | 48.08 | 6:00 | 80.38 |
| 6:30 | 9.23 | 6:30 | 12.25 | 6:30 | 20.47 |
| 7:00 | 4.06 | 7:00 | 5.39 | 7:00 | 9.01 |
| 7:30 | 2.71 | 7:30 | 3.59 | 7:30 | 6.01 |
| 8:00 | 2.37 | 8:00 | 3.15 | 8:00 | 5.26 |
| 8:30 | 1.86 | 8:30 | 2.47 | 8:30 | 4.13 |
| 9:00 | 1.95 | 9:00 | 2.58 | 9:00 | 4.32 |
| 9:30 | 1.27 | 9:30 | 1.69 | 9:30 | 2.82 |
| 10:00 | 1.02 | 10:00 | 1.35 | 10:00 | 2.25 |
| 10:30 | 1.44 | 10:30 | 1.91 | 10:30 | 3.19 |
| 11:00 | 0.93 | 11:00 | 1.24 | 11:00 | 2.07 |
| 11:30 | 0.85 | 11:30 | 1.12 | 11:30 | 1.88 |
| 12:00 | 0.85 | 12:00 | 1.12 | 12:00 | 1.88 |

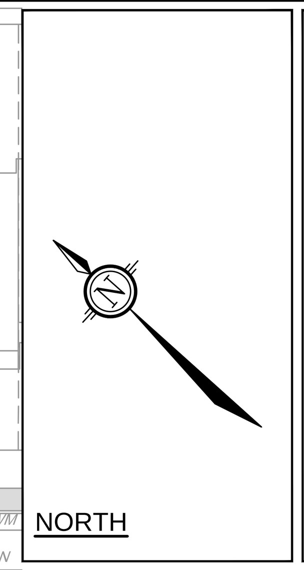
# Fernbank Crossing - Block 135
## Design Storm Time Series Data
## SCS Design Storms

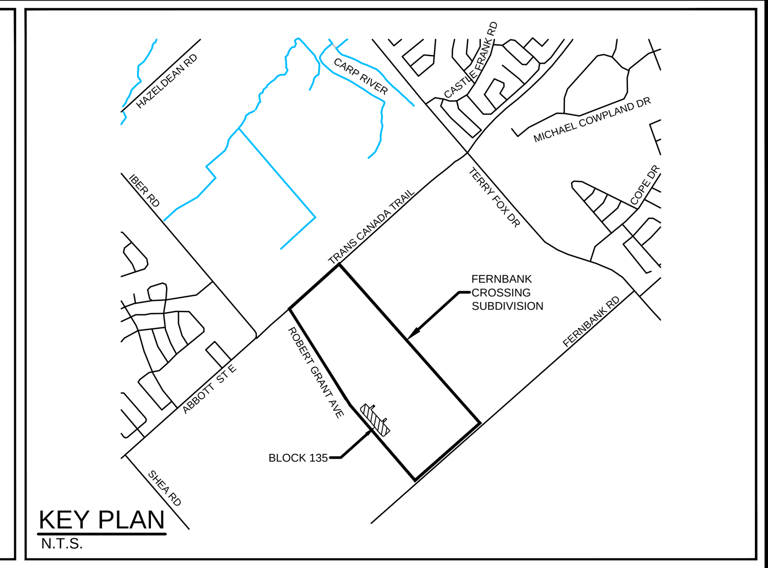
| S2-24.stm | | S5-24.stm | | S100-24.stm | |
|---|---|---|---|---|---|
| Duration | Intensity | Duration | Intensity | Duration | Intensity |
| min | mm/hr | min | mm/hr | min | mm/hr |
| 0:00 | 0 | 0:00 | 0 | 0:00 | 0 |
| 1:00 | 0.72 | 1:00 | 0.44 | 1:00 | 0.6 |
| 2:00 | 0.34 | 2:00 | 0.44 | 2:00 | 0.75 |
| 3:00 | 0.63 | 3:00 | 0.81 | 3:00 | 1.39 |
| 4:00 | 0.63 | 4:00 | 0.81 | 4:00 | 1.39 |
| 5:00 | 0.81 | 5:00 | 1.06 | 5:00 | 1.81 |
| 6:00 | 0.72 | 6:00 | 0.94 | 6:00 | 1.6 |
| 7:00 | 0.96 | 7:00 | 1.25 | 7:00 | 2.13 |
| 8:00 | 0.96 | 8:00 | 1.25 | 8:00 | 2.13 |
| 9:00 | 1.3 | 9:00 | 1.68 | 9:00 | 2.88 |
| 10:00 | 1.63 | 10:00 | 2.12 | 10:00 | 3.63 |
| 11:00 | 2.59 | 11:00 | 3.37 | 11:00 | 5.76 |
| 12:00 | 20.55 | 12:00 | 26.71 | 12:00 | 45.69 |
| 13:00 | 5.23 | 13:00 | 6.8 | 13:00 | 11.64 |
| 14:00 | 2.3 | 14:00 | 2.99 | 14:00 | 5.12 |
| 15:00 | 1.54 | 15:00 | 2 | 15:00 | 3.42 |
| 16:00 | 1.34 | 16:00 | 1.75 | 16:00 | 2.99 |
| 17:00 | 1.06 | 17:00 | 1.37 | 17:00 | 2.35 |
| 18:00 | 1.11 | 18:00 | 1.44 | 18:00 | 2.46 |
| 19:00 | 0.72 | 19:00 | 0.94 | 19:00 | 1.6 |
| 20:00 | 0.58 | 20:00 | 0.75 | 20:00 | 1.28 |
| 21:00 | 0.81 | 21:00 | 1.06 | 21:00 | 1.81 |
| 22:00 | 0.53 | 22:00 | 0.68 | 22:00 | 1.17 |
| 23:00 | 0.48 | 23:00 | 0.63 | 23:00 | 1.07 |
| 0:00 | 0.48 | 0:00 | 0.63 | 0:00 | 1.07 |

## APPENDIX C: Drawings

117089-GP
117089-GR
117089-STM
108180-19-SAN
108180-19-STM




## LEGEND

| | | | |
|---|---|---|---|
| | SANITARY MANHOLE, SEWER & DIRECTION OF FLOW | HYD | HYDRANT C/W VALVE & LEAD |
| | STORM MANHOLE, SEWER & DIRECTION OF FLOW | | CAP AND THRUST BLOCK |
| 300mmØ | WATERMAIN AND DIAMETER | | REDUCER |
| VB | VALVE & VALVE BOX | 95 | ROAD CATCHBASIN |
| W3 | GATE VALVE CHAMBER PER W3 | 96 | ROAD CATCHBASIN WITH ICD |
| | T-CONNECTION AND THRUST BLOCK | | SINGLE SERVICE LOCATION |
| | 11.25° BEND AND THRUST BLOCK | | DOUBLE SERVICE LOCATION |
| | 22.5° BEND AND THRUST BLOCK | | |
| | 45° BEND AND THRUST BLOCK | | |

## GENERAL NOTES:

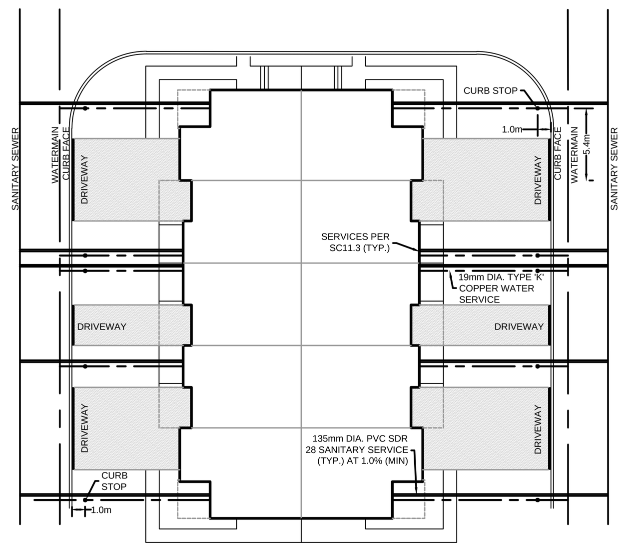
1. DIMENSIONS AND LAYOUT INFORMATION SHALL BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. THE ORIGINAL TOPOGRAPHY AND GROUND ELEVATIONS, SERVICING AND SURVEY INFORMATION SHOWN ON THIS PLAN ARE SUPPLIED FOR INFORMATION PURPOSES ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE ACCURACY OF ALL INFORMATION OBTAINED FROM THIS PLAN.
3. CO-ORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
4. BEFORE COMMENCING CONSTRUCTION, PROVIDE PROOF OF COMPREHENSIVE ALL RISK AND OPERATIONAL LIABILITY INSURANCE INCLUDING BLASTING. INSURANCE POLICY TO NAME THE OWNER, ENGINEER AND THE CITY AS CO-INSURED.
5. CONNECT TO EXISTING SYSTEMS AS DETAILED, INCLUDING ALL RESTORATION WORK NECESSARY TO REINSTATE SURFACES TO EXISTING CONDITIONS OR BETTER.
6. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THESE DRAWINGS.
7. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS BEFORE COMMENCING CONSTRUCTION.
8. RESTORE ALL TRENCHES AND SURFACE FEATURES TO EXISTING CONDITIONS OR BETTER AND TO THE SATISFACTION OF MUNICIPAL AUTHORITIES.
9. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER. EXCAVATE AND REMOVE FROM SITE ALL ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER.
10. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
11. REFER TO GEOTECHNICAL INVESTIGATION PROJECT: 64153.74 (MARCH 20, 2019), PREPARED BY GEMTEC FOR SUBSURFACE CONDITIONS AND CONSTRUCTION RECOMMENDATIONS.
12. PERFORATED PIPE SUB-DRAINS TO BE PROVIDED AT SUBGRADE LEVEL EXTENDING FROM THE ROADSIDE CATCHBASIN FOR A DISTANCE OF 3.0m, PARALLEL TO THE CURB IN TWO DIRECTIONS.

## SEWER NOTES:

1. SPECIFICATIONS:

| ITEM | SPEC. No. | REFERENCE |
|---|---|---|
| CATCHBASIN (600x600mm) | 705.010 | OPSD |
| STORM / SANITARY MANHOLE (1200Ø) | 701.010 | OPSD |
| ROADSIDE CB, FRAME & COVER | S2 & S19 | CITY of OTTAWA |
| STORM / SANITARY MH FRAME & COVER | S24.1 / S24 & S25 | CITY of OTTAWA |
| STORM SEWER | PVC DR 35 OR CONC. | (CLASS SPECIFIED ON PROFILE DRAWINGS) |
| SANITARY SEWER | PVC DR 35 | |
| CATCHBASIN LEAD | PVC DR 35 | |

2. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 1.5m COVER WITH 50mmX1200mm HI-40 INSULATION. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
3. SERVICES ARE TO BE CONSTRUCTED TO PROPERTY LINE AT MINIMUM SLOPE OF 1.0% (2.0% IS PREFERRED).
4. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
5. SEWER SERVICE CONNECTIONS PER CITY OF OTTAWA DETAILS S11 AND S11.1.
6. THE SITE SERVICING CONTRACTOR SHALL PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF THE ENGINEER.
7. STORM MANHOLES AND CBMHS SHALL HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED.
8. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO CONNECTING THE PROPOSED SEWERS. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES.



TYPICAL SERVICE CONNECTION
BACK TO BACK TOWNHOUSE (SLAB ON GRADE)

## WATERMAIN NOTES:

1. GENERAL:

| ITEM | DETAIL. No. | REFERENCE |
|---|---|---|
| WATERMAIN TRENCHING | W17 | CITY OF OTTAWA |
| THERMAL INSULATION IN SHALLOW TRENCHES | W22 | CITY OF OTTAWA |
| WATERMAIN CROSSING BELOW SEWER / OVER SEWER | W25 / W25.2 | CITY OF OTTAWA |

2. THE WATERMAIN SHALL BE PVC DR 18 IN ACCORDANCE WITH MATERIAL SPECIFICATION MW-18.1, UNLESS OTHERWISE INDICATED, COMPLETE WITH TRACING WIRE AND CATHODIC PROTECTION.
3. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OFFICIALS.
4. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
5. PROVIDE MINIMUM 0.25m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS.
6. WATER LATERAL AND SERVICE POST IS TO BE CONSTRUCTED 1.0m FROM BACK OF CURB.

### STM MANHOLE TABLE

| MANHOLE ID | SIZE (mm) | T/G ELEV (m) | INVERT (m) | PIPE DIAMETER (mm) |
|---|---|---|---|---|
| 1 | 1500Ø | 104.49 | NE=101.72<br>S=101.87<br>NW=101.94 | NE=600<br>S=450<br>NW=375 |
| 3 | 1200Ø | 104.56 | SE=102.11<br>SW=103.24 | SE=375<br>SW=200 |
| 5 | 1200Ø | 104.55 | N=101.89<br>SE=101.96 | N=450<br>SE=375 |
| 7 | 1200Ø | 104.53 | NW=102.06<br>S=103.06<br>NE=102.95 | NW=375<br>S=200<br>NE=200 |
| 9 | 1200Ø | 104.70 | NE=102.07<br>SE=102.14<br>NW=103.16 | NE=450<br>SE=375<br>NW=200 |
| 11 | 1200Ø | 105.04 | NW=102.36<br>E=102.42 | NW=375<br>E=375 |
| 13 | 1200Ø | 105.09 | W=102.45<br>SE=102.51 | W=375<br>SE=300 |
| 15 | 1200Ø | 105.41 | NW=102.68<br>SW=103.73 | NW=300<br>SW=200 |

### SAN MANHOLE TABLE

| MANHOLE ID | SIZE (mm) | T/G ELEV (m) | INVERT (m) | PIPE DIAMETER (mm) |
|---|---|---|---|---|
| 2 | 1200Ø | 104.49 | NE=100.43<br>S=100.73<br>NW=100.73 | NE=200<br>S=200<br>NW=200 |
| 4 | 1200Ø | 104.93 | SE=101.28<br>SW=101.54 | SE=200<br>SW=200 |
| 6 | 1200Ø | 105.16 | NE=101.86 | NE=200 |
| 8 | 1200Ø | 104.60 | N=100.88<br>SW=101.16<br>SE=100.94 | N=200<br>SW=200<br>SE=200 |
| 10 | 1200Ø | 105.00 | NE=101.73 | NE=200 |
| 12 | 1200Ø | 104.63 | NW=101.58<br>SW=101.64 | NW=200<br>SW=200 |
| 14 | 1200Ø | 104.90 | NE=101.92 | NE=200 |
| 16 | 1200Ø | 104.72 | NE=100.85<br>SE=101.40<br>NW=101.40 | NE=200<br>SE=200<br>NW=200 |
| 18 | 1200Ø | 104.76 | SE=101.68<br>SW=101.70 | SE=200<br>SW=200 |
| 20 | 1200Ø | 105.13 | NE=102.01 | NE=200 |
| 22 | 1200Ø | 105.00 | NW=101.77<br>E=101.83<br>SW=101.83 | NW=200<br>E=200<br>SW=200 |
| 24 | 1200Ø | 105.27 | NE=102.15 | NE=200 |
| 26 | 1200Ø | 105.22 | W=101.90<br>SE=101.96 | W=200<br>SE=200 |
| 28 | 1200Ø | 105.40 | SW=102.21<br>NW=102.15 | SW=200<br>NW=200 |
| 30 | 1200Ø | 105.59 | NE=102.59 | NE=200 |

### SEWER CROSSING TABLE

| LOCATION | ELEVATIONS | CLEARANCE |
|---|---|---|
| C1 | STM INV=101.72<br>SAN OBV=100.96 | 0.76m |
| C2 | STM INV=101.97<br>SAN OBV=101.39 | 0.58m |
| C3 | STM INV=102.07<br>SAN OBV=101.63 | 0.44m |
| C4 | STM INV=102.35<br>SAN OBV=102.04 | 0.31m |

### CATCHBASIN TABLE

| CB No. | T/G ELEVATION | INVERT | ICD DIA. | ICD TYPE | ICD RELEASE RATE (L/s) |
|---|---|---|---|---|---|
| 50 | 104.75 | 103.35 | 108mm | ORIFICE | 28.80 |
| 51 | 104.40 | 103.00 | 152mm | ORIFICE | 50.56 |
| 52 | 104.44 | 103.04 | 83mm | ORIFICE | 13.44 |
| 53 | 104.49 | 103.09 | 152mm | ORIFICE | 44.88 |
| 54 | 104.64 | 103.24 | 83mm | ORIFICE | 8.44 |
| 55 | 104.64 | 103.24 | 178mm | ORIFICE | 78.47 |
| 56 | 104.83 | 103.43 | 152mm | ORIFICE | 22.45 |
| 57 | 105.20 | 103.80 | 127mm | ORIFICE | 32.38 |

### WATERMAIN TABLE

| Station | F/G ELEVATION | TOP OF WATERMAIN | COVER | DESCRIPTION |
|---|---|---|---|---|
| 1+000.00 | 104.48 | 102.08 | 2.40 | CONNECT TO EXISTING |
| 1+025.00 | 104.48 | 102.08 | 2.40 | - |
| 1+031.85 | 104.51 | 102.11 | 2.40 | 45° HORIZONTAL BEND |
| 1+040.19 | 104.63 | 102.23 | 2.40 | 45° HORIZONTAL BEND |
| 1+043.19 | 104.66 | 102.26 | 2.40 | 200X150 TEE |
| 1+048.75 | 104.66 | 102.26 | 2.40 | HYD2 |
| 1+050.00 | 104.65 | 102.25 | 2.40 | - |
| 1+075.00 | 104.55 | 102.15 | 2.40 | - |
| 1+081.90 | 104.62 | 102.22 | 2.40 | 200X150 TEE |
| 1+099.60 | 104.79 | 102.39 | 2.40 | VB1 |
| 1+116.92 | 104.77 | 102.37 | 2.40 | HYD3 |
| 1+120.15 | 104.76 | 102.36 | 2.40 | 200X150 TEE |
| 1+122.76 | 104.74 | 102.34 | 2.40 | 11° HORIZONTAL BEND |
| 1+125.00 | 104.73 | 102.33 | 2.40 | - |
| 1+136.43 | 104.74 | 102.34 | 2.40 | 22.5° VERTICAL BEND |
| 1+138.12 | 104.77 | 103.04 | 1.73 | 22.5° VERTICAL BEND |
| 1+139.62 | 104.77 | 103.04 | 1.73 | 11° HORIZONTAL BEND |
| 1+141.92 | 104.75 | 103.04 | 1.71 | 22.5° VERTICAL BEND |
| 1+143.61 | 104.74 | 102.34 | 2.40 | 22.5° VERTICAL BEND |
| 1+145.17 | 104.76 | 102.36 | 2.40 | 200X150 TEE |
| 1+150.00 | 104.78 | 102.38 | 2.40 | - |
| 1+175.00 | 104.87 | 102.47 | 2.40 | - |
| 1+180.20 | 104.77 | 102.37 | 2.40 | CONNECT TO EXISTING |

### WATERMAIN TABLE

| Station | F/G ELEVATION | TOP OF WATERMAIN | COVER | DESCRIPTION |
|---|---|---|---|---|
| 2+000.00 | 104.91 | 102.51 | 2.40 | CONNECT TO EXISTING |
| 2+001.07 | 104.89 | 102.49 | 2.40 | 45° HORIZONTAL BEND |
| 2+002.59 | 104.85 | 102.45 | 2.40 | 45° HORIZONTAL BEND |
| 2+004.59 | 104.82 | 102.42 | 2.40 | HYD1 |
| 2+006.59 | 104.81 | 102.41 | 2.40 | REDUCER |
| 2+025.00 | 104.98 | 102.58 | 2.40 | - |
| 2+034.09 | 105.15 | 102.75 | 2.40 | CAP AND THRUST BLOCK |

### WATERMAIN TABLE

| Station | F/G ELEVATION | TOP OF WATERMAIN | COVER | DESCRIPTION |
|---|---|---|---|---|
| 3+000.00 | 104.66 | 102.26 | 2.40 | 200X150 TEE |
| 3+002.34 | 104.70 | 102.30 | 2.40 | 22.5° VERTICAL BEND |
| 3+003.50 | 104.70 | 102.79 | 1.91 | 22.5° VERTICAL BEND |
| 3+006.06 | 104.65 | 102.79 | 1.86 | 45° HORIZONTAL BEND |
| 3+007.56 | 104.66 | 102.79 | 1.87 | 22.5° VERTICAL BEND |
| 3+008.83 | 104.66 | 102.26 | 2.40 | 22.5° VERTICAL BEND |
| 3+011.74 | 104.65 | 102.25 | 2.40 | 45° HORIZONTAL BEND |
| 3+025.00 | 104.77 | 102.37 | 2.40 | - |
| 3+042.92 | 105.03 | 102.63 | 2.40 | CAP AND TRUST BLOCK |

### WATERMAIN TABLE

| Station | F/G ELEVATION | TOP OF WATERMAIN | COVER | DESCRIPTION |
|---|---|---|---|---|
| 4+000.00 | 104.62 | 102.22 | 2.40 | 200X150 TEE |
| 4+025.00 | 104.71 | 102.31 | 2.40 | - |
| 4+041.20 | 104.92 | 102.52 | 2.40 | CAP AND THRUST BLOCK |

### WATERMAIN TABLE

| Station | F/G ELEVATION | TOP OF WATERMAIN | COVER | DESCRIPTION |
|---|---|---|---|---|
| 5+000.00 | 104.76 | 102.36 | 2.40 | 200X150 TEE |
| 5+025.00 | 104.85 | 102.45 | 2.40 | - |
| 5+044.04 | 105.07 | 105.07 | 0.00 | CAP AND THRUST BLOCK |

### WATERMAIN TABLE

| Station | F/G ELEVATION | TOP OF WATERMAIN | COVER | DESCRIPTION |
|---|---|---|---|---|
| 6+000.00 | 104.76 | 102.36 | 2.40 | 200X150 TEE |
| 6+012.31 | 104.95 | 102.55 | 2.40 | 45° HORIZONTAL BEND |
| 6+015.09 | 104.87 | 102.47 | 2.40 | 22.5° VERTICAL BEND |
| 6+016.67 | 104.87 | 103.12 | 1.75 | 22.5° VERTICAL BEND |
| 6+018.17 | 104.88 | 103.12 | 1.76 | 45° HORIZONTAL BEND |
| 6+021.76 | 104.88 | 103.12 | 1.76 | 22.5° VERTICAL BEND |
| 6+023.32 | 104.88 | 102.48 | 2.40 | 22.5° VERTICAL BEND |
| 6+025.00 | 104.88 | 102.48 | 2.40 | - |
| 6+050.00 | 105.07 | 102.67 | 2.40 | - |
| 6+061.37 | 105.24 | 102.84 | 2.40 | CAP AND THRUST BLOCK |

### WATERMAIN TABLE

| Station | F/G ELEVATION | TOP OF WATERMAIN | COVER | DESCRIPTION |
|---|---|---|---|---|
| 7+000.00 | 105.30 | 102.90 | 2.40 | 200x150 TEE |
| 7+012.00 | 105.37 | 102.97 | 2.40 | W3 |
| 7+013.85 | 105.33 | 102.93 | 2.40 | 45° HORIZONTAL BEND |
| 7+016.85 | 105.31 | 102.91 | 2.40 | 45° HORIZONTAL BEND |
| 7+024.91 | 105.28 | 102.88 | 2.40 | HYD4 |
| 7+026.91 | 105.30 | 102.90 | 2.40 | REDUCER |
| 7+050.00 | 105.45 | 103.05 | 2.40 | - |
| 7+062.94 | 105.70 | 103.30 | 2.40 | CAP AND THRUST BLOCK |

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

APPROVED ☐ REFUSED ☐

THIS _____ DAY OF ____________, 20____

DERRICK MOODIE, MANAGER
DEVELOPMENT REVIEW WEST
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

| No. | REVISION | DATE | BY |
|---|---|---|---|
| 2. | REVISED PER CITY COMMENTS | JUN 12/19 | MAB |
| 1. | SITE PLAN SUBMISSION | MAR 22/19 | MAB |

SCALE 1:400

DESIGN LRW
CHECKED MAB
DRAWN DTD
CHECKED MAB
APPROVED JGR

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER L. R. WILSON 100160065 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER M.A. BISSETT 2019.06.12 PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
FERNBANK CROSSING - BLOCK 135

GENERAL PLAN OF SERVICES

PROJECT No. 117089
REV REV #2
DRAWING No. 117089-GP

PLAN #17927 D07-12-19-0053


| CATCHBASIN TABLE | | | | | |
|---|---|---|---|---|---|
| CB No. | T/G ELEVATION | INVERT | ICD DIA. | ICD TYPE | ICD RELEASE RATE (L/s) |
| 50 | 104.75 | 103.35 | 108mm | ORIFICE | 28.80 |
| 51 | 104.40 | 103.00 | 152mm | ORIFICE | 50.56 |
| 52 | 104.44 | 103.04 | 83mm | ORIFICE | 13.44 |
| 53 | 104.49 | 103.09 | 152mm | ORIFICE | 44.88 |
| 54 | 104.64 | 103.24 | 83mm | ORIFICE | 8.44 |
| 55 | 104.64 | 103.24 | 178mm | ORIFICE | 78.47 |
| 56 | 104.83 | 103.43 | 152mm | ORIFICE | 22.45 |
| 57 | 105.20 | 103.80 | 127mm | ORIFICE | 32.38 |

| ROADWAY PONDING | | | | | | | |
|---|---|---|---|---|---|---|---|
| PONDING ID | STRUCTURE | 100 YEAR PONDING ELEVATION | 100 YEAR PONDING DEPTH (m) | 100 YEAR +20% PONDING ELEVATION | 100 YEAR + 20% PONDING DEPTH (m) | MAX STATIC PONDING DEPTH (m) | MAX STATIC PONDING ELEVATION |
| P1 | CB-50 | 104.89 | 0.14 | 104.90 | 0.15 | 0.11 | 104.88 |
| P2 | CB-51 | 104.51 | 0.11 | 104.54 | 0.14 | 0.13 | 104.50 |
| P3 | CB-52 | 104.58 | 0.14 | 104.62 | 0.18 | 0.20 | 104.65 |
| P3 | CB-53 | 104.59 | 0.10 | 104.62 | 0.13 | 0.20 | 104.65 |
| P4 | CB-54 | 104.78 | 0.14 | 104.83 | 0.19 | 0.15 | 104.79 |
| P4 | CB-55 | 104.78 | 0.14 | 104.83 | 0.19 | 0.15 | 104.79 |
| P5 | CB-57 | 105.31 | 0.11 | 105.35 | 0.15 | 0.13 | 105.34 |

## PAVEMENT STRUCTURE:

PRIVATE ROADWAY

| | |
|---|---|
| 40mm | ASPHALT SP12.5 |
| 60mm | ASPHALT SP19.0 |
| 150mm | GRAN "A" |
| 400mm | GRAN "B" TYPE II |
| 650mm | TOTAL DEPTH |

## LEGEND

| | | | |
|---|---|---|---|
| 2.0% | PROPOSED GRADE AND DIRECTION | HYD TF=100.00 | PROPOSED HYDRANT AND TOP OF FLANGE ELEVATION |
| 72.55 / 72.45 | PROPOSED ELEVATION / EXISTING ELEVATION | 101 | PROPOSED SANITARY MANHOLE |
| x 72.55 | PROPOSED ELEVATION | 100 | PROPOSED STORM MANHOLE |
| x 72.55 HP | PROPOSED ELEVATION AT HIGH POINT | 15 TG=100.00 | PROPOSED CATCHBASIN |
| x 72.55 EP | PROPOSED ELEVATION AT EDGE OF PAVEMENT | | MAJOR OVERLAND FLOW DIRECTION |
| x 72.55 TC | PROPOSED ELEVATION AT TOP OF CURVE | | RETAINING WALL |
| VB | PROPOSED VALVE & VALVE BOX LOCATION | 3:1 | TERRACING AND SLOPE |
| W3 | GATE VALVE CHAMBER PER W3 | | 100 yr PONDING AREA |
| 104.68 | DEPRESSED CURB | | 100 yr + 20% PONDING AREA |
| | | | MAX. STATIC PONDING AREA |

## NOTES:

1. BENCHMARK LOCATION DESCRIPTION: OTTAWA LARGE CONCRETE CULVERT, UNDER HIGHWAYS NO. 7 AND 15, 2.4 km SOUTHWEST OF ROAD INTERSECTION WITH TRAFFIC LIGHT IN EAGLESON CORNERS, 155 m SOUTHWEST OF HAZELDEAN ANTIQUE, TABLET IN TOP OF CULVERT, 49 cm FROM SOUTH END, 49 cm FROM WEST EDGE, 12.2 m FROM CENTRE LINE OF HIGHWAY, 1 m BELOW ROAD LEVEL AT ELEVATION 94.043 m.

APPROVED ☐ REFUSED ☐

THIS _____ DAY OF ____________, 20____

DERRICK MOODIE, MANAGER
DEVELOPMENT REVIEW WEST
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

M:\2017\117089\CAD\Design\117089-GR.dwg, PLANS-B1, Jun 12, 2019 - 4:20pm, cboehmer

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

| No. | REVISION | DATE | BY |
|---|---|---|---|
| 2. | REVISED PER CITY COMMENTS | JUN 12/19 | MAB |
| 1. | SITE PLAN SUBMISSION | MAR 22/19 | MAB |

SCALE 1:300

1:300
0 3 6 9 12

| | |
|---|---|
| DESIGN | DTD |
| CHECKED | MAB |
| DRAWN | DTD |
| CHECKED | MAB |
| APPROVED | JGR |

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER L. R. WILSON 100160065 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER M.A. BISSETT 2019.06.12 PROVINCE OF ONTARIO

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Website www.novatech-eng.com

CITY OF OTTAWA
FERNBANK CROSSING - BLOCK 135

GRADING PLAN

PROJECT No. 117089
REV # 2
DRAWING No. 117089-GR

PLAN #17927 D07-12-19-0053

PLANB1.DWG - 1000mmx707mm


## LEGEND

- DRAINAGE AREA (hectares) — 0.24 ha
- AREA ID — 1
- RUN-OFF COEFFICIENT — 0.65
- DRAINAGE BOUNDARY AREA
- 100 yr PONDING AREA
- 100 yr + 20% PONDING AREA
- 100 — PROPOSED STORM MANHOLE & SEWER WITH DIRECTION OF FLOW
- 100 — EXISTING STORM MANHOLE & SEWER WITH DIRECTION OF FLOW
- CBMH — PROPOSED CATCHBASIN MANHOLE
- CBMH — EXISTING CATCHBASIN MANHOLE
- 95 — PROPOSED ROAD CATCHBASIN
- 95 — EXISTING ROAD CATCHBASIN
- RYCB — PROPOSED REAR YARD CATCHBASIN
- RYCB — EXISTING REAR YARD CATCHBASIN
- MAJOR SYSTEM FLOW ROUTE

### STM MANHOLE TABLE

| MANHOLE ID | OBVERT |
|---|---|
| 1 | NE=102.32<br>S=102.32<br>NW=102.32 |
| 3 | SE=102.48<br>SW=103.44 |
| 5 | N=102.34<br>SE=102.34 |
| 7 | NW=102.44<br>S=103.26<br>NE=103.15 |
| 9 | NE=102.52<br>SE=102.52 |
| 11 | NW=102.74<br>E=102.80 |
| 13 | W=102.82<br>SE=102.81 |
| 15 | NW=102.98<br>SW=103.93 |

### 100 YEAR PONDING

| PONDING ID | STRUCTURE | PONDING DEPTH (m) | PONDING ELEVATION (m) |
|---|---|---|---|
| P1 | CB-50 | 0.14 | 104.89 |
| P2 | CB-51 | 0.11 | 104.51 |
| P3 | CB-52 | 0.14 | 104.58 |
| P3 | CB-53 | 0.10 | 104.59 |
| P4 | CB-54 | 0.14 | 104.78 |
| P4 | CB-55 | 0.14 | 104.78 |
| P5 | CB-57 | 0.11 | 105.31 |

### 100 YEAR PONDING + 20%

| PONDING ID | STRUCTURE | PONDING DEPTH (m) | PONDING ELEVATION (m) |
|---|---|---|---|
| P1 | CB-50 | 0.15 | 104.90 |
| P2 | CB-51 | 0.14 | 104.54 |
| P3 | CB-52 | 0.18 | 104.62 |
| P3 | CB-53 | 0.13 | 104.62 |
| P4 | CB-54 | 0.19 | 104.83 |
| P4 | CB-55 | 0.19 | 104.83 |
| P5 | CB-57 | 0.15 | 105.35 |

### CATCHBASIN TABLE BLOCK 135

| CB ID | T/G ELEVATION | INVERT | I.C.D. DIA. |
|---|---|---|---|
| 50 | 104.75 | 103.35 | 108mm |
| 51 | 104.40 | 103.00 | 152mm |
| 52 | 104.44 | 103.04 | 83mm |
| 53 | 104.49 | 103.09 | 152mm |
| 54 | 104.64 | 103.24 | 83mm |
| 55 | 104.64 | 103.24 | 178mm |
| 56 | 104.83 | 103.43 | 152mm |
| 57 | 105.20 | 103.80 | 127mm |

APPROVED ☐ REFUSED ☐

THIS _____ DAY OF __________, 20____

DERRICK MOODIE, MANAGER
DEVELOPMENT REVIEW WEST
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

NOTE:
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FERNBANK CROSSING
the Heart of the Community

| No. | REVISION | DATE | BY |
|---|---|---|---|
| 2. | REVISED PER CITY COMMENTS | JUN 12/19 | MAB |
| 1. | SITE PLAN SUBMISSION | MAR 22/19 | MAB |

SCALE 1:300

DESIGN LRW
CHECKED MAB
DRAWN DTD
CHECKED MAB
APPROVED JGR

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
L. R. WILSON
100160065
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
M.A. BISSETT
2019.06.12
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
FERNBANK CROSSING - BLOCK 135

# STORM DRAINAGE AREA PLAN

PROJECT No. 117089
REV REV # 2
DRAWING No. 117089-STM

PLAN #17927 D07-12-19-0053


NOTE:
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| No. | REVISION | DATE | BY |
|---|---|---|---|
| 2. | ISSUED FOR APPROVAL (2nd SUBMISSION) | MAR 12/19 | MAB |
| 1. | ISSUED FOR APPROVAL | DEC 7/18 | MAB |

SCALE 1:1250

DESIGN LRW
CHECKED MAB
DRAWN DTD
CHECKED MAB
APPROVED JGR

**FOR CONSTRUCTION**

LICENSED PROFESSIONAL ENGINEER L. R. WILSON 100160065 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER M.A. BISSETT 2019.03.12 PROVINCE OF ONTARIO

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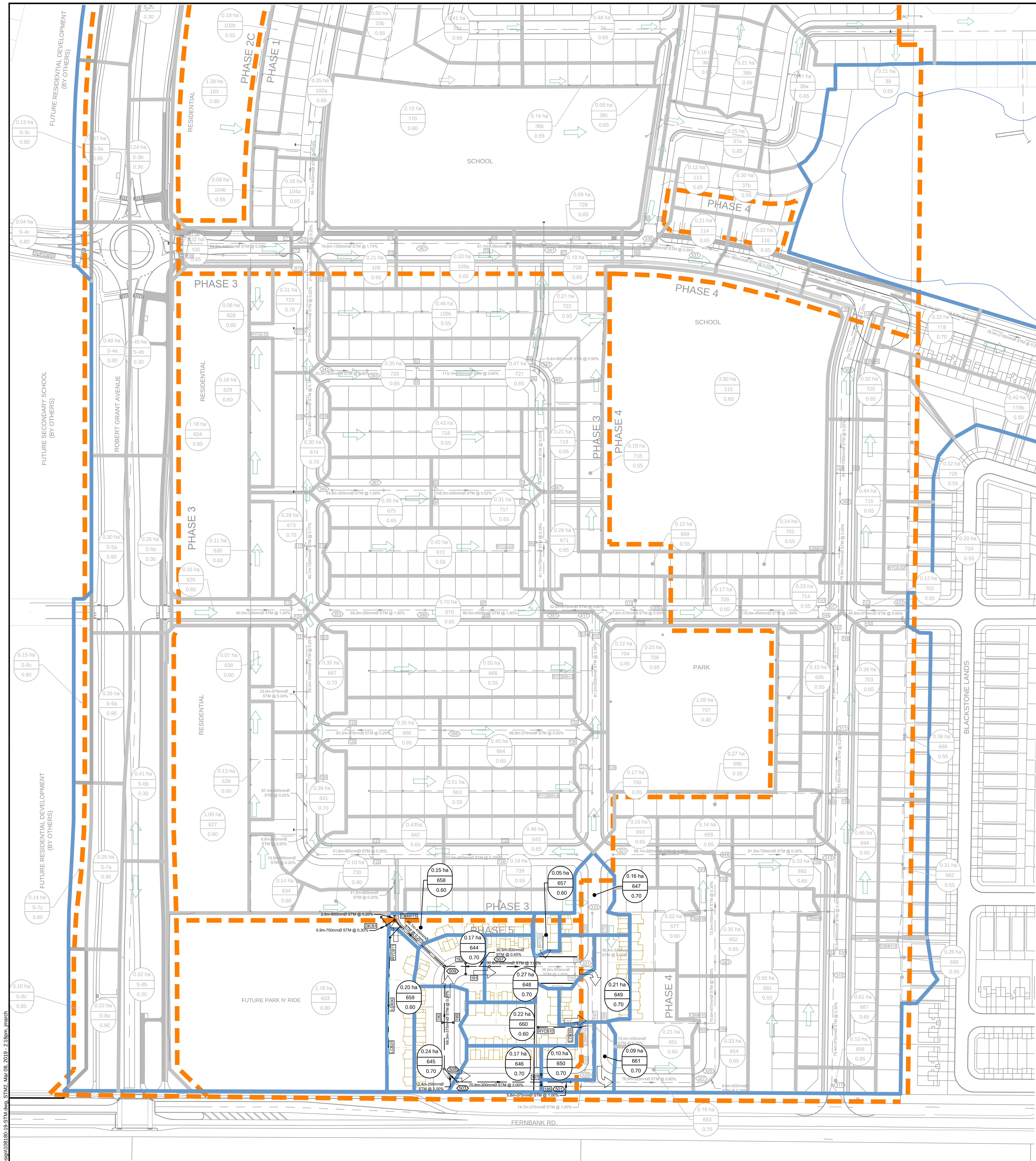
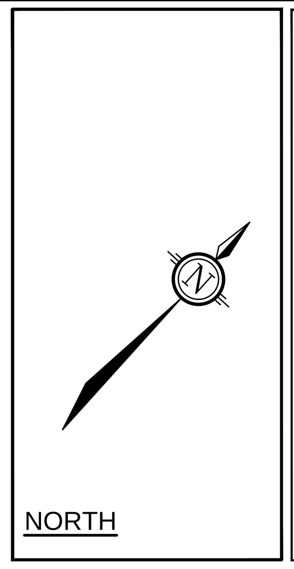
CITY OF OTTAWA
FERNBANK CROSSING - PHASE 5

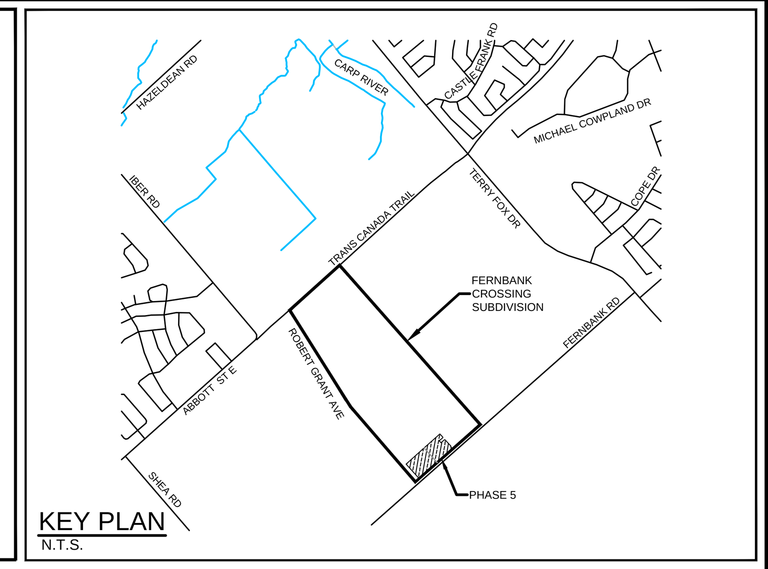
SANITARY DRAINAGE AREA PLAN

PROJECT No. 108180-19
REV REV # 2
DRAWING No. 108180-19-SAN

PLANB1.DWG - 1000mmx707mm




## LEGEND

| | |
|---|---|
| 0.24 ha / 88a / 0.65 | PHASE 5 AREA (hectares) / PHASE 5 AREA ID / PHASE 5 RUN-OFF COEFFICIENT |
| 0.24 ha / 88a / 0.65 | EXISTING DRAINAGE AREA (hectares) / EXISTING AREA ID / EXISTING RUN-OFF COEFFICIENT |
| | PROPOSED STORM DRAINAGE AREA BOUNDARY |
| | EXISTING STORM DRAINAGE AREA BOUNDARY |
| 100 | PROPOSED STORM MANHOLE / SEWER AND FLOW DIRECTION |
| 95 | PROPOSED ROAD CATCHBASIN |
| | MAJOR SYSTEM FLOW ROUTE |
| | 100 YEAR PONDING LIMIT |
| | 100 YEAR + 20% PONDING LIMIT |

### 100 YEAR PONDING

| PONDING ID | STRUCTURE | MAX PONDING DEPTH (m) | MAX PONDING ELEVATION (m) |
|---|---|---|---|
| P1 | 189-190 | 0.16 | 105.70 |
| P2 | 191-192 | 0.07 | 105.58 |
| P3 | 192-193 | 0.13 | 104.50 |
| P4 | 195 | 0.11 | 103.93 |

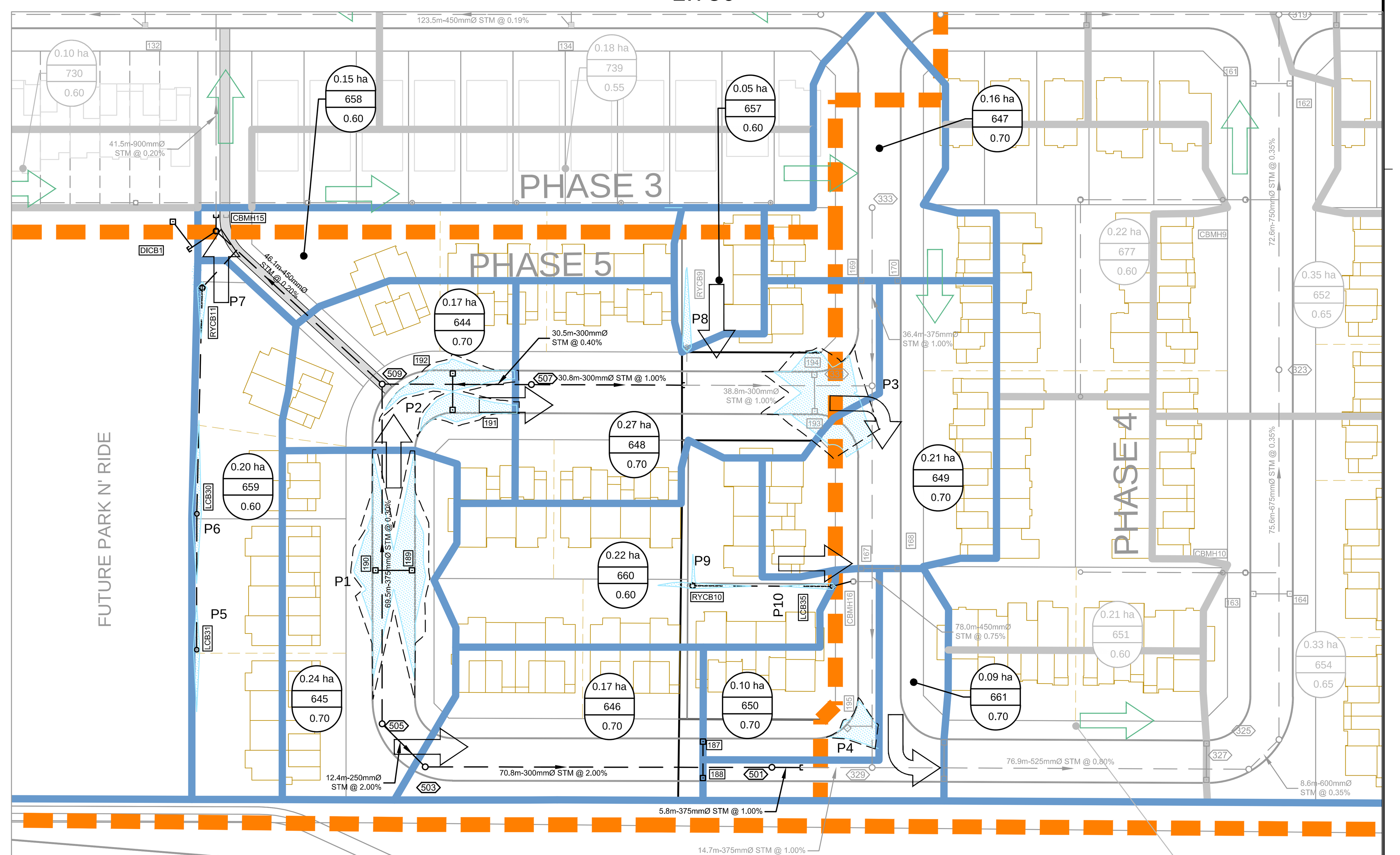
### 100 YEAR PONDING + 20%

| PONDING ID | STRUCTURE | MAX PONDING DEPTH (m) | MAX PONDING ELEVATION (m) |
|---|---|---|---|
| P1 | 189-190 | 0.17 | 105.71 |
| P2 | 191-192 | 0.17 | 105.68 |
| P3 | 193-194 | 0.19 | 104.56 |
| P4 | 195 | 0.12 | 103.94 |

### REAR YARD PONDING

| PONDING ID | STRUCTURE | MAX 100 YEAR PONDING DEPTH (m) | MAX 100 YEAR PONDING ELEVATION (m) | MAX 100 YEAR +20% PONDING DEPTH (m) | MAX 100 YEAR + 20% PONDING ELEVATION (m) |
|---|---|---|---|---|---|
| P5 | LCB31 | 0.30 | 105.92 | 0.30 | 105.92 |
| P6 | LCB30 | 0.30 | 105.83 | 0.30 | 105.83 |
| P7 | RYCB11 | 0.30 | 105.44 | 0.30 | 105.44 |
| P8 | LCB25 | 0.30 | 105.12 | 0.30 | 105.12 |
| P9 | LCB34 | 0.20 | 104.47 | 0.20 | 104.47 |
| P10 | LCB35 | 0.20 | 104.36 | 0.20 | 104.36 |

## PHASE 5
1:750

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| 1. | ISSUED FOR APPROVAL | DEC 7/18 | MAB |

SCALE 1:1250

1:1250 — 0 10 20 30 40 50

DESIGN LRW
CHECKED MAB
DRAWN DTD
CHECKED MAB
APPROVED JGR

**FOR CONSTRUCTION**

LICENSED PROFESSIONAL ENGINEER — L. R. WILSON 100160065 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — M.A. BISSETT — 2019.03.12 — PROVINCE OF ONTARIO

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CITY OF OTTAWA
FERNBANK CROSSING - PHASE 5

STORM DRAINAGE AREA PLAN

PROJECT No. 108180-19
REV REV # 2
DRAWING No. 108180-19-STM

M:\2008\108180\Subdivision - Phase 5\CAD\Design\108180-19-STM.dwg, STM2, Mar 08, 2019 - 2:18pm, jmarch

PLANB1.DWG - 1000mmx707mm

**Appendix D:**

DSS Checklist
RVCA Clearance

**FERNBANK CROSSING BLOCK 135, OTTAWA**
**DEVELOPMENT SERVICING STUDY CHECKLIST**

| **4.1 General Content** | **Addressed (Y/N/NA)** | **Comments** |
|---|---|---|
| Executive Summary (for larger reports only). | N/A | |
| Date and revision number of the report. | Y | |
| Location map and plan showing municipal address, boundary, and layout of proposed development. | Y | Refer to Report Figures |
| Plan showing the site and location of all existing services. | Y | Refer to Grading and Servicing Plans |
| Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere. | Y | Refer to Site Plan |
| Summary of Pre-consultation Meetings with City and other approval agencies. | Y | |
| Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria. | Y | |
| Statement of objectives and servicing criteria. | Y | Refer to Sections: 5.0 Sanitary Sewers, 6.0 Stormwater Management, 7.0 Water |
| Identification of existing and proposed infrastructure available in the immediate area. | Y | |
| Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available). | N/A | |
| Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighboring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths. | Y | Refer to Grading Plan and Stormwater Management Plan |

**FERNBANK CROSSING BLOCK 135, OTTAWA**
**DEVELOPMENT SERVICING STUDY CHECKLIST**

| **4.1 General Content** | **Addressed (Y/N/NA)** | **Comments** |
|---|---|---|
| Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts. | N/A | |
| Proposed phasing of the development, if applicable. | N/A | |
| Reference to geotechnical studies and recommendations concerning servicing. | Y | Refer to Section 3.0 Grading |
| All preliminary and formal site plan submissions should have the following information: | | |
| Metric scale | Y | |
| North arrow (including construction | Y | |
| Key plan | Y | |
| Name and contact information of applicant and property owner | Y | |
| Property limits including bearings and dimensions | Y | |
| Existing and proposed structures and parking areas | Y | |
| Easements, road widening and rights-of- | Y | |
| Adjacent street names | Y | |

| 4.2 Water | Addressed (Y/N/NA) | Comments |
|---|---|---|
| Confirm consistency with Master Servicing Study, if available. | Y | |
| Availability of public infrastructure to service proposed development. | Y | Refer to Sections: 5.0 Sanitary Sewers, 6.0 Stormwater Management, 7.0 Water |
| Identification of system constraints. | N/A | |
| Identify boundary conditions. | Y | Provided by City of Ottawa |
| Confirmation of adequate domestic supply and pressure. | Y | Refer to Appendix A |
| Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development. | Y | Refer to Appendix A |
| Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves. | Y | Refer to Appendix A |
| Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design. | N/A | |
| Address reliability requirements such as appropriate location of shut-off valves. | Y | |
| Check on the necessity of a pressure zone boundary modification. | N/A | |
| Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range. | Y | Refer to Section 7.0 Water |
| Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions. | Y | Refer to Section 7.0 Water |
| Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation. | N/A | |
| Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines. | Y | Refer to Section 7.0 Water |
| Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference. | N/A | |

**FERNBANK CROSSING BLOCK 135, OTTAWA**
**DEVELOPMENT SERVICING STUDY CHECKLIST**

| **4.3 Wastewater** | Addressed (Y/N/NA) | **Comments** |
|---|---|---|
| Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure). | Y | Refer to Section 5.0 Sanitary Sewers |
| Confirm consistency with Master Servicing Study and/or justifications for deviations. | N/A | |
| Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers. | N/A | |
| Description of existing sanitary sewer available for discharge of wastewater from proposed development. | Y | Refer to Section 5.0 Sanitary Sewers |
| Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable) | y | Refer to Appendix A |
| Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format. | N/A | |
| Description of proposed sewer network including sewers, pumping stations, and forcemains. | Y | Refer to Section 5.0 Sanitary Sewers |
| Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality). | N/A | |
| Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development. | N/A | |
| Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity. | N/A | |
| Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding. | N/A | |
| Special considerations such as contamination, corrosive environment etc. | N/A | |

**FERNBANK CROSSING BLOCK 135, OTTAWA**
**DEVELOPMENT SERVICING STUDY CHECKLIST**

| 4.4 Stormwater | Addressed (Y/N/NA) | Comments |
|---|---|---|
| Description of drainage outlets and downstream constraints including legality of outlet (i.e. municipal drain, right-of-way, watercourse, or private property). | Y | Refer to Section 6.0 Stormwater Management |
| Analysis of the available capacity in existing public infrastructure. | Y | Refer to Appendix A |
| A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns and proposed drainage patterns. | Y | Refer to Storm Drainage Area Plan (117089-STM) |
| Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects. | Y | Refer to Section 6.0 Stormwater Management |
| Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements. | Y | Refer to Section 6.0 Stormwater Management |
| Description of stormwater management concept with facility locations and descriptions with references and supporting information. | Y | Refer to Section 6.0 Stormwater Management |
| Set-back from private sewage disposal systems. | N/A | |
| Watercourse and hazard lands setbacks. | N/A | |
| Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed. | N/A | |
| Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists. | N/A | |
| Storage requirements (complete with calcs) and conveyance capacity for 5 yr and 100 yr events. | Y | Refer to Appendix B |
| Identification of watercourse within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals. | N/A | |
| Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions. | Y | Refer to Appendix B |
| Any proposed diversion of drainage catchment areas from one outlet to another. | N/A | |
| Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and SWM | N/A | |
| If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event. | N/A | |

| **4.4 Stormwater** | **Addressed (Y/N/NA)** | **Comments** |
|---|---|---|
| Identification of potential impacts to receiving watercourses. | N/A | |
| Identification of municipal drains and related approval requirements. | N/A | |
| Description of how the conveyance and storage capacity will be achieved for the development. | Y | Refer to Section 6.0 Stormwater Management |
| 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading. | Y | Refer to Grading Plan and Storm Drainage Area Plan |
| Inclusion of hydraulic analysis including HGL elevations. | N/A | |
| Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors. | Y | Refer to Section 4.0 Erosion Sediment Control |
| Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions. | N/A | |
| Identification of fill constrains related to floodplain and geotechnical investigation. | N/A | |

| **4.5 Approval and Permit Requirements** | **Addressed (Y/N/NA)** | **Comments** |
|---|---|---|
| Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act. | N/A | |
| Application for Certificate of Approval (CofA) under the Ontario Water Resources Act. | N/A | |
| Changes to Municipal Drains. | N/A | |
| Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.) | N/A | |

| **4.6 Conclusion** | **Addressed (Y/N/NA)** | **Comments** |
|---|---|---|
| Clearly stated conclusions and recommendations. | Y | Refer to Section 8.0 Conclusions and Recommendations |
| Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency. | Y | |
| All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario. | Y | |

also agrees to note the locations of all Community Mail Boxes within the development, and to notify affected homeowners of any established easements granted to Canada Post to permit access to the Community Mail Box.

d. The developer will provide a suitable and safe temporary site for a Community Mail Box until curbs, sidewalks and final grading are completed at the permanent Community Mail Box locations. Canada Post will provide mail delivery to new residents as soon as the homes are occupied.
e. The developer agrees to provide the following for each Community Mail Box site and to include these requirements on the appropriate servicing plans:
    i. Any required walkway across the boulevard, per municipal standards
    ii. Any required curb depressions for wheelchair access, with an opening of at least two meters (consult Canada Post for detailed specifications)

**<u>Rideau Valley Conservation Authority (RVCA)</u>**

1. The RVCA has reviewed the above noted Site Plan Control application for 6 back to back townhouse blocks and have no objections provided that the site servicing report is implemented for quality control protection (run off captured by Pond 6) as part of the Site Plan Agreement.

Please provide a resubmission that addresses each of the comments or issues listed above. Please include 6 copies of all revised drawings and 2 copies of revised reports. A cover letter must also be included that states how each provided comment was addressed in the resubmission. Please co-ordinate the numbering of each resubmission comment or issue, with the above noted comment number. All addenda or revisions to any studies and plans, must be accompanied by a PDF copy, either by USB or e-mail.

Please contact me at Kathy.Rygus@ottawa.ca or at 613-580-2424 ext. 28318 if you have any questions regarding design, site plan or landscaping comments. Please contact Project Manager Eric Surprenant directly for questions regarding engineering comments at or at 613-580-2424, Ext.27794

Sincerely,

Kathy Rygus, Planner
Development Review West
Planning, Infrastructure and Economic Development Department