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Abbott-Fernbank Holdings Inc.
Fernbank Crossing – Phase 5

Stormwater Management Report

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ABBOTT-FERNBANK HOLDINGS INC.
FERNBANK CROSSING

STORMWATER MANAGEMENT REPORT
(PHASE 5)

Prepared By:

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First Submission: December 7, 2018
Revised: March 12, 2019

Novatech File: 108180-19
Ref: R-2018-112

March 12, 2019

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

Attention: Mr. Eric Surprenant

Dear Mr. Surprenant

Reference: Stormwater Management Report
Fernbank Crossing, Phase 5
Our File No.: 108180-17

Please find enclosed the Stormwater Management Report for Phase 5 of the Abbott-Fernbank Holdings Inc. lands within the Fernbank Community – Fernbank Crossing. This report outlines the storm drainage and stormwater management strategy for Phase 5 of the Fernbank Crossing development. The stormwater management design has been developed based on the requirements of the City of Ottawa and Rideau Valley Conservation Authority.

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

Sincerely,

NOVATECH

Kallie Auld.

Kallie Auld, P.Eng.
Project Coordinator

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1.0 INTRODUCTION

1.1 Background

Novatech has been retained to prepare a stormwater management report for the proposed Phase 5 development of the Abbott-Fernbank Lands (hereafter referred to as Fernbank Crossing). The subject site is located within the new Fernbank Community on the North side of Fernbank Road and west of Terry Fox Drive as shown in **Figure 1**. The lands will be developed as a low to medium density residential subdivision.

Figure 1: Key Plan

1.2 Land Use

The Fernbank Crossing subdivision (67.30 ha) is comprised primarily of low and medium density residential dwellings with a total of 506 singles, 244 towns and 76 stacked units proposed. Medium density residential (6.81ha) and a Community Core Area (7.11ha) are proposed adjacent Robert Grant Way and the hydro corridor. The Community Core is comprised of Mixed-Use land and a Village Green which is a public green space. Two schools (4.95ha) will front onto Cope Drive which divides the site (North/South). A Park n' Ride facility (1.79ha) is proposed along Fernbank Road. A Transit Station (1.02ha), Hydro Corridor (3.37ha), a SWM facility (0.93ha) and a Park (1.00ha) make up the remainder of the site. The proposed Land Use Plan is shown in **Figure 2**.

Stormwater Management Draft Conditions are provided in **Appendix A**. The Draft Plan of Subdivision is included in **Appendix D**.

1.3 Phase 5

Fernbank Crossing Subdivision will be developed in phases as shown in **Figure 3**. This report includes details for the servicing design and construction of the Phase 5 lands that includes 6 semi-detached units and 41 townhouse units.

1.4 Changes from Fernbank Community Design Plan

Initially, a paramedic post was proposed in the Fernbank Community Design Plan for the lands comprising Phase 5. Coordination with the City of Ottawa concluded that a paramedic post is no longer required at this location. The proposed boundary of Phase 5 lands and the adjacent Park N' Ride has been circulated and approved by the City.

Figure 2: Conceptual Land Use Plan

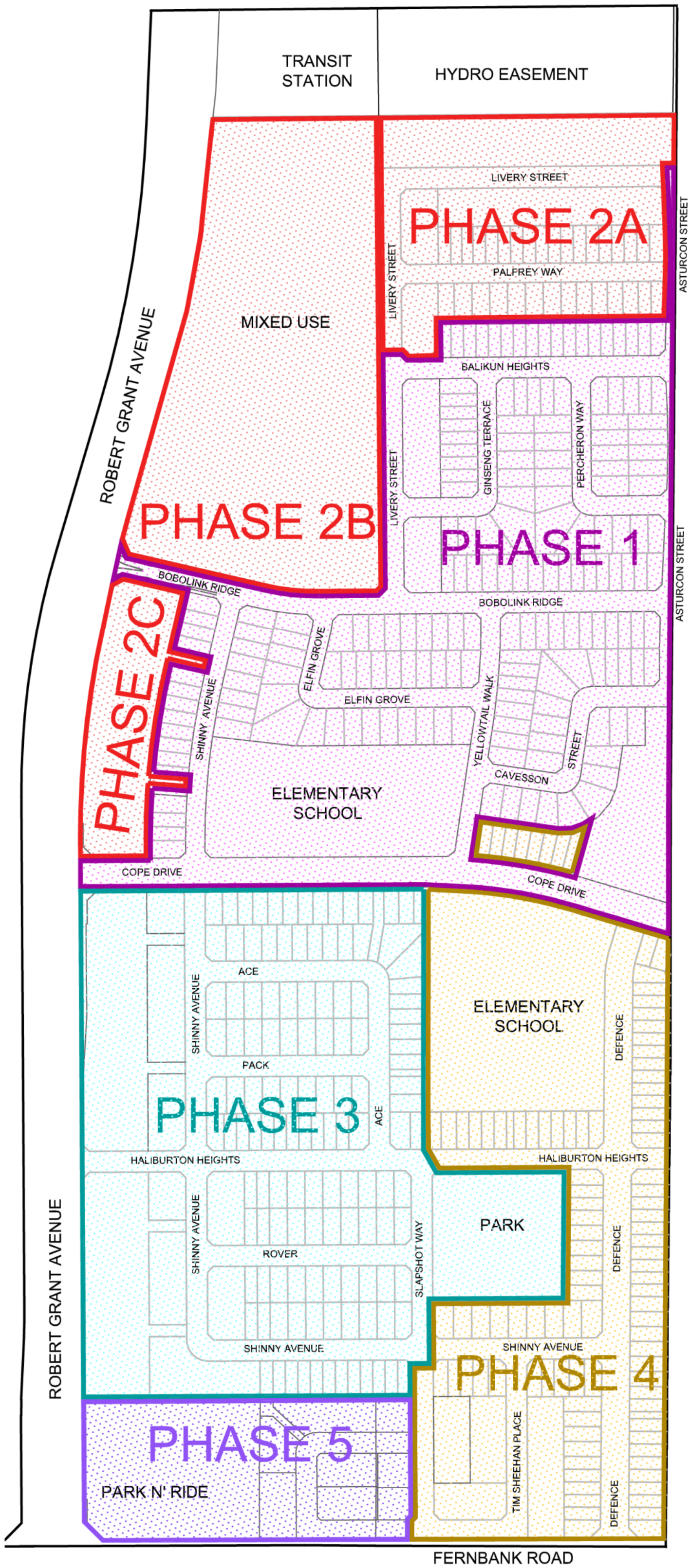

Figure 3: Phasing Plan

1.5 Additional Reports

This Stormwater Management Report provides information on the considerations and approach by which Novatech has designed and evaluated the proposed storm drainage system for the Phase 5 lands and builds upon the Fernbank Community Design Plan **[1]** prepared by Walker, Nott, Dragicevic Associates Limited, the Fernbank Master Servicing Study **[2]** prepared by Novatech, and the Fernbank Environmental Management Plan also prepared by Novatech **[3]**.

This report should be read in conjunction with the following:

- *Abbott-Fernbank Holdings Inc. Fernbank Crossing Stormwater Management Report (Phases 1&2)* prepared by Novatech, dated August 17, 2012. **[8]**
- *Abbott-Fernbank Holdings Inc. Fernbank Crossing – Phase 3 Stormwater Management Report* prepared by Novatech, July 15, 2015. **[9]**
- *Abbott-Fernbank Holdings Inc. Fernbank Crossing – Phase 4 Stormwater Management Report* prepared by Novatech, February 8, 2018. **[10]**
- *Geotechnical Investigation, Fernbank Crossing Residential Subdivision Phase 4, Ottawa, Ontario* prepared by Houle Chevrier Engineering, dated March 13, 2017. **[5]**
- *Servicing Design Brief (Phase 5) – Abbott-Fernbank Holdings Inc. Fernbank Crossing* prepared by Novatech, dated December 7, 2018 (R-2017-035). **[12]**

2.0 EXISTING CONDITIONS

2.1 Topography

The site generally slopes to the east with an average slope of approximately 3.0%. The maximum grade of approximately 106.00 metres in the middle of the site and a minimum elevation of approximately 103.00 metres near the southeast corner give a total elevation differential of approximately 3.0 metres across the site.

2.2 Subsurface Conditions

Geotechnical investigations were carried out by Houle Chevrier Engineering **[4][5]**, and bedrock was encountered between 2.0 and 5.0 metres below the existing ground surface (approximate value only – refer to geotechnical report for details).

2.3 Drainage Outlet

The Fernbank Crossing development is located at the headwaters of the Monahan Drain Subwatershed (part of the Jock River Watershed). **Figure 4** shows the location of the Fernbank Crossing development and the existing watershed boundaries. The Phase 5 development drains through Phases 3 and 4, which outlet to the existing Pond 6.

The Monahan Drain is a municipal drain flowing eastwards towards Terry Fox Drive, with several lateral branches on the north and south sides that connect with the main branch. As specified in the Fernbank Environmental Management Plan, the Monahan Drain upstream of Terry Fox Drive has been classified as an intermittent watercourse that provides indirect habitat supporting tolerant warm/cool water fish communities.

The Monahan Drain has been abandoned upstream of Pond 6, along with the various branch drains within the limits of the Fernbank Community. The branch drains will be filled in as new development within the Fernbank Community proceeds. The main branch between Terry Fox Drive and Pond 6 has been lowered and enhanced using natural channel design techniques to mitigate against the loss of habitat associated with abandoning the various branch drains.

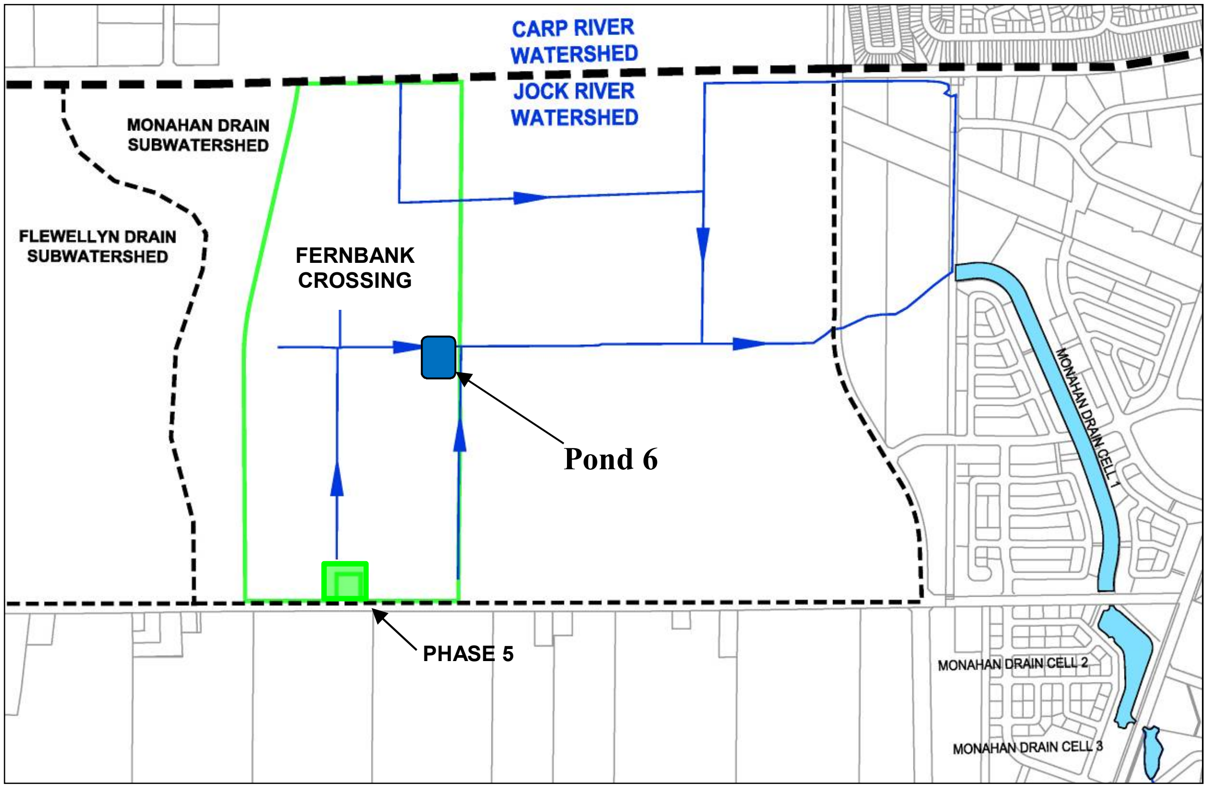

Figure 4: Pre-Development Watershed Boundaries

A minimum 40m wide riparian corridor has been designated for the section of the drain to be retained downstream of Pond 6 to protect aquatic habitat and stream function.

3.0 STORMWATER MANAGEMENT CRITERIA

The stormwater management criteria for the proposed development were established as part of the Fernbank Environmental Management Plan **[3]** and are based on the recommendations of the Jock River Reach 2 Subwatershed Study and input from Rideau Valley Conservation Authority.

In addition to the SWM criteria outlined in the Fernbank EMP, the proposed stormwater management strategy for Phase 5 will need to adhere to all applicable policies and guidelines of the Rideau Valley Conservation Authority, the City of Ottawa, the Ministry of the Environment, and other approvals agencies.

3.1 Quality & Quantity Control

- Storm runoff from Fernbank Crossing Phase 5 is to be directed to Fernbank Pond 6 for water quality & quantity control;
- Fernbank Pond 6 has been designed to control post-development peak flows in the Monahan Drain to pre-development levels and ensure no adverse impacts on the function of the Monahan Drain Constructed Wetlands SWM Facility.
- Fernbank Pond 6 has been designed to provide an *Enhanced* level of water quality protection (80% long term TSS removal) for the contributing drainage area, including Phase 5 Fernbank Crossing;

3.2 Storm Drainage / Conveyance

Technical Bulletin PIEDTB-2016-01 – Revisions to Ottawa Design Guidelines – Sewer **[11]** was considered for the design of the minor system. However, as the adjacent phases of development were all designed to the higher previous standard, Phase 5 is proposed to follow the same standard for consistency of performance in the subdivision.

- Storm sewers are to be designed to convey the 5-year post-development peak flow for the proposed development.
- Overland flows are to be confined within the rights-of-way and/or defined drainage easements for all storms up to and including the 100-year event.
- ICD flow rates are to be calculated for each drainage area to ensure that the following stormwater management (SWM) objectives are satisfied:
    - Surface water accumulation at street low points, during a 5-year event, shall follow Section 8.3.8.2 of the City of Ottawa Sewer Design Guidelines.
    - Major system storage in backyards is not to be included / accounted for in design computations.
    - Maximum flow depths and elevations on streets shall not exceed 350 mm and shall be confined to the road right-of-way as well as not be within 300 mm (vertical) to the nearest building opening.
        - The maximum flow depth on streets (both public and private and on parking lots) under either static or dynamic conditions shall be 350 mm.
    - The product of the 100-year flow depth (m) on street and flow velocity (m/s) shall not exceed 0.6.
    - The 100-year hydraulic grade line within the storm sewers shall not be within 30 cm (vertical) to adjacent building underside of footing.

3.3 Erosion and Sediment Control

- A qualified inspector should conduct daily visits during construction to ensure that the contractor is working in accord with the design drawings and that mitigation measures are being implemented as specified.
- Silt fencing is to be installed along the upland edge of all fish habitat corridors.
- Straw bale check dams are to be installed at the outlets to roadside ditches.
- Filter fabric is to be placed under all catchbasins and storm manhole covers.
- After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.

4.0 PROPOSED DEVELOPMENT

When the Stormwater Management report for Phase 4 **[10]** was submitted, the Phase 5 lands were intended to become a paramedic post, with runoff being directed through the existing Phase 3 lands. The design for the Phase 5 lands has been revised to include 59 townhouse units, with access provided via Slapshot Way within the Phase 4 development. Runoff from Phase 5 will be directed to both Phase 3 and Phase 4 under the revised design.

4.1 Storm Sewer Design (Minor System)

As noted above, runoff from the Phase 5 development will be directed into the existing storm sewer systems servicing Phases 3 and 4, where it will then be directed to the existing stormwater management facility 'Pond 6', which has been designed to provide the required quantity and quality control. The layout of the proposed storm sewer network is shown on **Figure 5**.

The proposed storm sewers have been designed using the Rational Method to convey peak flows associated with a 5-year return period. The storm sewer design sheets are provided in **Appendix B**. The corresponding Storm Drainage Area Plan (**Drawing 108180-19-STM**) is provided in **Appendix D**. The design parameters used in sizing the storm sewers are summarized in **Table 4.1** and **Table 4.2**.

Table 4.1: Storm Sewer Design Parameters

Parameter	Design Criteria
Local and Collector Roads	5-year Return Period
Storm Sewer Design	Rational Method/Modeling
IDF Rainfall Data	Ottawa Sewer Design Guidelines
Initial Time of Concentration (T_c)	10 minutes
Minimum Velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Minimum Diameter	250 mm

Table 4.2: Runoff Coefficients

Land Use	Runoff Coefficient
Park N' Ride	0.80
Towns Front Yards	0.70
Towns Rear Yards	0.60

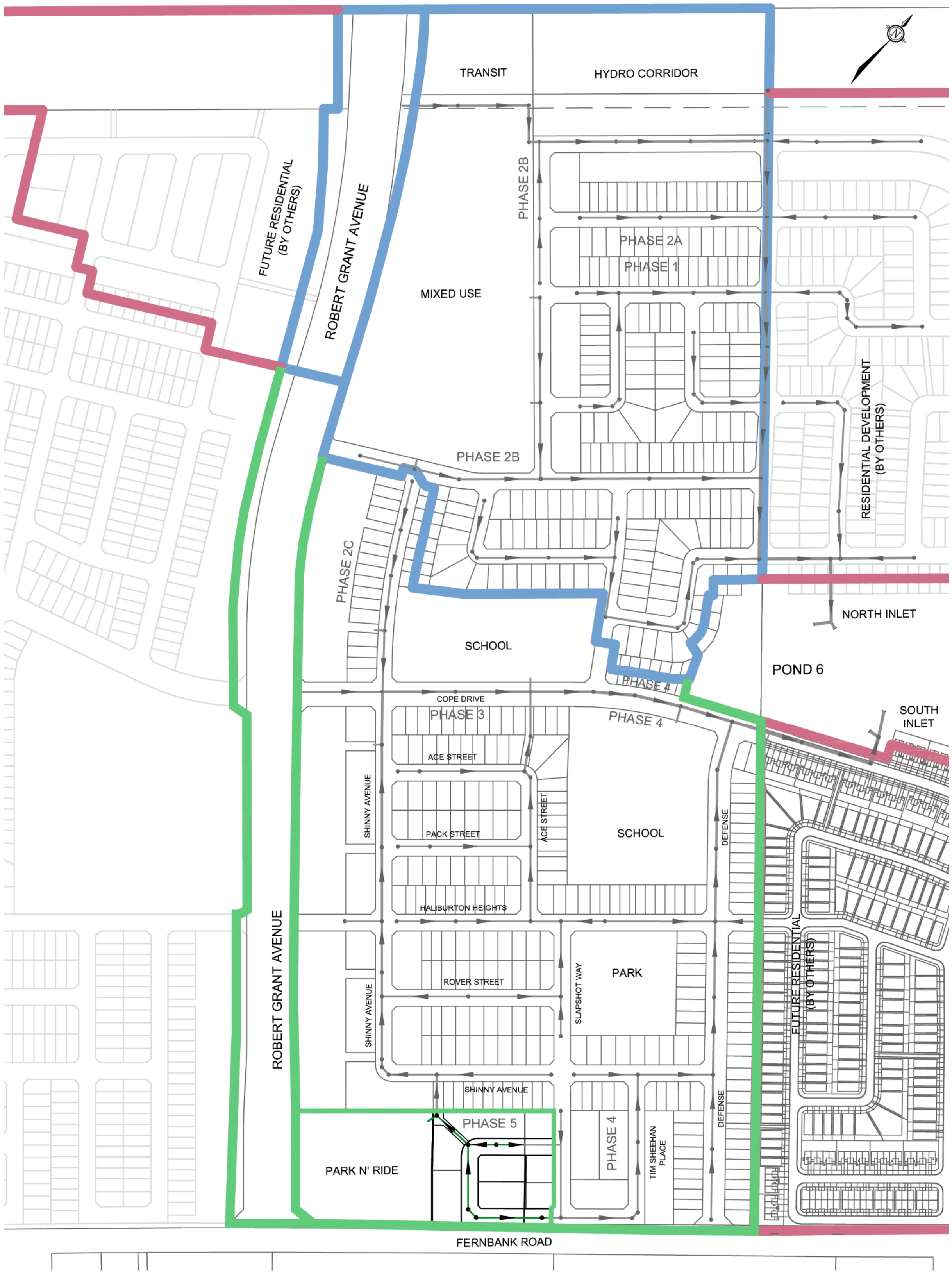

Figure 5: Storm Sewer Network

4.1.1 Inlet Control Devices

Inlet control devices (ICDs) will be installed as required to limit inflows to the minor system during large (>5-year) storm events. ICDs will be installed in roadway catchbasins. Rear yard catchbasins will connect to a catchbasin manhole, which will be fitted with an ICD. ICDs shall be slide-in orifice plate ICDs.

4.2 Overland Flow Path (Major System)

The rights-of-way have been designed to convey major system overland flow from the Phase 5 lands through Phase 4 via Slapshot Way to Pond 6. The road profiles have been graded to ensure that the 100-year peak overland flows are confined within the right-of-way at a maximum dynamic flow depth of 0.35 m. The major system has been designed to ensure that the product of velocity x depth does not exceed 0.60 during the 100-year event.

4.3 Infiltration Best Management Practices and Low Impact Development

The Fernbank EMP recommends lot level and infiltration best management practices (BMPs) and Low Impact Development (LIDs) to mitigate against the potential reduction in infiltration resulting from development. Phase 5 of the Fernbank Crossing subdivision will consist primarily of residential lots. Proposed BMPs and LIDs for groundwater infiltration include:

- Pipes connecting rear yard CBs will be perforated to promote infiltration of runoff from rear yard areas (as per City of Ottawa Standard Detail S29).
- Roof leaders should be directed to rear yard areas.

By implementing infiltration BMPs as part of the storm drainage design, the impacts of development on the hydrologic cycle can be considerably reduced. Infiltration of clean runoff will have additional benefits for stormwater management. By reducing the volume of “clean” water conveyed to the SWM facility, the end-of-pipe storage requirements can be reduced.

5.0 HYDROLOGIC & HYDRAULIC MODELING

The performance of the proposed storm drainage system for the site was evaluated using the ‘*Autodesk Storm and Sanitary Analysis’* (SSA) hydrologic / hydraulic model. To maintain compatibility with the previously developed Phase 1-4 models (each of which built in SSA), the Phase 5 model was also developed in SSA.

5.1 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 Ottawa Design Guidelines - Sewer (October 2012).

3 Hour Chicago Storms:
5-year 3hr Chicago storm
100-year 3hr Chicago storm
100-year 3hr +20% Chicago storm

12 Hour SCS Type II Storms:
5-year 12 hour SCS Type II storm
100-year 12 hour SCS Type II storm
100-year 12 hour +20% SCS Type II storm

The 3-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 3-hour Chicago design storm that has a 20% higher intensity and total volume compared to the 100-year event.

Model results from all storm distributions are provided on the enclosed CD.

5.2 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 right-of-way during the 100-year event; and
- Determine the total major and minor system runoff from the site to Pond 6.

The model uses ‘conveyance links’ to model all minor and major systems during analysis. The conveyance links allow you to input the appropriate road cross sections in the open channel option so during the analysis the major system is modelled correctly. The conveyance links are connected to ‘junctions’ and ‘storm inlets’ which represent the gutter grades at selected points, catchbasins in sags *(low points)* and overtopping points *(high points)*. The major system *(road network)* corresponds to the grading plan of the proposed site. The junctions, inlets and conveyance links are used to determine the flows, velocities and ponding depths at specific points on the road. The road networks on the plan and profile drawings are used to create the major system model using all slopes and grades for the site.

The model is capable of accounting for both static and dynamic storage within the rights-of-way, 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.

5.2.1 Storm Drainage Area Plan

The Fernbank Crossing subdivision 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 108180-19-STM** in **Appendix D**.

Due to the updated design for Fernbank Phase 5, the drainage areas for a portion of Fernbank Phase 4 have been updated. The following areas have changed or moved since the submission of the Fernbank Phase 4 SWM Report **[10]**: 646 ,647, 648, and 650.

5.2.2 Subcatchment Model Parameters

The hydrologic parameters for each subcatchment were developed based on the Land Use Plan (**Figure 2**) and the Storm Drainage Area Plan specified above. An overview of the modeling parameters is provided in **Table 5.1**. Supporting calculations are provided in **Appendix B**.

Table 5.1: Hydrologic Modeling Parameters (Phase 5)

Area ID	Catchment Area (ha)	Runoff Coefficient	Percent Impervious (%)	No Depression (%)	Equivalent Width (m)	Average Slope (%)
633	1.78	0.80	86%	10%	120	0.50
644	0.17	0.70	71%	50%	60	1.00
645	0.24	0.70	71%	40%	60	0.80
646	0.17	0.70	71%	40%	55	2.20
647	0.17	0.70	71%	20%	55	0.73
648	0.27	0.70	71%	30%	105	2.30
649	0.21	0.70	71%	40%	80	1.30
650	0.10	0.70	71%	30%	60	1.30
651	0.21	0.60	57%	100%	90	1.00
652	0.35	0.65	64%	50%	150	0.70
653	0.16	0.70	71%	50%	50	0.85
654	0.33	0.65	64%	50%	95	0.65
655	0.14	0.65	64%	50%	45	3.50
656	0.10	0.65	64%	50%	30	3.00
657	0.05	0.60	57%	100%	26	0.50
658	0.15	0.60	57%	100%	60	0.50
659	0.20	0.60	57%	100%	112	0.50
660	0.22	0.60	57%	100%	150	0.50
661	0.09	0.70	71%	0%	40	1.30

[1]Equivalent widths are calculated using the methods described in the OSDG

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 City of Ottawa **[6]** were used for all catchments.

Horton's Equation:
$f(t) = f_c + (f_o - f_c)e^{-k(t)}$

Initial infiltration rate: $f_o = 76.2$ mm/hr
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 City of Ottawa **[6]** 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, October 2012, Section 5.4.5.6*.

<u>*Impervious Values*</u>

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:

$$C = 0.90(\% \text{ IMP}) + 0.20(1 - \% \text{ IMP})$$

To check that the impervious values used in the design are appropriate, the impervious value for a typical lot was calculated for each land use and compared to the values used in the design. The results of this analysis indicate that the Runoff Coefficients and impervious values used in the stormwater management design are slightly higher than the calculated values and therefore represent a slightly conservative design. Supporting calculations are provided in **Appendix B**.

5.2.3 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%

5.2.4 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.

5.2.5 Park & Ride Facility

The model developed for Phases 1-5 of the Fernbank Crossing subdivision must account for inflows from all future phases, as well as inflows from adjacent development. Where detailed information does not exist, the following assumptions were made in developing the model:

- The maximum release rate for the proposed park and ride facility was established as 150L/s/ha as per the community design plan.

5.2.6 Modeling Files / Schematic

The modeling files and model schematics are provided in **Appendix C**. Individual model files for each storm event have been included. Digital copies of the modeling files and model output for all storm events are provided on the enclosed CD.

5.3 Results of Hydrologic 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.

5.3.1 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 5.2**.

Table 5.2: Inlet Control Device Sizes and Design Flows

Structure	ICD Size & Inlet Rate						5-year Peak Flow to CB** (L/s)
	Diameter 1 (mm)	Diameter 2* (mm)	T/G (m)	Invert (m)	Max Head (m)	Calculated 5-yr Capture Rate (L/s)	
ROW CBs							
CB187-188	83	83	104.59	103.19	1.36	35	38
CB189-190	94	94	105.54	104.14	1.35	44	49
CB191-192	83	83	105.51	104.11	1.36	35	35
CB193-194	102	102	104.37	102.97	1.35	52	60
CB195	83	0	103.82	102.42	1.36	17	27
Rear Yard CBMHs							
RYCB09	83	0	105.96	103.32	2.60	24	8
RYCB11	108	0	105.17	103.51	1.61	32	46
CBMH16	83	0	104.28	102.53	1.71	19	25

**Diameter 2 only specified where catchbasins are not interconnected*
***From SSA Model, 5-year 3-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.

5.3.2 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 Pond 6 as described in **Table 5.3**. The 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, the product of depth x velocity will be less than 0.60, and major system flows will be confined to the rights-of-way with no encroachment onto private property.

Table 5.3 also provides the model results for a 20% increase in the 100-year design event. 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. An expanded table of the ponding depths at low points in the roadway (including the stress-test event) is provided in **Appendix B**.

Table 5.3: Overland Flow Results (100-year Event)

Location/ Structure ID	T/G	Max. Static Ponding (Spill Depth)		100-yr Event (3hr)			
		Elev.	Depth	Total Dynamic Depth	Peak Flow	Velocity	Velocity * Depth
	(m)	(m)	(m)	(m)	(cms)	(m/s)	(m^2/s)
CB187-188	104.59	N/A	N/A	0.06	0.08	0.55	0.03
CB189-190	105.54	105.70	0.16	0.15	0.10	0.00	0.00
CB191-192	105.51	105.58	0.07	0.15	0.07	0.14	0.02
CB193-194	104.37	104.50	0.13	0.17	0.13	0.19	0.03
CB195	103.82	N/A	N/A	0.06	0.08	0.55	0.03
26+077	N/A	N/A	N/A	0.02	0.02	0.19	0.00
26+115	N/A	N/A	N/A	0.00	0.00	0.00	0.00
26+185	N/A	N/A	N/A	0.00	0.00	0.00	0.00

(1) N/A denotes catchbasin pairs on a continuous grade that do not have a static ponding depth.

5.3.3 Hydraulic Grade Line

The Phase 5 model has been integrated with the existing Fernbank Phase 1-4 SSA model. By integrating the models, the HGL elevations within the proposed Phase 5 development and downstream in Phase 3 and 4 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 is indicated on the Plan and Profile Drawings (submitted separately). The 100-year HGL elevations at each storm manhole with the respected underside of footing are provided in **Table 5.4**.

An expanded table showing the results of the stress test (100-year +20% event) and the HGL elevations for Phases 3 and 4, and Cope Drive is provided in **Appendix C**. The stress test indicates that the HGL elevations will be below the USF elevations for this event.

Table 5.4: 100-year HGL Elevations

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	100yr-3hr HGL Elevation (m)	Design USF (m)	Clearance (100yr) (m)
HGL - Phase 5					
501	100.81	104.24	101.32	102.87	1.55
503	102.36	105.84	102.68	103.90	1.22
505	102.58	105.79	102.98	103.90	0.92
507	102.43	105.69	102.32	103.78	1.46
509	101.97	105.63	103.17	104.03	0.86
HGL - Phase 4					
301	96.64	101.51	98.86	99.86	1.00
303	97.86	101.65	99.04	100.06	1.02
305	98.10	101.88	99.39	100.16	0.77
307	98.29	102.09	99.66	100.26	0.60
309	100.67	103.82	101.14	101.77	0.63
311	98.65	102.41	99.81	100.41	0.60
313	98.62	102.41	100.03	100.48	0.45
315	99.13	102.38	100.12	100.66	0.54
317	99.50	102.38	100.14	100.81	0.67
319	99.06	102.99	100.32	100.85	0.53
321	102.54	105.45	102.71	103.37	0.66
323	99.38	103.21	100.47	101.45	0.98
325	99.72	103.29	100.67	101.68	1.01
327	99.82	103.33	100.73	101.68	0.95
329	100.39	103.84	101.12	102.10	0.98
333	101.67	105.03	101.67	102.90	1.23

6.0 EROSION AND SEDIMENT CONTROL

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 Erosion and Sediment Control Plan (108180-15-ESC) provided in **Appendix D**.

- All erosion and sediment control measures are to be installed to the satisfaction of the engineer, the municipality and the conservation authority prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and remain present during all phases of site preparation and construction.
- A qualified inspector should conduct daily visits during construction to ensure that the contractor is working in accord with the design drawings and that mitigation measures are being implemented as specified.
    - A light duty silt fence barrier is to be installed in the locations shown on the Erosion and Sediment Control Plan.
    - Filter cloth bags/ inserts are to be placed in all catchbasins and structures within the construction area.
    - After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.
- The contractor shall ensure that proper dust control is provided with the application of water (and if required, calcium chloride) during dry periods.
- The contractor shall immediately report to the engineer or inspector any accidental discharges of sediment material into any ditch or sewer system. Appropriate response measures shall be carried out by the contractor without delay.
- The contractor acknowledges that failure to implement erosion and sediment control measures may result in penalties imposed by any applicable regulatory agency.

7.0 CONCLUSIONS AND RECOMMENDATIONS

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 Ottawa City Council on June 24, 2009.

The conclusions based on the results of the stormwater management analysis are as follows:

Storm Drainage / Conveyance

- Storm sewers (minor system) have been designed to convey the 5-year post-development peak flow for the proposed development.
- Inflows to the minor system will be controlled using inlet control devices (ICDs).
- The site has been graded to provide an overland flow route along the road network.
- Overland flows during the 100-year event will not exceed a maximum flow depth of 0.35m within the right-of-way. The product of depth x velocity will be less than 0.6.
- A minimum clearance of 0.30m will be provided between the 100-year hydraulic grade line (HGL) and the designed underside of footing elevations.

Stormwater Management

- Water quality and quantity control for the Fernbank Crossing subdivision (including the Phase 5 lands) will be provided by Fernbank Pond 6 located at the headwaters of the Monahan Drain.
- Pond 6 will control post-development flows to the Monahan Drain to pre-development levels for all storms up to and including the 100-year event.
- Pipes connecting rear yard catchbasins will be perforated to promote infiltration and reduce the volume of storm runoff to Pond 6.

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

NOVATECH

Prepared by

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

Reviewed by

Michael Petepiece, P.Eng.
Senior Project Manager | Water Resources

References

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

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

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

4. “Additional Test Pits East Portion of Brookfield Property, Fernbank Community Design, Ottawa, Ontario” Houle Chevrier Engineering Ltd. [Report No. 08-601, December 2008]

5. “Geotechnical Investigation, Fernbank Crossing Residential Subdivision Phase 3 and 4, Ottawa, Ontario” Houle Chevrier Engineering Ltd. [Report No. 14-482, December 2014]

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

7. “Standard Tender Documents, Material Specifications and Standard Detail Drawings” City of Ottawa, Department of Infrastructure Services and Community Sustainability [March 31, 2009]

8. “Fernbank Crossing Stormwater Management Report (Phases 1&2)”, Novatech Engineering Consultants Ltd. [August 17, 2012]

9. “Fernbank Crossing – Phase 3 Stormwater Management Report”, Novatech [July 13, 2015]

10. “Fernbank Crossing – Phase 4 Stormwater Management Report”, Novatech [February 8, 2018]

11. “Technical Bulletin PIEDTB-2016-01 Revisions to Ottawa Design Guidelines – Sewer”, City of Ottawa [September 6, 2016]

12. “Servicing Design Brief (Phase 5) – Abbott-Fernbank Holdings Inc. Fernbank Crossing”, Novatech [December 7, 2018]

Appendix A
Draft Conditions (SWM)

File: D07-16-09-0034

MENU OF CONDITIONS
FOR DRAFT APPROVAL
Abbott-Fernbank CORPORATION
Fernbank Road

DRAFT APPROVED 24/02/2012
REVISED 11/06/2013
REVISED AND EXTENDED 30/10/ 2015

INDEX

Manager, Planning and Growth Management.

106. The Owner agrees to enter into an agreement with the Ottawa Catholic School Board for the reservation of the designated school site known as Block 533 on the draft plan of subdivision for a period of up to seven years from the date of registration of the plan which contains the school site. The agreement shall address matters such as use of the site for construction by the Owner, and the condition the site must be in at the time of transfer.

Ottawa Catholic School Board

107. The Owner acknowledges and agrees to erect a 1.8 metres chain link fence along the property line between the Ottawa Catholic School Board's designated elementary school site and any adjacent residential or non-residential properties. The fences will not contain any gated access to the school site.

Ottawa Catholic School Board

Archaeology

108. ARC 1

(i) The Owner acknowledges having been required to retain a licensed consultant archaeologist to undertake an archaeological assessment of the entire property, including 1:10,000 scale mapping, "Archaeological Site Record" and report(s);

(ii) The Owner agrees to implement the recommendations of the approved assessment, including mitigation, through preservation or removal and documentation of archaeological resources; and

(iii) The Owner agrees that no site works shall take place until any archaeological resource conservation concerns have been addressed.

All of the above noted conditions shall be to the satisfaction of the Ministry of Culture and the General Manager, Planning and Growth Management.

OTTAWA Planning MTCS (Ministry provides written clearance to the City prior to registration, usually at the request of the applicant.)

Stormwater Management

109. SW1 The Owner shall provide to the General Manager, Planning and Growth Management any and all stormwater reports that may be required by the City for approval prior to the commencement of any works in any phase of the Plan of Subdivision. Such reports shall be in accordance with any watershed or subwatershed studies, conceptual stormwater reports, City or Provincial standards, specifications and guidelines. The reports shall include, but not be limited to, the provision of erosion and sedimentation control measures, implementation or phasing requirements of interim or permanent measures, and all stormwater monitoring and testing requirements. All reports shall be to the satisfaction of the General Manager, Planning and Growth Management.

OTTAWA Planning RVCA

110. SW2 (a) Prior to the commencement of construction of any phase of this Subdivision (roads, utilities, any off site work, etc.) the Owner shall:

i. have a Stormwater Management Plan and an Erosion and Sediment Control Plan prepared by a Professional Engineer in accordance with Current Best Management Practices,

OTTAWA Planning

ii. have said plans approved by the General Manager, Planning and Growth Management, and
iii. provide certification to the General Manager, Planning and Growth Management through a Professional Engineer that the plans has been implemented.

(b) Any changes made to the Plan shall be submitted to the satisfaction to the City of Ottawa and the Conservation Authority.

(c) The Owner shall implement an inspection and monitoring plan to maintain erosion control measures.

111. SW3	On completion of all stormwater works, the Owner shall provide certification to the General Manager, Planning and Growth Management through a Professional Engineer that all measures have been implemented in conformity with the approved Stormwater Site Management Plan.	**OTTAWA Planning**
112. SW4	Prior to the registration, or the making of an application for a Ministry of Environment Certificate of Approval for any stormwater works, whichever event first occurs, the Owner shall prepare a Stormwater Site Management Plan in accordance with a Conceptual Stormwater Site Management Plan (specified by title of plan, date). The Stormwater Site Management Plan shall identify the sequence of its implementation in relation to the construction of the subdivision and shall be to the satisfaction of the General Manager, Planning and Growth Management and the (Specify) Conservation Authority.	**OTTAWA Planning and CA**
113. SW5	The Owner shall maintain the stormwater management pond in accordance with the recommendations of the Stormwater Management Plan and to the satisfaction of the General Manager, Planning and Growth Management until such time as the stormwater management pond has been given Final Acceptance and assumed by the City of Ottawa.	**OTTAWA Planning**
114. SW6	The Owner shall design and construct, as part of the stormwater management infrastructure, at no cost to the City, a monitoring facility or facilities and vehicular access to the satisfaction of the General Manager, Planning and Growth Management.	**OTTAWA Planning**
115. SW7	The Owner agrees that the development of the Subdivision shall be undertaken in such a manner as to prevent any adverse effects, and to protect, enhance or restore any of the existing or natural environment, through the preparation of any storm water management reports, as required by the City. All reports are to be approved by the General Manager, Planning and Growth Management prior to the commencement of any Works.	**OTTAWA Planning**
116. SW8	The Owner covenants and agrees that the following clause shall be incorporated into all agreements of purchase and sale for the whole or any part of a lot or block on the Plan of Subdivision, and registered separately against the title:	**OTTAWA Legal**

"The Owner acknowledges that some of the rear yards within this subdivision are used for on-site storage of infrequent storm events. Pool installation and/or grading alterations on some of the lots may not be permitted and/or revisions to the approved Subdivision Stormwater Management Plan Report may be required to study the possibility of pool installation on any individual lot. The Owner must obtain approval of the General Manager, Planning and Growth Management of the City of Ottawa prior to undertaking any grading alterations."

117. The Owner shall acknowledge and agree in the subdivision agreement that the agricultural tile drains encountered during construction shall be decommissioned/removed in accordance with the direction provided in the Fernbank Community Design Plan Environmental Management Plan, as approved by Council June 24, 2009. **OTTAWA Planning**

118. The Owner acknowledges and agrees that prior to early servicing and prior to final approval and registration, a detailed stormwater site management plan in accordance with the Fernbank Community Design Plan, Master Servicing Study and Environmental Management Plan, as approved by Council June 24, 2009 shall be prepared and accepted by the City of Ottawa and Rideau Valley Conservation Authority. The final design shall satisfy the requirements for the receiving stream flow quantity and quality as they relate to natural channel design and the protection of fish habitat and maintenance of the existing hydrological characteristics. The final design shall also account for upstream drainage, including areas serviced by agricultural tiles drains in accordance with the Fernbank Community Design Plan, Master Servicing Study and Environmental Management Plan, as approved by Council June 24, 2009. **OTTAWA Planning**

119. Prior to early servicing and final approval and registration, the Owner shall provide an implementation/staging plan that clearly describes the coordination between the construction of the Pond 6 stormwater management facility and its outlet, related stormwater infrastructure and the undertaking of modifications and improvement works to the Monahan Drain as described in Section 11.9, 11.9.1 & 11.9.2 of the Fernbank Community Design Plan Environmental Management Plan, as approved by Council June 24, 2009. **OTTAWA Planning**

120. The Owner acknowledges and agrees that the proposed stormwater Pond identified as Pond 6 and the outlet to the downstream Monahan Drain shall require an application and approval under Ontario Regulation 174/06 under Section 28 of the Conservation Authorities Act "Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation" prior to undertaking said works. Any applications received in this regard would be assessed within the context of approved policies for the administration of the regulation, including those for the protection of fish habitat. **OTTAWA Planning RVCA**

121. The Owner acknowledges and agrees that the design and construction of the stormwater management facility identified as Pond 6 requires the concurrence and coordination with the adjacent landowner to the west. The **OTTAWA Planning**

Owner shall provide the General Manager, Planning and Growth Management written verification from the abutting owner that there is an agreement with respect to design and construction of Pond 6.

122.	Prior to early servicing and final approval and registration, a report documenting the process for undertaking the construction of the stormwater management facility identified as Pond 6 in coordination with the adjacent landowner to the west shall be prepared to the satisfaction of the Rideau Valley Conservation Authority and the City of Ottawa.	**OTTAWA Planning RVCA**
123.	The Owner acknowledges and agrees that the stormwater management facility identified as Pond 6 is constructed and operational prior to the commissioning of the stormsewers within the plan of subdivision.	**OTTAWA Planning**

<u>Sanitary Services</u>

124. SS1	The Owner shall submit detailed municipal servicing plans, prepared by a Civil Engineer licensed in the Province of Ontario, to the General Manager, Planning and Growth Management.	**OTTAWA Planning**
125. SS2	Where the Owner is required under this Agreement to provide and install sanitary sewers of a diameter larger and/or at a greater depth than would be required to service the area to be developed, as detailed in the approved plans of this agreement, the Owner shall convey to the City such 0.3m reserves as may be necessary to prevent the owners and developers of adjacent lands from making connections to the sanitary sewers installed by the Owner. Insofar as it legally may, the City will require other persons connecting to the sewer to pay an equitable share of the cost thereof to the Owner, the amount of which payment shall be determined by the General Manager, Planning and Growth Management.	**OTTAWA Planning**
126. SS3	Where the Owner is required under this Agreement to provide the oversize and/or over-depth storm sewers or open drains in order to make provisions for later development of upstream lands not owned by the Owner herein, as referred to in the approved plans, the City shall, insofar as it legally may, require that payment shall be made by the Owner of such upstream undeveloped land which will utilize the said storm sewers as an outlet(s), prior to the approval of a Plan of Subdivision for such land by the City, the amount of which shall be determined by the General Manager, Planning and Growth Management.	**OTTAWA Planning**
127. SS4	As the Owner proposes a road allowance(s) of less than 20 meters, and if the Owner also proposed boulevards between 4.0 and 5.0 meters wide, the Owner shall meet the following requirements: a) extend water, sanitary, and storm services a minimum of 2.0 meters onto private property during installation before being capped; b) install hydro high voltage cable through the transformer foundations to maintain adequate clearance from the gas main;	**OTTAWA Planning**

Appendix B
SWM Calculations & Design Sheets

- *Storm Sewer Design Sheet*
- *Typical Lot Impervious Calculations*

Fernbank Crossing (Phase 5) - Storm Sewer Design Sheet (Flows Outletting to Phase 3) (Rational Method)

LOCATION / AREA

Location	From node	To node	Park N' Ride 0.80	Parks 0.40	Singles Front Yards 0.65	Singles Rear Yard 0.55	Towns/ Semis Front Yard 0.70	Towns/ Semis Rear Yard 0.60	Total Area (ha)	Weighted Runoff Coefficient
Phase 5 (Outletting to Phase 3)										
645	505	509					0.24		0.24	0.70
									0.00	
644	507	509					0.17		0.17	0.70
									0.00	
	509	CBMH15							0.00	0.00
									0.00	
633	CAP	CBMH15	1.78						1.78	0.80
									0.00	
658, 659, 730, 739	CBMH15	EX387				0.18		0.45	0.63	0.59
									0.00	

FLOW

Location	Indivi 2.78 AR	Accum 2.78 AR	Time of Concentration	Rain Intensity (mm/hr) 5yr	Rain Intensity (mm/hr) 10yr	Peak Flow (L/s)	**Total Peak Flow (Q) (L/s)**
645	0.47	0.47	10.00	104.2		48.7	**48.7**
	0.00	0.00	10.00			0.0	
644	0.33	0.33	10.00	104.2		34.5	**34.5**
	0.00	0.00	10.00			0.0	
(509–CBMH15)	0.00	0.80	11.32	97.7		78.0	**78.0**
	0.00	0.00	11.32			0.0	
633	3.96	3.96	10.00	104.2		412.5	**412.5**
	0.00	0.00	10.00			0.0	
658, 659, 730, 739	1.03	5.78	12.27	93.6		541.1	**541.1**
	0.00	0.00	12.27			0.0	

PROPOSED SEWER

Location	Pipe Type	Size (mm)	Grade (%)	Length (m)	Capacity (l/s)	Full Flow Velocity (m/s)	Time of Flow (min.)	Q/Qfull (%)
645	PVC	375	0.30	69.5	100.2	0.88	1.32	48.6%
644	PVC	300	0.40	30.5	63.8	0.87	0.58	54.0%
(509–CBMH15)	PVC	450	0.20	46.1	133.0	0.81	0.95	58.6%
633	CONC	750	0.30	5.5	636.1	1.39	0.07	64.8%
658, 659, 730, 739	CONC	900	0.20	44.3	844.6	1.29	0.57	64.1%

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, Phase 5 (108180-19)
Designed: LRW
Checked: MAB
Date: March 12 2019

NOVATECH
Engineers, Planners & Landscape Architects

Fernbank Crossing (Phase 5 and Phase 4) - Storm Sewer Design Sheet (Rational Method)

LOCATION			AREA							FLOW							PROPOSED SEWER							
Location	From node	To node	Parks	Singles Front Yards	Singles Rear Yard	Towns/ Semis Front Yard	Towns/ Semis 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
			0.40	0.65	0.55	0.70	0.60	(ha)							(L/s)	(L/s)	Type	(mm)	(%)	(m)	(l/s)	(m/s)	(min.)	(%)
Phase 5 (Outletting through Phase 4)																								
647	333	331				0.16		0.16	0.70	0.31	0.31	10.00	104.2		32.4	**32.4**	PVC	375	1.00	36.4	182.9	1.60	0.38	17.7%
								0.00		0.00	0.00	10.00			0.0									
648, 657	507	331				0.27	0.05	0.32	0.68	0.61	0.61	10.00	104.2		63.4	**63.4**	PVC	300	1.00	69.6	100.9	1.38	0.84	62.9%
								0.00		0.00	0.00	10.00			0.0									
649, 650, 660	331	329				0.31	0.22	0.53	0.66	0.97	1.89	10.84	100.0		189.0	**189.0**	PVC	450	0.75	78.0	257.6	1.57	0.83	73.4%
								0.00		0.00	0.00	10.84			0.0									
	505	503						0.00	0.00	0.00	0.00	10.00			0.0	**0.0**	PVC	250	2.00	12.4	87.7	1.73	0.12	0.0%
								0.00		0.00	0.00	10.00			0.0									
646	503	501				0.17		0.17	0.70	0.33	0.33	10.12	103.6		34.3	**34.3**	PVC	300	2.00	70.8	142.7	1.96	0.60	24.0%
								0.00		0.00	0.00	10.12			0.0									
	501	329						0.00	0.00	0.00	0.33	10.72	100.5		33.3	**33.3**	PVC	375	1.00	20.5	182.9	1.60	0.21	18.2%
								0.00		0.00	0.00	10.72			0.0									
653, 661	329	327				0.25		0.25	0.70	0.49	2.71	11.67	96.1		260.3	**260.3**	CONC	525	0.80	76.9	401.3	1.80	0.71	64.9%
								0.00		0.00	0.00	11.67			0.0									
	327	325						0.00	0.00	0.00	2.71	12.38	93.1		252.1	**252.1**	CONC	600	0.35	8.6	379.0	1.30	0.11	66.5%
								0.00		0.00	0.00	12.38			0.0									
651, 654	325	323				0.33	0.21	0.54	0.66	0.99	3.70	12.49	92.6		342.8	**342.8**	CONC	675	0.35	75.6	518.8	1.40	0.90	66.1%
								0.00		0.00	0.00	12.49			0.0									
652, 677	323	319				0.35	0.22	0.57	0.66	1.05	4.75	13.39	89.2		423.3	**423.3**	CONC	750	0.35	72.6	687.1	1.51	0.80	61.6%
								0.00		0.00	0.00	13.39			0.0									
693	321	319		0.16				0.16	0.65	0.29	0.29	10.00	104.2		30.1	**30.1**	PVC	300	4.00	69.1	201.8	2.77	0.42	14.9%
								0.00		0.00	0.00	10.00			0.0									
655, 692	319	313		0.47				0.47	0.65	0.85	5.89	14.19	86.3		507.8	**507.8**	CONC	750	0.35	81.2	687.1	1.51	0.90	73.9%
								0.00		0.00	0.00	14.19			0.0									
656	317	315		0.10				0.10	0.65	0.18	0.18	10.00	104.2		18.8	**18.8**	PVC	375	0.30	75.4	100.2	0.88	1.43	18.8%
								0.00		0.00	0.00	10.00			0.0									
681, 687, 682, 688	315	313		0.61	1.07			1.68	0.59	2.74	2.92	11.43	97.2		283.7	**283.7**	CONC	600	0.30	80.5	350.8	1.20	1.12	80.9%
								0.00		0.00	0.00	11.43			0.0									
694, 696	313	311		0.46	0.27			0.73	0.61	1.24	10.05	15.09	83.3		836.8	**836.8**	CONC	975	0.25	83.5	1169.0	1.52	0.92	71.6%
								0.00		0.00	0.00	15.09			0.0									
703	311	307		0.39				0.39	0.65	0.70	10.75	16.01	80.4		865.1	**865.1**	CONC	1050	0.25	81.9	1424.4	1.59	0.86	60.7%
								0.00		0.00	0.00	16.01			0.0									
695, 699, 707, 709, 714	309	307	1.28	0.40	0.27			1.95	0.47	2.56	2.56	10.00	104.2		266.6	**266.6**	PVC	450	1.64	119.0	380.9	2.32	0.85	70.0%
								0.00		0.00	0.00	10.00			0.0									
698, 702, 724	433	307		0.12	0.58			0.70	0.57	1.10	1.10	10.00	104.2		115.0	**115.0**	PVC	375	0.50	45.8	129.3	1.13	0.67	88.9%
								0.00		0.00	0.00	10.00			0.0									
701	307	305			0.14			0.14	0.55	0.21	14.63	16.86	78.0		1141.0	**1141.0**	CONC	1050	0.25	78.8	1424.4	1.59	0.82	80.1%
								0.00		0.00	0.00	16.86			0.0									
715	305	303		0.44				0.44	0.65	0.80	15.43	17.69	75.8		1168.9	**1168.9**	CONC	1050	0.25	84.8	1424.4	1.59	0.89	82.1%
								0.00		0.00	0.00	17.69			0.0									
725, 726	303	301		0.32	0.32			0.64	0.60	1.07	16.49	18.58	73.5		1213.0	**1213.0**	CONC	1200	0.25	54.7	2033.7	1.74	0.52	59.6%
								0.00		0.00	0.00	18.58			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, Phase 5 (108180-19)
Designed: LRW
Checked: MAB
Date: March 12, 2019

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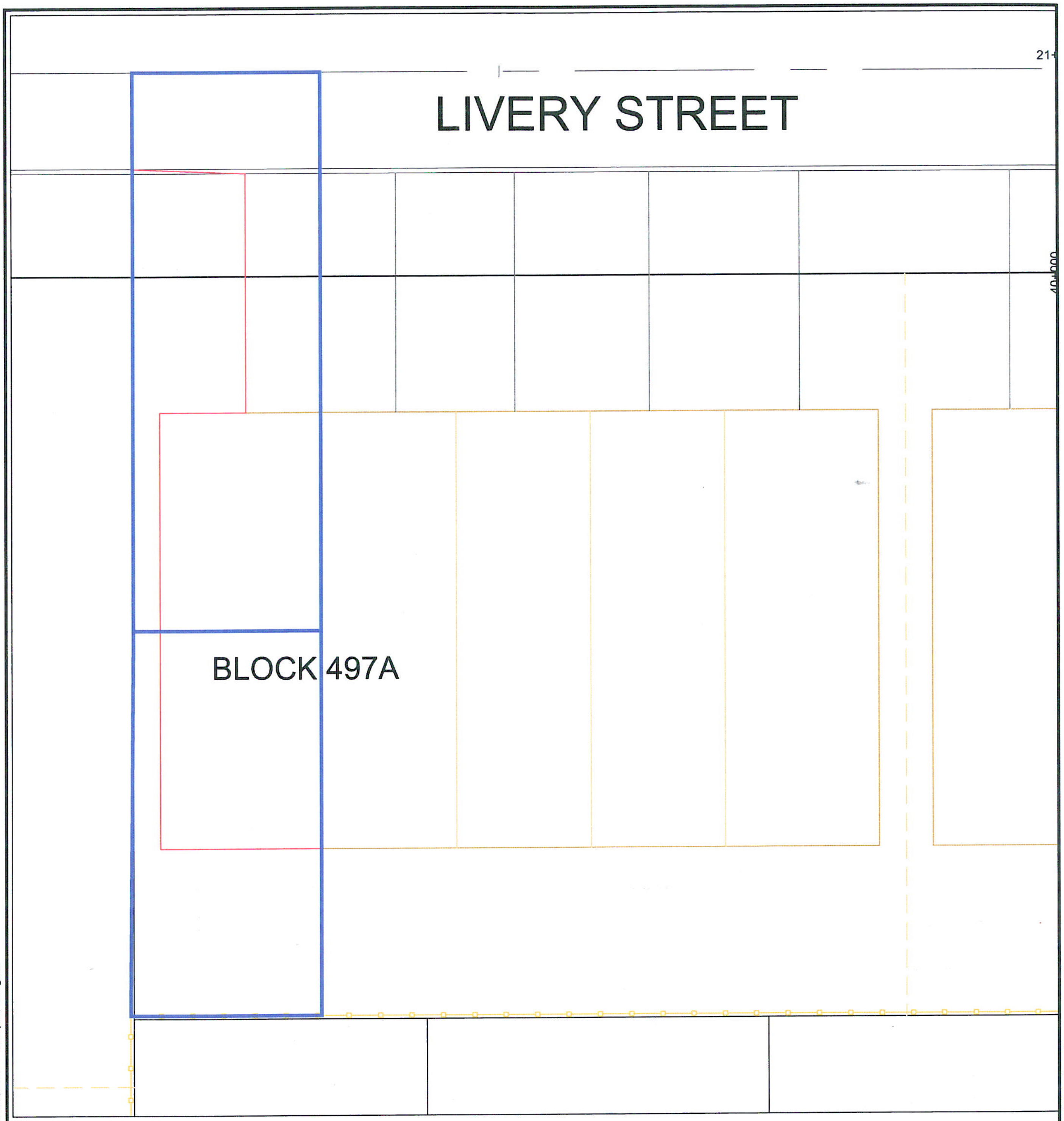
Engineers, Planners & Landscape Architects



FRONTYARD AREA = 207.151 m²
AREA OF IMPERVIOUSNESS = 141.718 m²
TOTAL IMPERVIOUSNESS = 68.4 %

REARYARD AREA = 144.070 m²
AREA OF IMPERVIOUSNESS = 69.418 m²
TOTAL IMPERVIOUSNESS = 48.2 %

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FERNBANK LANDS

EXAMPLE LOT 1 - TOWNS

JULY 2012	108180	TOWN 1

Appendix C
Autodesk Storm and Sanitary Analysis Model

- *HGL Elevations*
- *Ponding Depths*
- *ICD Chart*
- *Catchbasin Inlet Curves*
- *Catchbasin On-Grade Modeling Info.*

Schematics:

- *SSA Legend*
- *Overall Model Schematic*

Design Storms:

- *Chicago 3-hour Events*
- *SCS 12-hour Events*

Fernbank Crossing - Phase 5
Inlet Control Device Parameters

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Structure	ICD Size & Inlet Rate						5-year Peak Flow to CB** (L/s)
	Diameter 1 (mm)	Diameter 2* (mm)	T/G (m)	Invert (m)	Max Head (m)	Calculated 5-yr Capture Rate (L/s)	
ROW CBs							
CB187-188	83	83	104.59	103.19	1.36	35	38
CB189-190	94	94	105.54	104.14	1.35	44	49
CB191-192	83	83	105.51	104.11	1.36	35	35
CB193-194	102	102	104.37	102.97	1.35	52	60
CB195	83	0	103.82	102.42	1.36	17	27
Rear Yard CBMHs							
RYCB09	83	0	105.96	103.32	2.60	24	8
RYCB11	108	0	105.17	103.51	1.61	32	46
CBMH16	83	0	104.28	102.53	1.71	19	25

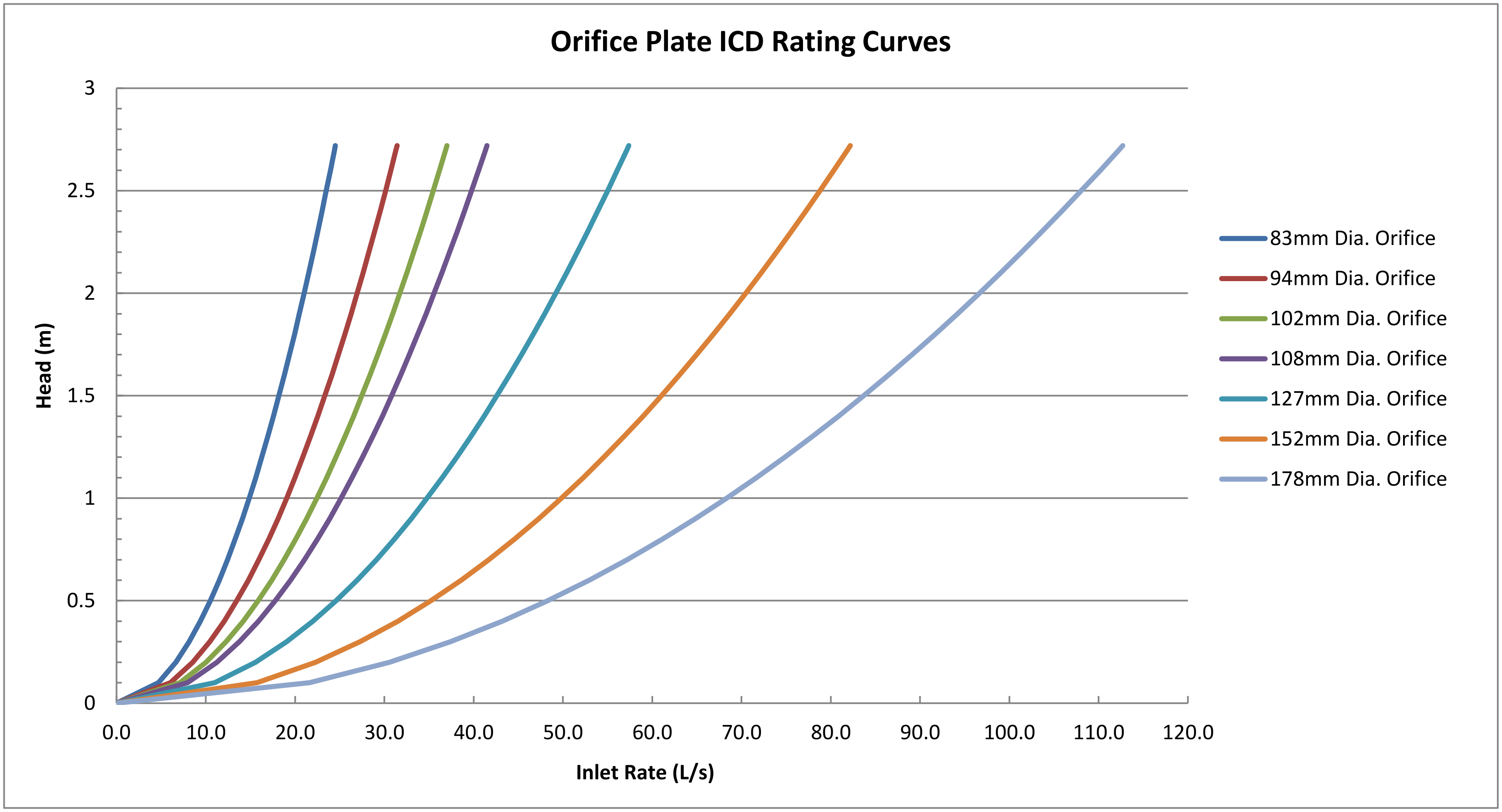
**Diameter 2 only specified where catchbasins are not interconnected*

***From SSA Model, 5-year 3-hour Chicago storm distribution*

DATE: 12/6/2018
PREPARED BY: NOVATECH

M:\2008\108180\Subdivision - Phase 5\DATA\Calculations\Sewer Calcs\SWM\SSA\108180-P5_ModelParams_R1.xlsx

Fernbank Corssing - Phase 5
ICD Rating Curves



Prepared By: Novatech Engineering Consultants
Date: 12/6/2018

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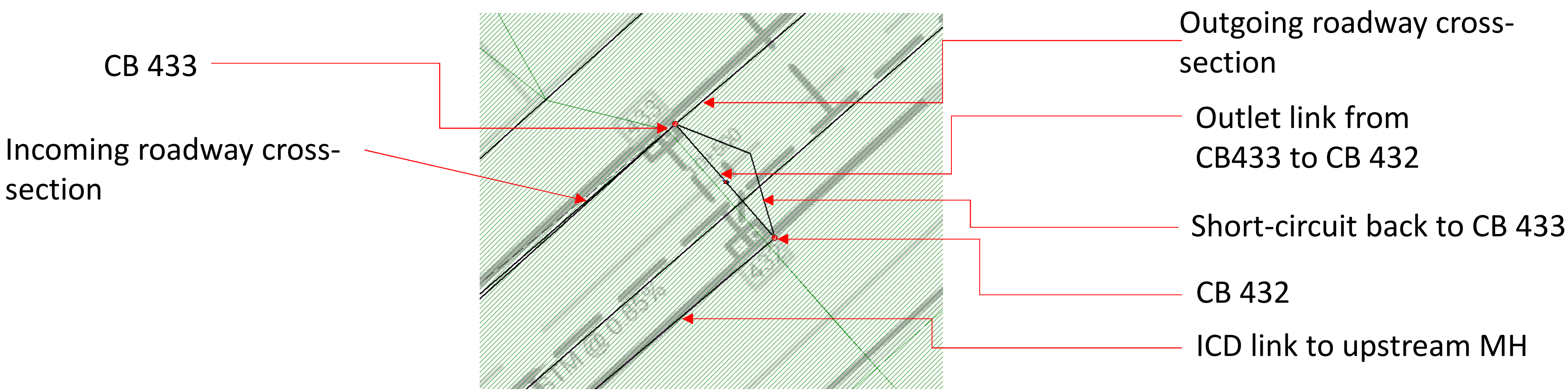
Catch basin pairs on a continuous grade modelling



The CB pair is made up of the components shown above. All flows from the catchment as well as external flows flowing down the road are directed to CB 433. Flow is then directed to an Outlet function. The outlet function is a tabular function that describes head and flow through the outlet to CB 432. This relationship was developed based on the inlet capacity of two CBs with a 3% gutter and crossfall pursuant to Appendix 7-A of the OSDG. Flows following that rating curve are directed to CB 432 where they are then directed through an orifice (as required) representing the ICD for that CB pair. In the minor system event, the outlet function controls flow into the minor system. During the major system event, the orifice controls the flow and backs water up at CB 432. This backup is why the short circuit is needed. Without it, flow simply builds on CB 432 and does not make it back to CB 433 and back down the roadway.

Fernbank Crossing - Phase 5
Ponding in Road Calculations

Structure	T/G	Max. Static Ponding (Spill Depth)		5-yr Event (3hr)				100-yr Event (3hr)				100-yr Event (+20%) (3hr)			
		Elev.	Depth	Elev.	Depth	Cascading	Cascade Depth	Elev.	Depth	Cascading	Cascade Depth	Elev.	Depth	Cascading	Cascade Depth
	(m)	(m)	(m)	(m)	(m)	Flow?	m	(m)	(m)	Flow?	(m)	(m)	(m)	Flow?	m
CB189-190	105.54	105.70	0.16	105.57	0.03	N	0.00	105.69	0.15	N	0.00	105.71	0.17	Y	0.01
CB191-192	105.51	105.58	0.07	105.49	0.00	N	0.00	105.66	0.15	Y	0.08	105.68	0.17	Y	0.10
CB193-194	104.37	104.50	0.13	104.41	0.04	N	0.00	104.54	0.17	Y	0.04	104.56	0.19	Y	0.06

Fernbank Crossing - Phase 5

HGL Elevations

NOVATECH
Engineers, Planners & Landscape Architects

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	100yr-3hr HGL Elevation (m)	100yr-3hr+20% HGL Elevation (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
HGL - Phase 5							
501	100.81	104.24	101.32	101.32	102.87	1.55	1.55
503	102.36	105.84	102.68	102.68	103.90	1.22	1.22
505	102.58	105.79	102.98	102.99	103.90	0.92	0.91
507	102.43	105.69	102.32	102.33	103.78	1.46	1.45
509	101.97	105.63	103.17	103.18	104.03	0.86	0.85
HGL - Phase 4							
301	96.64	101.51	98.86	98.91	99.86	1.00	0.95
303	97.86	101.65	99.04	99.12	100.06	1.02	0.94
305	98.10	101.88	99.39	99.52	100.16	0.77	0.64
307	98.29	102.09	99.66	99.83	100.26	0.60	0.43
309	100.67	103.82	101.14	101.16	101.77	0.63	0.61
311	98.65	102.41	99.81	100.02	100.41	0.60	0.39
313	98.62	102.41	100.03	100.26	100.48	0.45	0.22
315	99.13	102.38	100.12	100.37	100.66	0.54	0.29
317	99.50	102.38	100.14	100.40	100.81	0.67	0.41
319	99.06	102.99	100.32	100.56	100.85	0.53	0.29
321	102.54	105.45	102.71	102.71	103.37	0.66	0.66
323	99.38	103.21	100.47	100.73	101.45	0.98	0.72
325	99.72	103.29	100.67	100.94	101.68	1.01	0.74
327	99.82	103.33	100.73	101.01	101.68	0.95	0.67
329	100.39	103.84	101.12	101.27	102.10	0.98	0.83
331	101.16	104.66	101.67	101.69	102.90	1.23	1.21
333	101.67	105.03	102.05	102.05	103.20	1.15	1.15
HGL - Phase 3							
343	98.71	103.09	100.52	100.65	101.36	0.84	0.71
345	101.15	104.26	101.47	101.47	102.24	0.77	0.77
347	98.78	103.46	100.98	101.15	101.68	0.70	0.53
349	100.46	104.47	101.28	101.46	102.47	1.19	1.01
351	99.23	104.05	101.22	101.40	102.05	0.83	0.65
353	101.12	104.86	101.42	101.55	102.71	1.29	1.16
357	101.60	104.65	102.27	102.29	102.85	0.58	0.56
359	102.24	105.24	102.80	102.80	103.25	0.45	0.45
373	101.88	104.40	102.01	102.03	102.75	0.74	0.72
375	101.22	104.76	102.18	102.21	103.04	0.86	0.83
377	101.37	104.98	102.31	102.34	103.17	0.86	0.83
379	101.66	104.99	102.50	102.52	103.07	0.57	0.55
381	101.80	105.14	102.60	102.62	103.18	0.58	0.56
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	103.04	103.44	0.42	0.40
389	102.87	105.46	103.15	103.17	103.64	0.49	0.47
391	100.71	103.19	102.44	102.45	-	-	-
393	101.13	103.91	101.47	101.47	101.88	0.41	0.41
395	98.90	103.18	100.66	100.80	101.44	0.78	0.64
397	100.09	103.94	101.29	101.46	102.05	0.76	0.59
399	100.71	104.22	101.36	101.55	102.34	0.98	0.79
417	99.89	103.87	101.31	101.47	102.12	0.81	0.65
419	102.04	104.86	102.77	102.79	103.30	0.53	0.51

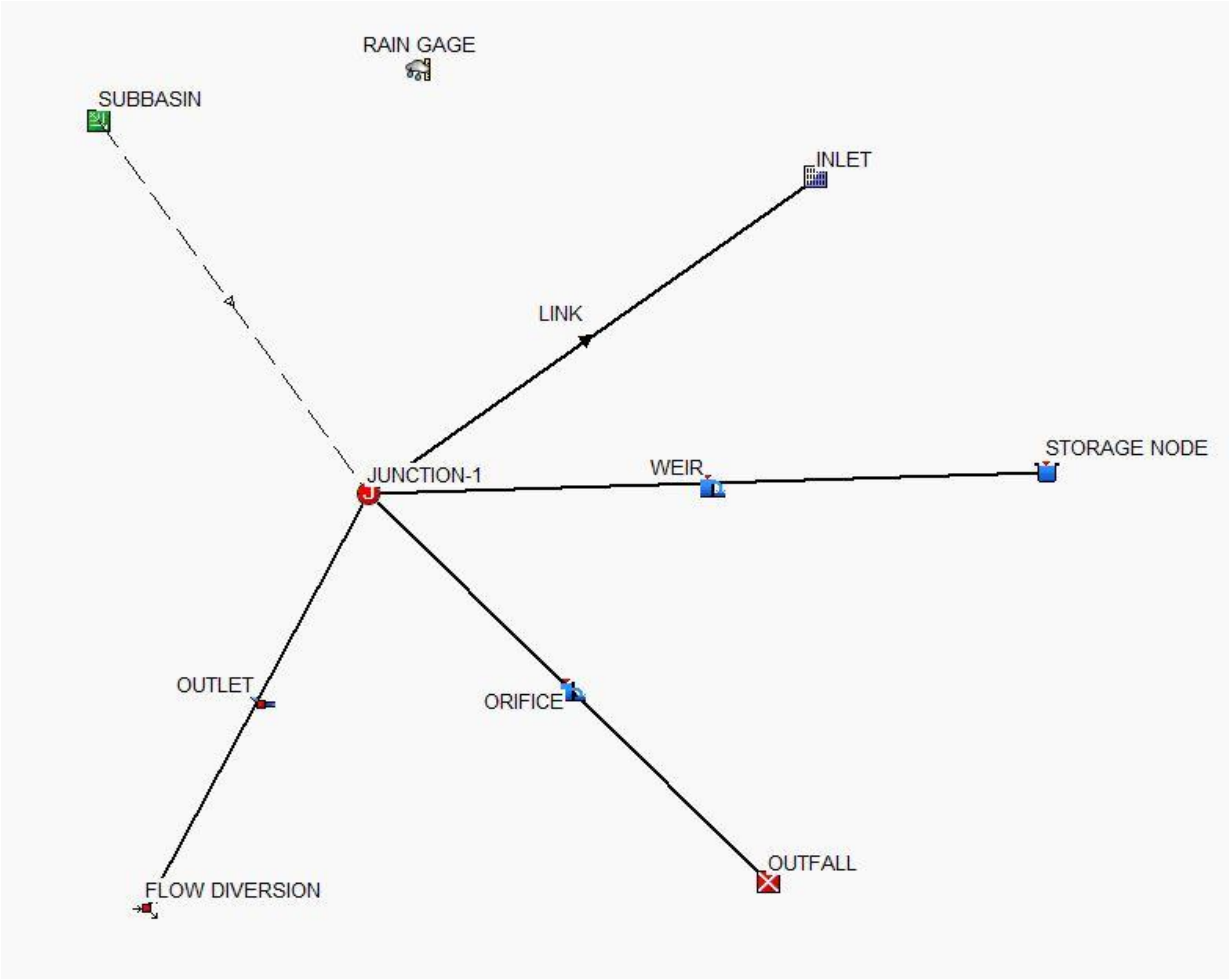
Fernbank Crossing - Phase 5

HGL Elevations

NOVATECH
Engineers, Planners & Landscape Architects

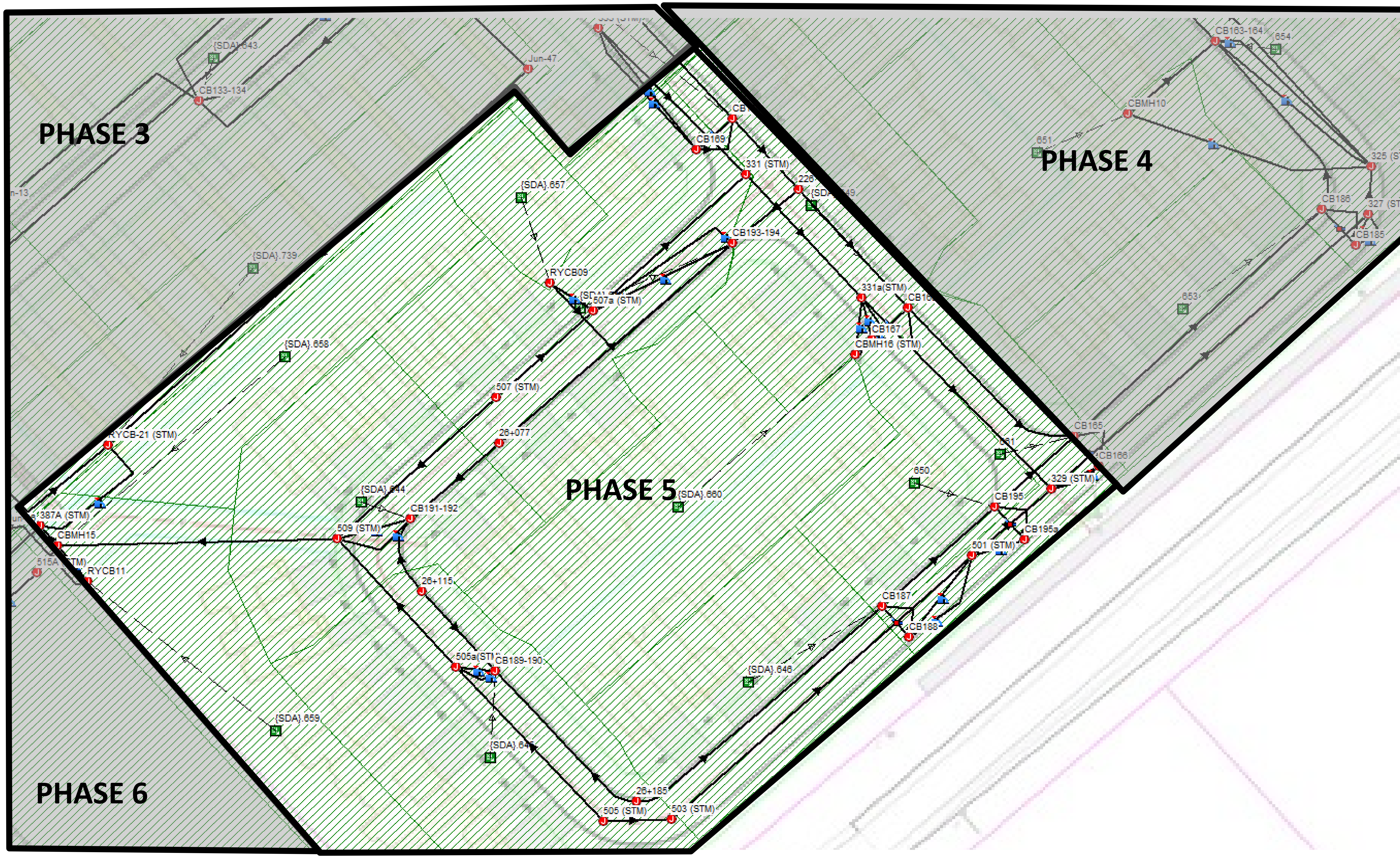
Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	100yr-3hr HGL Elevation (m)	100yr-3hr+20% HGL Elevation (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
HGL - Cope Drive							
301	96.94	101.51	98.86	98.91	99.86	1.00	0.95
335	96.66	101.86	99.21	99.28	100.05	0.84	0.77
337	96.79	102.14	99.47	99.55	100.30	0.83	0.75
339	96.90	102.43	99.68	99.77	100.55	0.87	0.78
341	97.32	102.85	100.09	100.21	101.23	1.14	1.02
361	99.03	103.65	100.83	100.99	101.87	1.04	0.88
363	100.40	104.46	101.51	101.59	102.41	0.90	0.82
365	101.02	104.46	101.95	101.95	102.50	0.55	0.55
367	101.34	104.59	102.08	102.08	102.67	0.59	0.59
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	102.45	-	-	-
M97	96.25	101.00	98.44	98.47	99.86	1.42	1.39
M98	95.80	100.75	98.15	98.16	99.86	1.71	1.70

Fernbank Crossing - Phase 5
SSA Legend



Fernbank Crossing - Phase 5
Overall Model Schematic

NOVATECH
Engineers, Planners & Landscape Architects



Fernbank Crossing - Phase 5
Design Storm Time Series Data
3-hour Chicago Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

C25mm-3.stm		C2-3.stm		C5-3.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	2.21	0:10	2.81	0:10	3.68
0:20	2.75	0:20	3.5	0:20	4.58
0:30	3.68	0:30	4.69	0:30	6.15
0:40	5.73	0:40	7.3	0:40	9.61
0:50	14.29	0:50	18.21	0:50	24.17
1:00	60.28	1:00	76.81	1:00	104.19
1:10	18.9	1:10	24.08	1:10	32.04
1:20	9.7	1:20	12.36	1:20	16.34
1:30	6.53	1:30	8.32	1:30	10.96
1:40	4.94	1:40	6.3	1:40	8.29
1:50	3.99	1:50	5.09	1:50	6.69
2:00	3.37	2:00	4.29	2:00	5.63
2:10	2.92	2:10	3.72	2:10	4.87
2:20	2.58	2:20	3.29	2:20	4.3
2:30	2.32	2:30	2.95	2:30	3.86
2:40	2.1	2:40	2.68	2:40	3.51
2:50	1.93	2:50	2.46	2:50	3.22
3:00	1.79	3:00	2.28	3:00	2.98

Fernbank Crossing - Phase 5
Design Storm Time Series Data
3-hour Chicago Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

C100-3.stm			C100-3+20%.stm	
Duration	Intensity		Duration	Intensity
min	mm/hr		min	mm/hr
0:00	0		0:00	0
0:10	6.05		0:10	6:14
0:20	7.54		0:20	9.05
0:30	10.16		0:30	12.19
0:40	15.97		0:40	19.16
0:50	40.65		0:50	48.78
1:00	178.56		1:00	214.27
1:10	54.05		1:10	64.86
1:20	27.32		1:20	32.78
1:30	18.24		1:30	21.89
1:40	13.74		1:40	16.49
1:50	11.06		1:50	13.27
2:00	9.29		2:00	11.15
2:10	8.02		2:10	9.62
2:20	7.08		2:20	8.5
2:30	6.35		2:30	7.62
2:40	5.76		2:40	6.91
2:50	5.28		2:50	6.34
3:00	4.88		3:00	5.86

Fernbank Crossing - Phase 5
Design Storm Time Series Data
SCS Design Storms

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

Appendix D
Drawings

- *Draft Plan of Subdivision* *(Annis, O'Sullivan, Vollebekk)*
- *General Plan* *108180-19-GP*
- *Grading Plan* *108180-19-GR*
- *Storm Drainage Area Plans* *108180-19-STM*
- *Erosion and Sediment Control Plan* *108180-19-ESC*

`

APPROVED UNDER SECTION 51 OF THE PLANNING ACT
BY THE CITY OF OTTAWA.

THIS ________ DAY OF ____________________ , 20_____

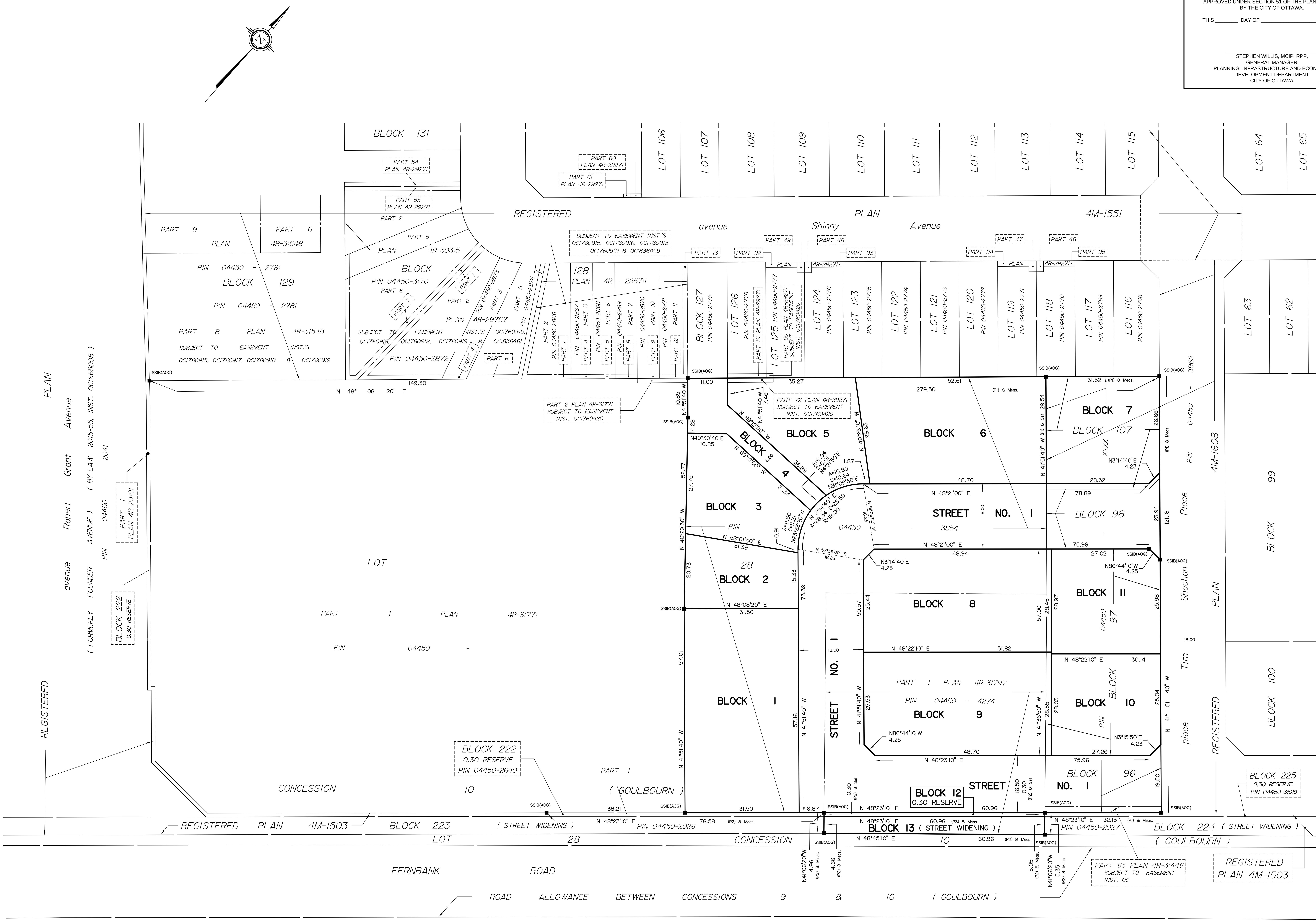
STEPHEN WILLIS, MCIP, RPP,
GENERAL MANAGER
PLANNING, INFRASTRUCTURE AND ECONOMIC
DEVELOPMENT DEPARTMENT
CITY OF OTTAWA

PLAN 4M-

I CERTIFY THAT THIS PLAN
IS REGISTERED IN THE LAND REGISTRY OFFICE
FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON NO. 4
AT _ _ _ _ _ O'CLOCK ON THE _ _ _ _ DAY OF _ _ _ _ _ _ _ _ _ _, _ _ _ _
AND ENTERED IN THE PARCEL REGISTER FOR
PROPERTY IDENTIFIERS _
_ _
AND THE REQUIRED CONSENTS ARE REGISTERED AS
PLAN DOCUMENT NO._ _ _ _ _ _ _ _ _ _ _ _

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
LAND REGISTRAR

This plan comprises all of PIN .



PLAN OF SUBDIVISION OF

PART OF LOT 28
CONCESSION 10

Geographic Township of Goulbourn
And

BLOCKS 96, 97, 98 And 107
REGISTERED PLAN 4M-1608
CITY OF OTTAWA

Surveyed by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 500

20 15 10 5 0 10 20 Metres

Metric

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

Surveyor's Certificate

I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act and the Land Titles Act and the regulations made under them.
2. The survey was completed on the _ _ day of _ _ _ _ _ _ _ _ _, 2019.

_ _ _ _ _ _ _ _ _ _ _
Date

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
Andre Roy
Ontario Land Surveyor

OWNER'S CERTIFICATE

THIS IS TO CERTIFY THAT :

1. Blocks 1 to 11, both inclusive, the Street, namely, Street No. 1, the Street Widening, namely, Block 13 and the Reserve, namely, Block 12 have been laid out in accordance with our instructions.
2. The Street and Street Widening are dedicated to City of Ottawa as public highways.

Dated the _ _ _ _ day
of _ _ _ _ _ _ _ _ _, 2019

_ _
Steven Gordon, President
Abbott - Fernbank Holdings Inc.
I have the authority to bind the corporation.

NOTES AND LEGEND

—□—	denotes	Survey Monument Planted.
—■—	"	Survey Monument Found
SIB	"	Standard Iron Bar.
SSIB	"	Short Standard Iron Bar.
CC	"	Cut Cross.
IB	"	Iron Bar.
CLF	"	Chain Link Fence
BF	"	Board Fence
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(P1)	"	Plan
(P2)	"	Plan
(P3)	"	Plan

All planted survey monuments are IB's unless otherwise noted.

Distances shown on curved limits are Arc distances unless otherwise noted.

Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.99997.

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS observations on reference points A and B, shown hereon, having a bearing of N 41°03'50" W and are referenced to Specified Control Points 01919750705 and 01919770923, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

Coordinates are derived from Can-Net 3.0 Real Time Network GPS observations referenced to Specified Control Points 01919750705 and 01919770923, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

Coordinate values are to urban accuracy in accordance with O. Reg. 216/10.

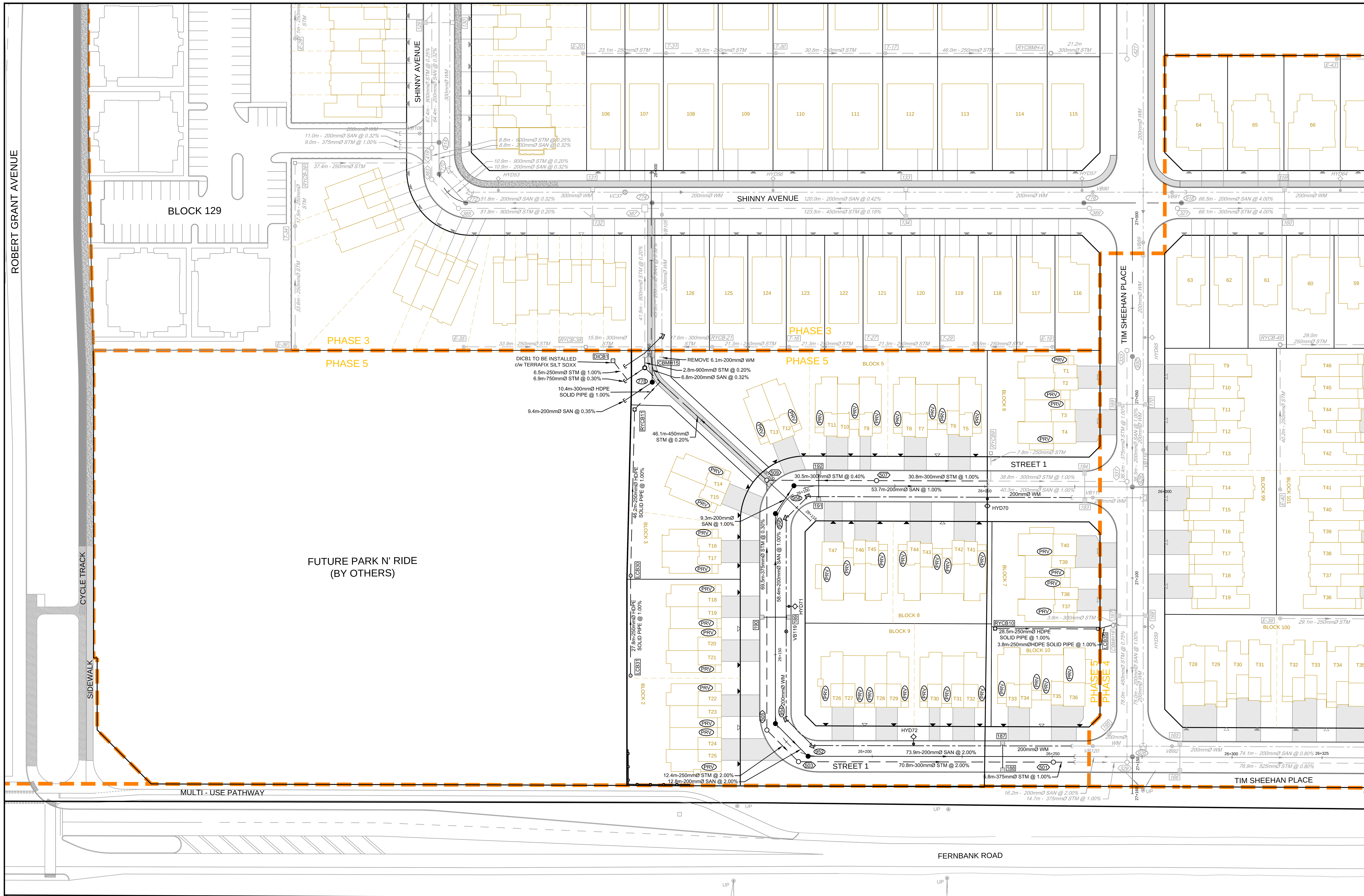
. 01919750705	Northing	5016816.93	Easting	360806.84
. 01919770923	Northing	5013536.21	Easting	346275.92
. Point A	~~Northing~~	~~5014359.45~~	~~Easting~~	~~353419.26~~
. Point B	~~Northing~~	~~5014519.31~~	~~Easting~~	~~353279.99~~

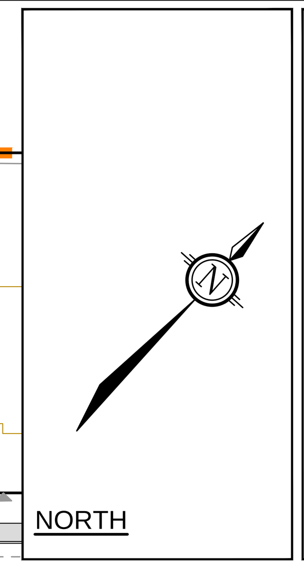
Caution: Coordinates cannot, in themselves, be used to re-establish corners or boundaries shown on this plan.

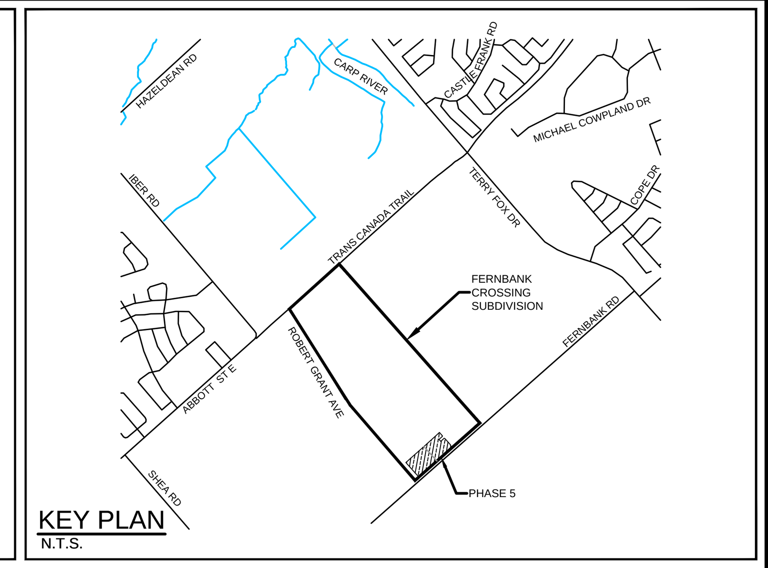
ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com

Ontario Land Surveyors

Job No. 18102-18 Regional Pt Lt 28 C10 GO SUB D8 | N







LEGEND

SANITARY MANHOLE, SEWER & DIRECTION OF FLOW	ROAD CATCHBASIN
STORM MANHOLE, SEWER & DIRECTION OF FLOW	ROAD CATCHBASIN WITH ICD
300mmØ WATERMAIN AND DIAMETER	LCB30 LANDSCAPE TYPE CATCHBASIN
VB VALVE & VALVE BOX	RYCB9 REAR YARD CATCH BASIN
VC VALVE & VALVE CHAMBER	CBMH15 CATCH BASIN MANHOLE
BEND AND THRUST BLOCK	SINGLE SERVICE LOCATION
HYD HYDRANT C/W VALVE & LEAD	DOUBLE SERVICE LOCATION
CAP	PHASING BOUNDARY
REDUCER	
PRV PRESSURE REDUCING VALVE	

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 DEBRIS AND EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER.
10. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
11. REFER TO GEOTECHNICAL INVESTIGATION (DATED MARCH 7, 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
CATCHBASIN MANHOLE (1200Ø)	701.010	OPSD
STORM / SANITARY MANHOLE (1200Ø)	701.010	OPSD
ROADSIDE CB, FRAME & COVER	S2 & S19	CITY of OTTAWA
CBMH FRAME & COVER	S25 & S24.1	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 BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES.

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.
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 0.50m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS.
6. WATER SERVICE SHALL BE CONSTRUCTED TO SERVICE POST AT PROPERTY LINE, UNLESS OTHERWISE INDICATED.
7. PRESSURE REDUCING VALVES SHALL BE INSTALLED AT ALL UNITS.

STM MANHOLE TABLE

MANHOLE ID	SIZE (mm)	T/G ELEV (m)	INVERT (m)	PIPE DIAMETER (mm)
CBMH15	1800Ø	105.34	E=102.78 S=102.48 NW=102.33	E=450 S=750 NW=900
501	1200Ø	104.30	SW=101.22 NE=101.15	SW=300 NE=375
503	1200Ø	105.84	W=102.69 NE=102.64	W=250 NE=300
505	1200Ø	105.78	NW=103.15 E=102.94	NW=375 E=250
507	1200Ø	105.66	SW=103.14 NE=102.30	SW=300 NE=300
509	1200Ø	105.67	W=102.87 SE=102.94 NE=103.02	W=450 SE=375 NE=300

SAN MANHOLE TABLE

MANHOLE ID	SIZE (mm)	T/G ELEV (m)	INVERT (m)	PIPE DIAMETER (mm)
778	1200Ø	105.46	NW=101.91 S=101.97	NW=200 S=200
952	1200Ø	105.90	NE=102.01 W=102.04	NE=200 W=200
954	1200Ø	105.86	E=102.30 NW=102.65	E=200 NW=200
956	1200Ø	105.76	SE=102.07 N=102.04	SE=200 N=200
958	1200Ø	105.64	S=101.95 NE=101.92	S=200 NE=200

REAR YARD CATCHBASIN TABLE

RYCB No.	T/G ELEVATION	INVERT	ICD DIA.
LCB30	105.55	NW=104.05 SE=104.05	-
LCB31	105.73	NW=104.33	-
LCB35	104.16	SW=102.60 NE=102.60	CB-LANDSCAPE
RYCB10	104.29	NE=102.89	CB-LANDSCAPE
RYCB11	105.14	N=103.51 SE=103.59	108mm
RYCB9	104.37	SE=103.42	83mm
CBMH16	104.28	SE=102.56 NE=102.56	83mm

PRESSURE REDUCING VALVE TABLE PHASE 5

LOT / BLOCK	PRESSURE REDUCING VALVE
T1 - T47	YES

CATCHBASIN TABLE

CB No.	T/G ELEVATION	INVERT	ICD DIA.
187	104.57	103.17	83mm
188	104.57	103.17	83mm
189	105.54	104.14	94mm
190	105.54	104.14	94mm
191	105.51	104.11	83mm
192	105.51	104.11	83mm
DICB1	104.72	103.32	-
193	104.37	102.97	102mm
194	104.37	102.97	102mm
195	103.82	102.42	83mm

5572 FERNBANK ROAD

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.

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1.	ISSUED FOR APPROVAL	DEC 7/18	MAB

SCALE 1:500

DESIGN	LRW
CHECKED	MAB
DRAWN	DTD
CHECKED	MAB
APPROVED	JGR

FOR REVIEW ONLY

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

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CITY OF OTTAWA
FERNBANK CROSSING - PHASE 5

GENERAL PLAN OF SERVICES

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

PLANB1.DWG - 1000mmx707mm

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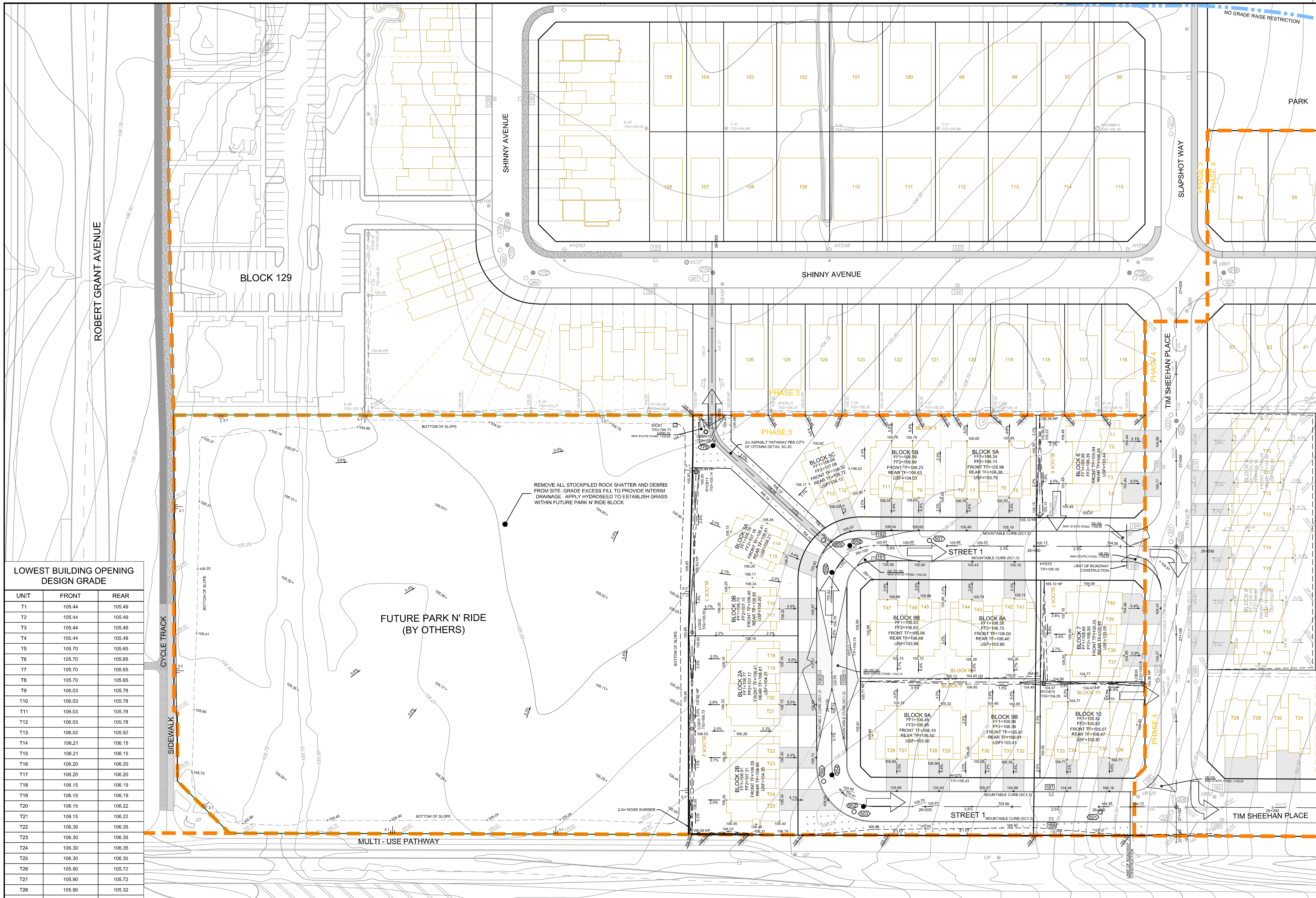
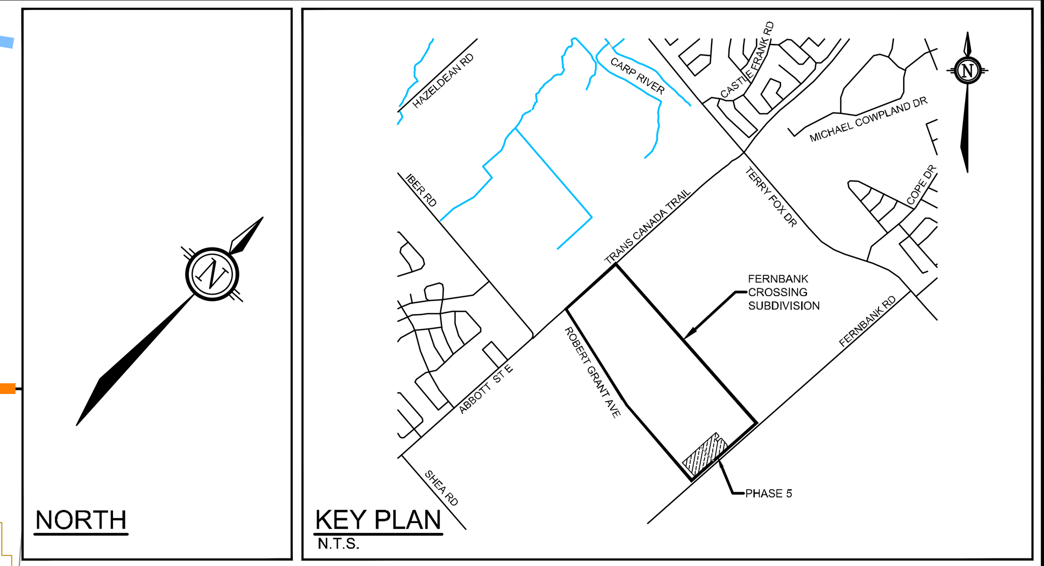




LEGEND

2.5%	PROPOSED GRADE AND DIRECTION	HYD T/F=105.19	PROPOSED HYDRANT WITH TOP OF FLANGE ELEVATION
105.59 HP	PROPOSED ELEVATION AT HIGH POINT	101	PROPOSED SANITARY MANHOLE
105.53 / 105.53	PROPOSED ELEVATION / EXISTING ELEVATION	100	PROPOSED STORM MANHOLE
105.59 PVI	PROPOSED ELEVATION AT POINT OF VERTICAL INFLECTION	95	PROPOSED CATCHBASIN
105.59 BVC	PROPOSED ELEVATION AT BEGINNING OF VERTICAL CURVE	LCB30 TG=	PROPOSED LANDSCAPE TYPE CATCHBASIN WITH TOP OF GRATE ELEVATION
105.59 EVC	PROPOSED ELEVATION AT END OF VERTICAL CURVE		PHASE BOUNDARY LINE
VB	PROPOSED VALVE & VALVE BOX LOCATION		SOD
VC	PROPOSED VALVE & VALVE CHAMBER LOCATION		STATIC PONDING AREA LIMITS
	PROPOSED NOISE BARRIER		SWALE AND TERRACE

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. AMOUNT OF INSURANCE TO BE SPECIFIED BY OWNER'S AGENT.
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 ALL 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 CITY OF OTTAWA AUTHORITIES.
   - ASPHALT RESTORATION SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA DETAIL R-10.
   - THICKNESS OF GRANULAR MATERIAL AND ASPHALT LAYERS TO MATCH EXISTING.
   - BOULEVARDS SHALL BE REINSTATED WITH 100mm OF TOPSOIL, SEED AND MULCH.
9. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER.
10. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
11. ALL FENCING TO BE LOCATED 0.15m INSIDE PROPERTY LINE. REFER TO LANDSCAPING PLAN FOR DETAILS.
12. ASPHALT PATHWAY TO BE CONSTRUCTED PER CITY STANDARD SC.20
13. REFER TO GEOTECHNICAL INVESTIGATION (DATED MARCH 7, 2019), PREPARED BY GEMTEC FOR SUBSURFACE CONDITIONS AND CONSTRUCTION RECOMMENDATIONS.
14. 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.
15. THERE ARE NO GRADE RAISE RESTRICTIONS ON SITE AS PER GEOTECHNICAL INVESTIGATION (DATED MARCH 7, 2019) PREPARED BY GEMTEC.
16. DECOMMISSIONING OF ALL MONITORING WELLS AND DRINKING WATER WELLS SHALL BE CARRIED OUT AND IN ACCORDANCE WITH O.REG. 903. ANY SEPTIC SYSTEM OR AGRICULTURAL TILES DRAINS SHALL BE DECOMMISSIONED PRIOR TO ISSUANCE OF COMMENCE WORK NOTIFICATION.

GRADING AND PAVEMENT NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED HARD SURFACE (ie. PAVEMENT, CURB, SIDEWALK, ETC.) AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE HEAVILY PROOF ROLLED WITH A LARGE (10 TON) VIBRATORY STEEL DRUM ROLLER UNDER DRY CONDITIONS AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. BUILD ROADWAYS WITH 3% CROSSFALL INCLUDING SUBGRADE AND GRANULAR BASE.
6. ROADWAY SUBGRADE TO BE INSPECTED BY THE GEOTECHNICAL ENGINEER AT THE TIME OF CONSTRUCTION TO REVIEW IF A WOVEN GEOTEXTILE IS REQUIRED BELOW THE GRANULAR MATERIALS; AND TO CONFIRM THE DEPTH AND COMPACTION OF GRANULAR 'B'
7. PRIOR TO PLACEMENT OF TOPLIFT, THE CONTRACTOR SHALL ADJUST ALL STRUCTURES TO FINAL GRADE PER CITY OF OTTAWA STANDARDS.
8. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
9. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
10. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
11. ALL CURBS SHALL BE MOUNTABLE CURB UNLESS OTHERWISE NOTED AND CONSTRUCTED PER CITY OF OTTAWA STANDARD (SC1.3).
12. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.

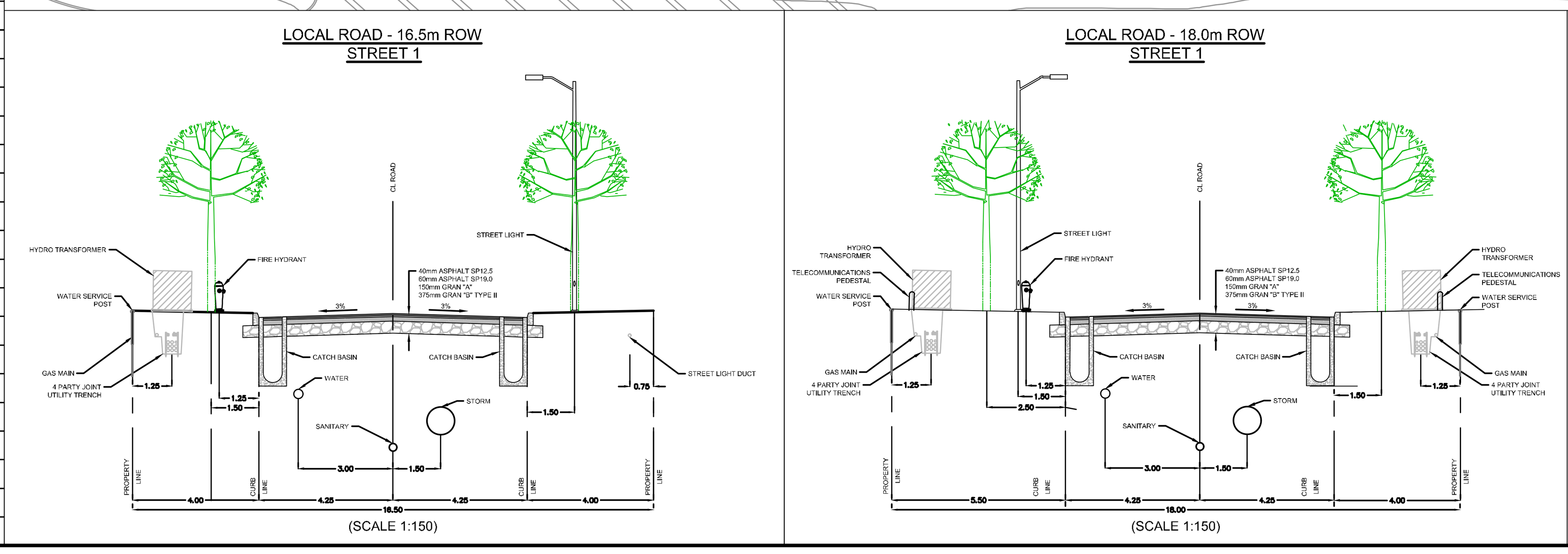
PAVEMENT STRUCTURE:

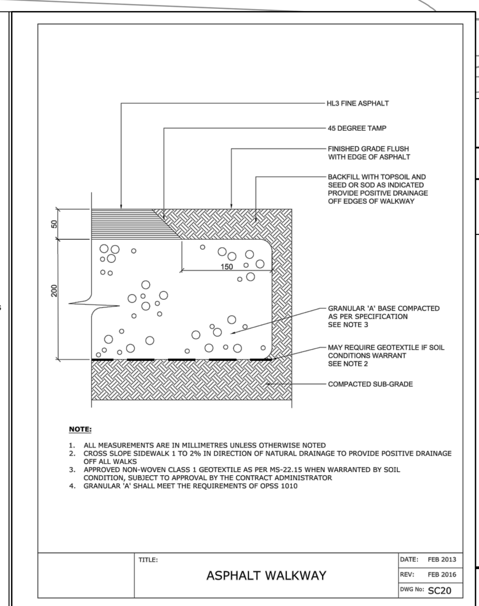
LOCAL ROADS (STREET 1, TIM SHEEHAN PLACE)
16.5m & 18.0 ROW - 8.5m PLATFORM

40mm	ASPHALT SP12.5
60mm	ASPHALT SP19.0
150mm	GRAN "A"
375mm	GRAN "B" TYPE II
625mm	TOTAL DEPTH

LOWEST BUILDING OPENING DESIGN GRADE

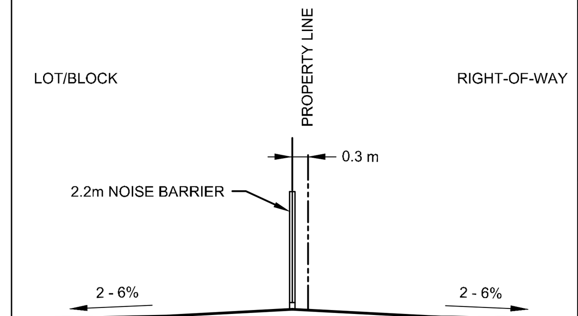
UNIT	FRONT	REAR
T1	105.44	105.49
T2	105.44	105.49
T3	105.44	105.49
T4	105.44	105.49
T5	105.70	105.65
T6	105.70	105.65
T7	105.70	105.65
T8	105.70	105.65
T9	106.03	105.78
T10	106.03	105.78
T11	106.03	105.78
T12	106.03	105.78
T13	106.02	105.92
T14	106.21	106.15
T15	106.21	106.15
T16	106.20	106.20
T17	106.20	106.20
T18	106.15	106.19
T19	106.15	106.19
T20	106.15	106.22
T21	106.15	106.22
T22	106.30	106.35
T23	106.30	106.35
T24	106.30	106.35
T25	106.30	106.35
T26	105.90	105.72
T27	105.90	105.72
T28	105.90	105.32
T29	105.90	105.32
T30	105.36	104.95
T31	105.36	104.95
T32	105.36	104.95
T33	104.71	104.77
T34	104.71	104.77
T35	104.71	104.70
T36	104.71	104.70
T37	104.90	104.85
T38	104.90	104.85
T39	104.90	105.10
T40	104.90	105.10
T41	105.74	105.26
T42	105.74	105.26
T43	105.74	105.26
T44	105.74	105.26
T45	105.88	105.72
T46	105.88	105.72
T47	105.88	105.75





NOISE BARRIER TABLE

REFERENCE	LOCATION	TYPE	HEIGHT	FINISH
NB1	BLOCK 2A	PRESTIGE OR EQUIVALENT	2.2m	NATURAL



TYPICAL NOISE BARRIER OFFSET

NOTE:
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1.	ISSUED FOR APPROVAL	DEC 7/18	MAB

SCALE 1:500

DESIGN	LRW
CHECKED	MAB
DRAWN	DTD
CHECKED	MAB
APPROVED	JGR

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

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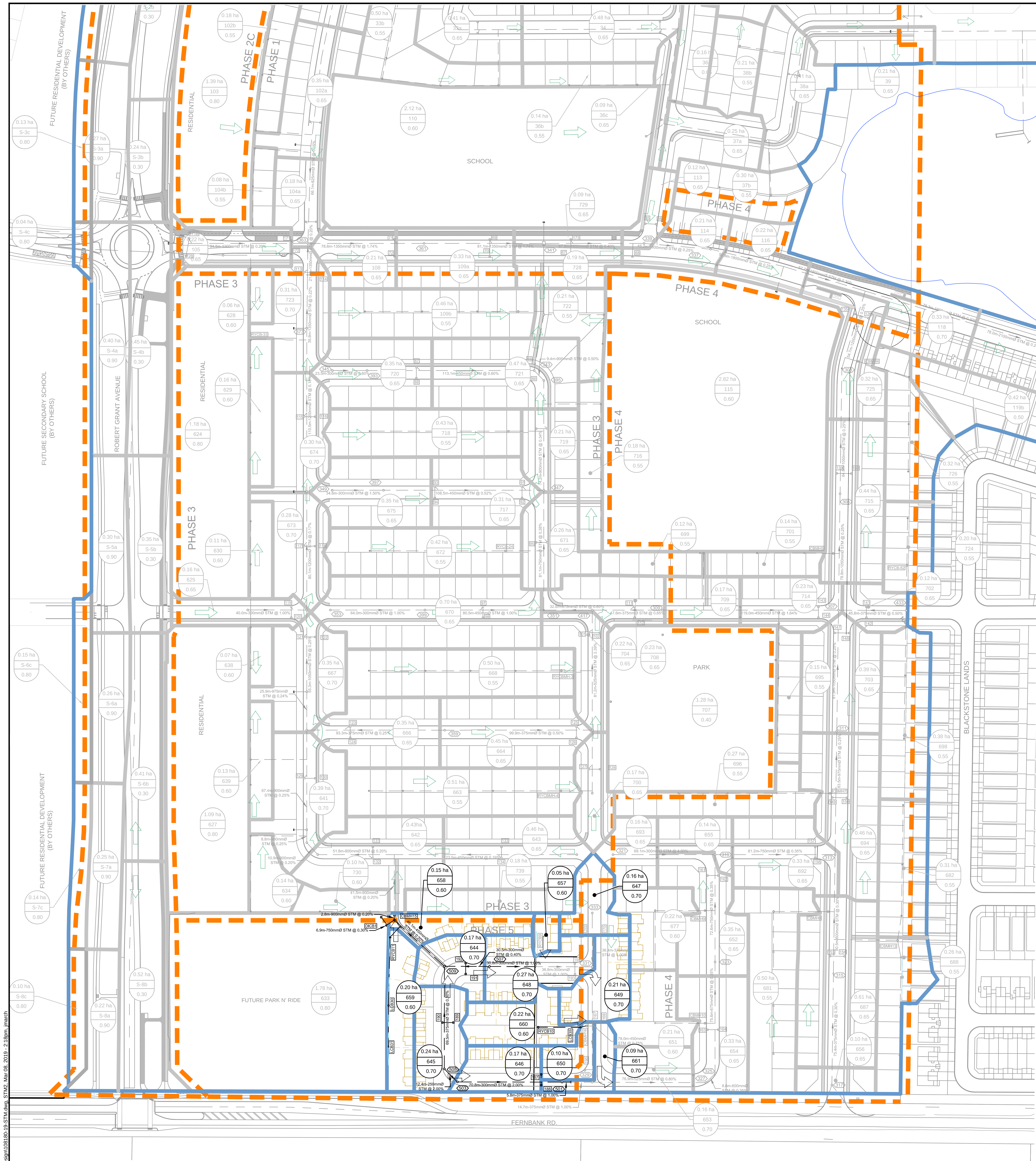
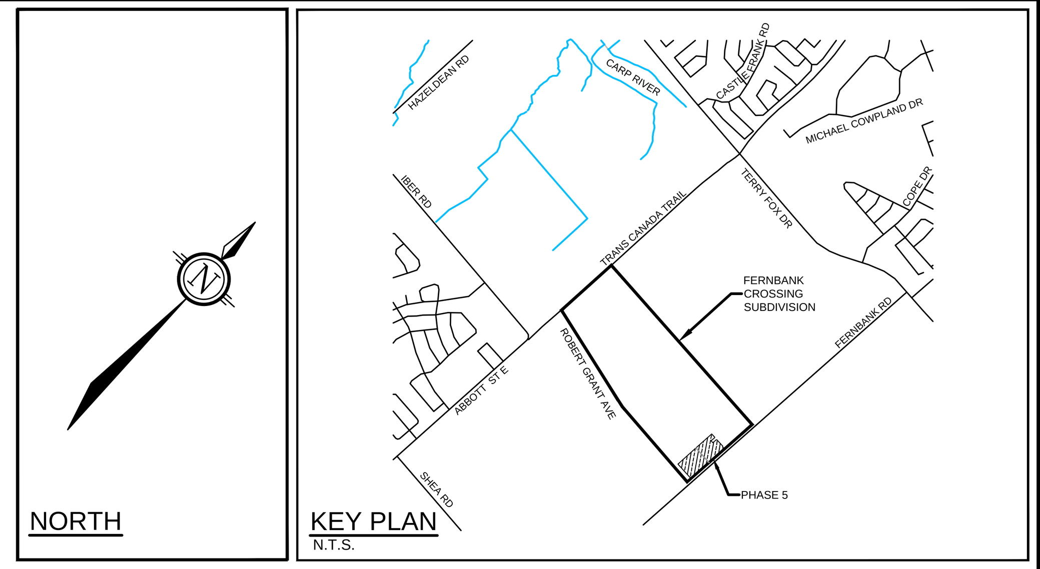
CITY OF OTTAWA
FERNBANK CROSSING - PHASE 5

GRADING PLAN

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





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
	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
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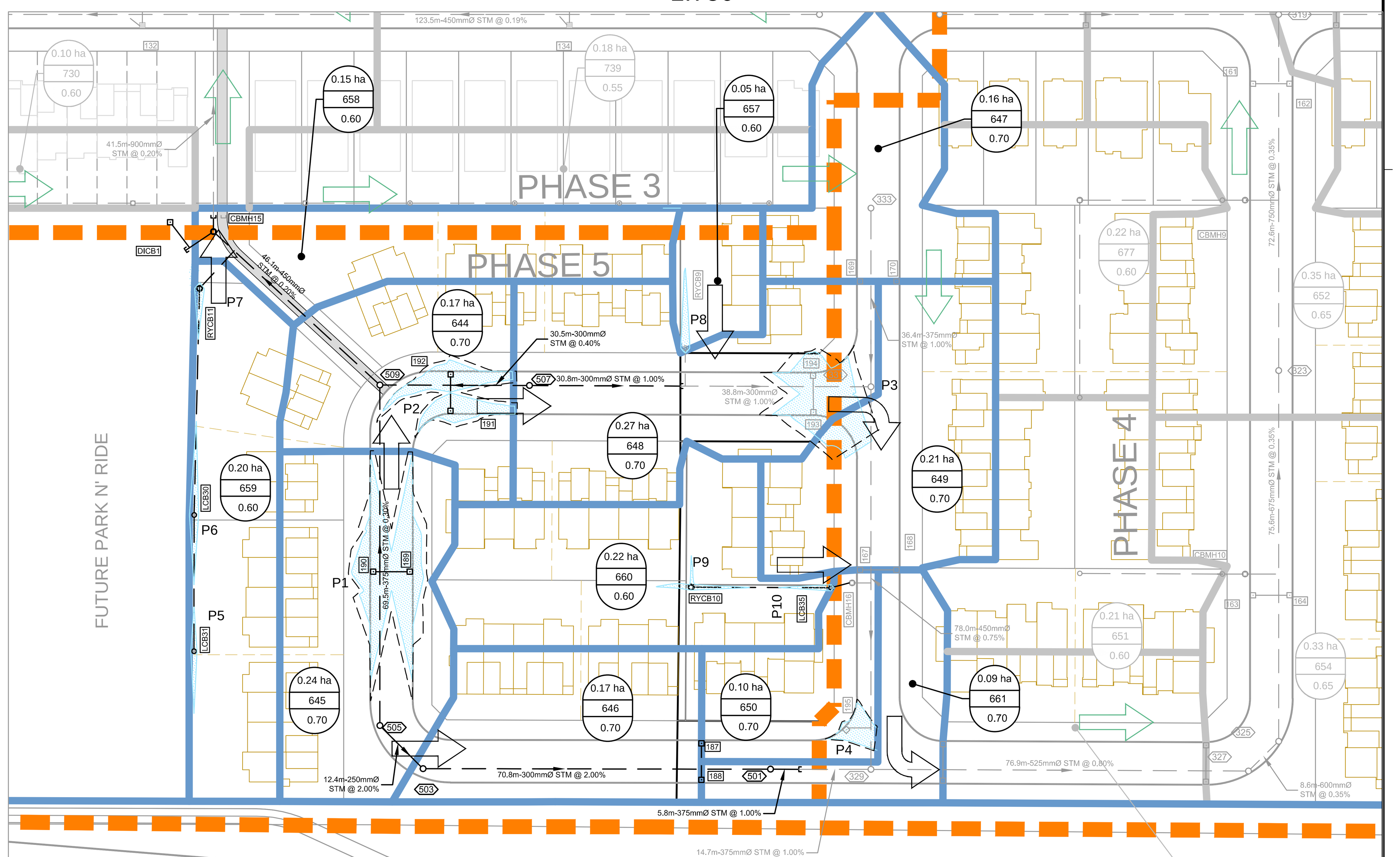

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SCALE 1:1250

DESIGN LRW · CHECKED MAB · DRAWN DTD · CHECKED MAB · APPROVED JGR

FOR CONSTRUCTION

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

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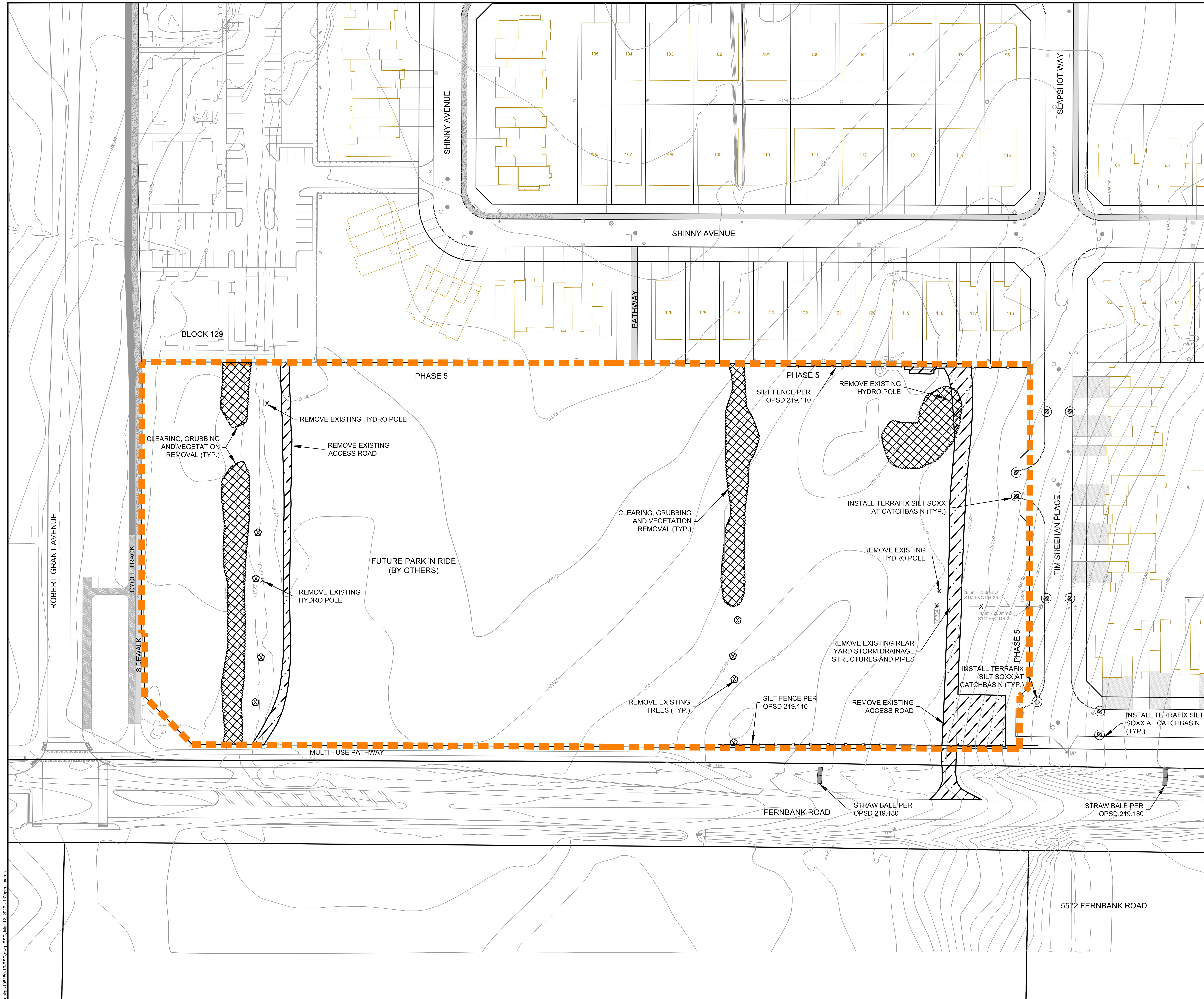
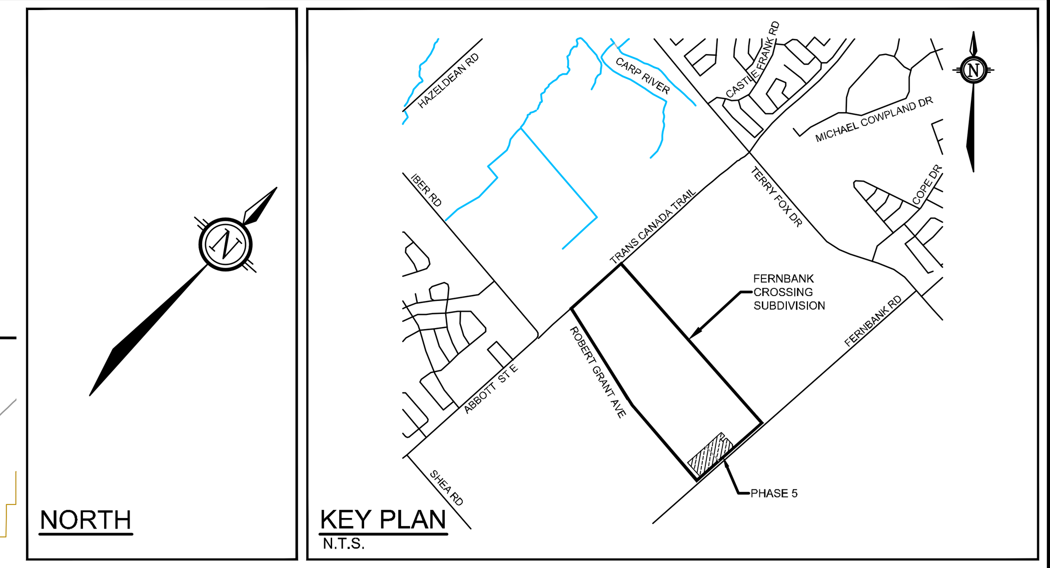
CITY OF OTTAWA
FERNBANK CROSSING - PHASE 5

STORM DRAINAGE AREA PLAN

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

PLANB1.DWG - 1000mmx707mm





LEGEND

- PHASING BOUNDARY
- SILT FENCE PER OPSD 219.110
- STRAW BALE FLOW CHECK PER OPSD 219.180
- CLEARING, GRUBBING AND VEGETATION REMOVAL
- REMOVE EXISTING ACCESS ROAD
- X REMOVALS
- TERRAFIX SILTSOXX INSTALLED AT CB

EROSION AND SEDIMENT CONTROL NOTES :

1. ALL EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED TO THE SATISFACTION OF THE ENGINEER, THE MUNICIPALITY AND THE CONSERVATION AUTHORITY. THEY SHALL BE APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION. THESE PRACTICES SHALL BE IMPLEMENTED IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL AND SHOULD INCLUDE AS A MINIMUM THOSE MEASURES INDICATED ON THE PLAN.
2. TO PREVENT SURFACE EROSION FROM ENTERING THE DITCH OR STORM SYSTEM DURING CONSTRUCTION, FILTER SOCKS WILL BE PLACED UNDER GRATES OF ALL PROPOSED AND EXISTING CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED IN SELECTED LOCATIONS SHOWN ON THIS PLAN, AND STRAW BALE BARRIERS WILL BE INSTALLED WITHIN THE OUTLET DITCHES. THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL VEGETATION HAS BEEN ESTABLISHED AND CONSTRUCTION COMPLETE.
3. THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE ENGINEER, THE MEASURES ARE NO LONGER REQUIRED. NO CONTROL MEASURES MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
4. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO ANY DITCH OR STORM SEWER SYSTEM. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
5. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
6. THE CONTRACTOR SHALL PROVIDE DUST CONTROL WITH THE APPLICATION OF WATER AND/OR CALCIUM CHLORIDE AS REQUIRED.

REMOVALS NOTES :

1. THE CONTRACTOR SHALL PROTECT ALL SURVEY MONUMENTS.
2. REMOVAL OF ALL ABOVE GROUND TRAFFIC PLANT AND STREETLIGHTING TO BE DONE BY OTHERS. CONTRACTOR SHALL PROTECT AND MAINTAIN EXISTING STREETLIGHTING, HYDRO POLES AND OVERHEAD LINES DURING CONSTRUCTION.
3. UTILITY ADJUSTMENTS SHALL BE PERFORMED BY AN APPROVED CONTRACTOR.
4. DECOMMISSIONING OF ALL MONITORING WELLS AND DRINKING WATER WELLS SHALL BE CARRIED OUT IN ACCORDANCE WITH O.REG. 903. ANY SEPTIC SYSTEM OR AGRICULTURAL TILE DRAINS SHALL BE DECOMMISSIONED PRIOR TO ISSUANCE OF COMMENCEMENT OF WORK NOTIFICATION.

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.	ISSUED FOR APPROVAL (2nd SUBMISSION)	MAR 12/19	MAB
1.	ISSUED FOR APPROVAL	DEC 7/18	MAB

SCALE 1:500

DESIGN	LRW
CHECKED	MAB
DRAWN	JMM
CHECKED	MAB
APPROVED	JGR

FOR REVIEW ONLY

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

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CITY OF OTTAWA
FERNBANK CROSSING - PHASE 5

REMOVALS & EROSION AND SEDIMENT CONTROL PLAN

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