Burnett Lands - 3370 Greenbank Road

Site Serviceability and Stormwater Management Report

BURNETT LANDS

3370 GREENBANK ROAD

SITE SERVICEABILITY AND STORMWATER MANAGEMENT REPORT

Prepared for:

Claridge Homes

Prepared By:

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Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
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December 9, 2016
1st Revision: January 26, 2018
2nd Revision: May 23, 2018

Novatech File: 111117
Ref: R-2016-170

NOVATECH
Engineers, Planners & Landscape Architects

May 23, 2018

City of Ottawa
Planning, Infrastructure and Economic Development Department
Planning Services Branch
110 Laurier Ave. West, 4th Floor
Ottawa, Ontario
K1P 1J1

Attention: **Mr. Don Herweyer, Manager of Development Review South**

Reference: **Burnett Lands - 3370 Greenbank Road**
Site Serviceability and Stormwater Management Report
Novatech File No.: 111117

Enclosed herein are three (3) copies of the "Site Serviceability and Stormwater Management Report" for the proposed development of the Burnett Lands located at 3370 Greenbank Road, Ottawa. The report is submitted in support of applications for Official Plan Amendment, Zoning By-Law Amendment and Draft Plan of Subdivision. It will address how the subject development will be serviced with sanitary sewer, storm sewers, watermain and stormwater management.

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

Sincerely,

NOVATECH

Marc St. Pierre
Senior Project Manager

Encl.

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1.0 INTRODUCTION

Novatech has been retained by Claridge Homes to prepare a Site Serviceability & Stormwater Management Report for the lands located at 3370 Greenbank Road (herein referred to as the "Burnett Lands"). This report has been prepared in support of the application for Official Plan Amendment, Zoning By-Law Amendment, and Draft Plan of Subdivision, and outlines the servicing and proposed storm drainage and stormwater management strategy for the site.

1.1 Background

The subject site is approximately 15.5 hectares in area and is located immediately north of the Jock River, south of Strandherd Drive and between the Kennedy Burnett Stormwater Management Facility and the existing Greenbank Road as shown on **Figure 1**. The Burnett Municipal Drain is tributary to the Jock River and travels through the subject site. The property currently has farm and accessory structures located near its southern boundary with an existing gravel access on to Greenbank Road. The remainder of the site is currently used for passive agriculture activities. The topography is generally flat with a gentle slope from the northeastern corner to the southwestern corner.

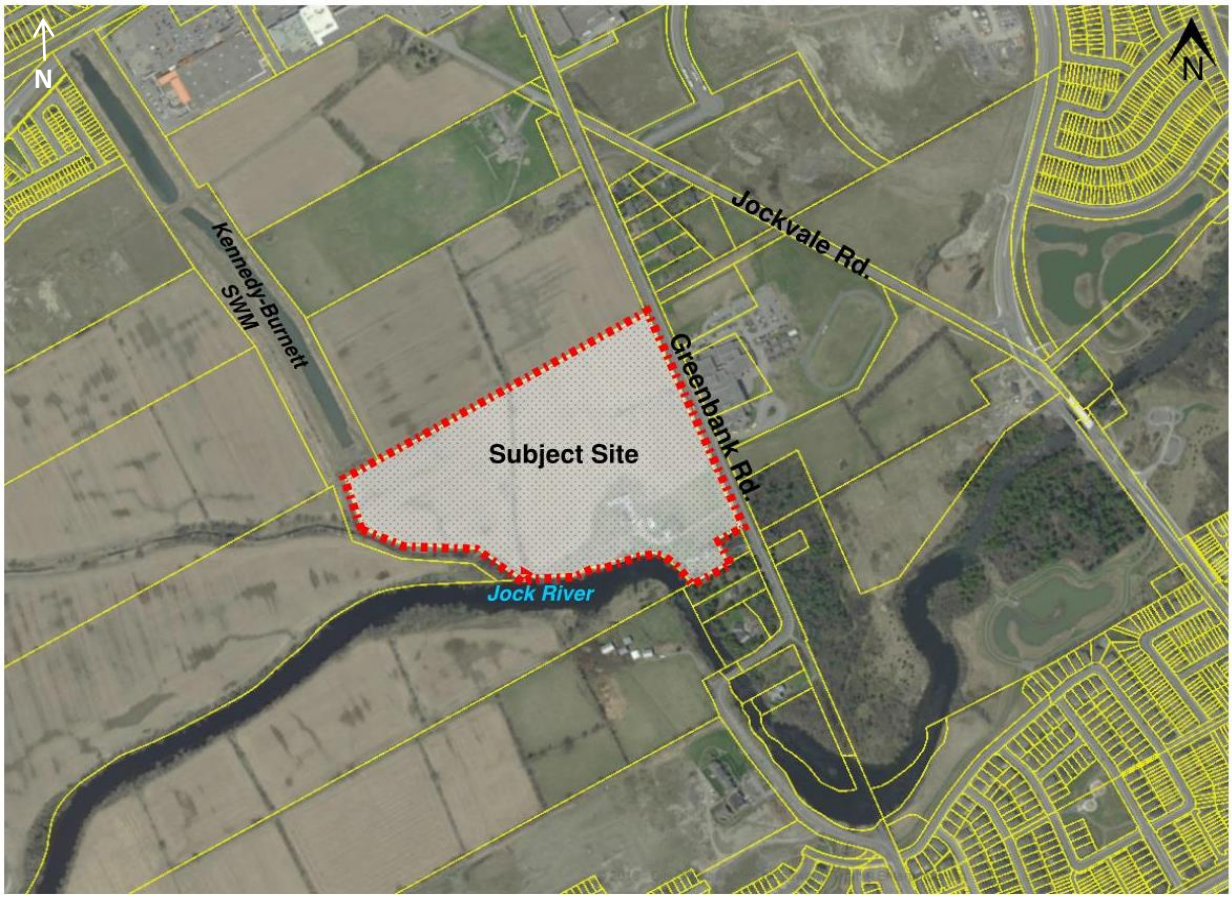
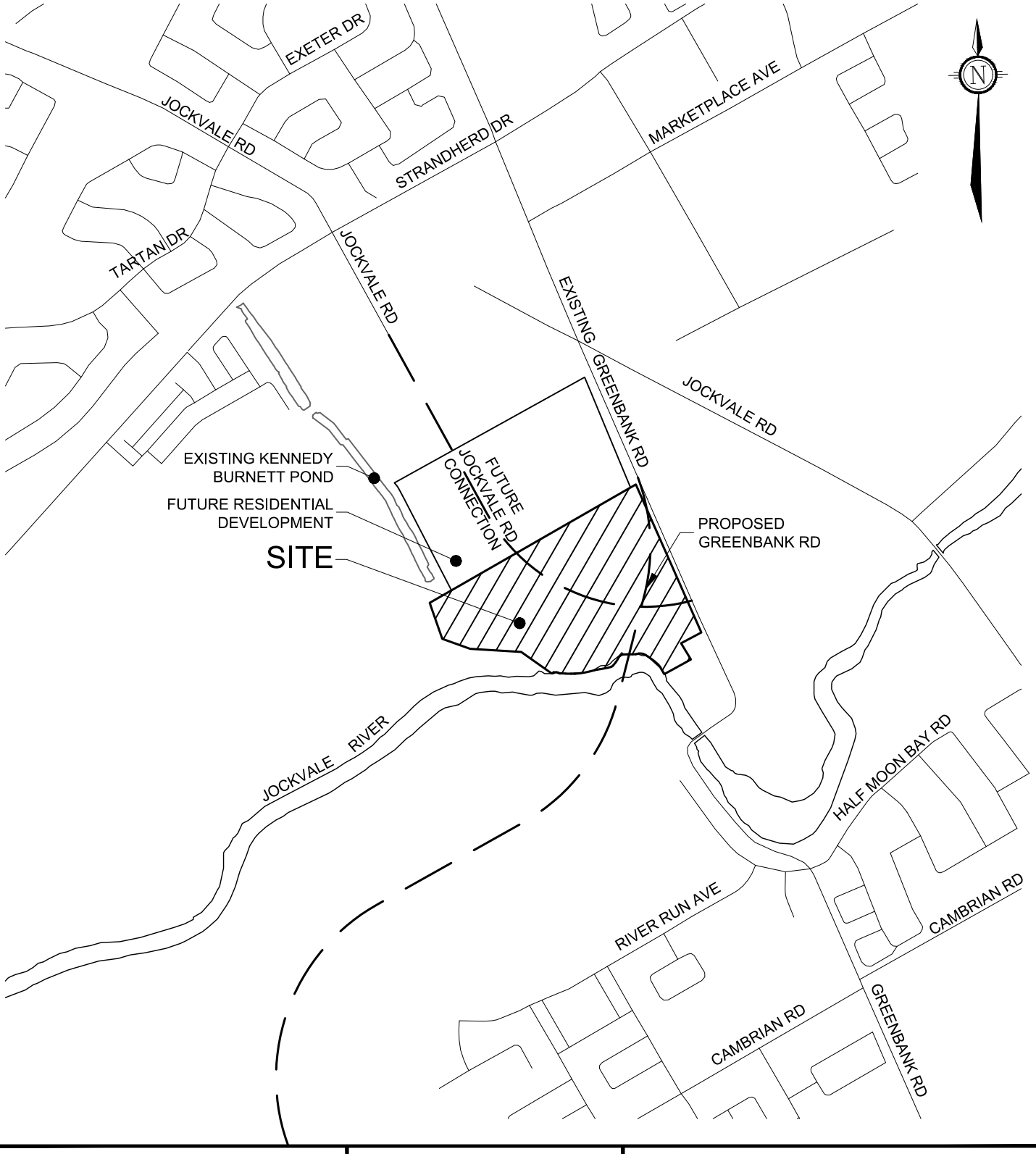


Figure 1: Site Location (Base Map Source: GeoOttawa)



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3370 GREENBANK RD. BURNETT LANDS

KEY PLAN

SCALE: NTS

DATE: MAY 2018 | JOB: 111117 | FIGURE: FIGURE 1

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The following describes the existing and planned land uses adjacent to the subject site:

North: Lands to the north, owned by Caivan Communities, are currently under the development approval process and have recently obtained OPA and ZBLA approval (Amendment #144) from the City to permit High Rise and Mid Rise Mixed-Use Residential developments, Mid Rise Residential Dwellings, and a Neighbourhood Park as per *Schedule 1- Land Use Plan, South Nepean Secondary Plan (Area 7)*. Further north of the Caivan Communities' development is the planned Barrhaven Town Centre which will include a variety of retail uses to service the surrounding existing and planned residential developments.

East: Lands east of the subject site contain a mixture of low density residential dwellings (single detached houses), a secondary school (St. Joseph Catholic High School), and an existing vegetated area. Greenbank Road currently forms the eastern boundary of the site. The realigned Greenbank Road will bisect the site as per the design by the City.

South: The Jock River flows west – east along the majority of the southern boundary of the property until it turns south near the southeastern corner of the site. The lands south of Jock River are within the Barrhaven *South Community Design Plan* and are intended for a future district park and residential uses as shown on *Figure 17* of the *Barrhaven South Community Design Plan.*

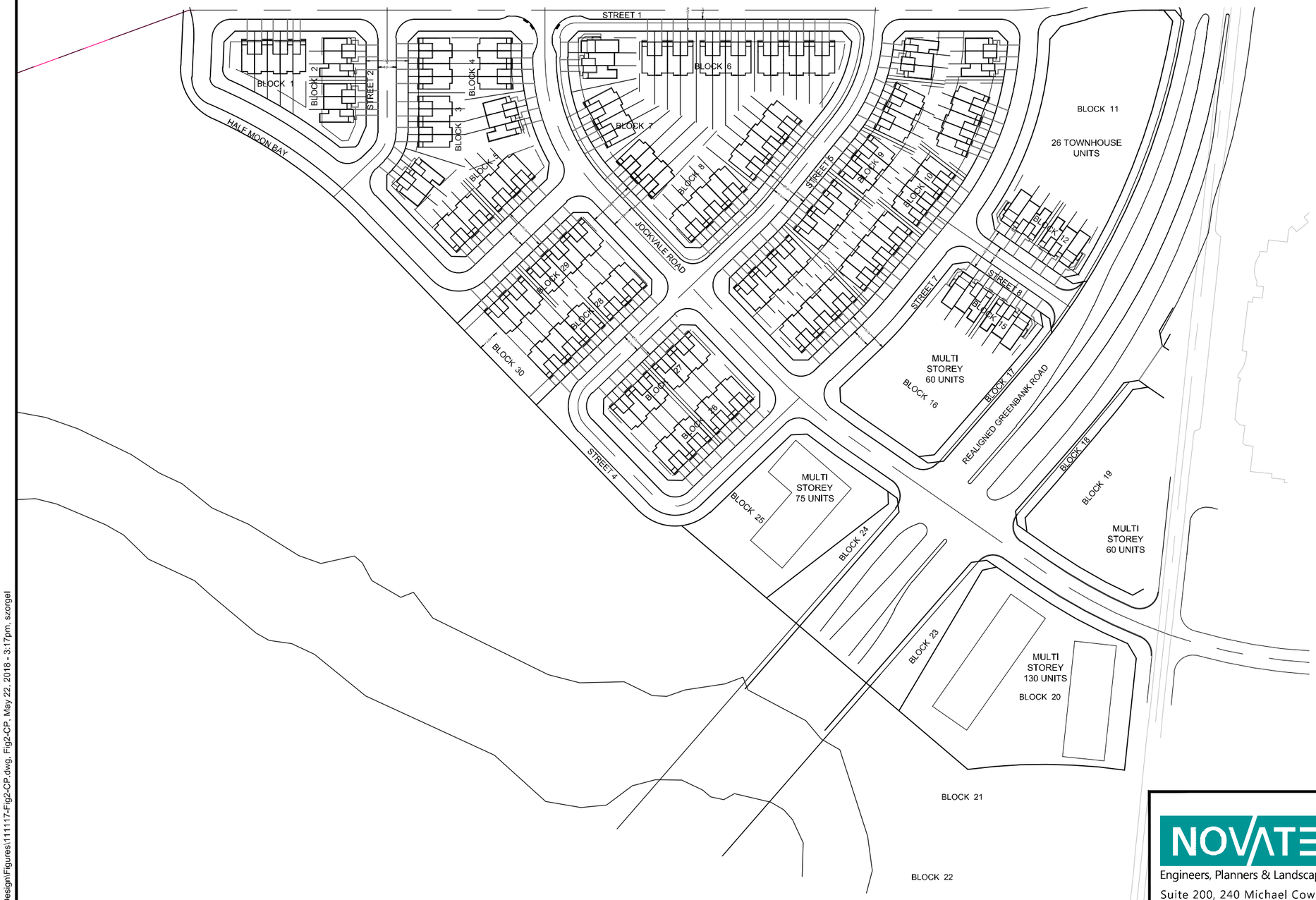
West: The Kennedy Burnett stormwater management facility is located north west of the subject site and drains into the Jock River. Lands immediately west are currently vacant and intended for mostly conservation and residential uses as identified in Schedule B of the Official Plan.

Plans are to develop a residential subdivision, as shown on **Figure 2 – Concept Plan**, which will consist of 247 townhome units and 420 condo units for a total of 667 units.

1.2 Additional Reports

This report provides information on the considerations and approach by which Novatech has designed and evaluated the proposed servicing for the Burnett Lands. This report should be read in conjunction with the following:

- *South Nepean Collector Sewer Alignment & Finalization Report – Phase 2,* prepared by Novatech, dated June 2014;
- *South Nepean Collector: Phase 2, Hydraulics Review/Assessment, Technical Memorandum, prepared by Novatech, dated August 20, 2015*
- *South Nepean Collector Sewer– Phase 2,* Preliminary Design Report, prepared by Novatech, dated March 2, 2016;
- *Hydrology Report – July 2004: Jock River Flood Risk Mapping (within the City of Ottawa)* prepared by the Rideau Valley Conservation Authority, dated July 2004;
- *Jock River Reach 1 Subwatershed Study and Barrhaven South Master Servicing Study;*
- *Hydraulics Report – November 2004: Jock River Flood Risk Mapping (within the City of Ottawa)* prepared by the Rideau Valley Conservation Authority, dated November 2004;



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3370 GREENBANK RD. BURNETT LANDS

CONCEPT PLAN

SCALE 1 : 2000 (0, 20, 40, 60, 80)

DATE MAY 2018 | JOB 111117 | FIGURE FIGURE 2

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- *Kennedy-Burnett Potable Water Master Servicing Study, by Stantec, dated April 29, 2014;*
- *Greenbank (Burnett Municipal Drain) Headwaters Report*, prepared by Bowfin Environmental Consulting and Muncaster Environmental Planning Inc., dated March 2016;
- *Geotechnical Investigation Proposed Residential Development Burnett Lands, Greenbank Road at the Jock River, Ottawa Ontario,* Prepared by Golder Associates Ltd., dated May 2016 (Report No. 1523044-1000)

2.0 EXISTING CONDITIONS

2.1 Topography & Drainage

The proposed site is currently undeveloped and consists of agricultural lands. Access to the site is currently provided at Greenbank Road. The site has a gentle slope from north to south, with most overland flow being directed to the existing Burnett Municipal Drain, which flows into the Jock River at the south end of the site boundary. The Burnett Municipal Drain transects the site in a north to south fashion.

2.2 Subsurface Conditions

Golder Associates Ltd. has completed a geotechnical investigation in support of the proposed development. The report is titled "Geotechnical Investigation, Proposed Residential Development, Burnett Lands, Greenbank Road at the Jock River, Ottawa Ontario, dated December 2016 (Report No. 1523044-1000)." The fieldwork for this investigation was carried out between February 18th and 23rd, 2016. The work consisted of advancing ten (10) boreholes to depths ranging from 1.7m to 8.2 m below ground surface. The principal findings of the Geotechnical Investigation are as follows:

- The site was divided into two distinct areas (A and B), with Area 'A' having a thick deposit of silty clay up to 8.2m deep and Area 'B' having a very stiff to stiff layer of silty clay overlying glacial till, or glacial till near the ground surface.
- Area 'A' generally consists of a 1.3 to 3.1 m layer of a silty clay deposit beneath the topsoil layer, which has been weathered to a grey brown crust. Below this is a grey silty clay, which extends to a depth of 3.1 to 8.2 m.
    - In some of the boreholes within Area 'A', glacial till was encountered beneath the silty clay deposit at a depth of 3.1 to 4.3 m.
- Area 'B' generally consists of a 0.6 to 2.5 m layer of a silty clay deposit beneath the topsoil layer, which has been weathered to a grey brown crust. Below this is a silty sand layer which ranges from 0.3 to 0.9 m thick. In all boreholes, glacial till exists below the silty clay and silty sand at depths ranging from 0.3 to 2.5 m.
- Groundwater inflow was observed in some of the boreholes at depths of between 0.91 m and 2.17 m below ground surface.

The report provides engineering guidelines based on Golder Associates interpretation of the borehole information and project requirements. Refer to the above-noted report for complete details.

3.0 SANITARY SERVICING

As per the South Nepean Collector Functional Design Update (FDU) prepared by Dillon Consulting (July 2012), the South Nepean Collector (SNC) is the sanitary outlet for the proposed development and has been sized to accommodate the peak sanitary flows from the proposed Burnett Lands development. Refer to Figure 1, Existing Sanitary Network and Collection Areas, and Table 5.1, Allocation of Commercial/Institutional and Residential Demands to SNC by Collection Area, of the FDU, located in **Appendix A**. The noted figure and table confirms the development is located within the Sanitary Drainage Area 8A of the SNC.

The design criteria used to determine the sanitary flows are based on the City of Ottawa's sewer design guidelines (2012) and Technical Bulletin ISTB-2018-01 and are as follows:

- Residential Average Flow = 280L/capita/day
- Residential Peaking Factor = Harmon Equation (max peaking factor = 4.0)
- Institutional Demand = 28,000L/gross ha/day
- Institutional Peaking Factor = 1.5 (if ICI in contributing area >20%), 1.0 (if ICI in contributing area <20%)
- Peak Extraneous Flows (Infiltration) = 0.33L/s/ha
- Population Density = 2.7 people/townhouse, 1.8 people/condo
- Minimum Pipe Slope (200mm/250mm) = 0.32% / 0.24%
- Minimum Full Flow Velocity = 0.6m/s
- Maximum Full Flow Velocity = 3.0m/s

In addition to the peak sanitary flows from the proposed Burnett Lands development, the on-site sanitary sewers are sized to accommodate a portion of the peak sanitary flows from the adjacent residential lands located immediately north of the site as well as the existing high school (St. Joseph) immediately east of Greenbank Road. The peak sanitary flow from the adjacent lands is based on 100 townhouses per hectare as per the *South Nepean Town Centre Community Design Plan* (July 2006) prepared by the City of Ottawa. For reference a copy of the South Nepean Town Centre Community Design Plan is included in **Appendix B**. The peak sanitary flow from the high school as per *South Nepean Collector: Phase 2, Hydraulics Review/Assessment, Technical Memorandum, prepared by Novatech, dated August 20, 2015* is based on 50,000 L/gross ha/day. The sanitary sewer design sheet updated this area to reflect the City of Ottawa Technical Bulletin ISTB-2018-01. Refer to **Appendix B** for technical memo excerpts and **Appendix A** for the design sheet.

The proposed sanitary sewer system is shown on the General Plan of Services (Drawing **111117-GP1-3**). The Sanitary Drainage Area Plan (Drawing **111117-SAN1**) confirms the sanitary drainage areas assumed to outlet in the proposed onsite sanitary sewers. Both drawings are included in **Appendix G**.

The calculated peak sanitary design flow for the development (including St. Joseph high school, 8.59/s) is 31.68/s: 9.5L/s will outlet into the SNC at the Half Moon Bay/Jockvale Road intersection and 22.18/s will outlet into the SNC at the Street 5/Jockvale Road intersection. For detailed calculations refer to the Sanitary Sewer Design Sheet located in **Appendix A**. There is a large difference in invert elevation between the proposed sewers within the Burnett lands and the SNC at the Burnett outlets (4.17m). During construction of the SNC, both outlet manholes have been equipped with cast in place drop structures as per 1003.010 to accommodate the drop and sanitary stub for connection.

4.0 WATERMAIN

Ultimately, the Burnett Lands will be serviced with a combination of 50mm, 200mm and 300 mm looped watermain with connections at both the northeast, northwest and southeast limits of the site. At the northeast limits, the watermain will connect to a 300 mm watermain to be located in the realigned Greenbank Road, at the southeast limits, to a future 300mm watermain (by others) located within Jockvale Road and at the northwest limits of the site, to a future watermain located within the lands to the north of the site. Refer to the following figures:

- **Figure 3 –** Realigned Greenbank Road Watermain
- **Figure 4 –** Watermain Layout

The ultimate watermain connections are consistent with Stantec's *Kennedy-Burnett Potable Water Master Servicing Study* (April 29, 2014) and have not been constructed to date. It has been noted by the City that the southeast connection (by others) should advance and be constructed prior to development of the Burnett Lands. It is proposed to construct approximately 335 m of the 300 mm realigned Greenbank Road watermain from the Greenbank and Jockvale intersection to south of the northeast limits of the site to provide a second connection. These two connections will serve as a loop system for the proposed Burnett development.

It is noted the proposed watermain works are located in a future Zone 3C pressure zone. The realignment of the pressure zone will be completed by the City of Ottawa and once complete will alter the boundary conditions for the development. The realignment is unknown at this time. The City of Ottawa has provided boundary conditions for the pre and post-realignment conditions. This report considers both conditions.

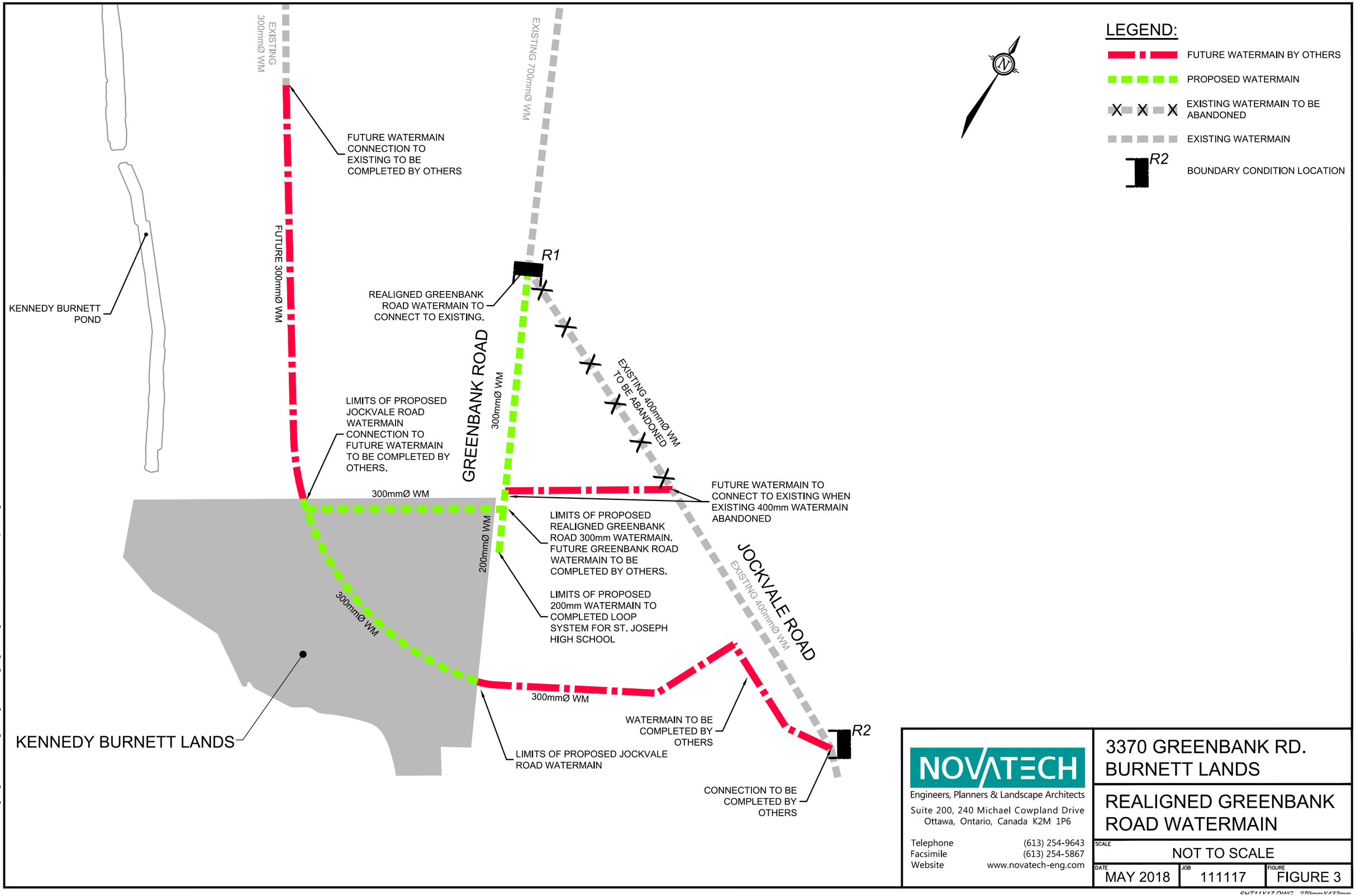
Fire flow demands have been calculated as per the Fire Underwriter's Survey (FUS) and are included in **Appendix C**. However as per the City of Ottawa's technical bulletin ISDTB-2014-02 (Revisions to Ottawa Design Guidelines – Water), the majority of the townhouse fireflows have been capped at 10,000 L/min (167 L/s). Watermain analysis was completed based on the following criteria:

Demands:

- Townhouse Density 2.7 persons/unit
- Condo/Apartment Density 1.8 persons/unit
- Average Daily Demand 350 L/capita/day
- Max. Daily Demand 2.5 x Average Daily Demand
- Peak Hour Demand 2.2 x Maximum Daily Demand
- Fire Flow Demand Fire Underwriters Survey

System Requirements:

- Max. Pressure (Unoccupied Areas) 690 kPa (100 psi)
- Max. Pressure (Occupied Areas) 552 kPa (80 psi)
- Min. Pressure 276 kPa (40 psi) excluding fire flows
- Min. Pressure (Fire) 138 kPa (20 psi) including fire flows
- Max. Age (Quality) 192 hours (onsite)



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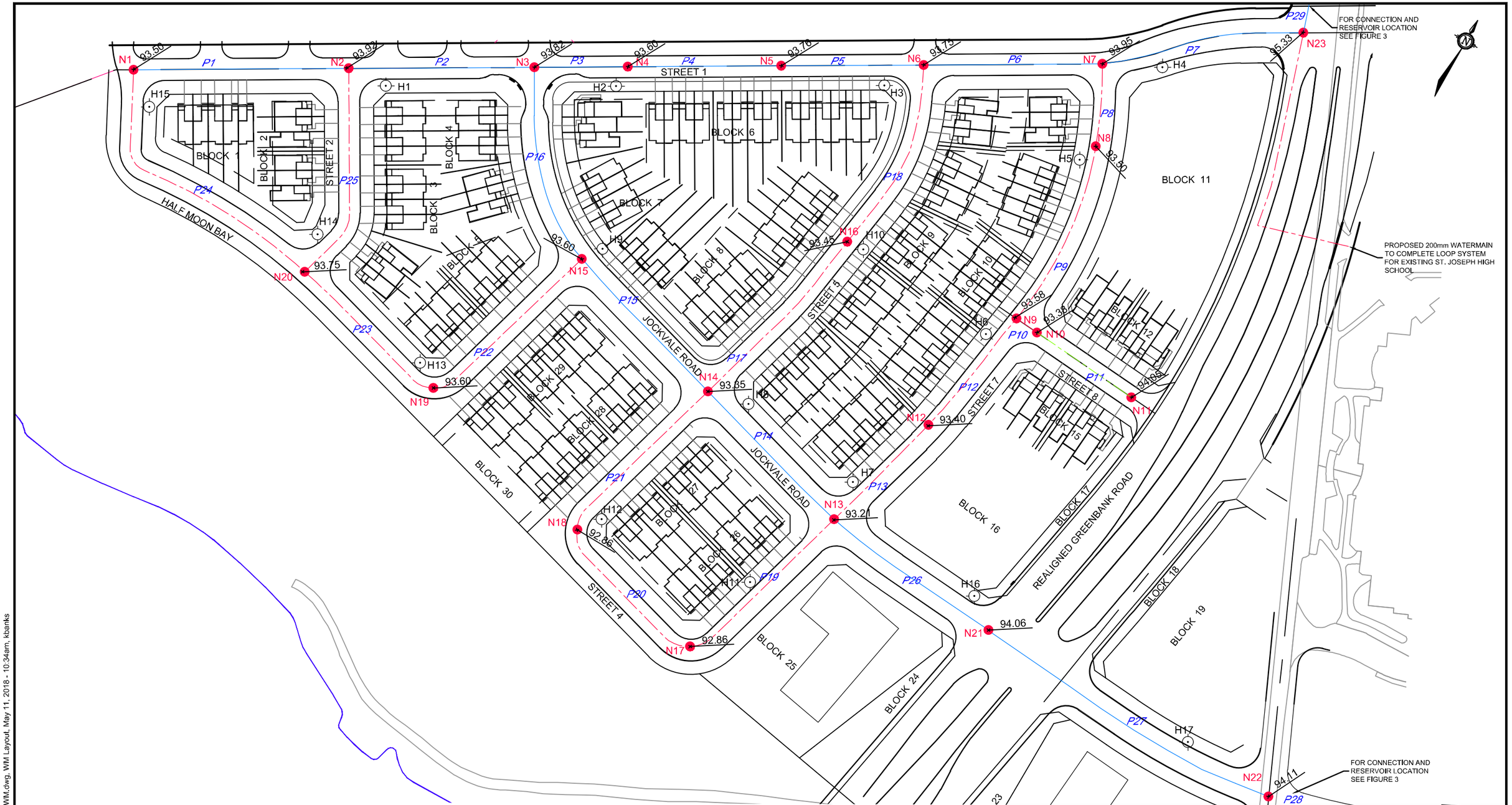
3370 GREENBANK RD. BURNETT LANDS

REALIGNED GREENBANK ROAD WATERMAIN

SCALE: NOT TO SCALE

DATE: MAY 2018 | JOB: 111117 | FIGURE: FIGURE 3



LEGEND

- 12 — PROPOSED 50mmØ WATERMAIN PIPE
- 12 — PROPOSED 200mmØ WATERMAIN PIPE
- 4 — PROPOSED 300mmØ WATERMAIN PIPE
- 4 — WATERMAIN NODE
- RESERVOIR
- HYDRANT
- 97.75 — GROUND ELEVATION
- FIREFLOWS CAN'T BE CAPPED

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3370 GREENBANK RD. BURNETT LANDS

WATERMAIN LAYOUT

SCALE 1:1500 (0, 15m, 30m, 60m)

DATE MAY 2018 | JOB 111117 | FIGURE FIGURE 4

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Friction Factors:

- Watermain Size C-Factor
- 50mm 100
- 200-250 mm 110
- 300-400 mm 120

Hydraulic modelling of the proposed 3370 Greenbank Road was completed using EPANET 2.0. EPANET is public domain software capable of modeling municipal water distribution systems by performing simulations of the water movement within a pressurized system. EPANET utilized the Hazen-Williams equation to predict the performance of the proposed watermain and considered the following input parameters: water demand, pipe length, pipe diameter, pipe roughness, and pipe elevation. Table 1 (Water Demand Calculations) in Appendix C confirms the water demands at each node in the system. Table 2 (Pipe Data) in Appendix C confirms the length, diameter, and roughness of each pipe in the system. Tables 3-8 in Appendix C confirms the elevation of each node in the system.

The high pressure condition (average daily demand) was analyzed to ensure the system meets the design criteria for maximum pressure and quality. The maximum daily demand plus fire flow and peak hour conditions were analyzed to ensure the system meets the design criteria for maximum flow and minimum pressure.

The hydraulic modelling results for the development prior to the City reconfiguring the watermain are listed in **Table 4.1**.

Table 4.1: Water Demand Summary (Pre Watermain Reconfiguration)

Condition	Demand (L/s)	Fire Flow (L/s)	Allowable Max/Min Pressure (kPa/psi)	Max/Min Pressure (kPa/psi)	Time (hrs)
High Pressure	4.53	N/A	690/100 (Max)	628.8/91.2	38
Maximum Daily Demand	11.33	167, 200	138/20 (Min)	326.8/47.4	N/A
Peak Hour	24.93	N/A	276/40 (Min)	514.3/74.6	N/A

The analysis confirms the proposed watermain can service the Burnett Lands prior to the site being included into the realigned Zone 3C pressure zone. It is noted that pressure in the main is greater than 552 kPa/80psi therefore the use of pressure reducing values will be considered during detailed design.

The hydraulic modelling results for the development after the watermain realignment of the watermain are listed in **Table 4.2**.

Table 4.2: Water Demand Summary (Post Watermain Reconfiguration)

Condition	Demand (L/s)	Fire Flow (L/s)	Allowable Max/Min Pressure (kPa/psi)	Max/Min Pressure (kPa/psi)	Time (hrs)
High Pressure	4.53	N/A	690/100 (Max)	536.4/77.8	38
Maximum Daily Demand	11.33	167, 200	138/20 (Min)	408.9/59.3	N/A
Peak Hour	24.93	N/A	276/40 (Min)	504.7/73.2	N/A

The analysis confirms the proposed watermain can service the Burnett Lands after the watermain realignment under all operating conditions.

A copy of the boundary conditions provided by the City of Ottawa, fire flow calculations, detailed hydraulic analysis results, and watermain layout figure are included in **Appendix C**.

Deviations from the City of Ottawa Design Guidelines – Water Distribution (2010) include:

- Isolation valves are to be located 2.0m away from the intersection, from the point where the projection of the property line intersects the watermain. This distance has been increased to accommodate intersection narrowing along the collector road to improve pedestrian crossings and to ensure no valve chamber is located under curb and located within the roadway. This occurs in the Jockvale/Street B intersection.

5.0 STORMWATER MANAGEMENT CRITERIA

The Burnett Lands are tributary to the Jock River, which falls under the jurisdiction of the Rideau Valley Conservation Authority (RVCA). The following stormwater management criteria have been developed based on the requirements of the RVCA and the City of Ottawa Sewer Design Guidelines (October 2012) and Technical Bulletins PIEDTB-2016-01 and ISTB-2018-01.

Minor System (Storm Sewers)

- Storm sewers are to be designed using the Rational Method for the 1:5-year return period;
    - Where necessary, pipes are to be oversized to accommodate the HGL elevation;
- Inlet control devices (ICDs) will be installed in road and rearyard catchbasins to control inflows to the storm sewers;
- The 100-year hydraulic grade line in the storm sewer shall be at least 0.3 m below the underside of footing (USF) elevations for the proposed development.

Major System (Overland Flow)

- Maximum depth of flow (static + dynamic) on local and collector streets shall not exceed 0.35 m. The depth of flow may extend adjacent to the right-of-way, provided that the water level must not touch any part of the building envelope and must remain below the lowest building opening during the stress test event (100-yr+20%);
    - There must be at least 0.15m of vertical clearance between the spill elevation on the street and the ground elevation at the building envelope in the proximity of a flow route or ponding area;
- Storm runoff that exceeds the capacity of the minor system is to be stored within road sags and conveyed overland along defined major system flow routes towards the proposed major system outlet to the Jock River;
- Surface water accumulation at street low points, during a 2-year event, shall not be present by the end of the rainfall event;
- Major system storage in backyards is not to be included/ accounted for in design computations;
- The product of the 100-year flow depth (m) on street and flow velocity (m/s) shall not exceed 0.60;
- ICD flow rates are to be calculated for each drainage area to ensure that the following criteria are satisfied.

Water Quality & Quantity Control

- An *Enhanced* (80% TSS removal) level of quality control is required for storm outfalls to the Jock River;
- Lot level and conveyance Best Management Practices should be to promote infiltration and treatment of storm runoff.
- Quantity control of post-development runoff to pre-development levels is not required for lands outletting directly to the Jock River, provided that there are no adverse impacts on downstream watercourses, structures, or property resulting from the proposed development. *(Refer to Jock River Reach One Subwatershed Study – Stantec, 2007)*

Erosion and Sediment Control

- Erosion and sediment control measures are to be implemented during construction in accordance with the “Guidelines on Erosion and Sediment Control for Urban Construction Sites” (Government of Ontario, May 1987).
- 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.

6.0 DRAINAGE OUTLETS

There are three drainage outlets from the Burnett Lands site. Each outlet is discussed in detail in the following sections.

6.1 Burnett Municipal Drain

The existing Burnett Municipal Drain bisects the site from north to south – Refer to **Figure 5**. The drain is a tributary to the Jock River, with a total length of approximately 1.3 km. A significant portion of the original Burnett Drain has been replaced by storm sewers. The drain has been fully enclosed and/or abandoned north of the Barrhaven Town Centre commercial plaza. The Burnett Municipal Drain is primarily an open channel between the Barrhaven Town Centre and the confluence with the Jock River, but a portion of the drain is piped across an existing driving range to the north of the Caivan Lands for a distance of approximately 170 m.

Novatech has prepared a memo (South Nepean Collector Culvert Crossings, June 10, 2016 – included in **Appendix E**) that outlines the sizing of culvert crossings to be installed as a part of the Phase 2 South Nepean Collector project. This memo provides an assessment of the design flows and capacity of the existing Burnett Municipal Drain. During the 100-year storm, the peak flow through the drain is approximately 2.7 m^3/s. The existing drain has a cross-section consisting of a 3.0 m bottom width, 0.6 m depth, and side slopes ranging from 2:1 to 4:1. This cross-section gives a bankfull capacity of approximately 3.9 m^3/s, based on Manning's equation.

Under interim conditions, the drain will be re-directed to the west, around the boundary of the site, connecting with the existing outlet for the KB Pond – as shown on **Figure 5**. To maintain the capacity of the drain, the realigned channel should maintain a cross-section consistent with the existing drain. Ultimately, it is anticipated that the drain will be abandoned as part of planned future development upstream. Further details on the KB outlet channel are provided in the following section.

Once construction of the subdivision and surrounding developments have been completed the majority of the municipal drain will be formally abandoned, as much of the area originally tributary to the drain will be captured by the proposed storm sewer systems. The portion of the drain to the south of the subdivision is to be left as-is, and will convey overland flows from the major system outlet of the subdivision to the Jock River.

As a part of the Municipal Drain Headwaters report, the Burnett Drain was classified using the four-step process of the Headwater Guidelines:

- Hydrology Classification
    - Municipal drain provides valued hydrologic function (due to flow in spring);
    - Tributary drains are constructed agricultural drains with limited hydrologic function.
- Riparian Classification
    - Municipal Drain and Tributary 1 have limited riparian functions;
    - Tributaries 2 & 3 have limited to contributing riparian functions.
- Fish and Fish Habitat Classification
    - Municipal Dain is considered to have a contributing fish habitat;
    - Tributaries have no value as fish habitat.
- Terrestrial Classification
    - Municipal Drain and Tributaries have limited terrestrial functions.

KENNEDY-BURNETT POND

BURNETT MUNICIPAL DRAIN

POND OUTLET

REALIGNED DRAIN

3370 GREENBANK ROAD
BURNETT LANDS

SECTION OF DRAIN
TO BE ABANDONED

FRASER-CLARKE DRAIN

GREENBANK RD

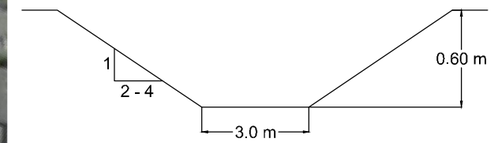
SECTION OF DRAIN
TO REMAIN AS
MAJOR SYSTEM OUTLET

JOCK RIVER

LEGEND

- PROPERTY BOUNDARY
- WATERCOURSE
- EXISTING BURNETT MUNICIPAL DRAIN
- RE-ALIGNED BURNETT MUNICIPAL DRAIN
- KB POND OUTLET (BURIED PIPE)
- DIRECTION OF FLOW
- SUBDIVISION BOUNDARY

DRAIN CROSS-SECTION (TYPICAL, NTS)



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3370 GREENBANK RD.
KENNEDY BURNETT LANDS

BURNETT
MUNICIPAL DRAIN

SCALE 1 : 2500 (0, 25, 50, 75, 100)

DATE MAY 2018 | JOB 111117 | FIGURE FIGURE 5

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Because of these classifications, it is recommended that there is no management required for the tributaries of the Burnett Municipal Drain and that they can be abandoned. It is recommended that the Burnett Municipal Drain be managed through mitigation, which can include replicating the function of the drain through lot level conveyance best management practices (i.e. directing roof leaders to grassed areas). Additional information on the Burnett Drain is available in Headwater Report referenced in **Section 1.2** of this report. Further information on possible mitigation measures are outlined in the Evaluation, Classification and Management of Headwater Drainage Features Guidelines (CVC & TRCA, January 2014).

6.2 KB Pond Outlet Channel

Under existing conditions, flows leaving the Kennedy Burnett SWM Facility enter a channel to the south of the pond, which then flows into the Fraser-Clarke Drain and ultimately to the Jock River. Based on geomorphic assessments of the channel completed by Parish Geomorphic (December 2009, November 2013) it was found that the channel is "in regime" and it is understood that the channel has sufficient capacity to convey the outflows from the KB pond. Refer to the following reports for more details:

- *Foster Ditch & Kennedy Burnett SWMF Geomorphic Assessment (Draft 2)*. Parish Geomorphic Ltd. (December 2009);
- *Foster & Kennedy-Burnett SWMF Geomorphic Assessment – Update*. Parish Geomorphic Ltd. (November 2013).

As noted in the above section, the Burnett Municipal drain is to be temporarily re-directed to the outlet channel from the KB pond. Ultimately, the drain will be abandoned and runoff from the Caivan Lands, as well as runoff from Street 'B' (shared between the Burnett and Caivan properties) will be directed to the KB pond outlet channel.

The City has a program in place to evaluate the KB pond outlet channel and Fraser-Clarke Drain to ensure they can accommodate the flows from the overall drainage area, including the additional flows from the Burnett Drain. Novatech will coordinate with the City to ensure that any required mitigation measures are in place before development proceeds.

6.3 Jock River Outlet

Under existing conditions, the entire Burnett Lands site is tributary to the Jock River. Under post-development conditions, runoff from the majority of the site (with the exception of Street 'B') will continue to outlet to the Jock River.

As noted in the SWM criteria, quantity control of post-development runoff to pre-development levels is not required for lands outletting directly to the Jock River, provided that there are no adverse impacts on downstream watercourses, structures, or property resulting from the proposed development. *(Refer to Jock River Reach One Subwatershed Study – Stantec, 2007)*. To reduce any impact to erosion in the Jock River as a result of the increase in peak flows, energy dissipation measures (such as a plunge pool, baffle blocks, etc.) should be put into place at the STM outlet from the proposed development.

7.0 STORMWATER MANAGEMENT DESIGN

Storm servicing for the subject development will be provided using a dual drainage system: Runoff from frequent events will be conveyed by storm sewers (minor system), while flows from large storm events which exceed the capacity of the minor system will be conveyed overland along defined overland flow routes (major system).

The stormwater management design for the Burnett Lands conforms to the recommended stormwater management strategy for the planned Environmental Assessment update for the Kennedy-Burnett SWM Facility – refer to **Figure 113221 FIG-6** in **Appendix D**.

7.1 Storm Sewer Design (Minor System)

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 sheet is provided in **Appendix A**. The corresponding Storm Drainage Area Plan (Drawing **111117-STM**) is provided in **Appendix G**. The design criteria used to size the storm sewers are summarized in **Table 7.1**.

Table 7.1: Storm Sewer Design Parameters

Parameter	Design Criteria
Local & Collector Roads	5-year Return Period
Storm Sewer Design	Rational Method/Modeling
IDF Rainfall Data	Ottawa Sewer Design Guidelines (Oct. 2012)
Initial Time of Concentration (T_c)	15 minutes (rearyards) / 10 minutes (roads)
Minimum Velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Minimum Diameter	250 mm

7.2 Inlet Control Devices

Inlet control devices (ICDs) will be installed in all catchbasins to limit inflows to the minor system during large (>1:5 year) storm events.

All catchbasins will have a single connection to the storm sewers. ICDs will be round orifice plugs with diameters of either 83mm, 94mm, 102mm, 127mm, 152mm, or 178mm.

7.3 Overland Flow Path (Major System)

The site has been graded to provide an engineered overland flow route (major system) for large, infrequent storms or in the event that the storm sewer system becomes obstructed. Flows will be directed to the Jock River at the low point in the system. The design of the major system conforms to the design standards outlined in Section 5.5 of the Sewer Design Guidelines.

7.4 Street 'B'/ Caivan Lands

Street 'B' is a shared road between the Burnett Lands and the Caivan Lands to the north. Approximately 1.66 ha of the Burnett Lands development and approximately 2.61 ha of the Caivan Lands will drain to Street 'B'. Since Street 'B' will be constructed as a part of the Burnett Lands Development, the street and tributary areas have been included in the design.

Storm runoff from the Caivan Lands and Street 'B' will be directed to the outlet channel for Kennedy-Burnett SWM facility by a shared storm sewer. Water quality treatment upstream of this outfall will be provided using a hydrodynamic separator at the western end of Street 'B' (refer to the General Plan of Services, **111117-GP** in **Appendix G**).

7.5 Greenbank Road

The Burnett Lands site is bounded to the east by Greenbank Road. In the future, Greenbank Road is to be re-aligned and storm sewers are to be installed. Runoff from the right-of-way will be conveyed to the east as a part of the Jockvale Road storm sewer system, and will not connect to the Burnett Lands sewer system. The roadway has been included in the PCSWMM model, with all subcatchments outletting to an off-site outfall node.

7.6 Water Quantity & Quality Control

Quantity Control

As outlined in the Jock River Reach One Subwatershed Study (Stantec, June 2007); "No quantity control storage required for flood control purposes as the hydrograph from the subwatershed will peak before the upstream peak in the Jock River."

While no quantity control is required, energy dissipation measures at the outfall are to be provided to ensure no impacts on erosion in the Jock River.

Quality Control

An *Enhanced* (80% TSS removal) level of water quality control will be provided by using hydrodynamic separators (HDS) upstream of the storm outfalls.

- Storm runoff from the majority of the site will be treated by an HDS unit upstream of the outfall to the Jock River near the southeast corner of the site.
- Storm runoff from Street B will be treated by an HDS unit located upstream of the outfall to the Kennedy-Burnett SWM Facility outlet channel near the northwest corner of the site. This storm outlet and HDS unit will also serve as the storm outlet for the adjacent Caivan development to the north.

In addition to the HDS units, lot level and conveyance Best Management Practices should be considered at the detailed design stage to promote infiltration and treatment of storm runoff;

- Perforated pipes for rear-yard catchbasin leads;
- Direct roof leaders to rear-yard areas;
- Infiltration trenches underlying swales in rear-yard areas;
- The use of fine sandy loam topsoil on residential lawns;

8.0 HYDROLOGIC & HYDRAULIC MODELING

The *City of Ottawa Sewer Design Guidelines* (October 2012) requires hydrologic modeling for all dual drainage systems. The performance of the proposed storm drainage system for the Burnett Lands was evaluated using the PCSWMM hydrologic/hydraulic model.

Modeling files are provided on the enclosed CD.

8.1 Design Storms

The hydrologic analysis was completed using the following synthetic design storm events. The IDF parameters used to generate the design storms were taken from the *City of Ottawa Sewer Design Guidelines* (October 2012).

4 Hour Chicago Storms:

25mm 4hr Chicago storm
2-year 4hr Chicago storm
5-year 4hr Chicago storm
100-year 4hr Chicago storm
100-year 4hr +20% 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.

8.2 Model Development

The PCSWMM model has been developed to account for both minor and major system flows from the development, and ensure no adverse impacts on the downstream drainage system. The results of the analysis were used to:

- Determine the total major and minor system runoff from the site.
- Calculate the storm sewer hydraulic grade line for the 100-year storm event;
- Evaluate overland flow depths and ponding volumes during the 100-year event; and
- Ensure no ponding in the right-of-ways remains at the end of all storm events;

8.2.1 Storm Drainage Areas

For modeling purposes, the site 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 (**111117-STM**) in **Appendix G**.

8.2.2 Subcatchment Model Parameters

The hydrologic parameters for each subcatchment were developed based on the Concept Plan (**Figure 2**) and the Storm Drainage Area Plan (**111117-STM**). An overview of the modeling parameters is provided in **Table 8.1**.

Table 8.1: Hydrologic Modeling Parameters

Area ID	Catchment Area (ha)	Runoff Coefficient	Percent Impervious (%)	No Depression Storage (%)	Equivalent Width (m)	Average Slope (%)
Burnett Lands - Claridge						
A01	0.163	0.65	64%	50%	138	0.85
A02	0.106	0.65	64%	100%	44	1.50
A03	0.352	0.65	64%	50%	166	0.75
A04	0.258	0.65	64%	50%	183	0.75
A05	0.032	0.65	64%	100%	12	1.50
A06	0.287	0.65	64%	50%	132	0.75
A07	0.178	0.65	64%	100%	66	2.00
A08	0.218	0.65	64%	50%	143	0.70
A09	0.265	0.65	64%	50%	99	1.30
A10	0.108	0.65	64%	50%	81	0.85
A11	0.147	0.65	64%	100%	57	1.80
A12	0.276	0.65	64%	50%	125	0.55
A13	0.143	0.65	64%	100%	40	1.50
A14	0.161	0.65	64%	50%	85	0.75
A15	0.215	0.65	64%	100%	77	1.50
A16	0.200	0.65	64%	50%	110	0.70
A17	0.135	0.65	64%	100%	37	1.50
A18	0.219	0.65	64%	50%	98	0.85
A19	0.285	0.65	64%	50%	152	0.75
A20	0.195	0.65	64%	100%	72	1.50
A21	0.154	0.65	64%	50%	105	1.00
A22	0.474	0.65	64%	50%	91	1.00
A23	0.070	0.65	64%	100%	47	1.50
A24	0.185	0.65	64%	50%	107	0.85
A25	0.174	0.65	64%	100%	59	1.50
A26	0.239	0.65	64%	50%	108	1.70
A27	0.071	0.65	64%	100%	50	1.50
A28	0.192	0.65	64%	50%	107	1.00
A29	0.317	0.65	64%	50%	58	1.00
A30	0.269	0.65	64%	50%	186	1.00
A31	0.269	0.65	64%	50%	194	0.80
A32	0.476	0.65	64%	50%	74	1.00
A33	0.145	0.65	64%	50%	98	1.30
A34-35	0.588	0.65	64%	50%	37	1.30
A-36	0.845	0.65	64%	50%	85	1.00
A-37	0.734	0.65	64%	0%	304	1.00
A-38	0.744	0.65	64%	0%	273	1.00

Area ID	Catchment Area (ha)	Runoff Coefficient	Percent Impervious (%)	No Depression Storage (%)	Equivalent Width (m)	Average Slope (%)
A-39	0.376	0.65	64%	0%	147	1.00
A-40	0.303	0.65	64%	0%	136	1.00
Street B - Caivan Lands						
B-01	0.135	0.65	64%	50%	129	2.00
B-02	0.824	0.65	64%	50%	134	1.00
B-03	0.095	0.65	64%	100%	36	1.80
B-04	0.137	0.65	64%	50%	141	0.60
B-05	0.226	0.65	64%	50%	154	0.75
B-06	0.200	0.65	64%	100%	65	1.50
B-07	0.204	0.65	64%	50%	155	1.00
B-08	1.111	0.30	14%	0%	150	0.85
B-09	0.090	0.65	64%	50%	41	1.00
B-10	0.186	0.65	64%	50%	148	0.85
B-11	0.097	0.65	64%	50%	87	1.00
B-12	0.111	0.65	64%	100%	45	2.00
B-13	0.120	0.65	64%	50%	86	1.00
B-14	0.136	0.65	64%	50%	88	1.00
B-15	0.026	0.65	64%	100%	21	1.80
B-16	0.121	0.65	64%	50%	84	1.00
B-17	0.342	0.65	64%	50%	181	0.85
B-18	0.107	0.65	64%	50%	48	1.00
CaivanLands	8.251	0.65	64%	50%	400	1.00

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 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 were used for all catchments.

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

Residential rooftops are assumed to provide no depression storage and all rainfall is converted to runoff.

Equivalent Width

'Equivalent Width' refers to the width of the sub-catchment flow path. This parameter (Table 5.1) is calculated as described in the *Sewer Design Guidelines, October 2012, Section 5.4.5.6*.

Impervious Values

Impervious (%IMP) values for each subcatchment area were calculated based on the concept plan (**Figure 2**). The impervious values correspond to the Runoff Coefficients (C) used in the Rational Method calculations using the equation:

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

For the Storm Sewer Design spreadsheet, typical lots were analyzed with respect to the concept plan and runoff coefficients were determined based on the proposed land use. For development consisting of primarily medium-density residential (multi-unit attached dwellings) a runoff coefficient (C) of 0.65 was selected.

8.2.3 Minor System

Inflows to the storm sewer were modeled 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. ICD parameters are outlined as follows in **Table 8.2**.

Table 8.2: ICD Parameters

Structure	ICD Size & Inlet Rate				5-year Peak Flow*
	Diameter (mm)	Max Head (m)	Calculated Inlet Capture Rate (L/s)	Actual 5-year Capture Rate* (L/s)	(L/s)
Burnett Lands - Claridge					
CB01-02	83	1.56	18.57	20.02	39.62
CB03-04	94	1.56	23.77	25.88	60.75
CB05-06	108	1.55	31.31	34.06	63.67
CB07-08	102	1.55	27.96	30.79	78.36
CB09-10	108	1.54	31.23	34.02	59.86
CB11-12	94	1.55	23.71	25.89	36.40
CB13-14	83	1.56	18.57	20.21	45.25
CB15-16	83	1.56	18.57	20.43	48.82
CB17-18	83	1.56	18.57	20.32	64.52
CB19-20	94	1.55	23.72	25.27	50.54
CB21-22	108	1.44	30.15	30.71	59.33
CB23-24	83	1.56	18.57	17.70	25.84
CB25-26	83	1.56	18.56	18.34	35.19
CB27-28	108	1.55	31.32	32.24	63.76
CB29-30	108	1.54	31.25	32.94	64.36
CB31-32	94	1.56	23.77	25.49	44.61
CB33-34	108	1.55	31.30	33.86	55.96

Structure	ICD Size & Inlet Rate				5-year Peak Flow* (L/s)
	Diameter (mm)	Max Head (m)	Calculated Inlet Capture Rate (L/s)	Actual 5-year Capture Rate* (L/s)	
CB35-36	94	1.56	23.77	25.96	42.72
CB37-38	83	1.56	18.57	20.05	36.78
RYCB01	83	1.61	18.85	4.82	4.82
RYCB02	83	1.56	18.55	19.14	19.63
RYCB03	83	1.96	20.79	19.78	20.56
RYCB04	83	1.64	19.02	20.43	26.48
RYCB05	83	1.46	17.94	5.93	5.93
RYCB06	83	2.07	21.37	20.71	32.97
RYCB07	94	1.84	25.87	27.73	37.04
RYCB08	83	2.13	21.68	21.90	39.82
RYCB09	83	1.97	20.85	21.07	25.00
RYCB10	83	2.07	21.37	20.36	27.23
RYCB11	83	1.77	19.76	17.35	17.60
RYCB12	83	2.01	21.06	21.23	32.23
RYCB13	94	2.81	31.96	26.97	36.12
RYCB14	83	1.85	20.20	12.87	13.15
RYCB15	83	1.83	20.09	12.67	12.97
Street B - Caivan Lands					
CB39-40	83	1.56	18.57	19.95	78.01
CB41-42	94	1.56	23.77	25.19	44.85
CB43-44	152	1.53	61.58	66.26	91.01
CB45-46	83	1.56	18.57	20.27	52.92
CB47-48	83	1.56	18.56	19.87	33.39
CB49-50	83	1.56	18.57	19.91	34.85

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

8.2.4 Major System

The proposed road network was input into the PCSWMM model to calculate the overland flows and flow depths within the right-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 in the PCSWMM model are based on the gutter elevations, as opposed to the centerline of road elevations shown on the Grading Plans (**111117-GR1-3** as provided in **Appendix G**). Right-of-way cross sections used in the PCSWMM model are provided in **Appendix D**.

8.2.5 Modeling Files / Schematic

The PCSWMM model schematics and 100-year model output data are provided in **Appendix D**. Digital copies of the modeling files and model output for all storm events are provided on the enclosed CD.

8.3 PCSWMM Model Results

8.3.1 Minor System

The minor system peak flows were evaluated using the 4-hour Chicago distribution for a full range of return periods. The results are summarized in **Table 8.3**.

Table 8.3: Minor System Peak Flows at Outlets (L/s)

Storm Distribution->	**4hr Chicago**				
Return Period->	25mm	2yr	5yr	100yr	100yr +20%
Burnett Lands - Flows to Jock River					
Minor System *(HW-01)*	723	952	1190	1351	1350
Major System *(OVF-OUT)*	0	0	0	7	18
Burnett & Caivan Lands - Flows to Fraser-Clarke Drain					
Outlet from Street B *(HW-02)*	966	1416	2148	2342	2400
Offsite Flows					
Greenbank Road *(GRBK-OUT)*	217	317	478	956	1182

8.3.2 Major System

The major system network was evaluated using the PCSWMM model to ensure that the ponding depths conform to City standards. A summary of ponding depths and volumes for the 100-year event is provided in **Table 8.4**. Ponding volumes and depths for all storm events (including the 100-yr+20% event and 5-year event) are provided in **Appendix D**.

Table 8.4: Ponding Depths at Catchbasins (100yr Event)

Structure	T/G	Max. Static Ponding (Spill Depth)		100-yr Event (4hr)			
		Elev.	Depth	Elev.	Total Dynamic Depth	Cascading Flow?	Cascade Depth
	(m)	(m)	(m)	(m)	(m)	(Y/N)	(m)
Burnett Lands - Claridge							
CB01-02	93.39	93.65	0.26	93.60	0.21	N	0.00
CB03-04	93.27	93.58	0.31	93.50	0.23	N	0.00
CB05-06	93.17	93.50	0.33	93.43	0.26	N	0.00
CB07-08	93.33	93.69	0.36	93.63	0.30	N	0.00
CB09-10	93.26	93.50	0.24	93.53	0.27	Y	0.03
CB11-12	93.24	93.43	0.20	93.47	0.23	Y	0.04
CB13-14	93.30	93.56	0.26	93.55	0.25	N	0.00
CB15-16	93.32	93.52	0.20	93.58	0.26	Y	0.06
CB17-18	93.10	93.39	0.29	93.37	0.27	N	0.00
CB19-20	92.93	93.12	0.19	93.16	0.23	Y	0.04
CB21-22	92.62	92.89	0.27	92.92	0.30	Y	0.03
CB23-24	92.69	92.80	0.11	92.92	0.23	Y	0.12
CB25-26	92.73	92.89	0.16	92.92	0.19	Y	0.03
CB27-28	92.85	92.92	0.07	93.06	0.21	Y	0.14
CB29-30	92.88	92.92	0.04	93.06	0.18	Y	0.14
CB31-32	93.07	93.27	0.20	93.30	0.23	Y	0.03
CB33-34	93.25	93.45	0.20	93.49	0.24	Y	0.04
CB35-36	93.27	93.45	0.18	93.50	0.23	Y	0.05
CB37-38	93.35	93.55	0.20	93.56	0.21	Y	0.01
Street B - Caivan Lands							
CB39-40	93.17	93.45	0.28	93.30	0.13	N	0.00
CB41-42	93.44	93.69	0.25	93.53	0.09	N	0.00
CB43-44	93.40	93.69	0.29	93.75	0.35	Y	0.06
CB45-46	93.41	93.62	0.21	93.65	0.24	Y	0.03
CB47-48	93.47	93.62	0.15	93.64	0.17	Y	0.02
CB49-50	93.67	93.82	0.15	93.83	0.16	Y	0.01

8.3.3 Hydraulic Grade Line

Peak flows from the subdivision will not coincide with peak flows in the Jock River. Consequently, a combined frequency analysis was used to assess the maximum HGL in the storm sewers. The hydraulic analysis was initially modeled for two scenarios:

1) 5-year flows in the storm sewers, 100-year flood elevation at the outlet (Jock River)
2) 100-year flows in the storm sewers, 5-year flood elevation at the outlet (Jock River)

The 5-year peak flow combined with the 100-year flood elevation of 91.28 at the Jock River and 91.58 at the Fraser-Clarke Drain produced the highest HGL values, representing the worst-case scenario. This scenario was used for all subsequent analysis.

Table 8.5 provides a summary of the 5-year peak flow combined with the 100-year flood elevation HGL elevation at each storm manhole within the proposed development. These HGL elevations have also been included on the Plan & Profile Drawings (**111117-P1-9**).

HGL elevations for the 100-year flows in the storm sewers, 5-year flood elevation at the outlet as well as a summary of the HGL elevations for a 20% increase (rainfall intensity and total precipitation) in the 100-year design event have been included in **Appendix D**. The results of this stress testing indicate that, even under this scenario, the hydraulic grade line in the sewers will only slightly increase, ensuring that the HGL will remain below the undersides of footing of the proposed units.

Table 8.5: Storm Sewer Hydraulic Grade Line:
5yr-4hr Chicago Distribution, 100-yr WL in Jock River

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation (m)	Design USF (m)	USF Clearance (m)
Burnett Lands - Claridge					
200 (STM)	90.92	93.70	91.70	92.03	0.33
202 (STM)	90.81	93.39	91.70	92.02	0.32
204 (STM)	90.78	93.41	91.70	92.02	0.32
300 (STM)	90.38	93.50	91.70	92.02	0.32
302 (STM)	90.28	93.67	91.69	92.02	0.33
304 (STM)	90.05	93.73	91.68	92.01	0.33
306 (STM)	90.90	93.26	91.69	92.02	0.33
400 (STM)	90.50	93.51	91.75	92.34	0.59
402 (STM)	90.38	93.41	91.75	92.34	0.59
404 (STM)	90.31	93.58	91.75	92.33	0.58
406 (STM)	90.11	93.57	91.75	92.32	0.57
408 (STM)	90.94	93.01	91.63	92.00	0.37
410 (STM)	90.12	92.99	91.65	91.99	0.34
412 (STM)	89.26	92.65	91.60	92.02	0.42
500 (STM)	90.74	93.62	91.82	92.12	0.30
502 (STM)	90.57	93.49	91.82	92.12	0.30
504 (STM)	90.42	93.37	91.82	92.12	0.30

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation (m)	Design USF (m)	USF Clearance (m)
506 (STM)	90.43	93.50	91.80	92.12	0.32
508 (STM)	89.93	93.31	91.76	92.10	0.34
600 (STM)	90.85	93.50	91.91	92.35	0.44
602 (STM)	90.64	93.33	91.91	92.32	0.41
604 (STM)	90.26	93.45	91.83	92.32	0.49
606 (STM)	89.95	93.26	91.74	92.32	0.58
608 (STM)	89.58	93.08	91.70	92.08	0.38
700 (STM)	88.65	94.14	91.80	92.12	0.32
802 (STM)	89.92	93.82	91.62	-	-
804 (STM)	89.82	93.93	91.60	-	-
806 (STM)	89.28	93.34	91.52	-	-
808 (STM)	89.25	93.38	91.56	-	-
810 (STM)	89.27	93.40	91.33	-	-
900 (STM)	89.18	92.61	91.56	-	-
902 (STM)	89.00	93.09	91.45	-	-
Street B - Caivan Lands					
100 (STM)	89.71	93.32	91.68	92.03	0.35
102 (STM)	89.86	93.37	91.70	92.03	0.33
104 (STM)	89.89	93.66	91.71	92.03	0.32
106 (STM)	90.14	93.75	91.73	-	-
108 (STM)	90.18	93.55	91.76	-	-
110 (STM)	90.31	93.71	91.80	-	-
112 (STM)	90.44	93.51	91.84	92.42	0.58
114 (STM)	90.62	93.66	91.90	92.49	0.59
116 (STM)	91.02	93.83	91.95	-	-
118 (STM)	90.99	94.51	91.96	-	-

8.3.4 On-Site Storage (Future Development Blocks)

Within the Burnett Lands are several blocks that are to be developed at a later date. Storm runoff from these blocks will be captured by the Burnett Lands storm sewer system. To simulate the stormwater management for these blocks, the subcatchment areas are directed to storage nodes, which are connected to the downstream sewers via orifices which have been sized for the 5-year uncontrolled peak flow from the block. Peak flows and required storage volumes are outlined in **Table 8.6**.

Table 8.6: Peak Flows & Storage Volumes – Future Development Blocks

Block ID	Drainage Area ID	Area (ha)	Allowable Release Rate* (L/s)	Storage Required (100-year event)	
				Total Volume (m^3)	Per-Hectare Volume (m^3/ha)
Block 11	A22	0.474	96	36	76
Block 16	A29	0.317	64	24	75
Block 19	A34-35	0.588	107	34	57
Block 20	A36	0.845	161	55	65
Block 25	A32	0.476	95	34	72

**The allowable release rate is the 5-year uncontrolled flow calculated using the PCSWMM model*

Storage nodes have been sized to provide enough storage for the 100-year event, without overflow or flooding. It is assumed that with storage volumes under 100m^3/ha, the required storage can be achieved on-site through a combination of low-point ponding in parking lots and roadways and rooftop storage.

9.0 UTILITIES

The development will be serviced by hydro, phone, cable, and gas from the existing services on Greenbank Road. During detailed design, the works will be coordinated with local utility companies. All local roads and Street 1 will follow the City of Ottawa standard cross-section. A typical cross-section for Jockvale Road has been provided in **Appendix G.**

10.0 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). Detailed plans will be provided at the detailed design stage.

Typical erosion and sediment control measures recommended include, but are not limited to, the use of silt fences around perimeter of site (OPSD 219.110), filter fabric or inserts under catch basin/maintenance hole lids, heavy duty silt fence barrier (OPSD 219.130), straw bale check dams (OPSD 219.180), rock check dams (219.210 or OPSD 219.211), turbidity curtain (OPSD 219.260), dewatering trap (OPSD 219.240), temporary water passage system (OPSD 221.030), riprap (OPSS 511), mud mats, silt bags for dewatering operations, topsoil and sod to disturbed areas and natural grassed waterways. Dewatering and sediment control techniques will be developed for the individual situations based on the above guidelines and utilizing typical measures to ensure erosion and sediment control is controlled in an acceptable manner and there is no negative impact to adjacent lands, water bodies or water treatment/conveyance facilities.

It will be the responsibility of the Contractor to submit a detailed construction schedule and appropriate staging, dewatering and erosion and sediment control plans to the Contract Administrator for review and approval prior to the commencement of work.

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.
    - Straw bale barriers are to be installed in drainage ditches
    - Inserts are to be placed under the grates of all proposed and existing catchbasins and structures.
    - 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.

To ensure the outflow from the subdivision does not have any negative impacts on the erosion in the Jock River, energy dissipation measures (such as a plunge pool, baffle blocks, etc.) are to be provided on a permanent basis at the storm outfall.

11.0 CONCLUSIONS AND RECOMMENDATIONS

Sanitary Servicing

The analysis of the proposed sanitary servicing conforms the following:

- The site is located within Sanitary Drainage Area 8A of Phase 2 of the SNC.
- The on-site sanitary sewers have been sized to accommodate a portion of the peak sanitary flows from the adjacent lands to the north, to be developed by others, and St. Joseph high school located east of the development across Greenbank Road.
- The proposed sanitary sewers have adequate capacity to accommodate the peak sanitary flow.

Watermain

The analysis of the proposed watermain network confirms the following:

- Approximately 335m of the 300mm Greenbank Road watermain is to be installed and connected to the proposed 300mm at the northeast limits of the site. A second connection will be provided by connecting to a future 300mm watermain (by others) on Jockvale Road at the southeast limits of the site. These connections will provide a loop system for the development.
- Ultimately the site will connect to a future watermain, to be completed by others, to the northwest.
- The site is located in a future Zone 3C pressure zone that once complete will increase the pressures in the system onsite for the maximum daily and peak hour conditions. The average day pressures will decrease and therefore improve the system by lowering pressures within acceptable standards (<80psi).
- This report confirms the proposed watermain can service the site pre and post zone reconfiguration.
- During detailed design the use of pressure reducing valves will be explored.

Stormwater Management

The stormwater management design for the Burnett Lands development conforms to the criteria established as part of this report.

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 uncontrolled 5-year peak flow using the Rational Method.
- Inflows to the minor system will be controlled using inlet control devices (ICDs). Proposed ICDs will consist of round orifice plates with various standard diameters (83mm, 94mm 102mm, 108mm, 127mm, 152mm, and 178mm).
- The site has been graded to provide surface storage at low points along roadways, and a major system outlet to the Jock River for flows which exceed the capacity of the road sags.
- Ponding depths will not exceed 0.35m for all storms up to and including the 100-year event.

- The post-development peak flows from the site will have no adverse impact on the Jock River downstream.
- 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

- An *Enhanced* level of water quality control (80% TSS removal) will be provided using hydrodynamic separators upstream of the storm outfalls.
- Quantity control is not required for the Burnett Lands, as they are located adjacent to the Jock River.

Erosion and Sediment control

- Erosion and sediment control measures (i.e. filter fabric, silt fences, etc.) will be implemented prior to construction and are to remain in place until vegetation is established.
- Energy dissipation measures will be provided at the storm outlet to the Jock River to reduce outlet velocities and ensure no adverse impacts on erosion in the Jock River.

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

NOVATECH

Stormwater Management and Modeling

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Sanitary and Water Modeling

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Senior Project Manager

Appendix A

Design Sheets

SANITARY SEWER DESIGN SHEET

BURNETT LANDS SUBDIVISION

DEVELOPER: CLARIDGE HOMES

NOVATECH
Engineers, Planners & Landscape Architects

PROJECT :	113191	111117
DESIGNED BY:	LSC	LSC
CHECKED BY:	CJR	GJM
DATE PREPARED:	MAR, 2014	Dec. 2015
DATE REVISED:		Nov. 25/16
DATE REVISED:		Jan. 26/18
DATE REVISED:		May 23/18

LOCATION										CUMULATIVE		PEAK FACTOR M	POPULATION FLOW Q(p) (L/s)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	PROPOSED SEWER								
STREET	AREA	FROM MH	TO MH	CONDOS	TOWNS	FUTURE TOWNS*	SCHOOL AREA (ha)	POPULATION (in 1000's)	AREA (ha.)	POPULATION (in 1000's)	AREA (ha.)					LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	Roughness Coef.	GRADE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap
Future	B01	Stub	101			23		0.0621	0.225	0.062	0.225	3.64	0.73	0.07	0.81	12.0	200	201.2	DR 35	0.013	0.35	19.7	0.62	0.04
Street B	101	101	103		2			0.0054	0.261	0.068	0.486	3.63	0.79	0.16	0.95	36.1	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.03
Future	B02	Stub	103			30		0.0810	0.298	0.081	0.298	3.61	0.95	0.10	1.05	12.0	200	201.2	DR 35	0.013	0.35	19.7	0.62	0.05
Street B	103	103	105		3			0.0081	0.189	0.157	0.973	3.55	1.80	0.32	2.12	35.5	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.07
Future	B03	Stub	105			33		0.0891	0.325	0.089	0.325	3.61	1.04	0.11	1.15	12.0	200	201.2	DR 35	0.013	0.35	19.7	0.62	0.06
Street B	105	105	107					0.0000	0.076	0.246	1.374	3.49	2.78	0.45	3.23	35.5	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.11
Future	B04/B05	Stub	107			54		0.1458	0.527	0.146	0.527	3.56	1.68	0.17	1.85	12.0	200	201.2	DR 35	0.013	0.35	19.7	0.62	0.09
Street B	107	107	109					0.0000	0.110	0.392	2.011	3.42	4.34	0.66	5.00	57.8	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.17
Future	B06	Stub	109			19		0.0513	0.189	0.051	0.189	3.65	0.61	0.06	0.67	12.0	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.02
Future**	B07**	Stub	113			83		0.2241	1.933	0.224	1.933	3.50	2.54	0.64	3.25	12.0	200	201.2	DR 35	0.013	0.35	19.7	0.62	0.17
Street B	113	113	111		14			0.0378	0.561	0.262	2.494	3.48	2.96	0.82	3.85	100.1	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.13
Street B	111	111	109					0.0000	0.109	0.262	2.603	3.48	2.96	0.86	3.89	58.1	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.13
Jockvale	109	109	601		7			0.0189	0.243	0.724	5.046	3.31	7.76	1.67	9.50	39.4	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.31
Jockvale		601	SNC					0.0000		0.724	5.046	3.31	7.76	1.67	9.50	3.0	250	251.5	DR 35	0.013	1.00	60.4	1.22	0.16
Jockvale	601	601	603		7			0.0189	0.261	0.019	0.261	3.71	0.23	0.09	0.31	38.0	250	251.5	DR 35	0.013	0.26	30.8	0.62	0.01
Jockvale		603	307					0.0000		0.019	0.261	3.71	0.23	0.09	0.31	5.8	250	251.5	DR 35	0.013	0.38	37.2	0.75	0.01
Street 2	201	201	203		14			0.0378	0.402	0.038	0.402	3.67	0.45	0.13	0.58	46.9	200	201.2	DR 35	0.013	0.38	20.5	0.65	0.03
Street 2	203	203	205		1			0.0027	0.005	0.041	0.407	3.67	0.48	0.13	0.62	6.9	200	201.2	DR 35	0.013	0.46	22.6	0.71	0.03
Street 2	205	205	301		2			0.0054	0.127	0.046	0.534	3.66	0.54	0.18	0.72	21.5	200	201.2	DR 35	0.013	0.37	20.3	0.64	0.04
Half Moon Bay	301	301	303					0.0000	0.122	0.046	0.656	3.66	0.54	0.22	0.76	66.3	200	201.2	DR 35	0.013	0.36	20.0	0.63	0.04
Half Moon Bay	303	303	305		1			0.0027	0.088	0.049	0.744	3.65	0.58	0.25	0.82	10.9	200	201.2	DR 35	0.013	0.37	20.3	0.64	0.04
Half Moon Bay	305	305	307		17			0.0459	0.493	0.095	1.237	3.60	1.10	0.41	1.51	73.0	200	201.2	DR 35	0.013	0.37	20.3	0.64	0.07
Jockvale	307	307	605		4			0.0108	0.259	0.124	1.757	3.57	1.44	0.58	2.02	74.0	250	251.5	DR 35	0.013	0.27	31.4	0.63	0.06
Street 4	409	409	605		18			0.0486	0.612	0.049	0.612	3.65	0.58	0.20	0.78	66.8	200	201.2	DR 35	0.013	0.40	21.1	0.66	0.04
Street 4	401	401	403		4			0.0108	0.211	0.011	0.211	3.73	0.13	0.07	0.20	24.4	200	201.2	DR 35	0.013	0.66	27.1	0.85	0.01
Street 4	403	403	405		5			0.0135	0.152	0.024	0.363	3.69	0.29	0.12	0.41	30.7	200	201.2	DR 35	0.013	0.39	20.8	0.65	0.02
Street 4	405	405	407		14			0.0378	0.392	0.062	0.755	3.64	0.73	0.25	0.98	47.8	200	201.2	DR 35	0.013	0.38	20.5	0.65	0.05
Street 4	407	407	605		11			0.0297	0.315	0.092	1.070	3.60	1.07	0.35	1.42	51.4	200	201.2	DR 35	0.013	0.37	20.3	0.64	0.07
Jockvale	605	605	607					0.0000	0.130	0.265	3.569	3.48	2.98	1.18	4.16	74.0	250	251.5	DR 35	0.013	0.27	31.4	0.63	0.13
Street 4	411	411	607		8			0.0216	0.377	0.022	0.377	3.70	0.26	0.12	0.38	66.6	200	201.2	DR 35	0.013	0.71	28.1	0.88	0.01
Street 5	501	501	503		30			0.0810	0.877	0.081	0.877	3.61	0.95	0.29	1.24	32.1	200	201.2	DR 35	0.013	0.72	28.3	0.89	0.04
Street 5	503	503	505		4			0.0108	0.144	0.092	1.021	3.60	1.07	0.34	1.41	37.6	200	201.2	DR 35	0.013	0.35	19.7	0.62	0.07
Street 5	505	505	507		3			0.0081	0.106	0.100	1.127	3.59	1.16	0.37	1.54	26.8	200	201.2	DR 35	0.013	0.37	20.3	0.64	0.08
ST. JOSEPH SCHOOL***	Offsite***	EX. SA 365	701				10.52					1.50	3.41	3.47	8.59									
Street 7	701	701	507		12			0.0324	0.405	0.032	0.405	3.68	0.39	0.13	9.11	56.7	250	251.5	DR 35	0.013	0.37	36.7	0.74	0.25
Street 5	507	507	509		8			0.0216	0.250	0.154	1.782	3.55	1.77	0.59	10.94	55.3	200	201.2	DR 35	0.013	0.34	19.4	0.61	0.56
Street 5	509	509	607	60	6			0.1242	0.542	0.278	2.324	3.47	3.13	0.77	12.48	57.1	200	201.2	DR 35	0.013	0.36	20.0	0.63	0.62
Jockvale	607	607	609					0.0000		0.564	6.270	3.36	6.14	2.07	16.79	4.6	250	251.5	DR 35	0.013	0.44	40.1	0.81	0.42
Street H	801	801	613	60				0.1080	0.352	0.108	0.352	3.59	1.26	0.12	1.37	75.6	200	201.2	DR 35	0.013	0.50	23.6	0.74	0.06
Jockvale	615	Stub	613	130				0.2340	0.734	0.234	0.734	3.50	2.65	0.24	2.89	10.0	200	201.2	DR 35	0.013	1.00	33.3	1.05	0.09

SANITARY SEWER DESIGN SHEET

BURNETT LANDS SUBDIVISION

DEVELOPER: CLARIDGE HOMES

PROJECT :	113191	111117
DESIGNED BY:	LSC	LSC
CHECKED BY:	CJR	GJM
DATE PREPARED:	MAR, 2014	Dec. 2015
DATE REVISED:		Nov. 25/16
DATE REVISED:		Jan. 26/18
DATE REVISED:		May 23/18

Engineers, Planners & Landscape Architects

LOCATION										CUMULATIVE		PEAK FACTOR M	POPULATION FLOW Q(p) (L/s)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	PROPOSED SEWER								
STREET	AREA	FROM MH	TO MH	CONDOS	TOWNS	FUTURE TOWNS*	SCHOOL AREA (ha)	POPULATION (in 1000's)	AREA (ha.)	POPULATION (in 1000's)	AREA (ha.)					LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	Roughness Coef.	GRADE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap
Jockvale	613	613	611					0.0000	0.273	0.342	1.359	3.44	3.82	0.45	4.26	74.1	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.14
Jockvale	611	611	609	75				0.1350	0.530	0.477	1.889	3.39	5.24	0.62	5.86	71.1	250	251.5	DR 35	0.013	0.25	30.2	0.61	0.19
Jockvale/Street 4/5		609	SNC					0.0000		1.041	8.159	3.23	10.90	2.69	22.18	2.8	250	251.5	DR 35	0.013	1.00	60.4	1.22	0.37

Notes:

1. Q(d) = Q(p) + Q(i) , where
   - Q(d) = Design Flow (L/sec)
   - Q(p) = Population Flow (L/sec)
   - Q(i) = Extraneous Flow (L/sec) = 0.33L/s/effective gross ha

2* Future townhouse population based on zoning density 100 units/ha.

3** Offsite parkland and half of fronting roadway excluded (1.111ha) from residential population calculations. Parkland contribution accounted for as per Appendix 4-A.4.

4*** Area taken from South Nepean Collector: Phase 2, Hydraulics Review/Assessment, Technical Memo, completed by Novatech, dated August 20, 2015. Flows adjusted for City of Ottawa Tehcnical Memo ISTB-2018-01.

Residential

Q(p) = (PxqxM/86,400), where
- P = Population (2.7 persons per town/semi, 2.1 person per multi-unit zen, 1.8 persons per apartment)
- q = Average per capita flow = 280 L/cap/day
- M = Harmon Formula (maximum of 4.0)

Institutional

Q(p) = (PxqxM/86,400), where
- P = Population Demand = 28,000L/gross ha/day
- M = 1.5 (if ICI in contributing area >20%), 1.0 (if ICI in contributing area <20%)

Parkland (as per Appendix 4-A.4)

Q(p) = (PxqxM/86,400), where
- P = Population = 75 persons/acre/day
- q = 20L/person/day
- M = 1.5

Project: 111117
Location: 3370 Greenbank Rd.
Client: Claridge Homes

DATE: November 2016
REVISED: January 2018
REVISED: May 2018

NOVATECH
Engineers, Planners & Landscape Architects

Storm Sewer Design Sheet

						FLOW					PROPOSED SEWER								
STREET	**FROM**	**TO**	**AREA ID**	**R= 0.30**	**R= 0.65**	**INDIV 2.78 AR**	**ACCUM 2.78 AR**	**TIME OF CONC.**	**RAINFALL INTENSITY I**	**PEAK FLOW Q (l/s)**	**NOMINAL SIZE (mm)**	**PIPE SIZE (mm)**	**PIPE SLOPE (%)**	**LENGTH (m)**	**CAPACITY (l/s)**	**FULL FLOW VELOCITY (m/s)**	**TIME OF FLOW (min.)**	**EXCESS CAPACITY (l/s)**	**Q/Qfull**
Half Moon Bay	MH 300	MH 302	A1		0.163	0.29	0.29	10.00	104.19	50.65	600	609.6	0.23	42.8	307.51	1.05	0.68	256.87	0.16
Half Moon Bay			A2		0.106	0.19	0.49												
								10.68											
Half Moon Bay	MH 200	MH 202	Services Only																
Half Moon Bay	MH 202	MH 204	A3		0.352	0.64	0.64	10.00	104.19	66.27	600	609.6	0.37	5.4	390.03	1.33	0.07	323.76	0.17
Half Moon Bay	MH 204	MH 302					0.64	10.07	103.84	66.05	600	609.6	0.20	25.1	286.76	0.98	0.43	220.71	0.23
								10.49											
Half Moon Bay	MH 302	MH 304	A4		0.258	0.47	1.59	10.68	100.74	165.84	600	609.6	0.20	74.0	286.76	0.98	1.26	120.91	0.58
Half Moon Bay			A5		0.032	0.06	1.65												
								11.93											
Half Moon Bay	MH 306	MH 304	A6		0.287	0.52	0.52	10.00	104.19	54.04	600	609.6	0.30	69.0	351.20	1.20	0.96	297.17	0.15
								10.96											
Block 28/29/30	MH 304	MH 410	A7		0.178	0.32	2.49	11.93	94.98	236.15	675	685.8	0.20	70.0	392.57	1.06	1.10	156.42	0.60
								13.03											
Street 4	MH 408	MH 410	A8		0.218	0.39	0.39	10.00	104.19	90.94	600	609.6	0.30	67.9	351.20	1.20	0.94	260.27	0.26
			A9		0.265	0.48	0.87												
								10.94											
Street 4	MH 410	MH 412	A10		0.108	0.20	3.55	13.03	90.50	345.72	750	762.0	0.15	78.0	450.27	0.99	1.32	104.55	0.77
Block 26/27			A11		0.147	0.27	3.82												
								14.35											
Jockvale	MH 600	MH 602	A12		0.276	0.50	0.50	10.00	104.19	51.96	600	609.6	0.57	35.0	484.10	1.66	0.35	432.14	0.11
Jockvale	MH 602	MH 604	A13		0.143	0.26	0.76	10.35	102.37	77.51	600	609.6	0.20	35.1	286.76	0.98	0.60	209.25	0.27
Jockvale	MH 604	MH 606	A14		0.161	0.29	1.05	10.95	99.44	142.85	600	609.6	0.20	79.6	286.76	0.98	1.35	143.91	0.50
			A15		0.215	0.39	1.44												
								12.30											
Street 4	MH 400	MH 402	A16		0.200	0.36	0.36	10.00	104.19	37.66	600	609.6	0.45	24.3	430.13	1.47	0.28	392.48	0.09
Street 4	MH 402	MH 404	A17		0.135	0.24	0.61	10.28	102.76	62.21	600	609.6	0.25	28.2	320.60	1.10	0.43	258.40	0.19
Street 4	MH 404	MH 406	A18		0.219	0.40	1.00	10.70	100.62	100.73	600	609.6	0.20	47.2	286.76	0.98	0.80	186.03	0.35
Street 4	MH 406	MH 606	A19		0.285	0.51	1.52	11.50	96.86	146.85	675	685.8	0.15	55.4	339.98	0.92	1.00	193.12	0.43
								12.51											
Jockvale	MH 606	MH 608	A20		0.195	0.35	3.31	12.51	92.58	305.96	750	762.0	0.21	78.0	532.76	1.17	1.11	226.80	0.57
								13.62											

						FLOW					PROPOSED SEWER								
STREET	FROM	TO	AREA ID	R= 0.30	R= 0.65	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	NOMINAL SIZE (mm)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
Street 5	MH 500	MH 502	A21		0.154	0.28	0.28	10.00	104.19	118.24	600	609.6	0.47	34.0	439.59	1.50	0.38	321.35	0.27
			A22		0.474	0.86	1.13												
Street 5	MH 502	MH 504	A23		0.070	0.13	1.26	10.38	102.24	128.96	675	685.8	0.18	38.2	372.43	1.01	0.63	243.47	0.35
Street 5	MH 504	MH 506	A24		0.185	0.33	1.60	11.01	99.15	189.38	675	685.8	0.22	26.9	411.73	1.11	0.40	222.36	0.46
			A25		0.174	0.31	1.91												
								11.41											
Street 7	MH 700	MH 506	A26		0.239	0.43	0.43	10.00	104.19	45.00	600	609.6	0.25	56.5	320.60	1.10	0.86	275.61	0.14
								10.86											
Street 5	MH 506	MH 508	A27		0.071	0.13	2.47	11.41	97.29	274.06	675	685.8	0.22	55.5	411.73	1.11	0.83	137.67	0.67
			A28		0.192	0.35	2.82												
Street 5	MH 508	MH 608	A29		0.317	0.57	3.39	12.24	93.67	363.08	750	762.0	0.19	61.7	506.76	1.11	0.93	143.67	0.72
			A30		0.269	0.49	3.88												
								13.17											
Half Moon Bay	MH 608	MH 412	A31		0.269	0.49	7.67	13.62	88.29	700.04	975	990.6	0.14	79.3	875.66	1.14	1.16	175.63	0.80
			A33		0.145	0.26	7.93												
								14.79											
Pathway Blk	MH 412	MH 900	A32		0.476	0.86	12.61	14.79	84.25	1062.33	1200	1219.2	0.12	56.5	1410.38	1.21	0.78	348.04	0.75
Pathway Blk	MH 900	MH 902				0.00	12.61	15.57	81.77	1031.02	1200	1219.2	0.11	120.0	1350.33	1.16	1.73	319.31	0.76
								17.30											
Jockvale	MH 802	MH 804	A34		0.071	0.13	0.13	10.00	104.19	110.71	600	609.6	0.21	24.1	293.84	1.01	0.40	183.13	0.38
			A35		0.517	0.93	1.06												
Apartment Block	MH 804	MH 902	A36		0.845	1.53	2.59	10.40	102.13	264.46	600	609.6	0.28	81.4	339.29	1.16	1.17	74.84	0.78
								11.57											
Outlet	MH 902	MH 806				0.00	15.20	17.30	76.80	1167.23	1200	1219.2	0.12	15.3	1410.38	1.21	0.21	243.14	0.83
Outlet	MH 806	MH 808				0.00	15.20	17.51	76.24	1158.71	1200	1219.2	0.28	3.6	2154.39	1.84	0.03	995.68	0.54
Outlet	MH 808	HW1				0.00	15.20	17.54	76.15	1157.41	1500	1524.0	0.10	47.0	2334.38	1.28	0.61	1176.97	0.50
								18.16											

						FLOW					PROPOSED SEWER								
STREET	FROM	TO	AREA ID	R= 0.30	R= 0.65	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	NOMINAL SIZE (mm)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
Street B	MH 118	MH 116	B01		0.135	0.24	0.24	10.00	104.19	25.42	675	685.8	0.20	37.4	392.57	1.06	0.59	367.15	0.06
Street B	MH 116	MH 114	B02		0.824	1.49	1.73	10.59	101.19	217.78	675	685.8	0.20	82.6	392.57	1.06	1.30	174.80	0.55
			B03		0.095	0.17	1.90												
			B04		0.137	0.25	2.15												
Street B	MH 114	MH 112	B05		0.226	0.41	2.56	11.88	95.19	278.15	750	762.0	0.20	120.0	519.92	1.14	1.76	241.77	0.53
			B06		0.200	0.36	2.92												
Street B	MH 112	MH 110	B07		0.204	0.37	3.29	13.64	88.23	372.06	750	762.0	0.20	39.0	519.92	1.14	0.57	147.87	0.72
			B08	1.111		0.93	4.22												
								14.21											
Caivan Lands	CAP	MH 110	B09		0.090	0.16	0.16	10.00	104.19	16.94	450	457.2	0.40	12.0	188.30	1.15	0.17	171.36	0.09
								10.17											
Street B	MH 110	MH108	B10		0.186	0.34	4.72	14.21	86.20	406.50	825	838.2	0.15	28.8	580.56	1.05	0.46	174.07	0.70
								14.67											
Caivan Lands	CAP	MH 108	B11		0.097	0.18	0.18	10.00	104.19	18.26	300	304.8	0.50	12.0	71.41	0.98	0.20	53.14	0.26
								10.20											
Street B	MH 108	MH 106	B12		0.111	0.20	5.09	14.67	84.65	431.00	825	838.2	0.15	28.5	580.56	1.05	0.45	149.56	0.74
								15.12											
Caivan Lands	CAP	MH 106	B13		0.120	0.22	0.22	10.00	104.19	22.59	300	304.8	0.50	12.0	71.41	0.98	0.20	48.81	0.32
								10.20											
Street B	MH 106	MH 104				0.00	5.31	15.12	83.17	441.53	975	990.6	0.14	35.5	875.66	1.14	0.52	434.13	0.50
								15.64											
Caivan Lands	CAP	MH 104	B14		0.136	0.25	0.25	10.00	104.19	25.61	300	304.8	0.50	12.0	71.41	0.98	0.20	45.80	0.36
								10.20											
Street B	MH 104	MH 102	B15		0.026	0.05	5.60	15.64	81.54	456.75	1050	1066.8	0.10	35.5	901.78	1.01	0.59	445.03	0.51
								16.23											
Caivan Lands	CAP	MH 102	B16		0.121	0.22	0.22	10.00	104.19	22.78	300	304.8	0.50	12.0	71.41	0.98	0.20	48.62	0.32
								10.20											
Street B	MH 102	MH 100	B17		0.342	0.62	6.44	16.23	79.79	513.69	1200	1219.2	0.10	36.1	1287.49	1.10	0.55	773.81	0.40
								16.77											
Caivan Lands	CAP	MH 100	B18		0.107	0.19	0.19	20.00	70.25	1184.00	1200	1219.2	0.15	12.0	1576.85	1.35	0.15	392.84	0.75
			Caivan Lands		9.220	16.66	16.85												
								20.15											
Outlet	MH 100	H2				0.00	23.29	20.15	69.93	1628.74	1500	1524.0	0.14	79.8	2762.07	1.51	0.88	1133.34	0.59

						FLOW					PROPOSED SEWER								
STREET	FROM	TO	AREA ID	R= 0.30	R= 0.65	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	NOMINAL SIZE (mm)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull

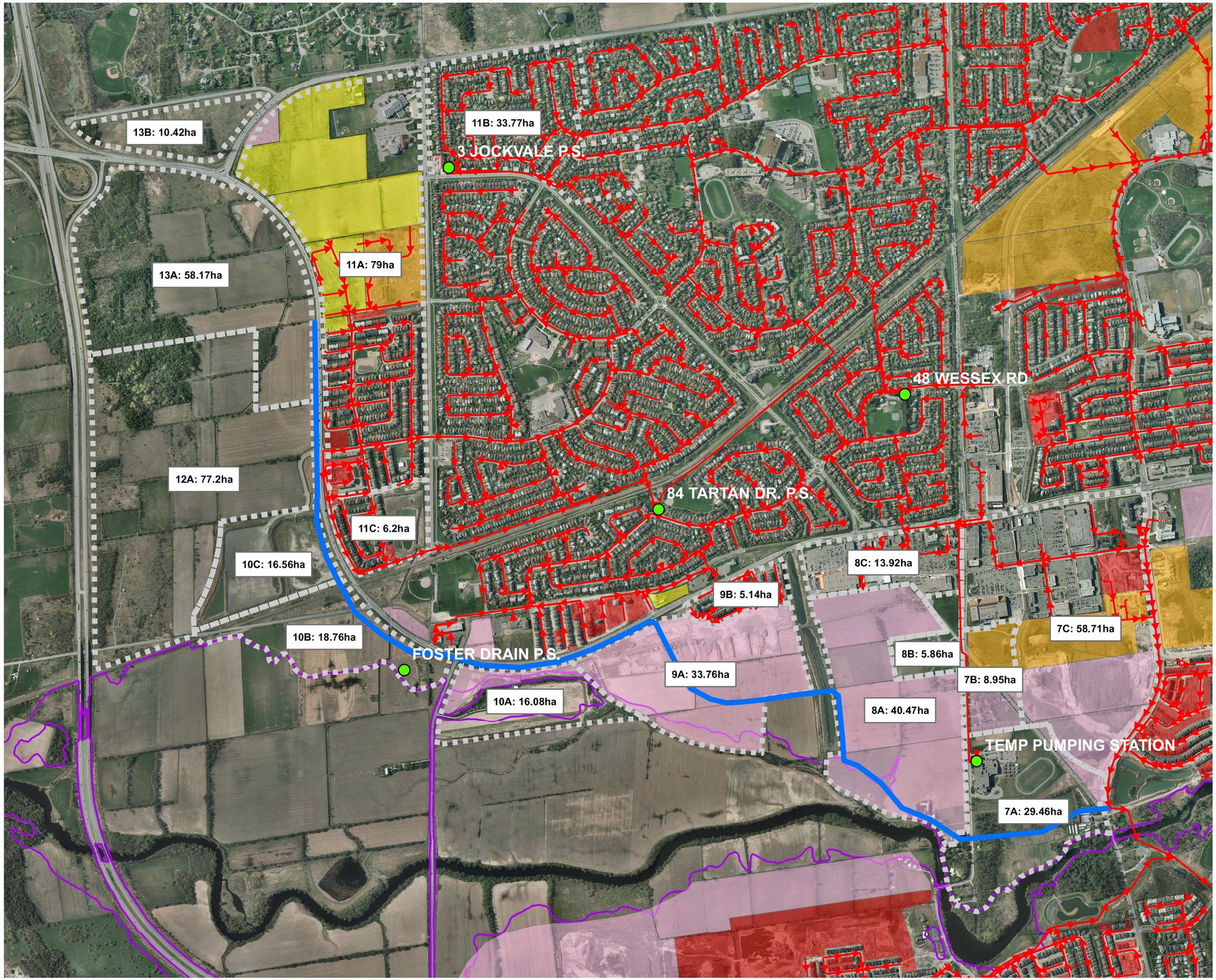
Definitions
Q = 2.78 AIR
Q = Peak Flow, in Litres per second (L/s)
A = Area in hectares (ha)
I = Rainfall Intensity (mm/h)

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min Velocity = 0.80 m/sec.

TC calculated based on an average travel time of 1.0m/s x 600m
Includes the remaining 9.22ha portion of the Caivan Lands not included in Area IDs B03,B09-B10,B-12,B14-B15, B17,B19 (2.61ha). The total area of the Caivan Lands is 11.83ha.

Appendix B

Sanitary Report Excerpts



City of Ottawa
South Nepean Collector

Figure 01
Existing Sanitary Network and Collection Areas

- Pump Station
- Existing Sanitary Main (With Flow Direction)
- Proposed Alignment for South Nepean Collector
- Collection Area

DEVELOPMENT STATUS

- Registered
- Draft Approved
- Pending
- No Plan
- Floodplain

NOT TO SCALE

MAP DRAWING INFORMATION:
DATA PROVIDED BY THE CITY OF OTTAWA

MAP CREATED BY: BC
MAP CHECKED BY: MBM
MAP PROJECTION: NO PROJECTION

FILE LOCATION: \\Dillon.ca\dillon_dfs\Ottawa\Ottawa CA\CAD\2011\115681\Design_GIS\MXD\Figure01c_ExistingSanitaryNetwork.mxd

DILLON CONSULTING

PROJECT: 11-5681
STATUS: FINAL
DATE: 18/07/12

Table 5.1: Allocation of Commercial/Institutional and Residential Demands to SNC by Collection Area

Collection Area	Discharging Node	Estimated from GIS			City of Ottawa VURL Data			Other Space [1] (ha)	Population (PE)	Residential Density (PE/net ha)	Comments	Additional Source(s)
		Gross Institutional/Commercial (ha)	Gross Residential (ha)	Gross Area (ha)	Net Residential (ha)	Units (#)	Unit Density (#/ha)					
7A	70	13.5	7.4	29.5	4.0	605	0.3	9.1	1637	4.25	Flow calculations include St Joseph H.S. Pump Station firm capacity of 7.0 L/s Additional 600 units (TAC)	3.4ppu (TAC)
7B		0.0	9.24	9.24	6.23	1474	136.7	3.0	3321	638.8	Population from split VURL allocated by area. VURL parcel id 323 - inconsistency between net and gross reported area.	2.7ppu (TAC)
8A		0.0	40.0	40.0	24.1	4462	185.1	15.9	12047.4	499.9		2.7ppu (TAC)
8B		5.9	0.0	5.9	0.0	0	0	0.0			Future Commercial area	
8C		13.9	0.0	13.9	0.0	0	0	0.0			Commercial area includes Home Depot	
9A	80	0.0	33.8	33.8	18.6	635	34.1	15.2	2210	116.2		3.4ppu (TAC)
10A	90	0.0	16.1	16.1	9.7	451	28.0	6.4	1533.4	158.0	Assume net population = 60% gross.	3.4ppu (TAC)
10B	100	18.8	0.0	35.3	0.0	0	0	16.5			Allocated as potential future I/C use as directed by TAC	
10C	110	16.6	0.0	35.3	0.0	0	0	18.7			Area includes current Municipal Snow Dump. Flow allowance is made for potential future I/C use	
11C		0.0	6.2	6.2	Note 2			2.5	306	82.7	This area is south of '11 block' in the existing development	From IBI Apr 2010 Report Figure 1
11A	120	12.5	66.5	79.0				26.6	3923	98.3	Institutional includes 4.38ha church site and 6.89 ha institution at northeast corner, as well and Claridge Commercial (0.56ha) and DCR/Phoenix Commercial (0.64ha)	From IBI Apr2010 Report Figure 1
11B		0.0	37.0	37.0				14.8	1550	69.8	Presently serviced by Jockvale pump station; to be redirected to SNC.	Estimated from 2011 Census Block data
12A		77.2	0.0	77.2				0.0			Allow sanitary peak flow 79.0 L/s	Novatech, Employment Lands Report, Revised Jan 2012
13A	130	58.5	0.0	58.5				0.0			Allow sanitary peak flow 62.8 L/s plus Collection Area 13B, total 82.2 L/s	
13B		12.5	0.0	12.5				0.0			Allow sanitary peak flow 19.4 L/s; gravity discharge to Collection Area 13A	IBI/Novatech

Notes:
1. Other space includes other residential space accounting for the difference between gross area (measured with GIS) and net area (provided in VURL data), such as sidewalks, roads, greenspace, etc.
2. Collection Area 11A and 11B population and land use as identified under Additional Source(s). Other space reported as 60% of gross residential area, consistent with VURL average.

Table 5.1: Allocation of Commercial/Institutional and Residential Demands to SNC by Collection Area

Collection Area	Discharging Node	Estimated from GIS			City of Ottawa VURL Data			Other Space [1] (ha)	Population (PE)	Residential Density (PE/net ha)	Comments	Additional Source(s)
		Gross Institutional/Commercial (ha)	Gross Residential (ha)	Gross Area (ha)	Net Residential (ha)	Units (#)	Unit Density (#/ha)					
7A	70	13.5	7.4	29.5	4.0	605	0.3	9.1	1637	4.25	Flow calculations include St Joseph H.S. Pump Station firm capacity of 7.0 L/s Additional 600 units (TAC)	3.4ppu (TAC)
7B		0.0	9.24	9.24	6.23	1474	136.7	3.0	3321	638.8	Population from split VURL allocated by area. VURL parcel id 323 - inconsistency between net and gross reported area.	2.7ppu (TAC)
8A		0.0	40.0	40.0	24.1	4462	185.1	15.9	12047.4	499.9		2.7ppu (TAC)
8B		5.9	0.0	5.9	0.0	0	0	0.0			Future Commercial area	
8C		13.9	0.0	13.9	0.0	0	0	0.0			Commercial area includes Home Depot	
9A	80	0.0	33.8	33.8	18.6	635	34.1	15.2	2210	116.2		3.4ppu (TAC)
10A	90	0.0	16.1	16.1	9.7	451	28.0	6.4	1533.4	158.0	Assume net population = 60% gross.	3.4ppu (TAC)
10B	100	18.8	0.0	35.3	0.0	0	0	16.5			Allocated as potential future I/C use as directed by TAC	
10C	110	16.6	0.0	35.3	0.0	0	0	18.7			Area includes current Municipal Snow Dump. Flow allowance is made for potential future I/C use	
11C		0.0	6.2	6.2	Note 2			2.5	306	82.7	This area is south of '11 block' in the existing development	From IBI Apr 2010 Report Figure 1
11A	120	12.5	66.5	79.0				26.6	3923	98.3	Institutional includes 4.38ha church site and 6.89 ha institution at northeast corner, as well and Claridge Commercial (0.56ha) and DCR/Phoenix Commercial (0.64ha)	From IBI Apr2010 Report Figure 1
11B		0.0	37.0	37.0				14.8	1550	69.8	Presently serviced by Jockvale pump station; to be redirected to SNC.	Estimated from 2011 Census Block data
12A		77.2	0.0	77.2				0.0			Allow sanitary peak flow 79.0 L/s	Novatech, Employment Lands Report, Revised Jan 2012
13A	130	58.5	0.0	58.5				0.0			Allow sanitary peak flow 62.8 L/s plus Collection Area 13B, total 82.2 L/s	
13B		12.5	0.0	12.5				0.0			Allow sanitary peak flow 19.4 L/s; gravity discharge to Collection Area 13A	IBI/Novatech

Notes:
1. Other space includes other residential space accounting for the difference between gross area (measured with GIS) and net area (provided in VURL data), such as sidewalks, roads, greenspace, etc.
2. Collection Area 11A and 11B population and land use as identified under Additional Source(s). Other space reported as 60% of gross residential area, consistent with VURL average.

South Nepean Town Centre Community Design Plan

Planning and Growth Management Department
Community Planning and Design Division
July 2006
Publication #03-14

OTTAWA CITY COUNCIL
28 AND 29 JUNE 2006
ANDREW S. HAYDON HALL
9:00 a.m.

MINUTES 61

PLANNING AND ENVIRONMENT COMMITTEE REPORT 50

13. SOUTH NEPEAN TOWN CENTRE COMMUNITY DESIGN PLAN AND OFFICIAL PLAN AMENDMENT

COMMITTEE RECOMMENDATIONS

That Council:

1. **Approve the South Nepean Town Centre Community Design Plan in Document 8, which has been submitted under separate cover.**

2. **Adopt Official Plan Amendment No. XX to the City of Ottawa Official Plan (2003), as detailed in Document 5, to implement the Community Design Plan.**

CARRIED

BY-LAW NO. 2006 - 260

A by-law of the City of Ottawa to amend the Official Plan for the City of Ottawa to change the designation of the lands which are the subject of the South Nepean Town Centre Community Design Plan.

WHEREAS Planning and Environment Committee convened a public meeting to consider the adoption of the aforementioned official plan amendment;

AND WHEREAS Planning and Environment Committee recommends the adoption of the aforementioned official plan amendment;

AND WHEREAS Council on June 28, 2006 carried the recommendation of Planning and Environment Committee;

THEREFORE the Council of the City of Ottawa enacts as follows**:**

1. Attachment A, being Official Plan Amendment No. 44 to the Official Plan for the City of Ottawa is hereby adopted.
2. This by-law shall come into force in accordance with the provisions of the Planning Act, R.S.O. 1990, c.P.13, as amended.

ENACTED AND PASSED this 29th day of June, 2006.

CITY CLERK MAYOR

4.4 Policy Area – High Rise Residential

The High Rise Residential policy area identifies sites within the Town Centre that will accommodate the highest density residential uses, located in proximity to the transit "hub". Apartment buildings will be the only residential type permitted.

Policies

For the High Rise Residential policy area:

(1) Apartments are the only permitted use. As part of an apartment building, retail, office and commercial uses at grade are also permitted.

(2) The minimum building height is 6 storeys and the maximum building height is 12 storeys.

(3) The net density target for residential uses is 300 units per hectare.

(4) At least 90% of required parking for each development must be provided in parking structures, either above-grade or below-grade.

4.5 Policy Area – Mid Rise Residential

The Mid Rise Residential policy area is intended to accommodate the majority of the Town Centre's ground-oriented multiple unit dwellings. This policy area will provide an appropriate transition between the low density neighbourhoods surrounding the Town Centre to the higher intensity uses within it.

Policies

For the Mid Rise Residential policy area:

(1) Apartments, street, block and stacked townhouses, public and institutional uses, schools, places of worship and community facilities are permitted. Ground floor retail uses within a mixed-use building with residential uses above are permitted along Greenbank Road.

(2) The minimum building height is 2 storeys and the maximum building height is 4 storeys.

(3) The net density target for residential uses is 100 units per hectare.

4.6 Policy Area – Neighbourhood Park

The Neighbourhood Park policy area will include both public parks and public plazas. The five public parks within the Town Centre will be designed to support the area's urban nature, as accessible amenities with open frontages and clearly defined entrances that work within the grid pattern of streets and blocks. The two public plazas within the Town Centre will be designed as predominately hard surfaced areas fronted by buildings in order to create a built form edge and generate pedestrian activity.

Policies

For the Neighbourhood Park policy area:

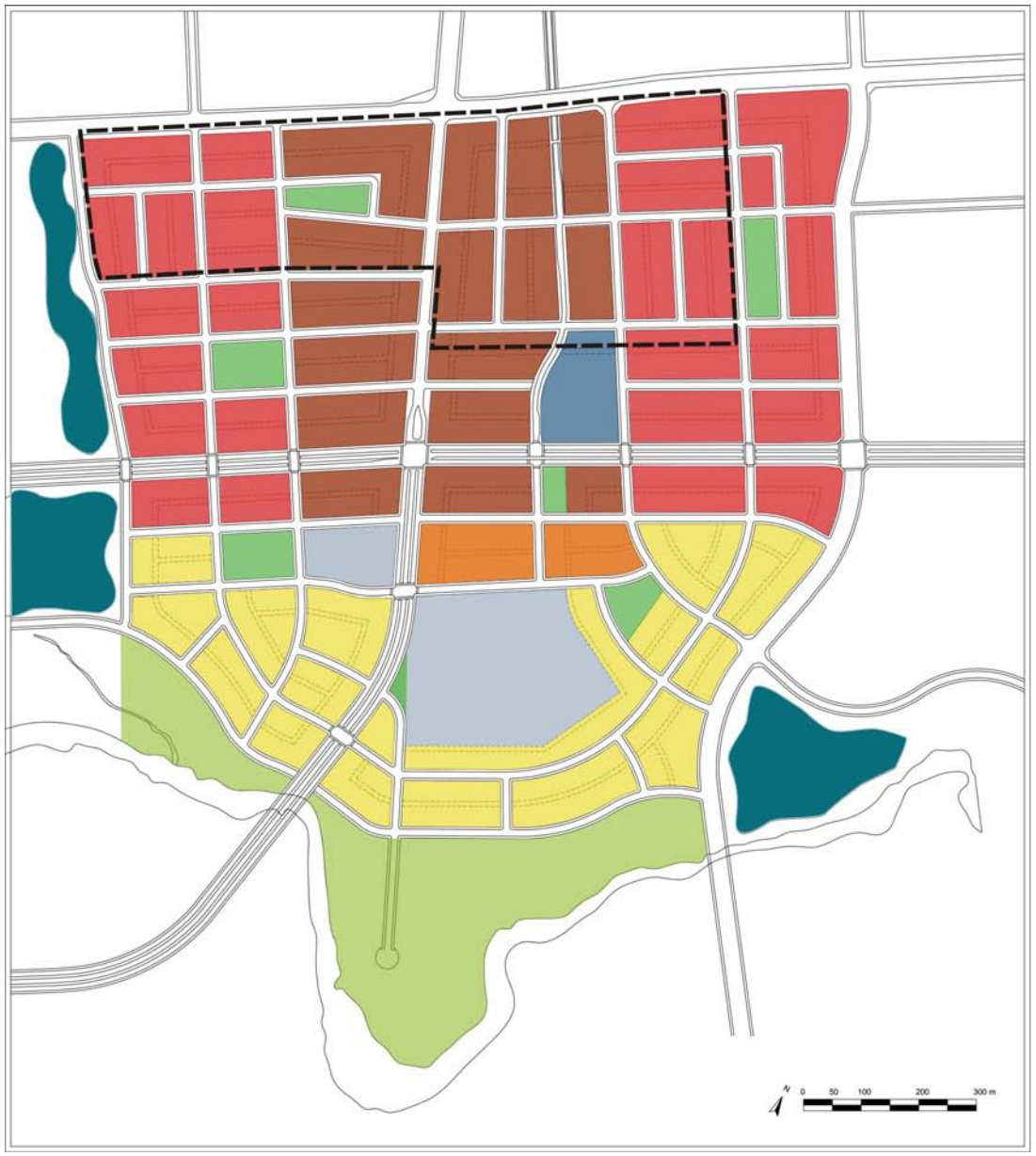
(1) Public parks, public plazas, community facilities, and conservation uses are permitted.

(2) The locations of the five public parks and the two public plazas are identified on Schedule 5 of this CDP.

(3) Acquisition of all neighbourhood parks will be as per Section 8.4 and Schedule 5 of this CDP.

(4) Public parks must:
   (a) Generally be between 0.4 and 1.0 hectares of level land;
   (b) Have at least three sides that are entirely open to the street;
   (c) Not have rear or side yards adjacent on their fourth side;
   (d) Be designed with an emphasis on hard surfacing and seating areas as compared to traditional suburban neighbourhood parks; and
   (e) Not contain sports fields.

(5) Public plazas must:
   (a) Generally be less than 0.4 hectares of level land;



Schedule 1 - Land Use Plan

- High Rise Mixed-Use
- Mid Rise Mixed-Use
- High Rise Residential
- Mid Rise Residential
- Neighbourhood Park
- District Park
- School
- Civic Complex
- Strandherd Retail District
- Stormwater Management Pond

Appendix A Property Boundaries

Note:

The colour of different parcels illustrates the boundaries of different parcels, or groups of parcels, and does not indicate land ownership.

Table 5: Updated Allocation of Commercial, Institutional and Residential Demands to Phases 2 & 3 (Nodes 70 – 130) of the SNC by Collection Area (Novatech, 2015)

Collection Area	Upstream Node	Existing / Proposed Development	Existing / Proposed Land Use	Area (ha)	Estimated Number of Residential Units	Population Density (persons / ha)	Comment	Reference
A1	130	Proposed	Commercial	12.80	-	-	O'Keefe Court – Conceptual site plan shows proposed commercial.	Conceptual Plans for O'Keefe Court
A2-A	130	Proposed	Commercial	85.18	-	-	CitiGate – Analysis uses same approach as the design for CitiGate.	Detailed Servicing and SWM Report (Phase 1) (Novatech, 2014)
A2-B	130	Proposed	Commercial	32.46	-	-		
A2-C	120	Proposed	Commercial (ex. Snow dump)	15.25	-	-	Existing snow dump facility assumed to be future commercial.	Functional Design Report and Update – SNC Phase 2 and 3 (Dillon, 2012)
A3-A	130	Proposed	Low Density Residential	16.48	461	95.2	Havencrest – Existing single family units.	Havencrest Design Report (IBI, 2013)
A3-B	130	Existing	Institutional	10.30	-	-	Cedarview Middle School and Cedarview Alliance Church.	Aerial Photos / Site Visits
A3-C	130	Existing	Medium Density Residential	5.19	311	162	Existing townhouse units.	
A3-D	130	Existing	Commercial	0.58	-	-	Existing commercial buildings.	
A3-E	130	Existing	Low Density Residential	35.68	999	95.2	Existing single family units.	
A3-F	130	Existing	Medium Density Residential	8.26	496	162.0	Existing townhouse units.	
A3-G	130	Existing	Institutional	0.90	-	-	Ottawa Torah Centre Chibad.	
A3-H	120	Existing	Low Density Residential	6.09	171	95.2	Existing single family units.	
A4	130	Existing	Low Density Residential	34.44	964	95.2	Existing single family units currently serviced by Jockvale pump station; to be redirected to SNC.	Functional Design Report and Update – SNC Phase 2 and 3 (Dillon, 2012); based on 2011 Census.
A5	110	Proposed	Commercial	17.72	-	-	Proposed commercial south of McKenna Casey Drive.	Site Visits
A6-A	100	Proposed	Institutional	20.70	-	-	Proposed school site on Minto property.	Conceptual Plan for Lands Adjacent the Kennedy-Burnett SWMF provided by Minto (2015)
A6-B	90	Existing	Medium Density Residential	4.87	292	162.0	Existing townhouse units.	Aerial Photos / Site Visits
A6-C	90	Proposed	Low Density Residential	10.11	283	95.2	Proposed single family units on lands owned by Minto.	Conceptual Plans for Lands Adjacent the Kennedy-Burnett SWMF provided by land owners.
A6-D	90	Proposed	Low Density Residential	5.59	157	95.2	Proposed single family units on lands owned by Mion.	
A6-E	90	Proposed	Low Density Residential	7.24	203	95.2	Proposed single family units on lands owned by Pavic / Braovac.	
A7-A	80	Existing	Commercial	13.62	-	-	Existing large retail stores (commercial).	Aerial Photos
A7-B	80	Proposed	High Density Residential	11.01	826	135.0	Proposed high density units on lands owned by Richcraft / Trinity.	Conceptual Plans for Lands Adjacent the Kennedy-Burnett SWMF provided by land owners.
A7-C	80	Proposed	Medium Density Residential	6.97	418	162.0	Proposed Medium density units on lands owned by Mion.	
A7-D	80	Proposed	Medium Density Residential	11.74	704	162.0	Proposed Medium density units on lands owned by Caivan.	
A7-E1/E2	80	Proposed	Medium Density Residential	9.24	554	162.0	Proposed Medium density units on lands owned by Claridge.	
A8-A	80	Existing	Commercial	28.45	-	-	Existing Barrhaven Market Place (commercial).	Aerial Photos / Site Visits
A8-B	80	Proposed	High Density Residential	39.34	2951	135.0	Future development similar to Ampersands development.	Site Visits
A8-C	80	Existing	Institutional	10.52	-	-	Existing St. Joseph High School.	Aerial Photos / Site Visits
A8-D	80	Proposed	Low Density Residential	16.87	1012	162.0	Proposed 600 low density residential units.	Functional Design Report and Update – SNC Phase 2 and 3 (Dillon, 2012)

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FALLOWFIELD RD

GREENBANK RD

MOODIE DR

HWY 416

MCKENNA CASEY DR

STRANDHERD DR

JOCK RIVER

LONGFIELDS DR

JOCKVALE RD

A1 12.80ha

A2-A 85.18ha

A2-B 32.46ha

A2-C 15.25ha

A3-A 16.18ha

A3-B 10.30ha

A3-C 5.19ha

A3-D 0.58ha

A3-E 35.68ha

A3-F 8.26ha

A3-G 0.90ha

A3-H 6.09ha

A4 34.44ha

A5 17.72ha

A6-A 15.18ha

A6-B 6.05ha

A6-C 4.87ha

A6-D 17.56ha

A6-E 6.94ha

A7-A 13.62ha

A7-B 11.01ha

A7-C 6.97ha

A7-D 11.74ha

A7-E1 7.70ha

A7-E2 1.54ha

A8-A 28.45ha

A8-B 39.34ha

A8-C 10.52ha

A8-D 10.87ha

130 120 110 100 90 80 70 60 50 40 30 20 10

LEGEND

- EXISTING / PROPOSED HIGH DENSITY RESIDENTIAL
- EXISTING / PROPOSED MEDIUM DENSITY RESIDENTIAL
- EXISTING / PROPOSED LOW DENSITY RESIDENTIAL
- EXISTING / PROPOSED COMMERCIAL
- EXISTING / PROPOSED INSTITUTIONAL
- OTHER LANDS (OPEN SPACE, PARKS, AND SWMFS)
- SOUTH NEPEAN COLLECTOR PHASE 1
- SOUTH NEPEAN COLLECTOR PHASE 2
- SOUTH NEPEAN COLLECTOR PHASE 3
- 80 SOUTH NEPEAN COLLECTOR NODE ID

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SOUTH NEPEAN COLLECTOR SEWER

SANITARY DRAINAGE AREAS AND LAND USE

SCALE 1:20 000

DATE AUG 2015 | JOB 115075 | FIGURE FIG. 1

PROJECT #: 115075
DESIGNED BY: CMS
CHECKED BY: MJP
DATE: August 20, 2015

SANITARY SEWER DESIGN SHEET

South Nepean Collector - Phase 2 & 3

Theoretical Current Operational Peak Wastewater Flow

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Location			Areas				Population				Individual Design Flows			Cumulative Design Flows				
Area I.D.	Existing Land Use	Upstream Node	Gross Commercial Area (ha)	Gross Institutional Area (ha)	Gross Residential Area (ha)	Total Gross Area (ha)	Residential Populatation Density (people / ha)	Individual Residential Population	Cumulative Residential Population	Residential Peaking Factor (Harmon Eqn[1])	Commercial Peak Flow Rate[2] (17,000 L/ha/d) (L/s)	Institutional Peak Flow Rate[2] (10,000 L/ha/d) (L/s)	Infiltration / Inflow Rate (0.05 L/s/ha) (L/s)	Commercial (L/s)	Institutional (L/s)	Infiltration / Inflow (L/s)	Residential Peak Flow Rate (300 L/cap/d) (L/s)	Cumulative Peak Design Flow (L/s)
A1	Open Space	130				0.00					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A2-A	Open Space	130				0.00					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A2-B	Open Space	130				0.00					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A3-A	Open Space	130				0.00					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A3-B	Institutional	130		10.30		10.30					0.0	1.2	0.5	0.0	1.2	0.5	0.0	1.7
A3-C	Medium Density Residential	130			5.19	5.19	162.0	841	841	2.71	0.0	0.0	0.3	0.0	1.2	0.8	7.9	9.9
A3-D	Commercial	130	0.58			0.58			841	2.71	0.1	0.0	0.0	0.1	1.2	0.8	7.9	10.0
A3-E	Low Density Residential	130			35.68	35.68	95.2	3397	4238	2.39	0.0	0.0	1.8	0.1	1.2	2.6	35.1	39.0
A3-F	Medium Density Residential	130			8.26	8.26	162	1338	5576	2.32	0.0	0.0	0.4	0.1	1.2	3.0	44.9	49.2
A3-G	Institutional	130		0.90		0.90			5576	2.32	0.0	0.1	0.0	0.1	1.3	3.0	44.9	49.4
A4	Low Density Residential*	130				0.00			5576	2.32	0.0	0.0	0.0	0.1	1.3	3.0	44.9	49.4
A2-C	Snow Dump Facility	120				0.00			5576	2.32	0.0	0.0	0.0	0.1	1.3	3.0	44.9	49.4
A3-H	Low Density Residential	120			6.09	6.09	95.2	580	6155	2.30	0.0	0.0	0.3	0.1	1.3	3.4	49.1	53.8
A5	Open Space	110				0.00			6155	2.30	0.0	0.0	0.0	0.1	1.3	3.4	49.1	53.8
A6-A	Open Space	100				0.00			6155	2.30	0.0	0.0	0.0	0.1	1.3	3.4	49.1	53.8
A6-B	Open Space	100				0.00			6155	2.30	0.0	0.0	0.0	0.1	1.3	3.4	49.1	53.8
A6-C	Medium Density Residential	90			4.87	4.87	162.0	789	6944	2.27	0.0	0.0	0.2	0.1	1.3	3.6	54.6	59.6
A6-D	Open Space	90				0.00			6944	2.27	0.0	0.0	0.0	0.1	1.3	3.6	54.6	59.6
A6-E	Open Space	90				0.00			6944	2.27	0.0	0.0	0.0	0.1	1.3	3.6	54.6	59.6
A7-A	Commercial	90	13.62			13.62			6944	2.27	2.7	0.0	0.7	2.8	1.3	4.3	54.6	63.0
A7-B	Open Space	90				0.00			6944	2.27	0.0	0.0	0.0	2.8	1.3	4.3	54.6	63.0
A7-C	Open Space	90				0.00			6944	2.27	0.0	0.0	0.0	2.8	1.3	4.3	54.6	63.0
A7-D	Open Space	90				0.00			6944	2.27	0.0	0.0	0.0	2.8	1.3	4.3	54.6	63.0
A7-E1/E2	Open Space	90				0.00			6944	2.27	0.0	0.0	0.0	2.8	1.3	4.3	54.6	63.0
A8-A	Commercial	80	28.45			28.45			6944	2.27	5.6	0.0	1.4	8.4	1.3	5.7	54.6	70.0
A8-B	Open Space	80				0.00			6944	2.27	0.0	0.0	0.0	8.4	1.3	5.7	54.6	70.0
A8-C	Institutional	80		10.52		10.52			6944	2.27	0.0	1.2	0.5	8.4	2.5	6.2	54.6	71.8
A8-D	Open Space	80				0.00			6944	2.27	0.0	0.0	0.0	8.4	2.5	6.2	54.6	71.8
ROW Along SNC Sewer Alignment	-	80				14.34			6944	2.27	0.0	0.0	0.7	8.4	2.5	6.9	54.6	72.5
TOTAL		***80***	***42.65***	***21.72***	***60.09***	***138.80***	***-***	***6944***	***6944***	***2.27***	***8.4***	***2.5***	***6.9***	***8.4***	***2.5***	***6.9***	***54.6***	***72.5***

Residential Land Use	Population Density (Units / ha)	Persons per Unit	Persons per ha
Low Density (singles and semis)	26 – 28 (28 used)	2.7 – 3.4 (3.4 used)	95.2
Medium Density (row/townhouse)	50 – 60 (60 used)	2.7	162.0
High Density (apartments)	60 – 75 (75 used)	1.8	135.0

Notes:

1. Harmon Equation = 1 + [14 / (4+(P/1000)$^{1/2}$)] x K

Where: P = population; K = correction factor = 0.6

2. Instituional / Commercial Peaking Factor = 1.0

Reported Design Flows / Assumptions:

1. Area A4: Existing single family units currently serviced by Jockvale pump station; currently not directed to SNC

PROJECT #: 115075
DESIGNED BY: CMS
CHECKED BY: MJP
DATE: August 20, 2015

SANITARY SEWER DESIGN SHEET

South Nepean Collector - Phase 2 & 3

Theoretical Future Full Service Peak Wastewater Flow

NOVATECH
Engineers, Planners & Landscape Architects

Location			Areas				Population				Individual Design Flows			Cumulative Design Flows				
Area I.D.	Existing / Proposed Land Use	Upstream Node	Gross Commercial Area (ha)	Gross Institutional Area (ha)	Gross Residential Area (ha)	Total Gross Area (ha)	Residential Popultation Density (people / ha)	Individual Residential Population	Cumulative Residential Population	Residential Peaking Factor (Harmon Eqn[1])	Commercial Peak Flow Rate[2] (50,000 L/ha/d) (L/s)	Institutional Peak Flow Rate[2] (50,000 L/ha/d) (L/s)	Infiltration / Inflow Rate (0.28 L/s/ha) (L/s)	Commercial (L/s)	Institutional (L/s)	Infiltration / Inflow (L/s)	Residential Peak Flow Rate (350 L/cap/d) (L/s)	Cumulative Peak Design Flow (L/s)
A1	Commercial	130	12.80			12.80					11.1	0.0	3.6	11.1	0.0	3.6	0.0	14.7
A2-A	Commercial	130	85.18			85.18					73.9	0.0	23.9	85.1	0.0	27.4	0.0	112.5
A2-B	Commercial	130	32.46			32.46					28.2	0.0	9.1	113.2	0.0	36.5	0.0	149.8
A3-A	Low Density Residential	130			16.18	16.18	95.2	1540	1540	3.67	0.0	0.0	4.5	113.2	0.0	41.1	22.9	177.2
A3-B	Institutional	130		10.30		10.30			1540	3.67	0.0	8.9	2.9	113.2	8.9	43.9	22.9	189.0
A3-C	Medium Density Residential	130			5.19	5.19	162.0	841	2381	3.53	0.0	0.0	1.5	113.2	8.9	45.4	34.0	201.6
A3-D	Commercial	130	0.58			0.58			2381	3.53	0.5	0.0	0.2	113.7	8.9	45.6	34.0	202.2
A3-E	Low Density Residential	130			35.68	35.68	95.2	3397	5778	3.19	0.0	0.0	10.0	113.7	8.9	55.5	74.6	252.8
A3-F	Medium Density Residential	130			8.26	8.26	162	1338	7116	3.10	0.0	0.0	2.3	113.7	8.9	57.9	89.4	269.9
A3-G	Institutional	130		0.90		0.90			7116	3.10	0.0	0.8	0.3	113.7	9.7	58.1	89.4	270.9
A4	Low Density Residential	130			34.44	34.44	95.2	3279	10395	2.94	0.0	0.0	9.6	113.7	9.7	67.8	123.7	314.9
A2-C	Commercial (ex. snow dump)	120	15.25			15.25			10395	2.94	13.2	0.0	4.3	127.0	9.7	72.0	123.7	332.4
A3-H	Low Density Residential	120			6.09	6.09	95.2	580	10974	2.91	0.0	0.0	1.7	127.0	9.7	73.7	129.6	340.0
A5	Commercial	110	17.72			17.72			10974	2.91	15.4	0.0	5.0	142.4	9.7	78.7	129.6	360.3
A6-A	Commercial	100	15.18			15.18			10974	2.91	13.2	0.0	4.3	155.5	9.7	82.9	129.6	377.8
A6-B	Institutional	100		6.05		6.05			10974	2.91	0.0	5.3	1.7	155.5	15.0	84.6	129.6	384.7
A6-C	Medium Density Residential	90			4.87	4.87	162.0	789	11763	2.88	0.0	0.0	1.4	155.5	15.0	86.0	137.4	393.9
A6-D	Low Density Residential	90			17.56	17.56	95.2	1672	13435	2.83	0.0	0.0	4.9	155.5	15.0	90.9	153.8	415.2
A6-E	Low Density Residential	90			6.94	6.94	95.2	661	14096	2.81	0.0	0.0	1.9	155.5	15.0	92.9	160.2	423.6
A7-A	Commercial	90	13.62			13.62			14096	2.81	11.8	0.0	3.8	167.4	15.0	96.7	160.2	439.2
A7-B	High Density Residential	90			11.01	11.01	135.0	1486	15582	2.76	0.0	0.0	3.1	167.4	15.0	99.8	174.3	456.4
A7-C	Medium Density Residential	90			6.97	6.97	162.0	1129	16711	2.73	0.0	0.0	2.0	167.4	15.0	101.7	184.9	468.9
A7-D	Medium Density Residential	90			11.74	11.74	162.0	1902	18613	2.68	0.0	0.0	3.3	167.4	15.0	105.0	202.4	489.7
A7-E1/E2	Medium Density Residential	90			9.24	9.24	162.0	1497	20110	2.65	0.0	0.0	2.6	167.4	15.0	107.6	215.9	505.8
A8-A	Commercial	80	28.45			28.45			20110	2.65	24.7	0.0	8.0	192.0	15.0	115.5	215.9	538.5
A8-B	High Density Residential	80			39.34	39.34	135.0	5311	25421	2.55	0.0	0.0	11.0	192.0	15.0	126.6	262.4	596.0
A8-C	Institutional	80		10.52		10.52			25421	2.55	0.0	9.1	2.9	192.0	24.1	129.5	262.4	608.1
A8-D	Low Density Residential	80			16.87	16.87	120.9	2040	27461	2.52	0.0	0.0	4.7	192.0	24.1	134.2	279.8	630.2
ROW Along SNC Sewer Alignment	-	80				14.34			27461	2.52	0.0	0.0	4.0	192.0	24.1	138.2	279.8	634.2
TOTAL		***80***	***221.24***	***27.77***	***230.38***	***493.73***	***-***	***27461***	***27461***	***2.52***	***192.0***	***24.1***	***134.2***	***192.0***	***24.1***	***138.2***	***279.8***	***634.2***

Residential Land Use	Population Density (Units / ha)	Persons per Unit	Persons per ha
Low Density (singles and semis)	26 – 28 (28 used)	2.7 – 3.4 (3.4 used)	95.2
Medium Density (row/townhouse)	50 – 60 (60 used)	2.7	162.0
High Density (apartments)	60 – 75 (75 used)	1.8	135.0

Notes:

1. Harmon Equation = $1 + [14 / (4+(P/1000)^{1/2})] \times K$

Where: P = population; K = correction factor = 1.0

2. Instituional / Commercial Peaking Factor = 1.5

Reported Design Flows / Assumptions:

1. Area A4: Existing single family units currently serviced by Jockvale pump station to be redirected to SNC

2. Area A8-D: proposed 600 medium density residential units

Appendix C

Watermain Boundary Conditions, FUS Calculations, and Modelling Results

Boundary Conditions 3370 Greenbank Road (Burnett Lands)

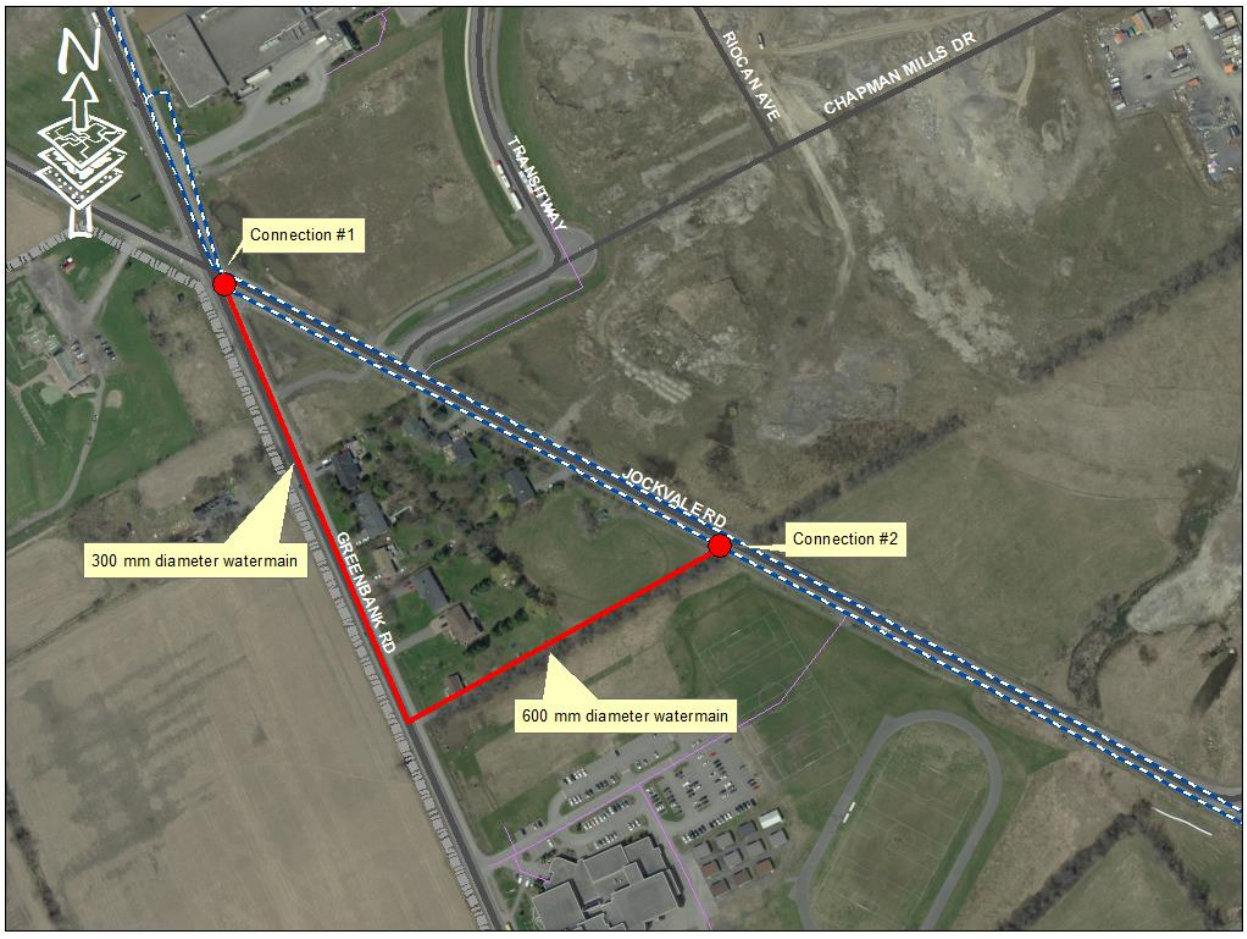
Information Provided

Date provided: 27 December 2017

Scenario	Demand	
	L/min	L/s
Average Daily Demand	348.6	5.81
Maximum Daily Demand	871.2	14.52
Peak Hour	1917	32.0
Fire Flow Demand # 1	12000	200.0
Fire Flow Demand # 2	15000	250.0
Fire Flow Demand # 3	18000	300.0

# of connections 2

Connection Location Scenario 1



Connection Location Scenario 2

Results

SCENARIO 1

PRE-configured Zone

Connection 1 - Greenbank Road and Jockvale Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	157.2	97.2
Peak Hour	141.2	62.6
Max Day plus Fire (12,000 l/min)	138.2	58.4
Max Day plus Fire (15,000 l/min)	133.7	52.0
Max Day plus Fire (18,000 l/min)	129.3	45.6

[1] Ground Elevation = 112.7 m

Connection 2 - Jockvale Road and Private Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	153.0	95.0
Peak Hour	140.9	60.2
Max Day plus Fire (12,000 l/min)	137.1	54.8
Max Day plus Fire (15,000 l/min)	132.2	47.8
Max Day plus Fire (18,000 l/min)	127.3	40.8

[1] Ground Elevation = 108.2 m

SCENARIO 2

PRE-configured Zone

Connection 1 - Greenbank Road and Jockvale Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	157.2	97.2
Peak Hour	141.2	62.6
Max Day plus Fire (12,000 l/min)	138.2	58.4
Max Day plus Fire (15,000 l/min)	133.7	52.0
Max Day plus Fire (18,000 l/min)	129.2	45.6

[1] Ground Elevation = 112.7 m

Connection 2 - Jockvale Road and Bren-Maur Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	157.2	104.1
Peak Hour	140.5	69.0
Max Day plus Fire (12,000 l/min)	136.8	63.7
Max Day plus Fire (15,000 l/min)	131.8	56.7
Max Day plus Fire (18,000 l/min)	126.9	49.7

[1] Ground Elevation = 108.2 m

SCENARIO 1

POST-configured Zone

Connection 1 - Greenbank Road and Jockvale Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.7	72.1
Peak Hour	146.3	70.0
Max Day plus Fire (12,000 l/min)	146.4	70.2
Max Day plus Fire (15,000 l/min)	146.2	69.9
Max Day plus Fire (18,000 l/min)	145.9	69.5

[1] Ground Elevation = 112.7 m

Connection 2 - Jockvale Road and Private Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.7	70.0
Peak Hour	146.0	67.5
Max Day plus Fire (12,000 l/min)	145.2	66.5
Max Day plus Fire (15,000 l/min)	144.6	65.5
Max Day plus Fire (18,000 l/min)	143.8	64.5

[1] Ground Elevation = 108.2 m

SCENARIO 2

POST-configured Zone

Connection 1 - Greenbank Road and Jockvale Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.7	72.1
Peak Hour	146.3	70.0
Max Day plus Fire (12,000 l/min)	146.4	70.2
Max Day plus Fire (15,000 l/min)	146.3	69.9
Max Day plus Fire (18,000 l/min)	145.9	69.5

[1] Ground Elevation = 112.7 m

Connection 2 - Jockvale Road and Bren-Maur Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.7	79.2
Peak Hour	145.7	76.2
Max Day plus Fire (12,000 l/min)	145.4	75.9
Max Day plus Fire (15,000 l/min)	144.9	75.1
Max Day plus Fire (18,000 l/min)	144.3	74.2

[1] Ground Elevation = 108.2 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.

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.

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 111117
Project Name: Kennedy Burnett
Date: 19/07/2017
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: Input by User; No Information or Input Required

Building Description: 3 Unit Townhouse (can't be capped as per Technical Bulletin ISDTB-2014-02)
Wood frame

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**					
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Fire resistive construction (< 3 hrs)		0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	270			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**540**	
	F	**Base fire flow without reductions**				**8,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**6,800**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Adequately Designed System (NFPA 13)		-30%		**0**
		Standard Water Supply		-10%		
		Fully Supervised System		-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	3.1 - 10 m		20%	**4,080**
		East Side	20.1 - 30 m		10%	
		South Side	20.1 - 30 m		10%	
		West Side	3.1 - 10 m		20%	
				Cumulative Total	**60%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**11,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**183**
				or	USGPM	2,906
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	1320

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 111117
Project Name: Kennedy Burnett
Date: 19/07/2017
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: Input by User; No Information or Input Required

Building Description: 4 Unit Townhouse (can't be capped as per Technical Bulletin ISDTB-2014-02)
Wood frame

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**					
	Coefficient related to type of construction **C**	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Fire resistive construction (< 3 hrs)		0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	380			
		Number of Floors/Storeys	2			
		Area of structure considered (m^2)			**760**	
	F	**Base fire flow without reductions**				**9,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**7,650**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Adequately Designed System (NFPA 13)		-30%		**0**
		Standard Water Supply		-10%		
		Fully Supervised System		-10%		
				Cumulative Total	**0%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	30.1- 45 m		5%	**4,208**
		East Side	20.1 - 30 m		10%	
		South Side	3.1 - 10 m		20%	
		West Side	3.1 - 10 m		20%	
				Cumulative Total	**55%**	
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 #: 111117
Project Name: Kennedy Burnett
Date: 19/07/2017
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: Input by User; No Information or Input Required

Building Description: Condo Unit - 4 Storey Blk 25
Non-combustible construction

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**					
	Coefficient related to type of construction C	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Fire resistive construction (< 3 hrs)		0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1800			
		Number of Floors/Storeys	4			
		Area of structure considered (m^2)			**7,200**	
	F	**Base fire flow without reductions**				**15,000**
		F = 220 C $(A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**12,750**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-6,375**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Total	**-50%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	30.1- 45 m		5%	**1,913**
		East Side	20.1 - 30 m		10%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**15%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**8,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**133**
				or	USGPM	2,114
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	960

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 111117
Project Name: Kennedy Burnett
Date: 19/07/2017
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: Input by User; No Information or Input Required

Building Description: Condo Unit - 4 Storey Blk 20
Non-combustible construction

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**					
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Fire resistive construction (< 3 hrs)		0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	2500			
		Number of Floors/Storeys	4			
		Area of structure considered (m^2)			**10,000**	
	F	**Base fire flow without reductions**				**18,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**15,300**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-7,650**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Total	**-50%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	30.1- 45 m		5%	**1,530**
		East Side	> 45.1m		0%	
		South Side	30.1- 45 m		5%	
		West Side	> 45.1m		0%	
				Cumulative Total	**10%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**9,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**150**
				or	USGPM	2,378
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	1080

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 111117
Project Name: Kennedy Burnett
Date: 19/07/2017
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: Input by User; No Information or Input Required

Building Description: Condo Unit - 4 Storey Blk 16
Non-combustible construction

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**					
	Coefficient related to type of construction C	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Fire resistive construction (< 3 hrs)		0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1600			
		Number of Floors/Storeys	4			
		Area of structure considered (m^2)			**6,400**	
	F	**Base fire flow without reductions**				**14,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**11,900**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-5,950**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Total	**-50%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	20.1 - 30 m		10%	**3,570**
		East Side	> 45.1m		0%	
		South Side	30.1- 45 m		5%	
		West Side	10.1 - 20 m		15%	
					Cumulative Total **30%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**10,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**167**
				or	USGPM	2,642
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	1200

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 111117
Project Name: Kennedy Burnett
Date: 19/07/2017
Input By: Steve Zorgel
Reviewed By: Drew Blair

Legend: Input by User; No Information or Input Required

Building Description: Condo Unit - 4 Storey Blk 19
Non-combustible construction

Step			Input	Multiplier Options	Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**					
	Coefficient related to type of construction C	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Fire resistive construction (< 3 hrs)		0.7		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	2000			
		Number of Floors/Storeys	4			
		Area of structure considered (m^2)			**8,000**	
	F	**Base fire flow without reductions**				**16,000**
		F = 220 C (A)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**					
	(1)	Non-combustible		-25%	-15%	**13,600**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**					
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-6,800**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Total	**-50%**	
5	**Exposure Surcharge (cumulative %)**					
	(3)	North Side	> 45.1m		0%	**680**
		East Side	> 45.1m		0%	
		South Side	30.1- 45 m		5%	
		West Side	> 45.1m		0%	
				Cumulative Total	**5%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**7,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**117**
				or	USGPM	1,849
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	840

Table 1
Watermain Demand Calculations

Node	Number of Units		Pop.	Demand (L/s)		
	Town	Apartment Condo		High Pres.	Max Daily	Peak Hour
1	5		14	0.06	0.14	0.31
2	7		19	0.08	0.19	0.42
3	10		27	0.11	0.27	0.60
4	4		11	0.04	0.11	0.25
5	7		19	0.08	0.19	0.42
6	6		17	0.07	0.17	0.38
7	16		44	0.18	0.45	0.98
8	18		49	0.20	0.50	1.09
9	8		22	0.09	0.22	0.49
10	6		17	0.07	0.17	0.38
11	6		17	0.07	0.17	0.38
12	9	60	133	0.54	1.35	2.96
13	4	75	146	0.59	1.48	3.25
14	20		54	0.22	0.55	1.20
15	18		49	0.20	0.50	1.09
16	19		52	0.21	0.53	1.16
17	4		11	0.04	0.11	0.25
18	10		27	0.11	0.27	0.60
19	8		22	0.09	0.22	0.49
20	10		27	0.11	0.27	0.60
21			0	0.00	0.00	0.00
22		190	342	1.39	3.46	7.62
23			0	0.00	0.00	0.00
				4.53	**11.33**	**24.93**

1. Residential Population density: 2.7 people/town, 2.1 people/apartment
2. Residential High Pressure demand = 350L/s/p/d
3. Residential Maximum Daily demand = 2.5 x High Pressure Demand
4. Residential Peak Hour Demand = 2.2 x Maximum Daily Demand

Table 2
Pipe Data

Pipe	Length (m)	Diameter (mm)	Roughness
1	87	300	120
2	75	300	120
3	44	300	120
4	55	300	120
5	59	300	120
6	72	300	120
7	80	300	120
8	38	200	110
9	74	200	110
10	10	200	110
11	45	50	100
12	56	200	110
13	54	200	110
14	74	300	120
15	74	300	120
16	81	300	120
17	84	200	110
18	79	200	110
19	83	200	110
20	68	200	110
21	76	200	110
22	80	200	110
23	72	200	110
24	120	200	110
25	89	200	110
26	75	300	120
27	130	300	120
28	610	300	120
29	330	300	120

Table 3
Pre Configuration Condition
High Pressure Check

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)	Age (hrs)
Resvr R1*	157.2	-2.45	157.20	0.0	0.0	0.0
Resvr R2*	157.2	-2.10	157.20	0.0	0.0	0.0
Junc N1	93.5	0.06	157.2	63.7	90.3	24.5
Junc N2	93.9	0.08	157.2	63.3	89.7	12.0
Junc N3	93.8	0.11	157.2	63.4	89.9	7.3
Junc N4	93.6	0.04	157.2	63.6	90.2	6.4
Junc N5	93.8	0.08	157.2	63.4	90.0	5.3
Junc N6	93.8	0.07	157.2	63.5	90.0	4.2
Junc N7	94.0	0.18	157.2	63.3	89.7	3.3
Junc N8	93.5	0.20	157.2	63.7	90.3	3.8
Junc N9	93.6	0.09	157.2	63.6	90.2	5.0
Junc N10	93.4	0.07	157.2	63.8	90.5	5.6
Junc N11	94.1	0.07	157.19	63.1	89.5	6.0
Junc N12	93.4	0.54	157.2	63.8	90.5	10.8
Junc N13	93.2	0.59	157.2	64.0	90.7	13.3
Junc N14	93.4	0.22	157.2	63.9	90.5	12.7
Junc N15	93.6	0.20	157.2	63.7	90.3	10.4
Junc N16	93.5	0.21	157.2	63.8	90.4	5.8
Junc N17	92.9	0.04	157.2	64.3	91.2	25.7
Junc N18	92.9	0.11	157.2	64.3	91.2	26.2
Junc N19	93.6	0.09	157.2	63.6	90.2	38.0
Junc N20	93.8	0.11	157.2	63.5	90.0	27.6
Junc N21	94.1	0.00	157.2	63.1	89.5	9.3
Junc N22	94.1	1.39	157.2	63.1	89.5	5.7
Junc N23	95.3	0.00	157.2	61.9	87.7	2.6

*** Boundary Condition**

Maximum Pressure
Maximum Time

Table 4a
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 1

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-110.7	138.2	0.0	0.0
Resvr R2*	137.1	-67.6	137.1	0.0	0.0
Junc N1	93.5	0.1	133.4	39.9	56.6
Junc N2	93.9	0.2	133.4	39.5	56.0
Junc N3	93.8	0.3	133.4	39.6	56.2
Junc N4	93.6	167.1	133.2	39.6	56.2
Junc N5	93.8	0.2	133.6	39.9	56.5
Junc N6	93.8	0.2	134.0	40.3	57.1
Junc N7	94.0	0.5	134.5	40.6	57.5
Junc N8	93.5	0.5	134.5	41.0	58.1
Junc N9	93.6	0.2	134.4	40.8	57.8
Junc N10	93.4	0.2	134.4	41.0	58.1
Junc N11	94.1	0.2	134.3	40.3	57.1
Junc N12	93.4	1.4	134.3	40.9	58.0
Junc N13	93.2	1.5	134.2	41.0	58.2
Junc N14	93.4	0.6	134.0	40.6	57.6
Junc N15	93.6	0.5	133.7	40.1	56.9
Junc N16	93.5	0.5	134.0	40.6	57.5
Junc N17	92.9	0.1	134.1	41.3	58.5
Junc N18	92.9	0.3	134.1	41.2	58.4
Junc N19	93.6	0.2	133.6	40.0	56.7
Junc N20	93.8	0.3	133.5	39.7	56.3
Junc N21	94.1	0.0	134.5	40.4	57.3
Junc N22	94.1	3.5	134.9	40.8	57.8
Junc N23	95.3	0.0	135.2	39.9	56.6

*** Boundary Condition**

Minimum Pressure

Table 4b
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 2

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-120.4	138.2	0.0	0.0
Resvr R2*	136.8	-73.9	136.8	0.0	0.0
Junc N1	93.5	0.1	131.2	37.7	53.4
Junc N2	93.9	183.2	131.2	37.2	52.8
Junc N3	93.8	0.3	132.4	38.5	54.6
Junc N4	93.6	0.1	132.6	39.0	55.3
Junc N5	93.8	0.2	133.0	39.2	55.6
Junc N6	93.8	0.2	133.3	39.6	56.1
Junc N7	94.0	0.5	133.9	39.9	56.6
Junc N8	93.5	0.5	133.8	40.3	57.1
Junc N9	93.6	0.2	133.6	40.1	56.8
Junc N10	93.4	0.2	133.6	40.3	57.1
Junc N11	94.1	0.2	133.6	39.6	56.1
Junc N12	93.4	1.4	133.5	40.1	56.9
Junc N13	93.2	1.5	133.4	40.2	57.0
Junc N14	93.4	0.6	133.1	39.8	56.4
Junc N15	93.6	0.5	132.6	39.1	55.4
Junc N16	93.5	0.5	133.2	39.8	56.4
Junc N17	92.9	0.1	133.3	40.4	57.3
Junc N18	92.9	0.3	133.2	40.4	57.2
Junc N19	93.6	0.2	132.0	38.4	54.4
Junc N20	93.8	0.3	131.4	37.6	53.4
Junc N21	94.1	0.0	133.7	39.6	56.2
Junc N22	94.1	3.5	134.2	40.1	56.8
Junc N23	95.3	0.0	134.7	39.4	55.9

*** Boundary Condition**

Minimum Pressure

Table 4c
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 4

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-112.6	138.2	0.0	0.0
Resvr R2*	136.8	-65.7	136.8	0.0	0.0
Junc N1	93.5	0.1	133.3	39.8	56.4
Junc N2	93.9	0.2	133.3	39.4	55.8
Junc N3	93.8	0.3	133.3	39.5	56.0
Junc N4	93.6	167.1	133.1	39.5	56.0
Junc N5	93.8	0.2	133.5	39.7	56.3
Junc N6	93.8	0.2	133.9	40.1	56.9
Junc N7	94.0	0.5	134.4	40.4	57.3
Junc N8	93.5	0.5	134.3	40.8	57.9
Junc N9	93.6	0.2	134.2	40.6	57.6
Junc N10	93.4	0.2	134.2	40.8	57.9
Junc N11	94.1	0.2	134.2	40.2	56.9
Junc N12	93.4	1.4	134.1	40.7	57.8
Junc N13	93.2	1.5	134.1	40.9	58.0
Junc N14	93.4	0.6	133.9	40.5	57.4
Junc N15	93.6	0.5	133.5	40.0	56.7
Junc N16	93.5	0.5	133.9	40.4	57.3
Junc N17	92.9	0.1	134.0	41.1	58.3
Junc N18	92.9	0.3	133.9	41.1	58.2
Junc N19	93.6	0.2	133.4	39.8	56.5
Junc N20	93.8	0.3	133.3	39.6	56.1
Junc N21	94.1	0.0	134.3	40.3	57.1
Junc N22	94.1	3.5	134.7	40.6	57.6
Junc N23	95.3	0.0	135.1	39.8	56.4

*** Boundary Condition**

Minimum Pressure

Table 4d
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 6

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-114.6	138.2	0.0	0.0
Resvr R2*	136.8	-63.7	136.8	0.0	0.0
Junc N1	93.5	0.1	133.9	40.4	57.2
Junc N2	93.9	0.2	133.9	40.0	56.6
Junc N3	93.8	0.3	133.9	40.0	56.8
Junc N4	93.6	0.1	133.8	40.2	57.0
Junc N5	93.8	0.2	133.7	40.0	56.7
Junc N6	93.8	167.2	133.6	39.9	56.6
Junc N7	94.0	0.5	134.3	40.3	57.2
Junc N8	93.5	0.5	134.3	40.8	57.8
Junc N9	93.6	0.2	134.2	40.7	57.7
Junc N10	93.4	0.2	134.2	40.9	57.9
Junc N11	94.1	0.2	134.2	40.2	57.0
Junc N12	93.4	1.4	134.2	40.8	57.9
Junc N13	93.2	1.5	134.2	41.0	58.2
Junc N14	93.4	0.6	134.1	40.7	57.7
Junc N15	93.6	0.5	134.0	40.4	57.3
Junc N16	93.5	0.5	133.8	40.4	57.3
Junc N17	92.9	0.1	134.2	41.3	58.6
Junc N18	92.9	0.3	134.1	41.3	58.5
Junc N19	93.6	0.2	133.9	40.3	57.2
Junc N20	93.8	0.3	133.9	40.1	56.9
Junc N21	94.1	0.0	134.5	40.4	57.3
Junc N22	94.1	3.5	134.8	40.7	57.7
Junc N23	95.3	0.0	135.0	39.7	56.3

*** Boundary Condition**

Minimum Pressure

Table 4e
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 8

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-114.9	138.2	0.0	0.0
Resvr R2*	136.8	-63.4	136.8	0.0	0.0
Junc N1	93.5	0.1	134.3	40.8	57.8
Junc N2	93.9	0.2	134.3	40.3	57.2
Junc N3	93.8	0.3	134.3	40.4	57.3
Junc N4	93.6	0.1	134.3	40.7	57.6
Junc N5	93.8	0.2	134.3	40.5	57.4
Junc N6	93.8	0.2	134.3	40.5	57.4
Junc N7	94.0	0.5	134.3	40.3	57.1
Junc N8	93.5	167.5	131.0	37.5	53.2
Junc N9	93.6	0.2	132.3	38.7	54.9
Junc N10	93.4	0.2	132.3	38.9	55.1
Junc N11	94.1	0.2	132.3	38.2	54.2
Junc N12	93.4	1.4	133.3	39.9	56.5
Junc N13	93.2	1.5	134.3	41.0	58.2
Junc N14	93.4	0.6	134.3	40.9	58.0
Junc N15	93.6	0.5	134.3	40.7	57.7
Junc N16	93.5	0.5	134.3	40.8	57.9
Junc N17	92.9	0.1	134.3	41.4	58.7
Junc N18	92.9	0.3	134.3	41.4	58.7
Junc N19	93.6	0.2	134.3	40.7	57.6
Junc N20	93.8	0.3	134.3	40.5	57.4
Junc N21	94.1	0.0	134.5	40.4	57.3
Junc N22	94.1	3.5	134.9	40.7	57.8
Junc N23	95.3	0.0	135.0	39.7	56.3

*** Boundary Condition**

Minimum Pressure

Table 4f
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 10

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-113.6	138.2	0.0	0.0
Resvr R2*	136.8	-64.7	136.8	0.0	0.0
Junc N1	93.5	0.1	134.2	40.7	57.7
Junc N2	93.9	0.2	134.2	40.3	57.1
Junc N3	93.8	0.3	134.2	40.4	57.3
Junc N4	93.6	0.1	134.2	40.6	57.6
Junc N5	93.8	0.2	134.3	40.5	57.4
Junc N6	93.8	0.2	134.3	40.5	57.5
Junc N7	94.0	0.5	134.3	40.4	57.3
Junc N8	93.5	0.5	132.6	39.1	55.4
Junc N9	93.6	0.2	129.2	35.6	50.4
Junc N10	93.4	167.2	127.5	34.1	48.4
Junc N11	94.1	0.2	127.5	33.4	47.4
Junc N12	93.4	1.4	131.7	38.3	54.3
Junc N13	93.2	1.5	134.2	40.9	58.1
Junc N14	93.4	0.6	134.2	40.8	57.9
Junc N15	93.6	0.5	134.2	40.7	57.6
Junc N16	93.5	0.5	134.2	40.8	57.8
Junc N17	92.9	0.1	134.2	41.3	58.6
Junc N18	92.9	0.3	134.2	41.3	58.6
Junc N19	93.6	0.2	134.2	40.6	57.6
Junc N20	93.8	0.3	134.2	40.5	57.4
Junc N21	94.1	0.0	134.4	40.3	57.2
Junc N22	94.1	3.5	134.8	40.7	57.7
Junc N23	95.3	0.00	135.1	39.8	56.4

*** Boundary Condition**

Minimum Pressure

Prepared By:
NOVATECH
Date: January 12, 2018

Table 4g
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 12

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-111.3	138.2	0.0	0.0
Resvr R2*	136.8	-67.1	136.8	0.0	0.0
Junc N1	93.5	0.1	134.2	40.7	57.7
Junc N2	93.9	0.2	134.2	40.3	57.1
Junc N3	93.8	0.3	134.2	40.4	57.2
Junc N4	93.6	0.1	134.2	40.6	57.6
Junc N5	93.8	0.2	134.3	40.5	57.5
Junc N6	93.8	0.2	134.3	40.6	57.6
Junc N7	94.0	0.5	134.5	40.5	57.5
Junc N8	93.5	0.5	133.5	40.0	56.7
Junc N9	93.6	0.2	131.6	38.0	53.8
Junc N10	93.4	0.2	131.6	38.2	54.1
Junc N11	94.1	0.2	131.5	37.5	53.1
Junc N12	93.4	168.4	130.1	36.7	52.1
Junc N13	93.2	1.5	134.0	40.8	57.8
Junc N14	93.4	0.6	134.1	40.7	57.7
Junc N15	93.6	0.5	134.1	40.6	57.5
Junc N16	93.5	0.5	134.2	40.8	57.8
Junc N17	92.9	0.1	134.0	41.1	58.3
Junc N18	92.9	0.3	134.0	41.2	58.4
Junc N19	93.6	0.2	134.2	40.6	57.5
Junc N20	93.8	0.3	134.2	40.4	57.3
Junc N21	94.1	0.0	134.2	40.2	56.9
Junc N22	94.1	3.5	134.6	40.5	57.5
Junc N23	95.3	0.0	135.2	39.9	56.5

*** Boundary Condition**

Minimum Pressure

Table 4h
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 15

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-128.6	138.2	0.0	0.0
Resvr R2*	136.8	-82.8	136.8	0.0	0.0
Junc N1	93.5	0.1	131.8	38.3	54.3
Junc N2	93.9	0.2	131.8	37.9	53.7
Junc N3	93.8	0.3	131.8	38.0	53.9
Junc N4	93.6	0.1	132.1	38.5	54.6
Junc N5	93.8	0.2	132.4	38.6	54.8
Junc N6	93.8	0.2	132.7	39.0	55.3
Junc N7	94.0	0.5	133.3	39.4	55.8
Junc N8	93.5	0.5	133.2	39.7	56.3
Junc N9	93.6	0.2	132.9	39.4	55.8
Junc N10	93.4	0.2	132.9	39.6	56.1
Junc N11	94.1	0.2	132.9	38.9	55.1
Junc N12	93.4	1.4	132.8	39.4	55.8
Junc N13	93.2	1.5	132.6	39.4	55.9
Junc N14	93.4	0.6	132.2	38.9	55.1
Junc N15	93.6	200.5	131.5	38.0	53.8
Junc N16	93.5	0.5	132.5	39.0	55.3
Junc N17	92.9	0.1	132.5	39.6	56.2
Junc N18	92.9	0.3	132.3	39.5	56.0
Junc N19	93.6	0.2	131.6	38.0	53.9
Junc N20	93.8	0.3	131.8	38.0	53.9
Junc N21	94.1	0.0	133.0	38.9	55.2
Junc N22	94.1	3.5	133.6	39.5	56.0
Junc N23	95.3	0.0	134.3	39.0	55.2

*** Boundary Condition**

Minimum Pressure

Table 4i
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 16

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-112.5	138.2	0.0	0.0
Resvr R2*	136.8	-65.8	136.8	0.0	0.0
Junc N1	93.5	0.1	133.9	40.4	57.2
Junc N2	93.9	0.2	133.9	39.9	56.6
Junc N3	93.8	0.3	133.9	40.0	56.8
Junc N4	93.6	0.1	133.9	40.3	57.1
Junc N5	93.8	0.2	133.9	40.1	56.9
Junc N6	93.8	0.2	133.9	40.1	56.9
Junc N7	94.0	0.5	134.4	40.5	57.4
Junc N8	93.5	0.5	134.3	40.8	57.9
Junc N9	93.6	0.2	134.2	40.6	57.6
Junc N10	93.4	0.2	134.2	40.8	57.9
Junc N11	94.1	0.2	134.2	40.1	56.9
Junc N12	93.4	1.4	134.1	40.7	57.8
Junc N13	93.2	1.5	134.1	40.9	57.9
Junc N14	93.4	0.6	133.8	40.5	57.4
Junc N15	93.6	0.5	133.9	40.3	57.1
Junc N16	93.5	167.5	130.2	36.7	52.1
Junc N17	92.9	0.1	134.0	41.1	58.3
Junc N18	92.9	0.3	133.9	41.1	58.2
Junc N19	93.6	0.2	133.9	40.3	57.1
Junc N20	93.8	0.3	133.9	40.1	56.9
Junc N21	94.1	0.0	134.3	40.2	57.1
Junc N22	94.1	3.5	134.7	40.6	57.6
Junc N23	95.3	0.0	135.1	39.8	56.5

*** Boundary Condition**

Minimum Pressure

Table 4j
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 18

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-107.3	138.2	0.0	0.0
Resvr R2*	136.8	-71.0	136.8	0.0	0.0
Junc N1	93.5	0.1	133.9	40.4	57.3
Junc N2	93.9	0.2	133.9	40.0	56.7
Junc N3	93.8	0.3	134.0	40.1	56.9
Junc N4	93.6	0.1	134.1	40.5	57.4
Junc N5	93.8	0.2	134.2	40.4	57.3
Junc N6	93.8	0.2	134.4	40.6	57.6
Junc N7	94.0	0.5	134.7	40.8	57.8
Junc N8	93.5	0.5	134.5	41.0	58.2
Junc N9	93.6	0.2	134.2	40.6	57.5
Junc N10	93.4	0.2	134.2	40.8	57.8
Junc N11	94.1	0.2	134.1	40.1	56.8
Junc N12	93.4	1.4	133.9	40.5	57.4
Junc N13	93.2	1.5	133.7	40.4	57.3
Junc N14	93.4	0.6	133.6	40.3	57.1
Junc N15	93.6	0.5	133.8	40.3	57.1
Junc N16	93.5	0.5	134.0	40.5	57.5
Junc N17	92.9	0.1	131.1	38.2	54.2
Junc N18	92.9	167.3	128.9	36.1	51.1
Junc N19	93.6	0.2	133.9	40.3	57.1
Junc N20	93.8	0.3	133.9	40.2	56.9
Junc N21	94.1	0.0	133.9	39.9	56.5
Junc N22	94.1	3.5	134.4	40.3	57.1
Junc N23	95.3	0.0	135.4	40.1	56.8

*** Boundary Condition**

Minimum Pressure

Table 4k
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 20

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-111.5	138.2	0.0	0.0
Resvr R2*	136.8	-66.9	136.8	0.0	0.0
Junc N1	93.5	0.1	132.3	38.8	55.0
Junc N2	93.9	0.2	132.5	38.6	54.7
Junc N3	93.8	0.3	133.2	39.4	55.9
Junc N4	93.6	0.1	133.4	39.8	56.5
Junc N5	93.8	0.2	133.7	39.9	56.6
Junc N6	93.8	0.2	134.0	40.2	57.1
Junc N7	94.0	0.5	134.5	40.5	57.4
Junc N8	93.5	0.5	134.4	40.9	58.0
Junc N9	93.6	0.2	134.2	40.6	57.6
Junc N10	93.4	0.2	134.2	40.8	57.9
Junc N11	94.1	0.2	134.2	40.1	56.9
Junc N12	93.4	1.4	134.1	40.7	57.7
Junc N13	93.2	1.5	134.0	40.8	57.8
Junc N14	93.4	0.6	133.7	40.4	57.3
Junc N15	93.6	0.5	133.3	39.7	56.4
Junc N16	93.5	0.5	133.9	40.4	57.3
Junc N17	92.9	0.1	133.9	41.0	58.2
Junc N18	92.9	0.3	133.8	41.0	58.1
Junc N19	93.6	0.2	131.7	38.1	54.0
Junc N20	93.8	167.3	130.2	36.4	51.6
Junc N21	94.1	0.0	134.2	40.2	57.0
Junc N22	94.1	3.5	134.6	40.5	57.5
Junc N23	95.3	0.0	135.2	39.9	56.5

*** Boundary Condition**

Minimum Pressure

Table 4l
Pre Configuration Condition
Max Daily Demand and Fire Flow at Node 22

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	138.2	-85.9	138.2	0.0	0.0
Resvr R2*	136.8	-75.5	136.8	0.0	0.0
Junc N1	93.5	0.1	135.4	41.9	59.4
Junc N2	93.9	0.2	135.4	41.5	58.8
Junc N3	93.8	0.3	135.4	41.6	59.0
Junc N4	93.6	0.1	135.5	41.9	59.4
Junc N5	93.8	0.2	135.6	41.8	59.3
Junc N6	93.8	0.2	135.7	41.9	59.4
Junc N7	94.0	0.5	135.9	42.0	59.5
Junc N8	93.5	0.5	135.7	42.2	59.9
Junc N9	93.6	0.2	135.5	41.9	59.4
Junc N10	93.4	0.2	135.5	42.1	59.7
Junc N11	94.1	0.2	135.4	41.4	58.7
Junc N12	93.4	1.4	135.2	41.8	59.3
Junc N13	93.2	1.5	135.1	41.9	59.3
Junc N14	93.4	0.6	135.2	41.9	59.4
Junc N15	93.6	0.5	135.3	41.8	59.2
Junc N16	93.5	0.5	135.5	42.0	59.6
Junc N17	92.9	0.1	135.1	42.3	59.9
Junc N18	92.9	0.3	135.2	42.3	60.0
Junc N19	93.6	0.2	135.4	41.8	59.2
Junc N20	93.8	0.3	135.4	41.7	59.1
Junc N21	94.1	0.0	134.7	40.7	57.6
Junc N22	94.1	153.5	134.1	40.0	56.7
Junc N23	95.3	0.0	136.4	41.0	58.2

*** Boundary Condition**

Minimum Pressure

Table 5
Pre Configuration Condition
Peak Hour Check

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1	141.2	-35.32	141.2	0.0	0.0
Resvr R2	140.5	10.40	140.5	0.0	0.0
Junc N1	93.5	0.31	140.67	47.2	66.9
Junc N2	93.9	0.42	140.67	46.8	66.3
Junc N3	93.8	0.60	140.67	46.9	66.4
Junc N4	93.6	0.25	140.68	47.1	66.8
Junc N5	93.8	0.42	140.7	46.9	66.6
Junc N6	93.8	0.38	140.72	47.0	66.6
Junc N7	94.0	0.98	140.76	46.8	66.4
Junc N8	93.5	1.09	140.72	47.2	67.0
Junc N9	93.6	0.49	140.67	47.1	66.8
Junc N10	93.4	0.38	140.67	47.3	67.1
Junc N11	94.1	0.38	140.58	46.5	66.0
Junc N12	93.4	2.96	140.64	47.2	67.0
Junc N13	93.2	3.25	140.63	47.4	67.2
Junc N14	93.4	1.20	140.65	47.3	67.1
Junc N15	93.6	1.09	140.66	47.1	66.8
Junc N16	93.5	1.16	140.68	47.2	67.0
Junc N17	92.9	0.25	140.64	47.8	67.8
Junc N18	92.9	0.60	140.64	47.8	67.8
Junc N19	93.6	0.49	140.66	47.1	66.7
Junc N20	93.8	0.60	140.67	46.9	66.5
Junc N21	94.1	0.00	140.61	46.6	66.0
Junc N22	94.1	7.62	140.57	46.5	65.9
Junc N23	95.3	0.00	140.84	45.5	64.5

*** Boundary Condition**

Minimum Pressure

Table 6
Post Configuration Condition
High Pressure Check

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)	Age (hrs)
Resvr R1*	147.7	-2.45	147.70	0.0	0.0	0.0
Resvr R2*	147.7	-2.10	147.70	0.0	0.0	0.0
Junc N1	93.5	0.06	147.7	54.2	76.9	24.5
Junc N2	93.9	0.08	147.7	53.8	76.3	12.0
Junc N3	93.8	0.11	147.7	53.9	76.4	7.3
Junc N4	93.6	0.04	147.7	54.1	76.7	6.4
Junc N5	93.8	0.08	147.7	53.9	76.5	5.3
Junc N6	93.8	0.07	147.7	54.0	76.5	4.2
Junc N7	94.0	0.18	147.7	53.8	76.2	3.3
Junc N8	93.5	0.20	147.7	54.2	76.9	3.8
Junc N9	93.6	0.09	147.7	54.1	76.7	5.0
Junc N10	93.4	0.07	147.7	54.3	77.0	5.6
Junc N11	94.1	0.07	147.69	53.6	76.1	6.0
Junc N12	93.4	0.54	147.7	54.3	77.0	10.8
Junc N13	93.2	0.59	147.7	54.5	77.3	13.3
Junc N14	93.4	0.22	147.7	54.4	77.1	12.7
Junc N15	93.6	0.20	147.7	54.2	76.8	10.4
Junc N16	93.5	0.21	147.7	54.3	76.9	5.8
Junc N17	92.9	0.04	147.7	54.8	77.8	25.7
Junc N18	92.9	0.11	147.7	54.8	77.8	26.2
Junc N19	93.6	0.09	147.7	54.1	76.7	38.0
Junc N20	93.8	0.11	147.7	54.0	76.5	27.6
Junc N21	94.1	0.00	147.7	53.6	76.1	9.3
Junc N22	94.1	1.39	147.7	53.6	76.0	5.7
Junc N23	95.3	0.00	147.7	52.4	74.3	2.6

*** Boundary Condition**

Maximum Pressure
Maximum Time

Prepared By:
NOVATECH
Date: January 12, 2018

Table 7a
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 1

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-109.2	146.4	0.0	0.0
Resvr R2*	145.4	-69.1	145.4	0.0	0.0
Junc N1	93.5	167.1	139.5	46.0	65.2
Junc N2	93.9	0.2	140.6	46.6	66.1
Junc N3	93.8	0.3	141.5	47.7	67.7
Junc N4	93.6	0.1	141.8	48.2	68.3
Junc N5	93.8	0.2	142.0	48.3	68.4
Junc N6	93.8	0.2	142.3	48.6	68.9
Junc N7	94.0	0.5	142.8	48.9	69.3
Junc N8	93.5	0.5	142.7	49.2	69.8
Junc N9	93.6	0.2	142.6	49.0	69.5
Junc N10	93.4	0.2	142.6	49.2	69.8
Junc N11	94.1	0.2	142.6	48.5	68.8
Junc N12	93.4	1.4	142.5	49.1	69.6
Junc N13	93.2	1.5	142.4	49.2	69.8
Junc N14	93.4	0.6	142.2	48.8	69.2
Junc N15	93.6	0.5	141.7	48.2	68.3
Junc N16	93.5	0.5	142.2	48.8	69.2
Junc N17	92.9	0.1	142.3	49.5	70.1
Junc N18	92.9	0.3	142.2	49.4	70.0
Junc N19	93.6	0.2	141.1	47.5	67.4
Junc N20	93.8	0.3	140.5	46.8	66.3
Junc N21	94.1	0.0	142.7	48.6	68.9
Junc N22	94.1	3.5	143.1	49.0	69.5
Junc N23	95.3	0.0	143.5	48.2	68.3

*** Boundary Condition**

Minimum Pressure

Table 7b
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 2

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-118.1	146.4	0.0	0.0
Resvr R2*	145.4	-76.2	145.4	0.0	0.0
Junc N1	93.5	0.1	139.6	46.1	65.3
Junc N2	93.9	183.2	139.5	45.6	64.7
Junc N3	93.8	0.3	140.7	46.9	66.5
Junc N4	93.6	0.1	141.0	47.4	67.2
Junc N5	93.8	0.2	141.3	47.6	67.5
Junc N6	93.8	0.2	141.7	47.9	68.0
Junc N7	94.0	0.5	142.2	48.3	68.5
Junc N8	93.5	0.5	142.2	48.7	69.0
Junc N9	93.6	0.2	142.0	48.4	68.7
Junc N10	93.4	0.2	142.0	48.6	68.9
Junc N11	94.1	0.2	142.0	47.9	68.0
Junc N12	93.4	1.4	141.9	48.5	68.8
Junc N13	93.2	1.5	141.8	48.6	68.9
Junc N14	93.4	0.6	141.5	48.2	68.3
Junc N15	93.6	0.5	141.0	47.4	67.3
Junc N16	93.5	0.5	141.6	48.1	68.3
Junc N17	92.9	0.1	141.7	48.8	69.2
Junc N18	92.9	0.3	141.6	48.7	69.1
Junc N19	93.6	0.2	140.4	46.8	66.3
Junc N20	93.8	0.3	139.8	46.0	65.3
Junc N21	94.1	0.0	142.1	48.1	68.1
Junc N22	94.1	3.5	142.7	48.5	68.8
Junc N23	95.3	0.0	143.1	47.7	67.7

*** Boundary Condition**

Minimum Pressure

Table 7c
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 4

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-110.1	146.4	0.0	0.0
Resvr R2*	145.4	-68.3	145.4	0.0	0.0
Junc N1	93.5	0.1	141.7	48.2	68.3
Junc N2	93.9	0.2	141.7	47.8	67.7
Junc N3	93.8	0.3	141.7	47.9	67.9
Junc N4	93.6	167.1	141.5	47.9	67.9
Junc N5	93.8	0.2	141.9	48.1	68.2
Junc N6	93.8	0.2	142.3	48.5	68.8
Junc N7	94.0	0.5	142.8	48.8	69.2
Junc N8	93.5	0.5	142.7	49.2	69.8
Junc N9	93.6	0.2	142.6	49.0	69.5
Junc N10	93.4	0.2	142.6	49.2	69.8
Junc N11	94.1	0.2	142.6	48.5	68.8
Junc N12	93.4	1.4	142.5	49.1	69.7
Junc N13	93.2	1.5	142.5	49.3	69.9
Junc N14	93.4	0.6	142.2	48.9	69.3
Junc N15	93.6	0.5	141.9	48.4	68.6
Junc N16	93.5	0.5	142.2	48.8	69.2
Junc N17	92.9	0.1	142.4	49.5	70.2
Junc N18	92.9	0.3	142.3	49.5	70.1
Junc N19	93.6	0.2	141.8	48.2	68.4
Junc N20	93.8	0.3	141.7	48.0	68.0
Junc N21	94.1	0.0	142.7	48.7	69.0
Junc N22	94.1	3.5	143.2	49.1	69.6
Junc N23	95.3	0.0	143.5	48.1	68.2

*** Boundary Condition**

Minimum Pressure

Table 7d
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 6

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-111.9	146.4	0.0	0.0
Resvr R2*	145.4	-66.4	145.4	0.0	0.0
Junc N1	93.5	0.1	142.3	48.8	69.1
Junc N2	93.9	0.2	142.3	48.3	68.5
Junc N3	93.8	0.3	142.3	48.4	68.7
Junc N4	93.6	0.1	142.2	48.6	68.9
Junc N5	93.8	0.2	142.1	48.3	68.5
Junc N6	93.8	167.2	142.0	48.3	68.4
Junc N7	94.0	0.5	142.6	48.7	69.0
Junc N8	93.5	0.5	142.6	49.1	69.7
Junc N9	93.6	0.2	142.6	49.1	69.6
Junc N10	93.4	0.2	142.6	49.3	69.8
Junc N11	94.1	0.2	142.6	48.6	68.8
Junc N12	93.4	1.4	142.6	49.2	69.8
Junc N13	93.2	1.5	142.6	49.4	70.1
Junc N14	93.4	0.6	142.5	49.1	69.6
Junc N15	93.6	0.5	142.3	48.8	69.2
Junc N16	93.5	0.5	142.2	48.8	69.2
Junc N17	92.9	0.1	142.6	49.7	70.5
Junc N18	92.9	0.3	142.5	49.7	70.4
Junc N19	93.6	0.2	142.3	48.7	69.1
Junc N20	93.8	0.3	142.3	48.5	68.8
Junc N21	94.1	0.0	142.9	48.8	69.2
Junc N22	94.1	3.5	143.3	49.2	69.7
Junc N23	95.3	0.0	143.4	48.0	68.1

*** Boundary Condition**

Minimum Pressure

Table 7e
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 8

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-112.1	146.4	0.0	0.0
Resvr R2*	145.4	-66.2	145.4	0.0	0.0
Junc N1	93.5	0.1	142.6	49.1	69.7
Junc N2	93.9	0.2	142.6	48.7	69.1
Junc N3	93.8	0.3	142.6	48.8	69.2
Junc N4	93.6	0.1	142.6	49.0	69.5
Junc N5	93.8	0.2	142.6	48.9	69.3
Junc N6	93.8	0.2	142.6	48.9	69.3
Junc N7	94.0	0.5	142.6	48.7	69.0
Junc N8	93.5	167.5	139.4	45.9	65.0
Junc N9	93.6	0.2	140.7	47.1	66.7
Junc N10	93.4	0.2	140.7	47.3	67.0
Junc N11	94.1	0.2	140.6	46.6	66.1
Junc N12	93.4	1.4	141.6	48.2	68.4
Junc N13	93.2	1.5	142.6	49.4	70.1
Junc N14	93.4	0.6	142.6	49.3	69.9
Junc N15	93.6	0.5	142.6	49.1	69.6
Junc N16	93.5	0.5	142.6	49.2	69.7
Junc N17	92.9	0.1	142.6	49.8	70.6
Junc N18	92.9	0.3	142.6	49.8	70.6
Junc N19	93.6	0.2	142.6	49.0	69.5
Junc N20	93.8	0.3	142.6	48.9	69.3
Junc N21	94.1	0.0	142.9	48.8	69.2
Junc N22	94.1	3.5	143.3	49.2	69.7
Junc N23	95.3	0.0	143.4	48.0	68.1

*** Boundary Condition**

Minimum Pressure

Table 7f
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 10

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-110.9	146.4	0.0	0.0
Resvr R2*	145.4	-67.4	145.4	0.0	0.0
Junc N1	93.5	0.1	142.6	49.1	69.6
Junc N2	93.9	0.2	142.6	48.7	69.0
Junc N3	93.8	0.3	142.6	48.8	69.2
Junc N4	93.6	0.1	142.6	49.0	69.5
Junc N5	93.8	0.2	142.6	48.9	69.3
Junc N6	93.8	0.2	142.7	48.9	69.3
Junc N7	94.0	0.5	142.7	48.8	69.1
Junc N8	93.5	0.5	140.9	47.4	67.3
Junc N9	93.6	0.2	137.5	44.0	62.3
Junc N10	93.4	167.2	135.9	42.5	60.3
Junc N11	94.1	0.2	135.9	41.8	59.3
Junc N12	93.4	1.4	140.0	46.6	66.1
Junc N13	93.2	1.5	142.6	49.3	70.0
Junc N14	93.4	0.6	142.6	49.2	69.8
Junc N15	93.6	0.5	142.6	49.0	69.5
Junc N16	93.5	0.5	142.6	49.2	69.7
Junc N17	92.9	0.1	142.6	49.7	70.5
Junc N18	92.9	0.3	142.6	49.7	70.5
Junc N19	93.6	0.2	142.6	49.0	69.5
Junc N20	93.8	0.3	142.6	48.9	69.3
Junc N21	94.1	0.0	142.8	48.7	69.1
Junc N22	94.1	3.5	143.2	49.1	69.6
Junc N23	95.3	0.00	143.4	48.1	68.2

*** Boundary Condition**

Minimum Pressure

Table 7g
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 12

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-108.7	146.4	0.0	0.0
Resvr R2*	145.4	-69.6	145.4	0.0	0.0
Junc N1	93.5	0.1	142.6	49.1	69.6
Junc N2	93.9	0.2	142.6	48.6	69.0
Junc N3	93.8	0.3	142.6	48.7	69.1
Junc N4	93.6	0.1	142.6	49.0	69.5
Junc N5	93.8	0.2	142.7	48.9	69.3
Junc N6	93.8	0.2	142.7	49.0	69.4
Junc N7	94.0	0.5	142.8	48.9	69.3
Junc N8	93.5	0.5	141.8	48.3	68.5
Junc N9	93.6	0.2	139.9	46.3	65.7
Junc N10	93.4	0.2	139.9	46.5	66.0
Junc N11	94.1	0.2	139.9	45.9	65.0
Junc N12	93.4	168.4	138.5	45.1	64.0
Junc N13	93.2	1.5	142.4	49.2	69.7
Junc N14	93.4	0.6	142.5	49.1	69.6
Junc N15	93.6	0.5	142.5	49.0	69.4
Junc N16	93.5	0.5	142.6	49.1	69.7
Junc N17	92.9	0.1	142.4	49.5	70.2
Junc N18	92.9	0.3	142.4	49.6	70.3
Junc N19	93.6	0.2	142.5	48.9	69.4
Junc N20	93.8	0.3	142.6	48.8	69.2
Junc N21	94.1	0.0	142.6	48.6	68.9
Junc N22	94.1	3.5	143.1	49.0	69.4
Junc N23	95.3	0.0	143.5	48.2	68.3

*** Boundary Condition**

Minimum Pressure

Table 7h
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 15

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-126.5	146.4	0.0	0.0
Resvr R2*	145.4	-84.9	145.4	0.0	0.0
Junc N1	93.5	0.1	140.2	46.7	66.2
Junc N2	93.9	0.2	140.2	46.3	65.6
Junc N3	93.8	0.3	140.2	46.4	65.8
Junc N4	93.6	0.1	140.5	46.9	66.4
Junc N5	93.8	0.2	140.8	47.0	66.6
Junc N6	93.8	0.2	141.1	47.3	67.1
Junc N7	94.0	0.5	141.7	47.7	67.7
Junc N8	93.5	0.5	141.6	48.1	68.1
Junc N9	93.6	0.2	141.3	47.7	67.7
Junc N10	93.4	0.2	141.3	47.9	68.0
Junc N11	94.1	0.2	141.3	47.2	67.0
Junc N12	93.4	1.4	141.2	47.8	67.7
Junc N13	93.2	1.5	141.0	47.8	67.8
Junc N14	93.4	0.6	140.6	47.3	67.0
Junc N15	93.6	200.5	139.9	46.3	65.7
Junc N16	93.5	0.5	140.9	47.4	67.2
Junc N17	92.9	0.1	140.9	48.0	68.0
Junc N18	92.9	0.3	140.7	47.9	67.9
Junc N19	93.6	0.2	140.0	46.4	65.8
Junc N20	93.8	0.3	140.1	46.4	65.8
Junc N21	94.1	0.0	141.4	47.3	67.1
Junc N22	94.1	3.5	142.1	47.9	68.0
Junc N23	95.3	0.0	142.6	47.3	67.0

*** Boundary Condition**

Minimum Pressure

Table 7i
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 16

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-110.0	146.4	0.0	0.0
Resvr R2*	145.4	-68.4	145.4	0.0	0.0
Junc N1	93.5	0.1	142.2	48.7	69.1
Junc N2	93.9	0.2	142.2	48.3	68.5
Junc N3	93.8	0.3	142.2	48.4	68.7
Junc N4	93.6	0.1	142.3	48.7	69.0
Junc N5	93.8	0.2	142.3	48.5	68.8
Junc N6	93.8	0.2	142.3	48.5	68.8
Junc N7	94.0	0.5	142.8	48.8	69.2
Junc N8	93.5	0.5	142.7	49.2	69.8
Junc N9	93.6	0.2	142.6	49.0	69.5
Junc N10	93.4	0.2	142.6	49.2	69.8
Junc N11	94.1	0.2	142.6	48.5	68.8
Junc N12	93.4	1.4	142.5	49.1	69.7
Junc N13	93.2	1.5	142.5	49.3	69.9
Junc N14	93.4	0.6	142.2	48.9	69.3
Junc N15	93.6	0.5	142.2	48.7	69.0
Junc N16	93.5	167.5	138.5	45.1	63.9
Junc N17	92.9	0.1	142.4	49.5	70.2
Junc N18	92.9	0.3	142.3	49.5	70.1
Junc N19	93.6	0.2	142.2	48.6	69.0
Junc N20	93.8	0.3	142.2	48.5	68.8
Junc N21	94.1	0.0	142.7	48.7	69.0
Junc N22	94.1	3.5	143.2	49.0	69.5
Junc N23	95.3	0.0	143.5	48.1	68.3

*** Boundary Condition**

Minimum Pressure

Table 7j
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 18

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-104.9	146.4	0.0	0.0
Resvr R2*	145.4	-73.4	145.4	0.0	0.0
Junc N1	93.5	0.1	142.3	48.8	69.2
Junc N2	93.9	0.2	142.3	48.4	68.6
Junc N3	93.8	0.3	142.3	48.5	68.8
Junc N4	93.6	0.1	142.4	48.8	69.2
Junc N5	93.8	0.2	142.6	48.8	69.2
Junc N6	93.8	0.2	142.7	49.0	69.4
Junc N7	94.0	0.5	143.1	49.1	69.6
Junc N8	93.5	0.5	142.9	49.4	70.0
Junc N9	93.6	0.2	142.5	48.9	69.4
Junc N10	93.4	0.2	142.5	49.1	69.7
Junc N11	94.1	0.2	142.5	48.5	68.7
Junc N12	93.4	1.4	142.3	48.9	69.3
Junc N13	93.2	1.5	142.1	48.8	69.3
Junc N14	93.4	0.6	142.0	48.7	69.0
Junc N15	93.6	0.5	142.2	48.6	69.0
Junc N16	93.5	0.5	142.4	48.9	69.4
Junc N17	92.9	0.1	139.4	46.6	66.1
Junc N18	92.9	167.3	137.3	44.5	63.0
Junc N19	93.6	0.2	142.2	48.6	69.0
Junc N20	93.8	0.3	142.3	48.5	68.8
Junc N21	94.1	0.0	142.3	48.3	68.4
Junc N22	94.1	3.5	142.8	48.7	69.1
Junc N23	95.3	0.0	143.7	48.4	68.6

*** Boundary Condition**

Minimum Pressure

Table 7k
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 20

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-109.0	146.4	0.0	0.0
Resvr R2*	145.4	-69.3	145.4	0.0	0.0
Junc N1	93.5	0.1	140.7	47.2	66.9
Junc N2	93.9	0.2	140.9	47.0	66.6
Junc N3	93.8	0.3	141.6	47.8	67.7
Junc N4	93.6	0.1	141.8	48.2	68.3
Junc N5	93.8	0.2	142.1	48.3	68.5
Junc N6	93.8	0.2	142.4	48.6	68.9
Junc N7	94.0	0.5	142.8	48.9	69.3
Junc N8	93.5	0.5	142.7	49.2	69.8
Junc N9	93.6	0.2	142.6	49.0	69.5
Junc N10	93.4	0.2	142.6	49.2	69.8
Junc N11	94.1	0.2	142.6	48.5	68.8
Junc N12	93.4	1.4	142.5	49.1	69.6
Junc N13	93.2	1.5	142.4	49.2	69.7
Junc N14	93.4	0.6	142.1	48.8	69.2
Junc N15	93.6	0.5	141.7	48.1	68.2
Junc N16	93.5	0.5	142.2	48.8	69.2
Junc N17	92.9	0.1	142.3	49.4	70.1
Junc N18	92.9	0.3	142.2	49.4	70.0
Junc N19	93.6	0.2	140.0	46.4	65.8
Junc N20	93.8	167.3	138.6	44.8	63.5
Junc N21	94.1	0.0	142.7	48.6	68.9
Junc N22	94.1	3.5	143.1	49.0	69.5
Junc N23	95.3	0.0	143.5	48.2	68.3

*** Boundary Condition**

Minimum Pressure

Table 7l
Post Configuration Condition
Max Daily Demand and Fire Flow at Node 22

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.4	-83.3	146.4	0.0	0.0
Resvr R2*	145.4	-78.0	145.4	0.0	0.0
Junc N1	93.5	0.1	143.8	50.3	71.3
Junc N2	93.9	0.2	143.8	49.9	70.7
Junc N3	93.8	0.3	143.8	50.0	70.8
Junc N4	93.6	0.1	143.8	50.2	71.2
Junc N5	93.8	0.2	143.9	50.2	71.1
Junc N6	93.8	0.2	144.0	50.3	71.3
Junc N7	94.0	0.5	144.2	50.3	71.3
Junc N8	93.5	0.5	144.1	50.6	71.7
Junc N9	93.6	0.2	143.8	50.2	71.2
Junc N10	93.4	0.2	143.8	50.4	71.5
Junc N11	94.1	0.2	143.8	49.7	70.5
Junc N12	93.4	1.4	143.6	50.2	71.2
Junc N13	93.2	1.5	143.4	50.2	71.2
Junc N14	93.4	0.6	143.6	50.2	71.2
Junc N15	93.6	0.5	143.7	50.1	71.1
Junc N16	93.5	0.5	143.8	50.4	71.4
Junc N17	92.9	0.1	143.5	50.6	71.8
Junc N18	92.9	0.3	143.5	50.7	71.9
Junc N19	93.6	0.2	143.7	50.1	71.1
Junc N20	93.8	0.3	143.8	50.0	70.9
Junc N21	94.1	0.0	143.1	49.0	69.5
Junc N22	94.1	153.5	142.5	48.4	68.7
Junc N23	95.3	0.0	144.7	49.3	69.9

*** Boundary Condition**

Minimum Pressure

Table 8
Post Configuration Condition
Peak Hour Check

Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m)	Pressure (PSI)
Resvr R1*	146.3	-33.22	146.3	0.0	0.0
Resvr R2	145.7	8.30	145.7	0.0	0.0
Junc N1	93.5	0.31	145.83	52.3	74.2
Junc N2	93.9	0.42	145.83	51.9	73.6
Junc N3	93.8	0.60	145.83	52.0	73.8
Junc N4	93.6	0.25	145.84	52.2	74.1
Junc N5	93.8	0.42	145.85	52.1	73.9
Junc N6	93.8	0.38	145.87	52.1	73.9
Junc N7	94.0	0.98	145.9	52.0	73.7
Junc N8	93.5	1.09	145.87	52.4	74.3
Junc N9	93.6	0.49	145.83	52.3	74.1
Junc N10	93.4	0.38	145.83	52.5	74.4
Junc N11	94.1	0.38	145.73	51.7	73.3
Junc N12	93.4	2.96	145.8	52.4	74.3
Junc N13	93.2	3.25	145.8	52.6	74.6
Junc N14	93.4	1.20	145.81	52.5	74.4
Junc N15	93.6	1.09	145.82	52.3	74.1
Junc N16	93.5	1.16	145.83	52.4	74.3
Junc N17	92.9	0.25	145.8	52.9	75.1
Junc N18	92.9	0.60	145.8	52.9	75.1
Junc N19	93.6	0.49	145.82	52.2	74.0
Junc N20	93.8	0.60	145.83	52.1	73.8
Junc N21	94.1	0.00	145.78	51.7	73.3
Junc N22	94.1	7.62	145.75	51.6	73.2
Junc N23	95.3	0.00	145.98	50.7	71.8

Minimum Pressure

Appendix D

SWM Calculations & PCSWMM Model

Burnett Lands - 3370 Greenbank Road
Overall Model Schematic

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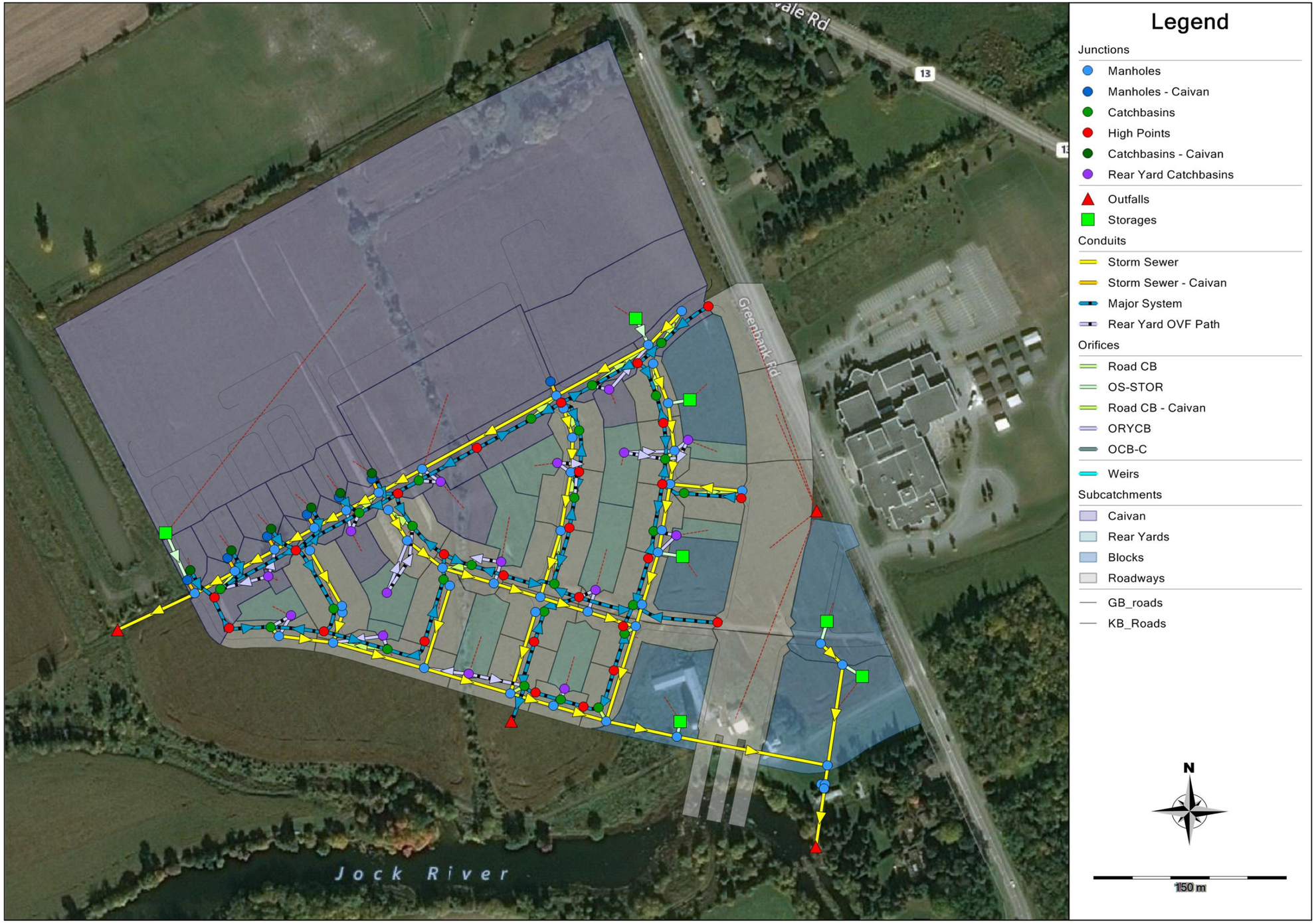
Engineers, Planners & Landscape Architects



22/05/2018
PREPARED BY: NOVATECH

Burnett Lands - 3370 Greenbank Road
Post-Development Model Parameters

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Area ID	Catchment Area (ha)	Runoff Coefficient	Percent Impervious (%)	No Depression (%)	Equivalent Width (m)	Average Slope (%)
Burnett Lands - Claridge						
A01	0.163	0.65	64%	50%	138	0.85
A02	0.106	0.65	64%	100%	44	1.50
A03	0.352	0.65	64%	50%	166	0.75
A04	0.258	0.65	64%	50%	183	0.75
A05	0.032	0.65	64%	100%	12	1.50
A06	0.287	0.65	64%	50%	132	0.75
A07	0.178	0.65	64%	100%	66	2.00
A08	0.218	0.65	64%	50%	143	0.70
A09	0.265	0.65	64%	50%	99	1.30
A10	0.108	0.65	64%	50%	81	0.85
A11	0.147	0.65	64%	100%	57	1.80
A12	0.276	0.65	64%	50%	125	0.55
A13	0.143	0.65	64%	100%	40	1.50
A14	0.161	0.65	64%	50%	85	0.75
A15	0.215	0.65	64%	100%	77	1.50
A16	0.200	0.65	64%	50%	110	0.70
A17	0.135	0.65	64%	100%	37	1.50
A18	0.219	0.65	64%	50%	98	0.85
A19	0.285	0.65	64%	50%	152	0.75
A20	0.195	0.65	64%	100%	72	1.50
A21	0.154	0.65	64%	50%	105	1.00
A22	0.474	0.65	64%	50%	91	1.00
A23	0.070	0.65	64%	100%	47	1.50
A24	0.185	0.65	64%	50%	107	0.85
A25	0.174	0.65	64%	100%	59	1.50
A26	0.239	0.65	64%	50%	108	1.70
A27	0.071	0.65	64%	100%	50	1.50
A28	0.192	0.65	64%	50%	107	1.00
A29	0.317	0.65	64%	50%	58	1.00
A30	0.269	0.65	64%	50%	186	1.00
A31	0.269	0.65	64%	50%	194	0.80
A32	0.476	0.65	64%	50%	74	1.00
A33	0.145	0.65	64%	50%	98	1.30
A34-35	0.588	0.65	64%	50%	37	1.30
A-36	0.845	0.65	64%	50%	85	1.00
A-37	0.734	0.65	64%	0%	304	1.00
A-38	0.744	0.65	64%	0%	273	1.00
A-39	0.376	0.65	64%	0%	147	1.00
A-40	0.303	0.65	64%	0%	136	1.00

Burnett Lands - 3370 Greenbank Road
Post-Development Model Parameters

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Area ID	Catchment Area (ha)	Runoff Coefficient	Percent Impervious (%)	No Depression (%)	Equivalent Width (m)	Average Slope (%)
Street B - Caivan Lands						
B-01	0.135	0.65	64%	50%	129	2.00
B-02	0.824	0.65	64%	50%	134	1.00
B-03	0.095	0.65	64%	100%	36	1.80
B-04	0.137	0.65	64%	50%	141	0.60
B-05	0.226	0.65	64%	50%	154	0.75
B-06	0.200	0.65	64%	100%	65	1.50
B-07	0.204	0.65	64%	50%	155	1.00
B-08	1.111	0.30	14%	0%	150	0.85
B-09	0.090	0.65	64%	50%	41	1.00
B-10	0.186	0.65	64%	50%	148	0.85
B-11	0.097	0.65	64%	50%	87	1.00
B-12	0.111	0.65	64%	100%	45	2.00
B-13	0.120	0.65	64%	50%	86	1.00
B-14	0.136	0.65	64%	50%	88	1.00
B-15	0.026	0.65	64%	100%	21	1.80
B-16	0.121	0.65	64%	50%	84	1.00
B-17	0.342	0.65	64%	50%	181	0.85
B-18	0.107	0.65	64%	50%	48	1.00
CaivanLands	8.251	0.65	64%	50%	400	1.00

Burnett Lands - 3370 Greenbank Road

Inlet Control Device Parameters

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Structure	ICD Size & Inlet Rate				5-year Peak Flow* (L/s)
	Diameter (mm)	Max Head (m)	Calculated Inlet Capture Rate (L/s)	Actual 5-year Capture Rate* (L/s)	
Burnett Lands - Claridge					
CB01-02	83	1.56	18.57	20.02	39.62
CB03-04	94	1.56	23.77	25.88	60.75
CB05-06	108	1.55	31.31	34.06	63.67
CB07-08	102	1.55	27.96	30.79	78.36
CB09-10	108	1.54	31.23	34.02	59.86
CB11-12	94	1.55	23.71	25.89	36.40
CB13-14	83	1.56	18.57	20.21	45.25
CB15-16	83	1.56	18.57	20.43	48.82
CB17-18	83	1.56	18.57	20.32	64.52
CB19-20	94	1.55	23.72	25.27	50.54
CB21-22	108	1.44	30.15	30.71	59.33
CB23-24	83	1.56	18.57	17.70	25.84
CB25-26	83	1.56	18.56	18.34	35.19
CB27-28	108	1.55	31.32	32.24	63.76
CB29-30	108	1.54	31.25	32.94	64.36
CB31-32	94	1.56	23.77	25.49	44.61
CB33-34	108	1.55	31.30	33.86	55.96
CB35-36	94	1.56	23.77	25.96	42.72
CB37-38	83	1.56	18.57	20.05	36.78
RYCB01	83	1.61	18.85	4.82	4.82
RYCB02	83	1.56	18.55	19.14	19.63
RYCB03	83	1.96	20.79	19.78	20.56
RYCB04	83	1.64	19.02	20.43	26.48
RYCB05	83	1.46	17.94	5.93	5.93
RYCB06	83	2.07	21.37	20.71	32.97
RYCB07	94	1.84	25.87	27.73	37.04
RYCB08	83	2.13	21.68	21.90	39.82
RYCB09	83	1.97	20.85	21.07	25.00
RYCB10	83	2.07	21.37	20.36	27.23
RYCB11	83	1.77	19.76	17.35	17.60
RYCB12	83	2.01	21.06	21.23	32.23
RYCB13	94	2.81	31.96	26.97	36.12
RYCB14	83	1.85	20.20	12.87	13.15
RYCB15	83	1.83	20.09	12.67	12.97

Burnett Lands - 3370 Greenbank Road

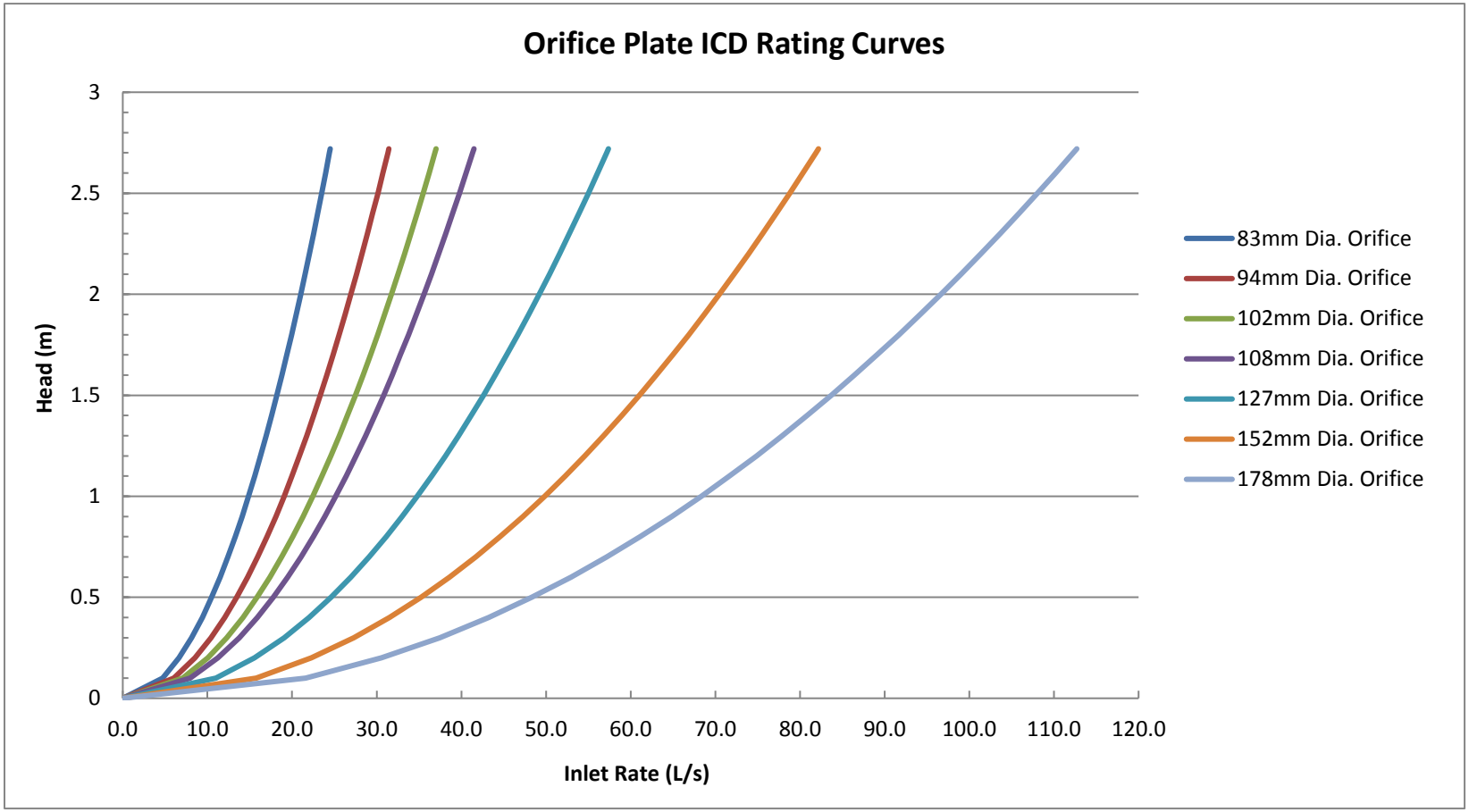
Inlet Control Device Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Structure	ICD Size & Inlet Rate				5-year Peak Flow* (L/s)
	Diameter (mm)	Max Head (m)	Calculated Inlet Capture Rate (L/s)	Actual 5-year Capture Rate* (L/s)	
Street B - Caivan Lands					
CB39-40	83	1.56	18.57	19.95	78.01
CB41-42	94	1.56	23.77	25.19	44.85
CB43-44	152	1.53	61.58	66.26	91.01
CB45-46	83	1.56	18.57	20.27	52.92
CB47-48	83	1.56	18.56	19.87	33.39
CB49-50	83	1.56	18.57	19.91	34.85

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

Burnett Lands - 3370 Greenbank Road
ICD Rating Curves



Burnett Lands - 3370 Greenbank Road

Ponding in Road Calculations

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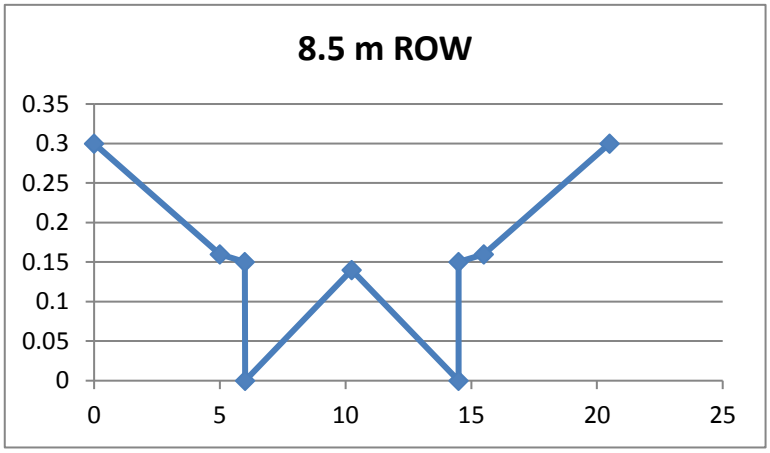
Structure	T/G	Max. Static Ponding (Spill Depth)		2-yr Event				5-yr Event				100-yr Event (4hr)				100-yr Event (+20%) (4hr)			
		Elev.	Depth	Elev.	Total Dynamic Depth	Cascading Flow?	Cascade Depth	Elev.	Total Dynamic Depth	Cascading Flow?	Cascade Depth	Elev.	Total Dynamic Depth	Cascading Flow?	Cascade Depth	Elev.	Total Dynamic Depth	Cascading Flow?	Cascade Depth
	(m)	(m)	(m)	(m)	(m)	(Y/N)	(m)	(m)	(m)	(Y/N)	(m)	(m)	(m)	(Y/N)	(m)	(m)	(m)	(Y/N)	(m)
Burnett Lands - Claridge																			
CB01-02	93.39	93.65	0.26	93.43	0.04	N	0.00	93.48	0.09	N	0.00	93.60	0.21	N	0.00	93.65	0.26	N	0.00
CB03-04	93.27	93.58	0.31	93.34	0.07	N	0.00	93.39	0.12	N	0.00	93.50	0.23	N	0.00	93.54	0.27	N	0.00
CB05-06	93.17	93.50	0.33	93.23	0.06	N	0.00	93.29	0.12	N	0.00	93.43	0.26	N	0.00	93.51	0.34	Y	0.01
CB07-08	93.33	93.69	0.36	93.43	0.10	N	0.00	93.49	0.16	N	0.00	93.63	0.30	N	0.00	93.68	0.35	N	0.00
CB09-10	93.26	93.50	0.24	93.30	0.04	N	0.00	93.38	0.12	N	0.00	93.53	0.27	Y	0.03	93.55	0.29	Y	0.05
CB11-12	93.24	93.43	0.20	93.27	0.03	N	0.00	93.37	0.14	N	0.00	93.47	0.23	Y	0.04	93.50	0.27	Y	0.07
CB13-14	93.30	93.56	0.26	93.37	0.07	N	0.00	93.42	0.12	N	0.00	93.55	0.25	N	0.00	93.60	0.30	Y	0.04
CB15-16	93.32	93.52	0.20	93.41	0.09	N	0.00	93.48	0.16	N	0.00	93.58	0.26	Y	0.06	93.59	0.27	Y	0.07
CB17-18	93.10	93.39	0.29	93.19	0.09	N	0.00	93.24	0.14	N	0.00	93.37	0.27	N	0.00	93.44	0.34	Y	0.05
CB19-20	92.93	93.12	0.19	92.98	0.05	N	0.00	93.06	0.13	N	0.00	93.16	0.23	Y	0.04	93.18	0.25	Y	0.06
CB21-22	92.62	92.89	0.27	92.68	0.06	N	0.00	92.80	0.18	N	0.00	92.92	0.30	Y	0.03	92.97	0.35	Y	0.08
CB23-24	92.69	92.80	0.11	92.12	0.00	N	0.00	92.79	0.10	N	0.00	92.92	0.23	Y	0.12	92.97	0.28	Y	0.17
CB25-26	92.73	92.89	0.16	92.75	0.02	N	0.00	92.84	0.11	N	0.00	92.92	0.19	Y	0.03	92.97	0.24	Y	0.08
CB27-28	92.85	92.92	0.07	92.92	0.07	N	0.00	92.99	0.14	Y	0.07	93.06	0.21	Y	0.14	93.11	0.26	Y	0.19
CB29-30	92.88	92.92	0.04	92.91	0.03	N	0.00	92.97	0.09	Y	0.05	93.06	0.18	Y	0.14	93.11	0.23	Y	0.19
CB31-32	93.07	93.27	0.20	93.10	0.03	N	0.00	93.17	0.10	N	0.00	93.30	0.23	Y	0.03	93.34	0.27	Y	0.07
CB33-34	93.25	93.45	0.20	93.27	0.02	N	0.00	93.35	0.10	N	0.00	93.49	0.24	Y	0.04	93.52	0.27	Y	0.07
CB35-36	93.27	93.45	0.18	93.29	0.02	N	0.00	93.40	0.13	N	0.00	93.50	0.23	Y	0.05	93.53	0.26	Y	0.08
CB37-38	93.35	93.55	0.20	93.38	0.03	N	0.00	93.45	0.10	N	0.00	93.56	0.21	Y	0.01	93.59	0.24	Y	0.04
Street B - Caivan Lands																			
CB39-40	93.17	93.45	0.28	93.22	0.05	N	0.00	93.25	0.08	N	0.00	93.30	0.13	N	0.00	93.33	0.16	N	0.00
CB41-42	93.44	93.69	0.25	93.45	0.01	N	0.00	93.48	0.04	N	0.00	93.53	0.09	N	0.00	93.56	0.12	N	0.00
CB43-44	93.40	93.69	0.29	92.60	0.00	N	0.00	93.48	0.08	N	0.00	93.75	0.35	Y	0.06	93.75	0.35	Y	0.06
CB45-46	93.41	93.62	0.21	93.49	0.08	N	0.00	93.54	0.13	N	0.00	93.65	0.24	Y	0.03	93.67	0.26	Y	0.05
CB47-48	93.47	93.62	0.15	93.47	0.00	N	0.00	93.54	0.07	N	0.00	93.64	0.17	Y	0.02	93.67	0.20	Y	0.05
CB49-50	93.67	93.82	0.15	93.68	0.01	N	0.00	93.74	0.07	N	0.00	93.83	0.16	Y	0.01	93.85	0.18	Y	0.03

Burnett Lands - 3370 Greenbank Road
Roadway Cross-Sections

Engineers, Planners & Landscape Architects

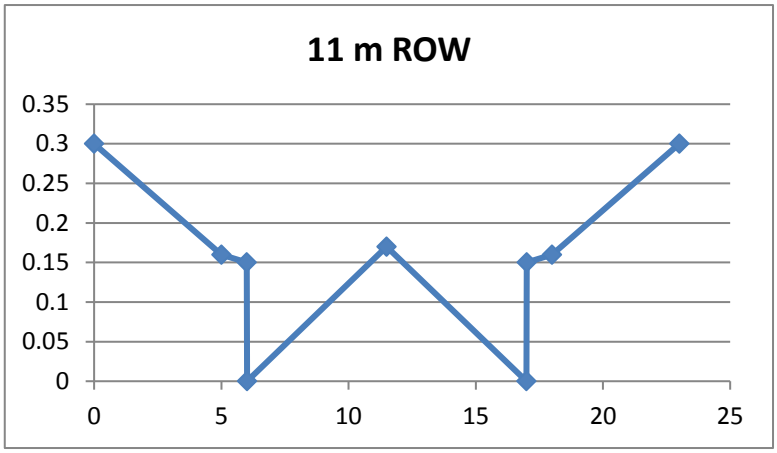
8.5m - ROW

0	0.3
5	0.16
6	0.15
6.01	0
10.25	0.14
14.49	0
14.5	0.15
15.5	0.16
20.5	0.3



11m - ROW

0	0.3
5	0.16
6	0.15
6.01	0
11.5	0.17
16.99	0
17	0.15
18	0.16
23	0.3



Burnett Lands - 3370 Greenbank Road

HGL Elevations

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Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elev - 5yr 4hr (100-yr Fixed) (m)	HGL Elev - 100yr 4hr (5-yr Fixed) (m)	HGL Elev - 100yr 4hr +20% (5-yr Fixed) (m)	Design USF (m)	Clearance 5yr 4hr (100-yr Fixed) (m)	Clearance 100yr 4hr (5-yr Fixed) (m)	Clearance 100yr 4hr +20% (5-yr Fixed) (m)
Burnett Lands - Claridge									
200 (STM)	90.92	93.70	91.70	91.26	91.26	92.03	0.33	0.77	0.77
202 (STM)	90.81	93.39	91.70	91.26	91.26	92.02	0.32	0.76	0.76
204 (STM)	90.78	93.41	91.70	91.24	91.24	92.02	0.32	0.78	0.78
300 (STM)	90.38	93.50	91.69	91.08	91.10	92.02	0.33	0.94	0.92
302 (STM)	90.28	93.67	91.69	91.08	91.10	92.02	0.33	0.94	0.92
304 (STM)	90.05	93.73	91.68	91.06	91.08	92.01	0.33	0.95	0.93
306 (STM)	90.90	93.26	91.69	91.34	91.35	92.02	0.33	0.68	0.67
400 (STM)	90.50	93.51	91.75	91.18	91.20	92.34	0.59	1.16	1.14
402 (STM)	90.38	93.41	91.75	91.17	91.20	92.34	0.59	1.17	1.14
404 (STM)	90.31	93.58	91.75	91.17	91.20	92.33	0.58	1.16	1.13
406 (STM)	90.11	93.57	91.75	91.17	91.19	92.32	0.57	1.15	1.13
408 (STM)	90.94	93.01	91.63	91.06	91.07	92.00	0.37	0.94	0.93
410 (STM)	90.12	92.99	91.64	91.04	91.05	91.99	0.35	0.95	0.94
412 (STM)	89.26	92.65	91.60	91.00	91.01	92.02	0.42	1.02	1.01
500 (STM)	90.74	93.62	91.82	91.26	91.29	92.12	0.30	0.86	0.83
502 (STM)	90.57	93.49	91.82	91.26	91.29	92.12	0.30	0.86	0.83
504 (STM)	90.42	93.37	91.81	91.25	91.28	92.12	0.31	0.87	0.84
506 (STM)	90.43	93.50	91.80	91.23	91.26	92.12	0.32	0.89	0.86
508 (STM)	89.93	93.31	91.75	91.18	91.20	92.10	0.35	0.92	0.90
600 (STM)	90.85	93.50	91.91	91.18	91.20	92.35	0.44	1.17	1.15
602 (STM)	90.64	93.33	91.92	91.18	91.20	92.32	0.40	1.14	1.12
604 (STM)	90.26	93.45	91.83	91.18	91.20	92.32	0.49	1.14	1.12
606 (STM)	89.95	93.26	91.74	91.16	91.18	92.32	0.58	1.16	1.14
608 (STM)	89.58	93.08	91.70	91.11	91.13	92.08	0.38	0.97	0.95
700 (STM)	88.65	94.14	91.80	91.23	91.26	92.12	0.32	0.89	0.86
802 (STM)	89.92	93.82	91.62	91.05	91.49	-	-	-	-
804 (STM)	89.82	93.93	91.60	91.01	91.50	-	-	-	-
806 (STM)	89.28	93.34	91.49	90.98	91.13	-	-	-	-
808 (STM)	89.25	93.38	91.56	90.78	90.99	-	-	-	-
810 (STM)	89.27	93.40	91.32	90.86	91.33	-	-	-	-
900 (STM)	89.18	92.61	91.56	90.96	90.97	-	-	-	-
902 (STM)	89.00	93.09	91.45	90.85	91.26	-	-	-	-

Burnett Lands - 3370 Greenbank Road

HGL Elevations

Manhole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elev - 5yr 4hr (100-yr Fixed) (m)	HGL Elev - 100yr 4hr (5-yr Fixed) (m)	HGL Elev - 100yr 4hr +20% (5-yr Fixed) (m)	Design USF (m)	Clearance 5yr 4hr (100-yr Fixed) (m)	Clearance 100yr 4hr (5-yr Fixed) (m)	Clearance 100yr 4hr +20% (5-yr Fixed) (m)
Street B - Caivan Lands									
100 (STM)	89.71	93.32	91.68	90.82	91.10	92.03	0.35	1.21	0.93
102 (STM)	89.86	93.37	91.69	90.84	91.14	92.03	0.34	1.19	0.89
104 (STM)	89.89	93.66	91.71	90.89	91.19	92.03	0.32	1.14	0.84
106 (STM)	90.14	93.75	91.73	90.96	91.26	-	-	-	-
108 (STM)	90.18	93.55	91.77	91.15	91.32	-	-	-	-
110 (STM)	90.31	93.71	91.80	91.24	91.37	-	-	-	-
112 (STM)	90.44	93.51	91.84	91.32	91.44	92.42	0.58	1.10	0.98
114 (STM)	90.62	93.66	91.90	91.45	91.52	92.49	0.59	1.04	0.97
116 (STM)	91.02	93.83	91.95	91.69	91.70	-	-	-	-
118 (STM)	90.99	94.51	91.96	91.69	91.70	-	-	-	-

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------

  111117 - Kennedy Burnett subdivision
  Draft plan for subdivision, located north of the Jock River and west of Greenbank Road.
  Third submission in response to comments.

  WARNING 03: negative offset ignored for Link 100-H2
  WARNING 03: negative offset ignored for Link 408-410
  WARNING 03: negative offset ignored for Link 410-412_1
  WARNING 03: negative offset ignored for Link 502-504
  WARNING 03: negative offset ignored for Link OVF-OUT
  WARNING 03: negative offset ignored for Link OR1
  WARNING 02: maximum depth increased for Node CB05-06
  WARNING 02: maximum depth increased for Node CB09-10
  WARNING 02: maximum depth increased for Node CB11-12
  WARNING 02: maximum depth increased for Node CB19-20
  WARNING 02: maximum depth increased for Node CB21-22
  WARNING 02: maximum depth increased for Node CB25-26
  WARNING 02: maximum depth increased for Node CB39-40
  WARNING 02: maximum depth increased for Node CB43-44
  WARNING 02: maximum depth increased for Node RYCB01
  WARNING 02: maximum depth increased for Node RYCB05
  WARNING 02: maximum depth increased for Node RYCB06
  WARNING 02: maximum depth increased for Node RYCB08
  WARNING 02: maximum depth increased for Node RYCB09
  WARNING 02: maximum depth increased for Node RYCB10
  WARNING 02: maximum depth increased for Node RYCB11
  WARNING 02: maximum depth increased for Node RYCB13
  WARNING 02: maximum depth increased for Node RYCB14
  WARNING 02: maximum depth increased for Node RYCB15

  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 58
  Number of nodes ........... 136
  Number of links ........... 184
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                 Data       Recording
  Name                 Data Source               Type       Interval
  ----------------------------------------------------------------
  Raingage             C5yr-4hr                  INTENSITY   10 min.


  ********************
  Subcatchment Summary
  ********************
  Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
  ------------------------------------------------------------------------------------------
--------
  A01                         0.16    138.00     64.00    0.8500 Raingage            CB01-02
  A02                         0.11     44.00     64.00    1.5000 Raingage            RYCB02
  A03                         0.35    166.00     64.00    0.7500 Raingage            CB07-08
  A04                         0.26    183.00     64.00    0.7500 Raingage            CB03-04
  A05                         0.03     12.00     64.00    1.5000 Raingage            RYCB05
  A06                         0.29    132.00     64.00    0.7500 Raingage            CB05-06
  A07                         0.18     66.00     64.00    2.0000 Raingage            RYCB06
  A08                         0.22    143.00     64.00    0.7000 Raingage            CB19-20
  A09                         0.27     99.00     64.00    1.3000 Raingage            CB21-22
  A10                         0.11     81.00     64.00    0.8500 Raingage            CB23-24
  A11                         0.15     57.00     64.00    1.8000 Raingage            RYCB10
  A12                         0.28    125.00     64.00    0.5500 Raingage            CB09-10
  A13                         0.14     40.00     64.00    1.5000 Raingage            RYCB04
  A14                         0.16     85.00     64.00    0.7500 Raingage            CB11-12
  A15                         0.22     77.00     64.00    1.5000 Raingage            RYCB08
  A16                         0.20    110.00     64.00    0.7000 Raingage            CB13-14
  A17                         0.14     37.00     64.00    1.5000 Raingage            RYCB09
  A18                         0.22     98.00     64.00    0.8500 Raingage            CB15-16
  A19                         0.28    152.00     64.00    0.7500 Raingage            CB17-18
  A20                         0.20     72.00     64.00    1.5000 Raingage            RYCB13
  A21                         0.15    105.00     64.00    1.0000 Raingage            CB37-38
  A22                         0.47     91.00     64.00    1.0000 Raingage            A22-STOR
  A23                         0.07     47.00     64.00    1.5000 Raingage            RYCB15
  A24                         0.19    107.00     64.00    0.8500 Raingage            CB35-36
  A25                         0.17     59.00     64.00    1.5000 Raingage            RYCB12
  A26                         0.24    108.00     64.00    1.7000 Raingage            CB33-34
  A27                         0.07     50.00     64.00    1.5000 Raingage            RYCB14
  A28                         0.19    107.00     64.00    1.0000 Raingage            CB31-32
  A29                         0.32     58.00     64.00    1.0000 Raingage            A29-STOR
  A30                         0.27    186.00     64.00    1.0000 Raingage            CB29-30
  A31                         0.27    194.00     64.00    0.8000 Raingage            CB27-28
  A32                         0.48     74.00     64.00    1.0000 Raingage            A32-STOR
  A33                         0.14     98.00     64.00    1.3000 Raingage            CB25-26
  A34-35                      0.59     37.00     64.00    1.0360 Raingage            A34-35-STOR
  A36                         0.84     85.00     64.00    1.0000 Raingage            A36-STOR
  A37                         0.73    304.00     64.00    1.0000 Raingage            GRBK-OUT
  A38                         0.74    273.00     64.00    1.0000 Raingage            GRBK-OUT
  A39                         0.38    147.00     64.00    1.0000 Raingage            GRBK-OUT
  A40                         0.30    136.00     64.00    1.0000 Raingage            GRBK-OUT
  B01                         0.14    129.00     64.00    2.0000 Raingage            CB49-50
  B02                         0.82    134.00     64.00    1.0000 Raingage            B02-STOR
  B03                         0.10     36.00     64.00    1.8000 Raingage            RYCB11
  B04                         0.14    141.00     64.00    0.6000 Raingage            CB47-48
  B05                         0.23    154.00     64.00    0.7500 Raingage            CB45-46
  B06                         0.20     65.00     64.00    1.5000 Raingage            RYCB07
  B07                         0.20    155.00     64.00    1.0000 Raingage            CB43-44
  B08                         1.11    150.00     14.00    0.8500 Raingage            CB43-44
  B09                         0.09     41.00     64.00    1.0000 Raingage            CB-283
  B10                         0.19    148.00     64.00    0.8500 Raingage            CB41-42
  B11                         0.10     87.00     64.00    1.0000 Raingage            CB-288
  B12                         0.11     45.00     64.00    2.0000 Raingage            RYCB03
  B13                         0.12     86.00     64.00    1.0000 Raingage            CB-284
  B14                         0.14     88.00     64.00    1.0000 Raingage            CB-285
  B15                         0.03     21.00     64.00    1.8000 Raingage            RYCB01
  B16                         0.12     80.00     64.00    1.0000 Raingage            CB-286
  B17                         0.34    181.00     64.00    0.8500 Raingage            CB39-40
  B18                         0.11     48.00     64.00    1.0000 Raingage            CB-287
  CaivanLands                 8.25    400.00     64.00    1.0000 Raingage            CAV-STOR


  ************
  Node Summary
  ************
                                                 Invert      Max.     Ponded    External
  Name                 Type                      Elev.      Depth      Area    Inflow
  ----------------------------------------------------------------------------------
  01+217               JUNCTION                  93.79       0.35       0.0
  01+292               JUNCTION                  93.69       0.35       0.0
  01+370               JUNCTION                  93.79       0.35       0.0
  01+449               JUNCTION                  93.62       0.35       0.0
  01+521               JUNCTION                  93.82       0.35       0.0
  01+586               JUNCTION                  94.97       0.35       0.0
  03+000               JUNCTION                  93.45       0.35       0.0
  03+048               JUNCTION                  93.65       0.35       0.0
  03+118               JUNCTION                  93.69       0.35       0.0
  03+214               JUNCTION                  93.58       0.35       0.0
  04+069               JUNCTION                  93.56       0.35       0.0
  04+118               JUNCTION                  93.52       0.35       0.0
  04+213               JUNCTION                  93.12       0.35       0.0
  04+264               JUNCTION                  92.80       0.35       0.0
  04+305               JUNCTION                  92.84       0.35       0.0
  04+357               JUNCTION                  93.07       0.35       0.0
  04+393               JUNCTION                  92.92       0.35       0.0
  05+067               JUNCTION                  93.55       0.35       0.0
  05+122               JUNCTION                  93.45       0.35       0.0
  05+177               JUNCTION                  93.27       0.35       0.0
  06+075               JUNCTION                  93.50       0.35       0.0
  06+132               JUNCTION                  93.43       0.35       0.0
  06+193               JUNCTION                  93.39       0.35       0.0
  06+300               JUNCTION                  93.99       0.35       0.0
  07+067               JUNCTION                  93.99       0.35       0.0
  100 (STM)            JUNCTION                  89.71       3.61       0.0
  102 (STM)            JUNCTION                  89.86       3.51       0.0
  104 (STM)            JUNCTION                  89.89       3.77       0.0
  106 (STM)            JUNCTION                  90.14       3.62       0.0
  108 (STM)            JUNCTION                  90.18       3.37       0.0
  110 (STM)            JUNCTION                  90.31       3.40       0.0
  112 (STM)            JUNCTION                  90.44       3.07       0.0
  114 (STM)            JUNCTION                  90.62       3.04       0.0
  116 (STM)            JUNCTION                  91.02       2.81       0.0
  118 (STM)            JUNCTION                  90.99       3.52       0.0
  200 (STM)            JUNCTION                  90.92       2.78       0.0
  202 (STM)            JUNCTION                  90.81       2.58       0.0
  204 (STM)            JUNCTION                  90.78       2.63       0.0
  282 (STM)            JUNCTION                  89.39       5.17       0.0
```

283 (STM)	JUNCTION	89.05	3.29	0.0
284 (STM)	JUNCTION	89.12	3.06	0.0
285 (STM)	JUNCTION	89.06	3.07	0.0
286 (STM)	JUNCTION	89.03	3.07	0.0
287 (STM)	JUNCTION	88.92	4.10	0.0
288 (STM)	JUNCTION	89.16	3.07	0.0
300 (STM)	JUNCTION	90.38	3.12	0.0
302 (STM)	JUNCTION	90.28	3.39	0.0
304 (STM)	JUNCTION	90.05	3.68	0.0
306 (STM)	JUNCTION	90.90	2.36	0.0
400 (STM)	JUNCTION	90.50	3.01	0.0
402 (STM)	JUNCTION	90.38	3.03	0.0
404 (STM)	JUNCTION	90.31	3.27	0.0
406 (STM)	JUNCTION	90.11	3.46	0.0
408 (STM)	JUNCTION	90.94	2.07	0.0
410 (STM)	JUNCTION	90.12	2.87	0.0
410a (STM)	JUNCTION	89.95	2.43	0.0
412 (STM)	JUNCTION	89.26	3.39	0.0
500 (STM)	JUNCTION	90.74	2.88	0.0
502 (STM)	JUNCTION	90.57	2.92	0.0
504 (STM)	JUNCTION	90.42	2.95	0.0
506 (STM)	JUNCTION	90.43	3.07	0.0
506a (STM)	JUNCTION	90.35	3.02	0.0
508 (STM)	JUNCTION	89.93	3.38	0.0
508a (STM)	JUNCTION	90.15	3.00	0.0
600 (STM)	JUNCTION	90.85	2.65	0.0
602 (STM)	JUNCTION	90.64	2.69	0.0
604 (STM)	JUNCTION	90.26	3.19	0.0
604a (STM)	JUNCTION	90.47	2.87	0.0
606 (STM)	JUNCTION	89.95	3.31	0.0
606a (STM)	JUNCTION	90.17	3.00	0.0
608 (STM)	JUNCTION	89.58	3.50	0.0
700 (STM)	JUNCTION	88.65	5.49	0.0
802 (STM)	JUNCTION	89.92	3.90	0.0
804 (STM)	JUNCTION	89.82	4.11	0.0
806 (STM)	JUNCTION	89.28	4.06	0.0
808 (STM)	JUNCTION	89.25	4.13	0.0
810 (STM)	JUNCTION	89.27	4.13	0.0
900 (STM)	JUNCTION	89.18	3.43	0.0
902 (STM)	JUNCTION	89.00	4.09	0.0
CB01-02	JUNCTION	91.79	1.95	0.0
CB03-04	JUNCTION	91.67	1.95	0.0
CB05-06	JUNCTION	91.57	1.95	0.0
CB07-08	JUNCTION	91.73	1.95	0.0
CB09-10	JUNCTION	91.66	1.95	0.0
CB11-12	JUNCTION	91.64	1.95	0.0
CB13-14	JUNCTION	91.70	1.95	0.0
CB15-16	JUNCTION	91.72	1.95	0.0
CB17-18	JUNCTION	91.50	1.95	0.0
CB19-20	JUNCTION	91.33	1.95	0.0
CB21-22	JUNCTION	91.13	1.94	0.0
CB23-24	JUNCTION	91.09	1.95	0.0
CB25-26	JUNCTION	91.13	1.95	0.0
CB27-28	JUNCTION	91.25	1.95	0.0
CB-283	JUNCTION	92.60	1.75	0.0
CB-284	JUNCTION	92.60	1.75	0.0
CB-285	JUNCTION	92.60	1.75	0.0
CB-286	JUNCTION	92.60	1.75	0.0
CB-287	JUNCTION	92.60	1.75	0.0
CB-288	JUNCTION	92.60	1.75	0.0
CB29-30	JUNCTION	91.28	1.95	0.0
CB31-32	JUNCTION	91.47	1.95	0.0
CB33-34	JUNCTION	91.65	1.95	0.0
CB35-36	JUNCTION	91.67	1.95	0.0
CB37-38	JUNCTION	91.75	1.95	0.0
CB39-40	JUNCTION	91.57	1.95	0.0
CB41-42	JUNCTION	91.84	1.95	0.0
CB43-44	JUNCTION	91.80	1.95	0.0
CB45-46	JUNCTION	91.81	1.95	0.0
CB47-48	JUNCTION	91.87	1.95	0.0
CB49-50	JUNCTION	92.07	1.95	0.0
RYCB01	JUNCTION	92.00	1.95	0.0
RYCB02	JUNCTION	92.03	1.90	0.0
RYCB03	JUNCTION	91.50	2.30	0.0
RYCB04	JUNCTION	91.76	1.98	0.0
RYCB05	JUNCTION	91.96	1.80	0.0
RYCB06	JUNCTION	91.11	2.41	0.0
RYCB07	JUNCTION	91.87	2.19	0.0
RYCB08	JUNCTION	91.31	2.47	0.0
RYCB09	JUNCTION	91.49	2.31	0.0
RYCB10	JUNCTION	91.08	2.41	0.0
RYCB11	JUNCTION	91.62	2.11	0.0
RYCB12	JUNCTION	91.42	2.35	0.0
RYCB13	JUNCTION	90.44	3.16	0.0
RYCB14	JUNCTION	91.51	2.19	0.0
RYCB15	JUNCTION	91.53	2.17	0.0
GRBK-OUT	OUTFALL	0.00	0.00	0.0
HW-01	OUTFALL	89.20	1.22	0.0
HW-02	OUTFALL	89.90	1.22	0.0
OVF-OUT	OUTFALL	92.78	0.30	0.0
A22-STOR	STORAGE	92.50	1.70	0.0
A29-STOR	STORAGE	92.50	1.70	0.0
A32-STOR	STORAGE	92.00	1.70	0.0
A34-35-STOR	STORAGE	93.00	1.70	0.0
A36-STOR	STORAGE	92.70	1.70	0.0
B02-STOR	STORAGE	92.75	1.70	0.0
CAV-STOR	STORAGE	92.10	1.70	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
100-H2	100 (STM)	HW-02	CONDUIT	79.8	0.1428	0.0130
102-100	102 (STM)	100 (STM)	CONDUIT	36.1	0.1109	0.0130
104-102	104 (STM)	102 (STM)	CONDUIT	35.5	0.1690	0.0130
106-104	106 (STM)	104 (STM)	CONDUIT	35.5	0.1127	0.0130
108-106	108 (STM)	106 (STM)	CONDUIT	28.5	0.1403	0.0130
110-108	110 (STM)	108 (STM)	CONDUIT	28.8	0.1390	0.0130
112-110	112 (STM)	110 (STM)	CONDUIT	39.0	0.2052	0.0130
114-112	114 (STM)	112 (STM)	CONDUIT	120.0	0.2000	0.0130
116-114	116 (STM)	114 (STM)	CONDUIT	82.6	0.1938	0.0130
118-116	118 (STM)	116 (STM)	CONDUIT	37.4	0.1871	0.0130
200-202	200 (STM)	202 (STM)	CONDUIT	50.5	0.1978	0.0130
202-204	202 (STM)	204 (STM)	CONDUIT	5.4	0.3720	0.0130
204-302b	204 (STM)	302 (STM)	CONDUIT	25.1	0.1989	0.0130
282-114	282 (STM)	114 (STM)	CONDUIT	12.0	0.3992	0.0130
283-110	283 (STM)	110 (STM)	CONDUIT	12.0	0.4074	0.0130
284-106	284 (STM)	106 (STM)	CONDUIT	12.0	0.5000	0.0130
285-104	285 (STM)	104 (STM)	CONDUIT	12.0	0.5000	0.0130
286-102	286 (STM)	102 (STM)	CONDUIT	12.0	0.5000	0.0130
287-100	287 (STM)	100 (STM)	CONDUIT	12.0	0.1500	0.0130
288-108	288 (STM)	108 (STM)	CONDUIT	12.0	0.5000	0.0130
300-302	300 (STM)	302 (STM)	CONDUIT	42.8	0.2338	0.0130
302-304	302 (STM)	304 (STM)	CONDUIT	74.0	0.2026	0.0130
304-410	304 (STM)	410 (STM)	CONDUIT	70.0	0.2000	0.0130
306-304	306 (STM)	304 (STM)	CONDUIT	69.0	0.3043	0.0130
400-402	400 (STM)	402 (STM)	CONDUIT	24.3	0.4521	0.0130
402-404	402 (STM)	404 (STM)	CONDUIT	28.2	0.2483	0.0130
404-406	404 (STM)	406 (STM)	CONDUIT	47.3	0.1989	0.0130
406-606	406 (STM)	606 (STM)	CONDUIT	55.4	0.1499	0.0130
408-410	408 (STM)	410 (STM)	CONDUIT	67.9	0.3003	0.0130
410-412_1	410 (STM)	410a (STM)	CONDUIT	35.3	0.1811	0.0130
410-412_2	410a (STM)	412 (STM)	CONDUIT	42.6	0.1173	0.0130
412-900	412 (STM)	900 (STM)	CONDUIT	56.5	0.1539	0.0130
500-502	500 (STM)	502 (STM)	CONDUIT	34.0	0.4708	0.0130
502-504	502 (STM)	504 (STM)	CONDUIT	38.2	0.2069	0.0130
504-506	504 (STM)	506 (STM)	CONDUIT	26.9	0.2232	0.0130
506-508_1	506 (STM)	506a (STM)	CONDUIT	37.3	0.2171	0.0130
506-508_2	506a (STM)	508 (STM)	CONDUIT	18.2	0.2140	0.0130
508-608_1	508 (STM)	508a (STM)	CONDUIT	43.3	0.1938	0.0130
508-608_2	508a (STM)	608 (STM)	CONDUIT	18.4	0.1961	0.0130
600-602	600 (STM)	602 (STM)	CONDUIT	28.9	0.6928	0.0130
602-604	602 (STM)	604 (STM)	CONDUIT	35.1	0.1993	0.0130
604-606_1	604 (STM)	604a (STM)	CONDUIT	44.5	0.2001	0.0130
604-606_2	604a (STM)	606 (STM)	CONDUIT	35.1	0.2022	0.0130
606-608_1	606 (STM)	606a (STM)	CONDUIT	38.9	0.2056	0.0130
606-608_2	606a (STM)	608 (STM)	CONDUIT	39.1	0.2046	0.0130
608-412	608 (STM)	412 (STM)	CONDUIT	79.3	0.1388	0.0130
700-506	700 (STM)	506 (STM)	CONDUIT	56.5	0.5328	0.0130
802-804	802 (STM)	804 (STM)	CONDUIT	24.1	0.2076	0.0130
804-902	804 (STM)	902 (STM)	CONDUIT	81.4	0.2703	0.0130
808-HW1	808 (STM)	HW-01	CONDUIT	47.0	0.1065	0.0130
900-902	900 (STM)	902 (STM)	CONDUIT	120.0	0.1083	0.0130
902-806	902 (STM)	806 (STM)	CONDUIT	15.3	0.1307	0.0130
C1	CB-287	03+000	CONDUIT	400.0	0.1375	0.0350
C2	CB-286	CB39-40	CONDUIT	400.0	0.2075	0.0350
C3	CB-285	01+217	CONDUIT	400.0	0.0525	0.0350
C4	CB-284	01+217	CONDUIT	400.0	0.0525	0.0350
C5	CB-288	CB41-42	CONDUIT	400.0	0.1395	0.0350
C6	CB-283	01+292	CONDUIT	400.0	0.0775	0.0350
C7	810 (STM)	808 (STM)	CONDUIT	8.0	0.2500	0.0130
C8	806 (STM)	810 (STM)	CONDUIT	5.0	0.2000	0.0130

OVF-OUT	CB21-22	OVF-OUT	CONDUIT	25.0	-0.0400	0.0350
RYOVF01	RYCB01	CB39-40	CONDUIT	15.0	3.1816	0.0350
RYOVF02	RYCB02	CB01-02	CONDUIT	15.0	1.5802	0.0350
RYOVF03	RYCB03	CB41-42	CONDUIT	15.0	0.3867	0.0350
RYOVF04	RYCB04	CB09-10	CONDUIT	15.0	1.2334	0.0350
RYOVF05	RYCB05	CB03-04	CONDUIT	15.0	1.2468	0.0350
RYOVF06	RYCB06	CB21-22	CONDUIT	15.0	3.2484	0.0350
RYOVF07	RYCB07	CB43-44	CONDUIT	15.0	2.3807	0.0350
RYOVF08	RYCB08	CB11-12	CONDUIT	15.0	1.6336	0.0350
RYOVF09	RYCB09	CB15-16	CONDUIT	15.0	1.1801	0.0350
RYOVF10	RYCB10	CB23-24	CONDUIT	15.0	3.3152	0.0350
RYOVF11	RYCB11	CB47-48	CONDUIT	15.0	-0.2800	0.0350
RYOVF12	RYCB12	CB35-36	CONDUIT	15.0	1.3134	0.0350
RYOVF13	RYCB13	06+193	CONDUIT	15.0	-0.6000	0.0350
RYOVF14	RYCB14	CB31-32	CONDUIT	15.0	2.1805	0.0350
RYOVF15	RYCB15	CB35-36	CONDUIT	15.0	0.8467	0.0350
ST1-01	03+000	CB39-40	CONDUIT	8.7	3.1874	0.0350
ST1-02	01+217	CB39-40	CONDUIT	66.8	0.9232	0.0350
ST1-03	01+217	CB41-42	CONDUIT	58.0	0.6000	0.0350
ST1-04	01+292	CB41-42	CONDUIT	34.3	0.7229	0.0350
ST1-05	01+292	CB43-44	CONDUIT	19.5	1.4724	0.0350
ST1-06	01+370	CB43-44	CONDUIT	52.5	0.7368	0.0350
ST1-07	01+370	CB45-46	CONDUIT	48.1	0.7843	0.0350
ST1-08	01+449	CB45-46	CONDUIT	26.7	0.7749	0.0350
ST1-09	01+449	CB47-48	CONDUIT	28.0	0.5281	0.0350
ST1-10	01+521	CB47-48	CONDUIT	40.0	0.8705	0.0350
ST1-11	01+521	CB49-50	CONDUIT	24.8	0.5930	0.0350
ST1-12	01+586	CB49-50	CONDUIT	47.2	2.7469	0.0350
ST2-01	01+217	CB07-08	CONDUIT	56.1	0.8147	0.0350
ST2-02	03+118	CB07-08	CONDUIT	20.9	1.7084	0.0350
ST3-01	03+048	03+000	CONDUIT	27.7	0.7225	0.0350
ST3-02	03+048	CB01-02	CONDUIT	32.3	0.7949	0.0350
ST3-03	03+118	CB01-02	CONDUIT	41.7	0.7120	0.0350
ST3-04	03+118	CB03-04	CONDUIT	51.7	0.8061	0.0350
ST3-05	03+214	CB03-04	CONDUIT	36.7	0.8373	0.0350
ST3-06	03+214	CB05-06	CONDUIT	51.6	0.7881	0.0350
ST3-07	06+075	CB05-06	CONDUIT	20.4	1.6070	0.0350
ST4-01	01+449	CB13-14	CONDUIT	28.2	1.1241	0.0350
ST4-02	04+069	CB13-14	CONDUIT	33.2	0.7736	0.0350
ST4-03	04+069	CB15-16	CONDUIT	21.2	1.1199	0.0350
ST4-04	04+118	CB15-16	CONDUIT	24.5	0.8032	0.0350
ST4-05	04+118	CB17-18	CONDUIT	46.5	0.8970	0.0350
ST4-06	06+193	CB19-20	CONDUIT	30.4	1.5269	0.0350
ST4-07	04+213	CB19-20	CONDUIT	25.6	0.7579	0.0350
ST4-08	04+213	CB21-22	CONDUIT	36.5	1.3681	0.0350
ST4-09	04+264	CB21-22	CONDUIT	10.8	1.6623	0.0350
ST4-10	04+264	CB23-24	CONDUIT	20.1	0.5474	0.0350
ST4-11	04+305	CB23-24	CONDUIT	18.7	0.8023	0.0350
ST4-12	04+305	CB25-26	CONDUIT	12.1	0.9058	0.0350
ST4-13	04+357	CB25-26	CONDUIT	32.6	1.0415	0.0350
ST4-14	04+357	CB27-28	CONDUIT	30.6	0.7070	0.0350
ST4-15	04+393	CB27-28	CONDUIT	6.2	1.0699	0.0350
ST5-01	01+521	CB37-38	CONDUIT	30.4	1.5364	0.0350
ST5-02	05+067	CB37-38	CONDUIT	22.6	0.8712	0.0350
ST5-03	05+067	CB35-36	CONDUIT	29.0	0.9557	0.0350
ST5-04	05+122	CB35-36	CONDUIT	20.4	0.8663	0.0350
ST5-05	05+122	CB31-32	CONDUIT	37.9	0.9952	0.0350
ST5-06	05+177	CB31-32	CONDUIT	22.4	0.8803	0.0350
ST5-07	05+177	CB29-30	CONDUIT	39.3	1.0006	0.0350
ST5-08	04+393	CB29-30	CONDUIT	18.7	0.2299	0.0350
ST6-01	01+292	CB09-10	CONDUIT	29.5	1.4750	0.0350
ST6-02	06+075	CB09-10	CONDUIT	33.5	0.7307	0.0350
ST6-03	06+075	CB11-12	CONDUIT	23.1	1.1456	0.0350
ST6-04	06+132	CB11-12	CONDUIT	26.4	0.7397	0.0350
ST6-05	06+132	CB17-18	CONDUIT	41.4	0.7903	0.0350
ST6-06	06+193	CB17-18	CONDUIT	23.1	1.2412	0.0350
ST6-07	06+193	CB29-30	CONDUIT	44.8	1.1459	0.0350
ST6-08	06+300	CB29-30	CONDUIT	68.4	1.6273	0.0350
ST7-01	07+067	CB33-34	CONDUIT	44.7	1.6515	0.0350
ST7-02	05+122	CB33-34	CONDUIT	19.7	1.0044	0.0350
OCB01-02	CB01-02	300 (STM)	ORIFICE			
OCB03-04	CB03-04	302 (STM)	ORIFICE			
OCB05-06	CB05-06	306 (STM)	ORIFICE			
OCB07-08	CB07-08	202 (STM)	ORIFICE			
OCB09-10	CB09-10	600 (STM)	ORIFICE			
OCB11-12	CB11-12	604 (STM)	ORIFICE			
OCB13-14	CB13-14	400 (STM)	ORIFICE			
OCB15-16	CB15-16	404 (STM)	ORIFICE			
OCB17-18	CB17-18	406 (STM)	ORIFICE			
OCB19-20	CB19-20	408 (STM)	ORIFICE			
OCB21-22	CB21-22	410 (STM)	ORIFICE			
OCB23-24	CB23-24	410a (STM)	ORIFICE			
OCB25-26	CB25-26	412 (STM)	ORIFICE			
OCB27-28	CB27-28	608 (STM)	ORIFICE			
OCB282	CB-283	283 (STM)	ORIFICE			
OCB284	CB-284	284 (STM)	ORIFICE			
OCB285	CB-285	285 (STM)	ORIFICE			
OCB286	CB-286	286 (STM)	ORIFICE			
OCB287	CB-287	287 (STM)	ORIFICE			
OCB288	CB-288	288 (STM)	ORIFICE			
OCB29-30	CB29-30	508a (STM)	ORIFICE			
OCB31-32	CB31-32	506a (STM)	ORIFICE			
OCB33-34	CB33-34	700 (STM)	ORIFICE			
OCB35-36	CB35-36	504 (STM)	ORIFICE			
OCB37-38	CB37-38	500 (STM)	ORIFICE			
OCB39-40	CB39-40	102 (STM)	ORIFICE			
OCB41-42	CB41-42	110 (STM)	ORIFICE			
OCB43-44	CB43-44	112 (STM)	ORIFICE			
OCB45-46	CB45-46	114 (STM)	ORIFICE			
OCB47-48	CB47-48	116 (STM)	ORIFICE			
OCB49-50	CB49-50	118 (STM)	ORIFICE			
OCB-A22	A22-STOR	502 (STM)	ORIFICE			
OCB-A29	A29-STOR	508 (STM)	ORIFICE			
OCB-A32	A32-STOR	900 (STM)	ORIFICE			
OCB-A36	A36-STOR	804 (STM)	ORIFICE			
OCB-B02	B02-STOR	116 (STM)	ORIFICE			
OR1	A34-35-STOR	802 (STM)	ORIFICE			
OR12	CAV-STOR	287 (STM)	ORIFICE			
ORYCB01	RYCB01	104 (STM)	ORIFICE			
ORYCB02	RYCB02	300 (STM)	ORIFICE			
ORYCB03	RYCB03	108 (STM)	ORIFICE			
ORYCB04	RYCB04	602 (STM)	ORIFICE			
ORYCB05	RYCB05	302 (STM)	ORIFICE			
ORYCB06	RYCB06	304 (STM)	ORIFICE			
ORYCB07	RYCB07	112 (STM)	ORIFICE			
ORYCB08	RYCB08	604a (STM)	ORIFICE			
ORYCB09	RYCB09	404 (STM)	ORIFICE			
ORYCB10	RYCB10	410a (STM)	ORIFICE			
ORYCB11	RYCB11	116 (STM)	ORIFICE			
ORYCB12	RYCB12	504 (STM)	ORIFICE			
ORYCB13	RYCB13	606a (STM)	ORIFICE			
ORYCB14	RYCB14	508 (STM)	ORIFICE			
ORYCB15	RYCB15	504 (STM)	ORIFICE			
W1	806 (STM)	808 (STM)	WEIR			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
100-H2	HORIZ_ELLIPSE	1.22	1.89	0.37	1.93	1	2841.90
102-100	CIRCULAR	1.22	1.17	0.30	1.22	1	1353.73
104-102	CIRCULAR	1.07	0.89	0.27	1.07	1	1171.78
106-104	CIRCULAR	0.99	0.77	0.25	0.99	1	785.65
108-106	CIRCULAR	0.84	0.55	0.21	0.84	1	560.67
110-108	CIRCULAR	0.84	0.55	0.21	0.84	1	557.97
112-110	CIRCULAR	0.76	0.46	0.19	0.76	1	526.11
114-112	CIRCULAR	0.76	0.46	0.19	0.76	1	519.43
116-114	CIRCULAR	0.69	0.37	0.17	0.69	1	386.33
118-116	CIRCULAR	0.69	0.37	0.17	0.69	1	379.66
200-202	CIRCULAR	0.61	0.29	0.15	0.61	1	285.43
202-204	CIRCULAR	0.61	0.29	0.15	0.61	1	391.37
204-302b	CIRCULAR	0.61	0.29	0.15	0.61	1	286.21
282-114	CIRCULAR	0.46	0.16	0.11	0.46	1	187.71
283-110	CIRCULAR	0.46	0.16	0.11	0.46	1	189.64
284-106	CIRCULAR	0.30	0.07	0.07	0.30	1	68.38
285-104	CIRCULAR	0.30	0.07	0.07	0.30	1	68.38
286-102	CIRCULAR	0.30	0.07	0.07	0.30	1	68.38
287-100	CIRCULAR	1.22	1.17	0.30	1.22	1	1574.47
288-108	CIRCULAR	0.30	0.07	0.07	0.30	1	68.38
300-302	CIRCULAR	0.61	0.29	0.15	0.61	1	310.31
302-304	CIRCULAR	0.61	0.29	0.15	0.61	1	288.83
304-410	CIRCULAR	0.69	0.37	0.17	0.69	1	392.50
306-304	CIRCULAR	0.61	0.29	0.15	0.61	1	354.02
400-402	CIRCULAR	0.61	0.29	0.15	0.61	1	431.48
402-404	CIRCULAR	0.61	0.29	0.15	0.61	1	319.77
404-406	CIRCULAR	0.61	0.29	0.15	0.61	1	286.23
406-606	CIRCULAR	0.69	0.37	0.17	0.69	1	339.79
408-410	CIRCULAR	0.61	0.29	0.15	0.61	1	351.65
410-412_1	CIRCULAR	0.76	0.46	0.19	0.76	1	494.29
410-412_2	CIRCULAR	0.76	0.46	0.19	0.76	1	397.83
412-900	CIRCULAR	1.22	1.17	0.30	1.22	1	1594.77

500-502	CIRCULAR	0.61	0.29	0.15	0.61	1	440.32
502-504	CIRCULAR	0.69	0.37	0.17	0.69	1	399.21
504-506	CIRCULAR	0.69	0.37	0.17	0.69	1	414.67
506-508_1	CIRCULAR	0.69	0.37	0.17	0.69	1	408.98
506-508_2	CIRCULAR	0.69	0.37	0.17	0.69	1	405.99
508-608_1	CIRCULAR	0.76	0.46	0.19	0.76	1	511.31
508-608_2	CIRCULAR	0.76	0.46	0.19	0.76	1	514.29
600-602	CIRCULAR	0.61	0.29	0.15	0.61	1	534.15
602-604	CIRCULAR	0.61	0.29	0.15	0.61	1	286.51
604-606_1	CIRCULAR	0.61	0.29	0.15	0.61	1	287.09
604-606_2	CIRCULAR	0.61	0.29	0.15	0.61	1	288.59
606-608_1	CIRCULAR	0.76	0.46	0.19	0.76	1	526.60
606-608_2	CIRCULAR	0.76	0.46	0.19	0.76	1	525.42
608-412	CIRCULAR	0.99	0.77	0.25	0.99	1	871.94
700-506	CIRCULAR	0.61	0.29	0.15	0.61	1	468.42
802-804	CIRCULAR	0.61	0.29	0.15	0.61	1	292.37
804-902	CIRCULAR	0.61	0.29	0.15	0.61	1	333.66
808-HW1	HORIZ_ELLIPSE	1.22	1.89	0.37	1.93	1	2453.79
900-902	CIRCULAR	1.22	1.17	0.30	1.22	1	1338.22
902-806	CIRCULAR	1.22	1.17	0.30	1.22	1	1469.98
C1	8.5m-ROW	0.35	3.72	0.22	20.50	1	1422.59
C2	8.5m-ROW	0.35	3.72	0.22	20.50	1	1747.58
C3	8.5m-ROW	0.35	3.72	0.22	20.50	1	879.04
C4	8.5m-ROW	0.35	3.72	0.22	20.50	1	879.04
C5	8.5m-ROW	0.35	3.72	0.22	20.50	1	1432.90
C6	8.5m-ROW	0.35	3.72	0.22	20.50	1	1068.02
C7	CIRCULAR	1.22	1.17	0.30	1.22	1	2032.89
C8	CIRCULAR	1.22	1.17	0.30	1.22	1	1818.27
OVF-OUT	TRIANGULAR	0.30	0.27	0.14	1.80	1	42.06
RYOVF01	TRIANGULAR	0.30	0.27	0.14	1.80	1	375.08
RYOVF02	TRIANGULAR	0.30	0.27	0.14	1.80	1	264.33
RYOVF03	TRIANGULAR	0.30	0.27	0.14	1.80	1	130.76
RYOVF04	TRIANGULAR	0.30	0.27	0.14	1.80	1	233.54
RYOVF05	TRIANGULAR	0.30	0.27	0.14	1.80	1	234.80
RYOVF06	TRIANGULAR	0.30	0.27	0.14	1.80	1	378.99
RYOVF07	TRIANGULAR	0.30	0.27	0.14	1.80	1	324.45
RYOVF08	TRIANGULAR	0.30	0.27	0.14	1.80	1	268.76
RYOVF09	TRIANGULAR	0.30	0.27	0.14	1.80	1	228.43
RYOVF10	TRIANGULAR	0.30	0.27	0.14	1.80	1	382.87
RYOVF11	TRIANGULAR	0.30	0.27	0.14	1.80	1	111.27
RYOVF12	TRIANGULAR	0.30	0.27	0.14	1.80	1	240.99
RYOVF13	TRIANGULAR	0.30	0.27	0.14	1.80	1	162.88
RYOVF14	TRIANGULAR	0.30	0.27	0.14	1.80	1	310.51
RYOVF15	TRIANGULAR	0.30	0.27	0.14	1.80	1	193.49
ST1-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	6849.24
ST1-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3686.10
ST1-03	8.5m-ROW	0.35	3.72	0.22	20.50	1	2971.71
ST1-04	8.5m-ROW	0.35	3.72	0.22	20.50	1	3261.97
ST1-05	8.5m-ROW	0.35	3.72	0.22	20.50	1	4655.23
ST1-06	8.5m-ROW	0.35	3.72	0.22	20.50	1	3293.17
ST1-07	8.5m-ROW	0.35	3.72	0.22	20.50	1	3397.63
ST1-08	8.5m-ROW	0.35	3.72	0.22	20.50	1	3377.08
ST1-09	8.5m-ROW	0.35	3.72	0.22	20.50	1	2787.97
ST1-10	8.5m-ROW	0.35	3.72	0.22	20.50	1	3579.35
ST1-11	8.5m-ROW	0.35	3.72	0.22	20.50	1	2954.22
ST1-12	8.5m-ROW	0.35	3.72	0.22	20.50	1	6358.39
ST2-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	3462.79
ST2-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	5014.41
ST3-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	3261.05
ST3-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3420.41
ST3-03	8.5m-ROW	0.35	3.72	0.22	20.50	1	3237.16
ST3-04	8.5m-ROW	0.35	3.72	0.22	20.50	1	3444.54
ST3-05	8.5m-ROW	0.35	3.72	0.22	20.50	1	3510.43
ST3-06	8.5m-ROW	0.35	3.72	0.22	20.50	1	3405.88
ST3-07	8.5m-ROW	0.35	3.72	0.22	20.50	1	4863.36
ST4-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	4067.53
ST4-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3374.38
ST4-03	8.5m-ROW	0.35	3.72	0.22	20.50	1	4059.91
ST4-04	8.5m-ROW	0.35	3.72	0.22	20.50	1	3438.24
ST4-05	8.5m-ROW	0.35	3.72	0.22	20.50	1	3633.49
ST4-06	8.5m-ROW	0.35	3.72	0.22	20.50	1	4740.66
ST4-07	8.5m-ROW	0.35	3.72	0.22	20.50	1	3339.82
ST4-08	8.5m-ROW	0.35	3.72	0.22	20.50	1	4487.34
ST4-09	8.5m-ROW	0.35	3.72	0.22	20.50	1	4946.29
ST4-10	8.5m-ROW	0.35	3.72	0.22	20.50	1	2838.32
ST4-11	8.5m-ROW	0.35	3.72	0.22	20.50	1	3436.41
ST4-12	8.5m-ROW	0.35	3.72	0.22	20.50	1	3651.33
ST4-13	8.5m-ROW	0.35	3.72	0.22	20.50	1	3915.29
ST4-14	8.5m-ROW	0.35	3.72	0.22	20.50	1	3225.82
ST4-15	8.5m-ROW	0.35	3.72	0.22	20.50	1	3968.30
ST5-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	4755.26
ST5-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3580.80
ST5-03	8.5m-ROW	0.35	3.72	0.22	20.50	1	3750.51
ST5-04	8.5m-ROW	0.35	3.72	0.22	20.50	1	3570.81
ST5-05	8.5m-ROW	0.35	3.72	0.22	20.50	1	3827.20
ST5-06	8.5m-ROW	0.35	3.72	0.22	20.50	1	3599.55
ST5-07	8.5m-ROW	0.35	3.72	0.22	20.50	1	3837.65
ST5-08	8.5m-ROW	0.35	3.72	0.22	20.50	1	1839.68
ST6-01	11m-ROW	0.35	4.26	0.22	23.00	1	5321.74
ST6-02	11m-ROW	0.35	4.26	0.22	23.00	1	3745.58
ST6-03	11m-ROW	0.35	4.26	0.22	23.00	1	4690.09
ST6-04	11m-ROW	0.35	4.26	0.22	23.00	1	3768.79
ST6-05	11m-ROW	0.35	4.26	0.22	23.00	1	3895.53
ST6-06	11m-ROW	0.35	4.26	0.22	23.00	1	4881.87
ST6-07	11m-ROW	0.35	4.26	0.22	23.00	1	4690.72
ST6-08	11m-ROW	0.35	4.26	0.22	23.00	1	5589.75
ST7-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	4930.15
ST7-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3844.89

****
Transect Summary
****

Transect 11m-ROW
Area:

0.0004	0.0015	0.0034	0.0060	0.0093
0.0134	0.0183	0.0238	0.0302	0.0373
0.0451	0.0537	0.0630	0.0730	0.0838
0.0954	0.1077	0.1207	0.1345	0.1491
0.1643	0.1807	0.2000	0.2211	0.2435
0.2665	0.2901	0.3143	0.3391	0.3645
0.3905	0.4171	0.4444	0.4722	0.5006
0.5297	0.5593	0.5896	0.6205	0.6519
0.6840	0.7167	0.7500	0.7839	0.8184
0.8535	0.8892	0.9255	0.9625	1.0000

Hrad:

0.0157	0.0313	0.0470	0.0626	0.0783
0.0939	0.1096	0.1252	0.1409	0.1565
0.1722	0.1878	0.2035	0.2191	0.2348
0.2504	0.2661	0.2817	0.2974	0.3130
0.3287	0.3203	0.3076	0.3235	0.3468
0.3730	0.3990	0.4248	0.4505	0.4762
0.5019	0.5276	0.5533	0.5790	0.6048
0.6306	0.6565	0.6825	0.7085	0.7347
0.7608	0.7871	0.8134	0.8399	0.8664
0.8929	0.9196	0.9463	0.9731	1.0000

Width:

0.0197	0.0394	0.0591	0.0788	0.0985
0.1182	0.1379	0.1576	0.1773	0.1970
0.2167	0.2364	0.2561	0.2758	0.2955
0.3152	0.3349	0.3546	0.3743	0.3940
0.4137	0.4681	0.5422	0.5779	0.5995
0.6156	0.6316	0.6476	0.6636	0.6796
0.6957	0.7117	0.7277	0.7437	0.7597
0.7757	0.7918	0.8078	0.8238	0.8398
0.8558	0.8719	0.8879	0.9039	0.9199
0.9359	0.9519	0.9680	0.9840	1.0000

Transect 8.5m-ROW
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1155	0.1295	0.1443	0.1599
0.1759	0.1923	0.2111	0.2313	0.2522
0.2738	0.2961	0.3191	0.3428	0.3671
0.3922	0.4179	0.4444	0.4715	0.4993
0.5279	0.5571	0.5870	0.6176	0.6489
0.6809	0.7136	0.7470	0.7810	0.8158
0.8512	0.8874	0.9242	0.9618	1.0000

Hrad:

0.0156	0.0312	0.0468	0.0623	0.0779
0.0935	0.1091	0.1247	0.1403	0.1559
0.1715	0.1870	0.2026	0.2182	0.2338
0.2494	0.2650	0.2806	0.2961	0.3117
0.3424	0.3428	0.3336	0.3587	0.3832
0.4073	0.4312	0.4550	0.4787	0.5024
0.5262	0.5500	0.5739	0.5979	0.6220
0.6463	0.6707	0.6952	0.7199	0.7446
0.7696	0.7947	0.8199	0.8452	0.8707
0.8963	0.9220	0.9479	0.9739	1.0000

Width:

```
  0.0207     0.0415     0.0622     0.0829     0.1036
  0.1244     0.1451     0.1658     0.1866     0.2073
  0.2280     0.2487     0.2695     0.2902     0.3109
  0.3317     0.3524     0.3731     0.3938     0.4146
  0.4146     0.4537     0.5148     0.5327     0.5507
  0.5687     0.5866     0.6046     0.6226     0.6406
  0.6585     0.6765     0.6945     0.7125     0.7304
  0.7484     0.7664     0.7843     0.8023     0.8203
  0.8383     0.8562     0.8742     0.8922     0.9101
  0.9281     0.9461     0.9641     0.9820     1.0000


***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ..... LPS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Starting Date ..... 01/02/2018 00:00:00
Ending Date ..... 01/03/2018 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:01:00
Dry Time Step ..... 00:01:00
Routing Time Step ..... 2.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 4
Head Tolerance ..... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Initial LID Storage .....          0.011         0.496
Total Precipitation .....          1.043        45.162
Evaporation Loss .....             0.000         0.000
Infiltration Loss .....            0.305        13.225
Surface Runoff .....               0.730        31.614
Final Storage .....                0.011         0.496
Continuity Error (%) .....        -0.706


**************************        Volume        Volume
Flow Routing Continuity        hectare-m       10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .....           0.000         0.000
Wet Weather Inflow .....           0.730         7.298
Groundwater Inflow .....           0.000         0.000
RDII Inflow .....                  0.000         0.000
External Inflow .....             0.000         0.000
External Outflow .....            0.730         7.297
Flooding Loss .....                0.000         0.000
Evaporation Loss .....             0.000         0.000
Exfiltration Loss .....            0.000         0.000
Initial Stored Volume ....         0.115         1.152
Final Stored Volume .....          0.118         1.175
Continuity Error (%) .....       -0.271


*************************
Highest Continuity Errors
*************************
Node 01+217 (99.99%)
Node 03+000 (99.95%)
Node 806 (STM) (3.90%)
Node 808 (STM) (-3.37%)
Node 284 (STM) (-1.74%)


***************************
Time-Step Critical Elements
***************************
Link 202-204 (1.55%)


*********************************
Highest Flow Instability Indexes
*********************************
Link ORYCB03 (111)
Link 110-108 (109)
Link 104-102 (100)
Link 286-102 (99)
Link 108-106 (99)


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.98 sec
Average Time Step           :     1.99 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     6.33
Percent Not Converging      :    49.26


***************************
Subcatchment Runoff Summary
***************************

-----------------------------------------------------------------------------------------------------------
-----
                          Total      Total      Total      Total      Total      Total      Peak
Runoff
                         Precip      Runon       Evap      Infil     Runoff     Runoff    Runoff
Coeff
  Subcatchment               mm         mm         mm         mm         mm   10^6 ltr        LPS
-----------------------------------------------------------------------------------------------------------
-----
  A01                     45.16       0.00       0.00      11.83      33.38       0.05     39.62
0.739
  A02                     45.16       0.00       0.00      11.98      28.93       0.03     19.63
0.641
  A03                     45.16       0.00       0.00      12.08      33.12       0.12     78.36
0.733
  A04                     45.16       0.00       0.00      11.91      33.30       0.09     60.75
0.737
  A05                     45.16       0.00       0.00      12.02      28.93       0.01      5.93
0.641
  A06                     45.16       0.00       0.00      12.09      33.11       0.10     63.67
0.733
  A07                     45.16       0.00       0.00      11.97      28.94       0.05     32.97
0.641
  A08                     45.16       0.00       0.00      11.95      33.25       0.07     50.54
0.736
  A09                     45.16       0.00       0.00      12.06      33.14       0.09     59.33
0.734
  A10                     45.16       0.00       0.00      11.87      33.34       0.04     25.84
0.738
  A11                     45.16       0.00       0.00      11.97      28.94       0.04     27.23
0.641
  A12                     45.16       0.00       0.00      12.18      33.02       0.09     59.86
0.731
  A13                     45.16       0.00       0.00      12.17      28.93       0.04     26.48
0.641
  A14                     45.16       0.00       0.00      12.02      33.17       0.05     36.40
0.735
  A15                     45.16       0.00       0.00      12.04      28.93       0.06     39.82
0.641
  A16                     45.16       0.00       0.00      12.02      33.18       0.07     45.25
0.735
  A17                     45.16       0.00       0.00      12.18      28.93       0.04     25.00
0.641
  A18                     45.16       0.00       0.00      12.07      33.12       0.07     48.82
0.733
  A19                     45.16       0.00       0.00      12.02      33.18       0.09     64.52
0.735
  A20                     45.16       0.00       0.00      12.03      28.93       0.06     36.12
0.641
```

A21	45.16	0.00	0.00	11.87	33.34	0.05	36.78
0.738							
A22	45.16	0.00	0.00	12.54	32.64	0.15	96.33
0.723							
A23	45.16	0.00	0.00	11.81	28.94	0.02	12.97
0.641							
A24	45.16	0.00	0.00	11.96	33.24	0.06	42.72
0.736							
A25	45.16	0.00	0.00	12.07	28.93	0.05	32.23
0.641							
A26	45.16	0.00	0.00	11.92	33.28	0.08	55.96
0.737							
A27	45.16	0.00	0.00	11.80	28.94	0.02	13.15
0.641							
A28	45.16	0.00	0.00	11.94	33.26	0.06	44.61
0.736							
A29	45.16	0.00	0.00	12.58	32.61	0.10	64.10
0.722							
A30	45.16	0.00	0.00	11.87	33.34	0.09	64.36
0.738							
A31	45.16	0.00	0.00	11.89	33.32	0.09	63.76
0.738							
A32	45.16	0.00	0.00	12.71	32.48	0.15	94.72
0.719							
A33	45.16	0.00	0.00	11.83	33.38	0.05	35.19
0.739							
A34-35	45.16	0.00	0.00	13.55	31.62	0.19	106.57
0.700							
A36	45.16	0.00	0.00	13.10	32.08	0.27	161.29
0.710							
A37	45.16	0.00	0.00	12.07	33.13	0.24	163.44
0.734							
A38	45.16	0.00	0.00	12.13	33.06	0.25	163.01
0.732							
A39	45.16	0.00	0.00	12.10	33.10	0.12	83.08
0.733							
A40	45.16	0.00	0.00	12.03	33.16	0.10	68.21
0.734							
B01	45.16	0.00	0.00	11.70	33.52	0.05	34.85
0.742							
B02	45.16	0.00	0.00	12.67	32.51	0.27	164.69
0.720							
B03	45.16	0.00	0.00	11.98	28.93	0.03	17.60
0.641							
B04	45.16	0.00	0.00	11.82	33.39	0.05	33.39
0.739							
B05	45.16	0.00	0.00	11.92	33.28	0.08	52.92
0.737							
B06	45.16	0.00	0.00	12.09	28.93	0.06	37.04
0.641							
B07	45.16	0.00	0.00	11.84	33.37	0.07	49.42
0.739							
B08	45.16	0.00	0.00	34.67	10.50	0.12	48.29
0.233							
B09	45.16	0.00	0.00	12.03	33.17	0.03	20.34
0.735							
B10	45.16	0.00	0.00	11.85	33.36	0.06	44.85
0.739							
B11	45.16	0.00	0.00	11.79	33.42	0.03	23.99
0.740							
B12	45.16	0.00	0.00	11.93	28.94	0.03	20.56
0.641							
B13	45.16	0.00	0.00	11.85	33.35	0.04	28.85
0.739							
B14	45.16	0.00	0.00	11.89	33.32	0.05	32.25
0.738							
B15	45.16	0.00	0.00	11.74	28.94	0.01	4.82
0.641							
B16	45.16	0.00	0.00	11.88	33.33	0.04	28.78
0.738							
B17	45.16	0.00	0.00	12.00	33.20	0.11	78.01
0.735							
B18	45.16	0.00	0.00	12.03	33.17	0.04	24.13
0.734							
CaivanLands	45.16	0.00	0.00	12.00	33.18	2.74	1617.40
0.735							

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
01+217	JUNCTION	0.00	0.00	93.79	0 01:34	0.00
01+292	JUNCTION	0.00	0.00	93.69	0 01:29	0.00
01+370	JUNCTION	0.00	0.00	93.79	0 00:00	0.00
01+449	JUNCTION	0.00	0.00	93.62	0 00:00	0.00
01+521	JUNCTION	0.00	0.00	93.82	0 00:00	0.00
01+586	JUNCTION	0.00	0.00	94.97	0 00:00	0.00
03+000	JUNCTION	0.00	0.00	93.45	0 01:34	0.00
03+048	JUNCTION	0.00	0.00	93.65	0 00:00	0.00
03+118	JUNCTION	0.00	0.00	93.69	0 00:00	0.00
03+214	JUNCTION	0.00	0.00	93.58	0 00:00	0.00
04+069	JUNCTION	0.00	0.00	93.56	0 00:00	0.00
04+118	JUNCTION	0.00	0.00	93.52	0 00:00	0.00
04+213	JUNCTION	0.00	0.00	93.12	0 00:00	0.00
04+264	JUNCTION	0.00	0.00	92.80	0 00:00	0.00
04+305	JUNCTION	0.00	0.00	92.84	0 00:00	0.00
04+357	JUNCTION	0.00	0.00	93.07	0 00:00	0.00
04+393	JUNCTION	0.00	0.07	92.99	0 01:30	0.07
05+067	JUNCTION	0.00	0.00	93.55	0 00:00	0.00
05+122	JUNCTION	0.00	0.00	93.45	0 00:00	0.00
05+177	JUNCTION	0.00	0.00	93.27	0 00:00	0.00
06+075	JUNCTION	0.00	0.00	93.50	0 00:00	0.00
06+132	JUNCTION	0.00	0.00	93.43	0 00:00	0.00
06+193	JUNCTION	0.00	0.02	93.41	0 01:30	0.02
06+300	JUNCTION	0.00	0.00	93.99	0 00:00	0.00
07+067	JUNCTION	0.00	0.00	93.99	0 00:00	0.00
100 (STM)	JUNCTION	1.87	1.97	91.68	0 01:30	1.97
102 (STM)	JUNCTION	1.73	1.84	91.70	0 01:30	1.84
104 (STM)	JUNCTION	1.69	1.82	91.71	0 01:30	1.82
106 (STM)	JUNCTION	1.45	1.60	91.73	0 01:30	1.60
108 (STM)	JUNCTION	1.40	1.59	91.77	0 01:30	1.59
110 (STM)	JUNCTION	1.28	1.61	91.91	0 00:00	1.49
112 (STM)	JUNCTION	1.14	1.40	91.84	0 01:30	1.40
114 (STM)	JUNCTION	0.97	1.28	91.90	0 01:30	1.28
116 (STM)	JUNCTION	0.57	0.93	91.95	0 01:30	0.93
118 (STM)	JUNCTION	0.60	0.97	91.96	0 01:30	0.96
200 (STM)	JUNCTION	0.37	0.78	91.70	0 01:27	0.78
202 (STM)	JUNCTION	0.48	0.89	91.70	0 01:27	0.87
204 (STM)	JUNCTION	0.51	0.92	91.70	0 01:27	0.90
282 (STM)	JUNCTION	2.20	2.51	91.90	0 01:30	2.51
283 (STM)	JUNCTION	2.53	2.75	91.80	0 01:30	2.75
284 (STM)	JUNCTION	2.47	2.71	91.83	0 00:03	2.64
285 (STM)	JUNCTION	2.52	2.67	91.73	0 01:30	2.67
286 (STM)	JUNCTION	2.55	2.69	91.71	0 01:30	2.69
287 (STM)	JUNCTION	2.67	3.16	92.08	0 01:30	3.16
288 (STM)	JUNCTION	2.42	2.63	91.79	0 01:30	2.62
300 (STM)	JUNCTION	0.91	1.31	91.69	0 01:27	1.30
302 (STM)	JUNCTION	1.01	1.41	91.69	0 01:27	1.40
304 (STM)	JUNCTION	1.24	1.63	91.68	0 01:26	1.61
306 (STM)	JUNCTION	0.39	0.79	91.69	0 01:26	0.78
400 (STM)	JUNCTION	0.79	1.25	91.75	0 01:30	1.25
402 (STM)	JUNCTION	0.91	1.37	91.75	0 01:30	1.37
404 (STM)	JUNCTION	0.98	1.44	91.75	0 01:30	1.44
406 (STM)	JUNCTION	1.18	1.63	91.75	0 01:30	1.63
408 (STM)	JUNCTION	0.34	0.89	91.83	0 01:24	0.69
410 (STM)	JUNCTION	1.16	1.52	91.64	0 01:26	1.51
410a (STM)	JUNCTION	1.33	1.67	91.62	0 01:26	1.66
412 (STM)	JUNCTION	2.03	2.34	91.60	0 01:29	2.34
500 (STM)	JUNCTION	0.55	1.08	91.82	0 01:30	1.08
502 (STM)	JUNCTION	0.72	1.26	91.82	0 01:30	1.25
504 (STM)	JUNCTION	0.87	1.39	91.81	0 01:30	1.39
506 (STM)	JUNCTION	0.86	1.37	91.80	0 01:30	1.37
506a (STM)	JUNCTION	0.94	1.42	91.77	0 01:30	1.42
508 (STM)	JUNCTION	1.36	1.83	91.75	0 01:30	1.83
508a (STM)	JUNCTION	1.14	1.57	91.71	0 01:30	1.57
600 (STM)	JUNCTION	0.44	1.06	91.91	0 01:21	0.91
602 (STM)	JUNCTION	0.65	1.28	91.92	0 01:21	1.12
604 (STM)	JUNCTION	1.03	1.58	91.83	0 01:21	1.49
604a (STM)	JUNCTION	0.82	1.28	91.75	0 01:30	1.27
606 (STM)	JUNCTION	1.34	1.79	91.74	0 01:30	1.79
606a (STM)	JUNCTION	1.12	1.55	91.72	0 01:30	1.55
608 (STM)	JUNCTION	1.71	2.12	91.70	0 01:30	2.12
700 (STM)	JUNCTION	2.64	3.15	91.80	0 01:30	3.15
802 (STM)	JUNCTION	1.37	1.70	91.62	0 01:29	1.70
804 (STM)	JUNCTION	1.46	1.78	91.60	0 01:29	1.78
806 (STM)	JUNCTION	2.00	2.21	91.49	0 17:38	2.06
808 (STM)	JUNCTION	2.03	2.31	91.56	0 19:53	2.07
810 (STM)	JUNCTION	2.01	2.05	91.32	0 01:25	2.05

900 (STM)	JUNCTION	2.11	2.38	91.56	0	01:29	2.38	
902 (STM)	JUNCTION	2.29	2.45	91.45	0	19:53	2.44	
CB01-02	JUNCTION	0.05	1.69	93.48	0	01:32	1.69	
CB03-04	JUNCTION	0.06	1.72	93.39	0	01:34	1.72	
CB05-06	JUNCTION	0.05	1.72	93.29	0	01:32	1.72	
CB07-08	JUNCTION	0.07	1.76	93.49	0	01:37	1.76	
CB09-10	JUNCTION	0.05	1.72	93.38	0	01:31	1.72	
CB11-12	JUNCTION	0.04	1.73	93.37	0	01:31	1.73	
CB13-14	JUNCTION	0.06	1.72	93.42	0	01:33	1.72	
CB15-16	JUNCTION	0.06	1.76	93.48	0	01:35	1.76	
CB17-18	JUNCTION	0.08	1.74	93.24	0	01:40	1.74	
CB19-20	JUNCTION	0.05	1.72	93.05	0	01:33	1.72	
CB21-22	JUNCTION	0.19	1.67	92.80	0	01:32	1.67	
CB23-24	JUNCTION	0.22	1.70	92.79	0	01:31	1.70	
CB25-26	JUNCTION	0.19	1.71	92.84	0	01:32	1.71	
CB27-28	JUNCTION	0.07	1.74	92.99	0	01:30	1.74	
CB-283	JUNCTION	0.02	1.40	94.00	0	01:30	1.40	
CB-284	JUNCTION	0.02	1.35	93.95	0	01:30	1.34	
CB-285	JUNCTION	0.03	1.42	94.02	0	01:30	1.42	
CB-286	JUNCTION	0.02	1.40	94.00	0	01:30	1.40	
CB-287	JUNCTION	0.03	1.41	94.01	0	01:30	1.41	
CB-288	JUNCTION	0.02	1.27	93.87	0	01:30	1.26	
CB29-30	JUNCTION	0.05	1.69	92.97	0	01:34	1.69	
CB31-32	JUNCTION	0.04	1.70	93.17	0	01:31	1.70	
CB33-34	JUNCTION	0.04	1.70	93.35	0	01:31	1.70	
CB35-36	JUNCTION	0.05	1.73	93.40	0	01:33	1.73	
CB37-38	JUNCTION	0.04	1.70	93.45	0	01:31	1.70	
CB39-40	JUNCTION	0.11	1.68	93.25	0	01:42	1.68	
CB41-42	JUNCTION	0.04	1.64	93.48	0	01:31	1.64	
CB43-44	JUNCTION	0.05	1.68	93.48	0	01:33	1.68	
CB45-46	JUNCTION	0.06	1.73	93.54	0	01:36	1.73	
CB47-48	JUNCTION	0.04	1.67	93.54	0	01:31	1.67	
CB49-50	JUNCTION	0.04	1.67	93.74	0	01:31	1.67	
RYCB01	JUNCTION	0.00	0.14	92.14	0	01:30	0.14	
RYCB02	JUNCTION	0.02	1.55	93.58	0	01:30	1.55	
RYCB03	JUNCTION	0.10	1.88	93.38	0	01:30	1.88	
RYCB04	JUNCTION	0.03	1.76	93.52	0	01:26	1.76	
RYCB05	JUNCTION	0.00	0.19	92.15	0	01:30	0.19	
RYCB06	JUNCTION	0.20	2.20	93.31	0	01:29	2.20	
RYCB07	JUNCTION	0.03	1.97	93.84	0	01:30	1.97	
RYCB08	JUNCTION	0.05	2.29	93.60	0	01:27	2.29	
RYCB09	JUNCTION	0.03	2.08	93.57	0	01:30	2.08	
RYCB10	JUNCTION	0.23	2.18	93.26	0	01:27	2.18	
RYCB11	JUNCTION	0.02	1.57	93.19	0	01:30	1.56	
RYCB12	JUNCTION	0.04	2.15	93.57	0	01:26	2.15	
RYCB13	JUNCTION	0.87	3.06	93.50	0	01:28	3.06	
RYCB14	JUNCTION	0.01	0.93	92.44	0	01:30	0.93	
RYCB15	JUNCTION	0.01	0.94	92.47	0	01:30	0.94	
GRBK-OUT	OUTFALL	0.00	0.00	0.00	0	00:00	0.00	
HW-01	OUTFALL	2.08	2.08	91.28	0	00:00	2.08	
HW-02	OUTFALL	1.68	1.68	91.58	0	00:00	1.68	
OVF-OUT	OUTFALL	0.00	0.01	92.79	0	01:32	0.01	
A22-STOR	STORAGE	0.02	1.40	93.90	0	01:30	1.39	
A29-STOR	STORAGE	0.02	1.38	93.88	0	01:30	1.38	
A32-STOR	STORAGE	0.02	1.40	93.40	0	01:30	1.40	
A34-35-STOR	STORAGE	0.03	1.40	94.40	0	01:30	1.40	
A36-STOR	STORAGE	0.03	1.40	94.10	0	01:30	1.40	
B02-STOR	STORAGE	0.03	1.40	94.15	0	01:30	1.40	
CAV-STOR	STORAGE	0.04	1.40	93.50	0	01:30	1.40	

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min		Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
01+217	JUNCTION	0.00	0.04	0	01:30	0	9.78e-006	9.783
ltr								
01+292	JUNCTION	0.00	0.00	0	01:29	0	6.59e-011	0.000
ltr								
01+370	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
01+449	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
01+521	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
01+586	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
03+000	JUNCTION	0.00	0.03	0	01:30	0	5.59e-006	5.584
ltr								
03+048	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
03+118	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
03+214	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+069	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+118	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+213	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+264	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+305	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+357	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+393	JUNCTION	0.00	21.76	0	01:30	0	0.00873	-1.020
05+067	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
05+122	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
05+177	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
06+075	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
06+132	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
06+193	JUNCTION	0.00	9.55	0	01:30	0	0.00313	-7.566
06+300	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
07+067	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
100 (STM)	JUNCTION	0.00	2137.27	0	01:30	0	3.92	-0.008
102 (STM)	JUNCTION	0.00	515.71	0	01:30	0	1.14	-0.234
104 (STM)	JUNCTION	0.00	472.65	0	01:31	0	0.98	-0.487
106 (STM)	JUNCTION	0.00	446.02	0	01:31	0	0.927	0.268
108 (STM)	JUNCTION	0.00	420.42	0	01:31	0	0.899	-0.324
110 (STM)	JUNCTION	0.00	380.91	0	01:31	0	0.824	-0.202
112 (STM)	JUNCTION	0.00	337.90	0	01:31	0	0.72	-0.083
114 (STM)	JUNCTION	0.00	241.29	0	01:31	0	0.483	-0.062
116 (STM)	JUNCTION	0.00	218.47	0	01:29	0	0.398	-0.005
118 (STM)	JUNCTION	0.00	22.16	0	01:22	0	0.0494	0.009
200 (STM)	JUNCTION	0.00	45.21	0	01:23	0	0.024	0.139
202 (STM)	JUNCTION	0.00	75.24	0	01:23	0	0.168	-0.007
204 (STM)	JUNCTION	0.00	60.85	0	01:23	0	0.185	-0.001
282 (STM)	JUNCTION	0.00	8.47	0	01:24	0	0.00615	0.074
283 (STM)	JUNCTION	0.00	18.17	0	01:30	0	0.0367	0.109
284 (STM)	JUNCTION	0.00	26.85	0	01:30	0	0.0426	-1.714
285 (STM)	JUNCTION	0.00	23.40	0	01:30	0	0.0469	-1.003
286 (STM)	JUNCTION	0.00	23.28	0	01:30	0	0.0421	-0.140
287 (STM)	JUNCTION	0.00	1632.68	0	01:30	0	2.78	-0.007
288 (STM)	JUNCTION	0.00	22.09	0	01:30	0	0.0367	-0.944
300 (STM)	JUNCTION	0.00	39.13	0	01:30	0	0.106	-0.200
302 (STM)	JUNCTION	0.00	112.98	0	01:28	0	0.395	-0.065
304 (STM)	JUNCTION	0.00	181.59	0	01:32	0	0.549	-0.058
306 (STM)	JUNCTION	0.00	53.30	0	01:22	0	0.113	0.004
400 (STM)	JUNCTION	0.00	20.21	0	01:33	0	0.0832	-0.161
402 (STM)	JUNCTION	0.00	22.70	0	01:48	0	0.0957	-0.185
404 (STM)	JUNCTION	0.00	61.76	0	01:30	0	0.199	-0.051
406 (STM)	JUNCTION	0.00	81.12	0	01:31	0	0.292	0.051
408 (STM)	JUNCTION	0.00	52.47	0	01:21	0	0.105	-0.158
410 (STM)	JUNCTION	0.00	245.11	0	01:33	0	0.741	-0.093
410a (STM)	JUNCTION	0.00	278.28	0	01:33	0	0.793	-0.085
412 (STM)	JUNCTION	0.00	831.14	0	01:30	0	2.22	0.019
500 (STM)	JUNCTION	0.00	28.63	0	01:20	0	0.0588	-0.170
502 (STM)	JUNCTION	0.00	114.91	0	01:30	0	0.218	-0.431
504 (STM)	JUNCTION	0.00	173.32	0	01:30	0	0.349	0.247
506 (STM)	JUNCTION	0.00	206.12	0	01:30	0	0.437	-0.232
506a (STM)	JUNCTION	0.00	229.85	0	01:30	0	0.498	-0.261
508 (STM)	JUNCTION	0.00	305.53	0	01:30	0	0.624	0.116
508a (STM)	JUNCTION	0.00	335.07	0	01:30	0	0.719	0.045
600 (STM)	JUNCTION	0.00	35.90	0	01:21	0	0.102	-0.122
602 (STM)	JUNCTION	0.00	54.20	0	01:31	0	0.147	-0.676
604 (STM)	JUNCTION	0.00	80.10	0	01:31	0	0.206	0.451
604a (STM)	JUNCTION	0.00	101.36	0	01:31	0	0.26	-0.231
606 (STM)	JUNCTION	0.00	182.53	0	01:31	0	0.549	-0.110

606a (STM)	JUNCTION	0.00	209.23	0	01:31	0	0.608	-0.030
608 (STM)	JUNCTION	0.00	572.62	0	01:30	0	1.41	-0.102
700 (STM)	JUNCTION	0.00	33.86	0	01:31	0	0.0863	-0.559
802 (STM)	JUNCTION	0.00	105.28	0	01:30	0	0.194	-0.136
804 (STM)	JUNCTION	0.00	265.19	0	01:30	0	0.477	0.355
806 (STM)	JUNCTION	0.00	1188.64	0	01:30	0	4.51	4.061
808 (STM)	JUNCTION	0.00	1189.18	0	01:30	0	4.57	-3.260
810 (STM)	JUNCTION	0.00	455.64	0	01:30	0	1.85	0.002
900 (STM)	JUNCTION	0.00	923.46	0	01:30	0	2.34	0.237
902 (STM)	JUNCTION	0.00	1188.62	0	01:30	0	2.89	-0.282
CB01-02	JUNCTION	39.62	39.62	0	01:30	0.0544	0.0544	-0.085
CB03-04	JUNCTION	60.75	60.75	0	01:30	0.0859	0.0859	-0.187
CB05-06	JUNCTION	63.67	63.67	0	01:30	0.095	0.095	0.058
CB07-08	JUNCTION	78.36	78.36	0	01:30	0.117	0.117	0.132
CB09-10	JUNCTION	59.86	65.94	0	01:30	0.0911	0.0931	0.047
CB11-12	JUNCTION	36.40	55.05	0	01:30	0.0534	0.0615	-0.099
CB13-14	JUNCTION	45.25	45.25	0	01:30	0.0663	0.0663	0.043
CB15-16	JUNCTION	48.82	52.81	0	01:30	0.0725	0.0734	0.127
CB17-18	JUNCTION	64.52	66.71	0	01:30	0.0946	0.0957	0.176
CB19-20	JUNCTION	50.54	52.82	0	01:30	0.0725	0.0736	0.167
CB21-22	JUNCTION	59.33	72.28	0	01:30	0.0878	0.0961	0.054
CB23-24	JUNCTION	25.84	33.10	0	01:30	0.036	0.0452	-0.053
CB25-26	JUNCTION	35.19	35.19	0	01:30	0.0484	0.0615	-0.088
CB27-28	JUNCTION	63.76	63.76	0	01:30	0.0896	0.0987	-0.023
CB-283	JUNCTION	20.34	20.34	0	01:30	0.0299	0.0298	-0.007
CB-284	JUNCTION	28.85	28.85	0	01:30	0.04	0.04	0.028
CB-285	JUNCTION	32.25	32.25	0	01:30	0.0453	0.0453	-0.045
CB-286	JUNCTION	28.78	28.78	0	01:30	0.0403	0.0403	-0.663
CB-287	JUNCTION	24.13	24.13	0	01:30	0.0355	0.0355	-0.230
CB-288	JUNCTION	23.99	23.99	0	01:30	0.0324	0.0324	0.018
CB29-30	JUNCTION	64.36	81.93	0	01:30	0.0897	0.0971	-0.002
CB31-32	JUNCTION	44.61	44.61	0	01:30	0.0639	0.0638	0.017
CB33-34	JUNCTION	55.96	55.96	0	01:30	0.0795	0.0795	0.052
CB35-36	JUNCTION	42.72	54.31	0	01:30	0.0615	0.0683	-0.074
CB37-38	JUNCTION	36.78	36.78	0	01:30	0.0513	0.0513	-0.024
CB39-40	JUNCTION	78.01	78.02	0	01:30	0.114	0.115	0.033
CB41-42	JUNCTION	44.85	44.85	0	01:30	0.062	0.062	-0.745
CB43-44	JUNCTION	91.01	100.32	0	01:30	0.185	0.188	-0.028
CB45-46	JUNCTION	52.92	52.92	0	01:30	0.0752	0.0752	-0.066
CB47-48	JUNCTION	33.39	33.39	0	01:30	0.0457	0.0457	0.021
CB49-50	JUNCTION	34.85	34.85	0	01:30	0.0452	0.0452	0.016
RYCB01	JUNCTION	4.82	4.82	0	01:30	0.00752	0.00752	-0.014
RYCB02	JUNCTION	19.63	19.63	0	01:30	0.0307	0.0307	0.009
RYCB03	JUNCTION	20.56	20.56	0	01:30	0.0321	0.0448	-1.348
RYCB04	JUNCTION	26.48	26.48	0	01:30	0.0414	0.0414	-0.113
RYCB05	JUNCTION	5.93	5.93	0	01:30	0.00926	0.00926	-0.006
RYCB06	JUNCTION	32.97	32.97	0	01:30	0.0515	0.0531	0.166
RYCB07	JUNCTION	37.04	37.04	0	01:30	0.0579	0.0578	0.197
RYCB08	JUNCTION	39.82	39.82	0	01:30	0.0622	0.0622	0.333
RYCB09	JUNCTION	25.00	25.00	0	01:30	0.039	0.039	-0.067
RYCB10	JUNCTION	27.23	27.23	0	01:30	0.0425	0.0492	0.150
RYCB11	JUNCTION	17.60	18.57	0	01:30	0.0275	0.028	0.009
RYCB12	JUNCTION	32.23	32.23	0	01:30	0.0503	0.0503	0.225
RYCB13	JUNCTION	36.12	36.12	0	01:30	0.0564	0.0646	-0.052
RYCB14	JUNCTION	13.15	13.15	0	01:30	0.0205	0.0205	0.009
RYCB15	JUNCTION	12.97	12.97	0	01:30	0.0203	0.0206	0.393
GRBK-OUT	OUTFALL	477.75	477.75	0	01:30	0.714	0.714	0.000
HW-01	OUTFALL	0.00	1189.41	0	01:30	0	3.47	0.000
HW-02	OUTFALL	0.00	2148.77	0	01:30	0	3.91	0.000
OVF-OUT	OUTFALL	0.00	0.03	0	01:32	0	1.07e-005	0.000

ltr

A22-STOR	STORAGE	96.33	96.33	0	01:30	0.155	0.155	0.008
A29-STOR	STORAGE	64.10	64.10	0	01:30	0.103	0.103	0.007
A32-STOR	STORAGE	94.72	94.72	0	01:30	0.155	0.155	0.007
A34-35-STOR	STORAGE	106.57	106.57	0	01:30	0.186	0.186	0.007
A36-STOR	STORAGE	161.29	161.29	0	01:30	0.271	0.271	0.007
B02-STOR	STORAGE	164.69	164.69	0	01:30	0.268	0.268	0.008
CAV-STOR	STORAGE	1617.40	1617.40	0	01:30	2.74	2.74	0.011

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
102 (STM)	JUNCTION	24.00	0.407	1.674
104 (STM)	JUNCTION	24.00	0.366	1.947
106 (STM)	JUNCTION	24.00	0.286	2.016
108 (STM)	JUNCTION	24.00	0.272	1.780
110 (STM)	JUNCTION	24.00	0.377	1.795
112 (STM)	JUNCTION	23.98	0.281	1.667
114 (STM)	JUNCTION	0.13	0.094	1.760
282 (STM)	JUNCTION	0.09	0.056	2.659
283 (STM)	JUNCTION	24.00	0.292	0.539
284 (STM)	JUNCTION	24.00	0.413	0.351
285 (STM)	JUNCTION	24.00	0.367	0.400
286 (STM)	JUNCTION	24.00	0.386	0.387
288 (STM)	JUNCTION	24.00	0.326	0.445
300 (STM)	JUNCTION	1.77	0.404	1.806
302 (STM)	JUNCTION	0.11	0.052	1.978
304 (STM)	JUNCTION	0.12	0.076	2.054
400 (STM)	JUNCTION	0.44	0.344	1.756
402 (STM)	JUNCTION	0.97	0.453	1.657
404 (STM)	JUNCTION	24.00	0.528	1.828
406 (STM)	JUNCTION	24.00	0.617	1.823
408 (STM)	JUNCTION	0.13	0.276	1.180
410 (STM)	JUNCTION	0.50	0.294	1.346
410a (STM)	JUNCTION	24.00	0.801	0.763
412 (STM)	JUNCTION	24.00	0.813	1.051
500 (STM)	JUNCTION	0.43	0.415	1.795
502 (STM)	JUNCTION	24.00	0.569	1.666
504 (STM)	JUNCTION	24.00	0.638	1.556
506 (STM)	JUNCTION	24.00	0.682	1.702
506a (STM)	JUNCTION	24.00	0.734	1.603
508 (STM)	JUNCTION	24.00	0.759	1.555
508a (STM)	JUNCTION	24.00	0.805	1.435
600 (STM)	JUNCTION	0.39	0.453	1.587
602 (STM)	JUNCTION	24.00	0.656	1.414
604 (STM)	JUNCTION	24.00	0.655	1.615
604a (STM)	JUNCTION	24.00	0.665	1.598
606 (STM)	JUNCTION	24.00	0.722	1.522
606a (STM)	JUNCTION	24.00	0.792	1.446
608 (STM)	JUNCTION	24.00	0.826	1.382
700 (STM)	JUNCTION	0.52	0.460	2.339
802 (STM)	JUNCTION	24.00	0.788	2.202
804 (STM)	JUNCTION	24.00	0.823	2.327
806 (STM)	JUNCTION	24.00	0.994	1.845
808 (STM)	JUNCTION	24.00	1.090	1.824
810 (STM)	JUNCTION	24.00	0.836	2.075
900 (STM)	JUNCTION	24.00	0.863	1.048
902 (STM)	JUNCTION	24.00	0.883	1.638

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
A22-STOR	0.000	0	0	0	0.001	1	0 01:30	95.10
A29-STOR	0.000	0	0	0	0.000	2	0 01:30	62.89
A32-STOR	0.000	0	0	0	0.001	1	0 01:30	93.44
A34-35-STOR	0.000	0	0	0	0.001	2	0 01:30	105.28
A36-STOR	0.000	0	0	0	0.001	1	0 01:30	159.90
B02-STOR	0.000	0	0	0	0.001	1	0 01:30	163.50
CAV-STOR	0.000	0	0	0	0.001	0	0 01:30	1614.44

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
GRBK-OUT	24.20	39.37	477.75	0.714
HW-01	99.93	43.92	1189.41	3.465

HW-02	96.97	53.31	2148.77	3.912
OVF-OUT	0.00	0.00	0.00	0.000
System	55.27	136.60	3791.33	8.091

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
100-H2	CONDUIT	2148.77	0	01:30	1.14	0.76	1.00
102-100	CONDUIT	516.08	0	01:30	0.44	0.38	1.00
104-102	CONDUIT	472.80	0	01:30	0.53	0.40	1.00
106-104	CONDUIT	445.75	0	01:31	0.58	0.57	1.00
108-106	CONDUIT	420.41	0	01:31	0.76	0.75	1.00
110-108	CONDUIT	381.00	0	01:31	0.69	0.68	1.00
112-110	CONDUIT	338.11	0	01:31	0.74	0.64	1.00
114-112	CONDUIT	244.57	0	01:31	0.54	0.47	1.00
116-114	CONDUIT	220.31	0	01:31	0.60	0.57	0.99
118-116	CONDUIT	37.15	0	01:31	0.11	0.10	0.92
200-202	CONDUIT	45.21	0	01:23	0.32	0.16	0.86
202-204	CONDUIT	47.13	0	01:34	0.37	0.12	0.98
204-302b	CONDUIT	60.85	0	01:23	0.31	0.21	1.00
282-114	CONDUIT	8.47	0	01:24	0.05	0.05	1.00
283-110	CONDUIT	18.65	0	01:30	0.11	0.10	1.00
284-106	CONDUIT	27.02	0	01:30	0.38	0.40	1.00
285-104	CONDUIT	23.49	0	01:30	0.33	0.34	1.00
286-102	CONDUIT	23.36	0	01:30	0.33	0.34	1.00
287-100	CONDUIT	1632.66	0	01:30	1.64	1.04	0.80
288-108	CONDUIT	22.21	0	01:30	0.31	0.32	1.00
300-302	CONDUIT	39.11	0	01:30	0.13	0.13	1.00
302-304	CONDUIT	119.73	0	01:33	0.41	0.41	1.00
304-410	CONDUIT	190.61	0	01:33	0.52	0.49	1.00
306-304	CONDUIT	52.09	0	01:26	0.24	0.15	0.90
400-402	CONDUIT	22.70	0	01:48	0.08	0.05	1.00
402-404	CONDUIT	22.73	0	01:48	0.08	0.07	1.00
404-406	CONDUIT	61.86	0	01:30	0.21	0.22	1.00
406-606	CONDUIT	81.14	0	01:31	0.22	0.24	1.00
408-410	CONDUIT	39.51	0	01:22	0.14	0.11	1.00
410-412_1	CONDUIT	245.51	0	01:33	0.54	0.50	1.00
410-412_2	CONDUIT	278.34	0	01:33	0.61	0.70	1.00
412-900	CONDUIT	831.24	0	01:30	0.71	0.52	1.00
500-502	CONDUIT	20.26	0	01:42	0.07	0.05	1.00
502-504	CONDUIT	114.93	0	01:30	0.31	0.29	1.00
504-506	CONDUIT	173.33	0	01:30	0.47	0.42	1.00
506-508_1	CONDUIT	206.20	0	01:30	0.56	0.50	1.00
506-508_2	CONDUIT	229.93	0	01:30	0.62	0.57	1.00
508-608_1	CONDUIT	305.60	0	01:30	0.67	0.60	1.00
508-608_2	CONDUIT	335.12	0	01:30	0.73	0.65	1.00
600-602	CONDUIT	35.51	0	01:46	0.12	0.07	1.00
602-604	CONDUIT	54.32	0	01:31	0.19	0.19	1.00
604-606_1	CONDUIT	80.16	0	01:31	0.27	0.28	1.00
604-606_2	CONDUIT	101.39	0	01:31	0.35	0.35	1.00
606-608_1	CONDUIT	182.66	0	01:31	0.40	0.35	1.00
606-608_2	CONDUIT	209.38	0	01:31	0.46	0.40	1.00
608-412	CONDUIT	572.74	0	01:30	0.74	0.66	1.00
700-506	CONDUIT	34.93	0	01:32	0.12	0.07	1.00
802-804	CONDUIT	105.33	0	01:30	0.36	0.36	1.00
804-902	CONDUIT	265.25	0	01:30	0.91	0.79	1.00
808-HW1	CONDUIT	1189.41	0	01:30	0.63	0.48	1.00
900-902	CONDUIT	923.48	0	01:30	0.79	0.69	1.00
902-806	CONDUIT	1188.64	0	01:30	1.02	0.81	1.00
C1	CHANNEL	0.03	0	01:30	0.02	0.00	0.02
C2	CHANNEL	0.01	0	01:30	0.00	0.00	0.11
C3	CHANNEL	0.04	0	01:30	0.02	0.00	0.03
C4	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C5	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
C6	CHANNEL	0.00	0	01:29	0.00	0.00	0.00
C7	CONDUIT	455.80	0	01:30	0.39	0.22	1.00
C8	CONDUIT	455.64	0	01:30	0.39	0.25	1.00
OVF-OUT	CONDUIT	0.03	0	01:32	0.03	0.00	0.06
RYOVF01	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
RYOVF02	CONDUIT	0.00	0	00:00	0.00	0.00	0.15
RYOVF03	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
RYOVF04	CONDUIT	6.40	0	01:26	0.36	0.03	0.32
RYOVF05	CONDUIT	0.00	0	00:00	0.00	0.00	0.20
RYOVF06	CONDUIT	12.98	0	01:29	0.62	0.03	0.28
RYOVF07	CONDUIT	9.32	0	01:30	0.53	0.03	0.26
RYOVF08	CONDUIT	19.15	0	01:28	0.56	0.07	0.39
RYOVF09	CONDUIT	3.99	0	01:30	0.15	0.02	0.35
RYOVF10	CONDUIT	7.32	0	01:28	0.54	0.02	0.26
RYOVF11	CONDUIT	1.16	0	01:31	0.16	0.01	0.16
RYOVF12	CONDUIT	12.11	0	01:28	0.46	0.05	0.36
RYOVF13	CONDUIT	9.55	0	01:30	0.27	0.06	0.37
RYOVF14	CONDUIT	0.00	0	00:00	0.00	0.00	0.17
RYOVF15	CONDUIT	7.40	0	01:34	0.25	0.04	0.33
ST1-01	CHANNEL	0.00	0	01:34	0.00	0.00	0.11
ST1-02	CHANNEL	0.00	0	01:34	0.00	0.00	0.11
ST1-03	CHANNEL	0.00	0	01:34	0.00	0.00	0.05
ST1-04	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
ST1-05	CHANNEL	0.00	0	00:00	0.00	0.00	0.12
ST1-06	CHANNEL	0.00	0	00:00	0.00	0.00	0.12
ST1-07	CHANNEL	0.00	0	00:00	0.00	0.00	0.19
ST1-08	CHANNEL	0.00	0	00:00	0.00	0.00	0.19
ST1-09	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
ST1-10	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
ST1-11	CHANNEL	0.00	0	00:00	0.00	0.00	0.10
ST1-12	CHANNEL	0.00	0	00:00	0.00	0.00	0.10
ST2-01	CHANNEL	0.00	0	01:34	0.00	0.00	0.23
ST2-02	CHANNEL	0.00	0	00:00	0.00	0.00	0.23
ST3-01	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
ST3-02	CHANNEL	0.00	0	00:00	0.00	0.00	0.13
ST3-03	CHANNEL	0.00	0	00:00	0.00	0.00	0.13
ST3-04	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
ST3-05	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
ST3-06	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
ST3-07	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
ST4-01	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
ST4-02	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
ST4-03	CHANNEL	0.00	0	00:00	0.00	0.00	0.22
ST4-04	CHANNEL	0.00	0	00:00	0.00	0.00	0.22
ST4-05	CHANNEL	0.00	0	00:00	0.00	0.00	0.20
ST4-06	CHANNEL	2.44	0	01:30	0.07	0.00	0.21
ST4-07	CHANNEL	0.00	0	00:00	0.00	0.00	0.18
ST4-08	CHANNEL	0.00	0	00:00	0.00	0.00	0.26
ST4-09	CHANNEL	0.00	0	00:00	0.00	0.00	0.26
ST4-10	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST4-11	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST4-12	CHANNEL	0.00	0	00:00	0.00	0.00	0.16
ST4-13	CHANNEL	0.00	0	00:00	0.00	0.00	0.16
ST4-14	CHANNEL	0.00	0	00:00	0.00	0.00	0.19
ST4-15	CHANNEL	21.76	0	01:30	0.13	0.01	0.28
ST5-01	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST5-02	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST5-03	CHANNEL	0.00	0	00:00	0.00	0.00	0.19
ST5-04	CHANNEL	0.00	0	00:00	0.00	0.00	0.19
ST5-05	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST5-06	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST5-07	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST5-08	CHANNEL	17.78	0	01:30	0.10	0.01	0.22
ST6-01	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
ST6-02	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
ST6-03	CHANNEL	0.00	0	00:00	0.00	0.00	0.19
ST6-04	CHANNEL	0.00	0	00:00	0.00	0.00	0.19
ST6-05	CHANNEL	0.00	0	00:00	0.00	0.00	0.20
ST6-06	CHANNEL	2.35	0	01:30	0.05	0.00	0.21
ST6-07	CHANNEL	2.26	0	01:30	0.06	0.00	0.16
ST6-08	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST7-01	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
ST7-02	CHANNEL	0.00	0	00:00	0.00	0.00	0.14
OCB01-02	ORIFICE	20.02	0	01:32			1.00
OCB03-04	ORIFICE	25.88	0	01:34			1.00
OCB05-06	ORIFICE	34.06	0	01:32			1.00
OCB07-08	ORIFICE	30.79	0	01:37			1.00
OCB09-10	ORIFICE	34.02	0	01:31			1.00
OCB11-12	ORIFICE	25.89	0	01:31			1.00
OCB13-14	ORIFICE	20.21	0	01:33			1.00
OCB15-16	ORIFICE	20.43	0	01:35			1.00
OCB17-18	ORIFICE	20.32	0	01:40			1.00
OCB19-20	ORIFICE	25.26	0	01:47			1.00
OCB21-22	ORIFICE	30.73	0	01:50			1.00
OCB23-24	ORIFICE	17.70	0	01:37			1.00
OCB25-26	ORIFICE	18.34	0	01:43			1.00
OCB27-28	ORIFICE	32.24	0	01:43			1.00
OCB282	ORIFICE	18.17	0	01:30			1.00
OCB284	ORIFICE	26.85	0	01:30			1.00
OCB285	ORIFICE	23.40	0	01:30			1.00
OCB286	ORIFICE	23.28	0	01:30			1.00
OCB287	ORIFICE	18.25	0	01:30			1.00

OCB288	ORIFICE	22.09	0	01:30	1.00
OCB29-30	ORIFICE	32.95	0	01:49	1.00
OCB31-32	ORIFICE	25.49	0	01:37	1.00
OCB33-34	ORIFICE	33.86	0	01:31	1.00
OCB35-36	ORIFICE	25.96	0	01:34	1.00
OCB37-38	ORIFICE	20.05	0	01:31	1.00
OCB39-40	ORIFICE	19.95	0	01:42	1.00
OCB41-42	ORIFICE	25.19	0	01:31	1.00
OCB43-44	ORIFICE	66.26	0	01:33	1.00
OCB45-46	ORIFICE	20.27	0	01:36	1.00
OCB47-48	ORIFICE	19.87	0	01:31	1.00
OCB49-50	ORIFICE	19.91	0	01:31	1.00
OCB-A22	ORIFICE	95.10	0	01:30	1.00
OCB-A29	ORIFICE	62.89	0	01:30	1.00
OCB-A32	ORIFICE	93.44	0	01:30	1.00
OCB-A36	ORIFICE	159.90	0	01:30	1.00
OCB-B02	ORIFICE	163.50	0	01:30	1.00
OR1	ORIFICE	105.28	0	01:30	1.00
OR12	ORIFICE	1614.44	0	01:30	1.00
ORYCB01	ORIFICE	4.82	0	01:30	1.00
ORYCB02	ORIFICE	19.14	0	01:30	1.00
ORYCB03	ORIFICE	19.78	0	01:30	1.00
ORYCB04	ORIFICE	20.43	0	01:26	1.00
ORYCB05	ORIFICE	5.93	0	01:30	1.00
ORYCB06	ORIFICE	20.70	0	01:23	1.00
ORYCB07	ORIFICE	27.73	0	01:30	1.00
ORYCB08	ORIFICE	21.90	0	01:23	1.00
ORYCB09	ORIFICE	21.06	0	01:27	1.00
ORYCB10	ORIFICE	20.35	0	01:25	1.00
ORYCB11	ORIFICE	17.35	0	01:30	1.00
ORYCB12	ORIFICE	21.22	0	01:24	1.00
ORYCB13	ORIFICE	26.98	0	01:25	1.00
ORYCB14	ORIFICE	12.87	0	01:30	1.00
ORYCB15	ORIFICE	12.66	0	01:30	1.00
W1	WEIR	733.46	0	01:30	1.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
100-H2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
102-100	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
104-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
106-104	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
108-106	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
110-108	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
112-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
114-112	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
116-114	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
118-116	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
200-202	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
202-204	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
204-302b	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
282-114	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
283-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
284-106	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
285-104	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
286-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
287-100	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
288-108	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
300-302	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
302-304	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
304-410	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
306-304	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
400-402	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
402-404	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
404-406	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
406-606	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
408-410	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
410-412_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
410-412_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
412-900	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
500-502	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
502-504	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
504-506	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
506-508_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
506-508_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
508-608_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
508-608_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
600-602	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
602-604	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
604-606_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
604-606_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
606-608_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
606-608_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
608-412	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
700-506	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
802-804	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
804-902	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
808-HW1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
900-902	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
902-806	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C1	1.00	0.06	0.93	0.00	0.01	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.95	0.04	0.00	0.01	0.00	0.00	0.00	0.94	0.00
C3	1.00	0.06	0.93	0.00	0.01	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.06	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
OVF-OUT	1.00	0.99	0.00	0.00	0.01	0.00	0.00	0.00	0.93	0.00
RYOVF01	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYOVF02	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYOVF03	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYOVF04	1.00	0.98	0.01	0.00	0.01	0.00	0.00	0.00	0.94	0.00
RYOVF05	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYOVF06	1.00	0.98	0.01	0.00	0.00	0.00	0.00	0.01	0.94	0.00
RYOVF07	1.00	0.98	0.01	0.00	0.00	0.00	0.00	0.01	0.94	0.00
RYOVF08	1.00	0.98	0.01	0.00	0.01	0.00	0.00	0.00	0.94	0.00
RYOVF09	1.00	0.97	0.02	0.00	0.01	0.00	0.00	0.00	0.94	0.00
RYOVF10	1.00	0.98	0.01	0.00	0.00	0.00	0.00	0.00	0.94	0.00
RYOVF11	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
RYOVF12	1.00	0.98	0.01	0.00	0.01	0.00	0.00	0.00	0.94	0.00
RYOVF13	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
RYOVF14	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYOVF15	1.00	0.98	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00
ST1-01	1.00	0.06	0.01	0.00	0.04	0.00	0.00	0.89	0.94	0.00
ST1-02	1.00	0.06	0.01	0.00	0.04	0.00	0.00	0.89	0.94	0.00
ST1-03	1.00	0.06	0.01	0.00	0.01	0.00	0.00	0.92	0.94	0.00
ST1-04	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-05	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-06	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-07	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-08	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-09	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-10	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-11	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-12	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST2-01	1.00	0.06	0.01	0.00	0.02	0.00	0.00	0.91	0.94	0.00
ST2-02	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-01	1.00	0.06	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-02	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-03	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-04	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-05	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-06	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-01	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-02	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-03	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-04	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-05	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-06	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.02	0.00
ST4-07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-08	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-09	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-10	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-11	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-12	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-13	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-14	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-15	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
ST5-01	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST5-02	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST5-03	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST5-04	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST5-05	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST5-06	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ST5-07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST5-08	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.01	0.00
ST6-01	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST6-02	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST6-03	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST6-04	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST6-05	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST6-06	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.04	0.00
ST6-07	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.02	0.00
ST6-08	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST7-01	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST7-02	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
100-H2	24.00	24.00	24.00	0.01	0.01
102-100	24.00	24.00	24.00	0.01	0.01
104-102	24.00	24.00	24.00	0.01	0.02
106-104	24.00	24.00	24.00	0.01	0.64
108-106	24.00	24.00	24.00	0.01	0.12
110-108	24.00	24.00	24.00	0.01	0.01
112-110	24.00	24.00	24.00	0.01	0.01
114-112	0.13	0.13	23.98	0.01	0.01
116-114	0.01	0.01	0.13	0.01	0.01
204-302b	0.01	0.01	0.11	0.01	0.01
282-114	0.09	0.09	0.14	0.01	0.01
283-110	24.00	24.00	24.00	0.01	0.01
284-106	24.00	24.00	24.00	0.01	0.01
285-104	24.00	24.00	24.00	0.01	0.57
286-102	24.00	24.00	24.00	0.01	0.01
287-100	0.01	0.01	0.01	0.02	0.01
288-108	24.00	24.00	24.00	0.01	0.01
300-302	1.76	1.76	24.00	0.01	0.01
302-304	24.00	24.00	24.00	0.01	0.01
304-410	24.00	24.00	24.00	0.01	0.01
306-304	0.01	0.01	0.12	0.01	0.01
400-402	0.44	0.44	0.97	0.01	0.01
402-404	1.85	1.85	24.00	0.01	0.01
404-406	24.00	24.00	24.00	0.01	0.01
406-606	24.00	24.00	24.00	0.01	0.01
408-410	0.13	0.13	0.50	0.01	0.01
410-412_1	24.00	24.00	24.00	0.01	0.01
410-412_2	24.00	24.00	24.00	0.01	0.01
412-900	24.00	24.00	24.00	0.01	0.01
500-502	0.43	0.43	24.00	0.01	0.01
502-504	24.00	24.00	24.00	0.01	0.01
504-506	24.00	24.00	24.00	0.01	0.01
506-508_1	24.00	24.00	24.00	0.01	0.01
506-508_2	24.00	24.00	24.00	0.01	0.04
508-608_1	24.00	24.00	24.00	0.01	0.01
508-608_2	24.00	24.00	24.00	0.01	0.01
600-602	0.39	0.39	24.00	0.01	0.01
602-604	24.00	24.00	24.00	0.01	0.01
604-606_1	24.00	24.00	24.00	0.01	0.01
604-606_2	24.00	24.00	24.00	0.01	0.01
606-608_1	24.00	24.00	24.00	0.01	0.01
606-608_2	24.00	24.00	24.00	0.01	0.01
608-412	24.00	24.00	24.00	0.01	0.01
700-506	0.52	0.52	24.00	0.01	0.01
802-804	24.00	24.00	24.00	0.01	0.01
804-902	24.00	24.00	24.00	0.01	0.01
808-HW1	24.00	24.00	24.00	0.01	0.05
900-902	24.00	24.00	24.00	0.01	0.01
902-806	24.00	24.00	24.00	0.01	3.91
C7	24.00	24.00	24.00	0.01	1.94
C8	24.00	24.00	24.00	0.01	5.74

Analysis begun on: Wed May 16 11:37:02 2018
Analysis ended on: Wed May 16 11:37:16 2018
Total elapsed time: 00:00:14

Burnett Lands – 3370 Greenbank Road
100-year Storm, 5-year Fixed Outlet Elevations
Model Output

NOVATECH
Engineers, Planners & Landscape Architects

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  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------

  111117 - Kennedy Burnett subdivision
  Draft plan for subdivision, located north of the Jock River and west of Greenbank Road.
  Third submission in response to comments.

  WARNING 03: negative offset ignored for Link 100-H2
  WARNING 03: negative offset ignored for Link 408-410
  WARNING 03: negative offset ignored for Link 410-412_1
  WARNING 03: negative offset ignored for Link 502-504
  WARNING 03: negative offset ignored for Link OVF-OUT
  WARNING 03: negative offset ignored for Link OR1
  WARNING 02: maximum depth increased for Node CB05-06
  WARNING 02: maximum depth increased for Node CB09-10
  WARNING 02: maximum depth increased for Node CB11-12
  WARNING 02: maximum depth increased for Node CB19-20
  WARNING 02: maximum depth increased for Node CB21-22
  WARNING 02: maximum depth increased for Node CB25-26
  WARNING 02: maximum depth increased for Node CB39-40
  WARNING 02: maximum depth increased for Node CB43-44
  WARNING 02: maximum depth increased for Node RYCB01
  WARNING 02: maximum depth increased for Node RYCB05
  WARNING 02: maximum depth increased for Node RYCB06
  WARNING 02: maximum depth increased for Node RYCB08
  WARNING 02: maximum depth increased for Node RYCB09
  WARNING 02: maximum depth increased for Node RYCB10
  WARNING 02: maximum depth increased for Node RYCB11
  WARNING 02: maximum depth increased for Node RYCB13
  WARNING 02: maximum depth increased for Node RYCB14
  WARNING 02: maximum depth increased for Node RYCB15

  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 58
  Number of nodes ........... 136
  Number of links ........... 184
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                  Data       Recording
  Name                 Data Source                Type       Interval
  ----------------------------------------------------------------------
  Raingage             C100yr-4hr                 INTENSITY   10 min.


  ********************
  Subcatchment Summary
  ********************
  Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
  ------------------------------------------------------------------------------------------
--------
  A01                         0.16    138.00     64.00    0.8500 Raingage            CB01-02
  A02                         0.11     44.00     64.00    1.5000 Raingage            RYCB02
  A03                         0.35    166.00     64.00    0.7500 Raingage            CB07-08
  A04                         0.26    183.00     64.00    0.7500 Raingage            CB03-04
  A05                         0.03     12.00     64.00    1.5000 Raingage            RYCB05
  A06                         0.29    132.00     64.00    0.7500 Raingage            CB05-06
  A07                         0.18     66.00     64.00    2.0000 Raingage            RYCB06
  A08                         0.22    143.00     64.00    0.7000 Raingage            CB19-20
  A09                         0.27     99.00     64.00    1.3000 Raingage            CB21-22
  A10                         0.11     81.00     64.00    0.8500 Raingage            CB23-24
  A11                         0.15     57.00     64.00    1.8000 Raingage            RYCB10
  A12                         0.28    125.00     64.00    0.5500 Raingage            CB09-10
  A13                         0.14     40.00     64.00    1.5000 Raingage            RYCB04
  A14                         0.16     85.00     64.00    0.7500 Raingage            CB11-12
  A15                         0.22     77.00     64.00    1.5000 Raingage            RYCB08
  A16                         0.20    110.00     64.00    0.7000 Raingage            CB13-14
  A17                         0.14     37.00     64.00    1.5000 Raingage            RYCB09
  A18                         0.22     98.00     64.00    0.8500 Raingage            CB15-16
  A19                         0.28    152.00     64.00    0.7500 Raingage            CB17-18
  A20                         0.20     72.00     64.00    1.5000 Raingage            RYCB13
  A21                         0.15    105.00     64.00    1.0000 Raingage            CB37-38
  A22                         0.47     91.00     64.00    1.0000 Raingage            A22-STOR
  A23                         0.07     47.00     64.00    1.5000 Raingage            RYCB15
  A24                         0.19    107.00     64.00    0.8500 Raingage            CB35-36
  A25                         0.17     59.00     64.00    1.5000 Raingage            RYCB12
  A26                         0.24    108.00     64.00    1.7000 Raingage            CB33-34
  A27                         0.07     50.00     64.00    1.5000 Raingage            RYCB14
  A28                         0.19    107.00     64.00    1.0000 Raingage            CB31-32
  A29                         0.32     58.00     64.00    1.0000 Raingage            A29-STOR
  A30                         0.27    186.00     64.00    1.0000 Raingage            CB29-30
  A31                         0.27    194.00     64.00    0.8000 Raingage            CB27-28
  A32                         0.48     74.00     64.00    1.0000 Raingage            A32-STOR
  A33                         0.14     98.00     64.00    1.3000 Raingage            CB25-26
  A34-35                      0.59     37.00     64.00    1.0360 Raingage            A34-35-STOR
  A36                         0.84     85.00     64.00    1.0000 Raingage            A36-STOR
  A37                         0.73    304.00     64.00    1.0000 Raingage            GRBK-OUT
  A38                         0.74    273.00     64.00    1.0000 Raingage            GRBK-OUT
  A39                         0.38    147.00     64.00    1.0000 Raingage            GRBK-OUT
  A40                         0.30    136.00     64.00    1.0000 Raingage            GRBK-OUT
  B01                         0.14    129.00     64.00    2.0000 Raingage            CB49-50
  B02                         0.82    134.00     64.00    1.0000 Raingage            B02-STOR
  B03                         0.10     36.00     64.00    1.8000 Raingage            RYCB11
  B04                         0.14    141.00     64.00    0.6000 Raingage            CB47-48
  B05                         0.23    154.00     64.00    0.7500 Raingage            CB45-46
  B06                         0.20     65.00     64.00    1.5000 Raingage            RYCB07
  B07                         0.20    155.00     64.00    1.0000 Raingage            CB43-44
  B08                         1.11    150.00     14.00    0.8500 Raingage            CB43-44
  B09                         0.09     41.00     64.00    1.0000 Raingage            CB-283
  B10                         0.19    148.00     64.00    0.8500 Raingage            CB41-42
  B11                         0.10     87.00     64.00    1.0000 Raingage            CB-288
  B12                         0.11     45.00     64.00    2.0000 Raingage            RYCB03
  B13                         0.12     86.00     64.00    1.0000 Raingage            CB-284
  B14                         0.14     88.00     64.00    1.0000 Raingage            CB-285
  B15                         0.03     21.00     64.00    1.8000 Raingage            RYCB01
  B16                         0.12     80.00     64.00    1.0000 Raingage            CB-286
  B17                         0.34    181.00     64.00    0.8500 Raingage            CB39-40
  B18                         0.11     48.00     64.00    1.0000 Raingage            CB-287
  CaivanLands                 8.25    400.00     64.00    1.0000 Raingage            CAV-STOR


  ************
  Node Summary
  ************
                                                 Invert      Max.     Ponded    External
  Name                 Type                      Elev.      Depth      Area    Inflow
  ----------------------------------------------------------------------------------
  01+217               JUNCTION                  93.79       0.35       0.0
  01+292               JUNCTION                  93.69       0.35       0.0
  01+370               JUNCTION                  93.79       0.35       0.0
  01+449               JUNCTION                  93.62       0.35       0.0
  01+521               JUNCTION                  93.82       0.35       0.0
  01+586               JUNCTION                  94.97       0.35       0.0
  03+000               JUNCTION                  93.45       0.35       0.0
  03+048               JUNCTION                  93.65       0.35       0.0
  03+118               JUNCTION                  93.69       0.35       0.0
  03+214               JUNCTION                  93.58       0.35       0.0
  04+069               JUNCTION                  93.56       0.35       0.0
  04+118               JUNCTION                  93.52       0.35       0.0
  04+213               JUNCTION                  93.12       0.35       0.0
  04+264               JUNCTION                  92.80       0.35       0.0
  04+305               JUNCTION                  92.84       0.35       0.0
  04+357               JUNCTION                  93.07       0.35       0.0
  04+393               JUNCTION                  92.92       0.35       0.0
  05+067               JUNCTION                  93.55       0.35       0.0
  05+122               JUNCTION                  93.45       0.35       0.0
  05+177               JUNCTION                  93.27       0.35       0.0
  06+075               JUNCTION                  93.50       0.35       0.0
  06+132               JUNCTION                  93.43       0.35       0.0
  06+193               JUNCTION                  93.39       0.35       0.0
  06+300               JUNCTION                  93.99       0.35       0.0
  07+067               JUNCTION                  93.99       0.35       0.0
  100 (STM)            JUNCTION                  89.71       3.61       0.0
  102 (STM)            JUNCTION                  89.86       3.51       0.0
  104 (STM)            JUNCTION                  89.89       3.77       0.0
  106 (STM)            JUNCTION                  90.14       3.62       0.0
  108 (STM)            JUNCTION                  90.18       3.37       0.0
  110 (STM)            JUNCTION                  90.31       3.40       0.0
  112 (STM)            JUNCTION                  90.44       3.07       0.0
  114 (STM)            JUNCTION                  90.62       3.04       0.0
  116 (STM)            JUNCTION                  91.02       2.81       0.0
  118 (STM)            JUNCTION                  90.99       3.52       0.0
  200 (STM)            JUNCTION                  90.92       2.78       0.0
  202 (STM)            JUNCTION                  90.81       2.58       0.0
  204 (STM)            JUNCTION                  90.78       2.63       0.0
  282 (STM)            JUNCTION                  89.39       5.17       0.0
  283 (STM)            JUNCTION                  89.05       3.29       0.0
  284 (STM)            JUNCTION                  89.12       3.06       0.0
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285 (STM)	JUNCTION	89.06	3.07	0.0
286 (STM)	JUNCTION	89.03	3.07	0.0
287 (STM)	JUNCTION	88.92	4.10	0.0
288 (STM)	JUNCTION	89.16	3.07	0.0
300 (STM)	JUNCTION	90.38	3.12	0.0
302 (STM)	JUNCTION	90.28	3.39	0.0
304 (STM)	JUNCTION	90.05	3.68	0.0
306 (STM)	JUNCTION	90.90	2.36	0.0
400 (STM)	JUNCTION	90.50	3.01	0.0
402 (STM)	JUNCTION	90.38	3.03	0.0
404 (STM)	JUNCTION	90.31	3.27	0.0
406 (STM)	JUNCTION	90.11	3.46	0.0
408 (STM)	JUNCTION	90.94	2.07	0.0
410 (STM)	JUNCTION	90.12	2.87	0.0
410a (STM)	JUNCTION	89.95	2.43	0.0
412 (STM)	JUNCTION	89.26	3.39	0.0
500 (STM)	JUNCTION	90.74	2.88	0.0
502 (STM)	JUNCTION	90.57	2.92	0.0
504 (STM)	JUNCTION	90.42	2.95	0.0
506 (STM)	JUNCTION	90.43	3.07	0.0
506a (STM)	JUNCTION	90.35	3.02	0.0
508 (STM)	JUNCTION	89.93	3.38	0.0
508a (STM)	JUNCTION	90.15	3.00	0.0
600 (STM)	JUNCTION	90.85	2.65	0.0
602 (STM)	JUNCTION	90.64	2.69	0.0
604 (STM)	JUNCTION	90.26	3.19	0.0
604a (STM)	JUNCTION	90.47	2.87	0.0
606 (STM)	JUNCTION	89.95	3.31	0.0
606a (STM)	JUNCTION	90.17	3.00	0.0
608 (STM)	JUNCTION	89.58	3.50	0.0
700 (STM)	JUNCTION	88.65	5.49	0.0
802 (STM)	JUNCTION	89.92	3.90	0.0
804 (STM)	JUNCTION	89.82	4.11	0.0
806 (STM)	JUNCTION	89.28	4.06	0.0
808 (STM)	JUNCTION	89.25	4.13	0.0
810 (STM)	JUNCTION	89.27	4.13	0.0
900 (STM)	JUNCTION	89.18	3.43	0.0
902 (STM)	JUNCTION	89.00	4.09	0.0
CB01-02	JUNCTION	91.79	1.95	0.0
CB03-04	JUNCTION	91.67	1.95	0.0
CB05-06	JUNCTION	91.57	1.95	0.0
CB07-08	JUNCTION	91.73	1.95	0.0
CB09-10	JUNCTION	91.66	1.95	0.0
CB11-12	JUNCTION	91.64	1.95	0.0
CB13-14	JUNCTION	91.70	1.95	0.0
CB15-16	JUNCTION	91.72	1.95	0.0
CB17-18	JUNCTION	91.50	1.95	0.0
CB19-20	JUNCTION	91.33	1.95	0.0
CB21-22	JUNCTION	91.13	1.94	0.0
CB23-24	JUNCTION	91.09	1.95	0.0
CB25-26	JUNCTION	91.13	1.95	0.0
CB27-28	JUNCTION	91.25	1.95	0.0
CB-283	JUNCTION	92.60	1.75	0.0
CB-284	JUNCTION	92.60	1.75	0.0
CB-285	JUNCTION	92.60	1.75	0.0
CB-286	JUNCTION	92.60	1.75	0.0
CB-287	JUNCTION	92.60	1.75	0.0
CB-288	JUNCTION	92.60	1.75	0.0
CB29-30	JUNCTION	91.28	1.95	0.0
CB31-32	JUNCTION	91.47	1.95	0.0
CB33-34	JUNCTION	91.65	1.95	0.0
CB35-36	JUNCTION	91.67	1.95	0.0
CB37-38	JUNCTION	91.75	1.95	0.0
CB39-40	JUNCTION	91.57	1.95	0.0
CB41-42	JUNCTION	91.84	1.95	0.0
CB43-44	JUNCTION	91.80	1.95	0.0
CB45-46	JUNCTION	91.81	1.95	0.0
CB47-48	JUNCTION	91.87	1.95	0.0
CB49-50	JUNCTION	92.07	1.95	0.0
RYCB01	JUNCTION	92.00	1.95	0.0
RYCB02	JUNCTION	92.03	1.90	0.0
RYCB03	JUNCTION	91.50	2.30	0.0
RYCB04	JUNCTION	91.76	1.98	0.0
RYCB05	JUNCTION	91.96	1.80	0.0
RYCB06	JUNCTION	91.11	2.41	0.0
RYCB07	JUNCTION	91.87	2.19	0.0
RYCB08	JUNCTION	91.31	2.47	0.0
RYCB09	JUNCTION	91.49	2.31	0.0
RYCB10	JUNCTION	91.08	2.41	0.0
RYCB11	JUNCTION	91.62	2.11	0.0
RYCB12	JUNCTION	91.42	2.35	0.0
RYCB13	JUNCTION	90.44	3.16	0.0
RYCB14	JUNCTION	91.51	2.19	0.0
RYCB15	JUNCTION	91.53	2.17	0.0
GRBK-OUT	OUTFALL	0.00	0.00	0.0
HW-01	OUTFALL	89.20	1.22	0.0
HW-02	OUTFALL	89.90	1.22	0.0
OVF-OUT	OUTFALL	92.78	0.30	0.0
A22-STOR	STORAGE	92.50	1.70	0.0
A29-STOR	STORAGE	92.50	1.70	0.0
A32-STOR	STORAGE	92.00	1.70	0.0
A34-35-STOR	STORAGE	93.00	1.70	0.0
A36-STOR	STORAGE	92.70	1.70	0.0
B02-STOR	STORAGE	92.75	1.70	0.0
CAV-STOR	STORAGE	92.10	1.70	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
100-H2	100 (STM)	HW-02	CONDUIT	79.8	0.1428	0.0130
102-100	102 (STM)	100 (STM)	CONDUIT	36.1	0.1109	0.0130
104-102	104 (STM)	102 (STM)	CONDUIT	35.5	0.1690	0.0130
106-104	106 (STM)	104 (STM)	CONDUIT	35.5	0.1127	0.0130
108-106	108 (STM)	106 (STM)	CONDUIT	28.5	0.1403	0.0130
110-108	110 (STM)	108 (STM)	CONDUIT	28.8	0.1390	0.0130
112-110	112 (STM)	110 (STM)	CONDUIT	39.0	0.2052	0.0130
114-112	114 (STM)	112 (STM)	CONDUIT	120.0	0.2000	0.0130
116-114	116 (STM)	114 (STM)	CONDUIT	82.6	0.1938	0.0130
118-116	118 (STM)	116 (STM)	CONDUIT	37.4	0.1871	0.0130
200-202	200 (STM)	202 (STM)	CONDUIT	50.5	0.1978	0.0130
202-204	202 (STM)	204 (STM)	CONDUIT	5.4	0.3720	0.0130
204-302b	204 (STM)	302 (STM)	CONDUIT	25.1	0.1989	0.0130
282-114	282 (STM)	114 (STM)	CONDUIT	12.0	0.3992	0.0130
283-110	283 (STM)	110 (STM)	CONDUIT	12.0	0.4074	0.0130
284-106	284 (STM)	106 (STM)	CONDUIT	12.0	0.5000	0.0130
285-104	285 (STM)	104 (STM)	CONDUIT	12.0	0.5000	0.0130
286-102	286 (STM)	102 (STM)	CONDUIT	12.0	0.5000	0.0130
287-100	287 (STM)	100 (STM)	CONDUIT	12.0	0.1500	0.0130
288-108	288 (STM)	108 (STM)	CONDUIT	12.0	0.5000	0.0130
300-302	300 (STM)	302 (STM)	CONDUIT	42.8	0.2338	0.0130
302-304	302 (STM)	304 (STM)	CONDUIT	74.0	0.2026	0.0130
304-410	304 (STM)	410 (STM)	CONDUIT	70.0	0.2000	0.0130
306-304	306 (STM)	304 (STM)	CONDUIT	69.0	0.3043	0.0130
400-402	400 (STM)	402 (STM)	CONDUIT	24.3	0.4521	0.0130
402-404	402 (STM)	404 (STM)	CONDUIT	28.2	0.2483	0.0130
404-406	404 (STM)	406 (STM)	CONDUIT	47.3	0.1989	0.0130
406-606	406 (STM)	606 (STM)	CONDUIT	55.4	0.1499	0.0130
408-410	408 (STM)	410 (STM)	CONDUIT	67.9	0.3003	0.0130
410-412_1	410 (STM)	410a (STM)	CONDUIT	35.3	0.1811	0.0130
410-412_2	410a (STM)	412 (STM)	CONDUIT	42.6	0.1173	0.0130
412-900	412 (STM)	900 (STM)	CONDUIT	56.5	0.1539	0.0130
500-502	500 (STM)	502 (STM)	CONDUIT	34.0	0.4708	0.0130
502-504	502 (STM)	504 (STM)	CONDUIT	38.2	0.2069	0.0130
504-506	504 (STM)	506 (STM)	CONDUIT	26.9	0.2232	0.0130
506-508_1	506 (STM)	506a (STM)	CONDUIT	37.3	0.2171	0.0130
506-508_2	506a (STM)	508 (STM)	CONDUIT	18.2	0.2140	0.0130
508-608_1	508 (STM)	508a (STM)	CONDUIT	43.3	0.1938	0.0130
508-608_2	508a (STM)	608 (STM)	CONDUIT	18.4	0.1961	0.0130
600-602	600 (STM)	602 (STM)	CONDUIT	28.9	0.6928	0.0130
602-604	602 (STM)	604 (STM)	CONDUIT	35.1	0.1993	0.0130
604-606_1	604 (STM)	604a (STM)	CONDUIT	44.5	0.2001	0.0130
604-606_2	604a (STM)	606 (STM)	CONDUIT	35.1	0.2022	0.0130
606-608_1	606 (STM)	606a (STM)	CONDUIT	38.9	0.2056	0.0130
606-608_2	606a (STM)	608 (STM)	CONDUIT	39.1	0.2046	0.0130
608-412	608 (STM)	412 (STM)	CONDUIT	79.3	0.1388	0.0130
700-506	700 (STM)	506 (STM)	CONDUIT	56.5	0.5328	0.0130
802-804	802 (STM)	804 (STM)	CONDUIT	24.1	0.2076	0.0130
804-902	804 (STM)	902 (STM)	CONDUIT	81.4	0.2703	0.0130
808-HW1	808 (STM)	HW-01	CONDUIT	47.0	0.1065	0.0130
900-902	900 (STM)	902 (STM)	CONDUIT	120.0	0.1083	0.0130
902-806	902 (STM)	806 (STM)	CONDUIT	15.3	0.1307	0.0130
C1	CB-287	03+000	CONDUIT	400.0	0.1375	0.0350
C2	CB-286	CB39-40	CONDUIT	400.0	0.2075	0.0350
C3	CB-285	01+217	CONDUIT	400.0	0.0525	0.0350
C4	CB-284	01+217	CONDUIT	400.0	0.0525	0.0350
C5	CB-288	CB41-42	CONDUIT	400.0	0.1395	0.0350
C6	CB-283	01+292	CONDUIT	400.0	0.0775	0.0350
C7	810 (STM)	808 (STM)	CONDUIT	8.0	0.2500	0.0130
C8	806 (STM)	810 (STM)	CONDUIT	5.0	0.2000	0.0130
OVF-OUT	CB21-22	OVF-OUT	CONDUIT	25.0	-0.0400	0.0350
RYOVF01	RYCB01	CB39-40	CONDUIT	15.0	3.1816	0.0350
RYOVF02	RYCB02	CB01-02	CONDUIT	15.0	1.5802	0.0350
RYOVF03	RYCB03	CB41-42	CONDUIT	15.0	0.3867	0.0350

RYOVF04	RYCB04	CB09-10	CONDUIT	15.0	1.2334	0.0350
RYOVF05	RYCB05	CB03-04	CONDUIT	15.0	1.2468	0.0350
RYOVF06	RYCB06	CB21-22	CONDUIT	15.0	3.2484	0.0350
RYOVF07	RYCB07	CB43-44	CONDUIT	15.0	2.3807	0.0350
RYOVF08	RYCB08	CB11-12	CONDUIT	15.0	1.6336	0.0350
RYOVF09	RYCB09	CB15-16	CONDUIT	15.0	1.1801	0.0350
RYOVF10	RYCB10	CB23-24	CONDUIT	15.0	3.3152	0.0350
RYOVF11	RYCB11	CB47-48	CONDUIT	15.0	-0.2800	0.0350
RYOVF12	RYCB12	CB35-36	CONDUIT	15.0	1.3134	0.0350
RYOVF13	RYCB13	06+193	CONDUIT	15.0	-0.6000	0.0350
RYOVF14	RYCB14	CB31-32	CONDUIT	15.0	2.1805	0.0350
RYOVF15	RYCB15	CB35-36	CONDUIT	15.0	0.8467	0.0350
ST1-01	03+000	CB39-40	CONDUIT	8.7	3.1874	0.0350
ST1-02	01+217	CB39-40	CONDUIT	66.8	0.9232	0.0350
ST1-03	01+217	CB41-42	CONDUIT	58.0	0.6000	0.0350
ST1-04	01+292	CB41-42	CONDUIT	34.3	0.7229	0.0350
ST1-05	01+292	CB43-44	CONDUIT	19.5	1.4724	0.0350
ST1-06	01+370	CB43-44	CONDUIT	52.5	0.7368	0.0350
ST1-07	01+370	CB45-46	CONDUIT	48.1	0.7843	0.0350
ST1-08	01+449	CB45-46	CONDUIT	26.7	0.7749	0.0350
ST1-09	01+449	CB47-48	CONDUIT	28.0	0.5281	0.0350
ST1-10	01+521	CB47-48	CONDUIT	40.0	0.8705	0.0350
ST1-11	01+521	CB49-50	CONDUIT	24.8	0.5930	0.0350
ST1-12	01+586	CB49-50	CONDUIT	47.2	2.7469	0.0350
ST2-01	01+217	CB07-08	CONDUIT	56.1	0.8147	0.0350
ST2-02	03+118	CB07-08	CONDUIT	20.9	1.7084	0.0350
ST3-01	03+048	03+000	CONDUIT	27.7	0.7225	0.0350
ST3-02	03+048	CB01-02	CONDUIT	32.3	0.7949	0.0350
ST3-03	03+118	CB01-02	CONDUIT	41.7	0.7120	0.0350
ST3-04	03+118	CB03-04	CONDUIT	51.7	0.8061	0.0350
ST3-05	03+214	CB03-04	CONDUIT	36.7	0.8373	0.0350
ST3-06	03+214	CB05-06	CONDUIT	51.6	0.7881	0.0350
ST3-07	06+075	CB05-06	CONDUIT	20.4	1.6070	0.0350
ST4-01	01+449	CB13-14	CONDUIT	28.2	1.1241	0.0350
ST4-02	04+069	CB13-14	CONDUIT	33.2	0.7736	0.0350
ST4-03	04+069	CB15-16	CONDUIT	21.2	1.1199	0.0350
ST4-04	04+118	CB15-16	CONDUIT	24.5	0.8032	0.0350
ST4-05	04+118	CB17-18	CONDUIT	46.5	0.8970	0.0350
ST4-06	06+193	CB19-20	CONDUIT	30.4	1.5269	0.0350
ST4-07	04+213	CB19-20	CONDUIT	25.6	0.7579	0.0350
ST4-08	04+213	CB21-22	CONDUIT	36.5	1.3681	0.0350
ST4-09	04+264	CB21-22	CONDUIT	10.8	1.6623	0.0350
ST4-10	04+264	CB23-24	CONDUIT	20.1	0.5474	0.0350
ST4-11	04+305	CB23-24	CONDUIT	18.7	0.8023	0.0350
ST4-12	04+305	CB25-26	CONDUIT	12.1	0.9058	0.0350
ST4-13	04+357	CB25-26	CONDUIT	32.6	1.0415	0.0350
ST4-14	04+357	CB27-28	CONDUIT	30.6	0.7070	0.0350
ST4-15	04+393	CB27-28	CONDUIT	6.2	1.0699	0.0350
ST5-01	01+521	CB37-38	CONDUIT	30.4	1.5364	0.0350
ST5-02	05+067	CB37-38	CONDUIT	22.6	0.8712	0.0350
ST5-03	05+067	CB35-36	CONDUIT	29.0	0.9557	0.0350
ST5-04	05+122	CB35-36	CONDUIT	20.4	0.8663	0.0350
ST5-05	05+122	CB31-32	CONDUIT	37.9	0.9952	0.0350
ST5-06	05+177	CB31-32	CONDUIT	22.4	0.8803	0.0350
ST5-07	05+177	CB29-30	CONDUIT	39.3	1.0006	0.0350
ST5-08	04+393	CB29-30	CONDUIT	18.7	0.2299	0.0350
ST6-01	01+292	CB09-10	CONDUIT	29.5	1.4750	0.0350
ST6-02	06+075	CB09-10	CONDUIT	33.5	0.7307	0.0350
ST6-03	06+075	CB11-12	CONDUIT	23.1	1.1456	0.0350
ST6-04	06+132	CB11-12	CONDUIT	26.4	0.7397	0.0350
ST6-05	06+132	CB17-18	CONDUIT	41.4	0.7903	0.0350
ST6-06	06+193	CB17-18	CONDUIT	23.1	1.2412	0.0350
ST6-07	06+193	CB29-30	CONDUIT	44.8	1.1459	0.0350
ST6-08	06+300	CB29-30	CONDUIT	68.4	1.6273	0.0350
ST7-01	07+067	CB33-34	CONDUIT	44.7	1.6515	0.0350
ST7-02	05+122	CB33-34	CONDUIT	19.7	1.0044	0.0350
OCB01-02	CB01-02	300 (STM)	ORIFICE			
OCB03-04	CB03-04	302 (STM)	ORIFICE			
OCB05-06	CB05-06	306 (STM)	ORIFICE			
OCB07-08	CB07-08	202 (STM)	ORIFICE			
OCB09-10	CB09-10	600 (STM)	ORIFICE			
OCB11-12	CB11-12	604 (STM)	ORIFICE			
OCB13-14	CB13-14	400 (STM)	ORIFICE			
OCB15-16	CB15-16	404 (STM)	ORIFICE			
OCB17-18	CB17-18	406 (STM)	ORIFICE			
OCB19-20	CB19-20	408 (STM)	ORIFICE			
OCB21-22	CB21-22	410 (STM)	ORIFICE			
OCB23-24	CB23-24	410a (STM)	ORIFICE			
OCB25-26	CB25-26	412 (STM)	ORIFICE			
OCB27-28	CB27-28	608 (STM)	ORIFICE			
OCB282	CB-283	283 (STM)	ORIFICE			
OCB284	CB-284	284 (STM)	ORIFICE			
OCB285	CB-285	285 (STM)	ORIFICE			
OCB286	CB-286	286 (STM)	ORIFICE			
OCB287	CB-287	287 (STM)	ORIFICE			
OCB288	CB-288	288 (STM)	ORIFICE			
OCB29-30	CB29-30	508a (STM)	ORIFICE			
OCB31-32	CB31-32	506a (STM)	ORIFICE			
OCB33-34	CB33-34	700 (STM)	ORIFICE			
OCB35-36	CB35-36	504 (STM)	ORIFICE			
OCB37-38	CB37-38	500 (STM)	ORIFICE			
OCB39-40	CB39-40	102 (STM)	ORIFICE			
OCB41-42	CB41-42	110 (STM)	ORIFICE			
OCB43-44	CB43-44	112 (STM)	ORIFICE			
OCB45-46	CB45-46	114 (STM)	ORIFICE			
OCB47-48	CB47-48	116 (STM)	ORIFICE			
OCB49-50	CB49-50	118 (STM)	ORIFICE			
OCB-A22	A22-STOR	502 (STM)	ORIFICE			
OCB-A29	A29-STOR	508 (STM)	ORIFICE			
OCB-A32	A32-STOR	900 (STM)	ORIFICE			
OCB-A36	A36-STOR	804 (STM)	ORIFICE			
OCB-B02	B02-STOR	116 (STM)	ORIFICE			
OR1	A34-35-STOR	802 (STM)	ORIFICE			
OR12	CAV-STOR	287 (STM)	ORIFICE			
ORYCB01	RYCB01	104 (STM)	ORIFICE			
ORYCB02	RYCB02	300 (STM)	ORIFICE			
ORYCB03	RYCB03	108 (STM)	ORIFICE			
ORYCB04	RYCB04	602 (STM)	ORIFICE			
ORYCB05	RYCB05	302 (STM)	ORIFICE			
ORYCB06	RYCB06	304 (STM)	ORIFICE			
ORYCB07	RYCB07	112 (STM)	ORIFICE			
ORYCB08	RYCB08	604a (STM)	ORIFICE			
ORYCB09	RYCB09	404 (STM)	ORIFICE			
ORYCB10	RYCB10	410a (STM)	ORIFICE			
ORYCB11	RYCB11	116 (STM)	ORIFICE			
ORYCB12	RYCB12	504 (STM)	ORIFICE			
ORYCB13	RYCB13	606a (STM)	ORIFICE			
ORYCB14	RYCB14	508 (STM)	ORIFICE			
ORYCB15	RYCB15	504 (STM)	ORIFICE			
W1	806 (STM)	808 (STM)	WEIR			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
100-H2	HORIZ_ELLIPSE	1.22	1.89	0.37	1.93	1	2841.90
102-100	CIRCULAR	1.22	1.17	0.30	1.22	1	1353.73
104-102	CIRCULAR	1.07	0.89	0.27	1.07	1	1171.78
106-104	CIRCULAR	0.99	0.77	0.25	0.99	1	785.65
108-106	CIRCULAR	0.84	0.55	0.21	0.84	1	560.67
110-108	CIRCULAR	0.84	0.55	0.21	0.84	1	557.97
112-110	CIRCULAR	0.76	0.46	0.19	0.76	1	526.11
114-112	CIRCULAR	0.76	0.46	0.19	0.76	1	519.43
116-114	CIRCULAR	0.69	0.37	0.17	0.69	1	386.33
118-116	CIRCULAR	0.69	0.37	0.17	0.69	1	379.66
200-202	CIRCULAR	0.61	0.29	0.15	0.61	1	285.43
202-204	CIRCULAR	0.61	0.29	0.15	0.61	1	391.37
204-302b	CIRCULAR	0.61	0.29	0.15	0.61	1	286.21
282-114	CIRCULAR	0.46	0.16	0.11	0.46	1	187.71
283-110	CIRCULAR	0.46	0.16	0.11	0.46	1	189.64
284-106	CIRCULAR	0.30	0.07	0.07	0.30	1	68.38
285-104	CIRCULAR	0.30	0.07	0.07	0.30	1	68.38
286-102	CIRCULAR	0.30	0.07	0.07	0.30	1	68.38
287-100	CIRCULAR	1.22	1.17	0.30	1.22	1	1574.47
288-108	CIRCULAR	0.30	0.07	0.07	0.30	1	68.38
300-302	CIRCULAR	0.61	0.29	0.15	0.61	1	310.31
302-304	CIRCULAR	0.61	0.29	0.15	0.61	1	288.83
304-410	CIRCULAR	0.69	0.37	0.17	0.69	1	392.50
306-304	CIRCULAR	0.61	0.29	0.15	0.61	1	354.02
400-402	CIRCULAR	0.61	0.29	0.15	0.61	1	431.48
402-404	CIRCULAR	0.61	0.29	0.15	0.61	1	319.77
404-406	CIRCULAR	0.61	0.29	0.15	0.61	1	286.23
406-606	CIRCULAR	0.69	0.37	0.17	0.69	1	339.79
408-410	CIRCULAR	0.61	0.29	0.15	0.61	1	351.65
410-412_1	CIRCULAR	0.76	0.46	0.19	0.76	1	494.29
410-412_2	CIRCULAR	0.76	0.46	0.19	0.76	1	397.83
412-900	CIRCULAR	1.22	1.17	0.30	1.22	1	1594.77
500-502	CIRCULAR	0.61	0.29	0.15	0.61	1	440.32
502-504	CIRCULAR	0.69	0.37	0.17	0.69	1	399.21
504-506	CIRCULAR	0.69	0.37	0.17	0.69	1	414.67
506-508_1	CIRCULAR	0.69	0.37	0.17	0.69	1	408.98
506-508_2	CIRCULAR	0.69	0.37	0.17	0.69	1	405.99
508-608_1	CIRCULAR	0.76	0.46	0.19	0.76	1	511.31

508-608_2	CIRCULAR	0.76	0.46	0.19	0.76	1	514.29
600-602	CIRCULAR	0.61	0.29	0.15	0.61	1	534.15
602-604	CIRCULAR	0.61	0.29	0.15	0.61	1	286.51
604-606_1	CIRCULAR	0.61	0.29	0.15	0.61	1	287.09
604-606_2	CIRCULAR	0.61	0.29	0.15	0.61	1	288.59
606-608_1	CIRCULAR	0.76	0.46	0.19	0.76	1	526.60
606-608_2	CIRCULAR	0.76	0.46	0.19	0.76	1	525.42
608-412	CIRCULAR	0.99	0.77	0.25	0.99	1	871.94
700-506	CIRCULAR	0.61	0.29	0.15	0.61	1	468.42
802-804	CIRCULAR	0.61	0.29	0.15	0.61	1	292.37
804-902	CIRCULAR	0.61	0.29	0.15	0.61	1	333.66
808-HW1	HORIZ_ELLIPSE	1.22	1.89	0.37	1.93	1	2453.79
900-902	CIRCULAR	1.22	1.17	0.30	1.22	1	1338.22
902-806	CIRCULAR	1.22	1.17	0.30	1.22	1	1469.98
C1	8.5m-ROW	0.35	3.72	0.22	20.50	1	1422.59
C2	8.5m-ROW	0.35	3.72	0.22	20.50	1	1747.58
C3	8.5m-ROW	0.35	3.72	0.22	20.50	1	879.04
C4	8.5m-ROW	0.35	3.72	0.22	20.50	1	879.04
C5	8.5m-ROW	0.35	3.72	0.22	20.50	1	1432.90
C6	8.5m-ROW	0.35	3.72	0.22	20.50	1	1068.02
C7	CIRCULAR	1.22	1.17	0.30	1.22	1	2032.89
C8	CIRCULAR	1.22	1.17	0.30	1.22	1	1818.27
OVF-OUT	TRIANGULAR	0.30	0.27	0.14	1.80	1	42.06
RYOVF01	TRIANGULAR	0.30	0.27	0.14	1.80	1	375.08
RYOVF02	TRIANGULAR	0.30	0.27	0.14	1.80	1	264.33
RYOVF03	TRIANGULAR	0.30	0.27	0.14	1.80	1	130.76
RYOVF04	TRIANGULAR	0.30	0.27	0.14	1.80	1	233.54
RYOVF05	TRIANGULAR	0.30	0.27	0.14	1.80	1	234.80
RYOVF06	TRIANGULAR	0.30	0.27	0.14	1.80	1	378.99
RYOVF07	TRIANGULAR	0.30	0.27	0.14	1.80	1	324.45
RYOVF08	TRIANGULAR	0.30	0.27	0.14	1.80	1	268.76
RYOVF09	TRIANGULAR	0.30	0.27	0.14	1.80	1	228.43
RYOVF10	TRIANGULAR	0.30	0.27	0.14	1.80	1	382.87
RYOVF11	TRIANGULAR	0.30	0.27	0.14	1.80	1	111.27
RYOVF12	TRIANGULAR	0.30	0.27	0.14	1.80	1	240.99
RYOVF13	TRIANGULAR	0.30	0.27	0.14	1.80	1	162.88
RYOVF14	TRIANGULAR	0.30	0.27	0.14	1.80	1	310.51
RYOVF15	TRIANGULAR	0.30	0.27	0.14	1.80	1	193.49
ST1-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	6849.24
ST1-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3686.10
ST1-03	8.5m-ROW	0.35	3.72	0.22	20.50	1	2971.71
ST1-04	8.5m-ROW	0.35	3.72	0.22	20.50	1	3261.97
ST1-05	8.5m-ROW	0.35	3.72	0.22	20.50	1	4655.23
ST1-06	8.5m-ROW	0.35	3.72	0.22	20.50	1	3293.17
ST1-07	8.5m-ROW	0.35	3.72	0.22	20.50	1	3397.63
ST1-08	8.5m-ROW	0.35	3.72	0.22	20.50	1	3377.08
ST1-09	8.5m-ROW	0.35	3.72	0.22	20.50	1	2787.97
ST1-10	8.5m-ROW	0.35	3.72	0.22	20.50	1	3579.35
ST1-11	8.5m-ROW	0.35	3.72	0.22	20.50	1	2954.22
ST1-12	8.5m-ROW	0.35	3.72	0.22	20.50	1	6358.39
ST2-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	3462.79
ST2-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	5014.41
ST3-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	3261.05
ST3-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3420.41
ST3-03	8.5m-ROW	0.35	3.72	0.22	20.50	1	3237.16
ST3-04	8.5m-ROW	0.35	3.72	0.22	20.50	1	3444.54
ST3-05	8.5m-ROW	0.35	3.72	0.22	20.50	1	3510.43
ST3-06	8.5m-ROW	0.35	3.72	0.22	20.50	1	3405.88
ST3-07	8.5m-ROW	0.35	3.72	0.22	20.50	1	4863.36
ST4-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	4067.53
ST4-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3374.38
ST4-03	8.5m-ROW	0.35	3.72	0.22	20.50	1	4059.91
ST4-04	8.5m-ROW	0.35	3.72	0.22	20.50	1	3438.24
ST4-05	8.5m-ROW	0.35	3.72	0.22	20.50	1	3633.49
ST4-06	8.5m-ROW	0.35	3.72	0.22	20.50	1	4740.66
ST4-07	8.5m-ROW	0.35	3.72	0.22	20.50	1	3339.82
ST4-08	8.5m-ROW	0.35	3.72	0.22	20.50	1	4487.34
ST4-09	8.5m-ROW	0.35	3.72	0.22	20.50	1	4946.29
ST4-10	8.5m-ROW	0.35	3.72	0.22	20.50	1	2838.32
ST4-11	8.5m-ROW	0.35	3.72	0.22	20.50	1	3436.41
ST4-12	8.5m-ROW	0.35	3.72	0.22	20.50	1	3651.33
ST4-13	8.5m-ROW	0.35	3.72	0.22	20.50	1	3915.29
ST4-14	8.5m-ROW	0.35	3.72	0.22	20.50	1	3225.82
ST4-15	8.5m-ROW	0.35	3.72	0.22	20.50	1	3968.30
ST5-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	4755.26
ST5-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3580.80
ST5-03	8.5m-ROW	0.35	3.72	0.22	20.50	1	3750.51
ST5-04	8.5m-ROW	0.35	3.72	0.22	20.50	1	3570.81
ST5-05	8.5m-ROW	0.35	3.72	0.22	20.50	1	3827.20
ST5-06	8.5m-ROW	0.35	3.72	0.22	20.50	1	3599.55
ST5-07	8.5m-ROW	0.35	3.72	0.22	20.50	1	3837.65
ST5-08	8.5m-ROW	0.35	3.72	0.22	20.50	1	1839.68
ST6-01	11m-ROW	0.35	4.26	0.22	23.00	1	5321.74
ST6-02	11m-ROW	0.35	4.26	0.22	23.00	1	3745.58
ST6-03	11m-ROW	0.35	4.26	0.22	23.00	1	4690.09
ST6-04	11m-ROW	0.35	4.26	0.22	23.00	1	3768.79
ST6-05	11m-ROW	0.35	4.26	0.22	23.00	1	3895.53
ST6-06	11m-ROW	0.35	4.26	0.22	23.00	1	4881.87
ST6-07	11m-ROW	0.35	4.26	0.22	23.00	1	4690.72
ST6-08	11m-ROW	0.35	4.26	0.22	23.00	1	5589.75
ST7-01	8.5m-ROW	0.35	3.72	0.22	20.50	1	4930.15
ST7-02	8.5m-ROW	0.35	3.72	0.22	20.50	1	3844.89

****
Transect Summary
****

Transect 11m-ROW
Area:

0.0004	0.0015	0.0034	0.0060	0.0093
0.0134	0.0183	0.0238	0.0302	0.0373
0.0451	0.0537	0.0630	0.0730	0.0838
0.0954	0.1077	0.1207	0.1345	0.1491
0.1643	0.1807	0.2000	0.2211	0.2435
0.2665	0.2901	0.3143	0.3391	0.3645
0.3905	0.4171	0.4444	0.4722	0.5006
0.5297	0.5593	0.5896	0.6205	0.6519
0.6840	0.7167	0.7500	0.7839	0.8184
0.8535	0.8892	0.9255	0.9625	1.0000

Hrad:

0.0157	0.0313	0.0470	0.0626	0.0783
0.0939	0.1096	0.1252	0.1409	0.1565
0.1722	0.1878	0.2035	0.2191	0.2348
0.2504	0.2661	0.2817	0.2974	0.3130
0.3287	0.3203	0.3076	0.3235	0.3468
0.3730	0.3990	0.4248	0.4505	0.4762
0.5019	0.5276	0.5533	0.5790	0.6048
0.6306	0.6565	0.6825	0.7085	0.7347
0.7608	0.7871	0.8134	0.8399	0.8664
0.8929	0.9196	0.9463	0.9731	1.0000

Width:

0.0197	0.0394	0.0591	0.0788	0.0985
0.1182	0.1379	0.1576	0.1773	0.1970
0.2167	0.2364	0.2561	0.2758	0.2955
0.3152	0.3349	0.3546	0.3743	0.3940
0.4137	0.4681	0.5422	0.5779	0.5995
0.6156	0.6316	0.6476	0.6636	0.6796
0.6957	0.7117	0.7277	0.7437	0.7597
0.7757	0.7918	0.8078	0.8238	0.8398
0.8558	0.8719	0.8879	0.9039	0.9199
0.9359	0.9519	0.9680	0.9840	1.0000

Transect 8.5m-ROW
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1155	0.1295	0.1443	0.1599
0.1759	0.1923	0.2111	0.2313	0.2522
0.2738	0.2961	0.3191	0.3428	0.3671
0.3922	0.4179	0.4444	0.4715	0.4993
0.5279	0.5571	0.5870	0.6176	0.6489
0.6809	0.7136	0.7470	0.7810	0.8158
0.8512	0.8874	0.9242	0.9618	1.0000

Hrad:

0.0156	0.0312	0.0468	0.0623	0.0779
0.0935	0.1091	0.1247	0.1403	0.1559
0.1715	0.1870	0.2026	0.2182	0.2338
0.2494	0.2650	0.2806	0.2961	0.3117
0.3424	0.3428	0.3336	0.3587	0.3832
0.4073	0.4312	0.4550	0.4787	0.5024
0.5262	0.5500	0.5739	0.5979	0.6220
0.6463	0.6707	0.6952	0.7199	0.7446
0.7696	0.7947	0.8199	0.8452	0.8707
0.8963	0.9220	0.9479	0.9739	1.0000

Width:

0.0207	0.0415	0.0622	0.0829	0.1036
0.1244	0.1451	0.1658	0.1866	0.2073
0.2280	0.2487	0.2695	0.2902	0.3109
0.3317	0.3524	0.3731	0.3938	0.4146
0.4146	0.4537	0.5148	0.5327	0.5507
0.5687	0.5866	0.6046	0.6226	0.6406
0.6585	0.6765	0.6945	0.7125	0.7304
0.7484	0.7664	0.7843	0.8023	0.8203

```
            0.8383     0.8562     0.8742     0.8922     0.9101
            0.9281     0.9461     0.9641     0.9820     1.0000


  ***********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  ***********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... LPS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Starting Date ............ 01/02/2018 00:00:00
  Ending Date .............. 01/03/2018 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:01:00
  Dry Time Step ............ 00:01:00
  Routing Time Step ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 4
  Head Tolerance ........... 0.001500 m


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Initial LID Storage ......         0.011         0.496
  Total Precipitation ......         1.755        76.002
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.376        16.268
  Surface Runoff ...........         1.357        58.763
  Final Storage ............         0.011         0.496
  Continuity Error (%) .....         1.270


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m       10^6 ltr
  **************************     ---------      ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         1.357        13.565
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         1.366        13.659
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.073         0.727
  Final Stored Volume ......         0.077         0.773
  Continuity Error (%) .....        -0.974


  ************************
  Highest Continuity Errors
  ************************
  Node 01+217 (56.54%)
  Node 03+000 (48.08%)
  Node 01+292 (7.83%)
  Node CB39-40 (3.12%)
  Node CB41-42 (2.10%)


  ***************************
  Time-Step Critical Elements
  ***************************
  Link 287-100 (2.06%)


  *********************************
  Highest Flow Instability Indexes
  *********************************
  Link ORYCB13 (109)
  Link W1 (3)
  Link C7 (1)
  Link C8 (1)


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     0.03 sec
  Average Time Step           :     1.99 sec
  Maximum Time Step           :     2.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.08
  Percent Not Converging      :     1.14


  ***************************
  Subcatchment Runoff Summary
  ***************************

  ---------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total      Total      Peak    Runoff
                           Precip      Runon       Evap      Infil     Runoff     Runoff    Runoff     Coeff
  Subcatchment                mm         mm         mm         mm         mm  10^6 ltr       LPS
  ---------------------------------------------------------------------------------------------------------
    A01                    76.00       0.00       0.00      14.65      61.45       0.10     76.53     0.809
    A02                    76.00       0.00       0.00      14.77      48.70       0.05     33.65     0.641
    A03                    76.00       0.00       0.00      14.86      61.22       0.22    156.70     0.806
    A04                    76.00       0.00       0.00      14.71      61.38       0.16    119.31     0.808
    A05                    76.00       0.00       0.00      14.81      48.70       0.02     10.16     0.641
    A06                    76.00       0.00       0.00      14.87      61.21       0.18    127.40     0.805
    A07                    76.00       0.00       0.00      14.76      48.70       0.09     56.50     0.641
    A08                    76.00       0.00       0.00      14.75      61.34       0.13     99.92     0.807
    A09                    76.00       0.00       0.00      14.84      61.24       0.16    118.52     0.806
    A10                    76.00       0.00       0.00      14.68      61.42       0.07     50.35     0.808
    A11                    76.00       0.00       0.00      14.76      48.70       0.07     46.66     0.641
    A12                    76.00       0.00       0.00      14.94      61.13       0.17    120.02     0.804
    A13                    76.00       0.00       0.00      14.93      48.70       0.07     45.39     0.641
    A14                    76.00       0.00       0.00      14.81      61.27       0.10     72.55     0.806
    A15                    76.00       0.00       0.00      14.83      48.70       0.10     68.25     0.641
    A16                    76.00       0.00       0.00      14.81      61.28       0.12     90.18     0.806
    A17                    76.00       0.00       0.00      14.94      48.69       0.07     42.85     0.641
    A18                    76.00       0.00       0.00      14.85      61.23       0.13     97.60     0.806
    A19                    76.00       0.00       0.00      14.81      61.28       0.17    128.55     0.806
    A20                    76.00       0.00       0.00      14.81      48.70       0.09     61.90     0.641
    A21                    76.00       0.00       0.00      14.68      61.41       0.09     71.73     0.808
    A22                    76.00       0.00       0.00      15.30      60.75       0.29    190.31     0.799
    A23                    76.00       0.00       0.00      14.64      48.71       0.03     22.22     0.641
    A24                    76.00       0.00       0.00      14.76      61.33       0.11     84.58     0.807
    A25                    76.00       0.00       0.00      14.85      48.70       0.08     55.23     0.641
```

A26	76.00	0.00	0.00	14.72	61.37	0.15	110.18
0.807							
A27	76.00	0.00	0.00	14.63	48.71	0.03	22.54
0.641							
A28	76.00	0.00	0.00	14.74	61.35	0.12	88.11
0.807							
A29	76.00	0.00	0.00	15.34	60.71	0.19	126.35
0.799							
A30	76.00	0.00	0.00	14.68	61.42	0.17	125.41
0.808							
A31	76.00	0.00	0.00	14.70	61.40	0.17	124.84
0.808							
A32	76.00	0.00	0.00	15.49	60.56	0.29	185.08
0.797							
A33	76.00	0.00	0.00	14.65	61.45	0.09	68.03
0.809							
A34-35	76.00	0.00	0.00	16.65	59.38	0.35	200.62
0.781							
A36	76.00	0.00	0.00	15.98	60.06	0.51	307.91
0.790							
A37	76.00	0.00	0.00	14.85	61.23	0.45	326.82
0.806							
A38	76.00	0.00	0.00	14.90	61.17	0.46	326.60
0.805							
A39	76.00	0.00	0.00	14.87	61.20	0.23	166.31
0.805							
A40	76.00	0.00	0.00	14.82	61.26	0.19	136.10
0.806							
B01	76.00	0.00	0.00	14.55	61.57	0.08	64.55
0.810							
B02	76.00	0.00	0.00	15.45	60.60	0.50	322.59
0.797							
B03	76.00	0.00	0.00	14.77	48.70	0.05	30.16
0.641							
B04	76.00	0.00	0.00	14.65	61.46	0.08	64.39
0.809							
B05	76.00	0.00	0.00	14.72	61.37	0.14	104.20
0.807							
B06	76.00	0.00	0.00	14.87	48.70	0.10	63.49
0.641							
B07	76.00	0.00	0.00	14.66	61.45	0.13	95.64
0.808							
B08	76.00	0.00	0.00	42.48	33.54	0.37	150.19
0.441							
B09	76.00	0.00	0.00	14.81	61.27	0.06	40.54
0.806							
B10	76.00	0.00	0.00	14.67	61.44	0.11	87.03
0.808							
B11	76.00	0.00	0.00	14.62	61.49	0.06	45.84
0.809							
B12	76.00	0.00	0.00	14.73	48.71	0.05	35.24
0.641							
B13	76.00	0.00	0.00	14.67	61.43	0.07	56.07
0.808							
B14	76.00	0.00	0.00	14.70	61.40	0.08	63.13
0.808							
B15	76.00	0.00	0.00	14.59	48.72	0.01	8.25
0.641							
B16	76.00	0.00	0.00	14.69	61.41	0.07	56.25
0.808							
B17	76.00	0.00	0.00	14.79	61.30	0.21	155.10
0.807							
B18	76.00	0.00	0.00	14.82	61.27	0.07	48.12
0.806							
CaivanLands	76.00	0.00	0.00	14.79	61.26	5.05	3445.31
0.806							

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
01+217	JUNCTION	0.00	0.01	93.80	0	01:56	0.01
01+292	JUNCTION	0.00	0.06	93.75	0	01:47	0.06
01+370	JUNCTION	0.00	0.00	93.79	0	00:00	0.00
01+449	JUNCTION	0.00	0.03	93.65	0	01:41	0.03
01+521	JUNCTION	0.00	0.01	93.83	0	01:34	0.01
01+586	JUNCTION	0.00	0.00	94.97	0	00:00	0.00
03+000	JUNCTION	0.00	0.01	93.46	0	01:55	0.01
03+048	JUNCTION	0.00	0.00	93.65	0	00:00	0.00
03+118	JUNCTION	0.00	0.00	93.69	0	00:00	0.00
03+214	JUNCTION	0.00	0.00	93.58	0	00:00	0.00
04+069	JUNCTION	0.00	0.02	93.58	0	01:33	0.02
04+118	JUNCTION	0.00	0.05	93.57	0	01:32	0.05
04+213	JUNCTION	0.00	0.04	93.16	0	01:37	0.04
04+264	JUNCTION	0.00	0.12	92.92	0	01:38	0.12
04+305	JUNCTION	0.00	0.08	92.92	0	01:40	0.08
04+357	JUNCTION	0.00	0.00	93.07	0	00:00	0.00
04+393	JUNCTION	0.01	0.14	93.06	0	01:40	0.14
05+067	JUNCTION	0.00	0.01	93.56	0	01:40	0.01
05+122	JUNCTION	0.00	0.05	93.50	0	01:31	0.05
05+177	JUNCTION	0.00	0.03	93.30	0	01:41	0.03
06+075	JUNCTION	0.00	0.03	93.53	0	01:51	0.03
06+132	JUNCTION	0.00	0.04	93.47	0	01:32	0.04
06+193	JUNCTION	0.00	0.04	93.43	0	01:30	0.04
06+300	JUNCTION	0.00	0.00	93.99	0	00:00	0.00
07+067	JUNCTION	0.00	0.00	93.99	0	00:00	0.00
100 (STM)	JUNCTION	1.21	1.32	91.04	0	01:34	1.32
102 (STM)	JUNCTION	1.07	1.20	91.05	0	01:34	1.20
104 (STM)	JUNCTION	1.04	1.18	91.07	0	01:33	1.18
106 (STM)	JUNCTION	0.79	0.97	91.11	0	01:33	0.97
108 (STM)	JUNCTION	0.75	1.03	91.21	0	01:32	1.03
110 (STM)	JUNCTION	0.63	0.97	91.27	0	01:33	0.97
112 (STM)	JUNCTION	0.50	0.90	91.34	0	01:33	0.90
114 (STM)	JUNCTION	0.45	0.84	91.46	0	01:35	0.84
116 (STM)	JUNCTION	0.29	0.67	91.69	0	01:35	0.67
118 (STM)	JUNCTION	0.39	0.70	91.69	0	01:34	0.70
200 (STM)	JUNCTION	0.30	0.34	91.26	0	01:44	0.34
202 (STM)	JUNCTION	0.32	0.45	91.26	0	01:46	0.45
204 (STM)	JUNCTION	0.32	0.46	91.24	0	01:46	0.46
282 (STM)	JUNCTION	2.00	2.07	91.46	0	01:34	2.07
283 (STM)	JUNCTION	2.01	2.23	91.28	0	01:33	2.22
284 (STM)	JUNCTION	2.01	2.17	91.29	0	01:32	2.17
285 (STM)	JUNCTION	2.01	2.16	91.22	0	01:34	2.16
286 (STM)	JUNCTION	2.01	2.16	91.18	0	01:32	2.16
287 (STM)	JUNCTION	2.08	3.22	92.14	0	01:35	3.22
288 (STM)	JUNCTION	2.01	2.16	91.31	0	01:31	2.16
300 (STM)	JUNCTION	0.32	0.70	91.08	0	01:35	0.70
302 (STM)	JUNCTION	0.37	0.80	91.08	0	01:34	0.80
304 (STM)	JUNCTION	0.59	1.01	91.06	0	01:35	1.01
306 (STM)	JUNCTION	0.31	0.44	91.34	0	01:42	0.44
400 (STM)	JUNCTION	0.32	0.67	91.17	0	01:35	0.67
402 (STM)	JUNCTION	0.32	0.79	91.17	0	01:35	0.79
404 (STM)	JUNCTION	0.34	0.86	91.17	0	01:35	0.86
406 (STM)	JUNCTION	0.54	1.05	91.17	0	01:34	1.05
408 (STM)	JUNCTION	0.01	0.12	91.06	0	01:59	0.12
410 (STM)	JUNCTION	0.52	0.91	91.04	0	01:35	0.91
410a (STM)	JUNCTION	0.69	1.06	91.02	0	01:34	1.06
412 (STM)	JUNCTION	1.38	1.74	91.00	0	01:34	1.74
500 (STM)	JUNCTION	0.08	0.52	91.26	0	01:34	0.52
502 (STM)	JUNCTION	0.08	0.69	91.26	0	01:34	0.69
504 (STM)	JUNCTION	0.23	0.83	91.25	0	01:34	0.83
506 (STM)	JUNCTION	0.22	0.80	91.23	0	01:34	0.80
506a (STM)	JUNCTION	0.30	0.85	91.20	0	01:34	0.85
508 (STM)	JUNCTION	0.72	1.25	91.18	0	01:34	1.25
508a (STM)	JUNCTION	0.50	0.98	91.13	0	01:34	0.98
600 (STM)	JUNCTION	0.01	0.33	91.18	0	01:35	0.33
602 (STM)	JUNCTION	0.03	0.54	91.18	0	01:35	0.54
604 (STM)	JUNCTION	0.39	0.92	91.17	0	01:36	0.91
604a (STM)	JUNCTION	0.18	0.69	91.16	0	01:34	0.69
606 (STM)	JUNCTION	0.70	1.21	91.16	0	01:34	1.21
606a (STM)	JUNCTION	0.48	0.97	91.14	0	01:34	0.97
608 (STM)	JUNCTION	1.07	1.54	91.11	0	01:34	1.53
700 (STM)	JUNCTION	2.10	2.58	91.23	0	01:35	2.58
802 (STM)	JUNCTION	0.72	1.13	91.05	0	01:21	1.11
804 (STM)	JUNCTION	0.82	1.19	91.01	0	01:35	1.19
806 (STM)	JUNCTION	1.35	1.69	90.97	0	00:10	1.68
808 (STM)	JUNCTION	1.38	1.68	90.93	0	00:01	1.46
810 (STM)	JUNCTION	1.36	1.69	90.96	0	00:01	1.45
900 (STM)	JUNCTION	1.46	1.78	90.96	0	01:34	1.78
902 (STM)	JUNCTION	1.64	2.26	91.26	0	00:01	1.82
CB01-02	JUNCTION	0.10	1.81	93.60	0	01:40	1.81
CB03-04	JUNCTION	0.12	1.83	93.50	0	01:41	1.83
CB05-06	JUNCTION	0.10	1.86	93.43	0	01:41	1.86
CB07-08	JUNCTION	0.14	1.90	93.63	0	01:43	1.90
CB09-10	JUNCTION	0.12	1.87	93.53	0	01:50	1.87
CB11-12	JUNCTION	0.09	1.83	93.47	0	01:32	1.83
CB13-14	JUNCTION	0.12	1.85	93.55	0	01:44	1.85
CB15-16	JUNCTION	0.11	1.86	93.58	0	01:32	1.86
CB17-18	JUNCTION	0.20	1.87	93.37	0	01:51	1.87
CB19-20	JUNCTION	0.09	1.83	93.16	0	01:36	1.83

CB21-22	JUNCTION	0.10	1.79	92.92	0	01:38	1.79
CB23-24	JUNCTION	0.09	1.83	92.92	0	01:40	1.83
CB25-26	JUNCTION	0.08	1.79	92.92	0	01:40	1.79
CB27-28	JUNCTION	0.09	1.81	93.06	0	01:40	1.81
CB-283	JUNCTION	0.05	1.44	94.04	0	01:32	1.44
CB-284	JUNCTION	0.04	1.45	94.05	0	01:31	1.45
CB-285	JUNCTION	0.05	1.46	94.06	0	01:33	1.46
CB-286	JUNCTION	0.05	1.44	94.04	0	01:32	1.44
CB-287	JUNCTION	0.05	1.45	94.05	0	01:34	1.45
CB-288	JUNCTION	0.04	1.43	94.03	0	01:31	1.43
CB29-30	JUNCTION	0.10	1.78	93.06	0	01:40	1.78
CB31-32	JUNCTION	0.09	1.83	93.30	0	01:40	1.83
CB33-34	JUNCTION	0.08	1.84	93.49	0	01:35	1.84
CB35-36	JUNCTION	0.08	1.83	93.50	0	01:30	1.83
CB37-38	JUNCTION	0.09	1.81	93.56	0	01:40	1.81
CB39-40	JUNCTION	0.20	1.73	93.30	0	01:51	1.73
CB41-42	JUNCTION	0.11	1.69	93.53	0	01:56	1.69
CB43-44	JUNCTION	0.13	1.95	93.75	0	01:46	1.95
CB45-46	JUNCTION	0.13	1.84	93.65	0	01:40	1.84
CB47-48	JUNCTION	0.07	1.77	93.64	0	01:31	1.77
CB49-50	JUNCTION	0.07	1.76	93.83	0	01:35	1.76
RYCB01	JUNCTION	0.01	0.32	92.32	0	01:30	0.32
RYCB02	JUNCTION	0.03	1.70	93.73	0	01:24	1.70
RYCB03	JUNCTION	0.04	2.14	93.64	0	01:30	2.14
RYCB04	JUNCTION	0.06	1.81	93.57	0	01:24	1.81
RYCB05	JUNCTION	0.01	0.46	92.42	0	01:29	0.46
RYCB06	JUNCTION	0.05	2.23	93.34	0	01:27	2.23
RYCB07	JUNCTION	0.04	2.02	93.89	0	01:25	2.02
RYCB08	JUNCTION	0.06	2.33	93.64	0	01:24	2.33
RYCB09	JUNCTION	0.05	2.13	93.62	0	01:30	2.13
RYCB10	JUNCTION	0.04	2.22	93.30	0	01:30	2.22
RYCB11	JUNCTION	0.05	2.01	93.63	0	01:30	2.01
RYCB12	JUNCTION	0.05	2.20	93.62	0	01:24	2.20
RYCB13	JUNCTION	0.25	3.14	93.58	0	01:25	3.14
RYCB14	JUNCTION	0.02	1.92	93.43	0	01:30	1.92
RYCB15	JUNCTION	0.03	1.97	93.50	0	01:30	1.97
GRBK-OUT	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
HW-01	OUTFALL	1.43	1.43	90.63	0	00:00	1.43
HW-02	OUTFALL	1.02	1.02	90.92	0	00:00	1.02
OVF-OUT	OUTFALL	0.00	0.06	92.84	0	01:38	0.06
A22-STOR	STORAGE	0.05	1.70	94.20	0	01:32	1.70
A29-STOR	STORAGE	0.05	1.70	94.20	0	01:32	1.70
A32-STOR	STORAGE	0.05	1.70	93.70	0	01:32	1.70
A34-35-STOR	STORAGE	0.05	1.70	94.70	0	01:33	1.70
A36-STOR	STORAGE	0.05	1.70	94.40	0	01:32	1.70
B02-STOR	STORAGE	0.05	1.70	94.45	0	01:32	1.70
CAV-STOR	STORAGE	0.07	1.61	93.71	0	01:35	1.61

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min		Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
01+217	JUNCTION	0.00	2.18	0	01:33	0	0.00241	130.100
01+292	JUNCTION	0.00	78.20	0	01:40	0	0.104	8.491
01+370	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
01+449	JUNCTION	0.00	15.97	0	01:31	0	0.00751	12.872
01+521	JUNCTION	0.00	9.55	0	01:31	0	0.00172	53.503
01+586	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
03+000	JUNCTION	0.00	1.57	0	01:37	0	0.00209	92.609
03+048	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
03+118	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
03+214	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+069	JUNCTION	0.00	19.96	0	01:30	0	0.00168	20.660
04+118	JUNCTION	0.00	44.30	0	01:29	0	0.0208	-3.626
04+213	JUNCTION	0.00	30.74	0	01:30	0	0.0114	8.351
04+264	JUNCTION	0.00	33.79	0	01:29	0	0.0168	1.800
04+305	JUNCTION	0.00	25.46	0	01:29	0	0.00944	1.478
04+357	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
04+393	JUNCTION	0.00	67.29	0	01:28	0	0.0499	-0.479
05+067	JUNCTION	0.00	6.39	0	01:32	0	0.000971	67.805
05+122	JUNCTION	0.00	49.19	0	01:30	0	0.0182	0.000
05+177	JUNCTION	0.00	12.99	0	01:31	0	0.00396	15.728
06+075	JUNCTION	0.00	15.39	0	01:32	0	0.0109	12.171
06+132	JUNCTION	0.00	36.69	0	01:30	0	0.0111	-2.746
06+193	JUNCTION	0.00	30.20	0	01:30	0	0.0141	-14.545
06+300	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
07+067	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
ltr								
100 (STM)	JUNCTION	0.00	2341.84	0	01:34	0	7.25	-0.001
102 (STM)	JUNCTION	0.00	594.26	0	01:53	0	2.13	-0.002
104 (STM)	JUNCTION	0.00	499.81	0	01:32	0	1.84	-0.001
106 (STM)	JUNCTION	0.00	473.07	0	01:33	0	1.75	0.068
108 (STM)	JUNCTION	0.00	445.22	0	01:33	0	1.67	-0.014
110 (STM)	JUNCTION	0.00	404.19	0	01:33	0	1.56	-0.005
112 (STM)	JUNCTION	0.00	360.50	0	01:33	0	1.34	0.016
114 (STM)	JUNCTION	0.00	264.54	0	01:33	0	0.843	-0.146
116 (STM)	JUNCTION	0.00	244.08	0	01:33	0	0.713	0.470
118 (STM)	JUNCTION	0.00	20.43	0	01:35	0	0.0816	-0.010
200 (STM)	JUNCTION	0.00	1.16	0	01:22	0	0.000327	3.707
202 (STM)	JUNCTION	0.00	32.04	0	01:45	0	0.217	0.009
204 (STM)	JUNCTION	0.00	32.04	0	01:45	0	0.216	-0.006
282 (STM)	JUNCTION	0.00	1.06	0	01:25	0	0.000189	-6.646
283 (STM)	JUNCTION	0.00	18.45	0	01:32	0	0.0601	0.197
284 (STM)	JUNCTION	0.00	27.82	0	01:31	0	0.0734	-0.002
285 (STM)	JUNCTION	0.00	23.77	0	01:33	0	0.0822	-0.002
286 (STM)	JUNCTION	0.00	23.56	0	01:32	0	0.0783	-0.003
287 (STM)	JUNCTION	0.00	1800.58	0	01:35	0	5.12	-0.003
288 (STM)	JUNCTION	0.00	23.51	0	01:31	0	0.062	-0.003
300 (STM)	JUNCTION	0.00	40.65	0	01:30	0	0.152	-0.020
302 (STM)	JUNCTION	0.00	105.72	0	01:29	0	0.549	0.010
304 (STM)	JUNCTION	0.00	153.78	0	01:50	0	0.813	-0.010
306 (STM)	JUNCTION	0.00	35.41	0	01:41	0	0.181	-0.007
400 (STM)	JUNCTION	0.00	20.96	0	01:44	0	0.127	0.118
402 (STM)	JUNCTION	0.00	24.76	0	01:50	0	0.127	-0.091
404 (STM)	JUNCTION	0.00	67.54	0	01:34	0	0.311	-0.006
406 (STM)	JUNCTION	0.00	91.16	0	01:50	0	0.527	-0.010
408 (STM)	JUNCTION	0.00	26.67	0	01:36	0	0.129	-0.058
410 (STM)	JUNCTION	0.00	223.49	0	01:50	0	1.14	0.000
410a (STM)	JUNCTION	0.00	262.00	0	01:50	0	1.3	-0.009
412 (STM)	JUNCTION	0.00	886.70	0	01:36	0	4.02	-0.007
500 (STM)	JUNCTION	0.00	20.72	0	01:40	0	0.0947	0.051
502 (STM)	JUNCTION	0.00	129.73	0	01:44	0	0.386	-0.014
504 (STM)	JUNCTION	0.00	193.20	0	01:33	0	0.615	0.001
506 (STM)	JUNCTION	0.00	227.21	0	01:34	0	0.774	0.008
506a (STM)	JUNCTION	0.00	253.74	0	01:34	0	0.912	0.003
508 (STM)	JUNCTION	0.00	336.33	0	01:32	0	1.15	-0.004
508a (STM)	JUNCTION	0.00	370.90	0	01:32	0	1.32	-0.001
600 (STM)	JUNCTION	0.00	35.51	0	01:50	0	0.209	0.014
602 (STM)	JUNCTION	0.00	57.60	0	01:50	0	0.286	0.000
604 (STM)	JUNCTION	0.00	91.35	0	01:50	0	0.409	-0.005
604a (STM)	JUNCTION	0.00	109.64	0	01:50	0	0.498	-0.003
606 (STM)	JUNCTION	0.00	215.62	0	01:50	0	1.04	0.001
606a (STM)	JUNCTION	0.00	230.22	0	01:51	0	1.14	-0.003
608 (STM)	JUNCTION	0.00	613.95	0	01:36	0	2.63	-0.001
700 (STM)	JUNCTION	0.00	35.27	0	01:35	0	0.15	-0.010
802 (STM)	JUNCTION	0.00	116.67	0	01:33	0	0.358	-0.005
804 (STM)	JUNCTION	0.00	293.81	0	01:33	0	0.884	-0.009
806 (STM)	JUNCTION	0.00	1282.77	0	01:35	0	5.2	-0.117
808 (STM)	JUNCTION	0.00	1282.87	0	01:36	0	5.3	-1.553
810 (STM)	JUNCTION	0.00	491.77	0	01:36	0	1.97	-0.326
900 (STM)	JUNCTION	0.00	989.65	0	01:36	0	4.3	-0.024
902 (STM)	JUNCTION	0.00	1282.82	0	01:35	0	5.17	-0.016
CB01-02	JUNCTION	76.53	90.12	0	01:30	0.1	0.106	-0.129
CB03-04	JUNCTION	119.31	156.10	0	01:29	0.158	0.16	-0.139
CB05-06	JUNCTION	127.40	127.40	0	01:30	0.176	0.181	-0.295
CB07-08	JUNCTION	156.70	156.70	0	01:30	0.215	0.216	-0.243
CB09-10	JUNCTION	120.02	144.70	0	01:30	0.169	0.238	-0.678
CB11-12	JUNCTION	72.55	117.26	0	01:30	0.0986	0.129	-0.801
CB13-14	JUNCTION	90.18	90.26	0	01:30	0.123	0.127	-0.288
CB15-16	JUNCTION	97.60	117.93	0	01:30	0.134	0.147	-0.701
CB17-18	JUNCTION	128.55	154.25	0	01:30	0.175	0.21	1.354
CB19-20	JUNCTION	99.92	109.91	0	01:30	0.134	0.14	0.281
CB21-22	JUNCTION	118.52	152.60	0	01:30	0.162	0.195	-0.316
CB23-24	JUNCTION	50.35	88.18	0	01:29	0.0663	0.0931	-0.262
CB25-26	JUNCTION	68.03	68.03	0	01:30	0.0891	0.0943	-0.029
CB27-28	JUNCTION	124.84	124.84	0	01:30	0.165	0.194	0.029
CB-283	JUNCTION	40.54	40.54	0	01:30	0.0551	0.0551	-11.691
CB-284	JUNCTION	56.07	56.07	0	01:30	0.0737	0.0737	-0.362
CB-285	JUNCTION	63.13	63.13	0	01:30	0.0835	0.0835	-0.661
CB-286	JUNCTION	56.25	56.25	0	01:30	0.0743	0.0743	-9.057
CB-287	JUNCTION	48.12	48.12	0	01:30	0.0656	0.0655	-2.207
CB-288	JUNCTION	45.84	45.84	0	01:30	0.0596	0.0596	-5.641

CB29-30	JUNCTION	125.41	185.77	0	01:28	0.165	0.194	0.587
CB31-32	JUNCTION	88.11	98.33	0	01:30	0.118	0.128	0.125
CB33-34	JUNCTION	110.18	119.49	0	01:30	0.147	0.152	-0.095
CB35-36	JUNCTION	84.58	119.30	0	01:29	0.113	0.137	-0.630
CB37-38	JUNCTION	71.73	71.73	0	01:30	0.0946	0.0953	-0.382
CB39-40	JUNCTION	155.10	158.10	0	01:30	0.21	0.215	3.217
CB41-42	JUNCTION	87.03	101.24	0	01:30	0.114	0.158	2.144
CB43-44	JUNCTION	243.96	279.37	0	01:30	0.498	0.519	-0.071
CB45-46	JUNCTION	104.20	104.20	0	01:30	0.139	0.139	-0.070
CB47-48	JUNCTION	64.39	71.24	0	01:30	0.0842	0.0895	-0.976
CB49-50	JUNCTION	64.55	64.55	0	01:30	0.0831	0.0833	-0.043
RYCB01	JUNCTION	8.25	8.25	0	01:30	0.0127	0.0127	-0.005
RYCB02	JUNCTION	33.65	33.65	0	01:30	0.0516	0.0516	-0.117
RYCB03	JUNCTION	35.24	35.24	0	01:30	0.0541	0.0552	0.431
RYCB04	JUNCTION	45.39	45.39	0	01:30	0.0696	0.0898	0.331
RYCB05	JUNCTION	10.16	10.16	0	01:29	0.0156	0.0182	-0.171
RYCB06	JUNCTION	56.50	56.50	0	01:30	0.0867	0.0867	0.249
RYCB07	JUNCTION	63.49	63.49	0	01:30	0.0974	0.0974	0.086
RYCB08	JUNCTION	68.25	68.25	0	01:30	0.105	0.105	0.286
RYCB09	JUNCTION	42.85	42.85	0	01:30	0.0657	0.0732	0.087
RYCB10	JUNCTION	46.66	46.66	0	01:30	0.0716	0.0716	0.138
RYCB11	JUNCTION	30.16	31.51	0	01:23	0.0463	0.059	0.289
RYCB12	JUNCTION	55.23	55.23	0	01:30	0.0847	0.0849	0.185
RYCB13	JUNCTION	61.90	61.90	0	01:30	0.095	0.0971	-0.022
RYCB14	JUNCTION	22.54	22.54	0	01:30	0.0346	0.0346	-0.027
RYCB15	JUNCTION	22.22	30.39	0	01:28	0.0341	0.0451	0.093
GRBK-OUT	OUTFALL	955.83	955.83	0	01:30	1.32	1.32	0.000
HW-01	OUTFALL	0.00	1283.09	0	01:36	0	5.44	0.000
HW-02	OUTFALL	0.00	2342.14	0	01:34	0	7.24	0.000
OVF-OUT	OUTFALL	0.00	7.00	0	01:38	0	0.0101	0.000
A22-STOR	STORAGE	190.31	190.31	0	01:30	0.288	0.288	0.062
A29-STOR	STORAGE	126.35	126.35	0	01:30	0.192	0.192	0.072
A32-STOR	STORAGE	185.08	185.08	0	01:30	0.288	0.288	0.062
A34-35-STOR	STORAGE	200.62	200.62	0	01:30	0.349	0.349	0.038
A36-STOR	STORAGE	307.91	307.91	0	01:30	0.508	0.507	0.054
B02-STOR	STORAGE	322.59	322.59	0	01:30	0.499	0.499	0.059
CAV-STOR	STORAGE	3445.31	3445.31	0	01:30	5.05	5.05	0.047

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
287 (STM)	JUNCTION	0.10	0.002	0.878
406 (STM)	JUNCTION	0.19	0.036	2.404
410a (STM)	JUNCTION	0.57	0.196	1.368
412 (STM)	JUNCTION	0.65	0.212	1.652
502 (STM)	JUNCTION	0.05	0.007	2.228
504 (STM)	JUNCTION	0.25	0.074	2.120
506 (STM)	JUNCTION	0.33	0.114	2.270
506a (STM)	JUNCTION	0.38	0.161	2.176
508 (STM)	JUNCTION	0.41	0.183	2.131
508a (STM)	JUNCTION	0.50	0.222	2.018
604a (STM)	JUNCTION	0.29	0.084	2.179
606 (STM)	JUNCTION	0.38	0.140	2.104
606a (STM)	JUNCTION	0.48	0.208	2.030
608 (STM)	JUNCTION	0.55	0.240	1.968
802 (STM)	JUNCTION	0.45	0.217	2.773
804 (STM)	JUNCTION	0.47	0.233	2.917
806 (STM)	JUNCTION	24.00	0.469	2.370
808 (STM)	JUNCTION	24.00	0.462	2.452
810 (STM)	JUNCTION	24.00	0.470	2.441
900 (STM)	JUNCTION	1.00	0.257	1.654
902 (STM)	JUNCTION	23.99	0.687	1.834

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
A22-STOR	0.000	1	0	0	0.035	97	0 01:32	105.47
A29-STOR	0.000	1	0	0	0.023	97	0 01:32	70.02
A32-STOR	0.000	1	0	0	0.034	98	0 01:32	103.35
A34-35-STOR	0.000	1	0	0	0.033	99	0 01:33	116.67
A36-STOR	0.001	1	0	0	0.053	97	0 01:32	177.15
B02-STOR	0.001	1	0	0	0.058	98	0 01:32	181.41
CAV-STOR	0.009	1	0	0	0.656	51	0 01:35	1782.07

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
GRBK-OUT	24.46	69.99	955.83	1.320
HW-01	99.77	68.51	1283.09	5.442
HW-02	95.00	98.38	2342.14	7.244
OVF-OUT	3.72	3.71	7.00	0.010
System	55.73	240.59	4461.39	14.016

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
100-H2	CONDUIT	2342.14	0 01:34	1.38	0.82	0.84
102-100	CONDUIT	717.16	0 01:52	0.87	0.53	0.82
104-102	CONDUIT	550.64	0 01:53	1.02	0.47	0.76
106-104	CONDUIT	473.06	0 01:33	0.96	0.60	0.74
108-106	CONDUIT	445.26	0 01:33	1.37	0.79	0.63
110-108	CONDUIT	404.47	0 01:34	1.07	0.72	0.67
112-110	CONDUIT	360.18	0 01:33	1.01	0.68	0.73
114-112	CONDUIT	264.93	0 01:36	0.88	0.51	0.63
116-114	CONDUIT	243.70	0 01:33	1.23	0.63	0.55
118-116	CONDUIT	45.43	0 01:49	0.32	0.12	0.53
200-202	CONDUIT	1.27	0 02:51	0.06	0.00	0.15
202-204	CONDUIT	32.04	0 01:45	0.58	0.08	0.25
204-302b	CONDUIT	32.04	0 01:46	0.66	0.11	0.22
282-114	CONDUIT	1.66	0 01:49	0.23	0.01	0.21
283-110	CONDUIT	19.71	0 01:51	0.60	0.10	0.54
284-106	CONDUIT	27.82	0 01:32	0.79	0.41	0.50
285-104	CONDUIT	23.77	0 01:34	0.76	0.35	0.46
286-102	CONDUIT	23.56	0 01:32	0.76	0.34	0.45
287-100	CONDUIT	1800.58	0 01:36	1.80	1.14	0.80
288-108	CONDUIT	23.51	0 01:31	0.76	0.34	0.45
300-302	CONDUIT	38.96	0 01:30	0.41	0.13	0.73
302-304	CONDUIT	110.09	0 01:50	0.73	0.38	0.91
304-410	CONDUIT	162.37	0 01:50	0.53	0.41	1.00
306-304	CONDUIT	35.41	0 01:42	0.77	0.10	0.21
400-402	CONDUIT	24.76	0 01:50	0.70	0.06	0.70
402-404	CONDUIT	31.51	0 01:50	0.52	0.10	0.86
404-406	CONDUIT	70.07	0 01:50	0.62	0.24	0.96
406-606	CONDUIT	100.22	0 01:50	0.39	0.29	1.00
408-410	CONDUIT	26.89	0 01:24	0.73	0.08	0.34
410-412_1	CONDUIT	234.15	0 01:50	0.51	0.47	1.00
410-412_2	CONDUIT	262.52	0 01:50	0.58	0.66	1.00
412-900	CONDUIT	886.71	0 01:36	0.76	0.56	1.00
500-502	CONDUIT	36.21	0 01:49	0.53	0.08	0.88
502-504	CONDUIT	136.34	0 01:44	0.52	0.34	1.00
504-506	CONDUIT	193.04	0 01:33	0.60	0.47	1.00
506-508_1	CONDUIT	227.14	0 01:34	0.61	0.56	1.00
506-508_2	CONDUIT	253.66	0 01:34	0.69	0.62	1.00
508-608_1	CONDUIT	336.30	0 01:32	0.74	0.66	1.00
508-608_2	CONDUIT	370.79	0 01:32	0.81	0.72	1.00
600-602	CONDUIT	40.08	0 01:50	0.82	0.08	0.70
602-604	CONDUIT	64.82	0 01:50	0.65	0.23	0.94
604-606_1	CONDUIT	99.24	0 01:50	0.55	0.35	1.00
604-606_2	CONDUIT	115.41	0 01:50	0.45	0.40	1.00

606-608_1	CONDUIT	221.15	0	01:51	0.49	0.42	1.00
606-608_2	CONDUIT	231.04	0	01:51	0.51	0.44	1.00
608-412	CONDUIT	613.99	0	01:36	0.80	0.70	1.00
700-506	CONDUIT	56.41	0	01:49	0.30	0.12	0.91
802-804	CONDUIT	117.25	0	01:48	0.40	0.40	1.00
804-902	CONDUIT	293.81	0	01:33	1.01	0.88	1.00
808-HW1	CONDUIT	1283.09	0	01:36	0.68	0.52	1.00
900-902	CONDUIT	989.77	0	01:36	0.85	0.74	1.00
902-806	CONDUIT	1282.77	0	01:35	1.10	0.87	1.00
C1	CHANNEL	1.57	0	01:37	0.06	0.00	0.08
C2	CHANNEL	3.56	0	01:32	0.02	0.00	0.23
C3	CHANNEL	1.45	0	01:34	0.05	0.00	0.09
C4	CHANNEL	0.76	0	01:32	0.04	0.00	0.07
C5	CHANNEL	1.81	0	01:31	0.02	0.00	0.15
C6	CHANNEL	3.02	0	01:37	0.06	0.00	0.13
C7	CONDUIT	491.83	0	01:36	0.42	0.24	1.00
C8	CONDUIT	491.77	0	01:36	0.42	0.27	1.00
OVF-OUT	CONDUIT	7.00	0	01:38	0.20	0.17	0.36
RYOVF01	CONDUIT	0.00	0	00:00	0.00	0.00	0.22
RYOVF02	CONDUIT	14.20	0	01:24	0.49	0.05	0.47
RYOVF03	CONDUIT	12.65	0	01:30	0.34	0.10	0.37
RYOVF04	CONDUIT	27.66	0	02:23	0.54	0.12	0.60
RYOVF05	CONDUIT	37.11	0	01:29	0.61	0.16	0.54
RYOVF06	CONDUIT	33.49	0	01:27	0.77	0.09	0.48
RYOVF07	CONDUIT	35.86	0	01:25	0.72	0.11	0.66
RYOVF08	CONDUIT	45.65	0	01:25	0.69	0.17	0.64
RYOVF09	CONDUIT	26.56	0	02:06	0.45	0.12	0.61
RYOVF10	CONDUIT	23.69	0	01:30	0.71	0.06	0.52
RYOVF11	CONDUIT	13.64	0	01:42	0.29	0.12	0.61
RYOVF12	CONDUIT	43.64	0	01:44	0.60	0.18	0.61
RYOVF13	CONDUIT	30.20	0	01:30	0.42	0.19	0.52
RYOVF14	CONDUIT	0.92	0	01:30	0.02	0.00	0.37
RYOVF15	CONDUIT	11.43	0	01:31	0.25	0.06	0.55
ST1-01	CHANNEL	0.35	0	01:55	0.07	0.00	0.20
ST1-02	CHANNEL	0.04	0	01:56	0.04	0.00	0.19
ST1-03	CHANNEL	0.03	0	01:56	0.04	0.00	0.14
ST1-04	CHANNEL	23.23	0	01:47	0.14	0.01	0.21
ST1-05	CHANNEL	75.65	0	01:40	0.08	0.02	0.58
ST1-06	CHANNEL	0.00	0	00:00	0.00	0.00	0.50
ST1-07	CHANNEL	0.00	0	00:00	0.00	0.00	0.33
ST1-08	CHANNEL	9.63	0	01:33	0.04	0.00	0.37
ST1-09	CHANNEL	12.16	0	01:30	0.06	0.00	0.26
ST1-10	CHANNEL	0.35	0	01:34	0.05	0.00	0.25
ST1-11	CHANNEL	9.55	0	01:31	0.05	0.00	0.24
ST1-12	CHANNEL	0.00	0	00:00	0.00	0.00	0.23
ST2-01	CHANNEL	0.04	0	01:56	0.04	0.00	0.44
ST2-02	CHANNEL	0.00	0	00:00	0.00	0.00	0.43
ST3-01	CHANNEL	0.00	0	00:00	0.00	0.00	0.01
ST3-02	CHANNEL	0.00	0	00:00	0.00	0.00	0.29
ST3-03	CHANNEL	0.00	0	00:00	0.00	0.00	0.29
ST3-04	CHANNEL	0.00	0	00:00	0.00	0.00	0.33
ST3-05	CHANNEL	0.00	0	00:00	0.00	0.00	0.33
ST3-06	CHANNEL	0.00	0	00:00	0.00	0.00	0.36
ST3-07	CHANNEL	3.97	0	01:51	0.07	0.00	0.39
ST4-01	CHANNEL	3.62	0	01:41	0.05	0.00	0.39
ST4-02	CHANNEL	0.76	0	01:33	0.03	0.00	0.37
ST4-03	CHANNEL	19.96	0	01:30	0.05	0.00	0.38
ST4-04	CHANNEL	44.30	0	01:29	0.08	0.01	0.44
ST4-05	CHANNEL	21.89	0	01:32	0.04	0.01	0.44
ST4-06	CHANNEL	10.04	0	01:30	0.06	0.00	0.37
ST4-07	CHANNEL	30.74	0	01:30	0.07	0.01	0.39
ST4-08	CHANNEL	9.96	0	01:37	0.06	0.00	0.48
ST4-09	CHANNEL	32.61	0	01:30	0.06	0.01	0.60
ST4-10	CHANNEL	20.23	0	01:31	0.06	0.01	0.50
ST4-11	CHANNEL	16.56	0	01:31	0.04	0.00	0.44
ST4-12	CHANNEL	25.46	0	01:29	0.07	0.01	0.39
ST4-13	CHANNEL	0.00	0	00:00	0.00	0.00	0.27
ST4-14	CHANNEL	0.00	0	00:00	0.00	0.00	0.30
ST4-15	CHANNEL	67.29	0	01:28	0.16	0.02	0.51
ST5-01	CHANNEL	0.46	0	01:34	0.05	0.00	0.31
ST5-02	CHANNEL	6.39	0	01:32	0.04	0.00	0.31
ST5-03	CHANNEL	0.28	0	01:40	0.04	0.00	0.33
ST5-04	CHANNEL	49.19	0	01:30	0.09	0.01	0.39
ST5-05	CHANNEL	15.87	0	01:31	0.05	0.00	0.37
ST5-06	CHANNEL	12.99	0	01:31	0.05	0.00	0.36
ST5-07	CHANNEL	3.18	0	01:41	0.05	0.00	0.30
ST5-08	CHANNEL	54.20	0	01:28	0.14	0.03	0.47
ST6-01	CHANNEL	35.42	0	01:47	0.09	0.01	0.47
ST6-02	CHANNEL	15.39	0	01:32	0.03	0.00	0.42
ST6-03	CHANNEL	3.58	0	01:51	0.07	0.00	0.36
ST6-04	CHANNEL	36.69	0	01:30	0.07	0.01	0.40
ST6-05	CHANNEL	11.52	0	01:32	0.03	0.00	0.42
ST6-06	CHANNEL	9.67	0	01:30	0.03	0.00	0.40
ST6-07	CHANNEL	9.29	0	01:30	0.05	0.00	0.30
ST6-08	CHANNEL	0.00	0	00:00	0.00	0.00	0.27
ST7-01	CHANNEL	0.00	0	00:00	0.00	0.00	0.34
ST7-02	CHANNEL	15.95	0	01:31	0.06	0.00	0.40
OCB01-02	ORIFICE	20.72	0	01:40			1.00
OCB03-04	ORIFICE	26.72	0	01:41			1.00
OCB05-06	ORIFICE	35.41	0	01:41			1.00
OCB07-08	ORIFICE	32.04	0	01:43			1.00
OCB09-10	ORIFICE	35.51	0	01:50			1.00
OCB11-12	ORIFICE	26.71	0	01:32			1.00
OCB13-14	ORIFICE	20.96	0	01:44			1.00
OCB15-16	ORIFICE	20.99	0	01:32			1.00
OCB17-18	ORIFICE	21.09	0	01:52			1.00
OCB19-20	ORIFICE	26.67	0	01:36			1.00
OCB21-22	ORIFICE	34.75	0	01:38			1.00
OCB23-24	ORIFICE	20.83	0	01:40			1.00
OCB25-26	ORIFICE	20.60	0	01:40			1.00
OCB27-28	ORIFICE	35.00	0	01:40			1.00
OCB282	ORIFICE	18.45	0	01:32			1.00
OCB284	ORIFICE	27.82	0	01:31			1.00
OCB285	ORIFICE	23.77	0	01:33			1.00
OCB286	ORIFICE	23.56	0	01:32			1.00
OCB287	ORIFICE	18.51	0	01:34			1.00
OCB288	ORIFICE	23.51	0	01:31			1.00
OCB29-30	ORIFICE	34.70	0	01:40			1.00
OCB31-32	ORIFICE	26.65	0	01:40			1.00
OCB33-34	ORIFICE	35.27	0	01:35			1.00
OCB35-36	ORIFICE	26.71	0	01:30			1.00
OCB37-38	ORIFICE	20.72	0	01:40			1.00
OCB39-40	ORIFICE	20.26	0	01:51			1.00
OCB41-42	ORIFICE	25.64	0	01:56			1.00
OCB43-44	ORIFICE	71.53	0	01:46			1.00
OCB45-46	ORIFICE	20.88	0	01:40			1.00
OCB47-48	ORIFICE	20.46	0	01:31			1.00
OCB49-50	ORIFICE	20.43	0	01:35			1.00
OCB-A22	ORIFICE	105.47	0	01:32			1.00
OCB-A29	ORIFICE	70.02	0	01:32			1.00
OCB-A32	ORIFICE	103.35	0	01:32			1.00
OCB-A36	ORIFICE	177.15	0	01:32			1.00
OCB-B02	ORIFICE	181.41	0	01:32			1.00
OR1	ORIFICE	116.67	0	01:33			1.00
OR12	ORIFICE	1782.07	0	01:35			1.00
ORYCB01	ORIFICE	8.25	0	01:30			1.00
ORYCB02	ORIFICE	20.08	0	01:24			1.00
ORYCB03	ORIFICE	22.58	0	01:30			1.00
ORYCB04	ORIFICE	20.75	0	01:24			1.00
ORYCB05	ORIFICE	10.13	0	01:29			1.00
ORYCB06	ORIFICE	23.05	0	01:27			1.00
ORYCB07	ORIFICE	28.09	0	01:25			1.00
ORYCB08	ORIFICE	23.56	0	01:24			1.00
ORYCB09	ORIFICE	22.52	0	01:30			1.00
ORYCB10	ORIFICE	22.98	0	01:30			1.00
ORYCB11	ORIFICE	21.75	0	01:30			1.00
ORYCB12	ORIFICE	22.88	0	01:24			1.00
ORYCB13	ORIFICE	32.81	0	01:23			1.00
ORYCB14	ORIFICE	21.38	0	01:30			1.00
ORYCB15	ORIFICE	21.65	0	01:30			1.00
W1	WEIR	879.83	0	00:01			1.00

****
Flow Classification Summary
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	Adjusted	Fraction of Time in Flow Class								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
100-H2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
102-100	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
104-102	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
106-104	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
108-106	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
110-108	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
112-110	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
114-112	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
116-114	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
118-116	1.00	0.00	0.00	0.00	0.26	0.00	0.00	0.74	0.18	0.00
200-202	1.00	0.82	0.05	0.00	0.14	0.00	0.00	0.00	0.88	0.00
202-204	1.00	0.00	0.00	0.00	0.20	0.00	0.00	0.80	0.00	0.00
204-302b	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
282-114	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00

283-110	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.01	0.00
284-106	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
285-104	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
286-102	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
287-100	1.00	0.00	0.00	0.00	0.78	0.00	0.00	0.22	0.69	0.00
288-108	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
300-302	1.00	0.00	0.36	0.00	0.64	0.00	0.00	0.00	0.93	0.00
302-304	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.11	0.00
304-410	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
306-304	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
400-402	1.00	0.00	0.00	0.00	0.08	0.01	0.00	0.91	0.02	0.00
402-404	1.00	0.00	0.36	0.00	0.64	0.00	0.00	0.00	0.94	0.00
404-406	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.14	0.00
406-606	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
408-410	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.02	0.00
410-412_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
410-412_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
412-900	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
500-502	1.00	0.00	0.00	0.00	0.07	0.00	0.00	0.93	0.03	0.00
502-504	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
504-506	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
506-508_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
506-508_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
508-608_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
508-608_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
600-602	1.00	0.00	0.00	0.00	0.18	0.01	0.00	0.81	0.15	0.00
602-604	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.94	0.00
604-606_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
604-606_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
606-608_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
606-608_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
608-412	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
700-506	1.00	0.00	0.38	0.00	0.62	0.00	0.00	0.00	0.97	0.00
802-804	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
804-902	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
808-HW1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
900-902	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
902-806	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C1	1.00	0.00	0.97	0.00	0.03	0.00	0.00	0.00	0.92	0.00
C2	1.00	0.89	0.08	0.00	0.03	0.00	0.00	0.00	0.94	0.00
C3	1.00	0.00	0.97	0.00	0.03	0.00	0.00	0.00	0.92	0.00
C4	1.00	0.00	0.98	0.00	0.02	0.00	0.00	0.00	0.93	0.00
C5	1.00	0.94	0.04	0.00	0.02	0.00	0.00	0.00	0.94	0.00
C6	1.00	0.00	0.97	0.00	0.03	0.00	0.00	0.00	0.93	0.00
C7	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
OVF-OUT	1.00	0.96	0.00	0.00	0.04	0.00	0.00	0.00	0.91	0.00
RYOVF01	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYOVF02	1.00	0.95	0.04	0.00	0.01	0.00	0.00	0.00	0.94	0.00
RYOVF03	1.00	0.94	0.01	0.00	0.00	0.00	0.04	0.01	0.00	0.00
RYOVF04	1.00	0.94	0.01	0.00	0.01	0.00	0.03	0.00	0.01	0.00
RYOVF05	1.00	0.94	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00
RYOVF06	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.94	0.00
RYOVF07	1.00	0.93	0.06	0.00	0.01	0.00	0.00	0.00	0.94	0.00
RYOVF08	1.00	0.96	0.03	0.00	0.01	0.00	0.00	0.00	0.94	0.00
RYOVF09	1.00	0.95	0.01	0.00	0.01	0.00	0.03	0.00	0.01	0.00
RYOVF10	1.00	0.96	0.03	0.00	0.01	0.00	0.00	0.00	0.94	0.00
RYOVF11	1.00	0.97	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00
RYOVF12	1.00	0.96	0.02	0.00	0.01	0.00	0.01	0.00	0.01	0.00
RYOVF13	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
RYOVF14	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.94	0.00
RYOVF15	1.00	0.96	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00
ST1-01	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.89	0.10	0.00
ST1-02	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.89	0.10	0.00
ST1-03	1.00	0.00	0.00	0.00	0.06	0.00	0.00	0.94	0.06	0.00
ST1-04	1.00	0.00	0.00	0.00	0.06	0.00	0.00	0.94	0.06	0.00
ST1-05	1.00	0.00	0.00	0.00	0.07	0.00	0.00	0.93	0.03	0.00
ST1-06	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-07	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST1-08	1.00	0.00	0.00	0.00	0.06	0.00	0.00	0.94	0.04	0.00
ST1-09	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.02	0.00
ST1-10	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.03	0.00
ST1-11	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.03	0.00
ST1-12	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST2-01	1.00	0.00	0.00	0.00	0.07	0.00	0.00	0.93	0.06	0.00
ST2-02	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-01	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-02	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-03	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-04	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-05	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-06	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST3-07	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.04	0.00
ST4-01	1.00	0.00	0.00	0.00	0.06	0.00	0.00	0.94	0.05	0.00
ST4-02	1.00	0.00	0.00	0.00	0.06	0.00	0.00	0.94	0.05	0.00
ST4-03	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.04	0.00
ST4-04	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.03	0.00
ST4-05	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.89	0.10	0.00
ST4-06	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.04	0.00
ST4-07	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.03	0.00
ST4-08	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.04	0.00
ST4-09	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.01	0.00
ST4-10	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.01	0.00
ST4-11	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.02	0.00
ST4-12	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.01	0.00
ST4-13	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-14	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST4-15	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
ST5-01	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.04	0.00
ST5-02	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.03	0.00
ST5-03	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.03	0.00
ST5-04	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.02	0.00
ST5-05	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.04	0.00
ST5-06	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.03	0.00
ST5-07	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.04	0.00
ST5-08	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.01	0.00
ST6-01	1.00	0.00	0.00	0.00	0.06	0.00	0.00	0.94	0.06	0.00
ST6-02	1.00	0.00	0.00	0.00	0.06	0.00	0.00	0.94	0.03	0.00
ST6-03	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.04	0.00
ST6-04	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.03	0.00
ST6-05	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.89	0.10	0.00
ST6-06	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.89	0.10	0.00
ST6-07	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.04	0.00
ST6-08	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST7-01	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST7-02	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.03	0.00

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Conduit Surcharge Summary
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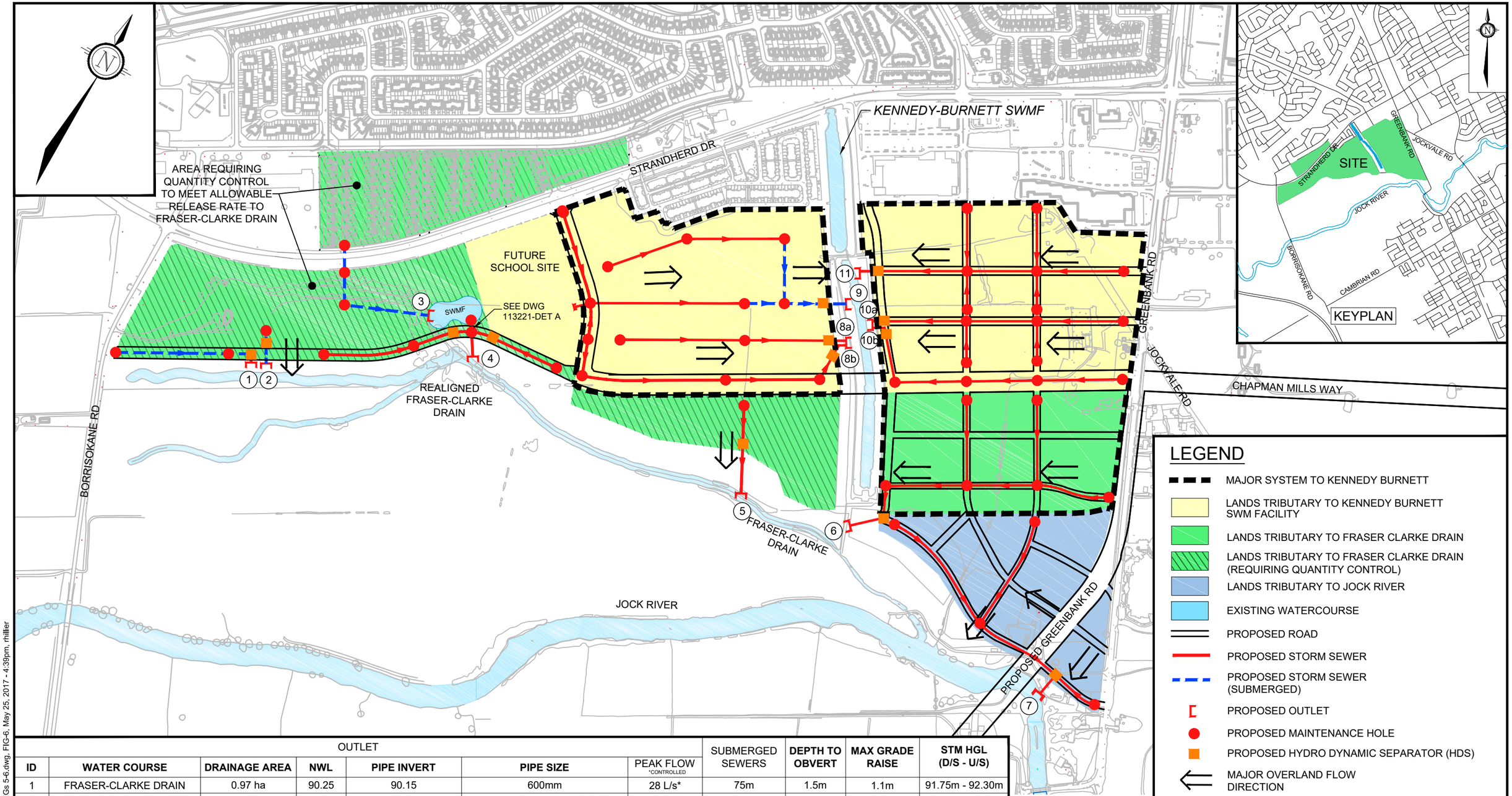
Conduit	Hours Full (Both Ends)	Hours Full (Upstream)	Hours Full (Dnstream)	Hours Above Full Normal Flow	Hours Capacity Limited
287-100	0.01	0.10	0.01	0.49	0.01
302-304	0.01	0.01	0.17	0.01	0.01
304-410	0.18	0.18	0.45	0.01	0.01
404-406	0.01	0.01	0.19	0.01	0.01
406-606	0.26	0.26	0.38	0.01	0.01
410-412_1	0.46	0.46	0.57	0.01	0.01
410-412_2	0.57	0.57	0.70	0.01	0.01
412-900	0.65	0.65	1.00	0.01	0.01
500-502	0.01	0.01	0.09	0.01	0.01
502-504	0.05	0.05	0.25	0.01	0.01
504-506	0.25	0.25	0.33	0.01	0.01
506-508_1	0.33	0.33	0.38	0.01	0.01
506-508_2	0.38	0.38	0.41	0.01	0.01
508-608_1	0.41	0.41	0.50	0.01	0.01
508-608_2	0.50	0.50	0.55	0.01	0.01
604-606_1	0.05	0.05	0.29	0.01	0.01
604-606_2	0.29	0.29	0.39	0.01	0.01
606-608_1	0.39	0.39	0.48	0.01	0.01
606-608_2	0.48	0.48	0.60	0.01	0.01
608-412	0.56	0.56	0.76	0.01	0.12
700-506	0.01	0.01	0.39	0.01	0.01
802-804	0.45	0.45	0.47	0.01	0.01
804-902	0.59	0.59	24.00	0.01	0.01
808-HW1	24.00	24.00	24.00	0.01	0.03
900-902	1.00	1.00	23.99	0.01	0.18
902-806	23.99	24.00	24.00	0.01	1.12
C7	24.00	24.00	24.00	0.01	0.04
C8	24.00	24.00	24.00	0.01	0.57
RYOVF07	0.01	0.01	22.47	0.01	0.01

Analysis begun on: Tue May 22 11:19:08 2018
Analysis ended on: Tue May 22 11:19:19 2018
Total elapsed time: 00:00:11



LEGEND

- MAJOR SYSTEM TO KENNEDY BURNETT
- LANDS TRIBUTARY TO KENNEDY BURNETT SWM FACILITY
- LANDS TRIBUTARY TO FRASER CLARKE DRAIN
- LANDS TRIBUTARY TO FRASER CLARKE DRAIN (REQUIRING QUANTITY CONTROL)
- LANDS TRIBUTARY TO JOCK RIVER
- EXISTING WATERCOURSE
- PROPOSED ROAD
- PROPOSED STORM SEWER
- PROPOSED STORM SEWER (SUBMERGED)
- PROPOSED OUTLET
- PROPOSED MAINTENANCE HOLE
- PROPOSED HYDRO DYNAMIC SEPARATOR (HDS)
- MAJOR OVERLAND FLOW DIRECTION

OUTLET							SUBMERGED SEWERS	DEPTH TO OBVERT	MAX GRADE RAISE	STM HGL (D/S - U/S)
ID	WATER COURSE	DRAINAGE AREA	NWL	PIPE INVERT	PIPE SIZE	PEAK FLOW *CONTROLLED				
1	FRASER-CLARKE DRAIN	0.97 ha	90.25	90.15	600mm	28 L/s*	75m	1.5m	1.1m	91.75m - 92.30m
2	FRASER-CLARKE DRAIN	5.34 ha	90.25	89.85	965 x 1525mm ELLIPTICAL	187 L/s*	400m	1.5m	0.9m	91.75m - 92.20m
3	MINTO SWM POND	14.64 ha	90.00	89.81	1220mm x 1930mm ELLIPTICAL	1,785 L/S	195m	1.5m	0.8m	91.65m - 92.23m
4	FRASER-CLARKE DRAIN	1.29 ha + 14.64 ha	89.90	89.90	1050mm	692 L/S*	0m	1.5m	1.0m	91.65m - 92.25m
5	FRASER-CLARKE DRAIN	6.49 ha	89.87	89.87	965 x 1525mm ELLIPTICAL	363 L/S*	0m	1.8m	0.9m	91.65m - 92.00m
6	FRASER-CLARKE DRAIN	11.83 ha	89.90	89.90	1220mm x 1930mm ELLIPTICAL	1,649 L/S	0m	1.8m	0.8m	91.75m - 92.65m
7	JOCK RIVER	9.24 ha	89.20	89.20	965 x 1525mm ELLIPTICAL	1,252 L/S	0m	1.8m	0.1m	91.60m - 92.45m
8A	KENNEDY-BURNETT SWMF	6.58 ha	90.20	90.20	1050mm	915 L/S	0m	1.5m	0.9m	91.80m - 92.80m
8B	KENNEDY-BURNETT SWMF	2.44 ha	90.20	90.20	825mm	444 L/S	0m	1.8m	0.9m	91.80m - 92.76m
9	KENNEDY-BURNETT SWMF	15.49 ha	90.20	90.00	1220mm x 1930mm ELLIPTICAL	2,034 L/S	200m	1.5m	1.2m	91.90m - 93.18m
10A	KENNEDY-BURNETT SWMF	6.68 ha	90.20	90.20	1050mm	928 L/S	0m	2.0m	0m	91.80m - 92.80m
10B	KENNEDY-BURNETT SWMF	2.07 ha	90.20	90.20	825 mm	365 L/S	0m	2.0m	0m	91.80m - 92.78m
11	KENNEDY-BURNETT SWMF	10.90 ha	90.20	90.20	1220mm x 1930mm ELLIPTICAL	1,892 L/S	0m	1.8m	0.3m	91.90m - 92.78m

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

KENNEDY-BURNETT SWMF SERVICING OPTIONS

OPTION 3b: HYBRID EXPANDED K-B SWIMF / HDS UNITS

SCALE 1 : 7500 (0, 100, 200, 300)
DATE JAN 2017 | JOB 113221 | FIGURE FIG-6

Burnett Lands - 3370 Greenbank Road
Design Storm Time Series Data
Chicago Design Storms

NOVATECH
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

Burnett Lands - 3370 Greenbank Road
Design Storm Time Series Data
Chicago Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

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		

CDS Average Annual Efficiency For TSS Removal

Area = 10.57 ha
C = 0.67
CDS Model: CDS PMSU56_68
Flowrate: 538
IDF Data: Ottawa

Engineer: **Novatech**
Contact: Kallie Auld, P.Eng.
Date: 15-Jan-18

Project: Burnett Lands - 3370 Greenbank Rd.
Location: Ottawa, ON
OGS ID: OGS 1

Return	Period	Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Frequency of Occurrence	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1m	0.08	128.72	94.2	185681	185681	91.70	128.72	129	0.00	100.00
2m	0.17	212.26	91.3	306184	306185	83.33	212.26	212	0.00	100.00
3m	0.25	282.70	88.7	407793	407793	75.00	282.70	283	0.00	100.00
4m	0.33	347.46	86.4	501206	501206	66.70	347.46	347	0.00	100.00
5m	0.42	402.91	84.6	574440	574440	58.30	402.91	403	0.00	100.00
6m	0.50	449.00	82.8	647674	647674	50.00	449.00	449	0.00	100.00
7m	0.58	491.75	81.3	701021	703549	41.70	491.75	492	0.00	99.69
8m	0.67	530.95	79.8	754367	759423	33.30	530.95	531	0.00	99.38
9m	0.75	565.20	78.2	807713	815297	25.00	565.20	538	27.18	99.07
10m	0.83	598.19	76.5	836069	860049	16.70	598.19	538	60.17	97.39
11m	0.92	629.36	74.8	864425	904801	8.30	629.36	538	91.34	95.70
1y	1	658.27	73.1	892781	949552	1.00	658.27	538	120.25	94.02
2y	2	921.70	60.5	1050620	1329544	0.50	921.70	538	383.68	79.02
5y	5	1074.82	55.0	1121754	1550420	0.20	1074.82	538	536.80	72.35
10y	10	1105.05	54.1	1135330	1594024	0.10	1105.05	538	567.03	71.22
25y	25	1144.69	53.0	1153135	1651208	0.04	1144.69	538	606.67	69.84
50y	50	1783.93	39.4	1353175	2573312	0.02	1783.93	538	1245.91	52.58
100y	100	1269.07	49.5	1197749	1830625	0.01	1269.07	538	731.05	65.43
Q-ave		**441.40** l/s		14491117.3	18144785.1					

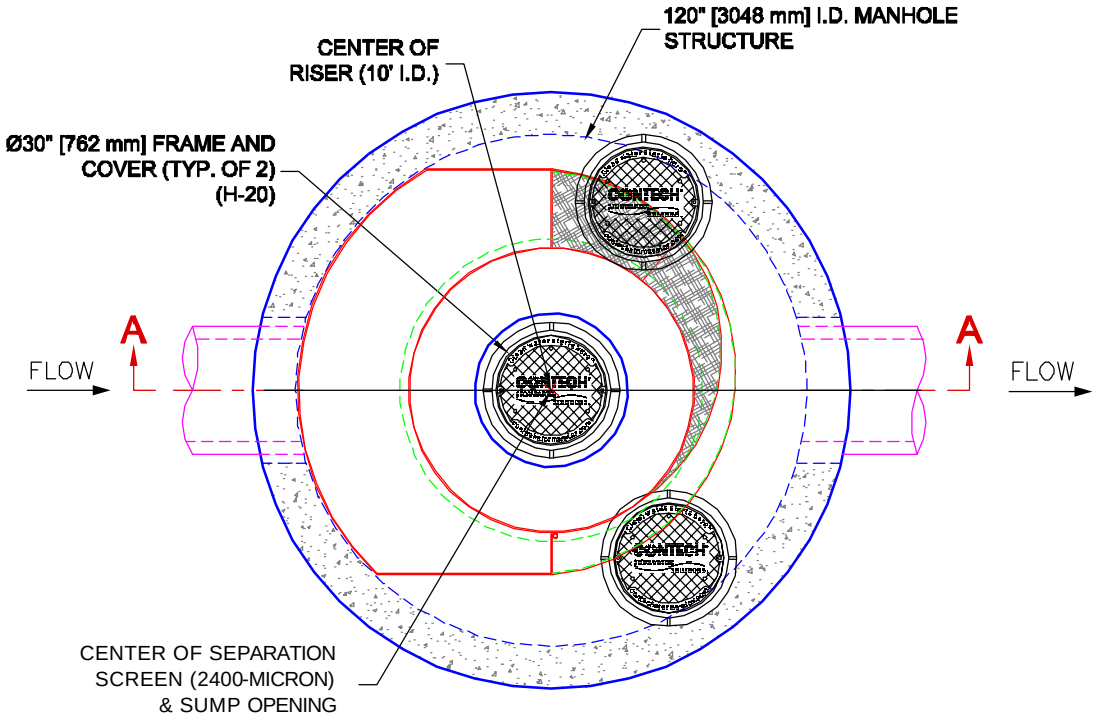
Average Annual TSS Removal Efficiency [%]: **82.9**

Ave. Ann. T. Volume [%]: **97.8**

ECHELON ENVIRONMENTAL

GDS TECHNOLOGIES

PLAN VIEW

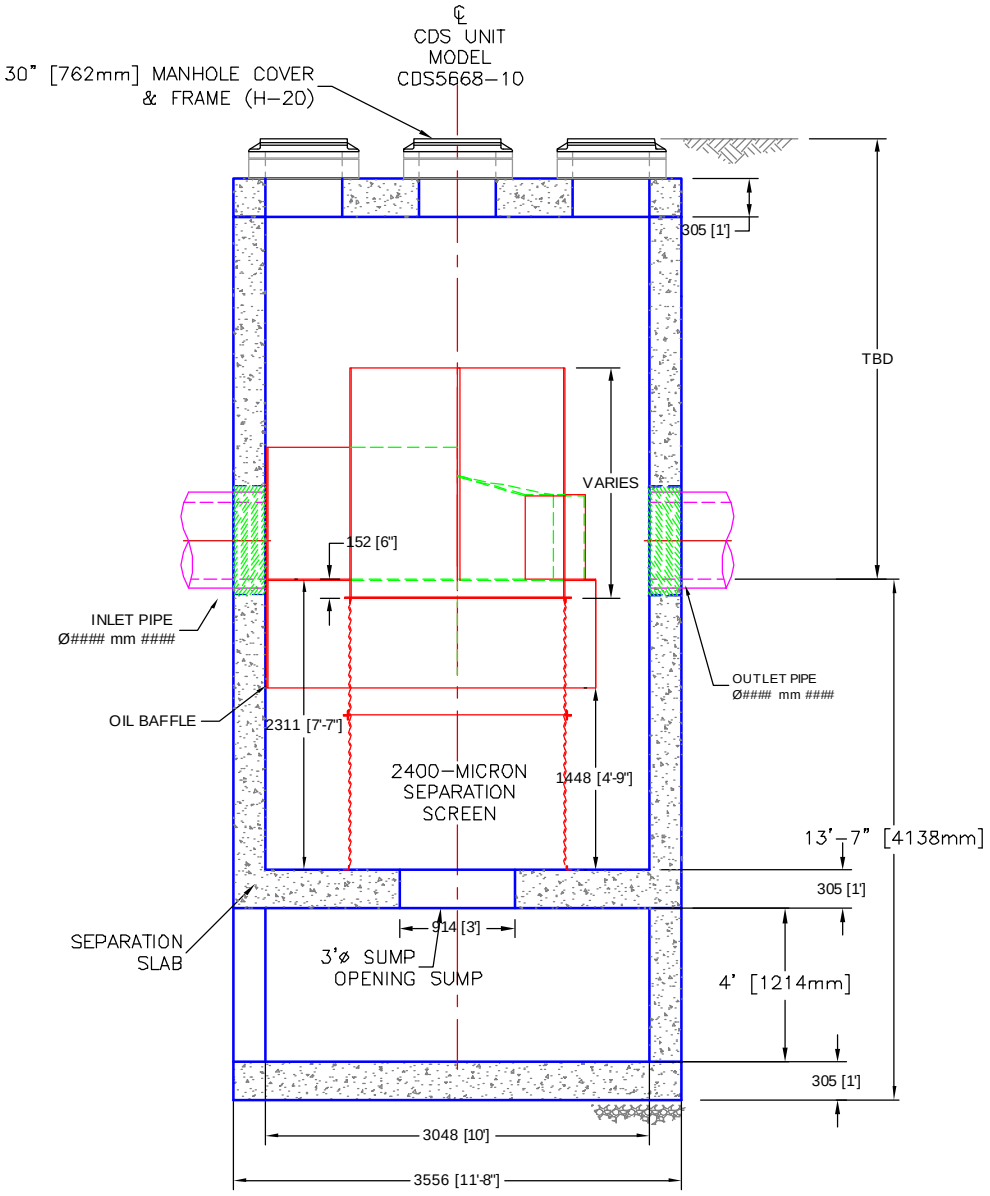


CDS MODEL PMSU56_68_10, 538 L/S TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# ###/##-##-###	SCALE 1" = 5'
		DATE ##/##/##	SHEET 1
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions, Inc. 200 Enterprise Drive, Scarborough, ME, 04074 Ph: 207-885-9830 Fax: 207-885-9825

SECTION A–A VIEW



CDS MODEL PMSU56_68_10, 538 L/S TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# ###/##–##–###	SCALE 1" = 6'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

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VORTECHS SYSTEM® ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON AN AVERAGE PARTICLE SIZE OF TYPICAL MICRONS
BURNETT LANDS 3370 GREENBANK RD
OTTAWA, ON
MODEL PC1319 OFF-LINE

CONTECH ENGINEERED SOLUTIONS

Design Ratio[1] = $\frac{\text{(10.57 hectares) x (0.67) x (2.775)}}{\text{(12.3 m2)}}$ **= 1.59**

Bypass occurs at an elevation of 90.16m (at approximately 26 l/s/m2)

Rainfall Intensity mm/hr	Operating Rate[2] % of capacity	Flow Treated (l/s)	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.5	1.2	9.9	9.2%	98.0%	9.0%
1.0	2.3	19.8	10.6%	98.0%	10.4%
1.5	3.5	29.7	9.9%	98.0%	9.7%
2.0	4.7	39.6	8.4%	98.0%	8.2%
2.5	5.8	49.5	7.7%	98.0%	7.5%
3.0	7.0	59.4	5.9%	98.0%	5.8%
3.5	8.2	69.3	4.4%	96.9%	4.2%
4.0	9.3	79.2	4.7%	96.3%	4.5%
4.5	10.5	89.1	3.3%	96.0%	3.2%
5.0	11.7	99.0	3.0%	95.3%	2.9%
6.0	14.0	118.8	5.4%	93.8%	5.1%
7.0	16.3	138.6	4.4%	90.6%	3.9%
8.0	18.6	158.4	3.5%	88.8%	3.1%
9.0	21.0	178.2	2.8%	87.3%	2.5%
10.0	23.3	198.0	2.2%	85.7%	1.9%
15.0	35.0	297.0	7.0%	80.0%	5.6%
20.0	46.6	396.0	4.1%	69.0%	2.9%
25.0	58.3	495.0	1.2%	59.3%	0.7%
30.0	69.9	594.1	0.5%	50.0%	0.3%
35.0	81.6	693.1	0.4%	33.7%	0.1%
40.0	93.2	792.1	0.4%	14.4%	0.1%
					91.5%

Predicted Annual Runoff Volume Treated = 92.5%
Assumed removal efficiency for bypassed flows = 0.0%
Estimated reduction in efficiency[5] = 6.5%
Predicted Net Annual Load Removal Efficiency = **85%**

1 - Design Ratio = (Total Drainage Area) x (Runoff Coefficient) x (Rational Method Conversion) / Grit Chamber Area
- The Total Drainage Area and Runoff Coefficient are specified by the site engineer.
- The rational method conversion based on the units in the above equation is 2.775.

2 - Operating Rate (% of capacity) = percentage of peak operating rate of 68 l/s/m^2.

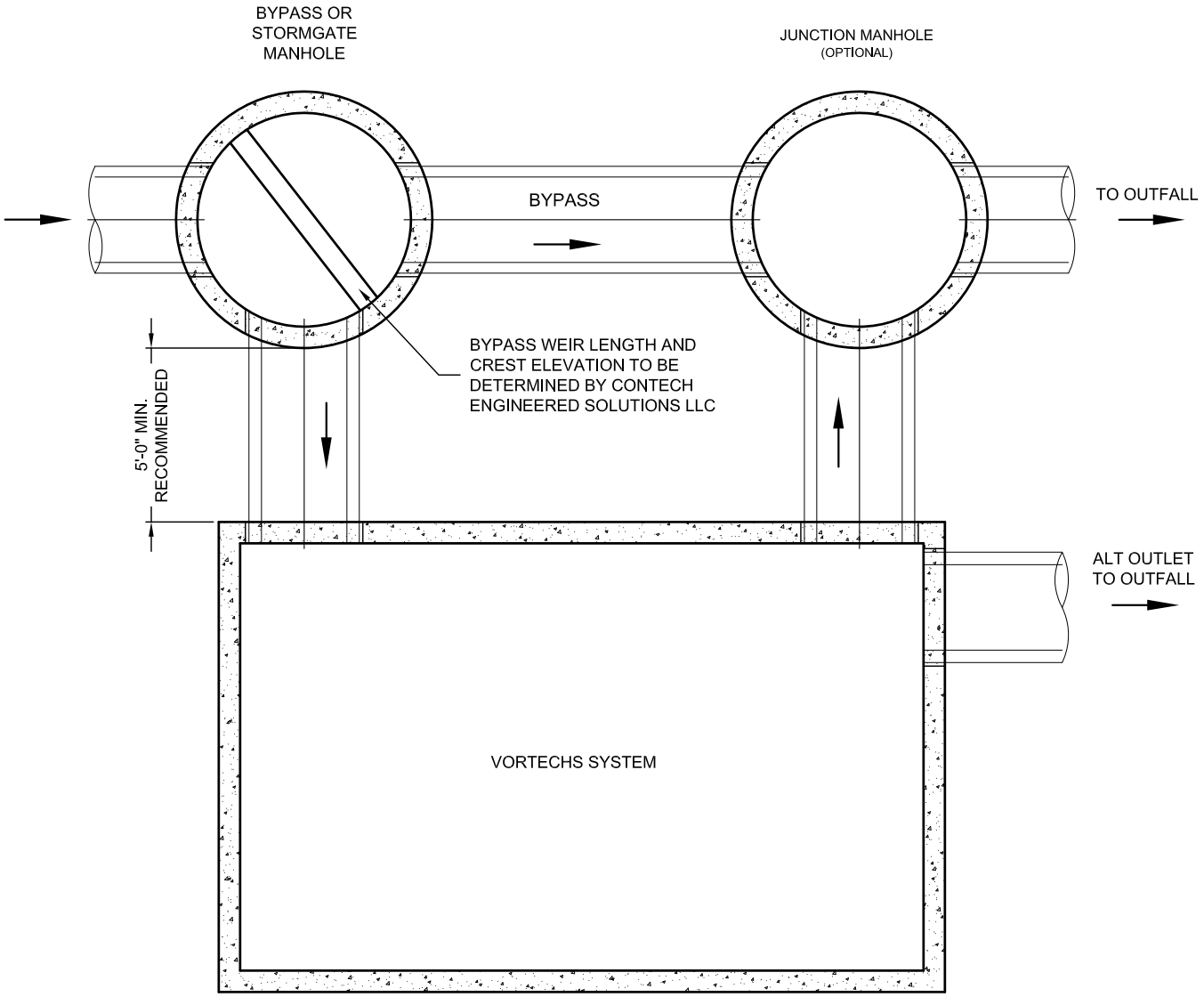
3 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa CDA, ON

4 - Based on Contech Construction Products laboratory verified removal of a TYPICAL particle size gradation (see Technical Bulletin #1).

5- Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by:	JAK	1/16	Checked by:

FOR INFORMATIONAL PURPOSES ONLY
NOT INTENDED AS A CONSTRUCTION DOCUMENT
- BYPASS AND JUNCTION STRUCTURES MAY OR MAY NOT BE SUPPLIED BY CONTECH -



ACTUAL ORIENTATION AND LAYOUT MAY VARY DUE TO
SITE SPECIFIC CONSIDERATIONS

Vortechs®

THIS PRODUCT MAY BE PROTECTED BY THE FOLLOWING
U.S. PATENT: 5,759,415; RELATED FOREIGN PATENTS.

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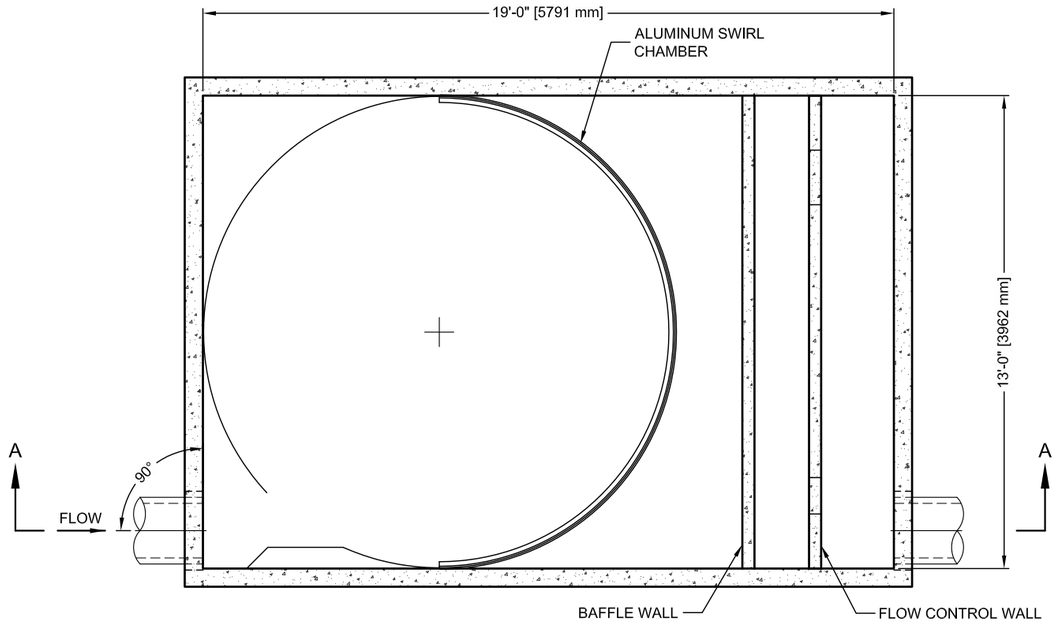
877-907-8676 207-885-9830 207-885-9825 FAX

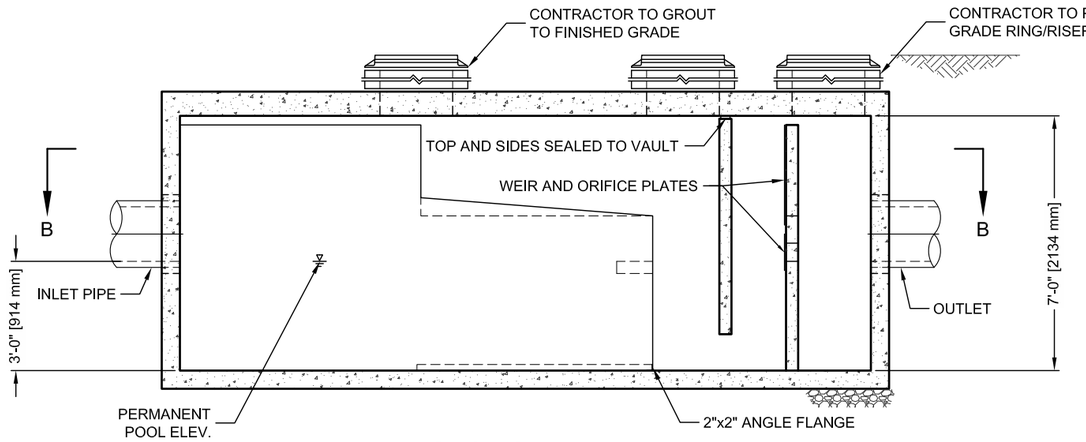
TYPICAL BYPASS LAYOUT
VORTECHS® STORMWATER TREATMENT SYSTEM

DATE: 3/8/13	SCALE: NONE	PROJECT No.: TYPVXBPLOR	SEQ. No.: N/A	DRAWN: SCF	CHECKED: NDG

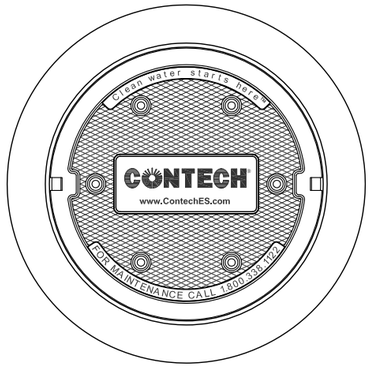
I:\COMMON\CAD\TREATMENT\20 VORTECHS\40 STANDARD DRAWINGS\SITY\PICAL DETAILS\TYPVXBPLOR.DWG 3/8/2013 3:11 PM



SECTION B-B



SECTION A-A



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

VORTECHS PC1319 DESIGN NOTES

VORTECHS PC1319 RATED TREATMENT CAPACITY IS 30 CFS, OR PER LOCAL REGULATIONS. IF THE SITE CONDITIONS EXCEED RATED TREATMENT CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD INLET/OUTLET CONFIGURATION IS SHOWN. FOR OTHER CONFIGURATION OPTIONS , PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (CFS)	*
PEAK FLOW RATE (CFS)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. VORTECHS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET AASHTO M306 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. INLET PIPE(S) MUST BE PERPEDICULAR TO THE VAULT AND AT THE CORNER TO INTRODUCE THE FLOW TANGENTIALLY TO THE SWIRL CHAMBER. DUAL INLETS NOT TO HAVE OPPOSING TANGENTIAL FLOW DIRECTIONS.
7. OUTLET PIPE(S) MUST BE DOWN STREAM OF THE FLOW CONTROL BAFFLE AND MAY BE LOCATED ON THE SIDE OR END OF THE VAULT. THE FLOW CONTROL WALL MAY BE TURNED TO ACCOMODATE OUTLET PIPE KNOCKOUTS ON THE SIDE OF THE VAULT.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE VORTECHS STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

Vortechs®

CONTECH® ENGINEERED SOLUTIONS LLC
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VORTECHS PC1319 STANDARD DETAIL

Appendix E

Burnett Municipal Drain Analysis

NOVATECH
Engineers, Planners & Landscape Architects

M E M O R A N D U M

DATE: **JUNE 10, 2016**

TO: **BOB DOWDELL, E.I.T. & EDSON DONNELLY, C.E.T.**

FROM: **CONRAD STANG, M.A.SC., P.ENG.**

RE: **SOUTH NEPEAN COLLECTOR CULVERT CROSSINGS**

CC: **MIKE PETEPIECE, P.ENG.**

This technical memorandum provides details on the sizing and location of the proposed access road culvert crossings which will be installed as part of Phase 2 of the South Nepean Collector (SNC). It is anticipated that the proposed culverts will remain in place until such time that the subject lands are developed. The location of the proposed culvert crossings and corresponding drainage areas are shown on the attached figure (DSK54):

- Culvert C1: Burnett Municipal Drain
- Culvert C2: Ditch draining Mion property west of K-B SWMF
- Culvert C3: Ditch adjacent the K-B SWMF

Design Criteria

The culverts are to convey the 10-year peak flows from their respective upstream drainage areas without overtopping the access road, as per Section 6.4.2 of the City of Ottawa Sewer Design Guidelines (October, 2012). For the 600mm culverts this corresponds to a Headwater / Depth (HW/D) of 1.5 (300mm cover), which corresponds to the maximum HW/D ratio as recommended by MTO. Excess flows will overtop the access road and graded back towards the downstream watercourse, as shown in the detail on the attached figure (DSK54).

Design Flows

The culvert crossings have been designed based on current City of Ottawa standards and rainfall data. Peak flows were estimated using the Visual Otthymo hydrologic model; modeling parameters and results are attached. The 12-hour SCS distribution generated the highest peak flows and was selected as the critical storm distribution for sizing the proposed culverts. Simulated peak flows at the proposed culvert crossings are provided in Table 1.

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Table 1: Simulated Peak Flows at Proposed Culvert Crossings

Culvert	Culvert Dimensions	Return Period (years)	Peak Flow (m^3/s)	HW/D (m)	Freeboard (m)
Culvert C1 Burnett Municipal Drain (29.27 ha)	3x 600mm Dia. CSP Culverts L = 8.0m S = 0.75% *Inv. = 91.10m	2-year	0.63	0.82	0.41
		5-year	1.10	1.13	0.22
		10-year	1.44	1.37	0.08
		25-year	1.90	1.65	0.09 Overtopping
		50-year	2.26	1.75	0.15 Overtopping
		100-year	2.66	1.84	0.20 Overtopping
Culvert C2 Mion/Pavic Ditch (5.11 ha)	1x 600mm Dia. CSP Culvert L = 8.0m S = 0.50% *Inv. = 92.30m	2-year	0.09	0.46	0.63
		5-year	0.16	0.64	0.51
		10-year	0.21	0.77	0.44
		25-year	0.28	0.93	0.34
		50-year	0.34	1.07	0.26
		100-year	0.40	1.21	0.17
Culvert C3 KB-SWMF Ditch (1.36 ha)	1x 1000mm Dia. CSP Culvert L = 12.0m S = 0.60% *Inv. = 92.35m	2-year	0.04	0.15	1.85
		5-year	0.07	0.20	1.80
		10-year	0.09	0.23	1.77
		25-year	0.12	0.26	1.74
		50-year	0.15	0.30	1.70
		100-year	0.17	0.32	1.68

**Inverts to be confirmed in the field.*

Culvert Crossings

The proposed culvert crossings were designed using Autodesk Hydraflow Express culvert sizing software – supporting calculations are attached. A summary of the proposed culvert crossings is provided below.

Culvert C1: Burnett Municipal Drain (3x 600mm CSP Culverts)

The Burnett Municipal Drain was established in the late 1960's after the passing of By-Law No. 107-68 (Township of Nepean). A copy of the Burnett Municipal Drain By-Law and October 16th, 1968 Engineers report is attached. Land use in the watershed has changed substantially since the adoption of the By-Law and a significant portion of the upstream drainage area has been redirected to the Kennedy-Burnett SWM Facility. It is anticipated that this drain will be abandoned in the near future as development proceeds within the remaining undeveloped areas south of Strandherd Drive.

The Burnett Municipal Drain is a trapezoidal channel with a 3m bottom width, 0.60m depth and side slopes ranging from 2:1 to 4:1. Based on Manning's equation, the Burnett Municipal Drain has a bankfull capacity of 3.88 m^3/s, which is sufficient to convey the 100-year peak flow from the current upstream drainage area (which is considerably smaller than the original drainage area from the 1968 Engineer's Report).

As per the 1968 by-law, an existing 900mm diameter CSP culvert was installed downstream of the proposed SNC crossing to provide access to the Kelvin Burnett property. The proposed crossing should therefore provide at least a similar flow capacity (approximately 900 L/s).

Based on current design standards, the proposed culvert crossing should be three (3) 600mm diameter CSP culverts, which will provide capacity for a 5-year return period flowing full and a 10-

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year return period without over topping the access road. Refer to the attached detailed calculations. Storm events greater than the 10-year return period will overtop the access road, but the grading will confine excess flows to the downstream ditch. The middle 600mm CSP culvert will be countersunk 0.10m.

Culvert C2: Mion Ditch (600mm CSP Culvert)

The west watercourse is an intermittent ditch that runs north-to-south through the Mion property. The ditch is a V-bottom ditch with a 0.30m depth and 3:1 / 6:1 side slopes. Based on Manning's equation, the capacity of the ditch is 0.23 m^3/s, which corresponds to a 10-year storm.

A 600mm diameter CSP culvert has capacity to convey storm events up-to and including the 100-year storm event (0.40 m^3/s) without overtopping the access road. Refer to the attached detailed calculations. The 600mm CSP culvert will be countersunk 0.10m.

Culvert C3: KB-SWMF Ditch (1000mm CSP Culvert)

The watercourse west of the KB-SWMF is a deep intermittent ditch that runs north-to-south adjacent the K-B SWMF. The ditch is a V-bottom ditch with a 2.0m depth and 2.5:1 side slopes. Based on Manning's equation, the capacity of the ditch is 21.06 m^3/s. The estimated 100-year peak flows from the 1.36 ha catchment are 0.17 m^3/s; therefore, the ditch has ample capacity to convey large peak flows.

Due to the dimensions of the ditch, a 1000mm diameter CSP culvert is recommended. The capacity of the culvert (HW/D=1.0) is 1.10 m^3/s. Flows should not overtop the culvert, but if they do they will spill into the KB-SWMF. Refer to the attached detailed calculations.

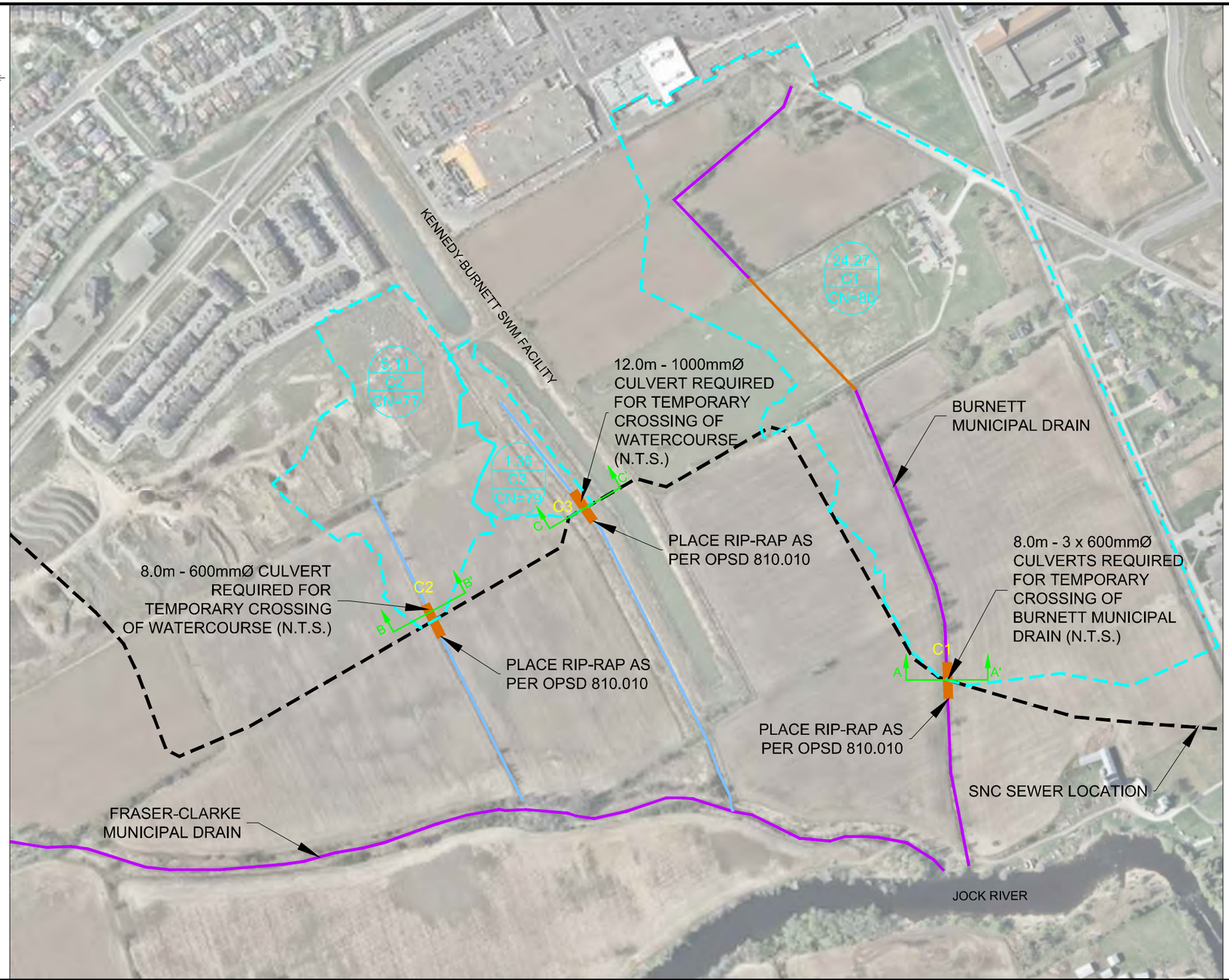
Access Road

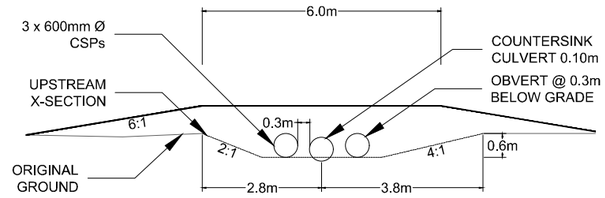
For culvert crossings C1 and C2, the 6.0m wide access road will be graded adjacent the culvert crossing in order to have two (2) 3.0m wide depressions, which will act as a weir for flows in excess of the culvert capacity. Refer to the cross-section detail on the attached Figure (DSK54).

Attachments:

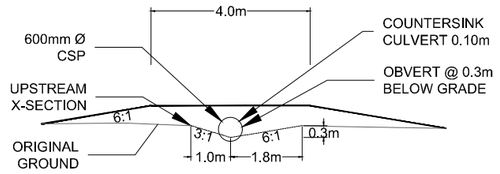
- Culvert Locations and Sizes (Figure DSK54)
- Visual Otthymo Modeling Parameters and Results
- Detailed Culvert and Ditch Calculations
- Burnett Municipal Drain By-Law

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

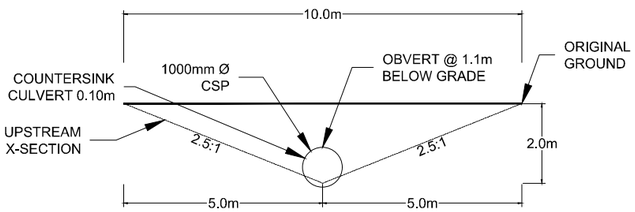




TEMPORARY CROSSING
CROSS SECTION A-A' (C1)
SCALE: 1:150



TEMPORARY CROSSING
CROSS SECTION B-B' (C2)
SCALE: 1:150



TEMPORARY CROSSING
CROSS SECTION C-C' (C3)
SCALE: 1:150

LEGEND

- CULVERT
- WATERCOURSE
- MUNICIPAL DRAIN
- PROPOSED ALIGNMENT OF THE SOUTH NEPEAN COLLECTOR (SNC)
- DRAINAGE AREA BOUNDARY

24.27 (CATCHMENT AREA (ha))
C1 (AREA ID)
CN=80 (RUNOFF CURVE NUMBER)

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

SOUTH NEPEAN COLLECTOR SEWER PHASE 2

REQUIRED CULVERT LOCATIONS AND SIZES

SCALE 1 : 5000 (0 50 100 150 200)
DATE JUN 2016 | JOB 115075 | FIGURE DSK54

South Nepean Collector Phase 2: Culvert Crossings
Existing Conditions Hydrologic Model Parameters and Results
115075

NOVATECH
Engineers, Planners & Landscape Architects

Time to Peak Calculations
(Uplands Overland Flow Method)

Area ID	Area (ha)	CN	Ia	Overland Flow						Concentrated Overland Flow						Channel Flow				Overall			
				Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Time of Concentration (min)	Time to Peak (min)	Time to Peak (min)	Time to Peak (hrs)
C1: Burnett MD	29.27	80	6.4	100	95.50	94.50	1.0%	0.28	5.95	150	94.50	92.75	1.2%	0.30	8.33	400	0.7%	0.38	18	32	21	21	0.36
C2: West Ditch	5.11	77	7.6	100	93.30	93.00	0.3%	0.15	11.11	125	93.00	92.75	0.2%	0.13	16.03	150	0.5%	0.32	8	35	23	23	0.39
C3: KB SWMF Ditch	1.36	79	6.8	50	93.35	93.15	0.4%	0.17	4.90	25	93.15	93.05	0.4%	0.16	2.60	150	0.6%	0.35	7	15	10	10	0.17

Ia = 0.10 x S

Model Results: 12-hour SCS Storm Distribution

Area ID	Peak Flow (m^3/s) (Return Period)					
	2-year	5-year	10-year	25-year	50-year	100-year
C1: Burnett MD	0.63	1.10	1.44	1.90	2.26	2.66
C2: West Ditch	0.09	0.16	0.21	0.28	0.34	0.40
C3: KB SWMF Ditch	0.04	0.07	0.09	0.12	0.15	0.17

Culvert Report

2-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 29 2016

C1: Burnett Municipal Drain Culvert Crossing (3x 600mm dia. CSP's)

Invert Elev Dn (m)	=	91.1000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0076
Invert Elev Up (m)	=	91.1006
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	3
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

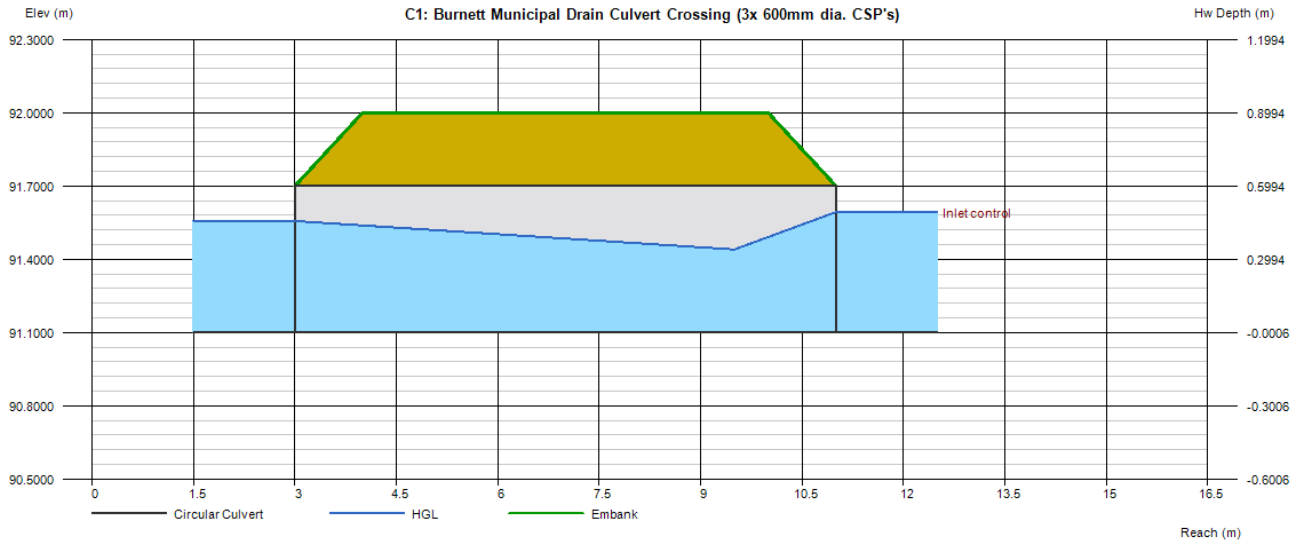
Top Elevation (m)	=	92.0000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	2.0000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.7000
Qpipe (cms)	=	0.7000
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	1.0109
Veloc Up (m/s)	=	1.5645
HGL Dn (m)	=	91.5565
HGL Up (m)	=	91.4135
Hw Elev (m)	=	91.5931
Hw/D (m)	=	0.8208
Flow Regime	=	Inlet Control



Culvert Report

5-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 29 2016

C1: Burnett Municipal Drain Culvert Crossing (3x 600mm dia. CSP's)

Invert Elev Dn (m)	=	91.1000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0076
Invert Elev Up (m)	=	91.1006
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	3
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

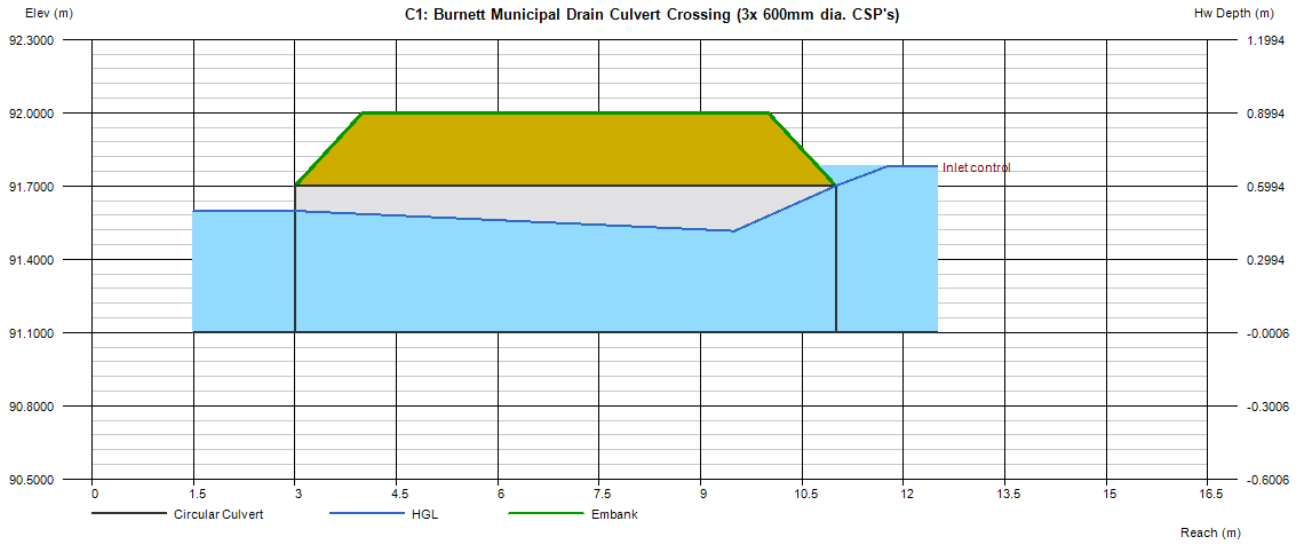
Top Elevation (m)	=	92.0000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	2.0000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	1.1000
Qpipe (cms)	=	1.1000
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	1.4614
Veloc Up (m/s)	=	1.8514
HGL Dn (m)	=	91.5981
HGL Up (m)	=	91.4967
Hw Elev (m)	=	91.7793
Hw/D (m)	=	1.1311
Flow Regime	=	Inlet Control



Culvert Report

10-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 29 2016

C1: Burnett Municipal Drain Culvert Crossing (3x 600mm dia. CSP's)

Invert Elev Dn (m)	=	91.1000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0076
Invert Elev Up (m)	=	91.1006
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	3
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

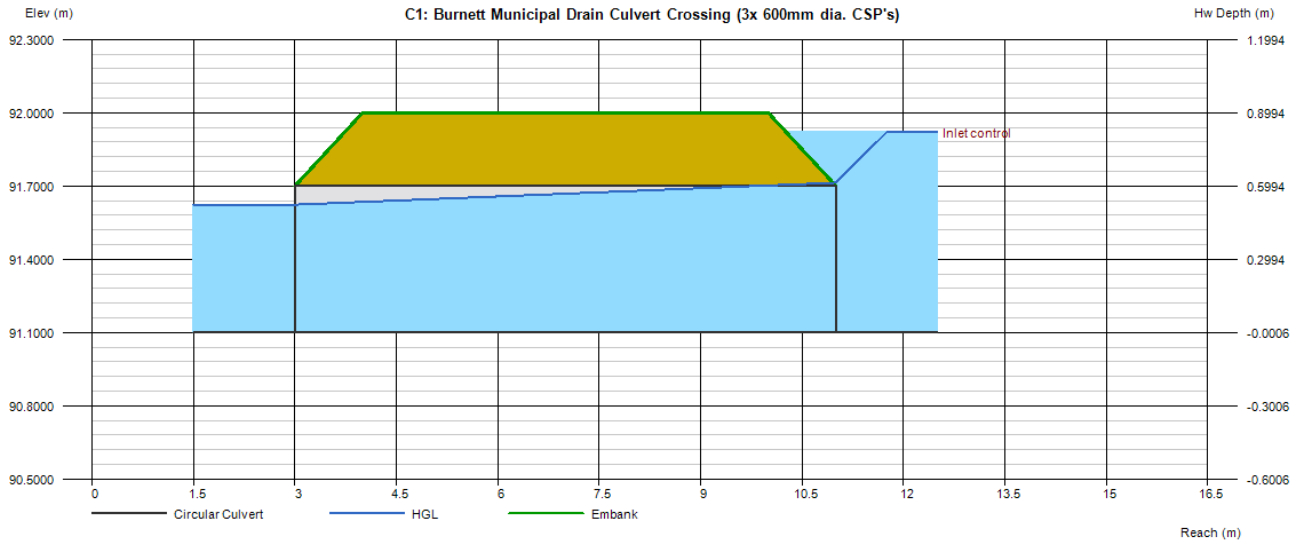
Top Elevation (m)	=	92.0000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	2.0000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	1.4000
Qpipe (cms)	=	1.4000
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	1.7823
Veloc Up (m/s)	=	1.6505
HGL Dn (m)	=	91.6237
HGL Up (m)	=	91.7136
Hw Elev (m)	=	91.9199
Hw/D (m)	=	1.3655
Flow Regime	=	Inlet Control



Culvert Report

25-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 29 2016

C1: Burnett Municipal Drain Culvert Crossing (3x 600mm dia. CSP's)

Invert Elev Dn (m)	=	91.1000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0076
Invert Elev Up (m)	=	91.1006
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	3
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

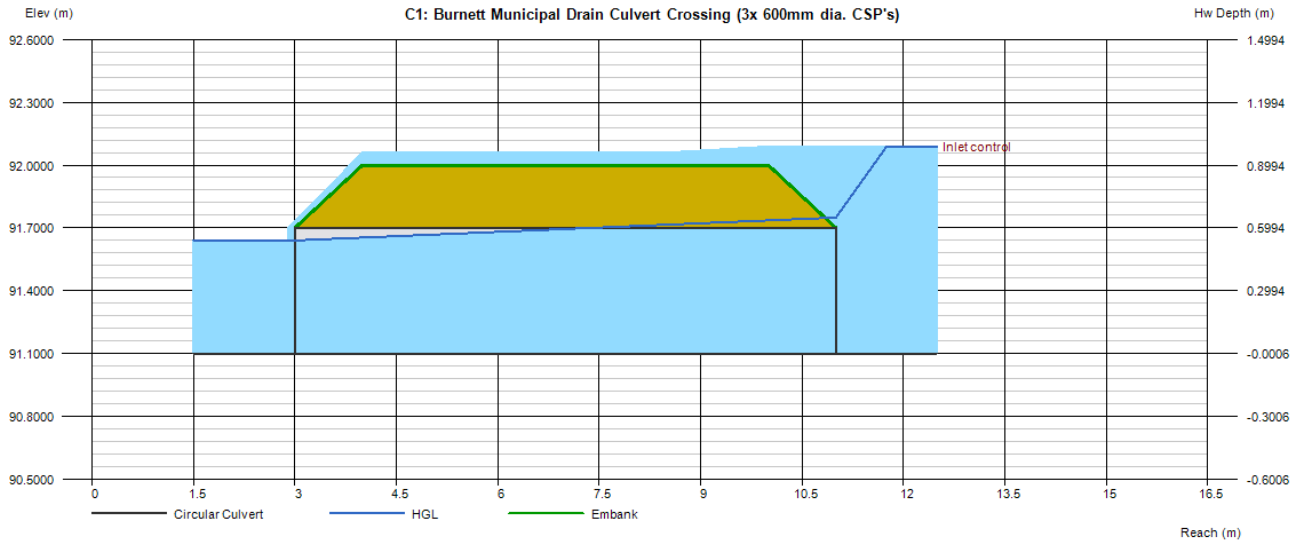
Top Elevation (m)	=	92.0000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	2.0000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	1.9000
Qpipe (cms)	=	1.6221
Qovertop (cms)	=	0.2779
Veloc Dn (m/s)	=	2.0174
Veloc Up (m/s)	=	1.9123
HGL Dn (m)	=	91.6400
HGL Up (m)	=	91.7494
Hw Elev (m)	=	92.0880
Hw/D (m)	=	1.6457
Flow Regime	=	Inlet Control



Culvert Report

50-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 29 2016

C1: Burnett Municipal Drain Culvert Crossing (3x 600mm dia. CSP's)

Invert Elev Dn (m)	=	91.1000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0076
Invert Elev Up (m)	=	91.1006
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	3
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

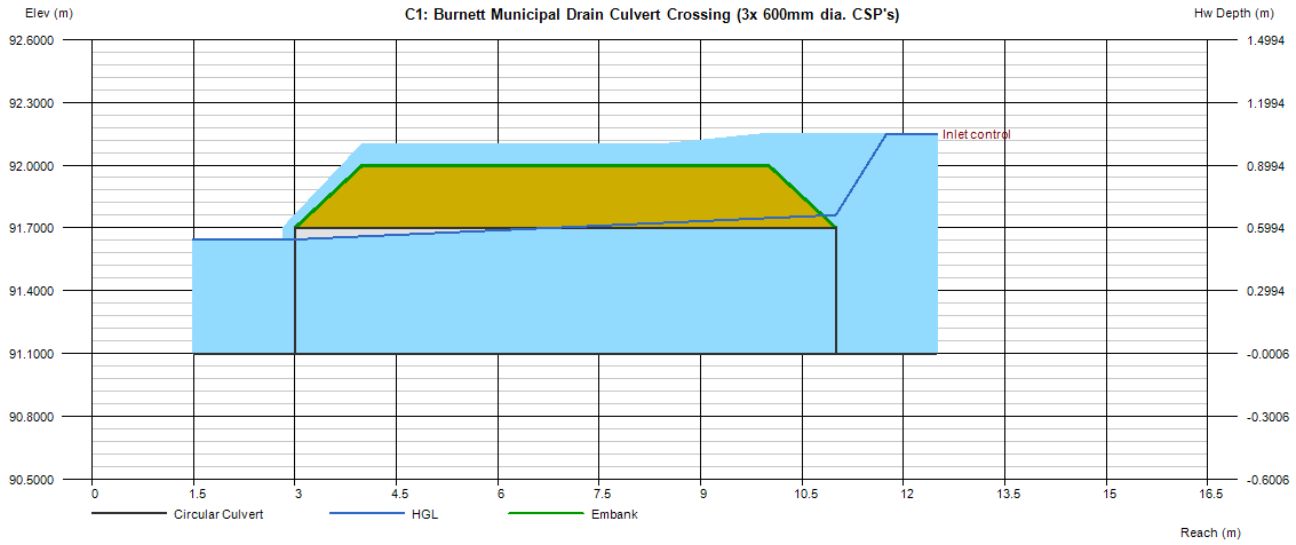
Top Elevation (m)	=	92.0000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	2.0000
Qmax (cms)	=	3.0000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	2.3000
Qpipe (cms)	=	1.6952
Qovertop (cms)	=	0.6048
Veloc Dn (m/s)	=	2.0950
Veloc Up (m/s)	=	1.9985
HGL Dn (m)	=	91.6448
HGL Up (m)	=	91.7612
Hw Elev (m)	=	92.1492
Hw/D (m)	=	1.7477
Flow Regime	=	Inlet Control



Culvert Report

100-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 29 2016

C1: Burnett Municipal Drain Culvert Crossing (3x 600mm dia. CSP's)

Invert Elev Dn (m)	=	91.1000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0076
Invert Elev Up (m)	=	91.1006
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	3
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

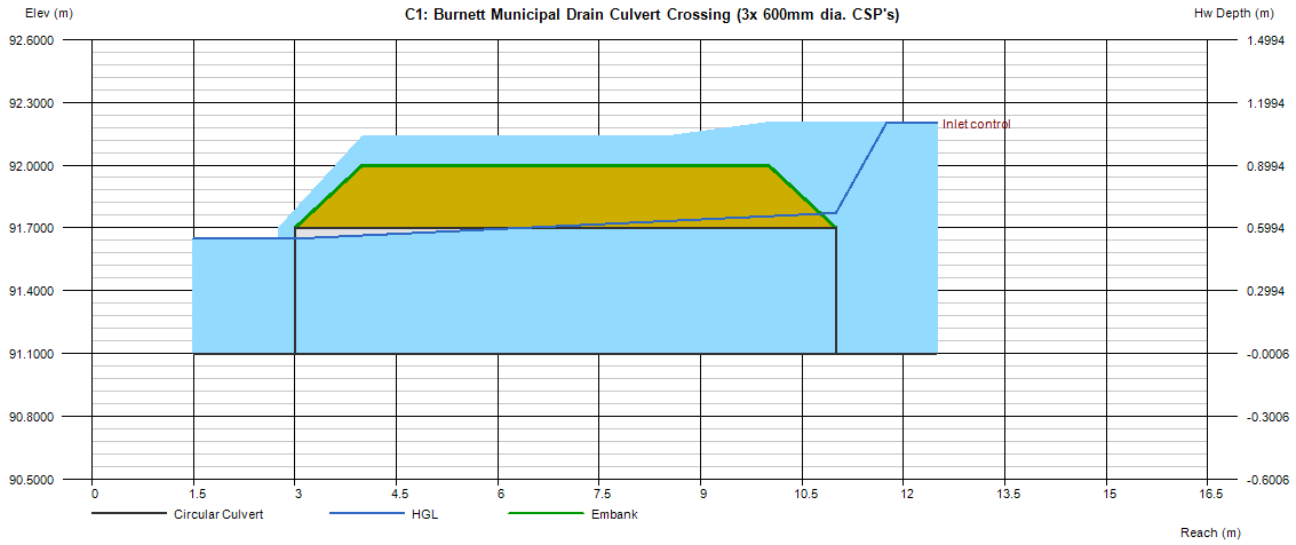
Top Elevation (m)	=	92.0000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	2.0000
Qmax (cms)	=	3.0000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	2.7000
Qpipe (cms)	=	1.7556
Qovertop (cms)	=	0.9444
Veloc Dn (m/s)	=	2.1591
Veloc Up (m/s)	=	2.0697
HGL Dn (m)	=	91.6486
HGL Up (m)	=	91.7709
Hw Elev (m)	=	92.2017
Hw/D (m)	=	1.8352
Flow Regime	=	Inlet Control



Culvert Report

2-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jun 9 2016

C2: West Ditch Culvert Crossing (600mm dia. CSP)

Invert Elev Dn (m)	=	92.3000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0049
Invert Elev Up (m)	=	92.3004
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	1
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

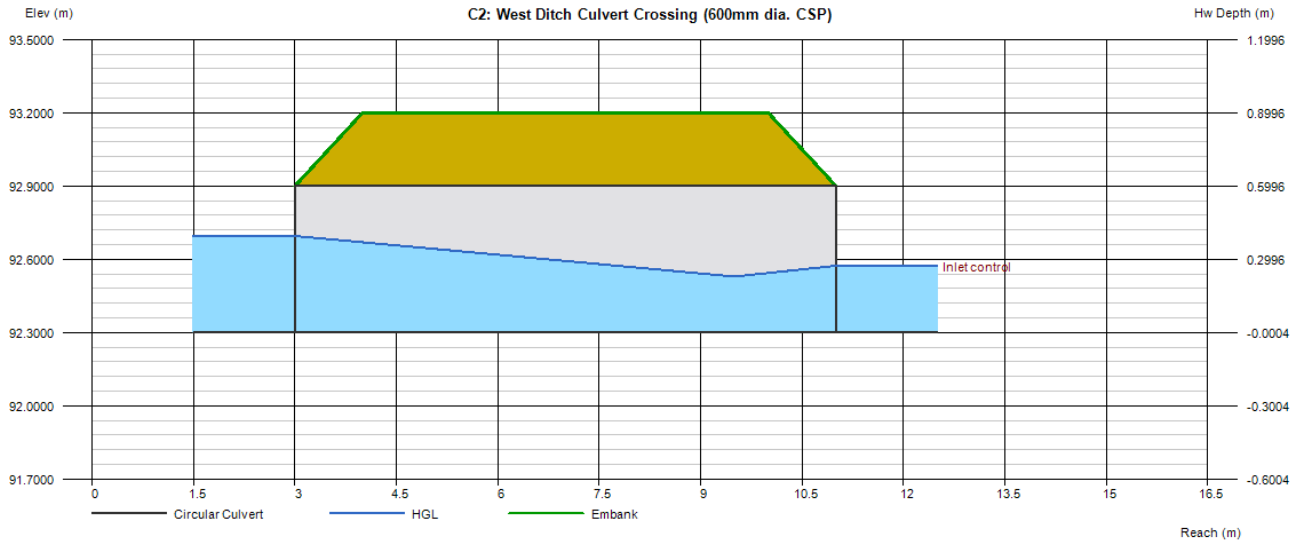
Top Elevation (m)	=	93.2000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.4000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.0900
Qpipe (cms)	=	0.0900
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.4555
Veloc Up (m/s)	=	1.1656
HGL Dn (m)	=	92.6953
HGL Up (m)	=	92.4910
Hw Elev (m)	=	92.5734
Hw/D (m)	=	0.4550
Flow Regime	=	Inlet Control



Culvert Report

5-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jun 9 2016

C2: West Ditch Culvert Crossing (600mm dia. CSP)

Invert Elev Dn (m)	=	92.3000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0049
Invert Elev Up (m)	=	92.3004
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	1
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

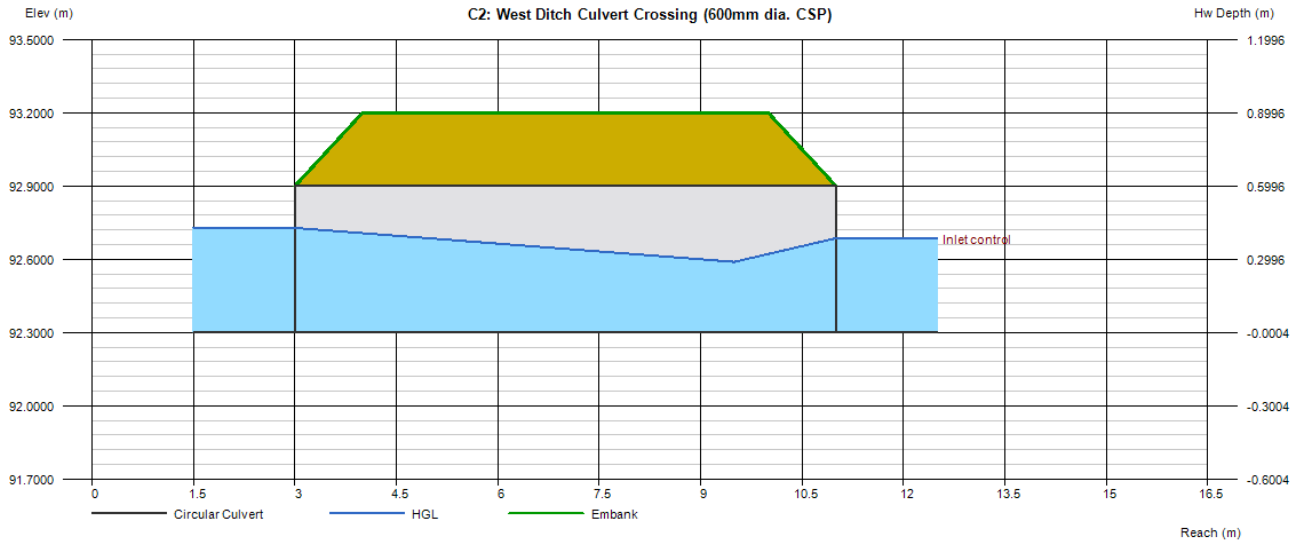
Top Elevation (m)	=	93.2000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.4000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.1600
Qpipe (cms)	=	0.1600
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.7407
Veloc Up (m/s)	=	1.3844
HGL Dn (m)	=	92.7284
HGL Up (m)	=	92.5573
Hw Elev (m)	=	92.6860
Hw/D (m)	=	0.6428
Flow Regime	=	Inlet Control



Culvert Report

10-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jun 9 2016

C2: West Ditch Culvert Crossing (600mm dia. CSP)

Invert Elev Dn (m)	=	92.3000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0049
Invert Elev Up (m)	=	92.3004
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	1
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

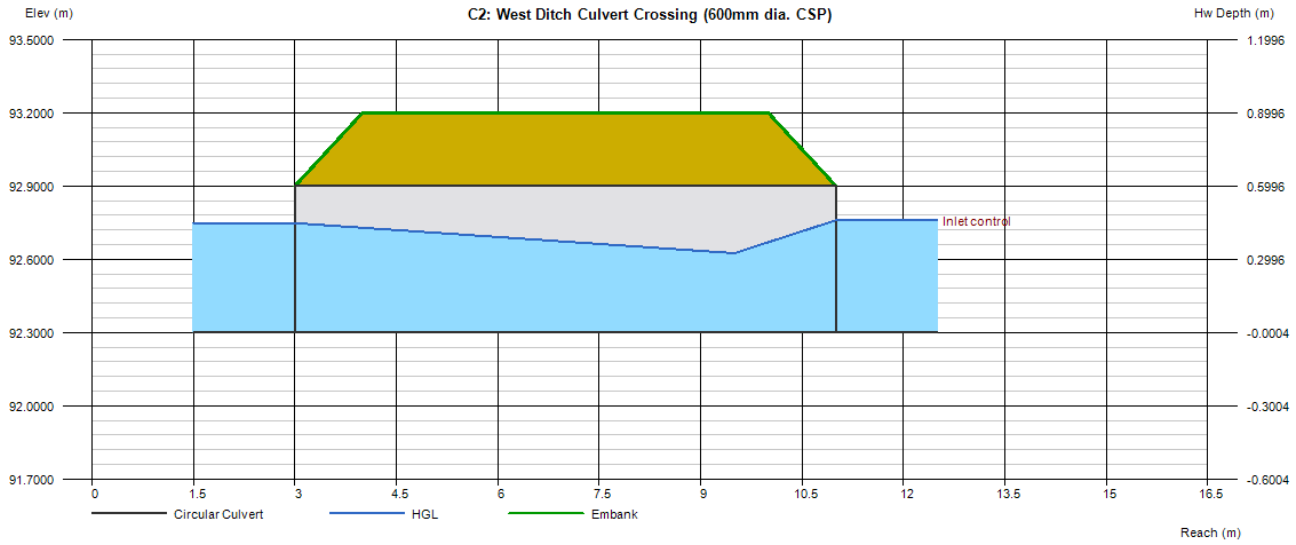
Top Elevation (m)	=	93.2000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.4000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.2100
Qpipe (cms)	=	0.2100
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.9273
Veloc Up (m/s)	=	1.5101
HGL Dn (m)	=	92.7481
HGL Up (m)	=	92.5966
Hw Elev (m)	=	92.7595
Hw/D (m)	=	0.7652
Flow Regime	=	Inlet Control



Culvert Report

25-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jun 9 2016

C2: West Ditch Culvert Crossing (600mm dia. CSP)

Invert Elev Dn (m)	=	92.3000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0049
Invert Elev Up (m)	=	92.3004
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	1
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

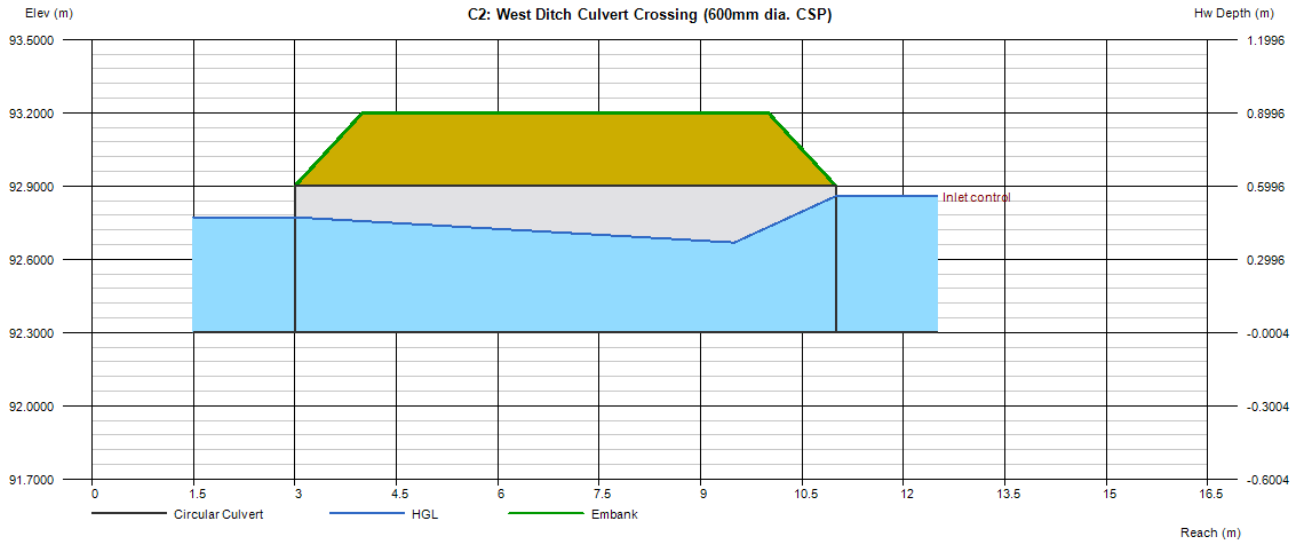
Top Elevation (m)	=	93.2000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.4000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.2800
Qpipe (cms)	=	0.2800
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	1.1731
Veloc Up (m/s)	=	1.6682
HGL Dn (m)	=	92.7722
HGL Up (m)	=	92.6447
Hw Elev (m)	=	92.8585
Hw/D (m)	=	0.9302
Flow Regime	=	Inlet Control



Culvert Report

50-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jun 9 2016

C2: West Ditch Culvert Crossing (600mm dia. CSP)

Invert Elev Dn (m)	=	92.3000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0049
Invert Elev Up (m)	=	92.3004
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	1
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

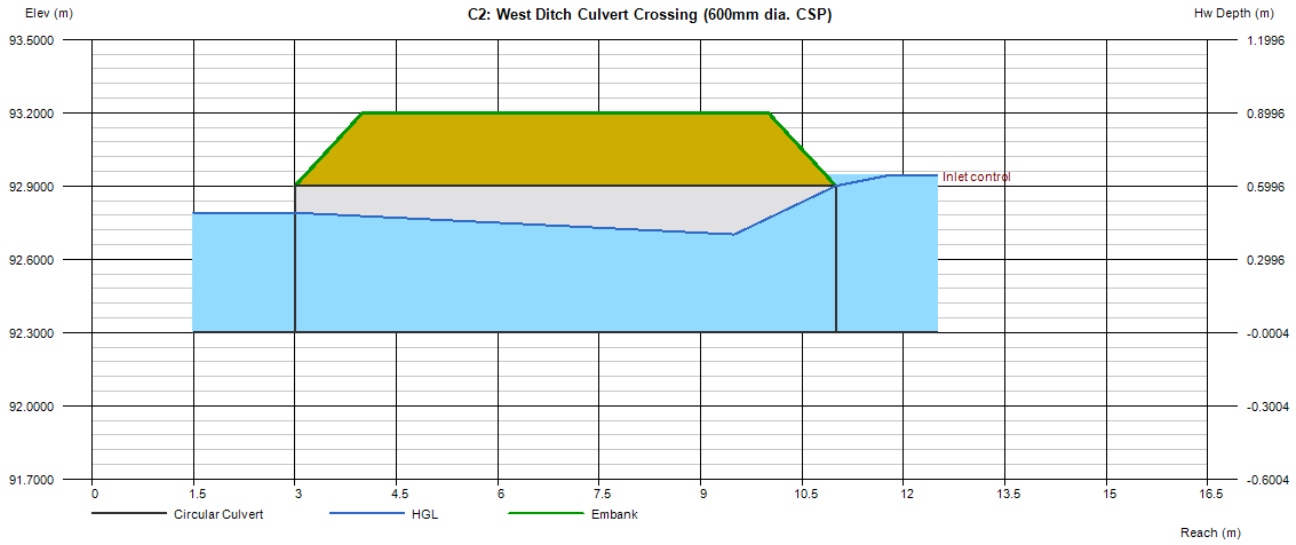
Top Elevation (m)	=	93.2000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.4000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.3400
Qpipe (cms)	=	0.3400
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	1.3741
Veloc Up (m/s)	=	1.7957
HGL Dn (m)	=	92.7905
HGL Up (m)	=	92.6813
Hw Elev (m)	=	92.9420
Hw/D (m)	=	1.0693
Flow Regime	=	Inlet Control



Culvert Report

100-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jun 9 2016

C2: West Ditch Culvert Crossing (600mm dia. CSP)

Invert Elev Dn (m)	=	92.3000
Pipe Length (m)	=	8.0000
Slope (%)	=	0.0049
Invert Elev Up (m)	=	92.3004
Rise (mm)	=	600.0
Shape	=	Circular
Span (mm)	=	600.0
No. Barrels	=	1
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

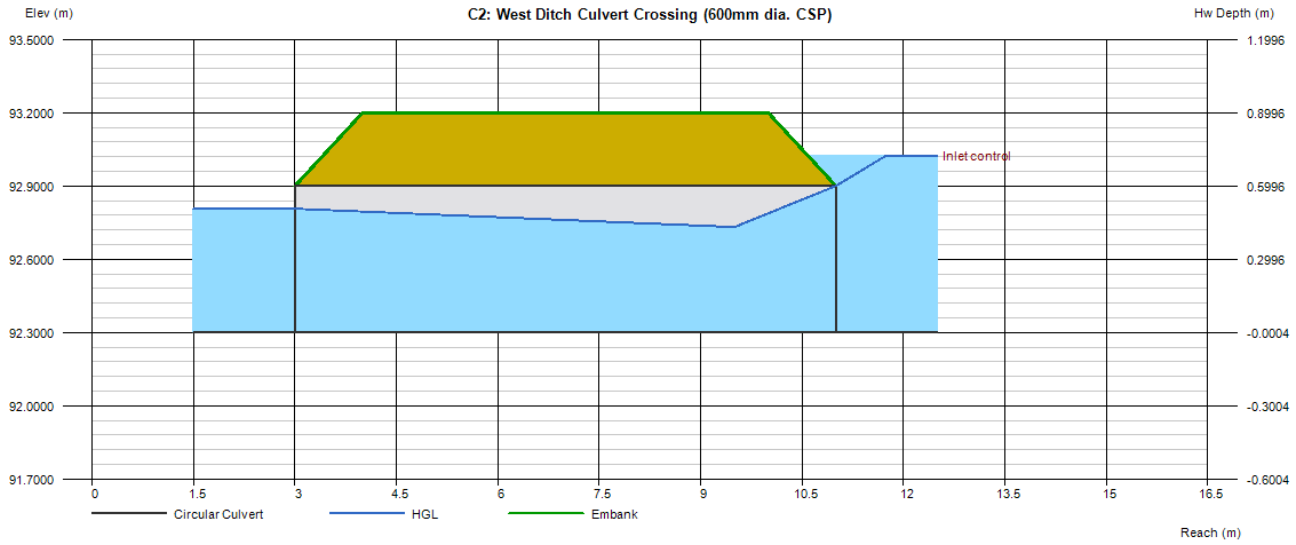
Top Elevation (m)	=	93.2000
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.4000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.4000
Qpipe (cms)	=	0.4000
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	1.5694
Veloc Up (m/s)	=	1.9217
HGL Dn (m)	=	92.8071
HGL Up (m)	=	92.7145
Hw Elev (m)	=	93.0256
Hw/D (m)	=	1.2087
Flow Regime	=	Inlet Control



Culvert Report

2-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2016

C3: KB SWMF Ditch Culvert Crossing (1000mm dia. CSP)

Invert Elev Dn (m)	=	92.3500
Pipe Length (m)	=	12.0000
Slope (%)	=	0.0058
Invert Elev Up (m)	=	92.3507
Rise (mm)	=	1000.0
Shape	=	Circular
Span (mm)	=	1000.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

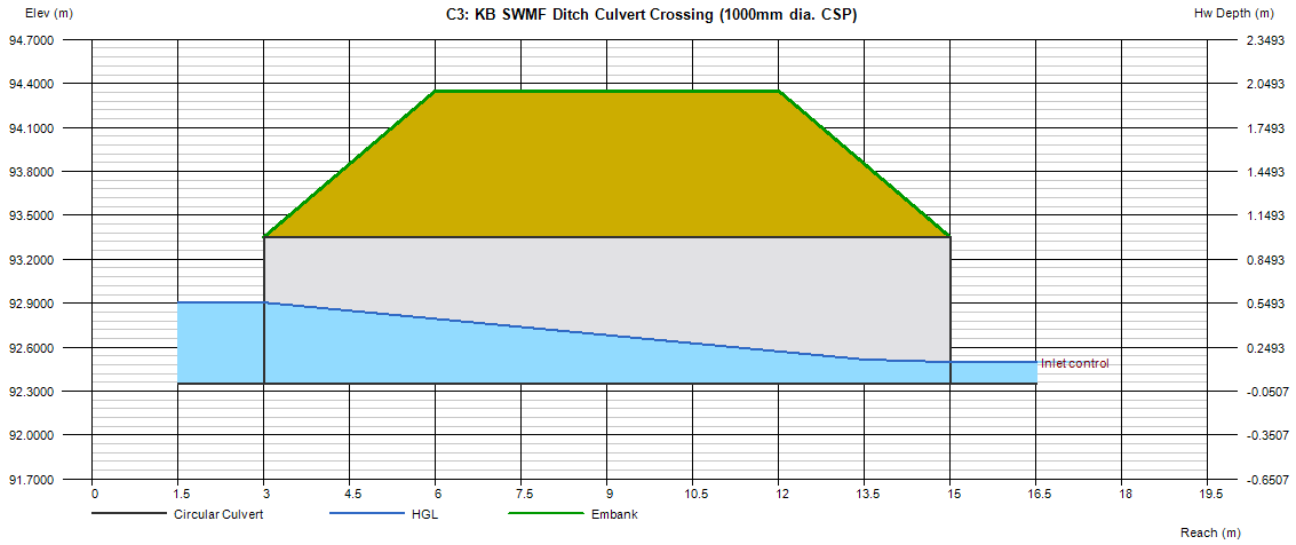
Top Elevation (m)	=	94.3500
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.2000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.0400
Qpipe (cms)	=	0.0400
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.0894
Veloc Up (m/s)	=	0.8567
HGL Dn (m)	=	92.9048
HGL Up (m)	=	92.4602
Hw Elev (m)	=	92.4986
Hw/D (m)	=	0.1479
Flow Regime	=	Inlet Control



Culvert Report

5-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2016

C3: KB SWMF Ditch Culvert Crossing (1000mm dia. CSP)

Invert Elev Dn (m)	=	92.3500
Pipe Length (m)	=	12.0000
Slope (%)	=	0.0058
Invert Elev Up (m)	=	92.3507
Rise (mm)	=	1000.0
Shape	=	Circular
Span (mm)	=	1000.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

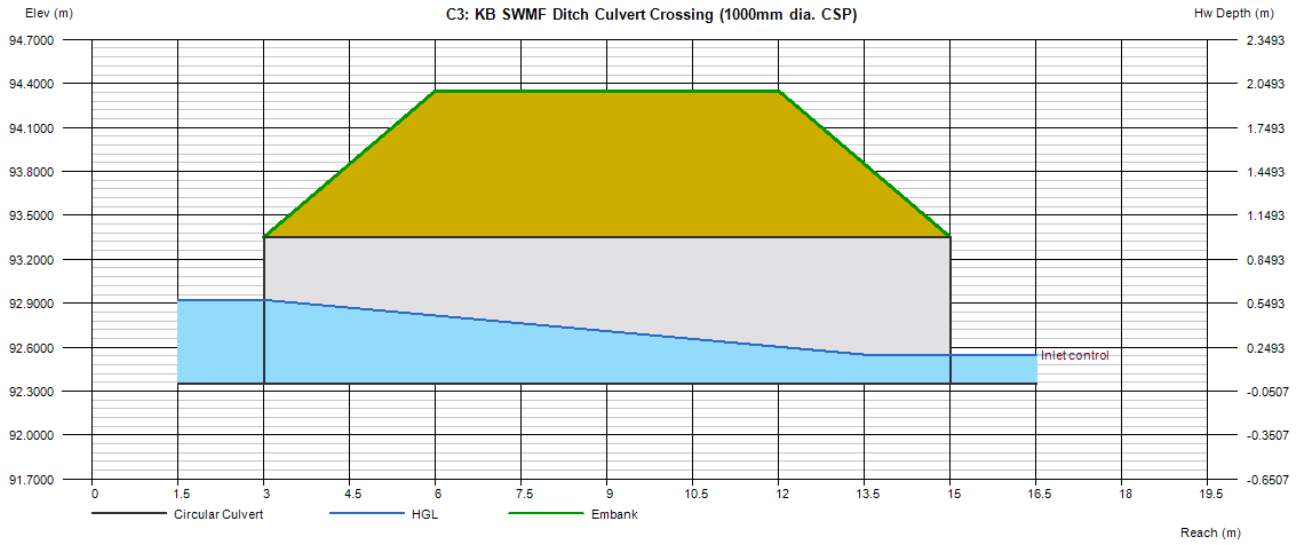
Top Elevation (m)	=	94.3500
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.2000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.0700
Qpipe (cms)	=	0.0700
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.1505
Veloc Up (m/s)	=	0.9911
HGL Dn (m)	=	92.9227
HGL Up (m)	=	92.4961
Hw Elev (m)	=	92.5484
Hw/D (m)	=	0.1977
Flow Regime	=	Inlet Control



Culvert Report

10-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2016

C3: KB SWMF Ditch Culvert Crossing (1000mm dia. CSP)

Invert Elev Dn (m)	=	92.3500
Pipe Length (m)	=	12.0000
Slope (%)	=	0.0058
Invert Elev Up (m)	=	92.3507
Rise (mm)	=	1000.0
Shape	=	Circular
Span (mm)	=	1000.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

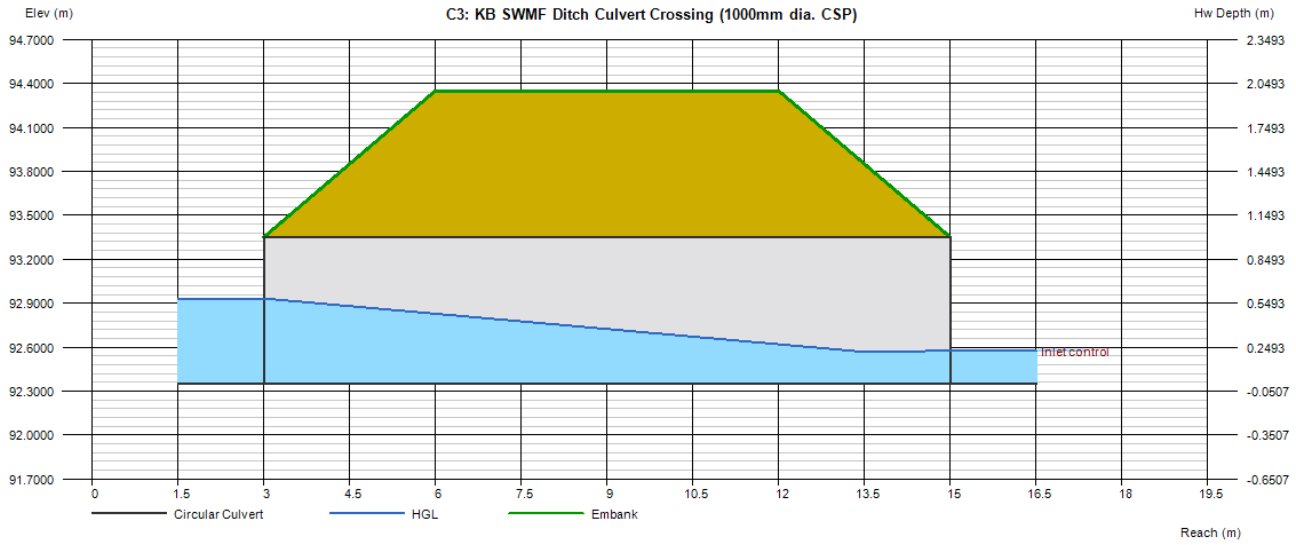
Top Elevation (m)	=	94.3500
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.2000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.0900
Qpipe (cms)	=	0.0900
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.1895
Veloc Up (m/s)	=	1.0598
HGL Dn (m)	=	92.9326
HGL Up (m)	=	92.5159
Hw Elev (m)	=	92.5763
Hw/D (m)	=	0.2256
Flow Regime	=	Inlet Control



Culvert Report

25-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2016

C3: KB SWMF Ditch Culvert Crossing (1000mm dia. CSP)

Invert Elev Dn (m)	=	92.3500
Pipe Length (m)	=	12.0000
Slope (%)	=	0.0058
Invert Elev Up (m)	=	92.3507
Rise (mm)	=	1000.0
Shape	=	Circular
Span (mm)	=	1000.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

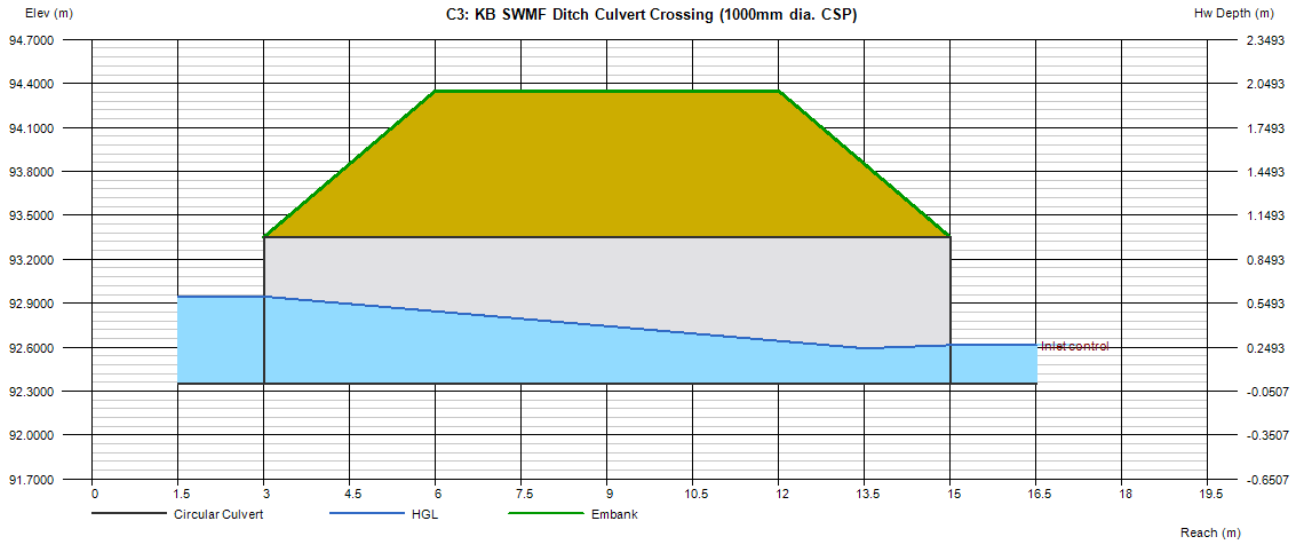
Top Elevation (m)	=	94.3500
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.2000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.1200
Qpipe (cms)	=	0.1200
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.2461
Veloc Up (m/s)	=	1.1449
HGL Dn (m)	=	92.9456
HGL Up (m)	=	92.5419
Hw Elev (m)	=	92.6136
Hw/D (m)	=	0.2629
Flow Regime	=	Inlet Control



Culvert Report

50-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2016

C3: KB SWMF Ditch Culvert Crossing (1000mm dia. CSP)

Invert Elev Dn (m)	=	92.3500
Pipe Length (m)	=	12.0000
Slope (%)	=	0.0058
Invert Elev Up (m)	=	92.3507
Rise (mm)	=	1000.0
Shape	=	Circular
Span (mm)	=	1000.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

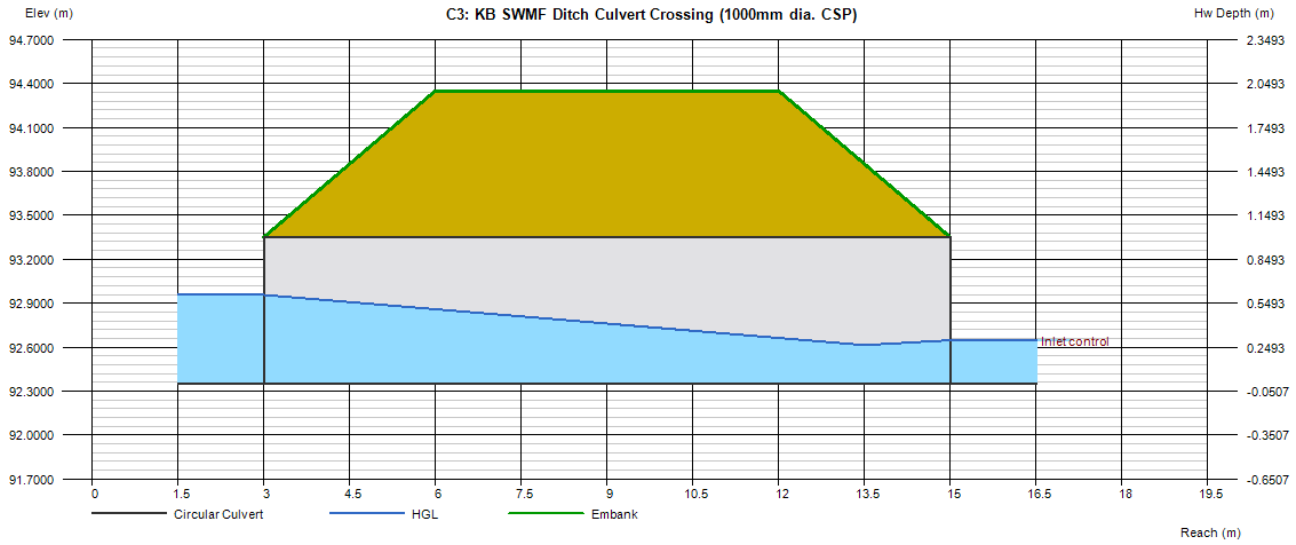
Top Elevation (m)	=	94.3500
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.2000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.1500
Qpipe (cms)	=	0.1500
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.3006
Veloc Up (m/s)	=	1.2156
HGL Dn (m)	=	92.9571
HGL Up (m)	=	92.5650
Hw Elev (m)	=	92.6472
Hw/D (m)	=	0.2965
Flow Regime	=	Inlet Control



Culvert Report

100-year 12-hour SCS Storm

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2016

C3: KB SWMF Ditch Culvert Crossing (1000mm dia. CSP)

Invert Elev Dn (m)	=	92.3500
Pipe Length (m)	=	12.0000
Slope (%)	=	0.0058
Invert Elev Up (m)	=	92.3507
Rise (mm)	=	1000.0
Shape	=	Circular
Span (mm)	=	1000.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

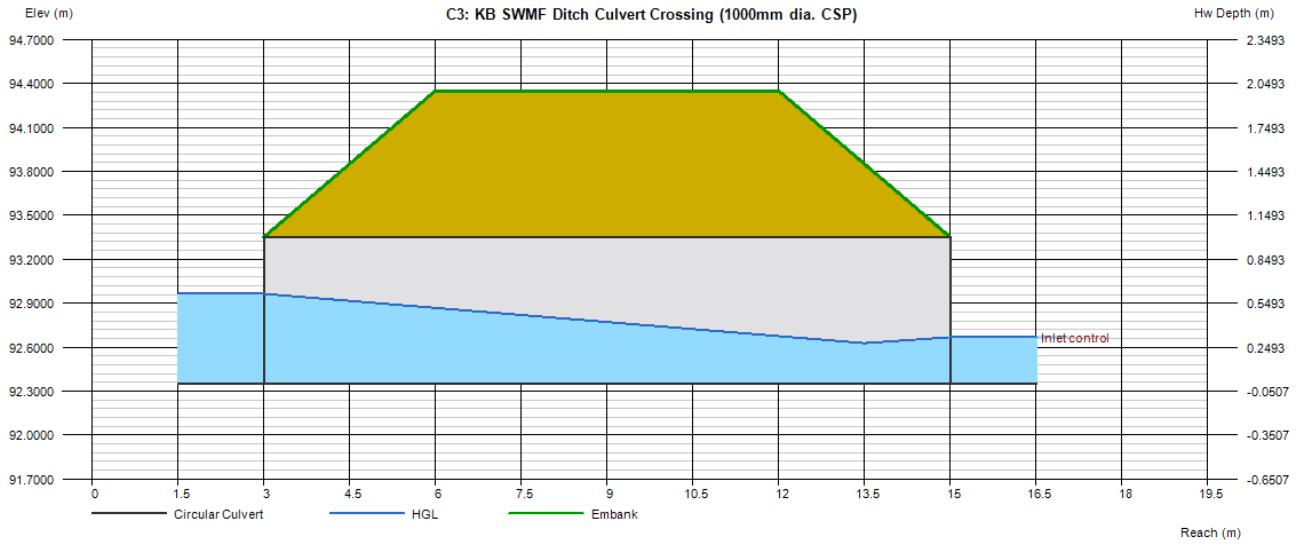
Top Elevation (m)	=	94.3500
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	0.2000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.1700
Qpipe (cms)	=	0.1700
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.3360
Veloc Up (m/s)	=	1.2582
HGL Dn (m)	=	92.9642
HGL Up (m)	=	92.5791
Hw Elev (m)	=	92.6682
Hw/D (m)	=	0.3175
Flow Regime	=	Inlet Control



Culvert Report

Full Flow Capacity (HW/D = 1.0)

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2016

C3: KB SWMF Ditch Culvert Crossing (1000mm dia. CSP)

Invert Elev Dn (m)	=	92.3500
Pipe Length (m)	=	12.0000
Slope (%)	=	0.0058
Invert Elev Up (m)	=	92.3507
Rise (mm)	=	1000.0
Shape	=	Circular
Span (mm)	=	1000.0
No. Barrels	=	1
n-Value	=	0.020
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

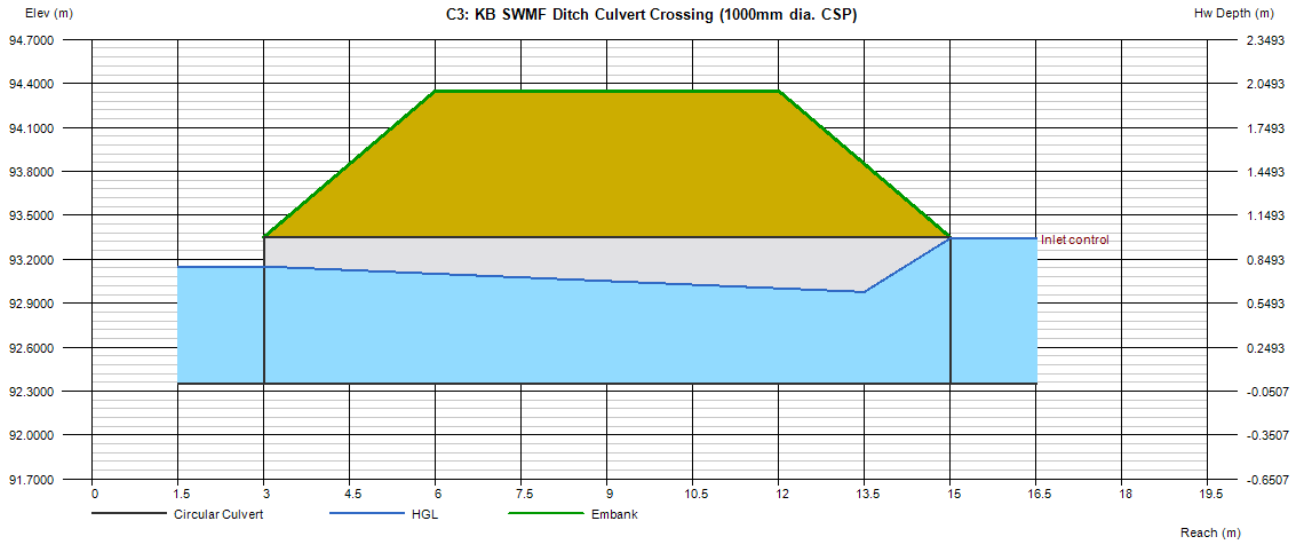
Top Elevation (m)	=	94.3500
Top Width (m)	=	6.0000
Crest Width (m)	=	6.0000

Calculations

Qmin (cms)	=	0.0000
Qmax (cms)	=	1.3000
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	1.1000
Qpipe (cms)	=	1.1000
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	1.6315
Veloc Up (m/s)	=	2.2284
HGL Dn (m)	=	93.1508
HGL Up (m)	=	92.9523
Hw Elev (m)	=	93.3430
Hw/D (m)	=	0.9923
Flow Regime	=	Inlet Control



South Nepean Collector Phase 2: Culvert Crossings
Ditch Capacities (Manning's Equation)

NOVATECH
Engineers, Planners & Landscape Architects

C1: Burnett Municipal Drain		
Parameter	**Units**	**Value**
Depth	m	0.60
Bottom Width	m	3.00
Side slope (L)	1 to X	2.0
Side slope (R)	1 to X	4.0
Top Width (L)	m	1.20
Top Width (R)	m	2.40
Area	m^2	2.880
Perimeter	m	6.82
R=A/P	m	0.42
n		0.035
Slope	m/m	0.007
Q_{max}	m^3/s	3.877
V_{max}	m/s	1.346

Trapezoidal Channel (different side slopes)

C2: West Ditch		
Parameter	**Units**	**Value**
Depth	m	0.30
Side slope (L)	1 to X	3.0
Side slope (R)	1 to X	6.0
Top Width (L)	m	0.90
Top Width (R)	m	1.80
Area	m^2	0.405
Perimeter	m	2.77
R=A/P	m	0.15
n		0.035
Slope	m/m	0.005
Q_{max}	m^3/s	0.227
V_{max}	m/s	0.560

V-bottom ditch (different side slopes)

C3: KB SWMF Ditch		
Parameter	**Units**	**Value**
Depth	m	2.00
Side slope (L)	1 to X	2.5
Side slope (R)	1 to X	2.5
Top Width (L)	m	5.00
Top Width (R)	m	5.00
Area	m^2	10.000
Perimeter	m	10.77
R=A/P	m	0.93
n		0.035
Slope	m/m	0.006
Q_{max}	m^3/s	21.063
V_{max}	m/s	2.106

V-bottom ditch (same side slopes)

CORPORATION OF THE TOWNSHIP OF NEPEAN

By-Law No. 107-68

(The Drainage Act, 1962-63, Section 27, Form 4)

A By-law to provide for Drainage Work in the Township of Nepean, in the County of Carleton and for borrowing on the credit of the Municipality the sum of Five Thousand, Six Hundred and Thirty-Three ($5,633.00) Dollars, for completing the same.

- - - - - - -

WHEREAS the requisite number of owners, as shown by the last revised Assessment Roll, of the property hereinafter set forth requiring drainage have petitioned the Council of the said Township of Nepean praying that the following lands and roads may be drained by a drainage works.

Plan and Profile:

The accompanying plan, profile and specifications dated October 16th, 1968 are to form a part of this report. The plan will show the area of the watershed, and the drain. The profile and specifications will show the extent of work, the bench marks, grades and disposal of materials, etc.

Recommendation:

It is our recommendation that this drain be reconstructed from station 0 + 00 to station 15 + 31 where it enters the present road ditch. At this location the present road ditch will carry the water to the south side of the forced road where construction is to continue from station 19 + 98. The drain then flows east to the present railway culvert which is of sufficient size and the drain has been designed to flow through it at its present elevation. From this location the drain still flows easterly to the Township Road between lots 15 and 16, Concession 3 at station 43 + 70. The present culvert through this road is to be lowered to the designed grade for this location and from here the drain flows east to its outlet in the Jock River at station 86 + 25.

AND WHEREAS the Council has procured a report made by Alex J. Graham, C.E., hereto attached and marked Schedule "C" of By-Law No. 107-68.

AND WHEREAS the Council is of opinion that the drainage of the area described is desirable:

THEREFORE the Council of the Township of Nepean pursuant to The Drainage Act, 1962-63, enacts as follows:

1. The report is hereby adopted, and the drainage works as therein indicated and set forth are hereby authorized and shall be completed in accordance therewith.

2. The Corporation of the Township of Nepean may borrow on the credit of the Corporation the sum of $5,633.00, being the funds necessary for the drainage works, not otherwise provided for, provided that such sum shall be reduced by the amount of grants and commuted payments with respect to the land and roads assessed, and may issue Debentures of the Corporation to that amount in sums of not less than Fifty Dollars each, and payable within ten years from the date of the said Debentures, with interest at the rate of 8 per centum per annum, that is to say annually with coupons.

3. For paying the sum of $2,914.65 the amount charged against such lands and roads for benefit, and the sum of $2,718.35 the amount charged against such lands and roads for outlet liability, and the sum of $Nil the amount charged against such lands and roads for injuring liability, and the sum of Nil the amount charged against lands and roads for improvement, apart from lands and roads belonging to or controlled by the Municipality, and for covering interest thereon for ten years at the rate of 8 per centum per annum, the following total special rates, over and above all other rates, shall be assessed, levied, and collected (in the same manner and at the same time as other taxes are levied and collected) upon and from the undermentioned parcels of land and parts of parcels and roads, and the amount of the total special rates and interest against each parcel or part of parcel respectively shall be divided into ten equal parts and one such part shall be assessed, levied and collected as aforesaid, in each year, for ten years after the passing of this by-law during which the Debentures have to run, provided that no greater amount shall be levied than is required after taking into account and crediting the amount of grants under subsection 3 of section 64 of The Drainage Act, 1962-63, the amount of moneys paid under a by-law passed under subsection 4 of section 40 of that Act and commuted payments with respect to lands and roads assessed.

4. For paying the sum of$590.43 the amount assessed against such roads and lands of the Municipality, and for covering interest thereon for ten years at the rate of 8 per cent per annum, a special rate, sufficient to produce the required yearly amount therefor, shall, over and above all other rates, be levied and collected (in the same manner and at the same time as other taxes are levied and collected) upon and from the whole rateable property in the Township of Nepean in each year for ten years, after the passing of this by-law, during which the Debentures have to run.

5. This by-law comes into force on the passing thereof and may be cited as the "Burnett Municipal Drain By-Law".

First Reading December 9th, 1968.

Second Reading December 9th, 1968.

Third Reading January 6th, 1969.

Enacted this 6th day of January, 1969.

D. A. Moodie Reeve

D. B. Robbs Clerk

TOWNSHIP OF NEPEAN

BURNETT MUNICIPAL DRAIN

SCHEDULE OF ASSESSMENT

No.	Lot	Name	Acreage Assessed	Main Drain Benefit	Main Drain Outlet	Total	Estimated Grant	Balance Payable	To Cover Interest For 10 yrs. at 8%	Total Special Rate	Annual Assessment During Each Year For 10 years
S½	Lot 19	Don Fraser	19		198.18	198.18	132.13	66.05	32.36	98.41	9.84
N½ S. pt.	Lot 18	Lorne Burnett	43	549.77	517.25	1,067.02	711.31	355.71	174.29	530.00	53.00
S Pt.	Lot 18	Robert Mowat	6		74.28	74.28	49.54	24.74	12.13	36.87	3.69
Pt. W3/4 N½	Lot 17	Mrs. E. Monk	8	96.25	99.84	196.09	130.72	65.37	30.05	97.42	9.74
Pt. W3/4 N½	Lot 17	Sala & Riccivto	11	76.23	136.18	212.41	141.62	70.79	34.69	105.48	10.55
S½	Lot 17	Carl Fraser	20	160.93	149.37	310.50	206.99	103.51	50.72	154.23	15.42
N1/3 & Pt S2/3	L16	Patrick Moloughney	15	249.10	223.80	472.90	315.27	157.63	77.24	234.87	23.49
S2/3 Less 30ac	L16	Fergus Houlahan	49	381.15	492.36	873.51	582.30	291.21	142.69	433.90	43.39
E2/3 N½	Lot 15	Carl Fraser	19	204.05	107.16	311.21	207.47	103.74	50.83	154.57	15.46
S½	Lot 15	Wm. Clark	18	204.05	73.98	278.03	185.35	92.68	45.41	138.09	13.81
Pt.E7/15 N3/8	L.14	Mrs. H. Houlahan	16	233.70	50.72	284.42	189.63	94.79	46.45	141.24	14.12
S. 5/8	Lot 14	John Houlahan	13	294.52	34.71	329.23	219.49	109.74	53.77	163.51	16.35
Pt. E.½	Lot 13	Kelvin Burnett	9	208.10	--	208.10	138.76	69.34	33.98	103.32	10.33
Forced Road in Concession 3			--	122.82	254.64	377.36	--	--	--	--	--
Township Road Between Lots 15 & 16			--	76.23	136.94	213.07	--	--	--	--	--
Canadian National Railways			--	57.75	168.94	226.69	--	--	--	--	--
		Totals		$2,914.65	$2,718.35	$5,633.00	$3,210.58	$1,605.30	$784.71	$2,391.91	$239.19

ENGINEER'S REPORT

BURNETT MUNICIPAL DRAIN

TOWNSHIP OF NEPEAN

Graham, Berman and Associates Ltd.,
Consulting Engineers,
Ottawa 8, Ontario.

October 16th, 1968.

Schedule "C" By-Law 107-68

October 16th, 1968.

The Reeve and Members of Council,
Township of Nepean,
3895 Richmond Road,
Ottawa 6, Ontario.

Gentlemen:

In answer to the prayer of a petition of over half the property owners concerned, requesting that the Burnett Award Ditch be re-constructed to relieve the present flooding conditions and provide adequate outlet for tile drains. This drain is to be reconstructed under section 3 of the Drainage Act 1962-63 and by reason of a motion passed in Council, I have caused a survey to be made, prepared plan, profile and schedule of assessment, and beg to report as follows:

The drainage works shall be known as the Burnett Municipal Drain.

Plan and Profile:

The accompanying plan, profile and specifications dated October 16th, 1968 are to form a part of this report. The plan will show the area of the watershed, and the drain. The profile and specifications will show the extent of work, the bench marks, grades and disposal of materials, etc.

Recommendation:

It is our recommendation that this drain be reconstructed from station 0 + 00 to station 15 + 31 where it enters the present road ditch. At this location the present road ditch will carry the water to the south side of the forced road where construction is to continue from station 19 + 98. The drain then flows east to the present railway culvert which is of sufficient size and the drain has been designed to flow through it at its present elevation. From this location the drain still flows easterly to the Township Road between lots 15 and 16, Concession 3 at station 43 + 70. The present culvert through this road is to be lowered to the designed grade for this location and from here the drain flows east to its outlet in the Jack River at station 86 + 25.

Farm Crossings:

A Severance Allowance is made in this report under Section 8 (6) of the Drainage Act 1962-63, culvert dimensions are stated in the following Schedule of Allowance.

Township of Nepean:

Concession 3:

N½	Lot 18	Lorne Burnett	1-24"Ø x 16' x 16 gauge CMP	$81.52
S½	Lot 18	Lorne Burnett	1-24"Ø x 16' x 16 gauge CMP	81.52
Pt.W3/4 N½	Lot 17	Mrs. E. Monk	1-24"Ø x 16' x 16 gauge CMP	81.52
W3/4 N½	Lot 17	Dale & Macalvie	1-24"Ø x 16' x 16 gauge CMP	81.52
S½	Lot 17	Clark Fraser	1-24"Ø x 16' x 16 gauge CMP	81.52
N 1/3	Lot 16	Patrick McLoughney	1-30"Ø x 16' x 16 gauge CMP	92.08
Pt S2/3	Lot 16	Fergus Houlahen	1-30"Ø x 16' x 16 gauge CMP	92.08
E2/3 N½	Lot 15	Carl Fraser	1-36"Ø x 16' x 16 gauge CMP	104.88
S½	Lot 15	Wm. Clark	1-36"Ø x 16' x 16 gauge CMP	104.88

.....2

Pt E7/15	Lot 14	Mrs. H. Houlahan	1-36"Ø x 16' x 16 gauge CMP	$104.88
S 5/8	Lot 14	John Houlahan	1-36"Ø x 16' x 16 gauge CMP	104.88
E Pt	Lot 13	Kelvin Burnett	1-36"Ø x 16' x 16 gauge CMP	104.88
			Total	$1,116.16

These allowances will, in my opinion, adequately compensate the above property owners for the cost and installation of the above culverts.

Road Bridges and Culverts:

The present 24"Ø x 48' CMP through the forced road in Concession 3 is sufficient in size, and the drain has been designed to flow through it at its present grade.

The present 30"Ø x 26' CMP through the Township Road between lots 15 and 16, Concession 3 is sufficient in size and requires only to be lowered to the designed grade at this location.

Estimated Costs $200.00

These estimated costs have not been included in the Estimated cost of construction as it is expected that the Township of Nepean's Road Department will accept this responsibility as part of their maintenance program.

Railroad Culvert:

The present culvert through the Canadian National Railway which consists of a 24"Ø CMP on the south side, and a 2' x 2.75' timber culvert on the north side of the tracks is sufficient in size, and the drain has been designed to flow through at the present grade.

Land Damage:

The amounts shown in the following allowances will, in my opinion, adequately compensate the property owners indicated for land or crop damage (if any) under Section 8 (1) of the Drainage Act 1962 63.

N½	Lot 18	Lorne Burnett	$66.00
S½	Lot 18	Lorne Burnett	62.00
Pt W3/4 N½	Lot 17	Mrs. E. Monk	9.00
W3/4 N½	Lot 17	Sala & Riccivto	18.00
S½	Lot 17	Clark Fraser	38.00
N 1/3	Lot 16	Patrick Mcloughney	59.00
Pt S2/3	Lot 16	Fergus Houlahan	90.00
E2/3 N½	Lot 15	Carl Fraser	81.00
S½	Lot 15	Wm. Clark	81.00
PtE7/15 & N 3/8	Lot 14	Mrs. Helen Houlahan	63.00
S 5/8	Lot 14	John Houlahan	63.00
EPt	Lot 13	Kelvin Burnett	96.00
		Total	$726.00

.....3

Distribution of Costs:

The estimated costs for this construction are apportioned to the properties responsible for benefit and outlet as determined by their areas, locations, and run-off.

In my opinion, no liability for injury will exist because of this construction, and for this reason no injury liability column will appear in the Schedule of Assessment, this being in my estimation a fair distribution of costs.

Future Maintenance:

This drain will be maintained by the Township of Nepean, and the costs of such future maintenance will be apportioned to the property owners in the same proportioned to the property owners in the same proportions as in the attached Schedule of Assessment.

The "Estimated Costs" and incidental expenses are as follows:

Earth Excavation and Spreading of 1,992 c.y. @ .60¢	$1,195.20
Hard Pan Excavation 282 c.y. @ $1.60	451.20
Brushing	40.00
Farm Crossings	1,116.16
Land Damage Section 8 (1) of the Drainage Act 1962-63	726.00
Engineer's Fees and Expenses	884.44
Contingencies	470.00
Clerk's Fees	200.00
Printing and Publishing By-Law	125.00
Advertising and Letting Contract	85.00
Court of Revision	150.00
Supervision of Construction	190.00
Total Estimated Cost	$5,633.00

Grants:

Under Section 61, 63 and 64 of the Drainage Act 1962-63, a Provincial Grant of 33 1/3% of the cost of construction for Agricultural Lands may be obtained.

A subsequent grant by Federal A.R.D.A. through the Provincial grant administration media will further reduce Agricultural assessments by another one-third.

The assessments are then payable two-thirds by grant, and one-third by property assessment.

Respectfully submitted this 16th day of October, 1968.

REGISTERED PROFESSIONAL ENGINEER
CIVIL
A. J. GRAHAM
PROVINCE OF ONTARIO

GRAHAM, BERMAN AND ASSOCIATES LTD.

John S. Morrison

John S. Morrison,
Drainage Manager.

SCHEDULE OF ASSESSMENT JOB NO. 1882 DATE: Oct. 16/68

BURNETT MUNICIPAL DRAIN

TOWNSHIP OF NEPEAN

Conc.	Lot	Name	Acreage Assessed	Main Drain Benefit	Main Drain Outlet	Total
3	S½ Lot 19	Don Fraser	13		198.18	198.18
	N½ Spt Lot 18	Lorne Burnett	43	549.77	517.25	1,067.02
	S Pt. Lot 18	Robert Nowat	6		74.28	74.28
	Pt W3/4 N½ L.17	Mrs. E. Monk	8	96.25	99.84	196.09
	Pt W3/4 N½ Lot 17	Sala & Riccivto	11	76.23	136.18	212.41
	S½ Lot 17	Carl Fraser	20	160.93	149.37	310.50
	N1/3 & PtS2/3 L.16	Patrick Naloughney	15	249.10	223.80	472.90
	S2/3 Less 30ac L. 16	Fergus Houlahan	49	381.15	492.36	873.51
	E2/3 N½ Lot 15	Carl Fraser	19	204.05	107.16	311.21
	S½ Lot 15	Wm. Clark	18	204.05	73.98	278.03
	Pt E7/15 N3/8 L.14	Mrs. H Houlahan	16	233.70	50.72	284.42
	S5/8 Lot 14	John Houlahan	13	294.52	34.71	329.23
	Pt E½ Lot 13	Kelvin Burnett	9	208.10		208.10
	Forced Road in Concession 3			122.82	254.64	377.46
	Township Road Between Lots 15 and 16			76.23	136.84	213.07
	Canadian National Railways			57.75	168.94	226.69
		Totals		$2,914.65	$2,718.35	$5,633.00

SUMMARY OF ASSESSMENT

LANDS:

Township Roads	$ 590.43
Non Agricultural Lands	$ 226.69
Land used for Agricultural Purposes	$4,815.88

GRANTS ON AGRICULTURAL LANDS

Estimated Provincial Grant of 33 1/3%	$1,605.29
Estimated Federal A.R.D.A. Grant of 33 1/3%	$1,605.29
Estimated Property Assessments	$1,605.30

SUMMARY OF ASSESSMENT

LANDS

Township roads	$ 590.43
Non Agricultural Lands	422.78
Land used for Agricultural Purposes	$4,619.79

Grants on Agricultural Lands

Estimated Provincial Grant of 33 1/3 %	$1,539.93
Estimated Federal A.R.D.A. Grant of 33 1/3%	$1,539.93
Estimated Property Assessments	$1,539.93

SUPPLEMENT TO THE GENERAL SPECIFICATIONS

BURNETT MUNICIPAL DRAIN

TOWNSHIP OF NEPEAN

Graham, Berman and Associates Ltd.,
Consulting Engineers,
Ottawa 8, Ontario.

October 16th, 1968.

Meaning of Terms:

"Municipal Council" - shall mean the Municipal Council of Nepean Township.

"Reeve" - shall mean the Reeve of Nepean Township.

"Engineer" - shall mean the Engineer in charge of the works, or his authorized representatives.

"Contractor" - shall mean the Contractor or Contractors performing the work, or their foreman on the grounds.

Nature of Work:

The accompanying plan, profile and specifications dated October 16th, 1968 apply to and govern this construction.

8,625 linear feet of open drain as follows:

Earth Excavation and Spreading of 1,992 c.y.

Hardpan Excavation and Spreading of 282 c.y.

Brushing

A Severence Allowance under Section 8 (6) of the Drainage Act 1962-63 is applied on this drain.

Center-line:

The present watercourse is to be the center-line of construction.

Important:

(a) The Engineer must be notified at least 5 days prior to the starting of work on this contract.

(b) Fences may be opened to allow construction equipment to go through them, and are to be closed immediately after that piece of equipment passes through, if fences are found to be left opened, they will be closed at the "Contractor's Expense".

GENERAL SPECIFICATIONS

Municipal Drainage (Open Drains)

Graham, Berman & Associates Ltd.
St.Thomas & Ottawa, Ontario.

1. These specifications are drawn up to cover the work as outlined in the Engineer's Report on the drain, and as further outlined in the supplement to General Specifications.

Where there is any doubt as to the meaning or intention of the specifications, it shall be the Contractor's duty to obtain a ruling in writing from the Engineer before proceeding with the work.

2. Supply of Labour and Materials:

The Contractor shall supply all materials, labour, equipment, tools, machinery etc. for the full and proper completion of this work in accordance with the specifications, plan and profile. All work must be done in a neat and workmanlike manner, and to the satisfaction of the Engineer.

3. Roads to be kept open:

All roads, public and private are to be kept open and in passable condition during the continuance of this work.

4. Relief Ditches:

Should the Contractor deem it necessary to dig relief ditches on any part of this work, he shall do so and refill same entirely at his own expense.

5. Damages:

a) In case of damage being done to any farm or other property along the line of work by blasting or other operations, the Contractor shall be held liable for such damage.

b) The Owner or Occupant of the property on which the drainage works is located shall be responsible for the protection of all livestock on said property during construction, and shall be liable for any damages caused to or by such livestock.

c) The Contractor shall also rebuild and leave in as good condition as before construction, all fences removed in order to execute this work.

i) Fences crossing the drainage works must be closed immediately after the construction equipment has passed through them.

ii) Fences parallel to the drain must be replaced immediately after the work is completed in each section.

d) When hay or other produce is growing on lands adjacent to the proposed work, the Contractor must give the Owner ten days'

/notice

notice in writing to remove the same before he begins work on that portion, otherwise he shall be held liable for any damage caused.

6. Clearing and Grubbing:

a) Trees or brush growing in or on the banks of the drain are to be grubbed out clean. Trees having a stump diameter of 6" or over are to be cut into log lengths and piled clear of the spread materials. The stumps are to be piled in a corner of the field from which they were taken, adjacent to, but not closer than 4 feet to the edge of the drain. Branches and brush under 6" in diameter are to be piled on the excavated materials for disposal by the Property Owner.

b) At locations where the drain passes through brush or wood-lots, it is necessary that a strip of land be cleared along one side of the drain; the locations and dimensions will be given in the Supplement Specifications. However it is not intended that large trees growing within this specified area should be cut unless it is apparent that excessive damage will be caused to them. Stumps are not to exceed 1 ft. in height, and brush and branches are to be disposed of as in section (a) above.

Payment for this work will be made under the lump sum tender item "Cutting Brush".

7. Disposal of Materials:

The excavated materials shall be disposed of so as to do as little damage to lands and crops as possible.

a) Earth excavated from the drain is to be taken back a distance of 10 feet, leaving a clean berm 10 feet wide along the edge of the drain; and to be spread over the adjoining lands in such a manner that the elevation of the completed work does not exceed the elevation of the adjoining lands by more than 6" on cultivated lands and 12" on unworked or bush lands.

The completed work is to have a neat appearance and to be comparatively smooth.

b) Hard Pan and Rock excavated from the drain is to be taken back 4 feet from the edge of the drain and left in a pile so that it may be disposed of by the Property Owner.

c) Water Courses where necessary will be cut through the spread materials every 200 feet or in the low spots along the drain to allow surface drainage of the surrounding areas.

d) Re-location of Drain: At locations where the drain is to be removed from a road allowance, materials excavated from the new drain may be used to fill the road ditch in such a manner so as to allow the water from the road to enter the new drain. Excess materials are to be spread on the adjoining lands as above.

e) Straightening: At locations where straightening occurs the upper end of the old water course is to be filled level to the shoulders for a distance of 20 feet, and the excavated material put in the old drain when the intervening distance does not exceed 100 feet. Where the distance exceeds 100, the shoulders

/ are

are to be pushed into the bottom of the remainder of the abandoned watercourse, and so shaped that the water will run out of the low end, and in such a manner as to allow the Property Owner to travel through the drain and gradually reclaim the land.

f) Boulders: All boulders having a cubic content of 1 cubic foot or more are to be neatly placed along the edge of the drain at a distance of approximately 4 feet from it.

The price for the above materials disposal is to be included in the bid price per cubic yard for excavation.

8. Description of Ditch:

The ditch is to be constructed to the grades, widths and side slopes as shown on the accompanying profile.

The bottom width shall not be increased without maintaining the specified side slopes.

The grade is to be constructed to provide a constant slope to the end of the ditch so that no water will be stagnant therein.

9. Centre Line:

The Centre Line shall be the Centre Line of the present ditch, provided the fences are far enough back from the shoulders to allow for the proper width of bottom and side slope as shown on the accompanying profile. In locations where fences are too close, the Centre Line may be moved away from the fence a sufficient distance so that bottom widths and side slopes may be maintained.

At locations where the drain is to be removed from a road allowance, the centre line will be staked by the Engineer to allow for a clear berm of 3 feet between the property line and the edge of the drain.

At locations where excessive meanderings of the present stream take place, straightening may be required; in such cases the Centre Line will be staked in the field by the Engineer.

10. Grades and Centre Line:

Grades and Centre Line will be given by the Engineer upon receiving 5 clear days notice in writing that such Grades and Centre Line are required.

The Contractor will take precautions to ensure that Grades and Line so set will not be disturbed during construction.

Any subsequent setting of Line and Grade on the project will be charged to the Contractor.

11. Inspection:

Upon completion of the work there should be a continuous ditch or water course of the size and dimensions according to the plan, profile and specifications.

Any foreign material accumulated in the drain will be removed by the Contractor, unless he can clearly show that he is not responsible for the foreign material being in the drain.

The Contractor, when he considers all work to have been so completed, must notify the Engineer that he requires an inspection of the works to be made and he, or his representative, will accompany the Engineer on this inspection.

12. Classification of Materials:

Earth shall mean clay, loam, sand, small stones, gravel and muck, etcetera.

Hard Pan shall mean materials other than rock that require the use of picks, bars, dynamite, etc. for their removal.

Rock shall mean strata rock or boulders having a cubic content of 1½ cubic feet or more.

Prices are to be submitted separately to cover each type of material.

13. Farm Bridges and Culverts:

The Contractor shall, as part of this contract, clean out or lower Farm Bridges and Culverts considered to be large enough for their locations.

The Contractor shall notify the Owner four clear days in writing to remove farm bridges that are not large enough to meet specifications; if the bridges are not removed, the Contractor may, after four days, remove same, exercising normal caution so as not to unduly damage the materials, piling same neatly 15 feet from the edge of the drain.

The Contractor may remove the flooring to clean out under a bridge that is of sufficient size; however, he must replace this flooring in as good condition as before it was removed.

The responsibility for the replacement of culverts or the construction of new ones is set forth in the Supplement Specifications.

Payment for the above work is to be included in the bid price per cubic yard for earth excavation.

14. Road Bridges and Culverts:

The Contractor shall notify the road Superintendent concerned as to the date and time the excavating equipment will be at the site of the road bridge or culvert.

The Contractor will construct the ditch to the ends of the present bridge or culvert.

The Contractor will clean all culverts that are of sufficient size and set at the required grade.

The Contractor will lower the grade and otherwise clear out under bridges having sufficient size for their locations. Payment for this work is deemed to be included in the bid price per cubic yard for earth excavation.

14. Road Bridges and Culverts: (Continued)

Work other than the above that may be required by the Road Superintendent will be paid for on an hourly basis by the Road Department responsible for the upkeep of this section of road.

15. Right to Increase or Decrease:

The Municipal Council reserves the right to increase the work as it deems necessary and the contract price per cubic yard shall remain the same.

16. Sub-Letting:

No portion of the work is to be sub-let without the consent of the Municipal Council and the Engineer.

17. Deposit:

A cash deposit or certified cheque on a chartered bank in the amount of 10% of the tender price must accompany each tender, such deposit will be returned to the unsuccessful bidders within 7 days of tender closing.

18. Date of Completion:

The whole work shall be completed on or before the _____ day of _____, 196___ and when the Contractor considers that the work is completed, he must notify the Engineer in writing that he requires a final inspection thereof.

19. Payment:

Cash payment will be made monthly equal to 90% of the value of the work completed on the certificate of the Engineer, when the value of work completed within the month amounts to Three Hundred Dollars ($300.00) or more. The remaining 10% will be retained until 60 days after the whole work has been accepted as finished.

20. The Municipal Council reserves the right to reject any and all tenders.

21. The Contractor shall comply with the regulations of the Workmen's Compensation Board of Ontario.

22. Damages caused to public utilities installation shall be the responsibility of the General Contractor.

Prior to starting this work, he shall obtain from the public utilities (i.e. telephone, hydro, gas) the locations, if any, of all their installations along these works.

Township of Nepean

TENDER FORM

I/WE OF
do hereby tender and agree to construct the
in accordance with the attached specifications and drawings.

I/WE have examined the site of the above work and are thoroughly familiar with the work that is to be done.

I/WE tender and agree to perform the above mentioned work for the following prices:

EXTENT OF WORK:

	TOTAL PRICE
Earth Excavation and Spreading of 1,992 c.y.....	
Hardpan Excavation and Spreading of 282 c.y.....	
Brushing.....	

TOTAL CONTRACT PRICE _____

I/WE guarantee that the above work will be completed on the day of , 196 .

I/WE enclose a certified cheque or cash deposit for the sum of ($), being 10% of the tender price, and further agree to furnish a suitable bond for 100% of the contract price within 7 days of notification of acceptance of tender, if so requested. In such case, the deposit will be returned on the signing of the contract.

The deposit or bonds of the successful bidder may be retained by the Clerk until 60 days after the above work has been completed and accepted, or in the event the tender is unsuccessful, it shall be returned within 7 days.

Offered on behalf of Contractor:

NAME: _____

ADDRESS: _____

_____

POSITION: _____

DATE: _____

Accepted on behalf of the Municipality

MAYOR: _____

CLERK: _____

DATE: _____

Appendix F

Correspondence

From: Greg Winters
Sent: January-15-18 11:06 AM
To: Marc St.Pierre
Subject: RVCA Burnett

See below RVCA

Greg Winters, MCIP, RPP, Senior Project Manager | Planning & Development
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 241 | Cell: 613.261.4990 | Fax: 613.254.5867

From: Jocelyn Chandler [mailto:jocelyn.chandler@rvca.ca]
Sent: Friday, September 23, 2016 12:48 PM
To: Rehman, Sami <Sami.Rehman@ottawa.ca>; Greg Winters <G.Winters@novatech-eng.com>; Weeks, Gwendolyn <Gwendolyn_Weeks@golder.com>
Cc: Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>
Subject: RE: Terms of Reference

OK but outlet to KB Pond is a watercourse too…filled with fish. I presume you have the setbacks on that?
Also we have never done a preliminary review of the cut/fill proposal because information was missing (email to Greg McDonald March 31, 2016). It should be reviewed in principle before application for sub is deemed complete.
Also what is the proposed infrastructure under eth bridge at this time? A path or a road? Does it meet Jock R setbacks too?
Thanks ,j

Jocelyn Chandler M.Pl. MCIP, RPP
Planner, RVCA
t) 613-692-3571 x1137
f) 613-692-0831
jocelyn.chandler@rvca.ca
www.rvca.ca
mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5
courier: 3889 Rideau Valley Dr., Nepean, ON K2C 3H1

From: Rehman, Sami [mailto:Sami.Rehman@ottawa.ca]
Sent: Friday, September 23, 2016 12:46 PM
To: Greg Winters <G.Winters@novatech-eng.com>; Jocelyn Chandler <jocelyn.chandler@rvca.ca>; Weeks, Gwendolyn <Gwendolyn_Weeks@golder.com>

Cc: Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>
Subject: RE: Terms of Reference

Thanks for the clarification.

Can you please explain what is a preliminary EIS and what is the purpose of it? Thank you. sami

Sami Rehman
Environmental Planner | Planificateur environnemental
Development Review Services | Services d'examen demandes d'aménagements
Planning, Infrastructure and Economic Development Department | Service de planifaction, d'Infrastructure et de Développement économique

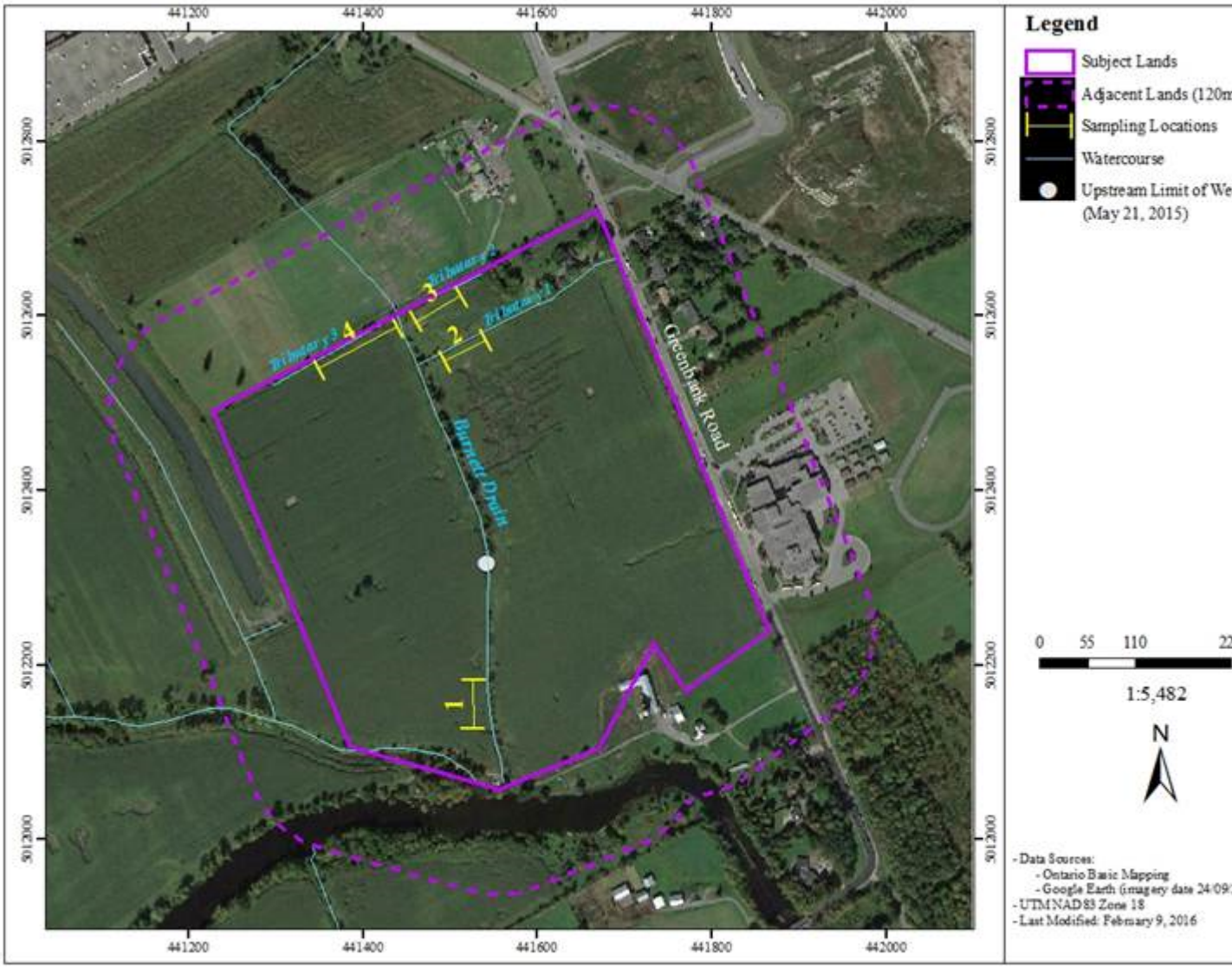
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 13364

From: Greg Winters [mailto:G.Winters@novatech-eng.com]
Sent: September 23, 2016 12:38 PM
To: Jocelyn Chandler; Weeks, Gwendolyn; Rehman, Sami
Subject: RE: Terms of Reference

Jocelyn

See attached and below from the HWS from Muncaster

You are correct. There are three tributaries/watercourses on site. All three will be replaced by the on-site storm sewers through the development of the subdivision. We are not looking for exceptions to setbacks as they will disappear.
We are also not looking for an exception for the Jock. There will be some adjustments to the flood plain through your review of a application to fill. Otherwise all the development is outside the 30 metre from nwl of the Jock.



Gregory Winters, MCIP, RPP, Project Manager-Planner
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x241 | Cell: 613.261.4990 | Fax: 613.254.5867
http://ca.linkedin.com/in/gregwinters/

From: Jocelyn Chandler [mailto:jocelyn.chandler@rvca.ca]
Sent: Friday, September 23, 2016 12:24 PM
To: Weeks, Gwendolyn <Gwendolyn_Weeks@golder.com>; Rehman, Sami <Sami.Rehman@ottawa.ca>
Cc: Greg Winters <G.Winters@novatech-eng.com>
Subject: RE: Terms of Reference

Hello Gwendolyn,
I haven't seen the HDF prepared by Muncaster so I don't know what it covers/contains.
If Claridge is going to be looking for any exceptions to watercourse setbacks as proposed in the OP (and there are three watercourses currently affecting the lands) that would need to be covered in the EIS.
Jocelyn

Jocelyn Chandler M.Pl. MCIP, RPP
Planner, RVCA
t) 613-692-3571 x1137
f) 613-692-0831
jocelyn.chandler@rvca.ca
www.rvca.ca
mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5
courier: 3889 Rideau Valley Dr., Nepean, ON K2C 3H1

From: Weeks, Gwendolyn [mailto:Gwendolyn_Weeks@golder.com]
Sent: Friday, September 16, 2016 2:58 PM
To: Rehman, Sami <Sami.Rehman@ottawa.ca>; Jocelyn Chandler <jocelyn.chandler@rvca.ca>
Cc: Greg Winters <G.Winters@novatech-eng.com>
Subject: Terms of Reference

Hello Sami and Jocelyn,
I have been retained by Claridge to help with their proposed development at 3370 Greenbank Road. Attached is a Terms of Reference to complete a preliminary EIS for the Site. Please review at your convenience, and If you have any questions, please give me a call.
Many thanks,
-Gwendolyn

Gwendolyn Weeks (H.B.Sc.Env) | Ecologist | **Golder Associates Ltd.**
1931 Robertson Road, Ottawa, Ontario, Canada, K2H 5B7 ◄ We Have Moved!
T: +1 (613) 592 9600 | **D:** +1 (613) 592-9600 x4234 | **F:** +1 (613) 592 9601 | **C:** +1 (613) 913-1179 | **E:** Gwendolyn_Weeks@golder.com | **www.golder.com**

Work Safe, Home Safe

From: Greg Winters
Sent: January-15-18 11:06 AM
To: Marc St.Pierre
Subject: RVCA Burnett

See below RVCA

Greg Winters, MCIP, RPP, Senior Project Manager | Planning & Development
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 241 | Cell: 613.261.4990 | Fax: 613.254.5867

From: Jocelyn Chandler [mailto:jocelyn.chandler@rvca.ca]
Sent: Friday, September 23, 2016 12:48 PM
To: Rehman, Sami <Sami.Rehman@ottawa.ca>; Greg Winters <G.Winters@novatech-eng.com>; Weeks, Gwendolyn <Gwendolyn_Weeks@golder.com>
Cc: Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>
Subject: RE: Terms of Reference

OK but outlet to KB Pond is a watercourse too…filled with fish. I presume you have the setbacks on that?
Also we have never done a preliminary review of the cut/fill proposal because information was missing (email to Greg McDonald March 31, 2016). It should be reviewed in principle before application for sub is deemed complete.
Also what is the proposed infrastructure under eth bridge at this time? A path or a road? Does it meet Jock R setbacks too?
Thanks ,j

Jocelyn Chandler M.Pl. MCIP, RPP
Planner, RVCA
t) 613-692-3571 x1137
f) 613-692-0831
jocelyn.chandler@rvca.ca
www.rvca.ca
mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5
courier: 3889 Rideau Valley Dr., Nepean, ON K2C 3H1

From: Rehman, Sami [mailto:Sami.Rehman@ottawa.ca]
Sent: Friday, September 23, 2016 12:46 PM
To: Greg Winters <G.Winters@novatech-eng.com>; Jocelyn Chandler <jocelyn.chandler@rvca.ca>; Weeks, Gwendolyn <Gwendolyn_Weeks@golder.com>

Cc: Renaud, Jean-Charles <Jean-Charles.Renaud@ottawa.ca>
Subject: RE: Terms of Reference

Thanks for the clarification.

Can you please explain what is a preliminary EIS and what is the purpose of it? Thank you. sami

Sami Rehman
Environmental Planner | Planificateur environnemental
Development Review Services | Services d'examen demandes d'aménagements
Planning, Infrastructure and Economic Development Department | Service de planifaction, d'Infrastructure et de Développement économique

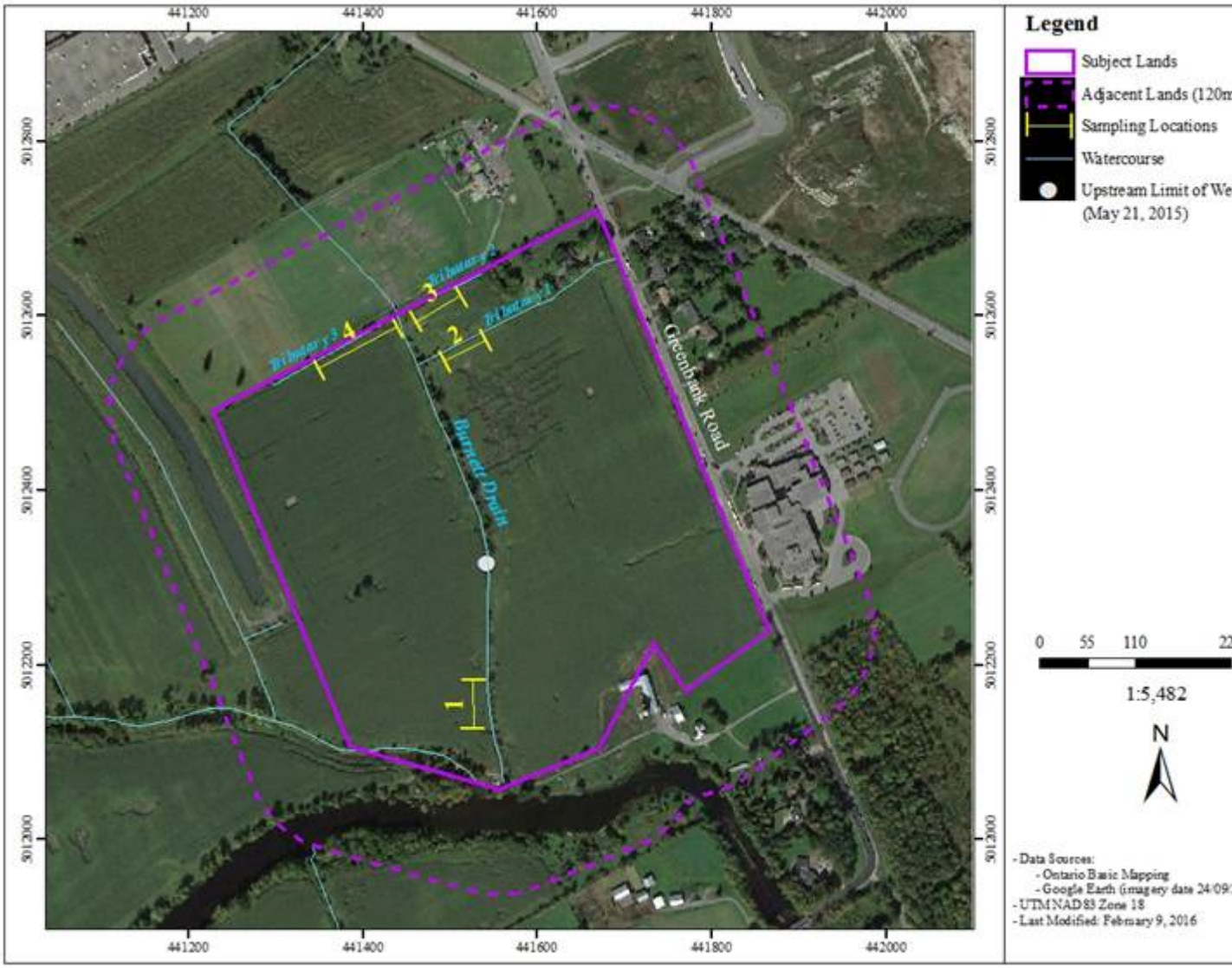
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 13364

From: Greg Winters [mailto:G.Winters@novatech-eng.com]
Sent: September 23, 2016 12:38 PM
To: Jocelyn Chandler; Weeks, Gwendolyn; Rehman, Sami
Subject: RE: Terms of Reference

Jocelyn

See attached and below from the HWS from Muncaster

You are correct. There are three tributaries/watercourses on site. All three will be replaced by the on-site storm sewers through the development of the subdivision. We are not looking for exceptions to setbacks as they will disappear.
We are also not looking for an exception for the Jock. There will be some adjustments to the flood plain through your review of a application to fill. Otherwise all the development is outside the 30 metre from nwl of the Jock.



Gregory Winters, MCIP, RPP, Project Manager-Planner
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x241 | Cell: 613.261.4990 | Fax: 613.254.5867
http://ca.linkedin.com/in/gregwinters/

From: Jocelyn Chandler [mailto:jocelyn.chandler@rvca.ca]
Sent: Friday, September 23, 2016 12:24 PM
To: Weeks, Gwendolyn <Gwendolyn_Weeks@golder.com>; Rehman, Sami <Sami.Rehman@ottawa.ca>
Cc: Greg Winters <G.Winters@novatech-eng.com>
Subject: RE: Terms of Reference

Hello Gwendolyn,
I haven't seen the HDF prepared by Muncaster so I don't know what it covers/contains.
If Claridge is going to be looking for any exceptions to watercourse setbacks as proposed in the OP (and there are three watercourses currently affecting the lands) that would need to be covered in the EIS.
Jocelyn

Jocelyn Chandler M.Pl. MCIP, RPP
Planner, RVCA
t) 613-692-3571 x1137
f) 613-692-0831
jocelyn.chandler@rvca.ca
www.rvca.ca
mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5
courier: 3889 Rideau Valley Dr., Nepean, ON K2C 3H1

From: Weeks, Gwendolyn [mailto:Gwendolyn_Weeks@golder.com]
Sent: Friday, September 16, 2016 2:58 PM
To: Rehman, Sami <Sami.Rehman@ottawa.ca>; Jocelyn Chandler <jocelyn.chandler@rvca.ca>
Cc: Greg Winters <G.Winters@novatech-eng.com>
Subject: Terms of Reference

Hello Sami and Jocelyn,
I have been retained by Claridge to help with their proposed development at 3370 Greenbank Road. Attached is a Terms of Reference to complete a preliminary EIS for the Site. Please review at your convenience, and If you have any questions, please give me a call.
Many thanks,
-Gwendolyn

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Work Safe, Home Safe

Greg Winters

From: Xu, Lily <Lily.Xu@ottawa.ca>
Sent: Friday, June 26, 2015 4:27 PM
To: 'jim.burghout@claridgehomes.com'; Greg Winters
Cc: Hall, James; Young, Mark; Carter, Riley; Krabicka, Jeannette; Rehman, Sami; McDonald, Glen; Greg MacDonald; jocelyn.chandler@rvca.ca; Xu, Lily
Subject: 3370 Jockvale (SNTC Claridge) pre-con - follow up
Attachments: Study and Plan ID List.docx

Hi Jim and Greg,

This is a follow-up of the Pre-Application Consultation on June 19, 2015 for Claridge's property at 3370 Jockvale Road. The attached "Applicant's Study and Plan Identification List" identifies the number of copies required for each report and plan in order to deem the application(s) complete. PDF files are needed for all required reports and plans. Guidance on preparing the studies and plans can be found online.

Further, please note Staff's preliminary comments:

Servicing and Engineering

- Please note the right of way (ROW) for Jockvale Road extension may need to be widened to 22-24 metres due to the additional space needed for the underground truck sewer.
- For Half Moon Bay Drive, Staff is open to other none-standard ROW cross section options provided the objectives of the secondary plan will still be achieved.
- In general, servicing is not permitted along lane ways. Please note the right angle of 8 metre laneways are discouraged due to maintenance challenges.

RVCA

The RVCA will be looking for:

- Plan showing:
    - 1:100 year floodplain (91.59 to 91.45) based on site specific geodetic elevations
    - 30 m from the NHWM of both the Jock River and the Clarke Drain
    - 15 m from top of bank
    - Geotechnical slope stability limit in accordance with MNR Technical Slope Stability Guidelines
    - Meander belt
- Detailed cut and fill proposal for floodplain boundary revision under O.Reg 174/06
- Location and detailed design of proposed stormwater outlets (should be based on a site visit and concurrence with RVCA watercourse regulations staff (Hal Stimson)
- Headwater Assessment of tributary proposed to be closed and potential offset plan for any values identified to be lost in Headwaters Assessment.
- Detailed cross section of area under bridge and proposed path.
- Hydrogeological report assessing risk to adjacent private water wells and recommendations for mitigation and pre-post construction monitoring.
- Stormwater management report including water budget and source control measures to promote infiltration.
- Identification of areas that would benefit from riparian planting.

Transportation

- Staff in general has no objection towards the proposed removal of the planned Half Moon Bay Drive under the Greenbank Road/Bridge, provided that:
    - the submission can demonstrate that the proposed road network can function properly;

    - pedestrian and cyclist connections will be continued under the bridge and connected conveniently with other pedestrian and cyclist facilities within the Town Centre;
    - sufficient information on the engineering and environmental benefits can be presented.
- Note streets at signalized intersections may need to be widened to accommodate turning lanes.
- Before starting the Community Transportation Study, please provide a Terms of Reference to Project Manager, Transportation, Riley Carter, at Riley.Carter@ottawa.ca or 613 580 2424 ext 14304, for review and concurrence.

Environment

- The required Environmental Impact Statement (EIS) shall address
    - Potential habitat for threatened or endangered species, OP Section 4.7.4
    - impacts from stormwater discharge, which may include but not limited to, potential erosion, suspended solids, changes in thermal regime, etc.
    - establishing the appropriate setback requirement, OP Section 4.7.3,
    - findings and recommendations from the headwater features study
    - slope stability and floodplain analyses from Geotechnical Study
    - recommendations for riparian plantings, as required under the Jock River Reach One Subwatershed Study.
- Please contact the Kemptville Office of the Ministry of Natural Resources and Forestry to determine their obligations under the Endangered Species Act and to identify which species should be covered in their field investigations.
- To assist with the riparian planting recommendations requested as part of the EIS, the authors can refer to and draw information from the MNR's extension notes, such as "Preserving and restoring natural shorelines" or "Buffers Protect the Environment" for example. http://lrconline.com/Extension_Notes_English/water/water_index.html
  Another valuable source is "Ecological Buffer Guideline Review" by Beacon Environmental (Dec 2012). http://www.creditvalleyca.ca/wp-content/uploads/2013/08/Ecological-Buffer-Guideline-Review.pdf
- A joint report of the Tree Conservation Report (TCR) and EIS is acceptable.
- For further clarifications, please contact Environmental Planner, Sami Rehman, at Sami.Rehman@ottawa.ca or 613 580 2424 ext 13364.

Planning and Land Use

- The policies in the most recent OP encourage mixed-uses within Town Centres. The Secondary Plan also suggests none-residential uses along major roads. The ground floor along Greenbank and other collectors shall be constructed to be able to accommodate non-residential uses. Considerations will be implemented into zoning details (and through subdivision, site plan and condominium). These considerations, in addition to permitted uses, may include:
    - minimum ground floor height of 4 m
    - minimum window glazing of 40%
    - maximum grading difference from the street to the ground floor is 0.45 m
    - no restriction of signage and commercial vehicles
    - warning clause of non-residential uses on title, etc
- The most recent policies in the PPS and OP encourage density surrounding transit stations and routes. Therefore the block along Greenbank has the potential to accommodate unit types of higher density. It is understood that other aspects such as servicing options, density targets, and marketability have to come into play.
- An OPA is required in order to achieve the requested change in building height and road removal. Road right of way justifications can be dealt with the Subdivision.
- Please ensure to comply with the Terms of Reference when preparing the Planning Rationale.

Parkland

- 5% parkland dedication is applicable to the site as per the Parkland Dedication Bylaw. Based on the site area of 15.4 ha, the required parkland dedication is 0.77 ha.

- Staff is willing to take a parkette as parkland dedication in combination with Cash-in-Lieu for the area. Suggest consider part of the triangular shaped block in the middle of the subdivision for a parkette.

Urban Design

- Please note the site is subject to the Urban Design Review Panel (UDRP). Please refer to the online link for Panel Meeting Schedule and Submission requirements.
- It is noted that the Design Brief package will not be a mandatory requirement for deeming the application(s) complete. However, to your advantage, it is highly recommended that the applications shall go to the UDRP for review and comment prior to staff providing the 1st round of comments.

I hope the above is of some assistance. Please let me know if there are further questions or any clarification will be helpful.

Yours truly,

Lily Xu, MPL, MCIP, RPP, LEED Green Assoc.
Planner II, Suburban Services
Urbaniste II, Serives suburbains

City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
tel/tél:613.580.2424 ext./poste **27505**, fax/téléc:613-580-2576, email/courriel:Lily.Xu@ottawa.ca
ottawa.ca/planning / ottawa.ca/urbanisme

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information and guidance on preparing required studies and plans refer to:

http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	6	1. Site Servicing Plan	2. Site Servicing Study	S	6
S	6	3. Grade Control and Drainage Plan	4. Geotechnical Study (Incl. Slope Stability Study)	S	4
	2	5. Composite Utility Plan	6. Groundwater Impact Study		6
	5	7. Servicing Options Report	8. Headwater tributary Assessment	S	6
S	9	9. Community Transportation Study	10.Erosion and Sediment Control Plan	S	6
S	6	11.Storm water Management Report	12.Hydro-geological Off Site Risk Assessment	S	6
S	3	13.Hydraulic Water main Analysis	14.Noise Feasibility Study	S	3
	35/50/55	15.Roadway Modification Design Plan	16.Confederation Line Proximity Study		9

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
S	55	17.Draft Plan of Subdivision	18.Plan Showing Layout of Parking Garage		2
	30	19.Draft Plan of Condominium	20.Planning Rationale	S	3
	35/55	21.Site Plan	22.Minimum Distance Separation (MDS)		3
S	55	23.Concept Plan Showing Proposed Land Uses and Landscaping	24.Agrology and Soil Capability Study		5
	3	25.Concept Plan Showing Ultimate Use of Land	26.Cultural Heritage Impact Statement		3
	35/55	27.Landscape Plan	28.Archaeological Resource Assessment Requirements: **S** (site plan) **A** (subdivision, condo)	A	3
S	2	29.Survey Plan	30.Shadow Analysis	A	3
S	3	31.Architectural Building Elevation Drawings (dimensioned) all unit types	32.Design Brief (includes the Design Review Panel Submission Requirements)	A	3
	6	33.Wind Analysis			

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	4	34.Phase 1 Environmental Site Assessment	35.Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		6
	5	36.Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	37.Assessment of Landform Features		7
	4	38.Record of Site Condition	39.Mineral Resource Impact Assessment		4
S	8	40.Tree Conservation Report	41.Environmental Impact Statement / Impact Assessment of Endangered Species	S	8
	4	42.Mine Hazard Study / Abandoned Pit or Quarry Study			

S/A	Number of copies	ADDITIONAL REQUIREMENTS		S/A	Number of copies
		43.	44.		

Meeting Date: June 19, 2015

Application Type: *OPA/Zoning/Subdivision*

File Lead (Assigned Planner): Lily Xu

Infrastructure Approvals Project Manager: James Hall

Site Address (Municipal Address): 3370 Greenbank

*Preliminary Assessment: 1☐ 2☐ 3☒ 4☐ 5☐

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. **This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.**

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the Planning and Growth Management Department will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the Planning and Growth Management Department.

From: Greg Winters
Sent: January-15-18 11:06 AM
To: Marc St.Pierre
Subject: FW: Claridge submission to RVCA for 3370 Greenbank Rd

RVCA notes

Greg Winters, MCIP, RPP, Senior Project Manager | Planning & Development
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 241 | Cell: 613.261.4990 | Fax: 613.254.5867

From: Jocelyn Chandler [mailto:jocelyn.chandler@rvca.ca]
Sent: Monday, September 26, 2016 1:43 PM
To: Greg Winters <G.Winters@novatech-eng.com>
Subject: Fw: Claridge submission to RVCA for 3370 Greenbank Rd

As requested. Jocelyn

From: Jocelyn Chandler
Sent: March 31, 2016 11:55 AM
To: Greg MacDonald
Cc: Jim Burghout (jim.burghout@claridgehomes.com)
Subject: Claridge submission to RVCA for 3370 Greenbank Rd

Hello Greg,

As discussed, we are in receipt of a plan and an application form under O.Reg 174/06 for i) the future closure of a tributary to the Jock River and ii) floodplain cut/fill works on the subject property.

I understand from our conversation that the actual work is unlikely to occur in the next two year, and that Claridge is seeking 'support in principle' on the plans relating to the imminent application for development under the Planning Act. Based on this information and our discussion, I will proceed as follows;

1) Return the application form for a regulatory permit. This can be submitted later when the date of the works is known as the permits have limited 2 year expiry dates.

2) Circulate the supporting documentation to our technical staff for review and support in principle.

3) To complete this review, we require the headwaters assessment report and a supporting technical memo to explain the cut/fill details.

Claridge will be invoiced for these two technical reviews only, which will be used in support of their future planning and regulatory applications. Please note that should the application under O.Reg 174/06 not be submitted within two years, it is possible the documents and related review will need to be updated as unfortunately we cannot provide support in principle indefinitely.

Please call me with any questions. Jocelyn

Jocelyn Chandler M.Pl. MCIP, RPP

Planner, RVCA

t) 613-692-3571 x1137

f) 613-692-0831

jocelyn.chandler@rvca.ca

www.rvca.ca

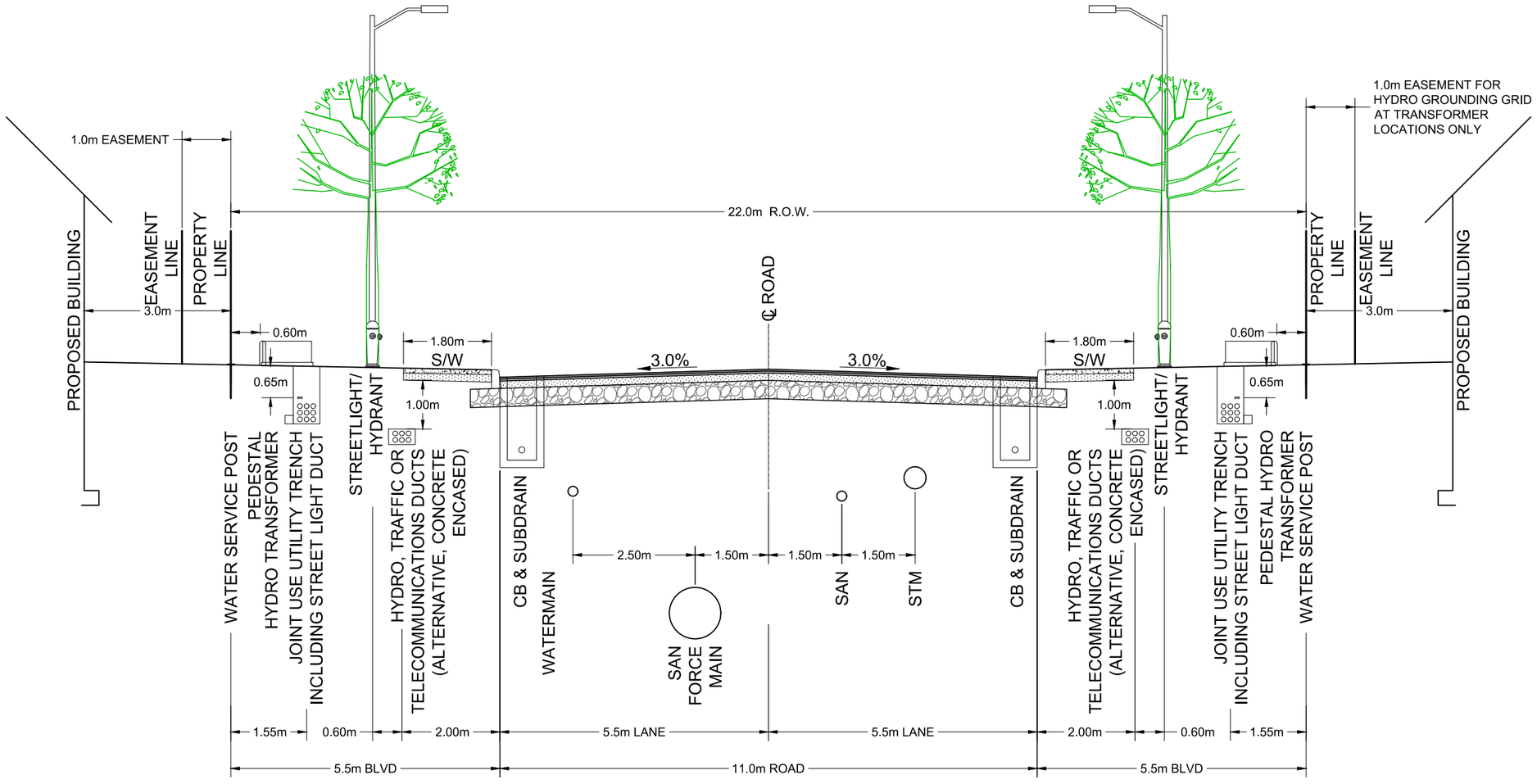
mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5

courier: 3889 Rideau Valley Dr., Nepean, ON K2C 3H1

Appendix G

Engineering Drawings

Typical Jockvale Road Cross Section	*Figure 1*
General Plan of Services	*111117-GP*
Grading Plan	*111117-GR*
Sanitary Drainage Area Plan	*111117-SAN*
Storm Drainage Area Plan	*111117-STM*



JOCKVALE TYPICAL CROSS SECTION

SCALE 1:100

NOTES:

1. REFERENCE STANDARD NOTES ROAD ALLOWANCE (DWG: ROAD NOTES).
2. AT CATCH BASIN LOCATIONS THE GAS MAIN SHALL HAVE A MINIMUM 0.6m CLEARANCE FROM STRUCTURES.
3. ALL PEDESTALS TO BE INSTALLED IN LINE WITH HYDRO TRANSFORMERS OR ON SIDE OF TRENCH AWAY FROM ROAD.
4. REQUIREMENTS FOR PROTECTIVE BOLLARDS AT TRANSFORMERS SHALL BE DETERMINED BY HYDRO ON A CASE BY CASE BASIS.
5. HYDRO DUCTS & COMMUNICATION DUCTS (ENCASED) TYPICALLY REQUIRED ON ONE SIDE OF ROW ONLY. PROVIDE 1.0m COVER ON ALL CONCRETE ENCASED DUCTS.
6. CONCRETE CURBS MY BE BARRIER TYPE OR MOUNTABLE TYPE, CATCH BASIN TYPE WILL SUIT DESIGN. SEE SEWER DESIGN GUIDELINES FOR CATCH BASIN PREFERENCE.

NOVATECH
Engineers, Planners & Landscape Architects
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Ottawa, Ontario, Canada K2M 1P6
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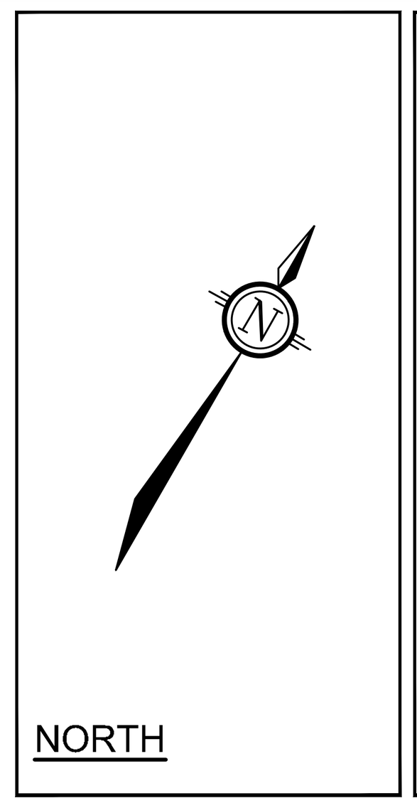
Facsimile (613) 254-5867
Website www.novatech-eng.com

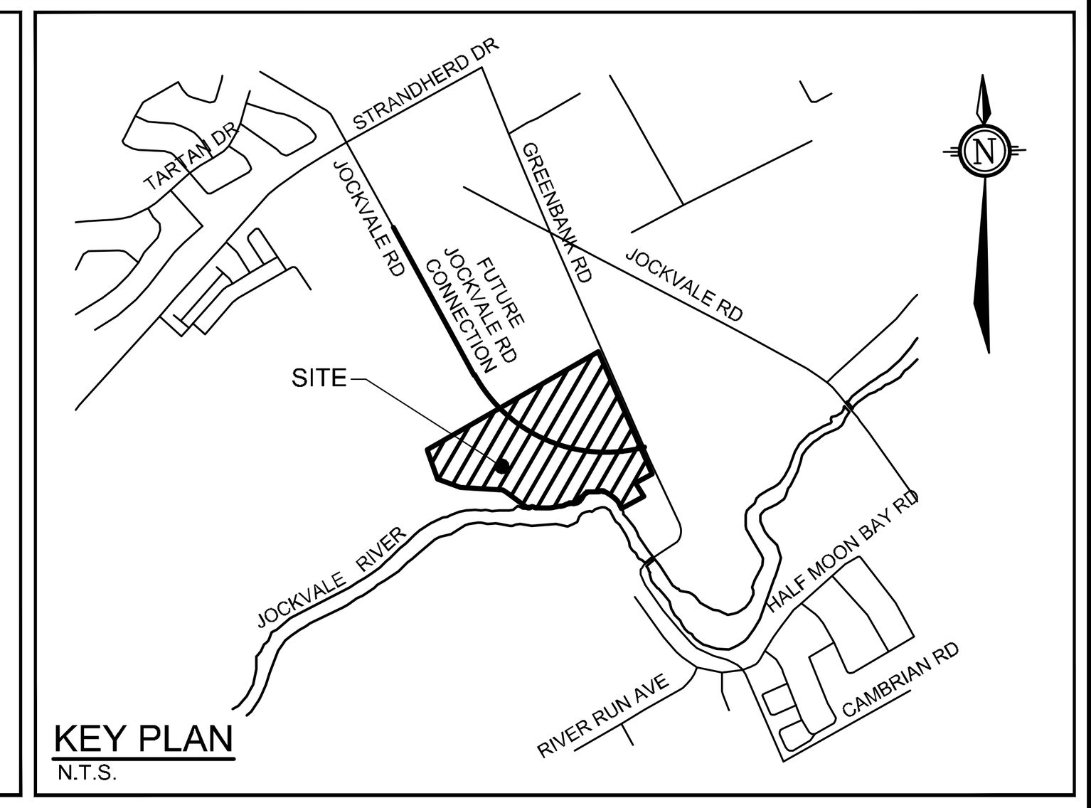
CITY OF OTTAWA
3370 GREENBANK ROAD

TYPICAL JOCKVALE ROAD CROSS SECTION

SCALE 1 : 100 (0 1 2 3 4)

DATE JAN 2018 | JOB 111117 | FIGURE FIGURE 1





CATCHBASIN TABLE				
CB No.	STATION	T/G ELEVATION	INVERT	ICD DIA.
1	3+081.96	93.39	91.79	
2	3+081.96	93.39	91.71	83mm
3	3+174.07	93.27	91.67	
4	3+174.06	93.27	91.58	94mm
5	3+267.41	93.17	91.57	
6	3+267.41	93.18	91.48	108mm
7	2+072.65	93.33	91.73	
8	2+072.65	93.33	91.65	102mm
9	6+044.62	93.34	91.66	
10	6+044.62	93.34	91.55	108mm
11	6+104.61	93.24	91.64	
12	6+104.61	93.24	91.53	94mm
13	4+039.86	93.30	91.70	
14	4+039.86	93.30	91.62	94mm
15	4+092.64	93.32	91.72	
16	4+092.68	93.32	91.63	102mm
17	4+162.84	93.20	91.50	
18	4+162.85	93.20	91.39	108mm
19	4+187.20	92.92	91.33	
20	4+187.20	92.92	91.24	94mm
21	4+251.68	92.62	91.13	
22	4+251.68	92.62	91.05	108mm
23	4+284.85	92.69	91.09	
24	4+284.85	92.69	91.00	83mm
25	4+319.99	92.73	91.13	
26	4+319.99	92.73	91.04	83mm
27	4+385.36	92.90	91.25	
28	4+385.36	92.88	91.16	108mm
29	5+220.96	92.97	91.28	
30	5+220.96	93.08	91.17	108mm
31	5+158.90	93.07	91.47	
32	5+158.90	93.07	91.38	94mm
33	7+024	93.25	91.65	
34	7+024	93.25	91.56	108mm
35	5+100.11	93.27	91.67	
36	5+100.11	93.27	91.58	94mm
37	5+047.04	93.35	91.75	
38	5+047.04	93.35	91.67	83mm
39	1+143	93.17	91.57	
40	1+143	93.17	91.49	127mm
41	1+267.13	93.44	91.84	
42	1+267.13	93.44	91.75	94mm
43	1+320.23	93.40	91.80	
44	1+320.24	93.40	91.72	127mm
45	1+420.82	93.41	91.81	
46	1+420.78	93.41	91.73	102mm
47	1+475.55	93.47	91.87	
48	1+475.54	93.47	91.79	83mm
49	1+538.52	93.67	92.07	
50	1+537.90	93.84	91.97	83mm

REAR YARD CATCHBASIN TABLE		
RYCB No.	T/G ELEVATION	INVERT
RYCB1	93.65	92.00
RYCB2	93.63	92.03
RYCB3	93.55	91.50
RYCB4	93.44	91.76
RYCB5	93.46	91.96
RYCB6	93.22	91.11
RYCB7	93.76	91.87
RYCB8	93.41	91.31
RYCB9	93.50	91.49
RYCB10	93.19	91.08
RYCB12	93.46	91.42
RYCB13	93.30	90.44
RYCB14	93.40	91.51
RYCB15	93.40	91.53
RYE1	93.56	91.75
RYE3	93.28	91.63
RYE4	93.55	92.36
RYE5	93.42	91.77
RYE6	93.41	91.78
RYE7	93.26	91.61
RYE9	93.48	91.56
RYE10	93.41	91.79
RYE11	93.39	91.74
RYE12	93.60	91.95
RYE13	93.60	91.95
RYT1	93.23	91.37
RYT2	93.76	92.09
RYT4	93.50	91.65
RYT5	93.42	91.56
RYT6	93.22	91.35
RYT7	93.43	91.59
RYT8	93.34	92.34
RYT9	93.31	92.31
RYT10	93.41	91.75
RYT11	93.41	91.75

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.

NOTE:
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No.	REVISION	mm/dd/yy	BY
2	REISSUED WITH DRAFT PLAN OF SUBDIVISION	MAY 23/18	MSP
1	REISSUED WITH DRAFT PLAN OF SUBDIVISION	JAN 26/18	MSP

SCALE 1:500

1:500
0 5 10 15 20

DESIGN SAZ
CHECKED DDB
DRAWN RBG
CHECKED DDB
APPROVED MSP

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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

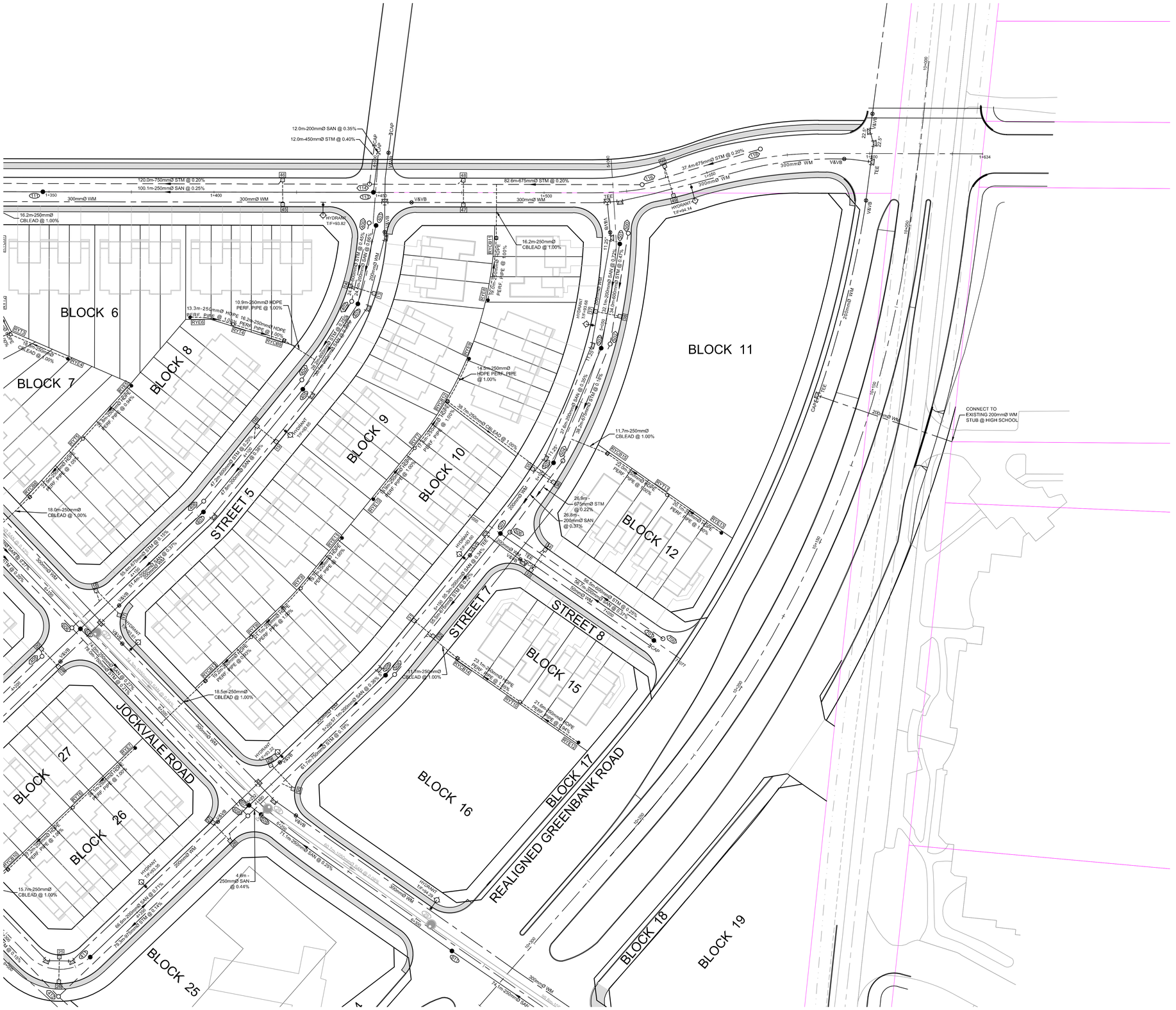
LOCATION
CITY OF OTTAWA
3370 GREENBANK ROAD

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 111117
REV REV # 2
DRAWING No. 111117-GP1

PLANB1.DWG - 1000mmx707mm

DVIEW 51.17°



CATCHBASIN TABLE

CB No.	STATION	T/G ELEVATION	INVERT	ICD DIA.
1	3+081.96	93.39	91.79	
2	3+081.96	93.39	91.71	83mm
3	3+174.07	93.27	91.67	
4	3+174.06	93.27	91.58	94mm
5	3+267.41	93.17	91.57	
6	3+267.41	93.18	91.48	108mm
7	2+072.65	93.33	91.73	
8	2+072.65	93.33	91.65	102mm
9	6+044.62	93.34	91.66	
10	6+044.62	93.34	91.55	108mm
11	6+104.61	93.24	91.64	
12	6+104.61	93.24	91.53	94mm
13	4+039.86	93.30	91.70	
14	4+039.86	93.30	91.62	94mm
15	4+092.64	93.32	91.72	
16	4+092.68	93.32	91.63	102mm
17	4+162.84	93.20	91.50	
18	4+162.85	93.20	91.39	108mm
19	4+187.20	92.92	91.33	
20	4+187.20	92.92	91.24	94mm
21	4+251.68	92.62	91.13	
22	4+251.68	92.62	91.05	108mm
23	4+284.85	92.69	91.09	
24	4+284.85	92.69	91.00	83mm
25	4+319.99	92.73	91.13	
26	4+319.99	92.73	91.04	83mm
27	4+385.36	92.90	91.25	
28	4+385.36	92.88	91.16	108mm
29	5+220.96	92.97	91.28	
30	5+220.96	93.08	91.17	108mm
31	5+158.90	93.07	91.47	
32	5+158.90	93.07	91.38	94mm
33	7+024	93.25	91.65	
34	7+024	93.25	91.56	108mm
35	5+100.11	93.27	91.67	
36	5+100.11	93.27	91.58	94mm
37	5+047.04	93.35	91.75	
38	5+047.04	93.35	91.67	83mm
39	1+143	93.17	91.57	
40	1+143	93.17	91.49	127mm
41	1+267.13	93.44	91.84	
42	1+267.13	93.44	91.75	94mm
43	1+320.23	93.40	91.80	
44	1+320.24	93.40	91.72	127mm
45	1+420.82	93.41	91.81	
46	1+420.78	93.41	91.73	102mm
47	1+475.55	93.47	91.87	
48	1+475.54	93.47	91.79	83mm
49	1+538.52	93.67	92.07	
50	1+537.90	93.84	91.97	83mm

REAR YARD CATCHBASIN TABLE

RYCB No.	T/G ELEVATION	INVERT
RYCB1	93.65	92.00
RYCB2	93.63	92.03
RYCB3	93.55	91.50
RYCB4	93.44	91.76
RYCB5	93.46	91.96
RYCB6	93.22	91.11
RYCB7	93.76	91.87
RYCB8	93.41	91.31
RYCB9	93.50	91.49
RYCB10	93.19	91.08
RYCB12	93.46	91.42
RYCB13	93.30	90.44
RYCB14	93.40	91.51
RYCB15	93.40	91.53
RYE1	93.56	91.75
RYE3	93.28	91.63
RYE4	93.55	92.36
RYE5	93.42	91.77
RYE6	93.41	91.78
RYE7	93.26	91.61
RYE9	93.48	91.56
RYE10	93.41	91.79
RYE11	93.39	91.74
RYE12	93.60	91.95
RYLE13	93.60	91.95
RYT1	93.23	91.37
RYT2	93.76	92.09
RYT4	93.50	91.65
RYT5	93.42	91.56
RYT6	93.22	91.35
RYT7	93.43	91.59
RYT8	93.34	92.34
RYT9	93.31	92.31
RYT10	93.41	91.75
RYT11	93.41	91.75

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SCALE
1:500
1:500
0 5 10 15 20

DESIGN SAZ
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LOCATION
CITY OF OTTAWA
3370 GREENBANK ROAD

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 111117
REV REV # 2
DRAWING No. 111117-GP2

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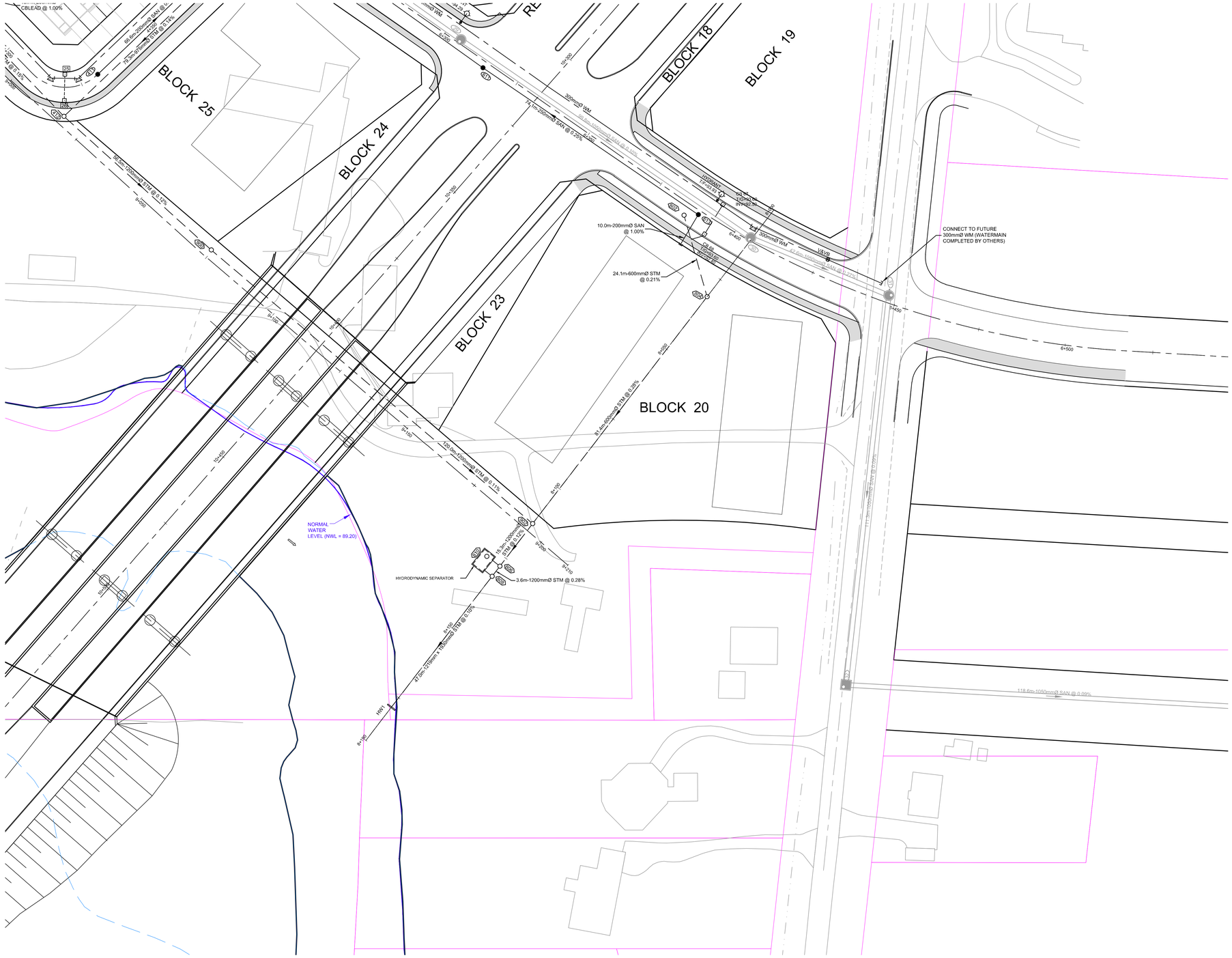
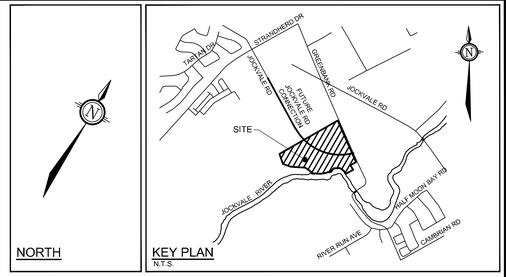
DVIEW 51.17"





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RYCB7	93.76	91.87
RYCB8	93.41	91.31
RYCB9	93.50	91.49
RYCB10	93.19	91.08
RYCB12	93.46	91.42
RYCB13	93.30	90.44
RYCB14	93.40	91.51
RYCB15	93.40	91.53
RYE1	93.56	91.75
RYE3	93.28	91.63
RYE4	93.55	92.36
RYE5	93.42	91.77
RYE6	93.41	91.78
RYE7	93.26	91.61
RYE9	93.48	91.56
RYE10	93.41	91.79
RYE11	93.39	91.74
RYE12	93.60	91.95
RYE13	93.60	91.95
RYT1	93.23	91.37
RYT2	93.76	92.09
RYT4	93.50	91.65
RYT5	93.42	91.56
RYT6	93.22	91.35
RYT7	93.43	91.59
RYT8	93.34	92.34
RYT9	93.31	92.31
RYT10	93.41	91.75
RYT11	93.41	91.75

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No.	REVISION	mm/dd/yy	BY
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1	REISSUED WITH DRAFT PLAN OF SUBDIVISION	JAN 26/18	MSP

SCALE 1:500 (1:500, 0 5 10 15 20)

DESIGN SAZ
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DRAWN RBG
CHECKED DDB
APPROVED MSP

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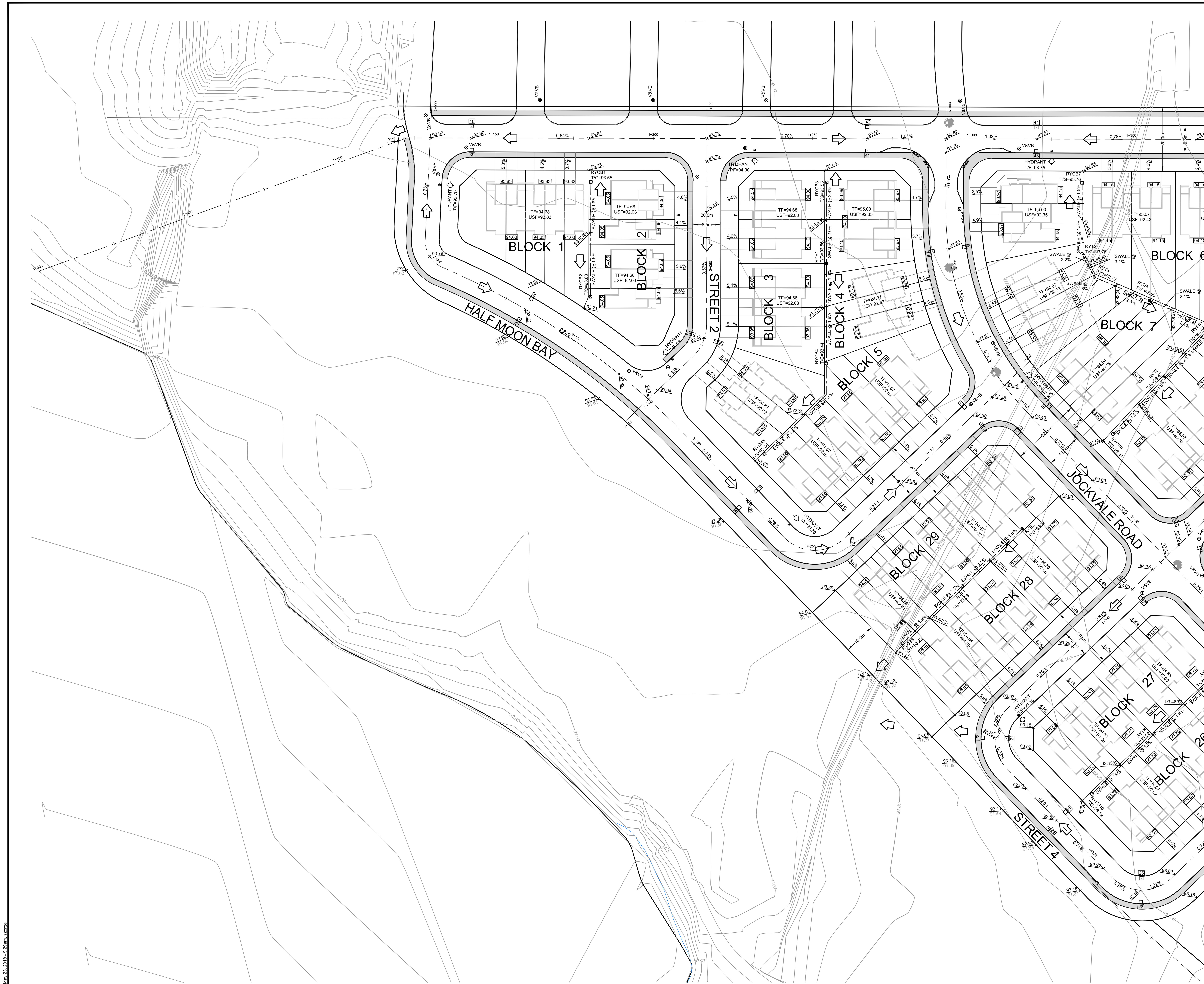
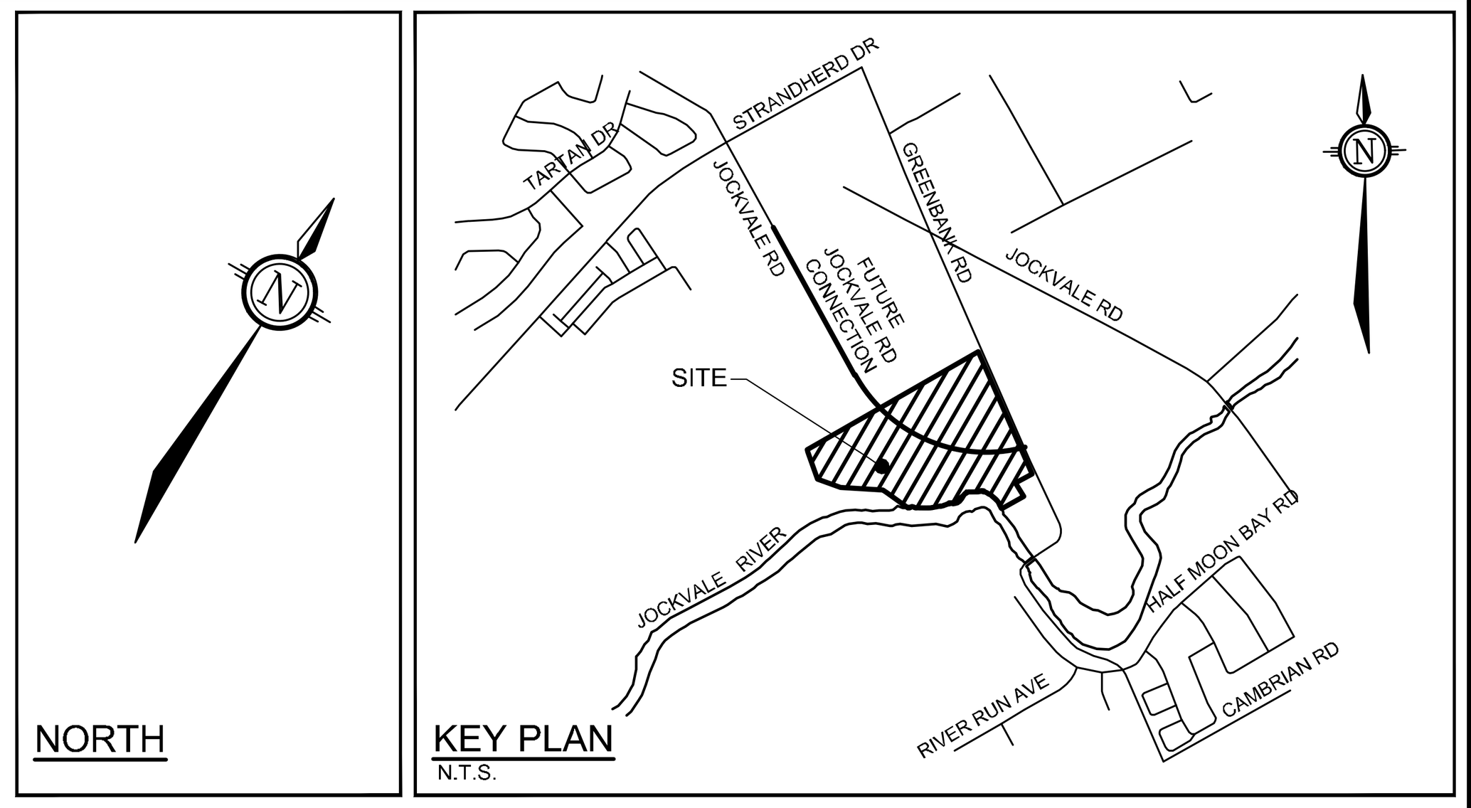
LOCATION
CITY OF OTTAWA
3370 GREENBANK ROAD

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 111117
REV. REV # 2
DRAWING No. 111117-GP3

M:\2017\111117\CAD\Design\111117 - GP.DWG, GP3, May 16, 2018 - 1:41pm, szorgal
DVIEW 51.17"
PLANFLOW2 - 1000mmx597mm





NORTH

KEY PLAN
N.T.S.

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SCALE
1:500

DESIGN SAZ
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LOCATION
CITY OF OTTAWA
3370 GREENBANK ROAD

DRAWING NAME
GRADING PLAN

PROJECT No. 111117
REV
REV # 2
DRAWING No.
111117-GR1

DVIEW 51.17°

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SCALE 1:500

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LOCATION
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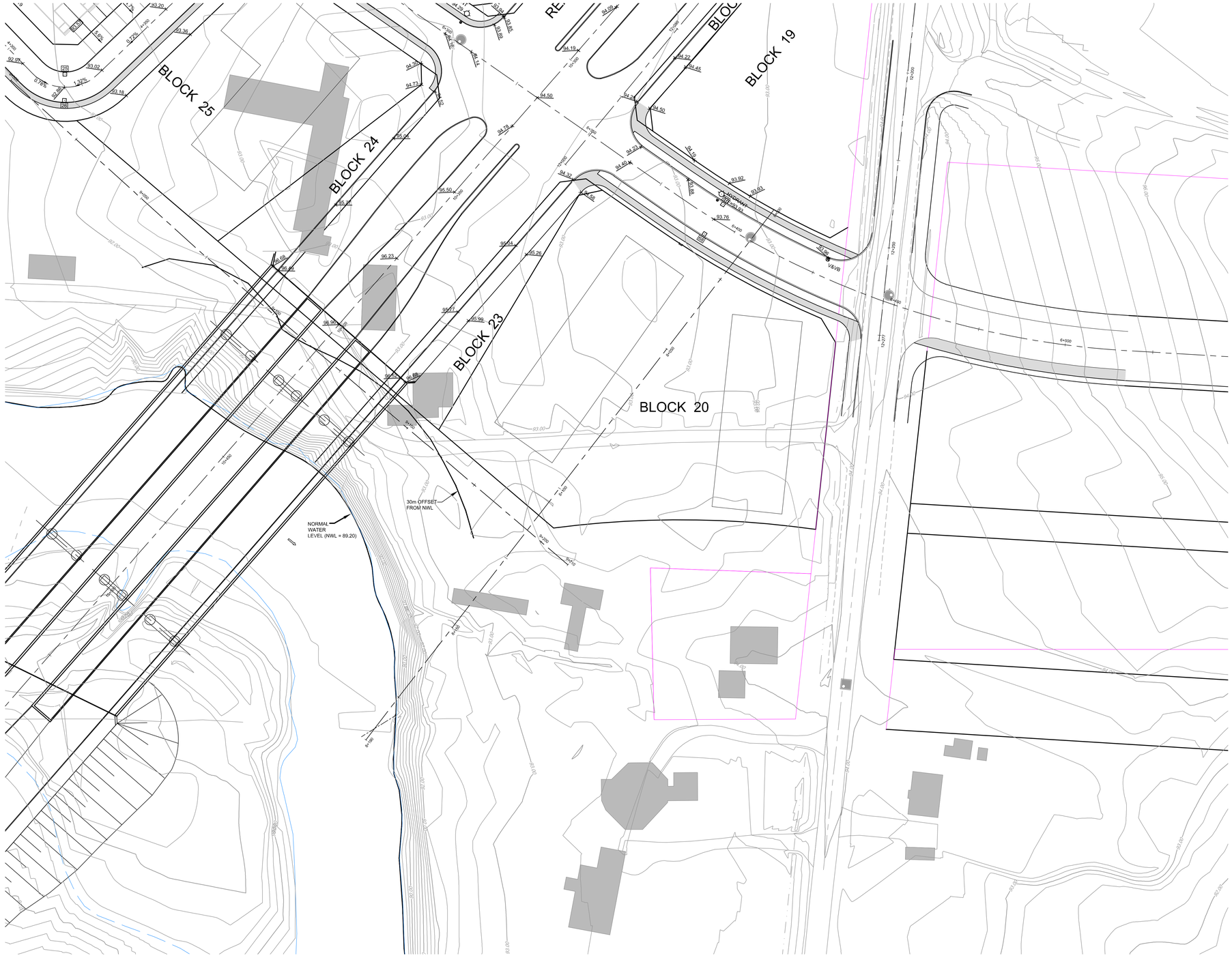
3370 GREENBANK ROAD

DRAWING NAME
GRADING PLAN

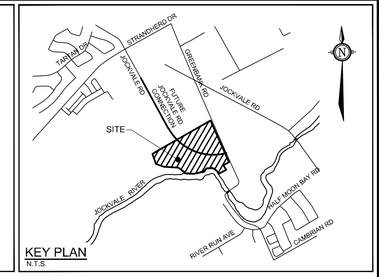
PROJECT No. 111117
REV REV # 2
DRAWING No. 111117-GR2

DVIEW 51.17°



NORTH

KEY PLAN
N.T.S.



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SCALE
1:500
1:500
0 5 10 15 20

DESIGN	SAZ
CHECKED	DDB
DRAWN	RBG
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LOCATION
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3370 GREENBANK ROAD

DRAWING NAME
GRADING PLAN

PROJECT No. 111117
REV REV # 1
DRAWING No. 111117-GR3

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1	ISSUED WITH DRAFT PLAN OF SUBDIVISION	DEC 6/16	GJM

SCALE 1:750

1:750 0 15 30

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LOCATION
CITY OF OTTAWA
3370 GREENBANK ROAD

DRAWING NAME
SANITARY DRAINAGE AREA PLAN

PROJECT No. 111117
REV REV # 3
DRAWING No. 111117-SAN1

PLANB1.DWG - 1000mmx707mm

LEGEND

- PROPOSED STORM MANHOLE & SEWER
- PROPOSED CATCHBASIN/MANHOLE & LEAD
- PROPOSED CATCHBASIN & LEAD
- PROPOSED REAR YARD CATCHBASIN & SUBDRAIN
- PROPOSED SERVICES LOCATION
- PROPOSED ROAD CROSSING HEAD WALL
- FUTURE DEVELOPMENT BY OTHERS
- DRAINAGE AREA (hectares)
- AREA IDENTIFICATION
- RUNOFF COEFFICIENT

BLOCK 1
BLOCK 2
BLOCK 3
BLOCK 4
BLOCK 5
BLOCK 6
BLOCK 7
BLOCK 8
BLOCK 9
BLOCK 10
BLOCK 11
BLOCK 12
BLOCK 13
BLOCK 14
BLOCK 15
BLOCK 16
BLOCK 17
BLOCK 18
BLOCK 19
BLOCK 20
BLOCK 21
BLOCK 22
BLOCK 23
BLOCK 24
BLOCK 25
BLOCK 26
BLOCK 27
BLOCK 28
BLOCK 29
BLOCK 30

STREET 1
STREET 2
STREET 3
STREET 4
STREET 5
STREET 7
STREET 8

HALF MOON BAY
JOCKVALE ROAD
REALIGNED GREENBANK ROAD

JOCK RIVER

STORM OUTLET DETAIL
SCALE: 1:300

KEY PLAN
N.T.S.

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SCALE 1:750 (1:750, 0, 15, 30)

DESIGN SAZ
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DRAWN RBG
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LOCATION
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DRAWING NAME
STORM DRAINAGE AREA PLAN

PROJECT No. 111117
REV REV # 3
DRAWING No. 111117-STM1