

**FUNCTIONAL SERVICING REPORT**

*FOR THE*

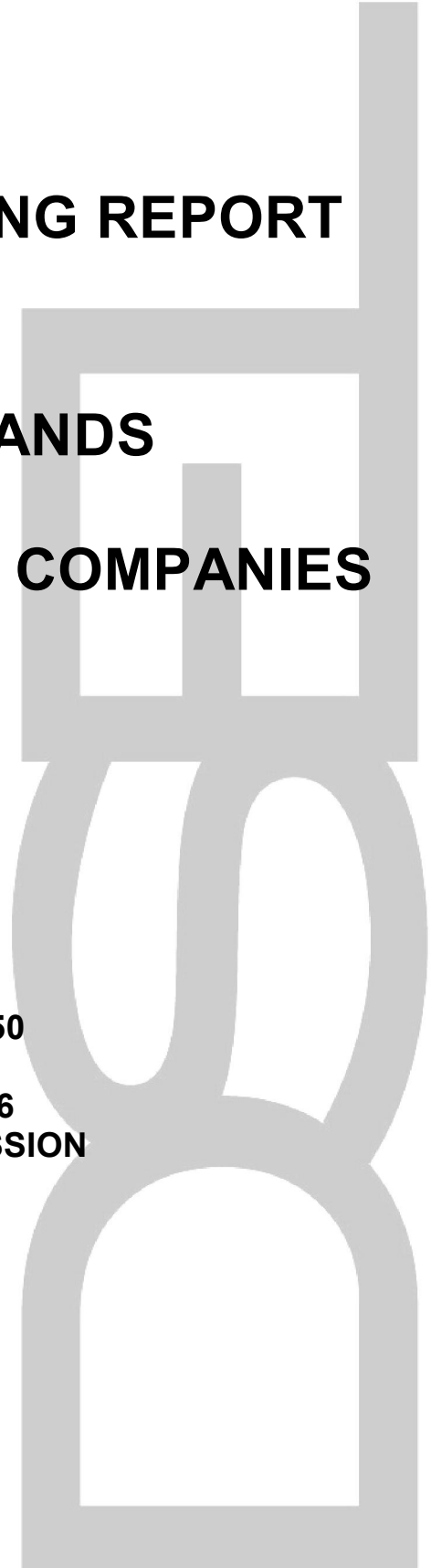
**KANATA HIGHLANDS**

**RICHCRAFT GROUP OF COMPANIES**

CITY OF OTTAWA

**PROJECT NO.: 10-450**

**DECEMBER 20, 2016**  
**REVISION 1, 1<sup>ST</sup> SUBMISSION**  
© DSEL



**FUNCTIONAL SERVICING REPORT  
FOR  
KANATA HIGHLANDS**

**RICHCRAFT GROUP OF COMPANIES**

**PROJECT NO: 10-450**

**TABLE OF CONTENTS**

|            |  |           |
|------------|--|-----------|
| <b>1.0</b> | <b>INTRODUCTION .....</b>  | <b>1</b>  |
| 1.1        | Existing Conditions .....  | 1         |
| 1.2        | Summary of Pre-consultation .....                                  | 1         |
| 1.3        | Development Concept .....  | 1         |
| 1.4        | Required Permits / Approvals .....                                 | 2         |
| <b>2.0</b> | <b>GUIDELINES, PREVIOUS STUDIES, AND REPORTS.....</b>              | <b>4</b>  |
| 2.1        | Existing Studies, Guidelines, and Reports.....                     | 4         |
| <b>3.0</b> | <b>WATER SUPPLY SERVICING .....</b>                                | <b>5</b>  |
| 3.1        | Existing Water Supply Services.....                                | 5         |
| 3.2        | Water Supply Servicing Design .....                                | 5         |
|            | 3.2.1 Watermain Modeling .....                                     | 8         |
| 3.3        | Water Supply Conclusion .....                                      | 12        |
| <b>4.0</b> | <b>WASTEWATER SERVICING.....</b>                                   | <b>12</b> |
| 4.1        | Existing Wastewater Services .....                                 | 12        |
| 4.2        | Wastewater Design and Outlet Constraints.....                      | 13        |
|            | 4.2.1 Kanata Lakes Trunk (via KLN Development Area) .....          | 13        |
|            | 4.2.2 Terry Fox Collector Sewer .....                              | 14        |
|            | 4.2.3 Signature Ridge Pumping Station.....                         | 15        |
| 4.3        | Potential Future Sanitary Flows from West of Terry Fox Drive ..... | 15        |
| 4.4        | Proposed Wastewater Servicing.....                                 | 16        |
| 4.5        | Wastewater Servicing Conclusions .....                             | 16        |
| <b>5.0</b> | <b>STORMWATER CONVEYANCE .....</b>                                 | <b>17</b> |
| 5.1        | Existing Conditions .....  | 17        |
| 5.2        | Minor System.....  | 17        |
| 5.3        | Major System.....  | 19        |
|            | 5.3.1 Water Quality Control.....                                   | 19        |

|            |  |           |
|------------|--|-----------|
| 5.3.2      | Water Quantity Control .....                 | 20        |
| 5.4        | Stormwater Conveyance Conclusion.....        | 20        |
| <b>6.0</b> | <b>SITE GRADING.....</b>                     | <b>20</b> |
| 6.1        | Master Grading.....                          | 20        |
| 6.2        | Grading Criteria .....                       | 21        |
| <b>7.0</b> | <b>EROSION AND SEDIMENT CONTROL .....</b>    | <b>21</b> |
| <b>8.0</b> | <b>CONCLUSIONS AND RECOMMENDATIONS .....</b> | <b>22</b> |

### **FIGURES**

|           |                                       |
|-----------|---------------------------------------|
| Figure 1  | Location Plan                         |
| Figure 2  | Concept Plan                          |
| Figure 3  | Conceptual Water Distribution         |
| Figure 4  | Conceptual Sanitary Servicing         |
| Figure 5  | Conceptual Storm Servicing – Option 1 |
| Figure 6  | Conceptual Storm Servicing – Option 2 |
| Figure 6A | Grading Plan – Option 1               |
| Figure 6B | Grading Plan – Option 2               |

### **TABLES**

|          |  |
|----------|--|
| Table 1  | Development Statistics Projections                         |
| Table 2  | Potential Required Permits / Approvals                     |
| Table 3  | Water Supply Design Criteria                               |
| Table 4  | Water Demand and Boundary Conditions – Proposed Conditions |
| Table 5  | Fire Demand and Minimum Pressure at Nodes                  |
| Table 6  | Model Simulation Output Summary                            |
| Table 7  | Summary of Existing Available Wastewater Outlets           |
| Table 8  | Wastewater Design Criteria                                 |
| Table 9  | Kanata Highlands Sanitary Flow Summary                     |
| Table 10 | Storm Design Criteria                                      |

### **APPENDICES**

|            |                       |
|------------|-----------------------|
| Appendix A | Water Supply          |
| Appendix B | Wastewater Supply     |
| Appendix C | Stormwater Conveyance |

**FUNCTIONAL SERVICING REPORT  
FOR  
KANATA HIGHLANDS**

**RICHCRAFT GROUP OF COMPANIES**

**PROJECT NO: 10-450**

## **1.0 INTRODUCTION**

David Schaeffer Engineering Ltd. was retained by the Richcraft Group of Companies to prepare the following functional servicing report in support of a Draft Plan of Subdivision for their Kanata Highlands development area on the east side of Terry Fox Drive (TFD). It is noted that the subject land area has been previously referred to as the “Upper/Lower Baylis” or “Interstitial Lands” in reports and studies.

The Kanata Highlands development consists of 25.05 ha of vacant land within the former Municipality of Kanata and is located approximately 1.2 km north of Richardson Side Road on the east side of TFD. There are future residential development lands to the east and south of the site, as illustrated in **Figure 1**.

This functional servicing report is provided to demonstrate that the site can be serviced in conformance with the design criteria of the City of Ottawa, background studies and general industry practice.

### **1.1 Existing Conditions**

The subject property is a Greenfield Site within the Kanata community within the City of Ottawa, adjacent to TFD. The site is not currently serviced, however some municipal services as described in this report are available within the TFD right-of-way (ROW).

The site is subject to grade raise restrictions as noted in the geotechnical report prepared by Paterson Group. The maximum permissible grade raise is recommended at 1.5 m in areas where foundations will be bearing on the silty clay deposit.

### **1.2 Summary of Pre-consultation**

There have been several pre-consultation meetings with City Staff and correspondence with the Mississippi Valley Conservation Authority regarding the overall Kanata Highlands servicing requirements.

### **1.3 Development Concept**

The draft plan of subdivision has is presented on **Figure 2**. The plan is comprised of single detached homes, townhomes, back-to-back townhomes, a park and open space.



The predicted populations currently associated with the development concept are described in **Table 1** below. The development is expected to proceed in phases, according to the landowner's preferred timing.

**Table 1: Development Statistic Projections**

| Land Use  | Total Area (ha) | Projected Residential Units | Residential Population per Unit * | Projected Population * |
|---|-----------------|-----------------------------|-----------------------------------|------------------------|
| Medium Density Residential - Townhouses         | 5.32            | 224                         | 2.7                               | 605                    |
| Medium Density Residential - Back-to-Back Towns | 0.60            | 52                          | 2.7                               | 141                    |
| Low Density Residential - Single Detached       | 5.94            | 159                         | 3.4                               | 541                    |
| Parks/Walkways                                  | 0.95            |                             |                                   |                        |
| Roads   | 5.22            |                             |                                   |                        |
| Open Space                                      | 7.02            |                             |                                   |                        |
| <b>Total</b>                                    | <b>25.05</b>    | <b>435</b>                  |                                   | <b>1287</b>            |

\* NOTE: Population projections may differ from population estimates used in background Transportation Studies, Planning Rationale, and other studies. Population projection and residential population per unit values are based on City of Ottawa and Ministry of Environment and Climate Change guidelines for servicing demand calculations.

#### 1.4 Required Permits / Approvals

The City of Ottawa must approve detailed engineering design drawings and reports prior to construction of the municipal infrastructure identified in this report. This is expected to occur as part of the approval process for *Planning Act* applications.

The following additional approvals and permits listed in **Table 2** could be expected to be required prior to construction of the municipal infrastructure detailed herein. Please note that other permits and approvals may be required, as detailed in the other studies submitted as part of the *Planning Act* applications (e.g. *Tree Conservation Report, Phase 1 Environmental Site Assessment, etc.*).

**Table 2: Potential Required Permits/Approvals**

| Agency                      | Permit/Approval Required   | Trigger   | Remarks  |
|-----------------------------|--|---|--|
| MVCA                        | Permit under Ontario Regulation 153/06, MVCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation | Any ditches requiring closure due to development/grading.<br>Any new connections to the Carp River.           | Proposed land uses & municipal infrastructure require grading within the subject lands and may result in the closure of existing ditches.<br><br>Construction of a new stormwater management pond will require a new outlet to the Carp River. |
| MOECC/<br>City of<br>Ottawa | Environmental Compliance Approval (ECA)  | Construction of new sanitary & storm sewers.  | The MOECC is expected to review the storm sewer system and sanitary sewer system through the transfer of review program.   |
| MOECC/<br>City of<br>Ottawa | Environmental Compliance Approval (ECA)  | Construction of oil & grit separators (OGS) or construction of new stormwater management facility (wet pond). | The MOECC is expected to review the stormwater management facility through the direct submission program.  |
| MOECC                       | Permit to Take Water (PTTW)  | Construction of proposed land uses (e.g. basements for residential homes) and services.                       | Pumping of groundwater and surface water may be required during construction, given groundwater conditions and proposed land uses/ municipal infrastructure.   |
| City of<br>Ottawa           | MOE Form 1 – Record of Watermains Authorized as a Future Alteration  | Construction of watermains.   | The City of Ottawa is expected to review the watermains on behalf of the MOECC through the Form 1 – Record of Watermains Authorized as a Future Alteration.  |

## 2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

### 2.1 Existing Studies, Guidelines, and Reports

The following material has been reviewed in order to identify the constraints, which govern development within the subject site:

- Carp River Watershed / Subwatershed Study – Volume 1 – Main Report  
Robinson Consultants, December 2004  
(*Subwatershed Study*)
- Carp River Watershed / Subwatershed Study Modeling Analysis,  
Robinson Consultants, December 2005
- Sewer Design Guidelines,  
City of Ottawa, October 2012  
(*City Standards*)
  - Technical Bulletin ISD-2012-1  
City of Ottawa, January 31, 2012.  
(ISD-2012-1)
  - Technical Bulletin ISDTB-2014-01, Revisions to Ottawa Design Guidelines  
- Sewer  
City of Ottawa, February 5, 2014  
(*ITSB-2014-01*)
  - Technical Bulletin PIEDTB-2016-01, Revisions to Ottawa Design  
Guidelines – Sewer  
City of Ottawa, September 6, 2016  
(*PIEDTB-2016-01*)
- Ottawa Design Guidelines – Water Distribution  
City of Ottawa, July 2010  
(*Water Supply Guidelines*)
  - Technical Bulletin ISD-2010-2  
City of Ottawa, December 15, 2010  
(*ISDTB-2010-2*)
  - Technical Bulletin ISDTB-2014-02  
City of Ottawa, May 27, 2014  
(*ISDTB-2014-02*)
- City of Ottawa Official Plan,  
adopted by Council 2003.  
(*Official Plan*)

- Stormwater Management Planning and Design Manual, Ministry of Environment, March 2003  
(*SWMP Design Manual*)
- Erosion & Sediment Control Guidelines for Urban Construction, Greater Golden Horseshoe Area Conservation Authorities, December 2006  
(*E&S Guidelines*)
- Kanata Lakes North Serviceability Study, IBI Group, June 2006
- Master Sanitary Servicing Plan, Kanata Lakes, Broughton and Interstitial Lands, Stantec Consulting Ltd., December 2007  
(*Master Sanitary Servicing Plan*)
- Pressure Zone 3W – Kanata North Potable Water Planning Study, Stantec Consulting Ltd., November 22, 2007  
(*Water Planning Study*)
- Preliminary Design for the Signature Ridge Pumping Station, Final Report R.V. Anderson Associates Limited, January 25, 2011  
(*RVA Preliminary Design*)
- Geotechnical Investigation, Kanata Highlands Phase 1 – Terry Fox Drive Paterson Group Consulting Engineers (PG2971), September 24, 2013  
(*Geotechnical Report*)
- Richardson Ridge Phase 4, Serviceability Report, IBI Group, August 2016  
(*Richardson Ridge Phase 4 Serviceability Report*)

### **3.0 WATER SUPPLY SERVICING**

#### **3.1 Existing Water Supply Services**

The proposed development is located within the City of Ottawa's water distribution Pressure Zone 3W. The northern sections of the 3W Zone are fed from the Campeau Drive Pumping Station while the Glen Cairn Pumping Station feeds the south. A 300 mm diameter watermain exists within the Terry Fox Drive right-of-way up to the south edge of the property boundary.

The existing watermains are shown on **Figure 3**.

#### **3.2 Water Supply Servicing Design**

There is a proposed subdivision to the south of the subject property. Servicing for the neighbouring subdivision is outlined in the **Richardson Ridge Phase 4 Serviceability**

**Report** prepared by *IBI Group*. The report describes that water servicing will be achieved through connections to the existing 300 mm watermain within Terry Fox Drive. As the development proposes a water demand in excess of **50 m<sup>3</sup>/day**, construction of a 150 mm diameter watermain is also proposed within Terry Fox Drive, extended to provide a redundant connection to the development. Please refer to **Appendix A** for an excerpt from the **Richardson Ridge Phase 4 Serviceability Report**, showing the conceptual servicing plan.

It is anticipated that the applicant will enter into a cost sharing agreement with the property owner to the south to construct the proposed second watermain within Terry Fox Drive.

A summary of the **Water Supply Guidelines** employed in the preparation of the preliminary water demand estimate is presented in **Table 3**.

**Table 3: Water Supply Design Criteria**

| Design Parameter  | Value   |
|---|---|
| Residential Single Family   | 3.4 P/unit                                    |
| Residential Semi-detached   | 2.7 P/unit                                    |
| Residential Townhouse/Back-to-Back  | 2.7 P/unit                                    |
| Residential Average Daily Demand  | 350 L/d/P                                     |
| Residential Maximum Daily Demand  | 2.5 x Average Daily *                         |
| Residential Maximum Hourly  | 5.5 x Average Daily *                         |
| Commercial / Park Maximum Daily Demand  | 1.5 x Average Daily *                         |
| Commercial / Park Maximum Hourly  | 2.7 x Average Daily *                         |
| Commercial / Park w/ Splash Pad Demand  | 28,000 L/ha/d                                 |
| Minimum Watermain Size  | 150 mm diameter                               |
| Minimum Depth of Cover  | 2.4 m from top of watermain to finished grade |
| During normal operating conditions desired operating pressure is within   | 350 kPa and 480 kPa                           |
| During normal operating conditions pressure must not drop below   | 275kPa  |
| During normal operating conditions pressure must not exceed   | 552kPa  |
| During fire flow operating pressure must not drop below   | 140kPa  |
| <small>*Daily average based on Appendix 4-A from <b>Water Supply Guidelines</b><br/> ** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons. City Guidelines used for populations greater than 500 persons.<br/> -Table updated to reflect ISD-2010-2</small> |   |

Water servicing for the subject site will be through the proposed property to the south. The 300 mm diameter watermain will be extended within Terry Fox Drive north to provide an additional connection along the west edge of the site. In order to ensure that minimum pressures are met throughout the development, it is recommended that the redundant connection within Terry Fox Drive be a 200 mm diameter watermain.

A 300 mm watermain is proposed through the site in accordance with the **Kanata North Potable Water Planning Study**, prepared by *Stantec*. The 300mm watermain is extended to the east edge of the site where, in the future, a connection can be made to service proposed development east of the subject site. The remaining internal watermain network will be made up of 150 mm, 200 mm, 250 mm and 300 mm diameter watermains. The proposed watermains are presented in **Figure 3**.

The proposed water supply demand and boundary conditions for the water servicing is presented in **Table 4**. Water demands include calculated water demands for the subject site, in addition to, the water demand found in the **Richardson Ridge Serviceability Report** for the property to the south. Refer to **Appendix A** for detailed calculations of water demands.

**Table 4: Water Demand and Boundary Conditions  
Proposed Conditions**

| Design Parameter   | Anticipated Demand <sup>1</sup><br>(L/min) | Boundary Condition <sup>2</sup><br>Connection 1 <sup>3</sup><br>(m H <sub>2</sub> O / kPa) |       |
|--|--|--|-------|
|  |  |  |       |
| Average Daily Demand   | 496.6                                      | 66.8   | 655.3 |
| Max Day + Fire Flow (250 L/s)  | 1,762.6 + 15,000= 16,762.6                 | 40.0   | 392.4 |
| Max Day + Fire Flow (184 L/s)  | 1,762.6 + 11,040= 12,762.6                 | 48.5   | 475.8 |
| Peak Hour  | 2,681.7                                    | 59.8   | 586.6 |
| 1) Water demand calculation per <b>Water Supply Guidelines</b> . See <b>Appendix B</b> for detailed calculations. Water demand includes anticipated demand for neighboring property to the south, see <b>Richardson Ridge Serviceability Report</b><br>2) Boundary conditions supplied by the City of Ottawa for the demands indicated in the correspondence as per the <b>Richardson Ridge Serviceability Report</b> , assumed ground elevation equal to <b>95.4m</b> . |  |  |       |

The City of Ottawa was contacted to obtain updated boundary conditions associated with the estimated water demands; however, they were not received at the time of this publication. See **Appendix A** for boundary condition request correspondence. Boundary conditions, summarized in **Table 4**, were extracted from the **Richardson Ridge Phase 4 Serviceability Report**. The pending boundary condition request results in an increase of **240%** in water demand compared to the original boundary condition request. Water distribution modeling and pressures summarized in this report are to be verified when updated boundary conditions are received.

The City of Ottawa provided both the anticipated minimum and maximum water pressures, as well as the estimated water pressure during fire flow summarized in **Table 4**. Pressures at the proposed connection point during the Average Day and Peak Hour scenarios exceed the recommended operating pressures summarized in **Table 3**. The available pressure for the fire flow demand is above the minimum pressure identified by the **Water Supply Guidelines**.

All single detached homes are expected to conform to the City of Ottawa **ISDTB-2014-02** for fire flow, resulting in a maximum fire flow of **10,000 L/min**.

In addition to single detached homes, the applicant has also contemplated back-to-back townhomes and traditional townhome units which would not conform to the described fire flow in **ISDTB-2014-02**; therefore, the **FUS** method was used to estimate fire flow.

The following assumptions were assumed to estimate fire flow based on the **FUS** method:

- Type of construction – Wood Frame
- Occupancy type – Limited Combustibility
- Sprinkler Protection – Non-Sprinklered

The above assumptions result in a maximum estimated fire flow of approximately **12,000L/min** for back-to-back townhomes and traditional townhomes which would not conform to the **ISDTB-2014-02**. Actual building materials selected will affect the estimated flow and fire flow may change at the detailed design stage. See **Appendix A** for detailed FUS calculations.

### 3.2.1 Watermain Modeling

EPANet was used to determine pipe sizing and the availability of pressures throughout the system during average day demand, max day plus fire flow, and peak hour demands. The static model determines pressures based on the available head obtained from the boundary conditions provided by the City of Ottawa, as indicated in **Table 4**.

The model utilizes the Hazen-Williams equation to determine pressure drop, while the pipe properties, including friction factors, have been selected in accordance with Table 4.4 of the **Water Supply Guidelines**; refer to **Appendix A** for model parameters. The model was prepared to assess the available pressure at the finished first floor of each building as well as the pressures the watermain provided to fire hydrants during fire flow conditions.

The fire flows indicated in **Table 5** were used to model fire demands at each of the model nodes. Fire demands were determined for each node based on the proximity of building type (Single, Townhome, Back-to-Back) from the draft plan prepared by Annis, O'Sullivan Vollebakk Ltd., dated December 9, 2016. Refer to model schematics in **Appendix A** for node locations.

**Table 5: Fire Demand and Minimum Pressure at Nodes**

| Node ID <sup>1</sup> |        | Fire Demand at Each Node (L/min) | Total Fire Demand (L/min) <sup>2</sup> | Critical Node ID <sup>3</sup> | Minimum Pressure at Critical Node (kPa) |
|----------------------|--------|----------------------------------|--|-------------------------------|---|
| Node 1               | Node 2 |                                  |  |                               |   |
| 24                   | -      | 12000                            | 12000                                  | 33                            | 153.0                                   |
| 25                   | -      | 12000                            | 12000                                  | 33                            | 152.3                                   |
| 26                   | -      | 12000                            | 12000                                  | 33                            | 151.9                                   |
| 27                   | -      | 12000                            | 12000                                  | 33                            | 149.6                                   |
| 28                   | -      | 12000                            | 12000                                  | 33                            | 142.7                                   |
| 29                   | -      | 12000                            | 12000                                  | 33                            | 141.4                                   |
| 30                   | -      | 10000                            | 10000                                  | 33                            | 186.3                                   |
| 31                   | -      | 10000                            | 10000                                  | 33                            | 184.9                                   |
| 32                   | 28     | 6000                             | 12000                                  | 33                            | 141.9                                   |
| 33                   | -      | 10000                            | 10000                                  | 33                            | 180.4                                   |
| 34                   | -      | 12000                            | 12000                                  | 33                            | 140.8                                   |
| 35                   | -      | 10000                            | 10000                                  | 33                            | 185.1                                   |
| 36                   | -      | 12000                            | 12000                                  | 33                            | 152.7                                   |
| 37                   | -      | 12000                            | 12000                                  | 33                            | 152.6                                   |
| 38                   | -      | 12000                            | 12000                                  | 33                            | 152.5                                   |
| 39                   | -      | 12000                            | 12000                                  | 33                            | 151.0                                   |
| 40                   | -      | 12000                            | 12000                                  | 33                            | 158.3                                   |
| 41                   | -      | 12000                            | 12000                                  | 33                            | 146.9                                   |
| 42                   | -      | 12000                            | 12000                                  | 33                            | 141.1                                   |
| 43                   | 42     | 6000                             | 12000                                  | 43                            | 140.5                                   |
| 44                   | -      | 10000                            | 10000                                  | 44                            | 178.5                                   |
| 45                   | -      | 10000                            | 10000                                  | 45                            | 174.0                                   |
| 46                   | -      | 10000                            | 10000                                  | 46                            | 170.1                                   |
| 47                   | -      | 10000                            | 10000                                  | 33                            | 186.6                                   |
| 48                   | -      | 10000                            | 10000                                  | 33                            | 185.1                                   |
| 49                   | -      | 10000                            | 10000                                  | 33                            | 183.1                                   |
| 50                   | -      | 10000                            | 10000                                  | 33                            | 182.6                                   |
| 51                   | -      | 10000                            | 10000                                  | 51                            | 176.5                                   |
| 52                   | -      | 12000                            | 12000                                  | 33                            | 151.1                                   |

1) If more than one node is listed in this column, the total fire demand has been split equally at each node, refer to model schematics in **Appendix B** for node locations.  
2) Demand based on ISDTB-2014-02 or the FUS estimated fire flow.  
3) Critical node is the node with the lowest residual pressure. The critical node can be one of the nodes being analyzed for fire flow or a separate node with lower pressure.



As shown above, minimum pressures are maintained during the fire flow scenario. It is anticipated that to achieve adequate pressures at some locations, fire flow would be split equally between two hydrants. During detailed design, units that will require split flows to achieve adequate pressures will have a minimum of 2 fire hydrants located within **90 m**, as per the **OBC**.

In some cases lower pressures were observed at nodes not being directly modeled for fire flow, these nodes are referred to as the critical node and their residual pressures are summarized in **Table 5** above.

As shown above, minimum pressures are maintained during the fire flow scenario at all node locations. The lowest pressure was realized at the critical node 43, pressures for this scenario are summarized in **Table 6** below.

**Table 6** summarizes the pressures during Average Day, Max Day + Fire Flow and Peak Hour.

**Table 6: Model Simulation Output Summary**

| Node ID | Average Day (kPa) | Max Day + Fire Flow (kPa) | Peak Hour (kPa) |
|---------|-------------------|---------------------------|-----------------|
| 24      | 570.6             | 231.3                     | 495             |
| 25      | 567.6             | 227.8                     | 492             |
| 26      | 559.1             | 219.2                     | 483.4           |
| 27      | 555.4             | 212.4                     | 479.7           |
| 28      | 547.1             | 196.9                     | 471.3           |
| 29      | 546               | 185.7                     | 470.2           |
| 30      | 538.6             | 178.4                     | 462.7           |
| 31      | 531.9             | 176.9                     | 456.1           |
| 32      | 524.1             | 173.2                     | 448.2           |
| 33      | 492.5             | 141.1                     | 416.6           |
| 34      | 526.6             | 177.3                     | 450.8           |
| 35      | 505.2             | 155.8                     | 429.4           |
| 36      | 574               | 234.6                     | 498.3           |
| 37      | 577.7             | 238.1                     | 502.1           |
| 38      | 573.7             | 234                       | 498.1           |
| 39      | 560.9             | 219.1                     | 485.2           |
| 40      | 555.6             | 222.6                     | 480.2           |
| 41      | 552               | 206.3                     | 476.3           |
| 42      | 544.7             | 144.8                     | 468.8           |
| 43      | 543.2             | 140.5                     | 467.3           |
| 44      | 538.5             | 145.1                     | 462.5           |
| 45      | 533.3             | 146.4                     | 457.3           |
| 46      | 523.6             | 144.9                     | 447.6           |
| 47      | 532.9             | 163.3                     | 456.9           |
| 48      | 528.8             | 176.2                     | 452.9           |
| 49      | 508.9             | 157.8                     | 433.1           |
| 50      | 503.3             | 150.4                     | 427.4           |
| 51      | 501.9             | 152.4                     | 426             |
| 52      | 561.5             | 219.9                     | 485.8           |
| PARK    | 544.7             | 144.8                     | 468.8           |

The recommended pressures from the **Water Supply Guidelines** shown in **Table 3** are respected during Peak Hour and minimum pressures are respected during Max Day + Fire Flow scenarios.

Pressures during Average Day conditions exceed the allowable pressure of **552 kPa**; it is recommended that a pressure check be conducted during construction to determine if pressure controls are required.

The model predicted that water will flow in all areas of the system and no 'dead' zones were found.

### 3.3 Water Supply Conclusion

Water servicing is to be provided through connections to the neighbouring property to the south. An existing 300 mm and proposed 150 mm watermain within Terry Fox Drive will provide a redundant water connection to both developments. It is recommended that the redundant connection with Terry Fox Drive be a 200 mm diameter watermain.

Anticipated water demand under proposed conditions were submitted to the City of Ottawa for establishing boundary conditions; however, a response was not received at the time of this publication. Boundary conditions from the servicing report for the south property were used in the analysis and pressures found in this report are to be verified once updated boundary conditions are provided.

Modeling results indicate adequate fire flow and supply is available per the demands established with the City of Ottawa. Based on the modeling results, pressure reducing valves may be required and should be confirmed at the time of construction.

The proposed water supply design conforms to all relevant City of Ottawa Guidelines and Policies.

## 4.0 WASTEWATER SERVICING

### 4.1 Existing Wastewater Services

There are three potential sanitary outlets for the Kanata Highlands development. The first two options are described in the *Master Sanitary Servicing Plan* prepared by *Stantec*.

- (i) Option 1 is through the KLN development area which borders the eastern portion of the development.
- (ii) Option 2 is to the existing Terry Fox Collector Sewer which conveys flows to the existing Signature Ridge Pumping Station (SRPS). The collector sewer is currently constructed along the east side of the Terry Fox Drive right-of-way (ROW) up to the Kanata Highlands southern property boundary.
- (iii) Option 3 is to construct a new sanitary pump station and convey flows via a new forcemain to the Signature Ridge Pump Station.

A summary of existing available wastewater outlets is presented in *Table 7*.

**Table 7: Summary of Existing Available Wastewater Outlets**

| Outlet             | Location                         |
|--------------------|----------------------------------|
| Signature Ridge PS | Didsbury Road at Terry Fox Drive |
| Kanata Lakes Trunk | Kimmins Court cul-de-sac         |

## 4.2 Wastewater Design and Outlet Constraints

The wastewater mains will be designed with the following design criteria, presented in **Table 8**:

**Table 8: Wastewater Design Criteria**

| Design Parameter   | Value  |
|--|--|
| Low Density Residential  | 3.4 p/unit   |
| Medium Density Residential                                       | 2.7 p/unit   |
| Peak Wastewater Generation per Person                            | 350 L/p/d  |
| Peaking Factor Applied   | Harmon's Equation (2.0 min, 4.0 max)               |
| Infiltration and Inflow Allowance                                | 0.28 L/s/ha  |
| Sanitary sewers are to be sized employing the Manning's Equation | $Q = \frac{1}{n} AR^{2/3} S^{1/2}$                 |
| Minimum Sewer Size   | 200 mm diameter                                    |
| Minimum Manning's 'n'  | 0.013  |
| Service Lateral Size   | 135 mm dia PVC SDR 28 with a minimum slope of 1.0% |
| Minimum Depth of Cover   | 2.0 m from crown of sewer to grade                 |
| Minimum Full Flowing Velocity                                    | 0.6 m/s  |
| Maximum Full Flowing Velocity                                    | 3.0 m/s  |

*Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012.*

### 4.2.1 Kanata Lakes Trunk (via KLN Development Area)

The KLN outlet has been evaluated in the Master Sanitary Servicing Plan as receiving flows from the northern portion of the Kanata Highlands development (previously referred to as "Upper Baylis (Interstitial Lands)"). The study has evaluated flows based upon 15.67 ha of development area with a projected population of 1,377.4 (see **Table 1.3.2** excerpt from Stantec Master Sanitary Servicing Plan in **Appendix B**). With the current refinement of the draft plan the new tributary area would equate to approximately 18.03 ha with an estimated population of 1287 (comprised of 159 single family homes and 276 townhomes).

The proposed KLN outlet could theoretically accept the projected flows, via gravity drainage, from the Highland development lands not accounted for in the TFD sanitary

sewer. To achieve this, an outlet to the KLN lands would require the construction of sanitary sewers whose downward gradient (eastward) is contrary to a significant ground surface downward gradient (trending westward). In order to convey the sanitary flows via gravity, a required sewer invert of approximately 100.00 m would be needed at the lowest drainage point of the Kanata Highlands system based upon a preliminary grading design centerline of 101.60 m adjacent to TFD. Plan and profiles of the proposed trunk line through the KLN development were not available for review, however, an evaluation of the required invert at the Kanata Highlands eastern boundary estimates a minimum outlet elevation requirement of 97.99 m. A preliminary centerline of road elevation for the adjacent KLN roadway (see Kanata Lakes North Master Grading Plan 3433-LD drawing 5002 in **Appendix B**) is at a high point of 112.00 m which results in a sewer that is approximately 14 meters deep.

Further evaluation of the proposed sanitary trunk line pipe slopes contained in the IBI Serviceability Study (2006), in conjunction with the Master Grading Plan, indicates that the pipe burial depths will range from 6.1 m up to the 14 m noted above. Ignoring the outlier high point elevation in the KLN development it is estimated that trunk sewers will be approximately 8.1 m deep on a weighted average in this gravity servicing scenario for the Highlands.

#### **4.2.2 Terry Fox Collector Sewer**

The TFD sewer is at the lower elevation (94.35 m) of the two alternative sewer outlets and could naturally accept drainage from all of the tributary area. However, the design of this sewer was established in previous servicing studies (previously referred to as “Lower Baylis (Interstitial Lands)”) and has accounted for only 2.26 ha of development area with a projected population of 198.7 (see Table 1.3.2 excerpt from Stantec Master Sanitary Servicing Plan, December 2007 in **Appendix B**). The flows are conveyed to the SRPS where they are then ultimately pumped to the Kanata Lakes Trunk.

It is also noted in the **Master Sanitary Servicing Plan** that the hydraulic grade line (HGL) in the Terry Fox sanitary trunk sewer would surcharge to the surface at several points during emergency overflow conditions at the SRPS. Therefore the study further recommends that basements should not be permitted where the ground elevation is below 97.0 m.

As noted above, the TFD sewer was designed for capacity of the Lower Baylis (Interstitial Lands), which is part of the Kanata Highlands development. Refer to the Richardson Ridge - Terry Fox Drive Sanitary Sewer Tributary Areas Plan and Sanitary Sewer Design Sheet prepared by IBI Group on 2011/02/18, enclosed in **Appendix B** for reference. Based on the Terry Fox Drive Sanitary Sewer Design Sheet, the residual capacity is approximately 4 L/s.

The proposed flows to the Terry Fox Drive Sanitary Sewer from the Kanata Highlands is presented in **Table 9**:

**Table 9: Kanata Highlands Sanitary Flow Summary**

|  | Area (ha) | Population | Peak Factor | Peak Flow (L/s) |
|--|-----------|------------|-------------|-----------------|
| <b>Approved Terry Fox Sanitary Sewer Design</b>            | 2.26      | 198.7      | 4.0         | 3.85            |
| <b>Current Proposal to Terry Fox Sanitary Sewer Design</b> | 18.3      | 1286       | 2.73        | 19.34           |

The Terry Fox Drive Sanitary Sewer Design Sheet has been updated for the current proposal to direct all of the Kanata Highlands to the TFD Sewer, enclosed in **Appendix B** for reference. The peak flow to the SRPS based on this is 84.23 L/s and the capacity of TFD sewer is 70.84 L/s. There is not sufficient residual capacity in the existing TFD Sanitary Sewer to service all of the Kanata Highlands development, when applying City of Ottawa Sewer Design Guidelines for peak design flows.

#### **4.2.3 Signature Ridge Pumping Station**

In January 2011 a *Preliminary Design* for upgrades to the SRPS was prepared by R.V. Anderson Associated Limited (RVA) which provided a comprehensive review of the Signature Ridge Pump Station's configuration and the existing (in the 2011 timeframe) and future servicing areas. The RVA design report built on previous design flow verification analyses completed by CH2M Hill in March and June 2010. It is our understanding that Stantec used the RVA Preliminary Design as the basis for the SRPS upgrades that were undertaken in 2014. Further upgrades are proposed to accommodate future flows. The City's ongoing flow monitoring program for the SRPS and associated infrastructure will ultimately confirm capacity for the Kanata Highlands.

#### **4.3 Potential Future Sanitary Flows from West of Terry Fox Drive**

A parcel of land on the west side of TFD (known municipally as 820 Huntmar Drive), across from the Highlands Phase 1 parcel, was previously identified as a candidate to be brought into the City's Urban Boundary by way of an Ontario Municipal Board decision on Official Plan Amendment #76. The land was re-designated to **Urban Expansion Study Area** on Schedule B (Urban Policy Plan) of the City of Ottawa Official Plan (OP). The irregularly shaped parcel consists of 76.6 ha with a preliminary estimate of approximately 45 ha of developable area due to the presence of the Carp River floodplain (to be confirmed with the Conservation Authority). The site is located outside of the urban boundary as identified on Schedule A of the Official Plan with TFD being the divider.

#### 4.4 Proposed Wastewater Servicing

The preferred sanitary servicing option for the Kanata Highlands is to construct a sanitary pump station on the Richcraft lands west of TFD, described in **Section 4.3**. The pump station would service the subject Kanata Highlands property located on the east side of TFD and could also be designed to function as a future viable sanitary outlet for the Urban Expansion Study Area lands on the west side of TFD. The proposed pumping station would pump directly to outlet into the SRPS via a forcemain along TFD. The proposed sanitary servicing is depicted on **Figure 4**.

#### 4.5 Wastewater Servicing Conclusions

There are three options identified to service the Kanata Highlands: the Kanata Lakes Trunk, the Terry Fox Drive Collector Sewer and a new wastewater pump station on the west side of TFD. The preferred sanitary servicing option for the Kanata Highlands is to construct a sanitary pump station on the Richcraft Lands, west of TFD. The pumping station would pump directly to the SRPS via a forcemain along TFD. The City's ongoing flow monitoring program for the SRPS and associated infrastructure will ultimately confirm capacity for the Kanata Highlands.

The new sanitary pump station is preferred for the following reasons:

- Servicing all of the Kanata Highlands by gravity to the east through the KNL Lands would result in trunk sewers that are over 8.0 m deep on average (and significantly deeper in some areas). This depth of sewer would require an evaluation of the possibility of introducing high level sewers depending on the depth locations in relation to other relevant factors (e.g. width of ROW, subsurface conditions, etc);
- Lack of residual capacity in the existing TFD Collector Sewer to service all of the Kanata Highlands based on City of Ottawa peak design flow parameters; and
- Future flexibility is provided for the Richcraft Urban Expansion Study Area Lands on the west side of TFD as it will provide a viable sanitary outlet.

## 5.0 STORMWATER CONVEYANCE

### 5.1 Existing Conditions

The subject site falls within the study limits for the **Carp River Watershed / Subwatershed Study**. The Subwatershed Study sets out the existing flood lines, and the flood control requirements for all lands within the Subwatershed.

The Kanata Highlands development area drains in two directions, separated by a height of land in the north east portion of the site. As illustrated on **Figure 5A** and **Figure 5B**, the majority of the lands drain in a westerly direction towards the Carp River. The remaining lands in the north east portion of the site drain easterly towards the Goulbourn Forced Road ROW.

The existing site is comprised of treed areas and various pockets of rock outcrops.

### 5.2 Minor System

The Kanata Highlands will be serviced by a storm sewer system designed in accordance with the amendment to the storm sewer and stormwater management elements of the Ottawa Design Guidelines – Sewer (Technical Bulletin PIEDTB-2016-01).

The minor storm sewer system will be sized as follows:

- 2-year event for local streets;
- 5-year event for collector streets; and
- 10-year events for arterial roads

The storm sewers are sized using City of Ottawa IDF curves. Inlet control devices will be employed to ensure that storm flows entering the minor system are limited to the flows described above. A Hydraulic Grade Line (HGL) analysis will be completed and underside of footing elevations will be set at a minimum of 0.30 m above the HGL elevation during detailed design. The HGL must remain below the underside of building footing during the stress test event (100-year + 20%).

All storm flows will be treated for water quality, erosion, and quantity control as noted in the **SWMP Manual**.

There are two storm servicing outlet options for Kanata Highlands. Option 1 and Option 2 are presented in **Figure 5A** and **Figure 5B**, respectively. The description of the two options is as follows:



### Option 1: New Stormwater Management (SWM) Facility

In this proposal, all of the Kanata Highlands are proposed to be serviced by a new SWM Facility on the west of Terry Fox Drive. Refer to the drainage areas and conceptual storm servicing for Option 1 on **Figure 5A**.

### Option 2: New Stormwater Management (SWM) Facility and Oil and Grit Separators

In this proposal, a portion of the Kanata Highlands are proposed to be serviced by a new SWM Facility on the west of Terry Fox Drive. A portion of the lands are proposed to be serviced by two oil and grit separators, located in the lands to the south. Refer to the **Richardson Ridge Phase 4 Report** for further details on the oil and grit separators. Refer to the drainage areas and conceptual storm servicing for Option 2 on **Figure 5B**.

A summary of the relevant **City Standards** employed in the design of the proposed storm sewer system referred to as the minor system is presented in **Table 10**:

**Table 10: Storm Sewer Design Criteria**

| Design Parameter  | Value   |
|---|---|
| Minor System Design Return Period   | 2-Year (Local Streets), 5-Year (Collector Streets), 10-Year (Arterial Streets) – PIEDTB-2016-01 |
| Major System Design Return Period   | 100-Year  |
| Intensity Duration Frequency Curve (IDF) 5-year storm event.<br>A = 998.071<br>B = 6.053<br>C = 0.814 | $i = \frac{A}{(t_c + B)^C}$   |
| Initial Time of Concentration   | 10 minutes  |
| Rational Method   | $Q = CiA$   |
| Runoff coefficient for paved and roof areas   | 0.9   |
| Runoff coefficient for landscaped areas   | 0.2   |
| Storm sewers are to be sized employing the Manning's Equation   | $Q = \frac{1}{n} AR^{2/3} S^{1/2}$  |
| Minimum Sewer Size  | 250 mm diameter   |
| Minimum Manning's 'n'   | 0.013   |
| Service Lateral Size  | 100 mm dia PVC SDR 28 with a minimum slope of 1.0%  |
| Minimum Depth of Cover  | 2.0 m from crown of sewer to grade  |
| Minimum Full Flowing Velocity   | 0.8 m/s   |
| Maximum Full Flowing Velocity   | 6.0 m/s   |
| Clearance from 100-Year HGL to building opening   | 0.30 m  |
| <i>Extracted from Sections 5 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012</i>    |   |

### 5.3 Major System

Major system runoff in excess of the minor system and up to the 100-year event will be conveyed within the road allowances via a continuous overland flow route towards TFD. In accordance with City guidelines, the 100-year major flows at TFD will have to be captured and conveyed under TFD to avoid overland flows from crossing the collector roadway. The flows are then ultimately directed to the proposed SWM facility outside of the Carp River floodplain.

The major system is to be designed in accordance with the amendment to the storm sewer and stormwater management elements of the Ottawa Design Guidelines – Sewer (Technical Bulletin PIEDTB-2016-01).

- The maximum depth of flow on local and collector streets is 0.35 m during the 100-year event. 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 year + 20%). There must be at least 15 cm of vertical clearance between the spill elevation on the street and the ground elevation at the nearest building envelope.
- Refer to **Figure 5A** and **Figure 5B** for a depiction of the major system flow design for the Kanata Highlands.

#### 5.3.1 Water Quality Control

Water quality control targets for the proposed SWM facility were outlined by Doug Nuttall of the Mississippi Valley Conservation Authority (MVCA) via email correspondence (see **Appendix C**). The targets are also discussed in Section 8.3.1.3 of the Subwatershed Study.

The recommended quality control objective for facilities discharging to the Carp River is a Level 2 (Normal Protection) control. This level of protection corresponds to a 70% total suspended solids (TSS) removal prior to discharging to the watercourse. The storage volumes required, based upon the chosen wet pond facility alternative, are dictated by Table 3.2 from the MOECC SWMP Design Manual.

As noted in the **Richardson Ridge Phase 4 Report**, previous studies required Normal Protection (Level 2, 70% TSS removal). Due to the proximity to the Provincially Significant Wetland (PSW) south of Richardson Ridge, Enhanced Protection (Level 1, 80% TSS removal) will be provided by the oil and grit separators.

### 5.3.2 Water Quantity Control

Water quantity control targets of matching post-development flows to pre-development conditions (up to the 100-year event) were identified by Doug Nuttall in the correspondence previously referenced. This quantity target is also in accordance with the governing Subwatershed Study.

### 5.4 Stormwater Conveyance Conclusion

The storm sewers are to be designed per the City of Ottawa guidelines, including the amendment to the guidelines per Technical Bulletin PIEDTB-2016-01.

- There are two options for the storm sewer outlet: either the entire Kanata Highlands property is serviced by a new SWM facility on the west side of Terry Fox Drive or the storm servicing is split between a new SWM facility on the west side of Terry Fox Drive and two oil and grit separators located on the property to the south (Richardson Ridge, Phase 4);
- The storm flows will be treated for quality control, quantity control and erosion protection;
- The proposed SWM facility will be designed to provide quality control treatment to achieve a Normal Level of Protection (70% TSS removal per MOECC guidelines);
- The oil and grit separators have been designed to provide quality control treatment to achieve an Enhanced Level of Protection (80% TSS removal per MOECC guidelines) due to the proximity to the PSW, south of Richardson Ridge.
- A Hydraulic Grade Line (HGL) analysis will be completed and underside of footing elevations will be set at a minimum of 0.30 m above the 100-Year HGL elevation during detailed design. The HGL must remain below the underside of building footing during the stress test event (100-year + 20%).

## 6.0 SITE GRADING

### 6.1 Master Grading

The Kanata Highlands site is constrained by the existing topography to the north and east, future development to the south and Terry Fox Drive to the west.

Based upon the **Geotechnical Investigation** undertaken, the site is subject to a grade raise restriction of 1.5 m in areas where the underside of footings will be founded on existing silty clay deposits. The servicing and grading has been designed to minimize grade raises in these areas along with maintaining an appropriate balance between cut and fill for the subdivision.

There are two grading options, corresponding to the two storm servicing options. Grading Plan – Option 1 corresponds to the storm servicing design where all of Kanata Highlands is serviced by a new SWM facility, west of Terry Fox Drive. Grading Plan – Option 1 is presented on **Figure 6A**. Grading Plan – Option 2 corresponds to the storm servicing design where the Kanata Highlands servicing is split between a new SWM Facility west of Terry Fox Drive and two oil and grit separators located on the property to the south. Grading Plan – Option 2 is presented on **Figure 6B**.

The final grading plans will be forwarded to the geotechnical consultant for review and recommendations (especially in areas where grade raises may be of concern) at the detailed design stage. Final signoff for the Kanata Highlands detailed grading plans will be provided by the Geotechnical Engineer.

## 6.2 Grading Criteria

The following grading criteria and guidelines will be applied at the time of detailed design as per City of Ottawa Guidelines:

- Maximum slope in grassed areas between 2% and 5%;
- Grades in excess of 7% require terracing to a maximum of a 3:1 slope;
- Driveway grades between 2% and 6%;
- Drainage ditches and swales should have a minimum slope of 1.5%;
- Perforated pipe is required for swales less than 1.5% in slope;
- Swales are to be 0.15 m deep with 3:1 side slopes unless otherwise indicated on the drawings;

## 7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosions losses is exaggerated during construction where the vegetation has been removed and the top layer of soil is disturbed.

Erosion and sediment controls will be implemented during construction. The following recommendations to the contractor will be included in contract documents.

- Limit extent of exposed soils at any given time;
- Re-vegetate exposed areas as soon as possible;
- Minimize the area to be cleared and grubbed;
- Protect exposed slopes with plastic or synthetic mulches;

- Install silt fence to prevent sediment from entering existing ditches;
- No refueling or cleaning of equipment near existing watercourses;
- Provide sediment traps and basins during dewatering;
- Install filter cloth between catch basins and frames;
- Installation of mud mats at construction accesses; and
- Plan construction at proper time to avoid flooding.

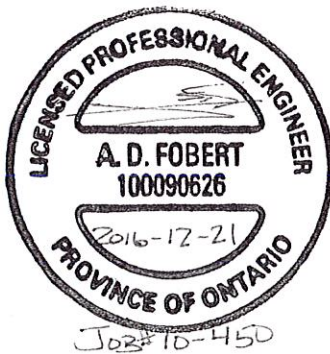
## 8.0 CONCLUSIONS AND RECOMMENDATIONS

The overall design summary for the Kanata Highlands development is as follows:

- The City of Ottawa has been pre-consulted regarding this application. Approvals will be required from the City of Ottawa, MOECC and MVCA.
- The proposed development is within the City's water distribution Pressure Zone 3W. Water servicing is to be provided through connections to the neighbouring property to the south. An existing 300 mm and proposed 150 mm watermain within Terry Fox Drive will provide a redundant water connection to both developments. Modeling results indicate adequate fire flow and supply is available per the demands established with the City of Ottawa. Based on the modeling results, pressure reducing valves may be required and should be confirmed at the time of construction. Boundary conditions from the servicing report for the south property were used in the analysis and pressures found in this report are to be verified once updated boundary conditions are provided. The proposed water supply design conforms to all relevant City of Ottawa Guidelines and Policies.
- Sanitary sewers are designed as per the City of Ottawa guidelines. There are three proposed sanitary options considered, with the preferred option being construction of a new sanitary pumping station to be located west of Terry Fox Drive. The sanitary pumping station flows will discharge to the Signature Ridge Pump Station via a proposed sanitary forcemain. This proposed servicing concept provides a viable servicing outlet for the Urban Expansion Study Area lands on the west side of TFD.
- Storm sewers are designed as per the City of Ottawa guidelines, including the amendment to the guidelines per Technical Bulletin PIEDTB-2016-01. Storm sewers will outlet to one of two storm servicing options. It is recommended that the Kanata Highlands outlet to a new SWM Facility west of TFD, outside the Carp River floodplain. The second option has the Kanata Highlands servicing split between a new SWM Facility west of TFD and two oil and grit separators located on the lands to the south (Richardson Ridge, Phase 4).

- The new SWM Facility will be designed to achieve the quality control target of 70% TSS removal (Normal Level of Protection) as well as controlling post-development flows to pre-development conditions. The oil and grit separators to the south are designed to achieve the quality control target of 80% TSS removal (Enhanced Level of Protection) due to the proximity to a PSW.
- A Hydraulic Grade Line (HGL) analysis will be completed and underside of footing elevations will be set at a minimum of 0.30 m above the 100-Year HGL elevation during detailed design. The HGL must remain below the underside of building footing during the stress test event (100-year + 20%).
- Servicing and grading has been designed as low as possible as the site is subject to a grade raise restriction of 1.5 m. The grading will be reviewed by the geotechnical engineer at the time of detailed design and provide recommendations.
- Erosion and sediment control measures will be implemented and maintained throughout construction. The Carp River will be protected from any negative impacts from construction.
- The design has been completed in general conformance with the City of Ottawa Design Guidelines and criteria presented in other background study documents.

Prepared by,  
**David Schaeffer Engineering Ltd.**

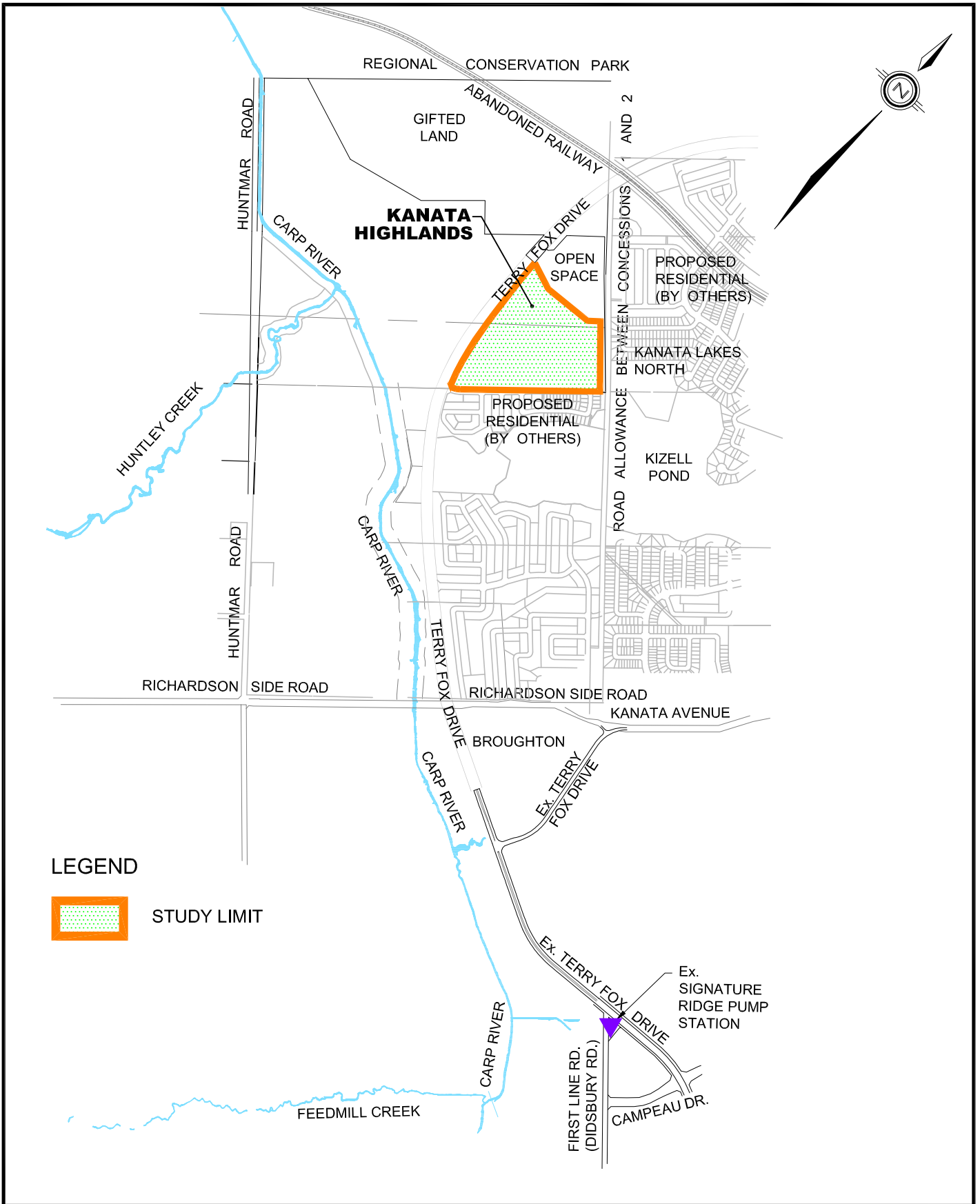


Per: Adam Fobert, P.Eng

Prepared by,  
**David Schaeffer Engineering Ltd.**

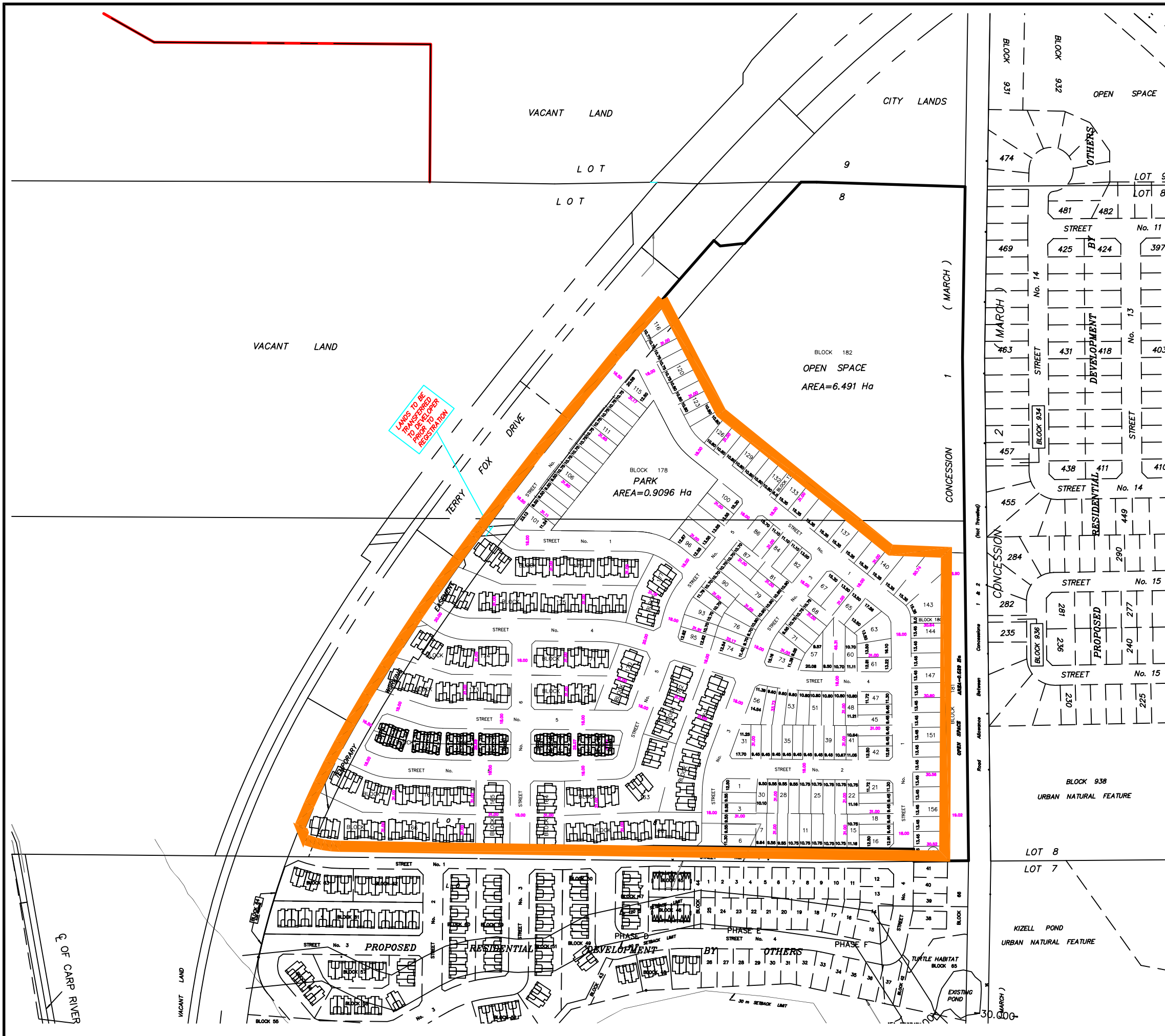


Per: Jennifer Ailey, P.Eng.



|   |  |  |
|---|--|--|
| <p><b>KANATA<br/>HIGHLANDS</b></p>  | <p><b>LOCATION PLAN</b></p>  | <p>SCALE: 1:20000</p>  |
|  | <p>120 Iber Road, Unit 103<br/>Stittsville, ON K2S 1E9<br/>Tel. (613) 836-0856<br/>Fax. (613) 836-7183<br/>www.DSEL.ca</p> | <p>DATE: DECEMBER 2016</p> <p>PROJECT No.: 10-450</p> <p>FIGURE: 1</p> |





LAWNS TO BE TRANSFERRED PRIOR TO REGISTERATION

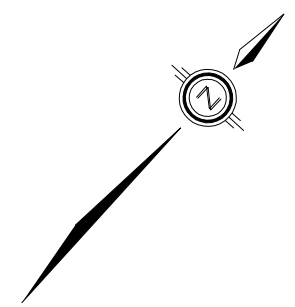
CONCEPT PLAN PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK, LTD. DATED DECEMBER 09, 2016.

LEGEND  
 STUDY LIMIT

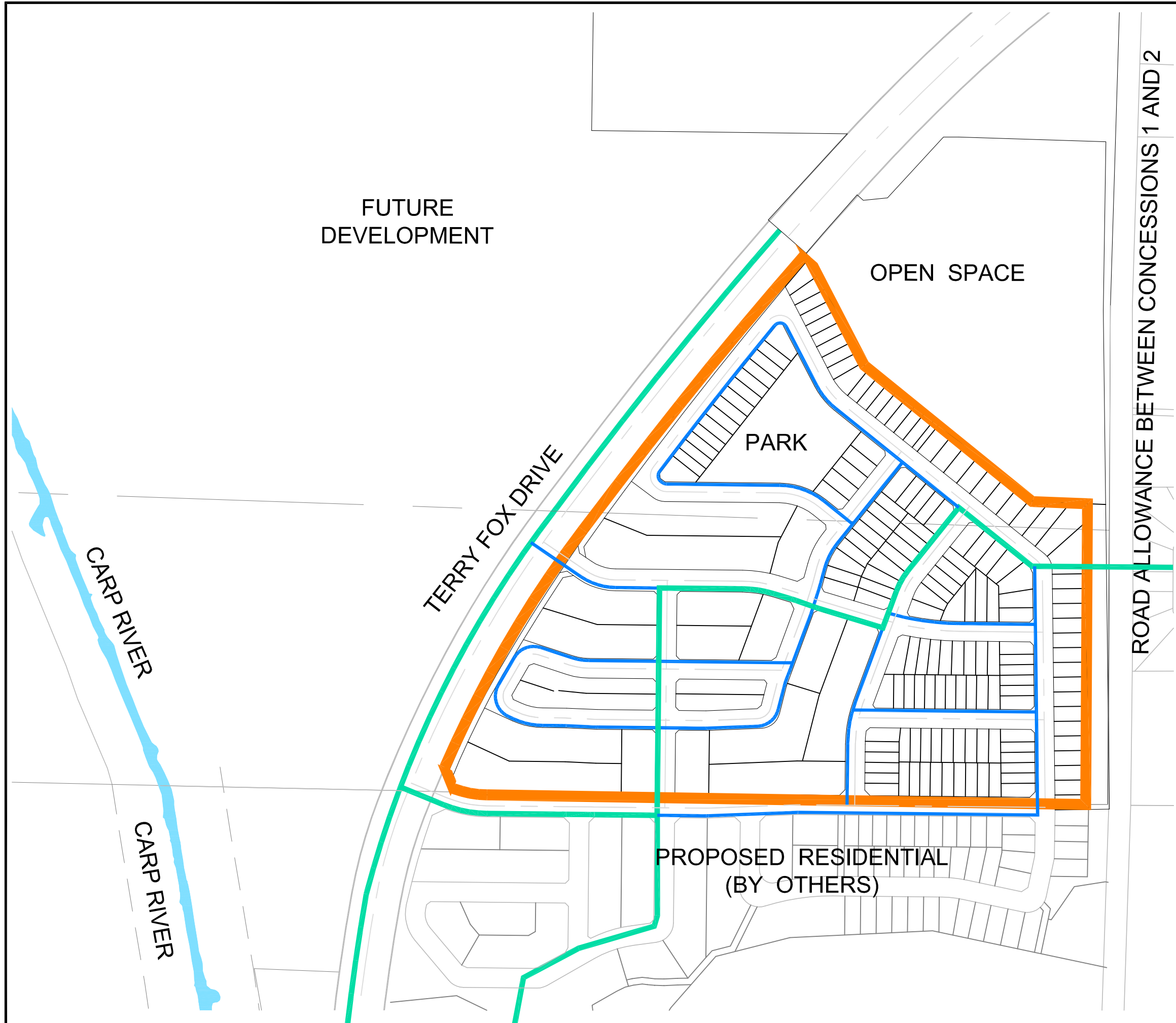
**DSEL**  
 david schaeffer engineering ltd  
 120 Iber Road, Unit 103  
 Stittsville, ON K2S 1E9  
 Tel. (613) 836-0856  
 Fax. (613) 836-7183  
 www.DSEL.ca

**KANATA HIGHLANDS**  
**CONCEPT PLAN**

|               |                    |             |
|---------------|--------------------|-------------|
| DRAWN BY:     | DATE: DEC. 2016    | CHECKED BY: |
| SCALE: 1:3500 | PROJECT No. 10-450 | FIGURE: 2   |







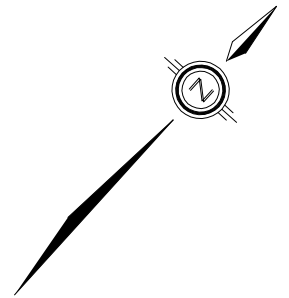
PROPOSED WATERMAIN SIZING  
 OBTAINED FROM "PRESSURE ZONE  
 3W-KANATA NORTH POTABLE WATER  
 PLANNING STUDY" PREPARED BY  
 STANTEC CONSULTING LTD., DATED  
 NOVEMBER 2007.

- LEGEND**
- LOCAL WATERMAIN
  - 3000Ø WATERMAIN
  - STUDY LIMIT

**DSEL**  
 david schaeffer engineering ltd








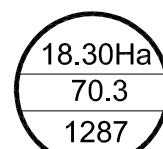
120 Iber Road, Unit 103  
 Stittsville, ON K2S 1E9  
 Tel. (613) 836-0856  
 Fax. (613) 836-7183  
 www.DSEL.ca

|  |                    |              |
|--|--------------------|--------------|
| <b>KANATA<br/>HIGHLANDS</b>              |                    |              |
| <b>CONCEPTUAL WATER<br/>DISTRIBUTION</b> |                    |              |
| DRAWN BY:                                | DATE: DEC. 2016    | CHECKED BY:  |
| SCALE:<br>1:3500                         | PROJECT No. 10-450 | FIGURE:<br>3 |

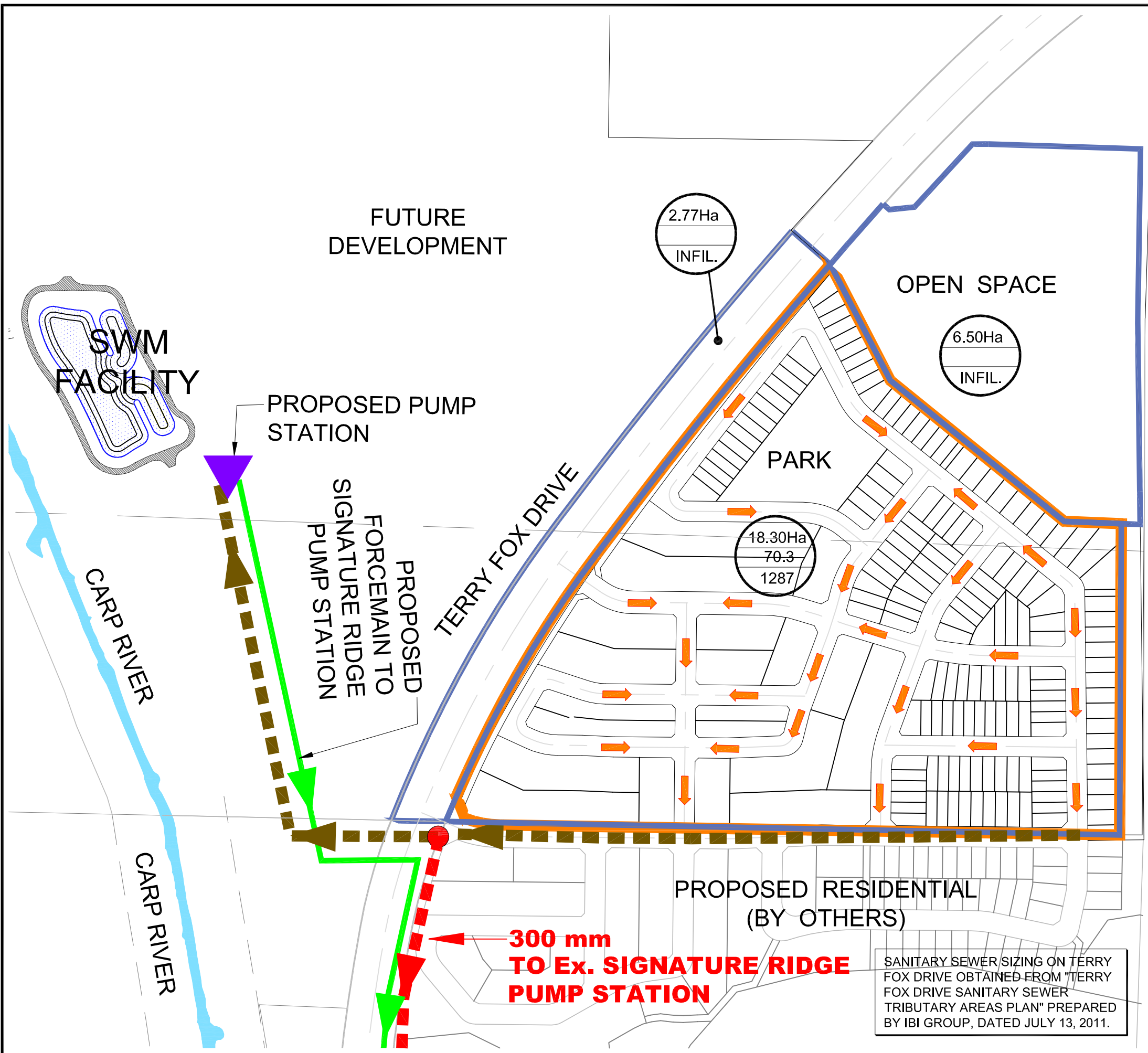


| UNIT TYPE     | UNITS      | P/UNITS | POPULATION  |
|---------------|------------|---------|-------------|
| SINGLES       | 159        | 3.4     | 541         |
| TOWNHOUSES    | 224        | 2.7     | 605         |
| BACK TO BACKS | 52         | 2.7     | 141         |
| <b>TOTAL</b>  | <b>435</b> |         | <b>1287</b> |

**LEGEND**

-  PROPOSED SANITARY FORCEMAIN
-  PROPOSED SANITARY TRUNK
-  PROPOSED SANITARY TRUNK (BY OTHERS)
-  SANITARY SYSTEM FLOW DIRECTION
-  SANITARY DRAINAGE AREA
-  STUDY LIMIT
-  PROPOSED SANITARY PUMP STATION
-  DRAINAGE AREA  
18.30Ha  
70.3  
1287  
AVERAGE DENSITY (PERSON/NET Ha)  
POPULATION

ROAD ALLOWANCE BETWEEN CONCESSIONS 1 AND 2



SANITARY SEWER SIZING ON TERRY FOX DRIVE OBTAINED FROM "TERRY FOX DRIVE SANITARY SEWER TRIBUTARY AREAS PLAN" PREPARED BY IBI GROUP, DATED JULY 13, 2011.

**DSEL**  
david schaeffer engineering ltd

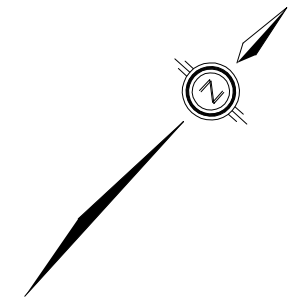
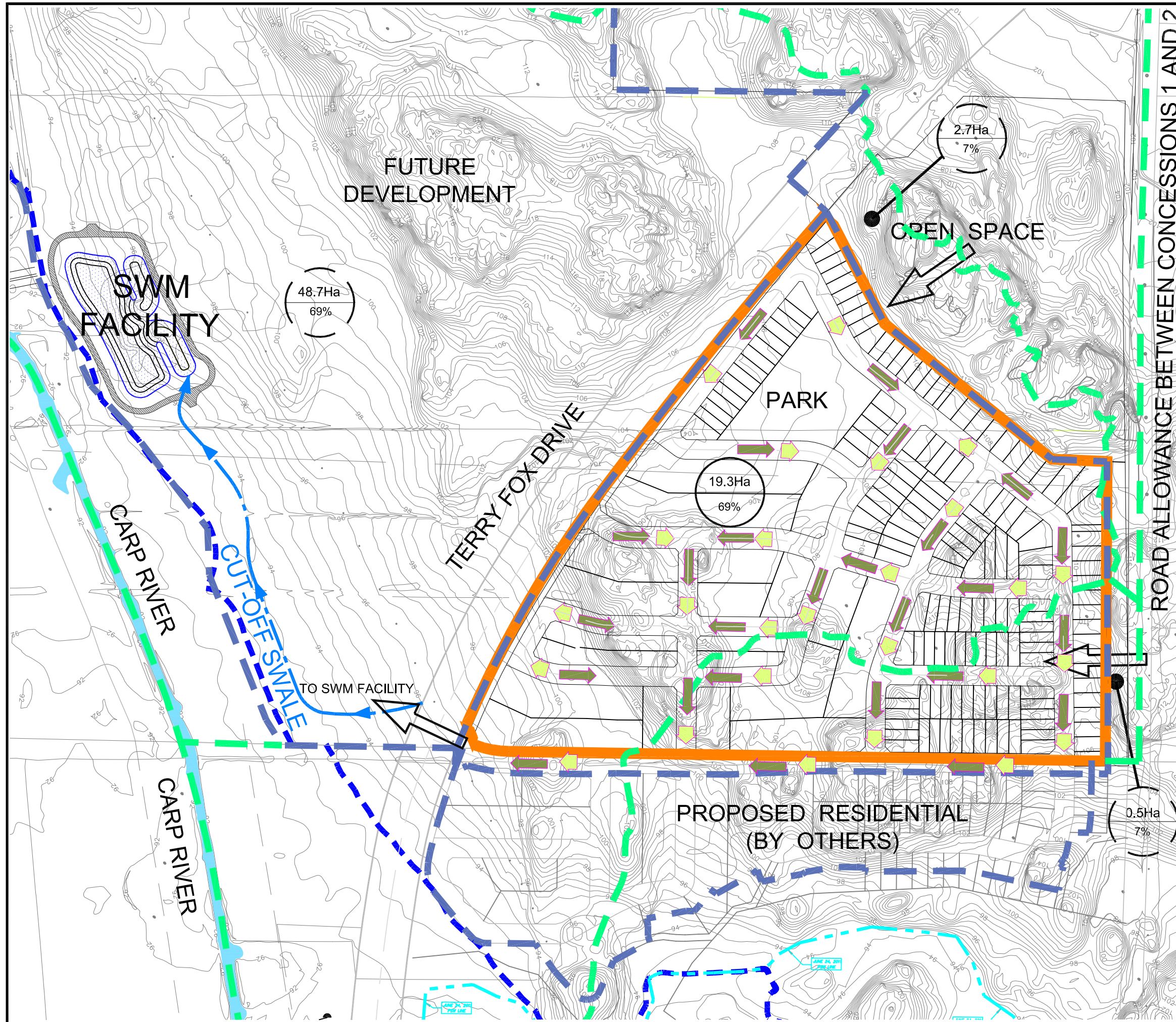
120 Iber Road, Unit 103  
Stittsville, ON K2S 1E9  
Tel. (613) 836-0856  
Fax. (613) 836-7183  
www.DSEL.ca

**KANATA HIGHLANDS**

**CONCEPTUAL SANITARY SERVICING**

|               |                    |             |
|---------------|--------------------|-------------|
| DRAWN BY:     | DATE: DEC. 2016    | CHECKED BY: |
| SCALE: 1:3500 | PROJECT No. 10-450 | FIGURE: 4   |





- LEGEND**
- STUDY LIMIT
  - - - REGULATORY FLOOD LINE
  - - - POST DEVELOPMENT DRAINAGE BOUNDARY
  - - - PRE DEVELOPMENT DRAINAGE BOUNDARY
  - STORM SEWER FLOW DIRECTION
  - MAJOR SYSTEM FLOW DIRECTION
  - 67.0Ha  
69% DRAINAGE AREA IMPERVIOUSNESS
  - 1.5Ha  
7% EXTERNAL DRAINAGE AREA IMPERVIOUSNESS

**DSEL**  
 david schaeffer engineering ltd

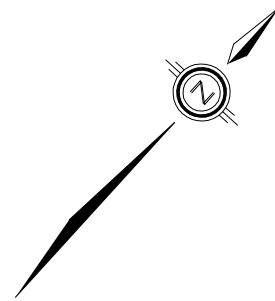
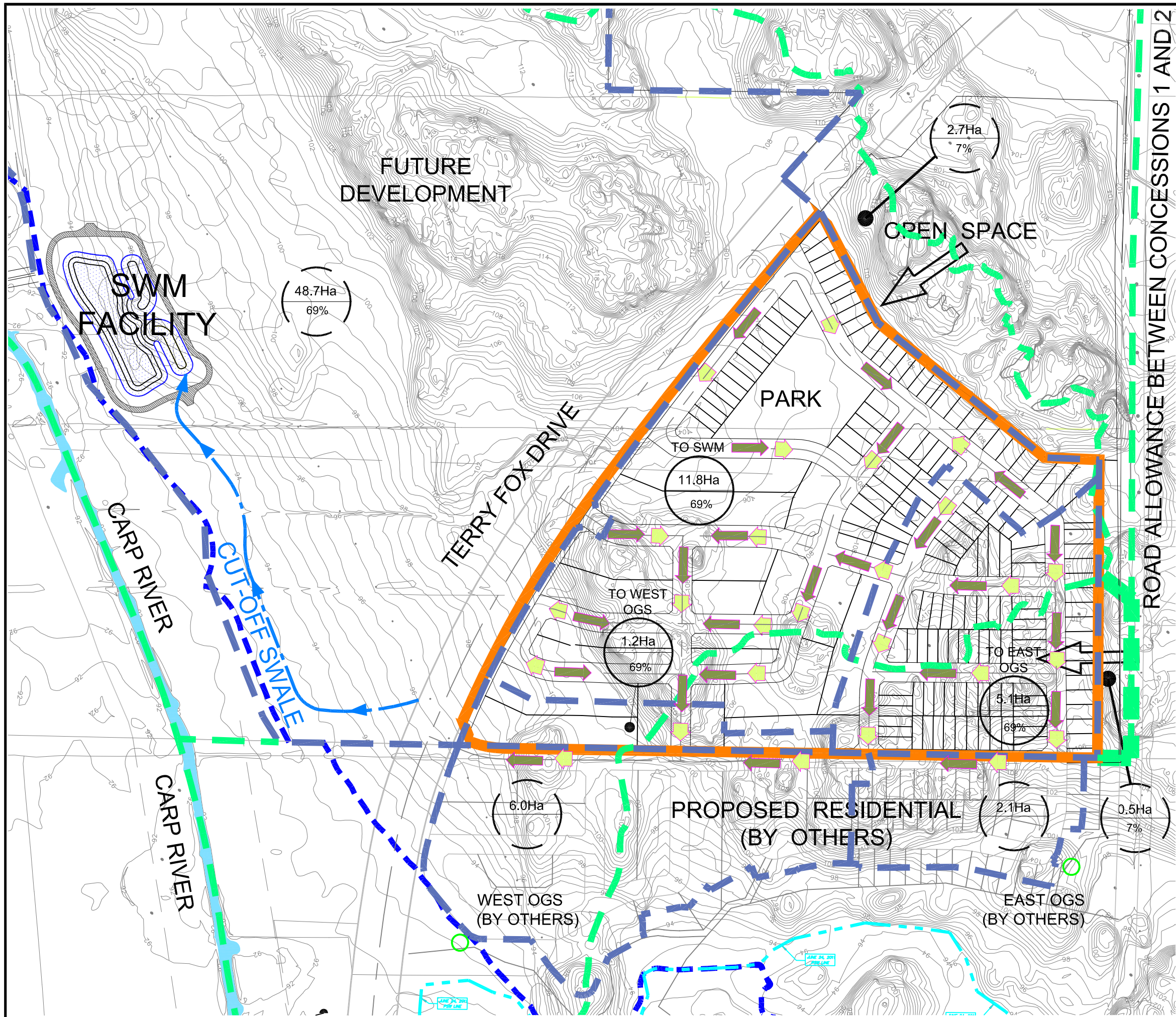
120 Iber Road, Unit 103  
 Stittsville, ON K2S 1E9  
 Tel. (613) 836-0856  
 Fax. (613) 836-7183  
 www.DSEL.ca

**KANATA  
 HIGHLANDS**

**CONCEPTUAL STORM  
 SERVICING - OPTION 1**

|                  |                    |               |
|------------------|--------------------|---------------|
| DRAWN BY:        | DATE: DEC. 2016    | CHECKED BY:   |
| SCALE:<br>1:3500 | PROJECT No. 10-450 | FIGURE:<br>5A |





**LEGEND**

- STUDY LIMIT
- REGULATORY FLOOD LINE
- POST DEVELOPMENT DRAINAGE BOUNDARY
- PRE DEVELOPMENT DRAINAGE BOUNDARY
- STORM SEWER FLOW DIRECTION
- MAJOR SYSTEM FLOW DIRECTION
- 67.0Ha  
69%  
DRAINAGE AREA  
IMPERVIOUSNESS
- 1.5Ha  
7%  
EXTERNAL DRAINAGE AREA  
IMPERVIOUSNESS

**DSEL**  
 david schaeffer engineering ltd

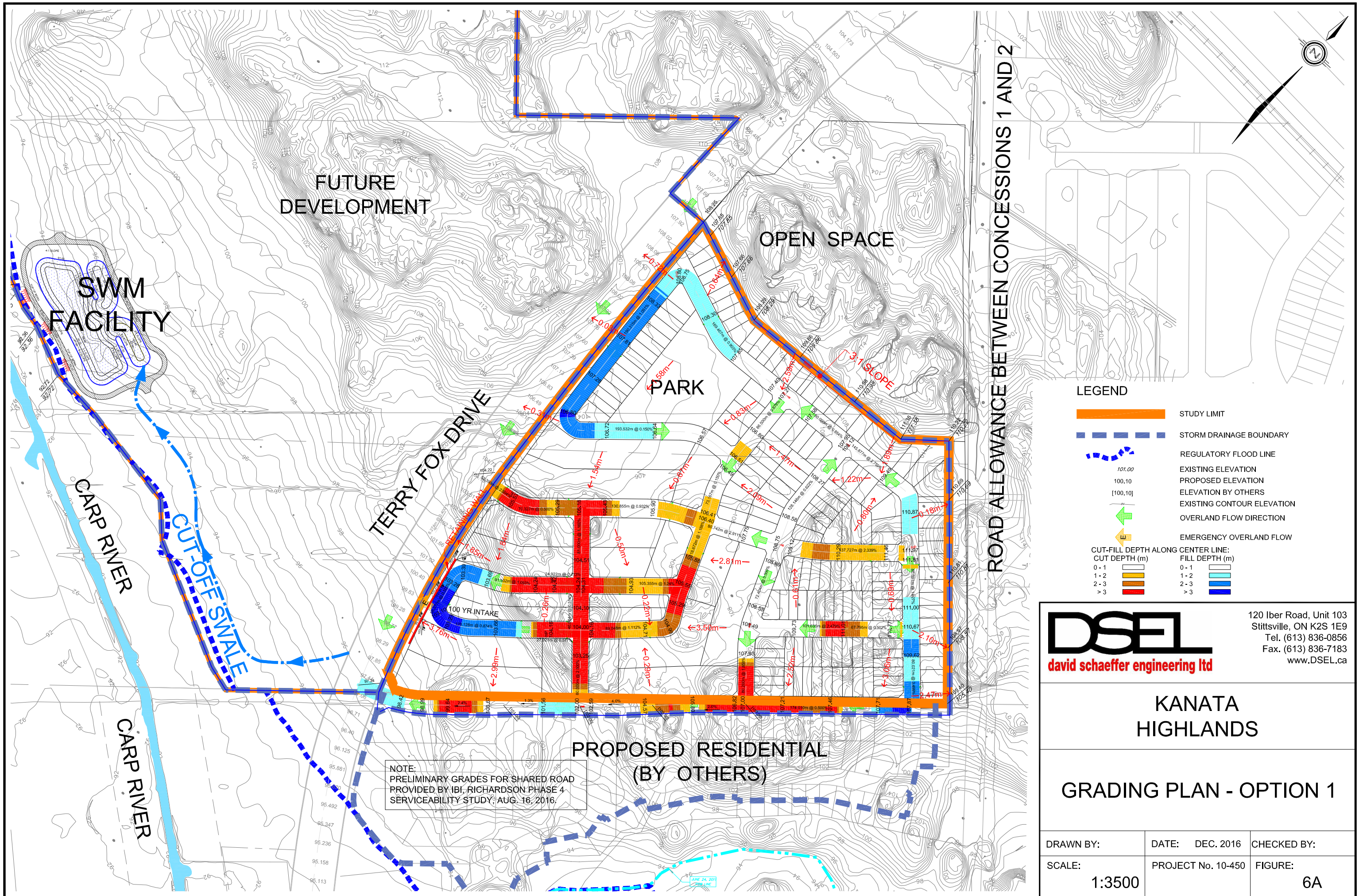
120 Iber Road, Unit 103  
 Stittsville, ON K2S 1E9  
 Tel. (613) 836-0856  
 Fax. (613) 836-7183  
 www.DSEL.ca

**KANATA  
HIGHLANDS**

**CONCEPTUAL STORM  
SERVICING - OPTION 2**

|                  |                    |               |
|------------------|--------------------|---------------|
| DRAWN BY:        | DATE: DEC. 2016    | CHECKED BY:   |
| SCALE:<br>1:3500 | PROJECT No. 10-450 | FIGURE:<br>5B |





FUTURE DEVELOPMENT

OPEN SPACE

SWM FACILITY

PARK

CARP RIVER

CARP RIVER

CARP RIVER

TERRY FOX DRIVE

PROPOSED RESIDENTIAL (BY OTHERS)

ROAD ALLOWANCE BETWEEN CONCESSIONS 1 AND 2

NOTE:  
PRELIMINARY GRADES FOR SHARED ROAD  
PROVIDED BY IBI, RICHARDSON PHASE 4  
SERVICEABILITY STUDY, AUG. 16, 2016.

**LEGEND**

|  |                                   |
|--|-----------------------------------|
|  | STUDY LIMIT                       |
|  | STORM DRAINAGE BOUNDARY           |
|  | REGULATORY FLOOD LINE             |
|  | EXISTING ELEVATION                |
|  | PROPOSED ELEVATION                |
|  | ELEVATION BY OTHERS               |
|  | EXISTING CONTOUR ELEVATION        |
|  | OVERLAND FLOW DIRECTION           |
|  | EMERGENCY OVERLAND FLOW           |
|  | CUT-FILL DEPTH ALONG CENTER LINE: |
|  | CUT DEPTH (m)                     |
|  | FILL DEPTH (m)                    |
|  | 0 - 1                             |
|  | 1 - 2                             |
|  | 2 - 3                             |
|  | > 3                               |
|  | 0 - 1                             |
|  | 1 - 2                             |
|  | 2 - 3                             |
|  | > 3                               |

**DSEL**  
david schaeffer engineering ltd

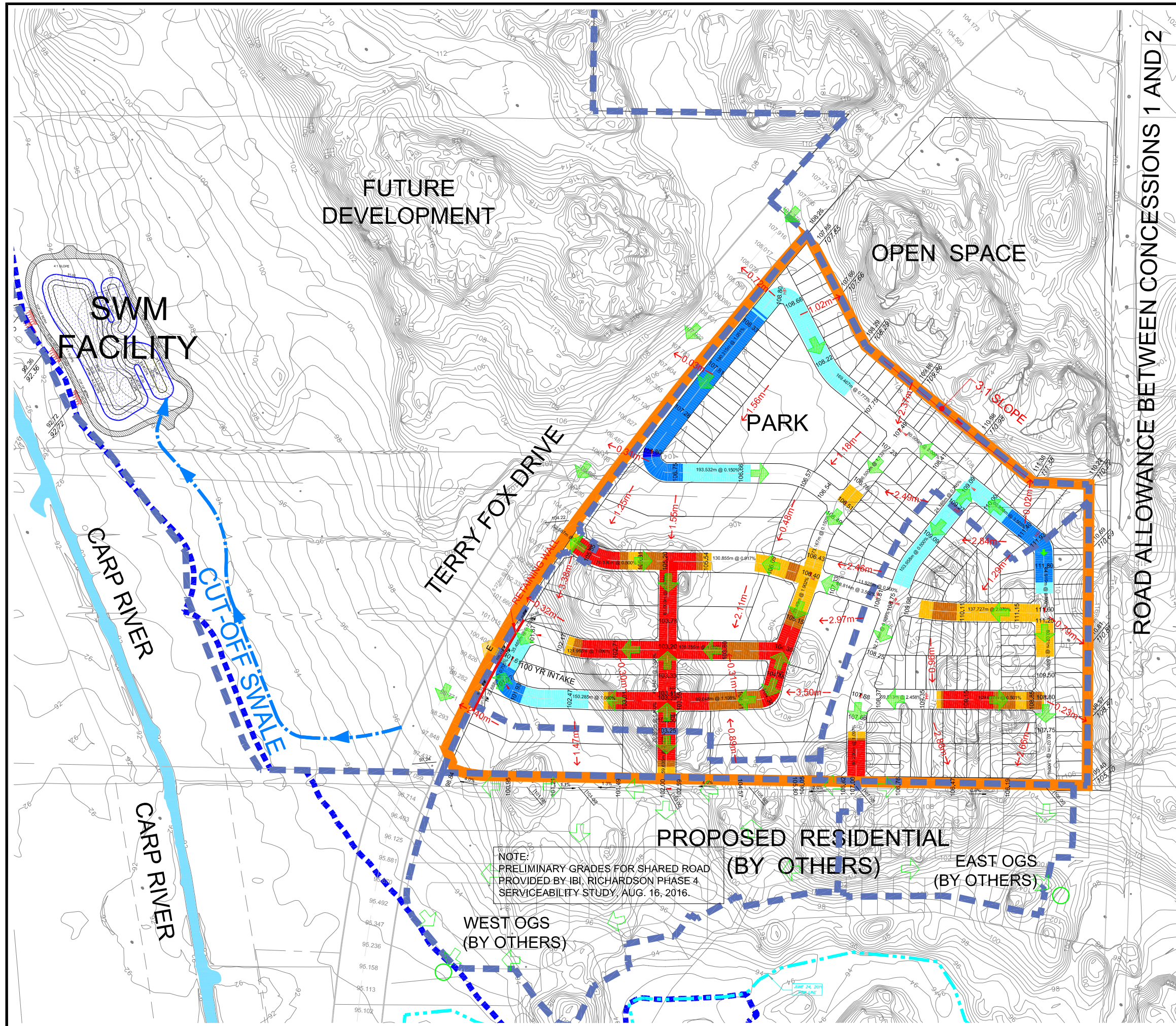
120 Iber Road, Unit 103  
Stittsville, ON K2S 1E9  
Tel. (613) 836-0856  
Fax. (613) 836-7183  
www.DSEL.ca

**KANATA HIGHLANDS**

**GRADING PLAN - OPTION 1**

|               |                    |             |
|---------------|--------------------|-------------|
| DRAWN BY:     | DATE: DEC. 2016    | CHECKED BY: |
| SCALE: 1:3500 | PROJECT No. 10-450 | FIGURE: 6A  |





ROAD ALLOWANCE BETWEEN CONCESSIONS 1 AND 2

**DSEL**  
 david schaeffer engineering ltd

120 Iber Road, Unit 103  
 Stittsville, ON K2S 1E9  
 Tel. (613) 836-0856  
 Fax. (613) 836-7183  
 www.DSEL.ca

**KANATA HIGHLANDS**

**GRADING PLAN - OPTION 2**

|               |                    |             |
|---------------|--------------------|-------------|
| DRAWN BY:     | DATE: DEC. 2016    | CHECKED BY: |
| SCALE: 1:3500 | PROJECT No. 10-450 | FIGURE: 6B  |



# **APPENDIX A**

## **WATER SUPPLY**



Sheet No.

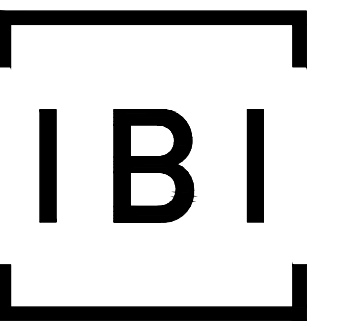
Drawing Title

Project Title

110  
2016-08-16

CONCEPTUAL  
SERVICING PLAN

RICHARDSON RIDGE PHASE 4  
SERVICEABILITY STUDY



16: Aug. 16, 2016. Saved By: e:\projects\110 Conceptual Servicing Plan.dwg. Name: 110 Conceptual Servicing Plan.dwg. Saved At: Aug. 16, 2016.



# BOUNDARY CONDITIONS EXTRACTED FROM RICHARDSON RIDGE SERVICEABILITY REPORT BY IBI GROUP (AUGUST 2016)

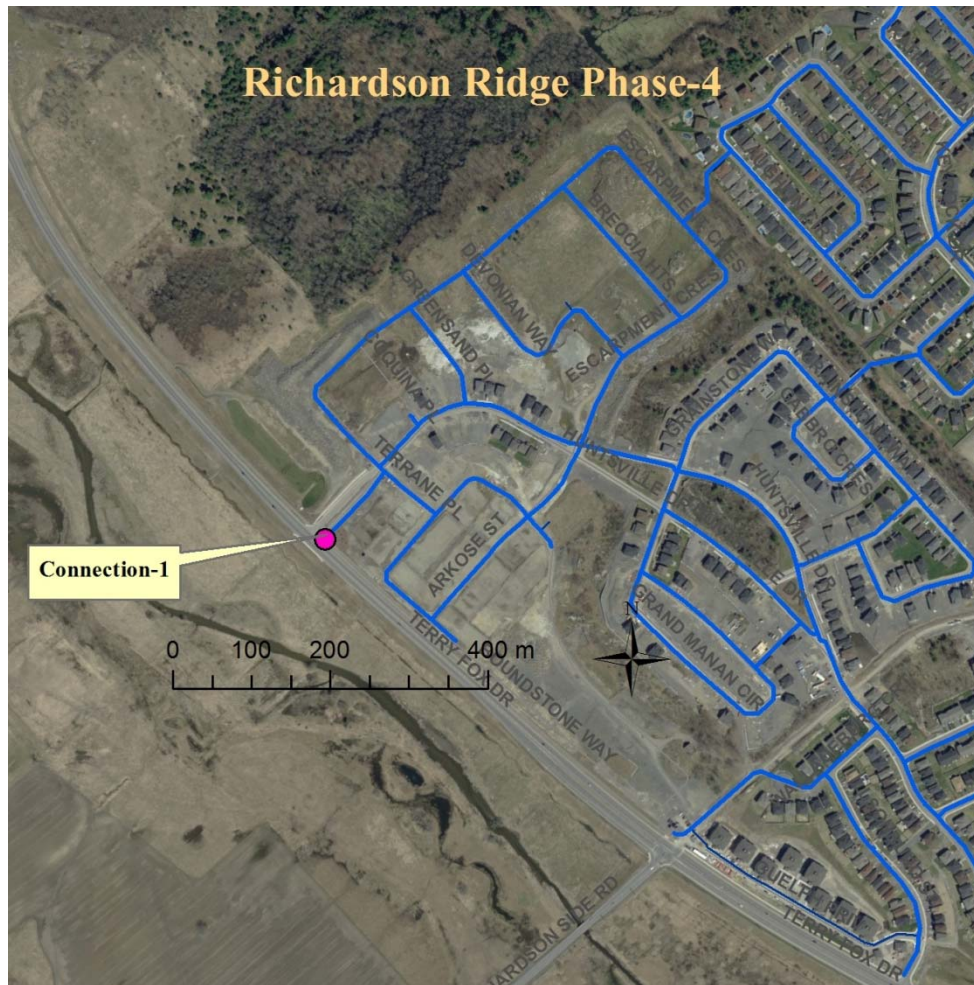
## Boundary Conditions at Richardson Ridge.

### Information Provided:

Date provided: 20 May 2016

| For Residential and School       |                |
|----------------------------------|----------------|
| Criteria                         | Demand (L/s)   |
| Average Demand                   | 2.56           |
| Maximum Daily Demand             | 6.39           |
| Peak Hourly Demand               | 14.07          |
| Fire Flow Demand                 | 250, 184       |
| Maximum Daily + Fire Flow Demand | 256.39, 190.39 |

### Location:



# BOUNDARY CONDITIONS EXTRACTED FROM RICHARDSON RIDGE SERVICEABILITY REPORT BY IBI GROUP (AUGUST 2016)

## Results:

### Connection-1:

| Criteria                   | Head (m) | Pressure (psi) |
|----------------------------|----------|----------------|
| Max HGL                    | 162.2    | 94.2           |
| PKHR                       | 155.2    | 84.3           |
| MXDY + Fire Flow (250 L/s) | 135.4    | 56.0           |
| MXDY + Fire Flow (184 L/s) | 143.9    | 68.2           |

Note: The client requested BCs at two connections. Generally, the City does not provide boundary conditions beyond the existing watermain network. In this case, BC is provided for only one connection as there is no available information for the second connection.

## Considerations:

1. According to the City of Ottawa Water Design Guidelines as well as the Ontario Building Code, the maximum pressure at any point within a distribution system shall not exceed 80 psi in occupied areas. In scenario-2, measures should be taken to try to reduce the residual pressure below 80 psi without the use of special pressure control equipment. In circumstances where the residual pressure cannot be reduced below 80 psi without the use of pressure control equipment, a pressure reducing valve (**PRV**) should be installed at site.
2. The site will not be permitted to develop more than 49 units until getting the second connection which will supply to the development as per Section 4.3.1 of the City's water design guidelines. The proponent must need to wait until availability of this second feed.

## 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.*

**Steve Merrick**

---

**To:** Robert Freel  
**Subject:** RE: Kanata Highlands - Boundary Condition Request

---

**From:** Alison Gosling  
**Sent:** December 16, 2016 10:18 AM  
**To:** Kuruvilla, Santhosh <[Santhosh.Kuruvilla@ottawa.ca](mailto:Santhosh.Kuruvilla@ottawa.ca)>  
**Cc:** Robert Freel <[RFreel@dsel.ca](mailto:RFreel@dsel.ca)>  
**Subject:** Kanata Highlands - Boundary Condition Request

Good morning Santhosh,

We would like to request water boundary conditions for Kanata Highlands – Phase 1 development using the following proposed development demands:

1. Location of Service / Street Number: 457 Terry Fox Drive
2. Type of development and the amount of fire flow required for the proposed development:
  - The proposed Phased development is residential. Phase 1 proposes 159 Single homes and 276 townhomes/back-to-back units.
  - It is anticipated that the development will have a connection from the existing 300 mm diameter watermain within Terry Fox Drive, as shown by the attached map.
  - It is anticipated that a fire flow of 12,000 L/min will be required. In addition, we would also request the available fire flow at 140 kPa (20 psi).

3.

|                   | L/min  | L/s   |
|-------------------|--------|-------|
| <b>Avg. Daily</b> | 330.5  | 5.51  |
| <b>Max Day</b>    | 808.6  | 13.48 |
| <b>Peak Hour</b>  | 1768.2 | 29.47 |

We understand that there is a development to the south of the subject site. Can you inquire with the modeling group to confirm if the boundary conditions will anticipate these demands?

It you have any questions please feel free to contact me.



Thanks,

Alison Gosling, E.I.T.  
Project Coordinator / Junior Designer

## **DSEL**

**david schaeffer engineering ltd.**

120 Iber Road, Unit 103  
Stittsville, ON K2S 1E9

**phone:** (613) 836-0856 ext.542

**fax:** (613) 836-7183

**email:** [agosling@DSEL.ca](mailto:agosling@DSEL.ca)

This email, including any attachments, is for the sole use of the intended recipient(s) and may contain private, confidential, and privileged information. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient, or if this information has been inappropriately forwarded to you, please contact the sender by reply email and destroy all copies of the original.



Water Demand Design Flows per Unit Count  
City of Ottawa - Water Distribution Guidelines, July 2010



**Domestic Demand**

| Type of Housing          | Per / Unit | Units | Pop |
|--------------------------|------------|-------|-----|
| Single Family            | 3.4        | 159   | 541 |
| Semi-detached            | 2.7        |       | 0   |
| Townhouse / Back-to-Back | 2.7        | 276   | 746 |
| Apartment                |            |       | 0   |
| Bachelor                 | 1.4        |       | 0   |
| 1 Bedroom                | 1.4        |       | 0   |
| 2 Bedroom                | 2.1        |       | 0   |
| 3 Bedroom                | 3.1        |       | 0   |
| Average                  | 1.8        |       | 0   |

|                              | Pop  | Avg. Daily        |       | Max Day           |       | Peak Hour         |        |
|------------------------------|------|-------------------|-------|-------------------|-------|-------------------|--------|
|                              |      | m <sup>3</sup> /d | L/min | m <sup>3</sup> /d | L/min | m <sup>3</sup> /d | L/min  |
| <b>Total Domestic Demand</b> | 1287 | 450.5             | 312.8 | 1126.1            | 782.0 | 2477.5            | 1720.5 |

**Institutional / Commercial / Industrial Demand**

| Property Type   | Unit Rate                 | Units  | Avg. Daily        |              | Max Day           |               | Peak Hour         |               |
|---|---------------------------|--------|-------------------|--------------|-------------------|---------------|-------------------|---------------|
|   |                           |        | m <sup>3</sup> /d | L/min        | m <sup>3</sup> /d | L/min         | m <sup>3</sup> /d | L/min         |
| Park  | 28,000.0 L/ha/d           | 0.9096 | 25.47             | 17.7         | 38.2              | 26.5          | 68.8              | 47.8          |
| Office  | 75 L/9.3m <sup>2</sup> /d |        | 0.00              | 0.0          | 0.0               | 0.0           | 0.0               | 0.0           |
| Industrial - Light  | 35,000 L/gross ha/d       |        | 0.00              | 0.0          | 0.0               | 0.0           | 0.0               | 0.0           |
| Industrial - Heavy  | 55,000 L/gross ha/d       |        | 0.00              | 0.0          | 0.0               | 0.0           | 0.0               | 0.0           |
| <b>Total I/CI Demand Subject Site</b>                           |                           |        | 25.5              | 17.7         | 38.2              | 26.5          | 68.8              | 47.8          |
| <b>Total Demand Subject Site</b>                                |                           |        | <b>475.9</b>      | <b>330.5</b> | <b>1164.3</b>     | <b>808.6</b>  | <b>2546.2</b>     | <b>1768.2</b> |
| <b>Total Demand from Richardson Ridge Serviceability Report</b> |                           |        | 239.3             | 166.1        | 598.3             | 415.2         | 1316.3            | 913.5         |
| <b>Total Demand Subject Site + Richardson Ridge</b>             |                           |        | <b>715.2</b>      | <b>496.6</b> | <b>1762.6</b>     | <b>1223.8</b> | <b>3862.5</b>     | <b>2681.7</b> |



## Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

### Fire Flow Required

#### 1. Base Requirement

$$F = 220C\sqrt{A} \text{ L/min} \quad \text{Where } F \text{ is the fire flow, } C \text{ is the Type of construction and } A \text{ is the Total floor area}$$

Type of Construction: **Wood Frame**

**C** 1.5 *Type of Construction Coefficient per FUS Part II, Section 1*  
**A** 589.0 m<sup>2</sup> *Total floor area based on FUS Part II section 1*

|                  |   |
|------------------|---|
| <b>Fire Flow</b> | 8008.9 L/min  |
|                  | <b>8000.0 L/min</b> <i>rounded to the nearest 1,000 L/min</i> |

### Adjustments

#### 2. Reduction for Occupancy Type

Limited Combustible -15%

|                  |                     |
|------------------|---------------------|
| <b>Fire Flow</b> | <b>6800.0 L/min</b> |
|------------------|---------------------|

#### 3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

|                  |                |
|------------------|----------------|
| <b>Reduction</b> | <b>0 L/min</b> |
|------------------|----------------|

#### 4. Increase for Separation Distance

|                    |  |
|--------------------|--|
| <b>N</b> 3.1m-10m  | 20%  |
| <b>S</b> 10.1m-20m | 15%  |
| <b>E</b> 10.1m-20m | 15%  |
| <b>W</b> 3.1m-10m  | 20%  |
| <b>% Increase</b>  | <b>70%</b> <i>value not to exceed 75% per FUS Part II, Section 4</i> |

|                 |                     |
|-----------------|---------------------|
| <b>Increase</b> | <b>4760.0 L/min</b> |
|-----------------|---------------------|

### Total Fire Flow

|                  |                      |  |
|------------------|----------------------|--|
| <b>Fire Flow</b> | 11560.0 L/min        | <i>fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section</i> |
|                  | <b>12000.0 L/min</b> | <i>rounded to the nearest 1,000 L/min</i>  |

#### Notes:

- Fire Underwriter Survey Calculates from Previously approved applications with applicant, fire flow to be confirmed when construction materials confirmed
- Calculations based on Fire Underwriters Survey - Part II

**Minor Loss Coefficients**

| <b>Fitting</b>                    | <b>Loss Coefficient</b> |
|-----------------------------------|-------------------------|
| Globe valve, fully open           | 10                      |
| Angle Valve, fully open           | 5                       |
| Swing check valve, fully open     | 2.5                     |
| Gate valve, fully open            | 0.2                     |
| Short-radius elbow                | 0.9                     |
| Medium-radius elbow               | 0.8                     |
| Long-radius elbow                 | 0.6                     |
| 45 degree elbow                   | 0.4                     |
| Closed return bend                | 2.2                     |
| Standard tee-flow through run     | 0.6                     |
| Standard tee- flow through branch | 1.8                     |
| Square entrance                   | 0.5                     |
| Exit                              | 1                       |

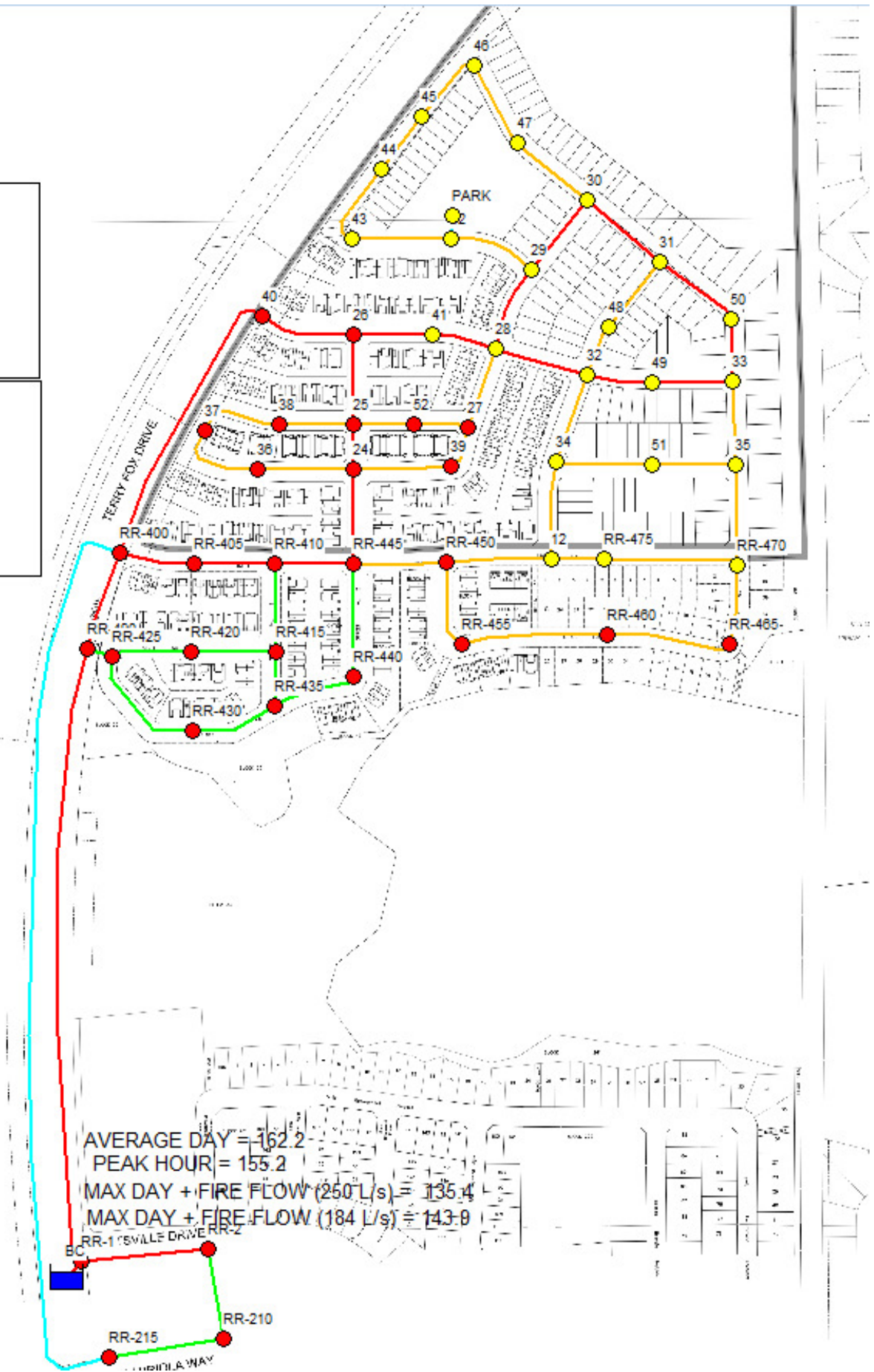
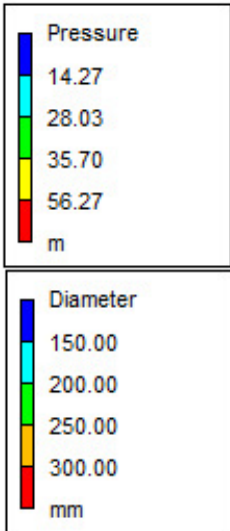
**Pipe Diameter vs. "C"**

| <b>Pipe Diameter (mm)</b> | <b>C-Factor</b> |
|---------------------------|-----------------|
| 150                       | 100             |
| 200 to 250                | 110             |
| 300 to 600                | 120             |
| Over 600                  | 130             |

**Node Pressures**

| <b>Kpa</b> | <b>Pressure (Kpa)</b> | <b>Pressure (mm H<sub>2</sub>O)</b> |
|------------|-----------------------|-------------------------------------|
| Max        | 552                   | 56.3                                |
| Rec Max    | 480                   | 49.0                                |
| Rec Min    | 350                   | 35.7                                |
| Min        | 275                   | 28.1                                |

# AVERAGE DAY SCHEMATIC





```
*****
*                               *
*           E P A N E T         *
*   Hydraulic and Water Quality *
*   Analysis for Pipe Networks  *
*           Version 2.0         *
*****
```

Input File: 2016-12-20\_450\_bnc.net

Link - Node Table:

| Link ID | Start Node | End Node | Length m | Diameter mm |
|---------|------------|----------|----------|-------------|
| 1       | BC         | RR-1     | 1        | 300         |
| 2       | RR-1       | RR-2     | 114.88   | 300         |
| 3       | RR-2       | RR-210   | 81.97    | 200         |
| 4       | RR-210     | RR-215   | 105.32   | 200         |
| 5       | RR-1       | RR-490   | 561.43   | 300         |
| 7       | RR-490     | RR-400   | 92.17    | 300         |
| 8       | RR-400     | RR-405   | 68.18    | 300         |
| 9       | RR-405     | RR-410   | 73.92    | 300         |
| 10      | RR-410     | RR-445   | 72.60    | 300         |
| 11      | RR-445     | RR-450   | 84.29    | 250         |
| 12      | RR-450     | 12       | 95       | 250         |
| 13      | 12         | RR-475   | 46.21    | 250         |
| 14      | RR-475     | RR-470   | 121.42   | 250         |
| 15      | RR-470     | RR-465   | 73.97    | 250         |
| 16      | RR-465     | RR-460   | 110      | 250         |
| 17      | RR-460     | RR-455   | 132.50   | 250         |
| 18      | RR-455     | RR-450   | 81.05    | 250         |
| 19      | RR-410     | RR-415   | 79.45    | 200         |
| 20      | RR-445     | RR-440   | 100.62   | 200         |
| 21      | RR-490     | RR-425   | 24.48    | 200         |
| 22      | RR-425     | RR-420   | 72.52    | 200         |
| 23      | RR-420     | RR-415   | 75.79    | 200         |
| 24      | RR-425     | RR-430   | 115.88   | 200         |
| 25      | RR-430     | RR-435   | 81.26    | 200         |
| 26      | RR-415     | RR-435   | 49.17    | 200         |
| 27      | RR-435     | RR-440   | 79.33    | 200         |
| 28      | RR-445     | 24       | 85.82    | 300         |
| 29      | 24         | 25       | 40.68    | 300         |
| 30      | 25         | 26       | 82       | 300         |
| 35      | 27         | 28       | 76.12    | 250         |
| 36      | 28         | 29       | 79.64    | 300         |
| 37      | 29         | 30       | 80.50    | 300         |

AVERAGE DAY SCENARIO

|    |    |    |       |     |
|----|----|----|-------|-----|
| 39 | 28 | 32 | 65.29 | 300 |
| 40 | 30 | 31 | 86.0  | 300 |
| 42 | 33 | 35 | 74.02 | 250 |
| 43 | 12 | 34 | 89.32 | 250 |
| 44 | 34 | 32 | 82.83 | 250 |



Page 2

Link - Node Table: (continued)

| Link ID | Start Node | End Node | Length m | Diameter mm |
|---------|------------|----------|----------|-------------|
| 48      | 35         | RR-470   | 90.12    | 250         |
| 49      | 24         | 36       | 87.70    | 250         |
| 50      | 36         | 37       | 82.70    | 250         |
| 51      | 37         | 38       | 79.49    | 250         |
| 52      | 38         | 25       | 67.65    | 250         |
| 53      | RR-215     | RR-400   | 837.7    | 200         |
| 54      | 24         | 39       | 88.67    | 250         |
| 55      | 39         | 27       | 39.75    | 250         |
| 56      | 40         | 26       | 88.0     | 300         |
| 57      | 26         | 41       | 71.67    | 300         |
| 58      | 41         | 28       | 58.62    | 300         |
| 59      | 29         | 42       | 81.42    | 250         |
| 60      | 42         | 43       | 90.0     | 250         |
| 61      | 43         | 44       | 79.43    | 250         |
| 62      | 44         | 45       | 60.44    | 250         |
| 63      | 45         | 46       | 70.20    | 250         |
| 64      | 46         | 47       | 80.83    | 250         |
| 65      | 47         | 30       | 81.44    | 250         |
| 66      | 32         | 48       | 48.58    | 250         |
| 67      | 48         | 31       | 78.20    | 250         |
| 68      | 32         | 49       | 59.77    | 300         |
| 69      | 49         | 33       | 73.03    | 300         |
| 70      | 31         | 50       | 84.31    | 300         |
| 71      | 50         | 33       | 58.64    | 300         |
| 72      | 34         | 51       | 86.43    | 250         |
| 73      | 51         | 35       | 75.73    | 250         |
| 74      | 25         | 52       | 55.30    | 250         |
| 75      | 52         | 27       | 48.40    | 250         |
| 76      | PARK       | 42       | 8        | 150         |
| 6       | 40         | RR-400   | 264.90   | 300         |

Node Results:

| Node ID | Demand LPS | Head m | Pressure m | Quality |
|---------|------------|--------|------------|---------|
|---------|------------|--------|------------|---------|

2016-12-20\_450\_bnc.rpt

|        |      |        |       |      |
|--------|------|--------|-------|------|
| RR-2   | 0.10 | 162.20 | 63.70 | 0.00 |
| RR-1   | 0.10 | 162.20 | 66.20 | 0.00 |
| RR-210 | 0.15 | 162.20 | 63.95 | 0.00 |
| RR-215 | 0.13 | 162.19 | 65.29 | 0.00 |
| RR-490 | 0.00 | 162.17 | 64.97 | 0.00 |
| RR-400 | 0.04 | 162.17 | 64.67 | 0.00 |
| RR-405 | 0.09 | 162.17 | 60.67 | 0.00 |
| RR-410 | 0.10 | 162.17 | 61.17 | 0.00 |
| RR-445 | 0.09 | 162.17 | 60.17 | 0.00 |
| RR-450 | 0.15 | 162.17 | 57.17 | 0.00 |
| 12     | 0.00 | 162.17 | 56.17 | 0.00 |



Page 3

Node Results: (continued)

| Node ID | Demand LPS | Head m | Pressure m | Quality |
|---------|------------|--------|------------|---------|
| RR-475  | 0.12       | 162.17 | 55.17      | 0.00    |
| RR-470  | 0.10       | 162.17 | 56.17      | 0.00    |
| RR-465  | 0.14       | 162.17 | 58.17      | 0.00    |
| RR-460  | 0.21       | 162.17 | 57.17      | 0.00    |
| RR-455  | 0.32       | 162.17 | 56.67      | 0.00    |
| RR-425  | 0.12       | 162.17 | 64.97      | 0.00    |
| RR-420  | 0.18       | 162.17 | 62.97      | 0.00    |
| RR-415  | 0.22       | 162.17 | 62.32      | 0.00    |
| RR-430  | 0.10       | 162.17 | 64.92      | 0.00    |
| RR-435  | 0.07       | 162.17 | 64.67      | 0.00    |
| RR-440  | 0.24       | 162.17 | 63.42      | 0.00    |
| 24      | 0.18       | 162.17 | 58.17      | 0.00    |
| 25      | 0.18       | 162.17 | 57.86      | 0.00    |
| 26      | 0.18       | 162.17 | 56.99      | 0.00    |
| 27      | 0.18       | 162.17 | 56.62      | 0.00    |
| 28      | 0.18       | 162.17 | 55.77      | 0.00    |
| 29      | 0.18       | 162.17 | 55.66      | 0.00    |
| 30      | 0.18       | 162.17 | 54.90      | 0.00    |
| 31      | 0.18       | 162.17 | 54.22      | 0.00    |
| 32      | 0.18       | 162.17 | 53.42      | 0.00    |
| 33      | 0.18       | 162.17 | 50.20      | 0.00    |
| 34      | 0.18       | 162.17 | 53.68      | 0.00    |
| 35      | 0.18       | 162.17 | 51.50      | 0.00    |
| 36      | 0.18       | 162.17 | 58.51      | 0.00    |
| 37      | 0.18       | 162.17 | 58.89      | 0.00    |
| 38      | 0.18       | 162.17 | 58.48      | 0.00    |
| 39      | 0.18       | 162.17 | 57.18      | 0.00    |
| 40      | 0.18       | 162.17 | 56.64      | 0.00    |
| 41      | 0.18       | 162.17 | 56.27      | 0.00    |
| 42      | 0.18       | 162.17 | 55.53      | 0.00    |

AVERAGE DAY SCENARIO

|      |       |        |       |                |
|------|-------|--------|-------|----------------|
| 43   | 0.18  | 162.17 | 55.37 | 0.00           |
| 44   | 0.18  | 162.17 | 54.89 | 0.00           |
| 45   | 0.18  | 162.17 | 54.36 | 0.00           |
| 46   | 0.18  | 162.17 | 53.37 | 0.00           |
| 47   | 0.18  | 162.17 | 54.32 | 0.00           |
| 48   | 0.18  | 162.17 | 53.90 | 0.00           |
| 49   | 0.18  | 162.17 | 51.88 | 0.00           |
| 50   | 0.18  | 162.17 | 51.30 | 0.00           |
| 51   | 0.18  | 162.17 | 51.16 | 0.00           |
| 52   | 0.18  | 162.17 | 57.24 | 0.00           |
| PARK | 0.30  | 162.17 | 55.53 | 0.00           |
| BC   | -8.28 | 162.20 | 0.00  | 0.00 Reservoir |



Page 4

Link Results:

| Link ID | Flow LPS | Velocity m/s | Unit Headloss m/km | Status |
|---------|----------|--------------|--------------------|--------|
| 1       | 8.28     | 0.12         | 0.48               | Open   |
| 2       | 1.85     | 0.03         | 0.01               | Open   |
| 3       | 1.75     | 0.06         | 0.04               | Open   |
| 4       | 1.60     | 0.05         | 0.03               | Open   |
| 5       | 6.34     | 0.09         | 0.05               | Open   |
| 7       | 4.26     | 0.06         | 0.02               | Open   |
| 8       | 3.01     | 0.04         | 0.01               | Open   |
| 9       | 2.92     | 0.04         | 0.01               | Open   |
| 10      | 3.35     | 0.05         | 0.02               | Open   |
| 11      | 1.76     | 0.04         | 0.01               | Open   |
| 12      | 0.84     | 0.02         | 0.00               | Open   |
| 13      | 0.41     | 0.01         | 0.00               | Open   |
| 14      | 0.29     | 0.01         | 0.00               | Open   |
| 15      | -0.09    | 0.00         | 0.00               | Open   |
| 16      | -0.23    | 0.00         | 0.00               | Open   |
| 17      | -0.44    | 0.01         | 0.00               | Open   |
| 18      | -0.76    | 0.02         | 0.00               | Open   |
| 19      | -0.52    | 0.02         | 0.00               | Open   |
| 20      | -0.63    | 0.02         | 0.01               | Open   |
| 21      | 2.08     | 0.07         | 0.07               | Open   |
| 22      | 1.06     | 0.03         | 0.02               | Open   |
| 23      | 0.88     | 0.03         | 0.01               | Open   |
| 24      | 0.90     | 0.03         | 0.01               | Open   |
| 25      | 0.80     | 0.03         | 0.01               | Open   |
| 26      | 0.14     | 0.00         | 0.00               | Open   |
| 27      | 0.87     | 0.03         | 0.01               | Open   |
| 28      | 2.13     | 0.03         | 0.01               | Open   |
| 29      | 0.83     | 0.01         | 0.00               | Open   |

|    |       |      |      |      |
|----|-------|------|------|------|
| 30 | -0.39 | 0.01 | 0.00 | Open |
| 35 | 1.08  | 0.02 | 0.01 | Open |
| 36 | 1.38  | 0.02 | 0.00 | Open |
| 37 | 0.44  | 0.01 | 0.00 | Open |
| 39 | 1.26  | 0.02 | 0.00 | Open |
| 40 | -0.35 | 0.01 | 0.00 | Open |
| 42 | -0.20 | 0.00 | 0.00 | Open |
| 43 | 0.43  | 0.01 | 0.00 | Open |
| 44 | -0.02 | 0.00 | 0.00 | Open |
| 48 | -0.28 | 0.01 | 0.00 | Open |
| 49 | 0.33  | 0.01 | 0.00 | Open |
| 50 | 0.15  | 0.00 | 0.00 | Open |
| 51 | -0.03 | 0.00 | 0.00 | Open |
| 52 | -0.21 | 0.00 | 0.00 | Open |
| 53 | 1.47  | 0.05 | 0.03 | Open |
| 54 | 0.79  | 0.02 | 0.00 | Open |
| 55 | 0.61  | 0.01 | 0.00 | Open |
| 56 | 2.49  | 0.04 | 0.01 | Open |
| 57 | 1.92  | 0.03 | 0.01 | Open |

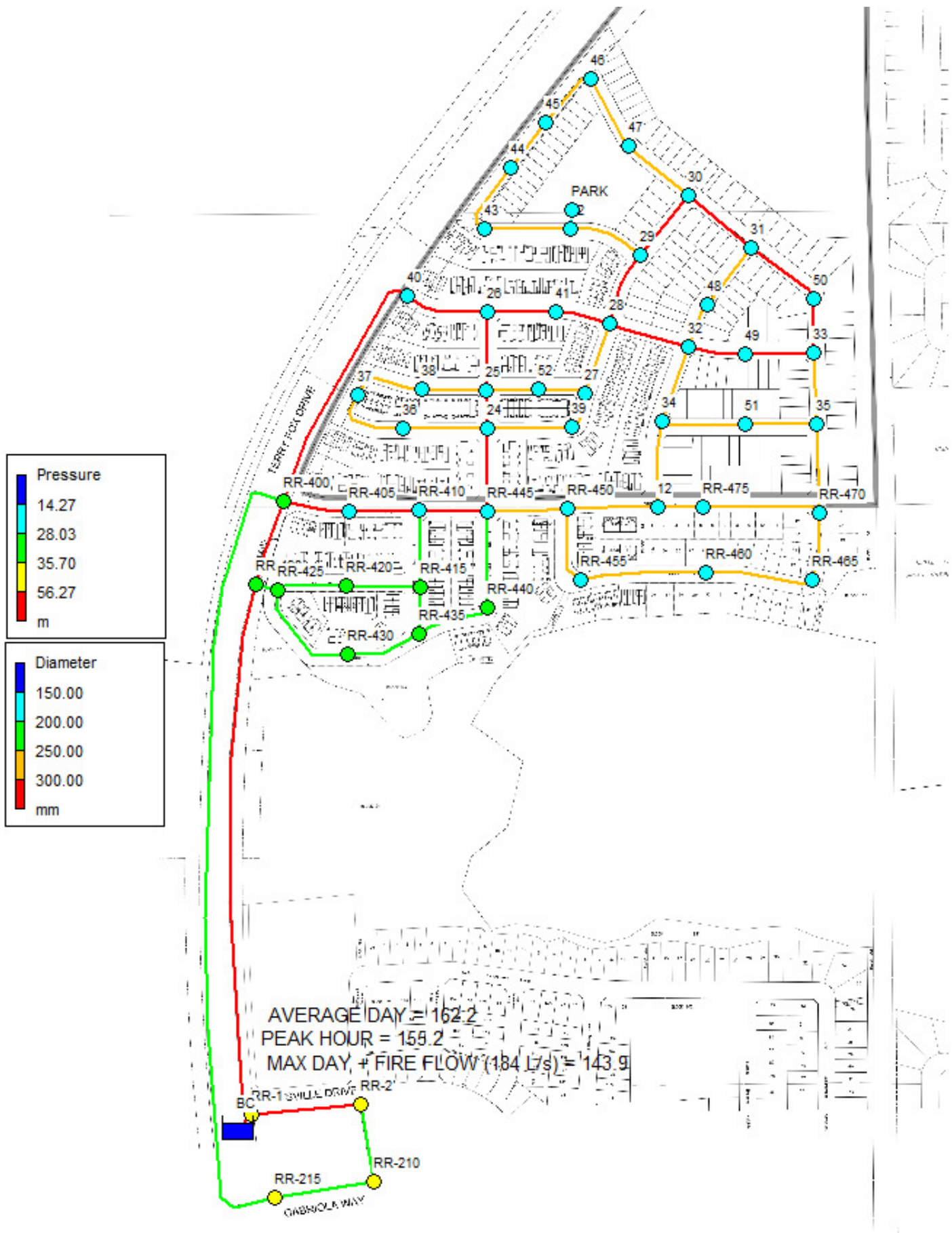


Page 5

Link Results: (continued)

| Link ID | Flow LPS | Velocity m/s | Unit Headloss m/km | Status |
|---------|----------|--------------|--------------------|--------|
| 58      | 1.74     | 0.02         | 0.00               | Open   |
| 59      | 0.76     | 0.02         | 0.00               | Open   |
| 60      | 0.28     | 0.01         | 0.00               | Open   |
| 61      | 0.10     | 0.00         | 0.00               | Open   |
| 62      | -0.08    | 0.00         | 0.00               | Open   |
| 63      | -0.26    | 0.01         | 0.00               | Open   |
| 64      | -0.44    | 0.01         | 0.00               | Open   |
| 65      | -0.62    | 0.01         | 0.00               | Open   |
| 66      | 0.47     | 0.01         | 0.00               | Open   |
| 67      | 0.29     | 0.01         | 0.00               | Open   |
| 68      | 0.59     | 0.01         | 0.00               | Open   |
| 69      | 0.41     | 0.01         | 0.00               | Open   |
| 70      | -0.25    | 0.00         | 0.00               | Open   |
| 71      | -0.43    | 0.01         | 0.00               | Open   |
| 72      | 0.28     | 0.01         | 0.00               | Open   |
| 73      | 0.10     | 0.00         | 0.00               | Open   |
| 74      | 0.83     | 0.02         | 0.00               | Open   |
| 75      | 0.65     | 0.01         | 0.00               | Open   |
| 76      | -0.30    | 0.02         | 0.01               | Open   |
| 6       | -2.67    | 0.04         | 0.01               | Open   |

# MAX DAY + FIRE FLOW SCHEMATIC



```
*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                 *
*                               Analysis for Pipe Networks                   *
*                               Version 2.0                                 *
*****
```

Input File: 2016-12-20\_450\_bnc.net

Link - Node Table:

| Link ID | Start Node | End Node | Length m | Diameter mm |
|---------|------------|----------|----------|-------------|
| 1       | BC         | RR-1     | 1        | 300         |
| 2       | RR-1       | RR-2     | 114.88   | 300         |
| 3       | RR-2       | RR-210   | 81.97    | 200         |
| 4       | RR-210     | RR-215   | 105.32   | 200         |
| 5       | RR-1       | RR-490   | 561.43   | 300         |
| 7       | RR-490     | RR-400   | 92.17    | 300         |
| 8       | RR-400     | RR-405   | 68.18    | 300         |
| 9       | RR-405     | RR-410   | 73.92    | 300         |
| 10      | RR-410     | RR-445   | 72.60    | 300         |
| 11      | RR-445     | RR-450   | 84.29    | 250         |
| 12      | RR-450     | 12       | 95       | 250         |
| 13      | 12         | RR-475   | 46.21    | 250         |
| 14      | RR-475     | RR-470   | 121.42   | 250         |
| 15      | RR-470     | RR-465   | 73.97    | 250         |
| 16      | RR-465     | RR-460   | 110      | 250         |
| 17      | RR-460     | RR-455   | 132.50   | 250         |
| 18      | RR-455     | RR-450   | 81.05    | 250         |
| 19      | RR-410     | RR-415   | 79.45    | 200         |
| 20      | RR-445     | RR-440   | 100.62   | 200         |
| 21      | RR-490     | RR-425   | 24.48    | 200         |
| 22      | RR-425     | RR-420   | 72.52    | 200         |
| 23      | RR-420     | RR-415   | 75.79    | 200         |
| 24      | RR-425     | RR-430   | 115.88   | 200         |
| 25      | RR-430     | RR-435   | 81.26    | 200         |
| 26      | RR-415     | RR-435   | 49.17    | 200         |
| 27      | RR-435     | RR-440   | 79.33    | 200         |
| 28      | RR-445     | 24       | 85.82    | 300         |
| 29      | 24         | 25       | 40.68    | 300         |
| 30      | 25         | 26       | 82       | 300         |
| 35      | 27         | 28       | 76.12    | 250         |
| 36      | 28         | 29       | 79.64    | 300         |
| 37      | 29         | 30       | 80.50    | 300         |

MAX DAY + FIRE FLOW SCENARIO

|    |    |    |       |     |
|----|----|----|-------|-----|
| 39 | 28 | 32 | 65.29 | 300 |
| 40 | 30 | 31 | 86.0  | 300 |
| 42 | 33 | 35 | 74.02 | 250 |
| 43 | 12 | 34 | 89.32 | 250 |
| 44 | 34 | 32 | 82.83 | 250 |



Page 2

Link - Node Table: (continued)

| Link ID | Start Node | End Node | Length m | Diameter mm |
|---------|------------|----------|----------|-------------|
| 48      | 35         | RR-470   | 90.12    | 250         |
| 49      | 24         | 36       | 87.70    | 250         |
| 50      | 36         | 37       | 82.70    | 250         |
| 51      | 37         | 38       | 79.49    | 250         |
| 52      | 38         | 25       | 67.65    | 250         |
| 53      | RR-215     | RR-400   | 837.7    | 200         |
| 54      | 24         | 39       | 88.67    | 250         |
| 55      | 39         | 27       | 39.75    | 250         |
| 56      | 40         | 26       | 88.0     | 300         |
| 57      | 26         | 41       | 71.67    | 300         |
| 58      | 41         | 28       | 58.62    | 300         |
| 59      | 29         | 42       | 81.42    | 250         |
| 60      | 42         | 43       | 90.0     | 250         |
| 61      | 43         | 44       | 79.43    | 250         |
| 62      | 44         | 45       | 60.44    | 250         |
| 63      | 45         | 46       | 70.20    | 250         |
| 64      | 46         | 47       | 80.83    | 250         |
| 65      | 47         | 30       | 81.44    | 250         |
| 66      | 32         | 48       | 48.58    | 250         |
| 67      | 48         | 31       | 78.20    | 250         |
| 68      | 32         | 49       | 59.77    | 300         |
| 69      | 49         | 33       | 73.03    | 300         |
| 70      | 31         | 50       | 84.31    | 300         |
| 71      | 50         | 33       | 58.64    | 300         |
| 72      | 34         | 51       | 86.43    | 250         |
| 73      | 51         | 35       | 75.73    | 250         |
| 74      | 25         | 52       | 55.30    | 250         |
| 75      | 52         | 27       | 48.40    | 250         |
| 76      | PARK       | 42       | 8        | 150         |
| 6       | 40         | RR-400   | 264.90   | 300         |

Node Results:

| Node ID | Demand LPS | Head m | Pressure m | Quality |
|---------|------------|--------|------------|---------|
|---------|------------|--------|------------|---------|



2016-12-20\_450\_bnc.rpt

|        |      |        |       |      |
|--------|------|--------|-------|------|
| RR-2   | 0.25 | 143.35 | 44.85 | 0.00 |
| RR-1   | 0.25 | 143.57 | 47.57 | 0.00 |
| RR-210 | 0.38 | 142.21 | 43.96 | 0.00 |
| RR-215 | 0.33 | 140.77 | 43.87 | 0.00 |
| RR-490 | 0.00 | 130.85 | 33.65 | 0.00 |
| RR-400 | 0.10 | 129.71 | 32.21 | 0.00 |
| RR-405 | 0.23 | 129.23 | 27.73 | 0.00 |
| RR-410 | 0.25 | 128.78 | 27.78 | 0.00 |
| RR-445 | 0.23 | 128.06 | 26.06 | 0.00 |
| RR-450 | 0.38 | 127.24 | 22.24 | 0.00 |
| 12     | 0.00 | 126.81 | 20.81 | 0.00 |



Page 3

Node Results: (continued)

| Node ID | Demand LPS | Head m | Pressure m | Quality |
|---------|------------|--------|------------|---------|
| RR-475  | 0.30       | 126.80 | 19.80      | 0.00    |
| RR-470  | 0.25       | 126.76 | 20.76      | 0.00    |
| RR-465  | 0.35       | 126.85 | 22.85      | 0.00    |
| RR-460  | 0.52       | 126.97 | 21.97      | 0.00    |
| RR-455  | 0.80       | 127.12 | 21.62      | 0.00    |
| RR-425  | 0.30       | 130.14 | 32.94      | 0.00    |
| RR-420  | 0.45       | 129.67 | 30.47      | 0.00    |
| RR-415  | 0.55       | 129.17 | 29.32      | 0.00    |
| RR-430  | 0.25       | 129.57 | 32.32      | 0.00    |
| RR-435  | 0.17       | 129.17 | 31.67      | 0.00    |
| RR-440  | 0.60       | 128.66 | 29.91      | 0.00    |
| 24      | 0.45       | 127.58 | 23.58      | 0.00    |
| 25      | 0.45       | 127.53 | 23.22      | 0.00    |
| 26      | 0.45       | 127.52 | 22.34      | 0.00    |
| 27      | 0.45       | 127.20 | 21.65      | 0.00    |
| 28      | 0.45       | 126.47 | 20.07      | 0.00    |
| 29      | 0.45       | 125.44 | 18.93      | 0.00    |
| 30      | 0.45       | 125.46 | 18.19      | 0.00    |
| 31      | 0.45       | 125.98 | 18.03      | 0.00    |
| 32      | 0.45       | 126.41 | 17.66      | 0.00    |
| 33      | 0.45       | 126.35 | 14.38      | 0.00    |
| 34      | 0.45       | 126.56 | 18.07      | 0.00    |
| 35      | 0.45       | 126.55 | 15.88      | 0.00    |
| 36      | 0.45       | 127.57 | 23.91      | 0.00    |
| 37      | 0.45       | 127.55 | 24.27      | 0.00    |
| 38      | 0.45       | 127.54 | 23.85      | 0.00    |
| 39      | 0.45       | 127.32 | 22.33      | 0.00    |
| 40      | 0.45       | 128.22 | 22.69      | 0.00    |
| 41      | 0.45       | 126.93 | 21.03      | 0.00    |
| 42      | 100.45     | 121.40 | 14.76      | 0.00    |

MAX DAY + FIRE FLOW SCENARIO

|      |         |        |       |                |
|------|---------|--------|-------|----------------|
| 43   | 100.45  | 121.12 | 14.32 | 0.00           |
| 44   | 0.45    | 122.07 | 14.79 | 0.00           |
| 45   | 0.45    | 122.73 | 14.92 | 0.00           |
| 46   | 0.45    | 123.57 | 14.77 | 0.00           |
| 47   | 0.45    | 124.50 | 16.65 | 0.00           |
| 48   | 0.45    | 126.23 | 17.96 | 0.00           |
| 49   | 0.45    | 126.38 | 16.09 | 0.00           |
| 50   | 0.45    | 126.20 | 15.33 | 0.00           |
| 51   | 0.45    | 126.55 | 15.54 | 0.00           |
| 52   | 0.45    | 127.35 | 22.42 | 0.00           |
| PARK | 0.44    | 121.40 | 14.76 | 0.00           |
| BC   | -220.42 | 143.90 | 0.00  | 0.00 Reservoir |



Page 4

Link Results:

| Link ID | Flow LPS | Velocity m/s | Unit Headloss m/km | Status |
|---------|----------|--------------|--------------------|--------|
| 1       | 220.42   | 3.12         | 329.39             | Open   |
| 2       | 43.37    | 0.61         | 1.89               | Open   |
| 3       | 43.12    | 1.37         | 13.99              | Open   |
| 4       | 42.74    | 1.36         | 13.61              | Open   |
| 5       | 176.80   | 2.50         | 22.66              | Open   |
| 7       | 124.94   | 1.77         | 12.29              | Open   |
| 8       | 85.39    | 1.21         | 7.09               | Open   |
| 9       | 85.17    | 1.20         | 6.14               | Open   |
| 10      | 108.27   | 1.53         | 9.95               | Open   |
| 11      | 60.63    | 1.24         | 9.72               | Open   |
| 12      | 39.95    | 0.81         | 4.46               | Open   |
| 13      | 9.66     | 0.20         | 0.31               | Open   |
| 14      | 9.36     | 0.19         | 0.28               | Open   |
| 15      | -18.63   | 0.38         | 1.11               | Open   |
| 16      | -18.98   | 0.39         | 1.13               | Open   |
| 17      | -19.50   | 0.40         | 1.14               | Open   |
| 18      | -20.30   | 0.41         | 1.41               | Open   |
| 19      | -23.35   | 0.74         | 4.97               | Open   |
| 20      | -26.19   | 0.83         | 5.98               | Open   |
| 21      | 51.86    | 1.65         | 28.91              | Open   |
| 22      | 27.40    | 0.87         | 6.49               | Open   |
| 23      | 26.95    | 0.86         | 6.55               | Open   |
| 24      | 24.16    | 0.77         | 4.96               | Open   |
| 25      | 23.91    | 0.76         | 4.89               | Open   |
| 26      | 3.05     | 0.10         | 0.11               | Open   |
| 27      | 26.79    | 0.85         | 6.44               | Open   |
| 28      | 73.60    | 1.04         | 5.51               | Open   |
| 29      | 34.53    | 0.49         | 1.28               | Open   |

|    |        |      |       |      |
|----|--------|------|-------|------|
| 30 | 8.15   | 0.12 | 0.08  | Open |
| 35 | 61.85  | 1.26 | 9.59  | Open |
| 36 | 119.70 | 1.69 | 12.97 | Open |
| 37 | -16.04 | 0.23 | 0.28  | Open |
| 39 | 30.36  | 0.43 | 0.93  | Open |
| 40 | -84.35 | 1.19 | 6.11  | Open |
| 42 | -31.25 | 0.64 | 2.69  | Open |
| 43 | 30.29  | 0.62 | 2.85  | Open |
| 44 | 25.43  | 0.52 | 1.82  | Open |
| 48 | -27.74 | 0.57 | 2.41  | Open |
| 49 | 7.37   | 0.15 | 0.20  | Open |
| 50 | 6.92   | 0.14 | 0.18  | Open |
| 51 | 6.47   | 0.13 | 0.14  | Open |
| 52 | 6.02   | 0.12 | 0.14  | Open |
| 53 | 42.42  | 1.35 | 13.20 | Open |
| 54 | 31.25  | 0.64 | 2.93  | Open |
| 55 | 30.80  | 0.63 | 3.11  | Open |
| 56 | 81.41  | 1.15 | 7.86  | Open |
| 57 | 89.12  | 1.26 | 8.28  | Open |

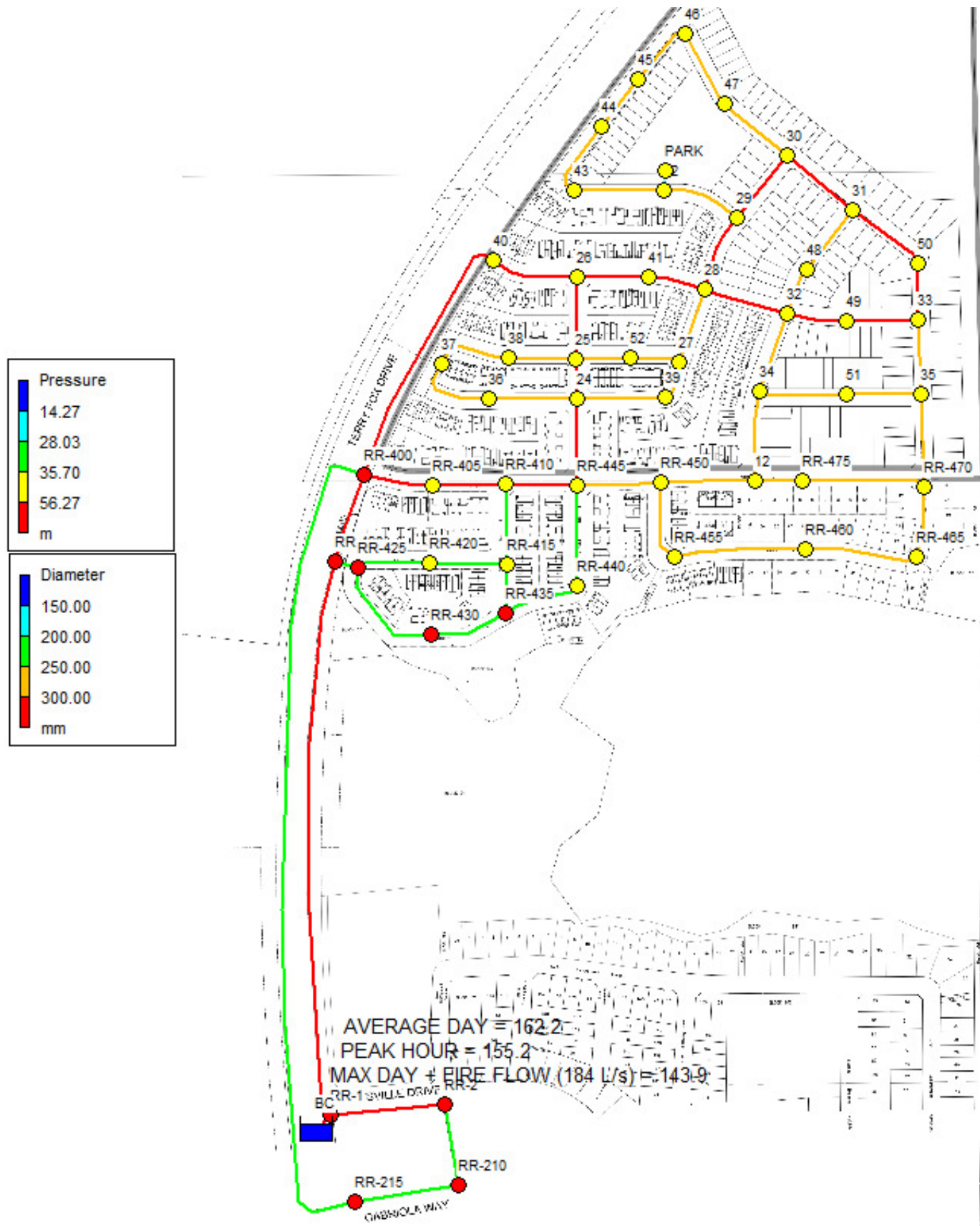


Page 5

Link Results: (continued)

| Link ID | Flow LPS | Velocity m/s | Headloss m/km | Status |
|---------|----------|--------------|---------------|--------|
| 58      | 88.67    | 1.25         | 7.88          | Open   |
| 59      | 135.28   | 2.76         | 49.60         | Open   |
| 60      | 34.39    | 0.70         | 3.11          | Open   |
| 61      | -66.06   | 1.35         | 11.96         | Open   |
| 62      | -66.51   | 1.35         | 10.93         | Open   |
| 63      | -66.96   | 1.36         | 12.02         | Open   |
| 64      | -67.41   | 1.37         | 11.44         | Open   |
| 65      | -67.86   | 1.38         | 11.81         | Open   |
| 66      | 34.87    | 0.71         | 3.66          | Open   |
| 67      | 34.42    | 0.70         | 3.14          | Open   |
| 68      | 20.48    | 0.29         | 0.50          | Open   |
| 69      | 20.03    | 0.28         | 0.41          | Open   |
| 70      | -50.38   | 0.71         | 2.58          | Open   |
| 71      | -50.83   | 0.72         | 2.49          | Open   |
| 72      | 4.41     | 0.09         | 0.08          | Open   |
| 73      | 3.96     | 0.08         | 0.06          | Open   |
| 74      | 31.95    | 0.65         | 3.35          | Open   |
| 75      | 31.50    | 0.64         | 3.02          | Open   |
| 76      | -0.44    | 0.03         | 0.01          | Open   |
| 6       | -81.86   | 1.16         | 5.66          | Open   |

# PEAK HOUR SCHEMATIC



```

*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                 *
*                               Analysis for Pipe Networks                   *
*                               Version 2.0                                 *
*****
    
```

Input File: 2016-12-20\_450\_bnc.net

Link - Node Table:

| Link ID | Start Node | End Node | Length m | Diameter mm |
|---------|------------|----------|----------|-------------|
| 1       | BC         | RR-1     | 1        | 300         |
| 2       | RR-1       | RR-2     | 114.88   | 300         |
| 3       | RR-2       | RR-210   | 81.97    | 200         |
| 4       | RR-210     | RR-215   | 105.32   | 200         |
| 5       | RR-1       | RR-490   | 561.43   | 300         |
| 7       | RR-490     | RR-400   | 92.17    | 300         |
| 8       | RR-400     | RR-405   | 68.18    | 300         |
| 9       | RR-405     | RR-410   | 73.92    | 300         |
| 10      | RR-410     | RR-445   | 72.60    | 300         |
| 11      | RR-445     | RR-450   | 84.29    | 250         |
| 12      | RR-450     | 12       | 95       | 250         |
| 13      | 12         | RR-475   | 46.21    | 250         |
| 14      | RR-475     | RR-470   | 121.42   | 250         |
| 15      | RR-470     | RR-465   | 73.97    | 250         |
| 16      | RR-465     | RR-460   | 110      | 250         |
| 17      | RR-460     | RR-455   | 132.50   | 250         |
| 18      | RR-455     | RR-450   | 81.05    | 250         |
| 19      | RR-410     | RR-415   | 79.45    | 200         |
| 20      | RR-445     | RR-440   | 100.62   | 200         |
| 21      | RR-490     | RR-425   | 24.48    | 200         |
| 22      | RR-425     | RR-420   | 72.52    | 200         |
| 23      | RR-420     | RR-415   | 75.79    | 200         |
| 24      | RR-425     | RR-430   | 115.88   | 200         |
| 25      | RR-430     | RR-435   | 81.26    | 200         |
| 26      | RR-415     | RR-435   | 49.17    | 200         |
| 27      | RR-435     | RR-440   | 79.33    | 200         |
| 28      | RR-445     | 24       | 85.82    | 300         |
| 29      | 24         | 25       | 40.68    | 300         |
| 30      | 25         | 26       | 82       | 300         |
| 35      | 27         | 28       | 76.12    | 250         |
| 36      | 28         | 29       | 79.64    | 300         |
| 37      | 29         | 30       | 80.50    | 300         |

PEAK HOUR SCENARIO

|    |    |    |       |     |
|----|----|----|-------|-----|
| 39 | 28 | 32 | 65.29 | 300 |
| 40 | 30 | 31 | 86.0  | 300 |
| 42 | 33 | 35 | 74.02 | 250 |
| 43 | 12 | 34 | 89.32 | 250 |
| 44 | 34 | 32 | 82.83 | 250 |



Page 2

Link - Node Table: (continued)

| Link ID | Start Node | End Node | Length m | Diameter mm |
|---------|------------|----------|----------|-------------|
| 48      | 35         | RR-470   | 90.12    | 250         |
| 49      | 24         | 36       | 87.70    | 250         |
| 50      | 36         | 37       | 82.70    | 250         |
| 51      | 37         | 38       | 79.49    | 250         |
| 52      | 38         | 25       | 67.65    | 250         |
| 53      | RR-215     | RR-400   | 837.7    | 200         |
| 54      | 24         | 39       | 88.67    | 250         |
| 55      | 39         | 27       | 39.75    | 250         |
| 56      | 40         | 26       | 88.0     | 300         |
| 57      | 26         | 41       | 71.67    | 300         |
| 58      | 41         | 28       | 58.62    | 300         |
| 59      | 29         | 42       | 81.42    | 250         |
| 60      | 42         | 43       | 90.0     | 250         |
| 61      | 43         | 44       | 79.43    | 250         |
| 62      | 44         | 45       | 60.44    | 250         |
| 63      | 45         | 46       | 70.20    | 250         |
| 64      | 46         | 47       | 80.83    | 250         |
| 65      | 47         | 30       | 81.44    | 250         |
| 66      | 32         | 48       | 48.58    | 250         |
| 67      | 48         | 31       | 78.20    | 250         |
| 68      | 32         | 49       | 59.77    | 300         |
| 69      | 49         | 33       | 73.03    | 300         |
| 70      | 31         | 50       | 84.31    | 300         |
| 71      | 50         | 33       | 58.64    | 300         |
| 72      | 34         | 51       | 86.43    | 250         |
| 73      | 51         | 35       | 75.73    | 250         |
| 74      | 25         | 52       | 55.30    | 250         |
| 75      | 52         | 27       | 48.40    | 250         |
| 76      | PARK       | 42       | 8        | 150         |
| 6       | 40         | RR-400   | 264.90   | 300         |

Node Results:

| Node ID | Demand LPS | Head m | Pressure m | Quality |
|---------|------------|--------|------------|---------|
|---------|------------|--------|------------|---------|

PEAK HOUR SCENARIO

2016-12-20\_450\_bnc.rpt

|        |      |        |       |      |
|--------|------|--------|-------|------|
| RR-2   | 0.55 | 155.17 | 56.67 | 0.00 |
| RR-1   | 0.55 | 155.19 | 59.19 | 0.00 |
| RR-210 | 0.83 | 155.10 | 56.85 | 0.00 |
| RR-215 | 0.71 | 155.03 | 58.13 | 0.00 |
| RR-490 | 0.00 | 154.59 | 57.39 | 0.00 |
| RR-400 | 0.22 | 154.54 | 57.04 | 0.00 |
| RR-405 | 0.50 | 154.52 | 53.02 | 0.00 |
| RR-410 | 0.55 | 154.50 | 53.50 | 0.00 |
| RR-445 | 0.50 | 154.47 | 52.47 | 0.00 |
| RR-450 | 0.83 | 154.45 | 49.45 | 0.00 |
| 12     | 0.00 | 154.44 | 48.44 | 0.00 |



Page 3

Node Results: (continued)

| Node ID | Demand LPS | Head m | Pressure m | Quality |
|---------|------------|--------|------------|---------|
| RR-475  | 0.66       | 154.44 | 47.44      | 0.00    |
| RR-470  | 0.55       | 154.44 | 48.44      | 0.00    |
| RR-465  | 0.77       | 154.44 | 50.44      | 0.00    |
| RR-460  | 1.15       | 154.44 | 49.44      | 0.00    |
| RR-455  | 1.76       | 154.44 | 48.94      | 0.00    |
| RR-425  | 0.66       | 154.55 | 57.35      | 0.00    |
| RR-420  | 0.99       | 154.52 | 55.32      | 0.00    |
| RR-415  | 1.21       | 154.50 | 54.65      | 0.00    |
| RR-430  | 0.55       | 154.52 | 57.27      | 0.00    |
| RR-435  | 0.38       | 154.50 | 57.00      | 0.00    |
| RR-440  | 1.32       | 154.48 | 55.73      | 0.00    |
| 24      | 0.99       | 154.46 | 50.46      | 0.00    |
| 25      | 0.99       | 154.46 | 50.15      | 0.00    |
| 26      | 0.99       | 154.46 | 49.28      | 0.00    |
| 27      | 0.99       | 154.45 | 48.90      | 0.00    |
| 28      | 0.99       | 154.44 | 48.04      | 0.00    |
| 29      | 0.99       | 154.44 | 47.93      | 0.00    |
| 30      | 0.99       | 154.44 | 47.17      | 0.00    |
| 31      | 0.99       | 154.44 | 46.49      | 0.00    |
| 32      | 0.99       | 154.44 | 45.69      | 0.00    |
| 33      | 0.99       | 154.44 | 42.47      | 0.00    |
| 34      | 0.99       | 154.44 | 45.95      | 0.00    |
| 35      | 0.99       | 154.44 | 43.77      | 0.00    |
| 36      | 0.99       | 154.46 | 50.80      | 0.00    |
| 37      | 0.99       | 154.46 | 51.18      | 0.00    |
| 38      | 0.99       | 154.46 | 50.77      | 0.00    |
| 39      | 0.99       | 154.45 | 49.46      | 0.00    |
| 40      | 0.99       | 154.48 | 48.95      | 0.00    |
| 41      | 0.99       | 154.45 | 48.55      | 0.00    |
| 42      | 0.99       | 154.43 | 47.79      | 0.00    |

PEAK HOUR SCENARIO

|      |        |        |       |                |
|------|--------|--------|-------|----------------|
| 43   | 0.99   | 154.43 | 47.63 | 0.00           |
| 44   | 0.99   | 154.43 | 47.15 | 0.00           |
| 45   | 0.99   | 154.43 | 46.62 | 0.00           |
| 46   | 0.99   | 154.43 | 45.63 | 0.00           |
| 47   | 0.99   | 154.43 | 46.58 | 0.00           |
| 48   | 0.99   | 154.44 | 46.17 | 0.00           |
| 49   | 0.99   | 154.44 | 44.15 | 0.00           |
| 50   | 0.99   | 154.44 | 43.57 | 0.00           |
| 51   | 0.99   | 154.44 | 43.43 | 0.00           |
| 52   | 0.99   | 154.45 | 49.52 | 0.00           |
| PARK | 0.80   | 154.43 | 47.79 | 0.00           |
| BC   | -44.74 | 155.20 | 0.00  | 0.00 Reservoir |



Page 4

Link Results:

| Link ID | Flow LPS | Velocity m/s | Unit Headloss m/km | Status |
|---------|----------|--------------|--------------------|--------|
| 1       | 44.74    | 0.63         | 13.92              | Open   |
| 2       | 10.01    | 0.14         | 0.12               | Open   |
| 3       | 9.46     | 0.30         | 0.83               | Open   |
| 4       | 8.64     | 0.27         | 0.70               | Open   |
| 5       | 34.18    | 0.48         | 1.07               | Open   |
| 7       | 23.00    | 0.33         | 0.53               | Open   |
| 8       | 16.32    | 0.23         | 0.32               | Open   |
| 9       | 15.83    | 0.22         | 0.27               | Open   |
| 10      | 18.01    | 0.25         | 0.35               | Open   |
| 11      | 9.44     | 0.19         | 0.30               | Open   |
| 12      | 4.51     | 0.09         | 0.08               | Open   |
| 13      | 2.23     | 0.05         | 0.02               | Open   |
| 14      | 1.57     | 0.03         | 0.01               | Open   |
| 15      | -0.42    | 0.01         | 0.00               | Open   |
| 16      | -1.19    | 0.02         | 0.01               | Open   |
| 17      | -2.35    | 0.05         | 0.02               | Open   |
| 18      | -4.11    | 0.08         | 0.07               | Open   |
| 19      | -2.74    | 0.09         | 0.09               | Open   |
| 20      | -3.33    | 0.11         | 0.13               | Open   |
| 21      | 11.18    | 0.36         | 1.57               | Open   |
| 22      | 5.70     | 0.18         | 0.35               | Open   |
| 23      | 4.71     | 0.15         | 0.25               | Open   |
| 24      | 4.82     | 0.15         | 0.25               | Open   |
| 25      | 4.27     | 0.14         | 0.20               | Open   |
| 26      | 0.77     | 0.02         | 0.01               | Open   |
| 27      | 4.65     | 0.15         | 0.24               | Open   |
| 28      | 11.40    | 0.16         | 0.16               | Open   |
| 29      | 4.36     | 0.06         | 0.03               | Open   |

PEAK HOUR SCENARIO



|    |       |      |      |      |
|----|-------|------|------|------|
| 30 | -2.26 | 0.03 | 0.01 | Open |
| 35 | 5.74  | 0.12 | 0.11 | Open |
| 36 | 7.13  | 0.10 | 0.07 | Open |
| 37 | 2.55  | 0.04 | 0.01 | Open |
| 39 | 6.77  | 0.10 | 0.06 | Open |
| 40 | -1.59 | 0.02 | 0.00 | Open |
| 42 | -0.97 | 0.02 | 0.00 | Open |
| 43 | 2.28  | 0.05 | 0.02 | Open |
| 44 | -0.22 | 0.00 | 0.00 | Open |
| 48 | -1.44 | 0.03 | 0.01 | Open |
| 49 | 1.81  | 0.04 | 0.01 | Open |
| 50 | 0.82  | 0.02 | 0.00 | Open |
| 51 | -0.17 | 0.00 | 0.00 | Open |
| 52 | -1.16 | 0.02 | 0.01 | Open |
| 53 | 7.92  | 0.25 | 0.59 | Open |
| 54 | 4.24  | 0.09 | 0.07 | Open |
| 55 | 3.25  | 0.07 | 0.05 | Open |
| 56 | 13.39 | 0.19 | 0.25 | Open |
| 57 | 10.14 | 0.14 | 0.14 | Open |



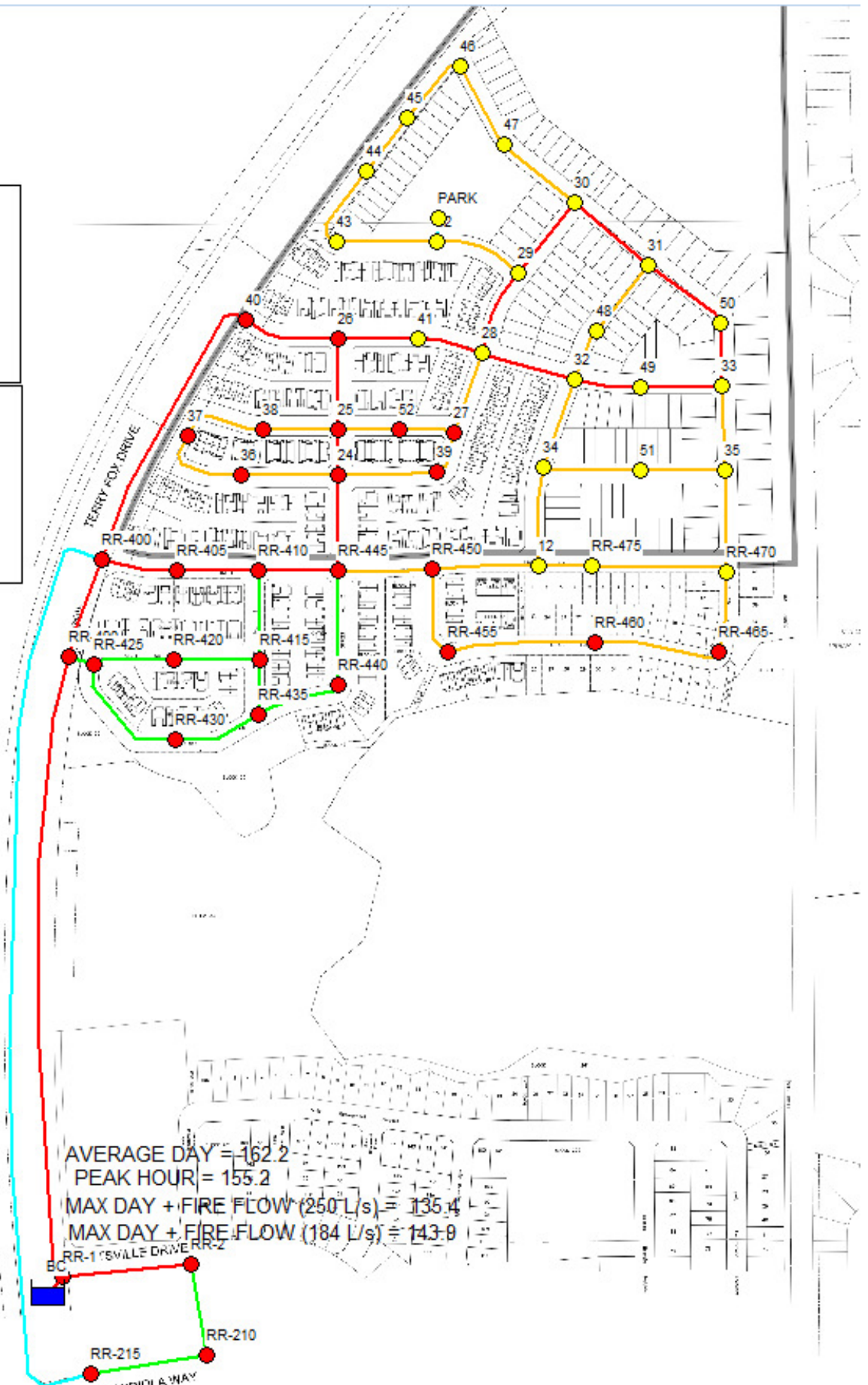
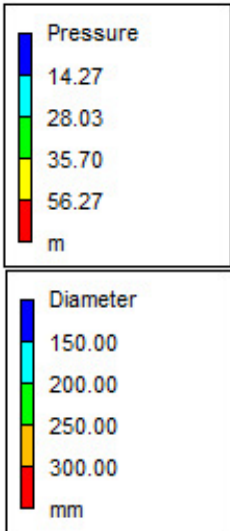
Page 5

Link Results: (continued)

| Link ID | Flow LPS | Velocity m/s | Unit Headloss m/km | Status |
|---------|----------|--------------|--------------------|--------|
| 58      | 9.15     | 0.13         | 0.11               | Open   |
| 59      | 3.59     | 0.07         | 0.05               | Open   |
| 60      | 1.80     | 0.04         | 0.01               | Open   |
| 61      | 0.81     | 0.02         | 0.00               | Open   |
| 62      | -0.18    | 0.00         | 0.00               | Open   |
| 63      | -1.17    | 0.02         | 0.01               | Open   |
| 64      | -2.16    | 0.04         | 0.02               | Open   |
| 65      | -3.15    | 0.06         | 0.04               | Open   |
| 66      | 2.44     | 0.05         | 0.03               | Open   |
| 67      | 1.45     | 0.03         | 0.01               | Open   |
| 68      | 3.13     | 0.04         | 0.01               | Open   |
| 69      | 2.14     | 0.03         | 0.01               | Open   |
| 70      | -1.13    | 0.02         | 0.00               | Open   |
| 71      | -2.12    | 0.03         | 0.01               | Open   |
| 72      | 1.51     | 0.03         | 0.01               | Open   |
| 73      | 0.52     | 0.01         | 0.00               | Open   |
| 74      | 4.47     | 0.09         | 0.08               | Open   |
| 75      | 3.48     | 0.07         | 0.05               | Open   |
| 76      | -0.80    | 0.05         | 0.04               | Open   |
| 6       | -14.38   | 0.20         | 0.22               | Open   |

PEAK HOUR SCENARIO

# AVERAGE DAY SCHEMATIC



# **APPENDIX B**

## **WASTEWATER SUPPLY**

**Table 1.3.1 City Suggested Population Density**

| Type   | Percentage (%) | Density per Unit (ppl/unit) <sup>A</sup> | (Percentage x ppl/unit x 29 units/ha) |
|--|----------------|--|---------------------------------------|
| Singles/Semis  | 60             | 3.4                                      | 59.16                                 |
| Apartments   | 10             | 1.8                                      | 5.22                                  |
| Multiple Units<br>(Townhouses/Stacked<br>Townhouses) | 30             | 2.7                                      | 23.49                                 |
| <b>SUM</b>   |                |  | <b>87.9 ppl/ha</b>                    |

<sup>A</sup>Densities were taken from the City of Ottawa Sewer Design Guidelines.

Population and landuse values for the Interstitial Lands varied significantly between the different sources of information. As such, Table 1.3.2 is provided to present the information and source that was assumed most updated and applicable. For areas outside of the Interstitial/Broughton lands, the information from the City's IMP database was used in the hydraulic modeling as it represents the most recent data available from the City of Ottawa.

**Table 1.3.2 Population & Landuses Sources.**

| ID | Location                              | Source                          | RES Area (ha) | COM/INST Area (ha) | IND Area (ha) | BUILDOUT Population | I/I Area (ha) |
|----|---------------------------------------|---------------------------------|---------------|--------------------|---------------|---------------------|---------------|
| 1  | Lower Baylis (Interstitial Lands)     | Stantec/Richcraft (August 2007) | 2.26          | na                 | na            | 198.7               | 2.26          |
| 2  | Upper Baylis (Interstitial Lands)     | Stantec/Richcraft (August 2007) | 15.67         | na                 | na            | 1377.4              | 15.67         |
| 3  | Richardson North (Interstitial Lands) | IBI (July 2007)                 | 11.8          | na                 | na            | 1037.2              | 11.8          |
| 4  | Lower Richardson (Interstitial Lands) | IBI (July 2007)                 | 16.13         | na                 | na            | 1417.8              | 16.13         |
| 5  | Upper Richardson (Interstitial Lands) | IBI (July 2007)                 | 24.36         | na                 | na            | 2141.2              | 24.36         |
| 6  | Broughton Lands                       | Novatech (May 2007)             | 17.21         | 1.5                | na            | 893                 | 18.71         |

|           |  |   |       |       |     |        |       |
|-----------|--|---|-------|-------|-----|--------|-------|
|           | <b>(Interstitial)</b>  |   |       |       |     |        |       |
| <b>7</b>  | <b>Terry Fox Right of Way</b>  | Novatech (May 2007)                     | na    | na    | na  | na     | 4.4   |
| <b>8</b>  | <b>Kanata Lakes (South of Kizell Pond)</b>                               | IBI (May 2007)                          | na    | na    | na  | 4753.1 | 106.8 |
| <b>9</b>  | <b>Kanata Lakes (North of Kizell Pond)</b>                               | IBI (June 2006)                         | na    | na    | na  | 9169.5 | 151.2 |
| <b>10</b> | <b>Existing Contributing Lands SRPS (Heritage Hills + North HWY 417)</b> | IMP Database City of Ottawa (June 2007) | 172.3 | 110.9 | 4.4 | 9543   | 310.4 |
| <b>11</b> | <b>TBD<sup>A</sup></b>   | Assumed                                 | 2     | na    | na  | 175.8  | 2     |

<sup>A</sup>Represents approximate area south of Broughton Lands also slated to be developed.

This information was used to establish expected buildout flows from the Interstitial Lands, as well as to verify the effects of the Interstitial Lands development on the capacities of the SRPS, Main Street/Penfield and Kanata Lakes North sanitary infrastructure services.





J:\IBI Engineering\CCL\CAD\Cad\Lead\3398-ld\VEB 2008\Report-bans.dwg Layout Name: 5002-GRADING Last Saved By: mmilne Oct 06, 2009 - 11:04am

| NO. | DATE     | BY | REVISION                        |
|-----|----------|----|---------------------------------|
| 1.  | 02:11:20 |    | GENERAL REVISIONS               |
| 2.  | 02:11:26 |    | REVISED AS PER NEW CONCEPT PLAN |
| 3.  | 05:08:16 |    | REVISED AS PER NEW CONCEPT PLAN |
| 4.  | 06:02:14 |    | REVISED AS PER NEW CONCEPT PLAN |
| 5.  | 06:06:15 |    | REVISED AS PER NEW CONCEPT PLAN |

**Legend:**

- Proposed Centreline Profile Grade
- Major Overland Flow Direction
- Major Flow Outlet
- DEVELOPMENT LIMITS

**KNL DEVELOPMENTS INC.**

1770 WOODWARD DR., OTTAWA (613)225-1311

**KANATA LAKES NORTH  
MASTER GRADING PLAN  
SERVICEABILITY  
STUDY**

|                               |                            |
|-------------------------------|----------------------------|
| SCALE: 1:5000                 |                            |
| DRAWN: M.M.                   | DATE: SEPT '02             |
| DESIGN: L.E.                  | DATE: SEPT '02             |
| CHECKED: R.W.W.               | DATE: SEPT '02             |
| PROJECT NO.<br><b>3433-LD</b> | DRAWING NO.<br><b>5002</b> |



SANITARY SEWER CALCULATION SHEET

PROJECT: Richcraft Group of Companies
LOCATION: Kanata Highlands
FILE REF: 10-450
DATE: 20-Dec-16

DESIGN PARAMETERS

Avg. Daily Flow Res. 350 L/p/d
Avg. Daily Flow Comm 50,000 L/ha/d
Avg. Daily Flow Instit. 50,000 L/ha/d
Avg. Daily Flow Indust. 35,000 L/ha/d

Peak Fact. Res. Per Harmons: Min = 2.0, Max =4.0
Peak Fact. Comm. 1.5
Peak Fact. Instit. 1.5
Peak Fact. Indust. per MOE graph

Infiltration / Inflow 0.28 L/s/ha
Min. Pipe Velocity 0.60 m/s full flowing
Max. Pipe Velocity 3.00 m/s full flowing
Mannings N 0.013



Table with columns: Location, Residential Area and Population, Commercial, Institutional, Industrial, Infiltration, Pipe Data. Rows include various sites like Terry Fox, Phase 1C, Phase 2A, Phase 2B, Phase 1B, Richardson Ph. 1D, Broughton Residential, Broughton Commercial, Broughton Total, and multiple Terry Fox entries with specific lot numbers and areas.

Duplicate of original IBI design sheet which shows only the Lower Baylis lands going to the Signature Pump Station





# **APPENDIX C**

## **STORMWATER CONVEYANCE**

450B1.4

Sum

**Adam Fobert**

**From:** Doug Nuttall <dnuttall@mvc.on.ca>  
**Sent:** February-06-13 1:51 PM  
**To:** afobert@dsel.ca  
**Subject:** RE: Carp River Floodplain Mapping

I don't have the 2-year levels. Your surveyor would be able to pick up bankfull fairly easily, and the 1:2 year will be slightly higher than that. Based on the cross sections I have, I'd say it is slightly above 92.1m elevation at lot 9/10, and slightly above 92.2 at lot 7/8.

At lot line 7/8, the closest cross section upstream is 38950  
At lot line 9/10, the closest cross section upstream is 37715

|     | SECNO     | Q     | CWSEL | VLOB | VROB | VCH  |
|-----|-----------|-------|-------|------|------|------|
| 100 | 37715.000 | 59.80 | 93.15 | .21  | .17  | 1.11 |
| 50  | 37715.000 | 54.20 | 93.03 | .21  | .17  | 1.23 |
| 25  | 37715.000 | 42.50 | 92.92 | .19  | .14  | 1.17 |
| 10  | 37715.000 | 38.10 | 92.82 | .18  | .14  | 1.22 |
| 5   | 37715.000 | 35.40 | 92.75 | .18  | .13  | 1.26 |
| *   | 37970.000 | 59.80 | 93.23 | .16  | .08  | .81  |
| *   | 37970.000 | 54.20 | 93.13 | .14  | .07  | .81  |
| *   | 37970.000 | 42.50 | 93.02 | .11  | .08  | .72  |
| *   | 37970.000 | 38.10 | 92.93 | .11  | .09  | .70  |
| *   | 37970.000 | 35.40 | 92.87 | .10  | .08  | .68  |
| *   | 38220.000 | 61.60 | 93.27 | .11  | .12  | .41  |
| *   | 38220.000 | 57.00 | 93.18 | .11  | .12  | .43  |
| *   | 38220.000 | 41.50 | 93.06 | .08  | .10  | .37  |
| *   | 38220.000 | 37.10 | 92.97 | .08  | .10  | .38  |
| *   | 38220.000 | 34.30 | 92.91 | .08  | .09  | .38  |
|     | 38450.000 | 40.40 | 93.28 | .11  | .08  | .34  |
|     | 38450.000 | 32.00 | 93.19 | .10  | .07  | .30  |
|     | 38450.000 | 24.30 | 93.06 | .08  | .06  | .27  |
|     | 38450.000 | 18.60 | 92.98 | .07  | .05  | .22  |
|     | 38450.000 | 17.20 | 92.92 | .06  | .05  | .22  |
|     | 38700.000 | 40.40 | 93.30 | .11  | .12  | .39  |
|     | 38700.000 | 32.00 | 93.20 | .10  | .10  | .37  |
| *   | 38700.000 | 24.30 | 93.08 | .09  | .09  | .37  |
| *   | 38700.000 | 18.60 | 92.99 | .08  | .08  | .36  |
| *   | 38700.000 | 17.20 | 92.93 | .08  | .08  | .38  |
|     | 38950.000 | 40.40 | 93.31 | .12  | .12  | .40  |
|     | 38950.000 | 32.00 | 93.22 | .11  | .10  | .38  |
|     | 38950.000 | 24.30 | 93.09 | .10  | .10  | .39  |
|     | 38950.000 | 18.60 | 93.00 | .08  | .08  | .37  |
|     | 38950.000 | 17.20 | 92.95 | .08  | .08  | .39  |

70% TSS removal is required right now. After the Restoration Project is complete, there is an expectation that the fish community will be sufficiently enhanced that 80% TSS removal will be required, but that is currently conjecture. As you would be discharging downstream of the Restoration Project, you would have to match post- flows to pre- flows.

Yes, the Carp River Watershed/Subwatershed Study is the most up-to-date and complete document in place today. It has additional water quality treatment requirements that may apply here.

Greenland Engineering is the 'model keeper', and Don Moss at Greenland can be contacted to get the current HEC-RAS model. He's at [dmoss@grnland.com](mailto:dmoss@grnland.com)

Douglas Nuttall, P.Eng.  
Water Resources Engineer  
Mississippi Valley Conservation

---

**From:** Adam Fobert [mailto:[afobert@dsel.ca](mailto:afobert@dsel.ca)]  
**Sent:** February-05-13 5:35 PM  
**To:** 'Doug Nuttall'  
**Subject:** RE: Carp River Floodplain Mapping

Hello Douglas,

Thank you for the cross-section information.

We should note that we are proposing a stormwater management pond on the western side of Terry Fox. As such we would like to confirm the following:

- 1) Water levels between lot line delineating Lots 7&8 and Lots 9&10. For all events from the 2-year to the 100-year. We require the 2-year water level to establish the pond's normal water level.
- 2) Release rate requirements: Quantity Control – Post development to Pre-Development Runoff rate?
- 3) Quality controls – Provide 80% TSS removal per MOE Enhanced?
- 4) Is the report 'Carp River Watershed / Subwatershet Study Modelling Analysis – Robinson Consultants, Dec 2005' the most current and accepted document?
- 5) Is an existing HEC-RAS model available for this area that our modellers (JFSA) can employ in the detailed design and modeling?

Thank you for your help. Feel free to call to discuss.

---

Adam Fobert, P.Eng.  
Senior Design Engineer

**DSEL**  
**david schaeffer engineering ltd.**

120 Iber Road, Unit 203  
Stittsville, ON K2S 1E9

**phone:** (613) 836-0856 ext.231

**fax:** (613) 836-7183  
**email:** afobert@DSEL.ca

This email, including any attachments, is for the sole use of the intended recipient(s) and may contain private, confidential, and privileged information. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient or if this information has been inappropriately forwarded to you, please contact the sender by reply email and destroy all copies of the original.

---

**From:** Doug Nuttall [<mailto:dnuttall@mvc.on.ca>]  
**Sent:** February-04-13 4:49 PM  
**To:** [afobert@dsel.ca](mailto:afobert@dsel.ca)  
**Subject:** RE: Carp River Floodplain Mapping

Your site is high and dry. The modelling I have in this location (where the Carp crosses the upstream side of Lot 9), which is section 38220.

|   | SECNO     | Q     | CWSEL | VLOB | VROB | VCH |
|---|-----------|-------|-------|------|------|-----|
| * | 38220.000 | 61.60 | 93.27 | .11  | .12  | .41 |
| * | 38220.000 | 57.00 | 93.18 | .11  | .12  | .43 |
| * | 38220.000 | 41.50 | 93.06 | .08  | .10  | .37 |
| * | 38220.000 | 37.10 | 92.97 | .08  | .10  | .38 |
| * | 38220.000 | 34.30 | 92.91 | .08  | .09  | .38 |

This is the 1:100, 1:50, 1:25, 1:10, 1:5. This downstream of the confluence with Huntley Creek. The Regulation line is at 93.3m elevation.

---

**From:** Adam Fobert [<mailto:afobert@dsel.ca>]  
**Sent:** February-04-13 2:42 PM  
**To:** [dnuttall@mvc.on.ca](mailto:dnuttall@mvc.on.ca)  
**Subject:** Carp River Floodplain Mapping

Hello Douglas,

We met some time ago during Richcraft's pre-consultation with municipal staff regarding their Kanata Highlands project on Terry Fox. I've pasted a site location image below for convenience.

I'm in the process of gathering all the background information for this area, or at least ensuring that I have the most current information.

What information is considered latest and greatest for establishing water levels on the Carp River (2-year, through 100-year)? What is the current regulatory floodplain established on? I've attached the mapping that I have on file. I believe we need the next sheet down for this site. If this information is still current could you provide?

Thank you for your help.



Adam Fobert, P.Eng.  
Senior Design Engineer

**DSEL**  
david schaeffer engineering ltd.

120 Iber Road, Unit 203  
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.231  
fax: (613) 836-7183  
email: afobert@DSEL.ca

This email including any attachments is for the sole use of the intended recipient(s) and may contain private, confidential, and privileged information. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient or if this information has been inappropriately forwarded to you, please contact the sender by reply email and destroy all copies of the original.