

**FUNCTIONAL SERVICING &  
PRELIMINARY STORMWATER  
MANAGEMENT REPORT**

**LONG POINT ROAD  
SUBDIVISION**

**TOWN OF THE BLUE MOUNTAINS  
COUNTY OF GREY**

**PREPARED FOR:**

**TERRA BROOK HOMES**

**PREPARED BY:**

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**AUGUST 2021**

**CFCA FILE NO. 1988-5783**

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<b>Revision Number</b>	<b>Date</b>	<b>Comments</b>
Rev.1	Sept 24, 2018	Issued for First Submission
Rev.2	Feb. 19, 2021	Issued for First Submission - Draft Plan Version #8
Rev.3	Aug. 20, 2021	Issued for Second Submission – Draft Plan Version #8

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## 1.0 INTRODUCTION

C.F. Crozier & Associates Inc. (Crozier) was retained by Terra Brook Homes to prepare a Functional Servicing & Preliminary Stormwater Management Report in support of a Zoning By-Law Amendment and Draft Plan of Subdivision Application consisting of 22 single detached lots. The proposed development is comprised of two properties, legally described as Plan 529 PT Lot 85 RP;16R2186 Parts 4 & 8, and Plan 529 PT Lot 85 RP;16R2186 Parts 5 & 9 in the Town of The Blue Mountains, County of Grey. The location of the proposed development and the proposed Draft Plan are included as **Figure 1** and **Figure 2**, respectively.

The proposed development, consisting of 22 lots, will be serviced with municipal sanitary, storm, and watermain infrastructure located within the municipal right-of-way (ROW). Preliminary servicing details have been reflected on the General Site Servicing Plan included in this report as **Figure 3**. Grading and storm servicing details have been reflected on the Grading and Storm Sewer Plan included in this report as **Figure 4**.

This report has been prepared to document details associated with the functional servicing and stormwater management design for the proposed development. Contained in this report is a description of the existing site (Section 2.0); the water servicing strategy (Section 3.0); the sanitary servicing strategy (Section 4.0); the drainage & stormwater management strategy (Section 5.0); proposed utilities (Section 6.0); sediment and erosion control plan (Section 7.0); and a concluding discussion (Section 8.0).

## 2.0 SITE DESCRIPTION

The Subject Property is approximately 2.2 ha and is located in a residential area in the Town of The Blue Mountains, north of Highway 26 and adjacent to Long Point Road.

The Subject Property is bounded by:

- Residential properties to the north
- A residential property to the south
- A municipal drainage easement to the west
- Long Point Road to the east

The site consists of a single cul-de-sac and access will be provided from Long Point Road. A TIS was not required for this site due to the smaller unit count and the ongoing MTO EA assessing traffic impacts along the MTO corridor in this area. These lands were included in that assessment and impacts from this site were agreed to be negligible given the draft approved future growth in the area (2018).

Currently the site is undeveloped and fully treed. The site is relatively flat, with the grades generally descending from southeast to northwest. The site drains into a municipal drain west of the property, which conveys flows approximately 1 km north of the site where it discharges to Georgian Bay.

The site is currently zoned Residential/Recreational Area per the Town of The Blue Mountains Official Plan, which specifies a maximum single detached density of 10 units/ha. Therefore, 22 units on 2.2 ha is in conformance with this zoning requirement.

A subsurface characterization program prepared by Wilson Associates (July 5, 2018) was completed for the site to identify the seasonal high-water table as well as determine the underlying soil profile. Within the investigation, three (3) boreholes were advanced across the site. The boreholes revealed that the site is underlain by a thin layer of fine sand with some silt deposit and sand with some gravel

and clay glacial till. In addition, monitoring wells were installed within each of the boreholes. The monitoring wells revealed that groundwater levels within the summer range between 0.58m and 0.81m below grade and 0.03m and 0.43m below grade in the spring (Wilson Associates, May 2019). The results of the subsurface investigation have been provided in **Appendix A**.

### 3.0 WATER SERVICING

The following subsections provide an analysis of the water servicing and fire protection strategy proposed for the Long Point Road Development.

#### 3.1 EXISTING INFRASTRUCTURE

Per As-Constructed Drawings (FM5 – FM7, Ainley 2006) an existing 150mm diameter watermain is located within the Long Point Road right-of-way. Town staff, through previously issued comments, confirmed that this watermain is owned and operated by the Town of The Blue Mountains. As-Constructed drawings have been provided in **Appendix B**.

#### 3.2 PROPOSED WATER SERVICING STRATEGY

The development will be serviced via connection to the existing watermain on Long Point Road. This watermain is owned and operated by the Town of The Blue Mountains. A tee connection will be provided from the existing main with a loop in the cul-de-sac to prevent a dead end.

#### 3.3 DESIGN WATER DEMAND

The Town of The Blue Mountains Design Criteria (The Blue Mountains Engineering Standards, April 2009) were referenced to calculate water demand flows for the proposed development. A per capita water demand of 450 L/C/day was used with an occupancy density of 2.3 persons/unit. The maximum peak day factor of 2.0 and peak hour factor of 4.50 were applied to the average daily demand flow of 0.26 L/sec to obtain max daily demand and peak hour demand flows. A summary of the results is presented in **Table 1** below and detailed calculations have been provided in **Appendix C**.

**Table 1: Estimated Design Water Demand**

Standard	Average Daily Demand (L/sec)	Maximum Daily Demand (L/sec)	Peak Hourly Demand (L/sec)
Town of The Blue Mountains	0.26	0.53	1.19

#### 3.4 FIRE FLOW DEMAND

The Fire Underwriters Survey (FUS) and Ontario Building Code (OBC) methods were used to estimate the fire flow requirements for the proposed development. All buildings are assumed to fall into building Class C with an estimated gross floor area (GFA) of 410 sq. m. **Table 2** summarizes the fire flow and duration requirements under both OBC and FUS approaches.

**Table 2: Estimated Fire Demand Flows**

Method	Demand Flow (L/sec)	Duration (h)
OBC	45	1.25
FUS	100	1.5

The subdivision currently meets the OBC fire flow requirements but does not meet the fire flow requirements calculated using the FUS. Please refer to the external flow analysis completed By JLR located for reference in **Appendix B**. If the Town requires that available fire flows meet the FUS requirements we will work with the developer/builder to revise the unit layout and/or provide fire protection measures on the interior and exterior of the units to lower the fire flow demands to the available flow in the existing system. This will be investigated further at detailed design. **Appendix C** contains the FUS and OBC calculations.

#### 4.0 SANITARY SERVICING

The following subsections provide an analysis of the sanitary servicing strategy for the proposed Long Point Road Development.

##### 4.1 EXISTING INFRASTRUCTURE

Per As-Constructed Drawing (N<sup>2</sup>81042/43-SW5, July 1984), a sanitary manhole labelled "MH#69" is located approximately 140m west of the Highway 26 and Osler Bluff Road intersection. This manhole connects to a gravity sanitary sewer system that conveys flow to the Craigeith sewage pumping station. Flow from this point is conveyed to the existing wastewater treatment plant located north of the proposed development on Long Point Road via two parallel sanitary high pressure forcemains. The As-Constructed Drawing has been provided in **Appendix B**.

##### 4.2 SANITARY DEMAND

Sanitary design flow calculations were completed in accordance with the Town of The Blue Mountains Design Criteria (The Blue Mountains Engineering Standards, April 2009). A per capita sewage flow of 450 L/C/day was used with an occupancy density of 2.3 persons/unit. Infiltration flow of 0.23 L/sec/ha and a peaking factor 4.3 were applied to the sewage flow rate to obtain the total estimated design sewage flow for the Subject Property. A summary of the design flows is presented in **Table 3** below and detailed calculations have been provided in **Appendix C**.

**Table 3: Estimated Sanitary Design Flows (22 Units)**

Standard	Average Flow (L/sec)	Peaking Factor	Peak Flow (L/sec)	Infiltration Flow (L/sec)	Total Estimated Design Flow (L/sec)
Town of The Blue Mountains	0.26	4.3	1.12	0.51	1.64

The proposed sanitary system will be sized to convey a peak sanitary flow of 1.64 L/sec for the development.

### 4.3 PROPOSED SANITARY SERVICING STRATEGY

Connection to the existing high-pressure forcemains located on Long Point Road was eliminated as a potential servicing strategy for this development, as the cost to construct a sanitary pump station for this small of a development was deemed infeasible. As a result, the development will be serviced through a low pressure forcemain that will connect to the existing gravity sanitary sewer located on Highway 26.

According to the January 27, 2020 Highway 26 Flow Monitoring Study by Tatham Engineering there is currently residual capacity within the existing 300mm diameter sanitary gravity sewer on Highway 26 based on monitored flow studies. It is understood that based on theoretical flow values (considering the full buildout of all developments draining to the ex. 300mm sewer) the sewer will reach capacity. Alternative arrangements such as upsizing the sewer or preparing an ECA application based on monitored rather than theoretical flows will be investigated further at detailed design to ensure the subject development does not contribute to the sewer reaching capacity.

At this time, it is anticipated that the low pressure forcemain can be installed via directional drilling. Utilizing this methodology would minimize roadway restorations requirements along Long Point Road and Highway 26. Consultation with the Town during detailed design would be required to determine a corridor for the forcemain within the existing municipal right-of-way. A conceptual cross-section illustrating the location of the forcemain along Long Point Road can be seen on **Figure 3**. The Town has indicated that a future gravity sanitary sewer will be constructed on Long Point Road, which the subject development will be expected to tie into. During detailed design we will account for the future connection and decommissioning/removal of the low pressure forcemain downstream of the development entrance. The ECA application will be amended as necessary for the future sanitary connection to Long Point Road.

It is acknowledged through received comments that an alternative alignment within the municipal drain easement through a change of use easement would not be supported by the Town.

### 5.0 DRAINAGE & STORMWATER MANAGEMENT

Management of stormwater and site drainage for the proposed development will proceed in conformance with the standards provided by the Town of The Blue Mountains, Grey Sauble Conservation Authority (GSCA), and Ministry of the Environment, Conservation and Parks (MECP).

A stormwater management strategy and accompanying recommendations regarding the proposed development have been included below.

- Water Quantity Control
  - Control of the post-development peak flows to pre-development levels for all storms up to and including the 100-year event
- Water Quality Control
  - "Enhanced Protection" per MECP
- Development Standard
  - Urban cross section within 20-meter right-of-way
  - Lot grading at 2% optimum
  - Minor/major drainage system to convey frequent rainfall/runoff events

## 5.1 EXISTING DRAINAGE

The soil type identified on the site is Granby well sorted sandy washout (Soil Map of Simcoe County, North Sheet, Soil Survey Report No. 29), which is classified as Hydrologic Soil Group B (Design Chart H2-6A, MTO Drainage Manual, 1985). This soil type has been generally confirmed in the Geotechnical Report by Wilson Associates, which identified onsite soils as predominantly glaciolacustrine sand overlying sandy silt fill.

Drainage from the site is predominately sheet flow from the southeast to the northwest and discharges into a municipal drain, as identified under the Drainage Act, located at the west limits of the site. The configuration of the municipal drain will not be altered, and peak flows will not be increased in post-development. The municipal drain conveys flows north to a culvert that crosses Brophy's Lane. North of Brophy's Lane, stormwater traverses the Town of The Blue Mountains wastewater treatment facility lands where it discharges into a small pond northwest of the treatment facility's main entrance. Town staff have advised that this pond is an aesthetic feature with no stormwater quality or quantity features. The pond discharges to a drainage channel flowing north down the Long Point Road west ditch to Georgian Bay.

## 5.2 PROPOSED DRAINAGE

The proposed development consists of an urban cross section roadway complete with curb and gutter with an internal storm sewer system. Front yards, side yards and rooftops will be graded to direct runoff towards the ROW where they will be collected by catchbasins and conveyed through the proposed storm sewer system, up to and including the 100-year storm event. An overland flow route will be located within the Open Space Block 25 in the event the storm sewer is blocked/surcharges. Rear yards will slope to the back of the lots where swales will convey flows west to the municipal drain. The proposed drainage configuration for the site is presented in **Figure 4**.

There is 0.13 ha of drainage on the east side of site (Drainage Area 1A), which includes a portion of the roadway and driveways, that is released without quality or quantity control to the north side of the development. The uncontrolled flows will be picked up in a drainage ditch along the frontage of Long Point Road, which will also accept flows from the existing roadway. The area has been reduced as much as possible and offset by overcontrolling the western portion of the site where the runoff coefficient exceeds the existing condition. These flows will discharge to the north of the site in accordance with the pre-development conditions. Approximately 0.79 ha of flows from rear yards and the Open Space Block 25 (Drainage Area 1D) will be collected in drainage swales and directed toward the Municipal Drain without quantity control. This drainage is considered clean, as it consists of rooftop and vegetative runoff only.

The internal roadway grading/geometrics will conform with the Town of The Blue Mountains Design Standards (The Blue Mountains Engineering Standards, April 2009).

## 5.3 STORMWATER QUANTITY CONTROL

Quantity control for the development will be provided by oversized storm sewer pipes within the proposed Town's ROW. Outflow from this storm sewer storage will be controlled by an orifice plate located at the downstream end of the oversized storm sewer.

Given the small area of the proposed development property, the analysis of on-site quantity control requirements was performed using the Rational Method, per industry standard. A composite runoff coefficient for the existing and proposed site conditions was calculated using values found in the Town of The Blue Mountains Design Standards (The Blue Mountains Engineering Standards, April 2009)

and MTO Standards (MTO Drainage Management Manual, 1997). **Table 4** illustrates the determination of pre- and post-development runoff coefficients.

**Table 4: Pre- and Post-Development Conditions Composite Runoff Coefficient**

Land Use	Pre-Development			Post-Development					
	Area (ha)	Runoff Coefficient*	A x C	Area (ha)	Runoff Coefficient*	A x C	Area (ha)	Runoff Coefficient*	A x C
Catchment	Pre-Development			Uncontrolled (1A & 1D)			Controlled (1B & 1C)		
Asphalt	0.00	0.95	0.0	0.03	0.95	0.03	0.35	0.95	0.33
Roof	0.00	0.70	0.0	0.04	0.70	0.03	0.44	0.70	0.31
Lawn	0.15	0.30	0.05	0.29	0.15	0.04	0.48	0.15	0.07
Woodland	2.04	0.25	0.51	0.56	0.30	0.17	0	0.30	0.00
<b>Composite</b>	<b>2.19</b>	<b>0.25</b>	<b>0.56</b>	<b>0.92</b>	<b>0.29</b>	<b>0.27</b>	<b>1.27</b>	<b>0.56</b>	<b>0.71</b>

The calculated composite runoff coefficients were used in the Rational Method calculations. Rainfall events were modelled using Town of The Blue Mountains IDF data, and a 15-minute time of concentration. Refer to **Appendix D** for the peak flow results. Note that runoff coefficients for the 25 year and 100-year storms were adjusted per the MTO Standard methodology. The results of the analysis are presented in **Table 5**. Detailed calculations have been provided in **Appendix D**.

**Table 5: Rational Method Storage Volume Results**

Storm	Pre-Development (m <sup>3</sup> /sec)	Post Development (m <sup>3</sup> /sec)			Storage (m <sup>3</sup> )
	Total	Uncontrolled (1A & 1D)	Controlled (1B & 1C)	Total	
<b>5-year</b>	0.12	0.06	0.06	0.12	90
<b>25-year</b>	0.18	0.09	0.09	0.18	134
<b>100-year</b>	0.25	0.12	0.13	0.25	185

Based on the information shown in Table 5 and Table 6, the proposed oversized storm sewer will provide the require storage volumes to control peak flows from the site. Final design and sizing will be completed as part of detailed design.

#### 5.4 STORMWATER QUALITY CONTROL

A preliminary screening of the most practical stormwater water quality measures to implement on-site was undertaken. Due to the small size of the site, and to achieve an “enhanced” treatment level required by the MECP, a Jellyfish filtration unit is the most practical quality control measure. The Jellyfish unit will be located on-line with the site storm system, downstream of the quantity control, as depicted in **Figure 4**.

Refer to **Table 6** below for a detailed breakdown of the performance of the proposed Jellyfish. Sizing calculations have been provided in **Appendix D**.

**Table 6: Jellyfish Sizing Criteria**

Catchment	Contributing Drainage Area (ha)	Jellyfish Unit	Total Suspended Solids Removal (%)	Total Annual Runoff Volume Treated (%)

Internal Sewer	1.27	JF6	98	>90
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Once the Jellyfish unit is installed, and operating according to the manufacturer's specifications, and assumed by the Town, Town staff will be required to inspect and service the unit on a regular basis per the guidelines outlined in the Owner's Manual provided in **Appendix E**, to ensure long term efficiency.

## 6.0 UTILITIES

The site is proposed to be serviced with natural gas, telephone, cable TV and hydro. We understand these utilities are available in the Long Point Road right-of-way adjacent the proposed development. Coordination with the aforementioned utilities will be undertaken during the detailed design phases to confirm utility design capacity and connection locations.

## 7.0 SEDIMENT AND EROSION CONTROLS DURING CONSTRUCTION

Sediment and erosion controls will be installed prior to the commencement of any construction activities and will be maintained until the site is stabilized or as directed by the Site Engineer and/or the Town of The Blue Mountains. A Grading & Sediment Erosion Control Plan will be prepared as part of the detailed design package to identify the location of the recommended control features. Controls will be inspected after each significant rainfall event and maintained in proper working condition. A summary of proposed controls to be implemented is included below.

- Silt Fencing

Silt fence will be installed where required to intercept sheet flow. Heavy duty silt fence will be located around the downstream side of the work zone limits. It should be noted that additional silt fencing may be added based on field decisions by the Site Engineer and Contractor prior to, during and following construction.

- Mud Mat

A mud mat will be installed at the entrance to the construction zone in order to prevent mud tracking from the site onto the surrounding lands and perimeter roadway network.

- Dust Suppression

During construction activities, the Contractor will ensure that measures for dust suppression are provided as required.

## 8.0 CONCLUSIONS & RECOMMENDATIONS

Based on the foregoing we conclude that the proposed Long Point Road Residential Development can be adequately serviced.

1. Access to the site will be provided by way of roadway connections to Long Point Road.
2. A Preliminary site drainage plan has been completed to demonstrate that overland flow routes to the municipal drain can be achieved.
3. The development will be serviced via an internal low-pressure forcemain sanitary sewer system that will outlet to the existing Highway 26 gravity sanitary sewer and to a gravity sewer along Long Point Road in the future (post-occupancy).
4. Domestic water supply for the development will be provided via a connection to the existing Town of The Blue Mountain watermain within the Long Point Road right-of-way. System pressures, flows, and external improvements will be confirmed with the Town of The Blue Mountain as development approvals proceed.
5. Utilities are available to service the site.

Therefore, we recommend approval of the Planning Applications for the site from the perspective of engineering servicing requirements.

Respectfully submitted,

**C.F. CROZIER & ASSOCIATES INC.**



Austin Spencer, P.Eng.  
Project Engineer

**C.F. CROZIER & ASSOCIATES INC.**



Brendan Hummelen, P.Eng.  
Project Engineer

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# APPENDIX A

## Subsurface Characterization Program (Wilson Associates)

July 5, 2018

Ms. Brittany Robertson, P.Eng.  
C.F. Crozier & Associates  
40 Huron Street  
Suite 301  
Collingwood, ON  
L9Y 4R3



Dear Ms. Robertson:

Re: Subsurface Characterization Program  
Proposed Long Point Road Subdivision, Blue Mountains

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It is proposed to develop a  $\pm 22$ -lot urban residential subdivision on a  $\pm 2.2$ ha parcel of land located within Part of Lots 20 and 21, Concession 1, Geographic Township of Collingwood, Town of Blue Mountains (Plan 529, Part Lot 85, RP16R2186, Parts 4, 5, 8 & 9). Figure 1 shows the layout of the site and surroundings.

It is understood that full municipal servicing will be available for the proposed subdivision.

As requested, a subsurface investigation was completed to identify the seasonal high watertable level, the soil profile and the bedrock surface level, and was conducted through the installation of three exploratory boreholes on June 7, 2018. An initial site reconnaissance was conducted May 18, 2018.

### **SITE SETTING AND GEOLOGICAL SETTING**

The proposed subdivision is located on a  $\pm 2.2$ ha parcel of land located on the west side of Long Point Road, approximately 200m north of Highway 26. Frontage along Long Point Road is approximately 93m, and the depth of the site is approximately 237m. The site is currently mainly forested, and is undeveloped.

According to imagery provided by on-line Grey County Maps as well as topographical information provided by Ontario Base Mapping, the site exhibits a very shallow relief with an overall slope to the north. A northwards- flowing improved drainage course is mapped to be situated approximately in the middle of the site, as well as along the western edge of the site. Mapped wetlands are located to the west and the east of the site. Lands surrounding the site are undeveloped forest to the west, mainly forested rural residential lots to the north and south, and residential properties to the east along Long Point Road.

According to the Ontario Geological Survey Map P.919 "Quaternary Geology of the Collingwood-Nottawasaga Area", the upper soils in the vicinity of the site will consist of glaciolacustrine sand overlying sandy silt till and/or limestone bedrock.

The bedrock beneath the site consists of limestone of the Simcoe Group.

According to local historical water well records completed prior to the local supply of municipal water (i.e. late 1960's to early 1970's, copies attached), the overburden in the vicinity of the site is in the range of 3.7m to 8.5m deep. All historical well records in the vicinity of the site report obtaining groundwater from the limestone bedrock aquifer beneath the site. The overburden is locally of insufficient thickness to have provided a viable, secure source of groundwater for domestic use.

### **SUBSURFACE ASSESSMENT**

Three boreholes were completed within accessible areas of the subject property on June 7, 2018. The boreholes were completed using a track-mounted power auger machine equipped with continuous flight hollow-stem augers and conventional soil sampling equipment. The boreholes were completed to the bedrock surface (4.6m at BH1 and BH3, 4.9m at BH2) and were instrumented as 5.1cm-diameter monitoring wells. Drilling conditions were observed through auger feedback on a continuous basis. Overburden formation samples were collected using conventional split-spoon technique and from auger cuttings, and were field-identified at regular depth intervals. Selected representative samples were retained for subsequent laboratory analysis.

Logs of the borehole installations are attached. Copies of the water well records for the monitoring well installations are also attached. The approximate locations of the boreholes are shown on attached Figure 1.

Two representative overburden formation samples were selected for laboratory analysis, these being from the surficial sands and the underlying sandy silt till. The following table provides a summary of the analyses:

Sample	Depth (m)	Grain-Size Distribution				Estimated Coefficient of Permeability (cm/sec)	Estimated T-time (minutes/cm)
		Clay%	Silt%	Sand%	Gravel%		
BH1 S1	0.3 - 0.8	0	12	88	0	$2 \times 10^{-3}$	10
BH3 S2	1.5 - 2.0	13	37	34	16	$7 \times 10^{-6}$	40

Note: The above coefficients of permeability and T-times are estimates based on field observation, grain-size analysis, experience with similar soils and guidelines published under the Ontario Building Code.

In summary, soil conditions are generally consistent with local Quaternary Geology mapping, with a thin fine sand with some silt deposit overlying a silt and sand with some gravel and clay glacial till. The bedrock surface was encountered at 4.6m to 4.9m below grade.

Copies of the grain-size curves are attached.

**WATERTABLE**

Monitoring wells were installed in the three boreholes for subsequent observation of the watertable surface. Water levels were observed in the monitoring wells on June 28, 2018.

The following tables summarize the water level observations, including the depth groundwater was first observed in the three boreholes during drilling.

Monitoring Well	Depth to First Groundwater in Open Borehole (m) June 7, 2018	Monitoring Well Observations June 28, 2018	
		Water Level (m below top of pipe)	Water Level (m below grade)
BH1	0.3	1.66	0.68
BH2	0.3	1.47	0.58
BH3	0.6	1.90	0.81

Consistent with the geological setting of the site, shallow groundwater conditions are present over the entire property. The observed early summer groundwater levels range between 0.58m and 0.81m below grade. Based on the setting and observations during the May 18, 2018 reconnaissance, it is anticipated that high spring water levels will be at or near current grade.

**SUMMARY**

1. The soil profile over the property consists of with a thin fine sand with some silt deposit overlying a silt and sand with some gravel and clay glacial till.
2. The bedrock surface is situated 4.6m to 4.9m below current grade.
3. Groundwater levels observed June 28, 2018 ranged between 0.58m and 0.81m below grade. Based on the setting and observations during an earlier spring reconnaissance, it is anticipated that high spring water levels will be at or near current grade.

Should you have any questions or require further detail, please do not hesitate to contact this office.

Yours sincerely,

**IAN D. WILSON ASSOCIATES LIMITED**



Geoffrey Rether, P.Geo.

**Legend**

- Parcels
- Large Scale Roads
- Provincial Highway
- County Road
- Township Road
- Seasonal Road

APPROXIMATE LOCATIONS  
OF EXPLORATORY  
BOREHOLES

LONG POINT ROAD  
SUBDIVISION

FIGURE 1

SCALE: AS SHOWN

**Notes**



This map is a user generated static output from an Internet mapping site and is for reference only.  
Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

0.08 Kilometers



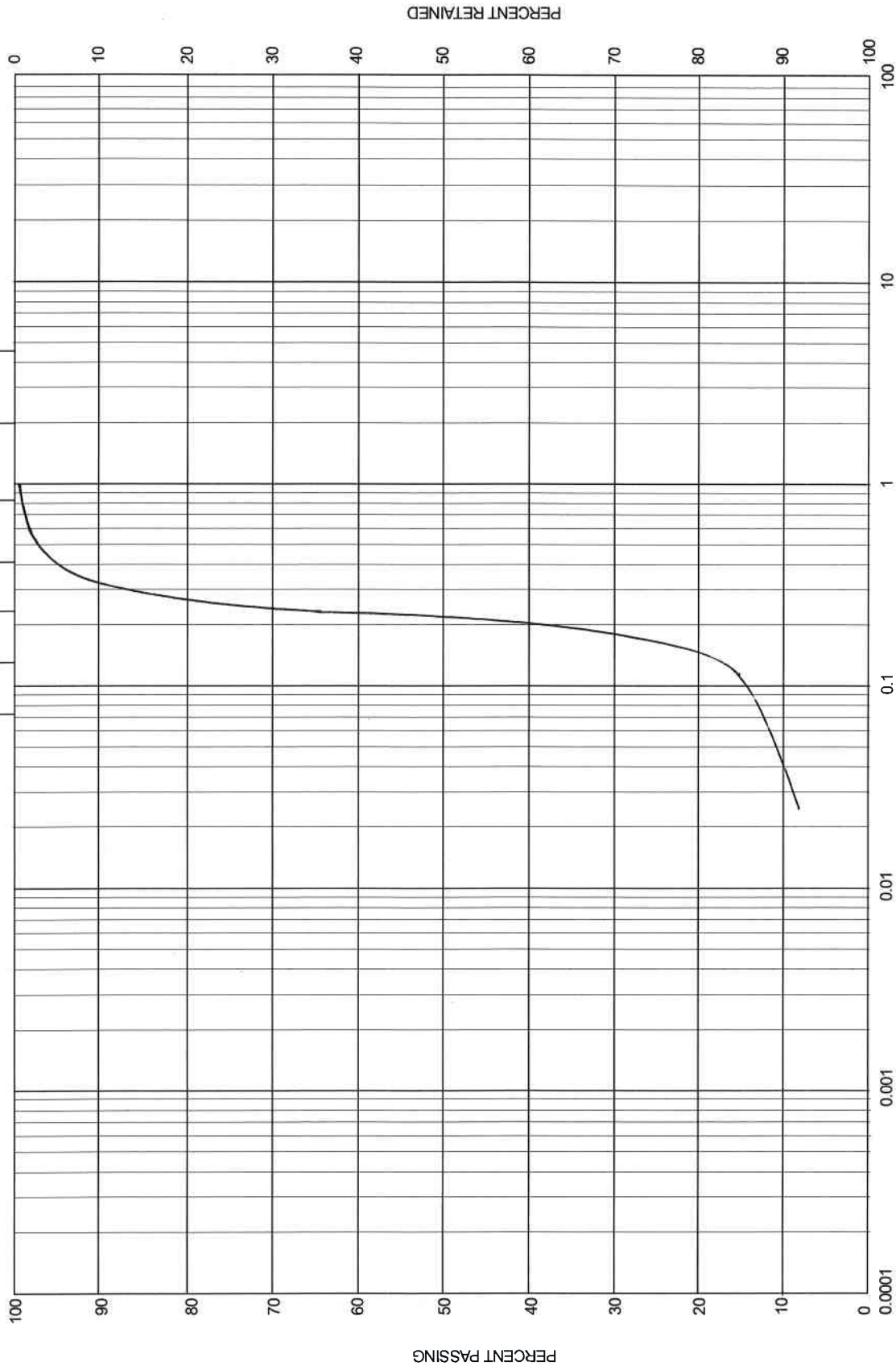




# GRAIN SIZE DISTRIBUTION CHART

PROJECT / SAMPLE | Long Point Road Subdivision - BH1, S1 - 0.3m to 0.8m

← HYDROMETER ANALYSIS      → SIEVE NUMBER (US STANDARD SIEVE SIZES)

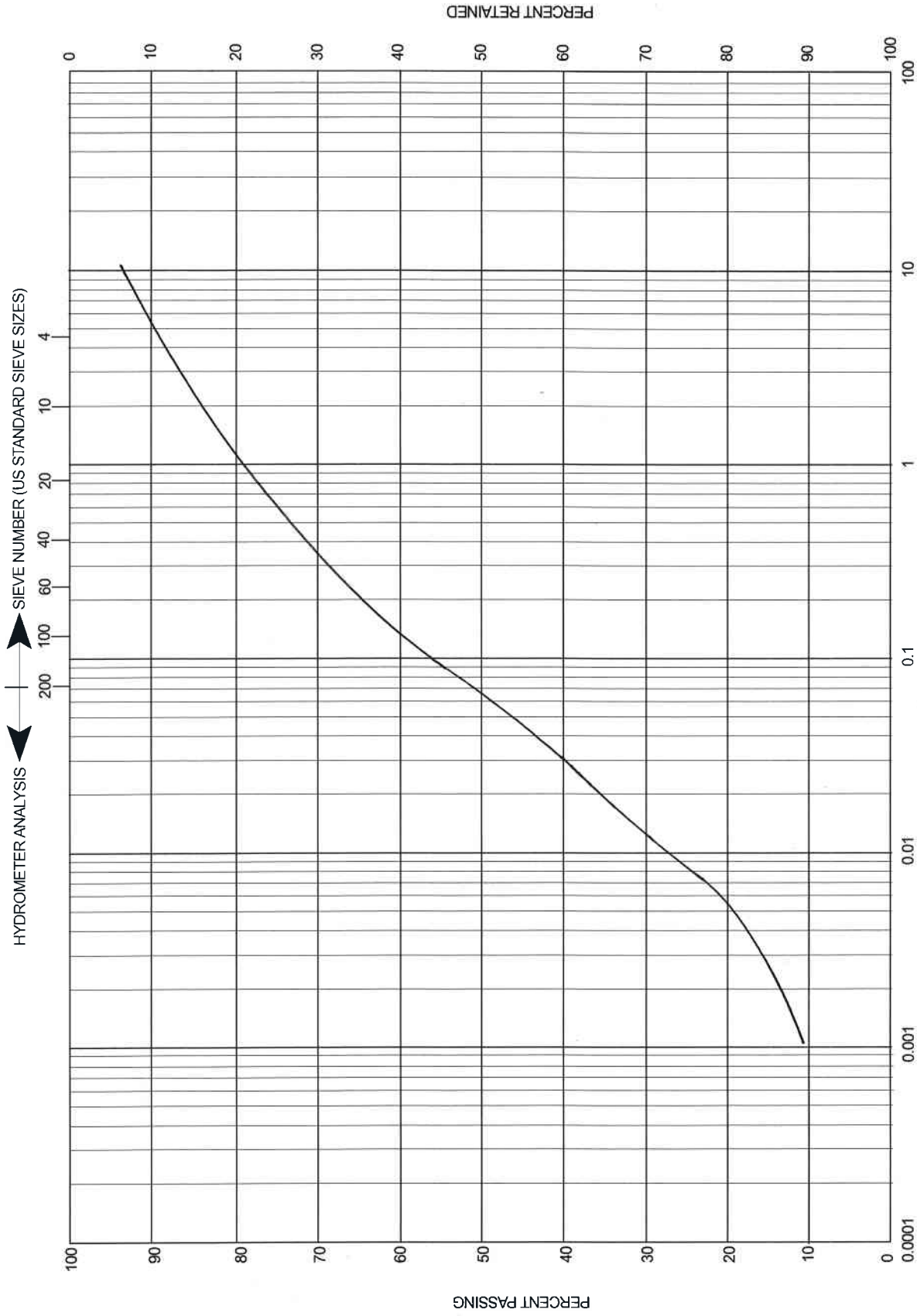


GRAIN SIZE IN MILLIMETRES

CLAY SIZE	SILT SIZE	SAND SIZE	GRAVEL SIZE	COBBLE SIZE
-----------	-----------	-----------	-------------	-------------

# GRAIN SIZE DISTRIBUTION CHART

PROJECT / SAMPLE Long Point Road Subdivision - BH3, S2 - 1.5m to 2.0m



CLAY SIZE	SILT SIZE	SAND SIZE	GRAVEL SIZE	COBBLE SIZE

ON-SITE BOREHOLE  
WELL RECORDS



A247422

Measurements recorded in:  Metric  Imperial

Well Owner's Information

First Name: TONY, Last Name / Organization: LESIAK, E-mail Address: Tlesiak@rogers.com, Mailing Address: 7 PINEHURST CR, Municipality: TROBICURE, Province: ON, Postal Code: N7A2B3, Telephone No.: 73344192

Well Location

Address of Well Location: LONE POINT RD, Township: Geo. Tshp. of Blue Huron, Lot: 1, Concession: 1, County/District/Municipality: GREY COUNTY, City/Town/Village: TOLLINGWOOD, Province: Ontario, Postal Code: N0R2R8, UTM Coordinates: NAD 83 1755162104 497301427, Municipal Plan and Sublot Number: P6039 PL 101 S5A1, Other: N0R2R8 L75 458'9"

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

Table with 5 columns: General Colour, Most Common Material, Other Materials, General Description, Depth (m/ft) From To. Rows include: Brown WEISSAND, Grey SILT TILL, Lime Stone, GRAVEL, Dense HARD.

Annular Space table with 3 columns: Depth Set at (m/ft) From To, Type of Sealant Used (Material and Type), Volume Placed (m³/ft³). Rows include: 16 to 8 SILICA SAND, 8 to 1 HYDRATED Bentonite, 1 to 0 CONCRETE.

Results of Well Yield Testing table with columns: Draw Down (Time, Water Level), Recovery (Time, Water Level). Includes pumping rate, duration, and final water level.

Method of Construction and Well Use checkboxes. Method of Construction includes Cable Tool, Rotary, Boring, etc. Well Use includes Public, Commercial, Municipal, etc.

Construction Record - Casing table with columns: Inside Diameter, Open Hole OR Material, Wall Thickness, Depth (m/ft) From To, Status of Well. Rows include: 2" PVC, 4" Steel CASING.

Construction Record - Screen table with columns: Outside Diameter, Material, Slot No., Depth (m/ft) From To. Row includes: 2" PVC, Slot No. 010, Depth 16 to 11.

Water Details and Hole Diameter tables. Water Details include depth and kind of water. Hole Diameter includes depth and diameter.

Well Contractor and Well Technician Information. Includes LONDON SOIL TEST LTD., 712078 Southgate Sdrd. 71, RR #6, Dundalk, ON N0C 1B0, 519-455-5777 info@londonsoil.com, Well Contractor's Licence No. 4190, Municipality, Address.

Map of Well Location and Comments. Comments: see attached.

Well Technician and Well Owner Information. Includes signature of Mike Watts, Well Technician's Licence No., Date Submitted, Date Package Delivered, Date Work Completed.

Ministry Use Only. Includes Audit No. 285305, Received.

20182110998





Ontario

Ministry of the Environment and Climate Change

Well Tag No. (Place Sticker and/or Print Below)

A247423

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in:  Metric  Imperial

Well Owner's Information

First Name: TONY Last Name / Organization: LESIAK E-mail Address: TLesiak@canadawater.com

Mailing Address (Street Number/Name): 7 KENHURST CR. Municipality: ETOBICOKE Province: ON Postal Code: M1R 3A7 Telephone No. (inc. area code): 416 233 4488

Well Location

Address of Well Location (Street Number/Name): Long Point RD Township: Co. Tshp of Collingwood Lot: R 10:21 Concession: 1

County/District/Municipality: GREY COUNTY City/Town/Village: Town of Blue Collingwood, Municipality: Ontario Province: Ontario Postal Code: \_\_\_\_\_

UTM Coordinates Zone: Easting: NAD 83 1175156014949301410 Northing: 460599716785RP Other: 16021861345819

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	SAND		WET.	0	5
Grey	SILT TILL	GRAVEL	Dense.	5	15
Grey	Light Silt Bedrock		HARD.	15	

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m <sup>3</sup> /ft <sup>3</sup> )
15	8	SILICA SAND	
8	1	HYDRATED Bentonite	
1	0	CONCRETE	

Results of Well Yield Testing

After test of well yield, water was:  
 Clear and sand free  
 Other, specify \_\_\_\_\_

If pumping discontinued, give reason: \_\_\_\_\_

Pump intake set at (m/ft): \_\_\_\_\_

Pumping rate (l/min / GPM): \_\_\_\_\_

Duration of pumping: \_\_\_\_\_ hrs + \_\_\_\_\_ min

Final water level end of pumping (m/ft): \_\_\_\_\_

If flowing give rate (l/min / GPM): \_\_\_\_\_

Recommended pump depth (m/ft): \_\_\_\_\_

Recommended pump rate (l/min / GPM): \_\_\_\_\_

Well production (l/min / GPM): \_\_\_\_\_

Disinfected?  Yes  No

Time (min)	Draw Down		Recovery	
	Water Level (m/ft)	Time (min)	Water Level (m/ft)	Time (min)
Static Level	5			
1		1		
2		2		
3		3		
4		4		
5		5		
10		10		
15		15		
20		20		
25		25		
30		30		
40		40		
50		50		
60		60		

Method of Construction:  Other, specify: digger

Well Use:  Public  Commercial  Not used  Domestic  Municipal  Dewatering  Livestock  Test Hole  Monitoring  Irrigation  Cooling & Air Conditioning  Industrial  Other, specify \_\_\_\_\_

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Well Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To	Status of Well
2"	PVC	3/16	10	13	<input type="checkbox"/> Water Supply <input type="checkbox"/> Replacement Well <input type="checkbox"/> Test Hole <input type="checkbox"/> Recharge Well <input type="checkbox"/> Dewatering Well <input checked="" type="checkbox"/> Observation and/or Monitoring Hole <input type="checkbox"/> Alteration (Construction) <input type="checkbox"/> Abandoned, Insufficient Supply <input type="checkbox"/> Abandoned, Poor Water Quality <input type="checkbox"/> Abandoned, other, specify _____ <input type="checkbox"/> Other, specify _____
4"	STEEL STRUCTURE CASING	1/8	1	13	

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
2"	PVC	1010	15	10

Water Details

Water found at Depth (m/ft)	Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify _____	Hole Diameter Depth (m/ft) From	Hole Diameter Depth (m/ft) To	Hole Diameter (cm/in)
5		0	15	8

Well Contractor and Well Technician Information

Business Name of Well Contractor: LONDON SOIL TEST LTD. 712078 Southgate Sdrd. 71, RR #6 Dundalk, ON N0C 1B0 519-455-5777 info@londonsoil.com

Well Contractor's Licence No.: 41190 Municipality: \_\_\_\_\_ Address: \_\_\_\_\_

Map of Well Location

Please provide a map below following instructions on the back.

Comments: see attached

Well Technician's License No. Signature of Technician and/or Contractor: WATTS MIKE Date Submitted: \_\_\_\_\_

Well owner's information package delivered:  Yes  No

Date Package Delivered: Y|Y|Y|Y|M|M|D|D

Date Work Completed: Y|Y|Y|Y|M|M|D|D

Ministry Use Only: Audit No. 2285303

20182110998

Long Point Rd  
Long Point Rd  
Long Point Rd  
Long Point Rd

BH2

A247493  
Z889303



Measurements recorded in:  Metric  Imperial

A047 401

Page 1 of 1

**Well Owner's Information**

First Name: Tony Last Name / Organization: LESIAK E-mail Address: lesiak@canadawater.com  Well Constructed by Well Owner

Mailing Address (Street Number/Name): 7 PINEHURST CR. Municipality: ETOBICOKE Province: ON Postal Code: M7A 3A4 Telephone No. (inc. area code): 416 733 4490

**Well Location**

Address of Well Location (Street Number/Name): Home Point Rd. Township: Geo. Ebp of Collingwood Lot: 17 201 21 Concession: 1

County/District/Municipality: Grey County City/Town/Village: Town of Blue Mountains Province: Ontario Postal Code:           

UTM Coordinates: Zone: 17 Easting: 9561101841930396 Northing: 4609599 Municipal Plan and Sublot Number: Plan 579 4609 858P AP 1687186 Pts 4, 3, 8, 9

**Overburden and Bedrock Materials/Abandonment Sealing Record** (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From To
<u>Brown</u>	<u>SAND</u>		<u>WT.</u>	<u>0 5</u>
<u>GRY?</u>	<u>SILT CL</u>	<u>GRAVEL</u>	<u>HARD</u>	<u>5 16</u>
	<u>BED ROCK</u>			<u>16 -</u>

**Annular Space**

Depth Set at (m/ft) From To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
<u>16 8</u>	<u>SILICA SAND</u>	
<u>8 1</u>	<u>Hydroxide Bentonite</u>	
<u>1 0</u>	<u>CONCRETE</u>	

**Results of Well Yield Testing**

After test of well yield, water was:  
 Clear and sand free  
 Other, specify \_\_\_\_\_

If pumping discontinued, give reason: \_\_\_\_\_

Time (min)	Draw Down		Recovery	
	Water Level (m/ft)	Time (min)	Water Level (m/ft)	Time (min)
Static Level	<u>5</u>			
1		1		
2		2		
3		3		
4		4		
5		5		
10		10		
15		15		
20		20		
25		25		
30		30		
40		40		
50		50		
60		60		

Pump intake set at (m/ft): \_\_\_\_\_

Pumping rate (l/min / GPM): \_\_\_\_\_

Duration of pumping: \_\_\_\_\_ hrs + \_\_\_\_\_ min

Final water level end of pumping (m/ft): \_\_\_\_\_

If flowing give rate (l/min / GPM): \_\_\_\_\_

Recommended pump depth (m/ft): \_\_\_\_\_

Recommended pump rate (l/min / GPM): \_\_\_\_\_

Well production (l/min / GPM): \_\_\_\_\_

Disinfected?  Yes  No

**Method of Construction**

Cable Tool  Diamond  Public  Commercial  Not used

Rotary (Conventional)  Jetting  Domestic  Municipal  Dewatering

Rotary (Reverse)  Driving  Livestock  Test Hole  Monitoring

Boring  Digging  Irrigation  Cooling & Air Conditioning

Air percussion  Industrial  Other, specify \_\_\_\_\_

Other, specify driller

**Construction Record - Casing**

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft)		Status of Well
			From	To	
<u>2"</u>	<u>PVC</u>	<u>3/16</u>	<u>11</u>	<u>+3</u>	<input type="checkbox"/> Water Supply <input type="checkbox"/> Replacement Well <input type="checkbox"/> Test Hole <input type="checkbox"/> Recharge Well <input type="checkbox"/> Dewatering Well <input type="checkbox"/> Observation and/or Monitoring Hole <input type="checkbox"/> Alteration (Construction) <input type="checkbox"/> Abandoned, Insufficient Supply <input type="checkbox"/> Abandoned, Poor Water Quality <input type="checkbox"/> Abandoned, other, specify _____ <input type="checkbox"/> Other, specify _____
<u>4"</u>	<u>Steel casing</u>	<u>1/8</u>	<u>1</u>	<u>+3</u>	

**Construction Record - Screen**

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft)	
			From	To
<u>2"</u>	<u>PVC</u>	<u>.010</u>	<u>16</u>	<u>11</u>

**Water Details**

Water found at Depth (m/ft)	Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify _____	Hole Diameter	
		Depth (m/ft) From To	Diameter (cm/in)
<u>5</u>		<u>0</u>	<u>16 8</u>

**Well Contractor and Well Technician Information**

Well Contractor's Licence No.: 4190 Municipality: \_\_\_\_\_

Address: \_\_\_\_\_

Well Contractor: **LONDON SOIL TEST LTD.**  
 712078 Southgate Sdrd. 71, RR #6  
 Dundalk, ON N0C 1B0  
 519-455-5777 info@londonsoil.com

**Map of Well Location**

Please provide a map below following instructions on the back.

Comments: see attached

Business telephone no. (inc. area code): \_\_\_\_\_ Name of well technician (Last Name, First Name): WALES MIKE

Well Technician's Licence No.: 1671 Signature of Technician and/or Contractor: \_\_\_\_\_ Date Submitted: \_\_\_\_\_

**Ministry Use Only**

Well owner's information package delivered:  Yes  No

Date Package Delivered: Y|Y|Y|Y|M|M|D|D  
2018 06 07

Date Work Completed: \_\_\_\_\_

Audit No.: 285304

Received: \_\_\_\_\_

20182110998

Long Point Rd

Long Point Rd

Long Point Rd

Long Point Rd

BH3

904-742-2830  
285304

# Well Owner Information Package

## Protect your health and our shared groundwater

Now that you have a well on your property, you are legally responsible for the proper maintenance and abandonment (plugging and sealing) of your well.

A poorly maintained or improperly abandoned well could result in contaminated well water and groundwater, and it could affect your health.

### The following tips will help you protect your well:

- Test the quality of your well water on a regular basis and look for changes in the water's appearance (e.g. colour, taste, odour)
- Keep surface water and foreign materials (e.g. insects and mice) from entering the well by securing the well cap in place and checking your well regularly for signs of rust and wear, cracks, holes or gaps in the well's structure
- If materials get in your well, safely remove them
- Keep ponded water, vehicles, pet waste, salt and fertilizer away from the well
- Make sure the ground around your well slopes away from your well
- Ensure the well is accessible for future repairs and maintain the minimum above ground height (typically 40 cm above the surface)
- Check for and identify abnormal sounds. They could indicate wear on the well's pump, waterlines or electrical cables or other issues
- Check the pump's efficiency. If the pump is continually running or losing pressure, it may be a sign of a crack or hole in the waterlines
- Ensure your septic tank system works and is pumped out regularly to prevent contamination of your well water

### For information on testing the quality of your well water, visit:

- [publichealthontario.ca](http://publichealthontario.ca) (search "water testing") to request a drinking water sample collection kit for free bacterial testing
- [ontario.ca/page/list-licensed-laboratories](http://ontario.ca/page/list-licensed-laboratories) to find a licensed laboratory for chemical testing (note: laboratories charge a fee for this service)

Inspecting your well can be dangerous work. If you are not familiar with wells, let an experienced and licensed well technician do the work.

[ontario.ca/ministry-environment](http://ontario.ca/ministry-environment)

### **Before inspecting a well, make sure to:**

- Shut off the power supply to the pump
- Assess the structure of the well and nearby ground to make sure they are stable before approaching the well
- Carefully remove the well cap and take all necessary precautions to make sure people and animals cannot fall into the well

If you no longer use your well or aren't maintaining it for future use as a well, it must be properly abandoned (plugged and sealed).

If you have a water quality or quantity problem or your well is in need of repair, upgrade or abandonment, see the licensed well contractor list on [ontario.ca/findwellcontractors](http://ontario.ca/findwellcontractors).

### **For more information on properly maintaining or abandoning your well:**

- visit [ontario.ca/propertywells](http://ontario.ca/propertywells)
- call 1-888-396-9355 (WELL)
- email [wellshelpdesk@ontario.ca](mailto:wellshelpdesk@ontario.ca)

For more information on your legal obligations, the Wells Regulation (under the Ontario Water Resources Act) is available at [ontario.ca/laws](http://ontario.ca/laws).

OFF-SITE HISTORICAL  
WELL RECORDS

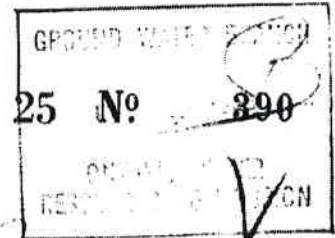


UTM 1172 5156 108 E

BR 49 29 9 80 N

The Ontario Water Resources Commission Act

41A/9/10



Elev. 5702580

# WATER WELL RECORD

Basin 221 Grey

Township, Village, Town or City Collingwood

Con. T Lot 21

Date completed 18 NOV 1961

Address

### Casing and Screen Record

Inside diameter of casing 4"

Total length of casing 15

Type of screen -

Length of screen -

Depth to top of screen -

Diameter of finished hole 4"

### Pumping Test

Static level 8

Test-pumping rate 2 G.P.M.

Pumping level 10'

Duration of test pumping 1 HR.

Water clear or cloudy at end of test Clear

Recommended pumping rate 2 G.P.M.

with pump setting of 35' feet below ground surface

### Well Log

### Water Record

#### Overburden and Bedrock Record

	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
T. M. SAND	0	17		
L. M. STONE	17	38	35	FRESH

For what purpose(s) is the water to be used?

COTTAGE

Is well on upland, in valley, or on hillside?

Drilling or Boring Firm

Address P. R. Collingwood

Licence Number 577

Name of Driller or Borer

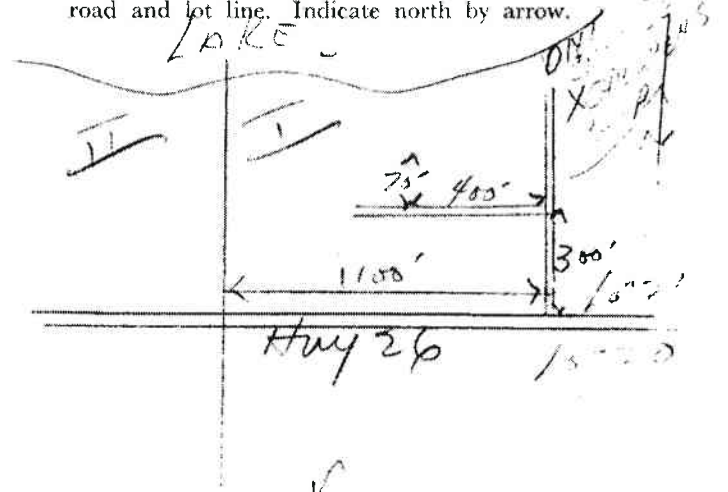
Address S. P. 1/62

Date 11/1/62

(Signature of Licensed Drilling or Boring Contractor)

### Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



JB

WM 1725561100  
4R 49300000  
ev. 15R 0590  
asin 221



Water management in Ontario

250-2974

41A  
9

The Ontario Water Resources Commission Act

# WATER WELL RECORD

County or District **GREY** Township, Village, Town or City **COLLINGWOOD**

Con. **L** Lot **#22** Date completed **23 June 1969**  
(day month year)

Address **TOWNLINE (COLLINGWOOD)**

### Casing and Screen Record

Inside diameter of casing **6"**  
Total length of casing **23'**  
Type of screen **-**  
Length of screen **-**  
Depth to top of screen **-**  
Diameter of finished hole **6"**

### Pumping Test

Static level **4'**  
Test-pumping rate **10** G.P.M.  
Pumping level **25'**  
Duration of test pumping **1 hr**  
Water clear or cloudy at end of test **clear**  
Recommended pumping rate **10** G.P.M.  
with pump setting of **25'** feet below ground surface

### Well Log

### Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
(some large stones) <b>stoney clay</b>	0	14		
<b>layers of grey shale</b>	14	23		
<b>grey limestone</b>	23	28	28	fresh

For what purpose(s) is the water to be used? **Cottage**

Is well on upland, in valley, or on hillside? **in beside**

Drilling or Boring Firm **Ken Nightow & Sons**

Address **stagner**

Licence Number **3404**

Name of Driller or Borer **Ferry & Ken Nightow**

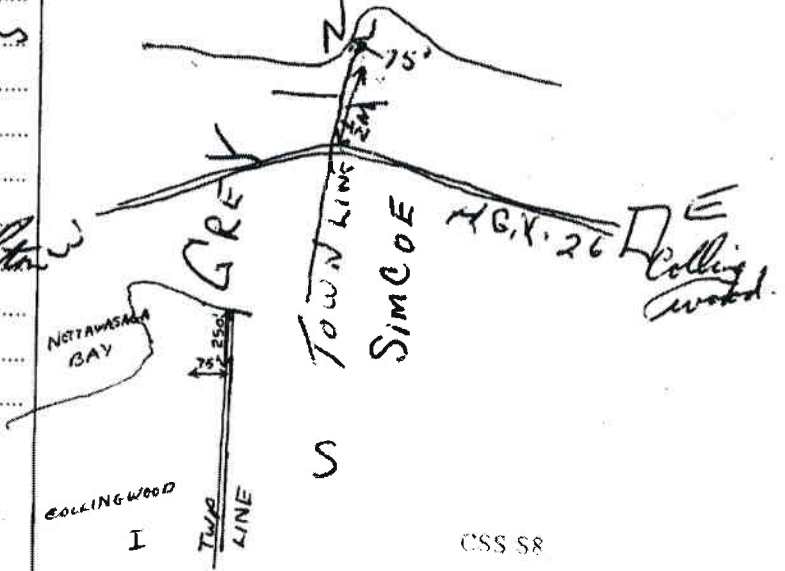
Address **stagner**

Date **5 July 69**

**Ken Nightow**  
(Signature of Licensed Drilling or Boring Contractor)

### Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7

OWRC COPY Long Point

CSS 58



# The Ontario Water Resources Commission Act

# WATER WELL RECORD

41A904  
C

Water management in Ontario 1. PRINT ONLY IN SPACES PROVIDED

2. CHECK  CORRECT BOX WHERE APPLICABLE

11

2503251

MUNICIP.

25.003

CON.

CON

LOT

021

COUNTY OR DISTRICT

GREY

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE

COLLINGWOOD

CON., BLOCK, TRACT, SURVEY, ETC.

1

LOT

021

DATE COMPLETED

DAY 02 NO 1970

R. # 3 COLLINGWOOD, D.T.

30.290

4 0596

5 22

### LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
BL.	TOPSOIL			0	1
OR.	SAND	CLAY & STONES		1	7
BL.	CLAY	SAND & STONES		7	17
DARK.	SHALE	CLAY	LAYERS.	17	23
	BEDROCK.		DARK LIMESTONE	23	33'6"

31

32

**41 WATER RECORD**

WATER FOUND AT - FEET: 0033

KIND OF WATER

1 <input checked="" type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR
2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL

15-16

1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR
2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL

20-23

1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR
2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL

25-28

1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR
2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL

30-33

1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR
2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL

**51 CASING & OPEN HOLE RECORD**

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
04"	STEEL	STD.	0	13-16
	2 <input type="checkbox"/> GALVANIZED			
	3 <input type="checkbox"/> CONCRETE			
	4 <input type="checkbox"/> OPEN HOLE			
	17-18	1 <input type="checkbox"/> STEEL		
	2 <input type="checkbox"/> GALVANIZED			
	3 <input type="checkbox"/> CONCRETE			
	4 <input type="checkbox"/> OPEN HOLE			
	24-25	1 <input type="checkbox"/> STEEL		
	2 <input type="checkbox"/> GALVANIZED			
	3 <input type="checkbox"/> CONCRETE			
	4 <input type="checkbox"/> OPEN HOLE			

**52 SCREEN**

SIZES OF OPENING (SLOT NO.)

DIAMETER

LENGTH

MATERIAL AND TYPE

DEPTH TO TOP OF SCREEN

**61 PLUGGING & SEALING RECORD**

DEPTH SET AT - FEET		MATERIAL AND TYPE	CEMENT GROUT, LEAD PACKER, ETC.
FROM	TO		
10-13	14-17		
18-21	22-25		
26-29	30-33		

**71 PUMPING TEST METHOD**

1  PUMP 2  BAILEY

PUMPING RATE: 0003 GPM

DURATION OF PUMPING: 01 HOURS

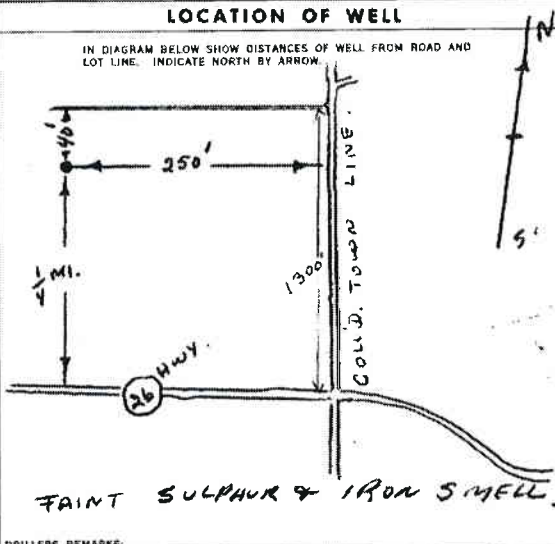
WATER LEVELS DURING PUMPING

15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	31-32	33-34	35-36

RECOMMENDED PUMP TYPE:  SHALLOW  DEEP

RECOMMENDED PUMP SETTING: 030

RECOMMENDED PUMPING RATE: 200 GPM



**84 FINAL STATUS OF WELL**

1  WATER SUPPLY 5  ABANDONED, INSUFFICIENT SUPPLY

2  OBSERVATION WELL 6  ABANDONED, POOR QUALITY

3  TEST HOLE 7  UNFINISHED

4  RECHARGE WELL

**85-86 WATER USE**

1  DOMESTIC 5  COMMERCIAL

2  STOCK 6  MUNICIPAL

3  IRRIGATION 7  PUBLIC SUPPLY

4  INDUSTRIAL 8  COOLING OR AIR CONDITIONING

9  OTHER 9  NOT USED

**87 METHOD OF DRILLING**

1  CABLE TOOL 6  BORING

2  ROTARY (CONVENTIONAL) 7  DIAMOND

3  ROTARY (REVERSE) 8  JETTING

4  ROTARY (AIR) 9  DRIVING

5  AIR PERCUSSION

**CONTRACTOR**

NAME OF WELL CONTRACTOR: F. WRIGHT & SON

LICENCE NUMBER: 3605

ADDRESS: 140-6th ST. COLLINGWOOD

NAME OF DRILLER OR BORER: F. WRIGHT

LICENCE NUMBER: 3605

SIGNATURE OF CONTRACTOR: [Signature]

SUBMISSION DATE: DAY 17 MO JAN YR 70

**OFFICE USE ONLY**

DATA SOURCE: 1

CONTRACTOR: 5510

DATE RECEIVED: 130870

DATE OF INSPECTION: [Blank]

INSPECTOR: P/L

REMARKS: [Blank]

OWRC COPY



MINISTRY OF THE ENVIRONMENT  
The Ontario Water Resources Act  
**WATER WELL RECORD**

41 A/9W

1. PRINT ONLY IN SPACES PROVIDED  
2. CHECK  CORRECT BOX WHERE APPLICABLE

2504485 25003 10/11

COUNTY OR DISTRICT: GREY TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: COLLINGWOOD CON. BLOCK, TRACT, QUARTER: Plan 527 LOT: 21-27  
DATE COMPLETED: DAY 16 MO 12 YR 73  
CRAIGLEITH

2504485 17 556164 4930352 4 600 5 22 OCT 17, 1975 69

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
Brown	SAND clay			0	6
Brown	stony clay			6	12
Grey	shale			12	18
11'	Limestone		Very Hard.	18	58

OWRG  
P.7

31 32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input checked="" type="checkbox"/> FRESH 2 <input checked="" type="checkbox"/> SULPHUR 3 <input checked="" type="checkbox"/> SALTY 4 <input checked="" type="checkbox"/> MINERAL
18-21	1 <input checked="" type="checkbox"/> FRESH 2 <input checked="" type="checkbox"/> SULPHUR 3 <input checked="" type="checkbox"/> SALTY 4 <input checked="" type="checkbox"/> MINERAL
20-23	1 <input checked="" type="checkbox"/> FRESH 2 <input checked="" type="checkbox"/> SULPHUR 3 <input checked="" type="checkbox"/> SALTY 4 <input checked="" type="checkbox"/> MINERAL
25-28	1 <input checked="" type="checkbox"/> FRESH 2 <input checked="" type="checkbox"/> SULPHUR 3 <input checked="" type="checkbox"/> SALTY 4 <input checked="" type="checkbox"/> MINERAL
30-33	1 <input checked="" type="checkbox"/> FRESH 2 <input checked="" type="checkbox"/> SULPHUR 3 <input checked="" type="checkbox"/> SALTY 4 <input checked="" type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

DEPTH - FEET	WELL THICKNESS INCHES	MATERIAL
10-13	1/2"	1 <input checked="" type="checkbox"/> GALVANIZED 2 <input checked="" type="checkbox"/> CONCRETE 3 <input checked="" type="checkbox"/> OPEN HOLE
18-21	1/2"	1 <input checked="" type="checkbox"/> GALVANIZED 2 <input checked="" type="checkbox"/> CONCRETE 3 <input checked="" type="checkbox"/> OPEN HOLE
20-23	1/2"	1 <input checked="" type="checkbox"/> GALVANIZED 2 <input checked="" type="checkbox"/> CONCRETE 3 <input checked="" type="checkbox"/> OPEN HOLE
25-28	1/2"	1 <input checked="" type="checkbox"/> GALVANIZED 2 <input checked="" type="checkbox"/> CONCRETE 3 <input checked="" type="checkbox"/> OPEN HOLE
30-33	1/2"	1 <input checked="" type="checkbox"/> GALVANIZED 2 <input checked="" type="checkbox"/> CONCRETE 3 <input checked="" type="checkbox"/> OPEN HOLE

Pulled

SCREEN

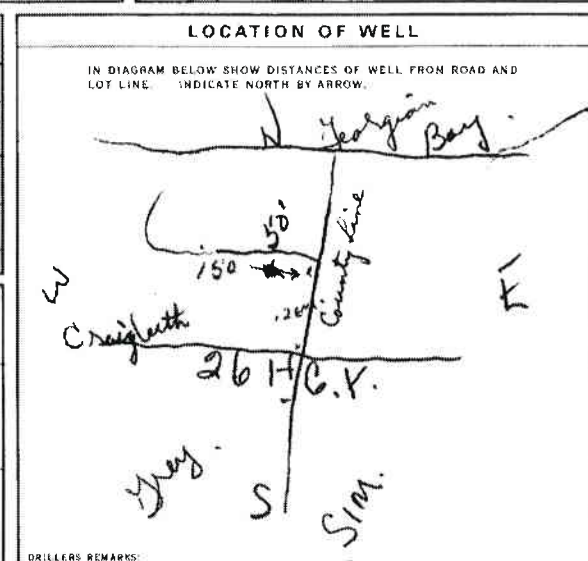
SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER, ETC.
10-13		
18-21		
20-23		
25-28		
30-33		

71 PUMPING TEST

PUMPING TEST METHOD	PUMP NO RATE	DURATION OF PUMPING
1 <input checked="" type="checkbox"/> PUMP 2 <input checked="" type="checkbox"/> RAISER		15-16 GPM 17-18 HOURS 19-20 MINS
STATIC WATER LEVEL	WATER LEVELS DURING	1 <input checked="" type="checkbox"/> PUMPING 2 <input checked="" type="checkbox"/> RECOVERY
25-28 FEET	15 MINUTES 30 MINUTES 45 MINUTES 60 MINUTES	
	25-28 FEET 30-34 FEET 35-37 FEET	
IF FLOODING USE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
		1 <input checked="" type="checkbox"/> CLEAR 2 <input checked="" type="checkbox"/> CLOUDY
RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
1 <input checked="" type="checkbox"/> SHALLOW 2 <input checked="" type="checkbox"/> DEEP		



84 FINAL STATUS OF WELL

1  WATER SUPPLY 5  ABANDONED, INSUFFICIENT SUPPLY  
2  OBSERVATION WELL 6  ABANDONED, POOR QUALITY  
3  TEST HOLE 7  UNFINISHED  
4  RECHARGE WELL

85-86 WATER USE

1  DOMESTIC 5  COMMERCIAL  
2  STOCK 6  MUNICIPAL  
3  IRRIGATION 7  PUBLIC SUPPLY  
4  INDUSTRIAL 8  COOLING OR AIR CONDITIONING  
9  OTHER 10  NOT USED

87 METHOD OF DRILLING

1  CABLE TOOL 6  BORING  
2  ROTARY (CONVENTIONAL) 7  DIAMOND  
3  ROTARY (REVERSE) 8  JETTING  
4  AIR PERCUSSION 9  DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: KEN MIGHTON 3602  
ADDRESS: STAYNER.  
NAME OF DRILLER OR BORER: LARRY & KEN MIGHTON  
SIGNATURE OF CONTRACTOR: Kenneth A. Mighton  
SUBMISSION DATE: DAY \_\_\_\_\_ MO \_\_\_\_\_ YR \_\_\_\_\_

OFFICE USE ONLY

DATA SOURCE: 1 3602 DATE RECEIVED: 160174  
DATE OF INSPECTION: 26, 9, 74 INSPECTOR: 71P  
REMARKS: [Signature]

CSS.S8



Ontario

# MINISTRY OF THE ENVIRONMENT The Ontario Water Resources Act WATER WELL RECORD

4/A  
9/11

1. PRINT ONLY IN SPACES PROVIDED  
2. CHECK  CORRECT BOX WHERE APPLICABLE

11

2504867

25003

CON

01

COUNTY OR DISTRICT: **PREV** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **COLLINGWOOD** 9  
 BLOCK, TRACT, SURVEY, ETC.: **1** LOT: **021**  
 DATE COMPLETED: DAY **24** MO. **10** YR. **74**  
 RC: **0352** ELEVATION: **4** 595 BASIN CODE: **5** 22 APR 06, 1976

### LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
BROWN	TOP SOIL		SHALLOW	0	1
BROWN	SAND	GRAVEL		1	6
GREY	CLAY	GRAVEL STONES		6	28
GREY	SHALE			28	63



31: **000160228** **000662811** **00282051112** **0063217**

**41 WATER RECORD**

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
13-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

**51 CASING & OPEN HOLE RECORD**

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
06-10-11	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		10-11	13-18
17-18	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		17-18	20-23
24-25	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		24-25	27-30

**SCREEN**

SECTION OF OPENING (SLOT NO.)	DIAMETER	LENGTH
31-33	INCHES	FEET
MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN
		FEET

**61 PLUGGING & SEALING RECORD**

DEPTH SET AT - FEET	MATERIAL AND TYPE	PACKING GROUP LEAD PACKER, ETC.
FROM TO		
10-13 14-17		
18-21 21-25		
28-31 31-35		

**71 PUMPING TEST**

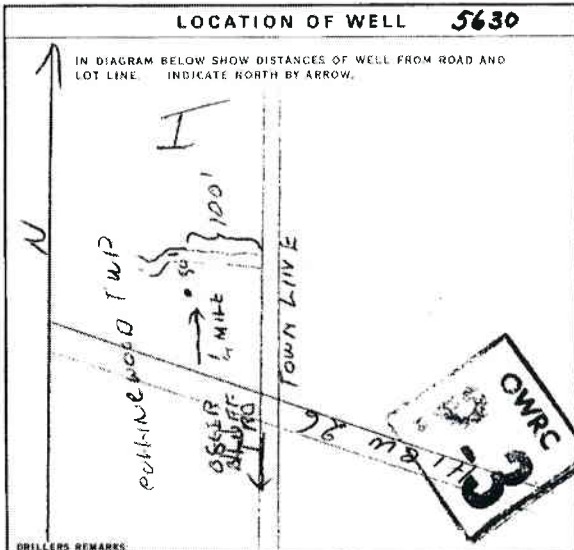
PUMPING TEST METHOD: 1  PUMP 2  BALER

STATIC LEVEL: 19-21 FEET

WATER LEVELS DURING PUMPING:

WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
22-24	20-28	20-31	22-34	28-37
FEET	FEET	FEET	FEET	FEET

RECOMMENDED PUMP TYPE:  SHALLOW  DEEP



**FINAL STATUS OF WELL** 5

1  WATER SUPPLY 2  OBSERVATION WELL 3  TEST HOLE 4  RECHARGE WELL

5  ABANDONED - INSUFFICIENT SUPPLY 6  ABANDONED - POOR QUALITY 7  UNFINISHED

**WATER USE** 10-16

1  DOMESTIC 2  STOCK 3  IRRIGATION 4  INDUSTRIAL 5  OTHER

6  COMMERCIAL 7  MUNICIPAL 8  PUBLIC SUPPLY 9  COOLING OR AIR CONDITIONING 10  NOT USED

**METHOD OF DRILLING** 17

1  CABLE TOOL 2  ROTARY (CONVENTIONAL) 3  ROTARY (REVERSE) 4  ROTARY (AIR) 5  AIR PERCUSSION

6  BORING 7  DIAMOND 8  JETTING 9  DRIVING

**CONTRACTOR**

NAME OF WELL CONTRACTOR: **DAWSON M SEWELL** LICENCE NUMBER: **4716**

ADDRESS: **RRI DUNTHWON**

NAME OF DRILLER OR BORER: **SAME** LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: *Dawson M Sewell* SUBMISSION DATE: DAY **07** MO. **11** YR. **74**

**OFFICE USE ONLY**

DATA SOURCE: **1** CONTRACTOR: **4716** DATE RECEIVED: **071174**

DATE OF INSPECTION: **June 24/75** INSPECTOR: **J.B.**

PREPARED BY: **P.B.**

CLASS: **WI**



Ministry of the Environment  
Ontario

#17

The Ontario Water Resources Act  
**WATER WELL RECORD**

41714W

1. PRINT ONLY IN SPACES PROVIDED  
2. CHECK  CORRECT BOX WHERE APPLICABLE

2507761 MUNICIPAL DISTRICT 25003 CON 01

COUNTY OR DISTRICT: Green TOWNSHIP/BOROUGH/CITY/TOWN/VILLAGE: Collingwood CON. BLOCK/TRACT/SURVEY ETC.: 1  
 DATE COMPLETED: 04 / 08 / 82  
 WELL NO.: 028 (PART 20)  
 LOCATION: OR 30/5 226 AR#2 Collingwood  
 ELEVATION: 30400 (PC) 0600 (SC) 5 (BSIN) 22 (IV)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)				
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	DEPTH - FEET	
			FROM	TO
BLACK	TOP SOIL		0	2
GREY	CLAY	STONES	2	13
GREY	CLAY	FINE SAND	13	22
BROWN	MEDIUM SAND	CLAY	22	23 1/2
BROWN	LIMESTONE	HARD	23 1/2	30

31 0002802 001320512 002220508 002460995 003061578  
 32

41 WATER RECORD

WATER FOUND AT - FEET: 0024 33 1/2

KIND OF WATER:

1  FRESH 3  SULPHUR  
 2  SALTY 4  MINERAL

19-18 1  FRESH 3  SULPHUR  
 2  SALTY 4  MINERAL

20-23 1  FRESH 3  SULPHUR  
 2  SALTY 4  MINERAL

24-25 1  FRESH 3  SULPHUR  
 2  SALTY 4  MINERAL

26-30 1  FRESH 3  SULPHUR  
 2  SALTY 4  MINERAL

51 CASING & OPEN HOLE RECORD

DEPTH - FEET	MATERIAL	W.A. - INCHES (INT.)
0-188	STEEL	188
188-228	GALVANIZED	228
228-30	STEEL	30

SCREEN

SIZE(S) OF OPENING (SLOT NO.):

DIAMETER: 34-38 INCHES

LENGTH: 39-40 FEET

MATERIAL AND TYPE:

DEPTH TO TOP OF SCREEN: 41-44 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	FINEMENT GROUP (LEAD PAPER, ETC.)
10-13		
18-21		
26-28		

71 PUMPING TEST

PUMPING TEST METHOD: 1  PUMP 2  DRAILER

PUMPING RATE: 001 GPM

DURATION OF PUMPING: 02 HOURS 00 MIN.

STATIC WATER LEVEL: 028 FEET

WATER LEVELS DURING PUMPING:

15 MINUTES: 024 FEET

30 MINUTES: 024 FEET

45 MINUTES: 024 FEET

60 MINUTES: 024 FEET

75 MINUTES: 024 FEET

90 MINUTES: 024 FEET

105 MINUTES: 024 FEET

120 MINUTES: 024 FEET

135 MINUTES: 024 FEET

150 MINUTES: 024 FEET

165 MINUTES: 024 FEET

180 MINUTES: 024 FEET

195 MINUTES: 024 FEET

210 MINUTES: 024 FEET

225 MINUTES: 024 FEET

240 MINUTES: 024 FEET

255 MINUTES: 024 FEET

270 MINUTES: 024 FEET

285 MINUTES: 024 FEET

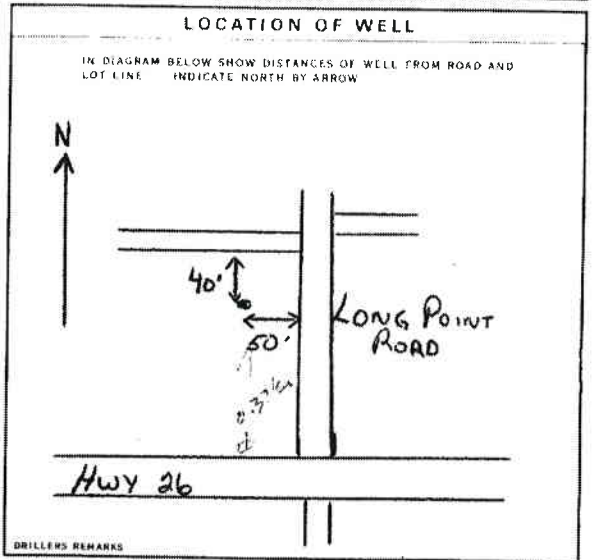
300 MINUTES: 024 FEET

IF FLOWING, GIVE RATE:

RECOMMENDED PUMP TYPE:  SHALLOW  DEEP

RECOMMENDED PUMP SETTING: 029 FEET

RECOMMENDED PUMPING RATE: 001 GPM



FINAL STATUS OF WELL: 1  WATER SUPPLY 5  ABANDONED - INSUFFICIENT SUPPLY  
 2  OBSERVATION WELL 6  ABANDONED - POOR QUALITY  
 3  TEST HOLE 7  UNFINISHED  
 4  RECHARGE WELL

WATER USE: 1  DOMESTIC 5  COMMERCIAL  
 2  STOCK 6  MUNICIPAL  
 3  IRRIGATION 7  PUBLIC SUPPLY  
 4  INDUSTRIAL 8  COOLING OR AIR CONDITIONING  
 OTHER 9  NOT USED

METHOD OF DRILLING: 1  CABLE TOOL 5  BORING  
 2  ROTARY (CONVENTIONAL) 6  DIAMOND  
 3  ROTARY (REVERSE) 7  JETTING  
 4  ROTARY (AIR) 8  DRIVING  
 5  AIR PERCUSSION

CONTRACTOR: NAME OF WELL CONTRACTOR: DANIEL M SEWELL LICENCE NUMBER: 4716  
 ADDRESS: RA... DUNTRON  
 NAME OF DRILLER OR BORER: Charles Lowe LICENCE NUMBER:  
 SIGNATURE OF CONTRACTOR: Daniel M Sewell SUBMISSION DATE: \_\_\_\_\_ DAY \_\_\_\_\_ MO \_\_\_\_\_ YR \_\_\_\_\_

OFFICE USE ONLY

DATA SOURCE: \_\_\_\_\_ CONTRACTOR: 4716 DATE OF INSPECTION: 01 10 82

DATE OF INSPECTION: 01 10 82 INSPECTOR: W.P. CSS.88

REMARKS: W.P. J.P.

May 10, 2019

Ms. Brittany Robertson, P.Eng.  
C.F. Crozier & Associates  
40 Huron Street  
Suite 301  
Collingwood, ON  
L9Y 4R3

**Wilson  
Associates**

Consulting Hydrogeologists

Dear Ms. Robertson:

Re: Update of Subsurface Characterization Program  
Follow-Up Watertable Observations  
Proposed Long Point Road Subdivision, Blue Mountains

It is proposed to develop a ±22-lot urban residential subdivision on a ±2.2ha parcel of land located within Part of Lots 20 and 21, Concession 1, Geographic Township of Collingwood, Town of Blue Mountains (Plan 529, Part Lot 85, RP16R2186, Parts 4, 5, 8 & 9).

A subsurface investigation was completed to identify the seasonal high watertable level, the soil profile and the bedrock surface level, and was conducted through the installation of three exploratory boreholes/monitoring wells on June 7, 2018. The results of the 2018 investigation are summarized in the Wilson Associates Report dated July 6, 2018. Figure 1 (attached) shows the location of the site, borehole locations and inferred direction of shallow groundwater flow in June 2018.

To address concerns from the Municipality regarding the characterization of the high watertable surface, two additional sets of water level observations were undertaken December 13, 2018 (after a wet autumn period) and April 10, 2019 (immediately after final snowmelt).

The following table summarizes all water level observations to date.

		BH1	BH2	BH3
Approximate Ground Surface Elevation* (m above sea level)		179.8	180.1	180.7
Approximate Top of Casing Elevation* (m above sea level)		180.78	180.99	181.79
June 28, 2018	Water Level (m below grade)	0.68	0.58	0.81
	Approximate Water Level Elevation* (m above sea level)	179.12	179.52	179.89
December 13, 2018	Water Level (m below grade)	0.16	0.59	0.13
	Approximate Water Level Elevation* (m above sea level)	179.64	179.51	180.57

April 10, 2019	Water Level (m below grade)	0.05	0.43	0.03
	Approximate Water Level Elevation* (m above sea level)	179.75	179.67	180.67

Note: \* Ground surface elevation is approximate, and was derived from survey mapping provided by C.F. Crozier & Associates for the property.

As indicated in the July 6, 2018 Report, it was anticipated that high spring water levels will be at or near current grade. The above monitoring data are consistent with this opinion.

Should you have any questions or require further detail, please do not hesitate to contact this office.

Yours sincerely,

**IAN D. WILSON ASSOCIATES LIMITED**

  
Geoffrey Rether, P. Geo.



**Legend**

- Parcels
- Large Scale Roads
- Provincial Highway
- County Road
- Township Road
- Seasonal Road

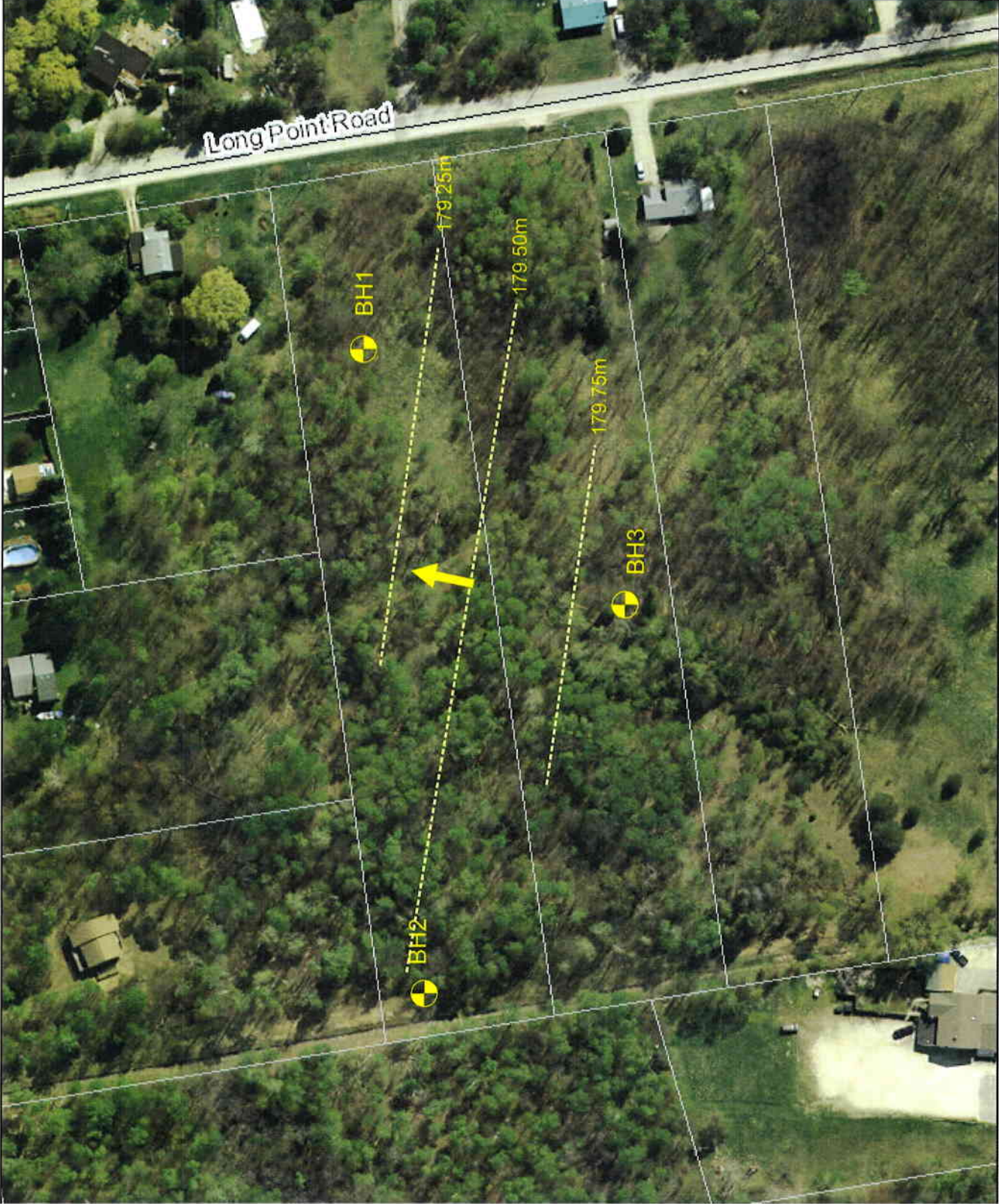
APPROXIMATE LOCATIONS OF EXPLORATORY BOREHOLES, APPROXIMATE (see report) CONTOURS OF THE WATERTABLE SURFACE ON JUNE 28, 2018, AND APPROXIMATE (see report) INFERRED DIRECTION OF SHALLOW GROUNDWATER FLOW

LONG POINT ROAD SUBDIVISION

FIGURE 1

SCALE: AS SHOWN

**Notes**



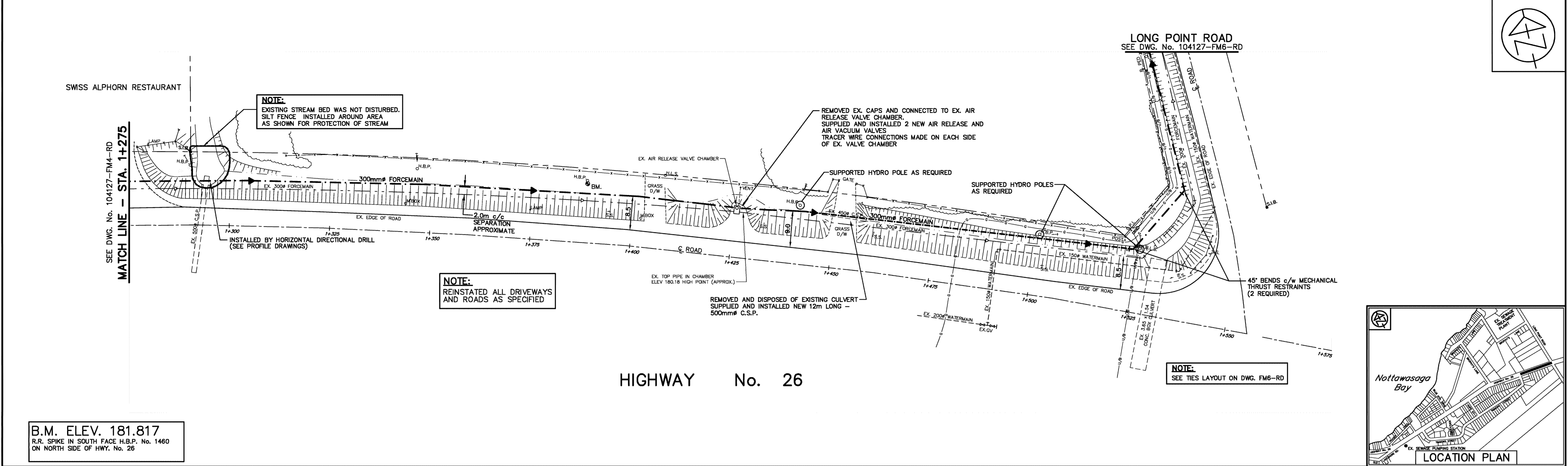
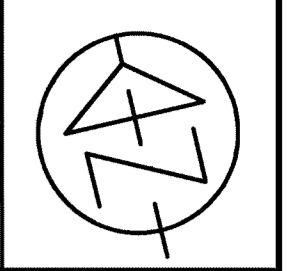
This map is a user generated static output from an internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

0.08 Kilometers

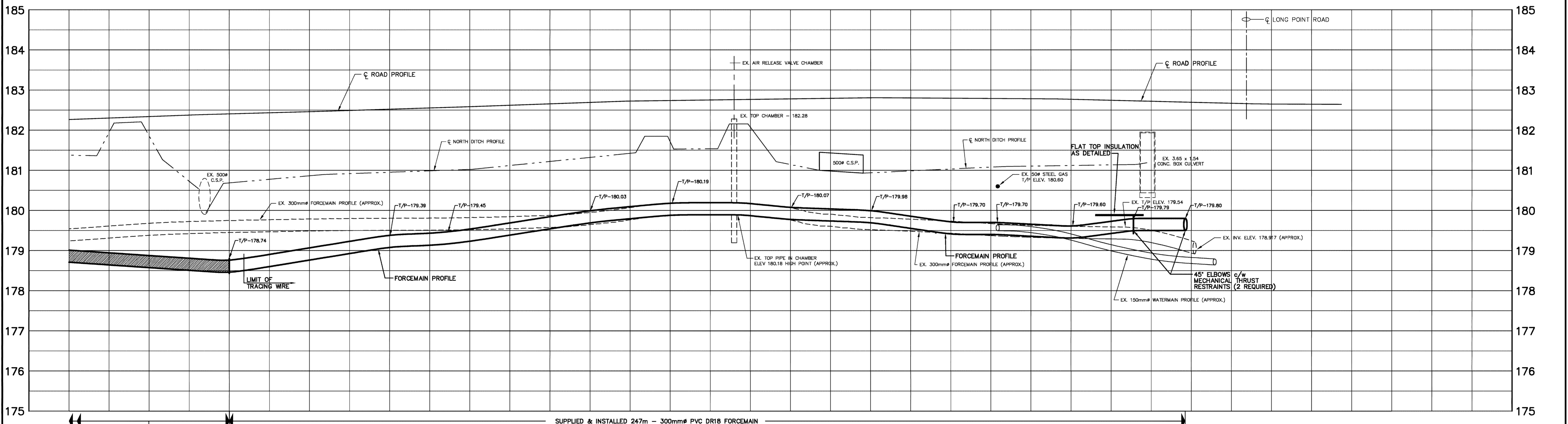


# APPENDIX B

## As-Constructed Drawings & Boundary Conditions Modeling Investigation



B.M. ELEV. 181.817  
 R.R. SPIKE IN SOUTH FACE H.B.P. No. 1460  
 ON NORTH SIDE OF HWY. No. 26



GR. ELEV. @ C. ROAD	182.34	182.46	182.49	182.52	182.65	182.72	182.78	182.81	182.81	182.8	182.76	182.66	182.64
CHAINAGE	1+275	1+300	1+325	1+350	1+375	1+400	1+425	1+450	1+475	1+500	1+525	1+550	1+575
PLOT 1=0.5													

**LEGEND**

- PROPERTY LINE
- U/B BURIED BELL CABLE
- C BURIED GAS MAIN
- EXISTING WATER MAIN AND VALVE
- EXISTING SANITARY SEWER & M.H.
- EXISTING SEWAGE FORCEMAIN
- PROPOSED SEWAGE FORCEMAIN

NOTE: 1) LOCATIONS OF UTILITIES ARE APPROXIMATE.

RECORD DRAWING			
COMPILED BY: D.S.	DATE: SEPT. 2006		
CHECKED BY: L.S.	DATE: NOV. 2006		
DRAWN BY: P.C.S.	DATE: NOV. 2006		
CHECKED BY: R.M.	DATE: DEC. 2006		
NO.	REVISIONS	DATE	INITIAL

**RECORD DRAWING**  
 NOTICE TO USERS

Information contained on this drawing may have changed since the completion of construction. Further, this drawing may contain information provided by others. While Alnley & Associates Limited believes this information to be reliable and correct as of the completion of construction, no warranty is provided as to its accuracy and/or completeness. As such, Alnley & Associates Limited shall not be responsible for any errors or omissions which may result from incorporation of the information herein.

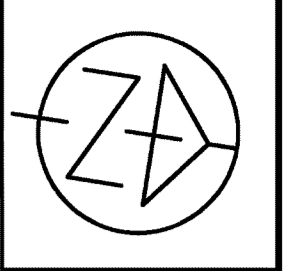
SCALE: HORIZ. 1=500 VERT. 1=50	DESIGN: N.M.S./R.M.
DRAWN: E.K./P.C.S.	CHECKED: M.W.A.
DATE: APR. 2006	

TOWN OF THE BLUE MOUNTAINS  
 CRAIGLEITH AREA  
 CONTRACT No. TBM-2006-3  
 DUPLICATE FORCEMAIN

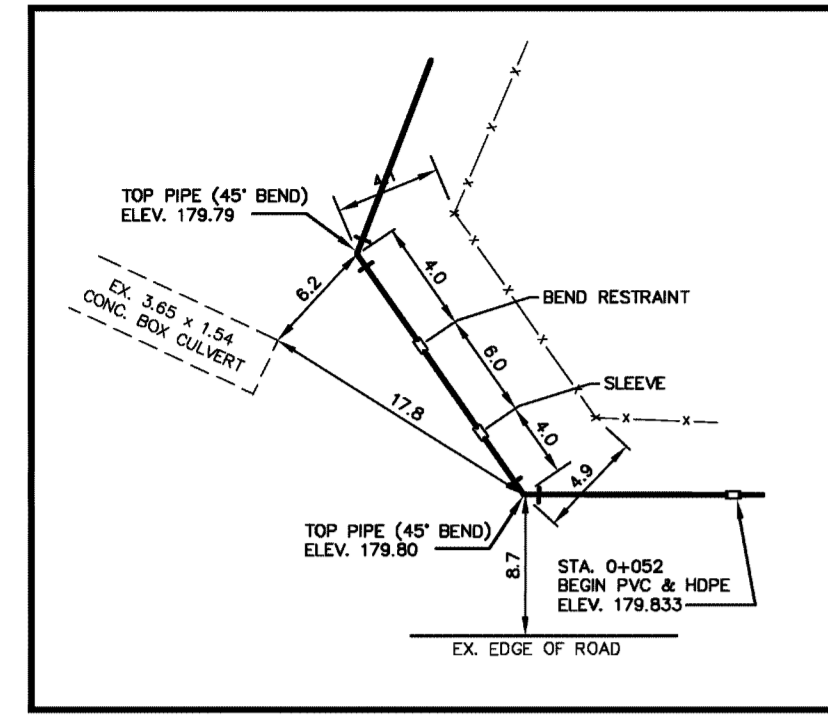
**PLAN & PROFILE**  
 HIGHWAY No. 26  
 STA. 1+275 TO LONG POINT ROAD

**Alnley GROUP** CONSULTING ENGINEERS PLANNERS

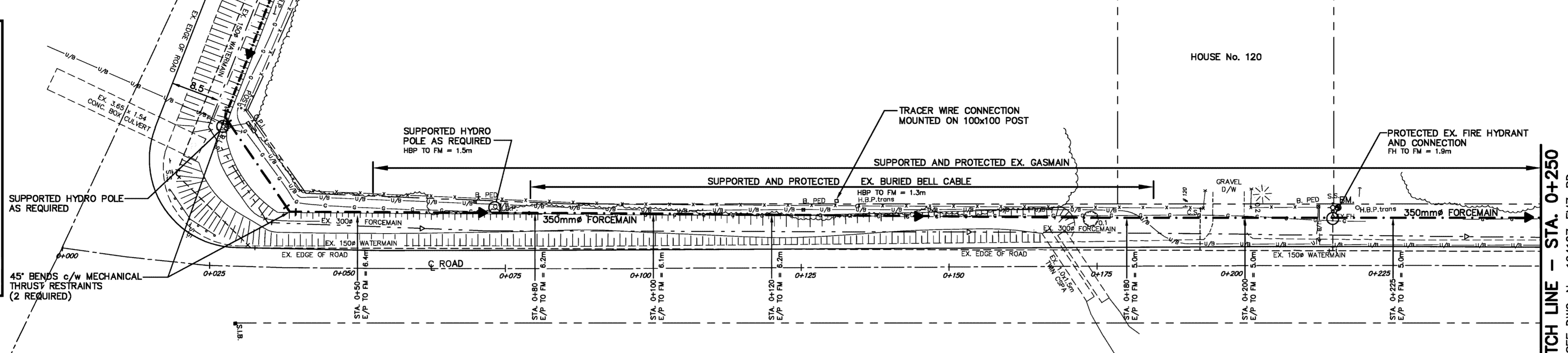
AAL-104127 DWG. FM5-RD



HIGHWAY No. 26  
SEE DWG. No. 104127-FM5-RD



TIES LAYOUT

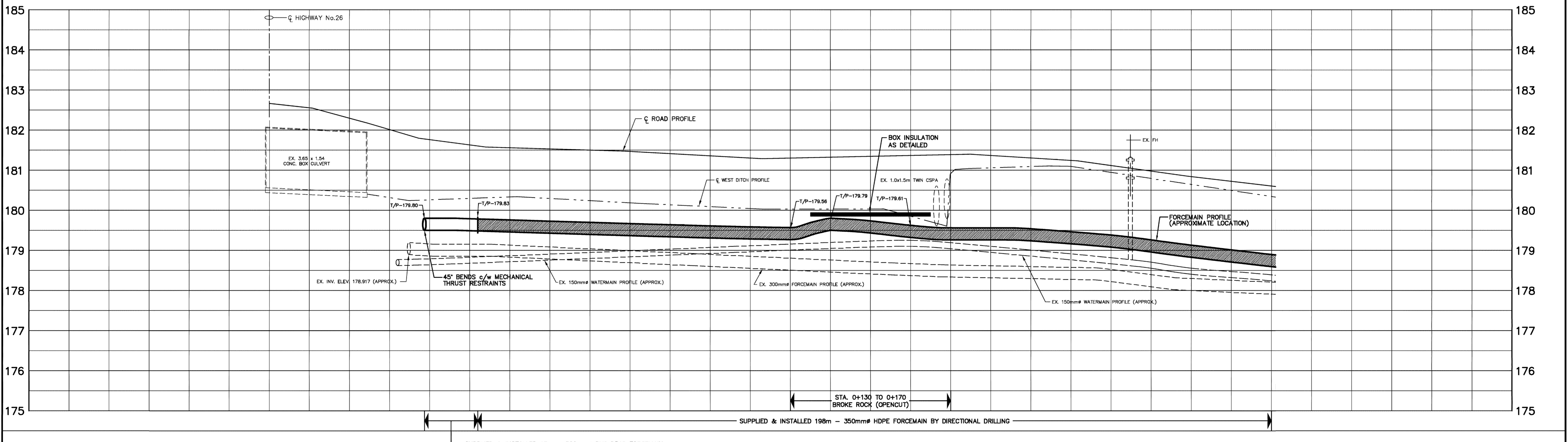
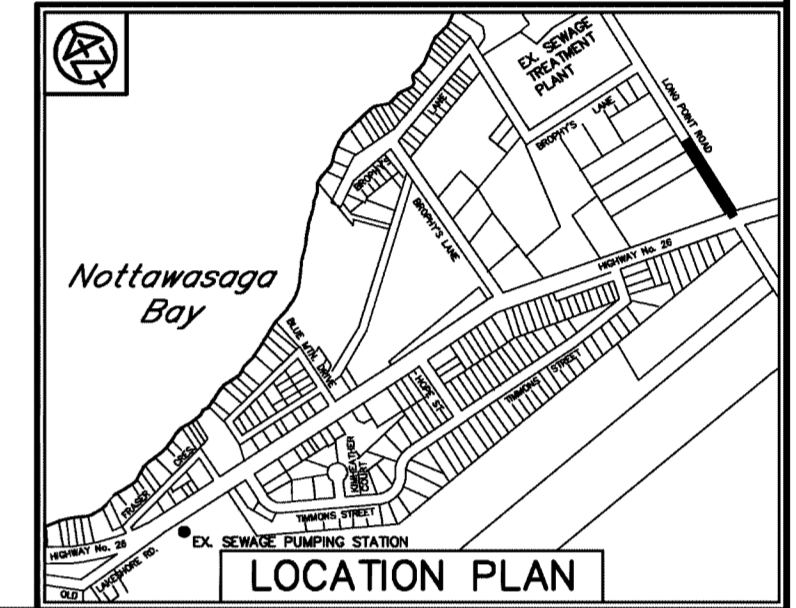


MATCH LINE - STA. 0+250  
SEE DWG. No. 104127-FM7-RD

NOTE:  
REINSTATE ALL DRIVEWAYS  
AND ROADS AS SPECIFIED

LONG POINT ROAD

B.M. ELEV. 181.761  
TOP NUT OF FIRE HYDRANT  
ON WEST SIDE OF LONG POINT ROAD  
IN FRONT OF HOUSE No. 120



CHAINAGE	0+000	0+025	0+050	0+075	0+100	0+125	0+150	0+175	0+200	0+225	0+250
GR. ELEV. @ C. ROAD	182.66	182.26	181.54	181.51	181.44	181.26	181.33	181.39	181.24	180.92	180.62

- LEGEND**
- PROPERTY LINE
  - U/B BURIED BELL CABLE
  - C BURIED GAS MAIN
  - EXISTING WATER MAIN AND VALVE
  - EXISTING SANITARY SEWER & M.H.
  - EXISTING SEWAGE FORCEMAIN
  - PROPOSED SEWAGE FORCEMAIN
- NOTE: 1) LOCATIONS OF UTILITIES ARE APPROXIMATE.

**RECORD DRAWING**

COMPILED BY: D.S.	DATE: SEPT. 2006
CHECKED BY: L.S.	DATE: NOV. 2006
DRAWN BY: P.C.S.	DATE: NOV. 2006
CHECKED BY: R.M.	DATE: DEC. 2006

NO.	REVISIONS	DATE	INITIAL
	REVISED AS RECORD DRAWING	DEC. 2006	R.M.

**RECORD DRAWING**  
NOTICE TO USERS

Information contained on this drawing may have changed since the completion of construction. Further, this drawing may contain information provided by others. While Ainley & Associates Limited believes this information to be reliable and correct as of the completion of construction, no warranty is provided as to its accuracy and/or completeness. As such, Ainley & Associates Limited shall not be responsible for any errors or omissions which may result from incorporation of the information herein.

SCALE: HORIZ 1=500  
VERT. 1=50

DESIGN: N.M.S./R.M.

DRAWN: E.K./P.C.S.

CHECKED: M.W.A.

DATE: APR. 2006

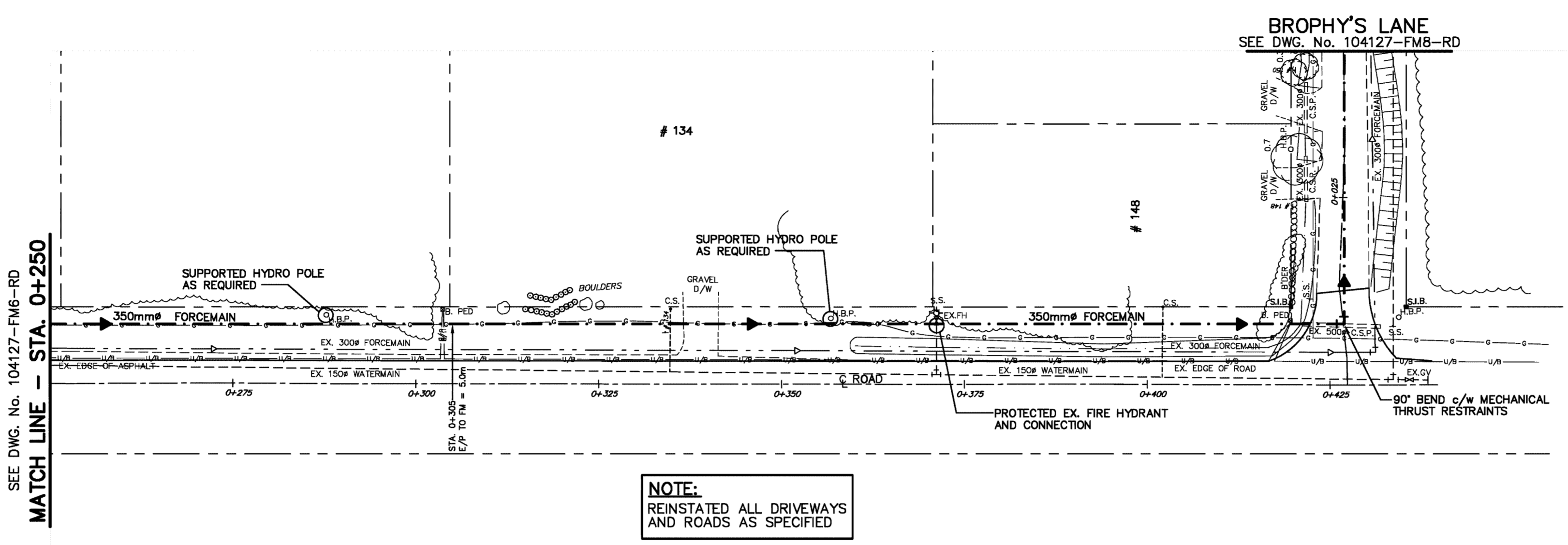
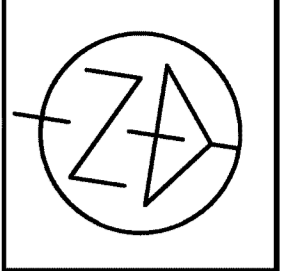


TOWN OF THE BLUE MOUNTAINS  
CRAIGLEITH AREA  
CONTRACT No. TBM-2006-3  
DUPLICATE FORCEMAIN

PLAN & PROFILE  
LONG POINT ROAD  
HIGHWAY No. 26 TO STA. 0+250

**Ainley GROUP** CONSULTING ENGINEERS PLANNERS

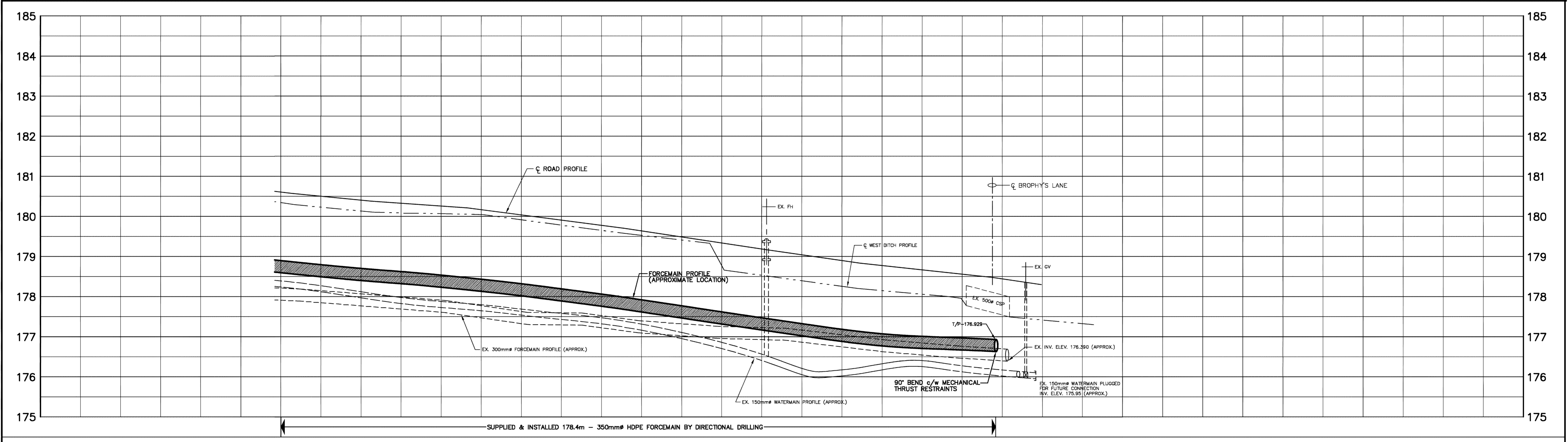
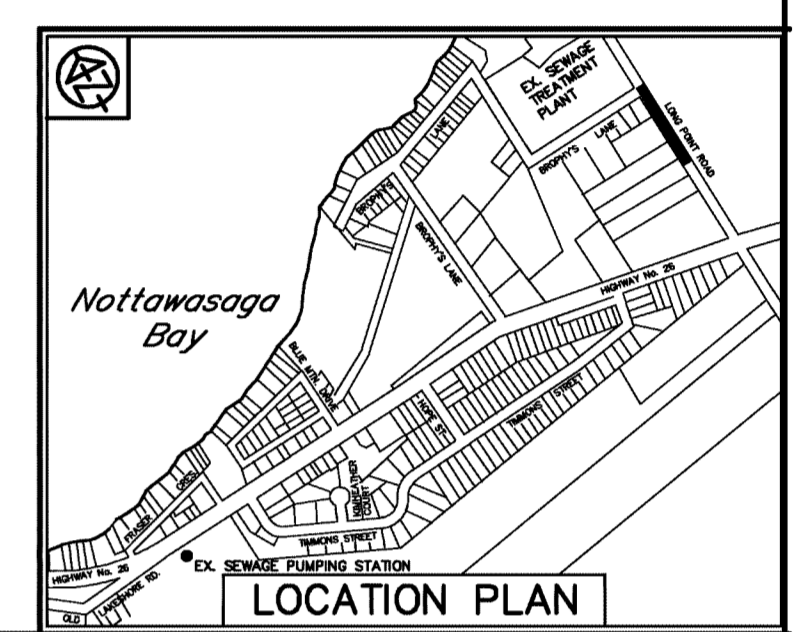
AAL-104127 DWG. FM6-RD



**NOTE:**  
REINSTATED ALL DRIVEWAYS  
AND ROADS AS SPECIFIED

**LONG POINT ROAD**

**B.M. ELEV. 181.761**  
TOP NUT OF FIRE HYDRANT  
ON WEST SIDE OF LONG POINT ROAD  
IN FRONT OF HOUSE No. 120



CHAINAGE @ 0.5m	OR. ELEV. @ ROAD
0+250	180.62
0+275	180.36
0+300	180.16
0+325	179.82
0+350	179.48
0+375	179.12
0+400	178.78
0+425	178.49
0+439.5	178.26

**LEGEND**

- PROPERTY LINE
- U/B BURIED BELL CABLE
- c BURIED GAS MAIN
- EXISTING WATER MAIN AND VALVE
- EXISTING SANITARY SEWER & M.H.
- EXISTING SEWAGE FORCEMAIN
- PROPOSED SEWAGE FORCEMAIN

NOTE: 1) LOCATIONS OF UTILITIES ARE APPROXIMATE.

**RECORD DRAWING**

COMPILED BY: D.S.	DATE: SEPT. 2006
CHECKED BY: L.S.	DATE: NOV. 2006
DRAWN BY: P.C.S.	DATE: NOV. 2006
CHECKED BY: R.M.	DATE: DEC. 2006

NO.	REVISIONS	DATE	INITIAL
	REVISED AS RECORD DRAWING	DEC. 2006	R.M.

**RECORD DRAWING**  
NOTICE TO USERS

Information contained on this drawing may have changed since the completion of construction. Further, this drawing may contain information provided by others. While Ainley & Associates Limited believes this information to be reliable and correct as of the completion of construction, no warranty is provided as to its accuracy and/or completeness. As such, Ainley & Associates Limited shall not be responsible for any errors or omissions which may result from incorporation of the information herein.

SCALE: HORIZ. 1=500  
VERT. 1=50

DESIGN: N.M.S./R.M.

DRAWN: E.K./P.C.S.

CHECKED: M.W.A.

DATE: APR. 2006

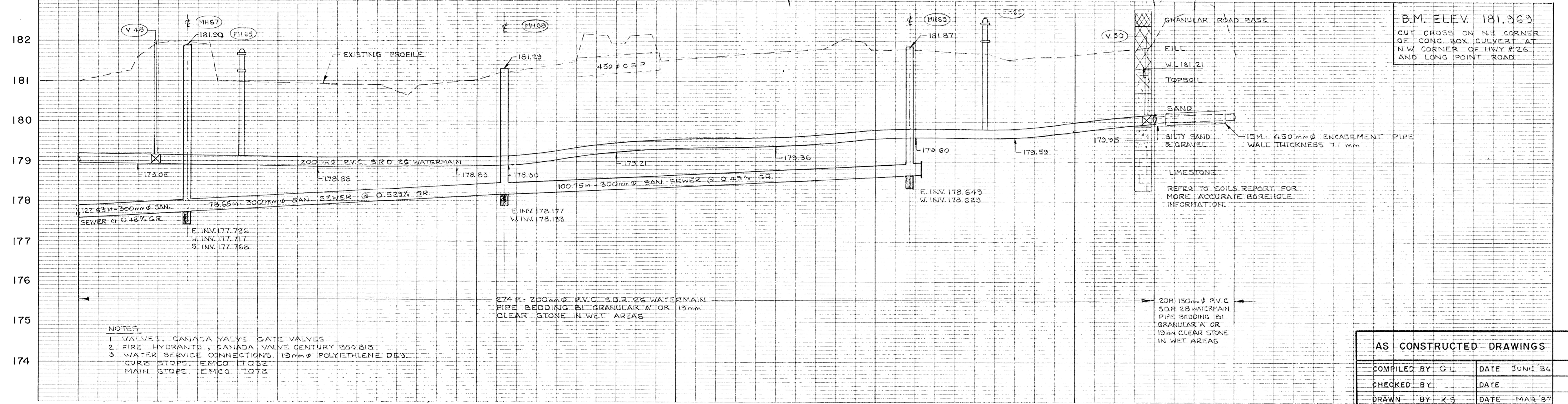
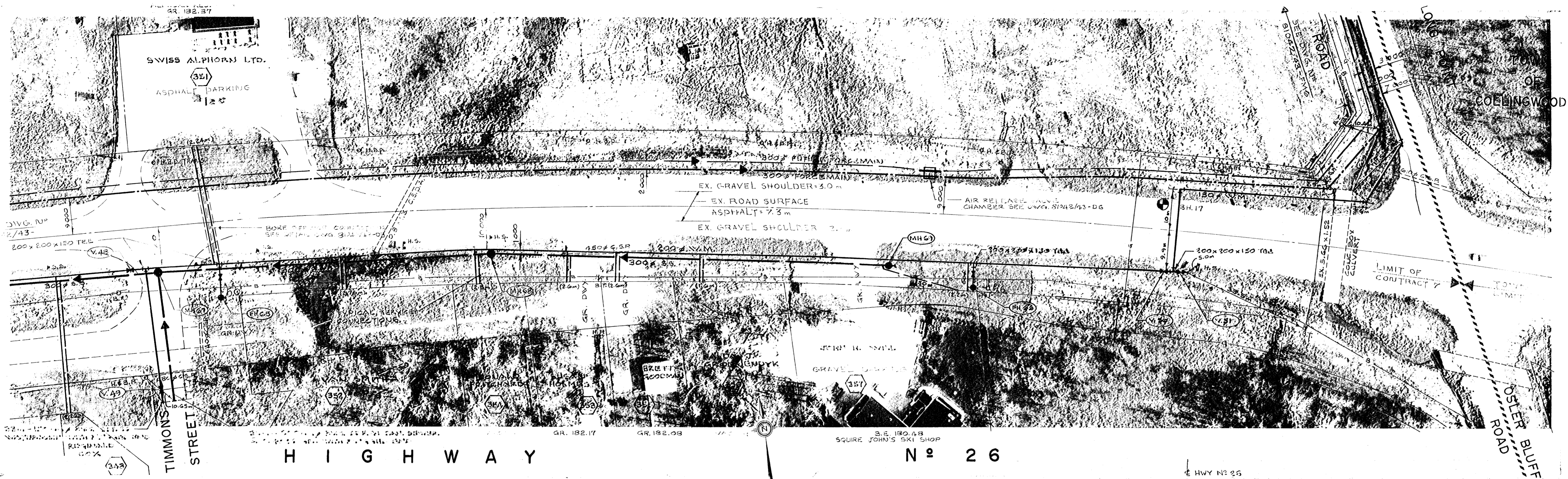


**TOWN OF THE BLUE MOUNTAINS**  
CRAIGLEITH AREA  
CONTRACT No. TBM-2006-3  
DUPLICATE FORCEMAIN

**PLAN & PROFILE**  
LONG POINT ROAD  
STA. 0+250 TO BROPHY'S LANE



AAL-104127 DWG. FM7-RD



NOTE:  
 1. VALVES, CANADA VALVE DATE VALVES  
 2. FIRE HYDRANTS, CANADA VALVE CENTURY 1350/1313  
 3. WATER SERVICE CONNECTIONS, 13mm POLYETHYLENE D13  
 CURB STOPS, EMCO 11052  
 MAIN STOPS, EMCO 11072

AS CONSTRUCTED DRAWINGS	
COMPILED BY G.L.	DATE JUNE '86
CHECKED BY	DATE
DRAWN BY K.S.	DATE MAR '87
CHECKED BY R.M.	DATE MAR '87

CHAINAGE EXISTING & ELEV	1+200	287+	50	180.92	300	07.39	50	181.50	400	181.76	50	181.63
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Notes:

LEGEND	
GR 199.89	Ground Elevation 199.89
BE 197.57	Basement Elevation 197.57
[Symbol]	Basement Elevation Right of Centre Line
[Symbol]	Basement Elevation Left of Centre Line
[Symbol]	Borehole
[Symbol]	Watermain
[Symbol]	Buried Bell Cable
[Symbol]	Gasmain
[Symbol]	Existing Watermain
[Symbol]	Sanitary Sewer
[Symbol]	Forcemain

NO.	REVISIONS	DATE	INITIAL
2	SECOND SUBMISSION	MAR. 1985	C.K.K.
1	DRAWING REDRAFTED	JULY 1984	C.K.K.

Approved

C. K. KENT  
 REGISTERED PROFESSIONAL ENGINEER  
 PROVINCE OF ONTARIO

TOWNSHIP OF COLLINGWOOD  
 (CRAIGLEITH CAMPERDOWN AREA)  
 ONTARIO MINISTRY OF THE ENVIRONMENT  
 DIRECT GRANT PROJECTS N° 3-0174 & 7-0242

PLAN AND PROFILE  
 HWY. N° 26 - STA. 1+200 TO STA. 1+490

**Ainley and Associates Ltd.**  
 Consulting Engineers and Planners  
 Collingwood - Barrie - Belleville

SCALE: HORIZ. 1:500 METRIC  
 VERT. 1:50

DESIGN WBL CHECKED CKK  
 DRAWN G.M./D.O. DATE JULY 1984

CONTRACT 7  
 DWG. N° 81042/43-SW5

# Long Point Road Subdivision Average Day Demand



Color Coding Legend	
Pipe: Diameter (mm)	
<span style="color: orange;">—</span>	<= 100
<span style="color: cyan;">—</span>	<= 150
<span style="color: green;">—</span>	<= 200
<span style="color: blue;">—</span>	<= 250
<span style="color: magenta;">—</span>	<= 300
<span style="color: purple;">—</span>	<= 350
<span style="color: pink;">—</span>	<= 400
<span style="color: brown;">—</span>	<= 600
<span style="color: black;">—</span>	Other

CR-729  
 Demand = 0.26 L/s  
 Pressure = 621 kPa  
 HGL = 243.45 m

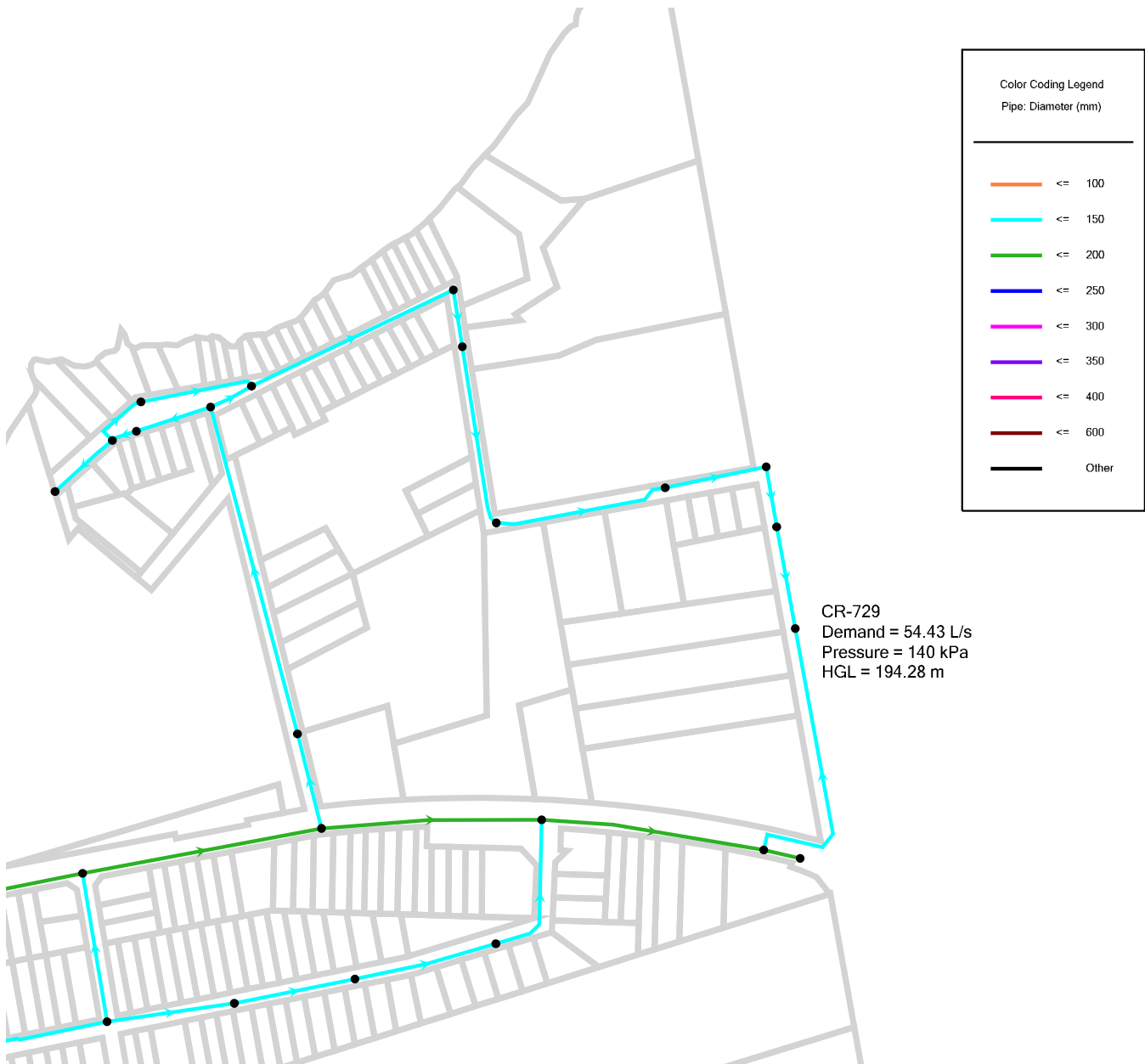
# Long Point Road Subdivision

## Maximum Day Demand + Fire Flow (45 L/s)



# Long Point Road Subdivision

## Maximum Day Demand + Fire Flow (53.9 L/s)



# Long Point Road Subdivision Peak Hour Demand



# APPENDIX C

## Domestic Water and Sanitary Flow Calculations



File: 1988-5783  
Date: 2021.05.25  
By: JL'A  
Check By: KV

### LONG POINT ROAD - WATER DEMAND CALCULATIONS

Developed Site Area	2.20 ha
Number of Residential Units	22 units
Person Per Residential Unit (Town of the Blue Mountains Development Standards)	2.3 persons/unit
Residential Population	51 persons
<b>Domestic Water Design Flows</b>	
Residential (Town of the Blue Mountains Development Standards)	450 L/C-day
<b>Total Domestic Water Design Flows</b>	
Average Residential Daily Flow (Town of the Blue Mountains Development Standards)	0.26 L/sec
Max Day Peak Factor (Town of the Blue Mountains Development Standards)	2.00
<b>Max Day Demand Flow</b>	0.53 L/sec
Peak Hour Factor (Town of the Blue Mountains Development Standards)	4.50
<b>Peak Hour Flow</b>	1.19 L/sec
<b>Fire Flow Demand (per FUS and OBC)</b>	100 L/sec
<b>Design Flow (per FUS and OBC)</b>	100.53 L/sec

**Water Supply for Public Fire Protection - 1999  
Fire Underwriters Survey**

**Part II - Guide for Determination of Required Fire Flow**

1. An estimate of fire flow required for a given area may be determined by the formula:

$$F = 220 * C * \text{sqrt } A$$

where

- F = the required fire flow in litres per minute
- C = coefficient related to the type of construction
  - = 1.5 for wood frame construction (structure essentially all combustible)
  - = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
  - = 0.8 for non-combustible construction (unprotected metal structural components)
  - = 0.6 for fire-resistive construction (fully protected frame, floors, roof)
- A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.

Proposed Buildings	Wood Frame Construction
2 number of floors	1.0 C
207 sq.m. floor area	413 sq.m. total floor area
100% Floor 1	
100% Floor 2	

413 sq.m. total floor area

**Therefore F= 4,000 L/min (rounded to nearest 1000 L/min)**

- Fire flow determined above shall not exceed:
- 30,000 L/min for wood frame construction
  - 30,000 L/min for ordinary construction
  - 25,000 L/min for non-combustible construction
  - 25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Non-Combustible	-25%	Free Burning	15%
Limited Combustible	-15%	Rapid Buring	25%
Combustible	No Charge		

Low fire Hazard occupancy for dwellings	15% reduction
---	---------------

**600 L/min reduction**

**Therefore UPDATED F= 3,000 L/min (rounded to nearest 1000 L/min)**

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above maybe reduce by up to 50% for complete automatic sprinkler protection.

**Sprinkler System** Assume 0% reduction  
**0 L/min reduction**

**Water Supply for Public Fire Protection - 1999  
Fire Underwriters Survey**

**Part II - Guide for Determination of Required Fire Flow**

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 45 metres by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	Charge
0 to 3 m	25%	20.1 to 30 m	10%
3.1 to 10 m	20%	30.1 to 45 m	5%
10.1 to 20 m	15%		

**Exposed buildings**

Name	Distance		
Front	32	5%	150
Left	1.2	25%	750
Right	1.2	25%	750

**1,650 L/min Surcharge**

**Determine Required Fire Flow**

No.1	4,000
No. 2	600 reduction
No. 3	0 reduction
No. 4	<u>1,650</u> surcharge

**Required Flow: 6,250 L/min**  
**Rounded to nearest 1000l/min: 6,000 L/min** or 100.0 L/s  
 1,585 USGPM

**Required Duration of Fire Flow**

Flow Required L/min	Duration (hours)
2,000 or less	1.0
3,000	1.25
4,000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	2.5
14,000	3.0
16,000	3.5
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32,000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

**Determine Required Fire Storage Volume**

Flow from above 6,000 L/min

Required duration 2.00 hours

Therefore: 720,000 Litres or  
 720 cu.m. is the required fire storage volume.

**Fire Protection Water Supply Guideline  
Part 3 of the Ontario Building Code (2006)**

$$Q = KVS_{TOT}$$

Q = minimum supply of water in litres (L)  
K = water supply coefficient  
V = total building volume in cubic metres  
S<sub>TOT</sub> = total of spatial coefficient values from property line exposures on all sides

K = 23.0 Group C/D building with combustible construction (Table 1)  
V = 1240 413 By 3m height  
S<sub>TOT</sub> = 2 S<sub>TOT</sub> Need Not Exceed 2.0

$$Q = 57040 \text{ L}$$

Based on ranges listed in Table 2, the required minimum water supply flow rate is

<b>1800</b>	<b>L/min</b>
<b>30</b>	<b>L/s</b>



File: 1988-5783  
Date: 2021.02.19  
By: JL'A  
Check By: KV

### LONG POINT ROAD - SANITARY DEMAND CALCULATIONS

Developed Site Area		2.20 ha
Number of Residential Units		22 units
Person Per Residential Unit	<i>(Town of The Blue Mountains Development Standards)</i>	2.30 persons/unit
Residential Population		51 persons
<b><u>Sanitary Design Flows</u></b>		
Residential	<i>(Town of The Blue Mountains Development Standards)</i>	450 L/C-day
Infiltration (typical)		0.23 L/s/ha
<b><u>Total Sanitary Design Flows</u></b>		
Average Daily Residential Flow		0.26 L/sec
Max Day Peak Factor	<i>(Harmon Formula)</i>	4.3
Infiltration		0.51 L/sec
<b>Total Daily Peak Flow</b>	<i>(Town of The Blue Mountain Development Standards)</i>	<b>1.64 L/sec</b>

# APPENDIX D

## Quality Control Measures & Stormwater Flow Calculations



PROJECT: Long Point Road Development  
 PROJECT No.: 1988-5783  
 DATE: 2021-08-16  
 DESIGN: NS  
 CHECK: JL'A

**Rational Method (5 Yr Pre-Development)**

**Peak Flow**  
 $Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot$

**Intensity**  
 $i_{(T_d)} = A (T_d)^B$

Pre-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountains	Intensity (mm/hr):	79.39
Return Period	5		
Time of Concentration (min)	15		
Coeff A	29.1		
Coeff B	-0.724		
Runoff Coeff (Unadjusted)	0.2500	Flow (m <sup>3</sup> /s)	0.1217
Runoff Coefficient (Adjusted)	0.2500		
Area (ha)	2.1900		



PROJECT: Long Point Road Development  
 PROJECT No.: 1988-5783  
 DATE: 2021-08-16  
 DESIGN: NS  
 CHECK: JL'A

**Rational Method (5 Yr Post-Development Uncontrolled Area)**

**Peak Flow**  
 $Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$

**Intensity**  
 $i_{(T_d)} = A (T_d)^B$

Post-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountain	Intensity (mm/hr):	79.39
Return Period	5 yr		
Time of Concentration (min)	15		
Coeff A	29.1		
Coeff B	-0.724		
Runoff Coeff (unadjusted)	0.2930	Uncont. Flow (m <sup>3</sup> /s)	0.0599
Runoff Coefficient (Adjusted)	0.2930		
Area (ha)	0.9200		

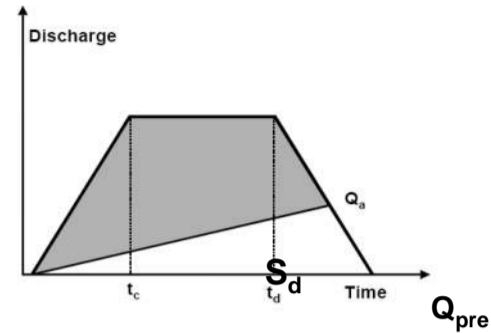
**Modified Rational Method Storage Sizing (5 Yr Post-Development Controlled Area)**

**Peak Flow**

$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

**Intensity**

**Storage**



Pre-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountain	Intensity (mm/hr):	79.39
Return Period	5		
Time of Concentration (min)	15		
Coeff A	29.1		
Coeff B	-0.724		
Runoff Coeff (Unadjusted)	0.25	Flow (m <sup>3</sup> /s)	0.0706
Runoff Coefficient (Adjusted)	0.25		
Area (ha)	1.2700		

Post-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountain	Intensity (mm/hr):	79.39
Return Period	5 yr		
Time of Concentration (min)	15		
Coeff A	29.1		
Coeff B	-0.724		
Runoff Coeff (unadjusted)	0.56	Uncont. Flow (m <sup>3</sup> /s)	0.1581
Runoff Coefficient (Adjusted)	0.56		
Area (ha)	1.2700		

Target Flow (m <sup>3</sup> /s)	0.0618
---------------------------------	--------

**REQUIRED STORAGE VOLUME: 89.7**

Storage Volume Determination (Detailed)				
T <sub>d</sub>	i	T <sub>d</sub>	Q <sub>Uncont</sub>	S <sub>d</sub>
min	mm/hr	sec	m <sup>3</sup> /s	m <sup>3</sup>
15	79.39	900	0.158	86.7
20	64.47	1200	0.128	89.2
25	54.85	1500	0.109	89.7
30	48.07	1800	0.096	88.9
35	42.99	2100	0.086	87.1
40	39.03	2400	0.078	84.6
45	35.84	2700	0.071	81.5
50	33.21	3000	0.066	77.9
55	30.99	3300	0.062	73.9
60	29.10	3600	0.058	69.6
65	27.46	3900	0.055	65.0
70	26.03	4200	0.052	60.1
75	24.76	4500	0.049	55.0
80	23.63	4800	0.047	49.8
85	22.61	5100	0.045	44.3
90	21.70	5400	0.043	38.7



PROJECT: Long Point Road Development  
 PROJECT No.: 1988-5783  
 DATE: 2021-08-16  
 DESIGN: NS  
 CHECK: JL'A

**Rational Method (25 Yr Pre-Development)**

**Peak Flow**  
 $Q_{post} = 0.0028 \cdot C_{post} \cdot i_{(T_d)} \cdot$

**Intensity**  
 $i_{(T_d)} = A (T_d)^B$

Pre-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountains	Intensity (mm/hr):	108.72
Return Period	25		
Time of Concentration (min)	15		
Coeff A	39.3		
Coeff B	-0.734		
Runoff Coeff (Unadjusted)	0.2500	Flow (m <sup>3</sup> /s)	0.1833
Runoff Coefficient (Adjusted)	0.2750		
Area (ha)	2.1900		



PROJECT: Long Point Road Development  
 PROJECT No.: 1988-5783  
 DATE: 2021-08-16  
 DESIGN: NS  
 CHECK: JL'A

**Rational Method (25 Yr Post-Development Uncontrolled Area)**

**Peak Flow**  
 $Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$

**Intensity**  
 $i_{(T_d)} = A (T_d)^B$

Post-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountain	Intensity (mm/hr):	108.72
Return Period	25 yr		
Time of Concentration (min)	15		
Coeff A	39.3		
Coeff B	-0.734		
Runoff Coeff (unadjusted)	0.2930	Uncont. Flow (m <sup>3</sup> /s)	0.0903
Runoff Coefficient (Adjusted)	0.3223		
Area (ha)	0.9200		

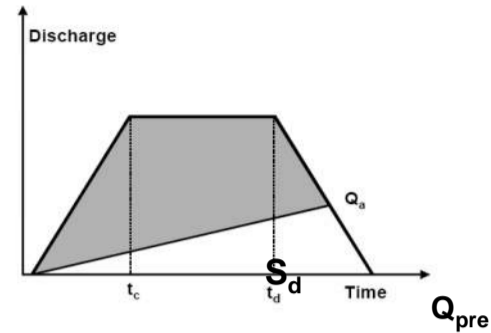
**Modified Rational Method Storage Sizing (25 Yr Post-Development Controlled Area)**

**Peak Flow**

$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

**Intensity**

**Storage**



Pre-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountain	Intensity (mm/hr):	108.72
Return Period	5		
Time of Concentration (min)	15		
Coeff A	39.3		
Coeff B	-0.734		
Runoff Coeff (Unadjusted)	0.25	Flow (m <sup>3</sup> /s)	0.0967
Runoff Coefficient (Adjusted)	0.25		
Area (ha)	1.2700		

Post-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountain	Intensity (mm/hr):	108.72
Return Period	25 yr		
Time of Concentration (min)	15		
Coeff A	39.3		
Coeff B	-0.734		
Runoff Coeff (unadjusted)	0.56	Uncont. Flow (m <sup>3</sup> /s)	0.2381
Runoff Coefficient (Adjusted)	0.62		
Area (ha)	1.2700		

Target Flow (m <sup>3</sup> /s)	0.0931
---------------------------------	--------

**REQUIRED STORAGE VOLUME: 133.8**

Storage Volume Determination (Detailed)				
T <sub>d</sub>	i	T <sub>d</sub>	Q <sub>Uncont</sub>	S <sub>d</sub>
min	mm/hr	sec	m <sup>3</sup> /s	m <sup>3</sup>
15	108.72	900	0.238	130.6
20	88.02	1200	0.193	133.7
25	74.73	1500	0.164	133.8
30	65.37	1800	0.143	132.1
35	58.37	2100	0.128	128.9
40	52.92	2400	0.116	124.7
45	48.54	2700	0.106	119.6
50	44.93	3000	0.098	113.8
55	41.89	3300	0.092	107.4
60	39.30	3600	0.086	100.5
65	37.06	3900	0.081	93.2
70	35.10	4200	0.077	85.6
75	33.36	4500	0.073	77.6
80	31.82	4800	0.070	69.3
85	30.43	5100	0.067	60.8
90	29.18	5400	0.064	52.0

**Rational Method (100 Yr Pre-Development)**

**Peak Flow**  
 $Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$

**Intensity**  
 $i_{(T_d)} = A (T_d)^B$

Pre-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountains	Intensity (mm/hr):	132.69
Return Period	100 yr		
Time of Concentration (min)	15		
Coeff A	47.7		
Coeff B	-0.738		
Runoff Coeff (Unadjusted)	0.250	Flow (m <sup>3</sup> /s)	0.2543
Runoff Coefficient (Adjusted)	0.313		
Area (ha)	2.190		

**Rational Method (100 Yr Post-Development Uncontrolled Area)**

**Peak Flow**  

$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

**Intensity**  

$$i_{(T_d)} = A (T_d)^B$$

Post-Development Scenario Data			
Inputs		Outputs	
IDF Location	Owen Sound	Intensity (mm/hr):	132.69
Return Period	100yr		
Time of Concentration (min)	15		
Coeff A	47.7		
Coeff B	-0.738		
Runoff Coeff (unadjusted)	0.29	Uncont. Flow (m <sup>3</sup> /s)	0.1252
Runoff Coefficient (Adjusted)	0.37		
Area (ha)	0.92		



PROJECT: Long Point Road Development  
 PROJECT No.: 1988-5783  
 DATE: 2021-08-16  
 DESIGN: NS  
 CHECK: JL'A

**Modified Rational Method Storage Sizing (100 Yr Post-Development Controlled Area)**

**Peak Flow**

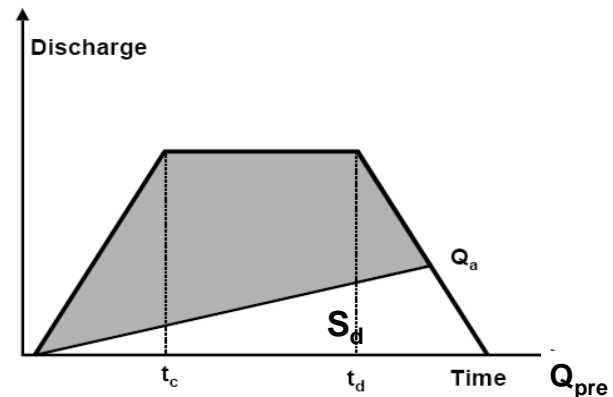
$$Q_{\text{post}} = 0.0028 \cdot C_{\text{post}} \cdot i_{(T_d)} \cdot A$$

**Intensity**

$$i_{(T_d)} = A (T_d)^B$$

**Storage**

$$S_d = Q_{\text{post}} \cdot T_d - Q_{\text{pre}} (T_d + T_c) / 2$$



Pre-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountains	Intensity (mm/hr):	132.69
Return Period	100 yr		
Time of Concentration (mi)	15		
Coeff A	47.7		
Coeff B	-0.738		
Runoff Coeff (Unadjusted)	0.25	Flow (m <sup>3</sup> /s)	0.1475
Runoff Coefficient (Adjusted)	0.31		
Area (ha)	1.2700		

Post-Development Scenario Data			
Inputs		Outputs	
IDF Location	Blue Mountains	Intensity (mm/hr):	132.69
Return Period	100 yr		
Time of Concentration (mi)	15		
Coeff A	47.7		
Coeff B	-0.738		
Runoff Coeff (unadjusted)	0.56	Uncont. Flow (m <sup>3</sup> /s):	0.3303
Runoff Coefficient (Adjusted)	0.70		
Area (ha)	1.2700		

Target Flow (m <sup>3</sup> /s)	0.1291
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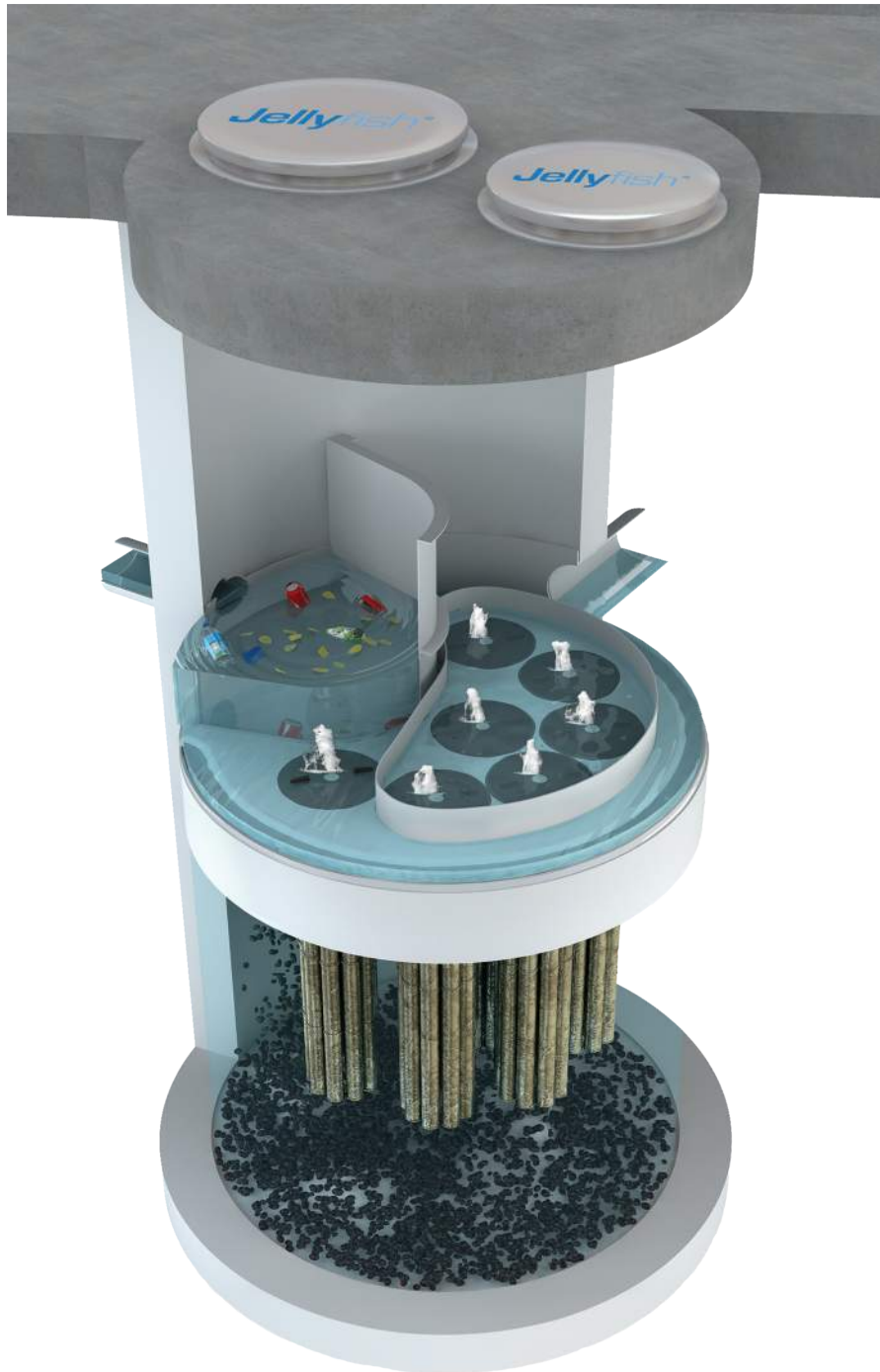
**REQUIRED STORAGE VOLUME: 185.0**

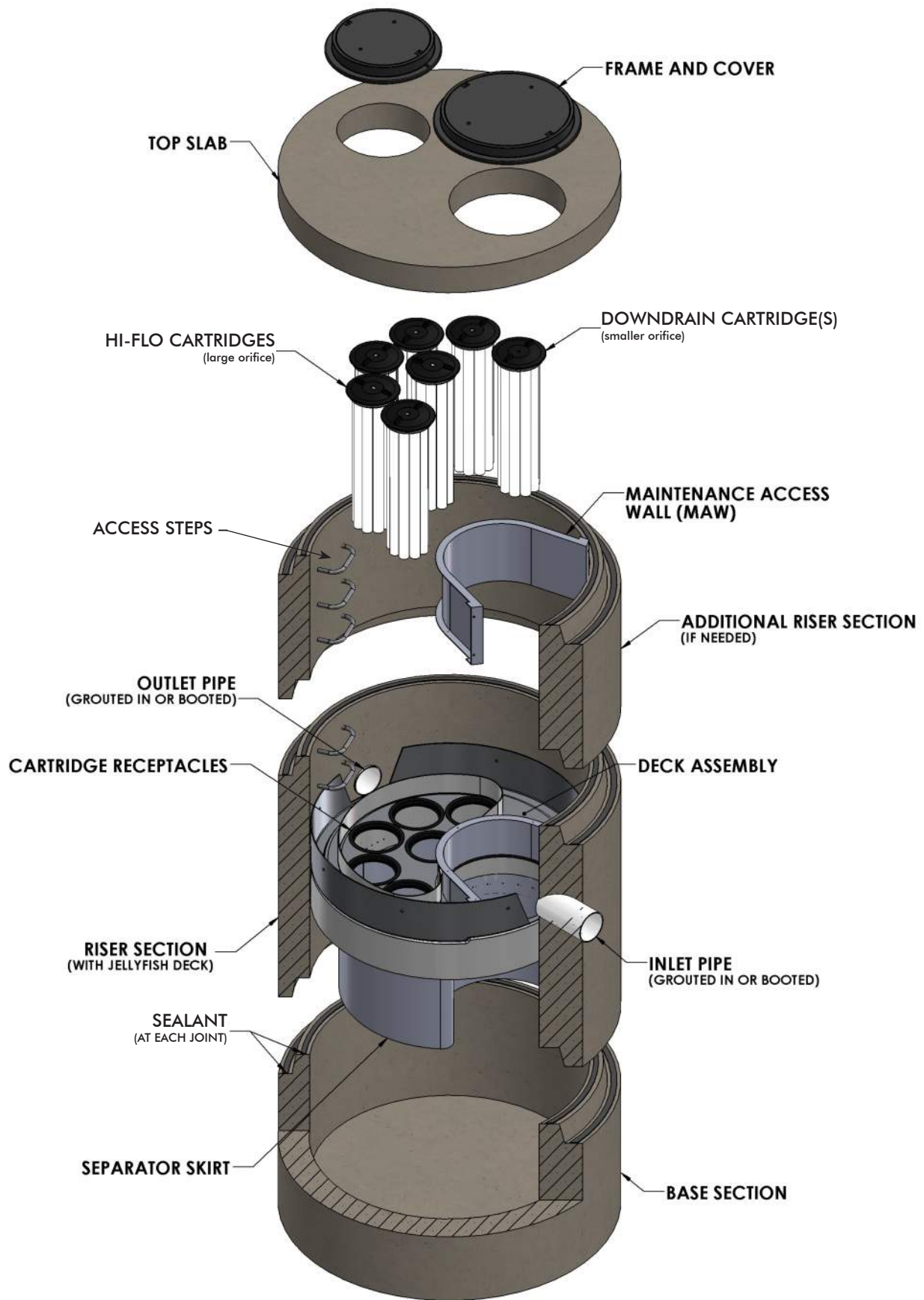
Storage Volume Determination (Detailed)				
T <sub>d</sub>	i	T <sub>d</sub>	Q <sub>Uncont</sub>	S <sub>d</sub>
min	mm/hr	sec	m <sup>3</sup> /s	m <sup>3</sup>
15	132.69	900	0.330	181.1
20	107.31	1200	0.267	185.0
25	91.02	1500	0.227	184.9
30	79.56	1800	0.198	182.2
35	71.00	2100	0.177	177.5
40	64.34	2400	0.160	171.4
45	58.98	2700	0.147	164.1
50	54.57	3000	0.136	155.8
55	50.86	3300	0.127	146.7
60	47.70	3600	0.119	137.0
65	44.96	3900	0.112	126.7
70	42.57	4200	0.106	115.9
75	40.46	4500	0.101	104.7
80	38.58	4800	0.096	93.0
85	36.89	5100	0.092	81.0
90	35.36	5400	0.088	68.8

# APPENDIX E

## Jellyfish Owners Manual

# *Jellyfish*<sup>®</sup> Filter **Owner's Manual**





## WARNINGS / CAUTION

1. FALL PROTECTION may be required.
2. WATCH YOUR STEP if standing on the Jellyfish Filter Deck at any time; Great care and safety must be taken while walking or maneuvering on the Jellyfish Filter Deck. Attentive care must be taken while standing on the Jellyfish Filter Deck at all times to prevent stepping onto a lid, into or through a cartridge hole or slipping on the deck.
3. The Jellyfish Filter Deck can be SLIPPERY WHEN WET.
4. If the Top Slab, Covers or Hatches have not yet been installed, or are removed for any reason, great care must be taken to NOT DROP ANYTHING ONTO THE JELLYFISH FILTER DECK. The Jellyfish Filter Deck and Cartridge Receptacle Rings can be damaged under high impact loads. *This type of activity voids all warranties. All damaged items to be replaced at owner's expense.*
5. Maximum deck load 2 persons, total weight 250 lbs. per person.

## Safety Notice

Jobsite safety is a topic and practice addressed comprehensively by others. The inclusions here are intended to be reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). OSHA and Canadian OSH, and Federal, State/Provincial, and Local Jurisdiction Safety Standards apply on any given site or project. The knowledge and applicability of those responsibilities is the Contractor's responsibility and outside the scope of Imbrium® Systems.

## Confined Space Entry

Secure all equipment and perform all training to meet applicable local and OSHA regulations regarding confined space entry. It is the Contractor's or entry personnel's responsibility to proceed safely at all times.

## Personal Safety Equipment

Contractor is responsible to provide and wear appropriate personal protection equipment as needed including, but not limited to safety boots, hard hat, reflective vest, protective eyewear, gloves and fall protection equipment as necessary. Make sure all equipment is **staffed with trained and/or certified personnel**, and all equipment is checked for proper operation and safety features prior to use.

- Fall protection equipment
- Eye protection
- Safety boots
- Ear protection
- Gloves
- Ventilation and respiratory protection
- Hard hat
- Maintenance and protection of traffic plan

## Thank You for purchasing the Jellyfish® Filter!

Imbrium® Systems would like to thank you for selecting the Jellyfish Filter to meet your project's stormwater treatment needs. With proper inspection and maintenance, the Jellyfish Filter is designed to deliver ongoing, high levels of stormwater pollutant removal.

If you have any questions, please feel free to call us or e-mail us at [info@imbriumsystems.com](mailto:info@imbriumsystems.com).

### Imbrium Systems

USA: 301.279.8827 | 888.279.8826

CAD: 416.960.9900 | 800.565.4801

INT'L: +1.416.960.9900

## Jellyfish Filter Patents

The Jellyfish Filter is protected by one or more of the following patents:

U.S. Patent No. 8,123,935; U.S. Patent No. 8,287,726; U.S. Patent No. 8,221,618

Australia Patent No. 2008,286,748

Canadian Patent No. 2,696,482

Korean Patent No. 10-1287539

New Zealand Patent No. 583,461; New Zealand Patent No. 604,227

South African Patent No. 2010,01068

*\*other patents pending*

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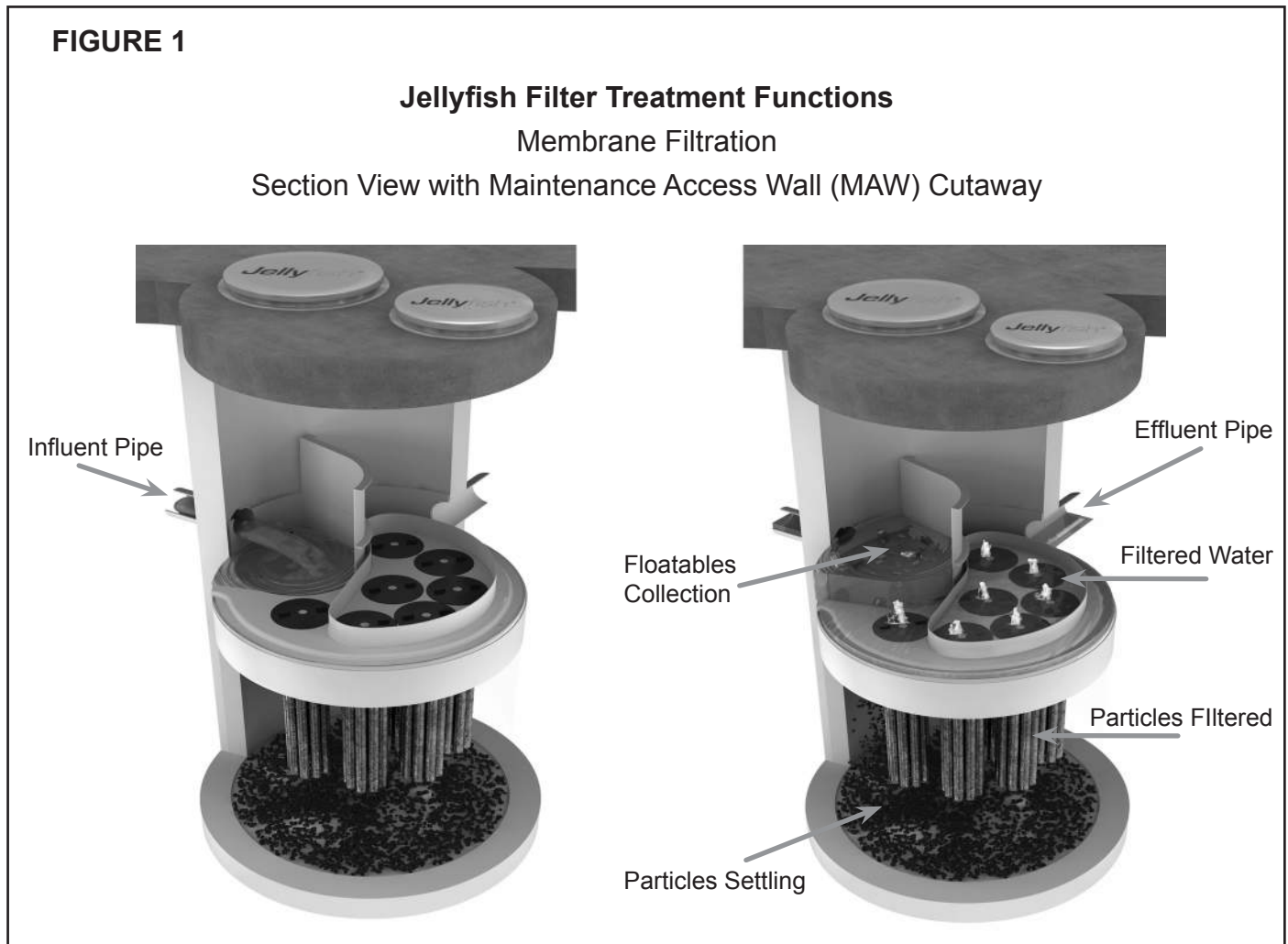


## Chapter 2

### 2.0 – Jellyfish Filter System Operations and Functions

The Jellyfish Filter is an engineered stormwater quality treatment technology that removes a high level and wide variety of stormwater pollutants. Each Jellyfish Filter cartridge consists of multiple membrane - encased filter elements (“filtration tentacles”) attached to a cartridge head plate. The filtration tentacles provide a large filtration surface area, resulting in high flow and high pollutant removal capacity.

The Jellyfish Filter functions are depicted in **Figure 1** below.



Jellyfish Filter cartridges are backwashed after each peak storm event, which removes accumulated sediment from the membranes. This backwash process extends the service life of the cartridges and increases the time between maintenance events.

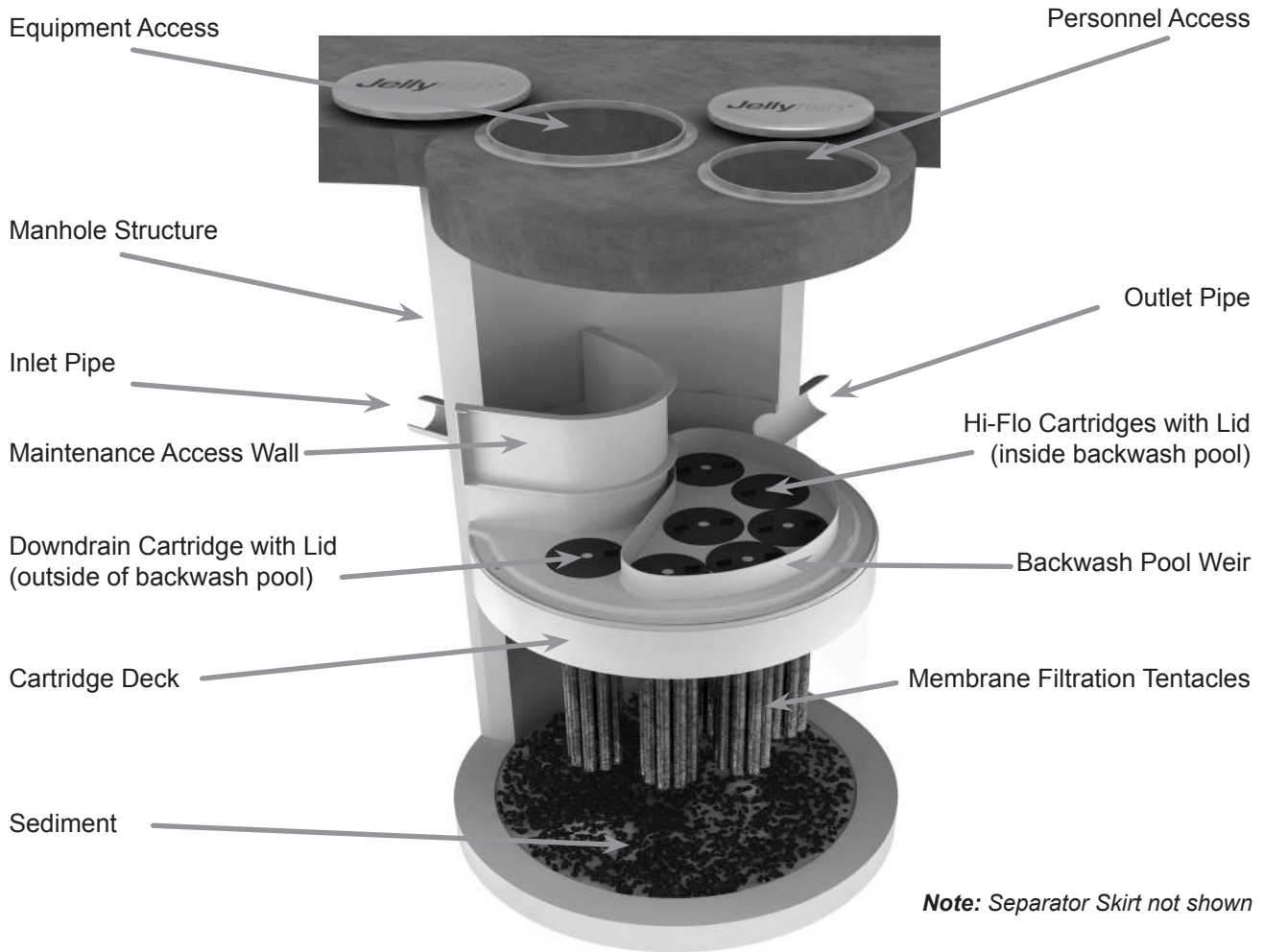
For additional details on the operation and pollutant capabilities of the Jellyfish Filter please refer to additional details on our website at [www.imbriumsystems.com](http://www.imbriumsystems.com).

## 2.1 – Components and Cartridges

The Jellyfish Filter and components are depicted in Figure 2 below.

**FIGURE 2**

**Jellyfish Filter Components**



Tentacles are available in various lengths as depicted in Table 1 below.

**Table 1 – Cartridge Lengths / Weights and Cartridge Lid Orifice Diameters**

Cartridge Lengths	Dry Weight	Hi-Flo Orifice Diameter	Draindown Orifice Diameter
15 inches (381 mm)	10 lbs (4.5 kg)	35 mm	20 mm
27 inches (686 mm)	14.5 lbs (6.6 kg)	45 mm	25 mm
40 inches (1,016 mm)	19.5 lbs (8.9 kg)	55 mm	30 mm
54 inches (1,372 mm)	25 lbs (11.4 kg)	70 mm	35 mm

A Jellyfish membrane filtration cartridge is depicted in Figure 3 below.

**FIGURE 3**

**Jellyfish Membrane Filtration Cartridge**

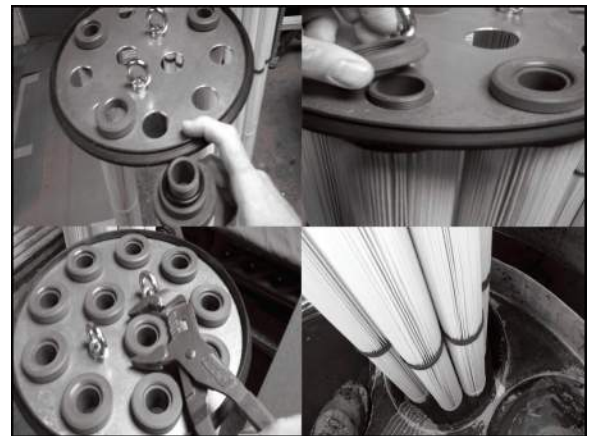


**2.2 – Jellyfish Membrane Filtration Cartridge Assembly**

The Jellyfish Filter utilizes multiple membrane filtration cartridges. Each cartridge consists of removable cylindrical filtration “tentacles” attached to a cartridge head plate. Each filtration tentacle has a threaded pipe nipple and o-ring. To attach, insert the top pipe nipples with the o-ring through the head plate holes and secure with locking nuts. Locking nuts to be hand tighten and checked with a wrench as shown below.

**2.3 – Jellyfish Membrane Filtration Cartridge Installation**

- After the upstream catchment and site have stabilized, remove any accumulated sediment and debris from the Jellyfish Filter structure and upstream diversion structure (if applicable). Failure to address this step completely will reduce the time between required maintenance.
- Descend to the cartridge deck (see Safety Notice and page 3).
- Lower the Jellyfish membrane filtration cartridges into the cartridge receptacles within the cartridge deck. A filter cartridge should be placed into each of the draindown cartridge receptacles outside the backwash pool weir. It is possible dependent on the Jellyfish Filter model purchased that not all cartridge receptacles will be filled with a filter cartridge. In that case, a blank headplate and blank cartridge lid (has no orifice) would be installed.



**Cartridge Assembly**

Avoid snagging the cartridge membranes on the receptacle lip when inserting the Jellyfish membrane filtration cartridges into the cartridge receptacles. Use a gentle twisting or sideways motion to clear any potential snag. Do not force the tentacles down into the cartridge receptacle, as this may damage the membranes. Apply downward pressure on the cartridge head plate to seat the rim gasket (thick circular gasket surrounding the circumference of the head plate) into the cartridge receptacle.

- Examine the cartridge lids to differentiate lids with a small orifice, a large orifice, and no orifice.
  - Lids with a small orifice are to be inserted into the draindown cartridge receptacles, outside of the backwash pool weir.
  - Lids with a large orifice are to be inserted into the hi-flo cartridge receptacles within the backwash pool weir.
  - Lids with no orifice (blank cartridge lids) and a blank headplate are to be inserted into unoccupied cartridge receptacles.
- **To install a cartridge lid, align the cartridge lid male threads with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise a minimum 110° to seat the filter cartridge snugly in place, with a proper watertight seal.**

## Chapter 3

### 3.0 – Inspection and Maintenance Overview

The primary purpose of the Jellyfish Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, captured pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Maintenance activities may be required in the event of an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments from manhole sump
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed.

It is recommended that Jellyfish Filter inspection and maintenance be performed by professionally trained individuals, with experience in stormwater maintenance and disposal services. Maintenance procedures may require manned entry into the Jellyfish structure. Only professional maintenance service providers trained in confined space entry procedures should enter the vessel. Procedures, safety and damage prevention precautions, and other information, included in these guidelines, should be reviewed and observed prior to all inspection and maintenance activities.

### 3.1 – Inspection

#### 3.1.1 – Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent.*

- Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired.
- A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.

- Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
- Inspection is recommended after each major storm event.
- Immediately after an upstream oil, fuel or other chemical spill.

### 3.1.2 – Inspection Tools and Equipment

The following equipment and tools are typically required when performing a Jellyfish Filter inspection:

- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

### 3.1.3 – Inspection Procedure

The following procedure is recommended when performing inspections:

- Provide traffic control measures as necessary.
- Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.
- Measure oil and sediment depth by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Retrieve the probe, record sediment depth, and presences of any oil layers and repeat in multiple locations within the MAW opening. **Sediment depth of 12 inches or greater indicates maintenance is required.**
- Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
- Inspect the MAW, cartridge deck, and backwash pool weir for cracks or broken components. If damaged, repair is required.
- **Dry weather inspections:** inspect the cartridge deck for standing water.
  - No standing water under normal operating condition.
  - Standing water **inside** the backwash pool, but not outside the backwash pool, this condition indicates that the filter cartridges need to be rinsed.
  - Standing water **outside** the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- **Wet weather inspections:** observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
  - **Less than 6 inches**, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
  - **Greater than 6 inches**, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
  - **18 inches or greater** and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed.



*The depth of sediment and oil can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and inserted through the Jellyfish Filter's maintenance access wall opening. The large opening provides convenient access for inspection and vacuum removal of water and pollutants.*

## 3.2 – Maintenance

### 3.2.1 – Maintenance Requirements

Required maintenance for Jellyfish Filter units is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

- **Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.**
- Floatable trash, debris, and oil must be removed.
- Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs first.
- Replace filter cartridge if rinsing does not remove accumulated sediment from the tentacles, or if tentacles are damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
- Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
- The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged by the spill.

### 3.2.2 – Maintenance Tools and Equipment

The following equipment and tools are typically required when performing Jellyfish Filter maintenance:

- Vacuum truck
- Ladder
- Garden hose and low pressure sprayer
- Rope or cord to lift filter cartridges from the cartridge deck to the surface
- Adjustable pliers for removing filter cartridge tentacles from cartridge head plate
- Plastic tub or garbage can for collecting effluent from rinsed filter cartridge tentacles
- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Proper safety equipment for confined space entry
- Replacement filter cartridge tentacles if required

### 3.2.3 – Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

- Provide traffic control measures as necessary.
- Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.
- **Caution:** Dropping objects onto the cartridge deck may cause damage.
- Perform **Inspection Procedure** prior to maintenance activity.
- To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. **Caution:** Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.

### 3.2.4 – Filter Cartridge Rinsing Procedure

- Remove a cartridge lid.
- Remove the cartridge from the receptacle using the lifting loops in the cartridge head plate. **Caution:** Should

a snag occur, do not force the cartridge upward as damage to the tentacles may result. Rotate the cartridge with a slight sideways motion to clear the snag and continue removing the cartridge.

- Thread a rope or cord through the lifting loops and lift the filter cartridge from the cartridge deck to the top surface outside the structure.
- **Caution:** Immediately replace and secure the lid on the exposed empty receptacle as a safety precaution. Never expose more than one empty cartridge receptacle.
- Repeat the filter cartridge removal procedure until all of the cartridges are located at the top surface outside the structure.
- Disassemble the tentacles from each filter cartridge by rotating counter-clockwise. Remove the tentacles from the cartridge head plate.
- Position a receptacle in a plastic tub or garbage can such that the rinse water is captured. Using a low-pressure garden hose sprayer, direct a wide-angle water spray at a downward 45° angle onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. **Caution:** Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane. Turn membran upside down and pour out any residual rinsewater to ensure center of tentacle is clear of any sediment.
- Remove rinse water from rinse tub or garbage can using a vacuum hose as needed.
- Slip the o-ring over the tentacle nipple and reassemble onto the cartridge head plate; hand-tighten.
- If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Imbrium Systems to order replacement tentacles.
- Lower a rinsed filter cartridge to the cartridge deck. Remove the cartridge lid on a receptacle and carefully lower the filter cartridge into the receptacle until the head plate gasket is seated squarely on the lip of the receptacle. **Caution:** Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur. Rotate the cartridge with a slight sideways motion to clear the snag and complete the installation.
- Replace the cartridge lid on the exposed receptacle. Rinse away any accumulated grit from the receptacle threads if needed to get a proper fit. **Align the cartridge lid male threads with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise a minimum 110° to seat the filter cartridge snugly in place, with a proper watertight seal.**
- Repeat cartridge installation until all cartridges are installed.



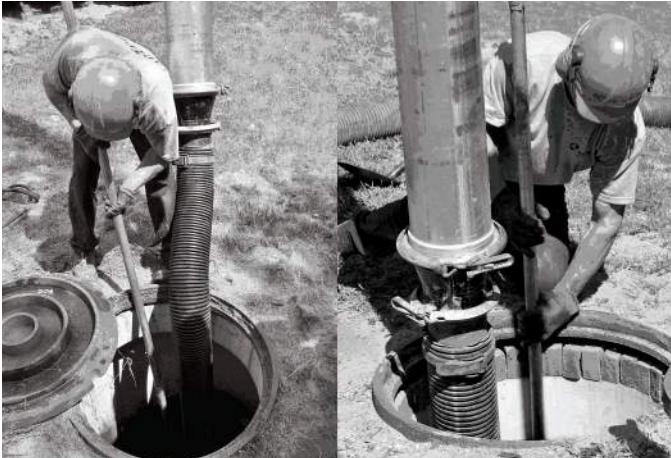
*Rinsing of dirty filter cartridge tentacles with a low-pressure garden hose sprayer, and using a plastic garbage container to capture rinse water.*

### 3.2.5 – Vacuum Cleaning Procedure

- **Caution:** Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning **only through the maintenance access wall (MAW) opening**, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. **Do not lower the vacuum wand through a cartridge receptacle**, as damage to the receptacle will result.
  - To remove floatable trash, debris, and oil, lower the vacuum hose into the MAW opening and vacuum floatable pollutants off the surface of the water. Alternatively, floatable solids may be removed by a net or skimmer.
  - Using a vacuum hose, remove the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
  - Remove the sediment from the bottom of the unit through the MAW opening.
  - For larger diameter Jellyfish Filter manholes (8-ft, 10-ft, 12-ft diameter), complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle..
  - After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.
  - Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

### 3.2.6 – Chemical Spills

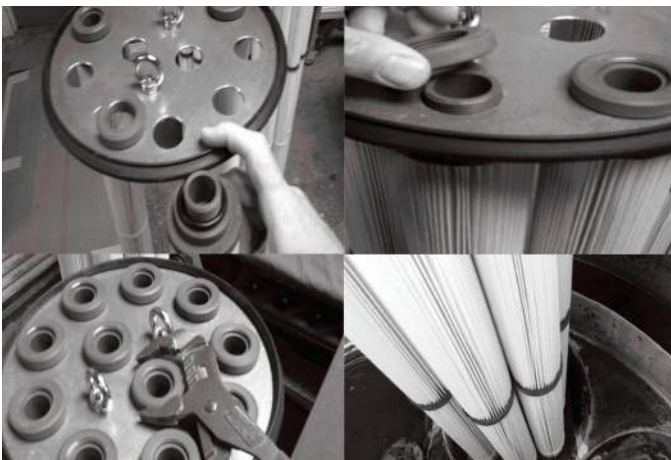
- **Caution:** If a chemical spill has been captured by the Jellyfish Filter, do not attempt maintenance. Immediately contact the local hazard response agency.



A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and floatables from the Jellyfish Filter by inserting the vacuum wand through the maintenance access wall opening.



A view of a Jellyfish Filter cartridge deck from the surface showing all the cartridge lids intact and no standing water on the deck (left image), and inspection of the flexible separator skirt from inside the maintenance access wall opening (right image).



Assembly of a Jellyfish Filter cartridge (left) and installation of a filter cartridge into a cartridge receptacle in the deck (right).

### 3.3 – Disposal Procedures

Disposal requirements for recovered pollutants and spent filtration tentacles may vary depending on local guidelines. In most areas the sediment and spent filtration tentacles, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.

Petroleum-based pollutants captured by the Jellyfish Filter, such as oil and fuels, should be removed and disposed of by a licensed waste management company.

Although the Jellyfish Filter captures virtually all free oil, a sheen may still be present at the MAW. A rainbow or sheen can be visible at oil concentrations of less than 10 mg/L (ppm).

## Chapter 4

### 4.0 – Recommended Safety Procedures

Jobsite safety is a topic and a practice addressed comprehensively by others. The inclusions here are merely reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). OSHA and Canadian OSH, and Federal, State/Provincial, and Local Jurisdiction Safety Standards apply.

### 4.1 – Confined Space/Personal Safety Equipment/Warning and Cautions

Please see reference on Page 3.

## Chapter 5

### 5.0 – Jellyfish Filter Replacement Parts

Jellyfish membrane filtration cartridges, cartridge components, cartridge lids, other replacement parts can be ordered by contacting Imbrium Systems at:

United States: 888-279-8826 or 301-279-8827  
Canada/International: 800-565-4801 or +1-416-960-9900  
[info@imbriumsystems.com](mailto:info@imbriumsystems.com)

### 5.1 – Jellyfish Filter Replacement Parts List

Note: Jellyfish Cartridges and/or Filtration tentacles are available in the following lengths:

• 15 Inch (381 mm)      • 27 Inch (686 mm)      • 40 Inch (1,016 mm)      • 54 Inch (1,372 mm)

- Jellyfish Cartridge (specify length). Includes head plate with lifting loops, rim gasket, eleven (11) filtration tentacles, eleven (11) o-rings, and eleven (11) locking nuts
- Standard Head plate
- Blank head plate
- Rim gasket (for head plate)
- Locking nuts (for tentacles)
- O-rings (for tentacles)
- Cartridge lids are available with the following orifice sizes: 70mm, 55mm, 45mm, 35mm, 30mm, 25mm, 30mm, blank lid (no orifice)
- Maintenance Access Wall (MAW) extension (18-inch segment)

*\* Nothing in this catalog should be construed as an expressed warranty or implied warranties, including the warranties of merchantability and of fitness for any particular purpose.*

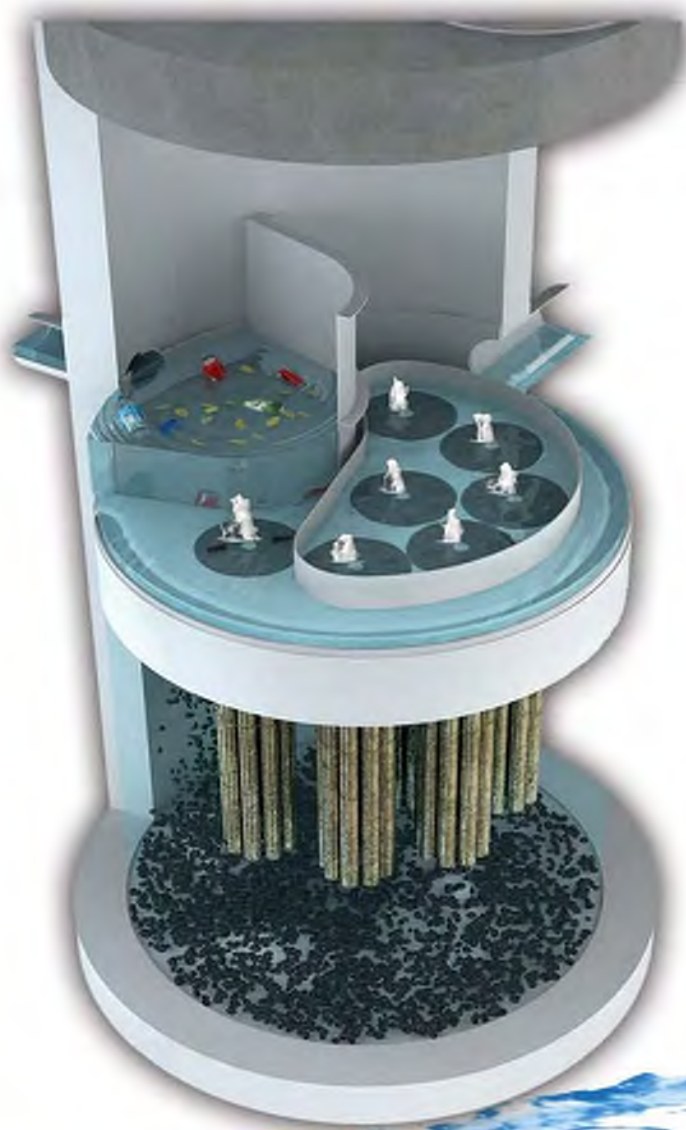
# Jellyfish Filter Inspection and Maintenance Log

Owner: \_\_\_\_\_ Jellyfish Model No.: \_\_\_\_\_  
 Location: \_\_\_\_\_ GPS Coordinates: \_\_\_\_\_  
 Land Use: Commercial: \_\_\_\_\_ Industrial: \_\_\_\_\_ Service Station: \_\_\_\_\_  
 Road/Highway: \_\_\_\_\_ Airport: \_\_\_\_\_ Residential: \_\_\_\_\_ Parking Lot: \_\_\_\_\_

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed						
Floatable Debris Present: (Y/N)						
Floatable Debris removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and re-commissioned: (Y/N)						
New tentacles put on Cartridges: (Y/N)						
Hi-Flo cartridges externally rinsed and recommissioned (Y/N):						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						

# *Jellyfish*<sup>®</sup> Filter

## Technical Manual



**imbrium**<sup>®</sup>  
Engineered Stormwater Treatment  
[www.imbriumsystems.com](http://www.imbriumsystems.com)

# Jellyfish<sup>®</sup> Filter

## Highlights

The Jellyfish Filter (patent pending) is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

### **Jellyfish efficiently captures a high level of stormwater pollutants, including:**

- ✓ Greater than 85% of the total suspended solids (TSS) load, including particles less than 5 microns
- ✓ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ✓ Free oil
- ✓ Floatable trash and debris



# Jellyfish<sup>®</sup> Filter Technical Manual

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## Jellyfish Filter Quick Glance

The Jellyfish Filter (patent pending) is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact standalone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and suspended sediment removal capacity.

Jellyfish efficiently captures a high level of stormwater pollutants, including:

- Greater than 85% of the total suspended solids (TSS) load, including particles less than 5 microns
- Particulate bound pollutants such as nutrients, toxic metals, hydrocarbons, and bacteria
- Free oil
- Floatable trash and debris

Jellyfish cartridges are passively backwashed automatically after each storm event, which removes accumulated sediment from the membranes and significantly extends the service life of the cartridges and the maintenance interval. If required, the cartridges can be easily manually backwashed without removing the cartridges. Additionally, the lightweight cartridges can be removed by hand and externally rinsed, and rinsed cartridges then reinstalled. These simple maintenance options allow for cartridge regeneration, thereby minimizing cartridge replacement costs and lifecycle treatment costs while ensuring long term treatment performance.

## Jellyfish Filter Patent Information

Jellyfish Filter is protected by one or more of the following patents: Australian Patent No. 2008,286,748; US Patent Nos. 8,123,935, 8,287,726, US 8,221,618; Canadian Patent No. 2,696,482; Korean Patent No. 10-1287539; New Zealand Patent Nos. 583461, 604227; South African Patent No. 201,001,068; Other International Patents Pending.



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## Chapter 1

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# Chapter 1

## 1.0 Imbrium® Systems Contact Information

Imbrium® Systems is an engineered stormwater treatment company that designs, develops, manufactures, and distributes post-construction stormwater quality treatment technologies, to protect water resources from pollutants. Imbrium has a strong record of environmental innovation in the industry as the creator of the Stormceptor® oil and sediment separator, the Jellyfish® Filter, Sorbtive® MEDIA, Sorbtive® FILTER, and Sorbtive® VAULT.

Imbrium Systems is a global company with U.S. headquarters (Imbrium Systems Corporation) located in Rockville, Maryland and Canadian and International headquarters (Imbrium Systems Incorporated and Imbrium International Limited) located in Toronto, Ontario, Canada.

The Jellyfish® Filter is represented by a variety of licensees and organizations globally.

**For assistance, please contact Imbrium Systems at:**

**United States:** 888-279-8826 or 301-279-8827

**Canada / International:** 800-565-4801 or 416-960-9900

# Chapter 2

## 2.0 Jellyfish Filter Design Overview

This technical manual provides information for design and installation of the Jellyfish Filter. When designed properly in accordance with this Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters. Test data is available from Imbrium Systems upon request.

## 2.1 Jellyfish Filter Description

The Jellyfish Filter (patent pending) is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge consists of multiple membrane-encased filter elements (“filtration tentacles”) attached to a cartridge head plate. The filtration tentacles provide an extraordinarily large amount of surface area, resulting in superior flow capacity and suspended sediment removal capacity.

Jellyfish efficiently captures a high level of stormwater pollutants, including:

- Greater than 85% of the total suspended solids (TSS) load, including particles less than 5 microns
- Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons, and bacteria
- Free oil
- Floatable trash and debris

Jellyfish cartridges are passively backwashed automatically after each storm event, which removes accumulated sediment from the membranes and significantly extends the service life of the cartridges and the maintenance interval. If required, the cartridges can be easily manually backwashed without removing the cartridges. Additionally, the lightweight cartridges can be removed by hand and externally rinsed, and rinsed cartridges then re-installed. These simple maintenance options allow for cartridge regeneration, thereby minimizing cartridge replacement costs and life-cycle treatment costs while ensuring long-term treatment performance. The Jellyfish Filter is comprised of several structural and functional components:

- A **cylindrical (manhole) or rectangular structure** constructed of either precast concrete or fiberglass, and available in a wide variety of sizes and configurations, serves as a vessel that provides long-lasting structural support for the system; provides hydraulic connections to the inlet and outlet pipes; provides surfaces for structural attachment of the cartridge deck and maintenance access wall; provides influent water storage and flow-through volume for pollutant separation and membrane filtration treatment; and provides a high-volume sump for storage of accumulated sediment.
- A rigid high-strength fiberglass **cartridge deck** separates the vessel into a lower chamber and upper chamber; houses the filter cartridges; provides a surface and flow path for treated water to the effluent pipe; provides doublewall containment of oil and other hydrocarbons below deck; and provides a platform for maintenance personnel to safely service the filter cartridges. The lower chamber provides influent water storage and flow-through volume for pollutant separation and membrane filtration treatment, and storage of accumulated sediment. The upper chamber provides above-deck clearance for inspection and maintenance service. The cartridge deck is securely attached to the vessel wall.
- A rigid high-strength fiberglass **maintenance access wall** attenuates influent water velocity; channels influent water into the lower chamber via a large opening in the cartridge deck; provides storage volume for floatable pollutants; and serves as a convenient inspection and maintenance access point for pollutant removal.
- **Cartridge receptacles** are secured to the cartridge deck and together with the cartridge lids, serve to securely anchor the filter cartridges into the cartridge deck.
- **Jellyfish membrane filtration cartridges** are inserted into the cartridge receptacles and secured with the cartridge lids. The filter cartridges treat the influent stormwater by filtering out fine suspended particulates (TSS) and particulate-bound pollutants on the membrane of each filtration tentacle. Filtered water passes through the membranes, flows up the center tube of each filtration tentacle and exits the top opening of each tentacle. Cartridges are available in various lengths and flow ratings. Filter cartridges are designated as either **hi-flo cartridges** or **draindown cartridges**, depending on their placement position within the cartridge deck. Cartridges placed within the backwash pool weir are automatically passively backwashed after each storm event, and are designated the hi-flo cartridges. Cartridges placed outside the backwash pool weir are not passively backwashed but facilitate the draindown of the backwash pool and these are designated the draindown cartridges. The design flow rate of a draindown cartridge is controlled by a cartridge lid orifice to one-half the design flow rate of a hi-flo cartridge of similar length. The lower design flow rate of the draindown cartridge reduces the likelihood of occlusion prior to scheduled maintenance.

- **Cartridge lids** are fastened onto the cartridge receptacles to securely anchor the filter cartridges into the cartridge deck. The lids are removable to allow manual backflushing or removal of the filter cartridges when required during maintenance service. Cartridge lids contain a **flow control orifice** that is specifically sized for use with hi-flo and draindown cartridges. **Blank lids** have no orifice and are used to cover unoccupied cartridge receptacles in systems that do not use the full rated flow capacity of the system.
- A **separator skirt** serves as a baffle that encloses the filtration tentacles and defines the filtration zone inside the separator skirt perimeter. The separator skirt extends the full length of the filtration tentacles and prevents contamination of the membranes with oil and floatable debris. The separator skirt has a large opening at the bottom that allows pre-treated water to enter the filtration zone under low velocity. The separator skirt is securely attached to the underside of the cartridge deck.
- A rigid fiberglass **backwash pool weir** extends 6 inches (150 mm) above the cartridge deck and encloses the hi-flo cartridges. During inflow, filtered water exiting the hi-flo cartridges forms a pool inside the weir. If sufficient driving head is available the pool overtops the weir and spills to the cartridge deck where it subsequently flows to the outlet pipe. As the inflow event subsides and forward driving head decreases, water in the backwash pool reverses flow direction and automatically passively backwashes the hi-flo cartridges, cleaning the membrane surfaces. Water in the lower chamber (below deck) is displaced through the draindown cartridges. This self-cleaning mechanism may occur multiple times during a single storm event as rainfall/runoff intensities rise and fall, thereby significantly extending the service life of the cartridges and the maintenance interval.
- **Optional internal bypass pressure relief pipe(s)** can be placed in one or multiple cartridge receptacles. The pressure relief pipe height and diameter can be varied to accommodate the design peak flow rate and system driving head requirements. When the internal bypass option is utilized, peak flow rates receive membrane filtration treatment up to the filtration design flow rate, with the balance of the peak flow receiving pre-treatment.
- A **deflector plate** (below-deck inlet pipe manhole configuration only) is installed across the below-deck inlet pipe opening to induce tangential water flow through the pre-treatment channel between the vessel wall and separator skirt.
- **Standard covers, rectangular hatches, or inlet grates** are installed at the surface and are removed to allow maintenance access to the system.
- **Built-in steps or ladder(s)** allow maintenance personnel to access the cartridge deck and filter cartridges. The Jellyfish Filter and components are depicted in **Figure 1**.

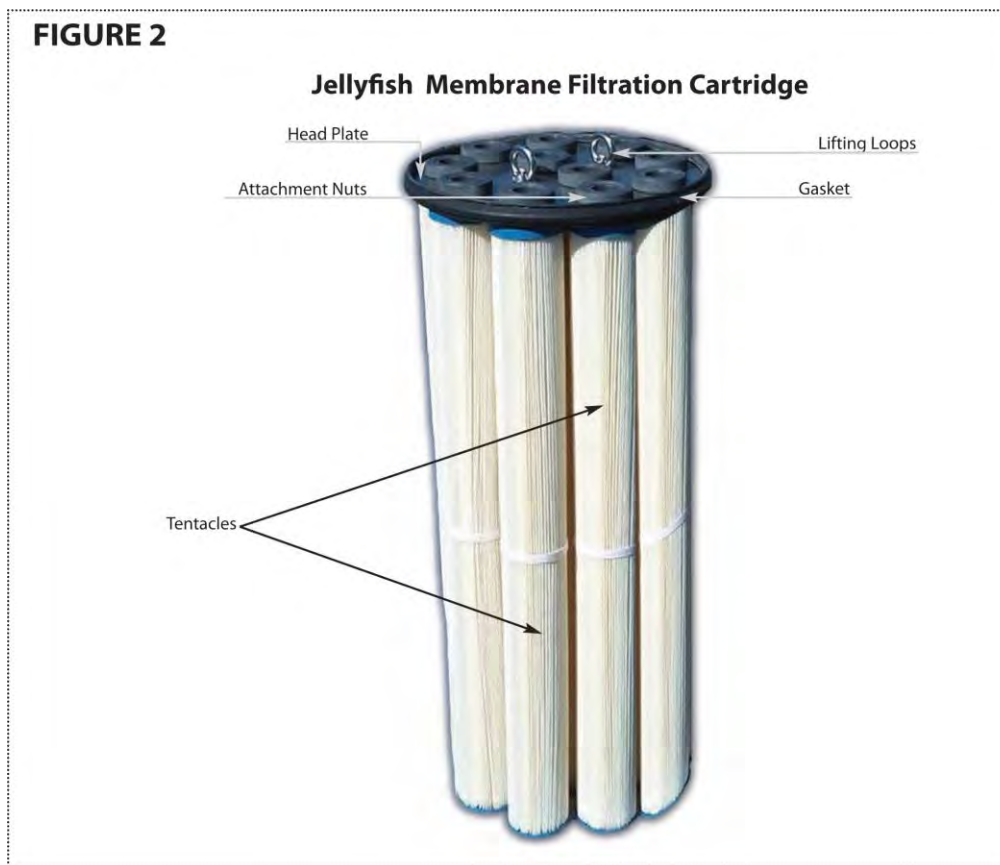


**Note:** Separator Skirt Not Shown

## 2.2 Jellyfish Membrane Filtration Cartridge

The Jellyfish Filter utilizes multiple lightweight membrane filtration cartridges. Each cartridge consists of multiple removable filter elements ("filtration tentacles") attached to a cartridge head plate. Each filtration tentacle consists of a central perforated tube surrounded by a specialized membrane. The cylindrical filtration tentacle has a threaded pipe nipple at the top and is sealed at the bottom with an end cap. A cluster of tentacles is attached to a stainless steel head plate by inserting the top pipe nipples through the head plate holes and securing with removable nuts. A removable oil-resistant polymeric rim gasket is attached to the head plate to impart a watertight seal when the cartridge is secured into the cartridge receptacle with the cartridge lid. A Jellyfish membrane filtration cartridge is depicted in **Figure 2**.

The cartridge length is typically either 27 inches (686 mm) or 54 inches (1372 mm), with options for custom lengths if required. The dry weight of a new cartridge is less than 20 pounds (9 kg), and the wet weight of a used cartridge is less than 50 pounds (23 kg), making a cartridge easy to install and remove by hand. No heavy lifting equipment is required.



The filtration tentacle membranes provide an extraordinarily large amount of surface area, resulting in superior flow capacity and suspended sediment removal capacity. A typical Jellyfish cartridge with eleven 54-inch (1372 mm) long filtration tentacles has 381 ft<sup>2</sup> (35.4 m<sup>2</sup>) of membrane surface area. Hydraulic testing on a clean 54-inch (1372 mm) filter cartridge has demonstrated a flow rate of 180 gpm (11.3 L/s) at 18 inches (457 mm) of driving head.

Extensive third-party field testing, including testing at an urban site with very high intensity rainfall and runoff, has demonstrated consistently high pollutant removal performance with a conservative design flow rate of 80 gpm (5.0 L/s) for the 54-inch (1372 mm) long hi-flo cartridge and 40 gpm (2.5 L/s) for the 54-inch (1372 mm) long draindown cartridge. These values translate to a conservative design membrane filtration flux rate (flow per unit surface area) of 0.21 gpm/ft<sup>2</sup> (0.14 Lps/m<sup>2</sup>) for the hi-flo cartridge and 0.11 gpm/ft<sup>2</sup> (0.07 Lps/m<sup>2</sup>) for the draindown cartridge.

The standard membrane demonstrates removal of >85% of fine sediment at a design flux rate of 0.21 gpm/ft<sup>2</sup>, based on laboratory testing with Sil-Co-Sil™106 which has a median particle size (d<sub>50</sub>) of 22 microns. In addition, the filtration tentacle membrane has anti-microbial characteristics that inhibit the growth of bio-film that might otherwise prematurely occlude the pores of the membrane and restrict hydraulic conductivity.

Hydraulic and sediment loading testing has demonstrated scalability of the membrane filtration surface area such that increases in the number and/or length of filtration tentacles contribute a uniform increase in total filter surface area and therefore flow capacity and sediment removal capacity. The flow rating of a particular Jellyfish Filter cartridge is based on the membrane filtration surface area of the cartridge and data collected from both laboratory testing and field testing.

The cartridge deck contains a receptacle for each filter cartridge. The cartridge is lowered down into the receptacle such that the cartridge head plate and rim gasket rest on the lip of the receptacle. A cartridge lid is fastened onto the receptacle to anchor the cartridge. Each cartridge lid contains a flow control orifice. The orifice in the hi-flo cartridge lid is larger than the orifice in the draindown cartridge lid.

Jellyfish Filter cartridges are designated as either hi-flo cartridges or draindown cartridges, depending on their placement position within the cartridge deck. Cartridges placed within the 6-inch (150 mm) high backwash pool weir that extends above the deck are automatically passively backwashed after each storm event and are designated as the hi-flo cartridges. Cartridges placed outside the backwash pool weir are not passively backwashed but facilitate the draindown of the backwash pool, and these are designated as the draindown cartridges. The design flow rate of a draindown cartridge is controlled by a cartridge lid orifice to one-half the design flow rate of a hi-flo cartridge of similar length. The lower design flow rate of the draindown cartridge reduces the likelihood of occlusion prior to scheduled maintenance.

Inflow events with driving head ranging from less than 1 inch (25 mm) up to the maximum design driving head will cause continuous forward flow and filtration treatment through the draindown cartridges. Inflow events with driving head that exceeds the 6-inch (150 mm) height of the backwash pool weir will cause continuous forward flow and filtration treatment through the hi-flo cartridges.

## **2.3 Jellyfish Filter Operation – Driving Head Requirement**

A differential in upstream and downstream water elevation during an inflow event provides the minimal driving head required to overcome the minor cumulative friction loss through the system, at which point flow-through operation of the Jellyfish Filter commences.

For systems using an external bypass with upstream diversion structure, the driving head is calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. For systems using an internal bypass, the driving head is calculated as the difference in elevation between the top of the pressure relief pipe(s) and the invert of the outlet pipe.

A minimum design driving head is selected to achieve design flow rates, while accounting for gradual increase in system head loss at the design flow rate due to long-term accumulation of sediment on the filtration membranes. A clean Jellyfish Filter cartridge has flow capacity far in excess of the cartridge design flow rate at the design driving head. This ensures that design flow capacity is maintained during the period between maintenance service operations. Typically, a minimum 18 inches (457 mm) of driving head is designed into the system but may vary from 12 to 24 inches (305 to 610 mm) depending on specific site requirements.

For systems that may experience submerged or backwater conditions due to dry weather base flow or tidal effects, driving head calculations must account for water elevation during the backwater condition. The Jellyfish Filter treatment functions will continue to operate during forward flow despite backwater conditions. An increase in the maintenance access wall height may be required to ensure floatables capture an increase in the height of the backwash pool weir may be required to ensure function of the automatic passive backwash feature.

## 2.4 Jellyfish Filter Operation – Treatment Functions

The Jellyfish Filter provides both **pre-treatment** and **membrane filtration** treatment to remove pollutants from stormwater runoff. These functions are depicted in **Figure 3** below.



**Pre-treatment** removes coarse sediment (generally > 50 microns), particulate-bound pollutants attached to coarse sediment (nutrients, toxic metals, hydrocarbons), free oil and floatable trash and debris. These pollutants are removed by gravity separation. Large, heavy particles fall to the sump (sedimentation) and low density pollutants rise to the surface (floatation) within the pre-treatment channel.

Pre-treatment begins when influent flow enters the system either through an above-deck inlet pipe (standard) or below-deck inlet pipe (optional). In the above-deck inlet pipe configuration, influent enters the maintenance access wall zone and is channeled through a large-diameter opening in the cartridge deck to the lower chamber. The large surface area of the deck opening and change in flow direction attenuate the influent flow velocity. Due to equalization of hydrostatic pressure and downstream pathway through the opening at the bottom of the separator skirt, influent flow spreads in lateral and downward directions throughout the pre-treatment channel between the vessel wall and the outer perimeter of the separator skirt. In the below-deck inlet pipe configuration, a deflector plate angled across the inlet pipe opening induces directional tangential flow in the pre-treatment channel. In either configuration, flow spreading throughout the pre-treatment channel serves to reduce the average flow velocity and enhance the separation of pollutants.

Pre-treatment for floatables occurs as buoyant pollutants rise toward the surface, with some of the floatables mass trapped beneath the cartridge deck in the pre-treatment channel. Most of the floatables mass accumulating in the maintenance access wall zone at the air-water interface. This feature allows convenient and easy inspection and maintenance for floatable contaminants. The separator skirt protects the filtration tentacles from contamination by oil and floatable debris.

Coarse sediment settles out of the pre-treatment channel to the sump. As water from the pre-treatment channel slowly flows downward and then laterally beneath the separator skirt, the combination of the large opening in the bottom of the separator skirt and a change in direction to an upward downstream flow path serves to further reduce average flow velocity and enhance particle separation. Sediment is stored in the sump until removed by vacuum during a maintenance service.

**Membrane filtration treatment** removes suspended particulates (generally < 50 microns) and particulate-bound pollutants (nutrients, toxic metals, hydrocarbons, and bacteria). Laboratory and field performance testing of the Jellyfish Filter have demonstrated capture of particulates as small as 2 microns.

Filtration treatment begins when pre-treated influent flows under the separator skirt and into the filtration zone through the large opening defined by the bottom edge of the separator skirt. Uniform hydraulic pressure gradient across the entire membrane surface area causes pre-treated water to penetrate the entire membrane surface area of each filtration tentacle. Water enters the membrane pores radially and deposits fine particulates on the exterior membrane surface. Filtered water flows into the perforated center drain tube of each filtration tentacle and then upward and out the top of each tentacle. Water exiting each of the tentacles of a single cartridge combines at the top of the cartridge under the cartridge lid. The combined flow then vertically exits the cartridge lid orifice with a pulsating fountain effect.

As a layer of sediment builds up on the external membrane surface, membrane pores are partially occluded which serves to reduce the effective pore size. This process, referred to as “filter ripening”, significantly improves the removal efficiency of pollutants relative to a brand new or clean membrane of some nominal pore size. Filter ripening accounts for the ability of the Jellyfish Filter to remove particles finer than the nominal pore size rating of the membranes.

Jellyfish Filter operation and maintenance are depicted in an animation on Imbrium Systems website ([www.imbriumsystems.com](http://www.imbriumsystems.com)).

## 2.5 Jellyfish Filter Operation – Self- Cleaning Functions

The Jellyfish Filter utilizes several self-cleaning processes to remove accumulated sediment from the external surfaces of the filtration membranes, including **automatic passive backwash** of the hi-flo cartridges, **vibrational pulses**, and **gravity**. Combined, these processes significantly extend the cartridge service life, maintenance interval and reduce life-cycle costs.

**Automatic passive backwash** is performed on the hi-flo cartridge at the end of each runoff event and can also occur multiple times during a single storm event as intensity and driving head varies. During inflow, filtered water exiting the hi-flo cartridges forms a pool above the cartridge deck inside the backwash pool weir. The depth and volume of the back wash pool will vary with the available driving head, ranging from some minimal quantity up to a quantity sufficient to fill and overflow the backwash pool (typical weir height is 6 inches / 150 mm). As the inflow event subsides and forward driving head decreases, water in the backwash pool reverses flow direction and automatically passively backwashes the hi-flo cartridges, removing sediment from the membrane surfaces. Water in the lower chamber (below deck) is displaced through the draindown cartridges.

**Vibrational pulses** occur as a result of complex and variable pressure and flow direction conditions that a rise in the space between the top surface of the cartridge head plate and the underside of the cartridge lid. During forward flow a stream of filtered water exits the top of each filtration tentacle into this space and encounters resistance from the cartridge lid and turbulent pool of water within the space. Water is forced through the cartridge lid flow control orifice with a pulsating fountain effect. The variable localized pressure causes pulses that transmit vibrations to the membranes, thereby dislodging accumulated sediment. The effect appears more pronounced at higher flow rates, and applies to both hi-flo and draindown cartridges.

**Gravity** continuously applies a force to accumulate sediment on the membranes, both during inflow events and inter-event dry periods. As fine particles agglomerate into larger masses on the membrane surface, adhesion to the membrane surface can lessen, and a peeling effect ensues which ultimately results in agglomerates falling away from the membrane. Complex chemical and biological effects may also play a role in this process.

## Chapter 3

### 3.0 Jellyfish Filter Design Guidelines

The Jellyfish Filter has many flexible design features to accommodate a wide range of specific site requirements and constraints. For design assistance, please contact Imbrium Systems.

#### 3.1 Configurations and Design Capacities

Design flow capacities and pollutant capacities for standard Jellyfish Filter manhole configurations are shown in **Tables 1 and 2**.

The Jellyfish Filter standard model numbers provide information about the manhole inside diameter (expressed in U.S. customary units) and cartridge counts for hi-flo and draindown cartridges. For example, Jellyfish Filter Model Number JF6-4-1 is a 6-ft (1.8 m) diameter manhole with four hi-flo cartridges and one draindown cartridge. Standard model numbers assume the use of 54-inch (1372 mm) long cartridges. Specific designations for non-standard structures or cartridge lengths are noted in the **Jellyfish Filter Owner's Manual**.

**Table 1**  
**Design Flow Capacities**  
**Standard Jellyfish Filter Manhole Configurations**

Manhole Diameter (ft / m) <sup>1</sup>	Model No.	Hi-Flo Cartridges <sup>2</sup> 54 in / 1372 mm	Draindown Cartridges <sup>2</sup> 54 in / 1372 mm	Treatment Flow Rate (gpm / cfs)	Treatment Flow Rate (L/S)
4 / 1.2	JF4-2-1	2	1	200 / 0.45	12.6
6 / 1.8	JF6-3-1	3	1	280 / 0.62	17.7
	JF6-4-1	4	1	360 / 0.80	22.7
	JF6-5-1	5	1	440 / 0.98	27.8
	JF6-6-1	6	1	520 / 1.16	32.8
8 / 2.4	JF8-6-2	6	2	560 / 1.25	35.3
	JF8-7-2	7	2	640 / 1.43	40.4
	JF8-8-2	8	2	720 / 1.60	45.4
	JF8-9-2	9	2	800 / 1.78	50.5
	JF8-10-2	10	2	880 / 1.96	55.5
10 / 3.0	JF10-11-3	11	3	1000 / 2.23	63.1
	JF10-12-3	12	3	1080 / 2.41	68.1
	JF10-12-4	12	4	1120 / 2.50	70.7
	JF10-13-4	13	4	1200 / 2.67	75.7
	JF10-14-4	14	4	1280 / 2.85	80.8
	JF10-15-4	15	4	1360 / 3.03	85.8
	JF10-16-4	16	4	1440 / 3.21	90.8
	JF10-17-4	17	4	1520 / 3.39	95.9
	JF10-18-4	18	4	1600 / 3.56	100.9
	JF10-19-4	19	4	1720 / 3.83	108.5
12 / 3.6	JF12-20-5	20	5	1800 / 4.01	113.6
	JF12-21-5	21	5	1880 / 4.19	118.6
	JF12-22-5	22	5	1960 / 4.37	123.7
	JF12-23-5	23	5	2040 / 4.54	128.7
	JF12-24-5	24	5	2120 / 4.72	133.8
	JF12-25-5	25	5	2200 / 4.90	138.8
	JF12-26-5	26	5	2280 / 5.08	143.8
	JF12-27-5	27	5	2360 / 5.26	148.9

<sup>1</sup> Smaller and larger systems may be custom designed

<sup>2</sup> Shorter length cartridge configurations are available

**Table 2**  
**Design Pollutant Capacities**  
**Standard Jellyfish Filter Manhole Configurations**

<b>Model Diameter (ft / m)</b>	<b>Wet Volume Below Deck (ft<sup>3</sup> / L)</b>	<b>Sediment Capacity<sup>1</sup> (ft<sup>3</sup> / L)</b>	<b>Oil Capacity<sup>2</sup> (gal / L)</b>
<b>JF4</b> 4 / 1.2	82 / 2313	12 / 0.34	100 / 379
<b>JF6</b> 6 / 1.8	184 / 5205	28 / 0.79	224 / 848
<b>JF8</b> 8 / 2.4	327 / 9252	50 / 1.42	388 / 1469
<b>JF10</b> 10 / 3.0	511 / 14,456	78 / 2.21	608 / 2302
<b>JF12</b> 12 / 3.6	735 / 20,820	113 / 3.20	732 / 2771

<sup>1</sup> Assumes 12 inches (305 mm) of sediment depth in sump.  
Systems may be designed with increased sediment capacity.

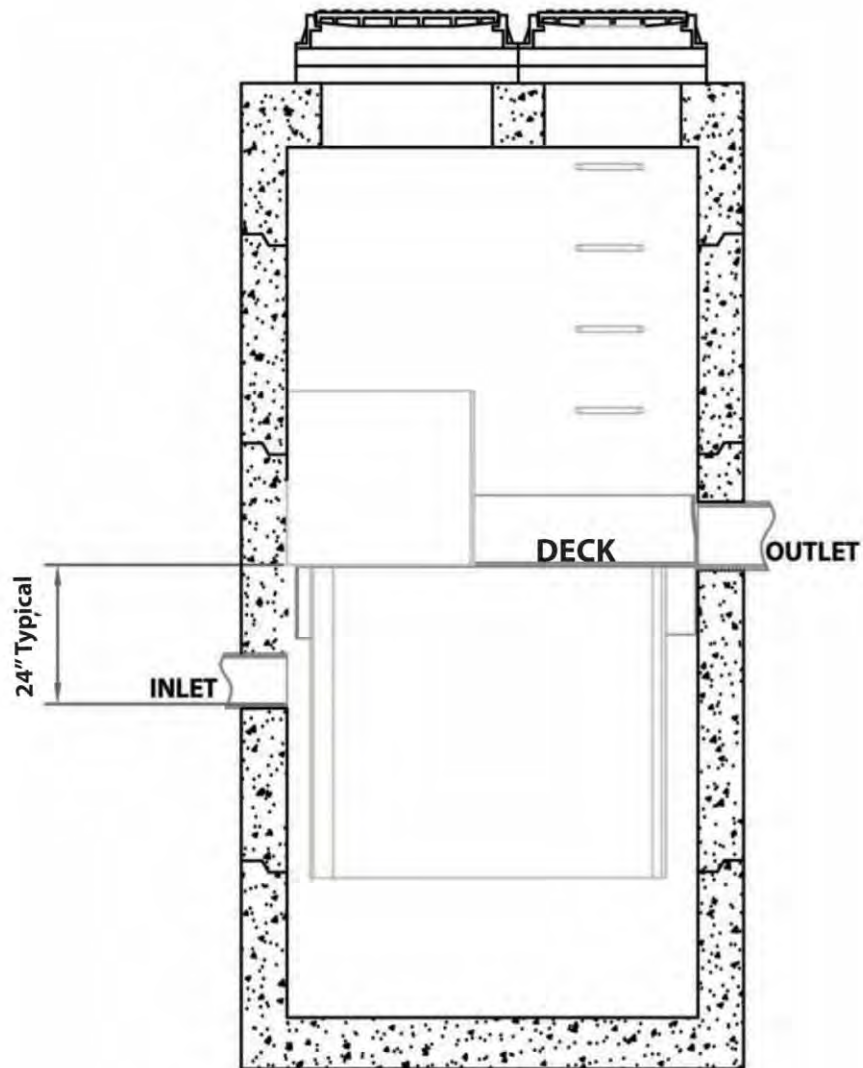
<sup>2</sup> Assumes 24 inches (610 mm) of pre-treatment channel depth for oil storage

### 3.2 Inlet and Outlet Pipes

The Jellyfish Filter is available in both the standard **above-deck inlet pipe** configuration and optional **below-deck inlet** pipe configuration. Specific site requirements generally determine the configuration that is most favorable for the site. For both configurations, the invert elevation of the outlet pipe is identical to the cartridge deck elevation. Please refer to **Figures 4** and **5**.

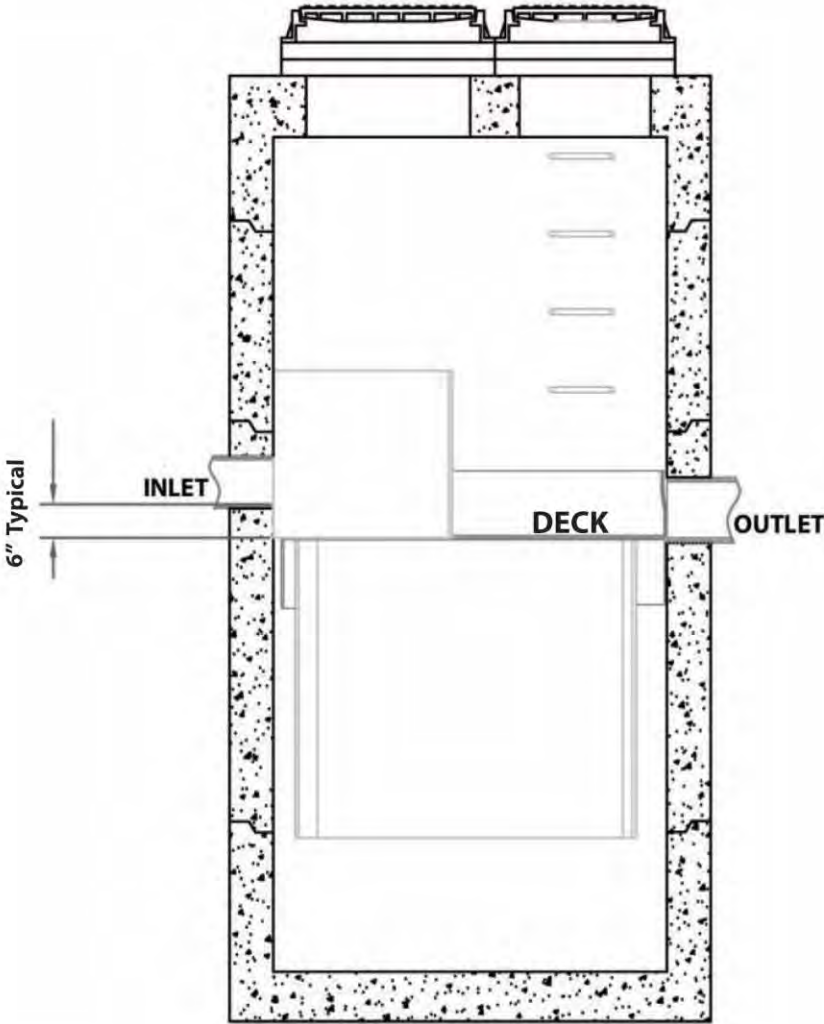
**FIGURE 4**

**Jellyfish Configuration  
with Below-Deck Inlet Pipe**



**FIGURE 5**

**Jellyfish Configuration  
with Above-Deck Inlet Pipe**



For the standard above-deck inlet pipe configuration, the invert elevation of the inlet pipe is typically set 6 inches (150 mm) higher than the invert elevation of the outlet pipe. This generally ensures that the inlet pipe will drain completely at the conclusion of each rainfall/runoff event, while providing sufficient volume within the maintenance access wall zone for surface accumulation of floatables below the inlet pipe. The elevation of the inlet pipe can be varied as required.

The Jellyfish Filter can accommodate a wide range of angles between the inlet and outlet pipes. The inlet pipe can be located anywhere about the circumference of the structure. The separation angle relationship of the inlet pipe to the outlet pipe can vary from 0 to 360 degrees to provide maximum design flexibility. Typical off-line layouts (external bypass using an upstream diversion structure) will have an inlet to outlet separation angle of 90 to 120 degrees. See **Table 3** below for the minimum separation angle for standard manhole configurations with an above-deck inlet pipe.

The Jellyfish Filter can accommodate **multiple inlet pipes** within certain restrictions.

The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems.

**Table 3**  
**Minimum Inlet and Outlet Pipe Separation Angles and Diameters**  
**(Jellyfish Filter Manhole Configurations with Above-Deck Inlet Pipe)**

<b>Model Diameter (ft / m)</b>	<b>Minimum Angle <sup>1</sup> Inlet / Outlet Pipes</b>	<b>Minimum Inlet Pipe Diameter (in / mm)</b>	<b>Minimum Outlet Pipe Diameter (in / mm)</b>
<b>JF4</b> 4 / 1.2	62°	6 / 152	8 / 203
<b>JF6</b> 6 / 1.8	59°	8 / 203	10 / 254
<b>JF8</b> 8 / 2.4	52°	10 / 254	12 / 305
<b>JF10</b> 10 / 3.0	48°	12 / 305	18 / 457
<b>JF12</b> 12 / 3.6	40°	12 / 305	18 / 457

<sup>1</sup> Assumes off-line (external bypass) configuration

### 3.3 Bypass Design

The Jellyfish Filter can be designed with either an off-line or on-line configuration. All stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations.

A standard off-line configuration has an external bypass that uses an upstream diversion structure. The elevation difference between the top of the diversion structure weir and the Jellyfish Filter outlet pipe invert establishes the design driving head associated with the design flow rate. Excess flow that overtops the diversion weir bypasses the Jellyfish Filter and proceeds downstream. Drawings that illustrate relative system elevations are available by contacting Imbrium Systems.

For some sites an off-line configuration may not be practical and use of an on-line configuration is advantageous. In these cases, an optional internal bypass pressure relief pipe(s) can be placed in one or multiple cartridge receptacles within the Jellyfish Filter. The pressure relief pipe height and diameter can be varied to accommodate the design peak flow rate and system driving head requirements. For these systems the driving head is calculated as the difference in elevation between the top of the pressure relief pipe and the invert of the outlet pipe. When the internal bypass option is utilized, peak flow rates receive membrane filtration treatment up to the filtration design flow rate, with the balance of the peak flow receiving pre-treatment. Increased sump depth may be required to increase sediment storage capacity and to minimize re-suspension of previously captured sediment at peak flow rates. Please contact Imbrium Systems for design assistance.

### 3.4 Shallow or Low Cover Installations

For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover to provide adequate access to all the cartridges within the unit. The general minimum depth of cover is 36 inches (915 mm) from the Jellyfish outlet pipe invert to the underside of the top slab. Further custom modifications may be possible. A typical drawing is included in **Appendix A** and **B**.

### 3.5 Submerged Installations

When properly designed, the Jellyfish Filter will function effectively under submerged conditions. For systems that may experience submerged or backwater conditions due to dry weather base flow or tidal effects, driving head calculations must account for water elevation during the backwater condition. The Jellyfish Filter treatment functions will continue to operate during forward flow despite backwater conditions. A customized increase to the maintenance access wall height may be required to ensure floatables capture and an increase in the height of the backwash pool weir may be required to ensure function of the automatic passive backwash feature.

### 3.6 Grated Inlet and Curb Inlet Jellyfish Filters

Existing drainage systems can be retrofitted by replacing conventional storm inlets with a Jellyfish Filter inlet. Imbrium Systems has two standard options, curb inlet and grated inlet configurations. Both configurations utilize the shorter 27-inch (686 mm) length Jellyfish filter cartridges and require minimal cover. Two typical drawings are included in **Appendix A** and **B**. Further custom modifications may be possible.

### 3.7 Series Jellyfish Filter

For sites with water quality treatment flow rates that exceed the design flow rate of the largest standard Jellyfish Filter model, custom systems can be designed that hydraulically connect multiple Jellyfish Filters in series. Please contact Imbrium Systems for assistance.

### 3.8 Jellyfish Filter with Sump Drain

The Jellyfish Filter is typically designed to maintain a pool of water in the lower chamber (below deck) between storms. However, certain sites or jurisdictions may require draindown of the sump between storms. To meet these requirements, a sump drain filter can be installed to slowly drain the lower chamber pool to the sub-grade for infiltration or to an alternate point of discharge. A typical drawing is included in **Appendix A** and **B**.

## Chapter 4

### 4.0 Jellyfish Filter Sizing Guidelines

The Jellyfish Filter is sized based on considerations of the specified treatment flow rate, anticipated sediment mass load transported from the site and required pollutant storage capacities.

An optional software-based continuous simulation modeling tool, such as **PCSWMM for Stormceptor**<sup>®</sup>, can be utilized to determine site hydrology from local historical rainfall data and thereby assist in sizing a Jellyfish Filter. In general, such a tool is useful in deriving the water quality treatment flow rate associated with treatment of a high percentage of the average annual runoff volume.

### 4.1 Sizing for Water Quality Treatment Flow Rate

The Jellyfish Filter can be sized using a specified flow rate (i.e. "water quality flow rate" or "treatment flow rate"). The treatment flow rate is determined by the engineer in accordance with methods approved by the local jurisdiction. The appropriate Jellyfish Filter model number is then selected from **Table 1**. Custom systems can be designed for sites with water quality treatment flow rates that exceed the design flow rate of the largest standard Jellyfish Filter model. Please contact Imbrium Systems for assistance.

### 4.2 Sizing for Sediment Mass Loading

A second sizing consideration is the anticipated sediment load that will enter the Jellyfish Filter. For a stormwater filter system to have practical application in the field, it is important that the system's sediment mass loading and storage is recommended that a system be designed to accommodate a minimum one year interval between maintenance services for pollutant removal and filter cartridge flushing/rinsing.

Laboratory testing using a standard test sediment demonstrated sediment mass loading capacity of 125 pounds (57 kg) of sediment per 54-inch (1372 mm) long hi-flo cartridge at 18 inches (457 mm) of driving head (see **Table 4** below). Specific site conditions will influence the sediment mass loading capacity of the Jellyfish Filter due to the variable nature of sediment characteristics, rainfall intensity, time intervals between runoff events and frequency of automatic passive backwash.

The projected annual sediment load transported from the site should be determined by the engineer. Calculations can be performed for the projected annual runoff volume using an assumed event mean suspended solids concentration (typically 60 mg/L for urban sites). As a guideline, the U.S. EPA has determined typical annual sediment loads per acre for various sites by land use (see **Table 5**). Certain states and local jurisdictions have also established such guidelines.

For some sites the Jellyfish Filter is installed downstream of a detention facility. In these cases, the Jellyfish Filter will typically treat a relatively low flow rate (orifice-controlled release flow rate) from the detention facility compared to flow rates that would be treated if the Jellyfish Filter received the site runoff directly. In such cases, the size of the Jellyfish Filter and number of filter cartridges will typically be determined by the projected annual sediment mass load transported to the Jellyfish Filter, accounting for sediment mass that is expected to settle out in the upstream detention facility.

It is important for the engineer to confirm that the system design has adequate storage capacity for anticipated pollutant loads that will accumulate over the specified maintenance interval. The oil and sediment pollutant capacities for each standard Jellyfish Filter model are shown in **Table 2**.

**Table 4**  
**Sediment Mass Loading Capacity**  
**Jellyfish Filter Hi-Flo and Draindown Cartridges**

Cartridge Type	Cartridge Length (in / mm)	Driving Head (in / mm)	Sediment Mass Loading Capacity <sup>1, 2</sup> (lbs / kg)
Hi-Flo	27 / 686	18 / 457	63 / 28
Hi-Flo	54 / 1372	18 / 457	125 / 57
Draindown	27 / 686	18 / 457	32 / 15
Draindown	54 / 1372	18 / 457	63 / 28

<sup>1</sup> Based on laboratory testing using simulated storm events and Sil-Co-Sil™ 106 test sediment ( $d_{50} = 22$  microns) at 40% of maximum cartridge flow rate

<sup>2</sup> Sediment Mass Loading Capacity expressed as pounds of NJPSD test sediment (1 – 1000 microns,  $d_{50} = 67$  microns, characterized as 55% sand / 40% silt / 5% clay), using conversion factor of 1.66 from Sil-Co-Sil 106 to NJPSD

**Note:** Actual sediment mass loading capacity will vary depending on specific site characteristics

**Table 5  
Typical Urban Areas and Pollutant Yields (Sediment)  
(Burton and Pitt, 2002)**

Annual Total Suspended Solids Load by Land Use (lbs/acre/year) (kg/hectare/year)							
Commercial	Parking Lot	Residential Density			Highways	Industrial	Shopping Centers
		High	Med.	Low			
1000	400	400	250	10	880	500	440
1120	448	448	280	11	986	560	493

Source: U.S. EPA Stormwater Best Management Practice Design Guide, Volume 1, Appendix D, Table D-1, Burton and Pitt 2002

### 4.3 Continuous Simulation Sizing Tool

A software-based continuous simulation modeling tool such as **PCSWMM for Stormceptor®**, can be utilized to determine site hydrology from local historical rainfall data, thereby assist in sizing a Jellyfish Filter. In general, such a tool is useful in deriving the water quality treatment flow rate associated with treatment of a high percentage (typically 80 - 90%) of the average annual runoff volume. The appropriately sized Jellyfish Filter is then selected from **Table 1** based on the derived water quality treatment flow rate. Please contact Imbrium Systems for assistance with optional sizing methodology.

## Chapter 5

### 5.0 Jellyfish Filter Installation

The installation of the precast concrete or fiberglass Jellyfish Filter structure should conform to state highway, provincial or local specifications for the installation of maintenance manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

For more information, please refer to the Jellyfish Filter Performance Specification with document title **Standard Specification – Water Quality Filter Treatment Device**.

#### Excavation

- Excavation and general site preparation for the installation of the Jellyfish Filter structure should conform to state highway, provincial or local specifications.
- Topsoil removed during the excavation should be stockpiled in designated areas and should not be mixed with subsoil or other materials.
- The Jellyfish Filter structure should not be installed on frozen ground.
- Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required.
- If the bottom of the excavation provides an unsuitable foundation additional excavation may be required. In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

- Level the sub-grade to the proper elevation. Verify the elevation against the structure dimensions, the invert elevations on the approved Jellyfish Filter drawing and the site plans. Adjust the base aggregate if necessary. Verify the soil bearing capacity is adequate for the required load.

#### Installation of Jellyfish Filter Structure

- Set the base section of the Jellyfish Filter structure on solid sub-grade.
- Verify the level and elevation of the base section before adding any riser sections.
- Add specified watertight seal to the base section. Set riser section(s) on the base section.
- Install the inlet and outlet pipes to the structure.
- Install the top slab and frames and covers.
- Do not install Jellyfish membrane filtration cartridges until the upstream catchment and site have been stabilized.

#### Installation of Jellyfish Membrane Filtration Cartridges

- After the upstream catchment and site have been stabilized, remove any accumulated sediment and debris from the structure.
- Safely descend to the cartridge deck using the ladder attached to the sidewall of the manhole. Confined space entry procedures are required.
- Carefully lower the Jellyfish membrane filtration cartridges into the cartridge receptacles within the cartridge deck. A filter cartridge should be placed into each of the draindown cartridge receptacles outside the backwash pool weir.
- Depending on the specific Jellyfish Filter model number, filter cartridges should be placed into most or all of the hi-flo cartridge receptacles within the backwash pool weir. If a membrane joint snags on the receptacle lip, use a slight twisting or sideways motion to clear the snag. Do not force the membranes down into the cartridge receptacle, as this may damage the membranes. Use a slight downward pressure on the cartridge head plate to seat the rim gasket (thick circular gasket on the stainless steel head plate) into the cartridge receptacle.
- Examine the cartridge lids to differentiate lids with a small orifice, a large orifice and no orifice. Lids with a small orifice are to be inserted into the draindown cartridge receptacles. Lids with a large orifice are to be inserted into the hi-flo cartridge receptacles. Lids with no orifice are to be inserted into unoccupied cartridge receptacles within the backwash pool weir.
- To install a cartridge lid, ensure the cartridge lid male threads are aligned properly with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise to seat the filter cartridge snugly in place.

## Chapter 6

### 6.0 Jellyfish Filter Inspection and Maintenance

For inspection and maintenance information, please refer to the **Jellyfish® Filter Owner's Manual**. Jellyfish Filter operation and maintenance are depicted in an **animation** on Imbrium Systems website ([www.imbriumsystems.com](http://www.imbriumsystems.com)).

## Chapter 7

### 7.0 Jellyfish Filter Replacement Parts

Replacement parts for the JellyfishFilter can be ordered by contacting Imbrium Systems at:

**United States:** 888-279-8826 or 301-279-8827

**Canada / International:** 800-565-4801 / 416-960-9900

[www.imbriumsystems.com](http://www.imbriumsystems.com)

## Chapter 8

### 8.0 Jellyfish Filter Performance Specification

The Jellyfish Filter Performance Specification is contained in the document titled **Standard Specification – Water Quality Filter Treatment Device**, shown in **Appendix C** and available on Imbrium Systems website.



# **Jellyfish® Filter Standard Specifications Water Quality Filter Treatment Device**



## Part 1- General

### 1.1 Work Included

Specifies requirements for construction and performance of an underground stormwater quality filter treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation and membrane filtration.

### 1.2 Reference Standards

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures  
ASTM D 4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks  
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections  
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets  
ASTM D 4101: Specification for Copolymer steps construction

### 1.3 Shop Drawings

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure precast concrete and/or fiberglass (FRP) components.

### 1.4 Handling and Storage

Prevent damage to materials during storage and handling.

## Part 2 - Products

### 2.1 General

#### 2.1.1

The device shall be circular or rectangular and constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications. Alternatively, the device shall be constructed of fiberglass (FRP), installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

#### 2.1.2 Fiberglass Insert (Cartridge Deck)

The concrete device shall include a fiberglass insert bolted and sealed watertight inside the precast concrete chamber. Alternatively, the fiberglass device shall include a fiberglass insert bolted and/or chemically welded watertight inside the fiberglass chamber. The fiberglass insert shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges; (d) a conduit for conveyance of treated water to the effluent pipe.

### 2.1.3 Membrane Filter Cartridges

Filter cartridges shall be comprised of cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 27 inches (690 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid and based on a design flux rate determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum flux rate shall be 0.21 gpm/ft<sup>2</sup> (0.142 lps/m<sup>2</sup>). Each lightweight membrane filter cartridge shall allow for manual installation and removal and shall have a dry installation weight not to exceed the following:

Cartridge Length		Maximum Cartridge Dry Weight for Installation	
27 inches	690 mm	20 pounds	9 kg
54 inches	1,370 mm	25 pounds	12 kg

### 2.1.4 Backwashing Cartridges

The filter device shall have a weir extending above the cartridge deck that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir shall collect a pool of water during inflow events that subsequently automatically backwashes the high flow rate cartridges when the inflow event subsides. All filter cartridges shall allow for use of a manual backwashing or filtration membrane rinsing procedure to restore flow capacity and sediment capacity and extend cartridge service life.

### 2.1.5 Maintenance Access to Captured Pollutants

A Maintenance Access Wall shall enclose an opening in the cartridge deck that has minimum diameter of 18 inches (450 mm) and thereby provide suitable access for removal of accumulated floatable pollutants and sediment.

### 2.1.6 Bend Structure

The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 66-degrees or less in the stormwater conveyance system.

### 2.1.7 Double-Wall Containment of Hydrocarbons

The precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck and the precast vessel wall. Alternatively, a device constructed of fiberglass (FRP) does not require double-wall containment as fiberglass is resistant to hydrocarbon penetration.

### 2.1.8 Separator Skirt

The device shall provide a flexible separator skirt that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The separator skirt shall serve as a baffle to protect the membrane filter elements from contamination by floatables and coarse sediment.

### 2.1.9 Sump

The device must include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer.

## **2.2 Precast Concrete Sections**

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer.

## **2.3 Gaskets**

All gaskets used for the concrete joints shall be manufactured using neoprene or nitrile rubber gaskets to prevent deterioration from presence of captured petroleum hydrocarbons. Mastic sealants or butyl tape are not an acceptable alternative as they are prone to leakage of petroleum hydrocarbons.

## **2.4 Frame and Cover**

Frame and covers must be manufactured from cast-iron and embossed with the name of the device manufacturer or the device brand name.

## **2.5 Doors and Hatches**

If provided shall meet designated loading requirements at a minimum for incidental traffic.

## **2.5 Concrete**

All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

## **2.6 Fiberglass**

The fiberglass portion of the water treatment device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

## **2.7 Steps**

Steps shall be constructed according to ASTM D4101 of copolymer polypropylene and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

## **2.8 Inspections**

All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

## Part 3 – Performance

### 3.1 General

#### 3.1.1 Function

The stormwater quality filter treatment device functions to remove pollutants by the following unit treatment processes; sedimentation, floatation and membrane filtration.

#### 3.1.2 Pollutants

The stormwater quality filter treatment device removes oil, debris, trash, sediment, sediment-bound pollutants, metals and nutrients from stormwater during frequent wet weather events.

#### 3.1.3 Bypass

The stormwater quality filter treatment device typically operates off-line.

#### 3.1.4 Treatment Flux Rate

The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum treatment flux rate across the membrane filter cartridges of 0.21 gpm/ft<sup>2</sup> (0.142 lps/m<sup>2</sup>).

### 3.2 Field Test Performance

At a minimum, the stormwater quality filter device shall have been field tested with a minimum 20 TARP qualifying rain events and field monitoring conducted according to the TARP or TAPE field test protocol.

#### 3.2.1 Suspended Solids Removal

The stormwater quality filter treatment device shall have demonstrated a minimum mean TSS removal efficiency of 85%, and a minimum mean SSC removal of 95%.

#### 3.2.2 Fine Particle Removal

The stormwater quality filter treatment device shall demonstrate the ability to capture fine particles as indicated by an effluent d<sub>50</sub> of 15 microns or lower for all monitored storm events, and an effluent turbidity of 25 NTUs or lower.

#### 3.2.3 Nutrient (Total Phosphorus & Total Nitrogen) Removal

The stormwater quality filter treatment device shall have demonstrated a minimum mean Total Phosphorus removal of 55%, and a minimum mean Total Nitrogen removal of 50%.

### 3.3 Lab Test Performance

#### 3.3.1 Suspended Solids Removal

The stormwater quality treatment device shall demonstrate the ability to remove a minimum of 85% of SiI-Co-Sil 106 (d<sub>50</sub> = 22 microns), measured as SSC, with a 95% confidence interval at the system's 100% operating rate with influent sediment concentrations ranging from 100 to 300 mg/L.

### 3.4 Inspection and Maintenance

The stormwater quality filter device shall have the following features:

3.4.1 The membrane filter elements shall be designed to last three years prior to requiring replacement.

3.4.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade.

3.4.3 Manual backflushing of the filter cartridges shall be possible to restore the flow capacity and sediment capacity of the filter cartridges and therefore extend cartridge service life.

3.4.4 Filter treatment shall have a minimum 12 inches (610 mm) of sediment storage depth.

3.4.5 Sediment removal from the filter treatment device shall be conducted using a standard maintenance truck and vacuum apparatus, and a single point of entry through the cartridge deck that is unobstructed by filter cartridges.

3.4.6 Filter cartridges be easily maintained without the use of additional lifting equipment.

## Part 4 – Execution

### 4.1 Precast & Installation

#### 4.1.1 Construction Sequence

The installation of a precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes. Selected sections of a general specification that are applicable are summarized below.

The precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- riser section and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the stormwater quality treatment device has been constructed, any lift holes must be plugged watertight with mortar or non-shrink grout.

#### 4.1.2 Inlet and Outlet Pipes

Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight.

#### 4.1.3 Frame and Cover Installation

Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

### **4.2 Fiberglass (FRP) Installation**

#### 4.2.1 Construction Sequence

The installation of the FRP device should conform to applicable sections of state, provincial and municipal building codes and highway, municipal or local specifications for the construction of such devices. Selected sections of a general specification that are applicable are summarized below. For detailed installation instructions refer to the submitted drawing and installation details.

Structural - Proposed installation details shall conform to all federal, provincial, state, municipal or other local specifications as may be applicable, including all building code requirements.

Water Quality Device Construction Sequence - The water quality FRP device is installed in the following sequence:

- Water quality device as delivered to site placed on prepared bedding or slab using spreader bars and the lifting lugs provided on the structure. Avoid lifting chains or cables from contacting sides of tank
- Do not drop, roll or slide vessel
- Backfill using approved back fill material
- Pour anti-buoyancy slab as required per the drawing
- Connect inlet and outlet pipes
- Riser sections and/or transitions (if required and if shipped separately)
- Frame and access cover

#### 4.2.2 Frame and Cover Installation

No direct structural connection shall be permitted to any FRP maintenance access surface riser pipe. No vertical structural connection shall be permitted to any FRP component under any circumstances unless approved by the manufacturer.

A minimum 1-inch (25 mm) gap shall be left around and above any required FRP maintenance access surface risers (i.e. not a buried installation), with this gap filled with pea gravel or approved fill material against the surrounding structure that must support the frame and cover in its entirety.

### 4.3 Maintenance Access Wall

In some instances the Maintenance Access Wall will require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

### 4.4 Filter Cartridge Installation

Filter cartridges shall be installed in the cartridge deck after the construction site is fully stabilized, unless otherwise specified by the design engineer.

### 4.5 Filter Cartridge Installation

Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed after site is stabilized and unit is ready to accept cartridges. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction. For systems with cartridges installed prior to full site stabilization and prior to system commissioning, the contractor can plug inlet and outlet pipes to prevent stormwater from entering the device. Plugs must be removed after the device has been commissioned.

## Part 5 – Quality Assurance

### 5.1 Clean Up and Restoration

Each component of the water quality treatment device shall be inspected by the Owners Representative prior to final acceptance. The contractor shall remove soil and debris created by the storm drainage work from the structure. At the completion of all work, the structure and surrounding area shall be left in a neat, safe and orderly condition.

### 5.2 Inspection and Maintenance

#### 5.2.1

The manufacturer shall provide an Owner's Manual upon request.

#### 5.2.2

After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines.

#### 5.2 Replacement Filter Cartridges

When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

# Jellyfish<sup>®</sup> Filter

## General Design Notes

### ✓ Driving Head

- ✓ Typical driving head designed into the system is 18 inches (457 mm)
- ✓ Off-line configuration has an external bypass that uses an upstream diversion structure to provide the 18 inches (457 mm) of driving head

### ✓ Inlet & Outlet Pipes

- ✓ A wide range of angles can be accommodated
  - The inlet pipe can be located anywhere about the structure circumference
  - The separation angle relationship between the inlet pipe and outlet pipe can vary from 0 to 360 degrees providing maximum design flexibility.
- ✓ Multiple inlet pipes can be accommodated
- ✓ For the standard above-deck configuration, the inlet pipe's invert elevation is typically set 6 inches (150 mm) higher than the invert elevation of the outlet pipe.
  - Alternative invert elevations between the inlet and outlet pipe can easily be accommodated with most all configurations

### ✓ Minimum Cover

- ✓ Low cover installations generally need a minimum depth of cover of 36 inches (915 mm) from the outlet pipe invert to the underside of the top slab.

### ✓ Cartridge Details:

- ✓ Cartridge length is typically either 27 inches (686 mm) or 54 inches (1372 mm)
  - Design flow rates for the 54-inch (1372 mm) length:
    - ♦ hi-flo cartridge: 80 gpm (5.0 L/s)
    - ♦ draindown cartridge: 40 gpm (2.5 L/s)
  - Design membrane filtration flux rate (flow rate per unit surface area) for the 54-inch (1372 mm) length:
    - ♦ hi-flo cartridge: 0.21 gpm/ft<sup>2</sup> (0.14 Lps/m<sup>2</sup>)
    - ♦ draindown cartridge: 0.11 gpm/ft<sup>2</sup> (0.07 Lps/m<sup>2</sup>)
  - Weight for the 54-inch (1372 mm) length:
    - ♦ Dry weight of a new cartridge is < 20 pounds (9 kg)
    - ♦ Wet weight of a used cartridge is < 50 pounds (23 kg)



**USA**

**Imbrium Systems**  
7564 Standish Place, Suite 112  
Rockville, MD 20855

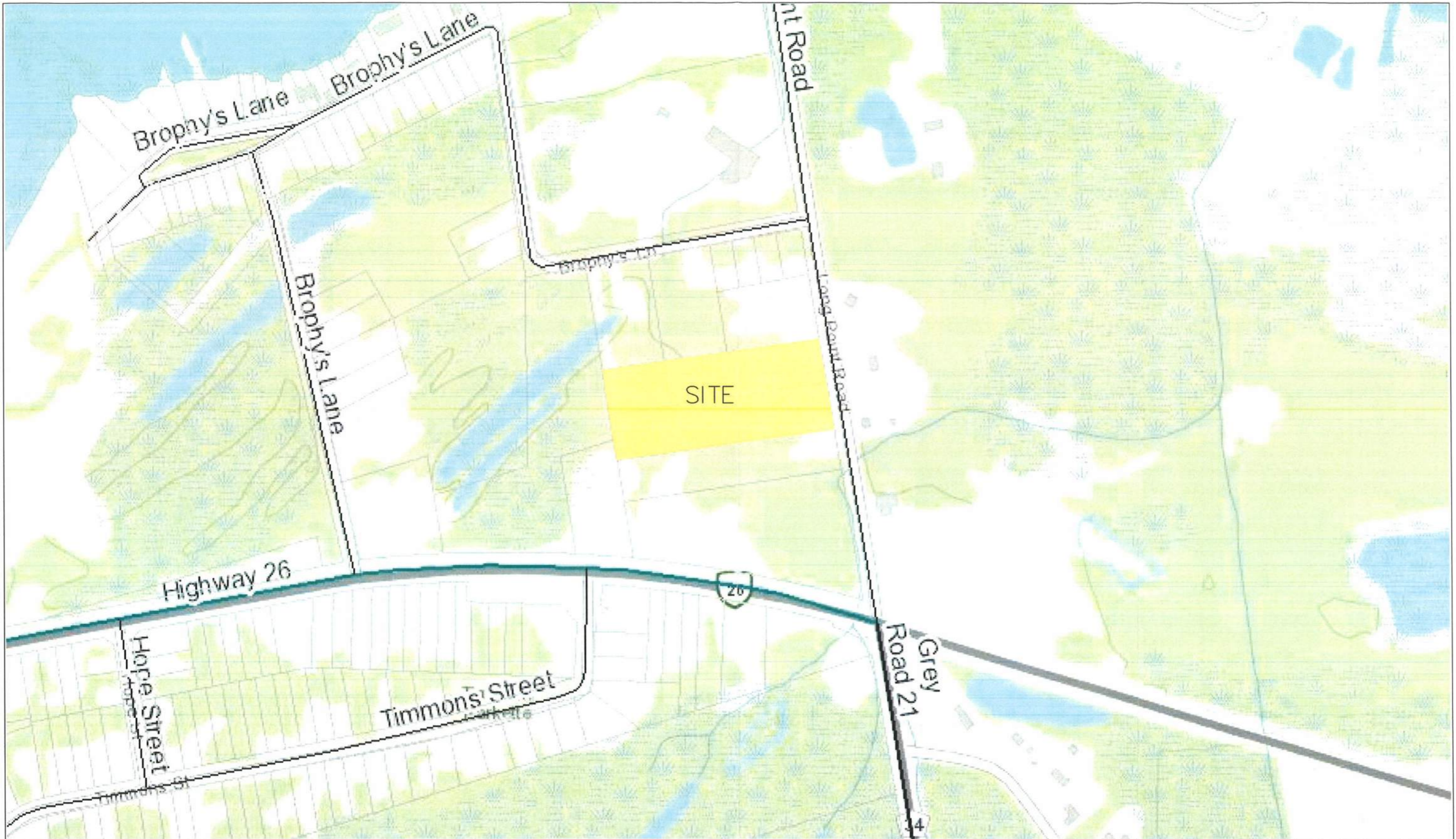
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Toll Free: 800.565.4801

[www.imbriumsystems.com](http://www.imbriumsystems.com)

# FIGURES

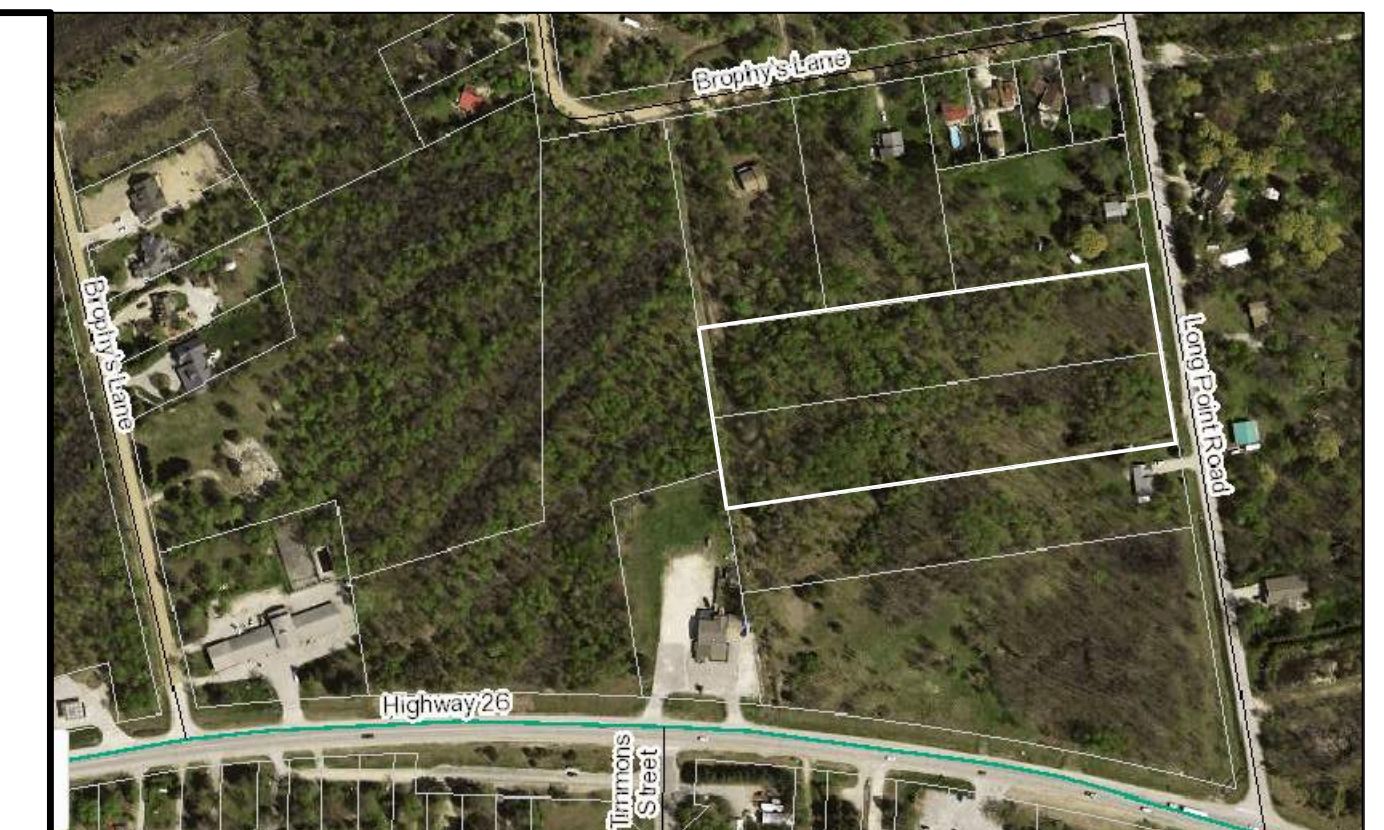
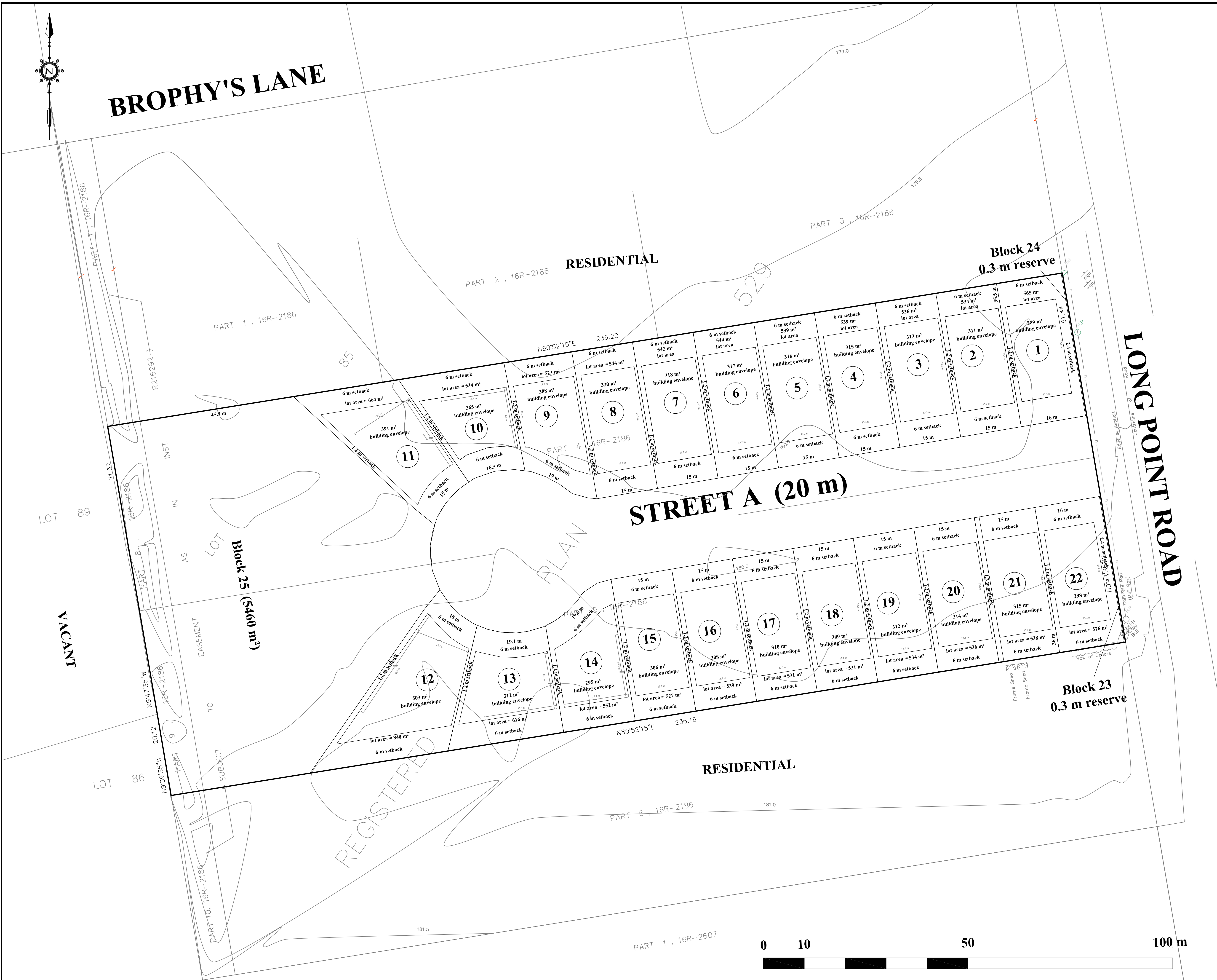


Project  
**LONG POINT ROAD**  
 Drawing  
**SITE LOCATION**

**CROZIER & ASSOCIATES**  
 Consulting Engineers

The HarbourEdge Building  
 40 Huron Street, Suite 301  
 Collierville, TN 37038  
 901-489-1100  
 www.crozier.ca  
 info@crozier.ca

Drawn By	Design By	Project	1988-5783
Scale	Date	Check By	Drawing
N.T.S.			FIGURE 1



## Draft Plan of Subdivision Long Point Road

PART OF LOT 85  
REGISTERED PLAN 529  
TOWN OF THE BLUE MOUNTAINS  
(Formerly Township of Collingwood)  
COUNTY OF GREY

### SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

OCTOBER 29, 2018  
PAUL R. THOMSEN O.L.S.  
ZUBEK, EMO, PATTEN & THOMSEN LTD

### OWNER'S CERTIFICATE

PASCUZZO PLANNING INC. WAS AUTHORIZED BY TONY LESIAK AND ISABELA LEHMANN TO SUBMIT THE PROPOSED PLAN OF SUBDIVISION TO THE COUNTY OF GREY FOR APPROVAL.

OCTOBER 29, 2018  
ANDREW PASCUZZO MCIP RPP  
PASCUZZO PLANNING INC.

### ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT

- |   |                               |
|---|-------------------------------|
| (a) AS SHOWN ON DRAFT PLAN,                                       | (g) AS SHOWN ON DRAFT PLAN,   |
| (b) AS SHOWN ON DRAFT PLAN,                                       | (h) MUNICIPAL WATER SUPPLY,   |
| (c) AS SHOWN ON DRAFT AND KEY PLAN,                               | (i) SAND,                     |
| (d) THE LAND IS TO BE USED ACCORDING TO THE SCHEDULE OF LAND USE, | (j) AS SHOWN ON DRAFT PLAN,   |
| (e) AS SHOWN ON DRAFT PLAN,                                       | (k) MUNICIPAL SANITARY SEWER, |
| (f) AS SHOWN ON DRAFT PLAN,                                       | (l) EASEMENT-MUNICIPAL DRAIN  |

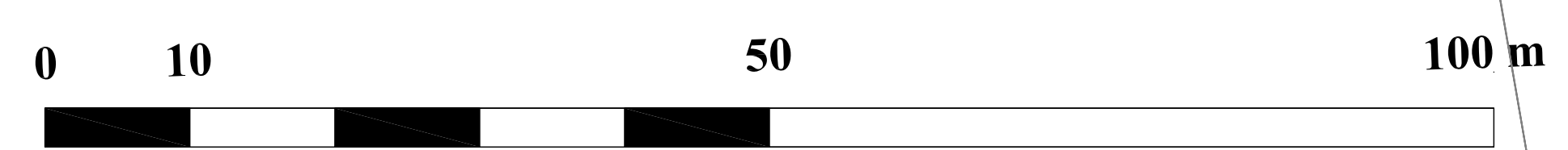
### SCHEDULE OF LAND USE

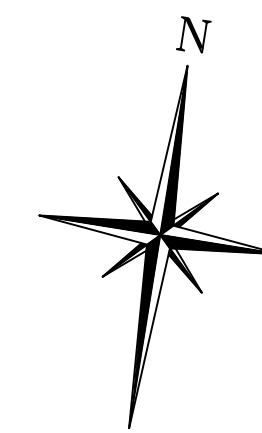
	UNITS	AREA
SINGLE-FAMILY RESIDENTIAL (LOTS 1-22)	22	1.23 ha.
1 FOOT RESERVES (BLOCK 23 and 24)		0.002 ha.
OPEN SPACE (BLOCK 25)		0.55 ha.
ROAD (STREET A)		0.38 ha.
<b>TOTAL</b>	<b>22</b>	<b>2.16 ha.</b>

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048  
PROJECT: 892-17 DRAWN: AP JAN 2021

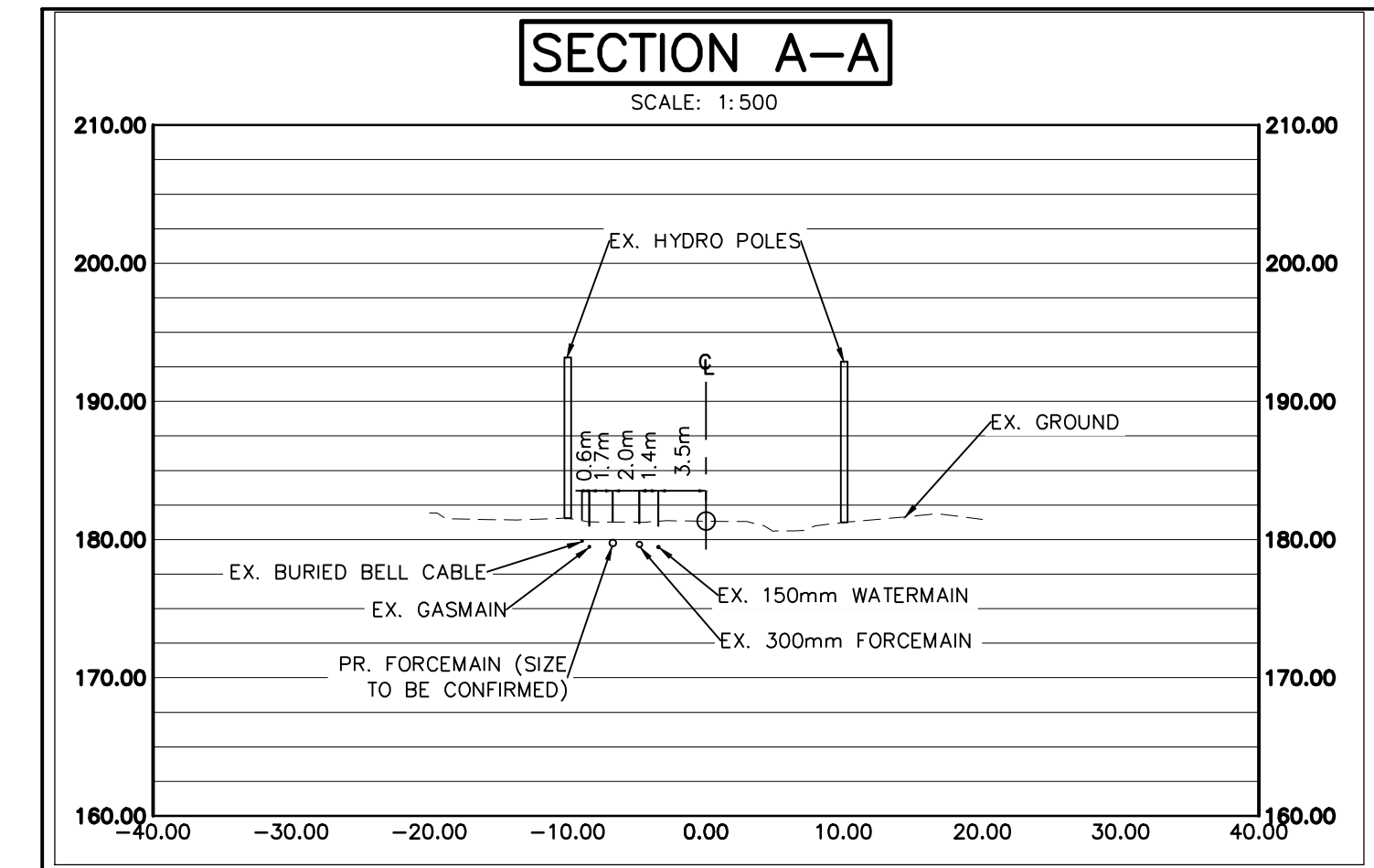
**DWG: 892-17-DP8+**

**PASCUZZO PLANNING INC.**





LEGEND	
	SITE BOUNDARY
	PROPOSED WATERMAIN
	PROPOSED SANITARY FORCEMAIN (LOW PRESSURE)
	EXISTING BELL CABLE
	EXISTING SANITARY FORCEMAIN
	EXISTING OVER HEAD HYDRO
	EXISTING GASMAIN



**NOTE:**  
 LOCATION OF EXISTING UTILITIES AND SERVICES IS APPROXIMATE AND BASED ON RECORD DRAWINGS FOR LONG POINT ROAD PREPARED BY AINLEY GROUP DATED DECEMBER 2006. TO BE CONFIRMED WITH AN SUE AT DETAILED DESIGN STAGE - EXACT ALIGNMENT OF PROPOSED FORCEMAIN TO BE DETERMINED AT THAT TIME.



Project	LONG POINT ROAD SUBDIVISION		
Drawing	GENERAL SITE SERVICING PLAN		

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