

FUNCTIONAL SERVICING REPORT

PREVIN COURT HOMES
RESIDENTIAL & COMMERCIAL DEVELOPMENT

180 & 190 FERNDALE DRIVE NORTH
CITY OF BARRIE, COUNTY OF SIMCOE



PEARSON
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November 2018

15028



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FUNCTIONAL SERVICING REPORT

180 & 190 FERNDALE DRIVE NORTH - BARRIE

1. INTRODUCTION

PEARSON Engineering Ltd. has been retained by Previn Court Homes (Client) to prepare a Functional Servicing Report (FSR) in support of the proposed mixed use commercial and residential development (Project) located at 180 and 190 Ferndale Drive North in the City of Barrie (City), County of Simcoe (County).

The subject property is approximately 7.95 ha in size and currently consists of vacant land. The existing site drains to the south sloping towards existing commercial development north of Dunlop Street West. The location of the site can be seen on Figure 1.

This FSR assesses the existing municipal infrastructure in the vicinity of the Project, the onsite Stormwater Management (SWM) facilities and internal services required to service the proposed Project. The report also includes preliminary design calculations and a brief outline of the proposed internal services, as well as comments regarding the ability of the various secondary utilities to service the site.

2. SUPPORTING DOCUMENTS

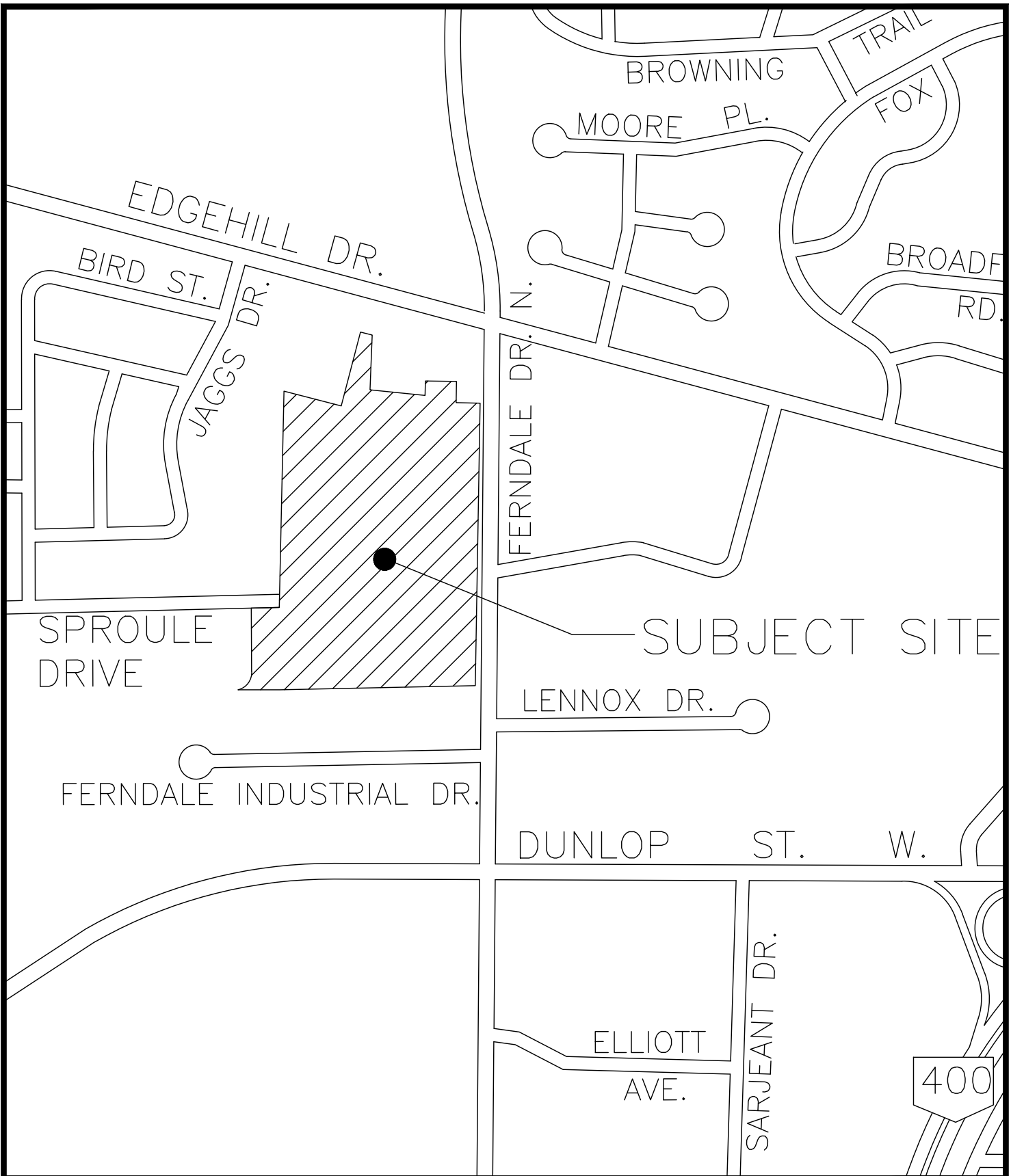
The following documents have been referenced in the preparation of this report:

- Ministry of the Environment, Design Guidelines for Sewage Works – 2008
- Ministry of the Environment, Design Guidelines for Drinking-Water Systems - 2008
- Ministry of the Environment, Stormwater Management Planning and Design Manual, March 2003
- City of Barrie, Sanitary Sewage Collection System Policies and Design Guidelines – September 2012
- City of Barrie, Water Distribution Specification – February 2005
- City of Barrie, Storm Drainage and Stormwater Management Policies and Design Guidelines – November 2009

3. DESIGN POPULATION

The proposed development includes both residential and commercial blocks. Assuming the residential space will be high density, a total 300 units for the residential area was used. Based on the City of Barrie standards, a design population of 1.67 persons per unit was selected. This results in a maximum projected design population of 501 persons.

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RESIDENTIAL SUBDIVISION
 FERNDAL DRIVE, CITY OF BARRIE



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LOCATION PLAN

DESIGNED BY	MWD	HORIZ SCALE	NTS	PROJECT #	15028
DRAWN BY	MJWP	VERT SCALE		DRAWING #	FIG-1
CHECKED BY	MWD	DATE	NOVEMBER 2018	REVISION #	0



4. WATER SUPPLY AND DISTRIBUTION

4.1. WATER SERVICING DESIGN CRITERIA

The site is to have a total population of 501 persons. Utilizing the Ministry of the Environment (MOE) Guidelines for domestic water use of 225 L/capita/day and commercial water use of 28,000 L/(ha·d), the required Average Day Demand (ADD) is 1.95 L/sec. A Peak Rate factor of 4.13 was used in calculating the Peak Hour Demand of 8.05 L/sec for the development. Calculations for the domestic water requirements for the site can be found in Appendix A.

4.2. INTERNAL WATER DISTRIBUTION SYSTEM

The proposed municipal watermain connecting Sproule Drive and Ferndale Drive North will supply the Project's domestic water service. The proposed development will be serviced by a proposed 150 mm diameter domestic water service.

The water system for this Project is intended for domestic and firefighting use. There is an existing 400 mm diameter municipal watermain on the west side of Ferndale Drive North and an existing watermain on the south side of Sproule Drive. The site will be serviced by connecting a 150 mm diameter watermain from the existing watermain on Sproule Drive to the existing watermain on Ferndale Drive North. The proposed watermain has a stub for future connection of the commercial and residential blocks. The proposed routing of the watermain is shown on Figure 2.

There is an existing Fire Hydrant located on the south side of Sproule Drive at the end of the existing cul-de-sac. The proposed development will be serviced by the proposed watermain, which will be connected to the existing watermains on Sproule Drive and Ferndale Drive North. Internal fire hydrants are to be proposed to provide adequate firefighting coverage and will be spaced at 152 m intervals in residential areas as per City of Barrie Standards.

We suggest that the City review the existing watermain distribution system with respect to the City's water treatment and supply capacities for both domestic and fire service for this development and confirm that capacity allocation is available. If required, a water pressure test on the hydrants can be completed at the detailed design stage to confirm existing pressure and flow.

5. SANITARY SERVICING OVERVIEW

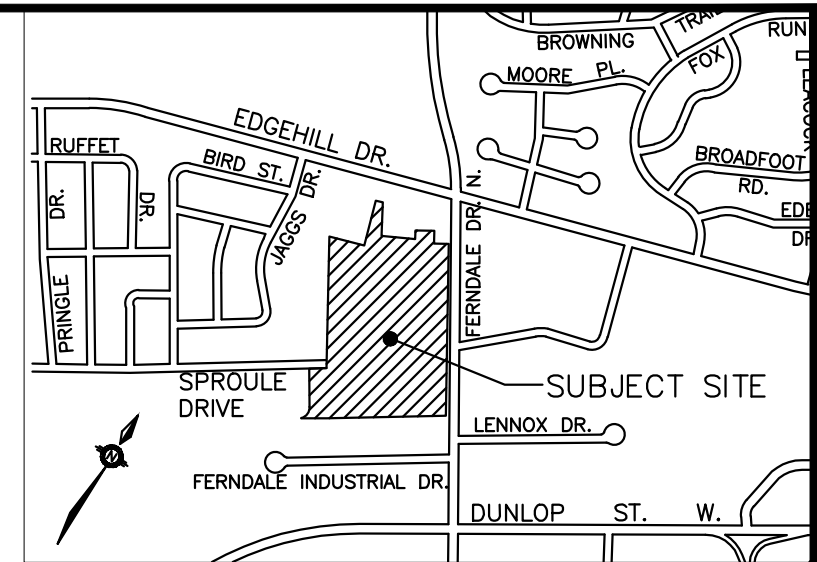
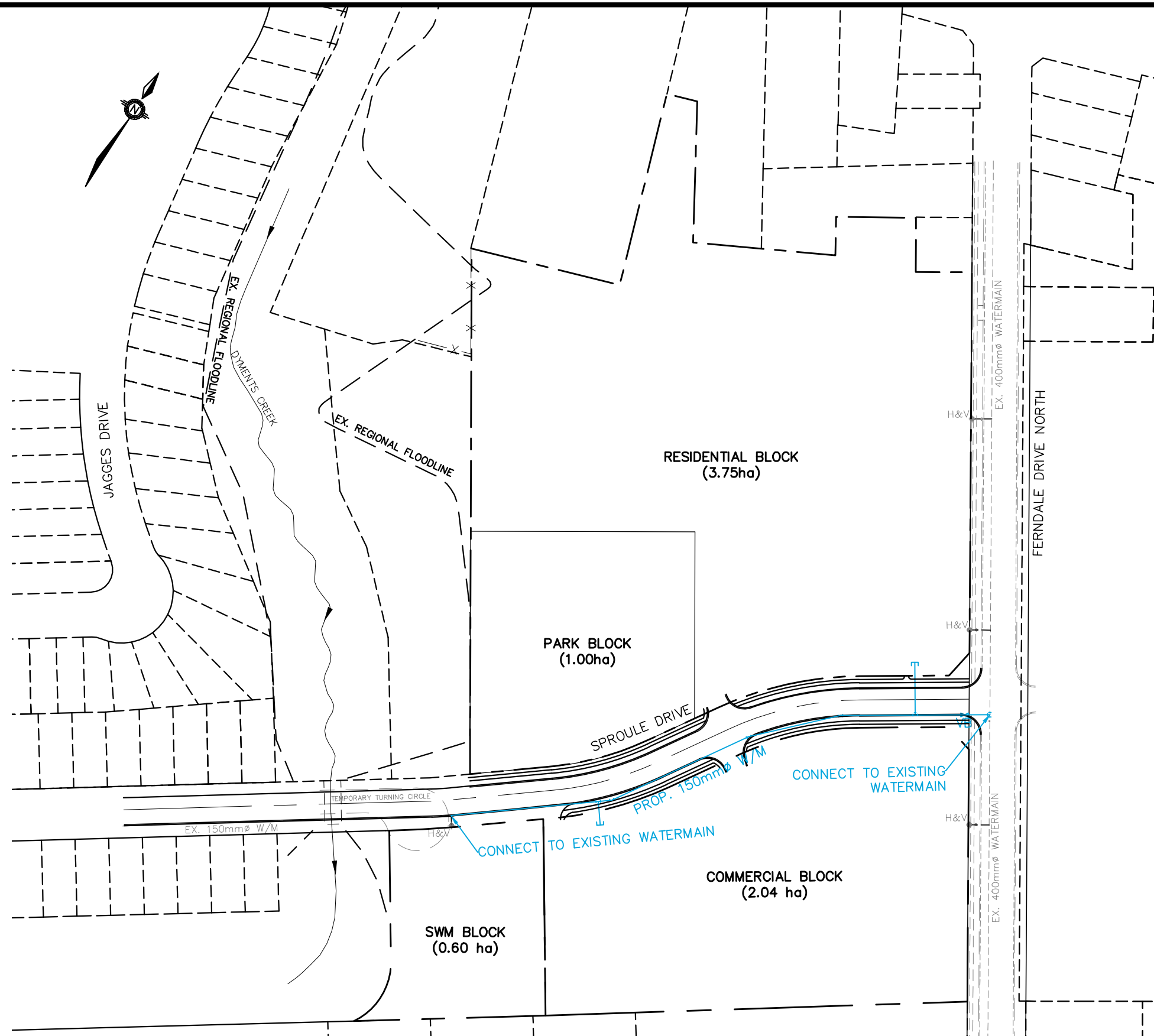
5.1. SANITARY DESIGN CRITERIA

The site is to have a total population of 501 persons. Utilizing the MOE Guidelines for domestic sewer use of 225 L/capita/day and commercial sewer use of 28,000 L/(ha·d), the Average Daily Flow (ADF) of 1.95 L/sec. is calculated. Using a Peaking Factor of 3.99 for this project, a Peak Flow of 7.77 L/sec was calculated for the entire development. Sanitary design flow calculations can be found in Appendix B.

5.2. INTERNAL SANITARY SEWER SYSTEM




The Project's sanitary sewer system will convey flow via a 250 mm gravity sanitary sewer from the site and connect to the existing 450 mm diameter sanitary sewer on Ferndale Drive North.

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KEY PLAN
NTS

LEGEND

-  PROPOSED FIRE HYDRANT
-  PROPOSED WATER VALVE
-  PROPOSED WATERMAIN

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RESIDENTIAL SUBDIVISION
FERNDALE DRIVE, CITY OF BARRIE

WATERMAIN LAYOUT



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DESIGNED BY	MWD	HORIZ SCALE	1:2000	PROJECT #	15028
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CHECKED BY	MWD	DATE	NOVEMBER 2018	REVISION #	0



The existing 450 mm diameter sanitary sewer on Ferndale Drive North runs north to south and has a capacity of 202 L/sec at 0.5%. The proposed peak flow is 7.0% of the existing capacity and therefore the existing 450 mm diameter sanitary sewer is sufficient to convey the sanitary design flows. The proposed sanitary sewer system is shown on Figure 3.

We suggest that the City review the sanitary design flow from this Project with respect to the City's sanitary treatment plant capacities and confirm that capacity allocation is available for this Development.

6. STORMWATER MANAGEMENT

A key component of the development is the need to address environmental and related SWM issues. These are examined in a framework aimed at meeting the City, LSRCA and MOE requirements. SWM parameters have evolved from an understanding of the location and sensitivity of the site's natural systems. This FSR focuses on the necessary measures to satisfy the MOE's SWM requirements.

It is understood the objectives of the SWM plan are to:

- Protect life and property from flooding and erosion
- Maintain water quality for ecological integrity, recreational opportunities etc.
- Protect and maintain groundwater flow regime(s).
- Protect aquatic and fishery communities and habitats.
- Maintain and protect significant natural features.

6.1. ANALYSIS METHODOLOGY

The design of the SWM Facilities for this site has been conducted in accordance with:

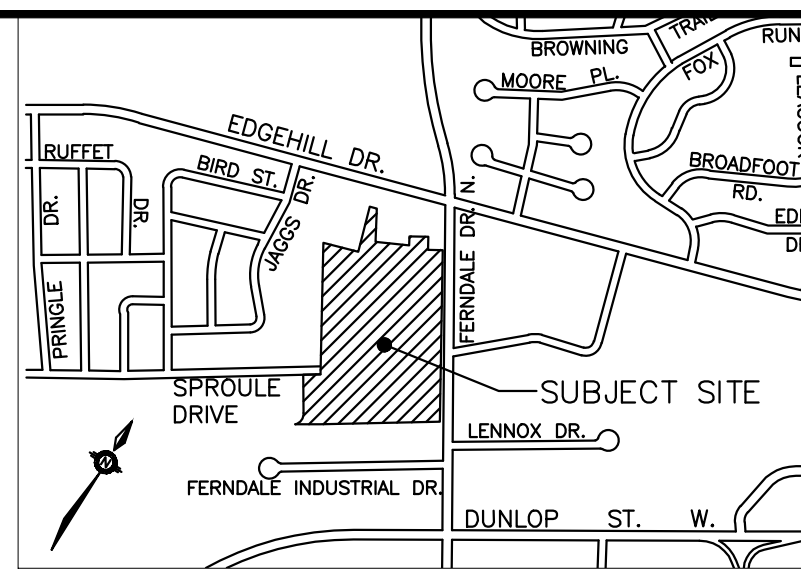
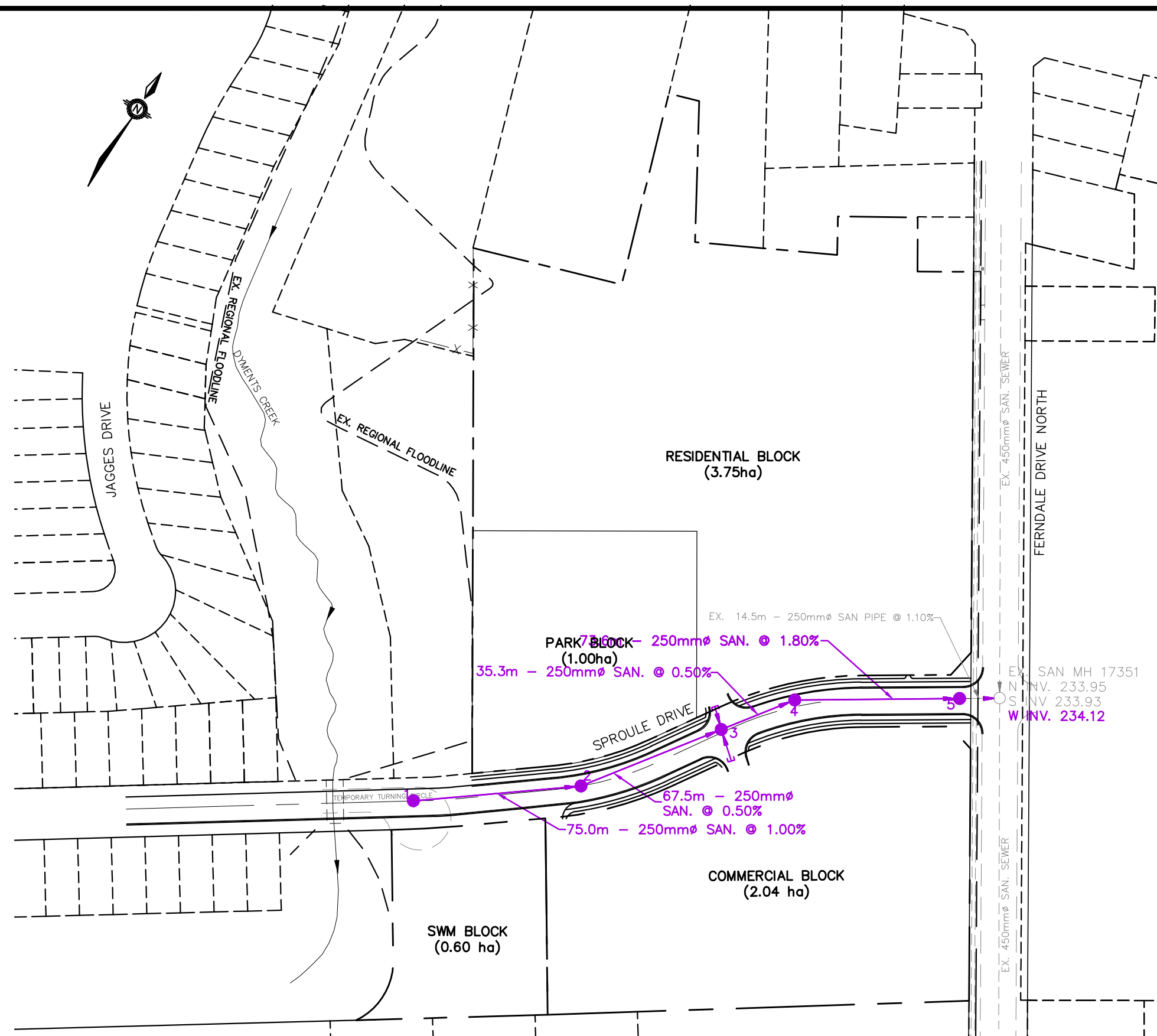
- The Ministry of the Environment Stormwater Management Planning and Design Manual, March 2003
- City of Barrie, Storm Drainage and Stormwater Management Policies and Design Guidelines – 30 November 2009
- Lake Simcoe Region Conversation Authority Technical Guidelines for Stormwater Management Submissions – September 2016

In order to design the facilities to meet these requirements, it is essential to select the appropriate modeling methodology for the storm system design. Given the size of the site and the number of catchment areas, the computer model Visual OTTHYMO is appropriate for the design for the SWM system.

6.2. EXISTING DRAINAGE CONDITIONS

The existing Project site currently consists of vacant land. Review of the site identifies that the majority of the site's stormwater flows from north to south via overland flow ultimately outletting to the existing storm sewer on Dunlop Street West. A portion of the site drains to Ferndale Drive North and is conveyed southerly to an existing 525 mm diameter storm sewer. Details of existing storm drainage conditions are shown on Figure 6.

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KEY PLAN
NTS

LEGEND

- PROPOSED SANITARY MANHOLE
- PROPOSED SANITARY SEWER

NO.	REVISION NOTE	DATE	BY

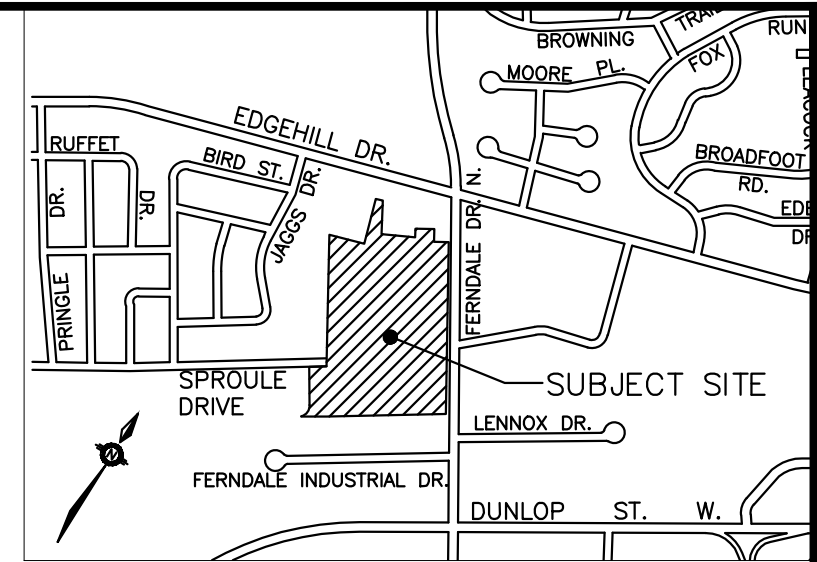
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FERNDALE DRIVE, CITY OF BARRIE

SANITARY LAYOUT

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KEY PLAN
NTS

LEGEND

- AREA # CN NUMBER
- 100 52
2.47 ha AREA
- ➔ OVERLAND FLOW ROUTE
- STORM DRAINAGE BOUNDARY
- EXISTING CREEK

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PRE-DEVELOPMENT STORM
DRAINAGE PLAN



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According to the soil investigation completed by Soil Engineers Limited in July 2003, the project site is comprised of layers of loose to dense, generally compact fine sand and very stiff to hard, generally very stiff silty clay underneath a layer of topsoil or peat. The pre-development peak flows from the site were calculated using Visual OTTHYMO and are provided in Table 1 below. The peak flow calculations and the Visual OTTHYMO Parameter calculations can be found in Appendix C.

Table 1 - Pre Development Peak Flows

	2 year (m ³ /s)	5 year (m ³ /s)	10 year (m ³ /s)	25 year (m ³ /s)	50 year (m ³ /s)	100 year (m ³ /s)
4 Hour Chicago Storm	0.12	0.22	0.31	0.43	0.52	0.62
24 Hour SCS Storm	0.21	0.39	0.53	0.73	0.88	1.04

6.3. PROPOSED STORM DRAINAGE SYSTEM

The post development storm drainage for the Project will generally follow pre development conditions. The majority of the minor system flows of the proposed drainage from the Project will be conveyed westerly to the stormwater management pond via a catch basin and storm sewer system. The site grading allows the major system to drain to the SWM pond via overland flow. A portion of the east side of the residential block will be conveyed to Ferndale Drive North. As per the Ferndale Drive North Reconstruction, Drawing 2011-032T "Storm Drainage Plan", completed by the City of Barrie, the storm sewer was sized for a portion of the project site to drain to Ferndale Drive North. The east portion of the proposed roadway will flow uncontrolled into the existing storm sewer on Ferndale Drive North. The external flows from the properties north of the site will be conveyed overland into the proposed SWM pond via the proposed storm sewer system. The proposed layout for stormwater servicing can be found on Figure 4. The proposed storm drainage patterns can be seen on Figure 7.

Table 2 - Post Development Peak Flows

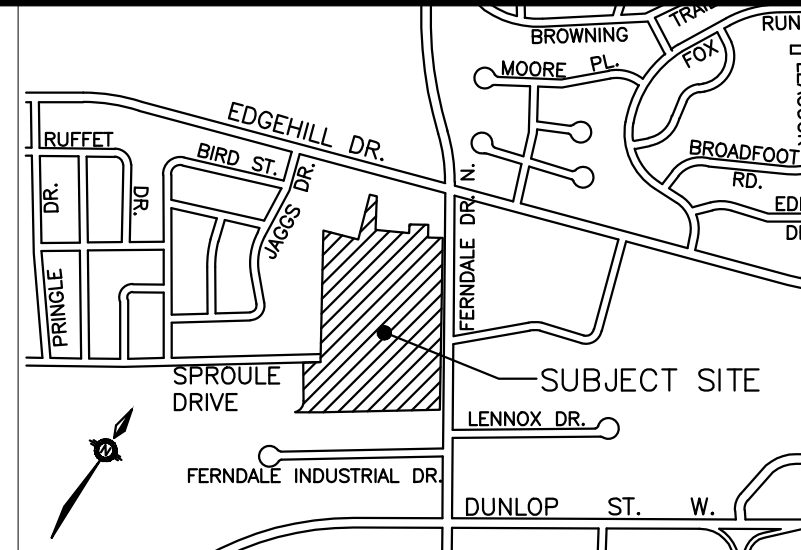
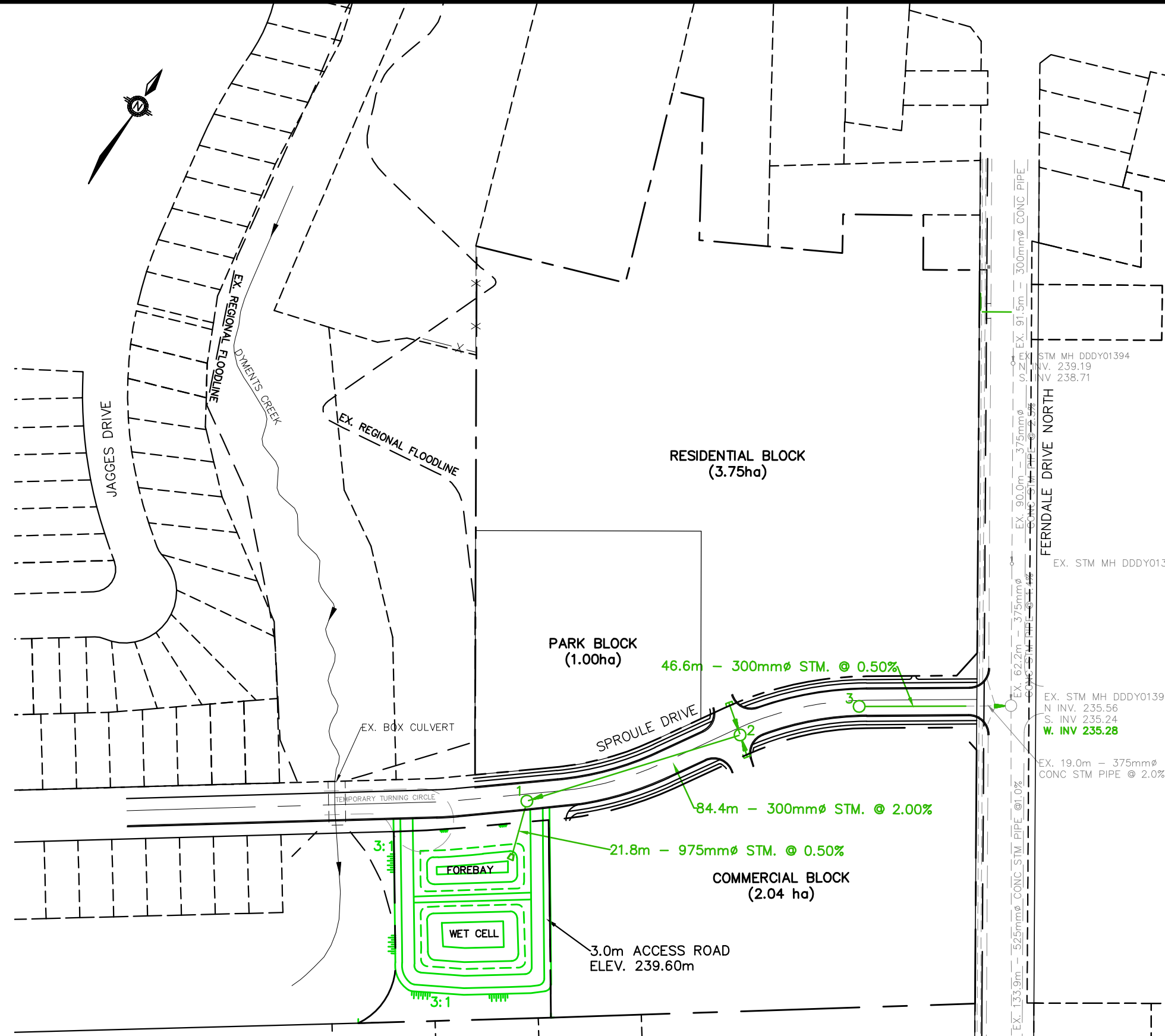
	2 year (m ³ /s)	5 year (m ³ /s)	10 year (m ³ /s)	25 year (m ³ /s)	50 year (m ³ /s)	100 year (m ³ /s)
4 Hour Chicago Storm	0.12	0.21	0.31	0.42	0.52	0.61
24 Hour SCS Storm	0.16	0.33	0.43	0.63	0.75	0.92

6.4. QUANTITY CONTROL

The proposed development will increase the imperviousness of the site and as such, the post-development peak flows will increase. It is important to quantify the increase in stormwater runoff rates due to the increased impervious values and attenuate these increases in peak flows.

The majority of the proposed drainage from the project will be conveyed southerly to a proposed wet pond at the southwestern corner of the development, which has been designed to provide quantity control by retaining flows and releasing them below pre development values. An outlet control structure comprised of an orifice tube and overflow weir will be used to convey stormwater from the proposed SWM Pond to the existing creek adjacent to the project site.

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- LEGEND**
- PROPOSED STORM MANHOLE
 - PROPOSED DIRECT CATCH BASIN MANHOLE
 - PROPOSED CATCH BASIN
 - PROPOSED STORM SEWER
 - EXISTING CREEK

NO.	REVISION NOTE	DATE	BY

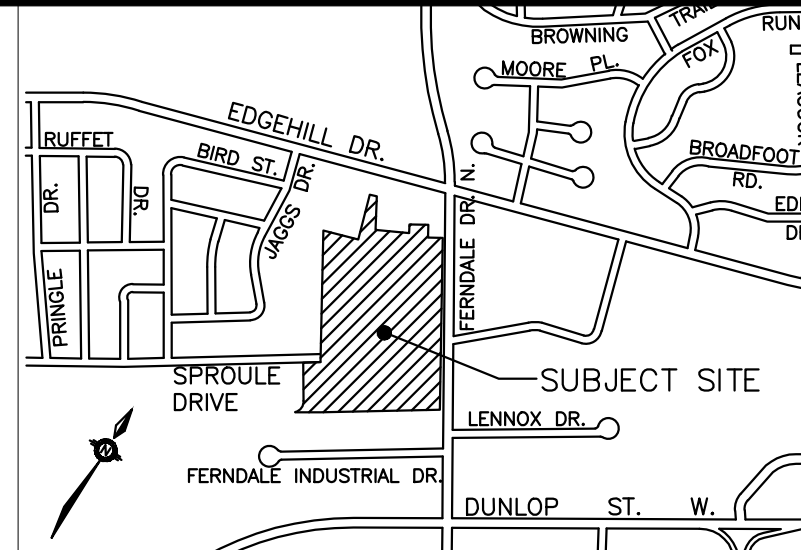
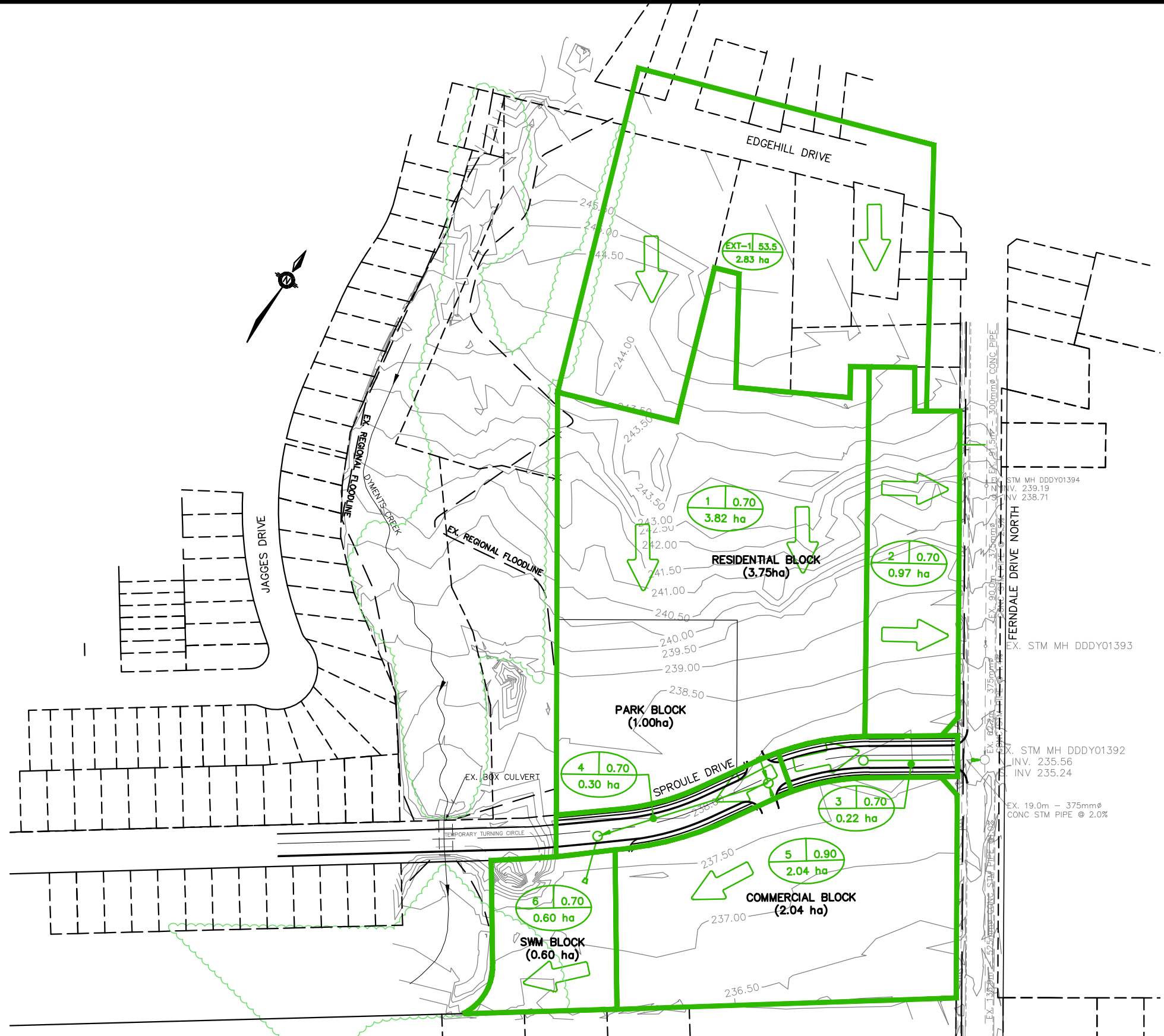
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FERNDALE DRIVE, CITY OF BARRIE

STORM SEWER LAYOUT

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KEY PLAN
NTS

LEGEND

- PROPOSED MANHOLE
- AREA # RUNOFF COEFFICIENT OR CN NUMBER
- AREA
- OVERLAND FLOW ROUTE
- STORM DRAINAGE BOUNDARY
- EXISTING CREEK

NO.	REVISION NOTE	DATE	BY

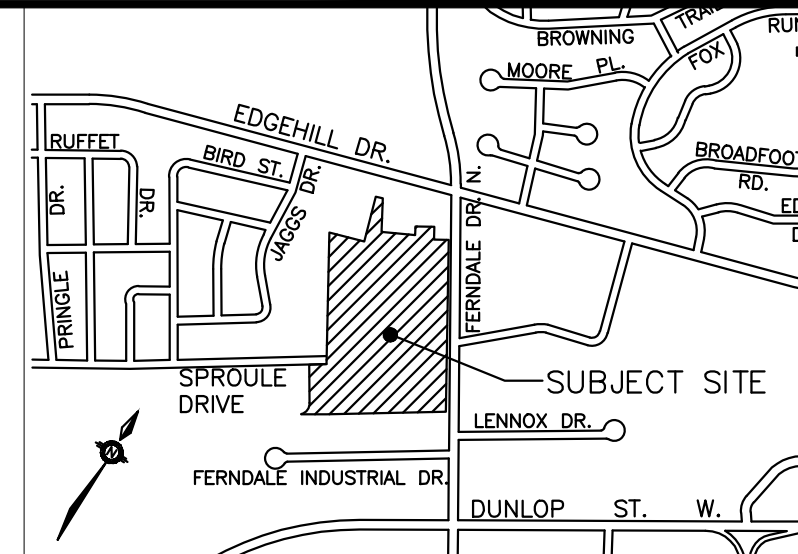
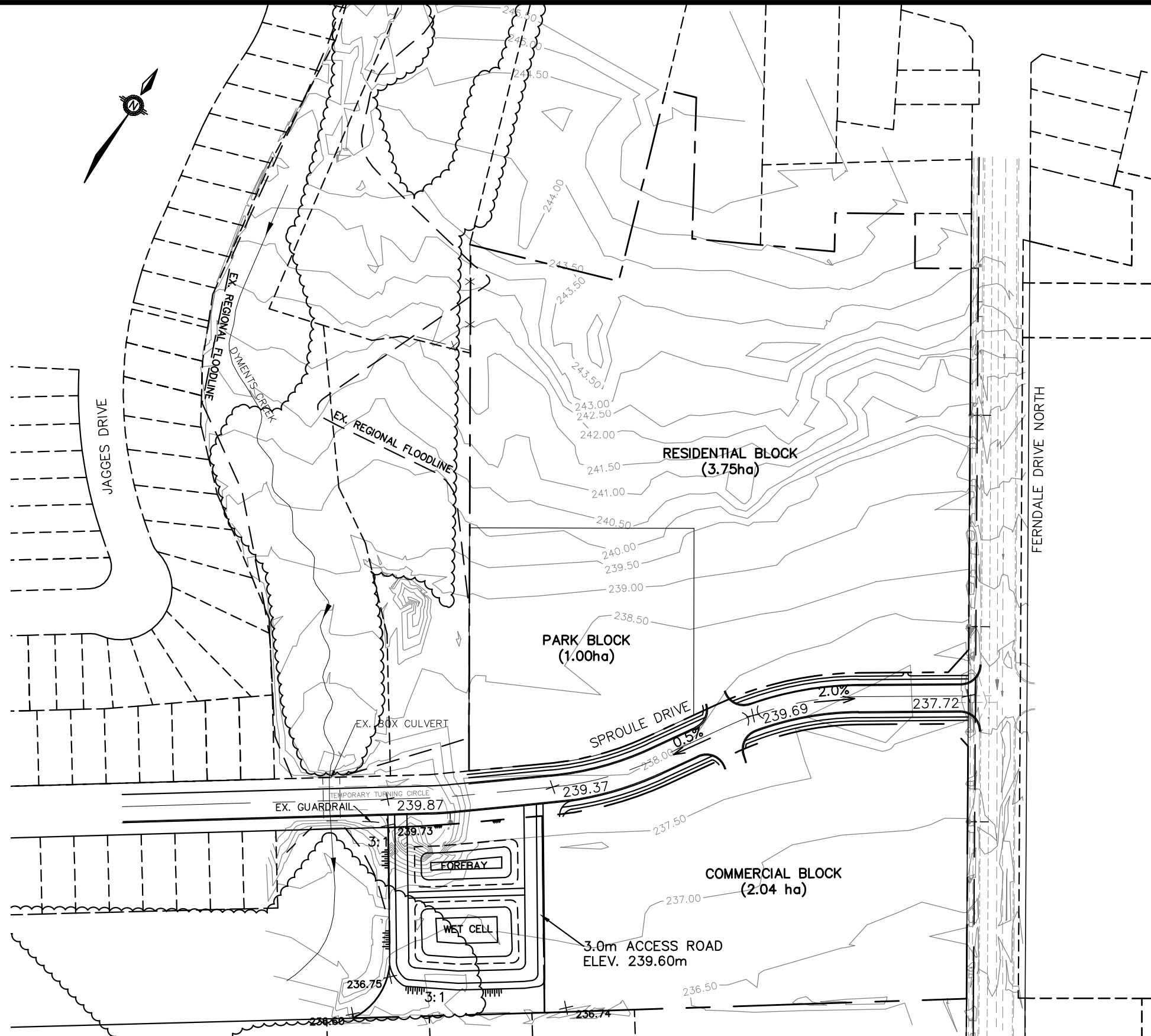
RESIDENTIAL SUBDIVISION
FERNDALE DRIVE, CITY OF BARRIE

POST-DEVELOPMENT STORM
DRAINAGE PLAN

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KEY PLAN
NTS

LEGEND

- 286.73 PROPOSED ELEVATION
- x 286.73 EXISTING ELEVATION
- 1.5% PROPOSED DIRECTION AND GRADE

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RESIDENTIAL SUBDIVISION
FERNDALE DRIVE, CITY OF BARRIE

PRELIMINARY GRADING PLAN

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The stormwater management pond is designed with 4:1 internal side slopes and 3.0 m wide 7:1 safety shelf on either side of the permanent pool elevation as per MOE guidelines. Rip rap will be placed on the northeast flow inlet location to prevent erosion. In order to maintain a free flowing outlet, the permanent pool elevation has been set at 237.80 m, which is located above the 100-year floodline elevation of 237.75 m.

An outlet control structure comprised of an orifice tube and overflow weir will reduce the flows leaving the pond. The pond will provide approximately 4,400 m³ of storage at an elevation of 239.30 m for the regional storm event. A minimum of 0.30 m of freeboard will be maintained as per MOE and Conservation Authority guidelines. The proposed SWM pond outflow and corresponding storage requirements can be seen in Table 3 below. The hydrologic modeling results can be seen in Appendix C.

Table 3 - SWM Pond Outflow and Storage

4 Hour Chicago Storm Events

	25 mm	2 year	5 year	10 year	25 year	50 year	100 year
Peak Flow (m ³ /s)	0.07	0.12	0.22	0.31	0.43	0.52	0.62
Storage Volume (m ³)	800	1400	1900	2150	2600	2700	3100

24 Hour SCS Storm Events

	2 year	5 year	10 year	25 year	50 year	100 year	Regional
Peak Flow (m ³ /s)	0.21	0.33	0.43	0.63	0.75	0.92	0.99
Storage Volume (m ³)	1850	2400	2900	3300	3650	3950	4060

6.5. QUALITY CONTROL

The Ministry of the Environment (MOE) in March 2003 issued a “Stormwater Management Planning and Design Manual”. This manual has been adopted by a variety of agencies including City of Barrie. The objective of the Stormwater Quality Control will be to ensure Enhanced Protection quality control as stated in the MOE manual is achieved. To achieve Enhanced Protection, permanent and temporary control of erosion and sediment transport are proposed.

The development's roadways pose a risk to stormwater quality through the collection of grit, salt, sand, and oils on the paved surfaces, and as such, quality control measures will be implemented throughout the site. A quality control forebay and wet cell have been sized to provide 2,373 m³ of quality storage, exceeding the calculated required 1,546 m³ as per MOE Table 3.2. The MOE standard stipulates a Total Suspended Solids (TSS) removal of at least 80%. Stormwater will ultimately be conveyed to a proposed Stormwater Management Pond. Detailed calculations can be seen in Appendix C.

During construction, earth grading and excavation will create the potential for soil erosion and sedimentation. It is imperative that effective environmental and sedimentation controls are in place and maintained throughout the duration of construction activities to ensure stormwater runoff's quality.



Therefore, the following recommendations shall be implemented and maintained during construction to achieve acceptable stormwater runoff quality:

- Installation of silt fence along the entire perimeter of the site to reduce sediment migration onto surrounding properties.
- Installation of a construction entrance mat at the entrance to minimize transportation of sediment onto roadways.
- Restoration of exposed surfaces with vegetative and non-vegetative material as soon as construction schedules permit;

6.6. LOW IMPACT DEVELOPMENT

Modern Stormwater Management (SWM) practices have evolved over recent years, with Low Impact Development (LID) techniques being widely used as the preferred method of Stormwater Management. The stormwater management for the site is to be provided by a combination of a treatment train approach consisting of LID features followed by a wet detention pond. As such, it is proposed that LID techniques be implemented throughout the development in the form of rooftop infiltration and bioretention trenches where soil conditions and water table elevations permit.

Low Impact Development features are an emerging technology and therefore the guidelines listed above are subject to change. As standard details and specifications are still being developed, all details and locations are to be reviewed and approved by the Municipality.

6.7. WATER BALANCE

Since the post-development state will increase the imperviousness of the site, considerations were taken in regards to groundwater recharge. A preliminary water budget was completed as per LSRCA guidelines and under pre-development conditions, the project site had an annual recharge volume of 24,475 m³. With the increased imperviousness of the site, this recharge will be reduced to 5,338 m³, resulting in a deficit volume of 19,137 m³. Infiltration galleries will be designed to infiltrate rooftop runoff to make up the deficit recharge volume. Detailed water balance calculations have been provided in Appendix D.

6.8. PHOSPHORUS CALCULATIONS

Local conservation authorities have determined the importance of reducing phosphorus levels in watercourses in this area. The reduction was based on conservative values derived from the LSRCA. The existing site generates approximately 0.56 kg of phosphorus annually and the proposed Project will generate approximately 14.47 kg of phosphorus annually if uncontrolled. Best efforts will be used in order to reduce the phosphorus loading as much as is reasonably possible.

To minimize the amount of phosphorus discharged from the site, a treatment train approach is to be utilized. The majority of the stormwater runoff on site will be conveyed to the proposed SWM pond and rooftop runoff from the proposed buildings will be conveyed to underground storage chambers for infiltration. With the use of a SWM pond, the project site phosphorous production is reduced to 6.35 kg annually. Based on the data contained in the Lake Simcoe Phosphorus Loading Development Tool (2012), typical phosphorus reductions are 60% for infiltration trenches, and 63% for wet detention ponds. Detailed calculations can be found in Appendix E.



7. SECONDARY UTILITIES

Given the location of the subject site, it is anticipated that secondary utilities (hydro, cable, phone and gas) will be available to service the site. This will be investigated further in the detailed design stage.

8. CONCLUSIONS

The proposed development will require the connection of sanitary and watermain services to the existing municipal services on Ferndale Drive North. Storm services for the development will be conveyed to the proposed SWM Pond, ultimately outletting to Dyments Creek.

The SWM design for this project generally follows the existing conditions of the site. A SWM Pond is proposed to provide the required quantity control and quality control to satisfy the MOE Enhanced level requirements.

A treatment train approach will be implemented in order to reduce the post development phosphorous loading for the site, as well as promote groundwater recharge through the use of low impact development facilities.

The analysis and conceptual design outlined in this report demonstrates that the servicing is feasible.

All of which is respectfully submitted,
PEARSON ENGINEERING LTD.

Gary Pearson, P. Eng
Principal

Mike Dejean, P.Eng.
Manager of Engineering Services



APPENDIX A

WATER SERVICING CALCULATIONS

180 & 190 Ferndale Drive North Water Flow Calculations

Design Criteria

Demand per capita (Q):	225	L/cap/day
Max. Day Factor	2.75	(Table 3-1: Peaking Factors, MOE Design Guidelines for Drinking-Water Systems)
Peak Rate Factor (Max. Hour)	4.13	(Table 3-1: Peaking Factors, MOE Design Guidelines for Drinking-Water Systems)
		*From MOE Manual based on Population of 500 - 1,000

Site Data

Description	Density	Area	Flow Rate
Residential Space	1.67 ppu	4.75 ha	225 L/cap/d
Commercial Space		1.99 ha	28,000 L/ha*d

Calculate Population

Pop. Residential	=	1.67	x	300	units
Pop. Total	=	501	people		

Calculate Average Day Demand (ADD)

ADD	=	225	x	501	+	28,000	x	1.99
ADD	=	168,445	L/d					
ADD	=	1.95	L/s					

Calculate Max Day Flow

MDF	=	1.95	x	2.75
MDF	=	5.36	L/s	

Calculate Peak Hour Demand

PHD	=	1.95	x	4.13
PHD	=	8.05	L/s	



APPENDIX B

SANITARY SERVICING CALCULATIONS

180 & 190 Ferndale Drive North Sanitary Flow Calculations

Design Criteria

Flow per capita (Q):

225 L/cap/day

Peak Flow

 $Q_p = P * Q * M / 86400 + I * A$

Peaking Factor (Harmon Formula)

 $M = 1 + (14 / (4 + (P / 1000) ^{0.5}))$

 Where: $2 \leq "M" \leq 4$
Site Data

Description	Density	Area	Flow Rate
Residential Space	1.67 ppu	4.75 ha	225 L/cap/d
Commercial Space		1.99 ha	28,000 L/ha/d

Calculate Population

Pop. Apartments = 1.67 x 300 units
 Pop. = 501 people

Calculate Average Daily Flows

ADF (L/s) = 225 x 501 + 28,000 x 1.99
 ADF (L/s) = 168,445 L/day
 ADF (L/s) = 1.95 L/s

Calculate Peaking Factor

M = $1 + \frac{14}{4 + \frac{501^{0.5}}{1,000}}$ + 0.1 * 0.12

M = 3.99

Calculate Peak Flow

Qp = 1.95 x 3.99
 = 7.77 L/s



APPENDIX C

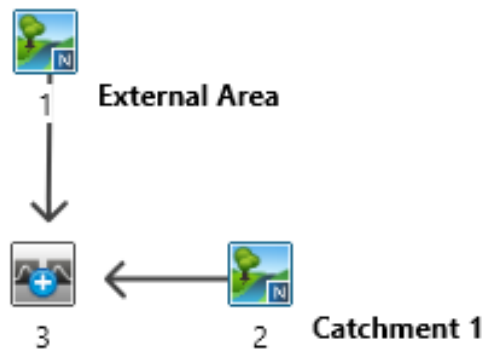
STORMWATER MANAGEMENT CALCULATIONS

180 & 190 Ferndale Drive North Conceptual Stage-Storage Table

Elevation (m)	Forebay Area (m ²)	Forebay Cum. Volume (m ³)	Main Cell Area (m ²)	Main Cell Cum. Volume (m ³)	Total Cum. Vol. (m ³)
Quality Control Storage					
235.80			303	0	0
235.90			331	32	32
236.00			360	66	66
236.10			389	104	104
236.20			420	144	144
236.30	128	0	451	188	188
236.40	159	14	484	234	249
236.50	189	32	517	284	316
236.60	220	52	551	338	390
236.70	252	76	586	395	470
236.80	285	103	622	455	558
236.90	319	133	660	519	652
237.00	353	166	698	587	753
237.10	389	203	736	659	862
237.20	426	244	776	735	979
237.30	237	277	817	814	1091
237.40	513	315	875	899	1214
237.50	592	370	965	991	1361
237.60	674	433	1058	1092	1525
237.70	760	505	1155	1203	1708
237.80	855	586	1266	1324	1909
237.90	946	676	1367	1455	2131
238.00	1045	775	1480	1598	2373
Quantity Control Storage					
238.10			2741	211	211
238.20			3036	289	500
238.30			3148	309	809
238.40			3240	319	1128
238.50			3334	329	1457
238.60			3428	338	1795
238.70			3524	348	2143
238.80			3622	357	2500
238.90			3720	367	2867
239.00			3820	377	3244
239.10			3921	387	3631
239.20			4023	397	4029
239.30			4126	407	4436
239.40			4231	418	4854
239.50			4336	428	5282
239.60			4443	439	5721



PRE-DEVELOPMENT OTTHYMO SCHEMATIC AND RESULTS



V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civical\WH5\e3319093-a62e-4bec-957c-fec698790bbc\led133730-4b3f-416b-970e-388bad714181\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civical\WH5\e3319093-a62e-4bec-957c-fec698790bbc\led133730-4b3f-416b-970e-388bad714181\sce

DATE: 07/31/2018 TIME: 05:05:47

USER:

COMMENTS: _____

** SIMULATION : Run 01 **

W/E COMMAND HYD ID DT AREA 'Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0
[Ptot= 36.95 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\606dafaf-6f15-461b-8ecc-4b
remark: 2yr_4hr_chi

*
** CALIB NASHYD 0001 1 5.0 2.81 0.03 1.67 4.03 0.11 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 10.0
[Ptot= 36.95 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\606dafaf-6f15-461b-8ecc-4b
remark: 2yr_4hr_chi

*
** CALIB NASHYD 0002 1 5.0 7.65 0.10 2.00 6.99 0.19 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

*
ADD [0001+ 0002] 0003 3 5.0 10.46 0.12 1.92 6.20 n/a 0.000

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L

V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voindat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\XH5\3319093-a62e-4bec-957c-fec698790bbc\31d5bda2-ad8c-406b-98b6-21bc29483900\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\XH5\3319093-a62e-4bec-957c-fec698790bbc\31d5bda2-ad8c-406b-98b6-21bc29483900\sce

DATE: 07/31/2018 TIME: 05:05:47

USER:

COMMENTS: _____

** SIMULATION : Run 02 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0
[Ptot= 50.52 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\d422d203-6a9f-4d9e-9174-4d
remark: 5yr_4hr_chi

*
** CALIB NASHYD 0001 1 5.0 2.81 0.06 1.67 7.77 0.15 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 10.0
[Ptot= 50.52 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\d422d203-6a9f-4d9e-9174-4d
remark: 5yr_4hr_chi

*
** CALIB NASHYD 0002 1 5.0 7.65 0.18 2.00 12.98 0.26 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

*
ADD [0001+ 0002] 0003 3 5.0 10.46 0.22 1.92 11.58 n/a 0.000

=====

V V I SSSSS U U A A L (v 5.1.2000)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM

O O T T H H Y Y M M M O O
O O T T H H Y M M O O
O O T T H H Y M M O O

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\vo.in.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\d43e244d-ca22-4f56-b8df-e53579d8aecc\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\d43e244d-ca22-4f56-b8df-e53579d8aecc\sce

DATE: 07/31/2018 TIME: 05:05:47

USER:

COMMENTS: _____

** SIMULATION : Run 03 **

W/E COMMAND HYD ID DT AREA 'Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0
[Ptot= 59.69 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\8d108c0a-08a9-4785-8199-84
remark: 10yr_4hr_chi
*

** CALIB NASHYD 0001 1 5.0 2.81 0.08 1.67 10.84 0.18 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]
*

READ STORM 10.0
[Ptot= 59.69 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\8d108c0a-08a9-4785-8199-84
remark: 10yr_4hr_chi
*

** CALIB NASHYD 0002 1 5.0 7.65 0.25 2.00 17.72 0.30 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]
*

* ADD [0001+ 0002] 0003 3 5.0 10.46 0.31 1.92 15.87 n/a 0.000
*

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\H5\3319093-a62e-4bec-957c-fec698790bbc\05e30537-19d8-4037-bd93-ffe438d9baa7\lsc
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\H5\3319093-a62e-4bec-957c-fec698790bbc\05e30537-19d8-4037-bd93-ffe438d9baa7\lsc

DATE: 07/31/2018 TIME: 05:05:47

USER:

COMMENTS: _____

** SIMULATION : Run 04 **

W/E COMMAND HYD ID DT AREA 'Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0
[Ptot= 71.24 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\fe898c6b-36f4-42d1-bb9b-b2
remark: 25yr_4hr_chi

*
** CALIB NASHYD 0001 1 5.0 2.81 0.12 1.67 15.26 0.21 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 10.0
[Ptot= 71.24 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\fe898c6b-36f4-42d1-bb9b-b2
remark: 25yr_4hr_chi

*
** CALIB NASHYD 0002 1 5.0 7.65 0.34 2.00 24.32 0.34 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

*
ADD [0001+ 0002] 0003 3 5.0 10.46 0.43 1.92 21.89 n/a 0.000

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\71f57428-54de-493b-ac35-b57d959f0ebb\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\71f57428-54de-493b-ac35-b57d959f0ebb\sce

DATE: 07/31/2018 TIME: 05:05:47

USER:

COMMENTS: _____

** SIMULATION : Run 05 **

W/E COMMAND HYD ID DT AREA 'Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0
[Ptot= 79.45 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\b54797e2-e577-4418-b557-d1
remark: 50yr_4hr_chi

*
** CALIB NASHYD 0001 1 5.0 2.81 0.14 1.67 18.74 0.24 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 10.0
[Ptot= 79.45 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\b54797e2-e577-4418-b557-d1
remark: 50yr_4hr_chi

*
** CALIB NASHYD 0002 1 5.0 7.65 0.42 2.00 29.39 0.37 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

*
ADD [0001+ 0002] 0003 3 5.0 10.46 0.52 1.92 26.53 n/a 0.000

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\37da4a9a-13df-4721-8b91-4def8a39f5c0\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\37da4a9a-13df-4721-8b91-4def8a39f5c0\sce

DATE: 07/31/2018 TIME: 05:05:47

USER:

COMMENTS: _____

** SIMULATION : Run 06 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0

[Ptot= 87.58 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a47e73c5d-4713-4f3d-946a-ca

remark: 100yr_4hr_chi

*
** CALIB NASHYD 0001 1 5.0 2.81 0.17 1.67 22.44 0.26 0.000

[CN=53.5]

[N = 3.0:Tp 0.20]

*
READ STORM 10.0

[Ptot= 87.58 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a47e73c5d-4713-4f3d-946a-ca

remark: 100yr_4hr_chi

*
** CALIB NASHYD 0002 1 5.0 7.65 0.50 1.92 34.66 0.40 0.000

[CN=69.0]

[N = 3.0:Tp 0.41]

*
ADD [0001+ 0002] 0003 3 5.0 10.46 0.62 1.92 31.38 n/a 0.000

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat

Output filename: C:\Users\MPinkney\AppData\Local\Civica\5e3319093-a62e-4bec-957c-fec698790bbc\c50bb4ae-e39c-48a9-810d-18ed90f30d4b\sce

Summary filename: C:\Users\MPinkney\AppData\Local\Civica\5e3319093-a62e-4bec-957c-fec698790bbc\c50bb4ae-e39c-48a9-810d-18ed90f30d4b\sce

DATE: 07/31/2018 TIME: 05:05:48

USER:

COMMENTS: _____

** SIMULATION : Run 07 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
 min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0

[Ptot= 55.00 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7ab0dedd1d-2df9-47a4-8105-74

remark: 2yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.06 12.08 9.22 0.17 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]
*

READ STORM 15.0

[Ptot= 55.00 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7ab0dedd1d-2df9-47a4-8105-74

remark: 2yr_24hr_scs

*
** CALIB NASHYD 0002 1 5.0 7.65 0.17 12.25 15.23 0.28 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]
*

ADD [0001+ 0002] 0003 3 5.0 10.46 0.21 12.17 13.62 n/a 0.000

*

=====

```
V V I SSSSS U U A L        (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLL
```

```
OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO
```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5le3319093-a62e-4bec-957c-fec698790bbc\7706dc6c-da12-4d6c-b655-bff2fa0a1c54\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5le3319093-a62e-4bec-957c-fec698790bbc\7706dc6c-da12-4d6c-b655-bff2fa0a1c54\sce

DATE: 07/31/2018 TIME: 05:05:48

USER:

COMMENTS: _____

** SIMULATION : Run 08 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
 min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0

[Ptot= 76.00 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\be39be8e-8284-4bbc-9cb8-40

remark: 5yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.11 12.08 17.24 0.23 0.000

[CN=53.5]

[N = 3.0:Tp 0.20]

*
READ STORM 15.0

[Ptot= 76.00 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\be39be8e-8284-4bbc-9cb8-40

remark: 5yr_24hr_scs

*
** CALIB NASHYD 0002 1 5.0 7.65 0.31 12.25 27.23 0.36 0.000

[CN=69.0]

[N = 3.0:Tp 0.41]

*
ADD [0001+ 0002] 0003 3 5.0 10.46 0.39 12.17 24.55 n/a 0.000

=====

V V I SSSSS U U A L (v 5.1.2000)

V V I SS U U AA L

V V I SS U U AAAAA L

V V I SS U U A A L

VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM

O O T T H H Y Y MM MM O O

O O T T H H Y M M O O

OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat

Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\e3319093-a62e-4bec-957c-fec698790bbc\198a0ec2-1dc4-4ed4-86e3-31afb1c04132\sce

Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\e3319093-a62e-4bec-957c-fec698790bbc\198a0ec2-1dc4-4ed4-86e3-31afb1c04132\sce

DATE: 07/31/2018

TIME: 05:05:48

USER:

COMMENTS: _____

** SIMULATION : Run 09 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
 min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0
[Ptot= 89.90 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\22796eeb-66fe-4bc1-b942-cc
remark: 10yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.16 12.08 23.54 0.26 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 15.0
[Ptot= 89.90 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\22796eeb-66fe-4bc1-b942-cc
remark: 10yr_24hr_scs

*
** CALIB NASHYD 0002 1 5.0 7.65 0.42 12.25 36.21 0.40 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

*
ADD [0001+ 0002] 0003 3 5.0 10.46 0.53 12.17 32.81 n/a 0.000

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\VH5\3319093-a62e-4bec-957c-fec698790bbc\edccf524-8c7b-402e-a918-6082353af506\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\VH5\3319093-a62e-4bec-957c-fec698790bbc\edccf524-8c7b-402e-a918-6082353af506\sce

DATE: 07/31/2018 TIME: 05:05:48

USER:

COMMENTS: _____

** SIMULATION : Run 10 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0
[Ptot=107.50 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\4f5b8d00-79d2-4173-b9a8-1f
remark: 25yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.22 12.08 32.44 0.30 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 15.0
[Plot=107.50 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\4f5b8d00-79d2-4173-b9a8-1f
remark: 25yr_24hr_scs

*
** CALIB NASHYD 0002 1 5.0 7.65 0.56 12.25 48.50 0.45 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

*
ADD [0001+ 0002] 0003 3 5.0 10.46 0.73 12.17 44.18 n/a 0.000

FINISH

=====
=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voindat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\81a45e7-8f8a-4443-80a6-d665d78c69e8\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\81a45e7-8f8a-4443-80a6-d665d78c69e8\sce

DATE: 07/31/2018 TIME: 05:05:48

USER:

COMMENTS: _____

** SIMULATION : Run 11 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0
[Plot=120.60 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\405bbb7b-7332-48a0-9322-21

remark: 50yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.27 12.08 39.65 0.33 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

READ STORM 15.0
[Ptot=120.60 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\405bbb7b-7332-48a0-9322-21
remark: 50yr_24hr_scs

*
** CALIB NASHYD 0002 1 5.0 7.65 0.68 12.25 58.17 0.48 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

ADD [0001+ 0002] 0003 3 5.0 10.46 0.88 12.17 53.19 n/a 0.000

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\e3319093-a62e-4bec-957c-fec698790bbc\14ae3d53-84ff-4047-a9ab-de33a8162e0b\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\e3319093-a62e-4bec-957c-fec698790bbc\14ae3d53-84ff-4047-a9ab-de33a8162e0b\sce

DATE: 07/31/2018 TIME: 05:05:47

USER:

COMMENTS: _____

** SIMULATION : Run 12 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0
[Ptot=133.60 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\0fd9b6a5-7abb-4257-a9d4-aa
remark: 100yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.32 12.08 47.25 0.35 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

```

*
READ STORM      15.0
[ Ptot=133.60 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\0fd9b6a5-7abb-4257-a9d4-aa
remark: 100yr_24hr_scs

```

```

** CALIB NASHYD    0002 1 5.0  7.65  0.80 12.25 68.13 0.51  0.000
[CN=69.0   ]
[ N = 3.0:Tp 0.41]

```

```

*
ADD [ 0001+ 0002] 0003 3 5.0  10.46  1.04 12.17 62.52 n/a  0.000

```

```

=====
V V I SSSSS U U A L      (v 5.1.2000)
V V I SS  U U AA L
V V I SS  U U AAAAA L
V V I SS  U U A A L
VV  I SSSSS UUUUU A A LLLLL

```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voindat
 Output filename: C:\Users\MPinkney\AppData\Local\Civica\XH5\3319093-a62e-4bec-957c-fec698790bbc\60cfd716-bb61-4966-8d42-86d7ae4159bclsce
 Summary filename: C:\Users\MPinkney\AppData\Local\Civica\XH5\3319093-a62e-4bec-957c-fec698790bbc\60cfd716-bb61-4966-8d42-86d7ae4159bclsce

DATE: 07/31/2018 TIME: 05:05:48

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 13                    **
*****

```

```

W/E COMMAND        HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
                  min ha ' cms hrs mm       cms

```

START @ 0.00 hrs

```

-----
READ STORM      10.0
[ Ptot= 25.00 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\ac869ccf-5f7d-451d-bb56-ca
remark: 25mm4hr

```

```

*
** CALIB NASHYD    0001 1 5.0  2.81  0.01 1.67  1.66 0.07  0.000
[CN=53.5   ]
[ N = 3.0:Tp 0.20]

```

```

*
READ STORM      10.0
[ Ptot= 25.00 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\ac869ccf-5f7d-451d-bb56-ca
remark: 25mm4hr

```

*
** CALIB NASHYD 0002 1 5.0 7.65 0.03 2.08 2.98 0.12 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

* ADD [0001+ 0002] 0003 3 5.0 10.46 0.04 2.00 2.63 n/a 0.000
*

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTTT TTTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\lVH5le3319093-a62e-4bec-957c-fec698790bbc\903d3e1a-dddf-4ccc-bd32-3e1d5a2bf866\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\lVH5le3319093-a62e-4bec-957c-fec698790bbc\903d3e1a-dddf-4ccc-bd32-3e1d5a2bf866\sce

DATE: 07/31/2018 TIME: 05:05:48

USER:

COMMENTS: _____

** SIMULATION : Run 14 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 60.0
[Ptot=212.00 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\bb2cb2d2-ed4e-43a7-921a-b7
remark: Hazel

*
** CALIB NASHYD 0001 1 5.0 2.81 0.26 10.00 99.98 0.47 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

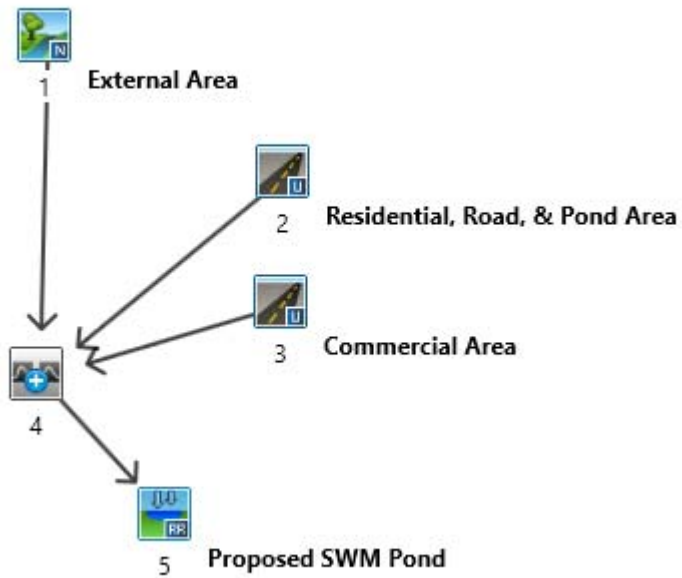
*
READ STORM 60.0
[Ptot=212.00 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\7c9745f9-f672-46ad-bbae-a9f9a14fed7a\bb2cb2d2-ed4e-43a7-921a-b7
remark: Hazel

*
** CALIB NASHYD 0002 1 5.0 7.65 0.82 10.17 133.42 0.63 0.000
[CN=69.0]
[N = 3.0:Tp 0.41]

* ADD [0001+ 0002] 0003 3 5.0 10.46 1.07 10.08 124.44 n/a 0.000
*



POST-DEVELOPMENT OTTHYMO SCHEMATIC AND RESULTS



```

V V I SSSSS U U A L      (v 5.1.2000)
V V I SS  U U AA L
V V I SS  U U AAAAA L
V V I SS  U U A A L
V V I SSSSS UUUUU A A LLLLL
    
```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO
    
```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voindat
 Output filename: C:\Users\MPinkney\AppData\Local\Civical\H5\5e3319093-a62e-4bec-957c-fec698790bbc\79658084-5953-47ac-9eab-72aec531e84e\sce
 Summary filename: C:\Users\MPinkney\AppData\Local\Civical\H5\5e3319093-a62e-4bec-957c-fec698790bbc\79658084-5953-47ac-9eab-72aec531e84e\sce

DATE: 08/01/2018 TIME: 09:15:16

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 01                      **
*****
    
```

W/E COMMAND	HYD	ID	DT	AREA	'Qpeak	Tpeak	R.V.	R.C.	Qbase
	min	ha	' cms	hrs	mm	cms			

START @ 0.00 hrs

```

-----
READ STORM                      10.0
[ Ptot= 36.95 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\606dafaf-6f15-461b-8ecc-4b
remark: 2yr_4hr_chi
*
    
```

```

** CALIB NASHYD                      0001 1 5.0 2.81 0.03 1.67 4.03 0.11 0.000
[CN=53.5                      ]
[ N = 3.0:Tp 0.20]
*
    
```

```

READ STORM                      10.0
[ Ptot= 36.95 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\606dafaf-6f15-461b-8ecc-4b
remark: 2yr_4hr_chi
*
    
```

```

* CALIB STANDHYD                      0002 1 5.0 4.91 0.70 1.50 29.38 0.79 0.000
[ I%=65.0:S%= 2.00]
*
    
```

```

READ STORM                      10.0
[ Ptot= 36.95 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\606dafaf-6f15-461b-8ecc-4b
remark: 2yr_4hr_chi
*
    
```

```

* CALIB STANDHYD                      0003 1 5.0 2.06 0.42 1.50 33.51 0.91 0.000
[ I%=85.0:S%= 2.00]
*
    
```

```

ADD [ 0001+ 0002] 0004 3 5.0 7.72 0.72 1.50 20.15 n/a 0.000
*
ADD [ 0004+ 0003] 0004 1 5.0 9.78 1.14 1.50 22.97 n/a 0.000
*
RESRVR [ 2: 0004] 0005 1 5.0 9.78 0.12 2.50 22.94 n/a 0.000
{ST= 0.14 ha.m}
*

```

=====

```

V V I SSSSS U U A L      (v 5.1.2000)
V V I SS  U U AA L
V V I SS  U U AAAAA L
V V I SS  U U A A L
V V I SSSSS UUUUU A A LLLLL

```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
 Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\leaf7ee37-a3be-41c7-b02b-68af8c1a0b13\sce
 Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\leaf7ee37-a3be-41c7-b02b-68af8c1a0b13\sce

DATE: 08/01/2018 TIME: 09:15:17

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 02          **
*****

```

W/E COMMAND	HYD ID	DT	AREA	'Qpeak	Tpeak	R.V.	R.C.	Qbase
	min	ha	' cms	hrs	mm			cms

START @ 0.00 hrs

```

-----
READ STORM          10.0
[ Ptot= 50.52 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\d422d203-6a9f-4d9e-9174-4d
remark: 5yr_4hr_chi
*

```

```

** CALIB NASHYD    0001 1 5.0 2.81 0.06 1.67 7.77 0.15 0.000
[CN=53.5          ]
[ N = 3.0:Tp 0.20]
*

```

```

READ STORM          10.0
[ Ptot= 50.52 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\d422d203-6a9f-4d9e-9174-4d
remark: 5yr_4hr_chi
*

```

```

* CALIB STANDHYD  0002 1 5.0 4.91 0.95 1.50 41.86 0.83 0.000
[ %=65.0:S%= 2.00]
*

```

```

READ STORM          10.0

```


[Ptot= 50.52 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\d422d203-6a9f-4d9e-9174-4d
remark: 5yr_4hr_chi

* CALIB STANDHYD 0003 1 5.0 2.06 0.56 1.50 46.72 0.92 0.000
[I%=85.0:S%= 2.00]
*
ADD [0001+ 0002] 0004 3 5.0 7.72 0.99 1.50 29.45 n/a 0.000
*
ADD [0004+ 0003] 0004 1 5.0 9.78 1.55 1.50 33.09 n/a 0.000
*
RESRVR [2: 0004] 0005 1 5.0 9.78 0.21 2.25 33.06 n/a 0.000
{ST= 0.19 ha.m }
*

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\XH5le3319093-a62e-4bec-957c-fec698790bbc\6c01fb3b-060a-42fa-92c0-3a74e4fd5a03\scce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\XH5le3319093-a62e-4bec-957c-fec698790bbc\6c01fb3b-060a-42fa-92c0-3a74e4fd5a03\scce

DATE: 08/01/2018 TIME: 09:15:16

USER:

COMMENTS: _____

** SIMULATION : Run 03 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0
[Ptot= 59.69 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\d108c0a-08a9-4785-8199-84
remark: 10yr_4hr_chi

*
** CALIB NASHYD 0001 1 5.0 2.81 0.08 1.67 10.84 0.18 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]
*

READ STORM 10.0
[Ptot= 59.69 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\8d108c0a-08a9-4785-8199-84
remark: 10yr_4hr_chi

* CALIB STANDHYD 0002 1 5.0 4.91 1.13 1.50 50.48 0.85 0.000
[I%=65.0:S%= 2.00]

READ STORM 10.0

[Ptot= 59.69 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\8d108c0a-08a9-4785-8199-84
remark: 10yr_4hr_chi

* CALIB STANDHYD 0003 1 5.0 2.06 0.66 1.50 55.72 0.93 0.000
[I%=85.0:S%= 2.00]

ADD [0001+ 0002] 0004 3 5.0 7.72 1.17 1.50 36.05 n/a 0.000

ADD [0004+ 0003] 0004 1 5.0 9.78 1.83 1.50 40.19 n/a 0.000

RESRVR [2: 0004] 0005 1 5.0 9.78 0.31 2.17 40.17 n/a 0.000
{ST= 0.22 ha.m }

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\VH5\3319093-a62e-4bec-957c-fec698790bbc\7d436141-aaa9-4649-b69e-561f8196c887\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\VH5\3319093-a62e-4bec-957c-fec698790bbc\7d436141-aaa9-4649-b69e-561f8196c887\sce

DATE: 08/01/2018 TIME: 09:15:16

USER:

COMMENTS: _____

** SIMULATION : Run 04 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0

[Ptot= 71.24 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\fe898c6b-36f4-42d1-bb9b-b2
remark: 25yr_4hr_chi

```

*
** CALIB NASHYD    0001 1 5.0  2.81  0.12 1.67 15.26 0.21 0.000
[CN=53.5      ]
[ N = 3.0:Tp 0.20]
*
READ STORM          10.0
[ Ptot= 71.24 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\fe898c6b-36f4-42d1-bb9b-b2
remark: 25yr_4hr_chi
*
* CALIB STANDHYD  0002 1 5.0  4.91  1.36 1.50 61.45 0.86 0.000
[ I%=65.0:S%= 2.00]
*
READ STORM          10.0
[ Ptot= 71.24 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\fe898c6b-36f4-42d1-bb9b-b2
remark: 25yr_4hr_chi
*
* CALIB STANDHYD  0003 1 5.0  2.06  0.79 1.50 67.09 0.94 0.000
[ I%=85.0:S%= 2.00]
*
ADD [ 0001+ 0002] 0004 3 5.0  7.72  1.43 1.50 44.64 n/a 0.000
*
ADD [ 0004+ 0003] 0004 1 5.0  9.78  2.22 1.50 49.37 n/a 0.000
*
RESRVR [ 2: 0004] 0005 1 5.0  9.78  0.42 2.08 49.34 n/a 0.000
{ST= 0.25 ha.m }
*

```

=====

```

V V I SSSSS U U A L      (v 5.1.2000)
V V I SS  U U AA L
V V I SS  U U AAAAA L
V V I SS  U U A A L
VV  I SSSSS UUUUU A A LLLLL

```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
 Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\e3319093-a62e-4bec-957c-fec698790bbc\65946267-8bb3-44ff-9256-1318e7c96196\sce
 Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\e3319093-a62e-4bec-957c-fec698790bbc\65946267-8bb3-44ff-9256-1318e7c96196\sce

DATE: 08/01/2018 TIME: 09:15:15

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 05            **
*****

```

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
 min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0
[Ptot= 79.45 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\b54797e2-e577-4418-b557-d1
remark: 50yr_4hr_chi

*
** CALIB NASHYD 0001 1 5.0 2.81 0.14 1.67 18.74 0.24 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 10.0
[Ptot= 79.45 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\b54797e2-e577-4418-b557-d1
remark: 50yr_4hr_chi

*
* CALIB STANDHYD 0002 1 5.0 4.91 1.52 1.50 69.34 0.87 0.000
[I%=65.0:S%= 2.00]

*
READ STORM 10.0
[Ptot= 79.45 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\b54797e2-e577-4418-b557-d1
remark: 50yr_4hr_chi

*
* CALIB STANDHYD 0003 1 5.0 2.06 0.89 1.50 75.21 0.95 0.000
[I%=85.0:S%= 2.00]

*
ADD [0001+ 0002] 0004 3 5.0 7.72 1.61 1.50 50.92 n/a 0.000

*
ADD [0004+ 0003] 0004 1 5.0 9.78 2.50 1.50 56.04 n/a 0.000

*
RESRVR [2: 0004] 0005 1 5.0 9.78 0.52 2.00 56.01 n/a 0.000
{ST= 0.28 ha.m }

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\XH5le3319093-a62e-4bec-957c-fec698790bbc\1b01abe0-7182-43e9-9059-2df100b7cb43\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\XH5le3319093-a62e-4bec-957c-fec698790bbc\1b01abe0-7182-43e9-9059-2df100b7cb43\sce

DATE: 08/01/2018 TIME: 09:15:15

USER:

COMMENTS: _____

 ** SIMULATION : Run 06 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
 min ha ' cms hrs mm cms

START @ 0.00 hrs

 READ STORM 10.0

[Ptot= 87.58 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\47e73c5d-4713-4f3d-946a-ca

remark: 100yr_4hr_chi

*
 ** CALIB NASHYD 0001 1 5.0 2.81 0.17 1.67 22.44 0.26 0.000

[CN=53.5]

[N = 3.0:Tp 0.20]

*
 READ STORM 10.0

[Ptot= 87.58 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\47e73c5d-4713-4f3d-946a-ca

remark: 100yr_4hr_chi

*
 * CALIB STANDHYD 0002 1 5.0 4.91 1.68 1.50 77.17 0.88 0.000

[%=65.0:S%= 2.00]

*
 READ STORM 10.0

[Ptot= 87.58 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\47e73c5d-4713-4f3d-946a-ca

remark: 100yr_4hr_chi

*
 * CALIB STANDHYD 0003 1 5.0 2.06 0.98 1.50 83.24 0.95 0.000

[%=85.0:S%= 2.00]

*
 ADD [0001+ 0002] 0004 3 5.0 7.72 1.79 1.50 57.25 n/a 0.000

*
 ADD [0004+ 0003] 0004 1 5.0 9.78 2.77 1.50 62.72 n/a 0.000

*
 RESRVR [2: 0004] 0005 1 5.0 9.78 0.61 2.00 62.70 n/a 0.000

{ST= 0.31 ha.m}

=====

V V I SSSSS U U A L (v 5.1.2000)
 V V I SS U U A A L
 V V I SS U U A A A A L
 V V I SS U U A A L
 V V I SSSSS UUUUU A A LLLLL

OOO TTTTT TTTTT H H Y Y M M OOO TM
 O O T T H H Y Y M M M M O O
 O O T T H H Y M M O O
 OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
 Output filename: C:\Users\MPinkney\AppData\Local\Civica\VH5\3319093-a62e-4bec-957c-fec698790bbc\69724c8-a8cd-41be-80dc-fd58baead495\sce
 Summary filename: C:\Users\MPinkney\AppData\Local\Civica\VH5\3319093-a62e-4bec-957c-fec698790bbc\69724c8-a8cd-41be-80dc-fd58baead495\sce

DATE: 08/01/2018 TIME: 09:15:17

USER:

COMMENTS: _____

** SIMULATION : Run 07 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0

[Ptot= 55.00 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\b0dedd1d-2df9-47a4-8105-74

remark: 2yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.06 12.08 9.22 0.17 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]
*

READ STORM 15.0

[Ptot= 55.00 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\b0dedd1d-2df9-47a4-8105-74

remark: 2yr_24hr_scs

* CALIB STANDHYD 0002 1 5.0 4.91 0.57 12.00 46.06 0.84 0.000
[I%=65.0:S%= 2.00]
*

READ STORM 15.0

[Ptot= 55.00 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\b0dedd1d-2df9-47a4-8105-74

remark: 2yr_24hr_scs

* CALIB STANDHYD 0003 1 5.0 2.06 0.33 12.00 51.11 0.93 0.000
[I%=85.0:S%= 2.00]
*

ADD [0001+ 0002] 0004 3 5.0 7.72 0.63 12.00 32.65 n/a 0.000

ADD [0004+ 0003] 0004 1 5.0 9.78 0.95 12.00 36.54 n/a 0.000

RESRVR [2: 0004] 0005 1 5.0 9.78 0.16 12.58 36.51 n/a 0.000
{ST= 0.16 ha.m }

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civical\H5\3319093-a62e-4bec-957c-fec698790bbc\4666557-6741-4312-9cfa-d239a7767ad\fsce
Summary filename: C:\Users\MPinkney\AppData\Local\Civical\H5\3319093-a62e-4bec-957c-fec698790bbc\4666557-6741-4312-9cfa-d239a7767ad\fsce

DATE: 08/01/2018 TIME: 09:15:16

USER:

COMMENTS: _____

** SIMULATION : Run 08 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0
[Ptot= 76.00 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\be39be8e-8284-4bbc-9cb8-40
remark: 5yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.11 12.08 17.24 0.23 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 15.0
[Ptot= 76.00 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\be39be8e-8284-4bbc-9cb8-40
remark: 5yr_24hr_scs

*
* CALIB STANDHYD 0002 1 5.0 4.91 0.83 12.00 66.02 0.87 0.000
[I%=65.0:S%= 2.00]

*
READ STORM 15.0
[Ptot= 76.00 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\be39be8e-8284-4bbc-9cb8-40
remark: 5yr_24hr_scs

*
* CALIB STANDHYD 0003 1 5.0 2.06 0.46 12.00 71.79 0.94 0.000
[I%=85.0:S%= 2.00]

*
ADD [0001+ 0002] 0004 3 5.0 7.72 0.94 12.00 48.26 n/a 0.000

*
ADD [0004+ 0003] 0004 1 5.0 9.78 1.39 12.00 53.22 n/a 0.000

*
RESRVR [2: 0004] 0005 1 5.0 9.78 0.31 12.50 53.19 n/a 0.000
{ST= 0.22 ha.m }

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O

OOO T T H H Y M M OOO
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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\9255119-bea1-45df-acfb-a213bdda22e8\lsce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\9255119-bea1-45df-acfb-a213bdda22e8\lsce

DATE: 08/01/2018 TIME: 09:15:18

USER:

COMMENTS: _____

** SIMULATION : Run 09 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0
[Ptot= 89.90 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\22796eeb-66fe-4bc1-b942-cc
remark: 10yr_24hr_scs
*

** CALIB NASHYD 0001 1 5.0 2.81 0.16 12.08 23.54 0.26 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]
*

READ STORM 15.0
[Ptot= 89.90 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\22796eeb-66fe-4bc1-b942-cc
remark: 10yr_24hr_scs
*

* CALIB STANDHYD 0002 1 5.0 4.91 1.03 12.00 79.42 0.88 0.000
[I%=65.0:S%= 2.00]
*

READ STORM 15.0
[Ptot= 89.90 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\22796eeb-66fe-4bc1-b942-cc
remark: 10yr_24hr_scs
*

* CALIB STANDHYD 0003 1 5.0 2.06 0.55 12.00 85.54 0.95 0.000
[I%=85.0:S%= 2.00]
*

ADD [0001+ 0002] 0004 3 5.0 7.72 1.17 12.00 59.08 n/a 0.000
*

ADD [0004+ 0003] 0004 1 5.0 9.78 1.72 12.00 64.65 n/a 0.000
*

RESRVR [2: 0004] 0005 1 5.0 9.78 0.42 12.33 64.62 n/a 0.000
{ST= 0.26 ha.m }
*

FINISH

=====
=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTTT TTTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voindat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5le3319093-a62e-4bec-957c-fec698790bbc\14cd1326-ef67-439b-85cc-40fe3ebdc579\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5le3319093-a62e-4bec-957c-fec698790bbc\14cd1326-ef67-439b-85cc-40fe3ebdc579\scse

DATE: 08/01/2018 TIME: 09:15:15

USER:

COMMENTS: _____

** SIMULATION : Run 10 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 15.0
[Ptot=107.50 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\4f5b8d00-79d2-4173-b9a8-1f
remark: 25yr_24hr_scs

*
** CALIB NASHYD 0001 1 5.0 2.81 0.22 12.08 32.44 0.30 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 15.0
[Ptot=107.50 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\4f5b8d00-79d2-4173-b9a8-1f
remark: 25yr_24hr_scs

*
* CALIB STANDHYD 0002 1 5.0 4.91 1.25 12.00 96.52 0.90 0.000
[I%=65.0:S%= 2.00]

*
READ STORM 15.0
[Ptot=107.50 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\4f5b8d00-79d2-4173-b9a8-1f
remark: 25yr_24hr_scs

*
* CALIB STANDHYD 0003 1 5.0 2.06 0.66 12.00 103.00 0.96 0.000
[I%=85.0:S%= 2.00]

*
ADD [0001+ 0002] 0004 3 5.0 7.72 1.45 12.00 73.20 n/a 0.000

```

*
ADD [ 0004+ 0003] 0004 1 5.0 9.78 2.11 12.00 79.47 n/a 0.000
*
RESRVR [ 2: 0004] 0005 1 5.0 9.78 0.60 12.33 79.45 n/a 0.000
{ST= 0.31 ha.m }
*

```

=====

```

V V I SSSSS U U A L      (v 5.1.2000)
V V I SS  U U AA L
V V I SS  U U AAAAA L
V V I SS  U U A A L
VV  I SSSSS UUUUU A A LLLL

```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
 Output filename: C:\Users\MPinkney\AppData\Local\Civica\VH5\3319093-a62e-4bec-957c-fec698790bbc\d4e2b288-0b18-489d-abda-52610f240085\sce
 Summary filename: C:\Users\MPinkney\AppData\Local\Civica\VH5\3319093-a62e-4bec-957c-fec698790bbc\d4e2b288-0b18-489d-abda-52610f240085\sce

DATE: 08/01/2018 TIME: 09:15:17

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 11            **
*****

```

W/E COMMAND HYD ID DT AREA 'Opeak Tpeak R.V. R.C. Qbase
 min ha ' cms hrs mm cms

START @ 0.00 hrs

```

-----
READ STORM            15.0
[ Ptot=120.60 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\405bbb7b-7332-48a0-9322-21
remark: 50yr_24hr_scs

```

```

*
** CALIB NASHYD    0001 1 5.0 2.81 0.27 12.08 39.65 0.33 0.000
[CN=53.5        ]
[ N = 3.0:Tp 0.20]

```

```

*
READ STORM            15.0
[ Ptot=120.60 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\405bbb7b-7332-48a0-9322-21
remark: 50yr_24hr_scs

```

```

*
* CALIB STANDHYD    0002 1 5.0 4.91 1.42 12.00 109.33 0.91 0.000
[ I%=65.0:S%= 2.00]

```

```

*
READ STORM            15.0
[ Ptot=120.60 mm ]

```

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\405bbb7b-7332-48a0-9322-21
remark: 50yr_24hr_scs

```

*
* CALIB STANDHYD    0003 1 5.0  2.06  0.74 12.00 116.01 0.96  0.000
  [I%=85.0:S%= 2.00]
*
  ADD [ 0001+ 0002] 0004 3 5.0  7.72  1.67 12.00 83.97 n/a  0.000
*
  ADD [ 0004+ 0003] 0004 1 5.0  9.78  2.41 12.00 90.72 n/a  0.000
*
  RESRVR [2: 0004] 0005 1 5.0  9.78  0.75 12.25 90.69 n/a  0.000
  {ST= 0.34 ha.m }
*

```

```

=====

V V I SSSSS U U A L      (v 5.1.2000)
V V I SS  U U AA L
V V I SS  U U AAAAA L
V V I SS  U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voindat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\e3319093-a62e-4bec-957c-fec698790bbc\d1fa7d82-4cd6-4c2b-8f78-4b35750e8faelsce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\e3319093-a62e-4bec-957c-fec698790bbc\d1fa7d82-4cd6-4c2b-8f78-4b35750e8faelsce

DATE: 08/01/2018 TIME: 09:15:17

USER:

COMMENTS: _____

```

*****
** SIMULATION : Run 12            **
*****

```

W/E COMMAND	HYD	ID	DT	AREA	'Qpeak	Tpeak	R.V.	R.C.	Qbase
	min	ha	' cms	hrs	mm	cms			

START @ 0.00 hrs

READ STORM 15.0

[Ptot=133.60 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\0fd9b6a5-7abb-4257-a9d4-aa

remark: 100yr_24hr_scs

```

*
** CALIB NASHYD    0001 1 5.0  2.81  0.32 12.08 47.25 0.35  0.000
  [CN=53.5      ]
  [ N = 3.0:Tp 0.20]
*

```

READ STORM 15.0

[Ptot=133.60 mm]

fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\0fd9b6a5-7abb-4257-a9d4-aa

remark: 100yr_24hr_scs

* CALIB STANDHYD 0002 1 5.0 4.91 1.65 12.00 122.08 0.91 0.000
[I%=65.0:S%= 2.00]

* READ STORM 15.0
[Ptot=133.60 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\0fd9b6a5-7abb-4257-a9d4-aa
remark: 100yr_24hr_scs

* CALIB STANDHYD 0003 1 5.0 2.06 0.83 12.00 128.94 0.97 0.000
[I%=85.0:S%= 2.00]

* ADD [0001+ 0002] 0004 3 5.0 7.72 1.95 12.00 94.84 n/a 0.000

* ADD [0004+ 0003] 0004 1 5.0 9.78 2.78 12.00 102.02 n/a 0.000

* RESRVR [2: 0004] 0005 1 5.0 9.78 0.91 12.17 101.99 n/a 0.000
{ST= 0.38 ha.m }

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U AA L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\le3319093-a62e-4bec-957c-fec698790bbc\6a8c153-8441-432e-bd62-0c971581a316\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\le3319093-a62e-4bec-957c-fec698790bbc\6a8c153-8441-432e-bd62-0c971581a316\sce

DATE: 08/01/2018 TIME: 09:15:18

USER:

COMMENTS: _____

** SIMULATION : Run 13 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

READ STORM 10.0
[Ptot= 25.00 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\ac869ccf-5f7d-451d-bb56-ca
remark: 25mm4hr

*

** CALIB NASHYD 0001 1 5.0 2.81 0.01 1.67 1.66 0.07 0.000
[CN=53.5]
[N = 3.0:Tp 0.20]

*
READ STORM 10.0
[Ptot= 25.00 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\ac869ccf-5f7d-451d-bb56-ca
remark: 25mm4hr

* CALIB STANDHYD 0002 1 5.0 4.91 0.40 1.50 18.76 0.75 0.000
[I%=65.0:S%= 2.00]

*
READ STORM 10.0
[Ptot= 25.00 mm]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\ac869ccf-5f7d-451d-bb56-ca
remark: 25mm4hr

* CALIB STANDHYD 0003 1 5.0 2.06 0.24 1.50 22.00 0.88 0.000
[I%=85.0:S%= 2.00]

*
ADD [0001+ 0002] 0004 3 5.0 7.72 0.41 1.50 12.53 n/a 0.000

*
ADD [0004+ 0003] 0004 1 5.0 9.78 0.65 1.50 14.53 n/a 0.000

*
RESRVR [2: 0004] 0005 1 5.0 9.78 0.07 2.67 14.50 n/a 0.000
{ST= 0.08 ha.m }

=====

V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
V V I SSSSS UUUUU A A LLLLL

OOO TTTTT TTTTT H H Y Y M M OOO TM
O O T T H H Y Y M M M M O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voim.dat
Output filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\9b49ba80-44fa-4b59-84eb-3342c347676f\sce
Summary filename: C:\Users\MPinkney\AppData\Local\Civica\WH5\3319093-a62e-4bec-957c-fec698790bbc\9b49ba80-44fa-4b59-84eb-3342c347676f\sce

DATE: 08/01/2018 TIME: 09:15:16

USER:

COMMENTS: _____

** SIMULATION : Run 14 **

W/E COMMAND HYD ID DT AREA ' Qpeak Tpeak R.V. R.C. Qbase
min ha ' cms hrs mm cms

START @ 0.00 hrs

```

-----
READ STORM          60.0
[ Ptot=212.00 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\bb2cb2d2-ed4e-43a7-921a-b7
remark: Hazel
*
** CALIB NASHYD      0001 1 5.0  2.81  0.26 10.00 99.98 0.47  0.000
[CN=53.5      ]
[ N = 3.0:Tp 0.20]
*
READ STORM          60.0
[ Ptot=212.00 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\bb2cb2d2-ed4e-43a7-921a-b7
remark: Hazel
*
* CALIB STANDHYD    0002 1 5.0  4.91  0.69 10.00 199.52 0.94  0.000
[ %=65.0:S%= 2.00]
*
READ STORM          60.0
[ Ptot=212.00 mm ]
fname : C:\Users\MPinkney\AppData\Local\Temp\33860b56-8993-468f-8aef-f190c162c948\bb2cb2d2-ed4e-43a7-921a-b7
remark: Hazel
*
* CALIB STANDHYD    0003 1 5.0  2.06  0.30 10.00 207.07 0.98  0.000
[ %=85.0:S%= 2.00]
*
ADD [ 0001+ 0002] 0004 3 5.0  7.72  0.95 10.00 163.29 n/a  0.000
*
ADD [ 0004+ 0003] 0004 1 5.0  9.78  1.25 10.00 172.51 n/a  0.000
*
RESRVR [ 2: 0004] 0005 1 5.0  9.78  1.00 10.33 172.48 n/a  0.000
{ST= 0.39 ha.m }
*

```



APPENDIX D

WATER BALANCE CALCULATIONS

180 & 190 Ferndale Drive North Water Balance Calculations

Pre Development Recharge

Precipitation data taken from Environment Canada information for the City of Barrie.

$$\text{Yearly Precipitation} = 932.9 \text{ mm}$$

Using Table 3.1 of the MOE's SWM Planning & Design Manual, the infiltration amount is approximately 33.0% of the precipitation value for Pasture and Shrubs for Fine Sandy Loam. Using site specific rainfall data, the infiltration can be calculated.

$$\begin{aligned} \text{Pasture and Shrubs} &= 7.95 \text{ ha} \\ \text{Annual Site Area Recharge Volume} &= 7.95 \times 0.33 \times 932.9 \\ &= 24,475 \text{ m}^3 \end{aligned}$$

Therefore, 24,475 m³ per year of recharge volume is required for the proposed project.

Post Development Recharge

Using Table 3.1 of the MOE's SWM Planning & Design Manual, the infiltration amount for Urban Lawns is approximately 29%.

$$\begin{aligned} \text{Grassed Area} &= 1.97 \text{ ha} \\ \text{Annual Site Area Recharge Volume} &= 1.97 \times 0.29 \times 932.9 \\ &= 5,338 \text{ m}^3 \end{aligned}$$

Therefore, post development infiltration deficit is as follows:

$$\begin{aligned} \text{Deficit Volume} &= \text{Pre Development} - \text{Post Development} \\ &= 24,475 - 5,338 \\ &= 19,137 \text{ m}^3 \end{aligned}$$

Infiltration galleries will be designed to infiltrate rooftop runoff to make up the difference from pre to post development recharge volume.



APPENDIX E

PHOSPHORUS CALCULATIONS

180 & 190 Ferndale Drive North Phosphorus Budget Tool

	Residential	Commercial	Pasture	Forest
Phosphorus Export (kg/ha/year)	1.32	1.82	0.07	0.05
Pre-Development Condition				
Area (ha):	Residential 0.00	Commercial 0.00	Pasture 7.95	Forest 0.00
Total P (kg):	0.00	0.00	0.56	0.00
Total Pre-Development P (kg):	0.56			
Post-Development Condition (Uncontrolled)				
Total Area Area (ha):	Residential 8.09	Commercial 2.06	Pasture 0.60	Forest 0.00
Total P (kg):	10.68	3.75	0.04	0.00
Total Post-Development P (kg):	14.47			
Post Development Condition (Controlled)				
Untreated Area Area (ha):	Residential 1.20	Commercial 0.00	Pasture 0.00	Forest 0.00
Total P (kg):	1.58	0.00	0.00	0.00
Area Draining to SWM Pond Area (ha):	6.89	2.06	0.60	0.00
Total P (kg):	9.10	3.75	0.04	0.00
SWM Pond Treatment SWM Pond Proficiency (%):	63			
P Removed (kg):	8.12			
P Remaining (kg):	4.77			
Total Post-Development P (kg):	6.35			

Note: Additional LIDs will be implemented to further reduce phosphorus levels at the detailed design stage.