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December 13, 2017

via Email (planningmanager@wasagabeach.com) & hand delivery
CCTA File 117098

Doug Herron, MCIP, RPP, MPA
Manager of Planning and Development Review
Town of Wasaga Beach
30 Lewis Street
Wasaga Beach, ON L9Z 1A1

**Re: Town of Wasaga Beach - Wasaga Meadows East Phase 4
 First Engineering Submission**

Dear Doug:

Introduction

C.C. Tatham & Associates Ltd. (CCTA) has been retained by Parkbridge Lifestyle Communities (Parkbridge) to complete the civil engineering design for the Wasaga Meadows East Phase 4 development, located on Theme Park Drive Drive in the Town of Wasaga Beach.

The following documents have been enclosed in **Appendix A** in support of the development and engineering submission:

- Legal Survey prepared by Rodney G. Reynolds signed on January 14, 1999;
- Stage 1-2 Archaeological Assessment prepared by Bluestone Research dated June 2017;
- Geotechnical Investigation prepared by Peto MacCallum September 2017;
- Scoped Environmental Impact Statement prepared by Beacon Environmental dated October 2017;
- Planning Justification Report prepared by Celeste Phillips Planning Inc. dated November 26, 2017;
- Traffic Impact Study prepared by CCTA dated December 11, 2017;
- Site Plan Control Application for Approval signed December 12, 2017;
- Official Plan Amendment Application for Approval signed December 12, 2017'

- Zoning By-law Amendment/Lifting of Hold (H)/Temporary Use By-law Application for Approval signed December 12, 2017;
- Civil Engineering design drawings prepared and reviewed by a senior engineer from CCTA stamped December 12, 2017 that conform to Town standards:
 - Siltation, Removals, and Erosion Control Plan SC-1;
 - Pre-Development Drainage Plan DP-1;
 - Post-Development Drainage Plan DP-2;
 - Storm Sewer Drainage Plan STM-1;
 - Site Servicing Plan SS-1;
 - Site Grading Plan SG-1;
 - Sanitary Drainage Plan SAN-1;
 - Pond Cross-Section and Details PND-1;
 - Plan and Profile for Wally Street PP-1; and
 - General Details and Notes DE-1.

We offer the following comments with respect to the submission package.

Existing Conditions

The 3.1 Ha property is located on Theme Park Drive and is bounded by Theme Park Drive to the west, Wally Drive to the north, an empty gravel lot to the south and undeveloped vegetated lands to the east. The majority of the property has already been cleared of trees and acts as a storage yard for Parkbridge's various equipment and stockpiles. The property, as well as the surrounding area, is shown on the Location Map over leaf. The boundary for the property is shown on the legal plan prepared by Rodney G. Reynolds.

Water Main

There is an existing 200 mm dia. water main along the west side of Theme Park Drive. This existing 200 mm dia. water main connects to an existing 400 mm dia. water main located on River Road West, a 150 mm dia. water main at Wally Drive and a 300 mm dia. water main on the north side of Sturgeon Creek on Donato Way off of River Road East.

Sanitary Sewer

There is an existing 200 mm dia. gravity sanitary sewer along the center of Theme Park Drive which drains north and connects to an existing sanitary sewer north of Sturgeon Creek that is utilized by the existing Country Life Resort. The upstream end of this 200 mm dia. sewer was connected to Sanitary Maintenance Hole (SAN MH) 207 complete with an 8.5 m - 250 mm dia. stub to the south along Theme Park Drive and a 12m - 300 mm dia. stub east along the un-opened road allowance for Wally Drive. SAN MH 207 then drains west along Wally Drive via 300 mm dia. gravity sewer towards Zoo Park Road.

Wally Drive & Access

Wally Drive east of Theme Park Drive is currently an un-opened right-of-way consisting of a 9 m wide gravel access connecting to the existing Wasaga Country Life development on Cabin Crescent. A rudimentary gravel access path/road is also connected to the east end of the un-opened road Wally Drive road allowance and runs south westerly towards the south west property corner of the Wasaga Meadows East Phase 4 property.

Soil Conditions

The existing soils within the property primarily consist of fine to medium sand with some traces of silt, gravel and organic. Ground water was observed between 0.5 metres to 1.0 meter deep throughout the property and will vary throughout the year. The existing soil conditions are summarized in the Geotechnical Investigation prepared by Peto MacCallum Ltd.

Grading and Stormwater Management

The topographic information obtained indicates the site generally slopes towards the northwest side of the property. Catchment 101 represents 1.74 ha of drainage which collected in the Wally Drive roadside ditch. Catchment 102 represent 1.32 ha of drainage which is conveyed north and it collected in the Theme Park Drive roadside ditch. Flows from catchment 101 and 102 combine at the intersection of Wally Drive and Theme Park Drive at the northwest corner of the property. Existing drainage patterns are depicted on the appended Dwg. DP-1.

External drainage from an area south of the property is currently conveyed across the site and have been represented as catchment 301 and 302 on drawing DP-1. An OTTHYMO model was created to quantify the existing condition peak flow rates to the intersection of Wally Drive and Theme Park Drive for the 2 through 100 year design storm. The existing condition model results are summarized in Table 1 and supporting calculations are attached in **Appendix A**.

Table 1: Existing Condition Peak Flow Summary

Storm Event	Peak Flow (m ³ /s) Catchment 101 +102	
	SCS	CHI
2-year	0.100	0.038
5-year	0.177	0.073
10-year	0.236	0.102
25-year	0.319	0.143
50-year	0.386	0.176
100-year	0.460	0.213
Regional	-	0.456

Utilities

Existing utilities in the area include overhead hydro, telephone and cable as well as underground gas along Theme Park Drive.

Proposed Development

The proposed development will consist of 66 multi-unit housing blocks containing between 4 to 8 units each. The following sections describe the respective services and how they meet the requirements of the proposed development:

Water Main

The existing 200 mm dia. water main along Theme Park Drive at the intersection of Wally Drive will be connected and a new 150 mm water main will be installed to the east within the Wally Drive un-opened road allowance complete with hydrants and isolation valves. The proposed internal 150 mm dia. water main will connect to the new 150 mm dia. water main along Wally Drive east of Theme Park Drive. A meter chamber and meter to Town standards (STD.DWG.No.15A) will be installed at the Wally Drive entrance to record the water usage for the development. Individual 25 mm dia. water services complete with curb stops will be installed to service all 66 units. Hydrants and water valves have been strategically placed throughout the development for firefighting and maintenance purposes. On this basis, we respectfully request the Town incorporate the additional infrastructure in their overall water model to ensure the Town's water system can support the Wasaga Meadows Phase 4 East development. The existing and proposed water main is shown on the Site Servicing Plan drawing SS-1 as well as the Wally Drive Plan and Profile drawing PP-1. Details of the meter chamber are provided on the Details and Notes Sheet drawing DE-1.

Sanitary Main

The existing 300 mm dia. gravity sanitary sewer connected to SANMH 207 is currently terminated at the easterly right-of way of Theme Park Drive and will be extended east approximately 155 m along Wally Drive and terminated at the east end of the un-opened right-of-way of Wally Drive for future developments not associated with Wasaga Meadows East Phase 4. The proposed internal 200 mm dia. gravity sewer will be installed throughout the development with maintenance holes at key locations. Each unit will contain an individual 125 mm dia. sanitary service. The sanitary sewer design model calculations and the Sanitary Drainage Plan (SAN-1) are included in **Appendix B**. On this basis, we respectfully request the Town incorporate the additional infrastructure in their overall sanitary sewer model to ensure the Town's sewer system can support the Wasaga Meadows Phase 4 East development. The detailed location of the proposed sanitary sewer and services are shown on drawing PP-1, SS-1 and DE-1.

Wally Drive & Internal Road Access

Wally Drive will be converted from a 20 m wide un-opened road allowance consisting a 9 m wide gravel access, into a Town of Wasaga Beach "Modified" Standard Cross-Section for a Local Residential Subdivision STD.DWG.No.2A. The centreline of the proposed Wally Drive east of Theme Park Drive must align with the centreline of the existing Wally Drive west of Theme Park Drive. Therefore, the proposed Wally Drive east of Theme Park Drive will not be centered in the proposed right-of-way. Therefore, we recommend the Town's standard be modified to show the proposed hydrant and transformer on the south side of the proposed Wally Drive. This modification will still allow for all the underground and above ground infrastructure to be installed, including curb and gutter, a 1.5 m wide concrete sidewalk, servicing including hydro, cable, telephone, gas and street lights while still maintaining the required road widths. The modification also allows for the existing landscaped berm north of Wally Drive to remain. The easterly termination of Wally Drive will consist of a Town of Wasaga Beach Typical Cul-de-sac c/w Curb and Gutter STD.DWG.No.5. Further discussions with the Town are necessary to confirm if the existing access from Wally Drive to Cabin Crescent will be maintained. The detailed design of Wally Drive is provided on Plan and Profile drawing PP-1 and DE-1.

The internal 12m wide access road allowance will include a 6 m wide asphalt surface complete with 0.5 m wide gravel shoulders and a 1.2 m wide concrete sidewalk and be connected to two separate access points, one on Theme Park Drive and the second on Wally Drive. A copy of the 12 m wide internal road allowance access is provided on DE-1.

As noted in the Planning Justification Report in **Appendix A**, this internal cross section has been consistently successful with most of Parkbridge's developments in Wasaga Beach, is pedestrian friendly and includes ample visitor and residential parking (i.e. two parking spaces per unit, 33 visitor parking spaces).

A stand-alone Traffic Impact Study (TIS) was also completed by CCTA in support of the Wasaga Meadows Phase 4 East development and should be read in conjunction with this letter report. The TIS concludes that the proposed Wasaga Meadows Phase 4 East development will not require any improvements to the study area road network over and above those already identified in the previous background traffic studies (i.e. Traffic signals at the intersection of Theme Park Drive and River Road West in 2024).

Grading & Stormwater Management

The proposed stormwater management strategy identified for this development will use a treatment train approach with at-source/conveyance controls (perforated pipe system, dry swales) to be used where possible to maximize water quality treatment and flow volume reduction for drainage being conveyed to the outlet. A stormwater pond will be implemented as the end-of-pipe control.

Infiltration galleries are a Low Impact Development (LID) feature designed to collect drainage from the proposed buildings and internal road network. Overflow from the perforated pipe system will be conveyed to the end-of-pipe SWM pond for further quantity and quality control. Preliminary soil testing results confirm that native soils are conducive to infiltration and suited for infiltration based SWM controls. Groundwater depths were suitable for infiltration as groundwater levels were determined to be greater than 2.0 m below the existing ground surface.

Water Quality Control

The SWM pond has been designed to provide water quality control treatment with a storage volume sized in accordance with MOECC Guidelines for Enhanced Level water quality control. A water quality storage volume of 183 m³/ha is required for the pond to provide Enhanced protection. The total required permanent pool storage volume is 290 m³ based on a contributing area of 2.03 ha. The water quality calculations and pond volume table can be found in **Appendix C**. The pond provides 344 m³ of permanent pool volume and 160 m³ of extended detention volume which meets the requirements for water quality treatment.

In addition to the water quality treatment achieved in the wet pond the LID practices will also provide water quality treatment. The infiltration trench will meet the water quality volume requirement for an infiltration facility of 30 m³/ha, which is 61 m³. The infiltration trench has been designed to infiltrate 63 m³ of runoff volume. Stormwater is collected in small grassed swales prior to entering the infiltration trench. The grassed swales will act as pre-treatment for the facility, and will start to settle out sediment prior to entering the infiltration trench.

Water quality calculations and storage volume calculations for the infiltration trenches can be found in **Appendix C**.

Water Quantity Control

An OTTHYMO hydrologic model was created to determine peak flow rates from the subject property under existing and proposed conditions for the Chicago design storms and the 24-hour SCS storm distributions. The model was then used to determine the required water quantity storage volume to attenuate the proposed condition peak flows during the 2-year through 100-year storm to existing condition levels. The primary outlet for the site is the Theme Park Drive roadside ditch.

The proposed development has been modelled as three catchments as shown on the attached DP-2. Catchment 201 and 202 consists of rear yard drainage collected in an infiltration trench which drains to Wally Drive and Theme Park Drive, respectively. Catchment 203 represents the majority of the site (2.03 ha) and is the area draining into the proposed stormwater management pond.

Flow is routed from throughout the development into the LID practices within the roadside swale. Minor flows are conveyed to the wet pond through the swale and the infiltration trench. Minor storm events (greater than the 5 year storm) will be conveyed to the pond within the road right-of-way. Table 2 found below summarizes the peak flows from the site. Additional model results for the existing and proposed condition scenarios, along with hydrologic input parameters, have been included in **Appendix C**. A summary of the proposed condition Stage-Storage-Discharge for the pond is provided in Table 3.

Table 2: Proposed Condition Peak Flow Summary

Storm Event	Peak Flow (m ³ /s)	
	Catchments 201+202+203+301+302	
	SCS	CHI
2-year	0.093 (0.100)	0.037 (0.038)
5-year	0.160 (0.177)	0.069 (0.073)
10-year	0.216 (0.236)	0.096 (0.102)
25-year	0.292 (0.319)	0.132 (0.143)
50-year	0.357 (0.386)	0.163 (0.176)
100-year	0.442 (0.460)	0.197 (0.213)
Regional	-	0.503 (0.456)

Table 3: Summary of Peak Flow Rates and SWM Pond Operation

Storm Event	Peak Discharge from Pond (m ³ /s)		Pond Storage Volume (m ³)		Pond Water Level (m)	
	SCS	CHI				
2-year	0.011	0.006	425	314	186.23	186.10
5-year	0.020	0.010	567	415	186.38	186.22
10-year	0.028	0.013	658	485	186.47	186.29
25-year	0.039	0.019	777	562	186.58	186.37
50-year	0.061	0.024	854	614	186.65	186.42
100-year	0.090	0.029	903	668	186.69	186.48
Regional	-	0.141	-	980	-	186.75

Note: Values in brackets represent existing condition flow

The results shown in Table 2 confirm that the proposed condition peak flow rates at the site outlets are maintained to below existing condition levels for all design storms. The water quantity storage volume provided to control the 100-year storm is 900 m³. Additional storage has been provided above this level to safely convey the Timmins storm through the SWM pond with an allowance for approximately 0.3 m of freeboard allowance above the Regional storm high water level.

The design of the SWM pond and outlet configuration consists of:

- 375 mm dia. HDPE pipe outlet from the stormwater pond to the ditch inlet catchbasin. The 375 mm dia. pipe has an orifice plate with a 60 mm and 100 mm diameter orifices set at an elevation of 185.65 m and 185.90 m respectively;
- a ditch inlet catchbasin is a set at an elevation of 186.33 m;
- a 525 mm dia. HDPE pipes outlet from the ditch inlet catchbasin to the roadside ditch is set at an inlet elevation of 185.50 m for quantity control; and
- a trapezoidal emergency overflow weir with a bottom width of 3.0 m is set at an elevation of 186.70 m to provide an outlet for storms exceeding the 100-year event.

The stage-storage-discharge table for the SWM pond is included in **Appendix C**. Further pond design details are provided in Dwg. PND-1.

The internal storm sewers within the development upstream of the proposed pond were sized using the Rational Method for a 5 year storm event. The external storm sewers along Wally Drive were also sized using the Rational Method however the Otthymo model output results for the external catchment

areas (201, 202 and 301) and pond discharge (209) were incorporated. This approach will more accurately reflect the actual proposed flows from the development. All the storm sewers ultimately connect to the existing storm sewer system on the north side of Theme Park Drive. Further discussions will need to occur with the Town in this regard as the existing storm sewer downstream of the development undersized due to the additional flow from the proposed Wally Drive catchment areas.

Stormwater Inspection and Maintenance

Ongoing maintenance of the SWM pond is necessary to ensure continued effectiveness. The SWM pond should be inspected regularly, and particularly after large rainfall events to make sure the pond and all of its component parts are functioning properly and in good repair. The inlet and outlets in particular should be inspected to confirm they are functioning properly and not blocked by debris. Accumulated sediment should be cleaned out of the SWM pond forebay when it reaches a depth of 0.30 m.

The perforated pipe systems will also require regular inspection. It is recommended that catchbasins are cleaned out to remove leaves and other debris that has accumulated and is restricting flow. The catchbasins should be inspected to ensure there is no ponding water 72 hours after a rainfall event. If water is ponding 72 hours after a storm event then the perforated pipe system should be flushed.

A stand alone SWM Operation and Maintenance Manual for the pond will be provided as part of the second submission.

Natural Features and Tree Preservation

A stand along Scoped Environmental Impact Study (EIS) was complete by Beacon Environmental and provides a comprehensive summary of the potential environmental and ecological issues associated with the development of the property as they pertain to Species at Risk (SAR), Wetlands, Greenlands, and Tree Preservation. The EIS concludes that there are no existing sensitive features on the property and recommend conventional erosion control measures and tree protection be implemented prior to the start of the works.

Parkbridge is currently in the process of retaining the landscaping design services of Envision Tatham Inc. to complete the proposed landscape design and planting plan. This design will be provided as part of the second engineering submission.

Utilities

As previously noted above, existing utilities are present on Theme Park Drive on the west side of the development. We have contacted all the respective utility companies and confirm that adequate plant is readily available to service the proposed lots.

As noted in the Planning Justification Report, Parkbridge intends to install dark sky friendly lighting consisting of yard lights with more conventional street lights at intersections which is also consistent with previous successful Parkbridge developments in Wasaga Beach. It is our understanding Parkbridge is in the process of retaining a lighting consultant to complete the street lighting design.

Closing Remarks

The above sections and enclosed documents show that the proposed development in theory satisfy the necessary conditions in terms of engineering including site servicing, access, grading, stormwater management, erosion control and utilities. Further coordination with the Town will be required to resolve the down stream storm sewer due to the construction of Wally Drive east of Theme Park Drive. In the meantime, I trust this submission is sufficient for the Town to complete their first engineering review. However, should you have any questions please do not hesitate to contact me.

Yours truly,
C.C. Tatham & Associates Ltd.



Kevin Sansom, B.A.Sc., P.Eng.
Senior Engineer, Project Manager

KRS:rlh

Encl.

Copy: Julie Pavao, via e-mail (jpavao@parkbridge.ca)

Celeste Phillips, via e-mail (dslade@dcslade.ca)

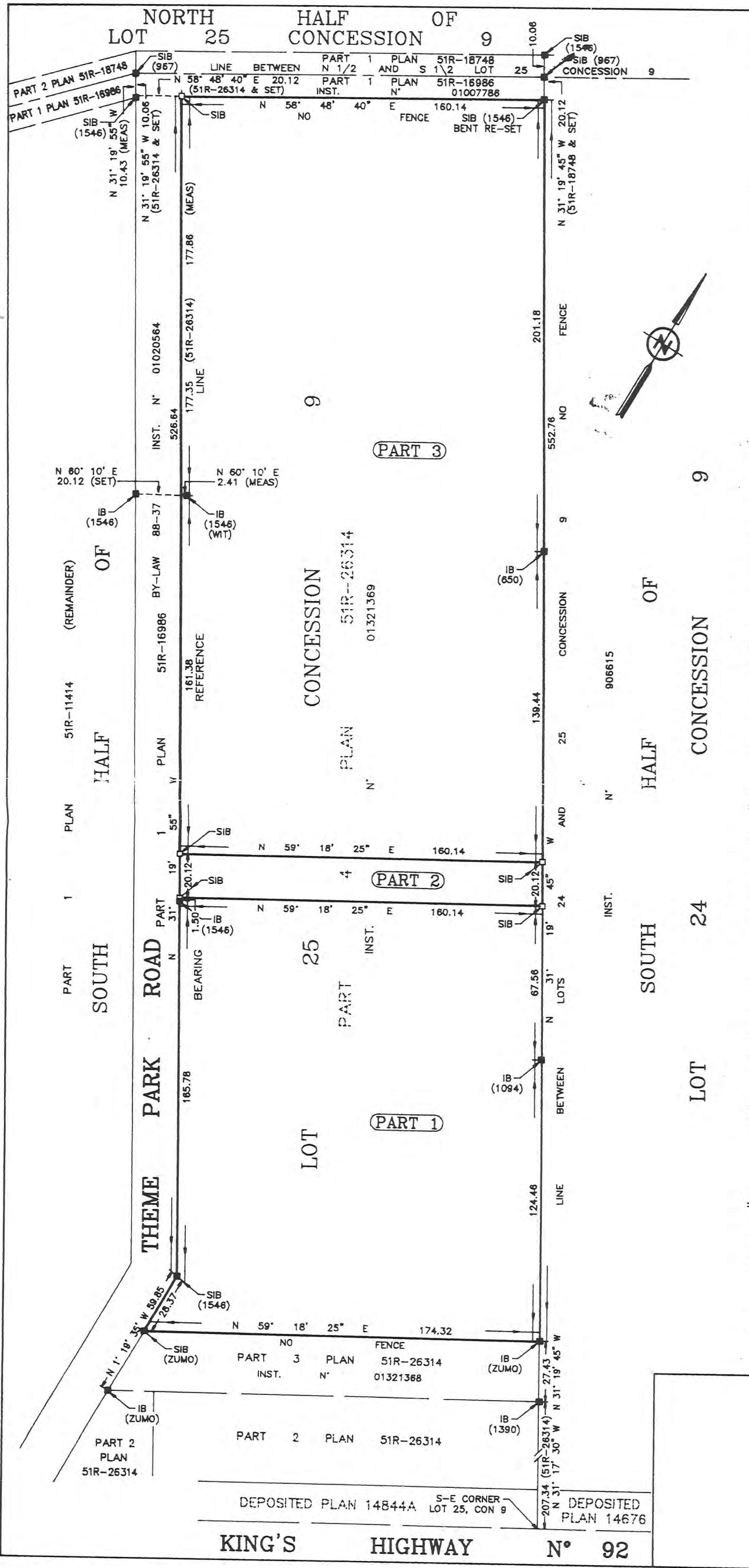
Mike Pincivero, via e-mail (m.pincivero@wasagabeach.com)

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Appendix A:
Background Information

Legal Survey

Prepared by Rodney G. Reynold, signed January 14, 1999



I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE REGISTRY ACT.

DECEMBER 3, 1998.

PLAN 51R-28360

RECEIVED AND DEPOSITED

JAN. 14, 1999

ASST. W. ABOLINS

1 DEP. LAND REGISTRAR FOR THE REGISTRY DIVISION OF SIMCOE (51)

RODNEY G. REYNOLDS
ONTARIO LAND SURVEYOR

PARTS SCHEDULE

PART	LOT	INSTRUMENT	AREA
1	PART OF THE SOUTH HALF OF LOT 25	PART OF INST. N° 01321369	3.10 HECTARES
2	PART OF THE SOUTH HALF OF LOT 25	PART OF INST. N° 01321369	0.32 HECTARES
3	PART OF THE SOUTH HALF OF LOT 25	PART OF INST. N° 01321369	5.44 HECTARES

PARTS 1, 2 AND 3, COMPRISE ALL OF INST. N° 01321369

PLAN OF SURVEY OF PART OF THE SOUTH HALF OF LOT 25, CONCESSION 9 TOWN OF WASAGA BEACH FORMERLY TOWNSHIP OF FLOS COUNTY OF SIMCOE

SCALE 1 : 1500

RODNEY G. REYNOLDS
ONTARIO LAND SURVEYOR
1998.

LEGEND

⊕ DENOTES PLANTED ⊙ DENOTES FOUND
 SIB - DENOTES STANDARD IRON BAR
 SSIB - DENOTES SHORT STANDARD IRON BAR
 IB - DENOTES IRON BAR

(650) - IDENTIFIES C.P. O'DALE, O.L.S.
 (1094) - IDENTIFIES J.W. NICHOLSON, O.L.S.
 (1390) - IDENTIFIES P.R. KITCHEN, O.L.S.
 (1546) - IDENTIFIES R. MAK, O.L.S.
 (ZUMO) - IDENTIFIES ZUBEK, EMO & PATTEN LTD.
 (WIT) - DENOTES WITNESS

BEARING NOTE

BEARINGS ARE ASTRONOMIC, DERIVED FROM THE N 31° 19' 55" W OF THE EASTERLY LIMIT OF THEME PARK ROAD, IN ACCORDANCE WITH DEPOSITED PLAN 51R-26314

DISTANCE NOTE

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

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

- THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYOR'S ACT AND THE REGISTRY ACT AND THE REGULATIONS MADE UNDER THEM.
- THIS SURVEY WAS COMPLETED ON THE 27th DAY OF NOVEMBER, 1998.

DECEMBER 3, 1998.

MIDLAND, ONTARIO

RODNEY G. REYNOLDS
ONTARIO LAND SURVEYOR

RODNEY G. REYNOLDS
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FILE - 98-270 FOR - LITZ

SCALE - 1 : 1500 DRAWN - P.M.T. & J.K.V.

56944

Scoped Environmental Impact Statement

prepared by Beacon Environmental, dated October 2017



GUIDING SOLUTIONS IN THE
NATURAL ENVIRONMENT

Scoped Environmental Impact Statement 91 Theme Park Drive Town of Wasaga Beach

Prepared For:

Parkbridge Lifestyle Communities Inc.

Prepared By:

Beacon Environmental Limited

Date: Project:

October 2017 217126

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Appendices

- A. MNRF Correspondence
- B. List of Plant Species

1. Introduction

Beacon Environmental Limited (Beacon) has been retained by Parkbridge Lifestyle Communities Inc. (the Proponent) to undertake a Scoped Environmental Impact Statement (EIS) regarding the proposed townhouse development of land located at 91 Theme Park Drive in the Town of Wasaga Beach, County of Simcoe (**Figure 1**).

The northern section of the property is regulated pursuant to Ontario Regulation 172/06, and falls within 120 meters of Wasaga Beach Swamp, a Provincially Significant Wetland (PSW).

Background information for the subject property was gathered and reviewed at the outset of the project. This involved existing documentation, including:

- Natural Heritage Information Centre (NHIC) database (2017);
- Digital Ortho-rectified Aerial Photography (County of Simcoe 1989 to 2016); and
- Ministry of Natural Resources and Forestry (MNRF) Ontario Base Mapping (OBM).

Additionally, Beacon contacted the MNRF regarding the potential for Species at Risk (SAR) and their protected habitats on the subject property (**Appendix A**).

2. Methods

An existing natural heritage features assessment of the subject property was undertaken on June 27th, 2017 by Geri Poisson (Terrestrial Ecologist, I.S.A.-Certified Arborist). This involved the assessment of the terrestrial features, as well as Ecological Land Classification and a botanical inventory. Information collected for the characterization of the terrestrial features included the following:

- The location of significant features, both geological and man-made;
- Site drainage to locate any permanent, seasonal or intermittent streams;
- Terrestrial resources including vegetation and wildlife habitat;
- Species at Risk and their habitats, and
- Characterization of the treed areas within the subject property.

3. Policy Review

3.1 Provincial Policy Statement (PPS)

The Province recently released an updated Provincial Policy Statement (2014) under section 3 of the Planning Act, which came into effect on April 30, 2014. The Provincial Policy Statement (2014) is intended to provide policy direction on matters of provincial interest related to land use planning.

Policy 2.1 of the Provincial Policy Statement (2014) provides direction to the regional and local municipalities regarding planning policies for the protection and management of natural heritage features and resources. The 2014 PPS defines eight natural heritage features and provides planning policies for each. The Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement (MNR 2010) is a technical guidance document used to help assess the natural heritage features listed.

Section 2.1 of the 2014 PPS relates to Natural Heritage. The following subsections are provided.

2.1.3 Natural heritage systems shall be identified in Ecoregions 6E & 7E, recognizing that natural heritage systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas.

2.1.4 Development and site alteration shall not be permitted in;

- a) significant wetlands in Ecoregions 5E, 6E and 7E; and*
- b) significant coastal wetlands.*

2.1.5 Development and site alteration shall not be permitted in:

- a) Significant wetlands north of the Canadian Shield north of Ecoregions 5E, 6E and 7E;*
- b) Significant woodlands in Ecoregions 6E and 7E;*
- c) Significant valleylands in Ecoregions 6E and 7E;*
- d) Significant wildlife habitat*
- e) Significant Areas of Natural and Scientific Interest (ANSI's); and*
- f) Coastal wetlands in Ecoregions 5E, 6E and 7E that are not subject to policy 2.1.4(b)*

unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

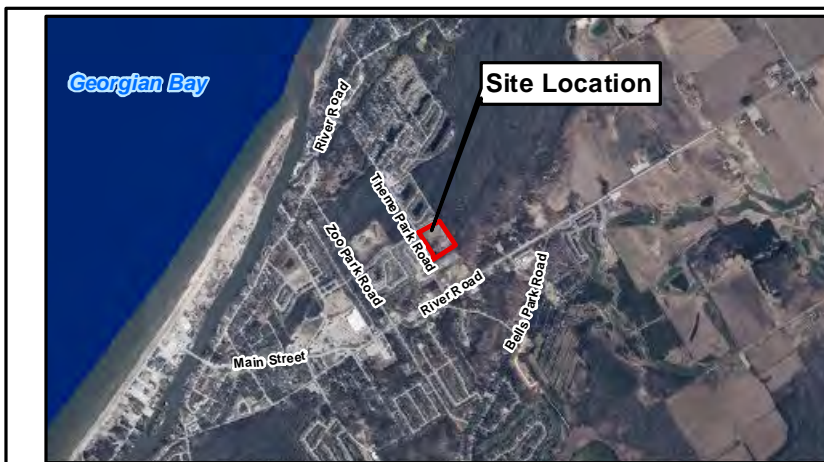
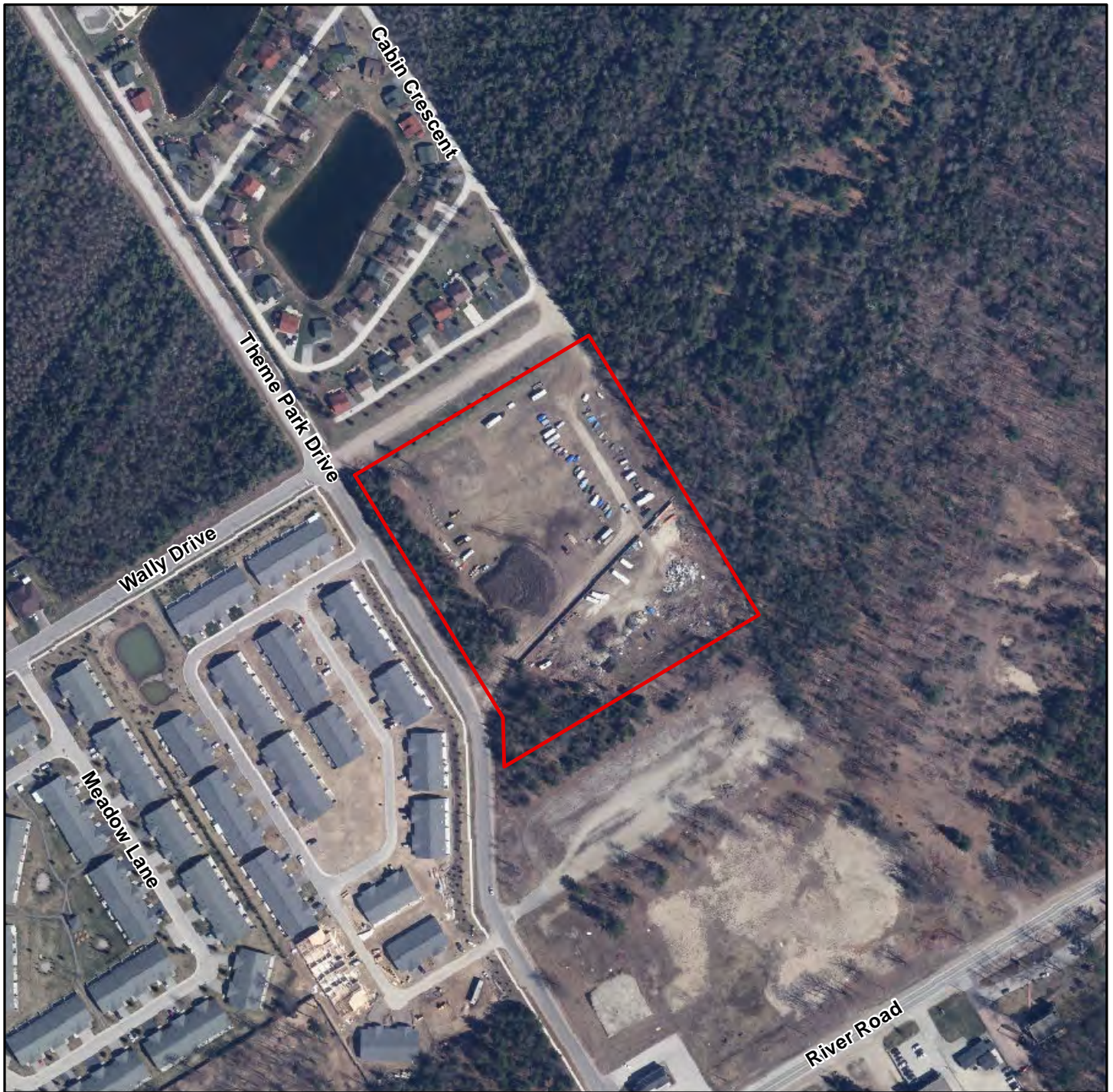
2.1.6 Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.

2.1.7 Development and site alternation shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.

2.1.8 Development and site alternation shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5 and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there are no negative impacts on the natural features or on their ecological functions.

Each of these features is afforded varying levels of protection subject to guidelines, and in cases, regulations.

Some of these features (i.e., PSW's and ANSI's) are identified by the MNR, while others are to be identified by the local area municipalities or planning authorities (i.e., significant woodlands, significant valleylands and significant wildlife habitat). Threatened and Endangered species are designated at the



Site Location		Figure 1	
91 Theme Park Drive, Wasaga Beach Parkbridge Lifestyle Communities Inc.			
First Base Solutions Web Mapping Service 2016			
UTM Zone 17 N, NAD 83			
0 25 50 100 Meters 		1:3,400	
		Project 217126 August 2017	

provincial level, but their habitat is typically identified or verified at the site-specific level. It is expected that even where features have been identified at the provincial, regional or local levels that verification and some level of refinement is required at the site-specific basis.

3.2 Official Plan of the County of Simcoe (2016)

The County of Simcoe's current Official Plan (OP) was approved in December 2016 with fifteen outstanding site specific appeals.

The OP has identified a Greenlands System. The purpose of Greenlands designation is to protect the natural features and functions of the natural heritage system. The Greenlands System is comprised of the following:

- a) Habitat of endangered species and threatened species;
- b) Significant wetlands, significant coastal wetlands, other coastal wetlands, and all wetlands 2.0 ha or larger in area which have been determined to be locally significant, including but not limited to evaluated wetlands;
- c) Significant woodlands;
- d) Significant valleylands;
- e) Significant wildlife habitat;
- f) Significant Areas of Natural and Scientific Interest (ANSI's);
- g) Regional Areas of Natural and Scientific Interest (ANSI's);
- h) Fish Habitat;
- i) Linkage areas in accordance with Section 3.3.16; and,
- j) Public lands as defined in the Public Lands Act.

Consistent with the PPS, the County of Simcoe Official Plan policies prohibit development and/or site alteration within Provincially Significant Wetlands and the habitats of threatened or endangered species. The plan generally directs development away from lands designated as Greenlands.

The County's Greenlands System is illustrated on Schedule 5.1 (Land Use Designations). The Greenlands System mapping is rather coarse, but generally corresponds with woodlands, wetlands, and valleylands. In some areas it appears to overlap with farm fields and existing residential development. Section 3.8.11 of the County's Official Plan indicates that the mapping is approximate with minor changes permitted as part of more detailed environmental work.

When development and site alteration is proposed within or adjacent to the local natural heritage system, it can only be supported if it has been determined through an EIS, to the satisfaction of the County, the local municipality, and appropriate agencies, that it will not adversely impact upon the local natural heritage system and associated ecological functions.

The subject property is within the County's designated Settlement Area of Wasaga Beach, as shown in Schedule 5.1. The subject lands are not designated Greenlands. Although there are areas within Wasaga Beach that are designated by Schedule 5.2.3 as Provincial or Regional ANSI's, the subject lands are unaffected by these designations.

3.3 Town of Wasaga Beach Official Plan (Office Consolidation, 2016)

The Town of Wasaga Beach Official Plan was adopted by Council on September 9, 2003. All development approvals within the Town must conform to the policies contained in the Official Plan. These policies are implemented through the Town's *Comprehensive Zoning By-law 2003-60*.

According to Section 13.4.10 of the Official Plan, lands within 120m of a Provincially Significant Wetland (Category 1 Natural Heritage area) shall require an EIS for development applications that demonstrates

“that there are no negative impacts on the natural features or on the ecological functions of the lands under review. The EIS should also determine the extent of the potential impacts (if any), recommend an appropriate buffer area, and propose any necessary mitigation measures to avoid negative impacts.”

Section 19.25 of the Town's Official Plan requires that, *“Prior to removal of vegetation and/or trees for the purpose of development, a tree identification/preservation plan shall be submitted to the satisfaction of the Town, which should locate and identify the trees in terms of size, species, and health.”* Where trees are proposed for removal, the Town may require the replacement and replanting of trees to compensate for tree loss.

3.4 Species at Risk

The Ontario *Endangered Species Act (ESA)* came into force in June 2008 and the *Act* is having a significant role in land use activities and planning due to protection of both the species as well as their habitat on all lands (i.e., private and public). Under the new *ESA* there are over 200 species in Ontario that are identified as Extirpated, Endangered, Threatened, or of Special Concern.

The *Act* prohibits the killing or harming of Threatened and Endangered species, as well as the destruction of particular species habitat. There are, however, several transitional provisions that provide extended timelines before the protection of the habitats for certain species comes into force. For Special Concern species the *Act* does not afford protection to the individual or their habitat.

Under the *ESA*, Habitat is defined as follows

- “Habitat” means:
 - (a) With respect to a species of animal, plant or other organism for which a regulation made under clause 55 (1) (a) is in force, the area prescribed by that regulation as the habitat of the species, or
 - (b) With respect to any other species of animal, plant or other organism, an area on which the species depends, directly or indirectly, to carry on its life processes, including life processes such as reproduction, rearing, hibernation, migration or feeding,and includes places in the area described in clause (a) or (b), whichever is applicable, that are used by members of the species as dens, nests, hibernacula or other residence; (habitat).

- Definition of “habitat”, cl. (B)
 - (2) For greater certainty, clause (b) of the definition of “habitat” in subsection (1) does not include an area where the species formerly occurred or has the potential to be reintroduced unless existing members of the species depend on that area to carry on their life processes. 2007, c. 6, s. 2 (2)

There are two key protection provisions in the ESA:

- Section 9 describes prohibited activities (e.g., kill, harm, harass, possess, collect, buy and sell) for species listed as Extirpated, Endangered or Threatened on the Species at Risk in Ontario (SARO) List.
- Section 10 prohibits the damage or destruction of protected habitat of species listed as Extirpated, Endangered or Threatened on the SARO List.

It is important to note that the owner of the land, as well as the individual or organization carrying out any activities on those lands, are both subject to the enforcement and penalty provisions of the *ESA* should Sections 9 or 10 of the *ESA* be contravened.

The MNRF provides a document entitled *Categorizing and Protecting Habitat under the Endangered Species Act (2012)* that outlines the overall approach and considerations that the MNRF uses in determining whether a proposed activity is likely to damage or destroy habitat protected under subsection 10(1) of the *ESA*. For clarity, the following is provided directly from that document:

Not every activity that occurs within or near habitat will damage or destroy that habitat. Determining whether a proposed activity is likely to damage or destroy the habitat of an endangered or threatened species requires the consideration of the activity details, which parts of habitat are likely to be altered by the activity, and how the alteration may affect the species’ ability to carry out its life processes.

3.1.1 Damaging Habitat

An activity that damages the habitat of a species is one that alters the habitat in ways that impair the function (usefulness) of the habitat for supporting one or more of the species’ life processes.

3.1.2 Destroying Habitat

An activity that destroys the habitat of a species is one that alters the habitat in ways that eliminate the function (usefulness) of the habitat for supporting one or more of the species’ life processes.

*In some cases, the anticipated alteration that a proposed activity will have on habitat may be so minor that the function of the habitat for supporting the species’ life processes will not become impaired or eliminated. In such cases the activity would not contravene subsection 10(1) of the *ESA* and would not require authorization under the Act with respect to this provision. In other cases, the alteration may be more significant such that the function of the habitat for supporting one or more of the species’ life processes may become impaired or eliminated. Such activities would contravene subsection 10(1) of the *ESA* and would require authorization under the Act prior to proceeding.*

It is also important to recognize the lands surrounding a subject property as the Provincial Policy Statement states in Policy 2.1.8:

Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5, and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

Determining what constitutes *Adjacent Lands* requires consideration of a number of factors including the type of feature (e.g., Provincially Significant Wetland), the sensitivity of a feature to disturbance (e.g., based on habitat function or ecological community), the ecological attributes that are species-specific, and the scale and type of development being considered.

Under the *ESA*, native species that are in danger of becoming extinct or extirpated from the province are identified as being Extirpated, Endangered, Threatened or Special Concern. These designations are defined as follows:

- Extirpated - a species that no longer exists in the wild in Ontario but still occurs elsewhere;
- Endangered – a species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's *Endangered Species Act*;
- Threatened - a species that is at risk of becoming endangered in Ontario if limiting factors are not reversed; and
- Special Concern (formerly Vulnerable) - a species with characteristics that make it sensitive to human activities or natural events.

Under the *Act*, protection is provided to Endangered or Threatened species and their habitat, as well as providing stewardship and recovery strategies for species.

Species of Special Concern require management plans from the MNR but are not directly protected under the *ESA* nor is their Habitat protected under the *ESA*.

3.5 Nottawasaga Valley Conservation Authority

The Nottawasaga Valley Conservation Authority (NVCA) provided the following pre-consultation comments reproduced from their email of February 15th, 2017:

Upon review of the development concept for the subject property, NVCA staff offer the following preliminary comments:

ECOLOGY

1. *A scoped Environmental Impact Study [EIS] is required in support of potential development on the property due to the proximity (less than 120 metres) from a Provincially Significant Wetland. (For reference purposes, we have attached a copy of NVCA Mapping showing the PSW's on the adjacent property. Please note that our maps are to be considered conceptual only) Preliminary considerations with regards to scoping include the following:*

- i. Assessment of any potential impacts of the proposed development on adjacent Provincially Significant wetland features;*
- ii. Recommendations regarding appropriate buffers, mitigation, offsetting and enhancement opportunities that may be required to address potential impacts of the proposed development;*
- iii. Screening for the presence or absence of butternut in the remnant forest strips along Theme Park Drive and the southern property boundary should be completed, vegetation communities on or abutting the proposed concept area should be identified. No in-season work will be required unless butternut or other species at risk [SAR] are found;*
- iv. Impacts of stormwater management on adjacent wetlands should be considered;*
- v. Standard mitigation practices including directional lighting and fencing should be developed and implemented through the planning and construction process.*

4. Existing Conditions

The subject property is located at 91 Theme Park Drive in the Town of Wasaga Beach, County of Simcoe. The general site context is primarily anthropogenic disturbed areas (ANT) with some vegetation within the western and southwestern edges (**Figure 2**).

4.1 Bedrock and Physical Geology

The subject property lies on a complex of limestone, dolostone, shale, arkose and sandstone (Ontario Geological Survey, 2003). The physiography of the area as described in Chapman & Putman (1984) is the Simcoe Lowlands which consist of a series of steep sided, flat-floored valleys bordered by beaches and bouldery terraces and is floored by sand, silt and clay (Chapman and Putnam, 1984).

The subject property is located in the provincial Ecological Site District 6E-6. This ecodistrict is characterized by a series of sand and till islands bordered by shore cliffs, beaches, dunes, and terraces. The present soils are a result of the advance and retreat of the last continental glaciation of North America (10,000 years ago). The Quaternary deposit encountered on the property and adjacent lands consists primarily of glaciolacustrine deposits described as raised beaches of Post-Nipissing Age (Ontario Geological Survey 2003).

4.2 Vegetation Communities

Vegetation communities were classified using the Ecological Land Classification for Southern Ontario (Lee *et al.* 1998). The communities are illustrated in **Figure 2**, and described below. A botanical inventory is provided in **Appendix B**.

Anthropogenic (ANT)

The majority of the subject property is represented by land with varying levels of human disturbance (**Photograph 1**). Some more active areas consist of exposed sandy soil, while lesser used areas are dominated by non-native herbaceous plant species such as, Kentucky Bluegrass (*Poa pratensis*), Queen Anne's Lace (*Daucus carota*), Red Clover (*Trifolium pretense*), Black Medic (*Medicago lupulina*), Bird's-foot Trefoil (*Lotus corniculatus*), and Tufted Vetch (*Vicia cracca*). Along the northern property boundary there is a maintained, low, grassed berm with eight (8) planted Colorado Blue Spruce (*Picea pungens*). There is also a low, earthen berm along the eastern property boundary with some weedy and native species such as Poison Ivy (*Toxicodendron rydbergii*) and an area of invasive Japanese Knotweed (*Polygonum cuspidatum*).

Fresh – Moist Poplar Mixed Forest (FOM8-1)

This community was found along the western portion of the subject property, as well to the east and southeast, beyond the property boundary. It is relatively characteristic of the area, and is generally dominated by a mature canopy of Large-toothed Aspen (*Populus grandidentata*), Northern Red Oak (*Quercus rubra*), Red Maple (*Acer rubrum*) and Eastern White Pine (*Pinus strobus*), with some Green Ash (*Fraxinus pennsylvanica*), White Ash (*F. americana*), Balsam Fir (*Abies balsamea*), Trembling Aspen (*Populus tremuloides*), White Birch (*Betula papyrifera*) and others. The shrub component is moderately dense and consists of Red-osier Dogwood (*Cornus sericea*), Canada Honeysuckle (*Lonicera canadensis*), Wild Grape (*Vitis riparia*), Northern Bush-honeysuckle (*Diervilla lonicera*) and Wild Red Raspberry (*Rubus idaeus*). Ground cover is dense and is mostly Bracken Fern (*Pteridium aquilinum*), Wild Sarsaparilla (*Aralia nudicaulis*) and Poison-ivy, with some Drooping Wood Sedge (*Carex arctata*), Spreading Dogbane (*Apocynum androsaemifolium*), Canada Mayflower (*Maianthemum canadense*) and Field Horsetail (*Equisetum arvense*).

White Cedar – Hardwood Mineral Mixed Swamp (SWM1-1)

This forested wetland community type is found in the troughs between low sandy ridges beyond the property boundary to the east of the subject property. It is characterized by seasonal shallow flooding and supports a tree canopy of Red Maple, Black Ash (*Fraxinus nigra*), Eastern White Cedar (*Thuja occidentalis*) and Balsam Fir (**Photograph 3**). Trees comprising this community include White Pine (*Pinus strobus*), Largetooth Aspen (*Populus grandidentata*), Red Oak, White Oak (*Quercus alba*), Quaking Aspen (*Populus tremloides*) and White Ash (*Fraxinus americana*).

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Existing Conditions

Figure 2

91 Theme Park Drive, Wasaga Beach
Parkbridge Lifestyle Communities Inc.

- Legend**
- Subject Property
 - ELC Communities

ELC Code	Description
ANT	Anthropogenic
FOM8-1	Fresh-Moist Poplar Mixed Forest
H	Hedgerow
SWM1-1	White Cedar - Hardwood Mineral Mixed Swamp

NOTE: The subject property delineation was digitized from file information. This drawing is for illustration purposes only and must not be used in place of surveyed information.

UTM Zone 17 N, NAD 83	
First Base Solutions Web Mapping Service 2016	
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October 2017

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Photograph 1. Anthropogenic Area Occupying Majority of Property (June 27, 2017)



Photograph 2. Fresh – Moist Poplar Mixed Forest in Western Portion of Property (June 27, 2017)



Photograph 3. View of White Cedar – Hardwood Mineral Mixed Swamp Located Beyond the Eastern Property Boundary (June 27, 2017)

4.3 Flora

A total of sixty-four plant species were observed on the subject property with a little more than a quarter (28%) being non-native plant species (**Appendix B**). This percentage of non-native plant species is common in disturbed areas that are also surrounded by development. There were no floral Species-at-Risk on the subject property. All of the native plant species were ranked provincially as S5 (Secure) with the exception of Clammy Ground Cherry (*Physalis heterophylla*) that is listed as S4 or “Apparently Secure; Uncommon but not rare”. None of the plant species found within or adjacent to the subject property are listed as rare or uncommon in Simcoe County by Riley (1989). None of the plant species are globally (G5) or provincially rare (S1, S2 or S3) as per the NHIC database or subject to the *Endangered Species Act*.

4.4 Significant Wildlife Habitat

None of the vegetation communities or potential habitats found within or adjacent to the subject property is considered significant wildlife habitat.

The MNR District has developed a bat survey protocol for determining the absence or presence of endangered species of bats that most other MNR Districts are employing. This survey protocol requires that works be conducted by undertaking three Steps as follows:

1. Conduct ELC mapping to locate Upland and Swamp forest communities;
2. Conduct bat maternity snag surveys for each forest community on the property;

3. Based on the results of the snag survey, conduct bat sonar acoustic monitoring for forest areas that support bat maternity snags.

The FOM8-1 vegetation community is a candidate maternity roost ELC area that was assessed for the presence of snag trees. The ELC community was surveyed for snag trees and consisted of one Red Maple with a DBH of 21 cm and a single shallow cavity, and several immature trees (<20 cm DBH) that are dead or in poor condition, but with no cavities.

5. Analysis and Recommendations

Beacon understands that the intent is to develop the entire subject property with retirement residential similar to neighbouring properties. The proposed development plan for the subject property is detailed in **Figure 3**.

As noted above, the PPS contains policies related to the protection of natural heritage features and functions, as well as natural hazards. The subject property does not contain any significant wetlands, significant coastal wetlands, significant woodlands, or significant valley lands. Significant features are however immediately adjacent to the subject property, and are addressed below. The PPS policies regarding Threatened and Endangered species are also addressed below in Section 5.3.

The existing forest community and sandy soils on the subject property are typical of the region. The subject property itself does not contain any of the features included in Category 1 lands of the Town's Natural Heritage System as listed in Section 13.2.2 and shown in *Schedule D* in the Town of Wasaga Beach Official Plan. Also, no watercourses, ephemeral, intermittent or permanent were found on the property during field investigations. A portion of the subject property is categorized as Category 2 as described in Section 13.2.3 of the Town's OP in so far as it is within 120m of a PSW natural heritage feature.

5.1 Wasaga Beach Provincially Significant Wetland (WB1)

The subject property is located southeast and southwest of and within 120 m of a portion of the Wasaga Beach PSW (WB1). This wetland is a mixed swamp separated from the subject property by upland forest and, in the case of the portion of the PSW to the northwest, a paved road intersection. None of the subject property is within the PSW boundary. No watercourses were found on the property during field investigations which would connect potential runoff from the subject property to the Wasaga Beach PSW. Additionally, the distance (~65m) from the subject property to the PSW to the northwest with the intervening paved intersection of Theme Park Drive and Wally Drive, further reduces the likelihood of any negative impacts to the PSW.

The relatively flat, level topographical position of the subject property and deep sandy soils means there is low likelihood of runoff during construction activities. Prior to, and during the period of land clearing and construction, **Beacon recommends** that:

- Erosion and Sedimentation Control (ESC) works, in the form of silt fencing and straw bales, be implemented along the entire property;

- Straw bales and silt fence should be stock piled on site to be prepared for potential breaches in the silt and erosion control works; and
- These works are to be maintained in good working order until the exposed soils have been greened up.

It is assumed that the roadside ditch that runs the length of Theme Park Drive that is adjacent to the PSW to the northwest will intercept any unlikely potential breaches that would flow across the roadway and reduce the likelihood of impact on the natural system.

5.2 Other Wetlands and Natural Areas

The subject property is adjacent to, on the east boundary, a natural forest with intervening wetland depressions. Currently, there is an earthen berm along the eastern property boundary that currently is preventing any overland stormwater flows from entering the adjacent wetlands. **Beacon recommends** that:

- should the existing earthen berm be removed, erosion and sedimentation control measures recommended in Section 5.1 be applied to prevent overland runoff into the wetlands during construction;
- residential design features that include outdoor lighting be kept away from the forest edge and/or directional lighting fixtures be used avoid impacts to the forested area and wetlands off property;
- solid fencing be used along the eastern property boundary to avoid impacts to the adjacent natural area such as light, noise, dust, pets and dumping of residential garden waste.

5.3 Species at Risk Habitat

While no specific records for Species at Risk occurring on the property, records exist in the general vicinity for following species:

- Eastern Hog-nosed Snake (*Heterodon platirhinos*) – Threatened,
- Snapping Turtle (*Chelydra serpentina*) – Special Concern,
- Eastern Map Turtle (*Graptemys geographica*) – Special Concern,
- Bobolink (*Dolichonyx oryzivorus*) – Threatened,
- Eastern Meadowlark (*Sturnella magna*) – Threatened,
- Barn Swallow (*Hirundo rustica*) – Threatened
- Little Brown Myotis (*Myotis lucifungus*) – Endangered,
- Northern Myotis (*Myotis septentrionalis*) – Endangered,
- Tri-coloured Bat (*Perimyotis subflavus*) – Endangered, and
- Butternut (*Juglans cinerea*) – Endangered.

Given the nature of this assessment, as well as the type and scale of development being considered, a screening of potentially suitable habitat was completed for each SAR species. This includes a review of the habitats and current status of each species and whether general habitat or regulated habitat protection applies under Section 10 of the provincial *ESA*.

The following is an analysis of the potential for these species to occur on the subject property.

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Proposed Development	Figure 3
91 Theme Park Drive, Wasaga Beach Parkbridge Lifestyle Communities Inc.	
Legend	
 Subject Property Proposed Development	
NOTE: The subject property delineation was digitized from file information. This drawing is for illustration purposes only and must not be used in place of surveyed information.	
UTM Zone 17 N, NAD 83	
First Base Solutions Web Mapping Service 2016	
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Project 217126 October 2017	

Bats

As a result of a fungal infection known as White Nose Syndrome (WNS), many of Ontario's bat species have been emergency listed as Species at Risk. In order to prevent damage to these protected species, measures can be taken to avoid damaging individuals during the active season. The following species may be present on the subject property: Little Brown Myotis (*Myotis lucifungus*), Northern Myotis (*Myotis septentrionalis*) and Tri-coloured Bat (*Perimyotis subflavus*).

The general habitat used for both roosting and hibernation includes forests, cavity trees, dead and dying trees, buildings, caves and abandoned mines. In Ontario, these species are classified as *Endangered*.

Habitat quality was assessed following the MNRF defined criteria for best candidate roost trees and it was determined by the absence of significant habitat that species at risk bat habitat is not present on the subject property. **Beacon is of the opinion that the proposed development will not have a negative impact on the Little Brown Myotis, the Northern Myotis, nor the Tri-coloured Bat species.**

Reptiles

Eastern Hog-nosed Snake (*Heterodon platirhinos*)

This species prefer sandy, well-drained habitats such as beaches and dry forests where they can lay their eggs and hibernate. The subject property contains open sandy areas, however, a search of the site did not reveal any evidence of burrows or hibernacula. In addition, the site appears to experience regular disturbances via storage of equipment, recreational vehicles and topsoil storage and transfers. Considering the ongoing anthropogenic disturbances, it is highly unlikely that the subject property is being utilized by this species. **Beacon is of the opinion that the proposed development will not have a negative impact on the Eastern Hog-nosed Snake.**

Snapping Turtle (*Clemmys guttata*)

The Snapping Turtle prefers open water lakes, ponds, swamps and marshes with slow moving water and plenty of cover. This species is classified as Special Concern in Ontario.

No suitable habitat was found within or adjacent to the subject property. **Beacon is of the opinion that the proposed development will not have a negative impact on the Snapping Turtle.**

Northern Map Turtle (*Graptemys geographica*)

Northern Map Turtles prefers lakeshores and rivers with slow moving water and plenty of basking logs and rocks. This species is classified as Special Concern in Ontario.

No suitable habitat was found within or adjacent to the subject property. **Beacon is of the opinion that the proposed development will not have a negative impact on the Northern Map Turtle.**

While Section 10 of the *ESA* does not provide habitat protection for Special Concern species, efforts should be made to avoiding impacts to individuals of this species, if they in fact make use of the subject property. It should be noted that no individuals were identified during the field investigation. The above mentioned ESC fencing should aid in preventing any turtles that may be disbursing or traveling between suitable habitats from accessing the site during construction activities.

Birds

Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*)

These two species live in tallgrass prairies, grasslands and hayfields and build their nests in dense grasses. The subject property supports a small area of sparse, short grass with areas of exposed mineral soil. Considering the small size and lack of dense grass or herbaceous cover, it is highly unlikely that either of these two species is present on the subject property. **Beacon is of the opinion that the proposed development will not have a negative impact on Bobolink or Eastern Meadowlark.**

Barn Swallow (*Hirundo rustica*)

This species is often nests in human-made structures such as open barns, under bridges and in culverts where they build their cup-shaped mud nests on covered ledges. The subject property contains a number of camper trailers, a portable office and one small brick building. These structures were inspected and no nests were found, nor was any suitable nesting structures found. **Beacon is of the opinion that the proposed development and removal of existing structures will not have a negative impact on Barn Swallow.**

Butternut (*Juglans cinerea*)

Butternut is a tree that is shade intolerant, and prefers moist, well drained soils in deciduous or mixed forests. In Ontario, this species is designated as Endangered and protected under the *ESA*.

During field investigations, a search was conducted for Butternut trees. No individuals of this species were found within the subject property nor within 50 m of the subject property.

5.4 Species of Conservation Concern

A search of the MNR’s Natural Heritage Information Centre indicated that, in addition to the species mentioned above, five (5) records of species of conservation concern were recorded and are shown in **Table 1** below.

Table 1. MNR Records of Species of Conservation Concern

Common Name	Scientific Name	Status	Date of Record
Beaked Spikerush	<i>Eleocharis rostellata</i>	S3	1978-07-15
Schweinitz’s Sedge	<i>Carex schweinitzii</i>	S3	n/d
Houghton’s Flatsedge	<i>Cyperus houghtonii</i>	S3	1973-08-20
Woodland Pinedrops	<i>Pterospora andromedea</i>	S2	1948-07-28
Prairie Warbler	<i>Setophaga discolor</i>	S3B, NAR	1948-08-01
Rainbow Smelt	<i>Osmerus mordax</i>	S5	2001-07-20

Beaked Spikerush and Schweinitz’s Sedge are found in wetlands and often form extensive stands. Neither of these species were found within or adjacent to the subject property.

Houghton's Flatsedge is found along stream banks, lakeshores and sandy openings in woods. This species was not found within or adjacent to the subject property.

Woodland Pinedrops is a plant that grows symbiotically with soil fungi and tree roots and is usually associated with coniferous trees. This species was not observed within or adjacent to the subject property.

Prairie Warbler is found in shrubby habitats, open fields and young forests. This species was not observed on or near the subject property, nor was it recorded in the most recent Breeding Bird Atlas.

Rainbow Smelt is a species of fish. This species will not be impacted by the proposed development, as there is no watercourse or water body on, or adjacent to the subject property.

5.5 Tree Preservation Plan

The majority of the subject property is disturbed with treed areas found only in a narrow strip along the western edge and southwestern corner (**Figure 2**). These areas are remnant forest that are classified as Fresh – Moist Poplar Mixed Forest (FOM8-1) and described above. The trees in these areas average approximately 20 cm dbh (diameter at breast height). The tree sizes range from seedlings up to an Eastern White Pine measuring approximately 60 cm dbh, but most trees only range up approximately 30 cm dbh. A moderate number trees, mostly Trembling Aspen, are in poor condition, exhibiting branch die-back and pose a risk of branch or whole tree failure. Some of the hazardous trees have recently been removed, as evidenced by machine tracks and cut stumps in the central portion of the strip of forest.

The proposed development plan would require the removal of all the treed areas within the property boundaries. This would result in the removal of approximately 0.506 ha of treed area.

The treed areas outside of the property boundaries along south and east boundaries shall be preserved and protected from damage. **Tree protection fencing shall be installed along the perimeter of the property and at least 3 meters from the base of any tree to provide a root preservation zone.** The main cause of construction damage to trees is from compaction of the soil around the roots. Equipment movement, or placement of excessive amounts of fill over the roots compresses the air pockets in the soil which reduces the tree's ability to absorb nutrients and water and harms the tree's health. Equipment use within the root preservation zones should be restricted to ensure that the tree's roots are not disturbed. Where the location of the ESC fencing and the Tree Protection Fencing coincide, the ESC fencing may be used as Tree Protection fencing. In addition to the root preservation zone, **Beacon recommends the following measures to protect trees during construction:**

1. Upon receiving the necessary approvals and prior to the commencement of tree removals, all areas designated for tree preservation must be flagged in the field. Birds, their nests and young are protected by various *Acts* and are generally protected at any time that they are found. For example, the federal *Migratory Birds Convention Act* protects the nests, eggs and young of most bird species from harassment, harm or destruction. The breeding bird season in southern Ontario is generally from mid-April to late-July; hence the clearing of vegetation should be outside of these dates. For any proposed clearing of vegetation within these dates, or where birds are suspected of nesting outside of typical dates, an ecologist should

undertake detailed nest searches immediately prior (within two days) to site alteration to ensure that no active nests are present. However, it is important to note that as many bird nests are difficult or impossible to locate (e.g., cavity nesters, conifer and grassland nesters) this is often not feasible and the presence of territorial birds during the breeding season would then be taken to indicate that nests are actually present.

2. Upon completion of the tree removals, all felled trees are to be removed from the site, and all brush chipped and either used on site, or removed. An exception to this is ash trees. The site is within the Canadian Food Inspection Agency (CFIA) regulated areas for Emerald Ash Borer (EAB). Before removal from the site, disposal of any material from Ash in this situation can be confirmed with the CFIA.
3. Where the location of the ESC fencing and the Tree Protection Fencing coincide, the ESC fencing may be used as Tree Protection fencing.
4. Areas within Tree Protection Fencing of the trees designated for preservation are not to be used for any type of storage.
5. Trees shall not have any rigging cables or hardware of any sort attached or wrapped around them, nor shall any contaminants be dumped within the protective areas or flushed where they may come into contact with the feeder roots of the trees.
6. In the event that it is necessary to remove additional limbs or portions of trees, after construction has commenced, to accommodate construction, the Consulting Arborist or project administrator is to be informed and the removal is to be executed carefully and in full accordance with arboricultural techniques, by a certified Arborist.
7. During excavation operations in which roots are affected, the Contractor is to prune all exposed roots cleanly with a sharp blade. Pruned root ends shall point obliquely downwards. The exposed roots should not be allowed to dry out and should be cover immediately with clean, native soil or mulch. The Contractor shall discuss watering of the roots with the Owner and Contract Administrator prior to pruning to ensure that optimum soil moisture is maintained during construction and backfilling operations. Backfilling must be completed with clean, uncontaminated native topsoil. Directional drilling is recommended for installing infrastructure servicing within Tree Protection Zones.

Disclaimer

The assessment of the trees presented within this report has been prepared using accepted arboricultural techniques. These include a visual examination of the above-ground parts of each tree. The trees examined were not dissected, cored, probed, or climbed, and detailed root crown examinations involving excavation were not undertaken.

As trees are living organisms and their health is constantly changing, no guarantees are offered or implied, that these trees or any part of them will remain standing. A standing tree will always pose some risk, and a tree's behaviour cannot be predicted in all situations. All trees have the potential for failure, which can be eliminated only if the tree is removed.

The assessment presented in this report is valid at the time of inspection and it is recommended that the trees are re-assessed on a regular basis.

6. Conclusion

Beacon was retained to undertake a Scoped Environmental Impact Statement (EIS) regarding the proposed townhouse development of a lot located at 91 Theme Park Drive in the Town of Wasaga Beach, County of Simcoe (**Figure 3**).

As a result of the existing condition analysis, we have determined that no sensitive features exist on the subject property that would require site specific recommendations, and appropriate conditions exist to permit this proposed development.

The Nottawasaga Conservation Authority was involved in the pre-consultation and provided comments and recommendations for components of an assessment for the property. This Scoped EIS fulfills those requirements listed in Section 3.5 above.

Since construction is adjacent to wetlands to the east, measures should be used to ensure that sediment-laden runoff to these features is prevented. During the period of land clearing and construction for the proposed development, **Beacon recommends** that:

- Prior to the native soil being disturbed and exposed, sedimentation and erosion control works, in the form of silt fencing and straw bales, should be implemented along the perimeter of the development area.
- To avoid construction impacts to tree roots, tree protection fencing should be installed at least 3 m from the base of trees on adjacent properties. Silt fencing may be used as tree protection fencing.
- Any silt fence should be constructed of heavy material and solid posts to ensure its integrity, and should be properly trenched in to maintain its integrity during weather events.
- Straw bales should be stock piled on site to be prepared for potential breaches in the silt and erosion control works; and
- These works must be maintained in good working order until any exposed soils have been greened up.

To ensure compliance under the *ESA*, **Beacon recommends**:

- Avoid tree removal during the breeding bird season to avoid damage to individuals or nests of Species at Risk birds.

This information is a key component to the feasibility of future construction and for compliance under the *Endangered Species Act*.

Report prepared by:
Beacon Environmental



Geri Poisson, B.A. (Hon), CAN-CISEC
Terrestrial Ecologist, ISA Certified Arborist
ON-1288A

Report reviewed by:
Beacon Environmental



Jamie Nairn, M.Sc., P.Ag.
Senior Ecologist

7. References

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Appendix A

MNRF Correspondence

Gerri Poisson

From: Eplett, Megan (MNRF) <Megan.Eplett@ontario.ca>
Sent: Wednesday, August 23, 2017 3:38 PM
To: Gerri Poisson
Subject: RE: Information Request

Follow Up Flag: FollowUp
Due By: Wednesday, August 23, 2017 8:05 PM
Flag Status: Flagged

Hello Gerri,

Please find below natural heritage information for 91 Theme Park Drive, Wasaga Beach.

- Barn Swallow should be considered if any suitable nesting structures exist on site and are proposed to be removed
- It is difficult to interpret from the air photo but should appropriate habitat exist on site for Bobolink and Eastern Meadowlark then these species should be included in your site assessment.
- As the development plan proposing tree removal, site assessment should be carried out to confirm whether any Butternut or species at risk bats (Little Brown Bat, Northern Bat, and Tri-coloured Bat) are present on site
- The restricted record is Eastern hog-nosed snake. There is the potential for this species to be present on site and therefore should be considering during your field investigations. Please ensure any reports that will be circulated widely do not list the species name and/or location as this is considered a sensitive species.

Please note the above list of species is not exhaustive. As a result, although there may be no record (or confirmation) of a species at risk on site it does not mean that they are not present if appropriate habitat exists. Due diligence is therefore still required and would include an appropriate consideration of what species could be present based on available habitat at this location as noted above.

This request information falls to me however in the future information requests can be send to midhurstinfo@ontario.ca and it will be designated to the appropriate staff member.

Thanks,

Megan

Megan Eplett

A/ Management Biologist | Ministry of Natural Resources and Forestry | Midhurst District
2284 Nursery Road, Midhurst, Ontario, L9X 1N8 | ☎ (705) 725-7513 | ✉ megan.eplett@ontario.ca

From: Gerri Poisson [mailto:gpoisson@beaconenviro.com]
Sent: August-16-17 2:07 PM
To: Eplett, Megan (MNRF)
Subject: Information Request

Hello Megan,

I would like to make an information request to screen a property for any SAR or other Natural Heritage features or species of concern. The attached figure shows the location (91 Theme Park Drive, Wasaga Beach).

The development plan contemplates removal of all the remaining vegetated areas within the property boundaries. We are aware of the PSW located to the northwest, and the other evaluated wetlands east of the property. Additionally, I conducted a query on the MNRF Make-a-map website which indicated a number of historical element occurrences and one that is listed only as RESTRICTED SPECIES (EO #13155). More info on this would be appreciated.

Please let me know if you require any additional information or if I should be contacting someone else in your office.

Thank you,

Geri Poisson, B.A. (Hon) / ISA Certified Arborist, CAN-CISEC

Terrestrial Ecologist

BEACON ENVIRONMENTAL

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Appendix B

List of Plant Species Noted During Field Investigations

Appendix B

List of Plant Species Noted During Field Investigations

Family Name	Scientific Name	Common Name	Coefficient Conservatism	Wetness Index	Origin	COSEWIC	COSSARO	S-RANK	Simcoe County (Riley 1989)
Aceraceae	<i>Acer negundo</i>	Manitoba Maple	0	-2	N			S5	
Aceraceae	<i>Acer rubrum</i>	Red Maple	4	0	N			S5	
Aceraceae	<i>Acer saccharinum</i>	Silver Maple	5	-3	N			S5	
Anacardiaceae	<i>Rhus hirta</i>	Staghorn Sumac	1	5	N			S5	
Anacardiaceae	<i>Toxicodendron rydbergii</i>	Western Poison Ivy	0	0	N			S5	
Apiaceae	<i>Daucus carota</i>	Queen Anne's Lace	0	5	I			SNA	
Apocynaceae	<i>Apocynum androsaemifolium</i> ssp. <i>androsaemifolium</i>	Spreading Dogbane	3	5	N			S5	
Araliaceae	<i>Aralia nudicaulis</i>	Wild Sarsaparilla	4	3	N			S5	
Asteraceae	<i>Achillea millefolium</i> var. <i>millefolium</i>	Common Yarrow	0	3	I			SNA	
Asteraceae	<i>Ambrosia artemisiifolia</i>	Annual Ragweed	0	3	N			S5	
Asteraceae	<i>Lactuca</i> sp.	Lettuce Species	0	0					
Asteraceae	<i>Leucanthemum vulgare</i>	Oxeye Daisy	0	5	I			SNA	
Asteraceae	<i>Symphyotrichum novae-angliae</i>	New England Aster	2	-3	N			S5	
Asteraceae	<i>Taraxacum officinale</i>	Common Dandelion	0	3	I			SNA	
Betulaceae	<i>Betula alleghaniensis</i>	Yellow Birch	6	0	N			S5	
Betulaceae	<i>Betula papyrifera</i>	Paper Birch	2	2	N			S5	
Boraginaceae	<i>Echium vulgare</i>	Common Viper's-bugloss	0	5	I			SNA	
Caprifoliaceae	<i>Diervilla lonicera</i>	Northern Bush-honeysuckle	5	5	N			S5	
Caprifoliaceae	<i>Lonicera canadensis</i>	American Fly-honeysuckle	6	3	N			S5	
Caprifoliaceae	<i>Sambucus racemosa</i> var. <i>racemosa</i>	Red-berried Elder	5	2	N			S5	
Cornaceae	<i>Cornus sericea</i> ssp. <i>sericea</i>	Red-osier Dogwood	2	-3	N			S5	
Cupressaceae	<i>Thuja occidentalis</i>	Northern White Cedar	4	-3	N			S5	
Cyperaceae	<i>Carex arctata</i>	Black Sedge	5	5	N			S5	
Cyperaceae	<i>Carex pensylvanica</i>	Pennsylvania Sedge	5	5	N			S5	
Dennstaedtiaceae	<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	Bracken Fern	2	3	N			S5	
Dryopteridaceae	<i>Onoclea sensibilis</i>	Sensitive Fern	4	-3	N			S5	
Equisetaceae	<i>Equisetum arvense</i>	Field Horsetail	0	0	N			S5	
Fabaceae	<i>Lotus corniculatus</i>	Bird's-foot Trefoil	0	1	I			SNA	
Fabaceae	<i>Medicago lupulina</i>	Black Medic	0	1	I			SNA	
Fabaceae	<i>Melilotus alba</i>	White Sweet Clover	0	3	I			SNA	
Fabaceae	<i>Robinia pseudo-acacia</i>	Black Locust	0	4	I			SNA	
Fabaceae	<i>Trifolium pratense</i>	Red Clover	0	2	I			SNA	
Fabaceae	<i>Trifolium repens</i>	White Clover	0	2	I			SNA	
Fabaceae	<i>Vicia cracca</i>	Tufted Vetch	0	5	I			SNA	
Fagaceae	<i>Fagus grandifolia</i>	American Beech	6	3	N			S5	
Fagaceae	<i>Quercus rubra</i>	Northern Red Oak	6	3	N			S5	
Geraniaceae	<i>Geranium robertianum</i>	Herb-robert	0	5	I			SNA	
Liliaceae	<i>Maianthemum canadense</i>	Wild-lily-of-the-valley	5	0	N			S5	
Liliaceae	<i>Maianthemum racemosum</i> ssp. <i>racemosum</i>	False Solomon's Seal	4	3	N			S5	
Oleaceae	<i>Fraxinus americana</i>	White Ash	4	3	N			S5	

Family Name	Scientific Name	Common Name	Coefficient Conservatism	Wetness Index	Origin	COSEWIC	COSSARO	S-RANK	Simcoe County (Riley 1989)
Oleaceae	<i>Fraxinus nigra</i>	Black Ash	7	-4	N			S5	
Oleaceae	<i>Fraxinus pennsylvanica</i>	Green Ash	3	-3	N			S5	
Orchidaceae	<i>Epipactis helleborine</i>	Eastern Helleborine	0	5	I			SNA	
Pinaceae	<i>Abies balsamea</i>	Balsam Fir	5	-3	N			S5	
Pinaceae	<i>Picea glauca</i>	White Spruce	6	3	N			S5	
Pinaceae	<i>Picea pungens</i>	Colorado Spruce	0		I			SNA	
Pinaceae	<i>Pinus strobus</i>	Eastern White Pine	4	3	N			S5	
Pinaceae	<i>Tsuga canadensis</i>	Eastern Hemlock	7	3	N			S5	
Plantaginaceae	<i>Plantago lanceolata</i>	English Plantain	0	0	I			SNA	
Plantaginaceae	<i>Plantago major</i>	Nipple-seed Plantain	0	-1	I			SNA	
Poaceae	<i>Oryzopsis asperifolia</i>	White-grained Mountain Ricegrass	6	5	N			S5	
Poaceae	<i>Poa compressa</i>	Canada Bluegrass	0	2	N			S5	
Poaceae	<i>Poa pratensis ssp. pratensis</i>	Kentucky Bluegrass	0	1	N			S5	
Polygonaceae	<i>Polygonum cuspidatum</i>	Japanese Knotweed	0	3	I			SNA	
Ranunculaceae	<i>Anemone canadensis</i>	Canada Anemone	3	-3	N			S5	
Rosaceae	<i>Fragaria virginiana</i>	Wild Strawberry	2	1	N			S5	
Rosaceae	<i>Rubus allegheniensis</i>	Allegheny Blackberry	2	2	N			S5	
Rosaceae	<i>Rubus idaeus ssp. strigosus</i>	Wild Red Raspberry	0	-2	N			S5	
Salicaceae	<i>Populus balsamifera ssp. balsamifera</i>	Balsam Poplar	4	-3	N			S5	
Salicaceae	<i>Populus grandidentata</i>	Large-tooth Aspen	5	3	N			S5	
Salicaceae	<i>Populus tremuloides</i>	Quaking Aspen	2	0	N			S5	
Solanaceae	<i>Physalis heterophylla</i>	Clammy Ground-cherry	3	5	N			S4	
Ulmaceae	<i>Ulmus americana</i>	American Elm	3	-2	N			S5	
Vitaceae	<i>Vitis riparia</i>	Riverbank Grape	0	-2	N			S5	

Stage 1-2 Archaeological Assessment
prepared by Bluestone Research Inc., dated June 2017

**Stage 1-2 Archaeological Assessment of the
Parkbridge Wasaga Country Life, in part of Lot 29,
Concession 9, Formerly Flos Township, now
Springwater Township, Simcoe County, Ontario**

Submitted to

Parkbridge Lifestyle Communities Inc.

85 Theme Park Drive
Wasaga Beach, ON, L9Z 1X7

and

The Ontario Ministry of Tourism, Culture, and Sport

Prepared by

Bluestone Research Inc.

Report Type: Original

Archaeological License Number P344, Derek Lincoln, MA, RPA
PIF P344-0148-2017

June 2017

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Executive Summary

Bluestone Research Inc. (Bluestone) was retained by Parkbridge Lifestyle Communities (Parkbridge) to complete a Stage 1-2 archaeological assessment to meet the requirements of the *Planning Act* (Government of Ontario 2014). The assessment was undertaken in advance of a Draft Plan approval for their Wasaga Country Life project located in part of Lot 19, Concession 9, in Springwater Township, Simcoe County, Ontario.

This assessment was triggered by the Provincial Policy Statement that is informed by the *Planning Act* (Government of Ontario 1990a), which states that decisions affecting planning matters must be consistent with the policies outlined in the larger *Ontario Heritage Act* (1990b). According to Section 2.6.2 of the PPS, “*development and site alteration shall not be permitted on lands containing archaeological resources or areas of archaeological potential unless significant archaeological resources have been conserved.*”

In accordance with Section 1.3.1 of the Ministry of Tourism, Culture and Sport’s (MTCS) 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), the Stage 1 archaeological assessment of the Parkbridge Wasaga Country Life Project has determined that the study area exhibits high potential for the identification and recovery of archaeological resources and a Stage 2 archaeological assessment is recommended.

The Stage 2 assessment was conducted on May 30th, 2017 under archaeological consulting license P344 issued to Derek Lincoln, MA, of Bluestone by the MTCS. No archaeological resources were identified during the Stage 2 archaeological assessment of the study area, and as such **no further archaeological assessment of the property is recommended.**

The MTCS is asked to review the results presented and accept this report into the Ontario Public Register of Archaeological Reports.

Project Personnel

Licensed Archaeologist:	Derek Lincoln, MA (P344)
Project Manager:	Derek Lincoln, MA (P344)
Licensed Field Director:	Derek Lincoln, MA (P344)
Field Technicians:	Eric Kovacs, Andy Chillman
GIS Specialist:	Emma Kerr, University of Toronto
Report Writer:	Derek Lincoln, MA (P344)

Acknowledgements

Proponent Contact:	Julie Pavao, Parkbridge Lifestyle Communities
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1.0 PROJECT CONTEXT

1.1 DEVELOPMENT CONTEXT

Bluestone Research Inc. (Bluestone) was retained by Parkbridge Lifestyle Communities (Parkbridge) to complete a Stage 1-2 archaeological assessment to meet the requirements of the *Planning Act* (Government of Ontario 2014). The assessment was undertaken in advance of a Draft Plan approval for their Wasaga Country Life project located in part of Lot 19, Concession 9, in Springwater Township, Simcoe County, Ontario.

This assessment was triggered by the PPS that is informed by the *Planning Act* (Government of Ontario 1990a), which states that decisions affecting planning matters must be consistent with the policies outlined in the larger *Ontario Heritage Act* (1990b). According to Section 2.6.2 of the PPS, “*development and site alteration shall not be permitted on lands containing archaeological resources or areas of archaeological potential unless significant archaeological resources have been conserved.*”

Permission to enter the study area and document archaeological resources was provided by Julie Pavao of Parkbridge Lifestyle Communities.

1.1.1 Objectives

In compliance with the provincial standards and guidelines set out in the Ministry of Tourism, Culture and Sport’s (MTCS) 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), the objectives of the Stage 1 Archaeological Overview/Background Study are as follows:

- To provide information about the study area’s geography, history, previous archaeological fieldwork, and current land conditions;
- To evaluate in detail the study area’s archaeological potential which will support recommendations for Stage 2 survey for all or parts of the property; and
- To recommend appropriate strategies for Stage 2 survey.

To meet these objectives Bluestone archaeologists employed the following research strategies:

- A review of relevant archaeological, historic and environmental literature pertaining to the study area;
- A review of the land use history, including pertinent historic maps;
- An examination of the Ontario Archaeological Sites Database (ASDB) to determine the presence of known archaeological sites in and around the project area.

Project Context
June, 2017

The objective of the Stage 2 assessment was to provide an overview of archaeological resources on the property and to determine whether any of the resources might be archaeological sites with cultural heritage value or interest and to provide specific direction for the protection, management and/or recovery of these resources. In compliance with the provincial standards and guidelines set out in the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), the objectives of the Stage 2 Property Assessment are as follows:

- To document all archaeological resources within the study area;
- To determine whether the study area contains archaeological resources requiring further assessment; and
- To recommend appropriate Stage 3 assessment strategies for archaeological sites identified.

1.2 HISTORICAL CONTEXT

The study area consists of approximately 2.8 hectares of woodlot, construction yard, and meadow off Theme Park Drive in part of Lot 19, Concession 9, in Springwater Township, Simcoe County, Ontario.

1.2.1 Pre and early Post-contact Aboriginal Resources

Our knowledge of past First Peoples settlement and land use in the Georgian Bay area is incomplete. Nonetheless, using province-wide (MCCR 1997) and region-specific archaeological data, a generalized cultural chronology for native settlement in the area can be proposed. The following paragraphs provide a basic textual summary of the known general cultural trends and a tabular summary appears in Table 1.

The Paleoindian Period

The first human populations to inhabit Ontario came to the region between 12,000 and 10,000 years ago, coincident with the end of the last period of glaciation. Climate and environmental conditions were significantly different then they are today; local environs would not have been welcoming to anything but short-term settlement. Termed Paleoindians by archaeologists, Ontario first peoples would have crossed the landscape in small groups (i.e., bands or family units) searching for food, particularly migratory game species. In the area, caribou may have provided the staple of the Paleoindian diet, supplemented by wild plants, small game, birds and fish. Given the low density of populations on the landscape at this time and their mobile nature, Paleoindian sites are small and ephemeral. They are usually identified by the presence of fluted projectile points and other finely made stone tools.

Table 1: Cultural Chronology for Native Settlement within the Georgian Bay area

Period		Time Range (circa)	Diagnostic Features	Complexes
Paleoindian	Early	9000 – 8400 B.C.	fluted projectile points	Gainey, Barnes, Crowfield
	Late	8400 – 8000	non-fluted and lanceolate points	Holcombe, Hi-Lo, Lanceolate

Project Context
June, 2017

			B.C.		
Archaic	Early		8000 – 6000 B.C.	serrated, notched, bifurcate base points	Nettling, Bifurcate Base Horizon
	Middle		6000 – 2500 B.C.	stemmed, side & corner notched points	Brewerton, Otter Creek, Stanly/Neville
	Late		2000 – 1800 B.C.	narrow points	Lamoka
			1800 – 1500 B.C.	broad points	Genesee, Adder Orchard, Perkiomen
			1500 – 1100 B.C.	small points	Crawford Knoll
	Terminal		1100 – 850 B.C.	first true cemeteries	Hind
Woodland	Early		800 – 400 B.C.	expanding stemmed points, Vinette pottery	Meadowood
	Middle		400 B.C. – A.D. 600	thick coiled pottery, notched rims; cord marked	Couture
	Late	Western Basin	A.D. 600 – 900	Wayne ware, vertical cord marked ceramics	Riviere au Vase-Algonquin
			A.D. 900 – 1200	first corn; ceramics with multiple band impressions	Young- Algonquin
			A.D. 1200 – 1400	longhouses; bag shaped pots, ribbed paddle	Springwells-Algonquin
			A.D. 1400-1600	villages with earthworks; Parker Festoon pots	Wolf- Algonquin
Contact		Aboriginal	A.D. 1600 – 1700	early historic native settlements	Neutral Huron, Odawa, Wenro
		Euro-Canadian	A.D. 1700-1760	fur trade, missionization, early military establishments	French
			A.D. 1760-1900	Military establishments, pioneer settlement	British colonials, UELs

Archaic

The archaeological record of early native life in Southern Ontario indicates a change in lifeways beginning circa 10,000 years ago at the start of what archaeologists call the Archaic Period. The Archaic populations are better known than their Paleoindian predecessors, with numerous sites found throughout the area. The characteristic projectile points of early Archaic populations appear similar in some respects to early varieties and are likely a continuation of early trends. Archaic populations continued to rely heavily on game, particularly caribou, but diversified their diet and exploitation patterns with changing environmental conditions. A seasonal pattern of warm season riverine or lakeshore settlements and interior cold weather occupations has been documented in the archaeological record. Since the large cold weather mammal species that formed the basis of the Paleoindian subsistence pattern became extinct or moved northward with the onset of warmer climate, Archaic populations had a more varied diet, exploiting a range of plant, bird, mammal and fish species. Reliance on specific food resources like fish, deer and nuts becomes more pronounced through time and the presence of more hospitable environs and resource abundance led to the expansion of band and family sizes. In the archaeological record, this is evident in the presence of larger sites and aggregation camps, where several families or bands would come together in times of resource abundance. The change to more preferable environmental circumstances led to a rise in population density. As a result, Archaic sites are more abundant than those from the earlier period. Artifacts typical of these occupations include a variety of stemmed and notched projectile points, chipped stone scrapers, ground stone tools (e.g. celts, adzes) and ornaments (e.g. bannerstones, gorgets), bifaces or tool blanks, animal bone and waste flakes, a by-product of the tool making process.

Woodland Period

Significant changes in cultural and environmental patterns are witnessed in the Woodland Period (circa 950 B.C to historic times). The coniferous forests of earlier times were replaced by stands of mixed and deciduous species. Occupations became increasingly more permanent in this period, culminating in major semi-permanent villages by 1,000 years ago. Archaeologically, the most significant changes by Woodland times are the appearance of artifacts manufactured from modeled clay and the construction of house structures. The Woodland Period is often defined by the occurrence of pottery, storage facilities and residential areas similar to those that define the incipient agricultural or Neolithic period in Europe. The earliest pottery was rather crudely made by the coiling method and house structures were simple enclosures.

1.2.2 Historic Euro-Canadian Resources

The 1879 *Illustrated Historical Atlas of Simcoe County's*, map of Flos Township depicts a sparsely developed rural landscape, with few landowners listed and no buildings listed within several lots and concession of Lot 19, Concession 9. One Samuel Ansley is listed as the owner of the Western portion of this lot, and a creek is shown running east-west through the lot passing just south of the Study Area. Though. It is important to note that not all settlement was represented accurately in the historic maps.

1.3 ARCHAEOLOGICAL CONTEXT

The study area consists of approximately 2.8 hectares of woodlot, construction yard, and meadow off Theme Park Drive in part of Lot 19, Concession 9, in Springwater Township, Simcoe County, Ontario.

1.3.1 The Natural Environment

The study area is situated within the Niagara Escarpment physiographic region as defined by Chapman and Putnam (1984 114-122). The Niagara Escarpment is described by Chapman and Putnam (1984) as being an escarpment that effectively divides Southern Ontario into its eastern and western halves along a roughly north-south aligned axis. The Niagara Escarpment in the area near Wasaga is characterized as being one of the steepest sections of relief, with cliffs and “mountainous terrain” facing northeast towards Georgian Bay (Chapman and Putnam (1984:117).

Potable water is the single most valuable resource for any extended human occupation or settlement and since water sources in southwestern Ontario have remained relatively stable over time, proximity to drinkable water is regarded as a useful index for the evaluation of archaeological site potential. In fact, distance to water is one of the most commonly used variables for predictive modeling of archaeological site location in Ontario. A small creek is listed on the historic mapping, running east-west just south of the study area and Georgian Bay lies five hundred meters to the north.

1.3.2 Previously Known Archaeological Sites and Surveys

To compile an inventory of archaeological resources, the registered archaeological site records kept by the MTCS were consulted. In Ontario, information concerning archaeological sites stored in the ASDB is maintained by the MTCS. This database contains archaeological sites registered per the Borden system. Under the Borden system, Canada is divided into grid blocks based on latitude and longitude. A Borden Block is approximately 13 kilometers east to west and approximately 18.5 kilometers north to south. Each Borden Block is referenced by a four-letter designator and sites within a block are numbered sequentially as they are found. The study area under review is within Borden Block BdHa.

Information concerning specific site locations is protected by provincial policy, and is not fully subject to the *Freedom of Information and Protection of Privacy Act*. The release of such information in the past has led to looting or various forms of illegally conducted site destruction. Confidentiality extends to all media capable of conveying location, including maps, drawings, or textual descriptions of a site location. The MTCS will provide information concerning site location to the party or an agent of the party holding title to a property, or to a licensed archaeologist with relevant cultural resource management interests.

An examination of the ASDB has shown that there are 1 archaeological sites registered within a one-kilometer radius of the study area (Site Data Search, June 16th; Government Ontario n.d.), but well outside the study area limits. The site was discovered by Andre Hunter in 1904, but completely destroyed by development in 1972. Table 2 summarizes the registered archaeological sites within one-kilometer of the study area.

Table 2: Registered Archaeological Sites within One Kilometer of the Study Area

Borden #	Site Name	Site Type	Cultural Affiliation
BdHa-1	Van Vlack	unknown	Precontact

1.3.3 Summary of Past Archaeological Investigations within 50m

Though a Site Data Search was conducted, no assessments adjacent to, or within 50meters of the subject property were found. To the east is existing Lonesome Pines Resort, while to the north, south, and west the land is unassessed agricultural land and woodlot.

1.3.4 Archaeological Potential

Archaeological potential is established by determining the likelihood that archaeological resources may be present on a subject property. Bluestone applied archaeological potential criteria commonly used by MTCS (Government of Ontario 2011) to determine areas of archaeological potential within the region under study. These variables include proximity to previously identified archaeological sites, distance to various types of water sources, soil texture and drainage, glacial geomorphology, elevated topography and the general topographic variability of the area.

Distance to modern or ancient water sources is generally accepted as the most important determinant of past human settlement patterns and, considered alone, may result in a determination of archaeological

Project Context
June, 2017

potential. However, any combination of two or more other criteria, such as well-drained soils or topographic variability, may also indicate archaeological potential. Finally, extensive land disturbance can eradicate archaeological potential (Wilson and Horne 1995).

As discussed above, distance to water is an essential factor in archaeological potential modeling. When evaluating distance to water it is important to distinguish between water and shoreline, as well as natural and artificial water sources, as these features affect sites locations and types to varying degrees. The MTCS categorizes water sources in the following manner:

- Primary water sources: lakes, rivers, streams, creeks;
- Secondary water sources: intermittent streams and creeks, springs, marshes and swamps;
- Past water sources: glacial lake shorelines, relic river or stream channels, cobble beaches, shorelines of drained lakes or marshes; and
- Accessible or inaccessible shorelines: high bluffs, swamp or marshy lake edges, sandbars stretching into marsh.

The closest extant source of potable water to the study area is Georgian Bay, which is approximately 500 meters north of the study area.

An examination of the ASDB has shown that there is one archaeological sites registered within a one-kilometer radius of the study area; however it is not located within the study area.

For Euro-Canadian sites, archaeological potential can be extended to areas of early Euro-Canadian settlement, including places of military or pioneer settlements; early transportation routes; and properties listed on the municipal register or designated under the *Ontario Heritage Act* or property that local histories or informants have identified with possible historical events. The *Illustrated Historical Atlas of Simcoe County, Ont.* demonstrates that the study area and its environs were sparsely occupied by Euro-Canadian settlers by the later 19th century. Few land owners are listed, and fewer buildings are noted, all some distance away from the study area.

When the above listed criteria are applied to the study area, the archaeological potential for pre-contact Aboriginal, post-contact Aboriginal, and Euro-Canadian sites is deemed to be moderate to high. Thus, in accordance with Section 1.3.1 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), the Stage 1 archaeological assessment of the Parkbridge Wasaga Country Life Project has determined that the study area exhibits moderate to high potential for the identification and recovery of archaeological resources and a Stage 2 archaeological assessment is recommended.

Field Methods
June, 2017

2.0 FIELD METHODS

The Stage 2 assessment of the Parkbridge Wasaga Country Life Project was conducted on May 30th, 2017 under PIF #P344-0148-2017 issued to Derek Lincoln, MA, of Bluestone by the MTCS. The study area consists of approximately 2.8 hectares of woodlot, construction yard, and meadow off Theme Park Drive in part of Lot 19, Concession 9, in Springwater Township, Simcoe County, Ontario.

During the Stage 2 survey, assessment conditions were excellent and at no time were the field, weather, or lighting conditions detrimental to the recovery of archaeological material (Table 3). Photos 1 to 10 confirm that field conditions met the requirements for a Stage 2 archaeological assessment, as per the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Section 7.8.6 Standard 1a; Government of Ontario 2011). Figure 4 provides an illustration of the Stage 2 assessment methods, as well as photograph locations and directions.

Table 3: Field and Weather Conditions

Date	Activity	Weather	Field Conditions
May 30 th 2017	Test Pit Survey	Sunny, warm	Dry, Friable Soils

Approximately 55% of the study area was subject to test pit survey. Only 20% of the study area was found to be undisturbed and this consisted of the woodlot along the western edge of the study area between the road and main construction yard area. These portions of the study area were surveyed at the standard 5-meter test pit interval. The remainder of the test pit survey (35% of the total study area) was carried out in the manicured meadow, which was found to be mostly overgrown gravel lot, where a baseball diamond once existed and test pits revealed that significant landscaping had been undertaken throughout the property, removing archaeological potential. The entire area was found to be disturbed, with only a thin layer of graded fill soil on top of beach sand, and in other places no soil at all, just gravel and sand. It appears as if the whole area was stripped at one point. These areas were assessed by test pit survey at 10 meter intervals to confirm disturbance. Test pits were excavated in accordance with Section 2.1.1 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011). No built structures existed on the property. Each test pit was approximately 30 centimeters in diameter and excavated five centimeters into sterile subsoil. The soils and test pits were then examined for stratigraphy, cultural features, or evidence of fill. All soil was screened through six millimeter (mm) mesh hardware cloth to facilitate the recovery of small artifacts and then used to backfill the pit. No further archaeological methods were employed since no artifacts were recovered during the test pit survey.

Approximately 45% of the study area was visually disturbed. These areas consisted of the stirred and graded dirt roads through the property and areas where no topsoil existed just open stripped serving as parking for heavy machinery. This portion of the property was photo-documented to confirm ground conditions.

Record of Finds
June, 2017

3.0 RECORD OF FINDS

The Stage 2 archaeological assessment was conducted employing the methods described in Section 2.0. An inventory of the documentary record generated by fieldwork is provided in Table 4 below. No archaeological resources were identified during the Stage 2 archaeological assessment of the study area.

Table 4: Inventory of Documentary Record

Document Type	Current Location of Document Type	Additional Comments
3 Pages of field notes	Bluestone office, London	In original field book and photocopied in project file
1 Hand drawn maps	Bluestone office, London	In original field book and photocopied in project file
1 map provided by Client	Bluestone office, London	Hard and digital copies in project file
21 Digital photographs	Bluestone office, London	Stored digitally in project file

Analysis and Conclusions
June, 2017

4.0 ANALYSIS AND CONCLUSIONS

The Stage 2 archaeological assessment was carried out in accordance with the Ministry of Tourism, Culture, and Sport's *Standard's and Guidelines for Consultant Archaeologist's* Government of Ontario (2011). The subject property was assessed using test pit survey at 5 meter and 10 meter intervals. Significant portions of the study area were found to be impacted and disturbed. The Stage 2 assessment did not result in the identification of any archaeological resources.

Recommendations
June, 2017

5.0 RECOMMENDATIONS

All work met provincial standards and no archaeological sites were identified during the Stage 2 assessment. If construction plans change to incorporate new areas that were not subject to a Stage 2 field survey, these must be assessed prior to the initiation of construction. In keeping with legislative stipulations, all construction and demolition-related impacts (including, for example, machine travel, material storage and stockpiling, earth moving) must be restricted to the areas that were archaeologically assessed and reported to the Ministry of Tourism, Culture and Sport.

As no archaeological resources were found on the subject property, no further archaeological assessment of the property is required.

6.0 ADVICE ON COMPLIANCE WITH LEGISLATION

This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c.0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48(1) of the *Ontario Heritage Act*.

The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48(1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological license.

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Images
June, 2017

8.0 IMAGES

8.1 PHOTOGRAPHS

STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT OF THE PARKVIEW WASAGA COUNTRY LIFE PROJECT

Images
June, 2017



Photo 1: Visually Disturbed, Not Assessed Facing East



Photo 2: Visually Disturbed, Not Assessed Facing South

Images
June, 2017



Photo 3: Area Assessed by Test Pit Survey at 10m Intervals Facing Northeast



Photo 4: Test Pitting in Progress, Facing South

Images
June, 2017



Photo 5: Typical Test Pit from Graded Meadow, Facing West



Photo 6: Surface Conditions in Graded Meadow, Facing North

Images
June, 2017



Photo 7: Typical Test Pit from Graded Meadow Facing South



Photo 8: Visually Disturbed, Not Assessed Facing South

Images
June, 2017



Photo 9: Wooded Area Assessed by Test Pit Survey at 5meter Intervals Facing South



Photo 10: Typical Test Pit in Woodlot, Facing North

Maps
June, 2017

9.0 MAPS

All maps will follow on succeeding pages.

Maps
June, 2017

Figure 1: Topographic Map of Study Area

Maps
June, 2017

Figure 2: Study Area

Maps
June, 2017

Figure 3: Portion of the Illustrated Historical Atlas of Simcoe County, Flos Township

Maps
June, 2017

Figure 4: Assessment Strategies and Results

Geotechnical Investigation

prepared by Peto MacCallum Ltd., dated September 2017



**GEOTECHNICAL INVESTIGATION
PROPOSED WASAGA COUNTRY LIFE RESIDENTIAL DEVELOPMENT
THEME PARK DRIVE AND WALLY DRIVE
WASAGA BEACH, ONTARIO
FOR
PARKBRIDGE LIFESTYLE COMMUNITIES INC.**

PETO MacCALLUM LTD.
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PML Ref.: 17CF002
Revised Report: 1
September 2017

September 26, 2017

PML Ref.: 17CF002
Revised Report: 1

Ms. Julie Pavao
Parkbridge Lifestyle Communities Inc.
85 Theme Park Drive
Wasaga Beach, Ontario
L9Z 1X7

Dear Ms. Pavao

Geotechnical Investigation
Proposed Wasaga Country Life Residential Development
Theme Park Drive and Wally Drive
Wasaga Beach, Ontario

Peto MacCallum Ltd. (PML) is pleased to present the results of the geotechnical investigation recently completed at the above noted project site. Authorization for this work was provided by Ms. J. Pavao in Purchase Order No. 2017-WCL-003, dated March 29, 2017.

The parcel of land at the southeast quadrant of Theme Park Drive and Wally Drive in Wasaga Beach is slated for development as a residential land lease community. The new development will be an extension of an existing residential area on the north side of Wally Drive. Site configuration has yet to be finalized, however in general, single floor slab-on-grade townhouses are proposed. Site servicing and paved access and parking are also planned, however, no grading details are available at this time.

A geotechnical investigation was requested to assess the subsurface conditions at the site, and based on this information, provide comments and geotechnical engineering recommendations for the building foundations, site servicing and pavement design.

This report presents the results of the geotechnical investigation. A Phase One Environmental Site Assessment and Phase Two Environmental Site Assessment are being carried out concurrently with results to be reported under separate cover (PML Ref.: 17CX003).

The comments and recommendations provided in this report are based on the site conditions as revealed in a limited number of boreholes at the time of the investigation. Design is in the conceptual stages and service inverts and final grades were not available at the time of this study. Accordingly, the comments and recommendations provided in this report are general in nature, and suitable only for preliminary design and planning purposes. When design details are available, they should be submitted for review by PML to verify the applicability of the recommendations presented in this report.

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INVESTIGATION PROCEDURES

The field work for this investigation was carried out June 29, 2017 and consisted of Boreholes 1 to 5 advanced to 5.0 m depth as shown on the Borehole Location Plan, Drawing 1, appended.

The location of the boreholes were established by PML with consideration for site coverage and environmental works. Co-ordination of clearances of underground utilities was provided by PML.

The boreholes were advanced using continuous flight solid stem augers, powered by a track mounted CME-75 drill rig, equipped with an automatic hammer, supplied and operated by a specialist drilling contractor working under the full-time supervision of a member of PML's engineering staff.

Representative samples of the overburden were recovered at frequent depth intervals for identification purposes using a conventional split spoon sampler. Standard penetration tests were carried out simultaneously with the sampling operations to assess the strength characteristics of the substrata. The ground water conditions in the boreholes were assessed during drilling by visual examination of the soil samples, the sampler, and drill rods as the samples were retrieved, and measurement of the water level in the open boreholes, if any.

Wells comprising 50 mm diameter pipe with stick-up protective casing were installed in three of the boreholes. As per O.Reg. 903, the wells become the property of the Owner and will have to be decommissioned when no longer required. PML would be pleased to assist in this regard. Boreholes without monitoring wells were backfilled in accordance with O.Reg. 903.

Ground surface elevations of the boreholes were established relative to a Temporary Bench Mark (TBM), as shown on Drawing 1 and described as follows:

TBM: Top of Nail with Yellow Marking Tape in Hydro Pole on East Side of
Theme Park Road, South of Entrance to Site
Elevation 100.00 (metric, assigned)



All recovered soil samples were returned to our laboratory for moisture content determinations and detailed examination to confirm field classification.

SITE DESCRIPTION AND SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions, including soil classifications, inferred stratigraphy, Standard Penetration test N values, well installation details, ground water observations and the results of laboratory moisture content determinations.

Due to the soil sampling procedures and limited sample size, the depth demarcations on the borehole logs must be viewed as "transitional" zones between layers, and cannot be construed as exact geologic boundaries between layers. PML should be retained to assist in determining geologic boundaries in the field during construction, if required.

The stratigraphy encountered in the boreholes consisted of a fill layer over a major sand deposit.

Fill was encountered at the surface of all five boreholes, continuing to 0.15 to 1.4 m depth (elevation 97.4 to 99.65). The fill comprised fine to medium sand with trace to some silt, trace gravel, and trace organics. Wood pieces and a coarse fibrous peat pockets were encountered in Borehole 4. The fill was moist to wet with depth, with moisture contents of 19 to 26%, locally 44% in Borehole 4.

A major sand deposit was encountered below the fill in all boreholes, extending to the 5.0 m depth of exploration. The sand was fine to medium grained, locally coarse, with trace silt and gravel. The material was typically loose or compact, becoming compact to dense with depth. The sand was typically wet, locally moist near the surface, with moisture contents typically 20 to 30 %.

The first water strike, the ground water levels measured in the boreholes upon completion of augering, and water levels measured in the wells are summarized in the table below, on a borehole by borehole basis:



BOREHOLE	GROUND ELEVATION	FIRST WATER STRIKE (DEPTH m / ELEVATION)	WATER LEVEL IN BOREHOLES UPON COMPLETION OF AUGERING JUNE 29, 2017 (DEPTH (m) / ELEVATION)	WATER LEVEL IN WELLS JULY 12, 2017 (DEPTH (m) / ELEVATION)
1	99.20	0.7 / 98.5	0.9 / 98.3	0.8 / 98.4
2	99.70	0.7 / 99.0	0.9 / 98.8	1.0 / 98.7
3	99.80	0.4 / 99.4	0.9 / 98.9	0.7 / 99.1
4	98.60	0.3 / 98.3	0.6 / 98.0	--
5	98.75	0.7 / 98.05	0.9 / 97.9	--

Based on the above the stabilized ground water level is within 0.5 to 1.0 m of the ground surface.

Ground water levels will fluctuate seasonally, and in response to variations in precipitation.

GEOTECHNICAL ENGINEERING CONSIDERATIONS

General

The parcel of land at the southeast quadrant of Theme Park Drive and Wally Drive in Wasaga Beach is slated for development as a residential land lease community. The new development will be an extension of an existing residential area on the north side of Wally Drive. Site configuration has yet to be finalized, however in general, single floor slab-on-grade townhouses are proposed. Site servicing and paved access and parking are also planned, however, no grading details are available at this time.

The boreholes revealed a fill layer over a major native sand deposit. The soils are typically loose to compact in the upper 2 m, becoming compact to dense with depth. The stabilized ground water table is within 0.5 to 1.0 m of existing grade.

It is recommended that the floor slabs be established minimum 0.5 m above the ground water table, corresponding to the finished floor at grade to no more than 0.5 m below existing grade. This will also reduce the depth of construction and thus ground water control during construction and long term drainage requirements.



Site Grading and Engineered Fill

Grading has not been determined at the time of this report. Cognizant of the recommendation to maintain the floor slabs at least 0.5 m above the ground water table, corresponding to the lowest finished floor at existing grade to no more than 0.5 m below existing grade. It is envisioned that the site grades need to be raised.

Where grades are to be raised under structures (houses, roads and site servicing) the fill needs to be constructed as engineered fill. Reference is made to Appendix A for guidelines for engineered fill construction. The following general highlights are provided:

- Strip existing topsoil, existing fill, and other deleterious materials down to native inorganic soil. The excavated soil should be segregated and stockpiled for reuse or disposal;
- Proofroll exposed subgrade using a heavy roller to targeted 100% Standard Proctor maximum dry density, under geotechnical review. It is advised that wet subgrade conditions can be generally expected which will be sensitive and easily disturbed. Also, weather will impact the moisture condition of the subgrade. In this regard, it is anticipated that site preparations may require the first lift or two of engineered fill comprise OPSS Granular B, Type II (crushed rock), subject to geotechnical review. The contractor will have to adopt equipment and methodology to take these issues into account;
- Following geotechnical review and approval of the subgrade, spread approved material in maximum 200 mm thick lifts and uniformly compacted to 100% Standard Proctor maximum dry density in building areas. Under pavements and servicing areas the engineered fill may be compacted to 95% Standard Proctor maximum dry density;
- Engineered fill material above the initial lift or two of Granular B Type II (if required) should comprise inorganic soil, free of deleterious material, at moisture content suitable for compaction. Excavated inorganic soils are expected to be suitable for reuse as engineered fill on a select basis, with most portions expected to be too wet for reuse unless allowed to “dry out”. It is anticipated that imported fill will be required. Also, weather will impact the moisture conditions of the soil and suitability for reuse. Reuse of excavated soils is subject to moisture control and geotechnical review and



approval during construction. Imported material should comprise OPSS Select Subgrade Material (SSM) or OPSS Granular B Type I. Sources of imported material should be reviewed by our office to ensure suitability;

- The engineered fill pad must extend at least 1 m beyond the structure to be supported, then outwards and downwards at no steeper than 45° to meet the underlying approved native subgrade. In this regard, strict survey control and detailed documentation of the lateral and vertical extent of the engineered fill limits should be carried out to ensure that the engineered fill pad fully incorporates the structure to be supported;
- Engineered fill construction must be carried out under full time field review by PML, to approve sub-excavation and subgrade preparation, backfill materials, placement and compaction procedures, and to verify that the specified compaction standards are achieved throughout.

Foundations

The buildings can be supported on spread and strip footings founded on engineered fill, constructed as noted above, or the native sand encountered at 0.1 to 1.4 m depth/elevation 97.4 to 99.6. A net geotechnical bearing resistance at Serviceability Limit State (SLS) of 75 kPa, and a factored bearing resistance at Ultimate Limit State (ULS) of 110 kPa are recommended for design. Higher bearing capacities are available at increased depths, however, footings should be maintained as high as possible to avoid/minimize ground water issues.

The geotechnical bearing resistance at SLS is based on 25 mm or settlement in the bearing stratum with differential settlement of 75% of the value.

Footings subject to frost action should be provided with a minimum 1.2 m of earth cover or equivalent. A 25 mm thickness of Polystyrene insulation is equivalent to 600 mm of earth cover.

Prior to placement of structural concrete, all founding surfaces must be examined by PML to check the design bearing capacity is available, and/or to reassess the available soil capacity.



Seismic Design

Based on the soil profile revealed in the borehole, Site Classification D is applicable for Seismic Site Response as set out in Table 4.1.8.4.A of the Ontario Building Code (2012). Based on the type and relative density of the soil cover at the site, there is a moderate potential for liquefaction.

Floor Slab

Floor slab-on-grade construction is feasible on engineered fill or the native sand. It is recommended that the floor slabs be established at least 0.5 m above the ground water table, corresponding to the finished floor at existing grade to no more than 0.5 m below existing grade.

A minimum 200 mm thick base layer of crushed stone (nominal 20 mm size) is recommended directly beneath the floor slab in conjunction with an underfloor drainage system of weeping tiles leading to a frost free sump or outlet. Polyethylene sheeting or similar means should be incorporated as a vapour barrier under the slab.

It is further recommended that a synthetic filter cloth be placed completely over the sand subgrade before placing the crushed stone bedding. This is intended to prevent movement of the sand into the clear stone which could lead to settlement. Care should also be exercised to ensure that piping or any opening in the sump pit is fully protected with filter cloth to prevent loss of soil.

It is advised that at least seasonal pumping from the sump pit can be expected.

In addition a perimeter weeping tile system around the building should be installed, with invert at about 300 mm below the finished floor. The perimeter weeping tile should drain to a frost free outlet or sump pit from under floor drain sump pit.

Exterior grades should be established to promote surface drainage away from the building.



Site Servicing

Design details were not finalized at the time of this report. However for purposes of this report it is assumed services will be a maximum 3.0 m below existing grade.

Trench Excavation and Ground Water Control

Trench excavation and ground water control are described later in the report under Excavation and Ground Water Control.

Pipe Bedding

Native sand is expected at invert levels which is considered satisfactory for pipe support.

Where existing fill or other deleterious material is encountered at the design invert level, such material should be sub-excavated and replaced with an increased thickness of bedding material, subject to geotechnical field review and approval.

Standard Granular A bedding, in accordance with OPSS, compacted to 95% Standard Proctor maximum dry density should be satisfactory. For flexible pipes, bedding and cover material should comprise OPSS Granular A. For rigid pipes, the bedding material should comprise OPSS Granular A and cover material may comprise select native soil free of oversized material.

Trench Backfill

Backfill in trenches should comprise select inorganics soil and be placed in maximum 200 mm thick loose lifts compacted to at least 95% Standard Proctor maximum dry density to minimize post construction settlement in the backfill. Topsoil, organic, excessively wet, frozen oversized (greater than 200 mm), or otherwise deleterious material should not be incorporated as trench backfill. The moisture content of the trench backfill should be within 2% of the optimum moisture content in order to achieve the specified compaction and be close to optimum moisture content in the upper 1 m to prevent subgrade instability issues. Ideally the backfill should comprise excavated site soil, in order to minimize differential frost heave.



The excavated soil will comprise existing sand fill and native sand which for the most part is expected to be too wet for reuse, unless subject to drying out. Also, weather will impact the moisture condition of the excavated soil and suitability for reuse. Reuse of excavated soil is subject to geotechnical review and approval at the time of construction. Prospective imported fill for reuse as backfill should be reviewed and approved by PML.

Earthworks operations should be inspected by PML to verify subgrade preparation, backfill materials, placement and compaction efforts and ensure the specified degree of compaction is achieved throughout.

Excavation and Ground Water Control

Excavation for engineered fill construction is expected to be a much as about 1.5 m below existing grade, typically less than 1 m and excavation for site servicing is expected to extend to about 3.5 m below existing grade. Excavation will encounter fill and the underlying native sand unit, with the ground water table anticipated within about 0.5 to 1.0 m of the ground surface.

Subject to effective ground water control, the site soils should be considered as Type 3 soil requiring excavation side walls to be constructed at no steeper than one horizontal to one vertical (1H:1V) from the base of the excavation in accordance with the Occupational Health and Safety Act.

Excavation for site servicing and foundations below the ground water table will require dewatering through the use of well points. It is recommended that the water level be lowered 0.5 m below the deepest excavation depth in order to carry out excavation in the dry. A dewatering system should be designed and installed by specialists in this field.

Water taking in Ontario is governed by the Ontario Water Resources Act (OWRA) and the Water Takings and Transfer Regulation O. Reg. 387/04. Section 34 of the OWRA requires anyone taking more than 50,000 L/d to obtain a Permit-To-Take-Water (PTTW) from the Ministry of the Environment and Climate Change (MOECC). This requirement applies to all withdrawals, whether for consumption, temporary construction dewatering, or permanent drainage



improvements. Recently the MOECC made some changes to the PTTW requirements. Where it is assessed that more than 50,000 L/d but less than 400,000 L/d of ground water taking is required, the Owner can register online via the Environmental Activity and Sector Registry (EASR) system. Where it is assessed that more than 400,000 L/d of ground water taking is required then a Category 3 PTTW is required. Based on the conditions in the boreholes, a PTTW or registry on the EASR system will be required. This should be reviewed when the founding elevations and inverts are established, and may require further hydrogeological studies and analysis in support of a PTTW or registry on the EASR.

It is recommended that a test dig be undertaken to allow prospective contractors an opportunity to observe and evaluate the subsurface conditions likely to be encountered and assess preferred means of excavation and ground water control measures based on their own experience.

Pavement Design and Construction

The location of the roadways have yet to be finalized and grading is still to be determined. Based on the boreholes, it is anticipated that the pavement subgrade will comprise moderately frost susceptible sand fill or native sand. The following preliminary pavement structure thicknesses are recommended and should be reviewed when grading has been finalized:

	LIGHT DUTY	HEAVY DUTY
Asphalt (mm)	90	110
Granular A Base Course (mm)	150	150
Granular B Subbase Course (mm)	300	400
Total Thickness (mm)	540	660

It is recommended that following rough grading to the design subgrade level, subgrade preparation should include proofrolling and compacting the exposed subgrade with a heavy compactor to minimum 95% Standard Proctor maximum dry density under geotechnical review. Any unstable zones identified during this process should be sub-excavated and replaced with compacted select material.



The pavement design considers that construction will be carried out during the drier time of the year and that the subgrade is stable, as determined by proofrolling operations. Considering the anticipated wet subgrade conditions and the ease with which the site soils can be disturbed, additional subbase material, the use of Granular B Type II and/or additional excavation may be required, subject to geotechnical review during construction.

Imported material for the granular base and subbase should conform to OPSS gradation specifications for Granular A and Granular B, and should be compacted to 100% Standard Proctor maximum dry density. Asphalt should be compacted in accordance with OPSS 310.

For the pavement to function properly, it is essential that provisions be made for water to drain out of and not collect in the base material. The incorporation of subdrains is recommended in conjunction with crowning of the final subgrade to promote drainage towards the pavement edge. Subdrains should be installed at least 300 mm below the subgrade level. Refer to OPSD 216 Series for details regarding pipe, filter fabric or filter sock, bedding and cover material. Maintenance hole/catchbasins should be backfilled with free draining material with frost tapers and stub drains extending out from structures. The above measures will help drain the pavement structure as well as alleviate the problems of differential frost movement between the catchbasins and pavement.



Geotechnical Review and Construction Inspection and Testing

It is recommended that the final drawings be submitted to PML for general geotechnical review for compatibility with the site conditions and the recommendations provided in this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures, and verify that the specified compaction standards are achieved throughout fill materials.

Prior to placement of structural concrete, all founding surfaces must be inspected by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions.

The comments and recommendations provided in this report are based on the site conditions as revealed in a limited number of boreholes at the time of the investigation. Design is in the conceptual stages and service inverts and final grades were not available at the time of this study. Accordingly, the comments and recommendations provided in this report are general in nature, and suitable only for preliminary design and planning purposes. When design details are available, they should be submitted for review by PML to verify the applicability of the recommendations presented in this report.



CLOSURE

We trust this report is complete within our terms of reference, and the information presented is sufficient for your present purposes. If you have any questions, or when we may be of further assistance, please do not hesitate to call our office.

Sincerely

Peto MacCallum Ltd.



Geoffrey R. White, P.Eng.
Associate
Manager, Geotechnical and Geoenvironmental Services

GRW/TLB:jlb

Enclosure(s):
List of Abbreviations
Log of Borehole Nos. 1 to 5
Drawing No. 1 - Borehole Location Plan

LIST OF ABBREVIATIONS



PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: - The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

<u>CONSISTENCY</u>	<u>N (blows/0.3 m)</u>	<u>c (kPa)</u>	<u>DENSENESS</u>	<u>N (blows/0.3 m)</u>
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		
WTPL	Wetter Than Plastic Limit			
APL	About Plastic Limit			
DTPL	Drier Than Plastic Limit			

TYPE OF SAMPLE

SS	Split Spoon	ST	Slotted Tube Sample
WS	Washed Sample	TW	Thinwall Open
SB	Scraper Bucket Sample	TP	Thinwall Piston
AS	Auger Sample	OS	Oesterberg Sample
CS	Chunk Sample	FS	Foil Sample
GS	Grab Sample	RC	Rock Core
	PH		Sample Advanced Hydraulically
	PM		Sample Advanced Manually

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

LOG OF BOREHOLE/MONITORING WELL NO. 1

17T 579694E 4931258N

PROJECT Proposed Wasaga Country Life Residential Development

PML REF. 17CF002

LOCATION Wasaga Beach, Ontario

BORING DATE June 29, 2017

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN RB

SOIL PROFILE			SAMPLES			ELEVATION SCALE	SHEAR STRENGTH (kPa)			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _l	UNIT WEIGHT kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		+ FIELD VANE △ TORVANE ○ Qu							
							▲ POCKET PENETROMETER ○ ○							
0.0	SURFACE ELEVATION 99.20					DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST × <td colspan="3">WATER CONTENT (%) <td></td> <td rowspan="6"> Stick-up casing Concrete Bentonite seal First water strike at 0.7 m 50 mm Slotted pipe Filter sand </td> </td>			WATER CONTENT (%) <td></td> <td rowspan="6"> Stick-up casing Concrete Bentonite seal First water strike at 0.7 m 50 mm Slotted pipe Filter sand </td>				Stick-up casing Concrete Bentonite seal First water strike at 0.7 m 50 mm Slotted pipe Filter sand	
0.70	FILL: Dark brown to brown, fine to medium sand, some silt, trace organics, roots, moist		1	SS	10									
0.70			2	SS	16									
1.0	SAND: Compact, brown, fine to medium sand, trace silt, stratified, wet		3	SS	12									
2.1	Becoming grey		4	SS	19									
2.1			5	SS	22									
3.0														
5.0			6	SS	18									
5.0	BOREHOLE TERMINATED AT 5.0 m												Upon completion of augering Water at 0.9 m Cave at 3.0 m Water Level Readings: Date Depth Elev. 2017-07-12 0.8 98.4	

NOTES

LOG OF BOREHOLE/MONITORING WELL NO. 2

17T 579718E 4931165N

PROJECT Proposed Wasaga Country Life Residential Development

PML REF. 17CF002

LOCATION Wasaga Beach, Ontario

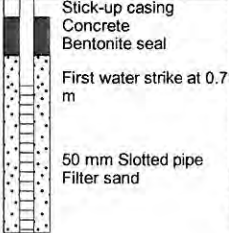
BORING DATE June 29, 2017

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN RB

SOIL PROFILE			SAMPLES			SHEAR STRENGTH (kPa)			PLASTIC NATURAL LIQUID			UNIT WEIGHT kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS			
DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	+ FIELD VANE Δ TORVANE ○ Qu				LIMIT	MOISTURE			LIMIT		
						▲ POCKET PENETROMETER ○ Q									W _p	w
						DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST ×			WATER CONTENT (%)			GRAIN SIZE DISTRIBUTION (%)				
						20	40	60	80	10	20	30	40	GR	SA	SI&CL
0.0	SURFACE ELEVATION 99.70															
0.70 99.00	FILL: Dark brown to brown, fine to medium sand, trace silt, trace gravel, trace organics, moist		1	SS	11											
1.0	SAND: Loose, brown, fine to medium sand, trace silt, trace gravel, wet		2	SS	9											
2.1 97.6	Becoming grey, medium to coarse sand		3	SS	10											
2.9 96.8	Becoming compact		4	SS	8											
3.0			5	SS	20											
5.0 94.7	BOREHOLE TERMINATED AT 5.0 m		6	SS	18											



Upon completion of augering
Water at 0.9 m
Cave at 3.0 m
Water Level Readings:
Date Depth Elev.
2017-07-12 1.0 98.7

NOTES

LOG OF BOREHOLE/MONITORING WELL NO. 3

17T 599778E 4931220N

PROJECT Proposed Wasaga Country Life Residential Development

PML REF. 17CF002

LOCATION Wasaga Beach, Ontario

BORING DATE June 29, 2017

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN RB

SOIL PROFILE			SAMPLES			SHEAR STRENGTH (kPa)				PLASTIC NATURAL LIQUID			UNIT WEIGHT kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	+ FIELD VANE Δ TORVANE ○ Qu				LIMIT	MOISTURE CONTENT	LIMIT			
						▲ POCKET PENETROMETER ○ Q									
						DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST ×				WATER CONTENT (%)					
						50	100	150	200	W _p	W	W _L	GR SA S&CL		
						20	40	60	80						
0.0	SURFACE ELEVATION 99.80														
0.15 99.65	FILL: Dark brown, fine to medium sand, trace silt, moist		1	SS	6									Stick-up casing Concrete First water strike at 0.4 m Bentonite seal 50 mm Slotted pipe Filter sand	
	SAND: Loose, brown, fine to medium sand, trace silt, stratified, moist to wet		2	SS	10										
1.0															
1.4 98.4	Becoming grey		3	SS	7										
2.0															
2.1 97.7	Becoming compact, coarse sand, trace gravel		4	SS	30										
3.0															
2.9 96.9	Becoming fine to medium sand		5	SS	29										
4.0															
5.0 94.8	BOREHOLE TERMINATED AT 5.0 m		6	SS	18								Upon completion of augering Water at 0.9 m Cave at 3.4 m Water Level Readings: Date Depth Elev. 2017-07-12 0.7 99.1		

NOTES

LOG OF BOREHOLE NO. 4

17T 579627E 4931265N

PROJECT Proposed Wasaga Country Life Residential Development

PML REF. 17CF002

LOCATION Wasaga Beach, Ontario

BORING DATE June 29, 2017

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN RB

SOIL PROFILE			SAMPLES			SHEAR STRENGTH (kPa)			PLASTIC NATURAL LIQUID			UNIT WEIGHT kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	+ FIELD VANE Δ TORVANE ○ Qu				W _p	w			W _L
						▲ POCKET PENETROMETER ○ Q								
						DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST ×				WATER CONTENT (%)				
						50	100	150	200	10	20	30	40	
0.0	SURFACE ELEVATION 98.60													
0.70 97.90	FILL: Brown, fine to medium sand, some silt, trace gravel, trace organics, over black, coarse fibrous peat pockets, wood pieces, moist to wet	[Hatched]	1	SS	6									First water strike at 0.3 m
1.0 97.2	SAND: Loose, brown, fine to medium sand, trace silt, wet	[Dotted]	2	SS	8									
1.4 97.2	Becoming compact to dense, grey	[Dotted]	3	SS	13									
2.1 96.5	Becoming coarse sand	[Dotted]	4	SS	32									
2.9 95.7	Becoming fine to medium sand	[Dotted]	5	SS	25									
5.0 93.6	BOREHOLE TERMINATED AT 5.0 m	[Dotted]	6	SS	21									

NOTES

LOG OF BOREHOLE NO. 5

17T 579703E 4931324N

PROJECT Proposed Wasaga Country Life Residential Development

PML REF. 17CF002

LOCATION Wasaga Beach, Ontario

BORING DATE June 29, 2017

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN RB

SOIL PROFILE			SAMPLES			SHEAR STRENGTH (kPa)		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _l	UNIT WEIGHT kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE						
0.0	SURFACE ELEVATION 98.75											
0.0 - 1.4	FILL: Dark brown to brown, fine to medium sand, trace to some silt, trace gravel, trace organics, moist to wet		1	SS	8	98						First water strike at 0.7 m
1.4 - 1.4			2	SS	9							
1.4 - 1.4			3	SS	12	97						
1.4 - 1.4			4	SS	33	96						
1.4 - 1.4			5	SS	31	95						
1.4 - 1.4			6	SS	32	94						
1.4 - 5.0	SAND: Compact to dense, grey, fine to medium sand, trace silt, stratified, wet											
5.0 - 5.0	BOREHOLE TERMINATED AT 5.0 m											Upon completion of augering Water at 0.9 m Cave at 3.0 m

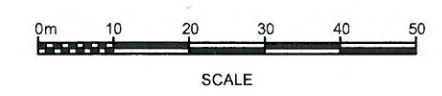
NOTES



KEY PLAN
WASAGA BEACH, ONTARIO

- LEGEND:**
- SITE LIMITS
 - BH/MW 1
EL. 99.20 BOREHOLE/MONITORING WELL 1
SURFACE ELEVATION
 - BH 4
EL. 98.60 BOREHOLE 4
SURFACE ELEVATION
 - TBM
EL. 100.00 TEMPORARY BENCHMARK (TBM)
TOP OF NAIL WITH YELLOW MARKING TAPE IN
HYDRO POLE ON EAST SIDE OF THEME PARK
ROAD, SOUTH OF ENTRANCE TO SITE
ELEVATION 100.00 (METRIC, ASSIGNED)

REFERENCE:
PLAN PRODUCED FROM GIS INFORMATION FROM THE SIMCOE
COUNTY ONLINE INTERACTIVE MAPPING SERVICE.



BOREHOLE LOCATION PLAN

PROPOSED WASAGA COUNTRY LIFE
RESIDENTIAL DEVELOPMENT
THEME PARK DRIVE, WASAGA BEACH, ONTARIO

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	RB	DATE	SCALE	PML REF.	DRAWING NO.
CHECKED	GW	SEPT. 2017	AS SHOWN	17CF002	1
APPROVED	GW				

Planning Justification Report

prepared by Celeste Phillips Planning Inc., dated November 26, 2017



PLANNING JUSTIFICATION REPORT

in support of an
Application for an
Official Plan Amendment,
Rezoning and Site Plan Approval
for
Parkbridge Lifestyle Communities
at the
Southeast corner of
Theme Park Drive and Wally Drive
Town of Wasaga Beach

November 26, 2017



**PLANNING JUSTIFICATION REPORT
PARKBRIDGE LIFESTYLE COMMUNITIES
SOUTHEAST CORNER OF THEME PARK AND WALLY DRIVES
TOWN OF WASAGA BEACH**

1. Background

Parkbridge Lifestyle Communities (“Parkbridge”) owns land generally located in the northeast part of the Town of Wasaga Beach. More particularly, the property consists of approximately 3.1 hectares and is located at the southeast corner of Theme Park Drive and Wally Drive. The lands are currently vacant. Figure 1 shows the location of the property.

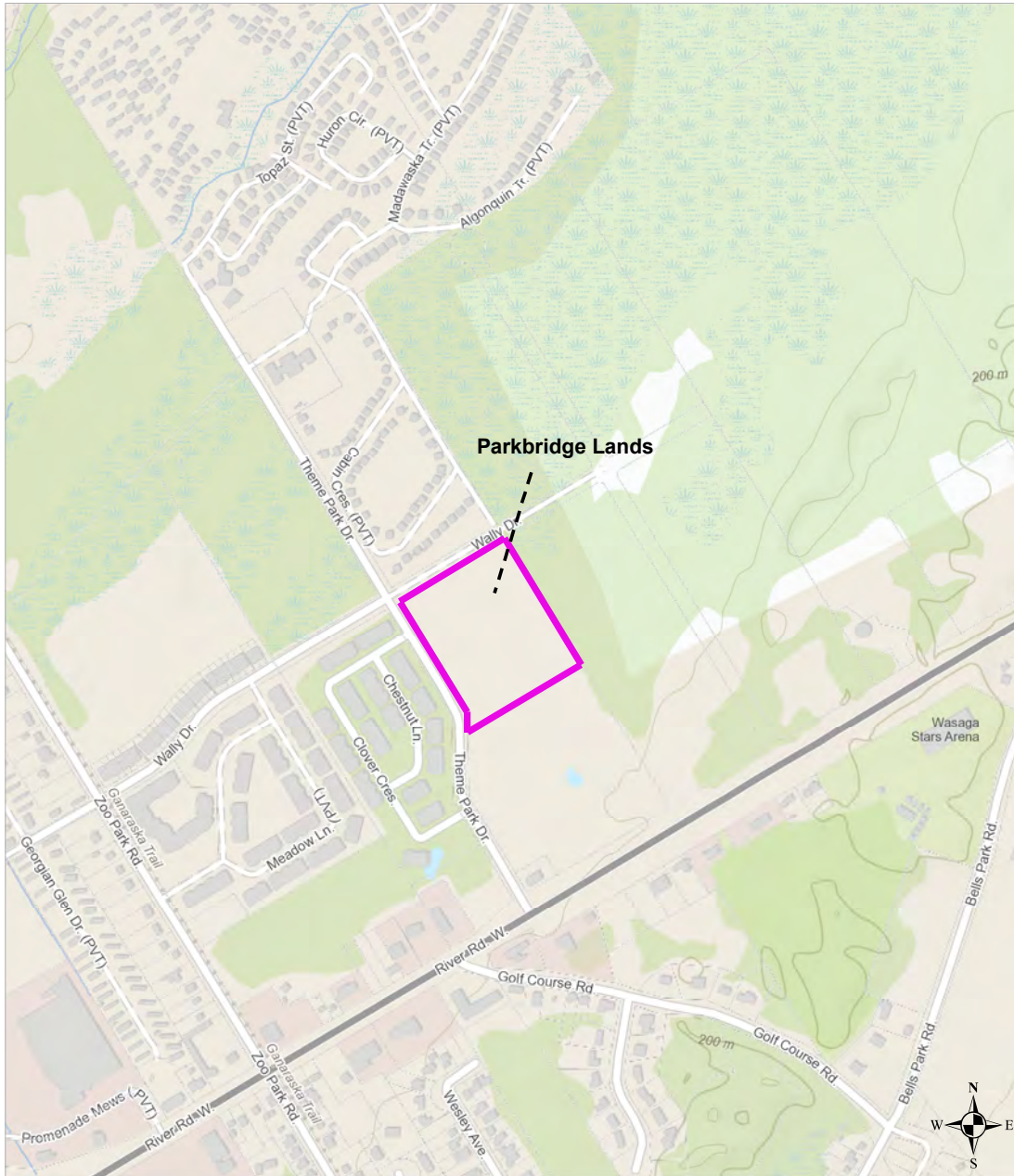
Parkbridge wishes to develop the lands with the final phase of its Wasaga Meadows East Phase 4 development. The proposed form of housing is land lease townhomes, constructed on a private roadway.

Parkbridge has developed lands to the north with seasonal cottages. Lands to the west, also developed by Parkbridge, are developed with permanent land lease townhomes. Lands to the east are undeveloped and lands to the south are occupied by the Wasaga Beach Chamber of Commerce.

The proposed development of the subject lands represents an expansion to the existing Parkbridge development, located on the west side of Theme Park Drive.

The Parkbridge lands are designated Tourism Commercial in the Town of Wasaga Beach Official Plan, with the requested designation being Residential. The lands are zoned CCH-4 on Schedule O to the Town of Wasaga Beach Zoning By-law. The requested zoning is the R3 zone. No special zoning standards appear to be necessary. Sixty six (66) land lease townhouses are proposed, of which, 20 units would be in 4-plex buildings, 30 units would be in 6-plex buildings and 16 units would be in 8-plex units. The development concept is illustrated in Figure 2.

Figure 1: Location Map



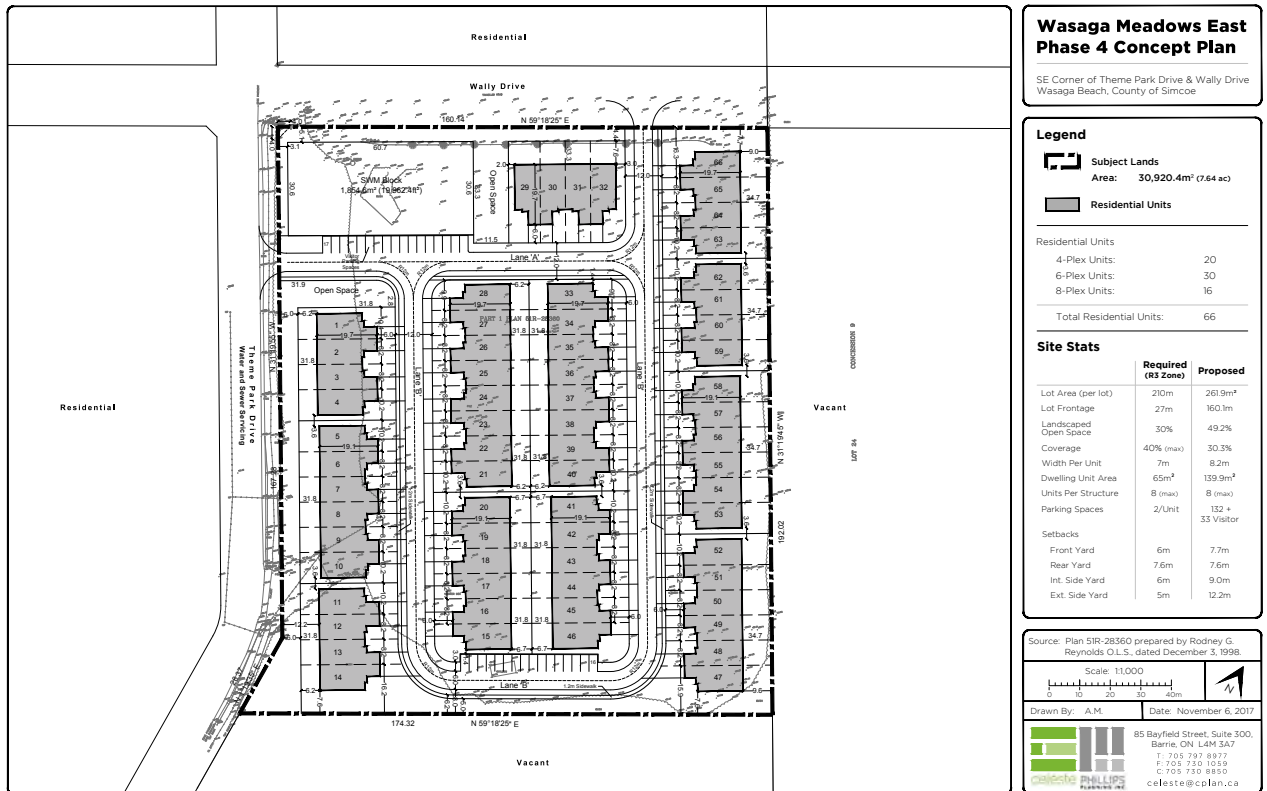
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0 0.125 0.25 0.5 km
 1:9,028



September 9, 2017

Figure 2: Development Concept
(larger size copies included as part of the application package)



2. Planning Policy Support for the Development

It is important to consider the planning policy support for the proposed development and to ensure that the use of the lands is a reasonable one that does not cause any adverse impacts on neighbouring uses.

To that end, I have reviewed the applicable planning policies of the Provincial Policy Statement, Growth Plan for the Greater Golden Horseshoe, the County of Simcoe Official Plan, and the Town of Wasaga Beach Official Plan.

It is not the intent of this planning report to examine the proposed land lease townhouse use in light of every component of the applicable planning policies but rather to demonstrate that the redesignation and rezoning of the lands



conforms and is consistent with the key provisions of the planning policy framework.

2.1 Provincial Policy Statement

The Provincial Policy Statement, 2014 (PPS) provides planning policy direction on matters of Provincial interest related to land use planning and development. The PPS sets the policy foundation for regulating the development and use of land in Ontario. All planning decisions made in the Province of Ontario are required to be consistent with the Provincial Policy Statement.

The redesignation and rezoning of the Parkbridge lands conforms to policies in the Provincial Policy Statement, particularly in Section 1, as follows:

- The development represents efficient development and land use patterns (1.1.1 a).
- The lands are located within an existing settlement area (1.1.3.1).
- The Provincial Policy statement encourages Intensification (1.1.3.2), which is defined as:

The development of a property, site or area at a higher density than currently exists through:

- a) redevelopment, including the reuse of brownfield sites;*
- b) the development of vacant and/or undertutilized lots within previously developed areas;*
- c) infill development; and*
- d) the expansion or conversion of existing buildings.*

The development of vacant lands owned by Parkbridge Lifestyle Communities meets the definition of intensification.

- The lands are located in an area where development is encouraged (1.1.3.3)
- There is no perceived impact to public health and safety (1.1.3.4).
- The lands are municipally serviced and the use of the property will allow for the efficient use and optimization of those services (1.6.1.1 a).



Based on the foregoing, it is my opinion that the proposed development is consistent with the Provincial Policy Statement.

2.2 Growth Plan for the Greater Golden Horseshoe

In May 2017, the Province released “Places to Grow: Growth Plan for the Greater Golden Horseshoe” (Growth Plan), an update to the 2006 document. This document came into effect on July 1, 2017 and sets out a strategy for how growth is to be managed throughout the Greater Golden Horseshoe. This document guides decisions on a wide range of issues, including where growth will occur, housing, infrastructure to support growth, protecting agricultural lands, water resource and natural heritage systems, mineral aggregate and cultural heritage resources, and provides a policy framework regarding climate change,

All Regional and Municipal documents in the Greater Golden Horseshoe are required to conform to the policies of this Plan. One of the guiding principles of the Growth Plan is prioritizing intensification to make efficient use of lands and infrastructure (1.2.1). The Growth Plan provides the same definition of intensification (as found in the Provincial Policy Statement) but the new Growth Plan emphasizes an “intensification first approach’ (2.1).

Section 6 of the Growth Plan incorporates policies respecting the Simcoe Sub-Area, including the Town of Wasaga Beach. The Town of Wasaga Beach is identified as one of the settlement areas in the County of Simcoe.

Section 6.1 provides the context for development in the Simcoe Sub-area such as: making the best use of existing infrastructure, optimizing the use of existing infrastructure and encouraging compact, complete urban communities.

Relevant and supportable policies from the Growth Plan include the following:

- Prioritizing intensification to make efficient use of land and supporting a range of mix of housing options to serve all sizes, incomes and ages of households (1.2.1).
- Providing a full range of housing to accommodate a range of incomes and household sizes (2.1).
- Building compact and complete communities (2.1).
- Directing growth to settlement areas (2.2.1 sub.2 a) and d)).



- Supporting a more diverse range and mix of housing options including affordable housing to accommodate people at all stages of life, and to accommodate the needs of all household sizes and incomes (2.1, 2.2.1 sub. 4)
- Ensuring the development of high quality compact built form (2.2.1 sub. 4 e))
- Encouraging intensification and the achievement of intensification targets (2.2.2 sub.4).
- Establishing annual minimum intensification targets (2.2.2 sub. 4).
- Identifying a diverse range and mix of housing options and densities and establishing targets for affordable ownership housing and rental housing (2.2.6 sub. 1 a)).
- Supporting a mix of unit sizes to accommodate a diverse range of household sizes and income (2.2.6 sub 3).

It is my opinion that use of the Parkbridge lands for a 66 unit land lease townhouse development conforms to the Growth Plan for the Greater Golden Horseshoe.

2.3 County of Simcoe Official Plan

In reviewing the consolidated edition of the County of Simcoe Official Plan (2016), I note the following:

Part 3, Growth Management Strategy encourages a significant portion of growth and development to settlement areas where it can be effectively serviced with a particular emphasis on settlement areas such as Wasaga Beach (3.1, 3.1.1). Compact communities that are transit supportive are encouraged and as such, there are density and intensification targets established.

Section 3.2, Population and Employment Projections/Allocations projects a population for Wasaga Beach of 27,500 by 2031. Within settlement areas, local municipalities are to provide for a mix of land uses, provide for densities and land use patterns supportive of transit (where planned to be available in



the future), as well as a variety of housing types including affordable housing (3.2.12).

Section 3.5 Settlements, contains a number of objectives and policies that promote development within settlement areas, compact urban form, and minimizing land consumption and servicing costs (3.5.1, 3.5.2, 3.5.4). As in the Province's Growth Plan, the County of Simcoe Official Plan contains policies that focus growth to settlement areas (3.5.7). Development is encouraged where it contributes to the achievement of density and intensification targets (3.5.9). The density target for Wasaga Beach is set at 32 residents and jobs per hectare and the intensification target is 20 percent for Wasaga Beach (3.5.23, 3.5.24).

Section 4.3 Affordable Housing, suggests that local municipalities should facilitate development and ensure zoning provisions do not hamper the appropriate provision of affordable housing (4.3.1, 4.3.3)

It is my planning opinion that the approval of an Official Plan Amendment and Rezoning for the Parkbridge lands conforms to the Growth Plan for the Greater Golden Horseshoe.

2.4 Town of Wasaga Beach Official Plan

The Official Plan for the Town of Wasaga Beach was adopted in September of 2003, approved by the County of Simcoe in June of 2004 and consolidated by the Town in February 2016.

Section 5 Residential, encourages a wide range of housing types and styles on a range of lot sizes (5.1.6). The Town prefers that the majority of approved residential development occurs within the serviced areas (5.1.8).

Townhouses such as those proposed by Parkbridge, are considered to be a medium density residential use (5.2.5 a)). Per the Official Plan, residential density shall generally not exceed 37 units per net residential hectare (5.2.5.b)). The density of the proposed Parkbridge development is approximately 21.3 units per hectare, well within the Official Plan's policy direction.

Section 5.2.5.1 of the Official Plan provides direction for Council when approving medium density residential use. It is my opinion that permitting medium density development on the Parkbridge lands conforms to these



criteria, particularly when medium density uses exist immediate opposite the subject property. Full municipal services (sanitary sewer and municipal water) are available to the site, in accordance with policy 5.2.5.6.

The redesignation of the Parkbridge lands from Tourist Commercial to Residential is in my opinion, in conformity with the policies of the Town of Wasaga Beach Official Plan.

3. Urban Design Guidelines for the Town of Wasaga Beach

The Urban Design Guidelines for the Town of Wasaga Beach were finalized in July 2017. The final phase of Wasaga Meadows East has been reviewed vis a vis the Town's Guidelines.

The Guidelines state on page 2 that: *"...overarching goal of these guidelines is to ensure that new development is compatible and sensitive to established neighbourhoods through design compatibility and the relationship with surrounding properties."* The final phase of the Wasaga Meadows development will adopt the same style as the Parkbridge development on the west side of Theme Park Drive, thereby assuring design compatibility. Put simply, Parkbridge will use the same prototype that has been used successfully elsewhere in the Town, (Park Place Phase 6, Country Meadows, Wasaga Meadows and Wasaga Meadows East).

In reviewing the Urban Design Principles found in Section 1.2, I note that Parkbridge has consistently met the suggested design principles and anticipates that this final phase will be no different. Figure 3 is an illustration of previously completed Parkbridge projects.

- Parkbridge has a proven track record in creating land lease communities with character and identity.
- The proposed development will result in a high quality neighbourhood, with an appropriate scale and pattern of development.
- The proposed development will be compatible with surrounding uses.
- As in previous Parkbridge developments in Wasaga Beach, this final phase will be pedestrian friendly, and will provide ample visitor and resident parking.
- Lighting will be the same as provided for the development to the west, that is, dark sky friendly lighting consisting of yard lights with streetlights on corners. Parkbridge's experience is that low level ground related lighting provides safety for its' senior residents.



- Environmental sustainability is promoted by way of reduced widths for asphalted roadways, and wider lot sizes, thereby increasing permeability for stormwater run off.
- The preparation of an Environmental Impact Study has addressed any concerns related to the preservation and enhancement of the natural environment.

Section 2.1 sets out guidelines for building orientation and the proposed development conforms to these guidelines with:

- Buildings oriented to the public realm, that being private roadways.
- Providing front yard paths to access each unit.
- Ensuring that front entrances are accessible (barrier free, at grade with no steps) and incorporating a front yard covered porch for each unit.
- The majority of the units have front-to-front or back-to-back relationships. Only 15 percent of the total units would have rear yards backing onto a public street and as in the past, Parkbridge would ensure privacy for rear yard amenity spaces for these units.

Section 2.2 contains guidelines for height and massing. As in the past, Parkbridge proposes low-rise land lease townhouses that are compatible with the area. There are no blocks of townhouses that exceed the maximum number (eight units) and only two of the twelve buildings contain 8 units. In other words, 50 of the 66 proposed units are contained within 4-plexes and 6-plexes, to provide variety and interest to the streetscape.

Guidelines for setbacks and separation distances are set out in Section 2.3. The proposed development deviates from the preferred standards in that Wasaga Meadows East Phase 4 is geared for seniors. It is important therefore to maximize floor space on one level, hence the need to project garages ahead of the main front wall. However, the garages meet the setback of 6 metres and the front yard setback to the habitable portion of the dwellings remains consistent throughout the development. Interior side yard setbacks are proposed at 1.8 metres, greater than the recommended 1.5 metres. Therefore, the total distance between townhouse block end walls is 3.6 metres, exceeding the recommended 3 metres. The Guidelines suggest a minimum separation distance of 15 metres between facing and rear-to-rear buildings. Parkbridge's development proposes a 24 metre separation for front-to-front buildings and a slightly lower rear-to-rear separation of 13.4 metres. However, the development will provide a private screened rear yard amenity area for each unit and there is a sufficient setback to permit light and privacy. Insofar as units backing onto a municipal roadway (Theme Park Drive), a 12 metre setback is proposed.



Section 2.4 of the Guidelines refers to Transition and Compatibility and is not applicable to this development as there is no need to transition to existing buildings of different densities, heights or setbacks.

The architectural design (Section 2.5) for Wasaga Meadows East Phase 4 will follow the format that has been so successful for Parkbridge in their senior-oriented housing projects. There will be consistency in architectural design and building materials to create a strong sense of community.

Similarly, the proposed development will mimic the landscape treatment (Section 2.6) used for the lands immediately to the west. The total landscaped open space is calculated at 49.2 percent, well above the required 30 percent. Additionally, dwelling unit widths are proposed at 8.2 metres, whereas only 7 metres is required. This wider unit allow for additional landscaped open space. Additionally, the proposed lot areas exceed the minimum required. A shared amenity space is proposed to be located immediately to the east of the stormwater management pond (Section 2.7). As noted previously, each unit will be provided with a private, screened rear yard amenity area. No fencing is proposed.

The Grading guidelines are found in Section 2.8 . There is no significant grade difference across the site, and Parkbridge intends to develop the townhouse units with barrier free access. Impermeable surfaces will be minimized and no adverse impacts from stormwater run-off is expected.

Section 3 of the Guidelines relates to Pedestrian and Vehicle Access. Parkbridge proposes a 1.2 metre sidewalk which will provide safe pedestrian movement. Roadways will be private. In addition to the driveway and garage (2 parking spaces per unit), 33 visitor parking spaces are proposed resulting in a total of 162 parking spaces.

In summary, as indicated in the document itself, the guidelines are just that, 'guidelines', and do not supersede the Zoning By-law standards. Having reviewed the Urban Design Guidelines, it is my opinion that the proposed development of Wasaga Meadows East Phase 4 conforms to the Town's expectations.

Figure 3: Similar Projects developed by Parkbridge Lifestyle Communities

Country Meadows



Park Place Phase 6
"Founders Village"





4. Technical Reports

In support of the requested Official Plan Amendment, Rezoning and Site Plan Approval, and in addition to this Planning Justification Report, the following reports are provided:

- Stage 1-2 Archaeological Assessment, Bluestone Research Inc., June 2017.
- Geotechnical Investigation, Peto MacCallum Ltd., August 2017.
- Scoped Environmental Impact Statement, Beacon Environmental, September 2017.
- 1st Engineering Submission, C.C. Tatham & Associates, November 2017.

5. Summary

Parkbridge Lifestyle Communities is requesting an Official Plan Amendment, Rezoning and Site Plan Approval for lands located on the southeast corner of Wally Drive and Theme Park Drive in the Town of Wasaga Beach. In summary, having reviewed Provincial, County and Municipal Planning policies as well as the Town's Urban Design Guidelines, it is my considered opinion that the requested planning approvals represent good planning. I would therefore request staff's recommendation for the scheduling of a public meeting and Council's favourable consideration of the applications.

Respectfully submitted,

Celeste Phillips, MCIP RPP

Traffic Impact Study

prepared by CCTA, dated December 11, 2017



C.C. Tatham & Associates Ltd.
Consulting Engineers

WASAGA MEADOWS EAST, PHASE 4
Town of Wasaga Beach

Traffic Impact Study

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December 11, 2017

CCTA File 117098

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1 Introduction

C.C. Tatham & Associates Ltd. (CCTA) was retained by Parkbridge Lifestyle Communities Inc. to prepare a Traffic Impact Study in support of Phase 4 of the Wasaga Meadows East development, located on Theme Park Road in the Town of Wasaga Beach. The site location is illustrated in Figure 1.

The purpose of this study is to address the requirements of the Town of Wasaga Beach with respect to the potential transportation impacts of the proposed Wasaga Meadow East Phase 4 development on the local road network. In particular, the following will be discussed:

- the operations of the road system through the study area prior to the proposed development;
- an estimation of the growth in the traffic volumes not otherwise attributed to the development (i.e. from overall growth in the area and/or other developments);
- an estimation of the number of new trips the proposed development is likely to generate;
- the operations of the study area road system upon completion of the development; and
- the resulting impacts and need for mitigating measures (if required) to ensure acceptable overall road operations.

Chapter 2 of this report addresses the existing conditions, detailing the road system and corresponding traffic operations. Chapter 3 addresses future conditions, prior to the completion of the proposed development, and will address the expected growth in the traffic levels and the resulting operating conditions. Chapters 4 and 5 address the proposed development, the ensuing vehicle trips that it will generate, and the associated impacts on the road system. Lastly, Chapter 6 summarizes the report and the key findings.

2 Existing Conditions

This chapter will describe the road network, traffic volumes and operating characteristics as defined for the existing conditions.

2.1 Existing Road Network

The road network to be addressed by this study consists of River Road West, Theme Park Drive, Zoo Park Road and the intersections of River Road West with Theme Park Drive and Zoo Park Road.

Photographs of the study area road network are provided in Figure 2.

2.1.1 Road Sections

River Road West is an arterial road under the jurisdiction of the Town of Wasaga Beach. The road is oriented east-west and provides one lane of travel per direction through the immediate study area (at Theme Park Road). It is noted that River Road West has a four-lane profile (i.e. two lanes of travel per direction) west of Zoo Park Road, carrying four lanes through the intersection at Zoo Park Road before narrowing to a two-lane profile approximately 160 metres east of Zoo Park Road. The posted speed limit is 50 km/h with an assumed design speed of 60 km/h (posted speed limit + 10 km/h). A road reflective of River Road West has an assumed planning capacity of 700 to 900 vehicles per hour per lane (vphpl). To maintain consistency with the *River Road West Class Environmental Assessment*¹, a lane capacity of 800 vphpl has been assumed. The road maintains a relatively straight and flat alignment through the study area.

Theme Park Drive is a two-lane local road under the jurisdiction of the Town of Wasaga Beach. The road originates at River Road West and terminates at the Wasaga CountryLife Resort main access. The speed limit is unposted on Theme Park Drive, thus a speed limit of 50 km/h has been assumed (typical for low-density, residential roads) and a design speed of 60 km/h applied (speed limit + 10 km/h). As a local road, Theme Park Drive has an assumed planning capacity of 400 vehicles per hour per lane (vphpl).

Zoo Park Road is a north-south collector, providing one lane of travel per direction. The road has a posted speed limit of 50 km/h. As a collector road, a planning capacity of 600 vphpl has been assumed.

2.1.2 Key Intersections

The intersection of River Road West with Theme Park Drive is a T-intersection with stop control on the north approach (Theme Park Drive). The west approach provides a single shared through/left lane

¹ *River Road West Class Environmental Assessment*. Ainley Group, September 2010.

whereas the east approach provides a single through/right lane. The north approach offers a single shared left/right turn lane. Although a 3-leg intersection, there is an access driveway to a gas station on what would otherwise be considered the south approach. For the purpose of this study, the driveway access has been included in the analysis of the intersection. Thus the north and south approaches have been modelled to consider single shared left/through/right turn lanes operating under stop control.

The intersection of River Road West with Zoo Park Road is a 4-leg intersection under signal control. The east and west approaches each provide a shared through/right and a shared through/left lane whereas the north and south approaches each offer an exclusive left turn lane and a shared through/right lane.

2.2 Existing Traffic Volumes

To determine the existing traffic volumes on the area road network, turning movement counts were conducted at the intersections of River Road West with Zoo Park Road and Theme Park Drive on Wednesday August 30, 2017 from 7:00 to 9:00 and 16:00 to 18:00 (additional details are provided in Appendix A). In consideration of the recreational and tourist nature of the area, summer traffic volumes have been considered for the traffic operations assessment. Given the time of year, the observed volumes are considered reflective of peak summer traffic conditions and thus no seasonal adjustment has been applied.

The resulting 2017 peak hour traffic volumes are illustrated in Figure 3.

2.3 Existing Traffic Operations

2.3.1 Intersection Operations

The assessment of existing conditions provides the baseline from which the future traffic volumes and operations (both with and without the subject development) can be assessed. The capacity, and hence operations, of a road system is effectively dictated by its intersections. As such, the analysis focused on the operations of the noted key intersections. The analysis is based on the 2017 traffic volumes, the existing configuration and intersection control (including optimization of traffic signal timings and schemes) and procedures outlined in the *2000 Highway Capacity Manual*² (using Synchro v.9 software). A summary of the analyses is provided in Table 1. For the signalized intersection, the review considers the average delay (measured in seconds), level of service (LOS) and volume to capacity (v/c) for each approach and the overall intersection. For the unsignalized intersection, the results are provided for the critical movement, namely the stop controlled movement. Level of service A corresponds to the best operating condition with minimal delays whereas level of service F corresponds to poor operations resulting from high intersection delays. A v/c ratio of less than 1.0

² *Highway Capacity Manual*. Transportation Research Board, Washington DC, 2000.

indicates the intersection movement/approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached. Detailed operations worksheets for the existing traffic conditions are included in Appendix B.

Table 1: Intersection Operations – 2017 Existing Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour			
		delay	LOS	v/c	delay	LOS	v/c	
Theme Park Drive & River Road West	NB	stop	14	B	0.04	21	C	0.12
	SB	stop	13	B	0.08	17	C	0.15
Zoo Park Road & River Road West	EB	signal	6	A	0.22	7	A	0.44
	WB		5	A	0.16	6	A	0.32
	NB		16	B	0.48	16	B	0.51
	SB		14	B	0.10	14	B	0.13
	overall		signal	8	A	0.29	9	A

Based on the 2017 volumes and existing intersection configurations and controls, the study area intersections provide good overall levels of service (LOS C) or better with average delays during both peak hours. As such, no improvements are required to support the existing conditions.

2.3.2 Road Section Operations

As previously noted, the following lane capacities have been assumed for the adjacent road network:

- River Road West – 800 vphpl (arterial);
- Theme Park Drive – 400 vphpl (local); and
- Zoo Park Road – 600 vphpl (local).

The existing road section operations are summarized in Table 2, reflective of the peak directional volumes during each of the noted peak hours.

As indicated, the study area road network is operating at 60% of capacity or less (i.e. $v/c \leq 0.60$), thus indicating that the network has reserve capacity to accommodate additional growth. No improvements are recommended to address capacity under existing conditions.

Table 2: Road Section Operations – 2017 Existing Conditions

Road and Lanes per Direction	Capacity ¹		Traffic Volumes		Volume to Capacity		
	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	
River Rd. W. (west of Zoo Park Rd.)	2	1,600	1,600	689	610	0.43	0.38
River Rd. W. (east of Zoo Park Rd.)	2	1,600	1,600	530	499	0.33	0.31
River Rd. W. (west of Theme Park Dr.)	1	800	800	481	444	0.60	0.56
River Rd. W. (east of Theme Park Dr.)	1	800	800	414	428	0.52	0.54
Theme Park Dr. (north of River Rd. W.)	1	400	400	52	50	0.13	0.13
Zoo Park Rd. (north of River Rd. W.)	1	600	600	128	106	0.21	0.18
Zoo Park Rd. (south of River Rd. W.)	1	600	600	192	218	0.32	0.36

¹ Capacity measured as vehicles per hour per direction.

3 Future Background Conditions

This chapter will describe the road network and background traffic volumes expected for the years 2019, 2024 and 2029. The 2019 horizon will consider full build-out and occupancy of Wasaga Meadows East Phase 4, whereas the 2024 and 2029 horizons will address the longer-term impacts (5 and 10 years beyond build-out) to the road network.

3.1 Road Network

As per the *Town of Wasaga Beach River Road West from Brillinger Drive to Eastern Town Limits Class Environmental Assessment*, a number of road improvements along the River Road West corridor are warranted over the next 10 to 15 years. Specific to this traffic impact study and in context of the study area road system, the Class EA recommended a widening of River Road West to 4 lanes (2 lanes per direction) from Zoo Park Road to the eastern Town limits by 2026, along with signalization of the intersection of River Road West with Theme Park Drive. The recommended intersection improvements also include provision of separate southbound left and right turn lanes on Theme Park Drive. As an interim measure prior to the widening to 4 lanes, the study recommended the provision of a continuous centre turn lane (e.g. 3 lane cross-section) as early as 2016.

The widening of River Road West was also addressed in the *Town of Wasaga Beach 2012 Transportation Study Update*³, with the need for 3 or 4 lanes identified in the 2020-2021 horizon. It is understood that the Town is currently undertaking a further update of this study; however, results have yet to be published.

3.2 Background Traffic Volumes

Background traffic volumes expected for the 2019, 2024 and 2029 horizon years have been determined based on the existing traffic volumes, projected growth for the study area as per the *River Road West from Brillinger Drive to Eastern Town Limits Class EA* and traffic increases associated with other planned development within the area.

3.2.1 River Road West Class EA

The *Town of Wasaga Beach River Road West from Brillinger Drive to Eastern Town Limits Class Environmental Assessment* prepared traffic projections for the 2026 horizon year in consideration of the following:

- historic growth from 1999 to 2006 and from 2006 to 2009;
- population and employment projections through to the year 2026;

³ *Town of Wasaga Beach 2012 Transportation Study Update*. Ainley Group, January 2013.

- growth from 17 specific area developments; and
- a general 2% background growth rate.

In considering the above, the Class EA study established a 5% annual growth rate on River Road West through the study area over the period 2011 to 2016, and 3% from 2016 to 2026.

3.2.2 Background Development – Georgian Sands

As previously noted, the *River Road West Class EA* considered several area developments, including the Georgian Sands development, formerly known as New England Village. The New England Village development plan consisted of 1,426 residential units, whereas the proposed Georgian Sands development will consist of 1,621 residential units, 178,500 ft² of commercial space and an elementary school with an assumed enrolment of 480 students. The *Georgian Sands Subdivision Traffic Impact Study (DRAFT)*⁴ provides updated trip volumes reflective of the new draft plan of subdivision for the development. As per the Georgian Sands draft traffic impact study, the development will occur in four phases with full build-out by 2026. The assumed phasing schedule is as follows:

- Phase 1 – 2020 build-out;
- Phase 2 – 2022 build-out;
- Phase 3 – 2024 build-out; and
- Phase 4 – 2026 build-out.

Overall, the Georgian Sand development is expected to generate 1,368 trips during the AM peak hour and 1,982 trips during the PM peak hour. The trip volumes associated with the Georgian Sands development that will travel to/from the west through the study area are provided in Figure 4 through Figure 8.

3.2.3 Background Traffic Volumes

2019 and 2024 Background Volumes

The 2019 and 2024 background traffic volumes have been established based on the 2017 existing volumes and the 2026 traffic projections provided in the *River Road West Class EA*, adjusted to remove the New England Village volumes (the Georgian Sands traffic has been re-introduced based on the new traffic volumes for the site and the proposed phasing). The 2019 volumes have been determined strictly through interpolation of the 2017 and 2026 traffic volumes (i.e. the Georgian Sands volumes have not been considered recognizing that Phase 1 will not be completed until after 2019). The 2024 background traffic volumes are based on interpolation of the 2017 and 2026 traffic volumes and further consider build-out of Phase 1 through Phase 3 of the Georgian Sands development. The

⁴ *Georgian Sands Subdivision Traffic Impact Study (DRAFT)*. C.C. Tatham & Associates Ltd. September 2017.

2019 and 2024 background volumes are illustrated in Figure 9 and Figure 10. It is noted that a 1% growth rate has been applied to the side streets (i.e. Theme Park Drive and Zoo Park Road), recognizing that growth on these roads, while not negligible, will be less than that experienced on River Road West.

2029 Background Volumes

The 2029 background traffic volumes have been established based on the 2026 traffic projections provided in the *River Road West Class EA* (adjusted to reflect full build-out of the Georgian Sands development) with further consideration of a sustained 3% annual growth rate for the period 2026 through 2029 (applied to the through volumes on River Road West). The 2029 background volumes are illustrated in Figure 11.

In comparison to the 2017 traffic volumes, the 2029 volumes reflect a realized annual growth in the order of 9.0%.

3.3 Background Traffic Operations

3.3.1 Intersection Operations

The study area intersections were again analyzed for each horizon year given the projected background volumes. While a number of road system improvements have been previously identified, they have not been considered in the initial intersection review; however, should traffic operations warrant, the previously improvements will be considered. The results of the operational assessment are summarized below (detailed worksheets are provided in Appendix C). For the intersection of Zoo Park Road with River Road West, the signal timings have been optimized to ensure efficient operations.

2019 Background Operations

The results for the 2019 horizon year are presented in Table 3. As indicated, the intersections will continue to provide good operating conditions (LOS C or better) with average delays during the weekday peak hour period. No intersection improvements are required to accommodate the 2019 background conditions.

2024 Background Operations

The results for the 2024 horizon year are provided in Table 4. As noted, the intersection of Zoo Park Road with River Road West will continue to provide good operations in 2024; however, the intersection of Theme Park Drive with River Road West will experience poor operating conditions (LOS F) with long delays given the projected 2024 background volumes. This is due to the significant increase of east-west traffic on River Road West.

Table 3: Intersection Operations – 2019 Background Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour			
		delay	LOS	v/c	delay	LOS	v/c	
Theme Park Drive & River Road West	NB	stop	15	C	0.05	25	C	0.14
	SB	stop	14	B	0.09	20	C	0.18
Zoo Park Road & River Road West	EB	signal	6	A	0.27	8	A	0.49
	WB		6	A	0.19	7	A	0.38
	NB		16	B	0.48	16	B	0.52
	SB		14	B	0.11	14	B	0.14
	overall		signal	8	A	0.32	9	A

Table 4: Intersection Operations – 2024 Background Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour			
		delay	LOS	v/c	delay	LOS	v/c	
Theme Park Drive & River Road West	NB	stop	72	F	0.25	>100	F	>20
	SB	stop	61	F	0.42	>100	F	19.97
Zoo Park Road & River Road West	EB	signal	8	A	0.50	12	B	0.78
	WB		7	A	0.48	8	A	0.63
	NB		16	B	0.50	25	C	0.63
	SB		14	B	0.11	20	C	0.16
	overall		signal	8	A	0.50	12	B

In order to address the poor operating conditions, the intersection improvements recommended in the *River Road West Class EA* (namely signalization) have been considered. While the *River Road West Class EA* also identified exclusive turn lanes on Theme Park Road, the volumes on Theme Park Road are not such that would otherwise warrant separate turn lanes. In addition to the noted improvements, exclusive left turn lanes have also been considered on River Road West (consistent with the interim recommendations of the *Class EA* and the recommended improvements in the *Town of Wasaga Beach 2012 Transportation Study Update*). The intersection operations were re-assessed in consideration of the recommended improvements. The results of the assessment are provided in Table 5. The signal timings have been optimized to ensure efficient operations.

Table 5: Intersection Operations – 2024 Background (w/improvements)

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
		delay	LOS	v/c	delay	LOS	v/c
Theme Park Drive & River Road West	EB	5	A	0.53	8	A	0.77
	WB	5	A	0.54	8	A	0.76
	NB	27	C	0.16	37	D	0.27
	SB	29	C	0.30	37	D	0.30
	overall	signal	6	A	0.52	9	A

In considering the noted intersection improvements and the projected 2024 background traffic volumes, the intersection of Theme Park Drive with River Road West will provide excellent overall operations with minimal delays.

2029 Background Operations

The operational assessment results for the 2029 horizon year are provided in Table 6. The assessment considers the intersection improvements recommended under 2024 background conditions.

As indicated, the study area intersections will provide good overall operations (LOS B or better) through the 2029 horizon, given the projected background volumes.

Table 6: Intersection Operations – 2029 Background Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
		delay	LOS	v/c	delay	LOS	v/c
Theme Park Drive & River Road West	EB	6	A	0.64	15	B	0.90
	WB	6	A	0.64	15	B	0.90
	NB	27	C	0.16	41	D	0.24
	SB	29	C	0.32	41	D	0.28
	overall	signal	7	A	0.63	16	B
Zoo Park Road & River Road West	EB	12	B	0.71	16	B	0.87
	WB	11	B	0.69	9	A	0.68
	NB	13	B	0.43	42	D	0.73
	SB	12	B	0.11	32	C	0.19
	overall	signal	11	B	0.61	15	B

3.3.2 Road Section Operations

The road section capacity operations have been reviewed in context of the future background traffic volumes, the results of which are provided in Table 7 through Table 9. Recall, a widening of River Road West is justified when the volume projections exceed the noted capacity, reflective of a v/c ratio greater than 1.0. The volumes reflect the peak hour peak directional volumes on the road network.

As noted, the existing 2-lane cross section along River Road West is expected to operate above capacity in 2024, with conditions worsening by 2029. This is consistent with the recommendations of the *River Road West Class EA*, which recommends the 4-laning of River Road West by 2026. The *Town of Wasaga Beach 2012 Transportation Study Update* recommends a 3 or 4-lane cross-section by 2020/2021. The projected volumes indicate that widening may be required by 2024; provided that growth occurs as assumed. It is noted that the study area intersections (i.e. the pinch points in the road network) will provide good operations through 2029 despite the apparent capacity constraints along River Road West.

Table 7: Road Section Operations – 2019 Background Conditions

Road and Lanes per Direction		Capacity ¹		Traffic Volumes		Volume to Capacity	
		NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
River Rd. W. (west of Zoo Park Rd.)	2	1,600	1,600	740	695	0.46	0.43
River Rd. W. (east of Zoo Park Rd.)	2	1,600	1,600	578	582	0.36	0.36
River Rd. W. (west of Theme Park Dr.)	1	800	800	523	525	0.65	0.66
River Rd. W. (east of Theme Park Dr.)	1	800	800	455	509	0.57	0.64
Theme Park Dr. (north of River Rd. W.)	1	400	400	53	51	0.13	0.13
Zoo Park Rd. (north of River Rd. W.)	1	600	600	131	108	0.22	0.18
Zoo Park Rd. (south of River Rd. W.)	1	600	600	196	222	0.33	0.37

Table 8: Road Section Operations – 2024 Background Conditions

Road and Lanes per Direction		Capacity ¹		Traffic Volumes		Volume to Capacity	
		NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
River Rd. W. (west of Zoo Park Rd.)	2	1,600	1,600	1,344	1,270	0.84	0.79
River Rd. W. (east of Zoo Park Rd.)	2	1,600	1,600	1,173	1,151	0.73	0.72
River Rd. W. (west of Theme Park Dr.)	1	800	800	1,104	1,090	1.38	1.36
River Rd. W. (east of Theme Park Dr.)	1	800	800	1,032	1,073	1.29	1.34
Theme Park Dr. (north of River Rd. W.)	1	400	400	56	54	0.14	0.13
Zoo Park Rd. (north of River Rd. W.)	1	600	600	137	114	0.23	0.19
Zoo Park Rd. (south of River Rd. W.)	1	600	600	206	234	0.34	0.39

Table 9: Road Section Operations – 2029 Background Conditions

Road and Lanes per Direction	Capacity ¹		Traffic Volumes		Volume to Capacity		
	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	
River Rd. W. (west of Zoo Park Rd.)	2	1,600	1,600	1,565	1,497	0.98	0.94
River Rd. W. (east of Zoo Park Rd.)	2	1,600	1,600	1,386	1,372	0.87	0.86
River Rd. W. (west of Theme Park Dr.)	1	800	800	1,301	1,303	1.63	1.63
River Rd. W. (east of Theme Park Dr.)	1	800	800	1,225	1,285	1.53	1.61
Theme Park Dr. (north of River Rd. W.)	1	400	400	59	56	0.15	0.14
Zoo Park Rd. (north of River Rd. W.)	1	600	600	144	119	0.24	0.20
Zoo Park Rd. (south of River Rd. W.)	1	600	600	216	246	0.36	0.41

3.4 Turn Lane Requirements

Despite the otherwise acceptable operations provided at the intersection of Theme Park Drive with River Road West, the need for exclusive left and right turn lanes on River Road West to serve turning traffic has been reviewed based on MTO warrants. The review is based on the following:

- MTO guidelines⁵ for auxiliary turn lanes at unsignalized intersections;
- a design speed of 60 km/h (reflective of the 50 km/h posted speed limit on River Road West);
- the projected 2019, 2024 and 2029 total traffic volumes for the right turns; and
- the projected 2019 total traffic volumes for the left turns (prior to the recommended signalization in 2024, at which point it is expected that left turn lanes would be implemented to complement the traffic signals).

3.4.1 Right Turn Lane

MTO guidelines suggest that an exclusive right turn lane be considered where right turn volumes exceed 60 vehicles per hour and impede the operations of through traffic. Based on the estimated volume of eastbound (entering the gas station) and westbound (entering Theme Park Drive) right turning traffic (40 to 70 vehicles per hour), an exclusive right turn lane is not warranted. While the PM peak hour right turns will exceed 60 vehicles per hour, the volumes are not such that would otherwise impede through traffic.

⁵ *Geometric Design Standards for Ontario Highways*, Ontario Ministry of Transportation, undated.

3.4.2 Left Turn Lane

For two-lane undivided highways, MTO warrants for left turn lanes at unsignalized intersections are based on design speed, advancing volume (i.e. traffic travelling in the same direction as left turning traffic), opposing volume (i.e. traffic travelling in the opposite direction that would impede left turning vehicles), and the percentage of left turns in the approaching volume. Based on the MTO warrant criteria using 5% left turns in the advancing volume and a design speed of 60 km/h, an eastbound left turn lane with 15 metres of storage is warranted under the 2019 background conditions.

Despite the warrant, a left turn lane is not considered necessary in 2019 given the otherwise good intersection operations and further considering the intersection improvements identified under the 2024 horizon. Given the impending improvements along River Road West, it is recommended that any turn lane requirements be coordinated with the overall improvement plans of the corridor, whether it be intersection improvements, additional through capacity or both.

4 Proposed Development

This chapter will provide additional details with respect to the proposed development, including its location, intended use, site access, the projected site generated traffic volumes and the assignment of such to the adjacent road network.

4.1 Site Location

As illustrated in Figure 1, the proposed development site is located on the east side of Theme Park Drive, in the Town of Wasaga Beach.

4.2 Proposed Land-Use

The existing Wasaga Meadows East development (Phases 1 to 3, located on the west side of Theme Park Road, opposite the Phase 4 site) is a retirement community comprised of 92 townhouses units. Phase 4 will consist of an additional 66 senior residential townhouse units. A site plan is provided in Figure 12.

For the purpose of this study, full build-out of Phase 4 is assumed by 2019 (i.e. a single two year phase).

4.3 Site Access

With the development of Phase 4, Wally Drive will be extended east of Theme Park Drive to serve the site. A second access to Phase 4 will be provided with direct access to Theme Park Drive, opposite the north leg of Clover Crescent (which serves Phases 1 to 3). Both access points to Phase 4 will provide two way operations (one inbound lane and one outbound lane).

4.4 Site Traffic

4.4.1 Trip Generation

The number of vehicle trips to be generated by the proposed development has been determined based on type of use, development size, and trip generation rates as per the *ITE Trip Generation Manual*⁶ 9th Edition. Considering the nature of the proposed development, the *senior adult housing – detached* (ITE code 251) land-use has been applied. While the ITE manual also provides trip rates for a *senior adult housing – attached* land-use, apartment/condominium style developments are included in the trip rates. Thus the *senior adult housing – detached* land-use was considered more appropriate for the subject development. It is further noted that the trip rates for the *senior adult housing – detached* land-

⁶ *ITE Trip Generation Manual, 9th Edition*. Institute of Transportation Engineers, 2012.

use are slightly more conservative than those for the attached housing land-use. The associated trip rates and trip estimates are provided in Table 10. The trip rates reflect the weekday AM and PM peak hour of the adjacent street.

Table 10: Trip Generation

Land Use	variable	Weekday AM Peak Hour			Weekday PM Peak Hour		
		in	out	total	in	out	total
senior adult housing - detached (ITE Code 251)	units	0.08	0.14	0.22	0.16	0.11	0.27
	66	5	10	15	11	7	18

Overall, the proposed development is expected to generate 15 trips during the weekday AM peak hour and 18 trips during the weekday PM peak hour.

4.4.2 Trip Distribution and Assignment

The distribution of the site-generated traffic to the area road system reflects the location of the site in context of the Town of Wasaga Beach and travel patterns observed at the intersection of Theme Park Drive with River Road West. Based on the existing travel patterns, the following distribution was applied:

- to/from the east – 40%; and
- to/from the west – 60%.

While it is expected that a small portion of the site trips will travel along Wally Drive to Zoo Park Road, it has been assumed that all site traffic will travel to/from the site via Theme Park Drive and its intersection with River Road West, thus ensuring a conservative approach with respect to the intersection operations at Theme Park Drive and River Road West.

The resulting site generated traffic volumes, assigned to the road network, are illustrated in Figure 13.

5 Transportation Impacts

This chapter will address the resulting impacts of the proposed Wasaga Meadows East Phase 4 development on the adjacent road system. The following areas are to be addressed:

- operations at the intersections River Road West with Zoo Park Road and Theme Park Drive;
- road section operations;
- available sight lines along Theme Park Drive at the proposed access points; and
- potential improvements to the study area road network, if necessary.

5.1 Future Total Traffic Volumes

To assess the impacts of the increased traffic volumes resulting from the proposed development, the site generated traffic was combined with the 2019, 2024, and 2029 background traffic volumes. The resulting total traffic volumes are presented in Figure 14 through Figure 16.

5.2 Future Total Traffic Operations

5.2.1 Intersection Operations

The operations of the study area intersections were again investigated considering the total traffic volumes for each horizon year. The results of the operational review are provided below (detailed worksheets are provided in Appendix D).

2019 Total Operations

The 2019 operations are summarized in Table 11. As indicated, the operations are comparative to the 2019 background operating conditions. The intersection of Theme Park Drive with River Road West will continue to provide good acceptable operations given the existing configuration with stop control on the minor movements. No improvements are required to accommodate the 2019 total conditions.

2024 Total Operations

The 2024 operations are summarized in Table 12. The operations assessment considers the improvements recommended to accommodate the 2024 background conditions (namely the provision of traffic signals and left turn lanes on River Road West at Theme Park Drive). As noted, the study area intersections will provide excellent overall operations with minimal delays in 2024. No additional intersection improvements are required to accommodate the 2024 total traffic volumes.

Table 11: Intersection Operations – 2019 Total Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour			
		delay	LOS	v/c	delay	LOS	v/c	
Theme Park Drive & River Road West	NB	stop	16	C	0.05	26	D	0.15
	SB	stop	14	B	0.10	21	C	0.22
Zoo Park Road & River Road West	EB	signal	6	A	0.27	8	A	0.49
	WB		6	A	0.19	7	A	0.38
	NB		16	B	0.48	16	B	0.52
	SB		14	B	0.11	14	B	0.14
	overall		signal	8	A	0.33	9	A

Table 12: Intersection Operations – 2024 Total Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour			
		delay	LOS	v/c	delay	LOS	v/c	
Theme Park Drive & River Road West	EB	signal	5	A	0.53	9	A	0.78
	WB		5	A	0.54	9	A	0.77
	NB		27	C	0.15	35	D	0.21
	SB		29	C	0.32	36	D	0.27
	overall		signal	6	A	0.53	10	B
Zoo Park Road & River Road West	EB	signal	10	A	0.59	14	B	0.84
	WB		9	A	0.56	10	A	0.68
	NB		13	B	0.41	21	C	0.54
	SB		12	B	0.09	18	B	0.14
	overall		signal	10	A	0.53	13	B

2029 Total Conditions

The 2029 operations are summarized in Table 13. The subject intersections will continue to provide good overall operations through 2029. No further intersection improvements are required to accommodate the 2029 total traffic volumes.

Table 13: Intersection Operations – 2029 Total Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
		delay	LOS	v/c	delay	LOS	v/c
Theme Park Drive & River Road West	EB	7	A	0.66	16	B	0.90
	WB	7	A	0.68	16	B	0.90
	NB	26	C	0.14	41	D	0.21
	SB	27	C	0.28	41	D	0.31
	overall	signal	8	A	0.64	17	B
Zoo Park Road & River Road West	EB	12	B	0.72	16	B	0.87
	WB	11	B	0.69	9	A	0.69
	NB	13	B	0.43	42	D	0.73
	SB	12	B	0.11	32	C	0.19
	overall	signal	12	B	0.62	15	B

2029 Total Conditions without River Road West Left Turn Lanes

A further review was conducted to consider the implications of only installing traffic signals at the intersection of Theme Park Road and River Road West (i.e. no left turn lanes on River Road West), recognizing that the provision of traffic signals may provide suitable operations at the intersection, thus providing an interim solution prior to improvements being implemented to River Road West (i.e. future widening). The review considered the 2029 total volumes which reflect the critical conditions. The results of the review are provided in Table 14.

Table 14: Theme Park Road & River Road West – Signals Only (2029 Conditions)

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
		delay	LOS	v/c	delay	LOS	v/c
Theme Park Drive & River Road West	EB	8	A	0.70	24	C	0.96
	WB	7	A	0.67	14	B	0.88
	NB	29	C	0.16	51	D	0.25
	SB	30	C	0.29	52	D	0.36
	overall	signal	8	A	0.67	20	C

As noted, the intersection will provide good overall operations through 2029 when considering signalization without exclusive left turn lanes on River Road West. This indicates that the implementation of traffic signals could serve as an interim solution until such time that additional through capacity is required on River Road West.

5.2.2 Site Access Operations

As previously noted, Wasaga Meadows East Phase 4 will be served by two access points. The operations of the proposed site access points have not been explicitly analyzed given the limited volumes observed along Theme Park Drive, the excess reserve capacity of the road and the minimal volumes to be generated by Phase 4. In considering single lane approaches with stop control on the minor movement (i.e. on exit from the site), the site access points are expected to continue to provide excellent operations throughout the study horizon.

5.2.3 Road Section Operations

The road section operations under total conditions for the 2029 horizon are provided in Table 15. As noted, the 2029 road section operations under total conditions are consistent with the background conditions for the same horizon year. Additional lane capacity (i.e. 4-lane cross-section) is required through the study area under both scenarios. However, the study area intersections, which dictate the capacity of the road network, will continue to provide good operating conditions through the 2029 horizon (provided signalization is implemented at Theme Park Drive). Thus additional lane capacity may not be necessary.

Table 15: Road Section Operations – 2029 Total Conditions

Road and Lanes per Direction		Capacity ¹		Traffic Volumes		Volume to Capacity	
		NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
River Rd. W. (west of Zoo Park Rd.)	2	1,600	1,600	1571	1501	0.98	0.94
River Rd. W. (east of Zoo Park Rd.)	2	1,600	1,600	1392	1376	0.87	0.86
River Rd. W. (west of Theme Park Dr.)	1	800	800	1307	1307	1.63	1.63
River Rd. W. (east of Theme Park Dr.)	1	800	800	1228	1290	1.53	1.61
Theme Park Dr. (north of River Rd. W.)	1	400	400	69	63	0.17	0.16
Zoo Park Rd. (north of River Rd. W.)	1	600	600	144	119	0.24	0.20
Zoo Park Rd. (south of River Rd. W.)	1	600	600	216	246	0.36	0.41

5.3 Sight Line Analysis

Sight lines on Theme Park Road have been reviewed for the Phase 4 access points at Wally Drive and opposite Clover Crescent. Based on MTO geometric design standards, the minimum stopping sight distance for a design speed of 60 km/h is 85 metres. This requirement provides sufficient distance for an approaching vehicle to observe a stationary hazard in the road (i.e. a vehicle stopped at an intersection waiting to complete a turn) and bring the vehicle to a complete stop prior to the hazard.

Wally Drive

The sight lines to/from the north along Theme Park Drive at Wally Drive are in excess of 250 metres, whereas the sight lines to/from the south are approximately 200 metres. In both instances the available sight lines satisfy the minimum stopping sight distances for a 60 km/h design speed.

Clover Crescent

The sight lines along Theme Park Drive from opposite Clover Crescent (i.e. proposed location of the second access to Phase 4) were also reviewed. The sight lines to/from the north are in excess of 250 metres, whereas the sight lines to/from the south are approximately 135 metres. As such, the available sight lines at the proposed access point opposite Clover Crescent satisfy the minimum stopping sight distance requirements for a 60 km/h design speed.

No improvements are required to address the available sight distances.

6 Summary

Wasaga Meadows East – Phase 4

This study has addressed the transportation impacts associated with Phase 4 of the Wasaga Meadows East development on Theme Park Drive within the Town of Wasaga Beach. The proposed development expansion is to consist of 66 senior residential townhouse units. Upon completion, the Phase 4 development is expected to generate 15 trips during the AM peak hour and 18 trips during the PM peak hour.

Intersection Operations

In addressing the study area traffic operations, the intersections of River Road West with Zoo Park Road and Theme Park Drive were analysed under existing conditions (2017) and for the 2019, 2024 and 2029 horizon periods. The results of the operational analyses indicate that the intersection of Zoo Park Road with River Road West will provide good overall conditions through 2029 under both future background and future total conditions. However, the intersection of Theme Park Drive with River Road West will experience poor operating conditions in 2024 under background conditions. Consistent with the recommendations of the *Town of Wasaga Beach River Road West from Brillinger Drive to Eastern Town Limits Class EA*, it is recommended that the noted intersection be signalized in 2024 to ensure acceptable operations under background conditions. Exclusive left turn lanes on River Road West are also considered. However, the provision of left turn lanes on River Road West may not be required in conjunction with the noted signalization. Signalization of the intersection will in itself provide good operations through 2029 without provision of exclusive left turn lanes on River Road West. With consideration for the noted improvements, good operating conditions through 2029 under both background and total conditions will be provided.

Link Operations

While the 2024 background traffic volumes on River Road West will exceed the available capacity at Theme Park Drive to the extent that additional through capacity be considered, it is noted that the otherwise good operating conditions at the study area intersections indicated that future widening may not be immediately required.

Site Access Intersections

Given the limited traffic volumes to be generated by the site, and further considering the excess capacity on Theme Park Drive, the site access points are expected to provide excellent operations through the 2029 horizon period.

Sight Line Review

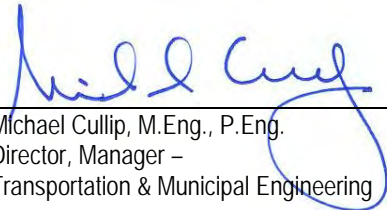
The available sight lines along Theme Park Drive at the proposed site access points were reviewed and are considered acceptable in consideration of the MTO minimum sight distance requirements for the respective design speed.

Summary

The proposed Wasaga Meadows East Phase 4 development will not require any improvements to the study area road network over and above those already identified in the noted background studies as required to accommodate future background conditions.



Authored by: David Perks, M.Sc., PTP
Transportation Planner

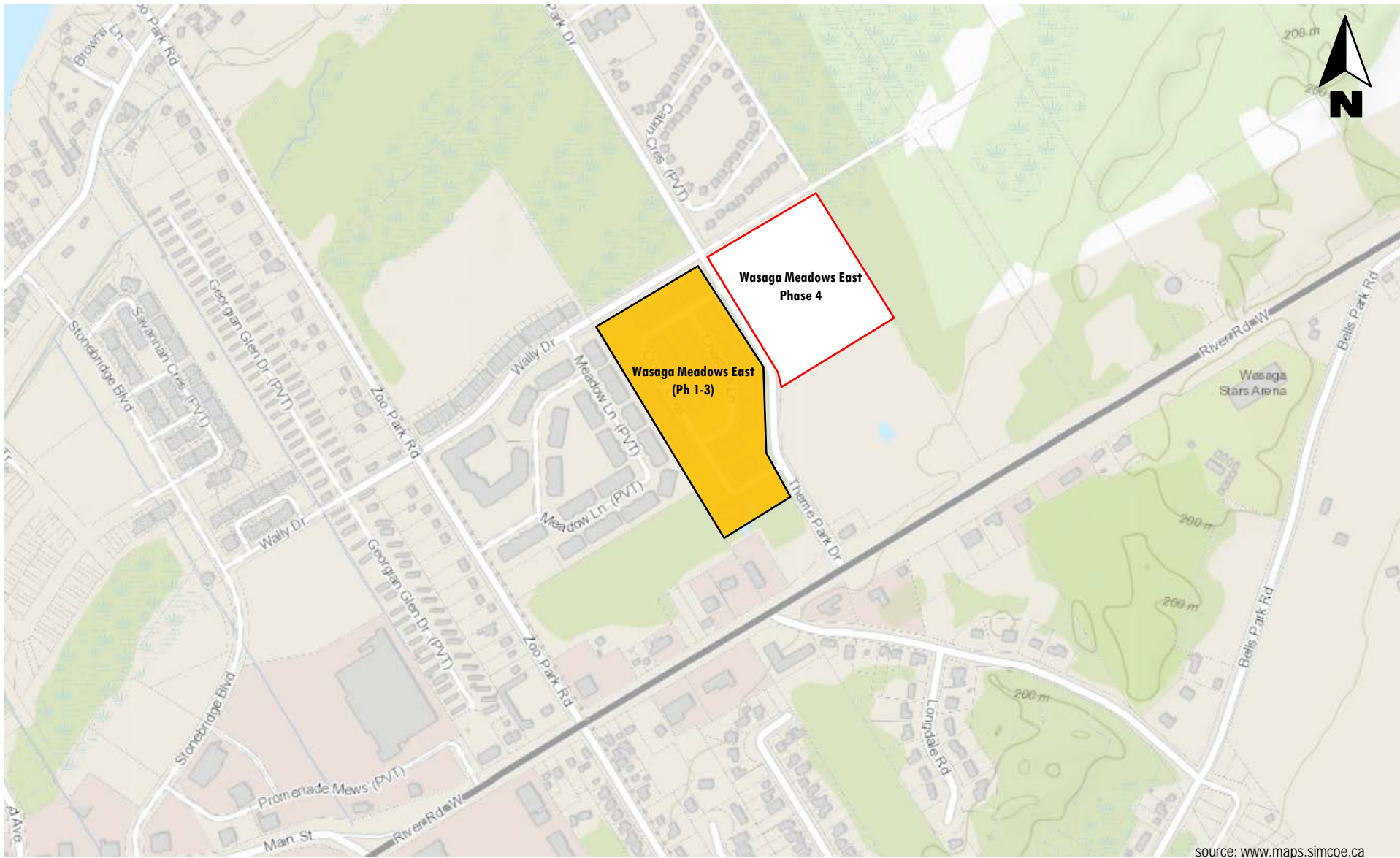


Reviewed by: Michael Cullip, M.Eng., P.Eng.
Director, Manager –
Transportation & Municipal Engineering

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Looking north along Theme Park Drive from River Road West



Looking at south approach (opposite Theme Park Dr.) from River Road West



Looking east along River Road West from Theme Park Drive



Looking west along River Road West from Theme Park Drive

source: Google Streetview



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Wasaga Meadows East – Phase 4, Traffic Impact Study

Area Road Network

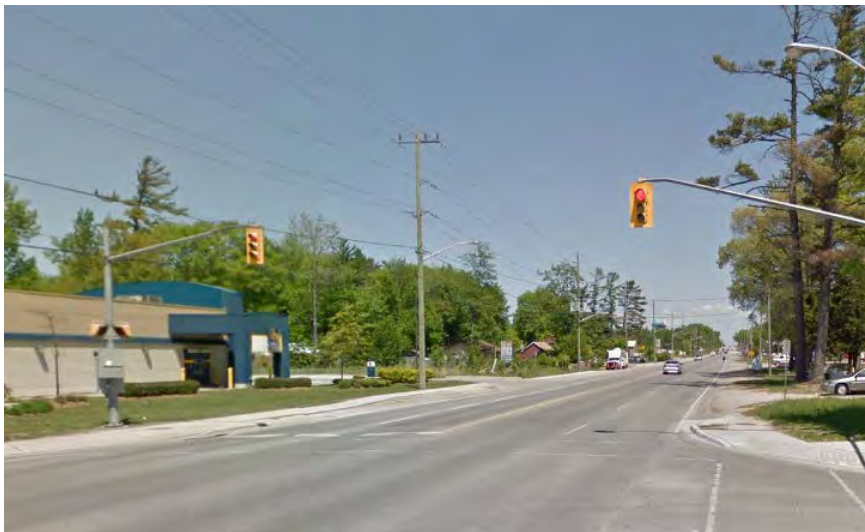
Figure
2a



Looking north along Zoo Park Road from River Road West



Looking south along Zoo Park Road from River Road West



Looking east along River Road West from Zoo Park Road



Looking west along River Road West from Zoo Park Road

source: Google Streetview



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Wasaga Meadows East – Phase 4, Traffic Impact Study

Area Road Network

Figure
2b



Looking north along Theme Park Drive from Wally Drive



Looking south along Theme Park Drive from Wally Drive



Looking north along Theme Park Drive from Clover Crescent



Looking south along Theme Park Drive from Clover Crescent

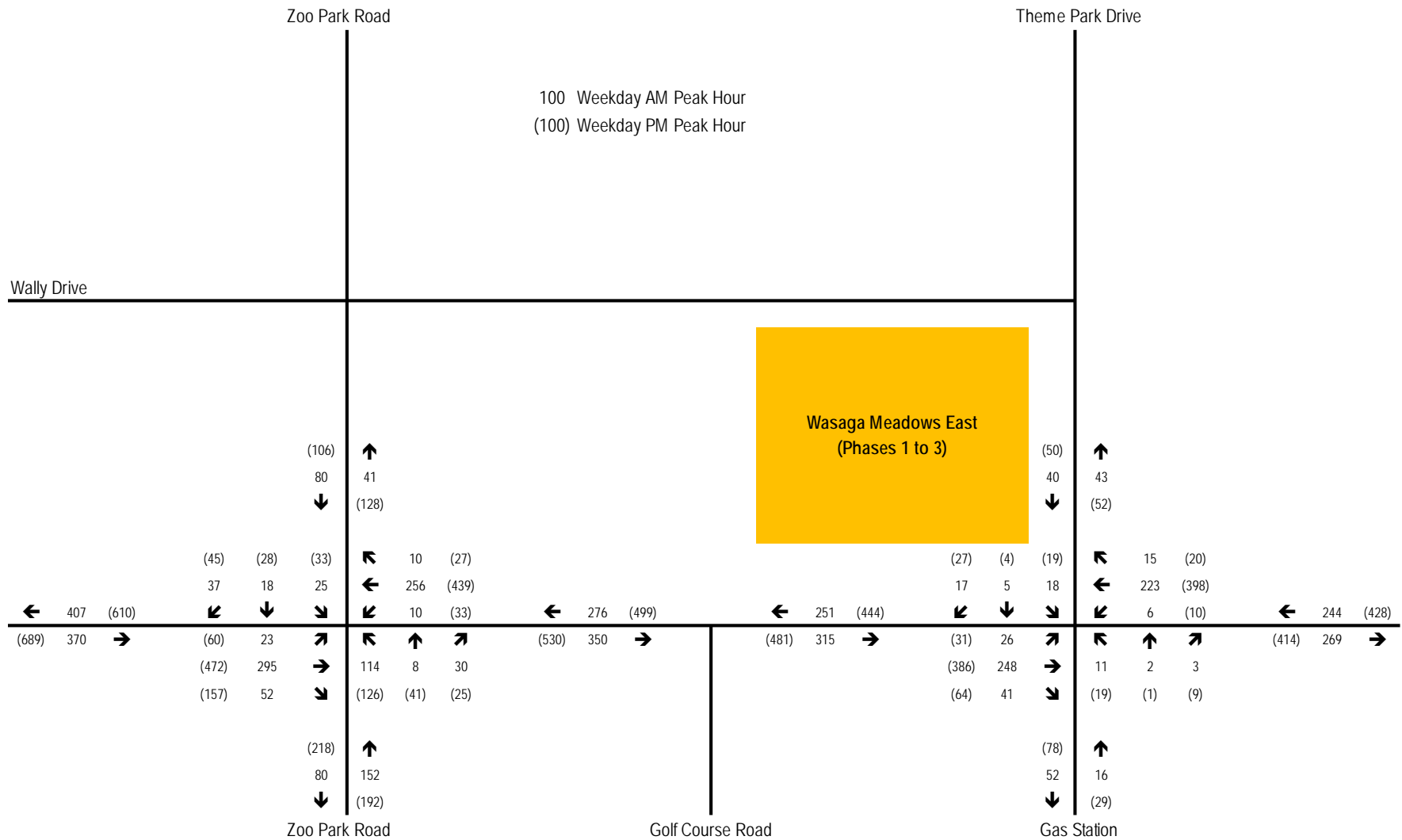
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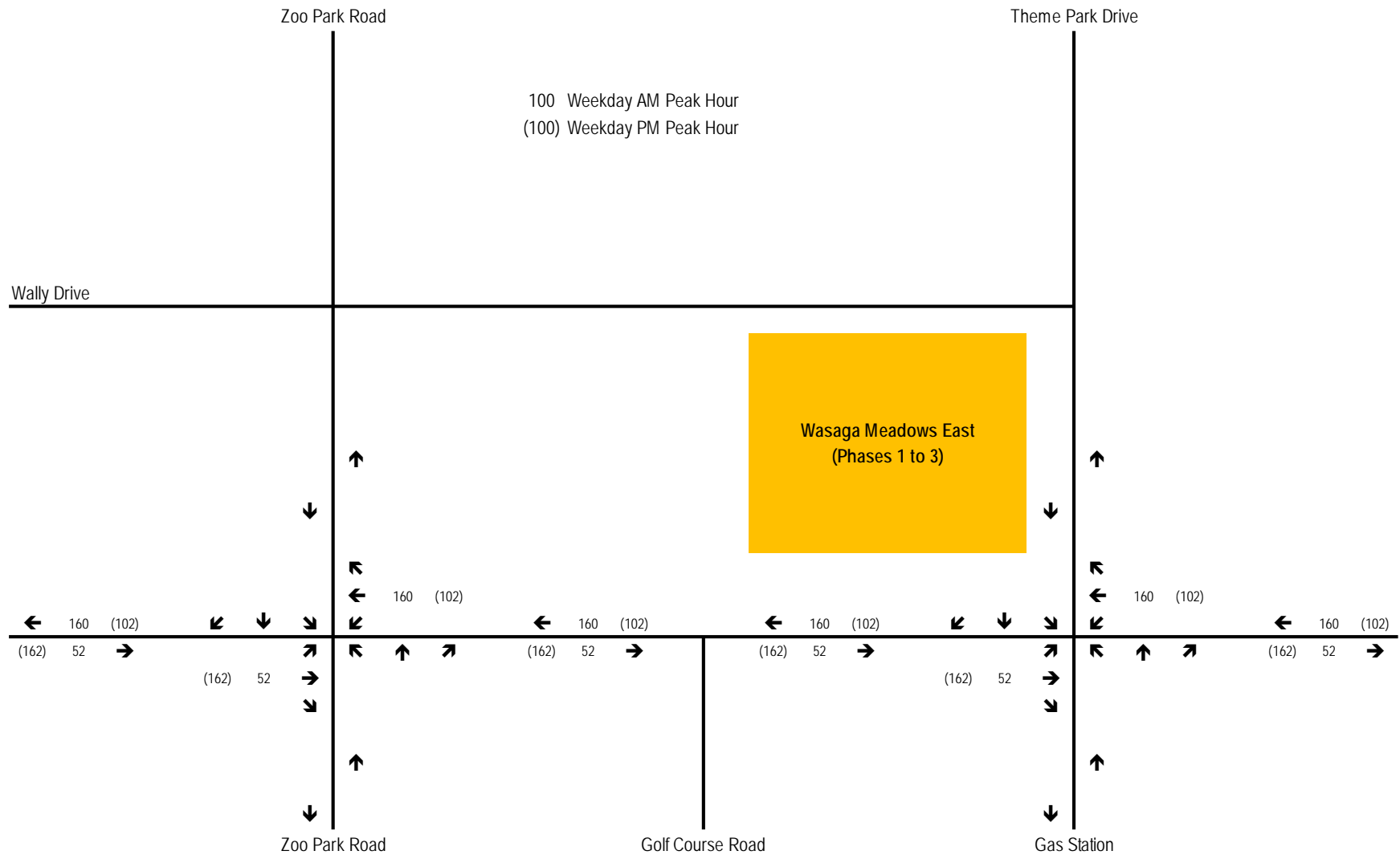


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Wasaga Meadows East – Phase 4, Traffic Impact Study
Area Road Network

Figure
2c



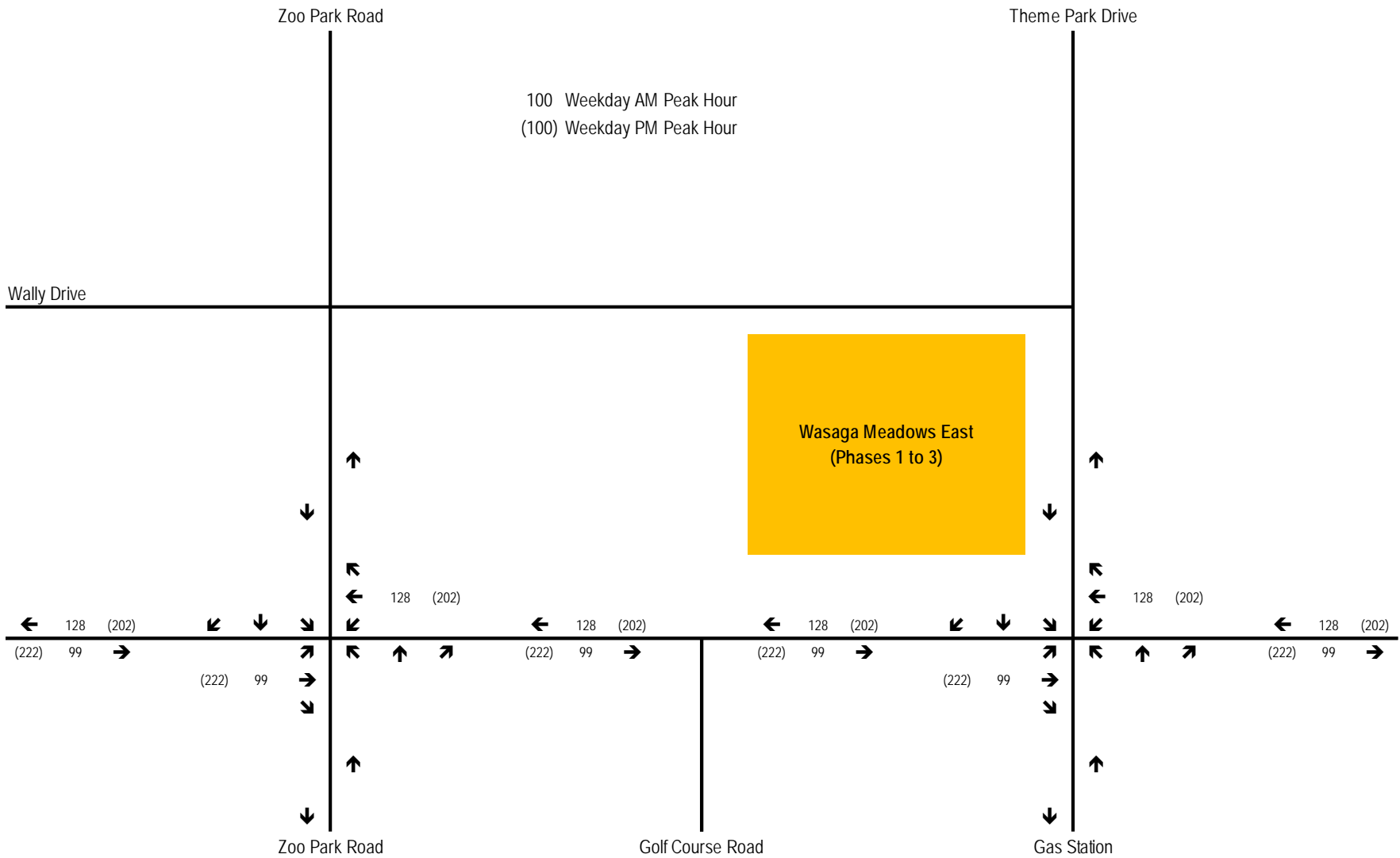


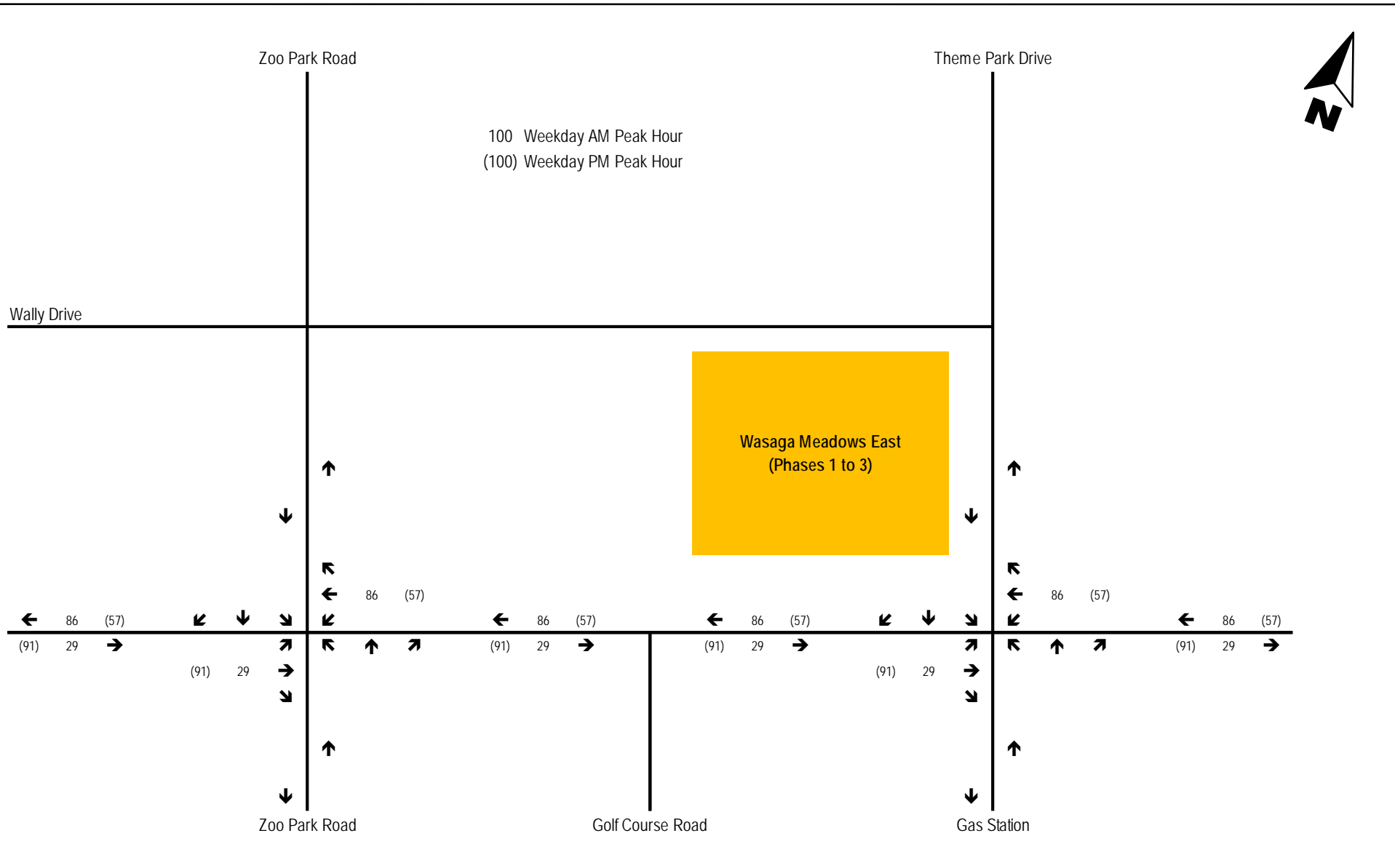
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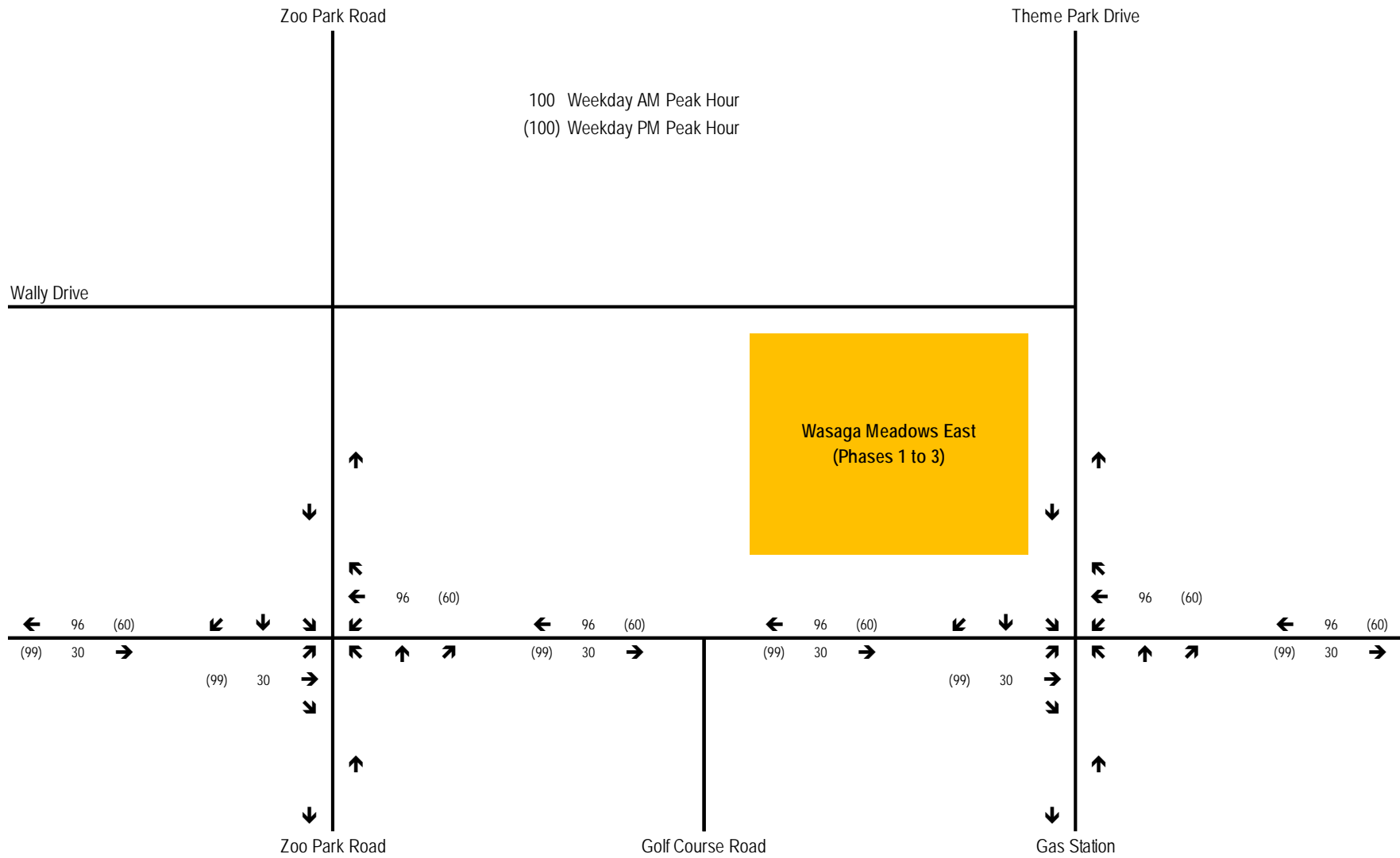
Wasaga Meadows East – Phase 4, Traffic Impact Study

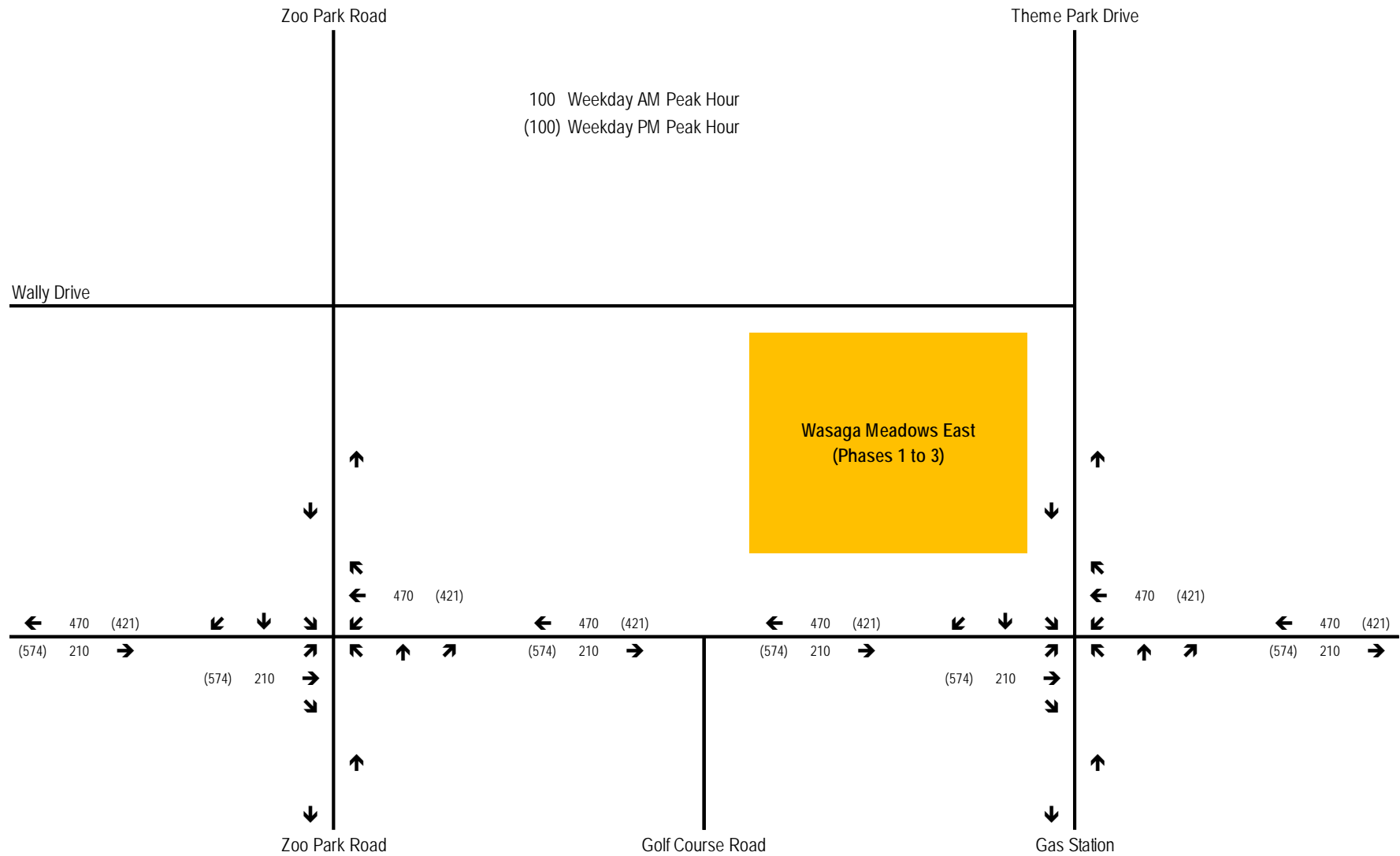
Background Development – Georgian Sands, Phase 1

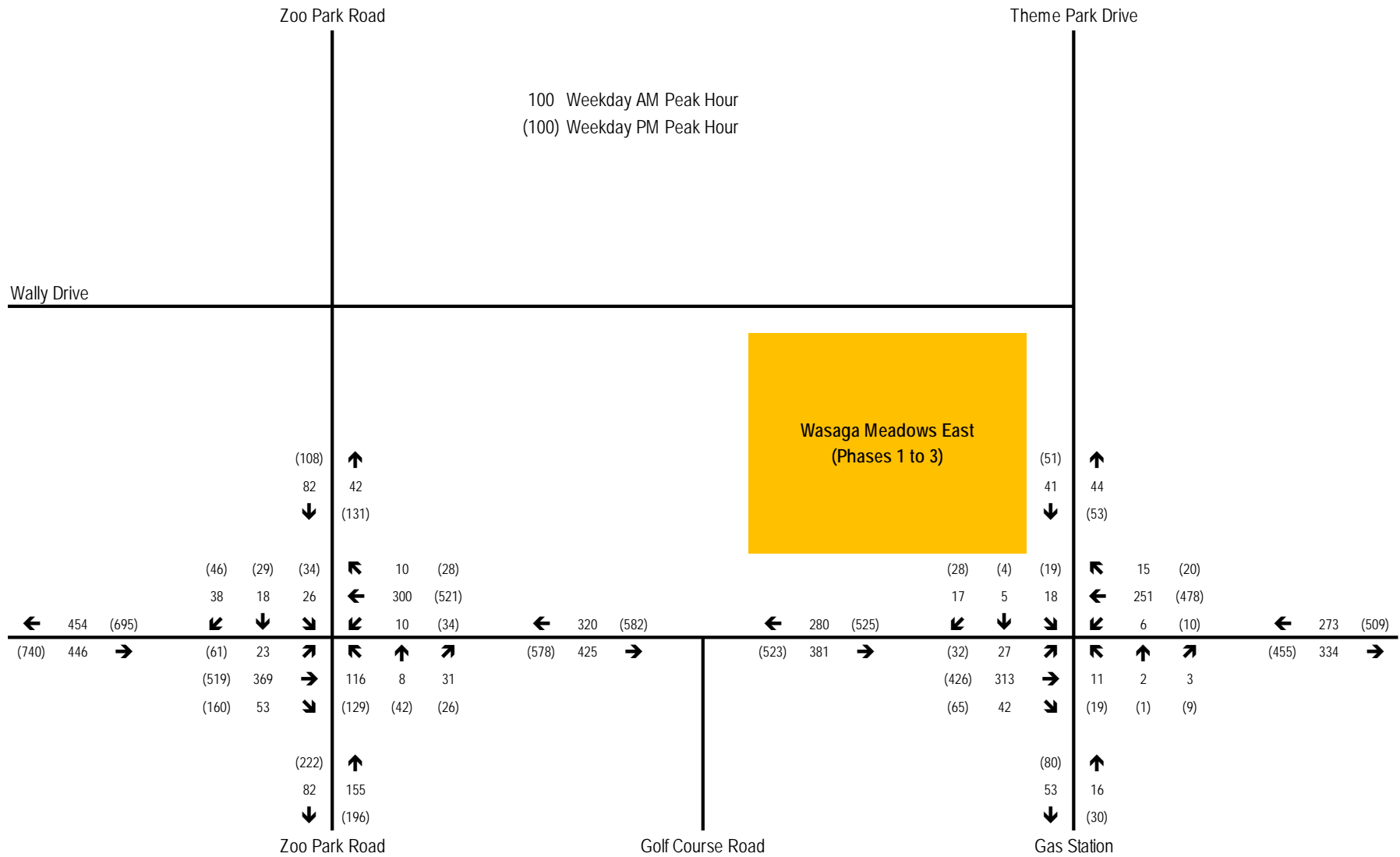
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4

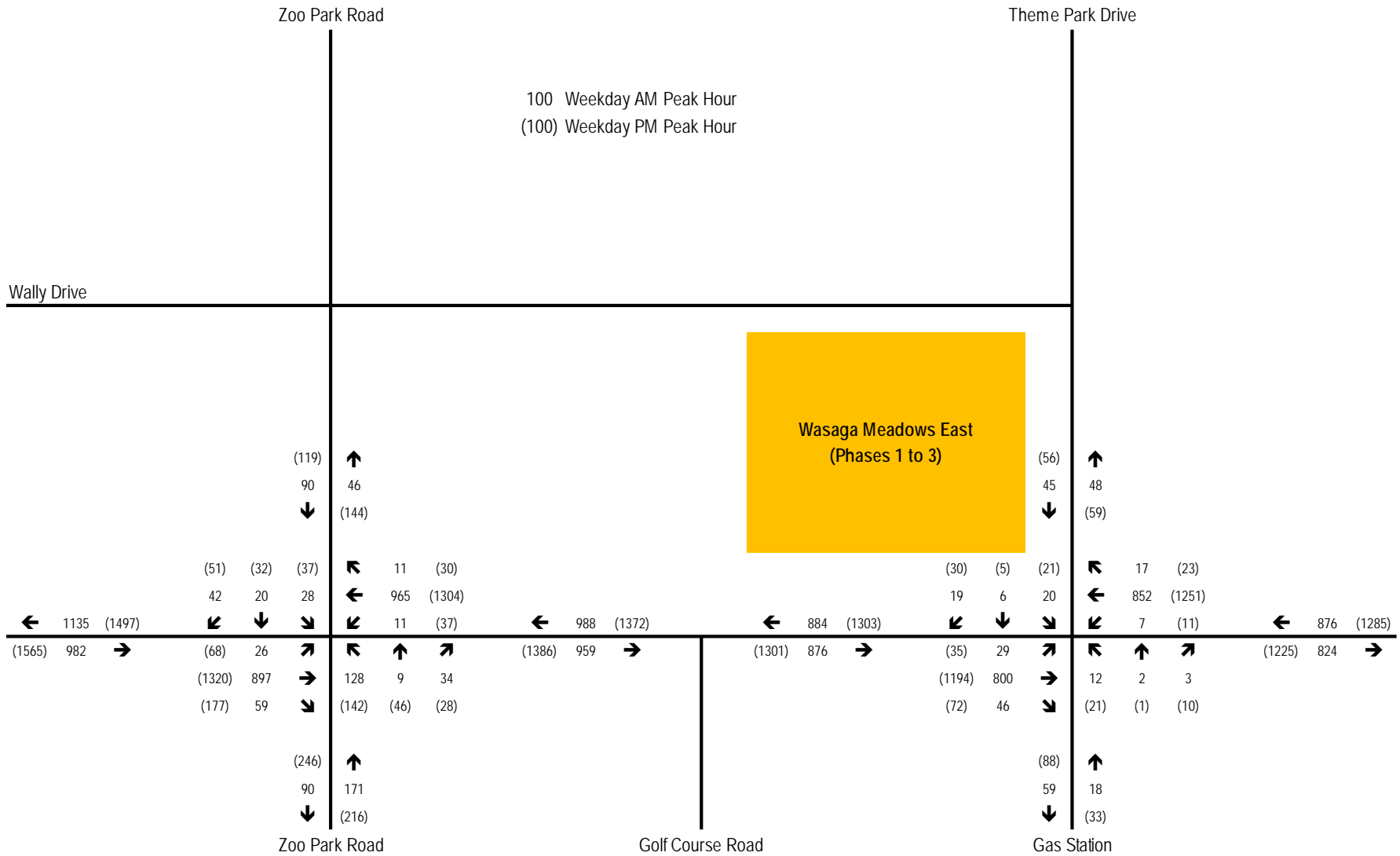


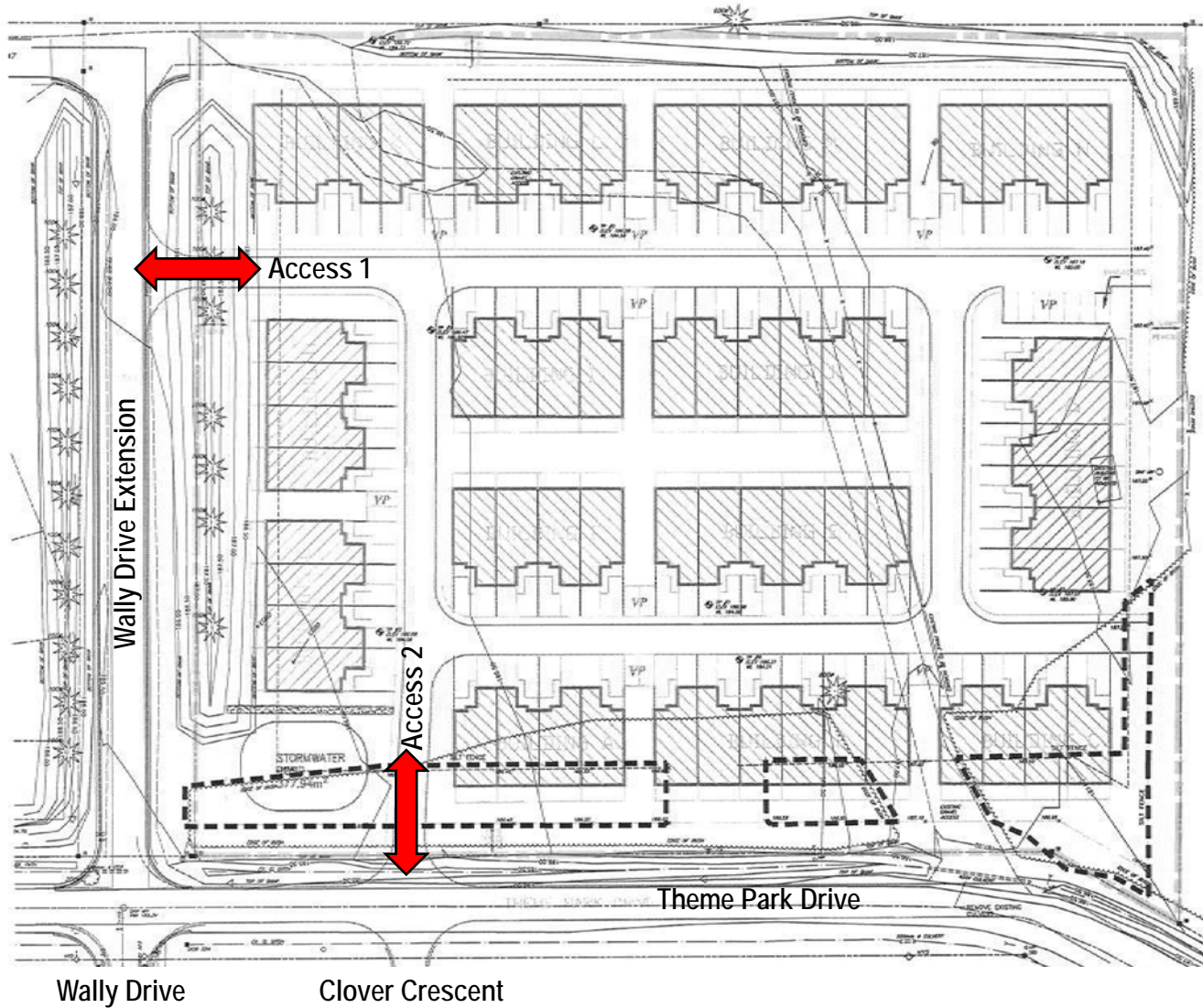


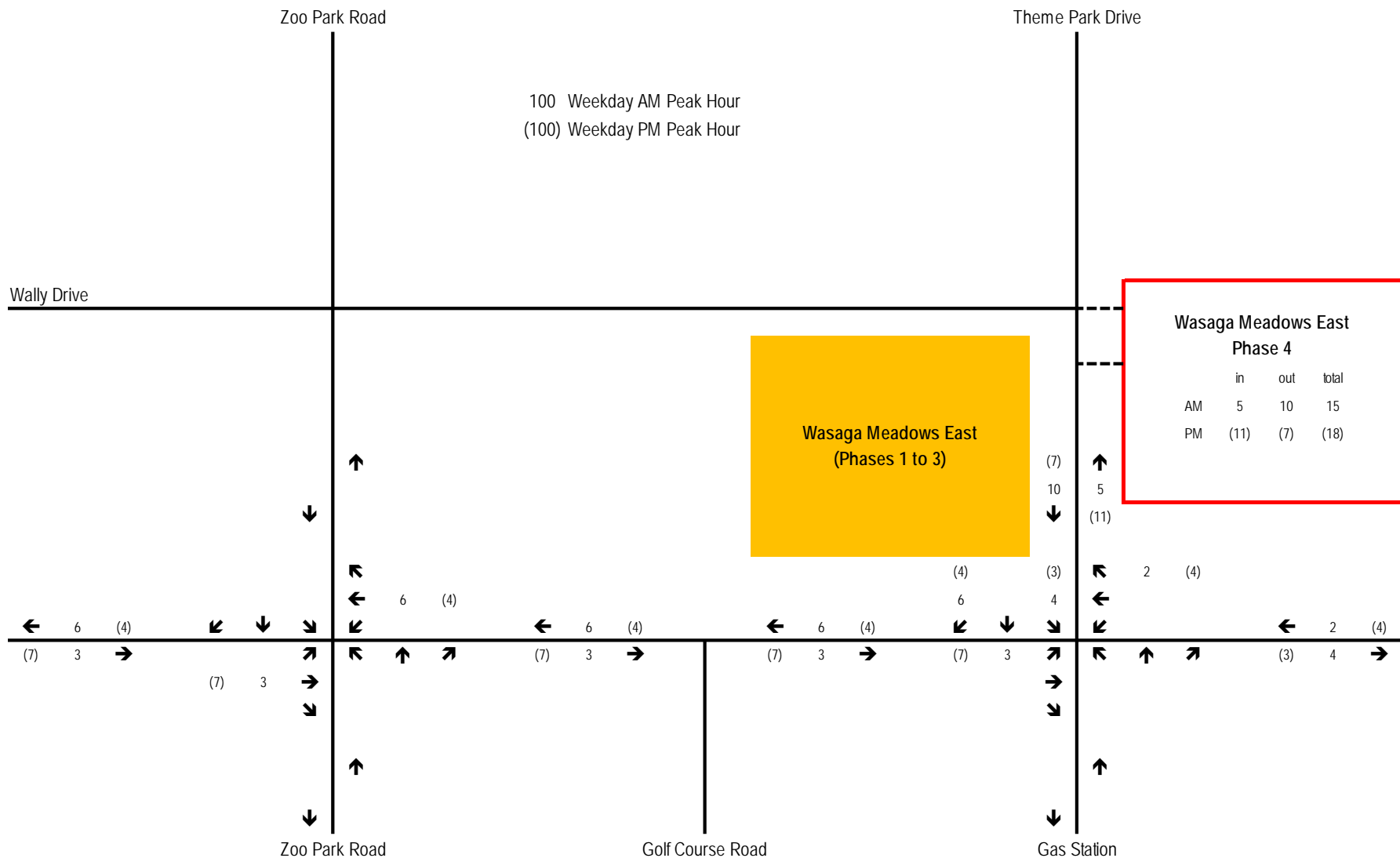


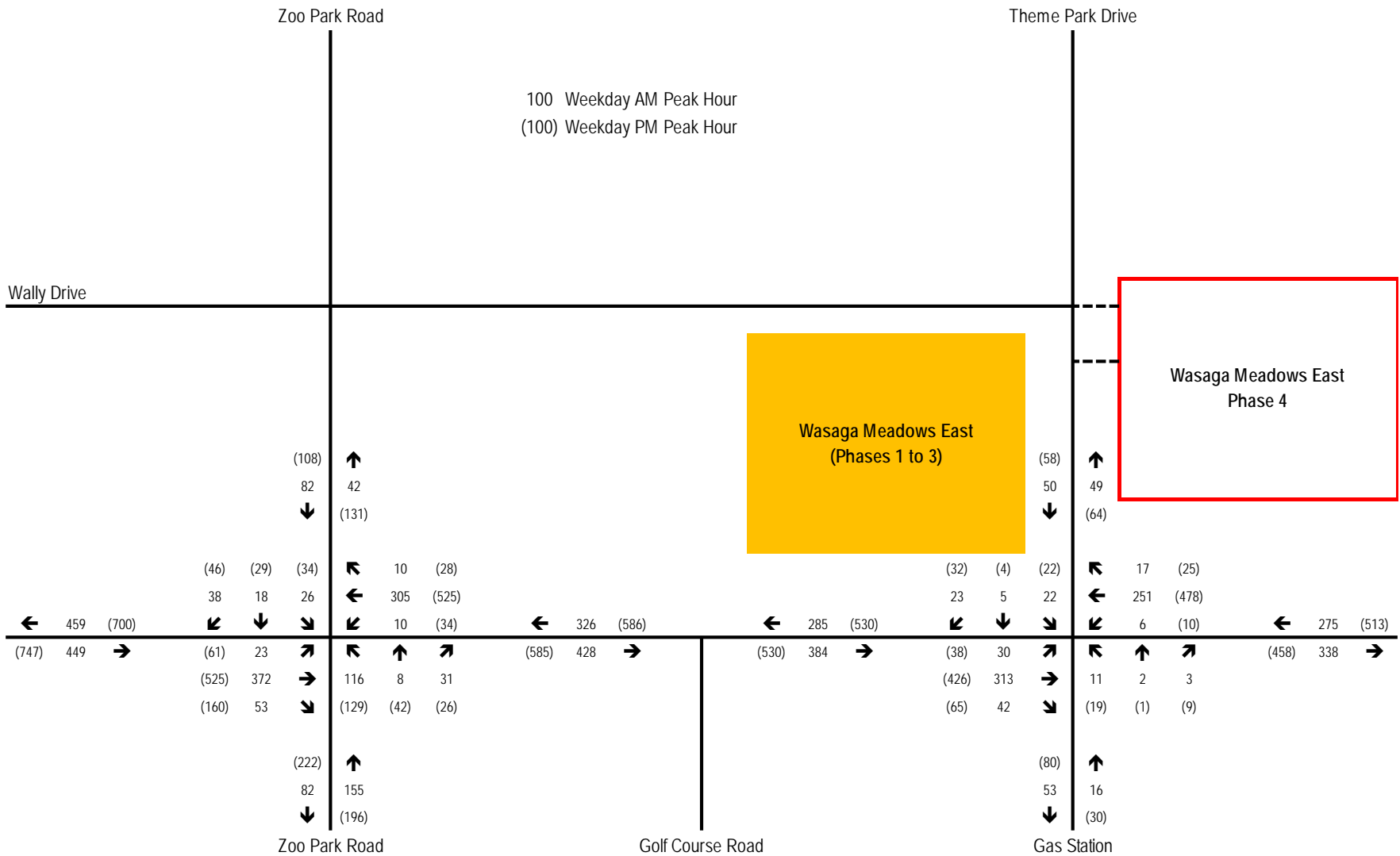


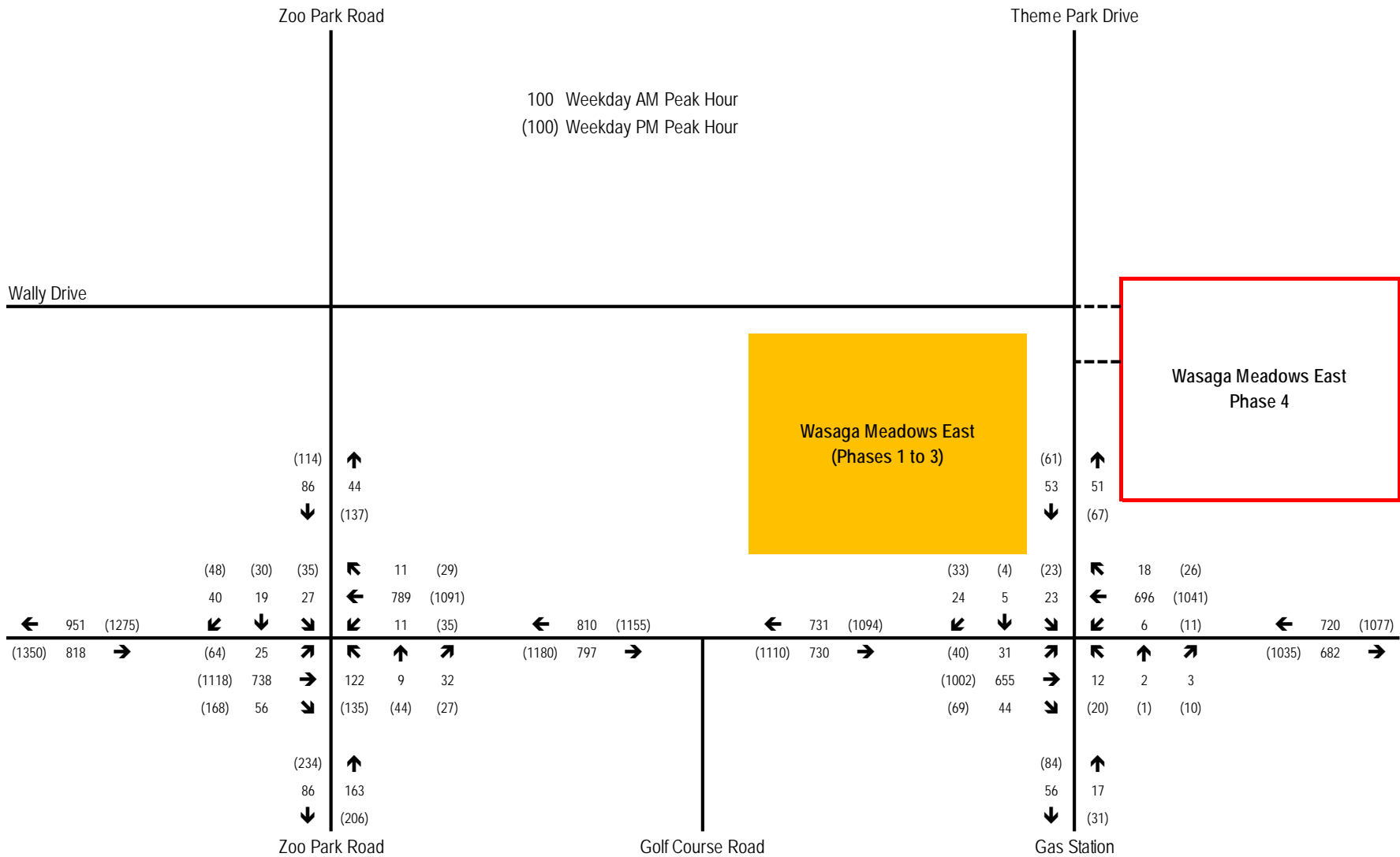


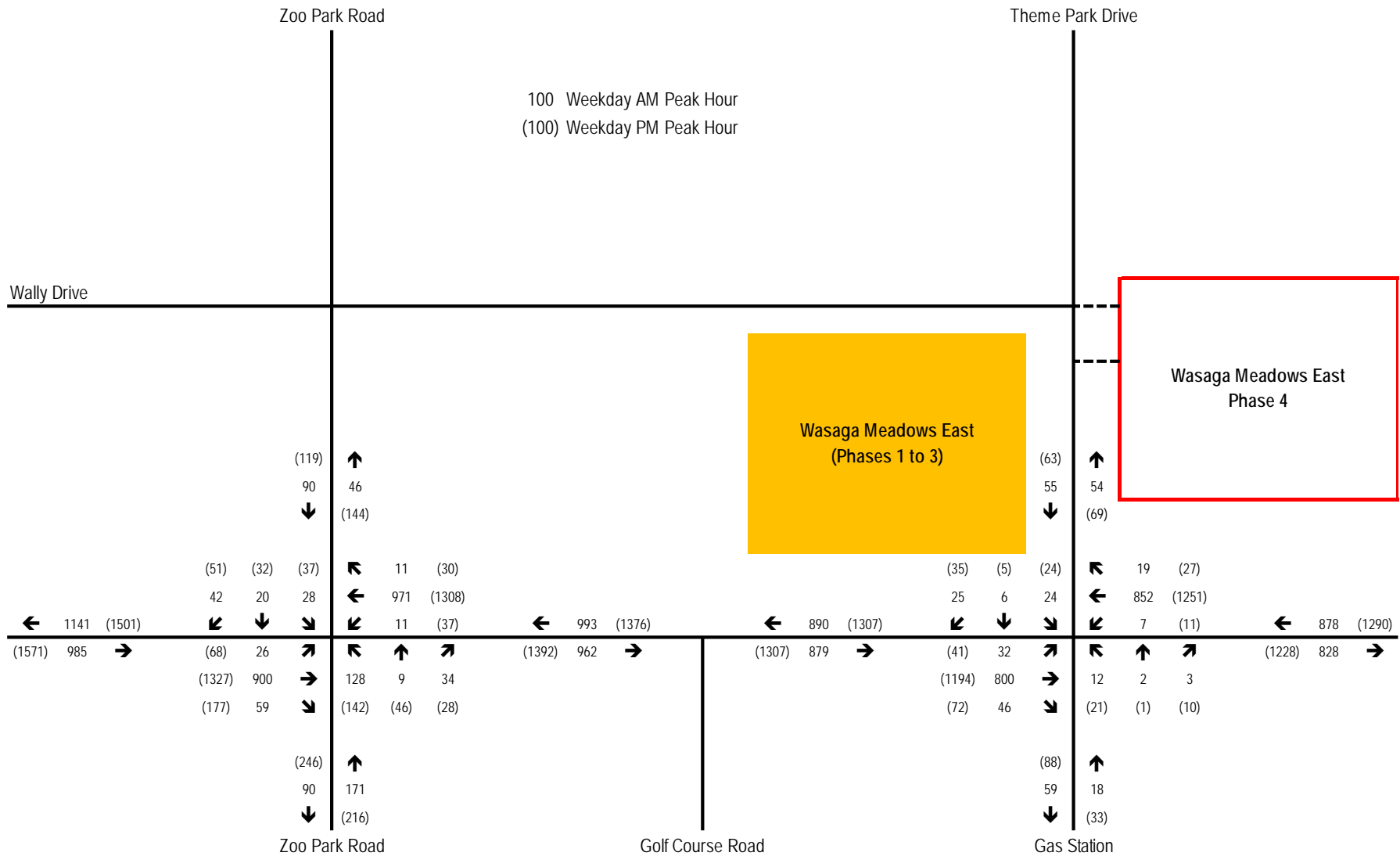












**APPENDIX A:
TRAFFIC COUNTS**

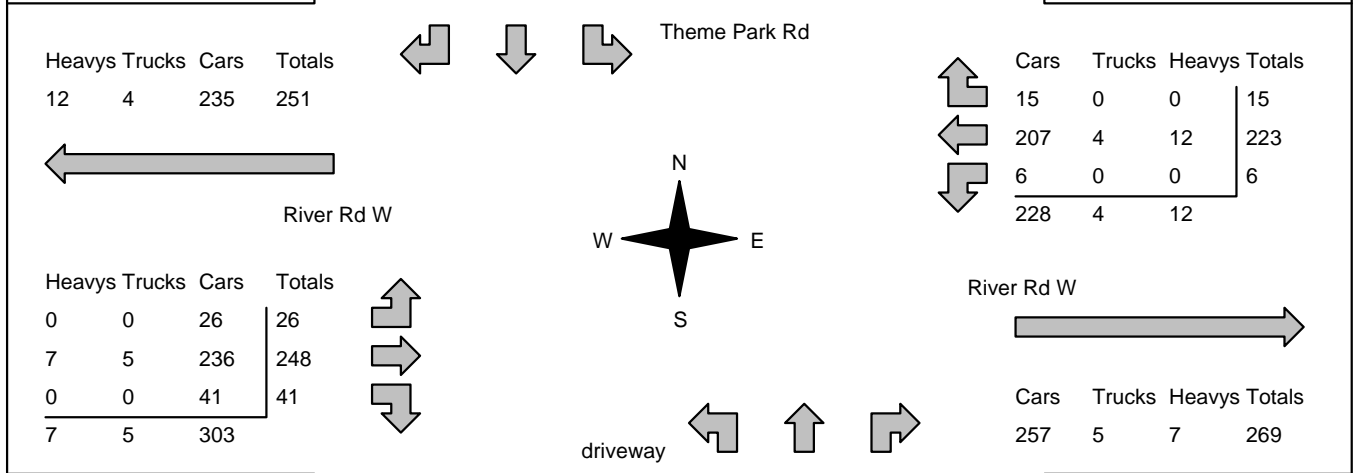
Accu-Traffic Inc.

Morning Peak Diagram	Specified Period From: 7:00:00 To: 9:00:00	One Hour Peak From: 8:00:00 To: 9:00:00
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Municipality: Wasaga Beach Site #: 1717600001 Intersection: River Rd W & Theme Park Rd TFR File #: 1 Count date: 30-Aug-17	Weather conditions: Person counted: Person prepared: Person checked:
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** Non-Signalized Intersection **	Major Road: River Rd W runs W/E
------------------------------------------	----------------------------------------

North Leg Total: 83 North Entering: 40 North Peds: 0 Peds Cross: ☒	<table style="margin: auto;"> <tr><td>Heavys</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Trucks</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Cars</td><td>17</td><td>5</td><td>18</td><td>40</td></tr> <tr><td>Totals</td><td>17</td><td>5</td><td>18</td><td></td></tr> </table>	Heavys	0	0	0	0	Trucks	0	0	0	0	Cars	17	5	18	40	Totals	17	5	18		<table style="margin: auto;"> <tr><td>Heavys</td><td>0</td></tr> <tr><td>Trucks</td><td>0</td></tr> <tr><td>Cars</td><td>43</td></tr> <tr><td>Totals</td><td>43</td></tr> </table>	Heavys	0	Trucks	0	Cars	43	Totals	43	East Leg Total: 513 East Entering: 244 East Peds: 1 Peds Cross: ☒
Heavys	0	0	0	0																											
Trucks	0	0	0	0																											
Cars	17	5	18	40																											
Totals	17	5	18																												
Heavys	0																														
Trucks	0																														
Cars	43																														
Totals	43																														



Peds Cross: ☒ West Peds: 2 West Entering: 315 West Leg Total: 566	<table style="margin: auto;"> <tr><td>Cars</td><td>52</td></tr> <tr><td>Trucks</td><td>0</td></tr> <tr><td>Heavys</td><td>0</td></tr> <tr><td>Totals</td><td>52</td></tr> </table>	Cars	52	Trucks	0	Heavys	0	Totals	52	<table style="margin: auto;"> <tr><td>Cars</td><td>11</td><td>2</td><td>3</td><td>16</td></tr> <tr><td>Trucks</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Heavys</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Totals</td><td>11</td><td>2</td><td>3</td><td></td></tr> </table>	Cars	11	2	3	16	Trucks	0	0	0	0	Heavys	0	0	0	0	Totals	11	2	3		Peds Cross: ☒ South Peds: 0 South Entering: 16 South Leg Total: 68
Cars	52																														
Trucks	0																														
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Totals	52																														
Cars	11	2	3	16																											
Trucks	0	0	0	0																											
Heavys	0	0	0	0																											
Totals	11	2	3																												

Comments

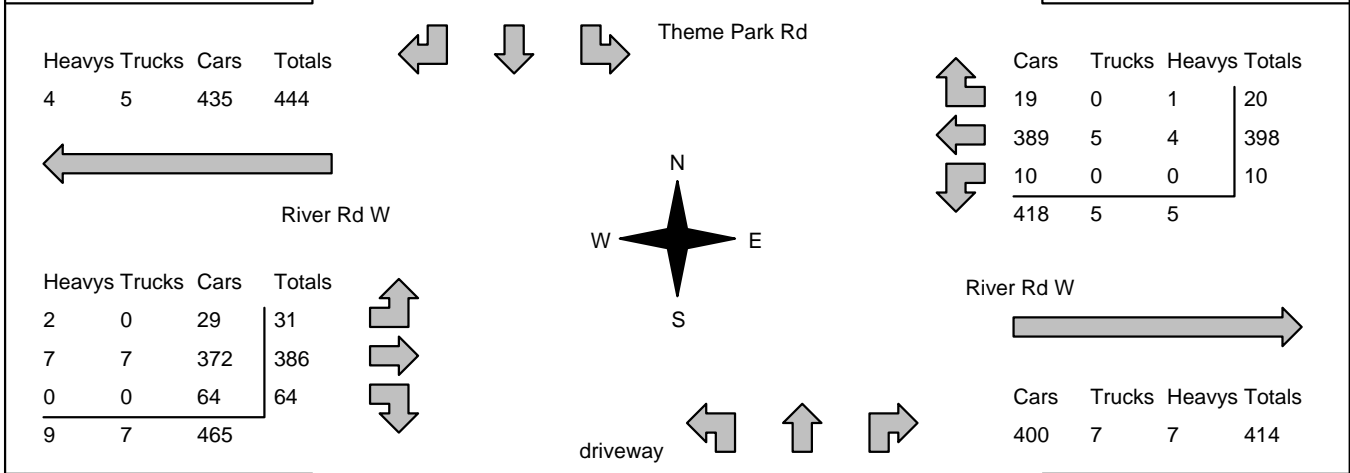
Accu-Traffic Inc.

Afternoon Peak Diagram	Specified Period From: 16:00:00 To: 18:00:00	One Hour Peak From: 16:45:00 To: 17:45:00
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Municipality: Wasaga Beach Site #: 1717600001 Intersection: River Rd W & Theme Park Rd TFR File #: 1 Count date: 30-Aug-17	Weather conditions: Person counted: Person prepared: Person checked:
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** Non-Signalized Intersection **	Major Road: River Rd W runs W/E
------------------------------------------	----------------------------------------

North Leg Total: 102 North Entering: 50 North Peds: 0 Peds Cross: ☒	<table style="border-collapse: collapse;"> <tr><td>Heavys</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Trucks</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Cars</td><td>27</td><td>4</td><td>19</td><td>50</td></tr> <tr><td>Totals</td><td>27</td><td>4</td><td>19</td><td></td></tr> </table>	Heavys	0	0	0	0	Trucks	0	0	0	0	Cars	27	4	19	50	Totals	27	4	19		↑	<table style="border-collapse: collapse;"> <tr><td>Heavys</td><td>3</td></tr> <tr><td>Trucks</td><td>0</td></tr> <tr><td>Cars</td><td>49</td></tr> <tr><td>Totals</td><td>52</td></tr> </table>	Heavys	3	Trucks	0	Cars	49	Totals	52	East Leg Total: 842 East Entering: 428 East Peds: 0 Peds Cross: ☒
Heavys	0	0	0	0																												
Trucks	0	0	0	0																												
Cars	27	4	19	50																												
Totals	27	4	19																													
Heavys	3																															
Trucks	0																															
Cars	49																															
Totals	52																															



Peds Cross: ☒ West Peds: 2 West Entering: 481 West Leg Total: 925	<table style="border-collapse: collapse;"> <tr><td>Cars</td><td>78</td></tr> <tr><td>Trucks</td><td>0</td></tr> <tr><td>Heavys</td><td>0</td></tr> <tr><td>Totals</td><td>78</td></tr> </table>	Cars	78	Trucks	0	Heavys	0	Totals	78	↓	<table style="border-collapse: collapse;"> <tr><td>Cars</td><td>19</td><td>1</td><td>9</td><td>29</td></tr> <tr><td>Trucks</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Heavys</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Totals</td><td>19</td><td>1</td><td>9</td><td></td></tr> </table>	Cars	19	1	9	29	Trucks	0	0	0	0	Heavys	0	0	0	0	Totals	19	1	9		Peds Cross: ☒ South Peds: 3 South Entering: 29 South Leg Total: 107
Cars	78																															
Trucks	0																															
Heavys	0																															
Totals	78																															
Cars	19	1	9	29																												
Trucks	0	0	0	0																												
Heavys	0	0	0	0																												
Totals	19	1	9																													

Comments

Accu-Traffic Inc.

Total Count Diagram

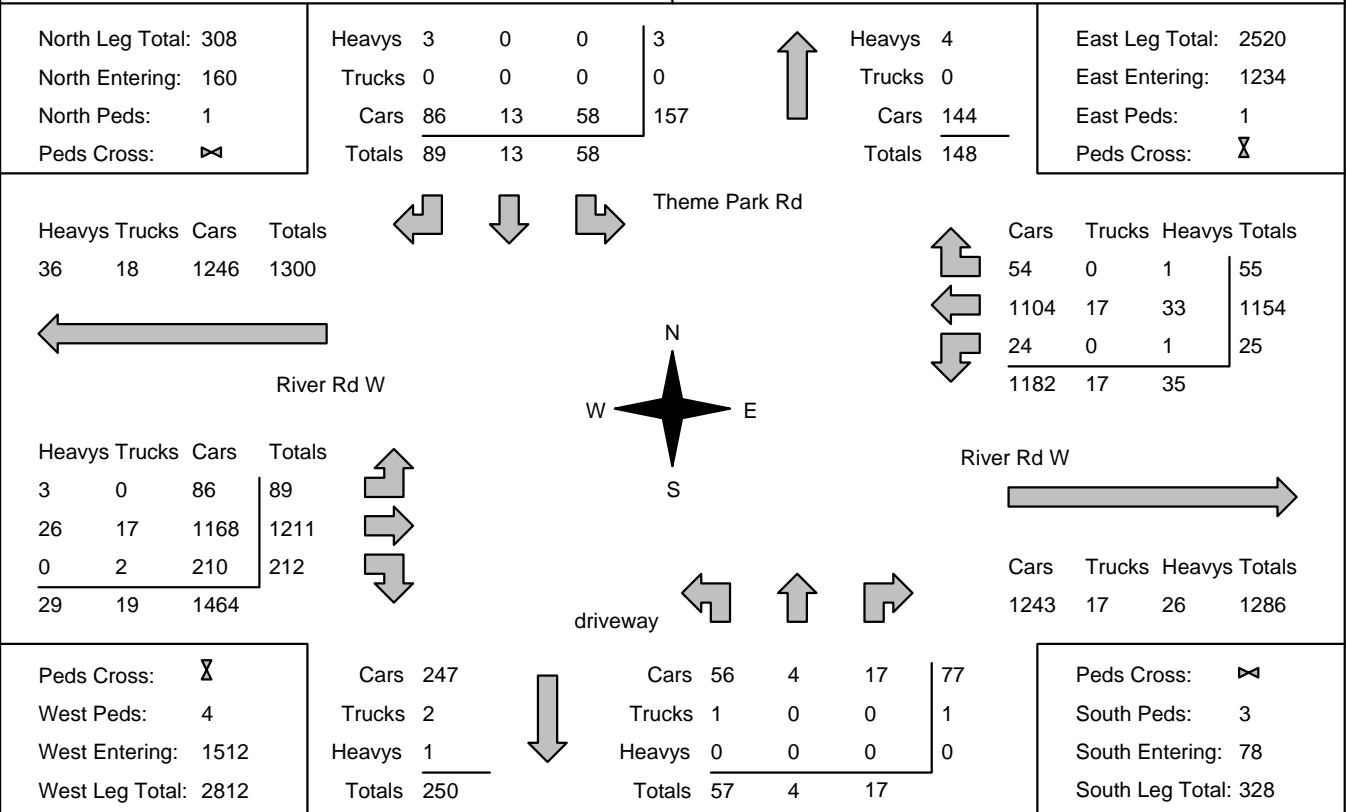
Municipality: Wasaga Beach
Site #: 1717600001
Intersection: River Rd W & Theme Park Rd
TFR File #: 1
Count date: 30-Aug-17

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Non-Signalized Intersection ****

Major Road: River Rd W runs W/E



Comments

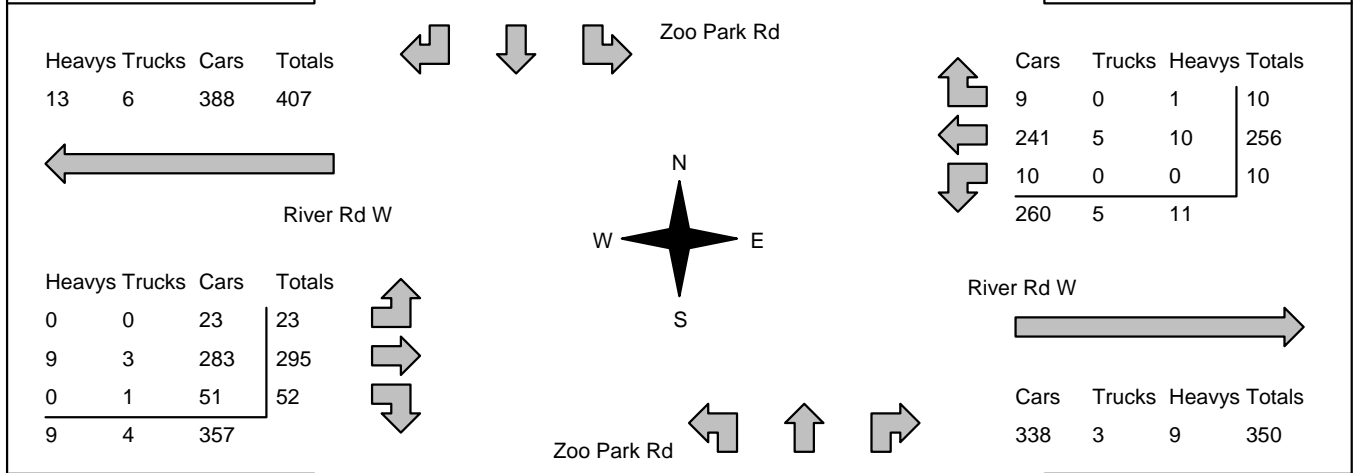
Accu-Traffic Inc.

Morning Peak Diagram	Specified Period From: 7:00:00 To: 9:00:00	One Hour Peak From: 8:00:00 To: 9:00:00
-----------------------------	-----------------------------------------------------------------------	--------------------------------------------------------------------

Municipality: Wasaga Beach Site #: 1717600002 Intersection: River Rd W & Zoo Park Rd TFR File #: 1 Count date: 30-Aug-17	Weather conditions: Person counted: Person prepared: Person checked:
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------

** Signalized Intersection **	Major Road: River Rd W runs W/E
--------------------------------------	----------------------------------------

North Leg Total: 121 North Entering: 80 North Peds: 3 Peds Cross: \bowtie	<table style="margin: auto;"> <tr><td>Heavys</td><td>3</td><td>0</td><td>0</td><td>3</td></tr> <tr><td>Trucks</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Cars</td><td>34</td><td>18</td><td>25</td><td>77</td></tr> <tr><td>Totals</td><td>37</td><td>18</td><td>25</td><td></td></tr> </table>	Heavys	3	0	0	3	Trucks	0	0	0	0	Cars	34	18	25	77	Totals	37	18	25		<table style="margin: auto;"> <tr><td>Heavys</td><td>1</td></tr> <tr><td>Trucks</td><td>0</td></tr> <tr><td>Cars</td><td>40</td></tr> <tr><td>Totals</td><td>41</td></tr> </table>	Heavys	1	Trucks	0	Cars	40	Totals	41	East Leg Total: 626 East Entering: 276 East Peds: 3 Peds Cross: \bowtie
Heavys	3	0	0	3																											
Trucks	0	0	0	0																											
Cars	34	18	25	77																											
Totals	37	18	25																												
Heavys	1																														
Trucks	0																														
Cars	40																														
Totals	41																														

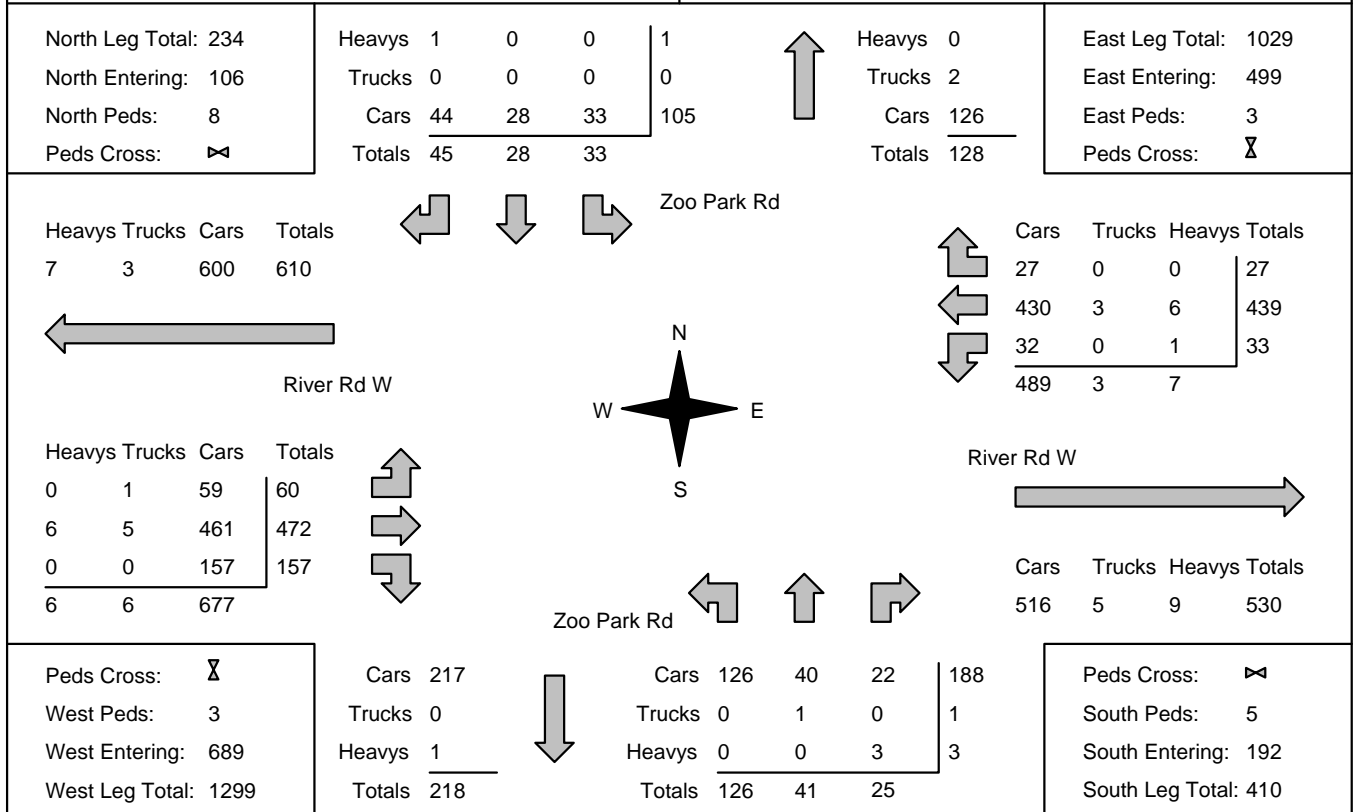


Peds Cross: \bowtie West Peds: 2 West Entering: 370 West Leg Total: 777	<table style="margin: auto;"> <tr><td>Cars</td><td>79</td></tr> <tr><td>Trucks</td><td>1</td></tr> <tr><td>Heavys</td><td>0</td></tr> <tr><td>Totals</td><td>80</td></tr> </table>	Cars	79	Trucks	1	Heavys	0	Totals	80	<table style="margin: auto;"> <tr><td>Cars</td><td>113</td><td>8</td><td>30</td><td>151</td></tr> <tr><td>Trucks</td><td>1</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>Heavys</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>Totals</td><td>114</td><td>8</td><td>30</td><td></td></tr> </table>	Cars	113	8	30	151	Trucks	1	0	0	1	Heavys	0	0	0	0	Totals	114	8	30		Peds Cross: \bowtie South Peds: 3 South Entering: 152 South Leg Total: 232
Cars	79																														
Trucks	1																														
Heavys	0																														
Totals	80																														
Cars	113	8	30	151																											
Trucks	1	0	0	1																											
Heavys	0	0	0	0																											
Totals	114	8	30																												

Comments

Accu-Traffic Inc.

Afternoon Peak Diagram	Specified Period From: 16:00:00 To: 18:00:00	One Hour Peak From: 16:15:00 To: 17:15:00
Municipality: Wasaga Beach Site #: 1717600002 Intersection: River Rd W & Zoo Park Rd TFR File #: 1 Count date: 30-Aug-17	Weather conditions: Person counted: Person prepared: Person checked:	
** Signalized Intersection **	Major Road: River Rd W runs W/E	



Comments

Accu-Traffic Inc.

Total Count Diagram

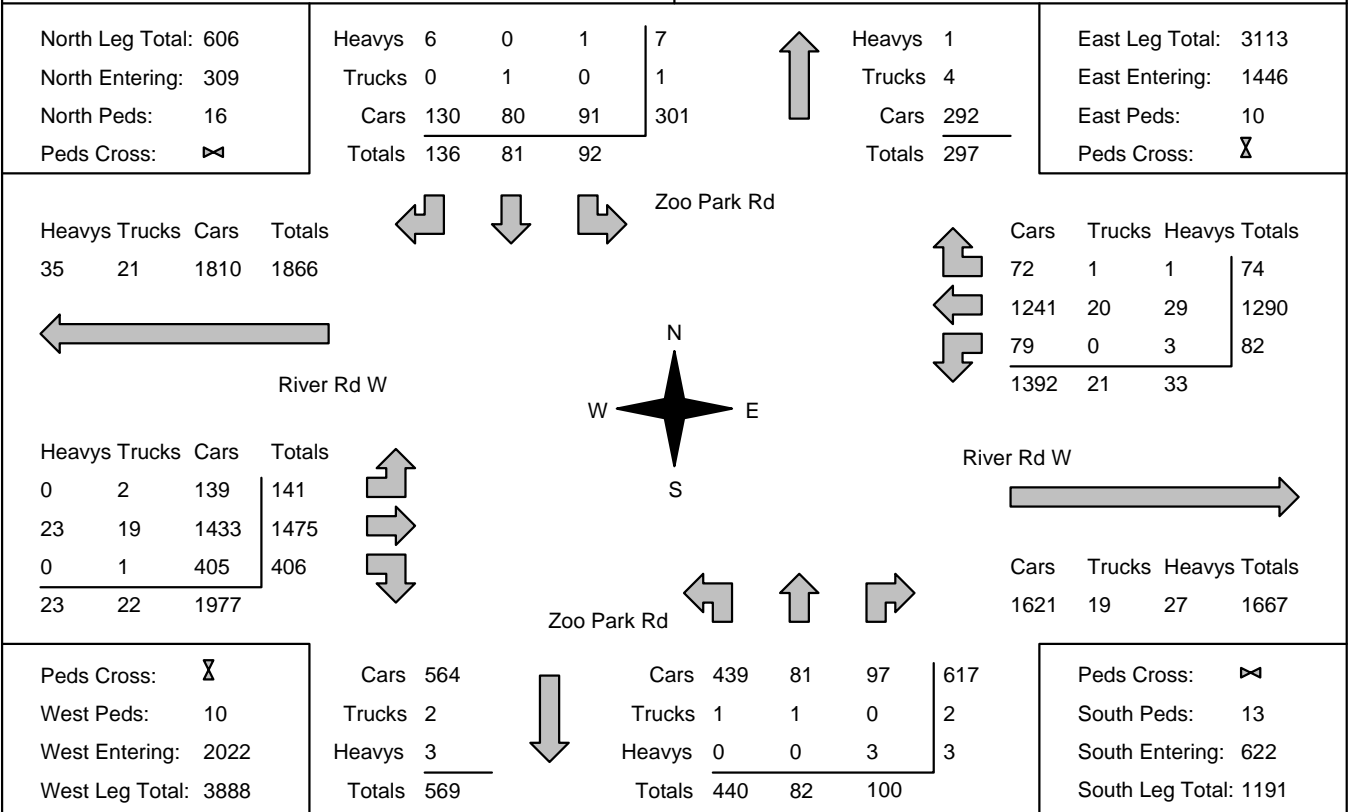
Municipality: Wasaga Beach
Site #: 1717600002
Intersection: River Rd W & Zoo Park Rd
TFR File #: 1
Count date: 30-Aug-17

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Signalized Intersection ****

Major Road: River Rd W runs W/E



















Comments

**APPENDIX B:
EXISTING OPERATIONS**

HCM Unsignalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West






















2017 Existing Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	248	41	6	223	15	11	2	3	18	5	17
Future Volume (Veh/h)	26	248	41	6	223	15	11	2	3	18	5	17
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	27	261	43	6	235	16	12	2	3	19	5	18
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		401										
pX, platoon unblocked												
vC, conflicting volume	251			304			612	600	282	596	613	243
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	251			304			612	600	282	596	613	243
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			97	100	100	95	99	98
cM capacity (veh/h)	1314			1257			385	404	756	405	397	796
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	331	257	17	42								
Volume Left	27	6	12	19								
Volume Right	43	16	3	18								
cSH	1314	1257	424	511								
Volume to Capacity	0.02	0.00	0.04	0.08								
Queue Length 95th (m)	0.5	0.1	1.0	2.0								
Control Delay (s)	0.8	0.2	13.8	12.7								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.8	0.2	13.8	12.7								
Approach LOS			B	B								
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization			38.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

















2017 Existing Conditions
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	23	295	52	10	256	10	114	8	30	25	18	37
Future Volume (vph)	23	295	52	10	256	10	114	8	30	25	18	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.98			0.99		1.00	0.88		1.00	0.90	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3492			3552		1789	1657		1789	1693	
Flt Permitted		0.93			0.94		0.72	1.00		0.73	1.00	
Satd. Flow (perm)		3242			3334		1355	1657		1377	1693	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	24	311	55	11	269	11	120	8	32	26	19	39
RTOR Reduction (vph)	0	22	0	0	5	0	0	26	0	0	32	0
Lane Group Flow (vph)	0	368	0	0	286	0	120	14	0	26	26	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.4			21.4		7.5	7.5		7.5	7.5	
Effective Green, g (s)		21.4			21.4		7.5	7.5		7.5	7.5	
Actuated g/C Ratio		0.52			0.52		0.18	0.18		0.18	0.18	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1696			1744		248	303		252	310	
v/s Ratio Prot								0.01				0.02
v/s Ratio Perm		c0.11			0.09		c0.09			0.02		
v/c Ratio		0.22			0.16		0.48	0.05		0.10	0.08	
Uniform Delay, d1		5.2			5.1		15.0	13.8		13.9	13.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.2		1.5	0.1		0.2	0.1	
Delay (s)		5.5			5.3		16.5	13.8		14.1	14.0	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		5.5			5.3			15.8			14.0	
Approach LOS		A			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			8.0				HCM 2000 Level of Service				A	
HCM 2000 Volume to Capacity ratio			0.29									
Actuated Cycle Length (s)			40.9				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			46.1%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West






















2017 Existing Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	386	64	10	398	20	19	1	9	19	4	27
Future Volume (Veh/h)	31	386	64	10	398	20	19	1	9	19	4	27
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	33	406	67	11	419	21	20	1	9	20	4	28
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		401										
pX, platoon unblocked												
vC, conflicting volume	440			473			987	968	440	966	990	430
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	440			473			987	968	440	966	990	430
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			90	100	99	91	98	96
cM capacity (veh/h)	1120			1089			207	244	617	223	237	626
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	506	451	30	52								
Volume Left	33	11	20	20								
Volume Right	67	21	9	28								
cSH	1120	1089	260	343								
Volume to Capacity	0.03	0.01	0.12	0.15								
Queue Length 95th (m)	0.7	0.2	2.9	4.0								
Control Delay (s)	0.9	0.3	20.6	17.3								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.9	0.3	20.6	17.3								
Approach LOS			C	C								
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			49.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

2017 Existing Conditions
PM Peak Hour

















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	60	472	157	33	439	27	126	41	25	33	28	45
Future Volume (vph)	60	472	157	33	439	27	126	41	25	33	28	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.97			0.99		1.00	0.94		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3441			3538		1789	1777		1789	1709	
Flt Permitted		0.87			0.88		0.71	1.00		0.71	1.00	
Satd. Flow (perm)		2995			3121		1333	1777		1341	1709	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	497	165	35	462	28	133	43	26	35	29	47
RTOR Reduction (vph)	0	48	0	0	7	0	0	21	0	0	38	0
Lane Group Flow (vph)	0	677	0	0	518	0	133	48	0	35	38	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.0			21.0		8.0	8.0		8.0	8.0	
Effective Green, g (s)		21.0			21.0		8.0	8.0		8.0	8.0	
Actuated g/C Ratio		0.51			0.51		0.20	0.20		0.20	0.20	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1534			1598		260	346		261	333	
v/s Ratio Prot								0.03				0.02
v/s Ratio Perm		c0.23			0.17		c0.10			0.03		
v/c Ratio		0.44			0.32		0.51	0.14		0.13	0.11	
Uniform Delay, d1		6.3			5.8		14.8	13.7		13.6	13.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9			0.5		1.7	0.2		0.2	0.2	
Delay (s)		7.2			6.4		16.5	13.8		13.9	13.7	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		7.2			6.4			15.6			13.8	
Approach LOS		A			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			8.5				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			41.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			62.4%				ICU Level of Service			B		
Analysis Period (min)			15									

c Critical Lane Group

**APPENDIX C:
FUTURE BACKGROUND OPERATIONS**

HCM Unsignalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West

2019 Background Conditions
 AM Peak Hour





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	313	42	6	251	15	11	2	3	18	5	17
Future Volume (Veh/h)	27	313	42	6	251	15	11	2	3	18	5	17
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	28	329	44	6	264	16	12	2	3	19	5	18
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		401										
pX, platoon unblocked												
vC, conflicting volume	280			373			712	699	351	695	713	272
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	280			373			712	699	351	695	713	272
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			96	99	100	95	99	98
cM capacity (veh/h)	1283			1185			329	354	692	346	348	767
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	401	286	17	42								
Volume Left	28	6	12	19								
Volume Right	44	16	3	18								
cSH	1283	1185	366	453								
Volume to Capacity	0.02	0.01	0.05	0.09								
Queue Length 95th (m)	0.5	0.1	1.1	2.3								
Control Delay (s)	0.8	0.2	15.3	13.8								
Lane LOS	A	A	C	B								
Approach Delay (s)	0.8	0.2	15.3	13.8								
Approach LOS			C	B								
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization			43.0%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

2019 Background Conditions

















AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	369	53	10	300	10	116	8	31	26	18	38
Future Volume (vph)	23	369	53	10	300	10	116	8	31	26	18	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.98			1.00		1.00	0.88		1.00	0.90	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3505			3555		1789	1656		1789	1692	
Flt Permitted		0.93			0.94		0.72	1.00		0.73	1.00	
Satd. Flow (perm)		3259			3335		1353	1656		1376	1692	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	24	388	56	11	316	11	122	8	33	27	19	40
RTOR Reduction (vph)	0	18	0	0	4	0	0	27	0	0	33	0
Lane Group Flow (vph)	0	450	0	0	334	0	122	14	0	27	26	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.2			21.2		7.6	7.6		7.6	7.6	
Effective Green, g (s)		21.2			21.2		7.6	7.6		7.6	7.6	
Actuated g/C Ratio		0.52			0.52		0.19	0.19		0.19	0.19	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1693			1732		252	308		256	315	
v/s Ratio Prot								0.01			0.02	
v/s Ratio Perm		c0.14			0.10		c0.09			0.02		
v/c Ratio		0.27			0.19		0.48	0.05		0.11	0.08	
Uniform Delay, d1		5.5			5.2		14.8	13.6		13.8	13.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.2		1.5	0.1		0.2	0.1	
Delay (s)		5.8			5.5		16.3	13.7		14.0	13.8	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		5.8			5.5			15.7			13.9	
Approach LOS		A			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			7.9				HCM 2000 Level of Service				A	
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			40.8				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			49.6%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West

2019 Background Conditions
 PM Peak Hour




















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	426	65	10	478	20	19	1	9	19	4	28
Future Volume (Veh/h)	32	426	65	10	478	20	19	1	9	19	4	28
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	34	448	68	11	503	21	20	1	9	20	4	29
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		401										
pX, platoon unblocked				0.98			0.98	0.98	0.98	0.98	0.98	
vC, conflicting volume	524			516			1116	1096	482	1095	1120	514
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	524			491			1107	1086	456	1085	1110	514
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			88	100	98	89	98	95
cM capacity (veh/h)	1043			1046			165	202	589	180	195	561
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	550	535	30	53								
Volume Left	34	11	20	20								
Volume Right	68	21	9	29								
cSH	1043	1046	212	289								
Volume to Capacity	0.03	0.01	0.14	0.18								
Queue Length 95th (m)	0.8	0.2	3.7	5.0								
Control Delay (s)	0.9	0.3	24.7	20.2								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.9	0.3	24.7	20.2								
Approach LOS			C	C								
Intersection Summary												
Average Delay			2.1									
Intersection Capacity Utilization			53.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

2019 Background Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	519	160	34	521	28	129	42	26	34	29	46
Future Volume (vph)	61	519	160	34	521	28	129	42	26	34	29	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Flt		0.97			0.99		1.00	0.94		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3448			3543		1789	1776		1789	1712	
Flt Permitted		0.86			0.88		0.71	1.00		0.71	1.00	
Satd. Flow (perm)		2969			3129		1329	1776		1339	1712	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	64	546	168	36	548	29	136	44	27	36	31	48
RTOR Reduction (vph)	0	44	0	0	6	0	0	22	0	0	39	0
Lane Group Flow (vph)	0	734	0	0	607	0	136	49	0	36	40	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.9			20.9		8.1	8.1		8.1	8.1	
Effective Green, g (s)		20.9			20.9		8.1	8.1		8.1	8.1	
Actuated g/C Ratio		0.51			0.51		0.20	0.20		0.20	0.20	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1513			1595		262	350		264	338	
v/s Ratio Prot								0.03				0.02
v/s Ratio Perm		c0.25			0.19		c0.10			0.03		
v/c Ratio		0.49			0.38		0.52	0.14		0.14	0.12	
Uniform Delay, d1		6.5			6.1		14.7	13.6		13.6	13.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			0.7		1.7	0.2		0.2	0.2	
Delay (s)		7.7			6.8		16.4	13.8		13.8	13.7	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		7.7			6.8			15.5			13.7	
Approach LOS		A			A			B			B	













Intersection Summary

HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	41.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West




















2024 Background Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	28	655	44	6	696	16	12	2	3	19	5	18
Future Volume (Veh/h)	28	655	44	6	696	16	12	2	3	19	5	18
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	29	689	46	6	733	17	13	2	3	20	5	19
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)		401										
pX, platoon unblocked				0.73			0.73	0.73	0.73	0.73	0.73	
vC, conflicting volume	750			735			1545	1532	712	1528	1546	742
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	750			453			1562	1544	422	1538	1564	742
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			78	98	99	69	94	95
cM capacity (veh/h)	859			809			58	80	462	65	78	416
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	764	756	18	44								
Volume Left	29	6	13	20								
Volume Right	46	17	3	19								
cSH	859	809	71	106								
Volume to Capacity	0.03	0.01	0.25	0.42								
Queue Length 95th (m)	0.8	0.2	6.8	13.3								
Control Delay (s)	0.9	0.2	72.2	61.4								
Lane LOS	A	A	F	F								
Approach Delay (s)	0.9	0.2	72.2	61.4								
Approach LOS			F	F								
Intersection Summary												
Average Delay			3.1									
Intersection Capacity Utilization			65.6%		ICU Level of Service					C		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
6: Zoo Park Road & River Road West

2024 Background Conditions

















AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	735	56	11	783	11	122	9	32	27	19	40
Future Volume (vph)	25	735	56	11	783	11	122	9	32	27	19	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			1.00		1.00	0.88		1.00	0.90	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3536			3568		1789	1660		1789	1692	
Flt Permitted		0.91			0.94		0.72	1.00		0.73	1.00	
Satd. Flow (perm)		3237			3353		1350	1660		1373	1692	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	774	59	12	824	12	128	9	34	28	20	42
RTOR Reduction (vph)	0	9	0	0	2	0	0	28	0	0	34	0
Lane Group Flow (vph)	0	850	0	0	846	0	128	15	0	28	28	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		22.0			22.0		7.9	7.9		7.9	7.9	
Effective Green, g (s)		22.0			22.0		7.9	7.9		7.9	7.9	
Actuated g/C Ratio		0.53			0.53		0.19	0.19		0.19	0.19	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1699			1760		254	312		258	319	
v/s Ratio Prot								0.01				0.02
v/s Ratio Perm		c0.26			0.25		c0.09			0.02		
v/c Ratio		0.50			0.48		0.50	0.05		0.11	0.09	
Uniform Delay, d1		6.4			6.3		15.2	13.9		14.1	14.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			0.9		1.6	0.1		0.2	0.1	
Delay (s)		7.5			7.3		16.8	14.0		14.3	14.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		7.5			7.3			16.1			14.2	
Approach LOS		A			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			8.4				HCM 2000 Level of Service				A	
HCM 2000 Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			41.9				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			63.8%				ICU Level of Service			B		
Analysis Period (min)			15									

c Critical Lane Group




















HCM Unsignalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West

2024 Background Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	1002	69	11	1041	21	20	1	10	20	4	29
Future Volume (Veh/h)	33	1002	69	11	1041	21	20	1	10	20	4	29
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	35	1055	73	12	1096	22	21	1	11	21	4	31
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)		401										
pX, platoon unblocked				0.42			0.42	0.42	0.42	0.42	0.42	
vC, conflicting volume	1118			1128			2326	2304	1092	2304	2329	1107
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1118			618			3457	3405	532	3406	3465	1107
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			97			0	65	95	0	0	88
cM capacity (veh/h)	625			406			0	3	231	1	3	256
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	1163	1130	33	56								
Volume Left	35	12	21	21								
Volume Right	73	22	11	31								
cSH	625	406	0	3								
Volume to Capacity	0.06	0.03	Err	19.97								
Queue Length 95th (m)	1.3	0.7	Err	Err								
Control Delay (s)	2.1	1.4	Err	Err								
Lane LOS	A	A	F	F								
Approach Delay (s)	2.1	1.4	Err	Err								
Approach LOS			F	F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			87.6%	ICU Level of Service					E			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
6: Zoo Park Road & River Road West

2024 Background Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	1111	168	35	1087	29	135	44	27	35	30	48
Future Volume (vph)	64	1111	168	35	1087	29	135	44	27	35	30	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Flt		0.98			1.00		1.00	0.94		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3503			3559		1789	1777		1789	1710	
Flt Permitted		0.82			0.87		0.70	1.00		0.71	1.00	
Satd. Flow (perm)		2877			3088		1324	1777		1335	1710	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	67	1169	177	37	1144	31	142	46	28	37	32	51
RTOR Reduction (vph)	0	15	0	0	3	0	0	23	0	0	42	0
Lane Group Flow (vph)	0	1398	0	0	1209	0	142	51	0	37	41	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		35.4			35.4		9.7	9.7		9.7	9.7	
Effective Green, g (s)		35.4			35.4		9.7	9.7		9.7	9.7	
Actuated g/C Ratio		0.62			0.62		0.17	0.17		0.17	0.17	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1783			1914		224	301		226	290	
v/s Ratio Prot								0.03				0.02
v/s Ratio Perm		c0.49			0.39		c0.11			0.03		
v/c Ratio		0.78			0.63		0.63	0.17		0.16	0.14	
Uniform Delay, d1		8.0			6.8		22.0	20.3		20.2	20.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.5			1.6		5.8	0.3		0.3	0.2	
Delay (s)		11.6			8.4		27.8	20.5		20.6	20.4	
Level of Service		B			A		C	C		C	C	
Approach Delay (s)		11.6			8.4			25.3			20.4	
Approach LOS		B			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			11.6				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			57.1				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			99.1%				ICU Level of Service			F		
Analysis Period (min)			15									




















c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Gas Station/Theme Park Road & River Road West

2024 Background (w/improvements)

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	655	44	6	696	16	12	2	3	19	5	18
Future Volume (vph)	28	655	44	6	696	16	12	2	3	19	5	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Fr _t	1.00	0.99		1.00	1.00			0.98			0.94	
Fl _t Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1789	1866		1789	1877			1777			1734	
Fl _t Permitted	0.34	1.00		0.35	1.00			1.00			0.97	
Satd. Flow (perm)	639	1866		654	1877			1841			1720	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	29	689	46	6	733	17	13	2	3	20	5	19
RTOR Reduction (vph)	0	2	0	0	1	0	0	3	0	0	18	0
Lane Group Flow (vph)	29	733	0	6	749	0	0	15	0	0	26	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	43.5	43.5		43.5	43.5			3.0			3.0	
Effective Green, g (s)	43.5	43.5		43.5	43.5			3.0			3.0	
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.05			0.05	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	475	1387		486	1395			94			88	
v/s Ratio Prot		0.39			c0.40							
v/s Ratio Perm	0.05			0.01				0.01			c0.02	
v/c Ratio	0.06	0.53		0.01	0.54			0.16			0.30	
Uniform Delay, d ₁	2.0	3.2		1.9	3.2			26.5			26.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d ₂	0.2	1.4		0.0	1.5			0.8			1.9	
Delay (s)	2.3	4.6		2.0	4.7			27.4			28.6	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		4.5			4.7			27.4			28.6	
Approach LOS		A			A			C			C	

Intersection Summary

HCM 2000 Control Delay	5.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	58.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		




















c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Gas Station/Theme Park Road & River Road West

2024 Background (w/improvements)

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	1002	69	11	1041	21	20	1	10	20	4	29
Future Volume (vph)	33	1002	69	11	1041	21	20	1	10	20	4	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Flt	1.00	0.99		1.00	1.00			0.95			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1789	1865		1789	1878			1743			1711	
Flt Permitted	0.18	1.00		0.17	1.00			0.77			0.86	
Satd. Flow (perm)	331	1865		323	1878			1391			1503	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	35	1055	73	12	1096	22	21	1	11	21	4	31
RTOR Reduction (vph)	0	2	0	0	1	0	0	10	0	0	29	0
Lane Group Flow (vph)	35	1126	0	12	1117	0	0	23	0	0	27	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	62.1	62.1		62.1	62.1			4.8			4.8	
Effective Green, g (s)	62.1	62.1		62.1	62.1			4.8			4.8	
Actuated g/C Ratio	0.79	0.79		0.79	0.79			0.06			0.06	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	260	1467		254	1478			84			91	
v/s Ratio Prot		c0.60			0.60							
v/s Ratio Perm	0.11			0.04				0.02			c0.02	
v/c Ratio	0.13	0.77		0.05	0.76			0.27			0.30	
Uniform Delay, d1	2.0	4.5		1.9	4.4			35.4			35.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.1	3.9		0.4	3.7			1.7			1.8	
Delay (s)	3.1	8.4		2.2	8.1			37.1			37.2	
Level of Service	A	A		A	A			D			D	
Approach Delay (s)		8.3			8.0			37.1			37.2	
Approach LOS		A			A			D			D	




















Intersection Summary

HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	78.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West

2029 Background Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	800	46	7	852	17	12	2	3	20	6	19
Future Volume (vph)	29	800	46	7	852	17	12	2	3	20	6	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Flt	1.00	0.99		1.00	1.00			0.98			0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1789	1868		1789	1878			1777			1736	
Flt Permitted	0.25	1.00		0.27	1.00			1.00			0.93	
Satd. Flow (perm)	478	1868		501	1878			1841			1657	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	842	48	7	897	18	13	2	3	21	6	20
RTOR Reduction (vph)	0	2	0	0	1	0	0	3	0	0	19	0
Lane Group Flow (vph)	31	888	0	7	914	0	0	15	0	0	28	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	43.2	43.2		43.2	43.2			3.1			3.1	
Effective Green, g (s)	43.2	43.2		43.2	43.2			3.1			3.1	
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.05			0.05	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	354	1384		371	1391			97			88	
v/s Ratio Prot		0.48			c0.49							
v/s Ratio Perm	0.06			0.01				0.01			c0.02	
v/c Ratio	0.09	0.64		0.02	0.66			0.16			0.32	
Uniform Delay, d1	2.1	3.7		2.0	3.8			26.4			26.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.5	2.3		0.1	2.4			0.8			2.1	
Delay (s)	2.6	6.0		2.1	6.3			27.1			28.7	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		5.9			6.2			27.1			28.7	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	58.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		




















c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

2029 Background Conditions

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	897	59	11	965	11	128	9	34	28	20	42
Future Volume (vph)	26	897	59	11	965	11	128	9	34	28	20	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Flt		0.99			1.00		1.00	0.88		1.00	0.90	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3542			3570		1789	1657		1789	1692	
Flt Permitted		0.90			0.94		0.71	1.00		0.73	1.00	
Satd. Flow (perm)		3204			3344		1346	1657		1371	1692	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	27	944	62	12	1016	12	135	9	36	29	21	44
RTOR Reduction (vph)	0	9	0	0	2	0	0	27	0	0	22	0
Lane Group Flow (vph)	0	1024	0	0	1038	0	135	18	0	29	43	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		17.1			17.1		9.0	9.0		9.0	9.0	
Effective Green, g (s)		17.1			17.1		9.0	9.0		9.0	9.0	
Actuated g/C Ratio		0.45			0.45		0.24	0.24		0.24	0.24	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1438			1500		317	391		323	399	
v/s Ratio Prot								0.01				0.03
v/s Ratio Perm		c0.32			0.31		c0.10			0.02		
v/c Ratio		0.71			0.69		0.43	0.04		0.09	0.11	
Uniform Delay, d1		8.5			8.4		12.4	11.2		11.4	11.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.0			2.6		0.9	0.0		0.1	0.1	
Delay (s)		11.5			11.0		13.3	11.3		11.5	11.5	
Level of Service		B			B		B	B		B	B	
Approach Delay (s)		11.5			11.0			12.8			11.5	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM 2000 Control Delay			11.4				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			38.1				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			69.3%				ICU Level of Service			C		
Analysis Period (min)			15									




















c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Gas Station/Theme Park Road & River Road West

2029 Background Conditions

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	1194	72	11	1251	23	21	1	10	21	5	30
Future Volume (vph)	35	1194	72	11	1251	23	21	1	10	21	5	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Flt	1.00	0.99		1.00	1.00			0.96			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1789	1867		1789	1878			1745			1714	
Flt Permitted	0.07	1.00		0.08	1.00			0.81			0.86	
Satd. Flow (perm)	139	1867		147	1878			1457			1506	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	37	1257	76	12	1317	24	22	1	11	22	5	32
RTOR Reduction (vph)	0	2	0	0	0	0	0	10	0	0	30	0
Lane Group Flow (vph)	37	1331	0	12	1341	0	0	24	0	0	29	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	71.7	71.7		71.7	71.7			6.3			6.3	
Effective Green, g (s)	71.7	71.7		71.7	71.7			6.3			6.3	
Actuated g/C Ratio	0.80	0.80		0.80	0.80			0.07			0.07	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	110	1487		117	1496			101			105	
v/s Ratio Prot		0.71			c0.71							
v/s Ratio Perm	0.27			0.08				0.02			c0.02	
v/c Ratio	0.34	0.90		0.10	0.90			0.24			0.28	
Uniform Delay, d1	2.5	6.5		2.0	6.5			39.6			39.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	8.1	8.7		1.8	8.7			1.2			1.4	
Delay (s)	10.6	15.2		3.8	15.2			40.8			41.1	
Level of Service	B	B		A	B			D			D	
Approach Delay (s)		15.1			15.1			40.8			41.1	
Approach LOS		B			B			D			D	
Intersection Summary												
HCM 2000 Control Delay			16.0									B
HCM 2000 Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			90.0								12.0	
Intersection Capacity Utilization			80.6%									D
Analysis Period (min)			15									




















c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

2029 Background Conditions

PM Peak Hour

















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	1320	177	37	1304	30	142	46	28	37	32	51
Future Volume (vph)	68	1320	177	37	1304	30	142	46	28	37	32	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Flt		0.98			1.00		1.00	0.94		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3510			3562		1789	1777		1789	1710	
Flt Permitted		0.76			0.84		0.70	1.00		0.71	1.00	
Satd. Flow (perm)		2664			2991		1318	1777		1331	1710	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	72	1389	186	39	1373	32	149	48	29	39	34	54
RTOR Reduction (vph)	0	10	0	0	2	0	0	24	0	0	46	0
Lane Group Flow (vph)	0	1637	0	0	1442	0	149	53	0	39	42	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		62.1			62.1		13.7	13.7		13.7	13.7	
Effective Green, g (s)		62.1			62.1		13.7	13.7		13.7	13.7	
Actuated g/C Ratio		0.71			0.71		0.16	0.16		0.16	0.16	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1884			2115		205	277		207	266	
v/s Ratio Prot								0.03				0.02
v/s Ratio Perm		c0.61			0.48		c0.11			0.03		
v/c Ratio		0.87			0.68		0.73	0.19		0.19	0.16	
Uniform Delay, d1		9.8			7.3		35.3	32.2		32.2	32.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.8			1.8		12.1	0.3		0.4	0.3	
Delay (s)		15.5			9.1		47.4	32.6		32.7	32.3	
Level of Service		B			A		D	C		C	C	
Approach Delay (s)		15.5			9.1			42.3			32.4	
Approach LOS		B			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			15.2				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			87.8				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			111.7%				ICU Level of Service			H		
Analysis Period (min)			15									

c Critical Lane Group

**APPENDIX D:
FUTURE TOTAL OPERATIONS**

HCM Unsignalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West




















2019 Total Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	313	42	6	251	18	11	2	3	20	5	19
Future Volume (Veh/h)	31	313	42	6	251	18	11	2	3	20	5	19
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	33	329	44	6	264	19	12	2	3	21	5	20
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		401										
pX, platoon unblocked												
vC, conflicting volume	283			373			725	712	351	706	724	274
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	283			373			725	712	351	706	724	274
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			96	99	100	94	99	97
cM capacity (veh/h)	1279			1185			320	347	692	339	341	765
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	406	289	17	46								
Volume Left	33	6	12	21								
Volume Right	44	19	3	20								
cSH	1279	1185	357	448								
Volume to Capacity	0.03	0.01	0.05	0.10								
Queue Length 95th (m)	0.6	0.1	1.1	2.6								
Control Delay (s)	0.9	0.2	15.6	14.0								
Lane LOS	A	A	C	B								
Approach Delay (s)	0.9	0.2	15.6	14.0								
Approach LOS			C	B								
Intersection Summary												
Average Delay			1.8									
Intersection Capacity Utilization			45.3%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

















2019 Total Conditions
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	373	53	10	302	10	116	8	31	26	18	38
Future Volume (vph)	23	373	53	10	302	10	116	8	31	26	18	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.98			1.00		1.00	0.88		1.00	0.90	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3506			3555		1789	1656		1789	1692	
Flt Permitted		0.93			0.94		0.72	1.00		0.73	1.00	
Satd. Flow (perm)		3260			3335		1353	1656		1376	1692	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	24	393	56	11	318	11	122	8	33	27	19	40
RTOR Reduction (vph)	0	17	0	0	4	0	0	27	0	0	33	0
Lane Group Flow (vph)	0	456	0	0	336	0	122	14	0	27	26	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.2			21.2		7.6	7.6		7.6	7.6	
Effective Green, g (s)		21.2			21.2		7.6	7.6		7.6	7.6	
Actuated g/C Ratio		0.52			0.52		0.19	0.19		0.19	0.19	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1693			1732		252	308		256	315	
v/s Ratio Prot								0.01				0.02
v/s Ratio Perm		c0.14			0.10		c0.09			0.02		
v/c Ratio		0.27			0.19		0.48	0.05		0.11	0.08	
Uniform Delay, d1		5.5			5.2		14.8	13.6		13.8	13.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.3		1.5	0.1		0.2	0.1	
Delay (s)		5.9			5.5		16.3	13.7		14.0	13.8	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		5.9			5.5			15.7			13.9	
Approach LOS		A			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			7.9				HCM 2000 Level of Service				A	
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			40.8				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			49.7%				ICU Level of Service			A		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West






















2019 Total Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	426	65	10	478	23	19	1	9	23	4	34
Future Volume (Veh/h)	36	426	65	10	478	23	19	1	9	23	4	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	38	448	68	11	503	24	20	1	9	24	4	36
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		401										
pX, platoon unblocked				0.97			0.97	0.97	0.97	0.97	0.97	
vC, conflicting volume	527			516			1133	1107	482	1104	1129	515
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	527			486			1122	1095	451	1093	1118	515
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			99			87	99	98	86	98	94
cM capacity (veh/h)	1040			1045			158	198	590	176	192	560
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	554	538	30	64								
Volume Left	38	11	20	24								
Volume Right	68	24	9	36								
cSH	1040	1045	204	289								
Volume to Capacity	0.04	0.01	0.15	0.22								
Queue Length 95th (m)	0.9	0.2	3.8	6.3								
Control Delay (s)	1.0	0.3	25.7	21.0								
Lane LOS	A	A	D	C								
Approach Delay (s)	1.0	0.3	25.7	21.0								
Approach LOS			D	C								
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization			56.2%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

2019 Total Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	523	160	34	527	28	129	42	26	34	29	46
Future Volume (vph)	61	523	160	34	527	28	129	42	26	34	29	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Flt		0.97			0.99		1.00	0.94		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3449			3543		1789	1776		1789	1712	
Flt Permitted		0.86			0.88		0.71	1.00		0.71	1.00	
Satd. Flow (perm)		2967			3129		1329	1776		1339	1712	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	64	551	168	36	555	29	136	44	27	36	31	48
RTOR Reduction (vph)	0	44	0	0	6	0	0	22	0	0	39	0
Lane Group Flow (vph)	0	739	0	0	614	0	136	49	0	36	40	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.9			20.9		8.1	8.1		8.1	8.1	
Effective Green, g (s)		20.9			20.9		8.1	8.1		8.1	8.1	
Actuated g/C Ratio		0.51			0.51		0.20	0.20		0.20	0.20	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1512			1595		262	350		264	338	
v/s Ratio Prot								0.03				0.02
v/s Ratio Perm		c0.25			0.20		c0.10			0.03		
v/c Ratio		0.49			0.38		0.52	0.14		0.14	0.12	
Uniform Delay, d1		6.6			6.1		14.7	13.6		13.6	13.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			0.7		1.7	0.2		0.2	0.2	
Delay (s)		7.7			6.8		16.4	13.8		13.8	13.7	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		7.7			6.8			15.5			13.7	
Approach LOS		A			A			B			B	




















Intersection Summary

HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	41.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West

2024 Total Conditions
 AM Peak Hour




















													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	32	655	44	6	696	19	12	2	3	21	5	20	
Future Volume (vph)	32	655	44	6	696	19	12	2	3	21	5	20	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0		
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00		
Flt	1.00	0.99		1.00	1.00			0.98			0.94		
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98		
Satd. Flow (prot)	1789	1866		1789	1876			1777			1732		
Flt Permitted	0.34	1.00		0.35	1.00			1.00			0.94		
Satd. Flow (perm)	635	1866		653	1876			1841			1667		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	34	689	46	6	733	20	13	2	3	22	5	21	
RTOR Reduction (vph)	0	2	0	0	1	0	0	3	0	0	20	0	
Lane Group Flow (vph)	34	733	0	6	752	0	0	15	0	0	28	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases		4			8			2			6		
Permitted Phases	4			8			2			6			
Actuated Green, G (s)	43.1	43.1		43.1	43.1			3.1			3.1		
Effective Green, g (s)	43.1	43.1		43.1	43.1			3.1			3.1		
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.05			0.05		
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0		
Lane Grp Cap (vph)	470	1381		483	1389			98			88		
v/s Ratio Prot		0.39			c0.40								
v/s Ratio Perm	0.05			0.01				0.01			c0.02		
v/c Ratio	0.07	0.53		0.01	0.54			0.15			0.32		
Uniform Delay, d1	2.1	3.2		2.0	3.3			26.3			26.5		
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00		
Incremental Delay, d2	0.3	1.5		0.0	1.5			0.7			2.1		
Delay (s)	2.4	4.7		2.0	4.8			27.0			28.6		
Level of Service	A	A		A	A			C			C		
Approach Delay (s)		4.6			4.8			27.0			28.6		
Approach LOS		A			A			C			C		
Intersection Summary													
HCM 2000 Control Delay			5.6									HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.53										
Actuated Cycle Length (s)			58.2									Sum of lost time (s)	12.0
Intersection Capacity Utilization			51.1%									ICU Level of Service	A
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West




















2024 Total Conditions
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	739	56	11	785	11	122	9	32	27	19	40
Future Volume (vph)	25	739	56	11	785	11	122	9	32	27	19	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			1.00		1.00	0.88		1.00	0.90	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3537			3568		1789	1660		1789	1692	
Flt Permitted		0.91			0.94		0.72	1.00		0.73	1.00	
Satd. Flow (perm)		3224			3345		1350	1660		1373	1692	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	778	59	12	826	12	128	9	34	28	20	42
RTOR Reduction (vph)	0	10	0	0	2	0	0	26	0	0	32	0
Lane Group Flow (vph)	0	853	0	0	848	0	128	17	0	28	30	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		17.1			17.1		8.8	8.8		8.8	8.8	
Effective Green, g (s)		17.1			17.1		8.8	8.8		8.8	8.8	
Actuated g/C Ratio		0.45			0.45		0.23	0.23		0.23	0.23	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1454			1509		313	385		318	392	
v/s Ratio Prot								0.01				0.02
v/s Ratio Perm		c0.26			0.25		c0.09			0.02		
v/c Ratio		0.59			0.56		0.41	0.04		0.09	0.08	
Uniform Delay, d1		7.8			7.6		12.3	11.3		11.4	11.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7			1.5		0.9	0.0		0.1	0.1	
Delay (s)		9.5			9.2		13.2	11.3		11.5	11.5	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		9.5			9.2			12.7			11.5	
Approach LOS		A			A			B			B	
Intersection Summary												
HCM 2000 Control Delay			9.7				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			37.9				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			63.9%				ICU Level of Service			B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West

2024 Total Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	1002	69	11	1041	24	20	1	10	24	4	35
Future Volume (vph)	37	1002	69	11	1041	24	20	1	10	24	4	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Flt	1.00	0.99		1.00	1.00			0.95			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1789	1865		1789	1877			1743			1709	
Flt Permitted	0.16	1.00		0.16	1.00			0.78			0.86	
Satd. Flow (perm)	307	1865		301	1877			1397			1500	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	39	1055	73	12	1096	25	21	1	11	25	4	37
RTOR Reduction (vph)	0	2	0	0	1	0	0	10	0	0	34	0
Lane Group Flow (vph)	39	1126	0	12	1120	0	0	23	0	0	32	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	61.1	61.1		61.1	61.1			6.2			6.2	
Effective Green, g (s)	61.1	61.1		61.1	61.1			6.2			6.2	
Actuated g/C Ratio	0.77	0.77		0.77	0.77			0.08			0.08	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	236	1436		231	1446			109			117	
v/s Ratio Prot		c0.60			0.60							
v/s Ratio Perm	0.13			0.04				0.02			c0.02	
v/c Ratio	0.17	0.78		0.05	0.77			0.21			0.27	
Uniform Delay, d1	2.4	5.3		2.2	5.2			34.3			34.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.5	4.4		0.4	4.1			1.0			1.3	
Delay (s)	3.9	9.6		2.6	9.3			35.2			35.7	
Level of Service	A	A		A	A			D			D	
Approach Delay (s)		9.4			9.2			35.2			35.7	
Approach LOS		A			A			D			D	




















Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	79.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West




















2024 Total Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	1115	168	35	1093	29	135	44	27	35	30	48
Future Volume (vph)	64	1115	168	35	1093	29	135	44	27	35	30	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Flt		0.98			1.00		1.00	0.94		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3503			3559		1789	1777		1789	1710	
Flt Permitted		0.82			0.87		0.70	1.00		0.71	1.00	
Satd. Flow (perm)		2873			3085		1324	1777		1335	1710	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	67	1174	177	37	1151	31	142	46	28	37	32	51
RTOR Reduction (vph)	0	17	0	0	3	0	0	22	0	0	41	0
Lane Group Flow (vph)	0	1401	0	0	1216	0	142	52	0	37	42	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		32.1			32.1		10.9	10.9		10.9	10.9	
Effective Green, g (s)		32.1			32.1		10.9	10.9		10.9	10.9	
Actuated g/C Ratio		0.58			0.58		0.20	0.20		0.20	0.20	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1676			1800		262	352		264	338	
v/s Ratio Prot								0.03				0.02
v/s Ratio Perm		c0.49			0.39		c0.11			0.03		
v/c Ratio		0.84			0.68		0.54	0.15		0.14	0.12	
Uniform Delay, d1		9.3			7.9		19.8	18.2		18.2	18.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.1			2.1		2.3	0.2		0.2	0.2	
Delay (s)		14.4			9.9		22.1	18.4		18.4	18.3	
Level of Service		B			A		C	B		B	B	
Approach Delay (s)		14.4			9.9			20.8			18.3	
Approach LOS		B			A			C			B	
Intersection Summary												
HCM 2000 Control Delay			13.2				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			55.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			99.3%				ICU Level of Service			F		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West

2029 Total Conditions
 AM Peak Hour




















													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	34	800	46	7	852	20	12	2	3	22	6	21	
Future Volume (vph)	34	800	46	7	852	20	12	2	3	22	6	21	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0		
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00		
Flt	1.00	0.99		1.00	1.00			0.98			0.94		
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98		
Satd. Flow (prot)	1789	1868		1789	1877			1777			1735		
Flt Permitted	0.24	1.00		0.26	1.00			0.78			0.85		
Satd. Flow (perm)	455	1868		482	1877			1441			1502		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	36	842	48	7	897	21	13	2	3	23	6	22	
RTOR Reduction (vph)	0	2	0	0	1	0	0	3	0	0	20	0	
Lane Group Flow (vph)	36	888	0	7	917	0	0	15	0	0	31	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases		4			8			2			6		
Permitted Phases	4			8			2			6			
Actuated Green, G (s)	42.9	42.9		42.9	42.9			4.4			4.4		
Effective Green, g (s)	42.9	42.9		42.9	42.9			4.4			4.4		
Actuated g/C Ratio	0.72	0.72		0.72	0.72			0.07			0.07		
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0		
Lane Grp Cap (vph)	329	1351		348	1357			106			111		
v/s Ratio Prot		0.48			c0.49								
v/s Ratio Perm	0.08			0.01				0.01			c0.02		
v/c Ratio	0.11	0.66		0.02	0.68			0.14			0.28		
Uniform Delay, d1	2.5	4.3		2.3	4.4			25.7			25.9		
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00		
Incremental Delay, d2	0.7	2.5		0.1	2.7			0.6			1.4		
Delay (s)	3.1	6.8		2.4	7.2			26.3			27.3		
Level of Service	A	A		A	A			C			C		
Approach Delay (s)		6.7			7.1			26.3			27.3		
Approach LOS		A			A			C			C		
Intersection Summary													
HCM 2000 Control Delay			7.6									HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.64										
Actuated Cycle Length (s)			59.3									Sum of lost time (s)	12.0
Intersection Capacity Utilization			59.4%									ICU Level of Service	B
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

2029 Total Conditions
AM Peak Hour




















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	902	59	11	967	11	128	9	34	28	20	42
Future Volume (vph)	26	902	59	11	967	11	128	9	34	28	20	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			1.00		1.00	0.88		1.00	0.90	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3542			3570		1789	1657		1789	1692	
Flt Permitted		0.90			0.94		0.71	1.00		0.73	1.00	
Satd. Flow (perm)		3205			3343		1346	1657		1371	1692	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	27	949	62	12	1018	12	135	9	36	29	21	44
RTOR Reduction (vph)	0	9	0	0	2	0	0	27	0	0	21	0
Lane Group Flow (vph)	0	1029	0	0	1040	0	135	18	0	29	44	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		17.1			17.1		9.0	9.0		9.0	9.0	
Effective Green, g (s)		17.1			17.1		9.0	9.0		9.0	9.0	
Actuated g/C Ratio		0.45			0.45		0.24	0.24		0.24	0.24	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1438			1500		317	391		323	399	
v/s Ratio Prot								0.01				0.03
v/s Ratio Perm		c0.32			0.31		c0.10			0.02		
v/c Ratio		0.72			0.69		0.43	0.04		0.09	0.11	
Uniform Delay, d1		8.5			8.4		12.4	11.2		11.4	11.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.1			2.7		0.9	0.0		0.1	0.1	
Delay (s)		11.6			11.1		13.3	11.3		11.5	11.5	
Level of Service		B			B		B	B		B	B	
Approach Delay (s)		11.6			11.1			12.8			11.5	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM 2000 Control Delay			11.5				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			38.1				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			69.4%				ICU Level of Service				C	
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: Gas Station/Theme Park Road & River Road West

2029 Total Conditions
PM Peak Hour




















													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	39	1194	72	11	1251	25	21	1	10	25	5	36	
Future Volume (vph)	39	1194	72	11	1251	25	21	1	10	25	5	36	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0			6.0			6.0		
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00		
Flt	1.00	0.99		1.00	1.00			0.96			0.93		
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98		
Satd. Flow (prot)	1789	1867		1789	1878			1745			1711		
Flt Permitted	0.07	1.00		0.07	1.00			0.86			0.86		
Satd. Flow (perm)	130	1867		141	1878			1549			1502		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	41	1257	76	12	1317	26	22	1	11	26	5	38	
RTOR Reduction (vph)	0	2	0	0	1	0	0	10	0	0	35	0	
Lane Group Flow (vph)	41	1331	0	12	1342	0	0	24	0	0	34	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases		4			8			2			6		
Permitted Phases	4			8			2			6			
Actuated Green, G (s)	70.9	70.9		70.9	70.9			6.5			6.5		
Effective Green, g (s)	70.9	70.9		70.9	70.9			6.5			6.5		
Actuated g/C Ratio	0.79	0.79		0.79	0.79			0.07			0.07		
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0			6.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0		
Lane Grp Cap (vph)	103	1480		111	1489			112			109		
v/s Ratio Prot		0.71			c0.71								
v/s Ratio Perm	0.31			0.09				0.02			c0.02		
v/c Ratio	0.40	0.90		0.11	0.90			0.21			0.31		
Uniform Delay, d1	2.8	6.7		2.1	6.7			39.0			39.3		
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00		
Incremental Delay, d2	11.1	9.1		2.0	9.2			1.0			1.6		
Delay (s)	13.9	15.8		4.0	15.9			40.0			40.9		
Level of Service	B	B		A	B			D			D		
Approach Delay (s)		15.7			15.8			40.0			40.9		
Approach LOS		B			B			D			D		
Intersection Summary													
HCM 2000 Control Delay			16.6									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.85										
Actuated Cycle Length (s)			89.4									Sum of lost time (s)	12.0
Intersection Capacity Utilization			81.3%									ICU Level of Service	D
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: Zoo Park Road & River Road West

2029 Total Conditions
PM Peak Hour

















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	1325	177	37	1310	30	142	46	28	37	32	51
Future Volume (vph)	68	1325	177	37	1310	30	142	46	28	37	32	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Flt		0.98			1.00		1.00	0.94		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3510			3562		1789	1777		1789	1710	
Flt Permitted		0.76			0.84		0.70	1.00		0.71	1.00	
Satd. Flow (perm)		2660			2990		1318	1777		1331	1710	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	72	1395	186	39	1379	32	149	48	29	39	34	54
RTOR Reduction (vph)	0	10	0	0	2	0	0	24	0	0	46	0
Lane Group Flow (vph)	0	1643	0	0	1448	0	149	53	0	39	42	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		62.1			62.1		13.7	13.7		13.7	13.7	
Effective Green, g (s)		62.1			62.1		13.7	13.7		13.7	13.7	
Actuated g/C Ratio		0.71			0.71		0.16	0.16		0.16	0.16	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1881			2114		205	277		207	266	
v/s Ratio Prot								0.03				0.02
v/s Ratio Perm		c0.62			0.48		c0.11			0.03		
v/c Ratio		0.87			0.69		0.73	0.19		0.19	0.16	
Uniform Delay, d1		9.8			7.3		35.3	32.2		32.2	32.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.0			1.8		12.1	0.3		0.4	0.3	
Delay (s)		15.8			9.1		47.4	32.6		32.7	32.3	
Level of Service		B			A		D	C		C	C	
Approach Delay (s)		15.8			9.1			42.3			32.4	
Approach LOS		B			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			15.4				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			87.8				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			112.0%				ICU Level of Service			H		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis 2029 Total Conditions (without LTL on RRW)

3: Gas Station/Theme Park Road & River Road West

















AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	34	800	46	7	852	20	12	2	3	22	6	21	
Future Volume (vph)	34	800	46	7	852	20	12	2	3	22	6	21	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.0			6.0			6.0			6.0		
Lane Util. Factor		1.00			1.00			1.00			1.00		
Frt		0.99			1.00			0.98			0.94		
Flt Protected		1.00			1.00			0.97			0.98		
Satd. Flow (prot)		1867			1877			1777			1735		
Flt Permitted		0.95			0.99			0.77			0.85		
Satd. Flow (perm)		1771			1866			1409			1502		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	36	842	48	7	897	21	13	2	3	23	6	22	
RTOR Reduction (vph)	0	2	0	0	1	0	0	3	0	0	20	0	
Lane Group Flow (vph)	0	924	0	0	924	0	0	15	0	0	31	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases		4			8			2			6		
Permitted Phases	4			8			2			6			
Actuated Green, G (s)		48.0			48.0			4.5			4.5		
Effective Green, g (s)		48.0			48.0			4.5			4.5		
Actuated g/C Ratio		0.74			0.74			0.07			0.07		
Clearance Time (s)		6.0			6.0			6.0			6.0		
Vehicle Extension (s)		3.0			3.0			3.0			3.0		
Lane Grp Cap (vph)		1317			1388			98			104		
v/s Ratio Prot													
v/s Ratio Perm		c0.52			0.50			0.01			c0.02		
v/c Ratio		0.70			0.67			0.16			0.29		
Uniform Delay, d1		4.4			4.2			28.2			28.5		
Progression Factor		1.00			1.00			1.00			1.00		
Incremental Delay, d2		3.1			2.5			0.7			1.6		
Delay (s)		7.6			6.7			29.0			30.1		
Level of Service		A			A			C			C		
Approach Delay (s)		7.6			6.7			29.0			30.1		
Approach LOS		A			A			C			C		
Intersection Summary													
HCM 2000 Control Delay			8.0									HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.67										
Actuated Cycle Length (s)			64.5									Sum of lost time (s)	12.0
Intersection Capacity Utilization			80.8%									ICU Level of Service	D
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 3: Gas Station/Theme Park Road & River Road West

2029 Total Conditions (no LTL on RRW)
 PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	39	1194	72	11	1251	25	21	1	10	25	5	36	
Future Volume (vph)	39	1194	72	11	1251	25	21	1	10	25	5	36	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.0			6.0			6.0			6.0		
Lane Util. Factor		1.00			1.00			1.00			1.00		
Frt		0.99			1.00			0.96			0.93		
Flt Protected		1.00			1.00			0.97			0.98		
Satd. Flow (prot)		1867			1878			1745			1711		
Flt Permitted		0.92			0.98			0.83			0.86		
Satd. Flow (perm)		1724			1849			1488			1502		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Adj. Flow (vph)	41	1257	76	12	1317	26	22	1	11	26	5	38	
RTOR Reduction (vph)	0	1	0	0	1	0	0	10	0	0	36	0	
Lane Group Flow (vph)	0	1373	0	0	1354	0	0	24	0	0	33	0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases		4			8			2			6		
Permitted Phases	4			8			2			6			
Actuated Green, G (s)		91.0			91.0			6.9			6.9		
Effective Green, g (s)		91.0			91.0			6.9			6.9		
Actuated g/C Ratio		0.83			0.83			0.06			0.06		
Clearance Time (s)		6.0			6.0			6.0			6.0		
Vehicle Extension (s)		3.0			3.0			3.0			3.0		
Lane Grp Cap (vph)		1427			1531			93			94		
v/s Ratio Prot													
v/s Ratio Perm		c0.80			0.73			0.02			c0.02		
v/c Ratio		0.96			0.88			0.25			0.36		
Uniform Delay, d1		8.0			6.1			49.1			49.4		
Progression Factor		1.00			1.00			1.00			1.00		
Incremental Delay, d2		16.3			7.8			1.4			2.3		
Delay (s)		24.3			13.9			50.5			51.7		
Level of Service		C			B			D			D		
Approach Delay (s)		24.3			13.9			50.5			51.7		
Approach LOS		C			B			D			D		
Intersection Summary													
HCM 2000 Control Delay			20.3									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.92										
Actuated Cycle Length (s)			109.9									Sum of lost time (s)	12.0
Intersection Capacity Utilization			106.6%									ICU Level of Service	G
Analysis Period (min)			15										

c Critical Lane Group

Town Planning Applications

Signed by Parkbridge December 12, 2017



THE CORPORATION OF THE TOWN OF WASAGA BEACH
PLANNING DEPARTMENT
SITE PLAN CONTROL APPLICATION FOR APPROVAL

OFFICE USE ONLY	
DATE RECEIVED:	FILE NO.:
DATE APPLICATION DEEMED COMPLETE:	
FEES	
Site Plan Approval (new development):	
Major*	\$4,000.00
Minor*	\$2,000.00
Site Plan Approval (revision)**	\$1,200.00
Site Plan Approval (minor revision)	\$ 750.00
Legal fees	\$ 750.00
<small>*plus a fee per dwelling unit or per square metre of site area plus deposit for Engineering Review Fee</small>	<small>**plus a fee per dwelling unit or per square metre of floor area</small>

1. CONTACT INFORMATION

Applicant Information

Name of applicant:			
Mailing Address:			
Telephone No:		Cell No:	
E-Mail:		Fax No:	

Owner Information (if different from Applicant)

Name of Owner:	Parkbridge Lifestyle Communities Inc.		
Mailing Address:	690 River Road West, Wasaga Beach L9Z 2P1		
Telephone No:	705.429.8559	Cell No:	
E-Mail:	jpavao@parkbridge.com	Fax No:	

Agent Information (if applicable)

Name of Agent:	Celeste Phillips Planning Inc.		
Mailing Address:	300-85 Bayfield Street, Barrie L4M 3A7		
Telephone No:	705.797.8977	Cell No:	
E-Mail:	celeste@cplan.ca	Fax No:	

Communications should be sent to Applicant Owner Agent

2. LOCATION AND DESCRIPTION OF THE SUBJECT LANDS

Location of Subject Property (complete applicable lines)

Street & Number:	southeast corner of Wally and Theme Park Drives		
Tax Roll #:	436401001136650		
Lot No.:	Pt. of the South Half of Lot 25	Concession:	9
Part No.:		Plan No.:	

Easements or Restrictive Covenants

Are there any easements or restrictive covenants affecting the subject lands?
If yes, Describe the easement or covenant and its effect:

Dimensions of Subject Property (in metric units)

Frontage	160.1 metres along Wally Drive	metres
Average Width	+/- 167 metres	metres
Depth	167.3 metres along Theme Park Drive	metres
Area	+/- 3.1 hectares	square metres

3. EXISTING LAND USES & ZONING

Existing Use and Zoning

Describe the existing uses on the subject land:	Currently vacant
The length of time that the existing uses on the subject land have continued:	
Current Land Use Designation in Official Plan:	Tourism Commercial
Current Zoning:	CCH-4
Current Land Use Designation of abutting lands:	
North Tourism Commercial	South Recreational Commercial
East Tourism Commercial	West Residential
Current Zoning of abutting lands:	
North CT-9	South CR
East EP and CDH	West R3

4. PROPOSED LAND USES & ZONING

Proposed Use and Variance

Describe the proposed uses on the subject land:
66 land lease townhouses
Proposed Land Use Designation in Official Plan:
Residential
Proposed Zoning:
R3

5. EXISTING AND PROPOSED STRUCTURES

STRUCTURE DETAILS	EXISTING	PROPOSED
Number of structures	0	12 buildings (66 townhouses)
Structure #1		
Date constructed:		
Gross Floor Area (sq/m)		
Structure height (metres)		
Setback from front lot line (metres)		
Setback from rear lot line (metres)		
Setback from side lot line (metres)		
Structure #2		
Date constructed:		
Gross Floor Area (sq/m)		
Structure height (metres)		
Setback from front lot line (metres)		
Setback from rear lot line (metres)		
Setback from side lot line (metres)		
Structure #3		
Date constructed:		
Gross Floor Area (sq/m)		
Structure height (metres)		
Setback from front lot line (metres)		
Setback from rear lot line (metres)		
Setback from side lot line (metres)		

6. ACCESS AND SERVICING INFORMATION

Type of Access	Existing	Proposed
Provincial highway		
Municipal road, maintained year round	Wally and Theme Park Drives	Access to 12 metre private roads by way of Wally and Theme Park Drives
Municipal road, maintained seasonally other public road		
Other public road		
Please specify:		
Right of way		
Please specify:		
Water access		
Please describe the parking and docking facilities and the approximate distances of these facilities from the subject land and the nearest public road		

Type of Water Supply	Existing	Proposed
Municipally operated piped water system		X
Privately owned/operated individual well		
Privately owned/operated communal well		
Lake or water body		
Please specify:		
Other means		
Please specify:		
Type of Storm Water Control	Existing	Proposed
Storm drainage sewer		SWM pond
Ditch		
Swale		
Other means		
Please specify:		
Type of Sewage Disposal	Existing	Proposed
Municipally operated sanitary sewers		X
Privately owned/operated individual septic		
Privately owned/operated communal septic		
Privy		
Other means		
Please specify:		
Utilities	Existing	Proposed
Hydro		X
Natural gas		
Telecommunications		X
Is it the intent of this application to permit development on privately owned and operated individual or communal septic systems where moere than 4500 litres of effluent would be produced per day as a result of the development being completed?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, the following is required:		
i) A servicing options report; ii) A hydrogeological report.		

7. PLANNING HISTORY OF THE SUBJECT LAND

Has the subject land or land within 120 metres of it, ever been the subject of a Zoning By-law Amendment, Minor Variance, Plan of Subdivision or Consent, Official Plan Amendment, Site Plan or Ministers Zoning Order?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, please specify the file number, the name of the approval authority considering it, the land it affects, its purpose, its status and its effect on the requested amendment. Parkbridge has developed lands to the west and north		
Has there ever been an industrial or commercial use, including gas station on the subject land or adjacent lands?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
If yes, please specify:		
Is there a reason to believe the subject lands have been contaminated by former uses on the subject land or adjacent lands?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
If yes, please specify:		
Has there ever been waste disposal on the subject land or adjacent lands?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
If yes, please specify:		

8. OTHER APPLICATIONS

Does the application require an Official Plan Amendment, Zoning By-law Amendment, Severance, Minor Variance, or Plan of Subdivision/Condominium?		
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
If yes, please specify: OPA and Rezoning required.		

9. OTHER INFORMATION

Is there any other information that you think may be useful to the Municipality or other agencies in reviewing the application? If so, explain in the space provided or attach on a separate page:

Planning Justification Report as well as technical reports accompany the

 planning applications

Enclosed herewith is the applicable fee and I/We hereby agree to pay further costs and expenses incurred by the Municipality for legal, planning, engineering and/or other costs incidental to this application to the completion of all appeals or Ontario Municipal Board hearings, should they arise.

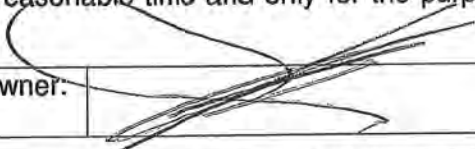
Be advised that the Applicant or a Representative is required to appear at the Development Committee meeting and any other meetings that are required to explain the proposal and answer any questions that may arise. Failure to do so may result in deferral of the application and increased costs.

The Applicant shall provide any other material or studies requested by an official representing the Corporation of the Town of Wasaga Beach in order for the Municipality to review the application. This could include special topic studies (Examples include but are not limited to, Noise Studies, Environmental Impact Studies, Traffic Studies, D-4 Studies, Golf Ball Scatter Studies, etc.) and could further include peer review of the studies as requested by the Municipality. Five copies of each plan (including 11x17 reduction of each plan) and three copies of any reports or studies including a digital copy of each drawing and report prepared in support of this application, is required.

10. PERMISSION TO ENTER

Consent is given to the Town of Wasaga Beach, its employees and authorized representatives to enter onto the above noted property, solely for the purpose of obtaining information to assist in the evaluation of this application.

The owner acknowledges that employees or authorized representatives of the Town may enter onto the subject property at any reasonable time and only for the purposes set out above.

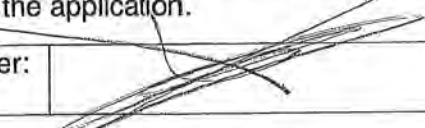
Date:	<i>Dec 12/17</i>	Signature of Owner:	
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11. AUTHORIZATION OF OWNER

If the applicant is not the owner of the land that is the subject of this application, the written authorization of the owner that the applicant is authorized to make the application must be included with this form or the authorization set out below must be completed.

12. AUTHORIZATION OF OWNER/AGENT TO MAKE APPLICATION AND TO PROVIDE PERSONAL INFORMATION

I, *William Higgins*, am the owner of the land this is the subject of this application and for purposes of the Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56., authorize *Celeste Phillips MCIP RPP* as my agent for this application, to provide any of my personal information that will be included in this application or collected during the processing of the application.

Date:	<i>Dec 12/17</i>	Signature of Owner:	
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William A. (Sandy) Higgins
Vice President - Planning & Infrastructure

13. CONSENT OF THE OWNER TO THE USE AND DISCLOSURE OF PERSONAL INFORMATION

I, _____, am the owner of the land that is the subject of this application and for the purposes of the *Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56*. I authorize and consent to the use by or the disclosure to any person or public body of any personal information that is collected under the authority of *The Planning Act* for the purposes of processing this application.

Personal information contained in this form, collected and maintained pursuant to *The Planning Act*, will be used for the purpose of responding to the Application and creating a public record. The Owner's Signature acknowledges that "personal information [is] collected and maintained specifically for the purpose of creating a record available to the general public;" per Section 14(1)(c) of the *Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56*.

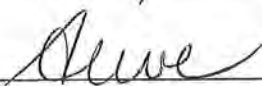
The applicant acknowledges that the Town considers the application forms and all supporting materials, including studies and drawings, filed with this application to be public information and to form part of the public record. With the filing of an application, the applicant consents to the Town photocopying and releasing the application and any supporting material either for its own use in processing the application or at the request of a third party, without further notification to or permission from the applicant. The applicant also hereby states that it has authority to bind its consultants to the terms of this acknowledgement. Questions regarding the collection of information should be directed to the Clerk of the Town of Wasaga Beach, 705-429-3844, ex 2223.

Date:	<u>Dec. 12/17</u>	Signature of Owner:	
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14. AFFIDAVIT OR SWORN DECLARATION OF OWNER/AGENT

Declaration for the Prescribed and Requested Information
I, William Higgins, of the Town of Wasaga Beach in the County of Simcoe do solemnly declare that all of the above statements and all attachments are true, and I make this oath declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of *The Canada Evidence Act*.

DECLARED before me at the Town of Wasaga Beach in the County of Simcoe this 12th day of Dec., 2017


Signature

Busan May Irvine, a Commissioner, etc.,
Province of Ontario, for
Parkbridge Lifestyle Communities Inc.
A Commissioner, etc.

Please submit your complete application to:

**The Town of Wasaga Beach
Planning Department
30 Lewis Street
Wasaga Beach, Ontario L9Z 1A1
Regular business hours: Monday to Friday from 8:30 a.m. to 4:30 p.m.**



THE CORPORATION OF THE TOWN OF WASAGA BEACH

PLANNING DEPARTMENT

**OFFICIAL PLAN AMENDMENT
APPLICATION FOR APPROVAL**

OFFICE USE ONLY	
DATE RECEIVED:	FILE NO.:
DATE APPLICATION DEEMED COMPLETE:	
FEES	
Official Plan Amendment	
• Major	\$8,500.00*
• Minor	\$4,500.00*
Legal fees	\$ 750.00
*plus prescribed fee and deposit for Engineering Review Fee	

1. CONTACT INFORMATION

Applicant Information

Name of applicant:	Parkbridge Lifestyle Communities Inc.		
Mailing Address:	690 River Road West, Wasaga Beach L9Z 2P1		
Telephone No:	705.429.8559	Cell No:	
E-Mail:	jpavao@parkbridge.com	Fax No:	705.429.6089

Owner Information (if different from Applicant)

Name of Owner:			
Mailing Address:			
Telephone No:		Cell No:	
E-Mail:		Fax No:	

Agent Information (if applicable)

Name of Agent:	Celeste Phillips Planning Inc.		
Mailing Address:	300-85 Bayfield Street, Barrie L4M 3A7		
Telephone No:	705.797.8977	Cell No:	
E-Mail:	celeste@cplan.ca	Fax No:	

Communications should be sent to Applicant Owner Agent

Name of Mortgagee, charges or encumbrances, in respect to the subject lands (if applicable)

Name:			
Mailing Address:			
Telephone No:		Cell No:	
E-Mail:		Fax No:	

2. LOCATION AND DESCRIPTION OF THE SUBJECT LANDS

Location of Subject Property (complete applicable lines)

Street & Number:	Not assigned		
Tax Roll #:	436401001136650		
Lot No.:	Part of the South Half Lot 25	Concession:	9
Part No.:		Plan No.:	

Easements or Restrictive Covenants

Are there any easements or restrictive covenants affecting the subject lands?
If yes, Describe the easement or covenant and its effect:

Dimensions of Subject Property (in metric units)

Frontage	160.1 metres along Wally Drive	metres
Average Width	+/- 167 metres	metres
Depth	167.3 metres along Theme Park Drive	metres
Area	+/- 3.1 hectares	square metres

3. EXISTING LAND USES & ZONING

Existing Use and Zoning

Describe the existing uses on the subject land:	Vacant lands
The length of time that the existing uses on the subject land have continued:	
Current land use designation in the Official Plan	Tourism Commercial
Current Zoning: CCH-4	
Current Land Use Designation of abutting lands:	
North Tourism Commercial	South Recreational Commercial
East Tourism Commercial	West Residential
Current Zoning of abutting lands:	
North CT-9	South CR
East EP and CDH	West R3

4. PROPOSED USES AND ZONING

Proposed Use and Zoning

Describe the proposed uses of the subject land:
Land lease townhouses
Proposed land use designation in the Official Plan:
Residential
Proposed Zoning: R3

5. EXISTING AND PROPOSED STRUCTURES

STRUCTURE DETAILS	EXISTING	PROPOSED
Number of structures	0	66 townhouses in 12 buildings
Structure #1		
Date constructed:		
Gross Floor Area (sq/m)		
Structure #2		
Date constructed:		
Gross Floor Area (sq/m)		
Structure #3		
Date constructed:		
Gross Floor Area (sq/m)		

6. ACCESS AND SERVICING INFORMATION

Type of Access	Existing	Proposed
Provincial highway		
Municipal road, maintained year round	X	Access via municipal road but private roads within development
Municipal road, maintained seasonally other public road		
Other public road		
Please specify:		
Right of way	20 m (Theme Park Dr.)	12 m private roads
Please specify:		
Water access		
Please describe the parking and docking facilities and the approximate distances of these facilities from the subject land and the nearest public road		
Type of Water Supply	Existing	Proposed
Municipally operated piped water system		X
Privately owned/operated individual well		
Privately owned/operated communal well		
Lake or water body		
Please specify		
Other means		
Please specify		

Type of Storm Water Control	Existing	Proposed
Storm drainage sewer		SWM pond
Ditch		
Swale		
Other means		
Please specify		
Type of Sewage Disposal	Existing	Proposed
Municipally operated sanitary sewers		X
Privately owned/operated individual septic		
Privately owned/operated communal septic		
Privy		
Other means		
Please specify		
Utilities	Existing	Proposed
Hydro		X
Natural gas		
Telecommunications		X
Is it the intent of this application to permit development on privately owned and operated individual or communal septic systems where more than 4500 litres effluent would be produced per day as a result of the development being completed?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, the following is required:	i) A Servicing Options Report ii) A Hydrogeological Report	

7. PLANNING HISTORY OF THE SUBJECT LAND

Has the subject land or land within 120 metres of it, ever been the subject of a Zoning By-law Amendment, Minor Variance, Plan of Subdivision or Consent, Official Plan Amendment, Site Plan or Ministers Zoning Order?		
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
If yes, specify the file number, the name of the approval authority considering it, the land it affects, its purpose, its status and its effect on the requested amendment:		
Other lands developed by Parkbridge to west and north (but not subject property)		
Has there ever been an industrial or commercial use, including gas station on the subject land or adjacent lands?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
If yes, please specify:		
Is there a reason to believe the subject lands have been contaminated by former uses on the subject land or adjacent lands?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
If yes, please specify:		

Has there ever been waste disposal on the subject land or adjacent lands?	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, please specify:	

8. OTHER APPLICATIONS

Does the application require a Zoning By-law Amendment, Severance, Minor Variance, Site Plan Approval, or Plan of Subdivision/Condominium?		
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
If yes, please specify: Zoning By-law Amendment and Site Plan Approval		

9. OFFICIAL PLAN AMENDMENT DETAIL

Does the proposed amendment change, replace or delete a policy in the Official Plan?	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, indicate the policy to be changed, replaced or deleted.	
Does the proposed amendment add a policy to the Official Plan?	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Describe the purpose of the proposed amendment:	
To redesignate the lands to a Residential category	
Provide the current designation of the subject land in the Official Plan and the land uses that the current designation authorizes:	
Tourist commercial uses currently permitted	
Does the requested amendment change or replace a designation in the Official Plan?	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, provide the designation to be changed or replaced:	
Redesignation to Residential is requested	
Provide the land uses that the proposed Official Plan Amendment would authorize:	
Townhomes	
If a policy in the Official Plan is being changed, replaced or deleted or if a policy is being added, has the text of the proposed amendment been provided with this application? No policy change proposed	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If the requested amendment changes or replaces a schedule in the Official Plan, has the proposed schedule and the accompanying text been provided with this application?	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

10. PROVINCIAL PLANS

Is the proposed amendment consistent with the policy statements issued under Subsection 3(1) of <i>The Planning Act</i> ?	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Is the subject land within an area of land designated under any provincial plan or plans?	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, does the application conform to or not in conflict with the applicable provincial plan or plans?	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Does the requested amendment remove the subject land from an area of employment?	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, provide the current official plan policies details that deal with the matter.	
Does the requested amendment alter all or any part of the boundary of an area of settlement in the municipality or establish a new area of settlement in the municipality?	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, provide current Official Plan policies if any dealing with the alteration or establishment of an area of settlement on a separate sheet.	

11. ADDITIONAL REQUIREMENTS

Supplementary and support material to accompany application, where applicable:

a) A survey of the subject property showing the following:

A survey of the property prepared by an Ontario Land Surveyor indicating topographical contours and other natural and artificial features such as existing buildings and their uses, railways, highways, pipelines, ditches, swamps, watercourses, drainage, and wooded areas within or adjacent to the subject land. This survey should clearly indicate the land which is the subject of this application.

OR

b) An accurate sketch drawn to scale in metric units showing the following:

1. The boundaries and dimensions of the subject land;
2. The location, size and type of all existing and proposed buildings and structures on the subject land, indicating the distance of the buildings or structures from the front yard lot line, rear yard lot line and the side yard lot lines.
3. The approximate location of all natural and artificial features on the subject land (for example, buildings, railways, roads, watercourses, drainage ditch, river or stream banks, wetlands, wooded areas, wells and septic tanks) that are located on the subject land and on land that is adjacent to the subject land and in the opinion of the applicant, may affect the application;
4. The current use(s) on land that is adjacent to the subject land;
5. The location, width and name of any roads within or abutting the subject land, indicating whether it is an unopened road allowance, a public traveled road, a private road or a right of way;
6. If access to the subject land is by water only, the location of the parking and docking facilities to be used; and,
7. The location and nature of any easement(s) affecting the subject land.

12. OTHER INFORMATION

Is there any other information that you think may be useful to the Municipality or other agencies in reviewing the application? If so, explain on the space provided or attach on a separate page:

Planning Justification Report included with planning applications.

Technical Reports also included with the application package.

Enclosed herewith is the applicable fee and I/We hereby agree to pay further costs and expenses incurred by the Municipality for legal, planning, engineering and/or other costs

incidental to this application to the completion of all appeals or Ontario Municipal Board hearings, should they arise.

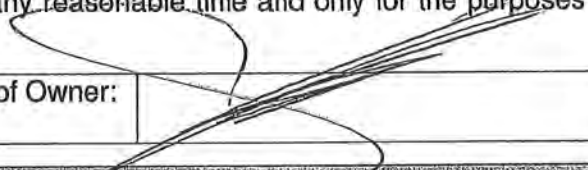
Be advised that the Applicant or a Representative is required to appear at the Development Services Section of Coordinated Committee Meeting and any other meetings that are required to explain the proposal and answer any questions that may arise. Failure to do so may result in deferral of the application and increased costs.

The Applicant shall provide any other material or studies requested by an official representing the Corporation of the Town of Wasaga Beach in order for the Municipality to review the application. This could include special topic studies (Examples include but are not limited to, Noise Studies, Environmental Impact Studies, Traffic Studies, D-4 Studies, Golf Ball Scatter Studies, etc.) and could further include peer review of the studies as requested by the Municipality. Five copies of each plan (including 11x17 reduction of each plan) and three copies of any reports or studies including a digital copy of each drawing and report prepared in support of this application, is required.

13. PERMISSION TO ENTER

Consent is given to the Town of Wasaga Beach, its employees and authorized representatives to enter onto the above noted property, solely for the purpose of obtaining information to assist in the evaluation of this application.

The owner acknowledges that employees or authorized representatives of the Town may enter onto the subject property at any reasonable time and only for the purposes set out above.

Date:	Dec. 12/17	Signature of Owner:	
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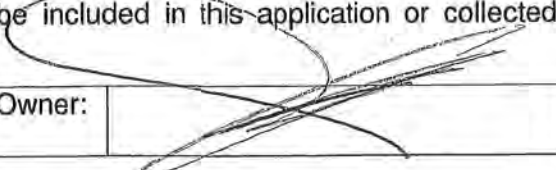
14. AUTHORIZATION OF OWNER

If the applicant is not the owner of the land that is the subject of this application, the written authorization of the owner that the applicant is authorized to make the application must be included with this form or the authorization set out below must be completed.

15. AUTHORIZATION OF OWNER FOR AGENT TO MAKE APPLICATION AND TO PROVIDE PERSONAL INFORMATION

I, William A Higgins, am the owner of the land this is the subject of this application for consent and for purposes of the *Freedom of Information and Protection of Privacy Act*, R.S.O. 1990, c.M. 56.

I authorize Celeste Phillips, MCIP RPP as my agent for this application, to provide any of my personal information that will be included in this application or collected during the processing of the application.

Date:	Dec. 12/17	Signature of Owner:	
-------	------------	---------------------	--------------------------------------------------------------------------------------

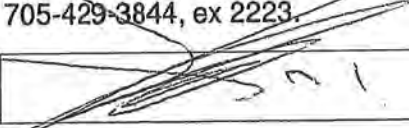
William A. (Sandy) Higgins
Vice President, Planning & Infrastructure

16. CONSENT OF OWNER TO THE USE AND DISCLOSURE OF PERSONAL INFORMATION

I, WILLIAM A. HIGGINS, am the owner of the land that is the subject of this consent application and for the purposes of the *Freedom of Information and Privacy Act*, R.S.O. 1990, c. M. 56. I authorize and consent to the use by or the disclosure to any person or public body of any personal information that is collected under the authority of The Planning Act for the purposes of processing this application.

Personal information contained in this form, collected and maintained pursuant to *The Planning Act*, will be used for the purpose of responding to the Application and creating a public record. The Owner's Signature acknowledges that "personal information [is] collected and maintained specifically for the purpose of creating a record available to the general public;" per Section 14(1)(c) of the *Municipal Freedom of Information and Protection of Privacy Act*, R.S.O. 1990, c. M. 56.

The applicant acknowledges that the Town considers the application forms and all supporting materials, including studies and drawings, filed with this application to be public information and to form part of the public record. With the filing of an application, the applicant consents to the Town photocopying and releasing the application and any supporting material either for its own use in processing the application or at the request of a third party, without further notification to or permission from the applicant. The applicant also hereby states that it has authority to bind its consultants to the terms of this acknowledgement. Questions regarding the collection of information should be directed to the Clerk of the Town of Wasaga Beach, 705-429-3844, ex 2223.

Date: <u>Dec. 12/17</u>	Signature of Owner: 
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17. AFFIDAVIT OR SWORN DECLARATION OF OWNER/AGENT

Declaration for the Prescribed and Requested Information
 I, WILLIAM A. HIGGINS, of the Town of Wasaga Beach in the County of SIMCOE do solemnly declare that all of the above statements and all attachments are true, and I make this oath declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of *The Canada Evidence Act*.

DECLARED before me at the Town of Wasaga Beach, in the County of SIMCOE this 12th day of December, 2017


 Signature

Susan May Irvine, a Commissioner, etc.,
 Province of Ontario, for
 Parkbridge Lifestyle Communities Inc.
 A Commissioner, etc.

Please submit your complete application and the associated fees to:

**The Town of Wasaga Beach
 Planning Department
 30 Lewis Street
 Wasaga Beach, Ontario L9Z 1A1
 Regular business hours: Monday to Friday from 8:30 a.m. to 4:30 p.m.**



**THE CORPORATION OF THE TOWN OF WASAGA BEACH
PLANNING DEPARTMENT**

**ZONING BY-LAW AMENDMENT/LIFTING OF HOLD (H)/
TEMPORARY USE BY-LAW
APPLICATION FOR APPROVAL**

OFFICE USE ONLY	
DATE RECEIVED:	FILE NO.:
DATE APPLICATION DEEMED COMPLETE:	
FEES	
Zoning By-law Amendment	
• Major	\$4,500.00
• Minor	\$2,000.00
Lifting of Hold	\$ 900.00
Temporary Use By-law	\$1,600.00

Pursuant to Sections 34, 36 and 39 of the Planning Act, R.S.O. 1990, c.P.13 and amendments thereto, I/We submit an application to the Town of Wasaga Beach for (please select one only):

- An amendment to Restricted Area (Zoning) by-law in force, with respect to the subject lands, Section 34
- An amendment to Restricted Area (Zoning) by-law in force, with respect to the subject lands to lift the Holding Symbol (H), Section 36
- A Temporary Use By-law, Section 39

1. CONTACT INFORMATION

Applicant Information

Name of applicant:			
Mailing Address:			
Telephone No:		Cell No:	
E-Mail:		Fax No:	

Owner Information (if different from Applicant)

Name of Owner:	Parkbridge Lifestyle Communities Inc.		
Mailing Address:	690 River Road West, Wasaga Beach L9Z 2P1		
Telephone No:	705.429.8559	Cell No:	
E-Mail:	jpavao@parkbridge.com	Fax No:	705.429.6089

Agent Information (if applicable)

Name of Agent:	Celeste Phillips Planning Inc.		
Mailing Address:	300-85 Bayfield Street, Barrie L4M 3A7		
Telephone No:	705.797.8977	Cell No:	
E-Mail:	celeste@cplan.ca	Fax No:	

Communications should be sent to Applicant Owner Agent

Name of Mortgagee, charges or encumbrances, in respect to the subject lands (if applicable)

Name:			
Mailing Address:			
Telephone No:		Cell No:	
E-Mail:		Fax No:	

2. LOCATION AND DESCRIPTION OF THE SUBJECT LANDS

Location of Subject Property (complete applicable lines)

Street & Number:	Not assigned		
Tax Roll #:	436401001136650		
Lot No.:	Part of the South Half Lot 25	Concession:	9
Part No.:		Plan No.:	

Easements or Restrictive Covenants

Are there any easements or restrictive covenants affecting the subject lands?
If yes, Describe the easement or covenant and its effect:

Dimensions of Subject Property (in metric units)

Frontage	160.1 metres along Wally Drive	metres
Average Width	+/- 167 metres	metres
Depth	167.3 metres along Theme Park Drive	metres
Area	+/- 3.1 hectares	square metres

3. EXISTING LAND USES & ZONING

Existing Use and Zoning

Date the subject land was acquired by the current Owner	to be provided	
Describe the existing uses on the subject land:	Vacant	
The length of time that the existing uses on the subject land have continued:		
Is the subject land within an area where zoning conditions apply?	Unknown	<input type="checkbox"/> Yes <input type="checkbox"/> No
If yes, please attach an explanation of how the application conforms to the Official Plan policies relating to the zoning with conditions. Planning Justification Report attached		
Is the subject land within an area where the Municipality has pre-determined the minimum and maximum density requirement or the minimum and maximum height requirements?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, state the requirements:		
Current Zoning:	CCH-4	
Current Land Use Designation of abutting lands:		
North	Tourism Commercial	South Recreational Commercial
East	Tourism Commercial	West Residential

4. PROPOSED USES AND ZONING

Proposed Use and Zoning

Proposed Zoning	R3
The purpose or reason why the rezoning has been requested:	
To permit the development of townhomes	
Describe the nature and intent of the proposed rezoning:	
To rezone to R3 to allow for land lease townhouses	
Describe the proposed uses of the subject land:	
See attached plan -- 66 townhouses in 12 buildings	
Is the requested amendment to the Zoning By-law consistent with the policy statements issued under subsection 3(1) of <i>The Planning Act</i> ?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

5. EXISTING AND PROPOSED STRUCTURES

STRUCTURE DETAILS	EXISTING	PROPOSED
Number of structures	0	66 townhouses in
Structure #1		12 buildings
Date constructed:		
Gross Floor Area (sq/m)		(see attached plan)
Ground Floor Area (sq/m)		
Number of storeys		
Structure length (m)		
Structure width (m)		
Structure height (m)		
Setback from front lot line (metres)		
Setback from rear lot line (metres)		
Setback from side lot line (metres)		
Structure #2		
Date constructed:		
Gross Floor Area (sq/m)		
Ground Floor Area (sq/m)		
Number of storeys		
Structure length (m)		
Structure width (m)		
Structure height (metres)		
Setback from front lot line (metres)		
Setback from rear lot line (metres)		
Setback from side lot line (metres)		
Structure #3		
Date constructed:		
Gross Floor Area (sq/m)		
Ground Floor Area (sq/m)		
Number of storeys		
Structure length (m)		
Structure width (m)		
Structure height (metres)		
Setback from front lot line (metres)		
Setback from rear lot line (metres)		
Setback from side lot line (metres)		

If there are more than 3 existing or proposed buildings, please provide the information for each additional building on a separate sheet.

6. ACCESS AND SERVICING INFORMATION

Type of Access	Existing	Proposed
Provincial highway		
Municipal road, maintained year round	Theme Park Drive Wally Drive	access from Theme Park and Wally Drives
Municipal road, maintained seasonally other public road		- private roads within proposed development
Other public road		
Please specify:		
Right of way		Private roads - 12 m.
Please specify:		
Water access		
Please describe the parking and docking facilities and the approximate distances of these facilities from the subject land and the nearest public road		
Type of Water Supply	Existing	Proposed
Municipally operated piped water system		X
Privately owned/operated individual well		
Privately owned/operated communal well		
Lake or water body		
Please specify		
Other means		
Please specify		
Type of Storm Water Control	Existing	Proposed
Storm drainage sewer		SWM Pond
Ditch		
Swale		
Other means		
Please specify		
Type of Sewage Disposal	Existing	Proposed
Municipally operated sanitary sewers		X
Privately owned/operated individual septic		
Privately owned/operated communal septic		
Privy		
Other means		
Please specify		

Utilities	Existing	Proposed
Hydro		X
Natural gas		
Telecommunications		X
Is it the intent of this application to permit development on privately owned and operated individual or communal septic systems where more than 4500 litres effluent would be produced per day as a result of the development being completed?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, the following is required:	i) A Servicing Options Report	
	ii) A Hydrogeological Report	

7. PLANNING HISTORY OF THE SUBJECT LAND

Has the subject land ever been the subject of a Zoning By-law Amendment, Minor Variance, Plan of Subdivision or Consent, Official Plan Amendment, Site Plan or Ministers Zoning Order?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Unknown
If yes, specify the file number and the status of the application:		
Has there ever been an industrial or commercial use, including gas station on the subject land or adjacent lands?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
If yes, please specify:		
Is there a reason to believe the subject lands have been contaminated by former uses on the subject land or adjacent lands?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
If yes, please specify:		
Has there ever been waste disposal on the subject land or adjacent lands?		
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
If yes, please specify:		

8. OFFICIAL PLAN INFORMATION

Provide the current Official Plan Designation of the subject lands	Tourism Commercial
How does the application conform to the Official Plan?	
Please see enclosed Planning Justification Report	
Redesignation requested to Residential	
Does the application to implement an alteration to the boundary of an area of settlement or implement a new area of settlement in the municipality	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, attach details of the Official Plan policies or Official Plan Amendments that deals with the matter.	
How does the application conform to the Official Plan?	
Please see attached Planning Justification Report	
Does the application to implement an alteration to the boundary of an area of settlement or implement a new area of settlement in the municipality?	

<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, attach details of the Official Plan policies or Official Plan Amendment that deals with the matter.	
How does the application conform to the Official Plan?	
See Planning Justification Report	
Does the requested amendment remove the subject land from an area of employment?	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, provide details of the current Official Plan policies or Official Plan Amendment that deal with the matter:	
Does the requested amendment alter all or any part of the boundary of an area of settlement in the municipality or establish a new area of settlement in the municipality?	
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, provide current Official Plan policies if any dealing with the alteration or establishment of an area of settlement on a separate sheet.	

9. PROVINCIAL PLANS INFORMATION

Is the proposed amendment consistent with the policy statements issued under Subsection 3(1) of the Planning Act?	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Is the subject land within an area of land designated under any provincial plan or plans?	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, does the application conform to or not in conflict with the applicable provincial plan or plans?	
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

10. ADDITIONAL REQUIREMENTS

Supplementary and support material to accompany application, where applicable:

a) A survey of the subject property showing the following:

A survey of the property prepared by an Ontario Land Surveyor indicating topographical contours and other natural and artificial features such as existing buildings and their uses, railways, highways, pipelines, ditches, swamps, watercourses, drainage, and wooded areas within or adjacent to the subject land. This survey should clearly indicate the land which is the subject of this application.

OR

b) An accurate sketch drawn to scale in metric units showing the following:

1. The boundaries and dimensions of the subject land;
2. The location, size and type of all existing and proposed buildings and structures on the subject land, indicating the distance of the buildings or structures from the front yard lot line, rear yard lot line and the side yard lot lines.
3. The approximate location of all natural and artificial features on the subject land (for example, buildings, railways, roads, watercourses, drainage ditch, river or stream banks, wetlands, wooded areas, wells and septic tanks) that are located on the subject land and on land that is adjacent to the subject land and in the opinion of the applicant, may affect the application;
4. The current use(s) on land that is adjacent to the subject land;
5. The location, width and name of any roads within or abutting the subject land, indicating whether it is an unopened road allowance, a public traveled road, a private road or a right of way;
6. If access to the subject land is by water only, the location of the parking and docking facilities to be used; and,
7. The location and nature of any easement(s) affecting the subject land.

11. OTHER INFORMATION

Is there any other information that you think may be useful to the Municipality or other agencies in reviewing the application? If so, explain on the space provided or attach on a separate page:

Planning Justification Report enclosed with planning applications, along with technical reports.

Enclosed herewith is the applicable fee and I/We hereby agree to pay further costs and expenses incurred by the Municipality for legal, planning, engineering and/or other costs incidental to this application to the completion of all appeals or Ontario Municipal Board hearings, should they arise.

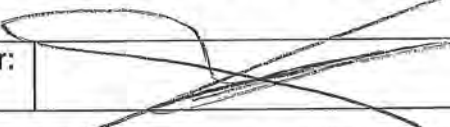
Be advised that the Applicant or a Representative is required to appear at the Committee of Adjustment meeting and any other meetings that are required to explain the proposal and answer any questions that may arise. Failure to do so may result in deferral of the application and increased costs.

The Applicant shall provide any other material or studies requested by an official representing the Corporation of the Town of Wasaga Beach in order for the Municipality to review the application. This could include special topic studies (Examples include but are not limited to, Noise Studies, Environmental Impact Studies, Traffic Studies, D-4 Studies, Golf Ball Scatter Studies, etc.) and could further include peer review of the studies as requested by the Municipality. Five copies of each plan (including 11x17 reduction of each plan) and three copies of any reports or studies including a digital copy of each drawing and report prepared in support of this application, is required.

12. PERMISSION TO ENTER

Consent is given to the Town of Wasaga Beach, its employees and authorized representatives to enter onto the above noted property, solely for the purpose of obtaining information to assist in the evaluation of this application.

The owner acknowledges that employees or authorized representatives of the Town may enter onto the subject property at any reasonable time and only for the purposes set out above.

Date:	Dec. 12/17	Signature of Owner:	
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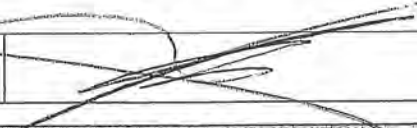
13. AUTHORIZATION OF OWNER

If the applicant is not the owner of the land that is the subject of this application, the written authorization of the owner that the applicant is authorized to make the application must be included with this form or the authorization set out below must be completed.

14. AUTHORIZATION OF OWNER FOR AGENT TO MAKE APPLICATION AND TO PROVIDE PERSONAL INFORMATION

I, William Higgins, am the owner of the land this is the subject of this application for consent and for purposes of the Freedom of Information and Protection of Privacy Act.

I authorize Celeste Phillips, MCIP RPP as my agent for this application, to provide any of my personal information that will be included in this application or collected during the processing of the application.

Date:	Dec. 12/17	Signature of Owner:	
-------	------------	---------------------	--------------------------------------------------------------------------------------


15. CONSENT OF OWNER TO THE USE AND DISCLOSURE OF PERSONAL INFORMATION

I, William Higgins, am the owner of the land that is the subject of this consent application and for the purposes of the *Freedom of Information and Privacy Act, R.S.O. 1990, c.M. 56*. I authorize and consent to the use by or the disclosure to any person or public body of any personal information that is collected under the authority of The Planning Act for the purposes of processing this application.

Personal information contained in this form, collected and maintained pursuant to *The Planning Act*, will be used for the purpose of responding to the Application and creating a public record. The Owner's Signature acknowledges that "personal information [is]

collected and maintained specifically for the purpose of creating a record available to the general public;" per Section 14(1)(c) of the *Municipal Freedom of Information and Protection of Privacy Act*, R.S.O. 1990, c. M. 56.

The applicant acknowledges that the Town considers the application forms and all supporting materials, including studies and drawings, filed with this application to be public information and to form part of the public record. With the filing of an application, the applicant consents to the Town photocopying and releasing the application and any supporting material either for its own use in processing the application or at the request of a third party, without further notification to or permission from the applicant. The applicant also hereby states that it has authority to bind its consultants to the terms of this acknowledgement. Questions regarding the collection of information should be directed to the Clerk of the Town of Wasaga Beach, 705-429-3844, ex 2223.

Date:	<u>Dec. 12/17</u>	Signature of Owner:	
-------	-------------------	---------------------	------------------------------------------------------------------------------------

16. AFFIDAVIT OR SWORN DECLARATION OF OWNER/AGENT

Declaration for the Prescribed and Requested Information

I, William Higgins, of the Town of Wasaga Beach in the County of Simcoe do solemnly declare that all of the above statements and all attachments are true, and I make this oath declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of *The Canada Evidence Act*.

DECLARED before me at the Town of Wasaga Beach in the County of Simcoe this 12th day of Dec., 2017

Signature 

Susan May Irvine, a Commissioner, etc.,
Province of Ontario, for
Planning Department
Planning Department
Planning Department Inc.

Please submit your complete application to:

**The Town of Wasaga Beach
Planning Department
30 Lewis Street
Wasaga Beach, Ontario L9Z 1A1**

Regular business hours: Monday to Friday from 8:30 a.m. to 4:30 p.m.

Appendix B:
Sanitary Sewer Design Sheet

SANITARY SEWER DESIGN SHEET



C.C. Tatham & Associates Ltd.
Consulting Engineers

Collingwood Bracebridge Orillia Barrie Ottawa

FLOW CRITERIA
Average Daily Flow Rate: 350 L/cap/d
Inflow/Infiltration Rate: 0.28 L/s/ha
Peaking Factor: Harmon
Density: 2.5 cap/unit


Project Number: 117098
Project Name: Wasaga County Life - Phase 5
Municipality: Town of Wasaga Beach
Designed By: SDH
Date: September 22, 2017
Revised By: PM
Date: December 12, 2017
Checked By: KRS
Date: December 12, 2017
Revision: 0

Approved:

LOCATION OF SECTION	AREA LABEL	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	NUMBER OF UNITS	POPULATION	ACCUMULATED POPULATION	PEAKING FACTOR	AREA	ACCUMULATED AREA	AVERAGE FLOW			PEAK FLOW			PROPOSED SEWER					
										RESIDENTIAL	INFILTRATION	TOTAL	RESIDENTIAL	INFILTRATION	TOTAL	LENGTH OF PIPE	PIPE DIAMETER	GRADE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	PEAK FLOW VELOCITY (ZERO INFILTRATION)
		MH No.	MH No.	no.	cap.	cap.		ha	ha	l/s	l/s	l/s	l/s	l/s	l/s	mm	%	l/s	m/s	m/s	
Street A	300	100	101	13	34	34	4.35	0.62	0.62	0.14	0.17	0.31	0.60	0.17	0.77	70.3	200	1.6%	41.48	1.32	0.48
Street A	301	101	105	17	44	78	4.27	0.59	1.20	0.32	0.34	0.65	1.35	0.34	1.69	70.3	200	0.5%	23.19	0.74	0.39
Street A	302	102	103	16	42	42	4.33	0.50	0.50	0.17	0.14	0.31	0.73	0.14	0.87	70.0	200	1.0%	32.80	1.04	0.43
Street A	303	103	104	12	31	73	4.28	0.86	1.38	0.29	0.39	0.68	1.26	0.39	1.65	70.0	200	0.5%	23.19	0.74	0.39
Street B	304	104	105	4	10	83	4.26	0.31	1.69	0.34	0.47	0.81	1.44	0.47	1.91	75.6	200	0.5%	23.19	0.74	0.40
Street A	305	105	107	4	10	172	4.17	0.17	3.06	0.70	0.86	1.55	2.90	0.86	3.76	56.2	200	0.5%	23.19	0.74	0.48
Welly Drive		106	107		0	0	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.2	300	0.5%	66.37	0.97	0.00
Welly Drive		107	207		0	172	4.17	0.00	3.06	0.70	0.86	1.55	2.90	0.86	3.76	117.3	300	0.5%	66.37	0.97	0.47

Notes:
1. Refer to Sanitary Drainage Plan drawing SAN-1 prepared by C.C. Tatham & Associates Ltd. (dated May 2017) for catchment areas and pipe details.

Appendix C:
Stormwater Management



C.C. Tatham & Associates Ltd.
Consulting Engineers

Collingwood Bracebridge Orillia Barrie
CN Calculator

Project: Wasaga County Life - Phase 5	
File No.: 117088	
Date: September 2017	
Designed By: AW	
Checked By:	
Subject: CN Calculator	

**Wasaga County Life - Phase 5
CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS**

CONDITIONS

Catchment Area: 101 1.74 ha

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient		Catchment Soil Characteristics		Forest/Woodland		Pasture/Lawn		Meadows		Gravel		Impervious		Wetland/Lake/SWMP		Average CN for Soil Type	
				Type	Value	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent		Area
Its	TIOGA	A	Sand Loam	#N/A	1	1.74	1	0	0	0	32	1.479	0	0	89	0.15	0	0	0	50	55
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0
Totals						1.74	1	0	0	1.479	0.85	0	0	0.261	0.15	0	0	0	0	50	55.0

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Brasby-Williams Formula

Maximum Catchment Elevation 187.38 m
 Minimum Catchment Elevation 185.36 m
 Catchment length 250 m
 Catchment Slope 1%
 Catchment Area 1.74 ha

Time of Concentration (Minutes) 14.07
 Time of Concentration (Hours) 0.23
 Time to Peak (2.5 x Time of Concentration) 0.16

Time to Peak 0.07 hrs

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation 187.38 m
 Minimum Catchment Elevation 185.36 m
 Catchment length 250 m
 Catchment Slope 1%
 Catchment Area 1.74 ha

Time of Concentration (Minutes) 51.15
 Time of Concentration (Hours) 0.85
 Time to Peak (2.5 x Time of Concentration) 0.57

Time to Peak 0.07 hrs

Initial Abstraction: 4.7 mm

Runoff Coefficient: 0.13

Wetlands	12
Woods	10
Meadows	8
Gravel	3
Lawns	5
Impervious	2

Landuse Type	Soil Series	
	tis	0
Forest/Woodland	0.08	#N/A
Gravel	0.6	#N/A
Pasture/Lawn	0.1	#N/A
Impervious	0.95	#N/A
Wetland/Lake/SWMP	0.05	#N/A
Meadows	0.09	#N/A
Soil Series Total	0.175	#N/A

C.C. Tatham & Associates Ltd.
Consulting Engineers

Collingwood Bracebridge Driflita Barrie

Project:	Wasaga County Life - Phase 5
File No.:	117088
Date:	September 2017
Designed By:	AW
Checked By:	
Subject:	CN Calculator

**Wasaga County Life - Phase 5
CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS**

CONDITIONS
Catchment Area ha

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland		Pasture/Lawns		Meadows		Gravel		Impervious		Wetland/Lake/SWMP		Average CN for Soil Type
					Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	
ts	TIOGA	A	Sand Loam	1	1.32	1	0.396	0.3	32	0.726	0.55	49	0.15	89	0	100	0	50	49.9
	#N/A	#N/A	#N/A	#N/A	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A
	#N/A	#N/A	#N/A	#N/A	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A
	#N/A	#N/A	#N/A	#N/A	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A
	#N/A	#N/A	#N/A	#N/A	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	#N/A
Totals					1.32	1	0.396	0.3	32	0.726	0.55	49	0.15	89	0	100	0	50	49.9

Time of Concentration Calculations
For Runoff Coefficients greater than 0.4
Bransby-Williams Formula

Maximum Catchment Elevation m
Minimum Catchment Elevation m
Catchment length m
Catchment Slope
Catchment Area ha

Time of Concentration (Minutes)
Time of Concentration (Hours)
Time to Peak (2.5 x Time of Concentration)
Time to Peak hrs

For Runoff Coefficients less than 0.4
Airport Method

Maximum Catchment Elevation m
Minimum Catchment Elevation m
Catchment length m
Catchment Slope
Catchment Area ha


Time of Concentration (Minutes)
Time of Concentration (Hours)
Time to Peak (2.5 x Time of Concentration)
Time to Peak hrs

Initial Abstraction mm

Wetlands	12
Woods	10
Meadows	8
Gravel	3
Lawns	5
Impervious	2

Runoff Coefficient

Landuse Type	Soil Series	
	ts	0
Forest/Woodland	1	#N/A
Gravel	0.8	#N/A
Pasture/Lawn	0.1	#N/A
Impervious	0.85	#N/A
Wetland/Lake/SWMP	0.05	#N/A
Meadows	0.09	#N/A
Soil Series Total	0.169	#N/A



C.C. Tatham & Associates Ltd.
Consulting Engineers

Collingwood Braccbridge Drifilla Barria

Project: Wasaga County Life - Phase 5
 File No.: 117098
 Date: September 2017
 Designed By: AW
 Checked By:
 Subject: CN Calculator

Wasaga County Life - Phase 5
CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

CONDITIONS
 Catchment Area: 302 3.70 ha

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient		Catchment Soil Characteristics		Forest/Woodland		Pasture/Lawn		Meadows		Gravel		Impervious		Wetland/Lake/SWMP		Average CN for Soil Type
				Type	Value	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	
IS	TIOGA	A	Sand Loam	1	3.7	1	0.185	0.05	32	2.405	0.65	49	0	38	1.11	0.3	89	0	100	50
				#/A	0	0	0	0	#/A	0	0	0	0	#/A	0	0	0	0	#/A	0
				#/A	0	0	0	0	#/A	0	0	0	0	#/A	0	0	0	0	#/A	0
				#/A	0	0	0	0	#/A	0	0	0	0	#/A	0	0	0	0	#/A	0
				#/A	0	0	0	0	#/A	0	0	0	0	#/A	0	0	0	0	#/A	0
Totals					3.7	1	0.185	0.05	2,405	0.65	49	0	38	1.11	0.3	89	0	100	50	60.15

Initial Abstraction: 4.56 mm

Wetlands	12
Woods	10
Meadows	8
Gravel	3
Lawns	5
Impervious	2

Runoff Coefficient: 0.25

Landuse Type	IS		T		Soil Series	
	IS	T	IS	T	IS	T
Forest/Woodland	0.08	0.08	#/A	#/A	#/A	#/A
Gravel	0.05	0.05	#/A	#/A	#/A	#/A
Pasture/Lawn	0.1	0.1	#/A	#/A	#/A	#/A
Impervious	0.95	0.95	#/A	#/A	#/A	#/A
Wetland/Lake/SWMP	0.05	0.05	#/A	#/A	#/A	#/A
Meadows	0.08	0.08	#/A	#/A	#/A	#/A
Soil Series Total	0.249	0.249	#/A	#/A	#/A	#/A

Time of Concentration Calculations
 For Runoff Coefficients greater than 0.4
 Bransby-Williams Formula

Maximum Catchment Elevation: 191 m
 Minimum Catchment Elevation: 186 m
 Catchment length: 325 m
 Catchment Slope: 2%
 Catchment Area: 3.7 ha

Time of Concentration (Minutes): 14.51
 Time of Concentration (Hours): 0.25
 Time to Peak (2/3 x Time of Concentration): 0.17
 Time to Peak: 0.34 hrs

For Runoff Coefficients less than 0.4
 Airport Method

Maximum Catchment Elevation: 191 m
 Minimum Catchment Elevation: 186 m
 Catchment length: 325 m
 Catchment Slope: 2%
 Catchment Area: 3.7 ha

Time of Concentration (Minutes): 43.39
 Time of Concentration (Hours): 0.72
 Time to Peak (2/3 x Time of Concentration): 0.48
 Time to Peak: 0.72 hrs

4hr Chicago storm - Existing Condition

```

V V V I I SSSS U U A A L
V V V I I SS U U A A L
V V V I I SS U U A A L
V V V I I SSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000
O O T T T H H Y Y M M O O
O O T T T H H Y Y M M O O
000 T T T H H Y Y M M 000
    
```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.2\voim.dat
 Output filename: I:\2017PR-1\117098-1\Design\SWM\103189-1\chi1.out
 Summary filename: I:\2017PR-1\117098-1\Design\SWM\103189-1\chi1.sum

DATE: 29/09/2017 TIME: 11:33:21 AM

USER:

COMMENTS:

```

*****
** SIMULATION NUMBER: 1 ** 25mm storm
*****
    
```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs								
READ STORM [Prot= 24.97 mm]		6.0						
Filename: I:\DESIGN\103189\PHASE 5\storms\CHIC25MM.4HR								
remark: OWEN SOUND 25 mm (from a 2 year--4hr storm)								
** CALIB NASHYD [CN=37.4]	0301	1	5.0	2.56	.00	2.75	.61	.02
* [N = 3.0:Tp .63]								
** CALIB NASHYD [CN=55.0]	0101	1	5.0	1.74	.01	2.58	1.80	.07

```

** [ N = 3.0:Tp .57 ]
** CALIB NASHYD 0302 1 5.0 3.70 .02 2.50 2.19 .09 .000
** [CN=60.2 ]
** [ N = 3.0:Tp .48 ]
** CALIB NASHYD 0102 1 5.0 1.32 .00 2.67 1.29 .05 .000
** [CN=49.9 ]
** [ N = 3.0:Tp .59 ]
** ADD [0301 + 0101] 0303 3 5.0 4.30 .01 2.67 1.09 n/a .000
** ADD [0302 + 0102] 0304 3 5.0 5.02 .02 2.50 1.95 n/a .000
** ADD [0303 + 0304] 0305 3 5.0 9.32 .03 2.50 1.56 n/a .000
    
```

 ** SIMULATION NUMBER: 2 ** 2 year

W/E COMMAND

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs								
CHIC STORM [Prot= 32.86 mm]		10.0						
** CALIB NASHYD 0301 1 5.0 2.56 .00 2.33 1.31 .04 .000								
* [CN=37.4]								
** CALIB NASHYD 0101 1 5.0 1.74 .01 2.08 3.36 .10 .000								
* [CN=55.0]								
** CALIB NASHYD 0302 1 5.0 3.70 .02 1.92 4.06 .12 .000								
* [CN=60.2]								
** CALIB NASHYD 0102 1 5.0 1.32 .00 2.17 2.52 .08 .000								
* [CN=49.9]								
** ADD [0301 + 0101] 0303 3 5.0 4.30 .01 2.17 2.14 n/a .000								
* ADD [0302 + 0102] 0304 3 5.0 5.02 .03 2.00 3.65 n/a .000								
* ADD [0303 + 0304] 0305 3 5.0 9.32 .04 2.00 2.95 n/a .000								

 ** SIMULATION NUMBER: 3 ** 5 year

W/E COMMAND

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs								
CHIC STORM [Prot= 43.82 mm]		10.0						
** CALIB NASHYD 0301 1 5.0 2.56 .01 2.25 2.69 .06 .000								
* [CN=37.4]								

```

* ** [ N = 3.0:Tp .63]
* ** CALIB NASHVD 0101 1 5.0 1.74 .01 2.08 6.20 .14 .000
* ** [CN=55.0]
* ** [ N = 3.0:Tp .57]
* ** CALIB NASHVD 0302 1 5.0 3.70 .04 1.92 7.41 .17 .000
* ** [CN=60.2]
* ** [ N = 3.0:Tp .48]
* ** CALIB NASHVD 0102 1 5.0 1.32 .01 2.08 4.83 .11 .000
* ** [CN=49.9]
* ** [ N = 3.0:Tp .59]
* ** ADD [0301 + 0101] 0303 3 5.0 4.30 .02 2.08 4.11 n/a .000
* ** ADD [0302 + 0102] 0304 3 5.0 5.02 .05 1.92 6.73 n/a .000
* ** ADD [0303 + 0304] 0305 3 5.0 9.32 .07 2.00 5.52 n/a .000
* **
* ** SIMULATION NUMBER: 4 **
* **
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
CHIC STORM 10.0
[ Ptot= 51.23 mm ]
** CALIB NASHVD 0301 1 5.0 2.56 .01 2.17 3.88 .08 .000
** [CN=37.4]
** [ N = 3.0:Tp .63]
** CALIB NASHVD 0101 1 5.0 1.74 .02 2.00 8.51 .17 .000
** [CN=55.0]
** [ N = 3.0:Tp .57]
** CALIB NASHVD 0302 1 5.0 3.70 .06 1.92 10.12 .20 .000
** [CN=60.2]
** [ N = 3.0:Tp .48]
** CALIB NASHVD 0102 1 5.0 1.32 .01 2.08 6.76 .13 .000
** [CN=49.9]
** [ N = 3.0:Tp .59]
** ADD [0301 + 0101] 0303 3 5.0 4.30 .03 2.08 5.76 n/a .000
** ADD [0302 + 0102] 0304 3 5.0 5.02 .07 1.92 9.23 n/a .000
** ADD [0303 + 0304] 0305 3 5.0 9.32 .10 2.00 7.63 n/a .000
**
* ** SIMULATION NUMBER: 5 **
* **
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
CHIC STORM 10.0

```

```

* ** [ Ptot= 60.42 mm ]
* ** CALIB NASHVD 0301 1 5.0 2.56 .02 2.17 5.63 .09 .000
* ** [CN=37.4]
* ** [ N = 3.0:Tp .63]
* ** CALIB NASHVD 0101 1 5.0 1.74 .03 2.00 11.78 .19 .000
* ** [CN=55.0]
* ** [ N = 3.0:Tp .57]
* ** CALIB NASHVD 0302 1 5.0 3.70 .08 1.92 13.90 .23 .000
* ** [CN=60.2]
* ** [ N = 3.0:Tp .48]
* ** CALIB NASHVD 0102 1 5.0 1.32 .02 2.08 9.51 .16 .000
* ** [CN=49.9]
* ** [ N = 3.0:Tp .59]
* ** ADD [0301 + 0101] 0303 3 5.0 4.30 .05 2.08 8.12 n/a .000
* ** ADD [0302 + 0102] 0304 3 5.0 5.02 .10 1.92 12.75 n/a .000
* ** ADD [0303 + 0304] 0305 3 5.0 9.32 .14 2.00 10.61 n/a .000
* **
* ** SIMULATION NUMBER: 6 **
* **
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
CHIC STORM 10.0
[ Ptot= 66.94 mm ]
** CALIB NASHVD 0301 1 5.0 2.56 .02 2.17 7.04 .11 .000
** [CN=37.4]
** [ N = 3.0:Tp .63]
** CALIB NASHVD 0101 1 5.0 1.74 .04 2.00 14.34 .21 .000
** [CN=55.0]
** [ N = 3.0:Tp .57]
** CALIB NASHVD 0302 1 5.0 3.70 .10 1.92 16.85 .25 .000
** [CN=60.2]
** [ N = 3.0:Tp .48]
** CALIB NASHVD 0102 1 5.0 1.32 .02 2.08 11.66 .17 .000
** [CN=49.9]
** [ N = 3.0:Tp .59]
** ADD [0301 + 0101] 0303 3 5.0 4.30 .06 2.08 9.99 n/a .000
** ADD [0302 + 0102] 0304 3 5.0 5.02 .12 1.92 15.49 n/a .000
** ADD [0303 + 0304] 0305 3 5.0 9.32 .18 1.92 12.95 n/a .000
**
* ** SIMULATION NUMBER: 7 **
* **
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
CHIC STORM 10.0

```

ADD [0303 + 0304] 0305 3 5.0 9.32 .46 7.25 82.74 n/a .000

FINISH

```

START @ .00 hrs
-----
CHIC STORM
[ Ptot= 73.52 mm ]
10.0
** CALIB NASHYD 0301 1 5.0 2.56 .03 2.17 8.60 .12 .000
[ CN=37.4
[ N = 3.0:Tp .63 ]
** CALIB NASHYD 0101 1 5.0 1.74 .04 2.00 17.12 .23 .000
[ CN=55.0
[ N = 3.0:Tp .57 ]
** CALIB NASHYD 0302 1 5.0 3.70 .12 1.92 20.03 .27 .000
[ CN=60.2
[ N = 3.0:Tp .48 ]
** CALIB NASHYD 0102 1 5.0 1.32 .03 2.08 14.06 .19 .000
[ CN=49.9
[ N = 3.0:Tp .59 ]
ADD [0301 + 0101] 0303 3 5.0 4.30 .07 2.08 12.05 n/a .000
ADD [0302 + 0102] 0304 3 5.0 5.02 .14 1.92 18.46 n/a .000
ADD [0303 + 0304] 0305 3 5.0 9.32 .21 1.92 15.50 n/a .000
*****
** SIMULATION NUMBER: 8
*****

```

W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase

```

min ha cms hrs mm cms
-----
START @ .00 hrs
-----
READ STORM
[ Ptot=193.00 mm ]
60.0
frame : I:\DESIGN\103189\PHASE 5\storm\Ttimmins.stm
remark: REGIONAL STORM TIMMINS - 12 hour storm
** CALIB NASHYD 0301 1 5.0 2.56 .08 7.33 55.78 .29 .000
[ CN=37.4
[ N = 3.0:Tp .63 ]
** CALIB NASHYD 0101 1 5.0 1.74 .09 7.25 89.51 .46 .000
[ CN=55.0
[ N = 3.0:Tp .57 ]
** CALIB NASHYD 0302 1 5.0 3.70 .23 7.17 99.57 .52 .000
[ CN=60.2
[ N = 3.0:Tp .48 ]
** CALIB NASHYD 0102 1 5.0 1.32 .06 7.25 78.98 .41 .000
[ CN=49.9
[ N = 3.0:Tp .59 ]
** ADD [0301 + 0101] 0303 3 5.0 4.30 .17 7.33 69.43 n/a .000
** ADD [0302 + 0102] 0304 3 5.0 5.02 .29 7.17 94.15 n/a .000

```

24hr SCS - Existing Condition

```

V V I SSSSS U U A A L
V V I SS U U A A L
V V I SS U U A A L
V V I SSSSS UUUU A A LLLL
000 TTTT TTTT H H Y Y M M 000
O O T T T H H Y Y M M O O
O O T T T H H Y Y M M O O
000 T T T H H Y Y M M 000
    
```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.2\voin.dat
 Output filename: I:\2017PR-1\117098-1\Design\SWM\103189-1\SCS.out
 Summary filename: I:\2017PR-1\117098-1\Design\SWM\103189-1\SCS.sum

DATE: 29/09/2017 TIME: 11:31:14 AM

USER:

COMMENTS:

```

*****
*** SIMULATION NUMBER: 1 of 2 year
*****
    
```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs MASS STORM [Ptot= 55.83 mm]		15.0						
CALIB NASHYD [CN=49.9 N = 3.0:Tp .59]	0102	1 5.0	1.32	.01	12.25	8.08	.14	.000
CALIB NASHYD [CN=60.2 N = 3.0:Tp .48]	0302	1 5.0	3.70	.06	12.17	11.95	.21	.000
CALIB NASHYD [CN=55.0]	0101	1 5.0	1.74	.02	12.25	10.10	.18	.000

```

[ N = 3.0:Tp .57]
*** CALIB NASHYD 0301 1 5.0 2.56 .01 12.33 4.72 .08 .000
[CN=37.4]
[ N = 3.0:Tp .63]
ADD [0102 + 0302] 0304 3 5.0 5.02 .07 12.17 10.94 n/a .000
ADD [0101 + 0301] 0303 3 5.0 4.30 .03 12.33 6.90 n/a .000
ADD [0304 + 0303] 0305 3 5.0 9.32 .10 12.17 9.07 n/a .000
*****
** SIMULATION NUMBER: 2 of 5 year
*****
    
```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs MASS STORM [Ptot= 74.18 mm]		15.0						
CALIB NASHYD [CN=49.9 N = 3.0:Tp .59]	0102	1 5.0	1.32	.02	12.25	14.31	.19	.000
CALIB NASHYD [CN=60.2 N = 3.0:Tp .48]	0302	1 5.0	3.70	.10	12.17	20.36	.27	.000
CALIB NASHYD [CN=55.0]	0101	1 5.0	1.74	.03	12.25	17.41	.23	.000
CALIB NASHYD [CN=37.4 N = 3.0:Tp .63]	0301	1 5.0	2.56	.02	12.33	8.76	.12	.000
ADD [0102 + 0302] 0304 3 5.0 5.02 .12 12.17 18.77 n/a .000								
ADD [0101 + 0301] 0303 3 5.0 4.30 .06 12.25 12.26 n/a .000								
ADD [0304 + 0303] 0305 3 5.0 9.32 .18 12.17 15.76 n/a .000								

```

*****
** SIMULATION NUMBER: 3 of 10 year
*****
    
```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs MASS STORM [Ptot= 86.44 mm]		15.0						
CALIB NASHYD [CN=49.9 N = 3.0:Tp .59]	0102	1 5.0	1.32	.03	12.25	19.20	.22	.000
CALIB NASHYD [CN=60.2]	0302	1 5.0	3.70	.13	12.08	26.79	.31	.000


```

[N = 3.0:Tp .48]
** CALIB NASHYD 0101 1 5.0 1.74 .05 12.25 23.07 .27 .000
[CN=55.0]
[ N = 3.0:Tp .57]
** CALIB NASHYD 0301 1 5.0 2.56 .03 12.33 12.04 .14 .000
[CN=37.4]
[ N = 3.0:Tp .63]
** ADD [0102 + 0302] 0304 3 5.0 5.02 .16 12.17 24.79 n/a .000
** ADD [0101 + 0301] 0303 3 5.0 4.30 .08 12.25 16.51 n/a .000
** ADD [0304 + 0303] 0305 3 5.0 9.32 .24 12.17 20.97 n/a .000
*****
** SIMULATION NUMBER: 4 ** 25 year
*****

```

```

W/E COMMAND HYD ID DT AREA Opeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
MASS STORM 15.0
[ Ptot=101.69 mm ]
** CALIB NASHYD 0102 1 5.0 1.32 .04 12.25 26.01 .26 .000
[CN=49.9]
[ N = 3.0:Tp .59]
** CALIB NASHYD 0302 1 5.0 3.70 .18 12.08 35.54 .35 .000
[CN=60.2]
[ N = 3.0:Tp .48]
** CALIB NASHYD 0101 1 5.0 1.74 .06 12.25 30.86 .30 .000
[CN=55.0]
[ N = 3.0:Tp .57]
** CALIB NASHYD 0301 1 5.0 2.56 .05 12.33 16.72 .16 .000
[CN=37.4]
[ N = 3.0:Tp .63]
** ADD [0102 + 0302] 0304 3 5.0 5.02 .21 12.17 33.03 n/a .000
** ADD [0101 + 0301] 0303 3 5.0 4.30 .11 12.25 22.44 n/a .000
** ADD [0304 + 0303] 0305 3 5.0 9.32 .32 12.17 28.15 n/a .000
*****
** SIMULATION NUMBER: 5 ** 50 year
*****

```

```

W/E COMMAND HYD ID DT AREA Opeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
MASS STORM 15.0
[ Ptot=112.86 mm ]
** CALIB NASHYD 0102 1 5.0 1.32 .05 12.25 31.45 .28 .000
[CN=49.9]

```

```


[N = 3.0:Tp .59]
** CALIB NASHYD 0302 1 5.0 3.70 .21 12.08 42.40 .38 .000
[CN=60.2]
[ N = 3.0:Tp .48]
** CALIB NASHYD 0101 1 5.0 1.74 .08 12.25 37.02 .33 .000
[CN=55.0]
[ N = 3.0:Tp .57]
** CALIB NASHYD 0301 1 5.0 2.56 .06 12.33 20.53 .18 .000
[CN=37.4]
[ N = 3.0:Tp .63]
** ADD [0102 + 0302] 0304 3 5.0 5.02 .26 12.17 39.52 n/a .000
** ADD [0101 + 0301] 0303 3 5.0 4.30 .13 12.25 27.20 n/a .000
** ADD [0304 + 0303] 0305 3 5.0 9.32 .39 12.17 33.84 n/a .000
*****
** SIMULATION NUMBER: 6 ** 100 year
*****

```

```

W/E COMMAND HYD ID DT AREA Opeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
MASS STORM 15.0
[ Ptot=124.03 mm ]
** CALIB NASHYD 0102 1 5.0 1.32 .06 12.25 37.23 .30 .000
[CN=49.9]
[ N = 3.0:Tp .59]
** CALIB NASHYD 0302 1 5.0 3.70 .25 12.08 49.60 .40 .000
[CN=60.2]
[ N = 3.0:Tp .48]
** CALIB NASHYD 0101 1 5.0 1.74 .09 12.25 43.52 .35 .000
[CN=55.0]
[ N = 3.0:Tp .57]
** CALIB NASHYD 0301 1 5.0 2.56 .07 12.33 24.64 .20 .000
[CN=37.4]
[ N = 3.0:Tp .63]
** ADD [0102 + 0302] 0304 3 5.0 5.02 .30 12.17 46.35 n/a .000
** ADD [0101 + 0301] 0303 3 5.0 4.30 .16 12.25 32.28 n/a .000
** ADD [0304 + 0303] 0305 3 5.0 9.32 .46 12.17 39.86 n/a .000
*****
FINISH
*****

```

 C.C. Tatham & Associates Ltd. Consulting Engineers <small>Collingwood Braintreebridge Orillia Barrie</small>	Project: Wasaga Country Life	Date: Dec. 1, 2017
	File No.: 117098	Designed: AO
	Subject: % Impervious Calculator	Checked

Driveway Footprint 30 m²
 Single Unit Footprint 124 m²
 Garage Footprint 18 m²

Catchment ID	Area (m ²)	Total Area of Houses	Total Area of Driveways/ Garages	Road Area (m ²)	Total Impervious Area (m ²)	% Impervious
201	5,000	1488	96	117	1,701	34
202	5,000	992	0	277	1,269	25
203	20,300	5704	2976	2087	10,767	53
Total	30,300					

4 hr Chicago Storm - Proposed Condition

```

V V I SSSSS U U A A L
V V I SS U U A A L
V V I SS U U A A L
W V I SSSSS UUUUU A A LLLLL
000 TTTT TTTT H H Y Y M M 000
O O T T T H H Y Y M M O O
O O T T T H H Y Y M M O O
000 T T T H H Y Y M M 000
    
```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.2\voin.dat
 Output filename: I:\2017PR-1\117098-1\Design\SWM\AO\103189-1\CHI Proposed.out
 Summary filename: I:\2017PR-1\117098-1\Design\SWM\AO\103189-1\CHI Proposed.sum

DATE: 12/1/2017 TIME: 2:23:22 PM

USER:

COMMENTS:

***** SIMULATION NUMBER: 1 *****
 ***** CHIC25mm Event *****

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs								
READ STORM [CN=37.4 POT=24.97 mm]		6.0						
Frame: I:\DESIGN\103189\PHASE 5\storms\CHIC25MM.4HR								
remark: OWEN SOUND 25 mm (from a 2 year-4hr storm)								
* ** CALIB NASHYD [CN=37.4 N = 3.0:Tp .63]	0301	1	5.0	2.56	.00	2.75	.61	.02
* ** CALIB STANDHYD [CN=37.4 N = 3.0:Tp .63]	0201	1	5.0	.50	.01	1.92	5.03	.20

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
* ** CALIB NASHYD [CN=60.2 N = 3.0:Tp .48]	0302	1	5.0	3.70	.02	2.50	2.19	.09
* ** CALIB STANDHYD [CN=60.2 N = 3.0:Tp .48]	0202	1	5.0	.50	.01	1.92	4.77	.19
* ** CALIB STANDHYD [CN=60.2 N = 3.0:Tp .48]	0203	1	5.0	2.03	.17	1.92	13.35	.53
* ** ADD [0301 + 0201]	0303	3	5.0	3.06	.01	1.92	1.33	n/a
* ** ADD [0302 + 0202]	0304	3	5.0	4.20	.02	2.50	2.50	n/a
* ** RESVR [2 : 0203] [ST=.02 ha.m]	0209	1	5.0	2.03	.00	4.00	12.73	n/a
* ** ADD [0303 + 0304]	0211	3	5.0	7.26	.03	1.92	2.01	n/a
* ** ADD [0211 + 0209]	0210	3	5.0	9.29	.03	1.92	4.35	n/a

***** SIMULATION NUMBER: 2 *****
 ***** CHIC25mm Event *****

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs								
READ STORM [CN=37.4 POT=32.86 mm]		10.0						
* ** CALIB NASHYD [CN=37.4 N = 3.0:Tp .63]	0301	1	5.0	2.56	.00	2.33	1.31	.04
* ** CALIB STANDHYD [CN=37.4 N = 3.0:Tp .63]	0201	1	5.0	.50	.01	1.33	7.56	.23
* ** CALIB NASHYD [CN=60.2 N = 3.0:Tp .48]	0302	1	5.0	3.70	.02	1.92	4.06	.12
* ** CALIB STANDHYD [CN=60.2 N = 3.0:Tp .48]	0202	1	5.0	.50	.01	1.33	7.12	.22
* ** CALIB STANDHYD [CN=60.2 N = 3.0:Tp .48]	0203	1	5.0	2.03	.22	1.33	18.12	.55
* ** ADD [0301 + 0201]	0303	3	5.0	3.06	.02	1.33	2.33	n/a
* ** ADD [0302 + 0202]	0304	3	5.0	4.20	.03	1.92	4.42	n/a
* ** RESVR [2 : 0203] [ST=.03 ha.m]	0209	1	5.0	2.03	.01	4.00	17.50	n/a
* ** ADD [0303 + 0304]	0211	3	5.0	7.26	.03	1.33	3.54	n/a
* ** ADD [0211 + 0209]	0210	3	5.0	9.29	.04	1.92	6.59	n/a

***** SIMULATION NUMBER: 3 *****
 ***** CHIC25mm Event *****

```

*****
W/E COMMAND      HYD ID  DT      AREA  Qpeak  Tpeak  R.V.  R.C.  Qbase
                  m/in   min   ha     cms    hrs    mm    n/a    cms
START @ .00 hrs
CHIC STORM
[ I%=53.0;S%= 2.00]
*****
* 0203 1 5.0 2.03 .34 1.33 29.85 .58 .000
* 0303 3 5.0 3.06 .03 1.33 5.66 n/a .000
* 0304 3 5.0 4.20 .07 1.83 10.56 n/a .000
* 0209 1 5.0 2.03 .01 4.00 29.23 n/a .000
* 0211 3 5.0 7.26 .09 1.83 8.49 n/a .000
* 0210 3 5.0 9.29 .10 1.83 13.02 n/a .000
*****
** SIMULATION NUMBER: 5 ** 25 year
*****
W/E COMMAND      HYD ID  DT      AREA  Qpeak  Tpeak  R.V.  R.C.  Qbase
                  m/in   min   ha     cms    hrs    mm    n/a    cms
START @ .00 hrs
CHIC STORM
[ I%=53.0;S%= 2.00]
*****
* 0301 1 5.0 2.56 .02 2.17 5.63 .09 .000
* 0201 1 5.0 .50 .03 1.33 18.91 .31 .000
* 0302 1 5.0 3.70 .08 1.92 13.90 .23 .000
* 0202 1 5.0 .50 .03 1.33 17.73 .29 .000
* 0203 1 5.0 2.03 .41 1.33 36.00 .60 .000
* 0303 3 5.0 3.06 .03 1.33 7.80 n/a .000
* 0304 3 5.0 4.20 .09 1.83 14.36 n/a .000
* 0209 1 5.0 2.03 .02 3.42 35.38 n/a .000
* 0211 3 5.0 7.26 .12 1.83 11.59 n/a .000
* 0210 3 5.0 9.29 .13 1.83 16.79 n/a .000
*****
** SIMULATION NUMBER: 6 ** 50 year
*****
W/E COMMAND      HYD ID  DT      AREA  Qpeak  Tpeak  R.V.  R.C.  Qbase
                  m/in   min   ha     cms    hrs    mm    n/a    cms
START @ .00 hrs
CHIC STORM
*****

```

```

*****
W/E COMMAND      HYD ID  DT      AREA  Qpeak  Tpeak  R.V.  R.C.  Qbase
                  m/in   min   ha     cms    hrs    mm    n/a    cms
START @ .00 hrs
CHIC STORM
[ I%=53.0;S%= 2.00]
*****
* 0301 1 5.0 2.56 .01 2.25 2.69 .06 .000
* 0201 1 5.0 .50 .02 1.33 11.63 .27 .000
* 0302 1 5.0 3.70 .04 1.92 7.41 .17 .000
* 0202 1 5.0 .50 .02 1.33 10.93 .25 .000
* 0203 1 5.0 2.03 .29 1.33 25.02 .57 .000
* 0303 3 5.0 3.06 .02 1.33 4.15 n/a .000
* 0304 3 5.0 4.20 .05 1.83 7.83 n/a .000
* 0209 1 5.0 2.03 .01 4.00 24.40 n/a .000
* 0211 3 5.0 7.26 .06 1.83 6.28 n/a .000
* 0210 3 5.0 9.29 .07 1.92 10.24 n/a .000
*****
** SIMULATION NUMBER: 4 ** 10 year
*****
W/E COMMAND      HYD ID  DT      AREA  Qpeak  Tpeak  R.V.  R.C.  Qbase
                  m/in   min   ha     cms    hrs    mm    n/a    cms
START @ .00 hrs
CHIC STORM
[ I%=53.0;S%= 2.00]
*****
* 0301 1 5.0 2.56 .01 2.17 3.88 .08 .000
* 0201 1 5.0 .50 .03 1.33 14.73 .29 .000
* 0302 1 5.0 3.70 .06 1.92 10.12 .20 .000
* 0202 1 5.0 .50 .02 1.33 13.82 .27 .000
*****

```

```

[ST=.07 ha.m ]
ADD [0303 + 0304] 0211 3 5.0 7.26 .17 1.83 16.64 n/a .000
ADD [0211 + 0209] 0210 3 5.0 9.29 .20 1.83 22.71 n/a .000
***** SIMULATION NUMBER: 8 *****
***** REGIONAL STORM TIMMINS *****
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
READ STORM
[ Ptot=193.00 mm ]
Frame : I:\DESIGN\103189\PHASE 5\storms\Timmings.stm
remark: REGIONAL STORM TIMMINS - 12 hour storm
0 04 CALIB NASHYD 0301 1 5.0 2.56 .08 7.33 55.78 .29 .000
[CN=37.4 ]
[ I%=14.0;S%=2.00 ]
[ N = 3.0;Tp .63 ]
* CALIB STANDHYD 0201 1 5.0 .04 7.00 105.35 .55 .000
[CN=60.2 ]
[ I%=14.0;S%=2.00 ]
* CALIB NASHYD 0302 1 5.0 3.70 .23 7.17 99.57 .52 .000
[CN=60.2 ]
[ I%=14.0;S%=2.00 ]
[ N = 3.0;Tp .48 ]
* CALIB STANDHYD 0202 1 5.0 .50 .03 7.00 99.87 .52 .000
[ I%=14.0;S%=2.00 ]
* CALIB STANDHYD 0203 1 5.0 2.03 .18 7.00 138.48 .72 .000
[ I%=53.0;S%=2.00 ]
* ADD [0301 + 0201] 0303 3 5.0 3.06 .10 7.00 63.88 n/a .000
* ADD [0302 + 0202] 0304 3 5.0 4.20 .26 7.08 99.60 n/a .000
RESRVR [ 2 : 0203] 0209 1 5.0 2.03 .14 7.08 137.85 n/a .000
[ST=.10 ha.m ]
* ADD [0303 + 0304] 0211 3 5.0 7.26 .36 7.17 84.55 n/a .000
* ADD [0211 + 0209] 0210 3 5.0 9.29 .50 7.08 96.19 n/a .000
FINISH

```

```

[ Ptot= 66.94 mm ]
0301 1 5.0 2.56 .02 2.17 7.04 .11 .000
CALIB NASHYD
[CN=37.4 ]
[ I%=14.0;S%=2.00 ]
[ N = 3.0;Tp .63 ]
* CALIB STANDHYD 0201 1 5.0 .04 1.33 22.09 .33 .000
[ I%=14.0;S%=2.00 ]
* CALIB NASHYD 0302 1 5.0 3.70 .10 1.92 16.85 .25 .000
[CN=60.2 ]
[ I%=14.0;S%=2.00 ]
[ N = 3.0;Tp .48 ]
* CALIB STANDHYD 0202 1 5.0 .50 .04 1.33 20.70 .31 .000
[ I%=14.0;S%=2.00 ]
* CALIB STANDHYD 0203 1 5.0 2.03 .46 1.33 40.47 .60 .000
[ I%=53.0;S%=2.00 ]
* ADD [0301 + 0201] 0303 3 5.0 3.06 .04 1.33 9.50 n/a .000
* ADD [0302 + 0202] 0304 3 5.0 4.20 .11 1.83 17.31 n/a .000
RESRVR [ 2 : 0203] 0209 1 5.0 2.03 .02 3.17 39.84 n/a .000
[ST=.06 ha.m ]
* ADD [0303 + 0304] 0211 3 5.0 7.26 .15 1.83 14.02 n/a .000
* ADD [0211 + 0209] 0210 3 5.0 9.29 .16 1.83 19.66 n/a .000
***** SIMULATION NUMBER: 7 *****
***** 100 year *****
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm
START @ .00 hrs
CHIC STORM
[ Ptot=73.52 mm ]
10.0
0301 1 5.0 2.56 .03 2.17 8.60 .12 .000
CALIB NASHYD
[CN=37.4 ]
[ I%=14.0;S%=2.00 ]
[ N = 3.0;Tp .63 ]
* CALIB STANDHYD 0201 1 5.0 .04 1.33 25.46 .35 .000
[ I%=14.0;S%=2.00 ]
* CALIB NASHYD 0302 1 5.0 3.70 .12 1.92 20.03 .27 .000
[CN=60.2 ]
[ I%=14.0;S%=2.00 ]
[ N = 3.0;Tp .48 ]
* CALIB STANDHYD 0202 1 5.0 .50 .04 1.33 23.86 .32 .000
[ I%=14.0;S%=2.00 ]
* CALIB STANDHYD 0203 1 5.0 2.03 .51 1.33 45.06 .61 .000
[ I%=53.0;S%=2.00 ]
* ADD [0301 + 0201] 0303 3 5.0 3.06 .05 1.33 11.35 n/a .000
* ADD [0302 + 0202] 0304 3 5.0 4.20 .13 1.83 20.49 n/a .000
RESRVR [ 2 : 0203] 0209 1 5.0 2.03 .03 3.00 44.44 n/a .000

```

24hr SCS - Post Development

```

V V I SSSS U U A A L
V V I SS U U A A L
V V I SS U U A A L
V V I SSSS UUUU A A LLLL
OOO TTTT TTTT H H Y Y M M OOO
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
OOO T T H H Y Y M M OOO
  
```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual\OTTHYMO 2.3.2\voim.dat
 Output filename: I:\2017PR~1\117098~1\Design\SWM\AO\103189~1\SCS Proposed.out
 Summary filename: I:\2017PR~1\117098~1\Design\SWM\AO\103189~1\SCS Proposed.sum

DATE: 12/1/2017 TIME: 2:09:01 PM

USER:

COMMENTS:

```

*****
** SIMULATION NUMBER: 1 ** 2 year
*****
  
```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ .00 hrs								
MASS STORM [Prot=55.83 mm]		15.0						
* CALIB STANDHYD [I%=53.0;S%=2.00]	0203 1	5.0	2.03	.21	11.75	32.91	.59	.000
* CALIB STANDHYD [I%=14.0;S%=2.00]	0202 1	5.0	.50	.02	11.75	15.73	.28	.000
* CALIB NASHYD [CN=60.2 [N = 3.0;Tp .48]	0302 1	5.0	3.70	.06	12.17	11.95	.21	.000

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
* CALIB STANDHYD [I%=14.0;S%=2.00]	0201 1	5.0	.50	.02	11.75	16.78	.30	.000
* CALIB NASHYD [CN=37.4 [N = 3.0;Tp .63]	0301 1	5.0	2.56	.01	12.33	4.72	.08	.000
* RESVR [2 : 0203] [ST=.04 ha.m]	0209 1	5.0	2.03	.01	13.33	32.28	n/a	.000
* ADD [0202 + 0302]	0304 3	5.0	4.20	.06	12.08	12.40	n/a	.000
* ADD [0201 + 0301]	0303 3	5.0	3.06	.02	11.75	6.69	n/a	.000
* ADD [0304 + 0303]	0211 3	5.0	7.26	.08	12.08	10.00	n/a	.000
* ADD [0209 + 0211]	0210 3	5.0	9.29	.09	12.08	14.87	n/a	.000

```

*****
** SIMULATION NUMBER: 2 ** 5 year
*****
  
```

START @ .00 hrs

MASS STORM
[Prot=74.18 mm]

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
* CALIB STANDHYD [I%=53.0;S%=2.00]	0203 1	5.0	2.03	.29	11.75	45.52	.61	.000
* CALIB STANDHYD [I%=14.0;S%=2.00]	0202 1	5.0	.50	.03	11.75	24.18	.33	.000
* CALIB NASHYD [CN=60.2 [N = 3.0;Tp .48]	0302 1	5.0	3.70	.10	12.17	20.36	.27	.000
* CALIB STANDHYD [I%=14.0;S%=2.00]	0201 1	5.0	.50	.03	11.75	25.80	.35	.000
* CALIB NASHYD [CN=37.4 [N = 3.0;Tp .63]	0301 1	5.0	2.56	.02	12.33	8.76	.12	.000
* RESVR [2 : 0203] [ST=.06 ha.m]	0209 1	5.0	2.03	.02	12.83	44.90	n/a	.000
* ADD [0202 + 0302]	0304 3	5.0	4.20	.11	12.08	20.81	n/a	.000
* ADD [0201 + 0301]	0303 3	5.0	3.06	.04	11.75	11.54	n/a	.000
* ADD [0304 + 0303]	0211 3	5.0	7.26	.14	12.08	16.91	n/a	.000
* ADD [0209 + 0211]	0210 3	5.0	9.29	.16	12.08	23.02	n/a	.000

```

*****
** SIMULATION NUMBER: 3 ** 10 year
*****
  
```

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

```

[ST= .08 ha.m ]
ADD [0202 + 0302] 0304 3 5.0 4.20 .19 12.08 35.94 n/a .000
ADD [0201 + 0301] 0303 3 5.0 3.06 .07 11.75 20.76 n/a .000
ADD [0304 + 0303] 0211 3 5.0 7.26 .26 12.08 29.54 n/a .000
ADD [0209 + 0211] 0210 3 5.0 9.29 .29 12.08 37.27 n/a .000
*****
SIMULATION NUMBER: 5 50 year
*****
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min cms hrs mm
START @ .00 hrs
MASS STORM [ Ptot=112.86 mm ] 15.0
CALIB STANDHYD 0203 1 5.0 2.03 .47 11.75 73.97 .66 .000
[ I%=53.0;S%= 2.00]
CALIB STANDHYD 0202 1 5.0 .50 .06 11.75 45.51 .40 .000
[ I%=14.0;S%= 2.00]
CALIB NASHYD 0302 1 5.0 3.70 .21 12.08 42.40 .38 .000
[ CN=60.2
[ N = 3.0;Tp .48]
CALIB STANDHYD 0201 1 5.0 .50 .07 11.75 48.42 .43 .000
[ I%=14.0;S%= 2.00]
CALIB NASHYD 0301 1 5.0 2.56 .06 12.33 20.53 .18 .000
[ CN=37.4
[ N = 3.0;Tp .63]
RESVR [ 2 : 0203] 0209 1 5.0 2.03 .06 12.33 73.35 n/a .000
[ ST= .09 ha.m ]
ADD [0202 + 0302] 0304 3 5.0 4.20 .23 12.08 42.77 n/a .000
ADD [0201 + 0301] 0303 3 5.0 3.06 .09 11.75 25.09 n/a .000
ADD [0304 + 0303] 0211 3 5.0 7.26 .30 12.08 35.32 n/a .000
ADD [0209 + 0211] 0210 3 5.0 9.29 .36 12.17 43.63 n/a .000
*****
SIMULATION NUMBER: 6 100 year
*****
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min cms hrs mm
START @ .00 hrs
MASS STORM [ Ptot=124.03 mm ] 15.0
CALIB STANDHYD 0203 1 5.0 2.03 .53 11.75 82.57 .67 .000
[ I%=53.0;S%= 2.00]

```

```

START @ .00 hrs
MASS STORM [ Ptot= 86.44 mm ] 15.0
CALIB STANDHYD 0203 1 5.0 2.03 .35 11.75 54.29 .63 .000
[ I%=53.0;S%= 2.00]
CALIB STANDHYD 0202 1 5.0 .50 .04 11.75 30.48 .35 .000
[ I%=14.0;S%= 2.00]
CALIB NASHYD 0302 1 5.0 3.70 .13 12.08 26.79 .31 .000
[ CN=60.2
[ N = 3.0;Tp .48]
CALIB STANDHYD 0201 1 5.0 .50 .04 11.75 32.50 .38 .000
[ I%=14.0;S%= 2.00]
CALIB NASHYD 0301 1 5.0 2.56 .03 12.33 12.04 .14 .000
[ CN=37.4
[ N = 3.0;Tp .63]
RESVR [ 2 : 0203] 0209 1 5.0 2.03 .03 12.58 53.67 n/a .000
[ ST= .07 ha.m ]
ADD [0202 + 0302] 0304 3 5.0 4.20 .15 12.08 27.23 n/a .000
ADD [0201 + 0301] 0303 3 5.0 3.06 .05 11.75 15.39 n/a .000
ADD [0304 + 0303] 0211 3 5.0 7.26 .19 12.08 22.74 n/a .000
ADD [0209 + 0211] 0210 3 5.0 9.29 .22 12.08 29.10 n/a .000
*****
SIMULATION NUMBER: 4 25 year
*****
W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min cms hrs mm
START @ .00 hrs
MASS STORM [ Ptot=101.69 mm ] 15.0
CALIB STANDHYD 0203 1 5.0 2.03 .42 11.75 65.53 .64 .000
[ I%=53.0;S%= 2.00]
CALIB STANDHYD 0202 1 5.0 .50 .05 11.75 38.93 .38 .000
[ I%=14.0;S%= 2.00]
CALIB NASHYD 0302 1 5.0 3.70 .18 12.08 35.54 .35 .000
[ CN=60.2
[ N = 3.0;Tp .48]
CALIB STANDHYD 0201 1 5.0 .50 .05 11.75 41.47 .41 .000
[ I%=14.0;S%= 2.00]
CALIB NASHYD 0301 1 5.0 2.56 .05 12.33 16.72 .16 .000
[ CN=37.4
[ N = 3.0;Tp .63]
RESVR [ 2 : 0203] 0209 1 5.0 2.03 .04 12.42 64.91 n/a .000

```

```

* 0202 1 5.0 .50 .08 11.75 52.38 .42 .000
CALIB STANDHYD
[I%=14.0:S%= 2.00]

* 0302 1 5.0 3.70 .25 12.08 49.60 .40 .000
CALIB NASHYD
[CN=60.2
 [ N = 3.0:Tp .46]

* 0201 1 5.0 .50 .08 11.75 55.66 .45 .000
CALIB STANDHYD
[I%=14.0:S%= 2.00]

* 0301 1 5.0 2.56 .07 12.33 24.64 .20 .000
CALIB NASHYD
[CN=37.4
 [ N = 3.0:Tp .63]

* 0209 1 5.0 2.03 .09 12.17 81.94 n/a .000
RESVR [ 2 : 0203]
{ST=.09 ha,m }

* 0304 3 5.0 4.20 .27 12.08 49.93 n/a .000
ADD [0202 + 0302]

* 0303 3 5.0 3.06 .11 11.75 29.71 n/a .000
ADD [0201 + 0301]

* 0211 3 5.0 7.26 .35 12.08 41.41 n/a .000
ADD [0304 + 0303]

* 0210 3 5.0 9.29 .44 12.08 50.27 n/a .000
ADD [0209 + 0211]

```

FINISH

Wasaga County Life - Phase 5
Volume Table

Active Pool

Side Slope 5 : 1

Bottom Elev. 184.50

Elev. (m)	Depth (m)	Areas		Pond Storage Volume				LID	Total
		Area (m ²)	Avg. Area (m ²)	Dead (m ³)	Accum. Dead (m ³)	Live (m ³)	Accum. Live (m ³)	Accum. Live (m ³)	Accum. Live (m ³)
184.5	0.00	28	0.00	0.00	0.00	0.00	0.00		
184.60	0.10	75.13	51.57	5.16	5.16	0.00	0.00		
184.70	0.20	122.26	98.70	9.87	15.03	0.00	0.00		
184.80	0.30	169.39	145.83	14.58	29.61	0.00	0.00		
184.90	0.40	216.52	192.96	19.30	48.90	0.00	0.00		
185.00	0.50	263.65	240.09	24.01	72.91	0.00	0.00		
185.10	0.60	310.78	287.22	28.72	101.63	0.00	0.00		
185.20	0.70	357.91	334.35	33.43	135.07	0.00	0.00		
185.30	0.80	405.04	381.48	38.15	173.22	0.00	0.00		
185.40	0.90	452.17	428.61	42.86	216.08	0.00	0.00		
185.50	1.00	499.30	475.74	47.57	263.65	0.00	0.00		
185.65	1.15	570.00	534.65	80.20	343.85	0.00	0.00		
185.70	1.20	598.78	584.39			29.22	29.22	20.96	50.18
185.80	1.30	656.33	627.56			62.76	91.98	62.88	154.86
185.90	1.40	713.89	685.11			68.51	160.49	104.80	265.29
186.00	1.50	771.44	742.67			74.27	234.75	146.72	381.47
186.10	1.60	829.00	800.22			80.02	314.77	188.64	503.41
186.20	1.70	886.56	857.78			85.78	400.55	230.56	631.11
186.30	1.80	944.11	915.33			91.53	492.09	230.56	722.65
186.40	1.90	1001.67	972.89			97.29	589.37	230.56	819.93
186.50	2.00	1059.22	1030.44			103.04	692.42	230.56	922.98
186.60	2.10	1116.78	1088.00			108.80	801.22	230.56	1031.78
186.70	2.20	1174.33	1145.56			114.56	915.77	230.56	1146.33
186.80	2.30	1231.89	1203.11			120.31	1036.09	230.56	1266.65
186.90	2.40	1289.44	1260.67			126.07	1162.15	230.56	1392.71
187.00	2.50	1347.00	1318.22			131.82	1293.97	230.56	1524.53

**Wasaga County Life - Phase 5
SWM Pond**

ORIFICE/PIPE CONTROL

	Outlet Pipe			
diameter =	60	100	525	mm
area =	0.0028	0.0079	0.2165	m ²
Orifice C =	0.63	0.63	0.80	
Invert =	185.65	185.90	185.50	m

Q = flow rate (cms)
C = constant
A = area of opening(sq. m)
H = net head on the orifice
g = Acceleration due to gravity

WEIR CONTROL

	Ditch Inlet		overflow	
Length of Weir	0.600	3		m
Weir Sill Elevation	186.33	186.70		m
Weir constant K	1.83	1.6		
Side Slope (H:V)	0	5		

$Q = K \times L \times H^{1.5}$
where Q = flow rate (cms)
K = constant
L = length (m)
H = head on the weir (m)

Water Level (m)	Low Flow Pipe		Secondary Inlet Pipe		Outlet Pipe		Ditch Inlet		Emergency Spillway		Total Discharge (cms)
	Head (m)	Discharge (cms)	Head (m)	Discharge (cms)	Head (m)	Discharge (cms)	Head (m)	Discharge (cms)	Head (m)	Discharge (cms)	
184.50	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
184.60	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
184.70	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
184.80	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
184.90	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
185.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
185.10	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
185.20	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
185.30	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
185.40	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
185.50	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
185.65	0.00	0.0000	0.00	0.0000	0.15	0.0326	0.00	0.0000	0.00	0.0000	0.0000
185.70	0.02	0.0011	0.00	0.0000	0.20	0.0559	0.00	0.0000	0.00	0.0000	0.0011
185.80	0.12	0.0027	0.00	0.0000	0.30	0.1156	0.00	0.0000	0.00	0.0000	0.0027
185.90	0.22	0.0037	0.00	0.0000	0.40	0.1847	0.00	0.0000	0.00	0.0000	0.0037
186.00	0.32	0.0045	0.10	0.0069	0.05	0.1715	0.00	0.0000	0.00	0.0000	0.0114
186.10	0.42	0.0051	0.15	0.0085	0.15	0.2971	0.00	0.0000	0.00	0.0000	0.0136
186.20	0.52	0.0057	0.25	0.0110	0.25	0.3835	0.00	0.0000	0.00	0.0000	0.0166
186.30	0.62	0.0062	0.35	0.0130	0.35	0.4538	0.00	0.0000	0.00	0.0000	0.0192
186.40	0.72	0.0067	0.50	0.0155	0.45	0.5146	0.07	0.0203	0.00	0.0000	0.0425
186.50	0.82	0.0071	0.60	0.0170	0.55	0.5689	0.17	0.0770	0.00	0.0000	0.1011
186.60	0.92	0.0076	0.65	0.0177	0.65	0.6185	0.27	0.1540	0.00	0.0000	0.1793
186.70	1.02	0.0080	0.75	0.0190	0.75	0.6643	0.37	0.2471	0.00	0.0000	0.2741
186.80	1.12	0.0084	0.90	0.0208	0.85	0.7072	0.47	0.3538	0.10	0.1771	0.5600
186.90	1.22	0.0087	1.00	0.0219	0.95	0.7477	0.57	0.4725	0.20	0.5724	1.0756
187.00	1.32	0.0091	1.05	0.0225	1.05	0.7860	0.67	0.6022	0.30	1.1831	1.8168

$$Q_w = 1.65 \left[\frac{\pi (D^2)}{4} \right] (2 \cos^{-1} \left[\frac{((D/2)-d)}{(D/2)} \right] + (180/\pi)) / 360 - ((D/2)-d) \left(\frac{Dd-d^2}{d^3} \right) / d^{1.5}$$

Where:-
Q_w is weir flow (m³/s)
D is orifice diameter (m)
d is depth of flow above the invert (m)

**WASAGA COUNTRY LIFE - PHASE 5
STAGE-STORAGE-DISCHARGE DATA**

Avg. Side Slope 5 :1
 Bottom Elev. 184.50 m
 Top of Bank 187.00 m

	ORIFICE / PIPE FLOW			WEIR FLOW		STORAGE VOLUME (m ³)
	#1	Outlet Pipe	DICB	Overflow	Total	
Water Level (m)	Discharge (m ³ /s)	Discharge (m ³ /s)	Discharge (m ³ /s)	Discharge (m ³ /s)	Discharge (m ³ /s)	
184.50	0.0000	0.0000	0.0000	0.0000	0.000	0
184.60	0.0000	0.0000	0.0000	0.0000	0.000	0
184.70	0.0000	0.0000	0.0000	0.0000	0.000	0
184.80	0.0000	0.0000	0.0000	0.0000	0.000	0
184.90	0.0000	0.0000	0.0000	0.0000	0.000	0
185.00	0.0000	0.0000	0.0000	0.0000	0.000	0
185.10	0.0000	0.0000	0.0000	0.0000	0.000	0
185.20	0.0000	0.0000	0.0000	0.0000	0.000	0
185.30	0.0000	0.0000	0.0000	0.0000	0.000	0
185.40	0.0000	0.0000	0.0000	0.0000	0.000	0
185.50	0.0000	0.0000	0.0000	0.0000	0.000	0
185.65	0.0000	0.0000	0.0000	0.0000	0.000	0
185.70	0.0011	0.0000	0.0000	0.0000	0.001	50
185.80	0.0027	0.0000	0.0000	0.0000	0.003	155
185.90	0.0037	0.0000	0.0000	0.0000	0.004	265
186.00	0.0045	0.0069	0.0000	0.0000	0.011	381
186.10	0.0051	0.0085	0.0000	0.0000	0.014	503
186.20	0.0057	0.0110	0.0000	0.0000	0.017	631
186.30	0.0062	0.0130	0.0000	0.0000	0.019	723
186.40	0.0067	0.0155	0.0203	0.0000	0.043	820
186.50	0.0071	0.0170	0.0770	0.0000	0.101	923
186.60	0.0076	0.0177	0.1540	0.0000	0.179	1032
186.70	0.0080	0.0190	0.2471	0.0000	0.274	1146
186.80	0.0084	0.0208	0.3538	0.1771	0.560	1267
186.90	0.0087	0.0219	0.4725	0.5724	1.076	1393
187.00	0.0091	0.0225	0.6022	1.1831	1.817	1525

WASAGA COUNTRY LIFE - PHASE 5
FILE NO. 117098

DRAWDOWN TIME FOR POND - EXTENDED DETENTION
 (Using the falling head orifice equation)

$$t = \frac{2 A_p}{C A_o (2g)^{0.5}} (h_1^{0.5} - h_2^{0.5})$$

where t = drawdown time in seconds

A_p = surface area of pond (m²)

C = discharge coefficient (typically 0.63)

A_o = cross-sectional area of orifice (m²)

g = gravitational acceleration constant (9.81 m/s²)

h_1 = starting water elevation above the orifice (m)

h_2 = ending water elevation above the orifice (m)

Value

713.89 m² = Extended Detention level

0.63

0.002827 m² for 60 mm dia

9.81 m/s²

0.220 m 185.90 m

0.000 m 185.65 m

t = 84,876.90 seconds

Q = 0.0037 m³/s

t = 23.58 hours

Wasaga Country Life- Phase 5
 SWM Facility Design Calculations
 Using MOE SWMPD Manual / March 2003
 SWM Pond Facility Sediment Forebay Sizing

1) Settling

Dist	=	$\text{SQRT}(r \cdot Q_p / V_s)$	Dist = Forebay length (m)	r	=	2.00
			r = Length to width ratio	Qp	=	0.0040 cms
			Qp = 25mm SWM outflow - water quality (cms)	Vs	=	0.0003 m/s
			Vs = settling velocity for 0.15 mm particles (m/s)			
Dist	=	5.16 m	Actual forebay length =			15

2) Dispersion Length

Dist	=	$8 \cdot Q / d \cdot V_f$	Dist = Length of dispersion (m)	Q	=	0.3430 cms
			Q = 10 Yr max inlet flow (cms)	d	=	1.0000 m
			d = depth of permanent pool in forebay (m)	Vf	=	0.5000 m/s
			Vf = desired velocity in forebay (m/s)			
Dist	=	5.49 m	Actual forebay length =			15

3) Cleanout Frequency

Table 6.3 MOE SWMPD Manual

Cleanout	=	$\text{Vol} / (\text{load} \cdot \text{Asew} \cdot \text{eff.})$	Asew = contributing sewer area (ha)	Asew	=	2.06 ha
			Actual Forebay Length	Alength	=	15.00 m
			Imp = avg. percent Impervious (%)	Imp	=	51 %
			load = sediment loading (cu.m/ha)	load	=	0.925 cu.m/ha
			eff. = removal efficiency (%)	eff.	=	80%
			Targ = cleanout Frequency Target (Years)	Targ	=	10 years
			Vol = bottom 0.70 m volume (cu.m)	Vol	=	44 cu.m
Cleanout	=	29 years - therefore cleanout target is satisfied				

Forebay Volume Table

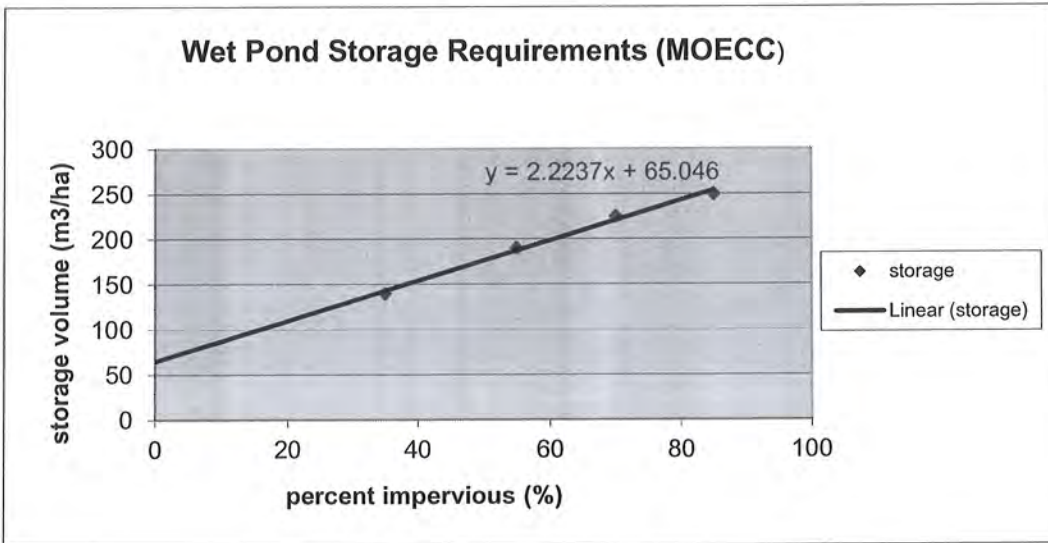
Side Slope 5 :1
Bottom Elev. 184.65
Top of Bank 185.65

Elev. (m)	Depth (m)	Areas		Volumes	
		Area (m ²)	Avg. Area (m ²)	Dead (m ³)	Accum. Dead (m ³)
184.65	0.00	8	0.00	0.00	0.00
184.75	0.10	24.20	16.10	2	1.61
184.85	0.20	40.40	32.30	3	4.84
184.95	0.30	56.60	48.50	5	9.69
185.05	0.40	72.80	64.70	6	16.16
185.15	0.50	89.00	80.90	8	24.25
185.25	0.60	105.20	97.10	10	33.96
185.35	0.70	121.40	113.30	11	45.29
185.45	0.80	137.60	129.50	13	58.24
185.55	0.90	153.80	145.70	15	72.81
185.65	1.00	170	161.90	16	89.00

MOECC Water Quality Storage Volumes

Table 3.1 Values

% impervious	storage
35	140
55	190
70	225
85	250

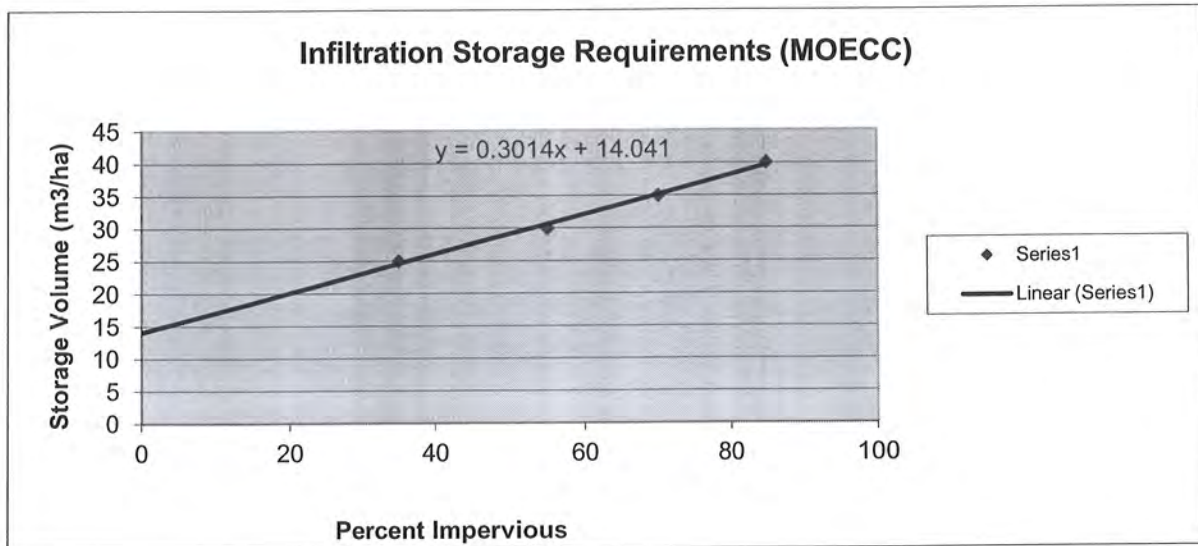


% Impervious	53
Storage Volume (m ³ /ha)	182.9
Drainage Area (ha)	2.03
Storage Volume (m ³)	371.3
Permanent Pool Volume (m ³)	290.1
Active Storage Volume (m ³)	81.2

MOECC Water Quality Storage Volumes

Table 3.1 Values

% impervious	storage (m ³ /ha)
35	25
55	30
70	35
85	40



% Impervious	53
Storage Volume (m ³ /ha)	30.0
Drainage Area (ha)	2.03
Storage Volume (m ³)	60.9

WASAGA COUNTRY LIFE - PHASE 5
PERFORATED PIPE SYSTEM VOLUME TABLE
CATCHMENT 201

Right of Way LID

Length 55.00 m
 Width 1.00 m
 Void Ratio 0.40 Clear Stone
 Bottom Elev. 100.00 m
 Stage 0.05 m

Rear Yard LID

Length 200.00 m
 Width 1.00 m
 Void Ratio 0.40 Clear Stone
 Bottom Elev. 100.00 m
 Stage 0.05 m

Elev. (m)	Depth (m)	Below Ground Storage		Infiltration		Active Storage	
		Profile Area (m ²)	Volume (m ³)	Accum. Total (m ³)	Accum. Total (ha-m)	Accum. Total (m ³)	Accum. Total (ha-m)
0.00	0.00	0.000	0.00	0.00	0.0000		
0.10	0.10	0.100	10.20	10.20	0.0010		
0.15	0.05	0.050	5.10	15.30	0.0015		
0.20	0.05	0.050	5.10			5.10	0.0005
0.30	0.10	0.100	10.20			15.30	0.0015
0.40	0.10	0.100	10.20			25.50	0.0026
0.50	0.10	0.100	10.20			35.70	0.0036
0.60	0.10	0.100	10.20			45.90	0.0046
0.70	0.10	0.100	10.20			56.10	0.0056

WASAGA COUNTRY LIFE - PHASE 5
PERFORATED PIPE SYSTEM VOLUME TABLE
CATCHMENT 202

Right of Way LID

Length 57.00 m
 Width 1.00 m
 Void Ratio 0.40 Clear Stone
 Bottom Elev. 100.00 m
 Stage 0.05 m

Rear Yard LID

Length 268.00 m
 Width 1.00 m
 Void Ratio 0.40 Clear Stone
 Bottom Elev. 100.00 m
 Stage 0.05 m

Elev. (m)	Depth (m)	Below Ground Storage		Infiltration		Active Storage	
		Profile Area (m ²)	Volume (m ³)	Accum. Total (m ³)	Accum. Total (ha-m)	Accum. Total (m ³)	Accum. Total (ha-m)
0.00	0.00	0.000	0.00	0.00	0.0000		
0.10	0.10	0.100	13.00	13.00	0.0013		
0.15	0.05	0.050	6.50	19.50	0.0020		
0.20	0.05	0.050	6.50			6.50	0.0007
0.30	0.10	0.100	13.00			19.50	0.0020
0.40	0.10	0.100	13.00			32.50	0.0033
0.50	0.10	0.100	13.00			45.50	0.0046
0.60	0.10	0.100	13.00			58.50	0.0059
0.70	0.10	0.100	13.00			71.50	0.0072

WASAGA COUNTRY LIFE - PHASE 5
PERFORATED PIPE SYSTEM VOLUME TABLE
CATCHMENT 203

Right of Way LID

Length 860.00 m
 Width 1.00 m
 Void Ratio 0.40 Clear Stone
 Bottom Elev. 100.00 m
 Stage 0.05 m

Rear Yard LID

Length 188.00 m
 Width 1.00 m
 Void Ratio 0.40 Clear Stone
 Bottom Elev. 100.00 m
 Stage 0.05 m

Elev. (m)	Depth (m)	Below Ground Storage		Infiltration		Active Storage	
		Profile Area (m ²)	Volume (m ³)	Accum. Total (m ³)	Accum. Total (ha-m)	Accum. Total (m ³)	Accum. Total (ha-m)
0.00	0.00	0.000	0.00	0.00	0.0000		
0.10	0.10	0.100	41.92	41.92	0.0042		
0.15	0.05	0.050	20.96	62.88	0.0063		
0.20	0.05	0.050	20.96			20.96	0.0021
0.30	0.10	0.100	41.92			62.88	0.0063
0.40	0.10	0.100	41.92			104.80	0.0105
0.50	0.10	0.100	41.92			146.72	0.0147
0.60	0.10	0.100	41.92			188.64	0.0189
0.70	0.10	0.100	41.92			230.56	0.0231

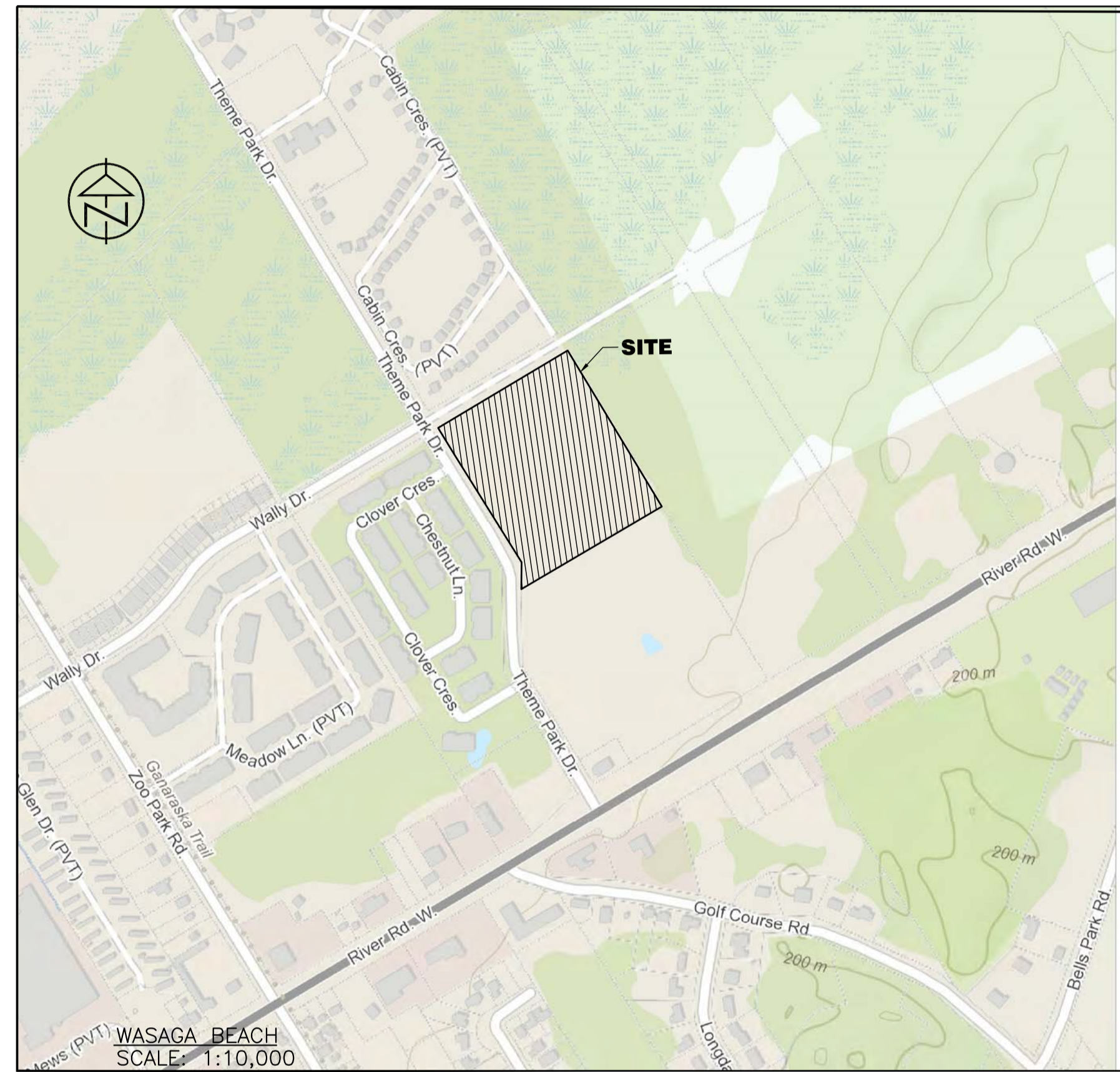
Civil Engineering Design Drawings Prepared and Reviewed by a Senior Engineer from CCTA stamped December 12, 2017 that conform to Town standards:

- SC-1: Siltation, Removals, and Erosion Control Plan
- DP-1: Pre-Development Drainage Plan
- DP-2: Post-Development Drainage Plan
- STM-1: Storm Drainage Plan
- SS-1: Site Servicing Plan
- SG-1: Site Grading Plan
- SAN-1: Sanitary Drainage Plan
- PND-1: Pond Cross-Section and Details
- PP-1: Plan and Profile for Wally Street
- DE-1: General Details and Notes

WASAGA MEADOWS

TOWN OF WASAGA BEACH

KEY PLAN



INDEX

Dwg.	Description
117098-TP-1	TITLE PAGE, INDEX AND LEGEND
117098-SC-1	SILTATION, REMOVALS, AND EROSION CONTROL PLAN
117098-DP-1	PRE-DEVELOPMENT DRAINAGE PLAN
117098-DP-2	POST-DEVELOPMENT DRAINAGE PLAN
117098-SS-1	SITE SERVICING PLAN
117098-SG-1	SITE GRADING PLAN
117098-STM-1	STORM DRAINAGE PLAN
117098-SAN-1	SANITARY DRAINAGE PLAN
117098-PND-1	POND CROSS-SECTION AND DETAILS
117098-PP-1	PLAN AND PROFILE - WALLY STREET - STA. 1+000 TO STA. 1+180
117098-DE-1	GENERAL DETAILS AND NOTES

LEGEND

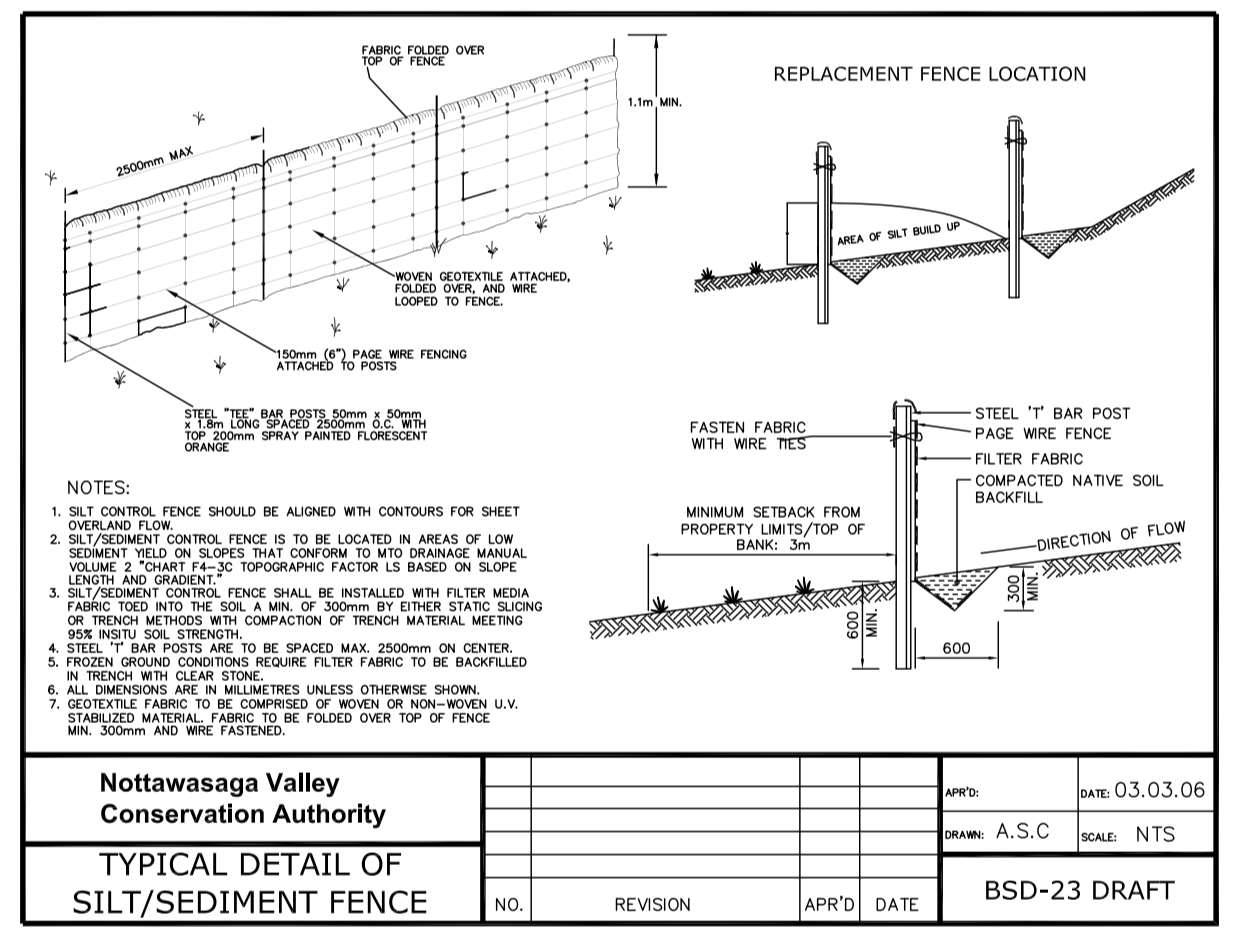
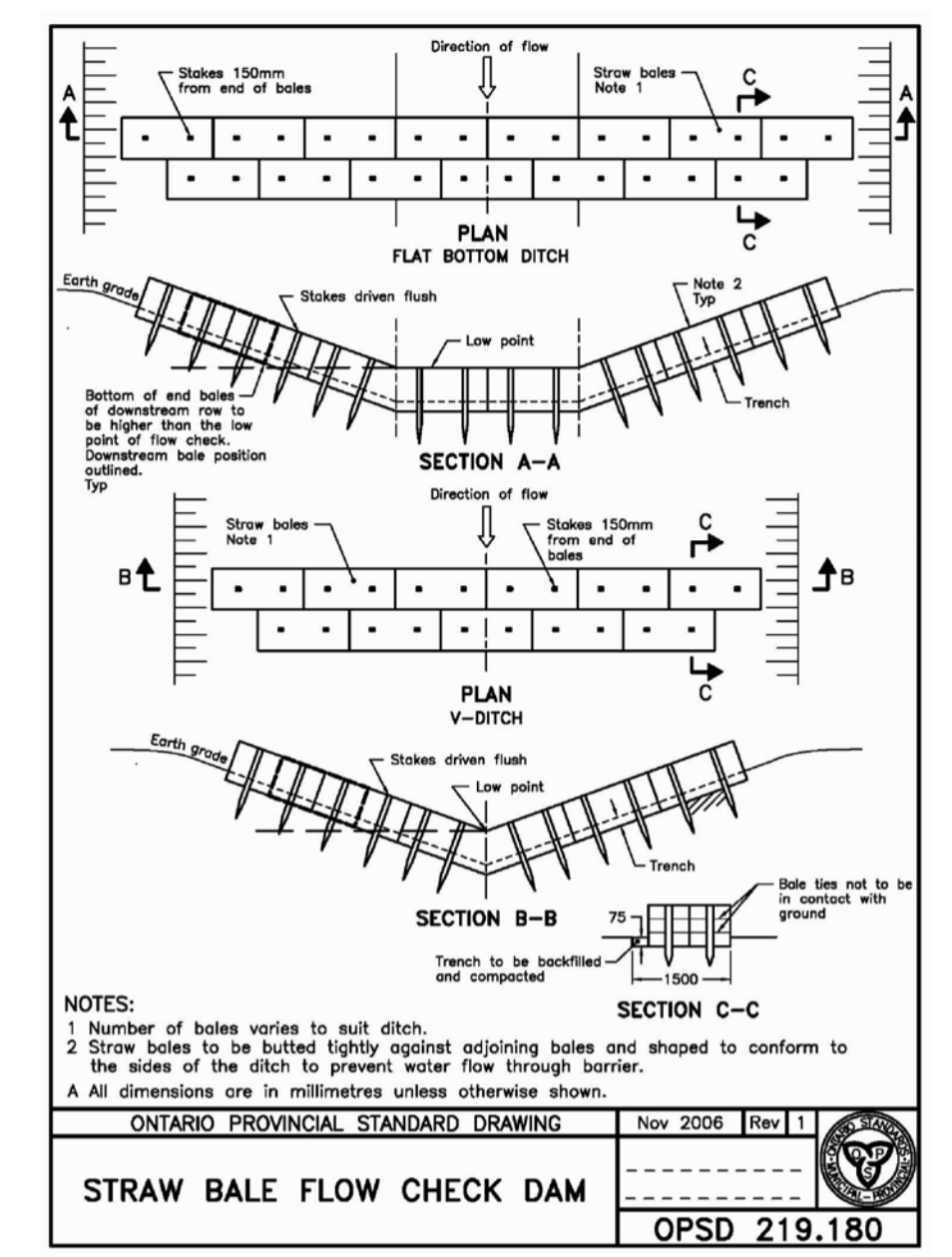
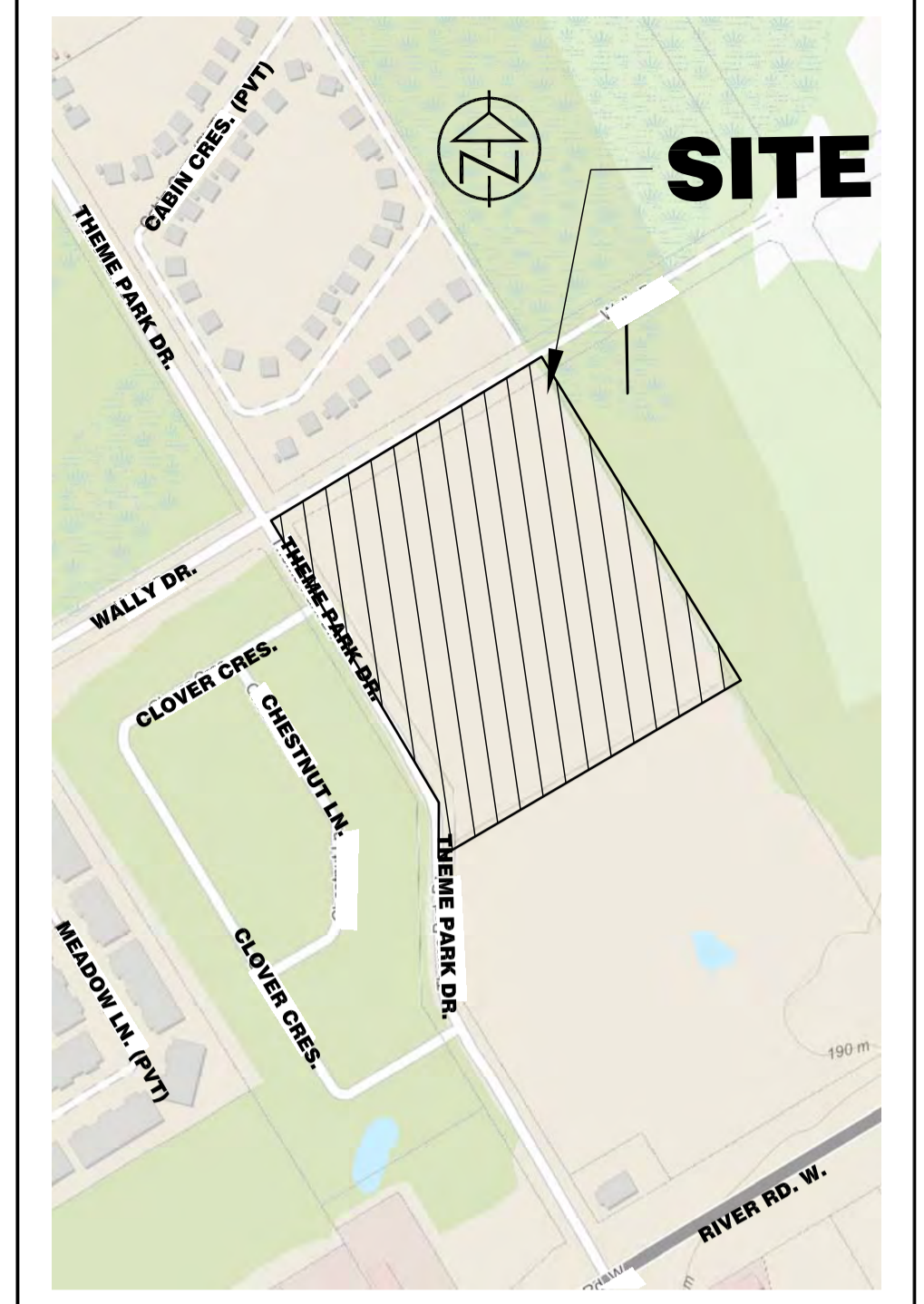
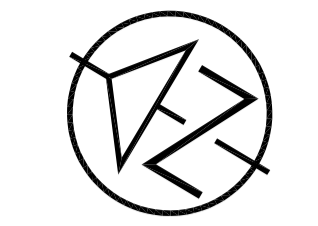
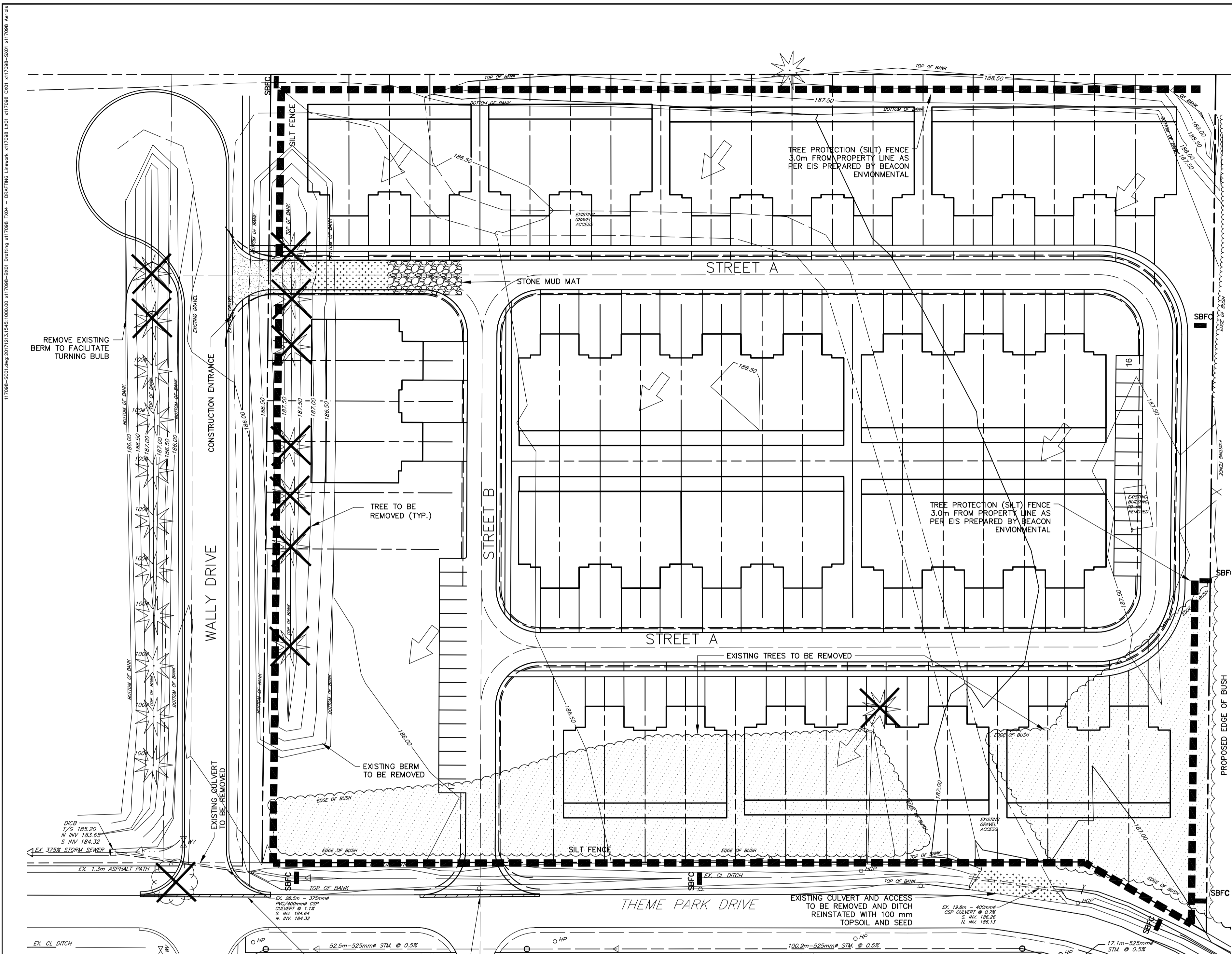
PROPERTY LINE	-----
EXISTING CENTERLINE	-----
PROPOSED CENTERLINE	-----
EXISTING EDGE OF ASPHALT	-----
PROPOSED EDGE OF ASPHALT	-----
EXISTING EDGE OF SHOULDER	-----
PROPOSED EDGE OF SHOULDER	-----
EXISTING DITCH/DIRECTION OF FLOW	----->
PROPOSED DITCH/DIRECTION OF FLOW	----->
EXISTING SANITARY SEWER/SIZE/DIRECTION OF FLOW	-----> 200# SAN
PROPOSED SANITARY SEWER/SIZE/DIRECTION OF FLOW	-----> 200# SAN
EXISTING SANITARY SERVICE	-----
PROPOSED SANITARY SERVICE	-----
EXISTING SANITARY FORCEMAIN/SIZE/DIRECTION OF FLOW	-----> 150# W/M
EXISTING WATERMAIN/SIZE	-----
PROPOSED WATERMAIN/SIZE	-----
EXISTING WATER SERVICE	-----
PROPOSED WATER SERVICE	-----
EXISTING STORM SEWER/SIZE/DIRECTION OF FLOW	-----> 375# STM
PROPOSED STORM SEWER/SIZE/DIRECTION OF FLOW	-----> 375# STM
EXISTING CULVERT	-----
PROPOSED CULVERT	-----
PROPOSED SWALE LOCATION	----->
PROPOSED JOINT HYDRO, BELL AND ROGERS	-----
EXISTING GAS MAIN	-----
PROPOSED GAS MAIN	-----
EXISTING FENCELINE	-----
PROPOSED PRIVACY FENCELINE	-----
PROPOSED CHAINLINK FENCELINE	-----
PROPOSED ACOUSTIC FENCELINE	-----
EXISTING BUSHLINE	-----
EXISTING CONTOUR	-----
EXISTING SPOT ELEVATION	x 179.00
PROPOSED SPOT ELEVATION	x 179.00
EXISTING GRADING DIRECTION	----->
PROPOSED GRADING DIRECTION	----->
PROPOSED SWALE LOCATION	----->
EXISTING TEMPORARY BENCHMARK	TBM
EXISTING STANDARD IRON BAR	SIB
EXISTING BOREHOLE/NUMBER	BH#
EXISTING GAS VALVE	GAS
EXISTING HYDRO TRANSFORMER	HT
EXISTING CABLE PEDESTAL	CP
EXISTING BELL PEDESTAL	BP
EXISTING BELL MAINTENANCE HOLE	BELL MH
EXISTING BELL POLE	BP
EXISTING HYDRO POLE AND HYDRO GUY WIRE	HP
PROPOSED LIGHT STANDARD	LS
EXISTING TRAFFIC SIGN	TS
PROPOSED TRAFFIC SIGN	TS
PROPOSED STOP SIGN	STOP SIGN
PROPOSED STREET NAME SIGN	STREET NAME SIGN
EXISTING DECIDUOUS TREE	DT
EXISTING CONIFEROUS TREE	CT
EXISTING SANITARY MAINTENANCE HOLE/NUMBER	SAN MH#
PROPOSED SANITARY MAINTENANCE HOLE/NUMBER	SAN MH#
EXISTING BUSH	B
EXISTING HYDRANT AND VALVE	HYD & WV
PROPOSED HYDRANT AND VALVE	HYD & WV
EXISTING WATER VALVE	WV
PROPOSED WATER VALVE	WV
PROPOSED CURB STOP VALVE	CSV
EXISTING WATERMAIN PLUG AND THRUST BLOCK	WP
PROPOSED WATERMAIN PLUG AND THRUST BLOCK	WP
PROPOSED BLOWOFF	BO
EXISTING STORM MAINTENANCE HOLE	STM MH#
PROPOSED STORM MAINTENANCE HOLE/NUMBER	STM MH#
EXISTING CATCH BASIN	CBMH 18
PROPOSED CATCH BASIN	CB
PROPOSED CATCH BASIN MAINTENANCE HOLE/NUMBER	CBMH#
PROPOSED DOUBLE CATCH BASIN	DCB
PROPOSED DITCH INLET CATCH BASIN	DICB
PROPOSED TACTILE WALKING SURFACE INDICATOR	TWSI
PROPOSED CURB CUT	CC
PROPOSED TRAFFIC SIGN	TS
VERTICAL POINT OF INFLECTION	VPI
PROPOSED COMMUNITY MAILBOX	MB
ROCK CHECK DAM	RCD
STRAW BALE CHECK DAM	SBCD
PROPOSED HEADWALL	HW
PROPOSED RIPRAP	RP



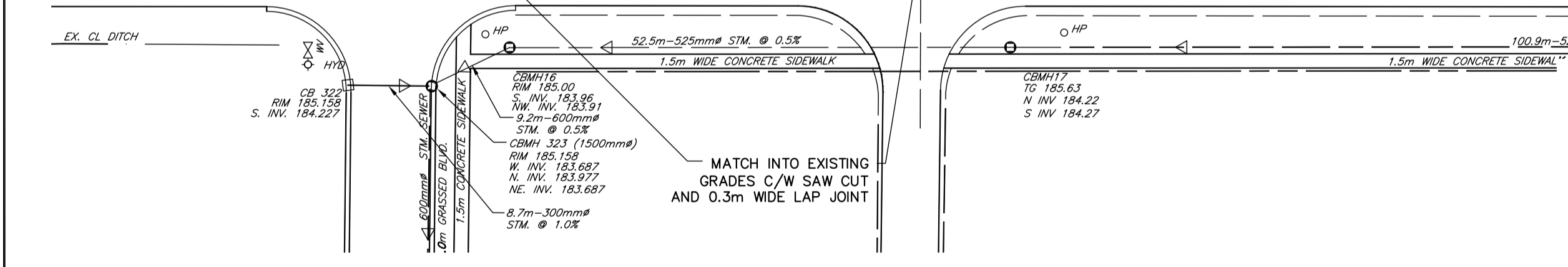
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Consulting Engineers

Collingwood Bracebridge Orillia Barrie Ottawa

PHASE 4 EAST
FIRST ENGINEERING SUBMISSION
CCTA FILE NO. 117098

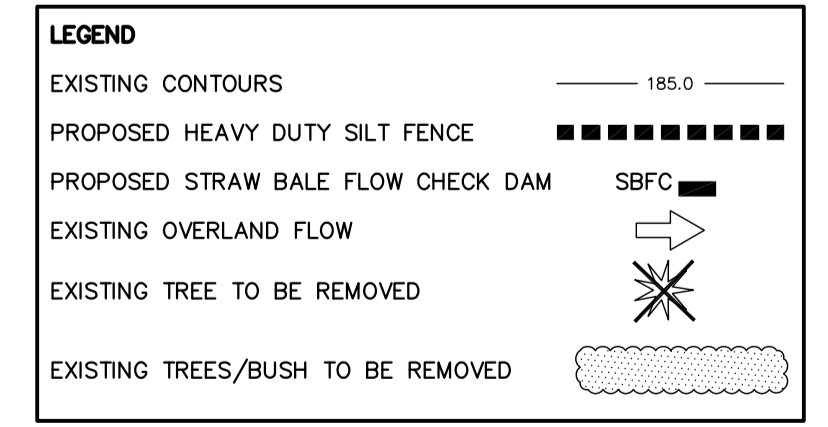
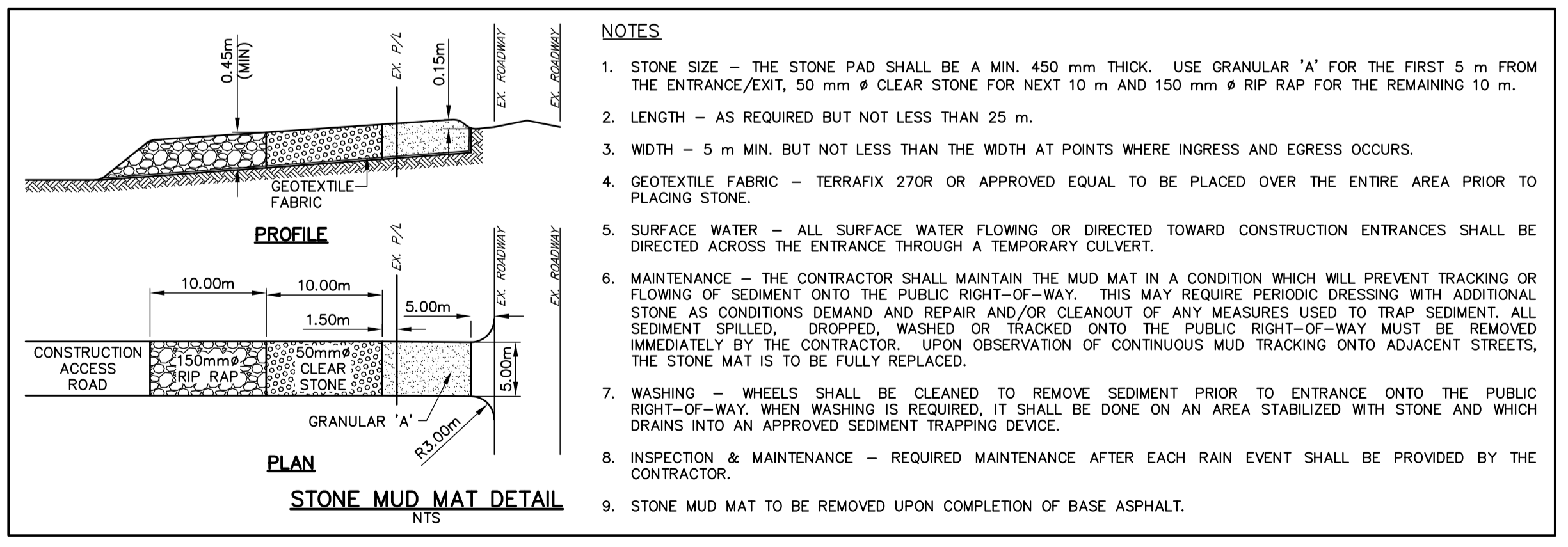


- NOTES:**
- ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE UNTIL ALL DISTURBED AREAS HAVE BEEN STABILIZED. SEDIMENT AND EROSION CONTROL MEASURES THAT ARE DESIGNED TO CONTROL RUNOFF FROM SPECIFIC AREAS MUST BE INSTALLED PRIOR TO ANY DISTURBANCE OF THAT PART OF THE SITE.
 - THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. SUCH MEASURES MUST BE PRESENTED IN WRITING FOR APPROVAL OF THE TOWN ENGINEER AND THE NOTTAWASAGA VALLEY CONSERVATION AUTHORITY.
 - THE CONTRACTOR SHALL HAVE MATERIALS AVAILABLE ON-SITE TO REPAIR SEDIMENT AND EROSION CONTROL MEASURES IN THE EVENT OF UNFORESEEN CONDITIONS: HIGH WATER, EXTREME RAINFALL EVENTS, ETC.
 - ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED BY THE ENGINEER BI-WEEKLY AND AFTER EACH MAJOR STORM EVENT. INSPECTION REPORTS TO BE FORWARDED TO THE TOWN ENGINEER BI-WEEKLY. AREAS THAT ARE UNDEVELOPED FOR AN EXTENDED PERIOD OF TIME SHALL BE RE-VEGETATED WITH TOPSOIL AND HYDRAULIC SEED AND MULCH AS DIRECTED BY THE TOWN.



TBM #1 ELEVATION 182.239
 CONCRETE BRIDGE OVER NOTTAWASAGA RIVER, TABLET IN COPING OF BRIDGE AT SOUTHEAST END, 2.04m SOUTH EAST END OF BRIDGE AND 30m BELOW STEEL GAURD RAIL.

TBM #2 ELEVATION 183.685
 NAIL AND WASHER IN EAST FACE OF HYDRO POLE LOCATED ON WEST SIDE OF THEME PARK ROAD 60m± SOUTH OF GATE TO PARK.



CONTRACT DRAWINGS:
 CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

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DRAWING REFERENCES:

- TOPOGRAPHIC SURVEY AND LEGAL BOUNDARY INFORMATION SHOWN ON THIS DRAWING ARE TAKEN FROM MULTIPLE AUTOCAD FILES RECEIVED FROM PARKBRIDGE LIFESTYLE COMMUNITIES.

NO.	REVISIONS	DATE	INITIAL
1.	FIRST ENGINEERING SUBMISSION	DEC / 17	KRS

APPROVED

**WASAGA MEADOWS
 PHASE 4 EAST
 TOWN OF WASAGA BEACH**

**SILTATION, REMOVALS, AND
 EROSION CONTROL PLAN**

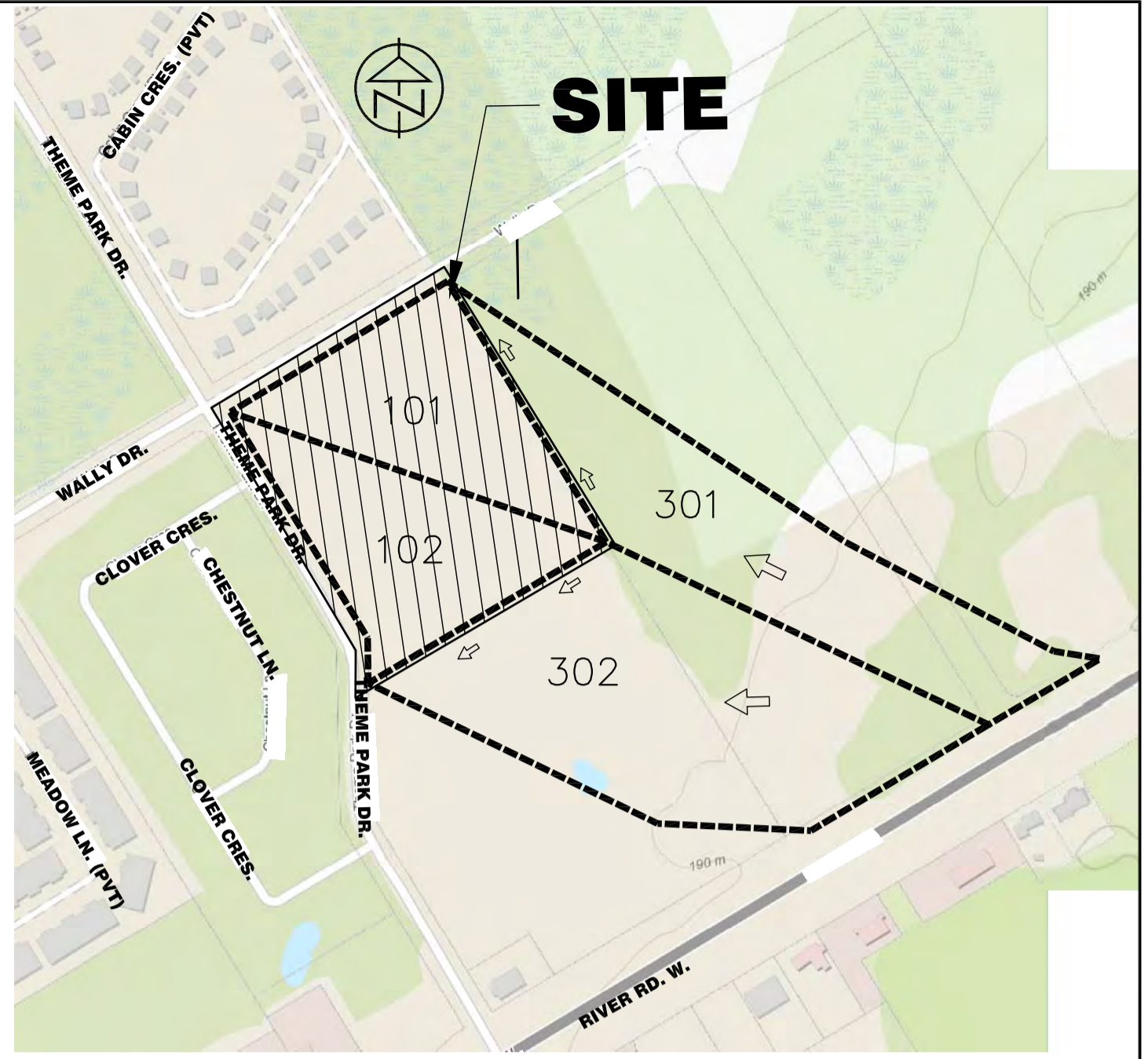
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Collingwood Bracebridge Orillia Barrie Ottawa

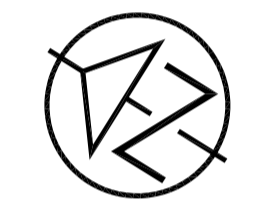
SCALE: 1:500
 DESIGN: SDH/PM
 DRAWN: SDH

CHECKED: KRS
 DATE: MAY/17

JOB NO. 117098
 DWG. **SC-1**



KEY PLAN
1:10,000



LEGEND	
PROPERTY LINE	---
EXISTING DRAINAGE DIRECTION	
CATCHMENT AREA BOUNDARY	-----
AREA IDENTIFICATION NUMBER	
AREA IN HECTARES	
PERCENT IMPERVIOUS / CN VALUE	---

TBM #1 ELEVATION 182.239
CONCRETE BRIDGE OVER NOTTAWASAGA RIVER, TABLET IN COPING OF BRIDGE AT SOUTHEAST END, 2.04m SOUTHEAST END OF BRIDGE AND 30cm BELOW STEEL GAURD RAIL.

TBM #2 ELEVATION 183.685
NAIL AND WASHER IN EAST FACE OF HYDRO POLE LOCATED ON WEST SIDE OF THEME PARK ROAD 60m± SOUTH OF GATE TO PARK.

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NO.	REVISIONS	DATE	INITIAL
1.	FIRST ENGINEERING SUBMISSION	DEC / 17	KRS

APPROVED

**WASAGA MEADOWS
PHASE 4 EAST
TOWN OF WASAGA BEACH**

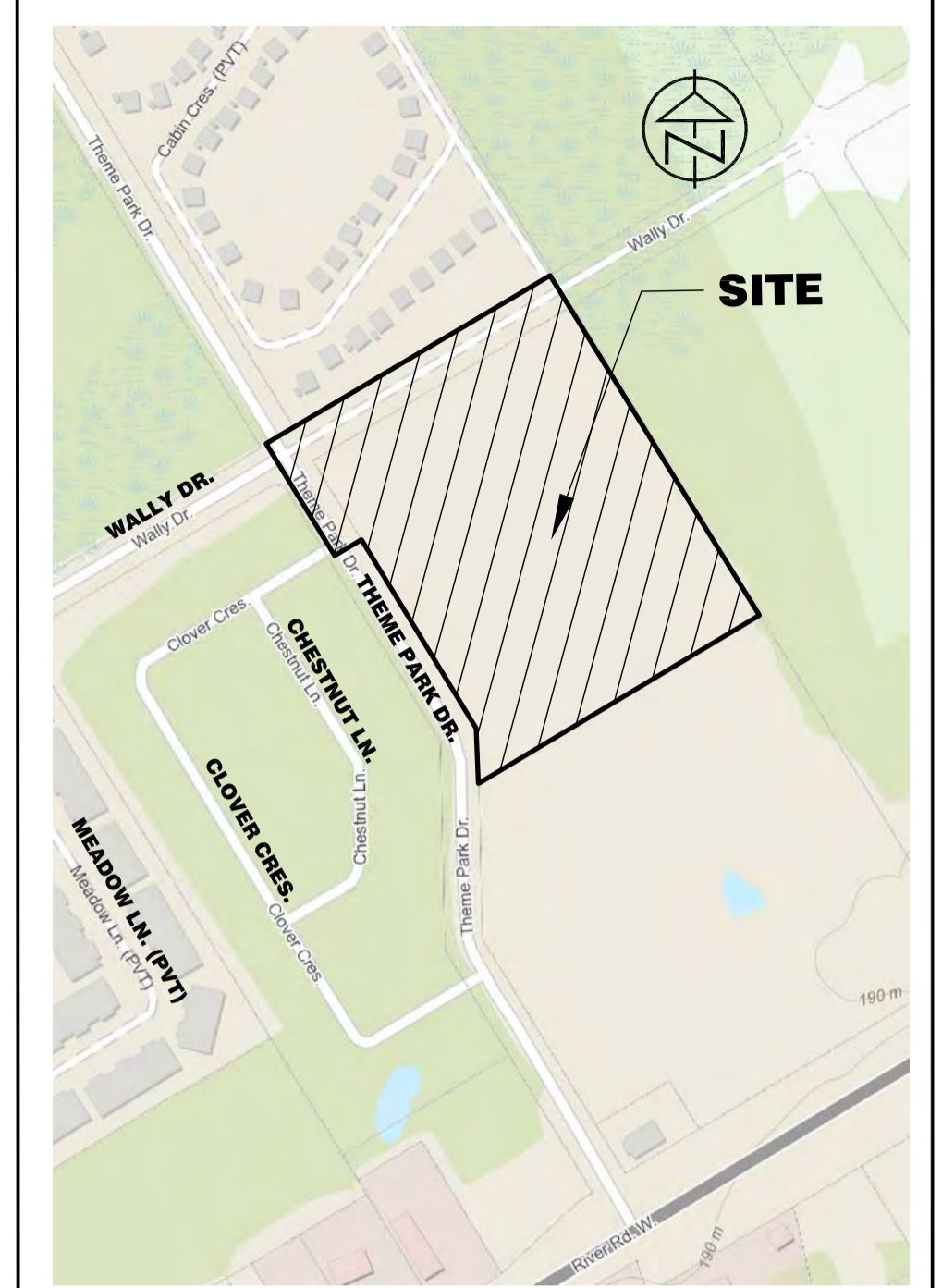
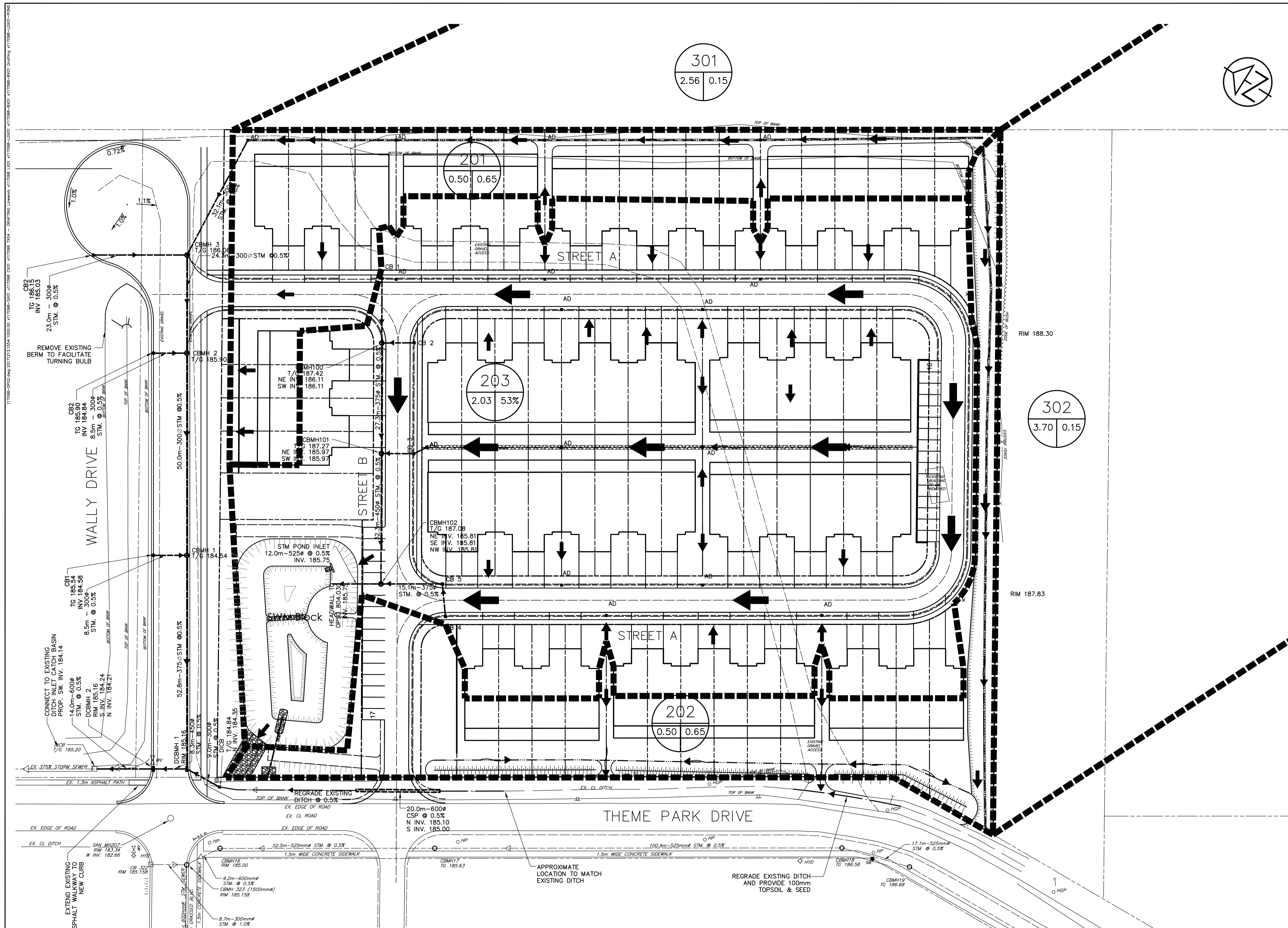
**EXISTING CONDITION
DRAINAGE PLAN**

C.C. Tatham & Associates Ltd.
Consulting Engineers

Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500	JOB NO. 117098
DESIGN: SDH/PM	CHECKED: KRS
DRAWN: SDH	DATE: MAY/17

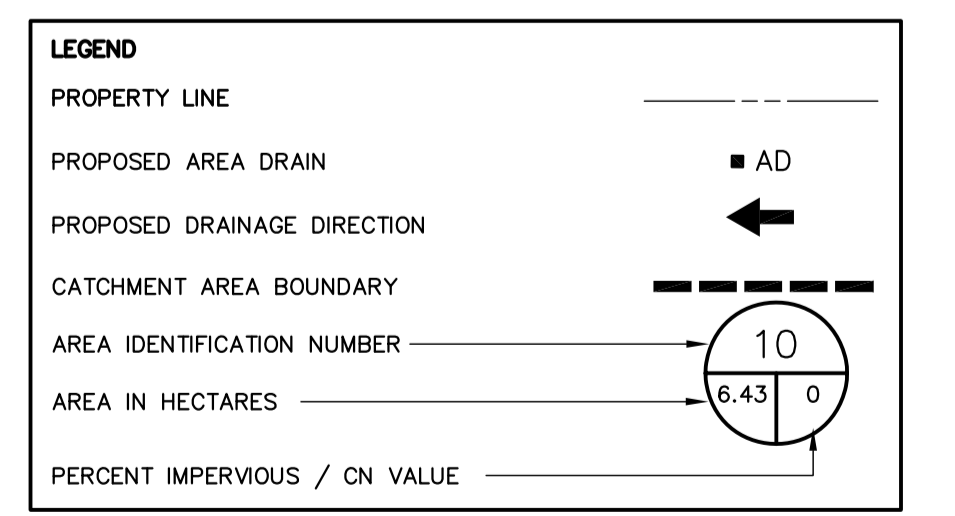
DWG. **DP-1**



KEY PLAN
1:10,000

STORM SEWER

- ALL MATERIALS SHALL BE CSA CERTIFIED IN ACCORDANCE WITH THE TOWN APPROVED MATERIALS LIST.
- CLASS 'B' BEDDING AND COVER AS PER OPSD-802.030 (RIGID PIPE) OR EMBEDMENT AS PER OPSD-802.010 (FLEXIBLE PIPE) USING GRANULAR 'A'. USE SELECT NATIVE MATERIAL COMPACTED TO 95% MAXIMUM DRY DENSITY FOR COVER MATERIAL.
- CATCHBASINS & MANHOLES TO BE BACKFILLED WITH SELECT NATIVE MATERIAL AND COMPACTED TO 95% MAXIMUM DRY DENSITY.
- STEPS AS PER OPSD-405.010 HOLLOW CIRCULAR ALUMINUM.
- CATCHBASIN LEADS; - 300mm DIA. FOR SINGLE AND DOUBLE CATCHBASINS.
- CATCHBASIN FRAMES AND COVERS PER OPSD 400.020.
- STORM LEAD CONNECTIONS TO STORM MAIN TO BE IN ACCORDANCE WITH OPSD 708.010 AND OPSD 708.030.
- STORM SEWER SHALL BE CCTV INSPECTED.
- STORM SEWER SHALL BE CONCRETE 100-D, OR PVC 320 KPa PIPE STIFFNESS.
- BEDDING AS PER OPSD-802.031 FOR RIGID PIPE OR BEDDING AS PER OPSD-802.010 (TYPE 3 SOIL)
- FOR FLEXIBLE PIPE. SELECT NATIVE SAND COMPACTED TO 95% MAXIMUM DRY DENSITY MAY BE USED FOR COVER MATERIAL IF APPROVED BY THE ENGINEER.
- MH AND CBMH TO OPSD 701.010, 701.011, 701.012, 701.013, 701.030, 701.040, 701.050 OR 701.060. MH TO BE BENCHED IN ACCORDANCE WITH OPSD 701.021.
- CB'S TO OPSD 705.010 OR DOUBLE TO OPSD 705.020, WITH 600mm SUMP.
- PIPE SUPPORT AT MH, CBMH AND CB TO OPSD 708.020.
- PROTECTION DURING CONSTRUCTION TO OPSD 808.010.
- ALL WORK TO BE IN ACCORDANCE WITH OPS 410.
- DITCHES/SWALES CONSTRUCTED AT LESS THAN 1% SHALL HAVE MIN. 150mm² SUBDRAIN, BEDDED IN A 300x300mm CLEARSTONE TRENCH AND WRAPPED IN FILTER FABRIC.
- DITCH INLET CATCH BASINS IN ACCORDANCE WITH OPSD 705.030, GRATES INSTALLED IN ACCORDANCE WITH OPSD 403.010 (4:1 UNLESS OTHERWISE SPECIFIED).
- DITCH INLET MAINTENANCE HOLE IN ACCORDANCE WITH OPSD 702.040. GRATES INSTALLED IN ACCORDANCE WITH OPSD 403.010 (4:1 UNLESS OTHERWISE SPECIFIED).



TBM #1 ELEVATION 182.239
CONCRETE BRIDGE OVER NOTTAWASAGA RIVER, TABLET IN COPING OF BRIDGE AT SOUTHEAST END, 2.04m SOUTH-EAST END OF BRIDGE AND 30cm BELOW STEEL GAIRD RAIL.

TBM #2 ELEVATION 183.685
NAIL AND WASHER IN EAST FACE OF HYDRO POLE LOCATED ON WEST SIDE OF THEME PARK ROAD 60m± SOUTH OF GATE TO PARK.

CONTRACT DRAWINGS:
CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

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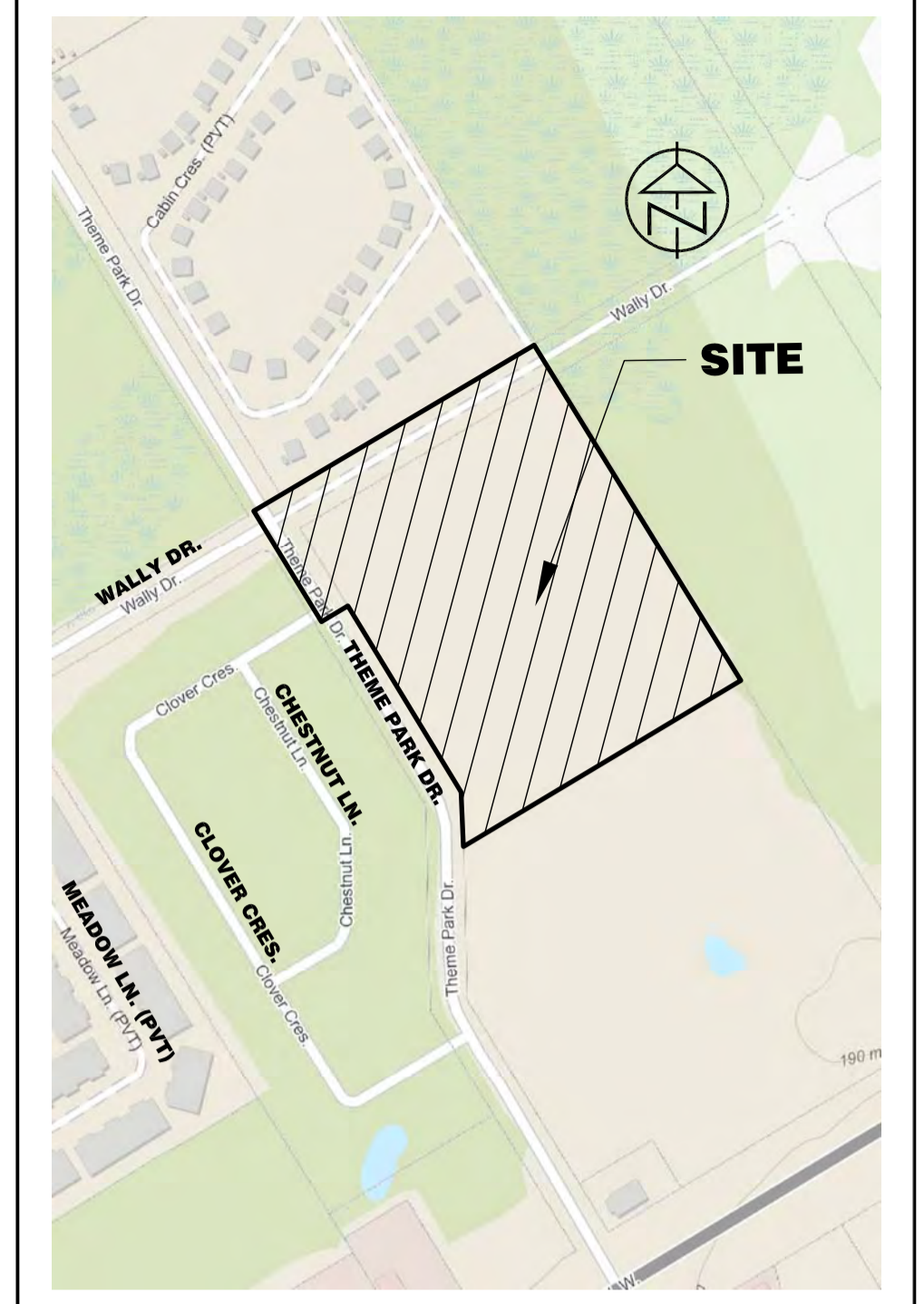
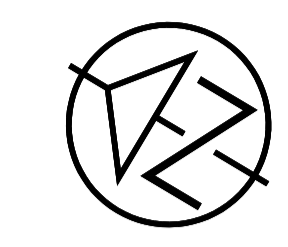
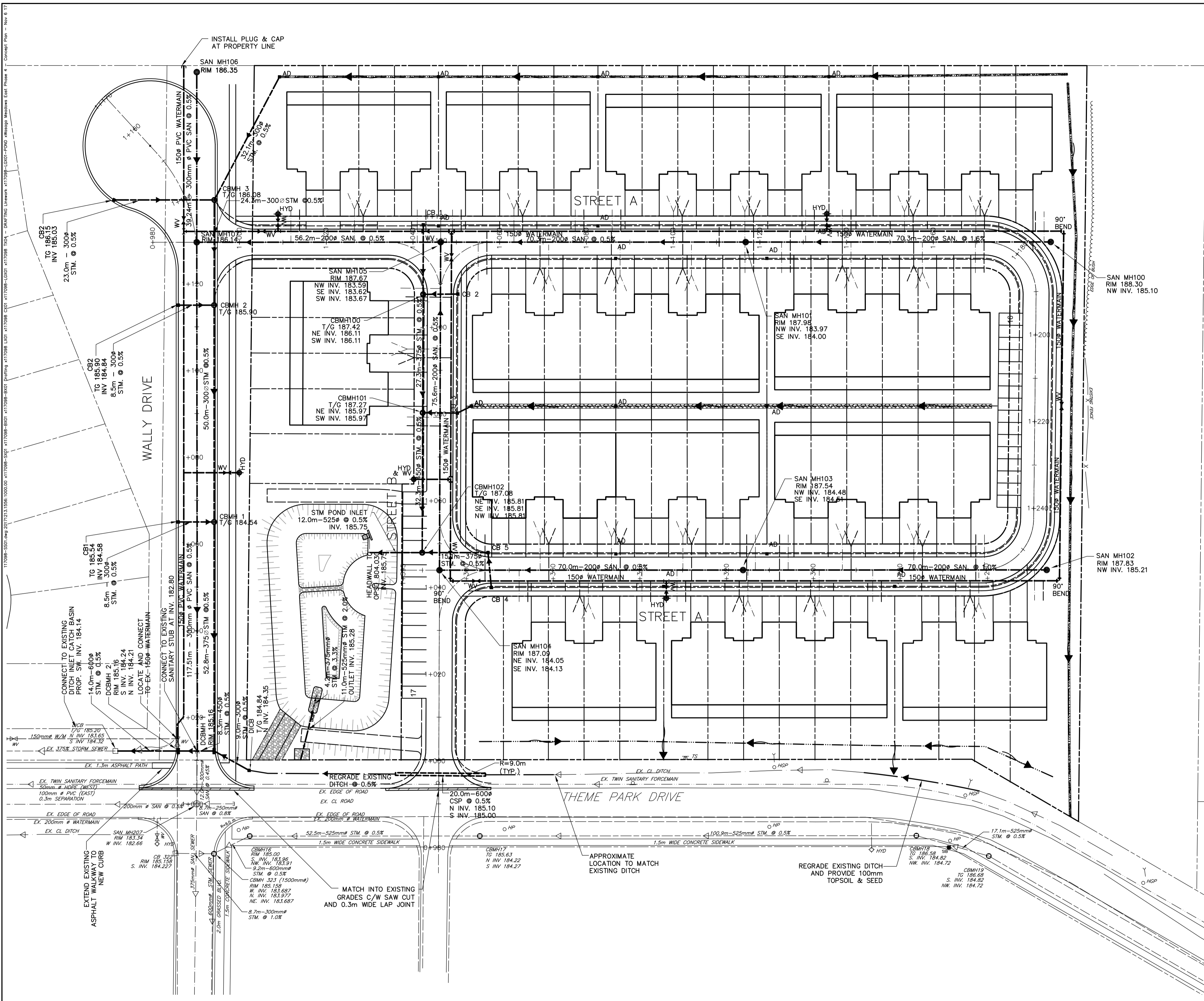
NO.	REVISIONS	DATE	INITIAL
1.	FIRST ENGINEERING SUBMISSION	DEC / 17	KRS

APPROVED

**WASAGA MEADOWS
PHASE 4 EAST
TOWN OF WASAGA BEACH**

**PROPOSED CONDITION
DRAINAGE PLAN**

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa
SCALE: 1:500
DESIGN: SDH/RA
DRAWN: SDH
JOB NO. 117098
CHECKED: KRS
DATE: MAY/17
DWG. **DP-2**



KEY PLAN
1:10,000

LEGEND:

PROPERTY LINE	
PROPOSED STEEP SLOPE	
PROPOSED BOTTOM BOTTOM OF SWALE	
PROPOSED OVERLAND FLOW DIRECTION	5.1%
PROPOSED SWALE FLOW DIRECTION	
EXISTING STORM SEWER	250mm ϕ STM
PROPOSED STORM SEWER	300 ϕ STM
PROPOSED STORM SERVICE	
PROPOSED STORM CATCH BASIN MAINTENANCE HOLE	
PROPOSED STORM MAINTENANCE HOLE	
EXISTING SANITARY FORCEMAIN	250mm ϕ SAN
PROPOSED SANITARY SEWER	200 ϕ SAN
PROPOSED SANITARY SERVICE	
PROPOSED SANITARY MAINTENANCE HOLE	
PROPOSED WATER MAIN	200 ϕ WATERMAIN
PROPOSED WATER VALVE	
PROPOSED HYDRANT AND LEAD	

TBM #1 ELEVATION 182.239
CONCRETE BRIDGE OVER NOTTAWASAGA RIVER, TABLET IN COPING OF BRIDGE AT SOUTHEAST END, 2.04m SOUTHEAST END OF BRIDGE AND 30cm BELOW STEEL GAURD RAIL.

TBM #2 ELEVATION 183.685
NAIL AND WASHER IN EAST FACE OF HYDRO POLE LOCATED ON WEST SIDE OF THEME PARK ROAD 60m \pm SOUTH OF GATE TO PARK.

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NO.	REVISIONS	DATE	INITIAL
1.	FIRST ENGINEERING SUBMISSION	DEC / 17	KRS

APPROVED

**WASAGA MEADOWS
PHASE 4 EAST
TOWN OF WASAGA BEACH**

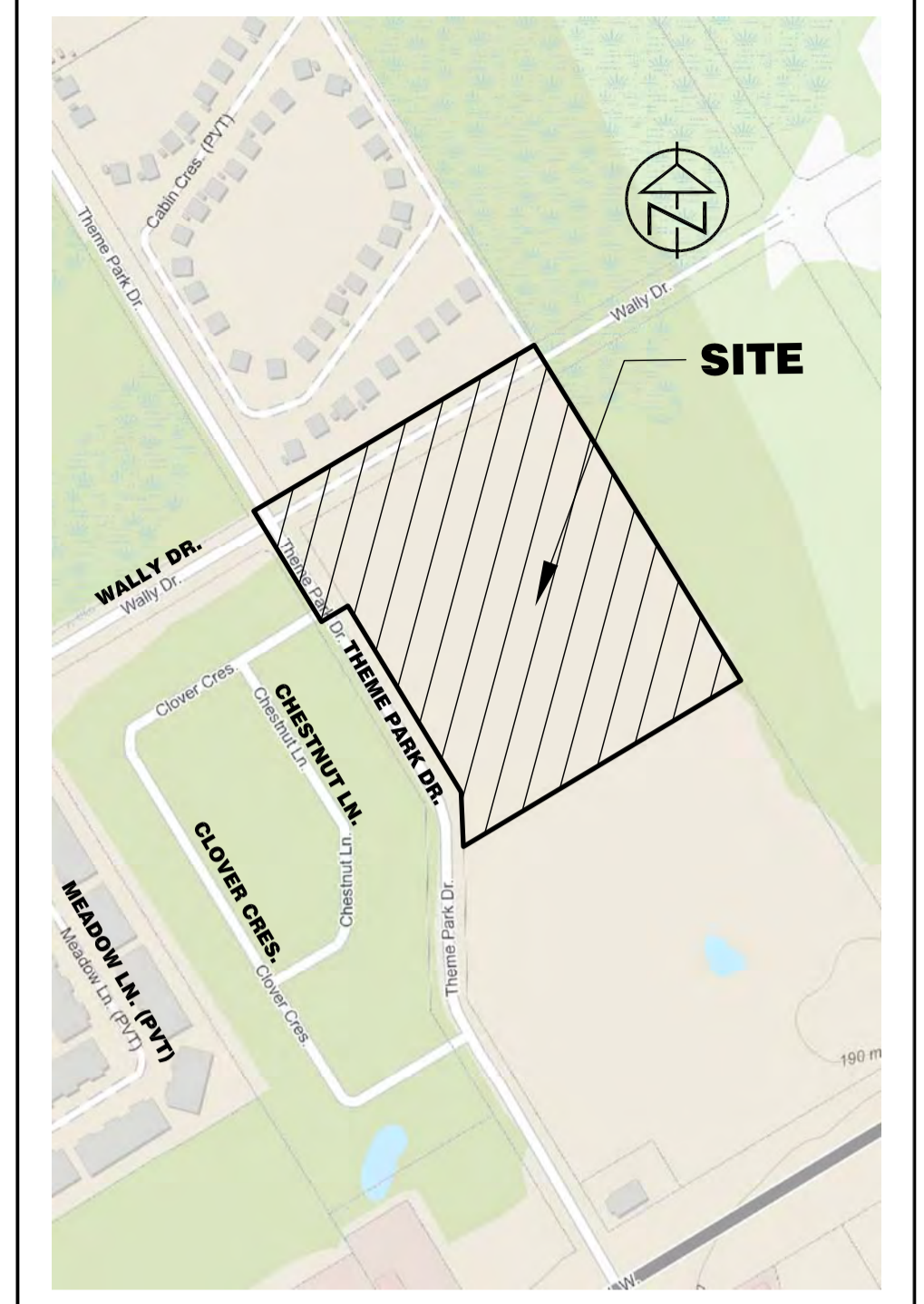
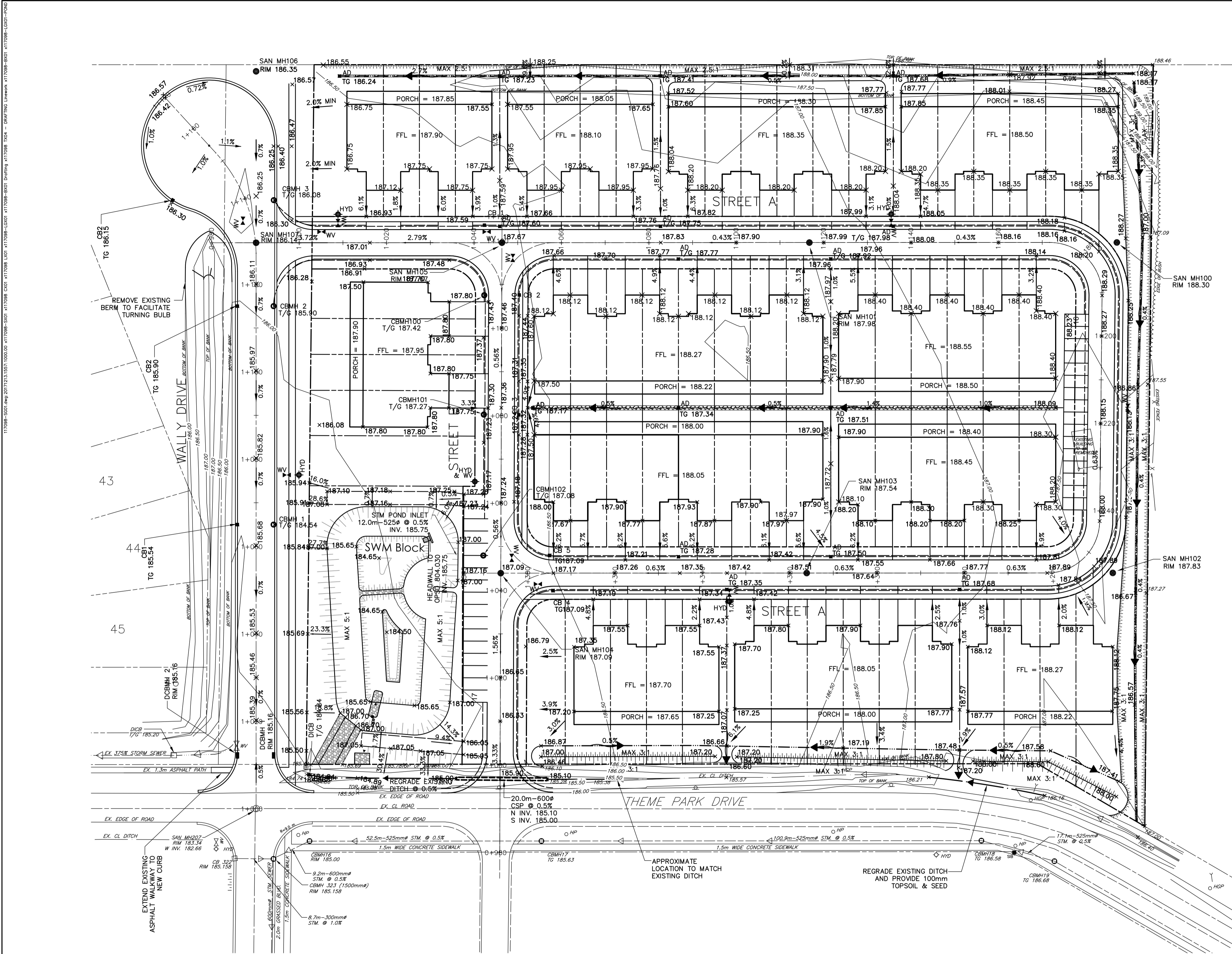
SITE SERVICING PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500
DESIGN: SDH/PM
DRAWN: SDH

JOB NO. 117098
CHECKED: KRS
DATE: MAY/17

DWG. **SS-1**



KEY PLAN
1:10,000

TBM #1 ELEVATION 182.239
CONCRETE BRIDGE OVER NOTTAWASAGA RIVER, TABLET IN COPING OF BRIDGE AT SOUTHEAST END, 2.04m SOUTH-EAST END OF BRIDGE AND 30cm BELOW STEEL GAURD RAIL.

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**WASAGA MEADOWS
PHASE 4 EAST
TOWN OF WASAGA BEACH**

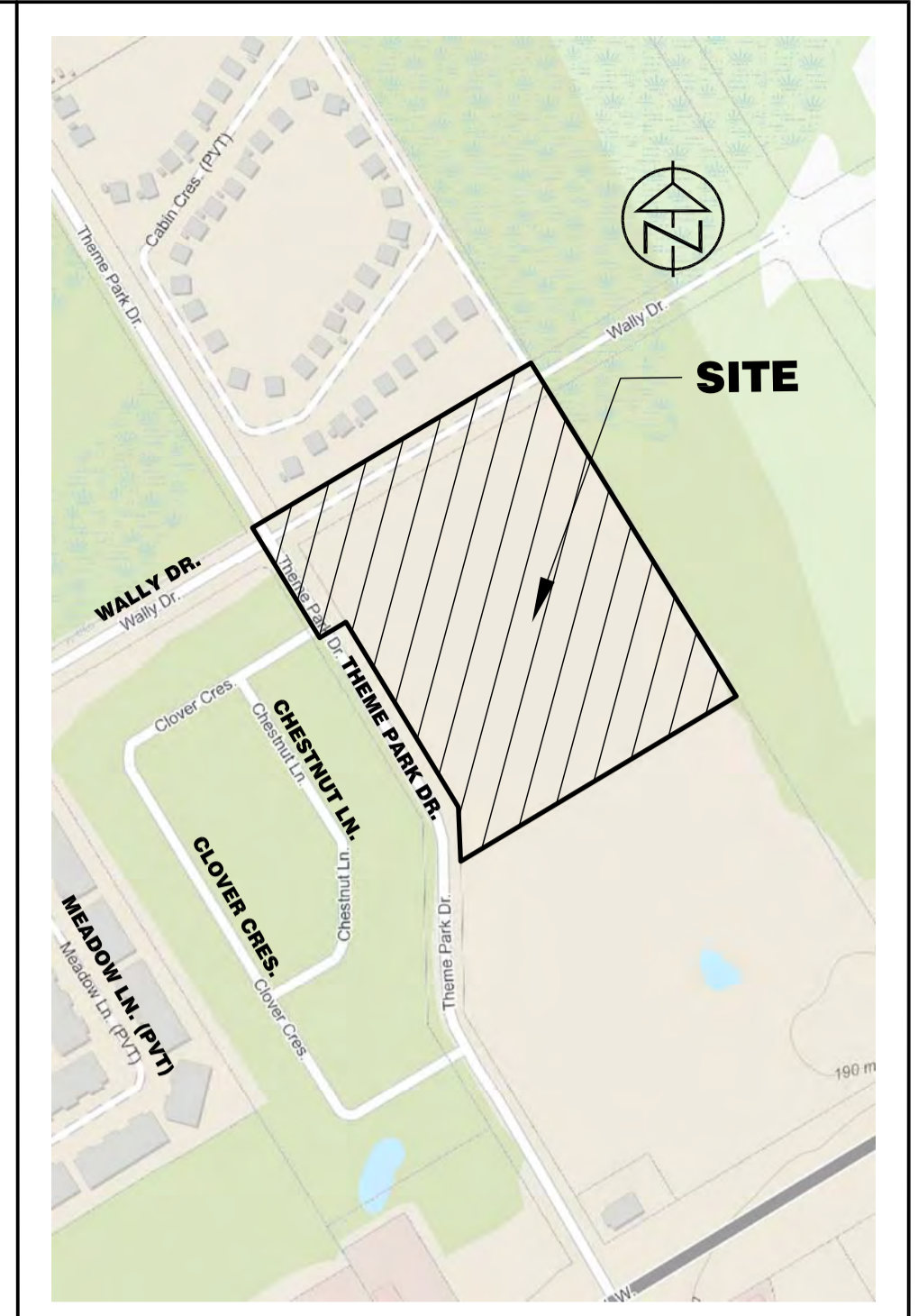
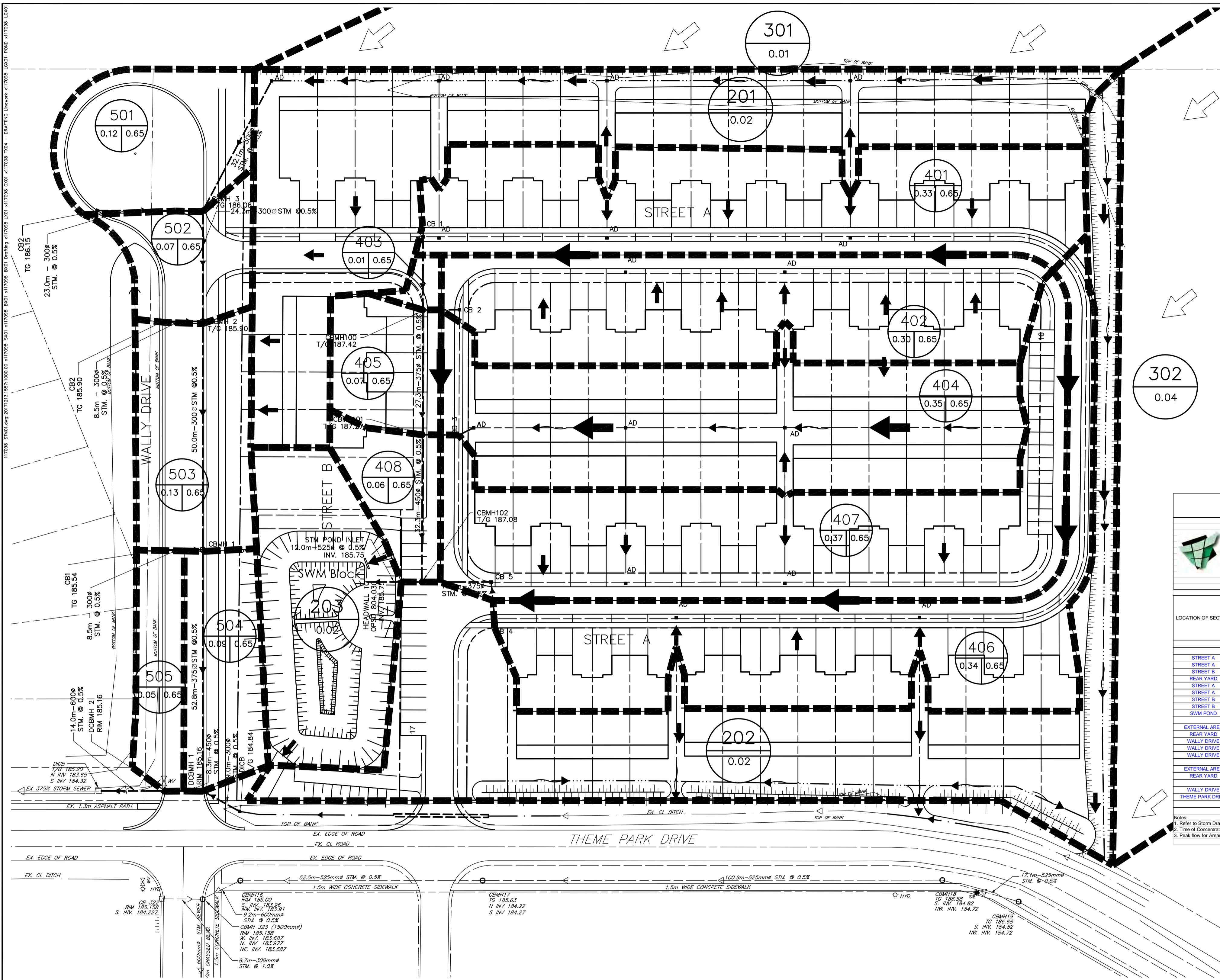
SITE GRADING PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500
DESIGN: SDH/PM
DRAWN: SDH

JOB NO. 117098
CHECKED: KRS
DATE: MAY/17

DWG. **SG-1**



STORM SEWER DESIGN SHEET - 5 YEAR

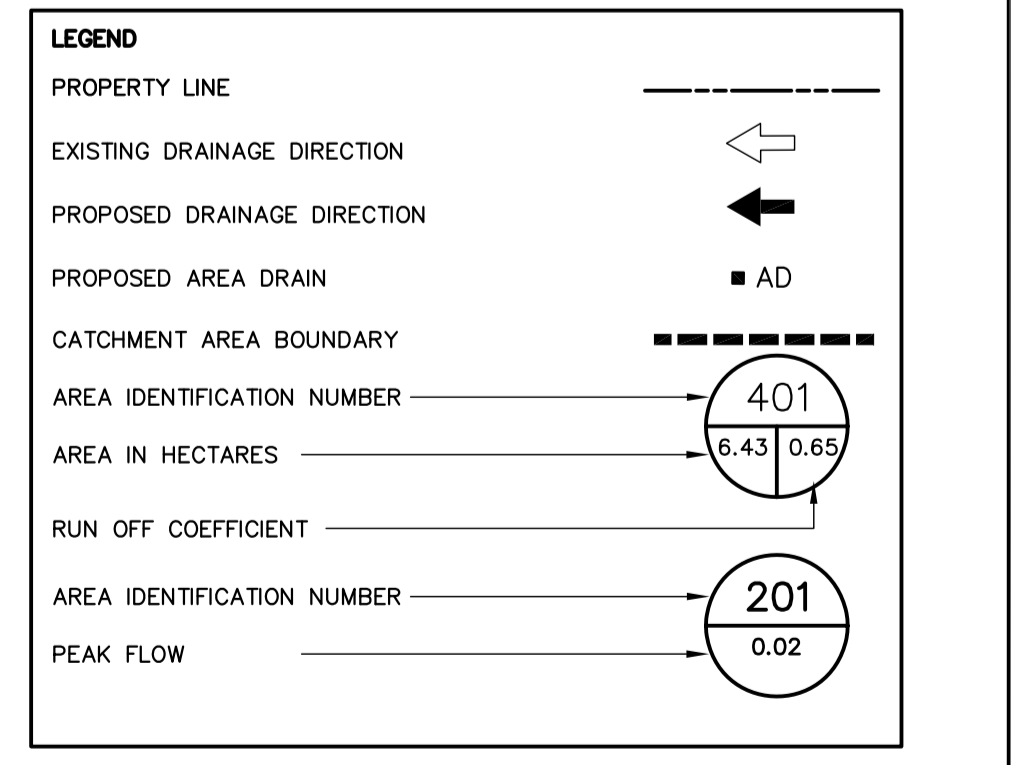
C.C. Tatham & Associates Ltd. Consulting Engineers Collingwood Bracebridge Orillia Barrie Ottawa	IDF Curve Coefficients	Storm	A	B	C	Project Name: Wasaga Meadows Ph 4 East Project Number: 117098 Municipality: Town of Wasaga Beach Designed By: PM Date: December 12, 2017 Revised By: PM Date: December 13, 2017 Checked By: KRS Date: December 13, 2017 Revision Number:
	2 Year	854.100	7.781	0.830		
	5 Year	1234.976	8.297	0.851		
	25 Year	1750.276	8.303	0.862		
	100 Year	2171.764	8.303	0.867		
	Manning's Coefficient	PVC / Concrete: 0.024				

LOCATION OF SECTION	AREA LABEL	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	MANHOLE AREA (m²)	RUNOFF COEFFICIENT - C	INDIVIDUAL A x C	CUMULATIVE AREA	CUMULATIVE A x C	CONCENTRATION (mm/hr)	RAINFALL INTENSITY (mm/hr)	PEAK FLOW (cms)	MANNING'S ROUGHNESS COEFFICIENT	LENGTH (m)	SLOPE (m/m)	DIAMETER (mm)	PIPE FLOW VELOCITY (m/s)	FULL FLOW CAPACITY (cms)	ACTUAL VELOCITY (m/s)	TIME OF FLOW (min)	CALCULATED PIPE DIAMETER (mm)	TIME OF CONCENTRATION (min)
STREET A	401	CB 1	CBMH 100	0.33	0.65	0.215	0.33	0.21	30.00	71.79	0.043	0.012	16.0	0.0200	300	2.10	0.148	1.70	0.16	158	20.16
STREET A	402	CB 2	CBMH 100	0.30	0.65	0.195	0.30	0.20	30.00	71.79	0.039	0.012	8.0	0.0200	300	2.10	0.148	1.65	0.08	182	20.08
STREET B	403	CBMH 100	CBMH 101	0.01	0.65	0.007	0.04	0.42	20.08	71.63	0.083	0.012	27.3	0.0050	375	1.22	0.134	1.20	0.38	313	20.46
REAR YARD	404	CB 3	CBMH 101	0.35	0.65	0.228	0.35	0.23	30.00	71.79	0.045	0.012	8.0	0.0200	300	2.10	0.148	1.72	0.08	152	20.08
STREET A	405	CBMH 101	CBMH 102	0.07	0.65	0.046	1.06	0.69	20.08	71.63	0.137	0.012	32.3	0.0050	450	1.37	0.218	1.36	0.39	378	20.47
STREET A	406	CB 4	CB 5	0.34	0.65	0.221	0.34	0.22	30.00	71.79	0.044	0.012	8.0	0.0200	300	2.10	0.148	1.71	0.08	160	20.08
STREET B	407	CB 5	CBMH 102	0.37	0.65	0.241	0.71	0.46	20.08	71.63	0.092	0.012	15.1	0.0050	375	1.22	0.134	1.22	0.21	325	20.28
STREET B	408	CBMH 102	HEAD WALL	0.06	0.65	0.039	1.83	1.19	20.28	71.18	0.235	0.012	12.0	0.0050	525	1.52	0.329	1.52	0.13	463	20.42
SWIM POND	203	SWIM POND	OUTLET								0.020										
EXTERNAL AREA	301	AD	CBMH 3								0.010										
REAR YARD	201	AD	CBMH 2	0.12	0.65	0.078	0.12	0.08	15.00	84.71	0.048	0.012	24.3	0.0050	300	1.05	0.074	1.05	0.39	296	15.39
WALLY DRIVE	501	CBMH 3	CBMH 1	0.07	0.65	0.046	0.19	0.12	15.39	83.53	0.059	0.012	50.0	0.0050	300	1.05	0.074	1.05	0.80	275	16.18
WALLY DRIVE	502	CBMH 1	DCBMH 1	0.13	0.65	0.085	0.32	0.21	15.18	81.22	0.077	0.012	52.8	0.0050	375	1.22	0.134	1.18	0.75	304	16.93
EXTERNAL AREA	302	DCB	DCBMH 1						15.00	84.71	0.040										
REAR YARD	202	DCB	DCBMH 1						15.00	84.71	0.080	0.012	9.0	0.0200	300	2.10	0.148	2.01	0.07	238	15.07
WALLY DRIVE	504	DCBMH 1	DCBMH 2	0.09	0.50	0.045	4.61	1.13	15.07	84.48	0.376	0.012	8.3	0.0200	450	2.75	0.437	2.75	0.05	405	15.13
THEME PARK DRIVE	505	DCBMH 2	EX DICB MH	0.05	0.65	0.033	4.66	1.17	15.13	84.33	0.383	0.012	14.0	0.0050	600	1.66	0.470	1.66	0.14	555	15.27

Notes:
 1. Refer to Storm Drainage Plan drawing STM-1 prepared by C.C. Tatham & Associates Ltd. (dated May 2017) for catchment areas and pipe details.
 2. Time of Concentration varies: 15 minutes for most circumstances and 20 minutes for rear lots with Area Drains due to the fact they have infiltration trenches.
 3. Peak flow for Areas 201, 202, 203, 301 and 302 uses the OTTHMO method to determine peak flow, refer to Appendix C for calculations.

TBM #1 ELEVATION 182.239
 CONCRETE BRIDGE OVER NOTTAWASAGA RIVER, TABLET IN COPING OF BRIDGE AT SOUTHEAST END, 2.04m SOUTH EAST END OF BRIDGE AND 30cm BELOW STEEL GAURD RAIL.

TBM #2 ELEVATION 183.685
 NAIL AND WASHER IN EAST FACE OF HYDRO POLE LOCATED ON WEST SIDE OF THEME PARK ROAD 60m± SOUTH OF GATE TO PARK.



CONTRACT DRAWINGS:
 CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

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DRAWING REFERENCES:

- TOPOGRAPHIC SURVEY AND LEGAL BOUNDARY INFORMATION SHOWN ON THIS DRAWING ARE TAKEN FROM MULTIPLE AUTOCAD FILES RECEIVED FROM PARKBRIDGE LIFESTYLE COMMUNITIES.

NO.	REVISIONS	DATE	INITIAL
1.	FIRST ENGINEERING SUBMISSION	DEC / 17	KRS

APPROVED

WASAGA MEADOWS PHASE 4 EAST TOWN OF WASAGA BEACH

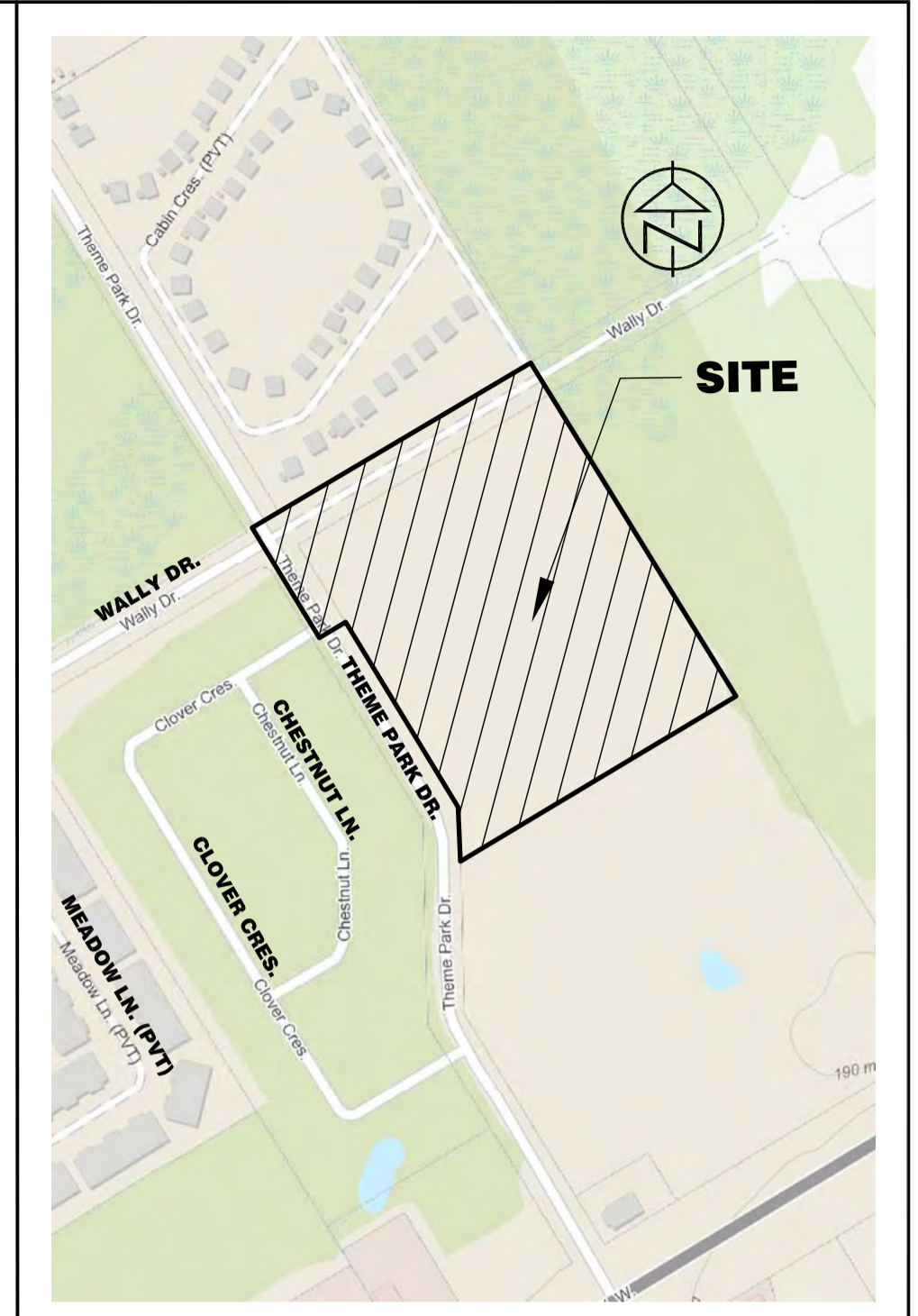
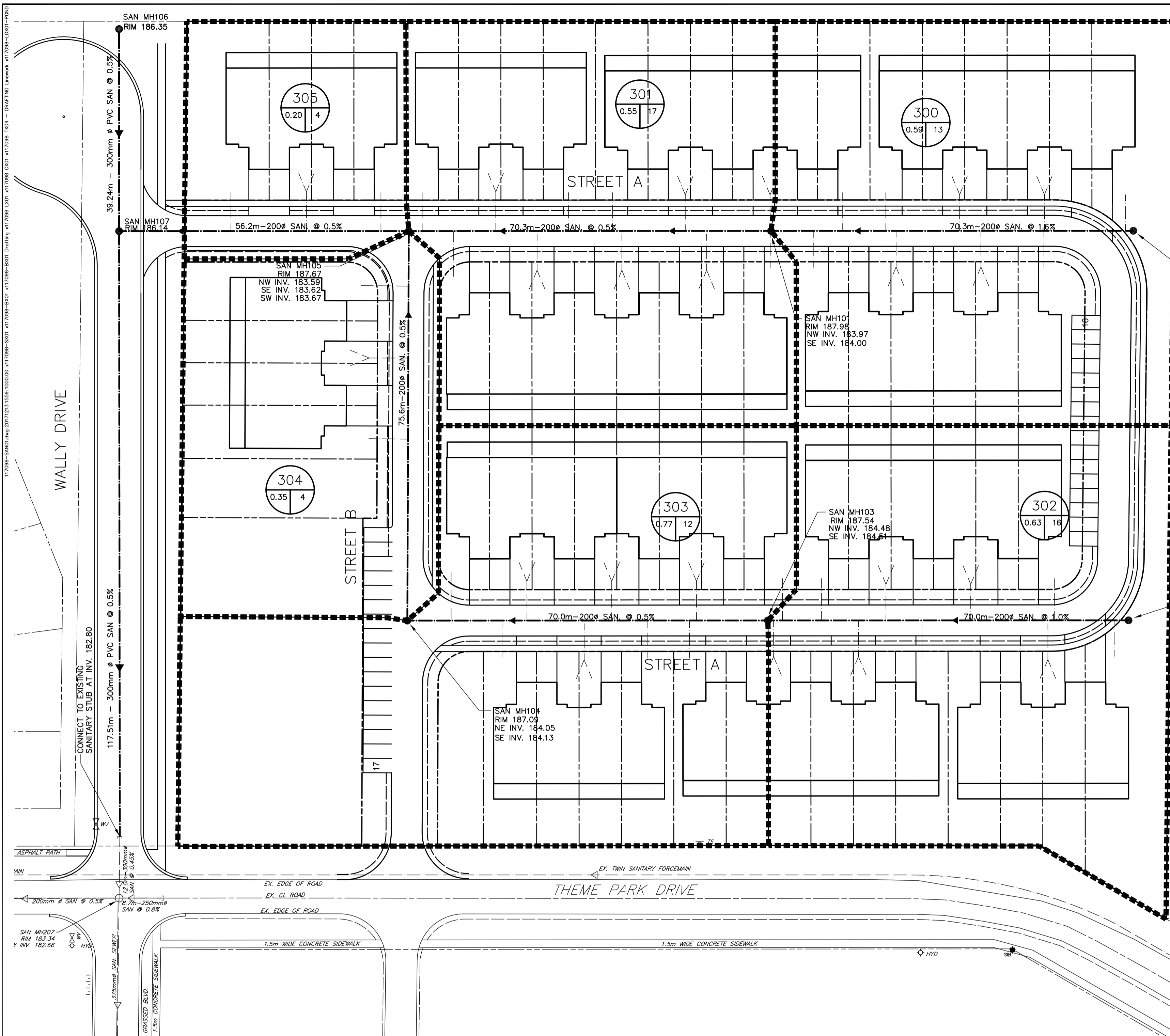
STORM DRAINAGE PLAN

C.C. Tatham & Associates Ltd.
 Consulting Engineers
 Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500
 DESIGN: SDH/PM
 DRAWN: SDH

CHECKED: KRS
 DATE: MAY/17

JOB NO. 117098
 DWG. **STM-1**



KEY PLAN
1:10,000

SANITARY SEWER DESIGN SHEET

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

FLOW CRITERIA
Average Daily Flow Rate: 350 L/cap/d
Inflow/Infiltration Rate: 0.28 L/s/ha
Peaking Factor: Harmon
Density: 2.6 cap/unit

Project Number: 117098
Project Name: Wasaga Country Life - Phase 5
Municipality: Town of Wasaga Beach
Designed By: SDH
Date: September 22, 2017
Revised By: PM
Date: December 12, 2017
Checked By: KRS
Date: December 12, 2017
Revision: 0

Approved: _____

LOCATION OF SECTION	AREA LABEL	UPSTREAM MAINTENANCE HOLE	DOWNSTREAM MAINTENANCE HOLE	NUMBER OF UNITS	POPULATION	ACCUMULATED POPULATION	PEAKING FACTOR	AREA	ACCUMULATED AREA	AVERAGE FLOW			PEAK FLOW			PROPOSED SEWER					
										RESIDENTIAL	INFILTRATION	TOTAL	RESIDENTIAL	INFILTRATION	TOTAL	LENGTH OF PIPE	PIPE DIAMETER	GRADE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	PEAK FLOW VELOCITY (2% INFILTRATION)
		MH No.	MH No.	no.	cap.	cap.		ha	ha	l/s	l/s	l/s	l/s	l/s	l/s	m	mm	%	l/s	m/s	m/s
Street A	300	100	101	13	34	34	4.35	0.62	0.62	0.14	0.17	0.60	0.17	0.77	70.3	200	1.6%	41.48	1.32	0.48	
Street A	301	101	105	17	44	78	4.27	0.58	1.20	0.32	0.34	0.65	1.35	0.34	1.69	70.3	200	0.5%	23.19	0.74	0.39
Street A	302	102	103	16	42	42	4.33	0.50	0.50	0.17	0.14	0.31	0.73	0.14	0.87	70.0	200	1.0%	32.89	1.04	0.43
Street A	303	103	104	12	31	73	4.29	0.89	1.39	0.29	0.39	0.66	1.26	0.39	1.65	70.0	200	0.5%	23.19	0.74	0.39
Street B	304	104	105	4	10	83	4.26	0.31	1.69	0.34	0.47	0.81	1.44	0.47	1.91	75.6	200	0.5%	23.19	0.74	0.40
Street A	305	105	107	4	10	172	4.17	0.17	3.06	0.70	0.86	1.55	2.90	0.86	3.76	56.2	200	0.5%	23.19	0.74	0.48
Wally Drive	106	107		0	0	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.2	300	0.5%	68.37	0.97	0.60	
Wally Drive	107	207		0	172	4.17	0.00	3.06	0.70	0.86	1.55	2.90	0.86	3.76	117.3	300	0.5%	68.37	0.97	0.47	

Notes:
1. Refer to Sanitary Drainage Plan drawing SAN-1 prepared by C.C. Tatham & Associates Ltd. (dated May 2017) for catchment areas and pipe details.

TBM #1 ELEVATION 182.239
CONCRETE BRIDGE OVER NOTTAWASAGA RIVER, TABLET IN COPING OF BRIDGE AT SOUTHEAST END, 2.04m SOUTH-EAST END OF BRIDGE AND 30cm BELOW STEEL GAURD RAIL.

TBM #2 ELEVATION 183.685
NAIL AND WASHER IN EAST FACE OF HYDRO POLE LOCATED ON WEST SIDE OF THEME PARK ROAD 60m± SOUTH OF GATE TO PARK.

LEGEND:

- PROPERTY LINE
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SERVICE
- PROPOSED SANITARY MAINTENANCE HOLE
- SANITARY AREA BOUNDARY
- AREA IDENTIFICATION NUMBER
- AREA IN HECTARES
- NUMBER OF UNITS

CONTRACT DRAWINGS:
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NO.	REVISIONS	DATE	INITIAL
1.	FIRST ENGINEERING SUBMISSION	DEC / 17	KRS

APPROVED

**WASAGA MEADOWS
PHASE 4 EAST
TOWN OF WASAGA BEACH**

SANITARY DRAINAGE PLAN

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

SCALE: 1:500
DESIGN: SDH/PM
DRAWN: SDH

CHECKED: KRS
DATE: MAY/17

JOB NO. 117098
DWG. **SAN-1**

