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Aqorpions Eco Retreat

FUNCTIONAL SERVICING STUDY

Aqorpions Inc.

Document Control

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Issue	Date	Description
1	April 19, 2022	1 st Submission

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1 Introduction

Tatham Engineering Limited (Tatham) was retained to complete a Functional Servicing Report in support of the proposed Eco Retreat and 5 residential stand-alone units on Parcels 1 and 2 on Part Lot 3, Concession Broken Front, in the Municipality of Meaford. This report has been prepared to address the preliminary servicing requirements for the proposed development, including potable water supply, sanitary sewage treatment, stormwater management, traffic implications and utility distribution.

1.1 SITE DESCRIPTION

The parcels are located at 423003 Harbour Drive and are approximately 14.0 ha in total. The property is currently wooded with a gravel laneway extending into the property from Harbour Drive and three existing wetland pockets. Parcels 1 and 2 both have frontage along Georgian Bay and are generally forested. The property generally slopes north towards the Bay and is bounded by forested land to the south and west, Georgian Bay to the north and forested federal lands under the jurisdiction of the Department of National Defense occupied by the Meaford Training Range to the east. Please refer to the attached Figure 1 and Figure 2 for a regional and local site location plan.

1.2 GEOTECHNICAL INVESTIGATIONS

On January 20, 2017, nine test pits were excavated across the property. The test pits ranged in depth from 1.1 m to 2.4 m below ground level. Standpipes were installed in 8 of the 9 test pits. Static water levels in the standpipes were measured on February 22, 2017.

The underlying soils for test pits 1-5 consisted of a surficial layer of topsoil, followed by a layer of sand. Test pits 6-9 consisted of a surficial layer of topsoil, followed by a layer of silty clay, followed by shale. Water seepage occurred in all test pits except for one, at a depth of 0.6 m to 1.5 m below ground level. Test pit elevations including groundwater levels are included on LG-1.



2 Proposed Land Use

The Eco Retreat will be located on parcels 1 and 2 and 5 stand-alone residential units will be constructed along the shore of parcel 2. Most of both parcels will remain in a natural state and will make up part of a trail system associated with the Eco Retreat. The Eco Retreat will consist of a 2-storey clubhouse, 7 two-bedroom waterfront huts, 4 two-bedroom ravine side huts, 4 one-bedroom ravine side huts, 2 treetop huts, 4 luxury tents, a manager's hut and a comfort station dispersed throughout the property. Additionally, an amphitheater and outdoor yoga area will be provided, along with 2 parking areas providing a total of 114 parking spaces with separate RV parking. Please refer to Figure 3 attached which illustrates the proposed Site Plan.



3 Sanitary

Sanitary servicing for the Eco Retreat huts and clubhouse will be provided by a low-pressure sewage collection system and conveyed to a large subsurface sewage disposal system. The proposed individual residential lots (5) located at the northeast limit of the development within Parcel 2 will be serviced by individual septic beds – Type ‘A’ dispersal beds with Waterloo Biofilter pre-treatment or approved equivalent.

3.1 SEWAGE COLLECTION SYSTEM

The Eco Retreat huts and clubhouse will be serviced by gravity sanitary services which will convey sewage to individual sewage pumping stations (SPS) sized in accordance with MECP guidelines. It is anticipated that one SPS will service three huts and an individual SPS will be provided for the clubhouse and comfort station. A total of 8 SPS are proposed to service the Eco Retreat development. Sewage will be pumped to a large subsurface sewage treatment plant via low pressure sanitary sewers for treatment and disposal.

The sewage from the residential lots will be collected in individual septic tanks.

3.2 SEWAGE TREATMENT & DISPOSAL

The sewage disposal system for the Eco Retreat development will consist of a sewage treatment plant discharging to a shallow buried trench system. The treatment plant will provide Level IV treatment (10 mg/L CBOD₅ and TSS) in accordance with OBC Sentence 8.6.2.2. Effluent from the treatment plant will be discharged to a leaching bed designed in accordance with OBC and MECP design criteria. The leaching bed was conservatively designed assuming a T-time greater than 50 and will consist of 6 cells, each with 6 rows of 30 m shallow buried trench. The leaching beds will be dosed from the sewage treatment plant on an alternating basis.

The capacity of the sewage works exceeds 10,000 L/day, therefore the sewage works will be regulated by MECP under an Environmental Compliance Approval (ECA).

The residential septic tanks will discharge to the Type ‘A’ dispersal beds with Waterloo Biofilter pre-treatment or approved equivalent. The sizing of the beds is based on OBC section 8.7.7. with an assumed T-time greater than 50min./cm and maximum house size of 3 bedrooms, 200m² (2,150sq.ft).

Preliminary design calculations for the sewage disposal systems are provided in Appendix A. The configuration of the sewage works is shown on drawing SD-1.



4 Stormwater Management

4.1 EXISTING CONDITIONS

As discussed above, the property is currently wooded with a gravel laneway extending into the property from Harbour Drive and three existing wetland pockets. The property generally slopes north towards the Bay. The eastern-most wetland has an existing culvert on the east side that provides an outlet to Georgian Bay. The western and central wetlands are split by the existing laneway. Based on the topographic survey completed by SMC Geomatics the center wetland spills over the laneway into the western-most wetland, ultimately spilling to the northwest towards the Bay. The wave uprush elevation of 178.80 and the 100-year flood elevation of 177.90 are shown on the attached lot grading plans.

4.2 STORMWATER DESIGN CRITERIA

Water quality control will be provided via a treatment train approach consisting of vegetated swales, filter strips, level spreaders and rock check dams. Quantity control is not required due to the proximity to the Bay.

4.3 STORMWATER MANAGEMENT PLAN

The proposed drainage patterns are shown on the attached lot grading plans. As noted above, the proposed development will consist of a number of huts, dispersed around a central clubhouse, along with 5 stand-alone residential dwellings on the east parcel. Existing drainage patterns will be maintained, with most of the site remaining in a natural state.

4.4 STORMWATER QUALITY CONTROL

As most of the site will remain in a natural vegetated state, water quality control is only required for the two proposed parking areas and the central road through the development. The Eco Retreat and individual dwellings will provide clean rooftop runoff and will be routed to Georgian Bay via overland flow and through vegetated swales which will serve to provide some water quality treatment prior to discharge.

4.4.1 South Parking Area

Runoff from the south parking area will be directed to the west corner of the parking area, where a level spreader will be provided to discourage erosion from a single point source outlet. Discharge from the level spreader will then be conveyed overland to the existing west wetland as the land does under existing conditions.



4.4.2 North Parking Area

Runoff from the north parking area will be directed to the west corner of the parking area, where it will be conveyed to the Bay by a vegetated swale. Rock check dams will be provided to promote sediment settling and decrease the flow velocity prior to outletting to the Bay. 300 mm diameter culverts will be provided under the proposed trail system to convey runoff from the north parking area.

4.4.3 Roadside Ditches

Roadside ditches will be provided along the central road to provide quality control for the roadway. A treatment train of rock check dams, trail crossing culverts and vegetated swales will be provided to promote sediment settling and convey stormwater to the Bay. Level spreaders will be provided to discourage point source erosion.

4.5 SITE GRADING

To keep the development as natural as possible, minimal grading is proposed for the site aside from regrading the proposed road to decrease the current slope and additional grading to ensure the huts and clubhouse are constructed above the wave uprush elevation. The gradient of the existing laneway from Harbour Drive to the main development area is approx. 11.5%, which is not recommended for this type of development. A proposed roadway aligned with the existing laneway has been designed with a maximum 8.5% grade to provide a safer access to the eco retreat site and proposed residences, especially during winter conditions.

A system of vegetated swales will be provided to convey stormwater around the huts and culverts will be provided under the proposed trail system to convey runoff to the existing wetlands and the Bay.

4.6 WETLANDS

The wetlands will remain in their existing condition. The west and central wetlands will be connected via a proposed 1.8m x 0.9m box culvert to maintain the existing drainage pattern, ensuring the central wetland can continue to discharge into the west wetland, prior to spilling towards the Bay. The east wetland will continue to use the existing culvert in the northeast section of the wetland to discharge to the Bay.



4.7 EROSION AND SEDIMENT CONTROL

Siltation and erosion control will be implemented for all construction activities for the proposed development, including vegetation clearing, topsoil stripping, road construction and stockpiling of materials. The basic principles considered to minimize erosion and sedimentation and resultant negative environmental impacts include:

- Minimize disturbance activities where possible;
- Expose the smallest possible land area to erosion for the shortest possible time;
- Institute erosion control measures before the outset of construction activities; and
- Carry out regular inspections of erosion/sediment control measures and repair or maintain as necessary.

The proposed siltation and erosion control measures, details and notes are shown on Plan SC-1.



5 Water Supply

At this time, it has been assumed that the water demand for the Eco Retreat development is equal to the daily sanitary flow to be treated by the sewage treatment plant. Therefore, a daily demand of 29,875 L/day is required to provide potable water to the huts, clubhouse and comfort station.

Following a review of local well records, it was determined that a drilled well would not be capable of providing the required flows for the development. It was determined that a shore well drawing water from Georgian Bay should be constructed to meet the required water demands for the development.

The shore well was constructed in January 2017 by RF King Contracting with final construction completed in February 2017. The shore well consists of a 900 mm diameter concrete tile connected to Georgian Bay by a 200 mm diameter PVC pipe laid in a trench and covered with 19 mm clear crushed stone to prevent debris from entering the intake.

On February 21, 2017, the shore well was pumped to flush any sediment from the pump chamber and interior of the lake intake. Pumping was completed until the water was clear to prepare the well for sampling. On February 22, 2017, the shore well was sampled by R.J. Burnside & Associates staff. The sampling determined the water contained low levels of nitrates, hardness, sodium and sulphate; however, an extended period of wave action could increase the turbidity, therefore treatment of the shore well should include filtration with duplicate trains so the system can remain in service while filters are cleaned and replaced.

The shore well will be equipped with pumps and connected to the proposed pump house which will provide domestic water throughout the development. Individual water services will branch off the watermain to service the Eco Retreat development.

Similar to the Eco Retreat development, individual shore wells from Georgian Bay will be constructed for the proposed residential lots to meet the required water demands. The shore wells will be located approximately 15m from the waters edge with a 25mm water service as shown on Plan LG-2. Further details to be provided at the site plan stage of the individual residential lots.



6 Transportation

This chapter will address the existing road system to be utilized to access the development, the volume of traffic to be generated and the potential impacts of such to the road system.

6.1 EXISTING ROAD SYSTEM

The existing road system is illustrated in Figure 4, consisting primarily of the following:

- Harbour Drive;
- Lakeshore Drive;
- Sideroad 8;
- Concession 2 North;
- Grey Road 15; and
- Highway 26.

Additional details pertaining to the road system, including corresponding photographs, are provided in Figure 4.

6.2 SITE ACCESS

As per the site plan, the development will be served by a single access off Harbour Drive. The access will accommodate 1 lane for entry and 1 lane for exit, with a centre median and entry feature.

6.3 SITE CIRCULATION

A 6.0 metre access road is proposed to provide circulation through the site, accommodating 2-way travel and operations. Two cul-de-sacs will be provided at the end of the internal roads, each with a diameter of 30 metres (thus having a radius of 15 metres) and maintaining a 7.0 metre circulatory road. This configuration is sufficient to accommodate the turning path of a recreational vehicle (RV) and a vehicle pulling a camper trailer.

The provision of a 6.0 metre access road and cul-de-sacs of 15.0 metre radii are also sufficient to accommodate circulation of emergency vehicles, including a fire truck, through the site.



6.4 SITE TRAFFIC

6.4.1 Trip Generation

The number of vehicle trips to be generated by the proposed development for the weekday AM, weekday PM and Saturday peak hours has been determined based on type of use, development size and trip generation rates as per the *ITE Trip Generation Manual, 10th Edition*. Given the range of uses proposed and the unique nature of some, a number of ITE land uses have been considered as noted in Table 1.

For the hotel and resort hotel uses, the trip rates correspond to “occupied rooms” as opposed to “rooms” thus ensuring a conservative approach (in that trips are only generated by those rooms that are occupied). Similarly for the campground/RV park land use, the trip rates are based on occupied sites. Trip rates for the Weekday AM and PM peak hours correspond to the peak hours of the adjacent road system (ie. the commuter peaks), during which time traffic volume on the road system are greatest. The trip rates for the Saturday peak hour correspond to the peak hour of each noted land use (ie. the busiest hour during which the greatest number of trips are generated). For the resort hotel and campground/RV park land uses, no Saturday information is provided in the ITE Trip Generation Manual.

Table 1: Trip Generation Rates

LAND-USE, ITE CODE & TRIP VARIABLE			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			SATURDAY PM PEAK HOUR		
			In	Out	Total	In	Out	Total	In	Out	Total
single family detached	210	units	0.19	0.56	0.74	0.62	0.37	0.99	0.50	0.43	0.93
recreational homes	260	units	0.15	0.07	0.22	0.11	0.17	0.28	0.18	0.20	0.38
hotel	310	occupied rooms	0.36	0.26	0.62	0.36	0.37	0.73	0.44	0.44	0.87
resort hotel	330	occupied rooms	0.27	0.10	0.37	0.20	0.27	0.47	-	-	-
campground/RV park	416	occupied sites	0.08	0.13	0.21	0.18	0.09	0.27	-	-	-

The resulting trip estimates are provided in Table 2. In considering the range of trip generation rates previously presented, those corresponding to the hotel land use (310) have been to the 21 development huts and tents (thus considering the greatest trip rates and hence greatest trip estimates), whereas the single family detached units (210) have been applied to the 5 development lots and the Manager Hut.



Table 2: Trip Estimates - ITE Methodology

LAND-USE, ITE CODE & TRIP VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			SATURDAY PM PEAK HOUR		
	In	Out	Total	In	Out	Total	In	Out	Total
2BR waterfront huts 7 units	3	2	4	3	3	5	3	3	6
2BR ravine side huts 4 units	1	1	2	1	1	3	2	2	3
1BR ravine side huts 4 units	1	1	2	1	1	3	2	2	3
treetop huts 2 units	1	1	1	1	1	1	1	1	2
luxury tents 4 units	1	1	2	1	1	3	2	2	3
manager hut 1 units	0	1	1	1	0	1	1	0	1
residential lots 5 units	1	3	4	3	2	5	3	2	5
Total	9	9	17	11	10	21	12	12	24

Further to the ITE trip methodology, site generated traffic has also been established based on a “first principles” approach, assuming the following as they relate to the accommodation sites:

- each site turns over each day with guests departing in the AM peak hour and arriving the PM peak hour;
- during the Saturday peak hour, inbound and outbound trips are assumed to be equal (to account of off-site trips or visitors);
- 1 vehicle per site (and hence only 1 inbound or outbound trip per site).

For the Manager Hut and the residential lots, the trip estimates as per the ITE methodology have been maintained. The resulting trip estimates are provided in Table 3.

As indicated, the estimates during the weekday AM and PM peak hours are relatively comparable regardless of the methodology employed (17 to 25 vehicles per hour). During the Saturday peak hours, the estimates are approximately double during the Saturday peak hour given the assumptions considered (24 vs 48 trips).



Table 3: Trip Estimates – First Principles Methodology

LAND-USE, ITE CODE & TRIP VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			SATURDAY PM PEAK HOUR		
	In	Out	Total	In	Out	Total	In	Out	Total
2BR waterfront huts 7 units	-	7	7	7	-	7	7	7	14
2BR ravine side huts 4 units	-	4	4	4	-	4	4	4	8
1BR ravine side huts 4 units	-	4	4	4	-	4	4	4	8
treetop huts 2 units	-	2	2	2	-	2	2	2	4
luxury tents 4 units	-	4	4	4	-	4	4	4	8
manager hut 1 units	0	1	1	1	0	1	1	0	1
residential lots 5 units	1	3	4	3	2	5	3	2	5
Total	1	24	25	25	2	27	24	24	48

6.4.2 Trip Distribution & Assignment

Given the local road system, site traffic is expected to utilize either Grey Road 15/Lakeshore Drive for travel to/from the west (via Highway 26) and Concession 2 North for travel to/from the east (via Highway 26). Given the location of the site, its regional market draw and the orientation and configuration of the upper tier road system, the following distribution/assignment is assumed:

- 50% to/from the west via Highway 26 (including Owen Sound and communities further west, and those to the south that will access via Highway 6); and
- 50% to/from the east via Highway 26 (including Meaford and communities further west, and those to the north and south that will access via the contributing road network such as Highways 11 and 400).

The resulting site traffic volumes assigned to the road system are illustrated in Figure 5.

6.5 TRAFFIC OPERATIONS & IMPACTS

Based on the limited traffic to be generated by the site and the distribution of such to the area road system and beyond, the resulting additional volumes are not significant (12 to 24 vehicles per hour in the peak directions). Given the scope of this study, new traffic counts were not completed. Rather, data from secondary sources has been compiled as follows:

- 1850 vehicles per day on Grey Road 15 as per the County's 2012 Traffic County Map; and



- 5500 vehicles per day (summer volumes) on Highway 26 between Meaford and Owen Sound as per MTO 2016 traffic counts.

Typically, the peak hour volumes constitute approximately 10% of the daily volumes and thus hourly volumes in the order of 200 to 550 vehicles result from the above (total of both directions). As the noted roads are considered arterials, they would have a capacity of 900 to 1100 vehicles per hour per lane (and thus 1800 to 2200 vehicles per hour for a 2-lane road considering both directions of travel), which is in excess of the noted volumes. While the volumes are somewhat dated, there is significant reserve capacity to accommodate growth through to the present day, the additional traffic to be generated by the site, and continued future growth.

For the local roads (namely Lakeshore Drive, Concession 2 North, Sideroad 8 and Harbour Drive), existing volumes are expected to be less and thus the additional increase resulting from the Eco Retreat development is not expected to have any appreciable impact.



7 Utilities

The relevant utility companies will be contacted to determine availability of services for the site. Detailed connection strategies with all utility providers will be formalized during final design.

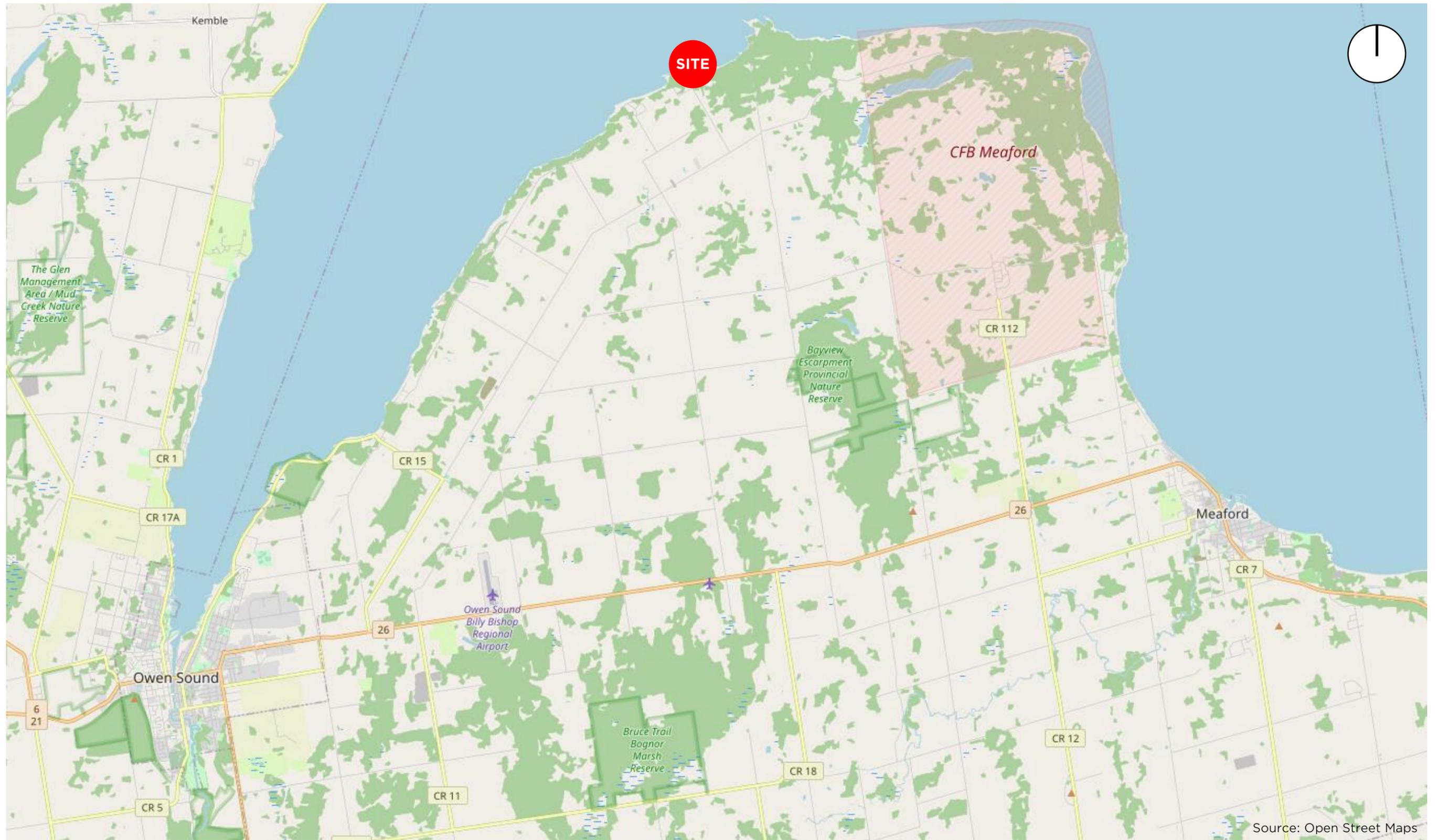


8 Summary

The proposed Functional Servicing Report demonstrates that adequate servicing is available to support the proposed development. In summary, the site will be serviced as follows:

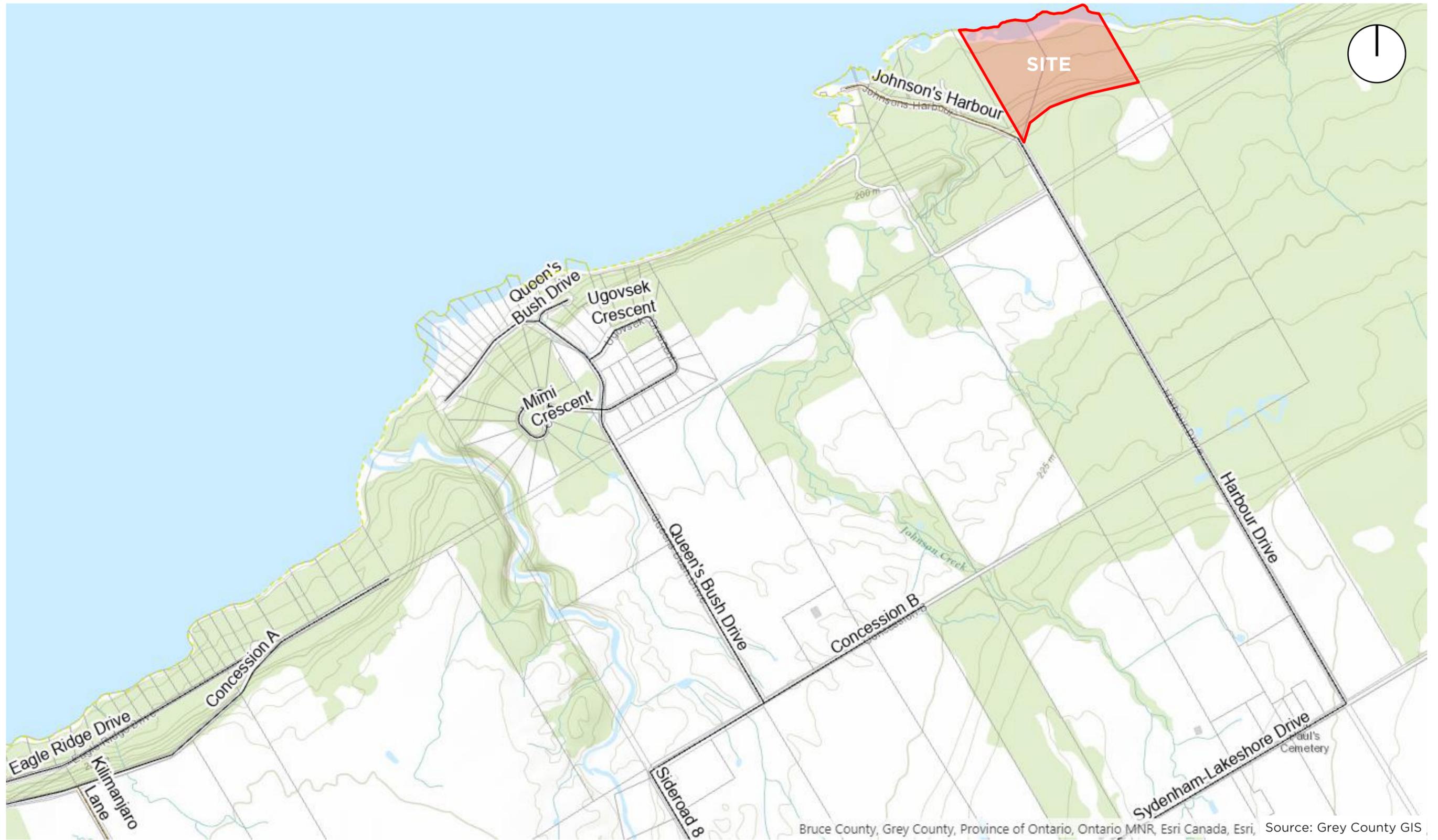
- The huts, clubhouse and comfort station will be serviced by 125 mm diameter gravity services which will convey sewage to sewage pumping stations (SPS). Sewage will then be pumped to a large subsurface sewage treatment plant via low pressure sanitary sewer. The sewage treatment plant will discharge to a shallow buried trench system consisting of 6 cells, each with 6 rows of 30 m shallow buried trench.
- The proposed residential lots (5) will be serviced by individual septic tanks and Type ‘A’ dispersal beds with Waterloo Biofilter pre-treatment or approved equivalent.
- Stormwater quality control will be provided for the parking areas and central road, using a treatment train approach consisting of roadside ditches, vegetated swales, level spreaders and rock check dams to promote sediment settling prior to discharge into the wetlands and Georgian Bay.
- Potable water for the Eco Retreat will be supplied by the existing shore well. The pumping system installed in the shore well will convey water to a proposed pump house, that will distribute water to the Eco Retreat development. Individual shore wells will be provided for the residential dwellings.
- Based on the limited traffic to be generated by the site and the distribution of such to the area road system and beyond, the resulting additional volumes are not significant (12 to 24 vehicles per hour in the peak directions). As the noted roads are considered arterials, they would have a capacity of 900 to 1100 vehicles per hour per lane (and thus 1800 to 2200 vehicles per hour for a 2-lane road considering both directions of travel), which is in excess of the noted volumes (200 to 550 vehicles in both directions of travel). There is significant reserve capacity to accommodate growth through to the present day, the additional traffic to be generated by the site, and continued future growth.
- For the local roads (namely Lakeshore Drive, Concession 2 North, Sideroad 8 and Harbour Drive) the additional increase resulting from the Eco Retreat development is not expected to have any appreciable impact.
- The relevant utility companies will be contacted to determine availability of services for the site. Detailed connection strategies with all utility providers will be formalized during final design.





AGORPIONS ECO RETREAT
 Figure 1: Site Location - Regional Context

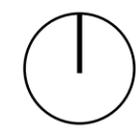
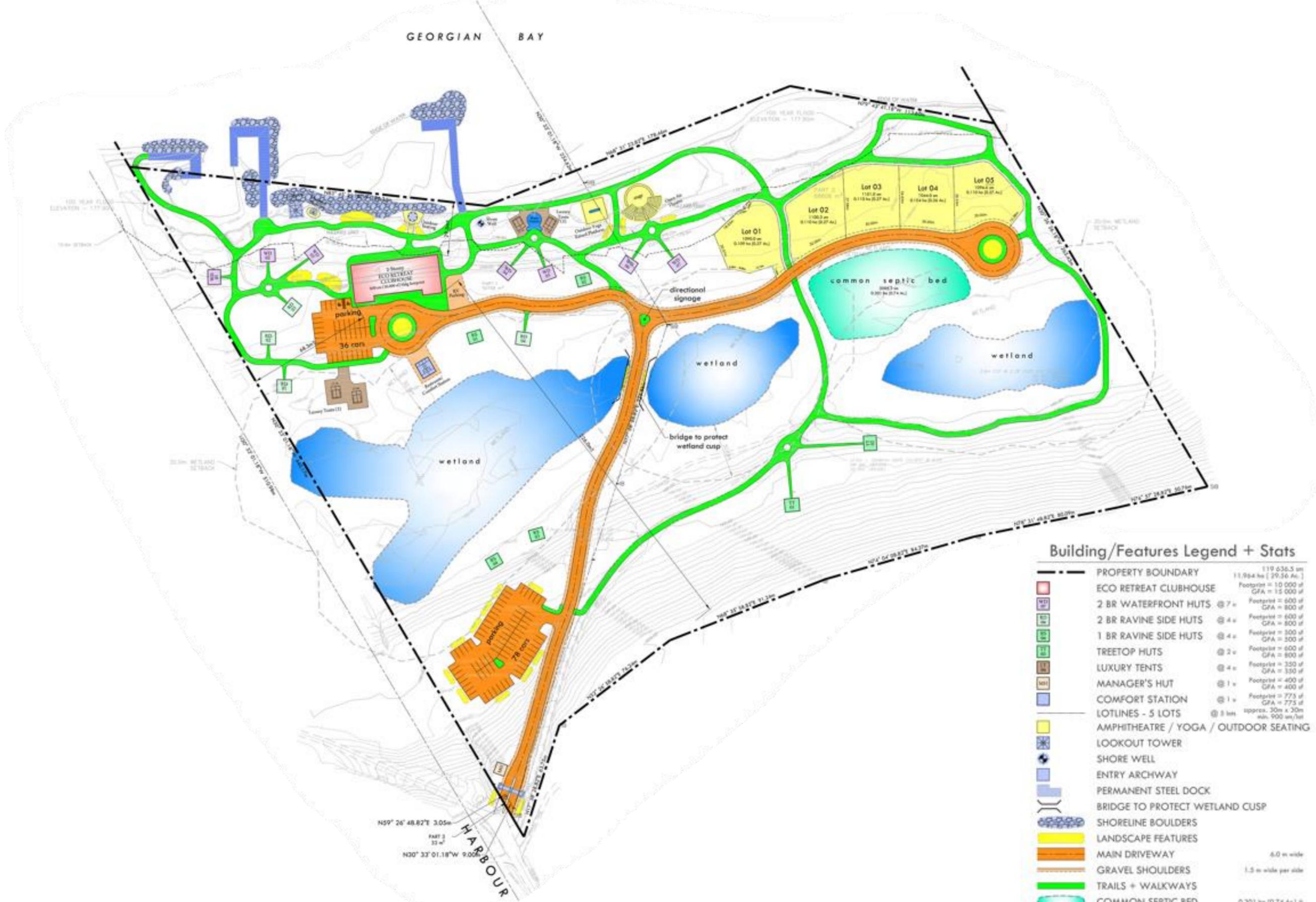




Bruce County, Grey County, Province of Ontario, Ontario MNR, Esri Canada, Esri, Source: Grey County GIS

AGORPIONS ECO RETREAT
 Figure 2: Site Location - Local Context





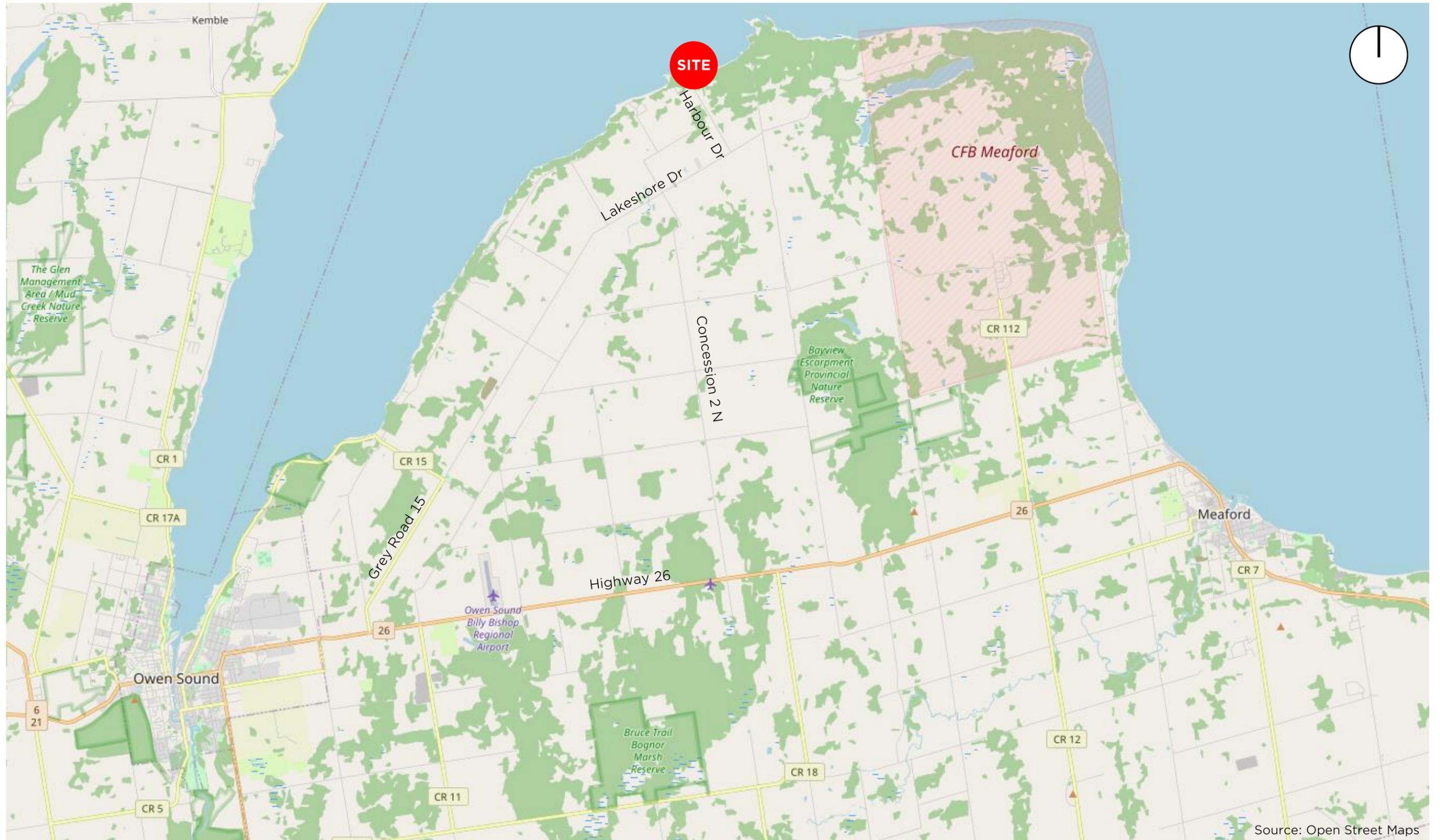
Building/Features Legend + Stats

	PROPERTY BOUNDARY	119,636.5 m
	ECO RETREAT CLUBHOUSE	11,864 ha [29.56 Ac.] Footprint = 10,000 sf GFA = 15,000 sf
	2 BR WATERFRONT HUTS @ 7 =	Footprint = 600 sf GFA = 800 sf
	2 BR RAVINE SIDE HUTS @ 4 =	Footprint = 600 sf GFA = 800 sf
	1 BR RAVINE SIDE HUTS @ 4 =	Footprint = 500 sf GFA = 500 sf
	TREETOP HUTS @ 2 =	Footprint = 600 sf GFA = 800 sf
	LUXURY TENTS @ 4 =	Footprint = 350 sf GFA = 350 sf
	MANAGER'S HUT @ 1 =	Footprint = 400 sf GFA = 400 sf
	COMFORT STATION @ 1 =	Footprint = 775 sf GFA = 775 sf
	LOT LINES - 5 LOTS @ 5 lots	Approx. 30m x 30m min. 900 sq/lot
	AMPHITHEATRE / YOGA / OUTDOOR SEATING	
	LOOKOUT TOWER	
	SHORE WELL	
	ENTRY ARCHWAY	
	PERMANENT STEEL DOCK	
	BRIDGE TO PROTECT WETLAND CUSP	
	SHORELINE BOULDERS	
	LANDSCAPE FEATURES	
	MAIN DRIVEWAY	6.0 m wide
	GRAVEL SHOULDERS	1.5 m wide per side
	TRAILS + WALKWAYS	
	COMMON SEPTIC BED	0.301 ha [0.74 Ac.] ±
	WETLANDS	1.724 ha [4.26 Ac.] ±
	30.0m WETLAND SETBACK	
	HAZARD LIMIT - 15.0m Setback from 100-Yr Floodline - 177.90	

AGORPIONS ECO RETREAT

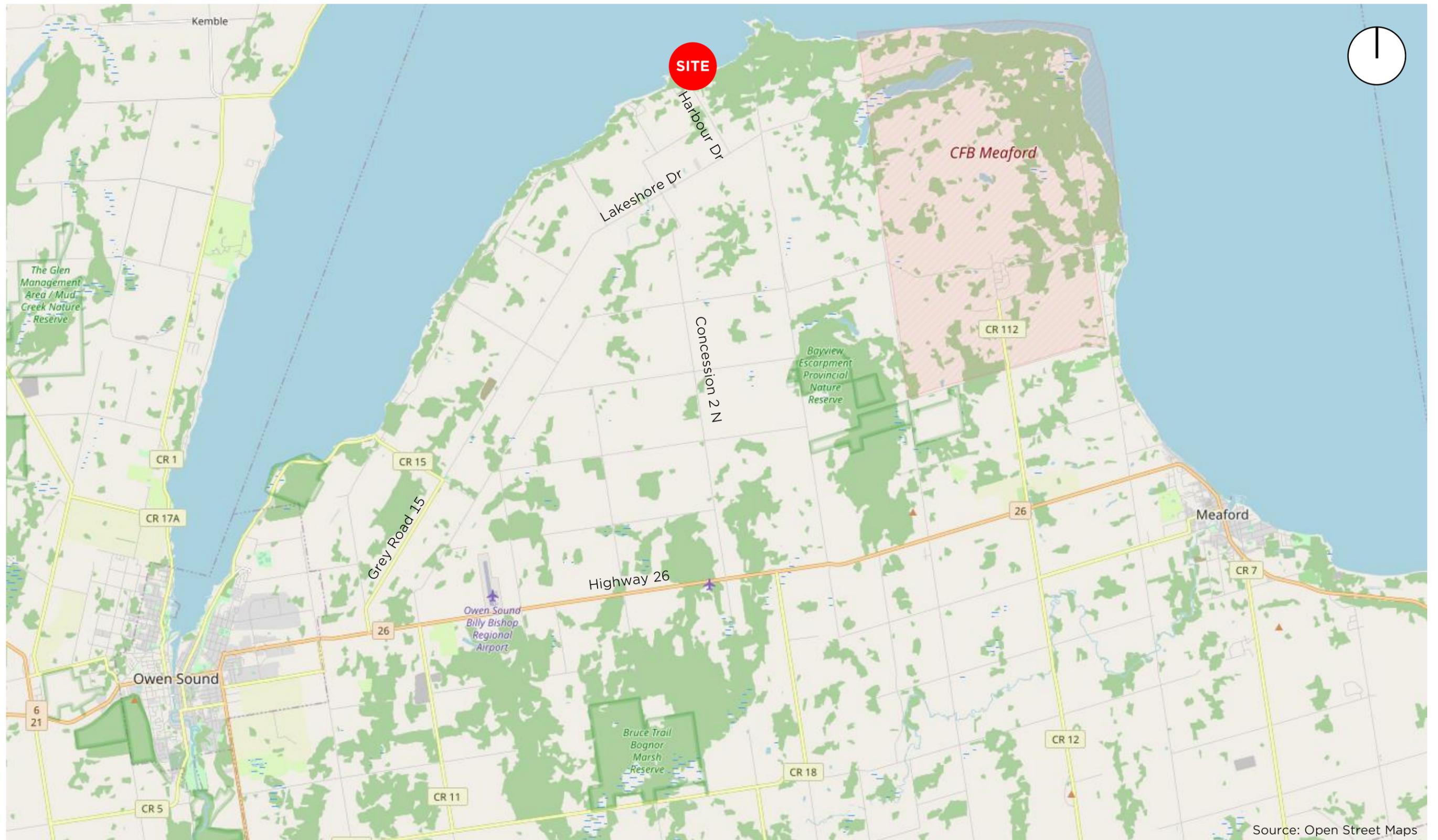
Figure 3: Site Plan





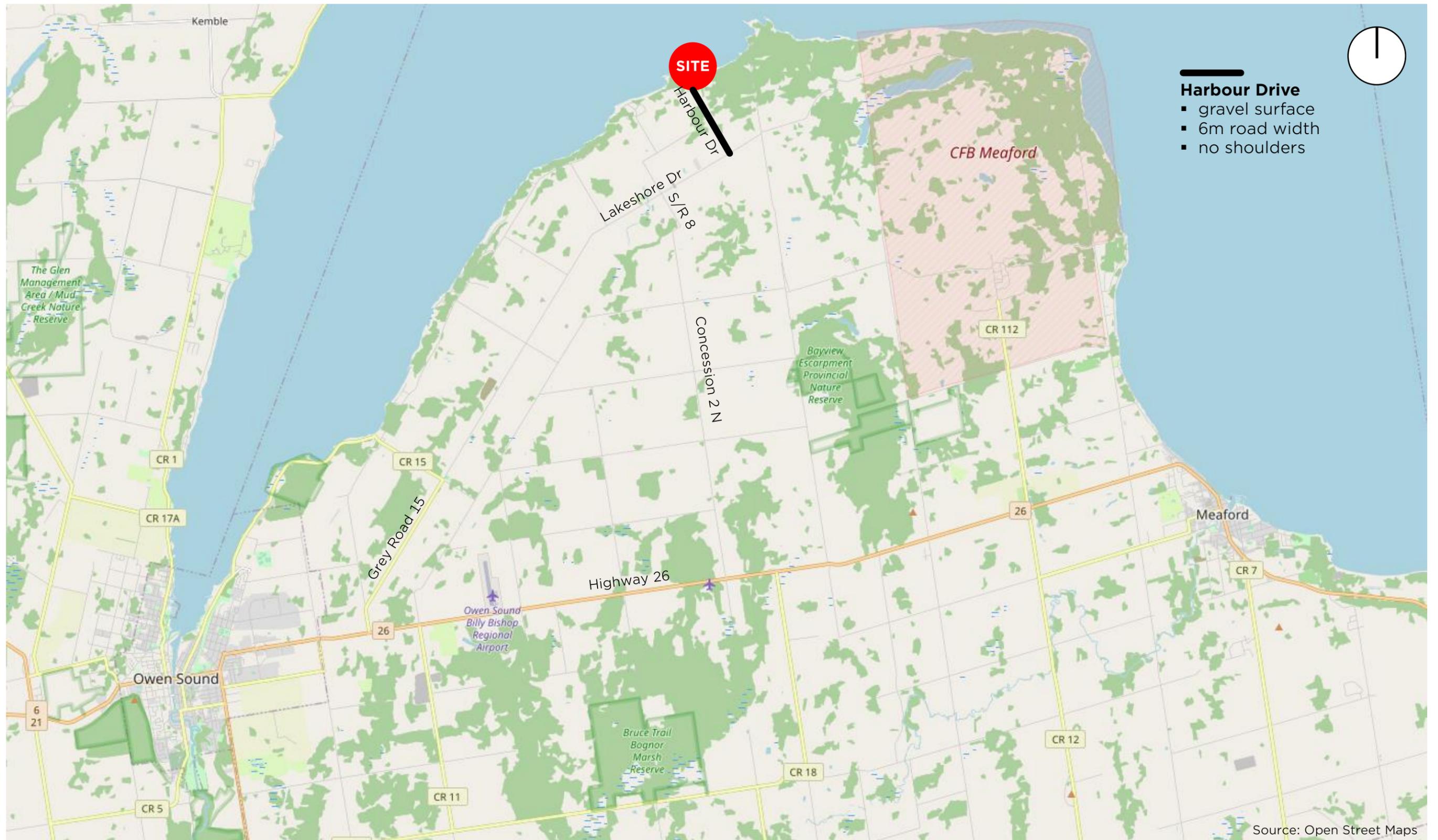
AGORPIONS ECO RETREAT
 Figure 4: Road System





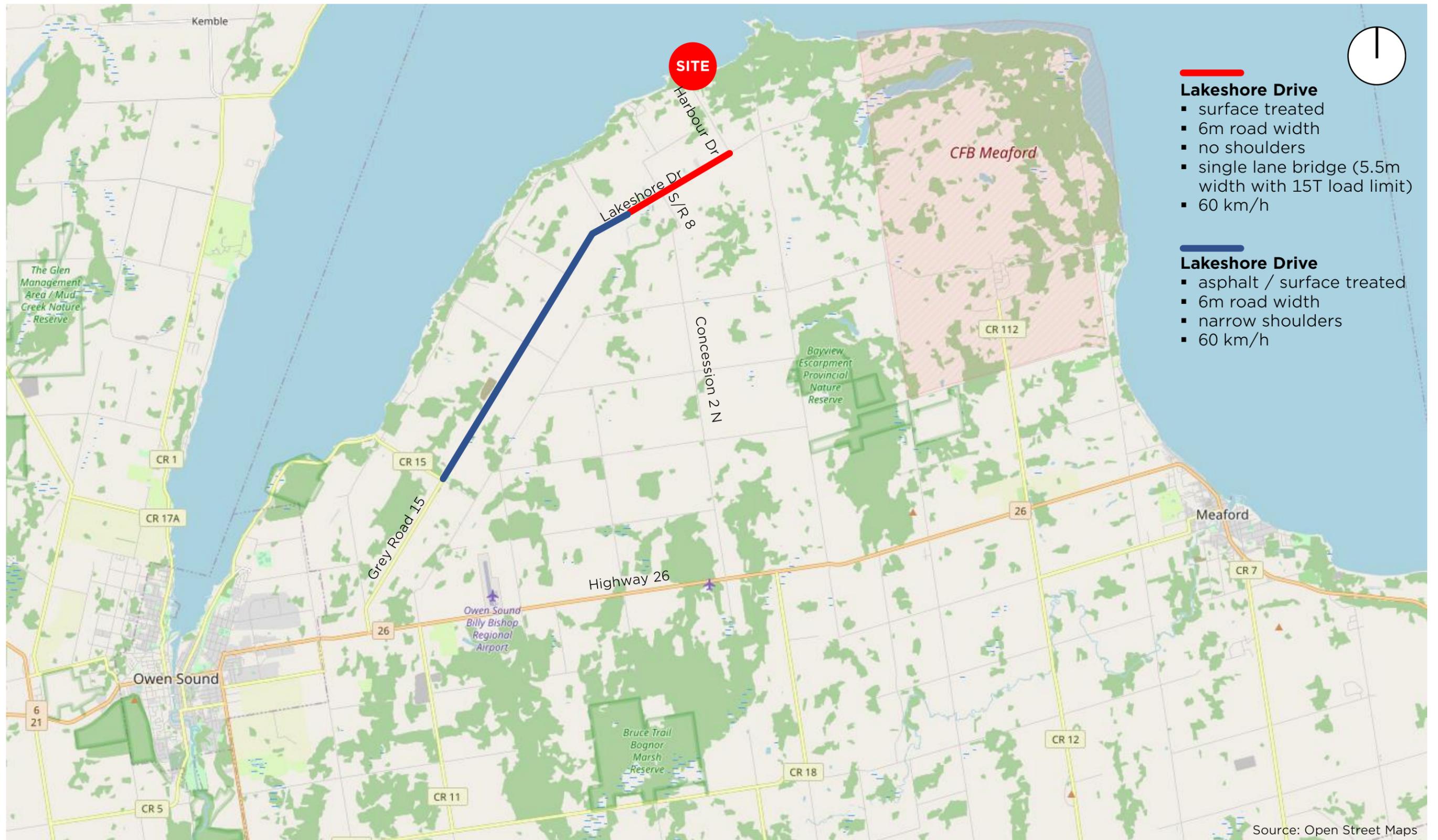
AGORPIONS ECO RETREAT
 Figure 4A: Road System





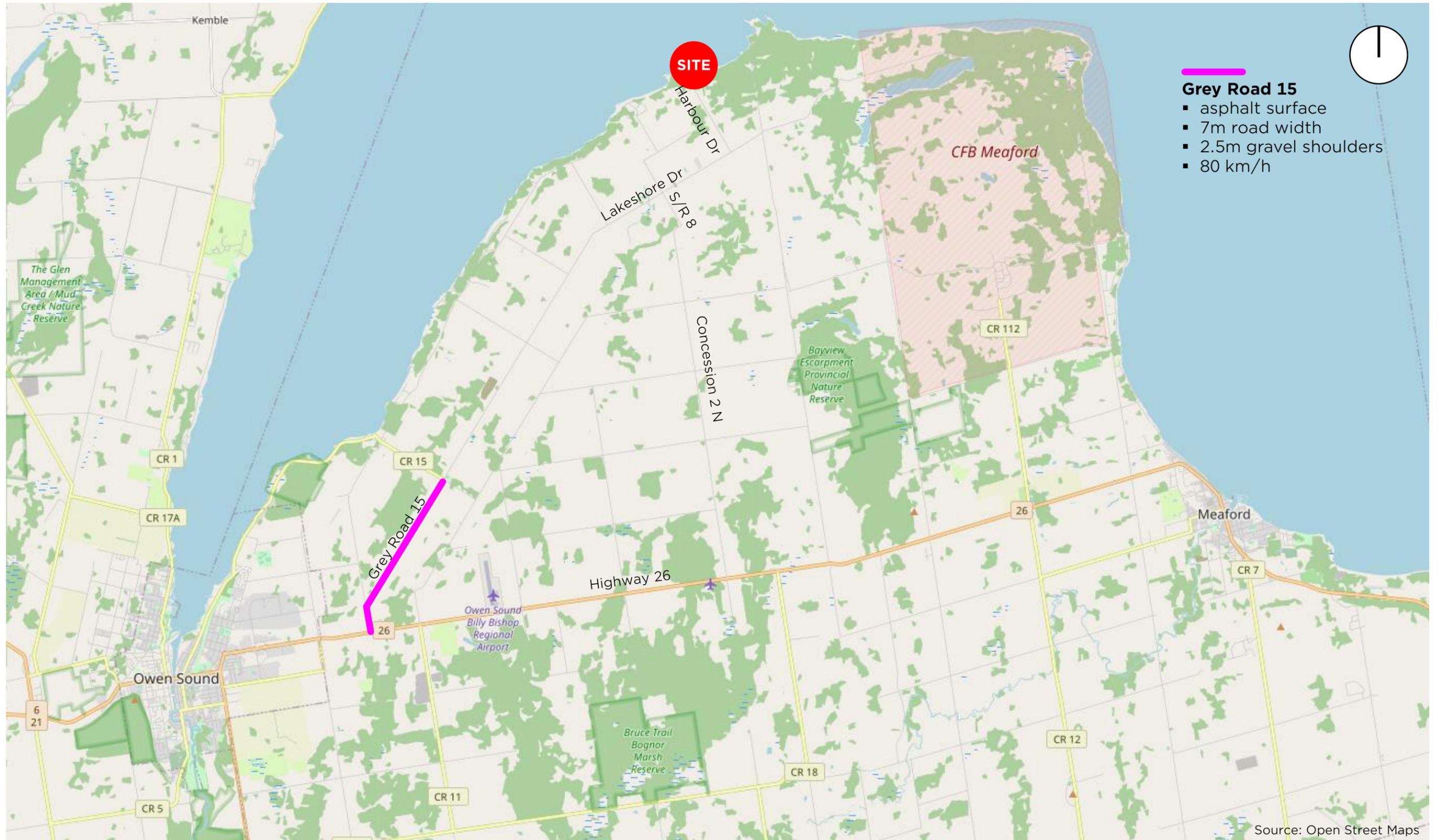
AGORPIONS ECO RETREAT
 Figure 4B: Road System - Harbour Drive





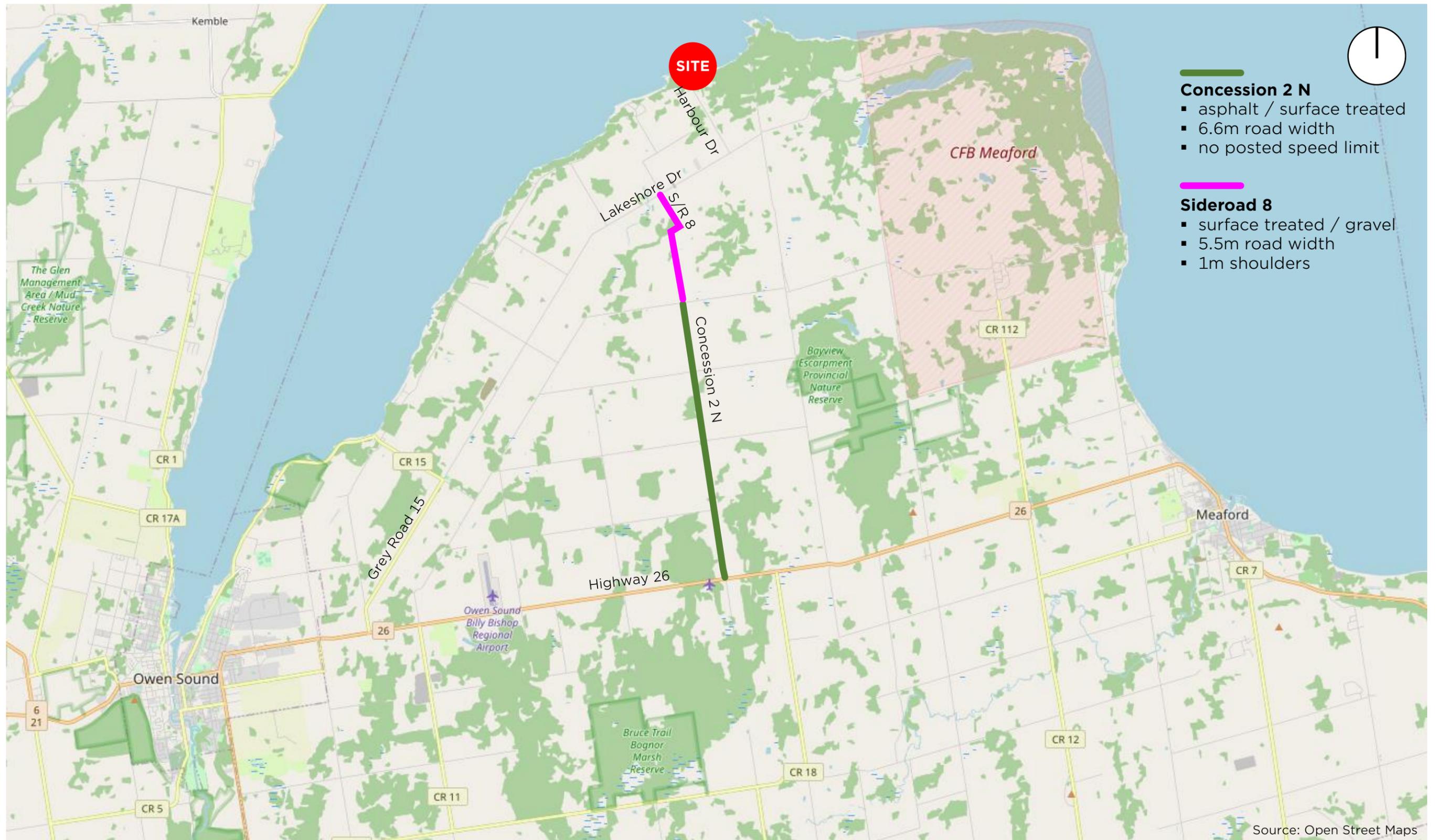
AGORPIONS ECO RETREAT
 Figure 4C: Road System - Lakeshore Drive





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 Figure 4D: Road System - Grey Road 15

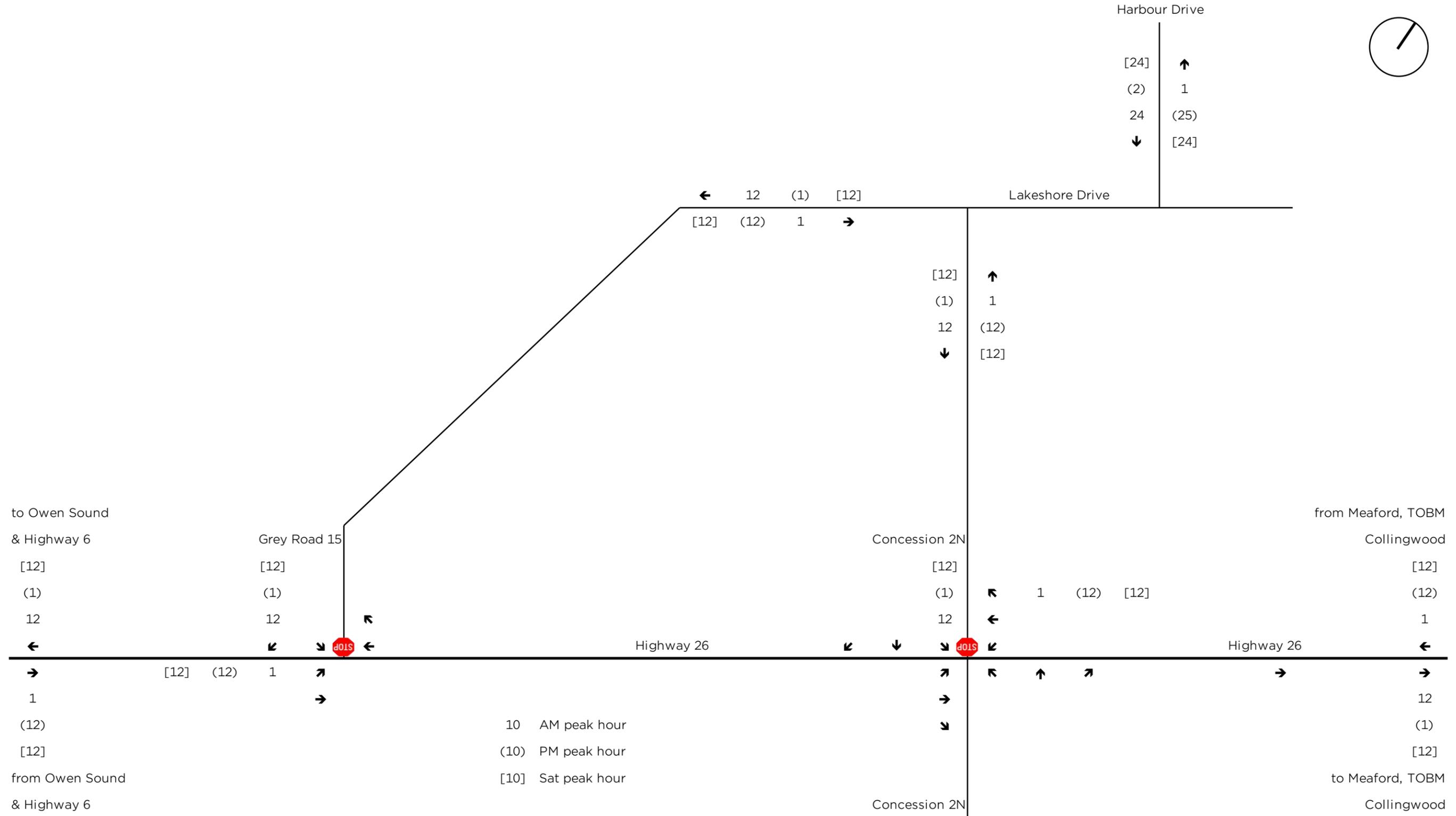




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Figure 4E: Road System - Concession 2 North / Sideroad 8





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 Figure 5: Site Traffic Volumes



Appendix A: Sewage Treatment and Disposal



PROJECT	Aqorpions Eco Retreat	FILE	120218
		DATE	Mar 28, 2022
SUBJECT	Preliminary Design - Sewage Treatment and Disposal Works	NAME	E. Watkin
		PAGE	1 OF 2

Daily Design Flow

Calculated in Accordance with OBC Table 8.2.1.3.B.

Daily Design Flow

Eco Retreat Clubhouse	5	Guest Rooms	*	250	L/room/day	1,250 L/day
	5	Laundry Machines	*	2,500	L/machine/day	12,500 L/day
	66	Restaurant Seats	*	125	L/seat/day	8,250 L/day
Water Front Hut 1	2	Guest Rooms	*	250	L/room/day	500 L/day
Water Front Hut 2	2	Guest Rooms	*	250	L/room/day	500 L/day
Water Front Hut 3	2	Guest Rooms	*	250	L/room/day	500 L/day
Water Front Hut 4	2	Guest Rooms	*	250	L/room/day	500 L/day
Water Front Hut 5	2	Guest Rooms	*	250	L/room/day	500 L/day
Water Front Hut 6	2	Guest Rooms	*	250	L/room/day	500 L/day
Water Front Hut 7	2	Guest Rooms	*	250	L/room/day	500 L/day
Ravine Side Hut 1	2	Guest Rooms	*	250	L/room/day	500 L/day
Ravine Side Hut 2	2	Guest Rooms	*	250	L/room/day	500 L/day
Ravine Side Hut 3	2	Guest Rooms	*	250	L/room/day	500 L/day
Ravine Side Hut 4	2	Guest Rooms	*	250	L/room/day	500 L/day
Ravine Side Hut 5	1	Guest Rooms	*	250	L/room/day	250 L/day
Ravine Side Hut 6	1	Guest Rooms	*	250	L/room/day	250 L/day
Ravine Side Hut 7	1	Guest Rooms	*	250	L/room/day	250 L/day
Ravine Side Hut 8	1	Guest Rooms	*	250	L/room/day	250 L/day
Comfort Station	5	tent/RV sites	*	275	L/site/day	1,375 L/day
Total						29,875 L/day



PROJECT	Aqorpions Eco Retreat	FILE	120218
		DATE	Mar 28, 2022
SUBJECT	Preliminary Design - Sewage Treatment and Disposal Works	NAME	E. Watkin
		PAGE	2 OF 2

Sewage Treatment and Disposal

Native Soil

R.J Burnside and Associates Limited completed an assessment of the west half of the site and reported their findings and in a report titled " Water Supply and On-Site sewage System Assessment Eco-Retreat Development", June 2017. The report characterized the site geology as follows:

- * Site is underlaid by shallow bedrock with over burden depths ranging from 0.0 m to 2.1m. Bedrock is exposed along the shoreline.
- * Overburden varies considerably and includes:

* Sand	Unified Soil Classification	SW	T-time	2 to 12 min/cm
* Silty Sand	Unified Soil Classification	SM	T-time	8 to 20 min/cm
* Silt	Unified Soil Classification	ML	T-time	20 to 50 min/cm
* Silty Clay	Unified Soil Classification	ML-CL	T-time	20 to > 50 min/cm
* Clay	Unified Soil Classification	CL	T-time	> 50 min/cm

(T-time from Tables 2 & 3, OBC Supplementary SB-6)

There is no information regarding native soil in the area identified for the leaching bed, therefore the preliminary design is conservatively based on the assumption the leaching bed will be constructed over soil with a T time between 50 and 125 min/cm.

Sewage Treatment and Disposal

Sewage treatment will be provided by a mechanical Level IV sewage treatment plant conforming to OBC Table 8.6.2.2. criteria (Effluent limit of 10 mg/L TSS and CBOD₅). Sewage Treatment plant effluent will be discharged to a leaching bed consisting of shallow buried trenches.

Shallow Buried Trench Sizing

Per OBC Table 8.7.3.1. the total length of shallow buried trench is to be calculated as follows when the T time of native soil is 50 to 125 min/cm:

$$L = Q/30 \quad \text{Where} \quad L = 996 \text{ m} \quad \text{Length of Shallow Buried Trench}$$

$$Q = 29,875 \text{ L/day} \quad \text{Daily Design Flow (Calculated above)}$$

Leaching bed is to be comprised of 36 - 30 m long shallow buried trenches configured in 6 cells with 6 - 30m long shallow buried trenches per cell.

PROJECT	Eco Retreat	FILE	120218
		DATE	March 28, 2022
SUBJECT	Sewage System Design- Residential lots	NAME	D. Casullo
		PAGE	1 OF 1

Daily Design Flow

HOUSE DESCRIPTION		200 m2	(2,150 SF)
Number of Bedrooms	=	3	
Finished Floor Area	=	278 m2	

FIXTURE COUNT

Fixture	Number	Fixture Load	Total
Bathroom Group (w/ flush tank)			0
Water Closet (w/flush tank)			0
Shower / Tub			0
Sink			0
Laundry Tub Washer			0
Kitchen Sink Dishwasher			0
Total			0

DESIGN FLOW

Base Design Flow	=	1600 litres/day
Surcharge for Fixture Units	=	0 litres/day
Surcharge for Floor Area	=	0 litres/day
Surcharge Bedrooms over 5	=	0 litres/day
Total Design Flow	=	1600 litres/day
Design T (Perc. Time)	=	50 min/cm

TREATMENT Waterloo Biofilter

Effluent Disposal - Type 'A' Dispersal Bed

Stone Layer

Calculated per OBC 8.7.7.1.(6)

$$A = Q / 75 \text{ L/m}^2/\text{day where } Q \leq 3,000 \text{ L/day}$$

$$A = Q / 50 \text{ L/m}^2/\text{day where } Q > 3,000 \text{ L/day}$$

Where A = 21 m² Area of Stone Layer (Calculated value)
 Q = 1,600 L/day Daily Design Flow (Calculated above)

Stone Layer Dimensions

Sand Layer

Calculated per OBC 8.7.3.1.

$$A = QT / 400 \text{ where } T \geq 15 \text{ min/cm}$$

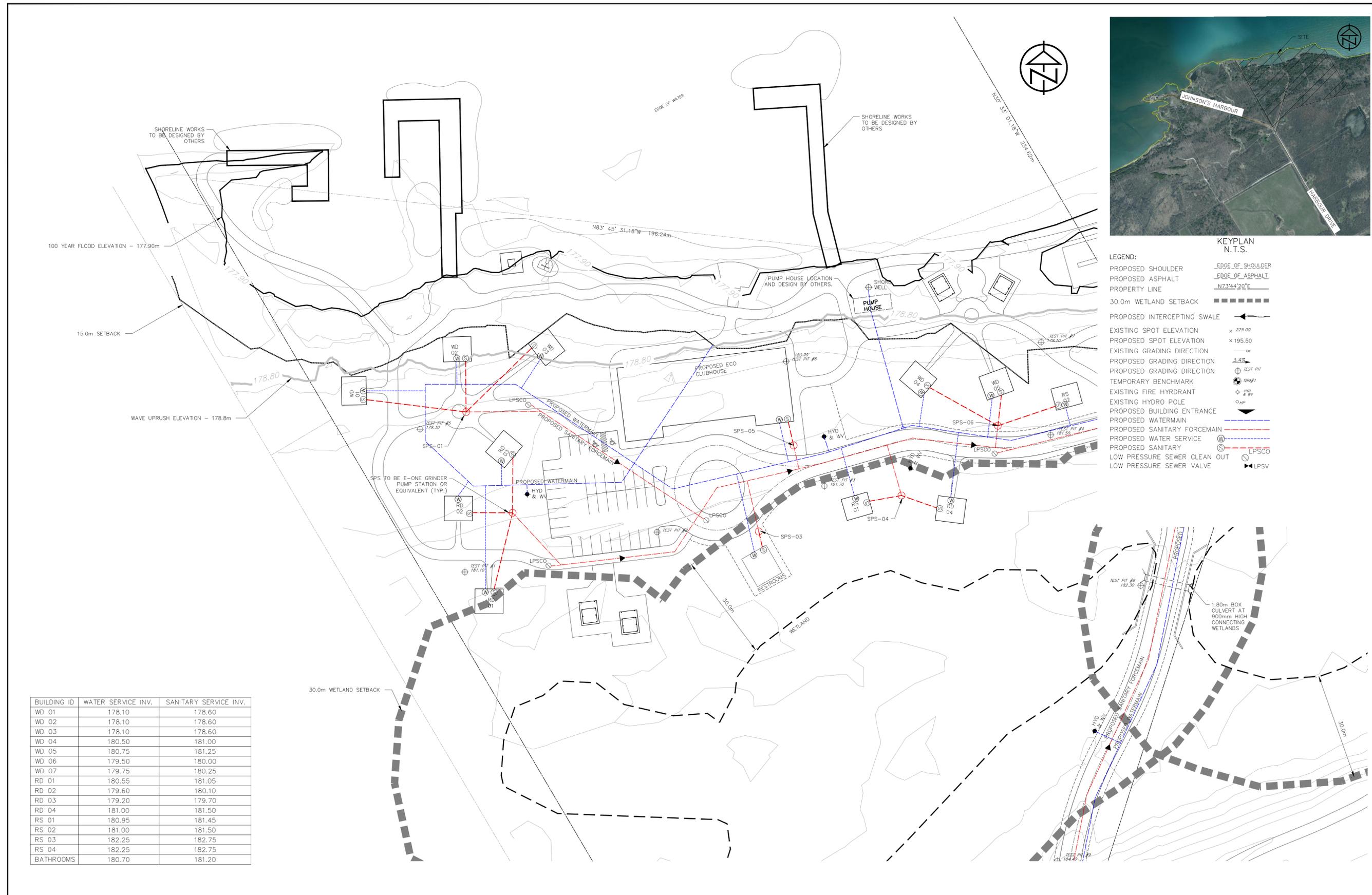
$$A = QT / 850 \text{ where } T < 15 \text{ min/cm}$$

Where A = 200 m² Area of Sand Layer (Calculated value)
 Q = 1,600 L/day Daily Design Flow (Calculated above)
 T = 50 min/cm Est. T-Time of native soil

Sand Layer Dimensions



- LEGEND:**
- PROPOSED SHOULDER
 - PROPOSED ASPHALT
 - PROPERTY LINE
 - 30.0m WETLAND SETBACK
 - PROPOSED INTERCEPTING SWALE
 - EXISTING SPOT ELEVATION x
225.00
 - PROPOSED SPOT ELEVATION x
195.50
 - EXISTING GRADING DIRECTION →
 - PROPOSED GRADING DIRECTION →
3.4%
 - PROPOSED GRADING DIRECTION →
3.4%
 - TEMPORARY BENCHMARK ⊕
TEST PIT
 - EXISTING FIRE HYDRANT ⊕
FID
 - EXISTING HYDRO POLE ⊕
HP
 - PROPOSED BUILDING ENTRANCE ⬇
 - PROPOSED WATERMAIN
 - PROPOSED SANITARY FORCEMAIN
 - PROPOSED WATER SERVICE
 - PROPOSED SANITARY
 - LOW PRESSURE SEWER CLEAN OUT ⊕
LPSCO
 - LOW PRESSURE SEWER VALVE ⊕
LPSV



BUILDING ID	WATER SERVICE INV.	SANITARY SERVICE INV.
WD 01	178.10	178.60
WD 02	178.10	178.60
WD 03	178.10	178.60
WD 04	180.50	181.00
WD 05	180.75	181.25
WD 06	179.50	180.00
WD 07	179.75	180.25
RD 01	180.55	181.05
RD 02	179.60	180.10
RD 03	179.20	179.70
RD 04	181.00	181.50
RS 01	180.95	181.45
RS 02	181.00	181.50
RS 03	182.25	182.75
RS 04	182.25	182.75
BATHROOMS	180.70	181.20

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BENCHMARKS

NOTES

No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	FIRST SUBMISSION	APR 19/22	

ENGINEER STAMP

AQORPIONS ECO RETREAT
MUNICIPALITY OF MEAFORD

GENERAL SERVICING PLAN

TATHAM ENGINEERING

DESIGN: ADM FILE: 120218 DWG:
 DRAWN: ADM DATE: NOV 2021 **GS01**
 CHECK: DC SCALE: 1:500

Drawing Name: T20218-0501.dwg, Plotted: Mar 30, 2022



KEYPLAN
N.T.S.

- LEGEND:**
- PROPOSED SHOULDER ——— EDGE OF SHOULDER
 - PROPOSED ASPHALT ——— EDGE OF ASPHALT
 - PROPERTY LINE ——— N73°44'20"E
 - 30.0m WETLAND SETBACK ———
 - PROPOSED INTERCEPTING SWALE ———
 - EXISTING SPOT ELEVATION × 225.00
 - PROPOSED SPOT ELEVATION × 195.50
 - EXISTING GRADING DIRECTION ———
 - PROPOSED GRADING DIRECTION ——— 3.4%
 - PROPOSED GRADING DIRECTION ———
 - TEMPORARY BENCHMARK ——— TEST PIT
 - EXISTING FIRE HYDRANT ———
 - EXISTING HYDRO POLE ———
 - PROPOSED BUILDING ENTRANCE ———
 - PROPOSED WATERMAIN ———
 - PROPOSED SANITARY FORCEMAIN ———
 - PROPOSED WATER SERVICE ———
 - PROPOSED SANITARY ———
 - LOW PRESSURE SEWER CLEAN OUT ——— LPSCO
 - LOW PRESSURE SEWER VALVE ——— LPSV

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MUNICIPALITY OF MEAFORD

GENERAL SERVICING PLAN

TATHAM ENGINEERING

DESIGN: ADM	FILE: 120218	DWG:
DRAWN: ADM	DATE: NOV 2021	GS02
CHECK: DC	SCALE: 1:500	

Drawing Name: T20218-0507.dwg, Plotted: Apr 11, 2022



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BENCHMARKS

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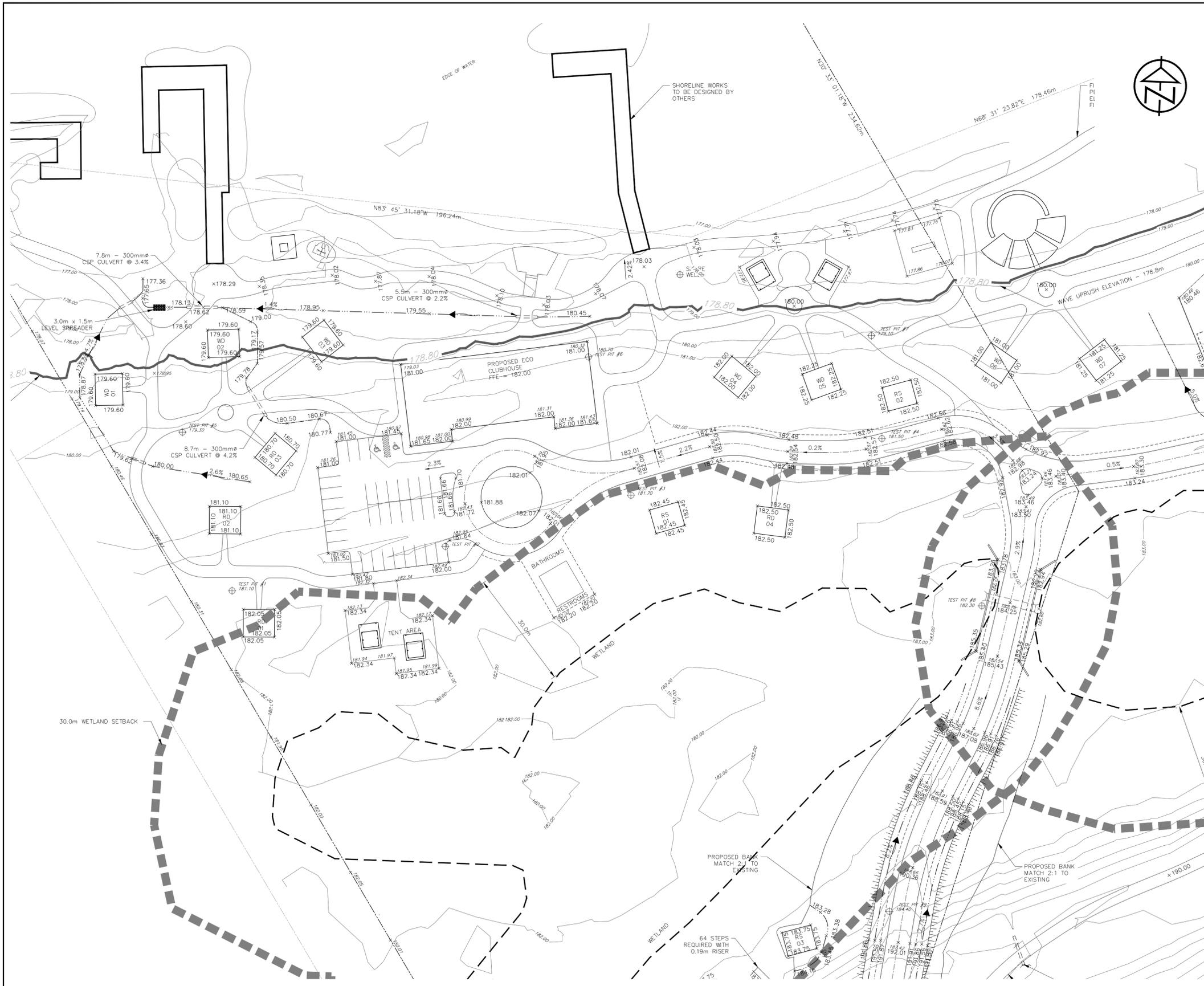
ENGINEER STAMP

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MUNICIPALITY OF MEAFORD

GENERAL SERVICING PLAN

TATHAM ENGINEERING

DESIGN: ADM	FILE: 120218	DWG:
DRAWN: ADM	DATE: NOV 2021	GS03
CHECK: DC	SCALE: 1:500	



KEYPLAN
N.T.S.

- GROUNDWATER**
- TEST PIT #1 ELEVATION: 182.50
GROUNDWATER: 181.10
 - TEST PIT #2 ELEVATION: 182.70
GROUNDWATER: -----
 - TEST PIT #3 ELEVATION: 182.50
GROUNDWATER: 181.70
 - TEST PIT #4 ELEVATION: 182.50
GROUNDWATER: 181.50
 - TEST PIT #5 ELEVATION: 180.10
GROUNDWATER: 179.30
 - TEST PIT #6 ELEVATION: 181.00
GROUNDWATER: 180.70
 - TEST PIT #7 ELEVATION: 180.30
GROUNDWATER: 179.10
 - TEST PIT #8 ELEVATION: 182.60
GROUNDWATER: 182.30
 - TEST PIT #9 ELEVATION: 186.10
GROUNDWATER: 184.40
- NOTE: GROUNDWATER ELEVATIONS BASED ON TEST PITS PROVIDED BY RJ BURNSIDE. COMPLETED ON MARCH 28, 2017.

- PROPOSED SHOULDER EDGE OF SHOULDER
- PROPOSED ASPHALT EDGE OF ASPHALT
- PROPERTY LINE N73°44'20"E
- 30.0m WETLAND SETBACK
- PROPOSED INTERCEPTING SWALE
- EXISTING SPOT ELEVATION x 225.00
- PROPOSED SPOT ELEVATION x 195.50
- EXISTING GRADING DIRECTION
- PROPOSED GRADING DIRECTION 3.4%
- PROPOSED GRADING DIRECTION 8.6%
- TEMPORARY BENCHMARK ⊕ TBM#1
- EXISTING FIRE HYDRANT ⊕ #10
- EXISTING HYDRO POLE ⊕ #10
- PROPOSED BUILDING ENTRANCE ⬇

BUILDING ID	FFE
WD 01	179.80
WD 02	179.80
WD 03	179.80
WD 04	182.20
WD 05	182.45
WD 06	181.20
WD 07	181.45
RD 01	182.25
RD 02	181.30
RD 03	180.90
RD 04	182.70
RS 01	182.65
RS 02	182.30
RS 03	183.95
RS 04	183.95
MH	203.75
TENT AREA	182.30
BATHROOMS	182.30

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BENCHMARKS

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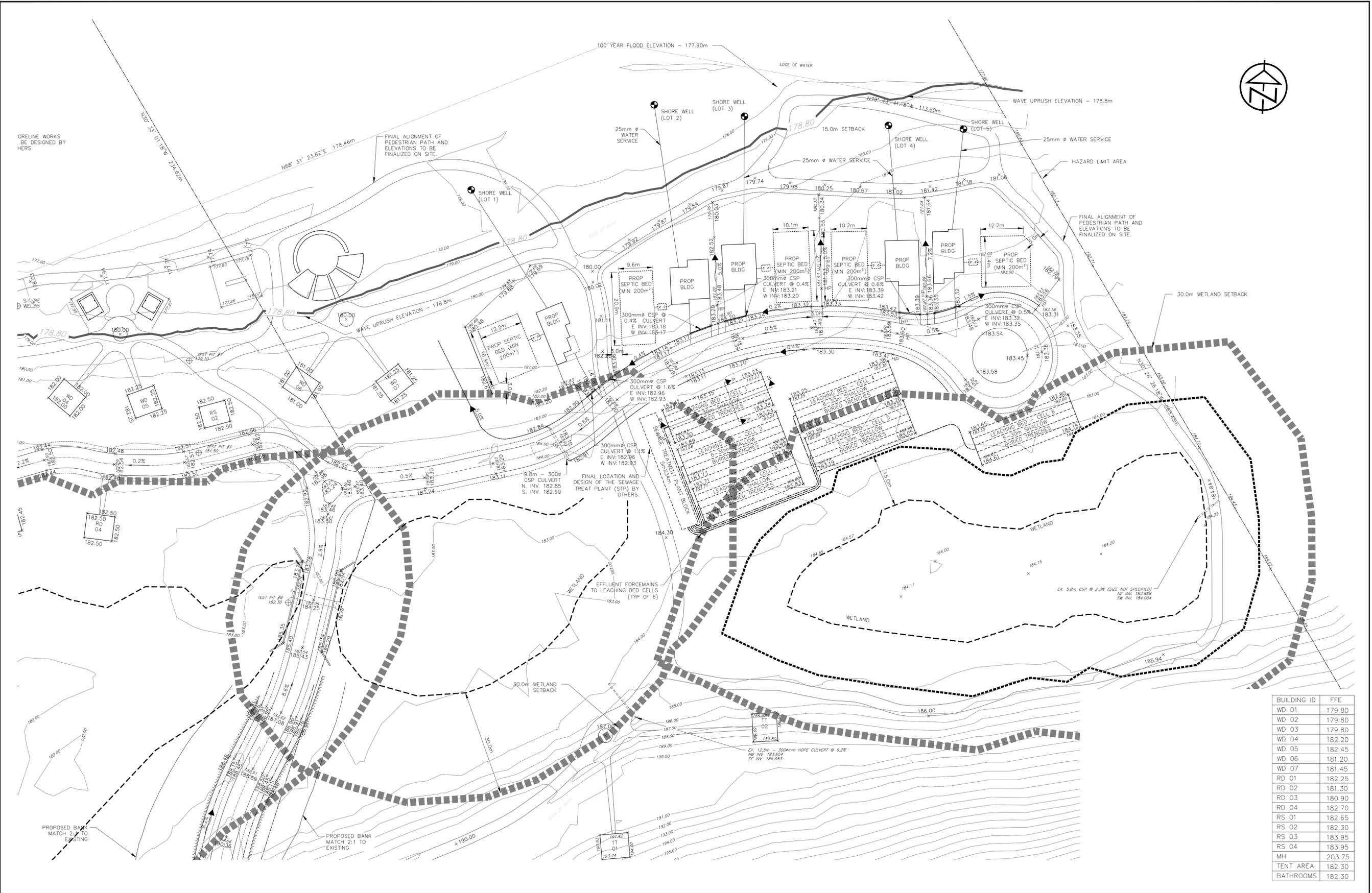
AQORPIONS ECO RETREAT
MUNICIPALITY OF MEAFORD

LOT GRADING PLAN

TATHAM ENGINEERING

DESIGN: ADM	FILE: 120218	DWG:
DRAWN: ADM	DATE: NOV 2021	LG01
CHECK: DC	SCALE: 1:500	

Drawing Name: T20218-LG01.dwg, Plotted: Mar 30, 2022



BUILDING ID	FFE
WD 01	179.80
WD 02	179.80
WD 03	179.80
WD 04	182.20
WD 05	182.45
WD 06	181.20
WD 07	181.45
RD 01	182.25
RD 02	181.30
RD 03	180.90
RD 04	182.70
RS 01	182.65
RS 02	182.30
RS 03	183.95
RS 04	183.95
MH	203.75
TENT AREA	182.30
BATHROOMS	182.30

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BENCHMARKS

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ENGINEER STAMP

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MUNICIPALITY OF MEAFORD

LOT GRADING PLAN

TATHAM ENGINEERING

DESIGN: ADM FILE: 120218 DWG:
 DRAWN: ADM DATE: NOV 2021 **LG02**
 CHECK: DC SCALE: 1:500



BUILDING ID	FFE
WD 01	179.80
WD 02	179.80
WD 03	179.80
WD 04	182.20
WD 05	182.45
WD 06	181.20
WD 07	181.45
RD 01	182.25
RD 02	181.30
RD 03	180.90
RD 04	182.70
RS 01	182.65
RS 02	182.30
RS 03	183.95
RS 04	183.95
MH	203.75
TENT AREA	182.30
BATHROOMS	182.30

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BENCHMARKS

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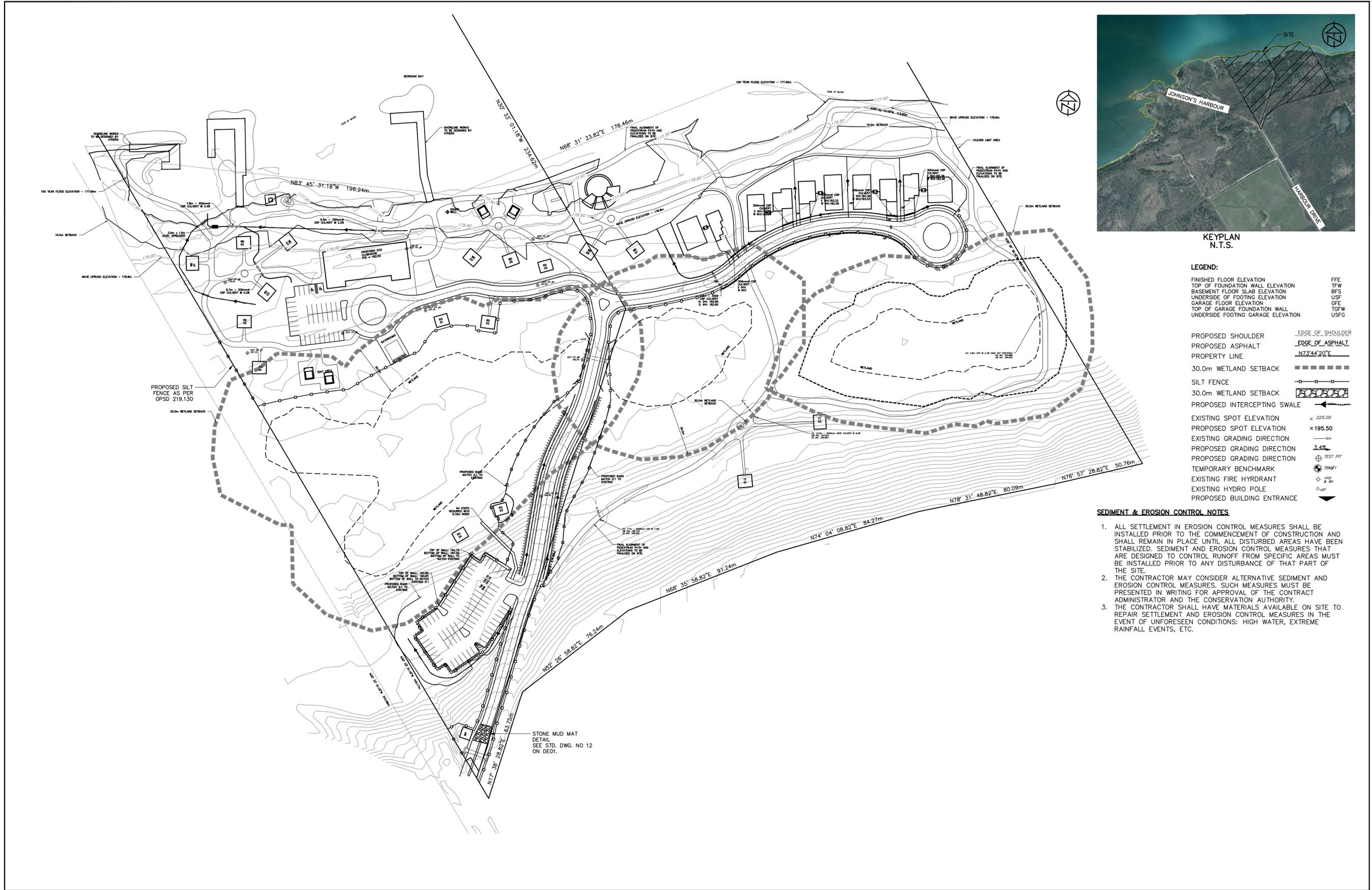
ENGINEER STAMP

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MUNICIPALITY OF MEAFORD

LOT GRADING PLAN

TATHAM ENGINEERING

DESIGN: ADM FILE: 120218 DWG:
 DRAWN: ADM DATE: NOV 2021 **LG03**
 CHECK: DC SCALE: 1:500



KEYPLAN
N.T.S.

- LEGEND:**
- FINISHED FLOOR ELEVATION FFE
 - TOP OF FOUNDATION WALL ELEVATION TFW
 - BASEMENT FLOOR SLAB ELEVATION BFS
 - UNDERSIDE OF FOOTING ELEVATION USF
 - GARAGE FLOOR ELEVATION GFE
 - TOP OF GARAGE FOUNDATION WALL TOFW
 - UNDERSIDE FOOTING GARAGE ELEVATION USFG
 - PROPOSED SHOULDER EDGE OF SHOULDER
 - PROPOSED ASPHALT EDGE OF ASPHALT
 - PROPERTY LINE N73°44'20"E
 - 30.0m WETLAND SETBACK
 - SILT FENCE
 - 30.0m WETLAND SETBACK
 - PROPOSED INTERCEPTING SWALE
 - EXISTING SPOT ELEVATION x 225.00
 - PROPOSED SPOT ELEVATION x 195.50
 - EXISTING GRADING DIRECTION
 - PROPOSED GRADING DIRECTION 3.4%
 - PROPOSED GRADING DIRECTION TEST PIT
 - TEMPORARY BENCHMARK TEMP 1
 - EXISTING FIRE HYDRANT HD & BV
 - EXISTING HYDRO POLE HP
 - PROPOSED BUILDING ENTRANCE

- SEDIMENT & EROSION CONTROL NOTES**
- ALL SETTLEMENT IN 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 CONTRACT ADMINISTRATOR AND THE CONSERVATION AUTHORITY.
 - THE CONTRACTOR SHALL HAVE MATERIALS AVAILABLE ON SITE TO REPAIR SETTLEMENT AND EROSION CONTROL MEASURES IN THE EVENT OF UNFORESEEN CONDITIONS: HIGH WATER, EXTREME RAINFALL EVENTS, ETC.

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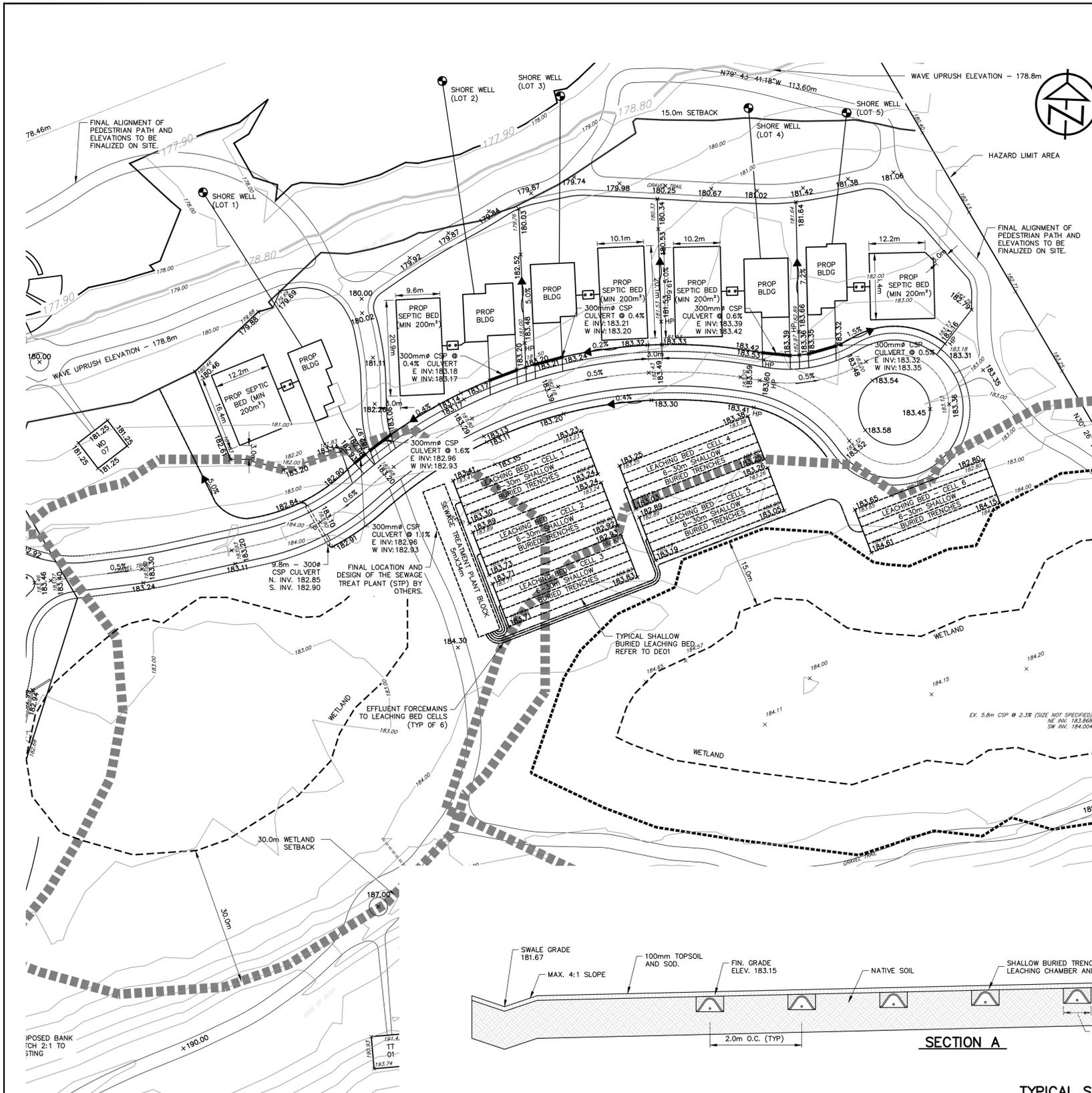
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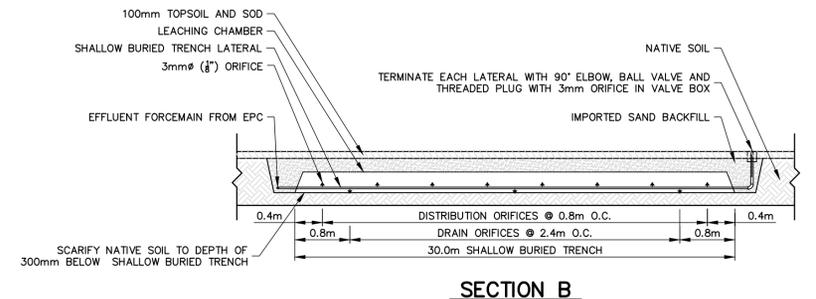
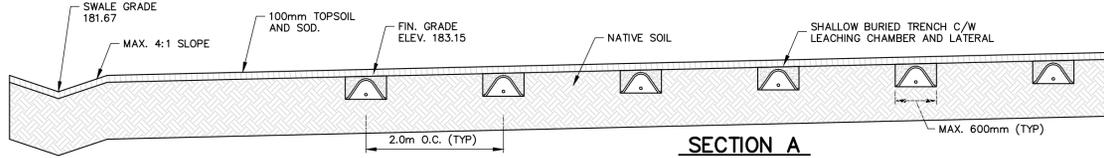
SILTATION AND EROSION CONTROL

TATHAM ENGINEERING

DESIGN: ADM	FILE: 120218	DWG: SC01
DRAWN: ADM	DATE: NOV 2021	
CHECK: DC	SCALE: 1:500	



- GENERAL NOTES
 - ALL ELEVATIONS AND DIMENSIONS ARE IN METRIC UNITS UNLESS OTHERWISE NOTED AND THE MINIMUM REQUIREMENTS UNLESS OTHERWISE.
 - ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH PART 8 OF THE ONTARIO BUILDING CODE (OBC) AND THE ONTARIO ELECTRICAL SAFETY CODE.
 - ALL EQUIPMENT AND MATERIALS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
 - LOCATION AND ELEVATION OF SHALLOW BURIED TRENCH LEACHING BED TO BE CONFIRMED BY ENGINEER AND OWNER PRIOR TO CONSTRUCTION.
 - ALL EQUIPMENT AND MATERIALS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
 - ALL WASTE MATERIAL REMOVED AS PART OF CONSTRUCTION SHALL BE TRANSPORTED TO AN DISPOSED AT A FACILITY LICENSED TO ACCEPT THE WASTE IN ACCORDANCE WITH O.REG. 347.
 - EXCAVATE WITH A TRACKED BACKHOE AND AVOID CONSTRUCTION TRAFFIC ON THE EXCAVATED SURFACE.
 - SEWERS AND FORCEMAINS TO BE BEDDED AND BACKFILLED WITH GRANULAR 'A' AND BACKFILLED WITH GRANULAR 'B' (TYPE 1). GRANULAR MATERIAL TO BE COMPACTED TO 100% OF THE MATERIALS SPMD.
 - DISTURBED AREAS TO BE REINSTATED TO PREVIOUS CONDITION OR BETTER.
 - INSTALLER IS RESPONSIBLE TO NOTIFY ALL UTILITIES AND OBTAIN LOCATES AND CO-ORDINATE CONSTRUCTION ACCORDINGLY.
 - ANY AREAS OF POSSIBLE CONFLICTS WITH EXISTING UTILITIES SHALL BE EXCAVATED BY HAND PRIOR TO COMMENCEMENT OF WORK.
 - PIPE DEFLECTIONS SHALL NOT EXCEED MANUFACTURERS SPECIFICATIONS.
 - THE INSTALLER SHALL COORDINATE ALL REQUIRED INSPECTIONS WITH THE TOWNSHIP OF MELANCTON BUILDING DEPARTMENT.
 - INSTALLER TO VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS AND NOTIFY ENGINEER OF ANY DISCREPANCIES.
 - ALL SEWERS, FORCEMAINS, HEADERS AND DISTRIBUTION PIPES SHALL BE INSTALLED WITH 3mm (1/8") GALVANIZED STEEL CABLE TAPED TO THE OBVERT OF THE PIPE AT 2m INTERVALS TO PERMIT MAGNETIC LOCATING OF THE WORKS.
- MATERIALS
 - GRAVITY SEWER - 100mm Ø SOLID WALL DR 35 PVC CONFORMING TO CAN/CSA-B182.1
 - EFFLUENT PUMP CHAMBER - 914mm X 3.6m DEEP (FLOOR TO UNDERSIDE OF LID) PRE-CAST CONCRETE MAINTENANCE HOLE C/W 600mm Ø LOCKABLE AND WATER-TIGHT ACCESS RISER BY ACTON PRECAST CONCRETE LIMITED OR APPROVED EQUAL.
 - EFFLUENT PUMP CHAMBER PIPING AND FITTINGS - 38mm Ø SCHEDULE 40 PVC CONFORMING TO CAN/CSA B137.3.
 - EFFLUENT PUMP SHUT OFF VALVE - 38mm Ø PVC TRUE UNION BALL VALVE CONFORMING TO CAN/CSA B137.3.



TYPICAL SHALLOW BURIED TRENCH BED SECTIONS

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1.	FIRST SUBMISSION	APR 19/22	

No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP

No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP



AQORPIONS ECO RETREAT
MUNICIPALITY OF MEAFORD
SEPTIC DESIGN PLAN

		DESIGN: ADM	FILE: 120218	DWG:
		DRAWN: ADM	DATE: DEC 2021	SD01
CHECK: DC	SCALE: 1:500			