

SERVICING BRIEF

Two Sisters Resort / Randwood Estate Re-development

**144 & 176 John Street
Niagara-on the-Lake, Ontario**

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Two Sisters Resort / Randwood Estate Re-development
144 & 176 John Street, Niagara-on the-Lake

Servicing Brief

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1. Introduction

This servicing brief serves to demonstrate how servicing of the subject development is intended to be achieved, and addresses the following key aspects of municipal servicing design:

- Water Supply and Distribution
- Sanitary Sewerage
- Drainage and Stormwater Management
- Roadways
- Utility Servicing

This brief should be read in conjunction with the separate stormwater management (SWM) report and Drawings 16332-SSG and 16332-D.

2. Background

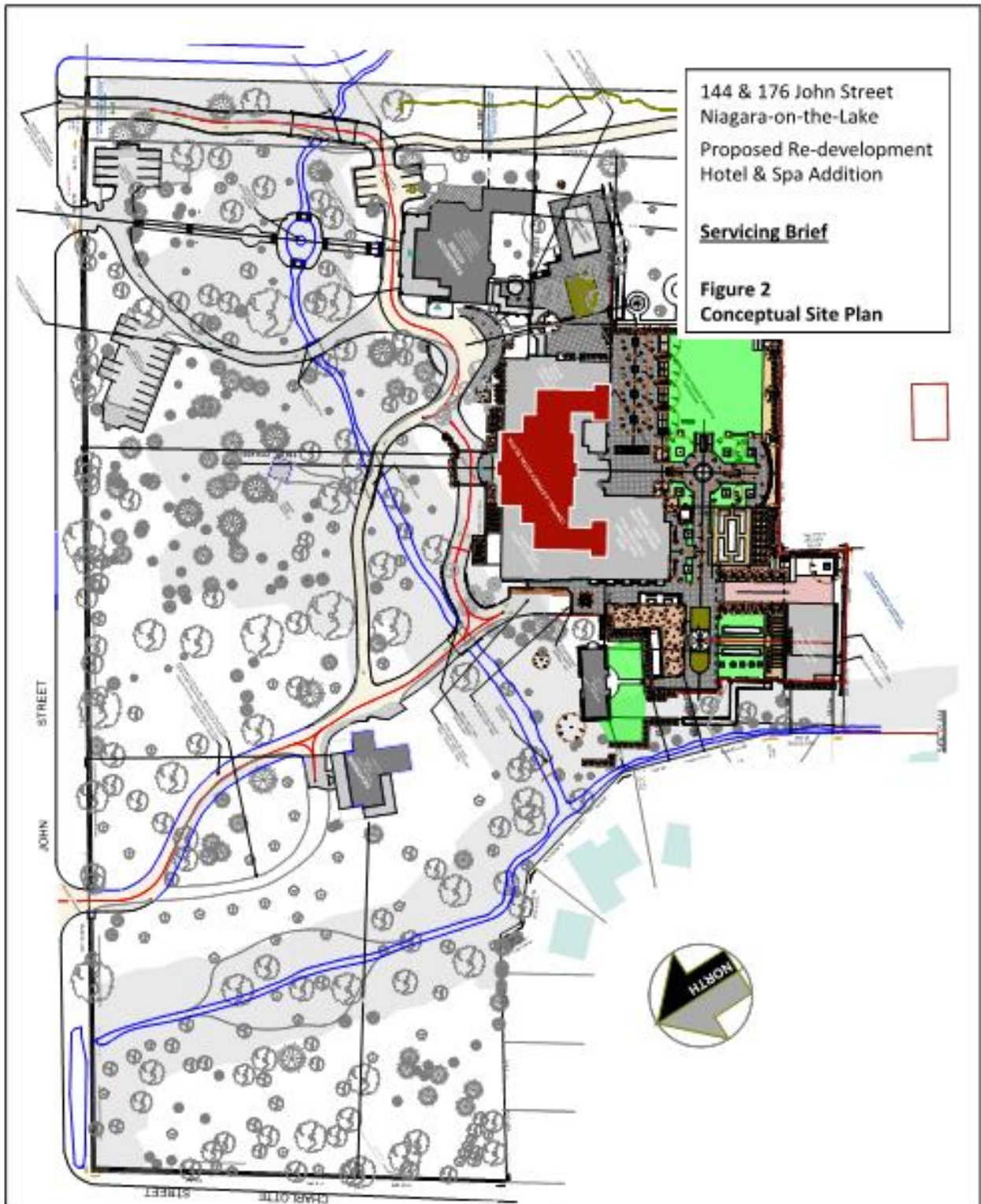
The 5.4 ha (13.3 acre) site, fronting on John Street in Niagara-on-the-Lake, has historically been occupied with a significant estate house. In recent decades this 'house' has had institutional uses such as a school of philosophy. In addition to the original estate house, there is now a smaller guest house known as the 'Devonian' and a coach house which more recently has housed a laundry facility. Servicing for these on-site facilities has evolved over the years and now includes municipal water supply for fire fighting and domestic usage, disposal of sanitary sewage by a system of holding tanks, balancing tanks and pumps, and drainage into on-site watercourses. There is a network of existing paved driveways on site and several small vehicle parking areas.

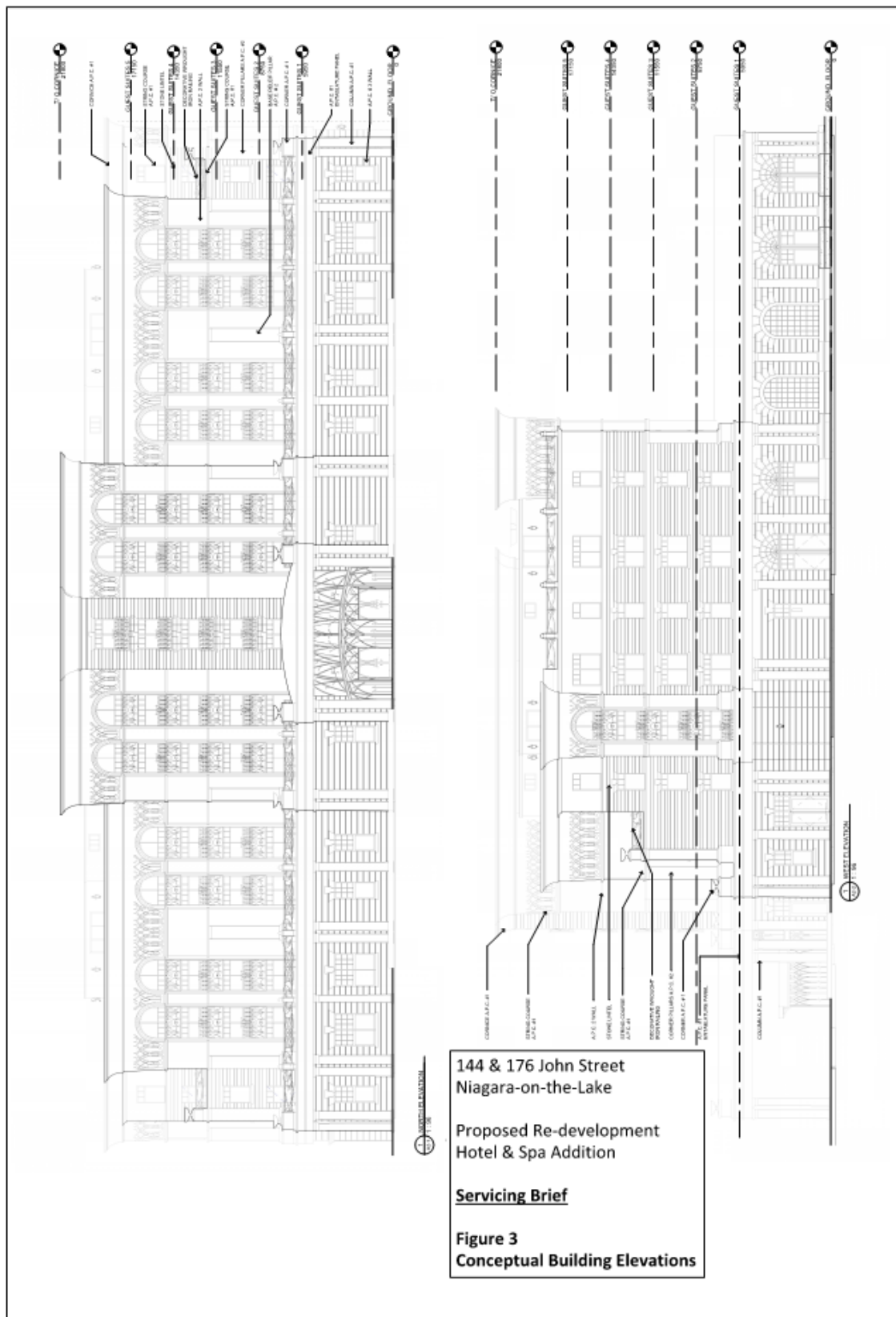
The development proposal contemplates the addition of a multi-storey hotel building with conference centre and spa facilities. New facilities are to include 145 hotel rooms, conference centre area, day spa and swimming pool. Vehicle parking will be largely underground located on 2-1/2 floors behind (south of) the hotel building. The area to be developed is currently occupied with a vehicle parking lot, a tennis court and grassed area.

It is relevant to an investigation of servicing for this proposed development to note that lands located immediately adjacent to the south, and once forming part of the Rand Estate, are currently designated as 'Residential Built Up Area' within the Town's Official Plan and therefore are contemplated for residential intensification uses. Both the subject lands and the lands adjacent are under the Ownership of the Applicant including a narrow strip of land parallel and adjacent to the multi-use recreational trail which runs NNW-SSE along the former railway. This strip is approximately 6.5 metres (22 feet) wide and has frontage on the east side of Charlotte Street, opposite Paffard Street. Accordingly, various servicing options have been investigated and the recommended serviceability of the site is based on existing services, which in future, can be alleviated through potential, future development immediately adjacent to the Subject Lands.

The site servicing plan, 16332-SSG, and accompanying drawing 16332-D, showing details for the SWM facility and servicing notes, are included in *Appendix A*, at reduced size for convenience and are enclosed in 24x36 format as well. An aerial image, derived from Niagara Navigator® and highlighting the subject property location, is shown as Figure 1 below and the conceptual site plan for the proposed condominium building is shown in Figure 2. Figure 3 presents conceptual elevation views of the proposed building for reference.







3. Water Supply and Distribution

There is currently a 150 mm Ø watermain on John Street fronting the property. A 150 mm Ø private watermain on the site connects to the municipal watermain on John Street at 2 locations, creating a looped feed for two (2) existing fire hydrants on the site. Flow tests at hydrants in front of the site indicated a static base pressure of 58 psi. Although this may be adequate for domestic water supply, it is likely that booster pumping will be required to ensure adequate pressure at the upper floors of the proposed hotel building. This will be verified through the detailed building design process.

The flow tests at hydrants in front of 144 John Street and 176 John Street indicated predicted available flow of 2073 USGPM and 2049 USGPM respectively at 20 psi residual pressure. The flow test results are included in Appendix B. As demonstrated in Appendix B, predicted required fire flow for the proposed hotel development is 3.35 L/s. Accordingly, it is expected that municipal water supply on John Street will be adequate for fire fighting. We understand that the new hotel building will be sprinklered. Assuming booster pumping will be required, as indicated above, the booster pumping system must have full redundancy and backup power for fire protection sprinkler operation.

Water supply piping for the new hotel building will be extended from the existing 150 mm Ø private watermain on site, with appropriate isolation and check valves, and metering on the new domestic waterline. Proposed pipe sizes are 150 mm Ø for fire protection into the building to supply the sprinkler system and a 100 mm Ø branch for domestic/potable uses.

Design parameters for water supply and distribution are outlined in Appendix B.

Subject to further review and comment by the Town we expect that there will be no impediments to domestic and fire fighting water supply for the development using currently existing municipal waterworks.

4. Sanitary Sewerage

The existing estate home on the site, having served a number of other uses in the recent past, is serviced by a sewage system that includes a septic tank from which sewage is pumped to a balancing tank at the north-east corner of the property. From there, sewage is pumped through a 50 mm Ø forcemain along John Street to a maintenance hole just east of King Street.

The existing 'Devonian' house near the westerly limit of the property has a separate septic tank and pumping chamber located just to the west. It is believed that this building and the prior coach house building, which more recently has housed a laundry facility, are serviced by this septic tank and pumping facility and that the combined sewage is pumped through a 75 mm Ø forcemain to a sanitary sewage maintenance hole on Charlotte Street. However, this has not been confirmed as of the publishing of this report. It is noted that the Charlotte Street sewer flows southerly to Paffard Street and westerly from there.

Calculations of proposed sewage flows included in Appendix C suggest average daily flow for the hotel facility of approximately 60,000 L and a peak design flow 3.52 L/s. Having investigated several alternatives for sanitary sewage servicing, including pumping and gravity pipe options, it is proposed to service the subject development using the existing 50 mm (2") Ø forcemain along John Street. The 450 metre length of forcemain results in head losses suggesting the strategic use of a balancing/holding tank to limit the peak pump discharge. The existing holding tank and pump chamber located just west of the existing estate house will require to be abandoned regardless due to their location within the proposed hotel building footprint. It is expected that a new holding tank with a capacity between 5,000 and 10,000 L and a pump chamber with duplex 10-12 hp pumps will be adequate to handle flows from the existing estate house, coach house and new hotel facility using the existing 50 mm (2") Ø forcemain. This tank and pumping facility is to be located within the new hotel building and will be designed and approved as part of the building permit application. It is proposed that the existing 'Devonian' house continue to discharge directly to the Charlotte Street sanitary sewer as it is expected to be onerous to implement gravity sewer to a new holding tank and pump facility at the new hotel building.

We understand from the *Town of Niagara-on-the-Lake King/Charlotte Area Sanitary Sewer Study* (Denco Engineering Ltd., February 1995) that downstream sewers have capacity for a full build-out allocation of 149,500 L/day (domestic sewage plus infiltration allowance) for the subject property. The predicted average daily sewage production is 60,900 L/day and infiltration is expected to be almost non-existent, given that gravity piping will be new, tight, PVC piping, and the rest of the piping is small diameter plastic forcemain. Accordingly, the anticipated average daily flow from the site is only approximately 40% of the sewage allocation for the fully developed property.

As noted in Section 2.0 Background, a residential subdivision is contemplated for the property abutting the subject site to the south. It is anticipated that the gravity sanitary sewer system for this subdivision will outlet to the existing municipal sewer at Charlotte and Paffard Streets. Given the long-term advantages of gravity sewer over pumping solutions related to operational costs, energy usage/costs, failure risks, etc., consideration should be given to an ultimate plan for sanitary sewage servicing for the subject property that consists of gravity sewer connecting to the subdivision sewer system. As the proposed residential development property is also owned by the owner of this subject property, it is considered that servicing of the 2 properties can be coordinated. A check of the sewer invert elevation at the existing receiving maintenance hole indicates that adequate grade exists to facilitate this approach. Thus, it is recommended that this approach be pursued at such time as the residential development is approved and servicing construction scheduled. We note that it may be necessary to continue to pump wastewater from one or more of the *existing facilities* even if a future gravity sewer outletting from the site becomes available.

Subject to further review and comment by the City, we expect that there will be no impediments to sanitary sewer servicing for the development using currently existing municipal sewage works.

5. Drainage and Stormwater Management

Storm drainage and stormwater management are addressed in a separate, accompanying 'Stormwater Management Report', updated June 2018. Observations and findings included in that report are summarized below, along with an overview description of proposed facilities. However, for detailed analysis, reference should be made to that report.

Surface runoff from the subject site currently drains to two (2) branches of One Mile Creek which traverse the site and convey drainage from approximately 55 hectares of upstream lands. One Mile Creek is regulated by the Niagara Peninsula Conservation Authority (NPCA) and regulated flood plain elevations vary from 88.57 metres at the east limit of the site to 86.86 metres where it leaves the site at its north-west corner to run westerly along the south side of John Street.

Rainfall over the parking garage will be collected using a network of landscape catchbasins and perforated tile drains and directed through the underground garage roof deck to the proposed SWM facilities. In addition, roof drainage will be piped to the storage facility after being managed using restricting roof drains.

Flows from storms up to the 100-year return period for the bulk of the site improvement area will be captured before they leave the site. We understand that it will be required to limit peak post-development flows to peak pre-development flow for storms up to the 100-year return period. Storm runoff storage requirements have been calculated based on a 3-hour, 100-year return period design storm.

Stormwater modeling indicate that, in addition to roof storage achieved through the use of flow-restricting roof drains, the proposed increase in impervious coverage will result in a requirement for storage in the range of 228 c.m. This is to be accounted for in a dedicated storage facility prior to outletting to an oil/grit separator and ultimately to the existing creek on site. A below-grade, cast-in-place concrete tank structure is proposed to abut the north-west corner of the proposed underground parking facility. A concrete structure will provide more storage per unit of surface area than a proprietary buried plastic chamber system (eg. Cultec), which will be important given the limited space available in the area of re-development for the hotel and parking garage. A tank with dimensions of 20m x 7m x 1.83m deep is proposed. Detailed structural design and construction will be coordinated with the proposed underground parking facility.

The receiving watercourse (One Mile Creek) is considered by the NPCA to be a Type '3' (Marginal) fish habitat. Accordingly, it is intended to provide water quality treatment consistent with 'Basic' level of protection in accordance with MOECC best stormwater management practices. This will require 60% total suspended solids (TSS) removal on an annual basis and associated total phosphorous and nitrogen removal. Given the limited site area available at grades above the regulated flood plain, it is recommended that water quality treatment be provided through the use of an oil/grit separator device HydroGuard® (Hydroworks) or Stormceptor® (Imbrium Systems). Based on the overall catchment area and proposed impervious area, a HydroGuard HG5 or equivalent unit is proposed.

Major system design will ensure that all opportunities for directing surface flows to on-site facilities without impacting adjacent private properties are employed. This will include good grading practice, use of curbs, etc. However, it is noted that the intent is to capture runoff from the 100-year return period storm.

Subject to further review and comment by the Town and/or NPCA, and subject to detailed design once the site plan is finalized for site plan application purposes, we expect that there will be no impediments to storm drainage servicing for the development.

6. Site Grading

Site grading will generally be carried out to Town of Niagara-on-the-Lake standards. It is anticipated that the proposed hotel building will respect the existing ground grade as it is intended to utilize existing driveways and provide pedestrian linkage with the existing estate house. The underground parking garage will be accessed by vehicles to the west of the hotel building and the surface grades above will be generally slightly below the grade at the hotel. There may be some opportunities for grade modifications at the south limit of the subject property facilitating future access from the proposed subdivision. However, this is not necessarily required and will occur subject to the timing of approvals, design and construction of that subdivision.

It is noted that most of the area over the underground parking facility is proposed to be essentially level, with roof drains built into the drainage membrane associated with the roof of the parking garage structure. These drains will be piped inside the parking garage to the stormwater management detention tank. Accordingly, no fixed grading is indicated on the proposed site servicing and grading plan.

7. Road Access, Parking and Driveway

Vehicular access/egress, other transportation issues and the potential for external improvement requirements are dealt with in a Traffic Impact Study prepared by others and submitted under separate cover. Drawing 16332-CSS shows a network of existing and proposed on-site driveways providing access to building entrances, delivery doors, garbage facilities and the proposed underground parking garage. Apart from some accessible, registration and valet parking spots above grade, vehicle parking will be provided at below-grade level the proposed underground parking garage located to the south of the hotel building.

Prepared by:



Doug Peters, P. Eng.
President



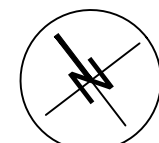
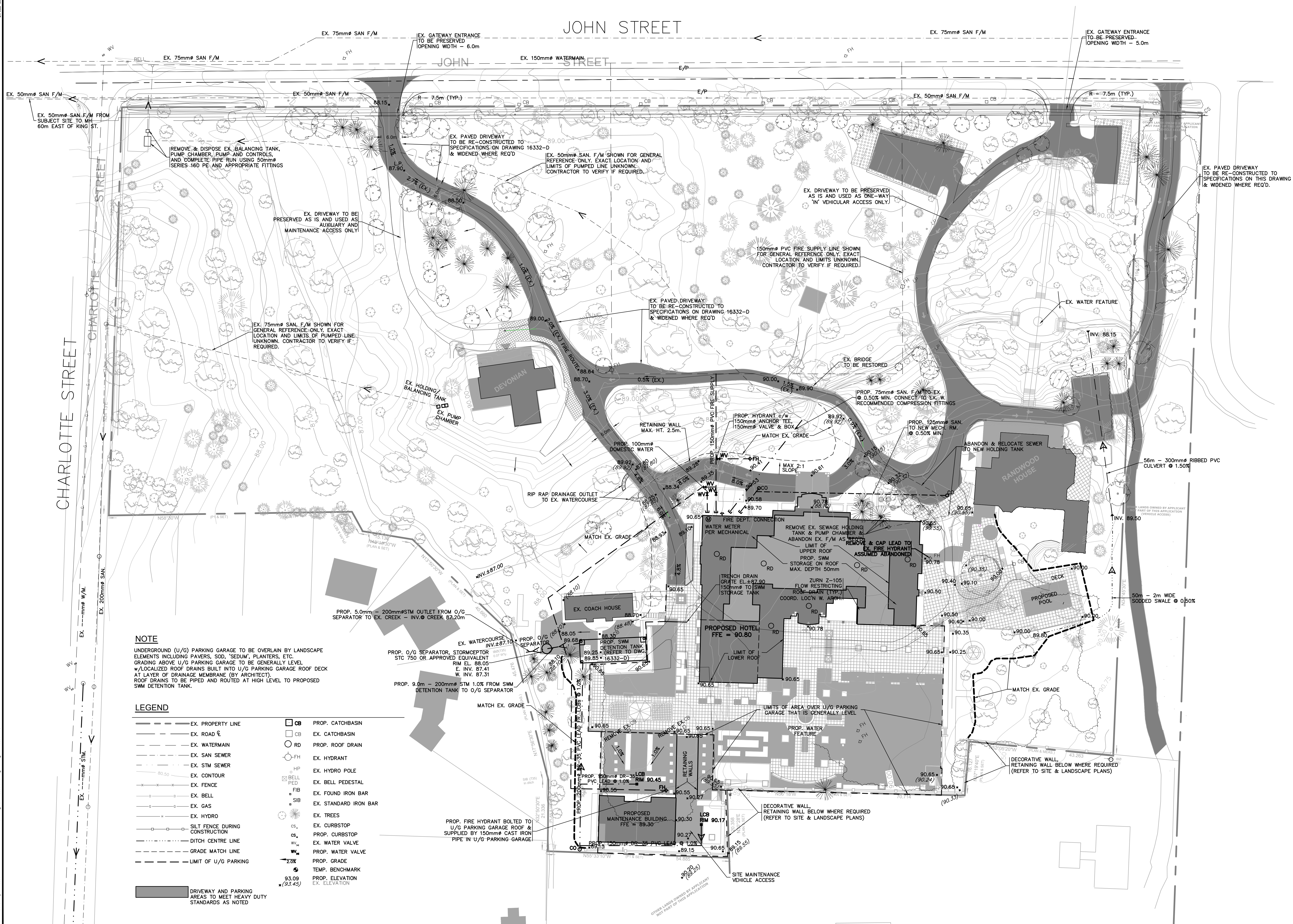
Functional Servicing Report

**Two Sisters Resort /
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Niagara-on the-Lake, Ontario**

APPENDIX A

Site Servicing Drawings



FOR SERVICING & GRADING NOTES
REFER TO DWG. 16332-D

C	SITE PLAN AGREEMENT	12 JUN 2018	BRH
B	SITE PLAN AGREEMENT	31 OCT 2017	J
A	CLIENT REVIEW	30 OCT 2017	J
issue	issued for	date	init

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Drawings must be sealed by the Architect and / or Engineer prior to their use for any building permit applications and / or government approvals. Seals must be signed by the Architect and / or Engineer before drawings are used for any construction.

All construction to be in accordance with the current Ontario Building Code and all applicable Ontario regulations.

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TWO SISTERS
Resorts

project title

RANDWOOD HOTEL
RESORT

JOHN STREET, NIAGARA-ON-THE-LAKE

drawing tit

SITE SERVICES AND GRADING PLAN

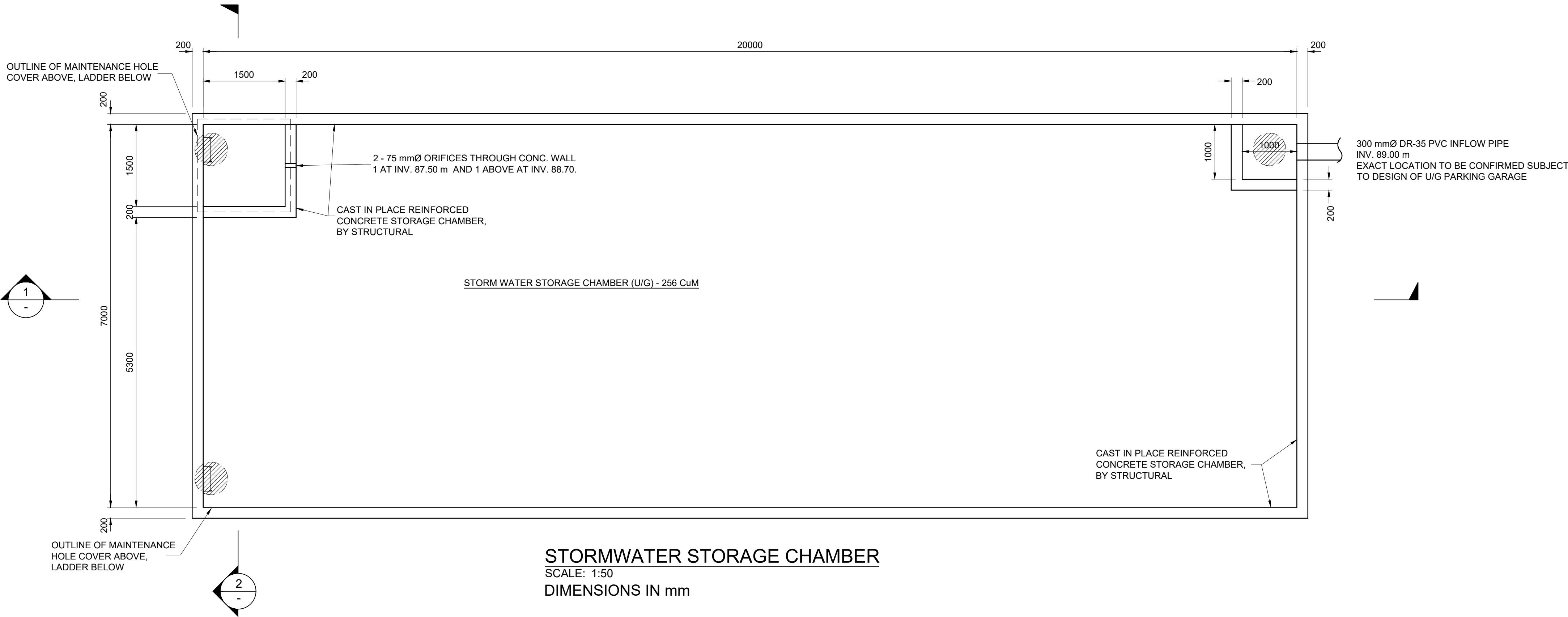
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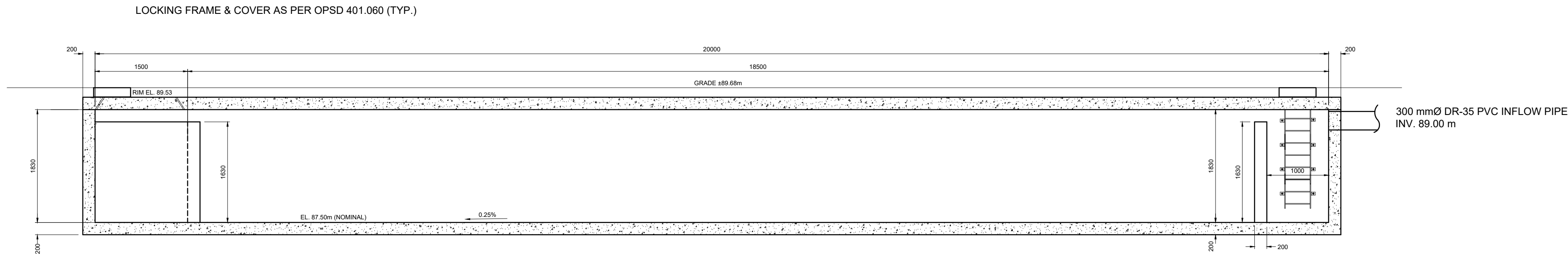
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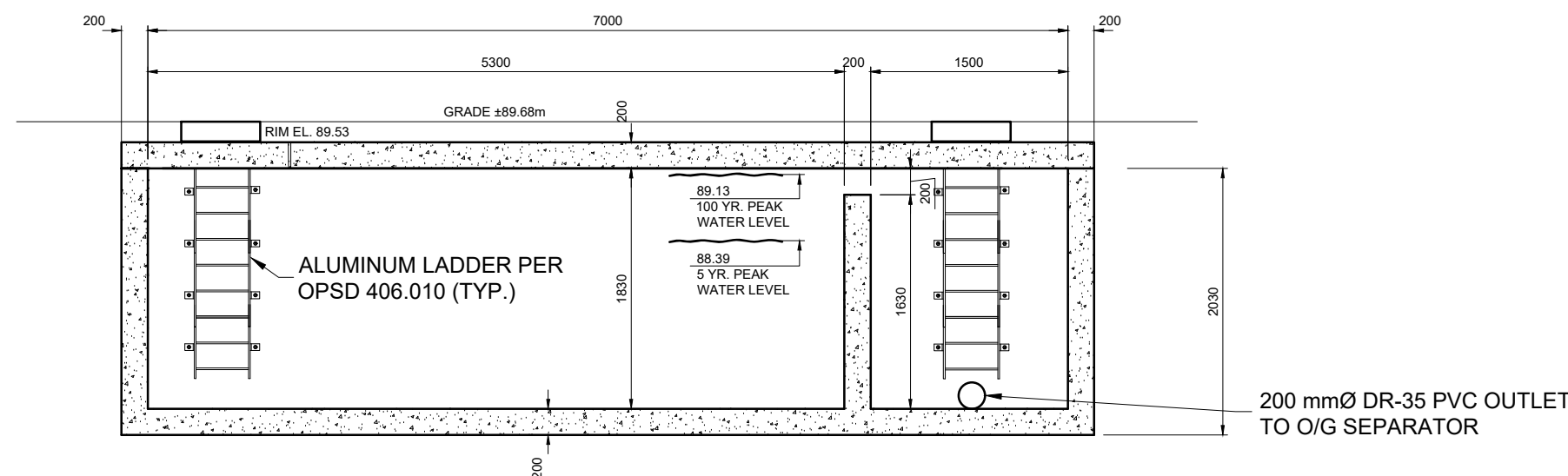
P:\2018 Projects\16322 Randwood Hotel Resort - Schematic Drawings\CH\16332 Stormwater Storage Chamber.dwg, drawing tab: 16332-2
plotted by: tjackson on Jun 14, 2018 - 3:38pm



STORMWATER STORAGE CHAMBER
SCALE: 1:50
DIMENSIONS IN mm



SECTION 1
SCALE: 1:50
DIMENSIONS IN mm



SECTION 2
SCALE: 1:50
DIMENSIONS IN mm

GENERAL

1. LOCATION AND SIZE OF EXISTING UTILITIES WAS DERIVED FROM QUARTEK TOPOGRAPHIC SURVEY VARIOUS DRAWINGS FROM OTHERS. THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN AND, WHERE SHOWN, THE ACCURACY OF THE LOCATION SHOWN OF SUCH UTILITIES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL CONTACT ALL SUCH UTILITIES INVOLVED AND INFORM HIMSELF AS TO THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME LIABILITY FOR DAMAGE TO THEM. CONTRACTOR TO REPORT ANY CONFLICTS OR DISCREPANCIES WITH THIS DRAWING TO THE ENGINEER IMMEDIATELY.
2. ALL MEASUREMENTS ARE IN METRES UNLESS OTHERWISE NOTED.
3. ALL WORK SHALL BE IN ACCORDANCE WITH THE RELEVANT SECTIONS OF THE TOWN MUNICIPAL ENGINEERING STANDARDS, THE ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND DRAWINGS, AND THE NIAGARA PENINSULA STANDARD CONTRACT DOCUMENT (NPSCD) UNLESS OTHERWISE NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS.
4. COMPUTER DRAWING FILE CO-ORDINATES FOR THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION LAYOUT UNLESS SPECIFICALLY DIRECTED BY THE ENGINEER.
5. ALL GRANULAR MATERIAL SHALL BE COMPACTED TO 100% STANDARD PROCTOR DENSITY AND ALL NATIVE BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY UNLESS OTHERWISE NOTED.
6. ALL CONSTRUCTION SHALL BE CARRIED OUT IN SUCH A WAY THAT SILTATION OR OTHER DAMAGE TO WATER COURSES DOES NOT OCCUR. THE REQUIREMENTS OF THE MINISTRY OF NATURAL RESOURCES ARE TO BE OBSERVED TO IN THIS RESPECT, AT A MINIMUM, PROVIDE SILT FENCE AND STABILIZED CONSTRUCTION ACCESS AND MAINTAIN SAME FOR DURATION OF CONSTRUCTION.
7. ALL EXCAVATION IN EXISTING ROADWAYS OR OTHER PAVED SURFACES SHALL BE BACKFILLED WITH GRANULAR 'A' COMPACTED TO 100% SPD, MINIMUM.
8. PROPOSED GRADES SHALL NOT ADVERSELY AFFECT ADJACENT PROPERTIES.
9. REFER TO SITE PLAN FOR SITE DIMENSIONS.
10. ALL AREA OF DISTURBED SOIL SHALL BE STABILIZED AND RE-VEGETATED WITH A NATIVE SEED MIX IMMEDIATELY UPON COMPLETION OF WORK AND RESTORED TO A PRE-DISTURBED STATE OR BETTER.
11. CONTRACTOR SHALL OBTAIN EXPLICIT APPROVAL FROM TOWNSHIP OF NIAGARA ON THE LAKE WATER DEPARTMENT PRIOR TO MAKING A CONNECTION TO THE EXISTING WATERMAIN. TOWN STAFF TO OPERATE ALL EXISTING MUNICIPAL WATER VALVES.
12. A MINIMUM CLEAR HORIZONTAL SEPARATION OF 2.5m SHALL BE MAINTAINED BETWEEN ANY SEWER & ANY PARALLEL WATERMAIN. A MINIMUM CLEAR VERTICAL SEPARATION OF 0.15m IF W/M CROSSING OVER SAN. A MINIMUM OF 500mm VERTICAL CLEARANCE SHALL BE PROVIDED BETWEEN WATERMAIN AND SANITARY SEWER PIPES. MINIMUM DEPTH OF COVER OVER WATERMANS TO BE 1.7m, EXCEPT AS REQUIRED TO CONNECT TO EXISTING WATERMAIN.
13. WATERMANS & SERVICES SMALLER THAN 150mmØ SHALL BE TYPE 'K' SOFT COPPER OR MUNICIPEX OR APPROVED EQUIVALENT. MINIMUM FINISHED COVER OVER WATERMANS & SERVICES SHALL BE 1.7m UNLESS OTHERWISE INDICATED.
14. ALL WATER SUPPLY AND DISTRIBUTION PIPING SHALL BE FLUSHED, PRESSURE TESTED & DISINFECTED IN ACCORDANCE WITH OPSS 441 & NPSCD SPC-D13 UNDER THE DIRECTION OF THE TOWN'S ENGINEERING PERSONNEL & TO THE SATISFACTION OF THE TOWN DIRECTOR OF PUBLIC WORKS.
15. FOR ALL NON-METALLIC WATERMANS AND SERVICES, 8-GAUGE COPPER TRACING WIRE SHALL BE INSTALLED ALONG THE CROWN AT 3mm INTERVALS ALONG ITS ENTIRE LENGTH, ALONG HYDRANT LEAD AND EXTENDED ABOVE EXPOSED FLANGE AT HYDRANT.
16. ALL EXISTING HYDRANTS ON SITE TO BE INSPECTED BY QUALIFIED PERSONNEL AND REPLACED IF NOT COMPLIANT WITH CURRENT MUNICIPAL AND C.S.A. STANDARDS, AND OPSS 1105.010.

ROADS AND EARTHWORKS

17. FILL FOR ROADWAY AND PARKING AREAS TO BE CONSTRUCTED IN ACCORDANCE WITH OPSS 201 IN 200mm THICK LIFTS, USING SUITABLE NATIVE EXCAVATED OR IMPORTED MATERIAL APPROVED BY CONTRACT ADMINISTRATOR AND GEOTECHNICAL ENGINEER. THE SUBSOIL BELOW ANY ROADWAY OR PARKING AREA SHALL BE COMPACTED, PROOF ROLLED AND INSPECTED BY THE GEOTECHNICAL ENGINEER OR HIS DESIGNATE PRIOR TO THE PLACEMENT OF ANY GRANULAR MATERIAL. THE UPPER 1.0m BELOW ANY RIGID OR PAVED SURFACE SHALL BE COMPACTED TO 100% SPD MIN.
18. WHERE DISTURBED OR DAMAGED, REINSTATEMENT OF EXISTING ROADS SHALL COMPLY WITH THE REQUIREMENT OF THE ROAD AUTHORITY. PAVEMENT REINSTATEMENT SHALL COMPLY WITH OPSS 509.010 AND OPSS 310.
19. CONCRETE CURBS WHERE SPECIFIED, TO COMPLY WITH OPSS 600.110 AND OPSS.MUNI 353.
20. SUBDRAIN TO BE 100mmØ HDPE PERFORATED FILTER-WRAPPED TILE, PER OPSS 216.021, DISCHARGING TO AN EXISTING DITCH OR OTHER DRAINAGE OUTLET.
21. MINIMUM ASPHALT AND GRANULAR THICKNESS FOR NEW AND WIDENED DRIVEWAYS AND PARKING AREAS PER OPSS 310 & 314 AS FOLLOWS:

	HEAVY DUTY	LIGHT DUTY
SURFACE COURSE	40mm HL3	40mm HL3
BINDER COURSE	65mm HL8	50mm HL8
GRANULAR BASE	150mm GRAN. 'A'	150mm GRAN. 'A'
GRANULAR SUBBASE	350mm GRAN. 'B'	200mm GRAN. 'B'
TOTAL THICKNESS	605mm	440mm
22. AREAS TO BE SODDED SHALL INCLUDE MINIMUM 75mm TOPSOIL PER OPSS 802 AND NPSCD SPC-B21, SOD TO BE IN ACCORDANCE WITH OPSS 803 AND NPSCD SPC-B21. NATIVE BACKFILLED AREAS TO BE SODDED SHALL BE FREE OF GRANULAR PARTICLES OR OTHER MATERIALS DELETERIOUS TO PLANT GROWTH.

SEWERS

23. ALL SEWERS, LEADS AND LATERALS SHALL HAVE CLASS 'B' BEDDING PER OPSS 802.010, GRANULAR 'A' COVER MATERIAL AND SELECT NATIVE BACKFILL UNLESS OTHERWISE NOTED.
24. ALL STORM SEWERS AND CATCHBASIN LEADS TO BE CONCRETE, CLASS III PER CSA A257.2 WITH CLASS 'B' BEDDING TO OPSS 802.030 OR PVC DR-35 PER CSA 182.1 WITH GRANULAR 'A' BEDDING TO OPSS 802.010 UNLESS OTHERWISE NOTED.
25. SEWER MAINTENANCE HOLES SHALL BE PRECAST CONCRETE PER OPSS 701.010 WITH FRAME & COVER PER OPSS 401.010 TYPE 'A', AND SHALL COMPLY WITH TOWNSHIP MUNICIPAL ENGINEERING STANDARDS, INCLUDING WATERPROOFING AND INSTALLATION OF A RAIN DISH.
26. OIL GRIT SEPARATOR TO BE STORMCEPTOR® STC750 OR APPROVED EQUIVALENT, CAPABLE OF ACHIEVING 70% TSS REMOVAL FOR TOTAL CATCHMENT AREA OF 1.16ha AND 82% IMPERVIOUS AREA, AND A BY-PASS FLOW FOR 100-YR RETURN PERIOD STORM OF 0.018cms.
27. LANDSCAPE CATCHBASINS TO BE NDS MODEL NDS900, 9" (225mm) SQUARE, OR APPROVED EQUIVALENT, WITH MODEL 990 GRATES IN NON-VEHICULAR AREAS AND MODEL 1210 GRATES IN VEHICULAR TRAFFIC AREAS. OUTLETS TO BE 3" (75mm) WITH 90° BEND DOWN THROUGH U/G PARKING GARAGE CONCRETE ROOF DECK.
28. FLOW RESTRICTING ROOF DRAINS TO BE ZURN Z105 N-1 (1-NOTCH), OR APPROVED EQUIVALENT.
29. OIL/GRIT SEPARATOR TO BE HYDROWORKS HG-5 OR APPROVED EQUIVALENT.

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TWO SISTERS
Resorts

project title

**RANDWOOD HOTEL
RESORT**

JOHN STREET, Niagara-on-the-Lake

drawing title

**SITE SERVICES AND
GRADING DETAILS**

drawn by

WE

designed by

DP

scale

AS NOTED

date

2017-11-03

job number

16322

issue

C

drawing number

16332-D

Functional Servicing Report

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Niagara-on the-Lake, Ontario**

APPENDIX B

**Domestic Water Supply and
Fire Flow Calculations**

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Servicing Brief

APPENDIX B – Domestic Water Supply Calculations

Design Parameters for Water Supply and Distribution

No. of Hotel/Residential Units	145 equivalent rooms
Design Flow per Room	300 L/day
Conference Centre Occupancy	515
Design Flow per Seat	30 L/day
Restaurant Occupancy	60 seats
Design Flow per Restaurant Seat	300 L/day
Estimated Day Spa Demand	4,500 L/day
Average Domestic Water Demand	81,450 L/day
Maximum Day Peaking Factor	4
Maximum Day Flow	3.77 L/s
Peak Design Flow Peaking Factor	5
Peak Flow	4.71 L/s
Fire Flow Min. Residual Pressure	20 psi (14.1 m head)
Max-Day Minimum Residual Pressure	40 psi (28.2 m head)
Hazen-Williams 'C'	120
Design Pipe Specification	PVC, CIOD, DR-18, CL235

Pressure Drop for Peak Domestic Water Flows

Minimal elevation head from the municipal main to buildings on site is assumed.
Elevation head loss to 6th floor of hotel building = 175 kPa (25.5 psi)

Using Hazen-Williams, friction (velocity) head losses are as follows:

- through existing 150 mm Ø 'fire' main: ½ design flow, or 1.72 L/s through each of 2 legs of 91m length; resulting head loss = 0.1 kPa (0.02 psi)
- through proposed 150 mm Ø 'fire' main: design flow of 4.71 L/s over 37m length; resulting head loss = 0.3 kPa (0.04 psi)
- through proposed 100 mm Ø 'domestic' service: design flow of 4.71 L/s over 55m length; resulting head loss = 3.1 kPa (0.43 psi)

Total friction head loss at peak design flow = 3.5 kPa (0.49 psi)

Thus, total anticipated pressure drop at peak design flow to 6th floor = 179 kPa (26 psi)

Static pressures at hydrants on John Street opposite the site are understood to be 58-59 psi. Applying the total pressure drop above results in residuals of 32 psi.

Fire Flows

New hotel building to be sprinklered, with appropriate design at time of building permit application.

Functional Servicing Report

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Sanitary Sewage Calculations

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Servicing Brief

Appendix C - Sanitary Sewer Design Calculations

Design Parameters for Sanitary Sewer Servicing

No. of Hotel/Residential Units	145
Design Flow per Room	300 L/day
Conference Centre Occupancy	515
Design Flow per Conference Attendee	30 L/day
Restaurant Occupancy	60 seats
Design Flow per Restaurant Seat	300 L/day
Estimated Day Spa Demand	4,500 L/day
Average Domestic Sewage Flow	81,450 L/day
Peaking Factor	4.5
Peak Domestic Sewage Flow	4.24 L/s
Infiltration allowance (2 ha @ 0.10 L/s/ha)	0.20 L/s
TOTAL PEAK DESIGN FLOW	4.44 L/s

Available Grade Confirmation for Contemplated Future Gravity Sewer

Proposed hotel first floor elevation – 90.80 m

Proposed gravity sewer elevation at proposed hotel building – 89.25 m

Length of gravity sewer through proposed residential subdivision and corridor along recreational trail – 575 m

Minimum grade for proposed 200 mm Ø gravity sanitary sewer – 0.35%

Estimated # of maintenance holes – 9, with 0.03 m drop at each MH

Elevation drop through gravity sewer from proposed hotel building to outlet on Charlotte Street at Paffard Street – 2.57 m

Proposed Easterly Sewer Invert Charlotte at Paffard – 86.97 m

Existing West Invert Sanitary Sewer at Paffard – 86.22 m

Thus, there is adequate grade for gravity sewer to service first floor and above of the proposed multi-storey hotel building.