MILLIKEN DEVELOPMENT GROUP

Keith Road Maison
Civil Servicing Design Brief

File No. 12202
November 2012

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Civil Engineers & Project Managers

TABLE OF CONTENTS

1. INTRODUCTION

Milliken Developments are proposing to redevelop the property at 805 & 825 Keith Road in West Vancouver. The subject lands include 2 lots on the North side of Keith Road and West side of Taylor Way. The 2 lots are aligned in a north-south orientation. The total site area is approximately 0.65ha.

Creus Engineering Ltd. has been retained by Milliken Developments to provide a preliminary review of the civil servicing requirements for the above project. This design brief will provide a preliminary review of the surrounding road system, the existing offsite municipal infrastructure capacity for the proposed development and it will define any special design requirements / offsite upgrades required to service the proposed development.

The following utilities will be reviewed in this report:

- Roads
- Water System
- Sanitary Sewers
- Storm Sewers
- Utilities

It is assumed that all works will be designed and constructed in accordance with the most recent version of the District of West Vancouver's Development Servicing Bylaw.

2. SITE CHARACTERIZATION

The proposed development is located in the Sentinel Hill area of West Vancouver, along Taylor Way. The subject property is bounded by residential properties on Eden Road to the north, residential properties to the west, Taylor Way to the east, and Keith Road to the south. See Figure 2.1 - Site Location Plan.

The subject property currently contains a 2 storey single family house with driveway access from Keith Road. The proposed development generally consists of a new 3 storey - 108 bed, care facility complete with underground parking. The project will involve a major redevelopment of the site including re-grading of the existing boulevards on Keith Road and Taylor Way. The total site area is approximately 6473m².

3. ROADS

The Keith Road Maison development proposal includes no changes to the local road network. Generally, the curb and sidewalk will be replaced with new boulevard sidewalk along the site frontages. The curb and sidewalk along Keith Road is being reconstructed as part of the Evelyn Drive development, so the extent of reconstruction on Keith Road may be less. All road upgrades will be constructed per District of West Vancouver / TAC standards. Works on Taylor Way will require Ministry of Transportation (MOT) review and approval. Taylor Way upgrades will be constructed per MOT standards. Site access will be from Keith Road with a new driveway constructed to District of West Vancouver standards. See Figure 3.1 for details.

4. WATER

The existing water system consists of a 350mm watermain along Keith Road and a 200mm watermain along Taylor Way. This proposed development will be serviced off of Keith Road. Based on the size of the existing water mains, the extent of looping in the existing water system and the system operating pressures, it is expected there will be no issues servicing the proposed development. Based on the proposed development plans, the estimated water demands have been estimated as follows:

Residences = 110
Fire Flow (FF) = 155l/s (estimated, per FUS)
Maximum Day Demand (MDD) = 1.6l/s
Peak Hour Demand (PHD) = 2.4l/s
Design Flow (greater of MDD+FF / PHD) = 156.6l/s

See Figure 4.1 for detailed calculations.

5. SANITARY

The existing sanitary system consists of a 200mm sanitary main along Keith Road and Taylor Way. The sanitary mains south of the proposed development were recently upgraded as part of the Evelyn Drive development. The existing gravity system has capacity for the proposed development. The 200m diameter main across Keith Rd flows approximately 44% full during peak wet weather flows. No downstream upgrades are required. Based on the proposed development plans, the estimated peak sanitary flows have been estimated as follows:

Residences = 110
Site Area = 0.65ha
Average Dry Weather Flow (ADWF) = 0.73l/s
Peak Wet Weather Flow (PWWF) = 3.09l/s

See Figure 5.1 for detailed calculations.

6. STORM

The existing storm system consists of a 525mm storm main along Keith Road, and a 600mm storm main along Taylor Way. While specific site coverage and grading are preliminary at this time, effective impervious areas are expected to increase as part of the proposed development. The proposed development will require a stormwater management plan (see Section 6.1 below). As part of the proposed stormwater management plan, detention for the 10yr storm event will be required to limit post-development runoff to pre-development levels. Therefore the increase in site imperviousness will be mitigated by on-site detention and there will be no impact to the downstream storm system. The existing storm sewer system is adequate for the existing condition therefore there will be no impacts to the storm sewer system from the proposed development. Based on the proposed development plans, the estimated peak storm flows have been estimated as follows:

Catchment Area = 0.65ha
Predevelopment Runoff Coefficient = 0.33
Estimated Predevelopment Peak Flow (10yr storm event) = 46l/s

Postdevelopment Runoff Coefficient = 0.64
Estimated Postdevelopment Peak Flow (10yr storm event) = 90l/s

6.1. STORMWATER MANAGEMENT PLAN

A stormwater management plan will be required for this site. Based on the proposed site plans, the postdevelopment impervious areas are estimated to be on the order of 53%. The stormwater objectives, per the District of West Vancouver Development Servicing Bylaw, are as follows:

- Reduce, to the extent possible, the volume of stormwater runoff from the developed condition during all storm events up to the 50% of mar storm event.
- Limit post-devlopment runoff during the 10yr storm event to predevelopment levels.
- Rainfall data: West Vancouver IDF Curve (MAR storm event = 78mm)

In addition, in accordance with the OCP Policy NE 8, proposed stormwater management facilities will be located and designed in conformance with policies that promote site sensitive design and minimize development in creek corridors. The proposed development, including underground parkade structures, has extents covering approximately 53% of the site. Stormwater BMP's based on infiltration to groundwater will be used where possible. The effective impervious area will be reduced, to the extent possible, with above grade landscape areas. An onsite bioswale is proposed along the east boundary to help infiltrate building runoff to ground. To help meet the stormwater objectives, a minimum soil depth of 300mm is recommended. It is assumed that these measures will be sufficient to satisfy the stormwater objectives. Rate control during the 10-year return period storm event will be achieved with infiltration / detention tank(s). Conveyance during the 100-year return period event will be managed through site grading.

7. OUTSIDE UTILITIES (BC HYDRO / TELUS / SHAW / FORTISBC)

BC Hydro, Telus and Shaw have existing overhead infrastructure on the north side of Keith Road, underground infrastructure on the south side of Keith Road and overhead infrastructure along Taylor Way. We do not anticipate any issues servicing the proposed development.

FortisBC has two existing gas mains on Keith Road: an intermediate pressure (IP) main and a regular pressure main on the south side of Keith Road. We do not anticipate any issues providing gas service to the proposed development.

As part of the detailed design for the project, coordination with BC Hydro, Telus, Shaw and FortisBC will be required for their respective utility designs.

8. REPORT SUBMISISON

Prepared By:

CREUS Engineering Ltd

Russell Warren, P.Eng.

APPENDIX A: FIGURES & CALCULATIONS

Figure 2.1: Site Location Plan

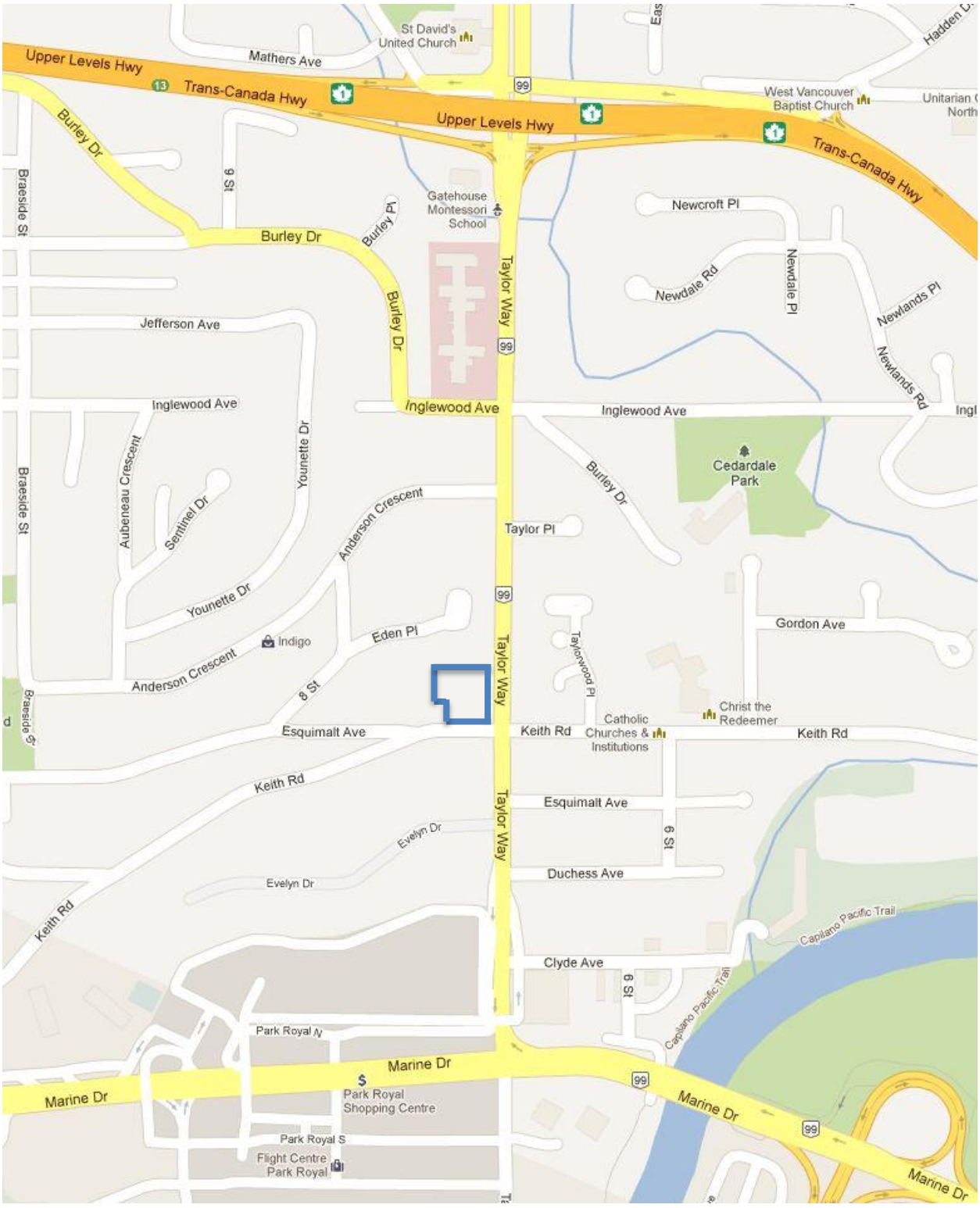
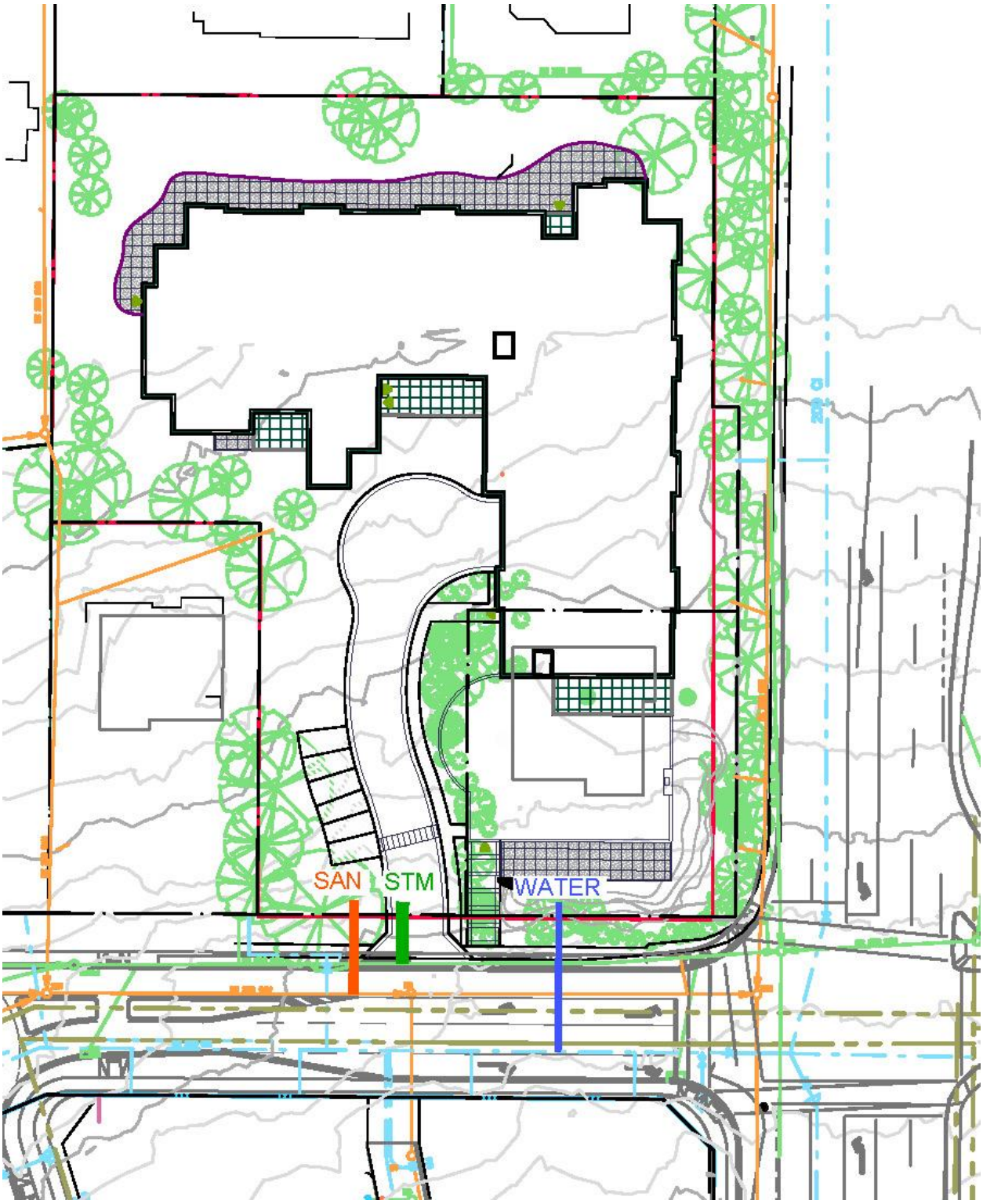
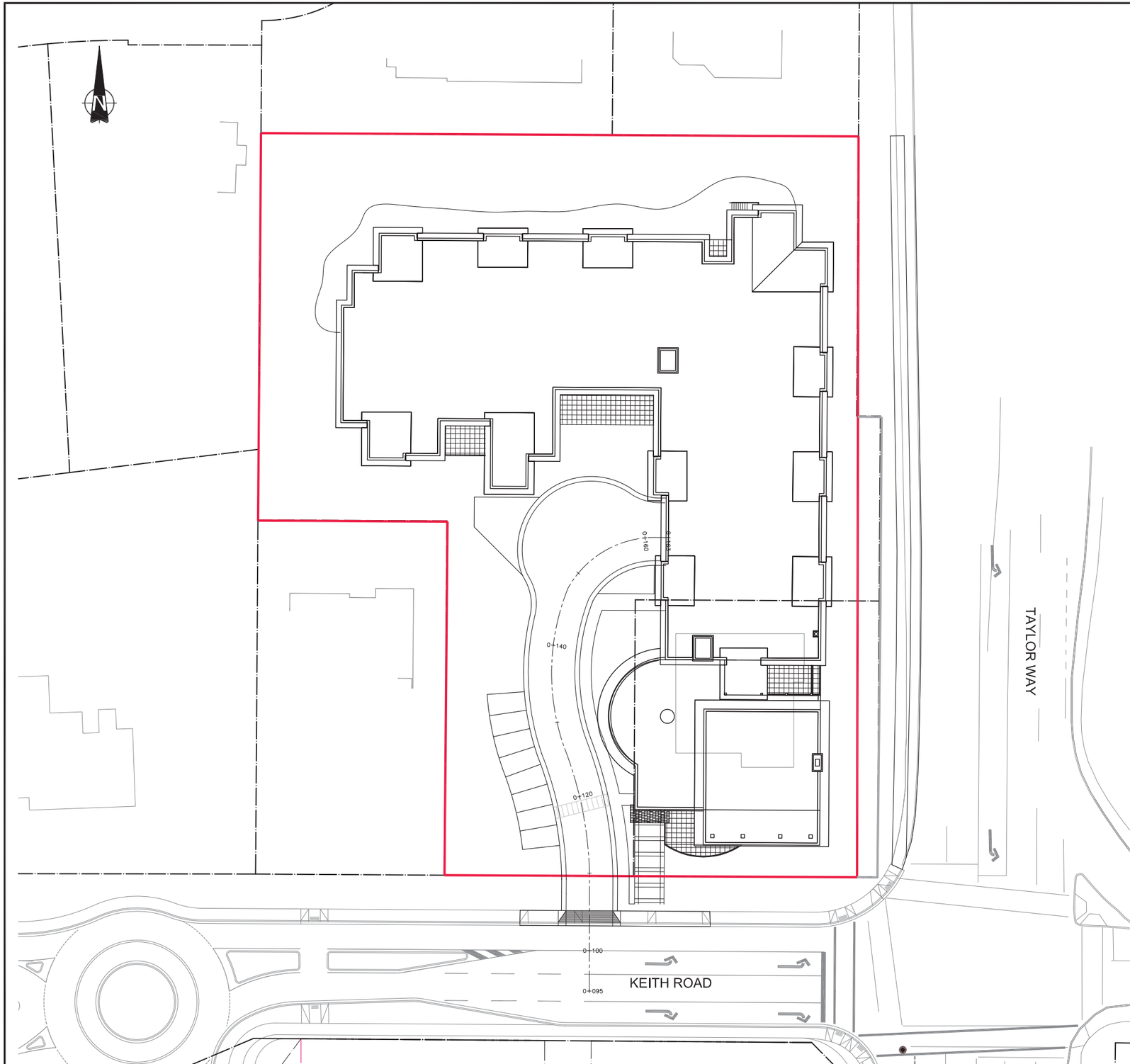
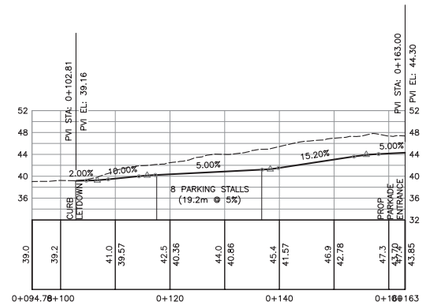


Figure 2.2: Site Plan







PROFILE SCALE
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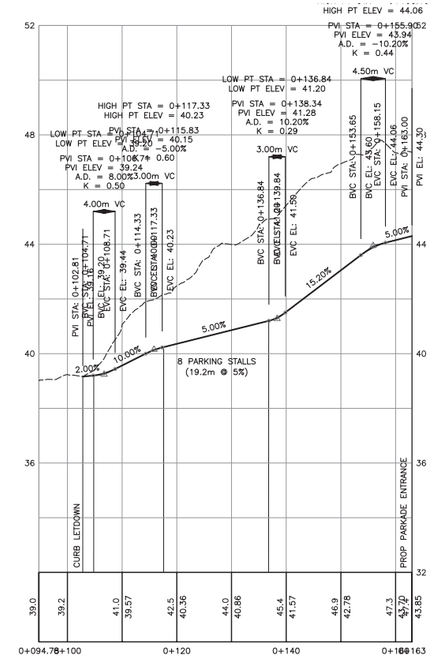
V 1:500



PROFILE SCALE
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V 1:100

no.	date	revision	chk'd	no.	date	revision	chk'd

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approved

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date: NOV.30,12

title: FIGURE 3.1: PRELIM DRIVEWAY GRADING

scales: hor: 1:250 vert: -
file no.: 12202
drawing no.: 3.1
rev.: -

Figure 4.1: Preliminary Water Calculations

FIRE FLOW (per FUS)				
Fire Flow				
Per 'WATER SUPPLY FOR PUBLIC FIRE PROTECTION', 1999 by Fire Underwriters Survey				
Base Fire Flow Calculation				
Construction Coefficient, C		1.0		(ordinary construction)
Floor Area, A		6903	m²	(per FUS)
Base Fire Flow (220C√A)	=	18279	l/min	
Content Hazard Credit/Surcharge		-25%		(low content hazard)
Adjusted Base Fire Flow	=	13709	l/min	
Sprinkler Protection Credit		-50%		(NFPA 13 sprinklers)
Sprinkler Protection Credit	=	-9139	l/min	
Exposure Surcharge				
	10.1 to 20m	15%	charge	1
	20.1 to 30m	10%	charge	1
	30.1 to 45	5%	charge	
Exposure Surcharge	=	4570	l/min	
Total Factored Fire Flow	=	9139	l/min	
Design Fire Flow (per FUS)	=	9300	l/min	(155 l/s)
DOMESTIC DEMAND				
Domestic Flow				
Care Units		110		(per NORR Architect)
Persons per unit		1.0		
Total Persons	=	110	capita	
Institutional Area		0.08	ha	
Equivalent Population		90	l/ha/d	(per MMCD)
Average daily flow	=	7	capita	
Total Persons	=	117	capita	
Maximum Day Demand		1200	l/capita/d	(per MMCD)
Peak Hour Demand		1800	l/capita/d	(per MMCD)
Total Maximum Day Demand	=	1.63	l/s	
Total Peak Hour Demand	=	2.44	l/s	
DESIGN FLOW				
Design Flows				
Design Fire Flow (FF)	=	155	l/s	(as above)
Total Maximum Day Demand (MDD)	=	1.63	l/s	(as above)
Total Peak Hour Demand (PHD)	=	2.44	l/s	(as above)
Design Flow	=	156.6	l/s	(MDD+FF / PHD)

Figure 5.1: Preliminary Sanitary Calculations

Postdevelopment Service Area				
Care Units		110		(per NOOR Architect)
Persons per unit		1.0		
Total Persons	=	110	capita	
Single Person Flow		410	l/capita/d	(per DWV Bylaw)
Average daily flow	=	0.52	l/s	
Institutional Area		0.8	ha	
Institutional Flow		22500	l/ha/d	(per DWV Bylaw)
Average daily flow	=	0.21	l/s	
Total average daily flow	=	0.73	l/s	
Infiltration Allowance				
Intensity		16800	l/ha/d	(per DWV Bylaw)
Site area		0.65	ha	
Total infiltration	=	0.13	l/s	
Peak Flow				
Average daily flow		0.73	L/s	(as above)
Peaking factor		4.23		(Harmon Formula)
Peak flow	=	3.09	l/s	
Design Flow				
Design flow	=	3.22	l/s	
Existing offfsite peak flow	=	15.70	l/s	(per DWV)
Total offsite design flow	=	18.92	l/s	
Pipe Details				
Diameter		200	mm	(existing sanitary)
n-value		0.013		
Slope		2.0	%	(lowest offsite grade)
Flow Calculations				
Flow depth		89	mm	
Velocity		1.4	m/s	
Percent Full		44	%	(sufficient capacity)
Flow		18.92	l/s	

POSTDEVELOPMENT

PIPE CAPACITY

Figure 6.1: Preliminary Storm Calculations

AREAS

Predevelopment Catchment Area		0.65	ha		
Impervious Area (ex buildings)		0.03	ha		
Pervious Area (undeveloped areas, landscape area		0.62	ha		
Postdevelopment Catchment Area		0.65	ha		
Impervious Area (buildings, driveways)		0.34	ha		
Pervious Area (undeveloped, landscape areas)		0.31	ha		
Postdevelopment Percent Impervious		52%			

PREDEVELOPMENT

Predevelopment Peak Flows					
Catchment area (A)		0.65	ha	(as above)	
Weighted average from impervious and pervious areas					
Impervious runoff coefficient		0.95	for	0.03	ha
Pervious runoff coefficient		0.30	for	0.62	ha
Predevelopment runoff coefficient (C)	=	0.33	for	0.65	ha
Rainfall intensity (I)					
Predevelpoment toc		15	min		
From West Vancouver Municipal Hall IDF Curve...					
10yr rainfall intensity		53	mm/hr		
Predevelopment peak flow (Q=CIA)	=	**32**	l/s		

POSTDEVELOPMENT

Postdevelopment Peak Flows					
Catchment area (A)		0.65	ha	(as above)	
Postdevelopment runoff coefficient (C)	=	0.64	for	0.65	ha
Rainfall intensity (I)					
Postdevelpoment toc		8	min		
From DWV Municipal Hall IDF Curve...					
10yr rainfall intensity		78	mm/hr		
Postdevelopment peak flow (Q=CIA)	=	**90**	l/s		