



DEVELOPMENT PERMIT APPLICATION STORMWATER MANAGEMENT STATEMENT

Parcel Address: 975/981/985 MCKENZIE & 982/986/988 ANNIE

Applicant: GIC DEVELOPMENTS LTD.

Date: February 28, 2023

Contact Person: JOHN BOURCET

Telephone: 250-590-3140

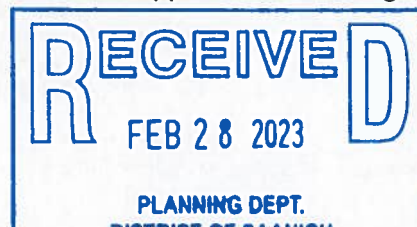
Storm water management is reviewed as part of the Development Permit Review process. Applications are required to meet:

1. The Engineering Specifications detailed in Section 3.5.16 of Schedule "H" of the Subdivision Bylaw, 7452; and
2. The intent of the Development Permit guidelines:
 - a) Development Permit Areas #1, 2, 3, 6, through 15, 17, 18, 20, 21, 22, 23
 - The total impervious cover of the site should minimize impact on the receiving aquatic environment. Consideration should be given to reducing impervious cover through reduction in building footprint and paved areas.
 - Storm water runoff controls should replicate the natural runoff regime. The controls could include on-site infiltration, storage in ponds or constructed wetlands, sand filtration and creative road/curb configurations.

b) Development Permit Area #27

Maintain pre-development hydrological characteristics should by the following means:

- minimize impervious surfaces.
- return the storm water runoff from impervious surfaces of the development to natural hydrologic pathways in the ground to the extent reasonably permitted by site conditions, and treat, store and slowly release the remainder per the specifications of Schedule H to the Subdivision Bylaw.
- minimize alteration of the contours of the land outside the areas approved for buildings, structures and site accesses by minimizing the deposit of fill and removal of soil, and
- minimize the removal of native trees outside the areas approved for buildings, structures and site accesses.



Keeping in mind the requirements of Schedule "H", describe how your storm water management concept will meet the intent of the relevant development permit guidelines. Provide details on types of treatment systems that will be used, considering the following questions:

- a) Will there be an increase or decrease in impervious area compared to existing conditions?
- b) What percentage of the site will be impervious cover compared to existing conditions?
- c) How will impervious surface area be minimized (e.g. minimizing paved area and building footprints, pervious paving, green roofing, absorbent landscaping)?
- d) How will the proposed system detain and regulate flows and improve storm water quality (e.g. infiltration systems, engineered wetlands, bioswales)?
- e) If the intent of the guideline cannot be met, explain why.

Use additional pages if necessary. Attach plans if available; detailed engineering plans will be required as part of the Building Permit process.

NOTE: Meeting the Development Permit guidelines and issuance of a Development Permit does not relieve the requirements of Schedule "H" of the Subdivision Bylaw.

a) **SEE ATTACHED "UNDERGROUND UTILITIES BRIEF" BY MCELHANNEY**

b)

c)

d)

e)

If you require clarification, please contact:

The District of Saanich • Planning Department • 3rd Floor • Municipal Hall
770 Vernon Avenue • Victoria • BC • V8X 2W7
Tel: 250-475-5471 Fax: 250-475-5430

UNDERGROUND UTILITIES BRIEF

To

District of Saanich
Engineering Department

From

Nathan Dunlop, P.Eng.,
Division Manager, Land Development
McElhanney Ltd. (Victoria office)

Re

985 McKenzie Avenue, Saanich, BC
UNDERGROUND UTILITIES BRIEF

Date

February 28, 2023

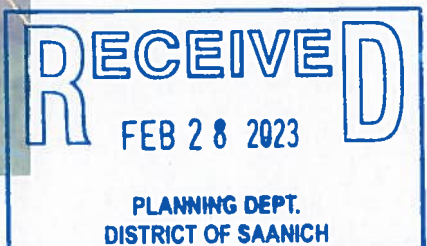
1. INTRODUCTION

The proposed development is located on the lots of 975, 981 and 985 McKenzie Avenue and 982, 986 and 988 Annie Street in Saanich, BC.

This Underground Utilities Brief is submitted in support of the Development Permit Application to the District of Saanich (the District). This brief will provide information on the existing utilities adjacent to the development and proposed preliminary storm, sanitary and water infrastructure required for the proposed development. A site plan is referenced below:



Figure 1 - Site Plan (Image from SaanichMap)



2. EXISTING CONDITIONS

2.1. MCKENZIE AVENUE

The following infrastructure exists within the District road right-of-way:

- Storm:
 - 200-millimetre (mm) diameter (dia) gravity main of unknown material
- Sanitary:
 - 150 mm dia Asbestos Cement (AC) gravity main
 - No service connections from the subject lots connecting to the McKenzie Avenue sanitary main
- Water:
 - 250 mm dia Ductile Iron (DI) main
 - 3 x 12.5 mm dia service connections of unknown material from the subject lots connecting to the McKenzie Avenue water main
 - 1 x fire hydrant (#2229) on the north side of McKenzie Avenue
- Natural Gas:
 - 88 mm dia Polyethylene (PE) distribution pressure main owned by FortisBC
- Electrical:
 - Buried street light conduit
 - Overhead and buried conduit power lines owned by BC Hydro
- Telecommunications:
 - Overhead and buried telecommunications lines (including fibreoptic line) owned by TELUS

2.2. MCKENZIE AVENUE LOT RIGHTS-OF-WAY (SOUTH) AND ANNIE STREET LOT STATUTORY RIGHT-OF-WAY (EAST)

The following infrastructure exists within established rights-of-way at the rear (south side) of #975, #981 and #985 McKenzie (RW 384110G, RW 379290G and RW 3819240G, respectively.):

- Storm:
 - 150 mm dia AC gravity main
 - 3 x service connections to the subject McKenzie Avenue lots with unknown diameter and material
- Sanitary:
 - 150 mm dia AC gravity main



- 3 x 100 mm dia service connections to the subject McKenzie Avenue lots of unknown material

The following infrastructure exists within an established statutory right-of-way at the east side of 986/988 Annie Street (SRW EPP46438):

- Storm:
 - 200 mm dia polyvinyl chloride (PVC) gravity main connecting to Annie Street
- Sanitary:
 - 150 mm dia PVC gravity main connecting to Annie Street

2.3. ANNIE STREET

The following infrastructure exists within the District road right-of-way:

- Storm:
 - 525 mm dia Reinforced Concrete (RC) gravity main
 - 1 x service connection to 982 Annie Street of unknown diameter and material
 - Segments of open ditching with slit trap inlets
- Sanitary:
 - 150 mm dia AC gravity main
 - 3 x 100 mm dia service connections to the subject Annie Street lots of unknown material
- Water:
 - 150 mm dia DI main
 - 2 x 19 mm dia and 1 x 12.5 mm dia service connections to the Annie Street lots of unknown material
 - 1 x fire hydrant (#1017) on the frontage of 982 Annie Street
- Natural Gas:
 - 42 mm dia PE distribution pressure main owned by FortisBC
- Electrical:
 - Buried street light conduit
 - Overhead and buried conduit power lines owned by BC Hydro

3. DESIGN CRITERIA AND ASSUMPTIONS

3.1. STORM

- Design Criteria:
 - District of Saanich Engineering Specifications Schedule H to Bylaw 7452 for a Type I watershed. This parameter will require storm water storage at 200 cubic meters (cu.m.)



per 1 hectare (ha) of impervious area; constructed wetland such as grass swales or rain garden. The release rate shall be 5 litres per second (L/s) per ha of impervious total contributory area.

- Assumptions:
 - No offsite storm water is entering the site.

3.2. SANITARY

- Design Criteria:
 - District of Saanich Subdivision Bylaw 7452 Schedule G and Schedule H. Sewage flows, peaking factor and infiltration will be calculated in accordance with Schedule H (see Appendix A).
- Assumptions:
 - The land use and occupancy load will be as proposed in the Development Permit.

3.3. WATER

- Design Criteria:
 - Fire Flows in accordance with the Fire Underwriters Survey (FUS) with 140 kilo Pascals (kPa) or 20 pounds per square inch (psi) of residual pressure.
 - Domestic Flows: meter sizing will be based on the American Water Works Association (AWWA) M22 calculation.
- Assumptions:
 - The FUS calculation and the AWWA M22 calculations will be based on the building configuration and occupancy load as proposed in the Development Permit.

4. PROPOSED FLOWS AND LOADS

4.1. STORM

See Stormwater Management Statement attached in **Appendix B**.

The proposed development has an impervious area of approximately 3,820 square meters (entirety of the site), therefore, 77 cubic meters of storage is required. The required storage volume will be adjusted during detailed design once the final impervious area is confirmed.

Release rate = 1.9 L/s

The 250 mm dia storm service is proposed to connect to the existing 525 mm dia storm main on Annie Street.



The proposed development is located within a Type I watershed which requires runoff be routed through a “constructed wetland or treatment train”. Roof and surface drainage are proposed to route through onsite rain gardens / drainage swales which will be connected to the on-site storage tanks. Flows will then be routed through a flow control manhole to limit release rates to the maximum allowable.

4.2. SANITARY

The proposed flows including residential, peaking factor and infiltration is approximately 4.9 L/s. For reference, a 150 mm dia PVC pipe at 2% has a capacity of approximately 20 L/s.

See detailed sanitary calculations attached in **Appendix C**.

The sanitary service is proposed to connect to the existing 150 mm dia AC sanitary gravity main on Annie Street.

4.3. WATER

According to the Fire Underwriter’s Survey (FUS) Water Supply for Public Fire Protection, 2020 guideline, fire flow demand is a function of the building construction materials, fire zone areas, separation distances and the use of sprinklers. The required fire flow based on the FUS guideline is approximately 283 L/s (see **Appendix D** for calculation details).

To determine whether the water system can provide the required fire flow, two criteria are typically analysed:

- 1) velocity of water in the system during the fire flow
- 2) flow available while maintaining minimum pressure of 20 pounds per square inch (psi) in the system

4.3.1 Velocity:

With an estimated fire flow of approximately 283 L/s, assuming flow through the existing 250mm diameter pipe on McKenzie Avenue from both directions, the velocity in the pipe would be approximately 2.9 metres per second (m/s) during the fire flow. This velocity is within a typically acceptable maximum range of 3.0 m/s to 3.5 m/s for water systems during fire flow scenarios.

4.3.2 Available Fire Flow:

We recommend the District of Saanich review the above calculations and confirm the existing water system has adequate capacity to provide the estimated fire flow.



5. CLOSURE

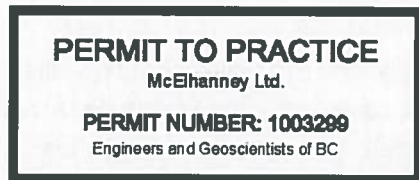
This report was completed by McElhanney Ltd.



Nathan Dunlop, P.Eng. 2023-02-28
Division Manager, Land Development

A handwritten signature in black ink, appearing to read "Alex Kasprzyk".

Alex Kasprzyk, P.Eng.
Project Engineer



Enclosures:

- Appendix A – District of Saanich Engineering Specifications Schedule “H” to Bylaw 7454, Sanitary Sewers Criteria
- Appendix B – Proposed Development, Stormwater Management Statement
- Appendix C – Proposed Development, Sanitary Flow Calculation
- Appendix D – Proposed Development, FUS Calculation

APPENDIX A

DISTRICT OF SAANICH

ENGINEERING SPECIFICATIONS

SCHEDULE H TO BYLAW 7454

SANITARY SEWERS CRITERIA

3.4 Sanitary Sewers

3.4.1 Materials

- 3.4.1.1 The class and type of pipe and fittings, together with required class of bedding and trench widths, shall be selected such that the pipe will support the anticipated loads with a reasonable margin of safety. The Consulting Engineer shall submit design calculations to the Municipality for review if requested.
- 3.4.1.2 Pipe product specifications and standards shall be as per the MMCD and the Supplementary Specifications.
- 3.4.1.3 Sewers may be smooth profile polyvinyl chloride (PVC) or concrete.
- 3.4.1.4 Concrete pipe design shall include detailed consideration of resistance to hydrogen sulphide.

3.4.2 Quantities

- 3.4.2.1 The quantity of sewage to be carried in a proposed sanitary sewer shall be determined by the Consulting Engineer, having regard for the type and extent of existing and ultimate development within the total area to be served. The Municipality will provide data upon request from its sewer modeling program for upstream flows.
- 3.4.2.2 The design flow for pipe size selection shall be the average flow due to population, times a peaking factor, plus an allowance for groundwater infiltration.

3.4.2.3 Flows Due to Population

- 3.4.2.3.1 Average daily sewage flows for residential land uses shall be based upon 360 litres per capita per day. Population per dwelling unit shall be as follows:

Type of Residential Use	Pop'n per unit
Single family and two family	2.75
All other residential uses	2.25

- 3.4.2.3.2 Average daily sewage flows for other land uses shall be as per the *Sewage Disposal Regulation of the Health Act* or some other criteria acceptable to the Director of Engineering Services..
- 3.4.2.3.3 Flows from all sources shall be converted to population equivalents at the residential rate when determining the peaking factor below.

3.4.2.4 Peaking

- 3.4.2.4.1 The peaking factor shall be calculated according to the Harmon formula:
$$PF = 1 + 14/(4 + \sqrt{P})$$

where: PF = peaking factor
P = population equivalent, in thousands.

3.4.2.5 Infiltration

- 3.4.2.5.1 The minimum allowance for ground water infiltration shall be 0.13 litres/second/ hectare (approx 1,000 lgal/day/acre).

3.4.3 Minimum Sizes

- 3.4.3.1 Sewer mains shall not be less than 200mm in diameter except that sewers in the upper 360m (total amount of upstream pipe) of a non-extendable system shall be 150mm in diameter.

- 3.4.3.2 Service connections shall not be less than 100mm in diameter.

3.4.4 Friction Factors

- 3.4.4.1 Pipe capacity shall be determined by the Manning Formula using the following roughness coefficients (n):

Concrete pipe	0.013
PVC pipe	0.011

3.4.5 Minimum Velocities and Grades

- 3.4.5.1 The minimum grade of sewers shall be that which produces a minimum velocity of 0.61 metres per second except for the upstream portion of a residential sewer serving a design population of 25 or less, in which case the minimum grade shall be 0.6%.

- 3.4.5.2 The minimum grade of sewers above the last manhole of a non-extendable system shall be that which produces a minimum velocity of 0.90 metres per second in the pipe or 0.6%, whichever is greater.

- 3.4.5.3 The minimum grade of service connections shall be 2.0%.

3.4.6 Vertical/horizontal Curves

- 3.4.6.1 Pipes shall be designed for straight alignment and constant grade between manholes. The Director of Engineering Services may approve a curved alignment if the Consulting Engineer can satisfactorily demonstrate why it is necessary.

- 3.4.6.2 If a curved alignment is approved by the Director of Engineering Services:

- 3.4.6.2.1 The radius of a horizontal curve shall be not less than 60m, or that radius recommended by the pipe manufacturer, whichever is the greater.

- 3.4.6.2.2 A vertical curve must be designed so that the pipe deflection does not exceed the manufacturer's specifications.

- 3.4.6.2.3 Only one curve, either horizontal or vertical, will be permitted between manholes without special permission of the Director of Engineering Services.

APPENDIX B

PROPOSED DEVELOPMENT

STORMWATER MANAGEMENT STATEMENT

STORMWATER MANAGEMENT STATEMENT

To

District of Saanich
Engineering Department

From

Nathan Dunlop, P.Eng.,
Division Manager, Land Development
McElhanney Ltd. (Victoria office)

Re

985 McKenzie Avenue, Saanich, BC
STORMWATER MANAGEMENT STATEMENT

Date

February 28, 2023

The following are details to address the requirements of Schedule "H" of the Subdivision Bylaw 7452 and to provide information in accordance with Saanich Planning Form APPL8, with respect to the Stormwater Management Statement. The project site is within the Type 1 Watershed requirements under Schedule "H". The questions noted in italics are as shown on the application form.

1) Will there be an increase or decrease in impervious area compared to existing conditions?

The existing property has a current area of 4,132 sq. m. with approximately 1,037 sq. m. of impervious area (buildings, driveways, and hardscape features). Upon property dedication, the total property area will be reduced to approximately 3,820 sq. m. Due to proposed parkade limits and on-site hardscaping, the entirety of the site is considered impervious (3,820 sq. m.). An increase to the amount of impervious area over existing conditions is anticipated.

2) What percentage of the site will be impervious cover compared to existing conditions?

The proposed development, after property dedication, will create a site coverage of approximately 85% impervious surfaces compared to approximately 25% of the site currently. It should be noted that this calculation does not account for any landscaping above the parkade (ie. all areas above the parkade are assumed as "impervious").

3) How will impervious surface area be minimized (e.g. minimized paved area and building footprints, pervious paving, green roofing, absorbent landscaping)?

Due to the proposed site configuration, a significant portion of the project site will contain the building and driveway. The loss of landscaped area will be offset by providing on-site storm water detention facilities.

4) How will the proposed system detain and regulate flows and improve storm water quality (e.g. infiltration systems, engineered wetlands, bio-swales)?

Live storage volume will be provided in accordance with Schedule H, Section 3.5.16.3.2 of the Engineering Specifications to Bylaw 7452. For a Type 1 Watershed, this would be 200 cu.m/ha for the impervious area resulting in a total required storage volume of 77 cu.m. This volume will be provided via a rain garden. The maximum release rate of 1.9 L/s (equivalent to 5 L/s/ha) will be achieved using a flow control manhole with orifice control.

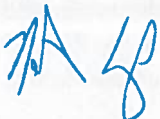
A combination of rain gardens and underground storage tanks (complete with flow control manhole) are proposed to regulate stormwater quantity and quality from the development site.

Rain gardens will be designed to have a surface area of no less than 1% of the contributory catchment area in accordance with Schedule H, Section 3.5.16.4.2 of the Engineering Specifications to Bylaw 7452.

5) If the intent of the guideline cannot be met, explain why.

N/A

This report was completed by McElhanney Ltd.



Nathan Dunlop, P.Eng.
Division Manager, Land Development



Alex Kaspyrk, P.Eng.
Project Engineer



APPENDIX C

PROPOSED DEVELOPMENT

SANITARY CALCULATIONS

Proposed Development, Sanitary Flow Calculation

Project: 985 McKenzie Avenue
Date: February 28, 2023
Client: GIC Developments Ltd.
McElhanney File #: 22-007

Estimated Sanitary Flow (126 Residential Units)

<u>McKenzie Building</u>	<u># Units*</u>
studio units	10
1-bedroom units	38
2-bedroom units	18
3-bedroom units	6
Total	72

<u>Annie Building</u>	<u># Units*</u>
studio units	12
1-bedroom units	24
2-bedroom units	18
3-bedroom units	0
Total	54

Total Number of units	126 units
Population per unit **	2.25 capita/unit
Estimated population	284 capita
Per Capita Flow Rate***	360 L/capita/day
	102,060 L/day
Total Average flow =	1.181 L/s
Peaking Factor (McKenzie and Annie buildings combined) -Harmon	4.09
Estimated Peak Flow =	4.83 L/s
Site Area =	3,820 sq.m.
Approx. Hard Surface building area =	0 sq.m.
Approx. area for infiltration (allows for infiltration over entire site) =	3,820
Inflow and Infiltration (0.13 L/s/ha)****	0.050 L/s
Total Estimated Flow = Estimated Peak Flow + Inflow and Infiltration	4.88 L/s

*based on information provided by Koka Architecture

**based on District of Saanich - Schedule H (Section 3.4.2.3 - Flows Due to Population, non-single family and two family residential use)

***based on District of Saanich - Schedule H (Section 3.4.2.3 - Flows Due to Population)

****based on District of Saanich - Schedule H (Section 3.4.2.5 - Infiltration)

$$\text{Harmon Peaking Factor} = \left(\frac{14}{4 + \sqrt{\frac{P}{1000}}} + 1 \right)$$

APPENDIX D

PROPOSED DEVELOPMENT

FUS CALCULATION

Fire Flow Calculation - based on 2020 Fire Underwriters Survey

McElhanney Proj.# 2241-22-007

985 McKenzie Avenue, Saanich, BC - McKenzie Building

Construction Coefficient (C) (see guide pg 20 & 21)

C=	1.5	for Type V Wood Frame Construction
	0.8	for Type IV-A Mass Timber Construction
	0.9	for Type IV-B Mass Timber Construction
	1.0	for Type IV-C Mass Timber Construction
	1.5	for Type IV-D Mass Timber Construction
	1.0	for Type III Ordinary Construction Wood Frame Construction
	0.8	for Type II Noncombustible Construction
	0.6	for Type I Fire Resistant Construction

C= **1.5** Type V

Total Effective Floor Area (A) (see guide pg 22&23)

A= **5820** sq.m 62631 sq.ft = 5819 sq.m

Required Fire Flow (RFF)

$$F = 220 \cdot C \cdot (A^{1/2})$$

F= 25175 L/min

F= 25000 L/min Rounded to nearest 1000

F= **416.7** L/s

Occupancy and Contents Adjustment Factor (see Table 3 in guide pg 25&26):

%	-25	Noncombustible Contents	Amount of Fire-Flow reduction (Occupancy):
	-15	Limited Combustible Contents	F= -62.5 L/s
	0	Combustible Contents	
	15	Free Burning Contents	Estimated Reduced Fire-Flow (Occupancy)
	25	Rapid Burning Contents	F= 354.2 L/s
%=	-15	Residential Occupancies, Limited Combustible Contents	

Automatic Sprinkler Protection (see guide pg 27):

Sprinkler Credits	Automatic Sprinkler System Design	Amount of Fire-Flow reduction (Sprinkler):
-30%	design and installed to NFPA 13	F= -177.1 L/s
-10%	water supply std for system and FD Hoses	
-10%	Fully supervised system	
-25%	Community Level Automatic Sprinkler (see guide pg 28)	
%=	-50	

Exposure Adjustment Charge (see guide pg 30):

# of sides	Separation	Charge %	
0	0 - 3 m	0	
0	3.1 - 10 m	0	
2	10.1 - 20 m	30	South to ex. building at #971 McKenzie (17m), East to ex. building at #991 McKenzie (11m)
0	20.1 - 30 m	0	
2	> 30 m	0	West side to ex. building (31m), North side to ex. building (41m)
4		30	% (75% max) Exposure Separation charge:

See Table 6 for exposure adjustment charges for subject building considering construction type of expose building face

F= **106.3** L/s

Estimated Fire-Flow (with reductions & charges)

F= **283.3** L/s

TOTAL FUS FIRE-FLOW COVERAGE REQUIRED:

F= **283.3** L/s DRAFT

17000.0 L/min

Fire Flow Calculation - based on 2020 Fire Underwriters Survey

McElhanney Proj.# 2241-22-007

985 McKenzie Avenue, Saanich, BC - Annie Building

Construction Coefficient (C) (see guide pg 20 & 21)

C=	1.5	for Type V Wood Frame Construction
	0.8	for Type IV-A Mass Timber Construction
	0.9	for Type IV-B Mass Timber Construction
	1.0	for Type IV-C Mass Timber Construction
	1.5	for Type IV-D Mass Timber Construction
	1.0	for Type III Ordinary Construction Wood Frame Construction
	0.8	for Type II Noncombustible Construction
	0.6	for Type I Fire Resistive Construction

C= 1.5 Type V

Total Effective Floor Area (A) (see guide pg 22&23)

A= 4080 sq.m 43812 sq.ft = 4070 sq.m

Required Fire Flow (RFF)

F= $220 \cdot C \cdot (A^{1/2})$
 F= 21079 L/min
 F= 21000 L/min Rounded to nearest 1000
 F= 350.0 L/s

Occupancy and Contents Adjustment Factor (see Table 3 in guide pg 25&26):

%	-25	Noncombustible Contents	Amount of Fire-Flow reduction (Occupancy):
	-15	Limited Combustible Contents	F= <u>-52.5</u> L/s
	0	Combustible Contents	
	15	Free Burning Contents	Estimated Reduced Fire-Flow (Occupancy)
	25	Rapid Burning Contents	F= <u>297.5</u> L/s
%=	<u>-15</u>	Residential Occupancies, Limited Combustible Contents	

Automatic Sprinkler Protection (see guide pg 27):

Sprinkler Credits	Automatic Sprinkler System Design	Amount of Fire-Flow reduction (Sprinkler):
-30%	design and installed to NFPA 13	F= <u>-148.8</u> L/s
-10%	water supply std for system and FD Hoses	
-10%	Fully supervised system	
-25%	Community Level Automatic Sprinkler (see guide pg 28)	
%=	<u>-50</u>	

Exposure Adjustment Charge (see guide pg 30):

# of sides	Separation	Charge %	
0	0 - 3 m	0	
0	3.1 - 10 m	0	
2	10.1 - 20 m	30	East to ex. building #991 McKenzie (11m), West to ex. building #971 McKenzie (12m)
0	20.1 - 30 m	0	
2	> 30 m	0	South side to ex. Building (38m), North side to proposed building (15m - sprinkler protected)
4		30	% (75% max)

See Table 6 for exposure adjustment charges for subject building considering construction type of expose building face

Exposure Separation charge:
 F= 89.3 L/s

Estimated Fire-Flow (with reductions & charges)

F= 238.0 L/s

TOTAL FUS FIRE-FLOW COVERAGE REQUIRED:

F= 238.0 L/s DRAFT

14280.0 L/min

