

## Attachment # 2

### **Redline Subdivision and Development Control Bylaw No. 7142, 2007**

# CORPORATION OF THE CITY OF NEW WESTMINSTER



## SUBDIVISION AND DEVELOPMENT CONTROL BYLAW NO. 7142, 2007

EFFECTIVE DATE: March 12, 2007

CONSOLIDATED FOR CONVENIENCE ONLY  
(July 18, 2019)

This is a consolidation of the bylaws listed below. The amendment bylaws have been combined with the original bylaw for convenience only. This consolidation is not a legal document. Certified copies of the original bylaws should be consulted for all interpretations and applications of the bylaws on this subject.

<u>AMENDMENT BYLAW</u>	<u>EFFECTIVE DATE</u>
7286, 2008	November 24, 2008
7563, 2012 (Part 12 Fees)	January 1, 2013
7582, 2013	March 4, 2013
7908, 2017 (replacing Section 6 of Schedule "B" Design Criteria)	May 1, 2017
8128, 2019 (replacing Sections 1, 3, 4, 5 and table 8.2 of Schedule "B" Design Criteria)	July 8, 2019

The bylaw numbers highlighted in this consolidation refer to the bylaws that amended the principal Bylaw No. 7142, 2007. The number of any amending bylaw that has been repealed is not referred to in this consolidation.

Obtainable from the City Clerk's Office

# CORPORATION OF THE CITY OF NEW WESTMINSTER

## BYLAW NO. 7142, 2007

A bylaw to regulate the subdivision of lands  
and to establish a standard of works and services  
to be provided in respect of subdivisions and developments

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Typical Letter of Credit format

# THE CORPORATION OF THE CITY OF NEW WESTMINSTER

## BYLAW NO. 7142, 2007

A bylaw to regulate the subdivision of lands  
and to establish a standard of works and services to  
be provided in respect of subdivisions and developments

### PART ONE CITATION

- 1.1 This Bylaw may be cited for all purposes as “Subdivision and Development Control Bylaw No. 7142, 2007”.

Deleted & Replaced with new content -  
See amendment bylaw Section 2.1

### PART TWO INTERPRETATION

#### 2.1 Definitions

Note: New amendment is combining the  
definitions from Section 2.1 Section 1.1  
Schedule B and Bylaw No 7582, 2013.

~~In this Bylaw:~~

~~“Applicant” means a person applying for approval of a subdivision or issuance of a building permit whether as owner or a duly authorized agent;~~

~~“Approving Officer” means the person appointed from time to time to that position under the provisions of the *Land Title Act*;~~

~~“Arterial road” means a highway of a minimum width of 20 metres between abutting property lines used or intended to be used for traffic having limited access to abutting properties;~~

~~“Bank” means a chartered bank, credit union or trust company having a branch office in the City of New Westminster;~~

~~“Certificate of Completion” means notice in writing issued by the City and signed by the City Engineer stating that all or a specified portion of the works and services have been completed;~~

~~“City” means City of New Westminster;~~

~~“City Electrical Engineer” means the person appointed from time to time by Council as the General Manager of Electrical Operations of the City and any person authorized by the City Electrical Engineer to act on his or her behalf;~~

~~“City Engineer” means the person appointed from time to time by Council as the Director of Engineering Services of the City and any person authorized by the City Engineer to act on his or her behalf;~~

~~“Collector road” means a highway of a minimum width of 20 metres between abutting property lines providing or intended to provide access to abutting properties and also serves to collect and distribute traffic between arterial and local streets;~~

~~“Community drainage system” means a system of stormwater drainage works owned, operated and maintained by the City or by a greater board or other lawful authority with jurisdiction over such system;~~

~~“Community sewerage system” means a system of sewage collection and disposal works approved under the applicable provincial legislation and owned, operated and maintained by the City or by a greater board or other lawful authority with jurisdiction over such system;~~

~~“Community water system” means a system of waterworks, including fire hydrants approved under the applicable provincial legislation which serves two or more parcels and which is owned, operated and maintained by the City or by a greater board or other lawful authority with jurisdiction over such system;~~

~~“Cul de sac” means a length of local highway made for vehicular use, the end of which is designed to be permanently closed by the pattern of subdivision or which is terminated by a natural feature such as inaccessible terrain;~~

~~“Develop”, “Development” or “Developed” means the subdivision of land or the construction of a building or structure on land which results in a requirement for the installation of works and services under this Bylaw;~~

~~“Drainage system” means a system designed, constructed and installed for the express purpose of containing or conveying drainage to an outlet destination and includes, without limitation, storm sewer mains, ditches, swales, creeks, ravines, watercourses, detention and infiltration systems;~~

~~“Excess or Extended Services” means those works and services which provide access to or serve land other than the land being subdivided or developed;~~

### **BYLAW NO. 7582, 2013**

~~“Fees and Rates Bylaw” means the current City Fees & Rates Bylaw No. 7553, 2013 as amended by Council from time to time;~~

~~“Final approval” means the approval of a subdivision by the approving officer when all relevant requirements of this Bylaw, the *Land Title Act*, the *Community Charter*, *Local Government Act* and any other relevant bylaws and legislation have been fulfilled and when all conditions of preliminary approval have been fulfilled;~~

~~“Highway” includes a street, road, lane, bridge, viaduct, walkway and any other way open to public use, but does not include a private right of way on private property;~~

~~“Lane” means a narrow highway which provides secondary vehicular access to any abutting parcel so that the parcel may be serviced or reached by vehicles using that highway;~~

~~“Local road” means a highway of a minimum width of 16.5 metres between abutting property lines used or intended to be used primarily for access to abutting residential parcels rather than for through or commercial traffic;~~

~~MFA means Municipal Finance Authority of British Columbia, an organization providing capital financing, investment leasing and short term financial services to local governments.~~

~~“MMCD General Specifications” means the current edition of the Master Municipal Construction Documents General Specifications as issued by the Master Municipal Construction Documents Association;~~

~~“Notice of acceptance” means notice in writing issued by the City confirming that ownership of all or part of the works and services required to be provided under this Bylaw in respect of a subdivision or other development have been accepted by the City;~~

~~“Owner” means the owner, as defined in the *Land Title Act*;~~

~~“Preliminary approval” means the written, conditional approval of a subdivision plan by the approving officer;~~

~~“Professional Engineer” means a person who is registered or duly licensed as such, under the provisions of the *Engineers and Geoscientists Act*;~~

~~“Roadway” means the portion of a highway that is constructed, paved, improved, designed and ordinarily used for vehicular traffic;~~

~~“Sanitary sewer system” means a system for the collection and disposal of domestic sewage;~~



~~“Sidewalk” means that portion of a highway improved for pedestrian traffic;~~

~~“Subdivide”, “Subdivided” or “Subdivision” means the division of land into two or more parcels, whether by plan or apt descriptive words or otherwise;~~

~~“Walkway” means a highway or public right of way with or without improvements for the use of pedestrian traffic only;~~

~~“Water distribution system” means a system of waterworks to provide potable water for human consumption and fire protection;~~

~~“Watercourse” means any natural drainage course or source of water, whether natural or man-made, having defined banks and a bed 0.6 metre or more below the surrounding lands whether usually containing water or not, and includes any lake, river, creek, spring, ravine, swamp, gorge or source of ground water;~~

~~“Works and services” means all public services, facilities and utilities which are required to be designed, constructed and installed as a condition of subdivision or other development approval and without limitation includes: highways, highway lighting, underground wiring and civil ductworks, concrete curbs, gutters and sidewalks, decorative sidewalks, boulevards, boulevard crossings, street trees, water distribution system, fire hydrant system, sanitary sewage collection system, drainage collection and disposal system, traffic control signs and devices, roadway markings, landscaping and the supply and distribution of electrical power, telephone, gas and cablevision;;~~

~~“Zone” means a zoning district established under the City’s Zoning Bylaw.~~

## 2.2 Schedules

Schedules “A” through “E”, inclusive, as annexed hereto, are incorporated into and form part of this Bylaw.

## 2.3 Severability

If any portion of this Bylaw is for any reason held invalid by a Court of Competent jurisdiction, the invalid portion shall be severed without affecting the remainder of this Bylaw.

## **PART THREE      GENERAL REGULATIONS & PROCEDURES**

### Prohibition

- 3.1 No land within the City shall be subdivided or developed except in conformity with this Bylaw.

### Compliance with Laws

- 3.2 Every applicant for subdivision approval or issuance of a building permit in respect of a development shall:

- (a) comply with all applicable requirements of this Bylaw and all other City bylaws, federal and provincial statutes, regulations, rules and policies; and
- (b) obtain all necessary consents and approvals of all government ministries, agencies and authorities having jurisdiction;

and compliance with this Bylaw shall not relieve the applicant from compliance with all other applicable enactments.

### Application for Subdivision

- 3.3 Every application for subdivision shall be made in writing to the Approving Officer on the form prescribed from time to time by the City for such purpose, and shall include the following information and documentation:
- (a) a sketch or survey plan of the parcel to be subdivided showing clearly and accurately the proposed method of subdivision and the location and dimensions of all structures located on the parcel;
  - (b) a statement or other indication as to the intended use of the subdivided lands;
  - (c) a topographic survey including spot elevations; and break point elevations, and existing structures on the subject property and on adjoining properties at common property lines; and

3.4 In cases where the City deems necessary the applicant shall provide a professional engineer's report on:

- (i) the effect on soil stability of disturbing natural grades or natural growth, or changing the moisture content of the soil by developing, using or occupying the land;
- (ii) groundwater levels and conditions for as much of the year as is considered necessary; and
- (iii) the depth and extent of flooding and the likely frequency of its occurring.

3.5 All drawings, sketches and plans submitted in respect of an application for approval of subdivision or other development shall comply with the Drafting and Drawing Submission Standards set forth in Schedule "D".

3.6 The acceptance for review by the approving officer of a subdivision application shall not be construed as either ~~preliminary approval~~ or final approval for *Land Title Act* purposes.

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Layout Approval

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#### ~~Preliminary Approval~~

3.7 ~~Preliminary approval~~ shall be effective for a period of ninety (90) days, following which time the subdivision application must be re-submitted for ~~preliminary approval~~ and all applicable application fees paid.

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3.8 Upon request by an applicant, the approving officer may grant an extension of time for ~~preliminary approval~~ where, in the approving officer's opinion, there has been ~~preliminary approval~~ or other special circumstances exist which would justify such extension of time.

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3.9 ~~Preliminary approval~~ of a proposed subdivision shall not be construed as final approval of such subdivision for *Land Title Act* purposes and such ~~preliminary approval~~ is revocable by the approving officer at any time.

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Layout Approval

#### Final Approval

3.10 Final approval of a subdivision shall only be effective upon the signing of the subdivision plan by the approving officer, thereby indicating that all requirements of this Bylaw, the *Land Title Act*, *Community Charter*, *Local Government Act* and all other matters and things required by the approving officer in respect of the subdivision, including all conditions of ~~preliminary approval~~, have been fulfilled to the approving officer's

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## **~~PART 4~~ WORKS AND SERVICES**

### **4.0 General Requirements**

- (a) Every applicant for approval of a subdivision or other development shall provide works and services for such development on the land being developed and, where required, on the highway adjacent to the land being developed, in accordance with the requirements of this Bylaw including, without limitation, Schedule "B" – *Design Criteria* and Schedule "C" – *Supplementary Specifications and Detail Drawings* and the MMCD General Specifications.
- (b) Within the bounds of a proposed subdivision or other development, all works and services shall be provided, designed, constructed and installed by the owner at the owner's cost, to the satisfaction of the ~~City Engineer~~.

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- (c) Unless otherwise agreed to by the ~~City Engineer~~, all works and services required to be provided by the owner under this Bylaw on an existing highway or public right of way or other property owned by the City, shall be constructed by the City at the expense of the owner of the land being subdivided or developed.

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### **4.1 Every owner of lands to be developed shall, at the Owner's sole cost:**

- (a) provide works and services for that development in accordance with the provisions of this Bylaw applicable to the proposed development; and
  - (b) design, construct and install such works and services to the applicable minimum standards and specifications prescribed in this Bylaw.
- 4.2 All works and services required to be provided, designed, constructed and installed under this Bylaw shall be provided, designed, constructed and installed at the owner's expense to the satisfaction of the ~~City Engineer~~ and to the standards and requirements of this Bylaw before the approving officer gives final approval of the subdivision or a building permit is issued for the development.

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### **Works and Services Agreement**

- 4.3 Despite Section 4.2, at the request of the owner, the approving officer may grant final approval of a subdivision or the City may issue a building permit prior to completion of the required works and services if the owner first:

- (a) enters into a works and services agreement with the City in substantially the form of agreement contained in Schedule "A" of this Bylaw; and
- (b) deposits with the City security in the form and amount prescribed in Section 4.4 of this Bylaw.

#### Security Deposit

- 4.4 Every owner entering into a works and services agreement with the City under Section 4.3 of this Bylaw shall deposit with the City security in the amount of 120% <sup>Replaced with "Director of Engineering"</sup> ~~Cost~~ of the required works and services, as estimated by the ~~City Engineer~~ or by the applicant's professional engineer, if such estimate is acceptable to the ~~City Engineer~~. <sup>Replaced with "Director of Engineering"</sup>
- 4.5 The security deposit required to be provided under Section 4.3 shall be in the form of cash, a certified cheque payable to the City or a clean, irrevocable letter of credit acceptable to the City and substantially in the form prescribed in Schedule "E" of this Bylaw.

#### Damage to City Property

- 4.6 If, in the course of construction or installation of the works and services required under this Bylaw, City property is ~~damaged or~~ destroyed as a result of such works, the owner shall restore <sup>Replaced with "Director of Engineering"</sup> ~~the property~~ to the current City standards to the satisfaction of the ~~City Engineer~~, at the owner's expense.
- 4.7 The City recognizes that site conditions may necessitate minor variations ~~to servicing~~ <sup>Replaced with "Director of Engineering"</sup> requirements and the requirements, standards and ~~the City Engineer~~ <sup>Replaced with "Director of Engineering"</sup> for works and services established in this Bylaw, and the ~~City Engineer~~ is authorized to approve such minor variations.

### **PART FIVE HIGHWAYS**

#### Prohibition

- 5.1 No parcel shall be created by subdivision unless it abuts a dedicated highway improved to the standards prescribed in this Bylaw.

#### Parcels on Controlled Access Highways

- 5.2 No parcel shall be created by subdivision adjacent to a controlled access highway unless the parcel also abuts a lane or a local or collector road.

### Highway Standards and Specifications

- 5.3 Every highway created by subdivision or designed, constructed or installed in respect of any development, including a widened strip of an existing highway and a walkway, shall be designed, cleared, drained, surfaced and constructed in accordance with the standards and specifications prescribed in this Bylaw and in the MMCD General Specifications.

### Highway Works and Services

- 5.4 Where a parcel is to be subdivided or developed as defined in this Bylaw, the owner shall, on the land being subdivided or developed and on the highway adjacent to the land being subdivided or developed, provide, locate and pay for the design, construction and installation of the following:

- (a) highway lighting in accordance with Schedule "B" of this Bylaw;
- (b) underground civil ductwork and underground wiring in accordance with the Canadian Electrical Code and City of New Westminster Electrical Utility Bylaw No. 6502, 1998.
- (c) concrete curbs, gutters and sidewalks in accordance with the standards prescribed in Schedules "B" and "C" of this Bylaw;
- (d) decorative sidewalks in accordance with the standards prescribed in Schedule "C" of this Bylaw and;
- (e) where the parcel to be subdivided or developed is located in any zone other than:
  - (i) AG-1 Limited Agricultural District, or
  - (ii) AG-2 Family Agricultural District;

street trees in accordance with the standards prescribed in this Bylaw.

## **PART SIX            WATER,   SEWER   AND   DRAINAGE   WORKS   AND   SERVICES**

- 6.1 Where a parcel is to be subdivided or developed as defined in this Bylaw, the owner shall provide each parcel created by the subdivision or being developed, with the following works and services, in accordance with the minimum standards prescribed in this Bylaw in schedules "B" and "C":

- (a) a water distribution system including standard service connections providing for connection to the community water system;
- (b) a sanitary sewage system including standard service connections providing for connection to the community sewerage system; and
- (c) a drainage system including standard service connections providing for connection to the community drainage system.

## **PART SEVEN CONNECTIONS**

- 7.1 Every connection to a community water system, community sewerage system, community drainage system or City electrical system located within a highway or other City right-of-way shall, unless otherwise agreed to by the ~~City Engineer~~, be carried out by the City at the expense of the owner.

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## **PART EIGHT EXCESS OR EXTENDED SERVICES**

- 8.1 Where the City requires an owner of land being subdivided or developed as defined in this Bylaw to pay the cost of providing excess or extended services, the City shall include in any charge to be imposed on a subsequent owner connecting to or using the excess or extended services, interest on the costs of providing the excess or extended services calculated at the current MFA rate.

## **PART NINE RIGHTS OF WAY**

### General

- 9.1 Every owner of land to be subdivided or developed shall provide and grant to the City, such statutory rights of way over the land as are required by the City for the proper operation and maintenance of the works and services required to be provided under this Bylaw.
- 9.2 Without limiting Section 9.1, no statutory right of way required to be granted by an owner under this Bylaw shall have a width of less than three (3) metres.

### Preparation and Registration

- 9.3 Statutory right of way plans shall be prepared and registered by and at the expense of the owner, and shall be tendered at the Land Title Office prior to the plan of subdivision or the commencement of construction under a building permit.

## **PART TEN COMPLETION AND ACCEPTANCE OF WORKS AND WARRANTY AND MAINTENANCE PERIOD**

### Completion of Works and Services

- 10.1 No works and services required under this Bylaw and covered by a works and services agreement shall be complete until a certificate of completion has been issued by the ~~City Engineer~~<sup>Replaced with "Director of Engineering"</sup>. Separate certificates of completion may, in the sole discretion of the ~~City Engineer~~<sup>Replaced with "Director of Engineering"</sup>, be issued for highway, water, sewerage, drainage and under ~~the City Engineer~~<sup>Replaced with "Director of Engineering"</sup> networks.

### Acceptance of Works and Services

- 10.2 The City shall not issue a notice of acceptance for all or any part of works and services constructed and installed by the owner until:
- (a) the owner has deposited with the ~~City Engineer~~<sup>Replaced with "Director of Engineering"</sup> "as constructed" drawings of the works and services prepared and sealed by a professional engineer, in accordance with the requirements of this Bylaw.
  - (b) a certificate of completion for all works and services has been issued;
  - (c) the proposed subdivision has been approved by the approving officer and filed at the New Westminster Land Title Office or the building permit for the proposed development has been issued, as the case may be;
  - (d) the owner has caused ~~the City Engineer~~<sup>Replaced with "Director of Engineering"</sup> to be filed in the Land title Office and has deposited with the ~~City Engineer~~<sup>Replaced with "Director of Engineering"</sup> a plan or plans of all rights of way required under this Bylaw; and
  - (e) twenty four (24) months have elapsed since the Certificate of Completion was issued, or where partial Certificates of Completion



have been issued, twenty four (24) months have elapsed since the initial Certificate of Completion issuance in each case.

#### Warranty and Maintenance Period

- 10.3 The owner shall be solely responsible for the costs of any maintenance and repairs to works and services constructed and installed on the owner's lands until such time as the works and services are accepted by the City by issuance of a notice of acceptance.

#### Failure to Maintain or Repair

- 10.4 If the owner fails to maintain or repair the works and services during the warranty and maintenance period, the City may at the expense of the owner undertake such maintenance or repairs, and Section 11.2 of this Bylaw applies.

### **PART ELEVEN ENFORCEMENT**

#### Penalty

- 11.1 Every person who contravenes or violates any provision of this Bylaw, or who suffers or permits any act or thing to be done in contravention or in violation of any provision of this Bylaw, or who neglects to do or refrains from doing anything required to be done by any provision of this Bylaw, commits an offence and, upon conviction, shall be liable to a fine not exceeding \$10,000.00 and, where the offence is a continuing one, each day the offence continues shall be a separate offence.

#### Completion

- 11.2 Should any person fail to do anything required to be done by them pursuant to this Bylaw, the Council may direct that such thing be done at the expense of the person in default, and the expense thereof together with interest at the current MFA rate of interest, with costs, may be recovered in like manner as municipal taxes.

#### Inspection

- 11.3 The ~~City Engineer~~ may enter at all reasonable times upon any property to ascertain whether the regulations and directions set out in this Bylaw are being observed. A person employed from time to time by the City as a Building Inspector, Supervisor of Inspections or Assistant ~~City Engineer~~ is

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hereby designated to act for the ~~City Engineer~~ for the purposes of this Section.

Replaced with "Director of Engineering"

## **PART TWELVE FEES**

### **BYLAW NO. 7582, 2013**

#### **12.1 Subdivision Application Fee**

Every applicant for subdivision approval, other than approval of an air parcel subdivision or a subdivision under the *Strata Property Act*, shall, at the time of submitting the subdivision application, pay the non-refundable application fees as specified in the *Fees and Rates Bylaw*.

### **BYLAW NO. 7286, 2008 (changes deleted)**

### **BYLAW NO. 7563, 2012 (changes deleted)**

#### **12.2 Works and Services Agreement**

### **BYLAW NO. 7286, 2008**

### **BYLAW NO. 7582, 2013**

Where an applicant desires to enter into and execute a works and services agreement, they shall pay a non-refundable fee in the amount specified in the *Fees and Rates Bylaw* to cover the costs of preparing and administering the agreement.

#### **12.3 Administration Fee**

Every applicant for approval of a subdivision or other development, other than approval of an air parcel subdivision or a subdivision under the *Strata Property Act*, shall pay an administration fee to the City in the amount of four (4%) percent of the total cost of all works and services required under this Bylaw to service the subdivision or development, as determined under Section 4.4 of this Bylaw and such Administration Fee shall cover all engineering project monitoring and administrative costs incurred by the City.

#### 12.4 Phased Strata Subdivision

**BYLAW NO. 7286, 2008**

**BYLAW NO. 7563, 2012**

**BYLAW NO. 7582, 2013**

Every applicant for approval of a phased strata subdivision under the *Strata Property Act* shall pay the City a processing fee as specified in the *Fees and Rates Bylaw* for the Phased Strata Plan Declaration and for each strata phase deposited thereafter.

#### 12.5 Strata Conversion

**BYLAW NO. 7286, 2008**

**BYLAW NO. 7563, 2012**

**BYLAW NO. 7582, 2013**

Every applicant for approval of a strata conversion of a previously occupied building shall pay the City a processing fee as specified in the *Fees and Rates Bylaw*.

#### 12.6 Air Space Parcel Subdivision

**BYLAW NO. 7286, 2008**

**BYLAW NO. 7582, 2013**

Every applicant for approval of a subdivision creating an air space parcel or parcels shall pay the City a processing fee as specified in the *Fees and Rates Bylaw*, plus legal costs and certified professional code compliance review costs.

### **PART THIRTEEN REPEAL**

13.1 Subdivision Control Bylaw No. 5798, 1988 and all amendments thereto are hereby repealed.

SCHEDULE "A"  
to  
CORPORATION OF THE CITY OF NEW WESTMINSTER  
BYLAW NO. 7142, 2007  
WORKS AND SERVICES AGREEMENT

THIS AGREEMENT made as of the [ ] day of [ ], 20 [ ].

BETWEEN:

(the "Developer")

AND:

CORPORATION OF THE CITY OF NEW WESTMINSTER  
City Hall  
511 Royal Avenue  
New Westminster, British Columbia  
V3L 1H9

(the "City")

WHEREAS:

- A. The Developer is the owner of the Lands herein defined;
- B. The Developer has made application to develop the Lands and has requested that the City approve the Development prior to the construction and installation of the Works required under the Bylaw;
- C. In accordance with Section 940 of the *Local Government Act*, the City and the Developer have agreed to enter into this Agreement to provide for the construction and installation of, and the provision of Security for, the Works required under the Bylaw;

NOW THEREFORE in consideration of the premises contained herein, the sum of TEN DOLLARS (\$10.00) now paid by the City to the Developer, the receipt and sufficiency of which the Developer hereby acknowledges, and of other good and valuable consideration, the Developer and the City covenant and agree, each with the other, as follows:

### Interpretation

1.(a) Unless otherwise defined in this Agreement, all terms used in this Agreement shall have the meanings assigned to them in the Bylaw, the *Local Government Act* or the *Community Charter*.

(b) In this Agreement:

"Bylaw" means City of New Westminster *Subdivision and Development Control Bylaw No. 7142, 2007*;

"Certificate of Acceptance" means the City's final approval and acceptance of ownership of the Works evidenced by a written certificate issued by the ~~City Engineer~~ following the Warranty Period;

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"Certificate of Completion" means the completion of the Works by the Developer to the satisfaction of the ~~City Engineer~~ when so certified by the ~~City Engineer~~ in writing;

Replaced with "Director of Engineering"

Replaced with "Director of Engineering"

Delete and Replace with Director of Engineering definition

~~"City Engineer" means the person appointed from time to time by City Council as the Director of Engineering Services for the City and his duly authorized assistants or such consulting or other professional engineers as may be appointed to act for the City in that capacity;~~

"Civic Services Inspector" means an individual certified as a civil services inspector by the Council, of ASTTBC and the Public Works Inspectors Society at a minimum Level I (CPWI 1)

"Developer" means that person, persons or company entering into this agreement with the City,

"Development" means the subdivision of land or the construction of a building or structure on land which results in the requirement for the installation of the works and services under the Bylaw;

"Lands" means that certain parcel or parcels of real property situated in New Westminster, British Columbia which are legally described in Appendix "A" of this Agreement;

"Offsite Works" means that portion of the Works which are to be located on an existing highway or other public right of way in the City;

"Professional Engineer" means a professional engineer currently registered with the Association of Professional Engineers and Geoscientists of B.C. under the provisions of the *Engineers and Geoscientists Act*;

"Security" means the security required to be deposited with the City under Section 16 of this Agreement for the due and proper performance of all of the Developer's obligations under this Agreement;

"Warranty Period" means that 24 month time period specified in Section 18 of this Agreement during which time the Developer must, at the Developer's expense, maintain Replaced with "Director of Engineering" ~~City Engineer~~ and reconstruct the Works to the satisfaction of the ~~City Engineer~~; and

"Works" means the works and services required to be constructed and installed under Section 3 of this Agreement both on and off the Lands and includes all things required to be done under this Agreement or the Bylaw or otherwise in relation to the construction and installation of the works and services.

## Payments

2. The Developer shall, prior to obtaining approval of the proposed Development, pay to the City:
  - (a) \$ , being four (4%) percent of the estimated total cost of all Works required to service the Development, in payment of all engineering, project monitoring and administrative costs incurred by the City;
  - (b) \$ as a credit towards the cost to the City of making connections to storm sewers, sanitary sewers, water mains and other City utilities located within a highway or other City right of way;
  - (c) \$ as a credit towards the cost to the City of constructing and installing the Offsite Works;

- (d) \$ as a credit towards the cost to the City of supplying and installing street and traffic signs and providing miscellaneous emergency street maintenance;
- (e) \$1,620.00 as the cost of preparing this Agreement;
- (f) all arrears of taxes outstanding against the Lands; and
- (g) all current taxes levied or about to be levied on the Lands on the basis and in accordance with the assessment and collectors roll entries.

### Construction of the Works

3. (1) The Developer, at his own expense, shall:

- (a) provide, design, construct and install on the Lands and, where permitted, off the Lands, all Works (including support structure and root zone for street trees) shown on the engineering drawings listed in Appendix "B" of this Agreement, all of which are incorporated into and form a part of this Agreement, to the specifications and standards prescribed by the Bylaw, and to the satisfaction of the ~~City Engineer~~, as evidenced by the delivery of the Certificate of Completion to the Developer; Replaced with "Director of Engineering"
- (b) not construct any buildings upon the Lands without the prior written approval of the ~~City Engineer~~; Replaced with "Director of Engineering"
- (c) complete the Works to the satisfaction of the ~~City Engineer~~ within days of the date of this Agreement, such satisfaction to be evidenced by the delivery of the Certificate of Completion to the Developer; and Replaced with "Director of Engineering"
- (d) perform all additional work that, in the opinion of the ~~City Engineer~~, is necessarily incidental to the provision of the Works required pursuant to this Agreement, including, notwithstanding the generality of the foregoing, any work or extra work that arises out of soil conditions or the existence of utilities not shown or incorrectly shown on design or other drawings, including those prepared or provided by the City; and
- (e) permit the City to install, at the Developer's expense, street and traffic signs as and where required by the City, at the City's discretion.

- (2) If for reasons beyond the control of the Developer, the Developer is not able to complete the Works substantially as provided for in this Agreement, the Developer shall carry out alternative or additional works of equivalent value at its cost to the satisfaction of the ~~City Engineer~~ Replaced with "Director of Engineering"
- (3) The Developer shall ensure that the Developer's employees responsible for supervising excavation on the Lands shall remain alert during excavation for unusual soil conditions indicative of contamination (discolouration or unusual odour). If soil is identified as potentially contaminated, the Developer shall arrange for the appropriate Professional Engineer to visit the Lands to survey the situation and make recommendations. ~~All site~~ Replaced with "Director of Engineering" profile reportage and, where applicable, subsequent ~~City Engineer~~ Replaced with "Director of Engineering" reports and activity schedules shall be provided to the ~~City Engineer~~ as soon as they are available to the Developer, to facilitate determination of remediation responsibilities, and the execution of appropriate remedial works.

#### Construction of the Offsite Works

- (5) (a) Subject to Subsection 5 (c) the City shall, at the Developer's expense, construct and install the Offsite Works shown on the engineering drawings listed in Appendix "B" of this Agreement.
- (b) Where the cost to the City under Subsection 5(a) of constructing and installing the Offsite Works exceeds the payments made to the City by the Developer under Subsections 2(b) and (c), the Developer shall forthwith on demand pay the deficiency to the City. Where the amounts paid by the Developer to the City under Subsections 2(b) and (c) exceed the cost of the City of constructing and installing the Offsite Works, the City shall refund the excess to the Developer. Replaced with "Director of Engineering"
- (c) Where permitted by the ~~City Engineer~~, the Developer may construct and install the Offsite Works shown in the Engineering drawings in Appendix "B".

#### Site Personnel

4. The Developer shall:



- (a) undertake contract administration services using qualified personnel during construction and the maintenance period including:
  - (i) survey control to permit construction layout by contractors;
  - (ii) interpretation of plans and specifications;
  - (iii) periodic inspection to determine if the work substantially complies in all material respects with the Contract Drawings and with District bylaws and with the requirements of utility companies and government agencies;
  - (iv) full time inspections and attendance during actual installation of all underground facilities including pipe surround materials and during all required testing;
  - (v) inspection of the site and the drainage, erosion and sediment control works and receiving waters to ensure those works are constructed and functioning according to the approved plans, that they are being operated and maintained in accordance with MMCD Supplementary Specification 01561.1.3, and that no unacceptable materials are discharged;
  - (vi) review and interpretation of test and Replaced with "Director of Engineering" reports;
  - (vii) determination, and advising the ~~City Engineer~~ of corrective action required as a result of c), d), e) and f);
  - (viii) keeping a record of site visits and any corrective action taken as a result of (vii)
  - (ix) attending construction progress meetings; and
  - (x) conducting final inspection to identify deficiencies;
- (b) submit summary reports during Replaced with "Director of Engineering" and the maintenance period as required by the ~~City Engineer~~ including test and inspection reports and his review and interpretation thereof;
- (c) submit Inspection and Compliance Certificates and other certifications required by the Bylaw;
- (d) conduct inspections with the ~~City Engineer~~; Replaced with "Director of Engineering"
- (e) submit record drawings in reproducible Mylar and AutoCAD format, service record cards and operation and maintenance manuals.

### Utilities

5. (1) The Developer shall:
- (a) install for each of the parcels comprising the Lands at least one connection to the water mains, sanitary sewers, storm sewers, telecommunication installation, cablevision installation, electrical installation, gas installation and any other utilities to be installed as part of the Works on the Lands;
  - (b) contact Terasen Gas, Telus or other telecommunication companies, cable companies, and the City's Electrical Operations Department to advise of the proposed Development and to coordinate the supply and installation of any required gas, telephone, cablevision and electrical installations, respectively, on the Lands; and
  - (c) supply and install Replaced with "Director of Engineering" regulators where they, in the opinion of the ~~City Engineer~~, are necessary.
- (2) The connection of any utility installed on the Lands by the Developer to and existing utility infrastructure shall be made only by the company, body or organization owning or controlling that infrastructure unless that body or organization otherwise agrees.

### Connections to City Services

6. (1) The Developer shall pay the full cost of connecting water mains, sanitary sewers storm sewers, electrical installations and other utilities installed on the Lands to existing City services located in a highway or other City right of way.
- (2) Unless the City otherwise agrees, the City shall perform the necessary work to connect the water mains, ~~sanitary sewers~~, storm sewers, electrical installations, and other Replaced with "Director of Engineering" d on the Lands to existing City services.
- (3) Where the cost to the City under Subsection 6(2) of connecting the utilities on the Lands to existing City services exceeds the payment made to the City by the Developer under Subsection 2(b), the Developer shall forthwith on demand pay the deficiency to the City. Where the amount paid by the Developer to the City under Subsection 2(b) exceeds the cost to the City of connecting the utilities to existing City services , the City shall refund the excess to the Developer.

### Street Treatment

7. The Developer shall ensure that all roadwork and boulevard treatment are provided and constructed in accordance with the requirements and standards in the Bylaw.

### Plans

8. Within two months of the delivery of the Certificate of Completion to the Developer, the Developer shall submit to the City "as constructed" drawings of the Works, prepared and sealed by a Professional Engineer in accordance with the requirements of this Agreement.

### Compliance with Laws and Bylaws

9. The Developer covenants and agrees with the City that:
  - (a) the Developer will comply with all City bylaws and all applicable federal and provincial laws, regulations and rules throughout the term of this Agreement; and
  - (b) despite Section 943 of the *Local Government Act*, the Developer agrees that any and all changes in subdivision requirements or standards affecting the Developer's Development or the requirements under this Agreement to provide the Works that are established by adoption of a City bylaw, shall have immediate effect and be applicable to the Developer's Development regardless of when such bylaw is adopted.
  - (c) For the purposes of Part 3 [Occupational Health and Safety] of the Workers' Compensation Act, the Developer or its authorized contractor, provided the Developer will be completely responsible for all acts or omissions of the authorized contractor in connection with this Agreement as if they were the acts or omissions of the Developer, will be and will assume the responsibilities of the "prime contractor" for the workplace and will, as required in the Workers Compensation Act (British Columbia) and regulations thereunder:
    - (i) co-ordinate workplace safety, including for its own workers as well as those of subcontractors, utilities, suppliers, inspectors and all other contractors performing work on the workplace; and
    - (ii) do everything that is reasonably practicable to establish and maintain a system or process that will ensure compliance with Part 3 of the Workers'

Compensation Act and the regulations in respect of the workplace.

- (iii) The Developer will provide the City, prior to commencement of the Works, with the name and telephone numbers (including a 24 hour emergency contact number) for the Developer's safety representative for the workplace

#### Debris

- 10. If any material or debris is left within any highway allowance during or after the construction of the Works and prior to issuance of the Certificate of Acceptance, the City may forthwith remove the material or debris at the expense of the Developer, the cost of the removal to be the actual cost to the City plus an administration fee equal to ten (10%) of that cost, and the Developer shall pay such amount to the City forthwith on demand.

#### Survey

- 11. The Developer shall protect all survey markers, pins, posts and similar things during the construction, installation, maintenance and repair of the Works and shall employ, at the Developers expense, a British Columbia Lands Surveyor to replace any such markers, pins, posts or similar things which may be moved, damaged or destroyed during the construction, installation, maintenance or repair of the Works.

#### Testing

- 12. The Developer shall pay for any testing required by the ~~City Engineer~~ or the Professional Engineer, including Benkleman Beam Testing of roads and video inspection of sewers, to confirm that the Works have been constructed and installed in accordance with the specifications and standards for the design and construction of the Works contained in the Bylaw as amended, and to the satisfaction of the ~~City Engineer~~.

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Replaced with "Director of Engineering"

#### Building and Occupancy Permits

- 13. The City may refuse to issue a building permit or occupancy permit or both in respect of the Lands or any portion thereof until all Certificates of Completion relating to the Works are delivered to the Developer.

### Completion

14. (1) The City shall:
- (a) permit the Developer to install and construct the Works on the terms and conditions contained in this Agreement and in accordance with the Bylaw;
  - (b) issue the Developer Replaced with "Director of Engineering" of Completion of the Works, signed by the ~~City Engineer~~, when the Works have been constructed and installed to the satisfaction of the ~~City Engineer~~ and after the Professional Engineer has delivered to the ~~City Engineer~~ the certification required by Section 3(2); and Replaced with "Director of Engineering"
  - (c) issue the Developer a Certificate of Acceptance of the Works, signed by the ~~City Engineer~~, on completion by the Developer of all its obligations Replaced with "Director of Engineering" this Agreement and the Bylaw, including, without limitation, those obligations Replaced with "Director of Engineering" the Warranty Period, to the satisfaction of the ~~City Engineer~~.
- (2) The City may, in its discretion, issue separate Certificates of Completion for highways, water, sewer, drainage and underground civil ductwork.

### Property

15. The Works, unless otherwise agreed between the parties hereto,
- (a) become the property of, and shall vest absolutely in, the City when the City delivers the Certificate of Acceptance to the Developer; and
  - (b) remain at the full risk of the Developer until the Certificate of Acceptance is delivered to the Developer.

### Security

16. (1) As security for the due and proper performance of all obligations of the Developer under this Agreement, the Developer shall deposit Security with the City consisting of:
- (a) cash,
  - (b) a certified cheque payable to the City, or

- (c) an irrevocable clean Letter of Credit in substantially the form prescribed in the Bylaw to remain valid and subsisting until the Certificate of Acceptance is delivered to the Developer.

in the amount of \$  .

- (2) The amount of the Security Replaced with "Director of Engineering" reduced at any time with the written approval of the ~~City Engineer~~.
- (3) The Developer may, on receipt of the Certificate of Completion, reduce the amount of the Security to 10% of its original amount or the estimated value of outstanding work as determined by the ~~City Engineer~~, whichever is greater.

Replaced with "Director of Engineering"

- 17. (1) If, in the sole discretion of the City, the City determines that the Developer has defaulted on any of its obligations in this Agreement, including without restricting the generality of the foregoing, the obligation under Subsection 3(1)(c) to satisfactorily complete the Works within the time period specified, the Security shall be forfeited and the City may:
  - (a) enter on the Lands at all reasonable times and perform the obligations of the Developer under this Agreement at the cost of the Developer; and
  - (b) from time to time draw upon any or all of the Security:
    - A. to compensate the City for the costs it incurs or expects to incur in performing the obligations of the Developer; and
    - B. to satisfy any amount the Developer is required to pay to the City.
- (2) The cost to the City of performing the obligations of the Developer includes the actual costs of construction plus engineering, supervision, testing, legal, survey, and other costs incurred by the City in connection with performing the obligations together with an administration fee equal to ten (10%) percent of the total of these costs.
- (3) If the Security is insufficient to compensate the City for the costs of performing the Developer's obligations or satisfying an amount required to be paid to the City, the Developer shall pay the insufficiency to the City forthwith on demand.

- (4) The City shall deliver the remaining balance of the Security, if any, to the Developer on delivery of the Certificate of Acceptance.
- (5) Despite any other provision of this Agreement, the City may, in the case of an emergency, enter on the Lands at any time and perform the obligations of the Developer relating to any of the Works and all such work shall be at the sole cost of the Developer. The City may, at its option, recover the costs of performing such work by drawing on the Security or by direct invoice to the Developer.

#### Warranty Period

18. For a period of twenty-four (24) months following the issuance of the Certificate of Completion, or where more than one Certificate of Completion has been issued, for a period of twenty-four (24) months from the date of the issuance of the last Certificate of Completion, the Developer, at its own expense, shall maintain, repair, modify or reconstruct the Works if in the opinion of the ~~City Engineer~~ <sup>Replaced with "Director of Engineering"</sup> the Works are in any way defective so that the Works are fully operative and have been constructed and function in accordance with the requirements and intent of the Bylaw and this Agreement and to the satisfaction of the ~~City Engineer~~ <sup>Replaced with "Director of Engineering"</sup>, or the Security shall be forfeited. The satisfaction of the ~~City Engineer~~ shall be evidenced by the delivery of the Certificate of Acceptance to the Developer.

#### Indemnity

19. The Developer releases, indemnifies and saves the City harmless from:
  - (a) any liability, cost, or expense of any kind arising from or in any way connected with the construction, installation, repair, or maintenance of all or any portion of the Works done or provided under this Agreement;
  - (b) without limiting subsection (a), any liability, costs or expense of any kind which the City may incur by reason of damage arising out of or in any way connected with the construction, installation, repair, or maintenance of the Works to any real or personal property owned in whole or in part by the City or which the City by duty or custom is obliged, directly or indirectly, in any way or to any degree, to construct, repair or maintain; and

- (c) without limiting the foregoing, any liability, costs or expense of any kind incurred by reason of liens for nonpayment of labour or materials, workers' compensation assessments, unemployment insurance, federal or provincial tax, check-off or encroachments owing to mistakes in surveying or claims for injurious affection;

unless caused or contributed to by the negligence of the City.

#### Insurance

- 20. (1) The Developer shall take out and maintain, with a company licensed to carry on the business of insurance in the Province of British Columbia, on terms that are acceptable to the City, and at the Developer's expense:
  - (a) until the Certificate of Acceptance is issued, comprehensive general liability insurance covering without limitation premises and operations liability, non-owned automobile liability and contractual liability;
  - (b) without limiting subsection (a), at least until the Certificate of Completion has been delivered to the Developer, insurance covering contractor's contingency liability with respect to the operations of sub-contractors; and
  - (c) without limiting subsection (a), during the Warranty Period, insurance covering completed operations liability.
- (2) The limits of liability for personal injury and property damage combined shall be not less than \$5,000,000.00 for each occurrence.
- (3) The City shall be added as an additional insured under, and a cross liability clause shall be included within, the policies of comprehensive general liability insurance.
- (4) All policies shall provide that they shall not expire, be cancelled or be materially changed without at least 30 days prior written notice to the City.
- (5) If any of the policies are cancelled or materially changed, the City may require the Developer to cease the construction and installation of the Works.



- (6) The Developer shall, prior to commencing the construction and installation of the Works and subsequently upon the request of the City, file with the City Certificates of each insurance policy required by this Agreement, or such other proof, satisfactory to the City, that all required policies are in force.
- (7) If the Developer does not obtain and maintain the required insurance or when required does not deliver the Certificates of the policy or policies to the City, the City shall have the right, but not the obligation, to obtain and maintain the required insurance. The Developer hereby appoints the City its lawful attorney to do all things necessary for this purpose. All amounts expended by the City for insurance premiums under the provisions of this section shall be charged to the Developer and are payable by the Developer to the City forthwith on demand.

#### Further Agreements

21. (1) The Developer shall provide and grant to the City all rights of way required by the ~~City Engineer~~ in terms acceptable to the ~~City Engineer~~.  

Replaced with "Director of Engineering"

Replaced with "Director of Engineering"
- (2) The Developer shall execute and deliver or use its best efforts to cause to be executed and delivered, all such further transfers, agreements, documents, instruments, easements, statutory rights of way, acts, deeds, and assurances and do and perform or cause or procure to be done, performed, executed and delivered all such acts and things as may in the opinion of the City be reasonably necessary to give full effect to the intent or meaning of this Agreement.

#### Delay

22. If in the opinion of the ~~City Engineer~~ a delay in performance of the Works is caused by reason of ~~labour disputes~~, fire, Act of God, unusual delay by common carriers or a ~~City Engineer~~ which is effectively beyond the Developer's control, the ~~City Engineer~~ will extend the time for completion of the Works by the Developer for whatever time the ~~City Engineer~~ deems to be reasonable in the circumstances.  

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Replaced with "Director of Engineering"

#### Interpretation

23. (1) All references to each party herein are deemed to be references to the heirs, executors, administrators, successors, assigns, servants, agents and officials of the respective parties hereto whenever the context so allows.

- (2) This Agreement shall enure to the benefit of and be binding on the parties hereto.
- (3) Whenever the singular or masculine is used in this Agreement, the same shall be deemed to include the plural, the feminine, or the body politic or corporate as the context so requires.
- (4) Waiver of any default by either party shall not be deemed to be a waiver of any subsequent default by that party.
- (5) The rights, powers and remedies of the City provided in this Agreement are cumulative and not exclusive of any right, power or remedy that may be available to City at law or in equity.
- (6) Time is of the essence of this Agreement.
- (7) Section headings are included for convenience only and do not form part of this Agreement and shall not be used in the construction or interpretation of this Agreement.

#### Entire Agreement

24. The whole Agreement between parties hereto is set forth in this Agreement and no representations, warranties, or conditions, express or implied, have been made other than expressed herein.

#### Notice

25. (1) Whenever it is required or desired that either party deliver or serve a notice on the other, delivery or service shall be deemed to be satisfactory and deemed to have occurred when:
- (a) served personally, on the date of service; or
  - (b) mailed by prepaid registered mail to the address listed for that party on the first page of this Agreement or other address of which that party has in writing notified the other, on the earlier of the date received or on the fifth business day following date of mailing at any Canada post office, but in the event of interruption of mail service, notice shall be deemed to be delivered only when actually received by the party to whom it is addressed.
- (2) The Developer's general superintendent or person in control or apparently in control of the Developer's activities on the Lands shall

be deemed an agent of the Developer for the purpose of the service of notices.

City's Right Reserved

26. Nothing contained in or implied by this Agreement shall in any way prejudice or affect the rights and powers of the City in the exercise of its function under any public and private statutes, bylaws, orders and regulations.

Severance

27. Should any clause or portion of this Agreement be declared or held invalid for any reason, the invalid portion shall be severed and the severance shall not affect the validity of the remainder.

Excess and Extended Services

28. Except as and to the extent specified in Section 29 of this Agreement, the Developer hereby waives, relinquishes and abandons any right which the Developer now has or may at any time hereafter have under Section 939 of the *Local Government Act* for any contribution from the City or any other person connecting to or using the Works towards the Developer's cost of installing the Works.
29. The Developer shall be entitled to contribution under Section 939 of the Local Government Act for the following excess and extended services to be provided by the Developer:
- (a) **(NIL).**

IN WITNESS WHEREOF the parties hereto have executed this Agreement as of the date first written above.

THE COMMON SEAL OF DEVELOPER )

was hereunto affixed this )

\_\_\_\_\_ day of \_\_\_\_\_ )

20\_\_\_\_\_ in the presence of: \_\_\_\_\_ )

\_\_\_\_\_ )

AUTHORIZED SIGNATORY \_\_\_\_\_ )

\_\_\_\_\_ )

AUTHORIZED SIGNATORY \_\_\_\_\_ )

THE CORPORATE SEAL OF THE )

CORPORATION OF THE CITY OF )

NEW WESTMINSTER was hereunto )

affixed this \_\_\_\_\_ day of \_\_\_\_\_ )

\_\_\_\_\_ 20 \_\_\_\_\_ in the \_\_\_\_\_ )

presence of: \_\_\_\_\_)

\_\_\_\_\_ )

MAYOR \_\_\_\_\_)

CLERK )

## APPENDIX "A"

The "Lands" as defined and referred to in this Agreement are legally described as:

## APPENDIX "B"

This Agreement includes the attached engineering drawings listed below  
and signed by the ~~City Engineer~~ "Approved" on .

Replaced with "Director  
of Engineering"

Drawings prepared by

Doc#95796



# **CITY OF NEW WESTMINSTER**

## **DESIGN CRITERIA**

[illegible]



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Definitions have  
been deleted from  
here and combined  
in Section 2.1

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## **BYLAW 8128, 2019**

### **1. DESIGN CRITERIA – GENERAL REQUIREMENTS**

#### **1.1 Glossary of Terms**

~~The following terms used in the Design Criteria shall have the meanings indicated below:~~

~~“Accepted for Construction Purposes” means that drawings so stamped are deemed acceptable by the Director of Engineering to proceed to construction.~~

~~“Approving Officer” means the person appointed by Council in accordance with the Land Title Act.~~

~~“Arterial Road” means a Highway whose primary function is to carry through traffic from one area to another with as little interference as possible from adjacent land uses, but which may provide direct access to property as a secondary function.~~

~~“City” means the City of New Westminster as a corporate body, as represented by the Director of Engineering.~~

~~“Collector Road” means a Highway primarily for collecting and distributing traffic between local roads and Arterial Roads but which may provide direct access to the property~~

~~“Council” means the body of elected representatives of the City of New Westminster.~~

~~“Consulting Engineer” or “Consultant” means the Professional Engineer currently registered under the provisions of the Engineers and Geoscientists Act of the Province of British Columbia responsible for the design and/or construction supervision of all works and services on behalf of the Owner.~~

~~“Contractor” means a person or firm having a contract with the Owner or the City to construct works and services or any other items required by this Bylaw;~~

~~“Developer” means the proponent of a land development proposal or the Owner as defined in a Servicing Agreement. Requirements of the Developer stated in this document, or associated documents, apply to the Consulting Engineer or Contractor acting on the Developer’s behalf.~~

~~“Director of Engineering” means the person appointed by the City as the Director of Engineering or the designated representative.~~

**“Highway”** means a public street, road, trail, lane, bridge, trestle, tunnel, ferry landing, ferry approach, any other public way or any other land as defined in the Transportation Act of British Columbia.

**“Lane”** means a Highway that is intended to provide direct access to a property and is not intended to provide legal frontage.

**“Local Road”** means a Highway which primarily provides internal circulation within the neighbourhood in addition to direct access to a property.

**“Owner”** means an owner of land, as defined in the Local Government Act, who subdivides land or applies for a building permit including duly authorized representatives such as agents, developers, consultants, contractors, etc.

**“Parcel”** means any lot, block or other area in which land is held or into which land is subdivided, but does not include a Highway.

**“Preliminary Layout Approval”** means a conditional approval by the Approving Officer of a proposed subdivision layout, and outlines the requirements which must be fulfilled to obtain approval of a subdivision plan

**“Provincial Highway”** means a Highway which is under the jurisdictional control of the Crown Province of British Columbia, within the Ministry of Transportation and Infrastructure and is intended for serving longer distance regional traffic.

**“Specifications”** (to be confirmed with the city) shall mean the Master Municipal Construction Documents (MMCD, Platinum Edition) Volume II – Specifications, and the City of New Westminster ‘Standard Construction Documents – Supplementary Specifications’, latest revision, including all amendments and appendices.

**“Standard Drawings”** means the Master Municipal Construction Drawings (MMCD, Platinum Edition ), Volume II – Specifications – Standard Detail Drawings, and the City of New Westminster “Supplementary Standard Drawings”, latest revision, including all amendments.

**“Subdivision”** means division of land into two or more parcels as defined in the Land Title Act or the Strata Property Act.

**“Trunk Sanitary Sewer”** is sewer which conveys ‘peak wet weather flows’ in excess of 40 litres per second from the total upstream service catchment area. Typically, a sewer that serves a population of approximately 3,000 people (upstream) is designated as a trunk sewer. In some cases, the sewer may also service areas lower in elevation than the sewer. Where sewage, from outside the natural catchment area, is discharged into a catchment from a force main, the catchment area tributary to the force main will be included as part of the catchment area.

~~“Trunk Storm Sewer” is storm sewer servicing an urban drainage basin in excess of 20 hectares.~~

~~“Works and Services” or any variation thereof means and included all works and services required to be done for the completion of development of a subdivision, to the satisfactory.~~



## **1.2 General**

### **Use of Design Criteria Mandatory**

All works and services to be provided and constructed under this Bylaw shall be designed by a professional engineer in accordance with the Design Criteria and Specifications and Standard Detail Drawings set out in this Bylaw. Where conditions arise which are not covered by the Design Criteria, Specifications or Standard Detail Drawings, it shall be the responsibility of the Consulting Engineer to consult with the Director of Engineering for direction prior to completing the design.

### **Minimum Standards and Consulting Engineer's Responsibilities**

The Design Criteria specified in this Bylaw shall be considered minimum standards and shall not relieve the Consulting Engineer from his or her professional responsibilities to ensure the adequacy of the design in accordance with good engineering practice, as determined in consultation with the City.

Where sub-consultants are employed by the Consulting Engineer in the design process, the City will expect the Consulting Engineer to represent the sub-consultant's work for administrative and procedural purposes.

The Consulting Engineer is encouraged to seek innovative and superior solutions where appropriate. A Consulting Engineer who wishes to adopt criteria not specifically included in or variant from those within this design specification shall justify the proposed change in a letter/report prepared, signed and sealed by a professional engineer. Submissions must demonstrate that the proposed change is equivalent to or better than these guidelines. The letter/report shall be submitted to the Director of Engineering for review and approval, prior to acceptance of the proposed change.

In spite of using these standards and specifications, the Developers and their Consulting Engineers remain fully responsible for the design and construction of City infrastructure utilities according to good engineering standards adequate to address the specific needs and site conditions of their project.

The Consulting Engineer must be satisfied that the design criteria contained herein are applicable to the project at hand, and must apply more stringent criteria where appropriate. The Consulting Engineer is fully responsible for designing to standards which exceed these standards when specific site conditions dictate that more stringent performance measures are required.

This document is to be used in conjunction with the City of New Westminster approved edition of the Master Municipal Construction Documents (MMCD) and the City of New Westminster Supplementary Specifications and Detail Drawings.

The City of New Westminster Supplementary Specifications and Detail Drawings for City services include:

- Item 1          Supplementary Specifications – Additions, amendments and deletions to the Specifications in the MMCD
- Item 2          List of Approved Materials and Products
- Item 3          Supplementary Detail Drawings

**Existing Works and Services**

Existing (as-constructed) services information may be available from the City. This information is made available on the understanding that the City accepts no responsibility for their accuracy or completeness. Verification of this information must be made by the Consulting Engineer responsible for the design. Variations must be referred to Director of Engineering before completion of design drawings

### 1.3 Approval of Services

Approval of the proposed design and construction of services, as applicable, must be given by several authorities in addition to the City. These authorities are:

#### Governing Authorities

#### Areas of Jurisdiction

Ministry of Environment

- pollution, sanitary sewer systems
- fisheries and wildlife

Greater Vancouver Sewerage and Drainage  
District (G.V.S. & D.D.)

- GVS&DD sanitary sewer systems
- Brunette River Drainage Channel

Greater Vancouver Water District (G.V.W.D.)

- G.V.W.D. water mains

Canadian Transportation Authority

- crossing of existing railway at grade associated with roadway widening
- construction of new road crossing existing Railway track at grade
- replacing existing Railway trestles

Canadian National Railway,  
Canadian Pacific Railway,  
Burlington Northern Santa Fe,  
Southern Railway

- as per Canadian Transportation Agency
- all underground services crossing existing Railway rights-of-way
- installation of overhead transmission lines crossing existing Railway rights-of-way

Fortis

- as per Fortis regulations and the Pipeline Act
- all work in the vicinity of intermediate pressure (IP) and transmission pressure (TP) gas mains and rights-of-way

BC Hydro

- as per BC Hydro regulations
- all work in the vicinity of any underground plant as well as any transmission lines and rights-of-way

City of New Westminster Electrical Utility	a) all work in the vicinity of any underground plant as well as any transmission lines and rights-of-way
Telus, Shaw, Rogers, AT&T, Bell Canada, and other telecommunications providers	• all telephone underground and overhead services
Ministry of Transportation and Infrastructure	<ul style="list-style-type: none"><li>• all construction (underground and/or surface work) on Ministry of Transportation and Infrastructure rights-of-way</li><li>• subdivision, road improvements within radius of 0.5 km of the intersection of a controlled access Highway with any other Highway (see Controlled Access Highway Act)</li></ul>
Vancouver Port Authority Fraser Basin Council (FBC)	<ul style="list-style-type: none"><li>• works on or about river and foreshore</li><li>• dredging proposals</li><li>• stormwater discharge points</li></ul>
Inspector of Dykes	<ul style="list-style-type: none"><li>• reconstruction of dykes, fill and excavations adjacent to dykes</li><li>• any structure on or across dykes</li></ul>
Vancouver Port Authority	<ul style="list-style-type: none"><li>• dredging proposals in Fraser River</li><li>• crossing of dykes – temporary or permanent works</li></ul>

For City projects, the Consulting Engineer will make all applications to the Authorities concerned on behalf of the City, unless otherwise advised. In case of subdivisions, applications will be made by the Developer, with any costs incurred from the application being assessed to the Developer. The final agreement for such application will be drawn between the Authority concerned and the City, provided the proposed services, upon satisfactory completion, revert to and form part of the City services system.

No construction may proceed without the approval of the Authority having jurisdiction.

In all cases, the Authority having jurisdiction has specific requirements of its own, such as

- specific application forms
- utility clearance from the proposed services
- protection of services, carrier pipes, depth of cover
- methods of construction (Ministry of Transportation and Infrastructure and railway companies may not permit open trenching on major Highways and freeways.)

These requirements will be obtained directly from the Authority involved.

#### **1.4 Subdivision and Development Servicing Procedures**

Unless otherwise specified, the Developer shall design and install complete City services for the land being subdivided or developed, including provision of services to facilitate further development.

The City services shall include but not limited to:

1. Roads, lanes and walkways
2. Concrete sidewalks, extruded curbs, combined curb and gutter or alternative street edge
3. Sanitary Sewer systems
4. Storm Sewers systems
5. Water mains
6. Ornamental Street Lights
7. Trees and Landscaping
8. Underground Hydro power
9. Underground Telephone
10. Underground Cablevision
11. Natural Gas
12. Lot Grading

#### **1.5 Drafting Requirements**

Engineering drawings, details sketches and digital files prepared for submission to the City must conform to the City of New Westminster drawing and digital information standards.

## **1.6 Rights of Way and Easements**

Where specifically approved by the Director of Engineering to locate a City service within a utility right-of-way, the minimum widths of rights-of-way shall be:

- a) for single service

R.O.W. width = 3 metres minimum width

- b) for two or more services

R.O.W. width = 6 metres minimum width

- c) When the service is within a City road allowance but the distance from the property line to the centre of the main is less than one half of the width necessary for a single service, the difference shall be provided as right-of-way on the adjacent property.

In all cases the width of rights-of-way shall be sufficient to permit an open excavation with side slopes in accordance with the Workers' Compensation Board (WCB) regulations, without impacting on or endangering adjacent structures.

Sanitary trunk and interceptor sewers shall have rights-of-way wide enough for future widening and/or twinning. The width of the right-of-way shall be the required separation between pipe centrelines plus 2 times the depth to the crown of the deeper sewer.

The Consulting Engineer shall provide cross sections on the design drawings, indicating the minimum safe distances to adjacent building footings based on a safe angle of repose from the limits of the excavation.

## **1.7 Certification by the Consulting Engineer**

Consulting Engineers offering their services, directly to the City or through Developers, accept the responsibility for their designs by completing and attaching the following statement to their design notes and design drawings:

"I ..... Professional Engineer, in good standing in and for the Province of British Columbia, hereby certify that the works as herein set out on the attached drawings have been designed to good engineering standards and in accordance with the latest edition of the City of New Westminster Design Criteria, the Master Municipal Construction Documents (MMCD), and the City of New Westminster Supplementary Specifications and Supplementary Standard Drawings, adopted by the City of New Westminster.

.....  
(Signature)

### 1.8 Design Populations by Land Use

The following equivalent population should be utilized for water and sanitary sewer design purpose:

Land Use (each unit)	ppdu	ppha
Single Family Detached	3.0	
Secondary Suite/Laneway Home	2.5	
Row Houses, Townhouses, Duplexes, Triplexes	2.6	
Apartments	1.8	
Commercial	-	90
Industrial	-	45
Institutional	-	50

NOTE:

ppdu - population per dwelling unit

ppha - population per hectare

Where development is expected to exceed the density of the above table, the actual development parameters shall govern.

### 1.9 Revisions to the Design Criteria

The criteria and design parameters contained in this document are subject to constant review and re-evaluation and the Director of Engineering reserves the right to initiate revisions or additions to these criteria as and when he deems it is necessary to make such revisions.

## **2.      FIELD SURVEY REQUIREMENTS**

All field survey information should follow the requirements outlined in the City of New Westminster Drafting and Drawing Submission Standards,



**BYLAW 8128, 2019**

**3. STORM DRAINAGE SYSTEM**

**3.1 General**

All storm drainage works including rainwater collection, management and conveyance facilities shall be designed with considerations for public safety, regulatory requirements, economic benefits and protection of the natural environment. Rainwater is a valuable resource that supports the protection, enhancement, maintenance of:

- Aquatic and terrestrial habitat;
- Surface water supply and groundwater resources;
- Recreational opportunities; and
- Community aesthetics and urban life.

Storm drainage designs shall be prepared by the Consulting Engineer with qualified expertise in storm water management systems. Design criteria only specify the minimum requirements and the Consulting Engineer shall confirm with the City on the design requirements. Storm drainage designs shall conform to local government bylaws, regulations, guidelines, policies and federal and provincial statutes.

The Consulting Engineer will need to confirm the following:

- a) Drainage catchment boundary
- b) Planned land uses within the drainage catchment
- c) Location of major pumped and gravity facilities
- d) Location of the future gravity conveyance systems
- e) New Westminster Citywide Integrated Stormwater Management Plan (ISMP)

The presence of an existing municipal storm drainage system does not mean, nor imply that the existing system has adequate capacity to accommodate the proposed design flows either adjacent to the site or further downstream, nor does it indicate that the existing system pattern is acceptable to the City. Undersized or inadequate existing storm drainage facilities must be upgraded at the Developer's expense to accommodate the appropriate flows as specified herein. Alternative stormwater management proposals may be considered.

A Stormwater Management Plan (SWMP) and Erosion and Sediment Control Plan (ESCP) are required for all proposed developments within the City.

### **3.1.1 Stormwater Design Manuals, Guidelines and Plans**

The Engineering Design Criteria applies to the analysis, design and construction of storm drainage systems located in City rights-of-way, easements, lots and parks, and which will be eventually owned and operated by the City. In addition to the Engineering Design Criteria, the storm drainage design shall conform to the Citywide ISMP which provides design guidance and required water quality and infiltration targets for on-site storm drainage systems.

### **3.1.2 Citywide Integrated Stormwater Management Plan**

The Citywide Integrated Stormwater Management Plan (ISMP) provides information related to:

- Approved goals and strategies for developments to minimize the effects of flooding, erosion on water quality and ecological health; and
- Remedial and new capital works to be incorporated with developments.

The ISMP is to be used in conjunction with the Official Community Plan (OCP) and relevant Neighbourhood Community Plans (NCP's) for mitigating the impacts of developments on the City storm drainage system.

### **3.1.3 Stormwater Management Plan**

A Stormwater Management Plan (SWMP) details the proposed storm drainage servicing for the development and the impact on the downstream system. Unless otherwise directed by the City, a SWMP must be submitted for City's approval. The submission shall include technical drawings and a report including:

- Development characteristics;
- Existing and proposed tributary catchment area and boundaries along with existing and ultimate land uses;
- The development area within the drainage catchment including all features such as roads, ditches, watercourses with their environmental classification, existing and proposed drainage control structures, storm sewers, culverts, stormwater management facilities, and site grading;
- Method and parameters used for hydrological/hydraulic analysis;
- Tabulated pre and post development hydrologic and hydraulic calculations;
- Major and minor systems flow routing;
- Downstream conveyance capacity limitations;
- Minor and major hydraulic grade lines of all proposed works;
- Design calculations, details and supporting information for all stormwater management facilities to meet *Citywide ISMP Volume 1 (Vision, Principles & Actions)* and *Volume II (BMP Tool Kit)*;

- Proposed service connection locations, Minimum Building Elevations (MBE), and pre and post-development flows entering and leaving the subject site;
- Groundwater management for the protection of municipal and private infrastructure and property;
- External drainage issues and recommended options to address impacts;
- Potential floodplain issues and recommended options to address impacts; and
- Easements required.

The SWMP shall demonstrate how the development and the proposed storm drainage system will be consistent with the Official Community Plan (OCP), Neighbourhood Community Plan (NCP) and the Citywide ISMP. A SWMP design report shall also be prepared if Runoff Hydrograph Method is used for the analysis (see Section 3.3.4).

### **3.1.4 Erosion and Sediment Control Plan**

Erosion and Sediment Control Plan (ESCP) shall be submitted to the City for approval. The plan shall include measures such as siltation basins, channels, sediment basins, cut-off ditches and swales, siltation fencing, soil covers, truck washes, etc. to manage erosion and sedimentation from the construction activities in compliance with City's Erosion and Sediment Control Bylaw 7754, 2016 and Sewerage and Drainage Regulation Bylaw 7746, 2015, as amended.

## **3.2 Design Objectives and Requirements**

### **3.2.1 Servicing Objectives**

#### Design Frequencies

The design frequency for storm drainage systems will be in accordance to the followings, unless otherwise directed by the Director of Engineering:

Minor System	Storm sewers, driveway culverts and local road ditches	1:10 Year (Mainland) 1:25 Year (Queensborough)
Major System	Watercourses, channels, culvert crossings, overland flood paths, major trunk storm sewers <sup>1</sup> and outfalls	1:100 Year
Flood Control Facilities	Within the Fraser River Floodplain and major watercourse crossings under Provincial Highways	1:200 Year

### 3.2.2 Climate Change Impact Consideration

The design of the storm drainage infrastructure shall incorporate climate change impacts based on the following principles:

**“Do nothing”** Approach: for temporary infrastructure or assessment of existing infrastructure near the end of useful life (less than five to ten years of service life). The existing climate rainfall data and ocean boundary condition data shall be used to verify capacity.

**“Middle of the road”** Approach: for new infrastructure (i.e. storm sewers, culverts, floodboxes and flow control facilities). Use a moderate climate change forecast for Year 2050 as discussed in Section 3.3.2.

**“Worse-case”** Approach: for high-risk infrastructure (i.e. with catastrophic or high consequences of failure such as dikes and drainage pump stations). Use a moderate climate change forecast for Year 2100 as discussed in Section 3.3.2.

### 3.2.3 Combined Sewer System

A significant area of the City is currently serviced by combined sewer systems. The City is committed to separate all combined sewer systems under the Regional Liquid Waste Management Plan.

Separate sanitary and storm sewer systems shall be designed and installed for new subdivisions and rezoning applications along the entire site frontage. The development may be required to separate the combined sewer system immediate downstream from the site as determined by the Director of Engineering.

<sup>1</sup> at the discretion of the Director of Engineering

Flows in the combined sewers shall be calculated to account for both stormwater flows and sanitary flows as per the City's Sanitary and Stormwater design criteria.

### **3.2.4 Design Requirements & Procedures**

The design shall show in plan and profile the proposed storm sewer mains, service connections, existing underground services, overland flow details and ditch drainage patterns as applicable. The following considerations shall be incorporated into the design:

- a) A topographic field survey of the site with sufficient details to determine drainage patterns will be required including elevations of surrounding properties, existing drainage systems and the crown of the roadway. Proposed ground elevations for the final development should also be given.
- b) Provision must be made for house drains from each lot, either to storm sewer, open ditches in the road or lane, underground storm sewers elsewhere or natural watercourses. Onsite storm drainage works shall be consolidated into a single service connection into the City drainage system.
- c) Catch basin type shall be chosen according to Supplementary Specifications and Detail Drawings. Lead size shall be not less than that shown on Detail Drawings. Type of catch basin and lead size shall be marked on construction drawings.
- d) When establishing inverts in a manhole at the junction of two or more pipes, the crowns of pipes shall be coincident. In built up areas where there is not sufficient cover available at the ultimate upstream terminal, the design pipe profile may be invert to invert with the hydraulic grade line shown.

### **3.2.5 Site and Lot Grading Requirements**

Site grading around the building(s) shall be graded away from the foundation in accordance with BC Building Code and drain into a municipal drainage system, natural drainage path or roadway. Surface runoff across the parcel to adjacent lots is to be avoided. If cross-lot drainage is unavoidable, a swale shall be provided to divert runoff away from the lower lots. Lots lower than the adjacent roadways shall have road runoff directed away from buildings and driveways and into an appropriate municipal drainage system.

- a) Lot grades and swales shall have a minimum slope of 1% and a maximum slope of 6%.
- b) Where grade changes in excess of the above are required, the maximum slope should be 3:1. Where these occur between dwellings, the slope is to be located on the lower lot.

- c) Grade changes in excess of 1 m are to be accomplished by the use of a retaining wall.
- d) The maximum depth of rear yard swales shall be 0.3 m.
- e) The maximum depth of side yard swales shall be 0.2 m. The grade adjacent to the house shall follow the grade of the swale to maintain constant depth.
- f) At least one side yard of all dwelling units shall have a minimum (2% slope) level area of 0.6 m.
- g) The crossfall at the back of all units shall not exceed 2%.
- h) For all lots with detached and semi-detached dwellings having conventional rear yard setbacks and reverse frontage on arterial roads, the rear area shall be graded at 2% for at least 7.5 m of the total rear yard depth.
- i) The maximum flow allowed into a swale between two houses is that from 4 rear yards.
- j) The maximum flow allowed into a rear yard swale shall be that from 6 rear yards and in no case will the swale lengths be greater than 3 lot widths for single and semi-detach houses. For townhouse units, 8 rear yards and a maximum swale length of 4 lot widths will be permitted.
- k) The ponding depth over rear yard catch basins shall not exceed 0.3 m.
- l) Grade differences between housing units shall be minimized, especially where new developments abut existing developments. The vertical distance between the ground level at the rear wall of houses which back on to each other shall not be greater than that achieved by striking a 3% grade between the units.

### **3.2.6 Minimum Building Elevation (MBE)**

The MBE is defined as the elevation of the lowest floor slab in a building or the underside of the floor joists where the lowest floor is constructed over the crawl space. Crawl space is the space between a floor and the underlying ground having a maximum height of 1.2 m to the underside of the joists and not used for storage of goods or equipment damageable by floodwater.

The MBE shall be established at least 0.6 m above the storm service connection invert at the property line or 0.3 m above the 1:100 year hydraulic grade line whichever is greater.

For sites located within the Fraser River Floodplain, the MBE shall be established above the designated Flood Construction Level (FCL). The FCL is 0.6 m above the Fraser River Flood Design Level established by the Province of British Columbia.

For sites adjacent to major watercourses other than the Fraser River, the FCL is 0.3 m above the 1:200 year return period hydraulic grade line of the subject watercourse. In addition, the MBE shall be 1.5 m above the natural boundary of any watercourse, lake, marsh or pond.

The rationale used to establish the MBE for a site shall be presented in the SWMP or a separate report.

### **3.3 Runoff Analysis**

Storm drainage systems shall be designed to accommodate post-development flows using the Rational Method or the Runoff Hydrograph Method. For developments where the total tributary area is 10 hectares or less, the Rational Method will be used to compute the peak runoffs. For systems where the total tributary areas is greater than 10 hectares or where stormwater management systems require more than basic flow conveyance, the Runoff Hydrograph Method will be used to compute the peak flows and to design the runoff control facilities. All calculations pertinent to the design of the drainage system shall be signed and sealed by the Consulting Engineer and submitted to the Director of Engineering for approval.

In areas serviced solely by combined sewers, pre and post development flows for both storm and sanitary contributions shall be determined. Where post-development flows exceed pre-development flows, onsite storage or equivalent best management practices will be required to limit peak discharge rates to pre-development levels. Existing conditions will be considered ‘pre-development’ for non-greenfield sites unless historical site design documentation is submitted.

#### **3.3.1 Catchment Area**

The extent of the tributary areas of the storm drainage system under design shall be in accordance with the natural contours of the land, subject to any overall drainage plans established by the City. The Consulting Engineer is responsible to confirm the extent of the drainage area with the City prior to detailed design.

Although minor changes in the catchment boundaries may be necessary for development, the post-development tributary area should not deviate from the total natural drainage area, unless otherwise approved by the Director of Engineering. The Consulting Engineer is responsible for obtaining true and accurate surface elevations and drainage system information under the existing and proposed future development conditions. The analysis must include all lands tributary to the drainage system, whether considered on-site or off-site to the Developer’s parcels.

#### **3.3.2 Rainfall Data**

Rainfall Intensity Frequency (IDF) curves for 5 minutes to 24-hour durations are based on the 2018 report: “*Study of the Impacts of Climate Change on Precipitation and Stormwater Management*” prepared by GHD for the Greater Vancouver Sewage and Drainage District. The

recorded rainfall data in the regional rain stations up to 2016 were used to derive the updated IDF data.

### Climate Change Adaptation

The City of New Westminster is located within Zone 4 of the Homogeneous Rainfall Zones developed for the entire Metro Vancouver area in the GHD study. The existing climate condition IDF curves are based on the dimensionless IDF curves for Zone 4 using index rain values selected for New Westminster for durations from 5 minutes to 24 hours. The moderate change future climate scenarios for time horizons of 2050 and 2100 were developed by scaling up the existing climate condition IDF curves with Delta Changes for Zone 4. Current 2016, future 2050 and future 2100 IDF curves for the City are provided on Figures 3.1, 3.2 and 3.3. Rainfall intensity taken from these curves can be used with the Rational Method to calculate design flows under the required time horizon specified in Section 3.2.2.

Design storms shall be used for the Runoff Hydrograph Method computation. Tables 3.4 to 3.8 provide design storm hyetographs under current climatic condition (2016) for different return frequencies. To adjust for climate change impacts specified in Section 3.2.2, IDF curve values for future 2050 and 2100 conditions shall be used with the appropriate return period and duration to pro-rate the current (2016) design hyetographs.

### **3.3.3 Rational Method**

The Rational Method calculates the peak flow using the formula:

$$Q = RAIN$$

Where R = Runoff Coefficient  
A = Drainage Area (ha)  
I = Rainfall Intensity at the Time of Concentration (mm/hr)  
N = 0.00278  
Q = Flow (m<sup>3</sup>/s)

#### a) Runoff Coefficients

The following runoff coefficients based on the highest and best land use in the City's Official Community Plan (OCP) shall be used to compute the design flow:



**Table 3.1 Runoff Coefficients**

Type of Area	Percent Impervious	Runoff Coefficient	
		10 Year Storm	25/100 Year Storm
Wood Lands	5	0.10	0.30
Cultivated Lands	30	0.30	0.40
Park and Green Open Space	10	0.15	0.25
Single Family Residential	45	0.50	0.55
Single family with laneway/coach house	60	0.55	0.60
Low Density Multi-Family Residential	65	0.60	0.65
Apartment	80	0.75	0.80
Commercial	90	0.80	0.85
Industrial	90	0.80	0.85
Institutional	80	0.75	0.80
Roofs or Pavement	100	0.95	0.95

The values in Table 3.1 are for general applications. The Consulting Engineer should verify the coefficient applicable for the area involved. The Director of Engineering shall have the final authority on the coefficient to be utilized.

b) Rainfall Intensity

The rainfall intensity used in the Rational Method should be determined using the appropriate rainfall Intensity-Duration-Frequency (IDF) curve with the duration equal to the Time of Concentration ( $T_c$ ) calculated as indicated in the later section.

c) Time of Concentration ( $T_c$ )

$T_c$  is the time required for water to flow from the most remote part of the catchment area under consideration to the design node.  $T_c$  can be calculated using the following formula:

$$T_c = T_i + T_t$$

Where  $T_c$  = time of concentration (minutes)

$T_i$  = inlet or overland flow time (minutes)

$T_t$  = travel time in sewers, ditches, channels or watercourses (minutes)

Inlet or Overland Flow Time ( $T_i$ )

Two methods can be used to estimate  $T_i$  as follows:

- i) This method is typically used for direct runoff from small urban development areas ( $\leq 2000 \text{ m}^2$ ) with runoff coefficients greater than 0.4 under the assumption that BMP's are not applied. These values assume direct runoff.

Land Use Type	$T_i$ (Min)
Single Family Lot	10
Multi-Family Lot	8
Commercial/Industrial/ Institutional	5

- ii) This method is used for relatively flat and larger areas and is calculated using the following formula (referred to as the Airport Method):

$$T_i = \frac{3.26(1.1 - C) L^{0.5}}{S^{0.33}}$$

Where  $T_i$  = Inlet time (minutes), minimum time = 15 minutes

$C$  = Runoff coefficient

$L$  = Travel distance (m), maximum length = 300m

$S$  = Slope of travel path (%)

#### Travel Time ( $T_t$ )

The travel time in sewers, ditches, channels or watercourses can be estimated using the following formula:

$$T_t = \frac{C_t L n}{12 s^{0.5}}$$

Where,  $C_t$  = Concentration coefficient

= 0.5 for natural watercourses or ditches, storm sewer flow

$L$  = Length of watercourse or conduit flow (m), along the drainage path from the furthest point in the basin to the outlet.

$n$  = Roughness coefficient

= 0.050 Natural channels

= 0.030 Excavated ditches

= 0.013 Concrete pipe

= 0.011 PVC Pipe

= 0.024 Corrugated Steel Pipe (CSP or CMP)

$s$  = Basin slope (m/m)

d) Manning's Formula

The hydraulic analysis of sewers and open channels shall be carried out assuming steady state flow conditions and using the Manning equation, with the pipe flowing full:

$$Q = \frac{AR^{2/3}S^{1/2}}{n}$$

Where, Q = Pipe Design flow (m<sup>3</sup>/s)

A = Pipe cross section area (m<sup>2</sup>)

R = Hydraulic radius (m) = diameter/4 for pipes

S = Slope of energy grade line (m/m)

n = Manning coefficient of roughness

= 0.013 Concrete Pipe

= 0.011 PVC Pipe

= 0.024 Corrugated Steel Pipe (CSP or CMP)

= 0.030 to 0.10 for open channels.

e) Presentation of Rational Method Design Calculations

The Consulting Engineer will be required to tabulate the Rational Method design calculations on the "Storm Sewer Design - Rational Method" table for submission along with the appropriate plans and other relevant information. Table 3.2 attached shows an example of the "Storm Sewer Design - Rational Method" table. Governing climate conditions for design calculations of the storm sewers shall be clearly noted in the design calculation sheet.

### 3.3.4 Runoff Hydrograph Method

Hydrologic modelling programs using Runoff Hydrograph Method shall be used for the design of storm drainage systems serving areas greater than 10 hectares and for all erosion and detention retention/detention facilities.

a) Selection of Modeling Program

Prior to commencing any computer modelling, the Consulting Engineer shall obtain approval from the Director of Engineering on the selection of the proposed computer program. City uses SWMM based runoff simulation modelling programs.

b) Modelling Parameters

For design purposes, land use data shall be based on the best available post-development condition as per the Official Community Plan (OCP) and other pertinent land use information. Percent of imperviousness can be selected based on values suggested in Table 3.1 unless more accurate information from air photos or actual site designs are specifically available.

Either the Horton or Green-Ampt methods may be used to estimate the infiltration characteristics based on the best available soil conditions information. The parameters must be reflective of the type of soils, ground cover and typical Antecedent Moisture Condition (AMC) prevalent during the winter season.

c) Modelling Procedures

Efforts shall be made to calibrate/validate the results using the observed rainfall/flow data. Sensitivity to input parameter values shall be tested to ensure that the model predictions are adequate for establishing a proper system design. Conservative parameters shall be selected if calibration data is not available.

Design flows should be calculated at key intervals of the drainage system for all design storms (see Tables 3-4 to 3-8) with various design return periods, storm durations and climate change adjustments as prescribed in this document. This will identify the critical event to be used in designing the system. Note that the storm duration that generates the critical peak flow may be different from the duration that generates the critical storage volume. Systems with a number of interconnected ponds or with restricted outlet flow capacity may require analysis for sequential storm events or modelling with a continuous rainfall record.

d) Presentation of Modeling Results

A design report that documents the design rationale used to develop the hydrologic model and modelling results shall be submitted to the City along with a SWMP drawing. The design report shall include the followings:

- Design criteria used for the hydrologic/hydraulic analysis;
- Name and version of computer model;
- Design storms;
- Schematic diagram of model;
- Drainage map showing the catchment and sub-catchment boundaries and areas, slopes, land uses, soil conditions, etc.;
- Specific simulation assumptions and parameters;
- Description of the proposed stormwater features;
- Flow hydrographs under both pre- and post-development conditions at key locations;

- Flow exceedance curves for the pre-development, post-development without detention and post-development with detention, if a detention facility is proposed and continuous modelling is performed;
- Rationale and calculations for sizing onsite BMPs;
- Operation and maintenance plans and performance monitoring plans for the proposed on-site stormwater management features.

The SWMP drawing attached to the report shall include the following:

- Catchment areas and boundaries and the proposed storm drainage system including storm sewer locations, sizes and slopes, and functional layout of the proposed detention facility, on-site BMPs and other hydraulic control structures. Minimum Building Elevations (MBEs) shall also be presented in the SWMP drawing.
- A table summarizing design information and modelling results on the “Storm Sewer Design – Runoff Hydrograph Method” table.

In addition, the following design details shall also be shown in the SWMP drawing or in the detailed design drawings for the storm drainage system:

- Profiles showing pipe inverts and obverts, ground profiles, predicted Hydraulic Grade Lines (HGL's) under conditions governing the design and lowest MBEs throughout the storm drainage system.
- Design details of the proposed detention facility, BMPs (e.g. rock pit, rain garden, bio-swale, etc.) and hydraulic control structures (e.g. catch basins, manholes, detention pond outlet structures, flow control/diversion structures, oil and grit separators, spillways, etc.).
- Stage-discharge, stage-area and stage-volume curves of the detention facilities.
- Tabulated peak inflows and outflows, design water levels, detention pond areas and storage volumes.

## **3.4 Storm Sewers and Appurtenances**

### **3.4.1 Flow Velocity**

Maximum and minimum design velocities for pipes flowing full or half full:

- Minimum 0.6 m/s;
- Maximum 6.0 m/s.

Where design velocities are supercritical or in excess of 3.0 m/s, special provisions shall be made to protect against sewer displacement.

Where discharge velocities greater than 1.0 m/s enters a channel or sensitive receiving environment, evaluation of the downstream channel is required. Provisions for energy dissipation may be required to prevent scouring and control erosion.

For all outfalls, a rigorous hydraulic analysis is to be completed to ensure that the exit velocities will not produce scour and damage.

### **3.4.2 Minimum Sewer Diameter and Grade**

The minimum diameter of storm sewers shall be 250 mm. The minimum grade shall be 0.25% for pipes less than 525 mm diameter and 0.10% for pipes equal or greater than 525mm diameter. In areas where the minimum grades cannot be achieved, the Consulting Engineer shall confirm with the Director of Engineering that the minimum velocity requirement is met.

For new extensions, no reduction in pipe size will be made for pipes downstream irrespective of grade provided on the pipe unless specifically approved by the Director of Engineering.

Sewers are to be designed with constant grade. Pipes with grades at 15% or greater shall have an anchoring system and scour protection as approved by the Director of Engineering.

Due to the specific topography in Queensborough, minimum grade and velocity may not always be achievable. Site specific designs will be reviewed by the City on a case by case basis. A methodology must be identified to verify that the storm drainage system is designed and constructed with a positive gradient.

### **3.4.3 Storm Sewer Location**

Storm sewers and service connections shall be located within public road right-of-ways. Side or rear yard statutory right-of-ways or easements should be avoided if possible. The location of the storm sewer will be in accordance with the Supplementary Detail Drawings - "Typical Roadway Cross Section". If the location shown is impractical, the offset may be varied with the approval of the Director of Engineering but in all cases it shall be located under the road pavement and clear of curbs and gutters.

At least 3.0 m horizontal clearance from water mains shall be maintained. Provincial regulatory separation requirements will govern where sewers are adjacent to or crossing existing or proposed water mains.

Sewers must extend across the full width of each lot to the boundary of the development plan; thus allowing future extension and connection beyond the development where such extension is possible.

Where not technically feasible to locate within a road right-of-way, a storm sewer may be located within an open lane or a statutory right-of-way (SROW) if authorized by the Director of Engineering and that:

- a) The open lane meets the minimum requirements of 6.0 m width;
- b) The open lane is capable of supporting maintenance vehicles and equipment access under all weather conditions;
- c) Within a statutory rights-of-way, the Owner must provide unimpeded maintenance vehicles and equipment access under all weather conditions;
- d) Within a statutory rights-of-way, the sewer shall be centred within the registered SROW with a minimum width of 3.0 m, unless the sewer depth exceeds 3.0 m or is combined with a sanitary sewer, in which case a greater SROW width shall be provided;
- e) There are no service connections or manholes within the SROW; and
- f) The sewer alignment in the lane or SROW is straight.

All-weather vehicular access must be provided to all manholes, inlet structures, inspection chambers and flow control structures.

The elevations of all existing underground utilities crossing the proposed storm sewer shall be confirmed in the field and shown on the profile and plan drawings.

Where feasible, all new storm sewers shall interconnect at the high points to provide alternate routing of stormwater in case of blockage and for added subsurface storage capacity.

#### **3.4.4 Sewer Depth**

Storm sewers shall be installed at a depth to:

- Provide gravity service to all properties tributary to the sewer;
- Prevent freezing;
- Clear other underground utilities; and
- Prevent damage from surface loading.

The Consulting Engineer shall verify that the pipe material and bedding are suitable for the live and dead loads imposed on the pipe. In no case shall the cover be less than 0.9 m and greater than 6.0 m without the approval of the Director of Engineering.

#### **3.4.5 Pipe Joints**

All storm sewers shall have water tight (gasket) joints unless otherwise approved by the Director of Engineering.

### **3.4.6 Curvilinear Sewers**

Pipes are not to be laid on a curve unless approved by the Director of Engineering.

### **3.4.7 Manholes**

Manholes are required:

- every change of grade or direction;
- where sewers intersect;
- when pipe sizes change;
- at pipe intervals of 100 m;
- at the end of each sewer line;
- downstream of curved sewers (if a curvilinear sewer is approved by the City); and
- wherever future extensions are anticipated.

Generally, frames and covers should be located outside the vehicular and bicycle wheel path on the roadway.

Where ditches discharge into a storm sewer system, the initial manhole shall be of a sump type. All other manholes shall be channelled and benched. A detail drawing shall be provided for manholes of special design.

The inside diameter of manholes shall conform to the City approved edition of the MMCD and the City Supplementary Specifications and Detail Drawings.

Manholes are required at service connection tie-ins to mains where the service connection size is greater than  $\frac{1}{2}$  the diameter of the sewer main or the service connection is 200mm diameter or greater.

Drop manholes will only be used when a new incoming sewer cannot be steepened or where site conditions do not permit excavation to the base of an existing manhole. Outside drop shall be provided where the difference between the inlet and outlet inverts exceeds 600mm. The minimum manhole diameter for inside drop shall be:

- 1200mm diameter manholes for mains 300mm or smaller;
- 1500mm diameter manholes with an inside drop for mains larger than 300mm.

Temporary cleanouts are required where an extension of the sewer, in the future, will provide a manhole at an appropriate spacing.

Manholes shall be designed to incorporate a minimum pipe invert elevation difference of at least 30 mm in addition to the normal grade of the lateral sewer. For alignment deflections in excess



of 45 degrees, a 60 mm drop shall be provided. The crown elevations of sewers entering a manhole shall not be lower than the crown elevation of the sewer leaving the manhole.

### **3.4.8 Groundwater Recharge**

For groundwater recharge systems in suitable soil conditions as identified by a qualified geotechnical engineer, additional site specific designed exfiltration systems shall be provided. Conversely, seepage collars or clay plugs shall be provided where groundwater may adversely affect deep sewers.

### **3.4.9 Perforated Pipes**

Perforated storm sewers may be used, subject to the approval of the Director of Engineering, to exfiltrate runoff back to the ground or to lower the groundwater table in areas where elevated groundwater levels are problematic for existing buildings and infrastructure. However, it shall not be used as a means to reduce constraints for new development.

Perforated storm sewers used for groundwater recharge shall be flat, generally 1% or less.

Perforated drains located adjacent to road shall be extended well below the road base. The trench for subsurface drains shall be filled with clear round drain rock in an envelope of approved filter material. The minimum size of the perforated pipe is 100 mm.

### **3.4.10 Catch Basins**

Catch basins shall be:

- spaced to drain a maximum area of 500 m<sup>2</sup> on road grades up to 3% and 350 m<sup>2</sup> on steeper grades including sidewalks;
- provided at regular intervals along a roadway, upstream of a curb return radius at intersections and at low points;
- located to intercept the water flowing in the gutter in advance of a wheelchair ramp, curb letdown or pedestrian crossing;
- avoided at low points within curb returns and where they interfere with crosswalks;

Catch basins at low points and on steep grades shall include a side inlet for roads with a barrier curb. Double catch basins shall be used at low points and on steep grades for roads with roll-over curb. The Consulting Engineer must ensure that there is sufficient inlet capacity for design runoff to enter the underground pipe system.

Generally, 600 mm diameter reinforced concrete catch basins shall be used for roadway drainage except when installation is restricted by depth. Special offset catch basins shall only be used where approved by the Director of Engineering.

Grates shall have a “fish” symbol.

Lawn basins shall be provided on boulevards and private properties where necessary to prevent ponding or flooding of sidewalks, boulevards, driveways, buildings and yards.

Catch basin leads will have a minimum diameter of:

- 200 mm for single basins
- 250 mm for double basins. Double catch basins shall not be connected directly together but rather one basin will be wye'd into the lead of the other.

The maximum length of the lead is 30 m. The minimum grade for the lead is 2%.

### **3.4.11 Service Connections**

Each lot will have:

- a) A gravity connection to the frontage storm sewer; or
- b) A gravity connection to the storm sewer in an open lane, walkway or service corridor with an access road.

A gravity service connection shall be made to the storm sewer where the habitable portion of a dwelling is above the major system hydraulic grade line (1:100 year return storm). A pumped service connection will be allowed when the habitable area of a dwelling is below the major system hydraulic grade line of the storm sewer. A backflow prevention device shall be installed at the gravity service connection line under such circumstance.

In situations where the frontage storm sewer does not have sufficient depth to accommodate a gravity service connection and an existing combined sewer in an open lane can accommodate the design runoff, a service connection to the combined sewer may be considered if there is an established City plan to separate combined sewer in the open lane in the future, subject to the approval of the Director of Engineering.

Every lot (existing or newly created) capable of being serviced, whether it is vacant or not, shall be provided with a separated service connection. The service connection shall be installed in accordance with the standard drawings.

The minimum diameter of all service connections shall be 150 mm and have a slope not less than 2.0% from the property line to the main. Refer to the Supplementary Specifications and Detail Drawings for the location of storm sewer connections. No service connection shall be installed on sewers greater than 4.5 m depth unless otherwise approved by the Director of Engineering.

Service connections will be located at the lowest corner of the property with the depth no less than 0.9 m. Where basements are proposed, the depths of the storm sewers and services shall be increased where feasible. The service connection invert shall be at least 0.6 m below the Minimum Building Elevation (MBE).

Connections to new mains shall be made with a standard wye fitting. Connections to existing mains may use wye saddle or insertable tee. The service connection centreline must not be below the centreline of the sewer main.

Inspection chambers are required on residential connections unless the service is less than 2.5 m long and connects to a manhole. Service connections exceeding 30 m in length shall be designed as storm sewers. Manholes are required on service connections larger than 250 mm diameter.

#### **3.4.12 Surcharged Sewers**

Every effort should be made to avoid surcharge of existing or proposed sewers unless surcharge is unavoidable due to conflicts with existing utilities, structures or other implications.

Surcharged sewers will have the 1:10 year and 1:25 year return storm hydraulic grade lines shown on the design drawings. In cases where the catch basins and storm sewers are designed to convey the 1:100 year return storm runoff, the 1:100 year hydraulic grade line shall also be shown. The 1:100 year hydraulic grade line shall be at least 0.3 below the lowest Minimum Building Elevation (MBE) of all of the serviced properties.

#### **3.4.13 Culverts**

The minimum culvert diameter will be:

- a) 450mm for driveway crossing (Mainland)
- b) 600mm or equivalent for driveway crossing (Queensborough)
- c) 600mm for road crossings

Culverts crossing roads will be designed to accommodate the major flow with either an inlet or outlet control.

On collector and local roads, road overtopping is only allowed when the backwater profile does not negatively encumber properties. Where road overtopping is anticipated, appropriate scour protection shall be provided. All roads will be graded to provide the low point (sag) at the

watercourse culvert crossing to provide a fail-safe major system outlet with limited ponding on the road right-of-way.

Inlet and outlet structures are required for all major culverts. Design considerations are to include inlet control and outlet control conditions, energy dissipation and erosion control. The Consulting Engineer shall determine whether the culvert will operate under inlet or outlet control at design conditions. Aquatic habitat protection requirements must be considered for culverts in natural channels.

Driveway culverts shall be installed or approved for installation by the City. All new driveway culverts shall be sized to ensure that there is no adverse impact on the adjacent properties under the major system runoff conditions.

Culvert design calculations and assumptions shall be submitted for City and other regulatory agency approvals.

#### **3.4.14 Flood Boxes**

New flood boxes through an existing dike may be required to facilitate drainage. New flood boxes shall have a minimum diameter of 600 mm or as directed by the Director of Engineering. Flood boxes will incorporate a flap gate on the river side of the dike, and be reverse graded to ensure proper seating of the flap gate during high tide conditions.

Pressure treated timber support piles shall be installed on either side of the flood box and connected above and below the flood box with pressure treated 2x4 wood slats on the river side of the dike to anchor the flood box in place. At least 1/3 of the total height of the timber support piles will be buried below grade.

Flood boxes shall be backfilled with structural clay, containing no organics, compacted to 95% Standard Proctor Density (SPD). A non-woven geotextile may also be required beneath the flood box, as designed by the Consulting Engineer.

#### **3.4.15 Ditches and Swales**

Ditches are only permitted where approved by the Director of Engineering and shall be designed to convey minor system flows. Ditches shall be trapezoidal in shape having maximum side slopes of 1.5 H:1V and a minimum bottom width of 0.5 m, depending on the soil characteristics.

The minimum ditch profile slope is 0.5%, except in lowland areas. The maximum velocity in an unlined ditch will be 1.0 m/s. Higher velocities may be permitted where soil conditions are suitable or where erosion protection has been provided. On steep slopes, grade control structures may be used to reduce velocities.

The ditch right-of-way shall be sufficiently wide to provide a 3.6 m graded access road suitable for maintenance vehicles, in addition to the width required for the ditch, where the ditch is not adjacent to a municipal roadway.

Swales shall be used in road allowances where there is no curb and gutter to direct flow towards catch basins or the storm sewer system. Swales will be used in conjunction with proper lot grading to convey runoff and minor flows, as well as direct major flows within City right-of-way.

Ditches and swales are to be incorporated into road designs.

### **3.4.16 Inlet and Outlet Structures**

The Standard Detail Drawings shall be used as a guide for designing inlet and outlet structures for storm sewers and culverts. Structures that vary from the standard drawings shall include specific structural design with details shown on the drawings.

Design of inlet and outlet structures is to include consideration of energy dissipation and erosion control. Outlets for culverts and storm sewers having discharge velocities greater than 1.0 m/s require evaluation of the downstream channel. Rip-rap or an approved energy dissipating structure may be required to control erosion.

A trash screen/safety grillage is required at the entrance to every permanent storm sewer or culvert over 450 mm diameter or greater than 30 m in length (except large culverts over 1200 mm diameter). Grating with vertical bars, spaced no more than 150 mm apart, shall be installed and fixed in the form of a gate with adequate means for locking in a closed position. Provision for opening or removal of the gate for cleaning or replacing the bars is required. Gratings shall be designed to break away under extreme hydraulic loads in the case of blockage.

Outfalls located in parks, ravines or on river banks should be aesthetically pleasing and safe. The appearance of these structures is important and cosmetic treatment or concealment shall be part of the design.

Guard-rails or fences made of corrosion resistant material shall be installed along concrete headwalls and wing walls to provide protection against persons inadvertently falling over the wall.

A storm sewer inlet from a ditch shall have a minimum diameter of 450 mm.

### 3.4.17 Flow Control Structures

For the design of flow control of storage facilities, riparian diversions and trunk sewer diversions, the orifice and weir equations may be used.

#### Orifice Equation:

$$Q = CA(2gh)^{0.5}$$

Where, Q = Desired Release flow (m<sup>3</sup>/s)

A = Area of Orifice (m<sup>2</sup>)

g = Acceleration due to Gravity (m/s<sup>2</sup>)

h = Net Head on the Orifice Plate (m)

C = Coefficient of Discharge (0.62 for sharp or square edged orifices)

The minimum orifice size shall be 100 mm in diameter. Where smaller orifices are required, special provisions are required to prevent blockage. These special provisions shall be clearly marked on the design drawings.

#### Weir Equation:

$$Q = CLH^{1.5}$$

Where, Q = Desired Release flow (m<sup>3</sup>/s)

C = Coefficient of Discharge (0.62 for sharp or square edged orifice)

L = Effective Length of Weir Crest (m)

H = Total Head on Crest (m)

Flow control manholes shall be a minimum of 1200 mm diameter to provide for access and maintenance. The design of a flow control structure will include provision for safe conveyance of overflows.

### 3.4.18 Ditch Enclosure

Roadside ditch enclosures will be replaced with an approved storm sewer system:

- a) To provide access to adjacent municipal or private property;
- b) To meet safety needs; or
- c) To meet community objectives if the ditch is classified as Class C or D under the City's Watercourse Classification System.

Open ditches along local streets in Queensborough are required to be enclosed with an engineered storm drainage system unless otherwise specified by the Director of Engineering.

For Class B and higher classification watercourses, input from qualified environmental professionals and authorization from regulatory agencies will be required.

The design of the storm sewer system must provide compensation for lost storage volume resulting from the enclosure and ensure that there is no negative impact to upstream private or municipal property or infrastructure. Water surface profiles and hydraulic grade lines within the ditch in the vicinity of the proposed enclosure shall be shown on the design drawings.

### **3.4.19 Major Flow Routes**

Unless the storm sewer system is oversized to accommodate the major flow (i.e. 1:100 year return frequency storm), overland major flow routing is required. The major flow routing will normally be provided along roadways, culvert crossings and watercourses. In some cases the major flow may be carried alongside the road in swales or across side and rear of lots. These designated flow paths shall be protected by restrictive covenants or statutory rights-of-way and clearly identified in the Stormwater Management Plans.

The quantity of flow to be conveyed by the surface flow path is the total overland flow minus the capacity of the piped system. The major flow routing shall be designed to ensure public safety and to minimize property damage under the major flow conditions.

Urban roadways with curbs and gutters can be designed as wide shallow channels to convey overland major flow. The maximum depths of flow shall not exceed 140 mm above the gutter line.

The design of intersections shall ensure that the surface flow can continue along the designated path crossing over lateral streets. Similar considerations are required if a change of direction is required at an intersection.

Flooding will not be permitted on private properties except in flow channels in municipal rights-of-way.

Flow capacity of the overland flow routes can be calculated using the Manning formula presented in Section 3.3.3. Typical values of the Manning's roughness coefficient "n" are:

- 0.018 for paved roadway
- 0.030 for grassed boulevards and swales;
- 0.040 to 0.100 for irregular or treed channels.

All habitable areas of buildings, including basements, shall be above the 1:100 year HGL, except where specific flood proofing measures to eliminate backwater effects from the downstream City system have been incorporated.

In special circumstances, or to accommodate low building elevations, the minor storm drainage system may be enlarged or supplemented to accommodate major flows, subject to the approval by the Director of Engineering.

### **3.5 Stormwater Runoff Rate Controls**

Stormwater runoff controls are required to meet the objectives of the Citywide ISMP. Proper operations and maintenance of the on-site and off-site systems are required to ensure the long-term effectiveness of these controls.

- For on-site facilities (typically located within multi-family residential and non-residential sites), registered covenants for proper maintenance by the Owner is required to the satisfaction of the Director of Engineering.
- For off-site facilities (public lands, road right-of-ways and parks), operation and maintenance is the responsibility of the City.

Detention storage facilities to control discharge rates include:

- On-line control where the flow path is within the storage facility; and
- Off-line control where the storage facility is separate from the normal flow path and is filled by overflow during severe event.

Refer to the *New Westminster Citywide ISMP Volume II, Best Management Practice Toolkit* for specific onsite stormwater management facility options and design guidelines. Off-site runoff control facility options and design guidelines are provided in the section below.

Large storage facilities shall include provisions for discharges rates greater than design release rates. Rapid drawdown of the water level may be necessary for emergency purposes or to restore the available storage to accommodate subsequent storm events.

#### **3.5.1 Off-Site Detention Storage Facilities**

##### **a) Underground Storage**

Underground storage can be provided with subsurface tanks or oversized pipes with outlet controls. Storage facilities may be on-line or off-line. Cross sections, inlet and outlet locations and maintenance access shall be designed to minimize maintenance requirements.

Structural design is required to accommodate anticipated traffic loads and groundwater pressure.

Runoff controls are required to meet the objectives indicated in previous sections.

##### **b) Dry Detention Ponds**



Dry ponds are intended to provide storage only during severe storm events. They may be on-line or off-line and are generally located off-site. Dry Ponds shall accommodate active recreational uses. Overflow elevations shall be designed below adjacent MBE's.

Design details, other than discharge rates, should be in accordance with current technologies as outlined in *Land Development Guidelines for Protection of Aquatic Habitat* (Canada/BC), and related documents.

#### c) Wet Detention Ponds

Wet ponds are intended to provide on-line detention storage and maintain a permanent minimum water level year round. They are generally located off-site.

A wet pond shall have a minimum tributary catchment area of 20 ha to limit number of ponds and also to ensure sufficient base flows to sustain wet storage without the pond becoming stagnant.

Overflow elevations shall be designed below adjacent MBE's.

Design details other than discharge rates should be in accordance with current technologies as outlined in *Land Development Guidelines for Protection of Aquatic Habitat* (Canada/BC), and related documents.

### 3.5.2 Outlet Controls

Outlet controls for storage facilities may be designed using the standard orifice and weir equations provided in Section 3.4.17.

Provisions to accommodate higher discharges will involve oversizing the fixed openings and sewers connected to the outlet control structure. Adjustable mechanisms such as slide gates or removable orifice plates can be used to regulate design release rates. The extent of the oversizing will depend on the capacity of the downstream drainage system.

The access to the outlet control structures shall be provided with access hatches with lock.

## 3.6 Stormwater Quality and Volume Controls

Stormwater quality and volume control will typically be provided onsite at or near the source. Refer to the *New Westminster Citywide ISMP Volume II, Best Management Practice Toolkit* for specific onsite stormwater management facility options and design guidelines. A number of additional stormwater quality control measures are also listed herein.

#### Stormwater Quality Source Control Criteria

- a) **Single Family, Duplex and Triplex Residential Area:** Treat 28 mm rainfall in 24 hours.

Ground level paved surfaces (including driveways, patios and walkways) shall:

- Drain to vegetation area with deep (450 mm) absorbent soils;
- Use pervious paving; or
- Collect and drain runoff through a sump prior to discharge to the City storm sewer system.

- b) **All other lands uses and streets:** Treat 50 mm rainfall in 24 hours from impervious areas with appropriate Best Management Practices (BMP's) in consultation with the City. Rate of discharge will not be greater than required to provide suitable hydraulic retention time as to maximize the effectiveness of the specific BMP.

#### Stormwater Volume Reduction Criteria

- c) Capture the first 25 mm to 50 mm rainfall in 24 hours onsite. Volume reduction targets vary depending on land use type and receiving water as per the Citywide ISMP.

#### Stormwater Detention and Rate Control Criteria

- d) "Large Scale Developments": Use detention and/or other best practices to reduce post development runoff rates as per the rate control targets set for different areas in the Citywide ISMP.

### **3.6.1 Roof Drainage**

Roof runoff for all new dwellings is encouraged to be harvested and reused such as discharging to on-site absorbent landscape areas via downspout splash pads. Disconnected roof drainage will be subject to an approval process and only in neighbourhoods with foundation drains at buildings.

In cases where roof drainage is directed to the ground surface, water quality and volume reduction targets will apply to the roof drainage. The use of deep absorbent soils and/or properly sized rain gardens for infiltration of the small and large storm events shall be considered with provision for safe conveyance of extreme storm overflow from private property to the public major drainage flow path.

Where discharge of roof leaders to splash pads is not feasible, roof drainage may be discharged into the City drainage system at the discretion of the Director of Engineering if the proposed or existing storm sewer can be shown to accommodate the anticipated flows. The roof leaders shall be connected directly to the storm service connection at the property line. Roof leaders shall not be connected to foundation drains.

### **3.6.2 Oil and Grit Separators**

Oil and grit separators are used to remove coarse sediments and capture oil from surface runoff. They shall be provided by the Owner to service parking lots, multi-family residential, commercial, institutional and industrial sites as well as other hard surfaces.

The Consulting Engineer is responsible to select an appropriate type of separator to suit each application. The location for installations shall be accessible for cleaning and inspection.

Design details shall be provided by the product supplier or the Consulting Engineer for approval by the Director of Engineering.

### **3.6.3 Coalescing Plate Oil Separator**

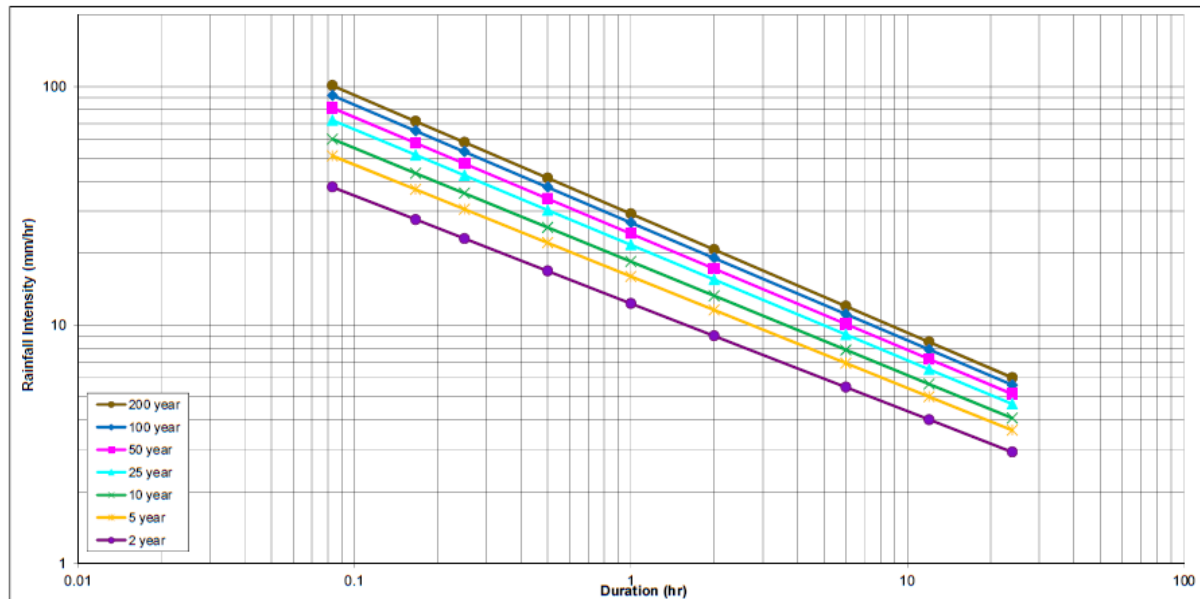
Where requested by the Director of Engineering, at sites likely to generate high concentrations of oil for sustained periods (generally > 20 mg/L) such as gasoline service stations, vehicle maintenance yards and industrial areas, a coalescing plate oil separator shall be installed. These units are oil and grit separators with the addition of coalescing plate packs to significantly enhance oil capture capabilities.

TABLE 3.2: STORM SEWER DESIGN - RATIONAL METHOD (TEMPLATE)

[illegible]

NEW WESTMINSTER RAINFALL INTENSITY DATA

FIGURE 3.1: CURRENT (2016) CLIMATE RAINFALL INTENSITY - DURATION FREQUENCY CURVE  
RAINFALL ZONE 4 DIMENSIONLESS IDF CURVE WITH SELECTED PEAK INDEX RAINS FOR NEW WESTMINSTER  
DATA FROM STUDY OF THE IMPACTS OF CLIMATE CHANGE ON PRECIPITATION AND STORMWATER MANAGEMENT (AUG 2018)



RAINFALL INTENSITY-DURATION FREQUENCY INTERPOLATION EQUATION

IDF EQUATION PARAMETERS	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
	Coefficient A	12.306	15.995	18.445	21.688	24.161	26.882
Exponent B	-0.452	-0.468	-0.476	-0.484	-0.488	-0.494	-0.498

$I = A \cdot T^B$  (I = intensity in mm/h, T = storm duration in hours)

RAINFALL INTENSITY-DURATION FREQUENCY VALUES (All Duration)  
COMPUTED FROM THE INTERPOLATION EQUATION

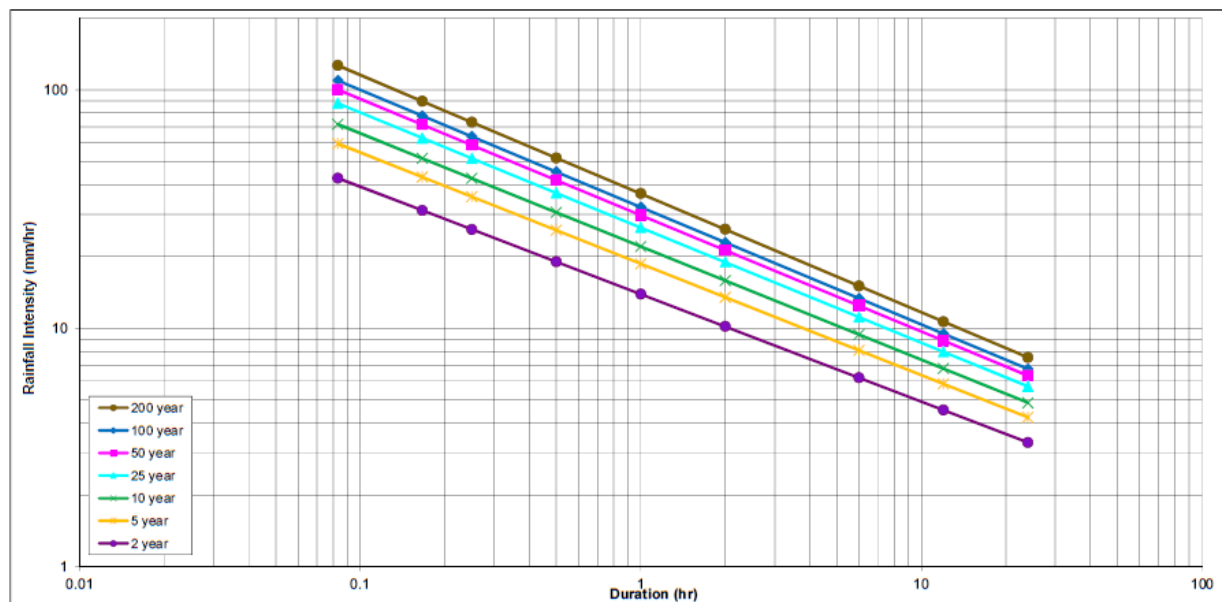
DURATION	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
Rainfall Intensity (mm/hr)							
5 min	37.8	51.2	60.2	72.2	81.2	91.7	100.9
10 min	27.7	37.0	43.3	51.6	57.9	65.1	71.4
15 min	23.0	30.6	35.7	42.4	47.5	53.3	58.4
30 min	16.8	22.1	25.7	30.3	33.9	37.9	41.3
1 h	12.3	16.0	18.4	21.7	24.2	26.9	29.3
2 h	9.0	11.6	13.3	15.5	17.2	19.1	20.7
6 h	5.5	6.9	7.9	9.1	10.1	11.1	12.0
12 h	4.0	5.0	5.7	6.5	7.2	7.9	8.5
24 h	2.9	3.6	4.1	4.7	5.1	5.6	6.0

RETURN PERIOD DESIGN RAINFALL AMOUNTS (All Duration)

DURATION	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
Rainfall Amount (mm)							
1h	12.3	16.0	18.4	21.7	24.2	26.9	29.3
2 h	18.0	23.1	26.5	31.0	34.5	38.2	41.4
6 h	32.9	41.5	47.2	54.7	60.5	66.6	71.9
12 h	48.0	60.0	67.8	78.2	86.2	94.5	101.9
24 h	70.2	86.7	97.5	111.8	123.0	134.2	144.3

NEW WESTMINSTER RAINFALL INTENSITY DATA

FIGURE 3.2: FUTURE 2050 CLIMATE RAINFALL INTENSITY - DURATION FREQUENCY CURVE  
WITH ZONE 4 DELTA CHANGES FOR 2050 MODERATE CLIMATE CHANGE SCENARIO  
DATA FROM STUDY OF THE IMPACTS OF CLIMATE CHANGE ON PRECIPITATION AND STORMWATER MANAGEMENT (AUG 2018)



RAINFALL INTENSITY-DURATION FREQUENCY INTERPOLATION EQUATION

IDF EQUATION PARAMETERS	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
Coefficient A	13.894	18.636	22.024	26.430	29.781	32.202	36.692
Exponent B	-0.451	-0.467	-0.475	-0.483	-0.488	-0.492	-0.498

$$I = A \cdot T^B \quad (I = \text{intensity in mm/h, } T = \text{storm duration in hours})$$

RAINFALL INTENSITY-DURATION FREQUENCY VALUES (All Duration)  
COMPUTED FROM THE INTERPOLATION EQUATION

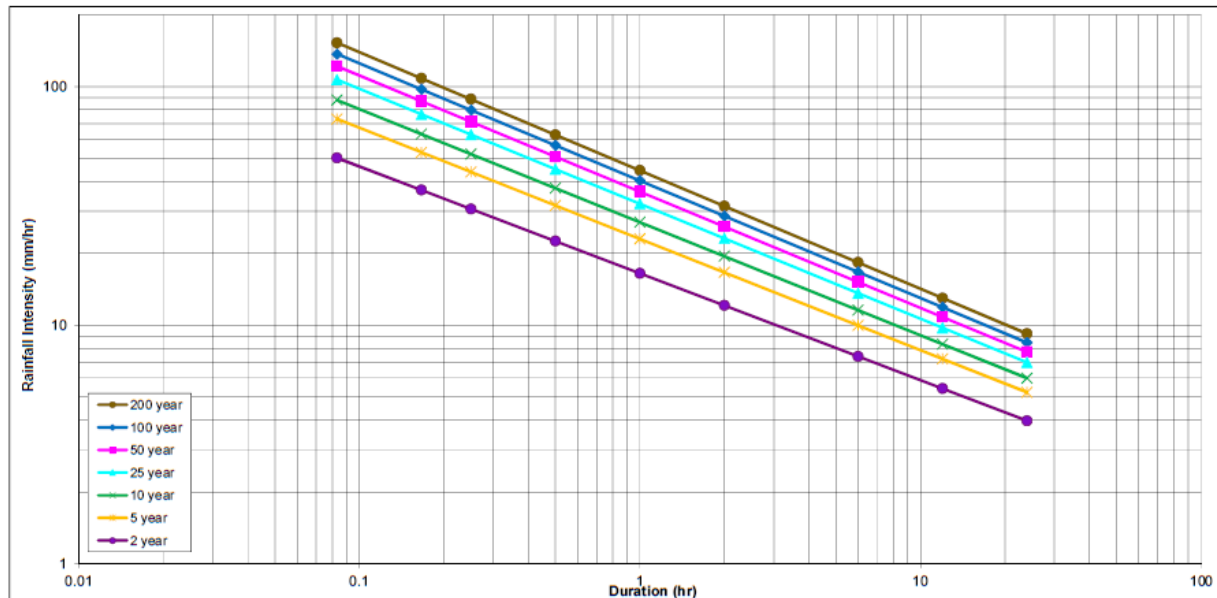
DURATION	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
Rainfall Intensity (mm/hr)							
5 min	42.6	59.5	71.7	87.8	100.1	109.4	126.5
10 min	31.2	43.0	51.6	62.8	71.4	77.8	89.6
15 min	26.0	35.6	42.5	51.6	58.6	63.7	73.2
30 min	19.0	25.8	30.6	36.9	41.8	45.3	51.8
1 h	13.9	18.6	22.0	26.4	29.8	32.2	36.7
2 h	10.2	13.5	15.8	18.9	21.2	22.9	26.0
6 h	6.2	8.1	9.4	11.1	12.4	13.3	15.0
12 h	4.5	5.8	6.8	8.0	8.9	9.5	10.6
24 h	3.3	4.2	4.9	5.7	6.3	6.7	7.5

RETURN PERIOD DESIGN RAINFALL AMOUNTS (All Duration)

DURATION	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
Rainfall Amount (mm)							
1h	13.9	18.6	22.0	26.4	29.8	32.2	36.7
2 h	20.3	27.0	31.7	37.8	42.5	45.8	52.0
6 h	37.2	48.4	56.4	66.7	74.5	80.0	90.2
12 h	54.4	70.1	81.2	95.5	106.3	113.8	127.7
24 h	79.5	101.4	116.8	136.7	151.6	161.8	180.9

NEW WESTMINSTER RAINFALL INTENSITY DATA

FIGURE 3.3: FUTURE 2100 CLIMATE RAINFALL INTENSITY - DURATION FREQUENCY CURVE  
WITH ZONE 4 DELTA CHANGES FOR 2100 MODERATE CLIMATE CHANGE SCENARIO  
DATA FROM STUDY OF THE IMPACTS OF CLIMATE CHANGE ON PRECIPITATION AND STORMWATER MANAGEMENT (AUG 2018)



RAINFALL INTENSITY-DURATION FREQUENCY INTERPOLATION EQUATION

IDF EQUATION PARAMETERS	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
Coefficient A	16.493	22.981	27.015	32.257	36.257	40.330	44.490
Exponent B	-0.448	-0.466	-0.474	-0.482	-0.487	-0.492	-0.496

$I = A \cdot T^B$  (I = intensity in mm/h, T = storm duration in hours)

RAINFALL INTENSITY-DURATION FREQUENCY VALUES (All Duration)  
COMPUTED FROM THE INTERPOLATION EQUATION

DURATION	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
Rainfall Intensity (mm/hr)							
5 min	50.2	73.2	87.7	106.9	121.6	137.0	152.6
10 min	36.8	53.0	63.2	76.5	86.8	97.4	108.2
15 min	30.7	43.8	52.1	62.9	71.2	79.8	88.5
30 min	22.5	31.7	37.5	45.1	50.8	56.7	62.7
1 h	16.5	23.0	27.0	32.3	36.3	40.3	44.5
2 h	12.1	16.6	19.4	23.1	25.9	28.7	31.5
6 h	7.4	10.0	11.6	13.6	15.2	16.7	18.3
12 h	5.4	7.2	8.3	9.7	10.8	11.9	13.0
24 h	4.0	5.2	6.0	7.0	7.7	8.4	9.2

RETURN PERIOD DESIGN RAINFALL AMOUNTS (All Duration)

DURATION	RETURN PERIOD						
	2 year	5 year	10 year	25 year	50 year	100 year	200 year
Rainfall Amount (mm)							
1h	16.5	23.0	27.0	32.3	36.3	40.3	44.5
2 h	24.2	33.3	38.9	46.2	51.7	57.4	63.1
6 h	44.3	59.8	69.3	81.6	90.9	100.2	109.8
12 h	65.0	86.6	99.8	116.9	129.7	142.5	155.7
24 h	95.3	125.4	143.7	167.3	185.1	202.7	220.7

**TABLE 3.4: NEW WESTMINSTER DESIGN STORM**  
**1:2-Year Design Storms - CURRENT CLIMATE**

1-Hour Storm		2-Hour Storm		6-Hour Storm		12-Hour Storm		24-Hour Storm	
Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)
0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5	7.38	5	5.40	10	3.95	10	1.21	20	1.36
10	8.86	10	5.40	20	3.95	20	1.21	40	1.41
15	13.29	15	6.48	30	3.95	30	1.21	60	1.41
20	13.29	20	6.48	40	4.61	40	2.42	80	1.76
25	14.77	25	9.71	50	4.61	50	2.42	100	1.76
30	16.25	30	9.71	60	4.61	60	2.42	120	1.76
35	20.67	35	9.71	70	5.91	70	2.91	140	2.11
40	16.25	40	9.71	80	5.91	80	2.91	160	2.11
45	11.81	45	10.81	90	5.91	90	2.91	180	2.11
50	10.35	50	10.81	100	5.26	100	3.39	200	2.45
55	8.86	55	11.87	110	5.23	110	3.39	220	2.45
60	5.90	60	11.87	120	5.26	120	3.39	240	2.45
		65	15.11	130	5.26	130	4.35	260	3.15
		70	15.11	140	5.23	140	4.35	280	3.15
		75	11.87	150	5.26	150	4.35	300	3.15
		80	11.87	160	7.89	160	5.81	320	4.22
		85	8.64	170	7.89	170	5.81	340	4.22
		90	8.64	180	7.89	180	5.81	360	4.22
		95	7.55	190	5.91	190	8.23	380	5.97
		100	7.55	200	5.91	200	8.23	400	5.97
		105	6.48	210	5.91	210	8.23	420	5.97
		110	6.48	220	5.91	220	10.17	440	7.37
		115	4.32	230	5.91	230	10.17	460	7.37
		120	4.32	240	5.91	240	10.17	480	7.37
				250	5.91	250	7.74	500	5.61
				260	5.91	260	7.74	520	5.61
				270	5.91	270	7.74	540	5.61
				280	5.26	280	6.29	560	4.56
				290	5.25	290	6.29	580	4.56
				300	5.26	300	6.29	600	4.56
				310	5.26	310	5.81	620	4.22
				320	5.23	320	5.81	640	4.22
				330	5.26	330	5.81	660	4.22
				340	4.61	340	4.84	680	3.51
				350	4.61	350	4.84	700	3.51
				360	4.61	360	4.84	720	3.51
						370	3.87	740	2.81
						380	3.87	760	2.81
						390	3.87	780	2.81
						400	4.35	800	3.15
						410	4.35	820	3.15
						420	4.35	840	3.15
						430	2.91	860	2.11
						440	2.91	880	2.11
						450	2.91	900	2.11
						460	3.87	920	2.81
						470	3.87	940	2.81
						480	3.87	960	2.81
						490	2.91	980	2.11
						500	2.91	1000	2.11
						510	2.91	1020	2.11
						520	2.42	1040	1.76
						530	2.42	1060	1.76
						540	2.42	1080	1.76
						550	1.94	1100	1.41
						560	1.94	1120	1.41
						570	1.94	1140	1.41
						580	2.42	1160	1.76
						590	2.42	1180	1.76
						600	2.42	1200	1.76
						610	1.94	1220	1.41
						620	1.94	1240	1.41
						630	1.94	1260	1.41
						640	1.94	1280	1.41
						650	1.94	1300	1.41
						660	1.94	1320	1.41
						670	2.42	1340	1.76
						680	2.42	1360	1.76
						690	2.42	1380	1.76
						700	1.94	1400	1.41
						710	1.94	1420	1.41
						720	1.94	1440	1.41
Total Rain (mm)	12.31		17.99		32.85		48.03		70.22



**TABLE 3.5: NEW WESTMINSTER DESIGN STORM**  
**1:5-Year Design Storms - CURRENT CLIMATE**

1-Hour Storm		2-Hour Storm		6-Hour Storm		12-Hour Storm		24-Hour Storm	
Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)
0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5	9.60	5	6.94	10	4.99	10	1.51	20	1.68
10	11.52	10	6.94	20	4.99	20	1.51	40	1.74
15	17.27	15	8.33	30	4.99	30	1.51	60	1.74
20	17.27	20	8.33	40	5.82	40	3.02	80	2.18
25	19.19	25	12.48	50	5.82	50	3.02	100	2.18
30	21.12	30	12.48	60	5.82	60	3.02	120	2.18
35	26.87	35	12.48	70	7.46	70	3.63	140	2.60
40	21.12	40	12.48	80	7.46	80	3.63	160	2.60
45	15.34	45	13.90	90	7.46	90	3.63	180	2.60
50	13.45	50	13.90	100	6.65	100	4.23	200	3.03
55	11.52	55	15.26	110	6.60	110	4.23	220	3.03
60	7.67	60	15.26	120	6.65	120	4.23	240	3.03
		65	19.42	130	6.65	130	5.44	260	3.89
		70	19.42	140	6.60	140	5.44	280	3.89
		75	15.26	150	6.65	150	5.44	300	3.89
		80	15.26	160	9.96	160	7.25	320	5.21
		85	11.11	170	9.96	170	7.25	340	5.21
		90	11.11	180	9.96	180	7.25	360	5.21
		95	9.70	190	7.46	190	10.28	380	7.37
		100	9.70	200	7.46	200	10.28	400	7.37
		105	8.33	210	7.46	210	10.28	420	7.37
		110	8.33	220	7.46	220	12.70	440	9.11
		115	5.55	230	7.46	230	12.70	460	9.11
		120	5.55	240	7.46	240	12.70	480	9.11
				250	7.46	250	9.67	500	6.93
				260	7.46	260	9.67	520	6.93
				270	7.46	270	9.67	540	6.93
				280	6.65	280	7.85	560	5.64
				290	6.64	290	7.85	580	5.64
				300	6.65	300	7.85	600	5.64
				310	6.65	310	7.25	620	5.21
				320	6.60	320	7.25	640	5.21
				330	6.65	330	7.25	660	5.21
				340	5.82	340	6.05	680	4.34
				350	5.82	350	6.05	700	4.34
				360	5.82	360	6.05	720	4.34
						370	4.83	740	3.47
						380	4.83	760	3.47
						390	4.83	780	3.47
						400	5.44	800	3.89
						410	5.44	820	3.89
						420	5.44	840	3.89
						430	3.63	860	2.60
						440	3.63	880	2.60
						450	3.63	900	2.60
						460	4.83	920	3.47
						470	4.83	940	3.47
						480	4.83	960	3.47
						490	3.63	980	2.60
						500	3.63	1000	2.60
						510	3.63	1020	2.60
						520	3.02	1040	2.18
						530	3.02	1060	2.18
						540	3.02	1080	2.18
						550	2.42	1100	1.74
						560	2.42	1120	1.74
						570	2.42	1140	1.74
						580	3.02	1160	2.18
						590	3.02	1180	2.18
						600	3.02	1200	2.18
						610	2.42	1220	1.74
						620	2.42	1240	1.74
						630	2.42	1260	1.74
						640	2.42	1280	1.74
						650	2.42	1300	1.74
						660	2.42	1320	1.74
						670	3.02	1340	2.18
						680	3.02	1360	2.18
						690	3.02	1380	2.18
						700	2.42	1400	1.74
						710	2.42	1420	1.74
						720	2.42	1440	1.74
Total Rain (mm)	16.00		23.13		41.49		59.99		86.75

**TABLE 3.6: NEW WESTMINSTER DESIGN STORMS**  
**1:10-Year Design Storms - CURRENT CLIMATE**

1-Hour Storm		2-Hour Storm		6-Hour Storm		12-Hour Storm		24-Hour Storm	
Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)
0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5	11.07	5	7.96	10	5.67	10	1.71	20	1.89
10	13.29	10	7.96	20	5.67	20	1.71	40	1.95
15	19.91	15	9.55	30	5.67	30	1.71	60	1.95
20	19.91	20	9.55	40	6.61	40	3.41	80	2.45
25	22.13	25	14.32	50	6.61	50	3.41	100	2.45
30	24.35	30	14.32	60	6.61	60	3.41	120	2.45
35	30.98	35	14.32	70	8.49	70	4.11	140	2.93
40	24.35	40	14.32	80	8.49	80	4.11	160	2.93
45	17.69	45	15.94	90	8.49	90	4.11	180	2.93
50	15.51	50	15.94	100	7.56	100	4.79	200	3.41
55	13.29	55	17.50	110	7.50	110	4.79	220	3.41
60	8.85	60	17.50	120	7.56	120	4.79	240	3.41
		65	22.27	130	7.56	130	6.15	260	4.37
		70	22.27	140	7.50	140	6.15	280	4.37
		75	17.50	150	7.56	150	6.15	300	4.37
		80	17.50	160	11.33	160	8.20	320	5.86
		85	12.74	170	11.33	170	8.20	340	5.86
		90	12.74	180	11.33	180	8.20	360	5.86
		95	11.13	190	8.49	190	11.63	380	8.29
		100	11.13	200	8.49	200	11.63	400	8.29
		105	9.55	210	8.49	210	11.63	420	8.29
		110	9.55	220	8.49	220	14.36	440	10.24
		115	6.36	230	8.49	230	14.36	460	10.24
		120	6.36	240	8.49	240	14.36	480	10.24
				250	8.49	250	10.93	500	7.79
				260	8.49	260	10.93	520	7.79
				270	8.49	270	10.93	540	7.79
				280	7.56	280	8.88	560	6.34
				290	7.54	290	8.88	580	6.34
				300	7.56	300	8.88	600	6.34
				310	7.56	310	8.20	620	5.86
				320	7.50	320	8.20	640	5.86
				330	7.56	330	8.20	660	5.86
				340	6.61	340	6.84	680	4.88
				350	6.61	350	6.84	700	4.88
				360	6.61	360	6.84	720	4.88
						370	5.47	740	3.90
						380	5.47	760	3.90
						390	5.47	780	3.90
						400	6.15	800	4.37
						410	6.15	820	4.37
						420	6.15	840	4.37
						430	4.11	860	2.93
						440	4.11	880	2.93
						450	4.11	900	2.93
						460	5.47	920	3.90
						470	5.47	940	3.90
						480	5.47	960	3.90
						490	4.11	980	2.93
						500	4.11	1000	2.93
						510	4.11	1020	2.93
						520	3.41	1040	2.45
						530	3.41	1060	2.45
						540	3.41	1080	2.45
						550	2.73	1100	1.95
						560	2.73	1120	1.95
						570	2.73	1140	1.95
						580	3.41	1160	2.45
						590	3.41	1180	2.45
						600	3.41	1200	2.45
						610	2.73	1220	1.95
						620	2.73	1240	1.95
						630	2.73	1260	1.95
						640	2.73	1280	1.95
						650	2.73	1300	1.95
						660	2.73	1320	1.95
						670	3.41	1340	2.45
						680	3.41	1360	2.45
						690	3.41	1380	2.45
						700	2.73	1400	1.95
						710	2.73	1420	1.95
						720	2.73	1440	1.95
Total Rain (mm)	18.45		26.52		47.17		67.82		97.52

**TABLE 3.7: NEW WESTMINSTER DESIGN STORMS**  
**1:25-Year Design Storms - CURRENT CLIMATE**

1-Hour Storm		2-Hour Storm		6-Hour Storm		12-Hour Storm		24-Hour Storm	
Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)
0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5	13.01	5	9.30	10	6.57	10	1.97	20	2.17
10	15.62	10	9.30	20	6.57	20	1.97	40	2.24
15	23.42	15	11.17	30	6.57	30	1.97	60	2.24
20	23.42	20	11.17	40	7.67	40	3.93	80	2.81
25	26.03	25	16.74	50	7.67	50	3.93	100	2.81
30	28.64	30	16.74	60	7.67	60	3.93	120	2.81
35	36.43	35	16.74	70	9.84	70	4.73	140	3.36
40	28.64	40	16.74	80	9.84	80	4.73	160	3.36
45	20.81	45	18.64	90	9.84	90	4.73	180	3.36
50	18.23	50	18.64	100	8.76	100	5.52	200	3.91
55	15.62	55	20.47	110	8.70	110	5.52	220	3.91
60	10.40	60	20.47	120	8.76	120	5.52	240	3.91
		65	26.04	130	8.76	130	7.08	260	5.01
		70	26.04	140	8.70	140	7.08	280	5.01
		75	20.47	150	8.76	150	7.08	300	5.01
		80	20.47	160	13.13	160	9.45	320	6.71
		85	14.89	170	13.13	170	9.45	340	6.71
		90	14.89	180	13.13	180	9.45	360	6.71
		95	13.01	190	9.84	190	13.40	380	9.50
		100	13.01	200	9.84	200	13.40	400	9.50
		105	11.17	210	9.84	210	13.40	420	9.50
		110	11.17	220	9.84	220	16.55	440	11.74
		115	7.44	230	9.84	230	16.55	460	11.74
		120	7.44	240	9.84	240	16.55	480	11.74
				250	9.84	250	12.60	500	8.93
				260	9.84	260	12.60	520	8.93
				270	9.84	270	12.60	540	8.93
				280	8.76	280	10.23	560	7.26
				290	8.74	290	10.23	580	7.26
				300	8.76	300	10.23	600	7.26
				310	8.76	310	9.45	620	6.71
				320	8.70	320	9.45	640	6.71
				330	8.76	330	9.45	660	6.71
				340	7.67	340	7.88	680	5.59
				350	7.67	350	7.88	700	5.59
				360	7.67	360	7.88	720	5.59
						370	6.30	740	4.48
						380	6.30	760	4.48
						390	6.30	780	4.48
						400	7.08	800	5.01
						410	7.08	820	5.01
						420	7.08	840	5.01
						430	4.73	860	3.36
						440	4.73	880	3.36
						450	4.73	900	3.36
						460	6.30	920	4.48
						470	6.30	940	4.48
						480	6.30	960	4.48
						490	4.73	980	3.36
						500	4.73	1000	3.36
						510	4.73	1020	3.36
						520	3.93	1040	2.81
						530	3.93	1060	2.81
						540	3.93	1080	2.81
						550	3.15	1100	2.24
						560	3.15	1120	2.24
						570	3.15	1140	2.24
						580	3.93	1160	2.81
						590	3.93	1180	2.81
						600	3.93	1200	2.81
						610	3.15	1220	2.24
						620	3.15	1240	2.24
						630	3.15	1260	2.24
						640	3.15	1280	2.24
						650	3.15	1300	2.24
						660	3.15	1320	2.24
						670	3.93	1340	2.81
						680	3.93	1360	2.81
						690	3.93	1380	2.81
						700	3.15	1400	2.24
						710	3.15	1420	2.24
						720	3.15	1440	2.24
Total Rain (mm)	21.69		31.01		54.67		78.18		111.79

**TABLE 3.8: NEW WESTMINSTER DESIGN STORMS**  
**1:100-Year Design Storms - CURRENT CLIMATE**

1-Hour Storm		2-Hour Storm		6-Hour Storm		12-Hour Storm		24-Hour Storm	
Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)	Time (min)	Intensity (mm/hr)
0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5	16.13	5	11.45	10	8.00	10	2.38	20	2.61
10	19.36	10	11.45	20	8.00	20	2.38	40	2.69
15	29.02	15	13.74	30	8.00	30	2.38	60	2.69
20	29.02	20	13.74	40	9.33	40	4.76	80	3.37
25	32.26	25	20.61	50	9.33	50	4.76	100	3.37
30	35.49	30	20.61	60	9.33	60	4.76	120	3.37
35	45.15	35	20.61	70	11.97	70	5.72	140	4.03
40	35.49	40	20.61	80	11.97	80	5.72	160	4.03
45	25.79	45	22.94	90	11.97	90	5.72	180	4.03
50	22.60	50	22.94	100	10.66	100	6.67	200	4.69
55	19.36	55	25.20	110	10.59	110	6.67	220	4.69
60	12.89	60	25.20	120	10.66	120	6.67	240	4.69
		65	32.06	130	10.66	130	8.56	260	6.02
		70	32.06	140	10.59	140	8.56	280	6.02
		75	25.20	150	10.66	150	8.56	300	6.02
		80	25.20	160	15.98	160	11.43	320	8.06
		85	18.33	170	15.98	170	11.43	340	8.06
		90	18.33	180	15.98	180	11.43	360	8.06
		95	16.02	190	11.97	190	16.20	380	11.41
		100	16.02	200	11.97	200	16.20	400	11.41
		105	13.74	210	11.97	210	16.20	420	11.41
		110	13.74	220	11.97	220	20.01	440	14.10
		115	9.16	230	11.97	230	20.01	460	14.10
		120	9.16	240	11.97	240	20.01	480	14.10
				250	11.97	250	15.23	500	10.73
				260	11.97	260	15.23	520	10.73
				270	11.97	270	15.23	540	10.73
				280	10.66	280	12.37	560	8.72
				290	10.64	290	12.37	580	8.72
				300	10.66	300	12.37	600	8.72
				310	10.66	310	11.43	620	8.06
				320	10.59	320	11.43	640	8.06
				330	10.66	330	11.43	660	8.06
				340	9.33	340	9.53	680	6.72
				350	9.33	350	9.53	700	6.72
				360	9.33	360	9.53	720	6.72
						370	7.62	740	5.37
						380	7.62	760	5.37
						390	7.62	780	5.37
						400	8.56	800	6.02
						410	8.56	820	6.02
						420	8.56	840	6.02
						430	5.72	860	4.03
						440	5.72	880	4.03
						450	5.72	900	4.03
						460	7.62	920	5.37
						470	7.62	940	5.37
						480	7.62	960	5.37
						490	5.72	980	4.03
						500	5.72	1000	4.03
						510	5.72	1020	4.03
						520	4.76	1040	3.37
						530	4.76	1060	3.37
						540	4.76	1080	3.37
						550	3.81	1100	2.69
						560	3.81	1120	2.69
						570	3.81	1140	2.69
						580	4.76	1160	3.37
						590	4.76	1180	3.37
						600	4.76	1200	3.37
						610	3.81	1220	2.69
						620	3.81	1240	2.69
						630	3.81	1260	2.69
						640	3.81	1280	2.69
						650	3.81	1300	2.69
						660	3.81	1320	2.69
						670	4.76	1340	3.37
						680	4.76	1360	3.37
						690	4.76	1380	3.37
						700	3.81	1400	2.69
						710	3.81	1420	2.69
						720	3.81	1440	2.69
Total Rain (mm)	26.88		38.18		66.56		94.52		134.23



## **BYLAW 8128, 2019**

### **4. SANITARY SEWER SYSTEM**

#### **4.1 General**

Sanitary sewer design shall be prepared by the Consulting Engineer with qualified expertise in sanitary sewer systems. Design criteria only specify the minimum requirements and the Consulting Engineer shall confirm with the City on the design requirements. Sanitary designs shall conform to local government bylaws, regulations, guidelines, policies, regional Liquid Waste Management Plan and federal and provincial statutes.

The Consulting Engineer will need to confirm the following:

- Sewer service catchment boundary
- Planned land uses within the sewer service catchment
- Location of major pumped and gravity facilities
- Location of the future gravity conveyance systems

The presence of an existing municipal sanitary or combined sewer system does not mean, nor imply that the existing system has adequate capacity to accommodate the proposed design flows either adjacent to the site or further downstream, nor does it indicate that the existing system pattern is acceptable to the City. Undersized or inadequate existing sanitary or combined sewer facilities must be upgraded at the Developer's expense to accommodate the appropriate flows as specified herein.

For all new developments, the discharge of storm water into the sanitary system or the combined sewer system is prohibited unless authorized by the Director of Engineering. A separated new storm system shall be provided for the development project.

#### **4.2 Sewage Flow Generation**

##### **4.2.1 Residential**

Residential flow shall be based on 300 L/capita/day x population.

The population is the ultimate saturation population from land use designations in accordance with the Official Community Plan (OCP) and related neighbourhood community plans for the subject catchment area. Refer to General Requirements Section: Design Population by Land Use. All design population assumptions must be approved by the Director of Engineering.

#### 4.2.2 Non-residential

Average Dry Weather Flows (ADWF) for non-residential areas shall be based on specific data related to the development or zoning.

**Table 4.1 Sewage Flows**

Land Use	Average Dry Weather Flow
General Commercial	34,000 litres/ha/day
Office Towers	85,000 litres/ha/day
Industrial	Actual or expected land use with a minimum of 34,000 litres/ha/day
Institutional	
• Hospitals	900 litres / bed/day
• Nursing Homes	681 litres/bed/day
• Schools	90 litres/student
• Other	According to Health Act Guidelines with a minimum of 23,200 L/ha/day

Where sanitary flow from the development is expected to exceed calculated minimum flow from the above table, the actual development parameters shall govern.

#### Separated Sewer Areas

For development within existing areas, the design basis shall be based on the greater of:

- a) flows from the present development combined with anticipated flows for extension of the sewer to both developed and undeveloped lands; and
- b) flows from future development of the catchment area to full OCP density and land-use.

#### Combined Sewer Areas

For combined sewerage area where the proposed development will be discharging into the combined sewer system, the difference between the post-development and pre-development sewage flows must be estimated and the stormwater discharge be reduced by the same amount. Effectively, the increased sanitary flow from the development is offset by reducing the stormwater discharge which ultimately results in the same flow rate as the pre-development conditions entering the sewer system.

Until full separation of combined sewers is completed, the current combined sewer flows upstream and downstream of the subject development is to be used in the sanitary flow calculation, and any designated sanitary sewer systems may operate at a full flow condition (i.e.  $d/D = 0.85$ ) until full sewer separation within the catchment has occurred and all onsite/offsite drainage sources removed.

#### 4.2.3 Design Flow

Sanitary sewers shall be designed to convey the calculated peak sewage flows, including an allowance for inflow and infiltration. The steady-state design flow rate shall be calculated as follows:

$$Q_{\text{design}} = \text{Peak Dry Weather Flow} + \text{Infiltration and Inflow}$$

Where:

$$\begin{aligned} \text{Peak Dry Weather Flow} &= Q_{\text{ADWF}} \times \text{Peaking Factor} + Q_{\text{PUMPED}} \\ Q_{\text{ADWF}} &= \text{Average Dry Weather Flow from all sources upstream} \\ &\quad \text{that is conveyed by gravity} \\ Q_{\text{PUMPED}} &= \text{Peak Wet Weather Pumping Rate from all upstream} \\ &\quad \text{pump stations.} \end{aligned}$$

The total design sewage flow shall be based on the greater of:

- a) ultimate population densities and land use designations as outlined in the Official Community Plan for the entire catchment area, or
- b) planned developments for the entire catchment area.

#### 4.2.4 Peaking Factor

The Peaking Factor will be calculated using the Harmon Equation for the design residential population or equivalent population:

$$\text{Peaking Factor} = 1 + \frac{14}{4 + \sqrt{\frac{\text{Population}}{1000}}}$$

#### 4.2.5 Infiltration

- Mainland area inflow and infiltration allowance is 15,000 litres/ha/day
- Queensborough area inflow and infiltration allowance is 30,000 litres/ha/day.



### 4.3 Sewer System Capacity Review

#### 4.3.1 System Capacity

The Consulting Engineer shall discuss downstream system capacity requirements with the Director of Engineering. If required, the calculation of sufficient capacity of the existing system downstream of the proposed catchment area will be based on modelling results provided by the City at Developer's cost or as otherwise directed by the Director of Engineering.

#### 4.3.2 Hydraulic Analysis

The hydraulic analysis of gravity sewer pipes shall be conducted using the Manning equation under steady-state full flow condition:

Flow Rate

$$Q = \frac{A \cdot R^{\frac{2}{3}} \cdot S^{\frac{1}{2}}}{n}$$

Where:

- Q = full pipe flow in cubic meters per second
- A = cross sectional area of pipe in square metres
- R = hydraulic radius in meters, D/4 (for circular pipes)
- D = inside diameter of pipe in metres
- S = slope of energy grade line in metres/metre of length
- n = Manning coefficient of roughness; 0.013 for all pipes

Force Mains analysis shall be conducted using the Hazen Williams formula:

$$Q = \frac{C \cdot D^{2.63} \cdot S^{0.54}}{278780}$$

Where:

- Q = Rate of flow in L/s
- D = Internal pipe diameter in mm
- S = Slope of hydraulic grade line in m/m
- C = Friction coefficient = 120 for all pipes

### 4.4 Sanitary Sewers and Appurtenances

#### 4.4.1 Flow Velocity

Design velocities for gravity sewers are:

- Minimum 0.6 m/s;
- Maximum 6.0 m/s.

Where design velocities are supercritical or in excess of 3.0 m/s, special provisions shall be made to protect against sewer displacement.

#### **4.4.2 Minimum Sewer Diameter and Grade**

The minimum diameter of sanitary sewers is:

- Gravity sewers: 200mm
- Sewage force mains: 100mm

Sanitary sewers will be designed as open channels with the depth of flow, under maximum design flow condition, not to exceed:

- Up to 450mm diameter: 50% of the internal diameter (e.g.  $d/D=0.5$ )
- 525 mm diameter or larger 70% of the internal diameter (e.g.  $d/D=0.7$ )

For new extensions, no reduction in pipe size will be made for pipes downstream irrespective of grade provided on the pipe unless specifically approved by the Director of Engineering.

Sewers are to be designed with constant grade. Pipes with grades at 15% or greater shall have an anchoring system and scour protection as approved by the Director of Engineering.

The upstream terminal section of sewers may require steeper grade to ensure a self-cleansing velocity under partial flow conditions. The following design minimum grades are acceptable:

- 1.0% if sewer section servicing 6 houses or less,
- 0.6% if sewer section is servicing 7 to 12 houses,
- 0.5% if sewer section is servicing 13 or more houses.

#### **4.4.3 Sanitary Sewer Location**

Sanitary sewers and service connections shall be located within public road rights-of-way. Side or rear yard statutory rights-of-way or easements should be avoided if possible. The location of the sanitary sewer will be in accordance with the Supplementary Detail Drawings - "Typical Roadway Cross Section". If the location shown is impractical, the offset may be varied with the approval of the Director of Engineering but in all cases it shall be located under the road pavement and clear of curbs and gutters.

At least 3.0 m horizontal clearance from water mains shall be maintained. Provincial regulatory separation requirements will govern where sewers are adjacent to or crossing existing or proposed water mains.

Sewers must extend across the full width of each lot to the boundary of the development plan; thus allowing future extension and connection beyond the development where such extension is possible.

Where not technically feasible to locate within a road right-of-way, a sanitary sewer may be located within an open lane or a statutory right-of-way (SROW) if authorized by the Director of Engineering and that:

- g) The open lane meets the minimum requirements of 6.0 m width;
- h) The open lane is capable of supporting maintenance vehicles and equipment access under all weather conditions;
- i) Within a statutory rights-of-way, the Owner must provide unimpeded maintenance vehicles and equipment access under all weather conditions;
- j) Within a statutory rights-of-way, the sewer shall be centred within the registered SROW with a minimum width of 3.0 m, unless the sewer depth exceeds 3.0 m or is combined with a storm sewer, in which case a greater SROW width shall be provided;
- k) There are no service connections or manholes within the SROW; and
- l) The sewer alignment in the lane or SROW is straight.

All-weather vehicular access must be provided to all manholes, inlet structures, inspection chambers and flow control structures.

The elevations of all existing underground utilities crossing the proposed sanitary sewer shall be confirmed in the field and shown on the profile and plan drawings.

Where a new sewer will service existing buildings and existing vacant properties, the crown of the sewer will be at least 1.0m below the basement elevations of the lots to be serviced.

#### **4.4.4 Sewer Depth**

Sanitary sewer depth shall be installed at a depth to:

- Provide gravity service to all properties tributary to the sewer;
- Prevent freezing;
- Accommodate ultimate saturation population from all tributary lands;
- Clear other underground utilities;
- Prevent damage from surface loading;
- Be between 2.0m and 4.5m, from finished ground surface to pipe invert unless otherwise approved by the Director of Engineering.

The Consulting Engineer shall verify that the pipe material and bedding are suitable for the live and dead load imposed on the pipe. In no case shall the cover be less than 0.9m and greater than 6.0 m without the approval of the Director of Engineering.

#### **4.4.5 Curvilinear Sewers**

Pipes are not to be laid on a curve unless authorized by the Director of Engineering.

### **4.5 Manholes**

Manholes are required:

- every change of grade or direction;
- where sewers intersect;
- when pipe sizes change;
- at maximum pipe intervals of 100 m;
- at the end of each sewer line;
- downstream of curved sewers (if a curvilinear sewer is approved by the City); and
- wherever future extensions are anticipated.

Generally, frames and covers should be located outside the vehicular and bicycle wheel path on the roadway.

The inside diameter of manholes shall conform to the City approved edition of the MMCD and the City Supplementary Specifications and Detail Drawings.

A sump manhole is to be provided immediately upstream of any line feeding to a pump station, siphon or forcemain system.

Manholes are required at service connection tie-ins to mains where the service connection size is greater than ½ the diameter of the sewer main or the service connection is 200mm diameter or greater.

Drop manholes will only be used when a new incoming sewer cannot be steepened or where site conditions do not permit excavation to the base of an existing manhole. Outside drop shall be provided where the difference between the inlet and outlet inverts exceeds 600mm. The minimum manhole diameter for inside drop shall be:

- 1200mm diameter manholes for mains 300mm or smaller;
- 1500mm diameter manholes with an inside drop for mains larger than 300mm.

Temporary cleanouts are required where an extension of the sewer, in the future, will provide a manhole at an appropriate spacing.

Manholes shall be designed to incorporate a minimum pipe invert elevation difference of at least 30 mm in addition to the normal grade of the lateral sewer. For alignment deflections in excess of 45 degrees a 60 mm drop shall be provided. The crown elevations of sewers entering a manhole shall not be lower than the crown elevation of the sewer leaving the manhole.

## **4.6 Service Connections**

Each lot will have:

- c) A gravity connection to the frontage sanitary sewer; or
- d) A gravity connection to the sanitary sewer in an open lane, walkway or service corridor with an access road.

Every lot (existing or newly created) capable of being serviced, whether it is vacant or not, shall be provided with a separated service connection. Only one service connection will be provided for each parcel. The service connection shall be installed in accordance with the standard drawings.

The size of service connection shall be designed to accommodate the peak flow rate on the property being served. The minimum diameters shall be 100 mm for single family dwellings and 150mm for all other land uses. The slope shall not less than 2.0% from the property line to the main. Refer to the Supplementary Specifications and Detail Drawings for the location of sanitary sewer connections. No service connection shall be installed on sewers greater than 4.5 m depth unless otherwise approved by the Director of Engineering.

Connections to new mains shall be made with a standard wye fitting. Connections to existing mains may use wye saddle or insertable tee. The service connection centreline must not be below the centreline of the sewer main.

Inspection chambers are required on residential connections. Service connections exceeding 30 m in length shall be designed as sanitary sewers. Manholes are required on service connections larger than 150 mm diameter.

Building elevation and plumbing will be established to allow service connection to function by gravity. Pumped connections may be permitted subject to the approval of the Director of Engineer prior to sewer design with appropriate restrictive covenants provided.

Existing service connections over 40 years old will be replaced in conjunction with the new sewer main installation.

## **4.7 Pumping Stations**

### **4.7.1 General**

Specific requirements and instructions including the defined tributary catchment for pumping stations and forcemains shall be obtained from the Director of Engineering prior to undertaking design. The Consulting Engineer will submit a preliminary design report that addresses the requirements for approval by the Director of Engineering prior to proceeding with detailed design.

The City of New Westminster Engineering Design Criteria (“Design Criteria”) is to be used as a guide to the design process. They provide a general outline of design criteria system requirements and plant and products to maintain uniformity in the City and a guide to designers as to what is likely to be approved. MMCD specifications are to be met at a minimum with this document to overrule and supplement the standard. Good engineering design practice shall be used in the design of sanitary sewage pump stations and sewage forcemains.

Upgrades or modifications to existing wastewater pump stations shall meet these standards to the extent practical. These criteria govern submersible sanitary pump stations. Larger capacity stations or stations with special design criteria may require additional assessment and design criteria.

### **4.7.2 Pump Station Design**

Sewage pump stations will be designed by a Consulting Engineer with specific expertise in pump station design, construction and operations. The design shall satisfy the hydraulic conditions of the planned station in accordance with the City’s Design Criteria, Bylaws and Hydraulic Institute Standards.

Sewage pump stations shall be designed to accommodate the projected peak hour flow rate for existing and future developments.

The Consulting Engineer shall provide system head curve calculations using recommended pipe friction coefficients (C-factor) for both new and aged pipe materials, and for pumping discharge flows at High Water Level (HWL) and Low Water Level (LWL) static conditions. The Consulting Engineer shall confirm that the pump will be suitable for each flow operating condition and shall identify the pumping unit efficiencies for the various operating conditions.

For Total Dynamic Head (TDH) calculations, the Consulting Engineer shall use  $C=120$  (for PVC Pipe) and then recalculate the system curve using a  $C=145$  to ensure adequate motor horsepower and pump characteristics.

Pump/system curves will be shown for individual and combined simultaneous pump operation. The design calculations shall be submitted in the preliminary design report along with all design assumptions, limitations and restrictions.

The Consulting Engineer shall include in the calculations the Net Positive Suction Head Available (NPSHA) as well as the Net Positive Suction Head Required (NPSHR) to assure cavitation will not occur.

#### **4.7.3 Wet Well Configuration**

Pump stations will be a packaged engineered Fibre Reinforced Plastic (FRP) wet well containing duplex (at a minimum) submersible Flygt pumps for a Duty/Standby operation to a safety factor of N+1.

Wet wells will be considered a hazardous environment, as classified in the latest edition of NFPA 820 and designed accordingly.

#### **4.7.4 Pump Station Piping**

The Consulting Engineer will be responsible for designing and/or reviewing the forcemain that the pump station will be discharging to.

The below velocities shall be used as limiting criteria for the design of all pipework.

Pump Discharge Pipes	Minimum Velocity = 1.0 m/s Maximum Velocity = 3.5 m/s
Common Discharge Header	Maximum Velocity = 3.0 m/s
Forcemain pipe	Minimum Velocity = 1.0 m/s Maximum Velocity = 3.0 m

#### **4.7.5 Valves, Valve Chambers and Bypass Chambers**

The pump station will be equipped with an external valve vault/chamber. Isolation valves to be provided on each discharge pipe to permit removal and maintenance of pumps and check valves without affecting the operation of remaining pumps. Isolation valves will be full port (100% opening) plug valves. Check valves will be of the sinking ball type, HDL Model 5087 or approved equivalent. All check valves to be installed on the horizontal and in accordance with the manufacturer's recommendations to suppress water hammer. Clear access is to be provided into the chamber for maintenance. An FRP pre-engineered valve vault with wet well is preferred.

Influent sewers to the wet well will have an isolation valve immediately upstream of pump station. The valve will have a nelson box to house the actuator.

A bypass chamber is required on the discharge pipe downstream of the valve chamber to allow for emergency bypass pumping from the wet well. An isolation valve will be installed immediately downstream of the bypass chamber. The bypass chamber will be equipped with a 100 mm diameter pipe complete with blind flange.

#### **4.7.6 Appurtenance**

- Water Service – the pump station shall be serviced by a 50mm water supply. The water service connection will be housed in a separate vault/box adjacent the wet well and not in the electrical kiosk.
- A pressure gauge shall be provided in the valve chamber at a location that is easily accessible and readable. All gauges shall include an oil isolation diaphragm for isolation of the gauge from the wastewater.
- A pump station may be subject to the provision of a magnetic flow meter although this is not a standard item. Such provision will be project dependant at the direction of the City.

#### **4.7.7 Control and Level Regulation**

The control and level regulation of the pump station shall be designed to ensure robust, optimum and alternating pump cycle times in accordance with the pump manufacturer's recommendations. The pumping active volume will be appropriate to avert any septic conditions in both the wet well and forcemain. Sewage levels will be controlled continuously by an ultrasonic level transmitter with back-up float switches (Flygt ENM-10) for an emergency high and low level alarm. These systems within the wet well shall be located to minimize the turbulent influences of flow into the wet well and on the control of the sewage levels.

#### **4.7.8 Station Access**

Both the wet well and valve vault shall be equipped with an aluminum access hatch. The wet well access hatch shall be positioned so that a truck mounted crane can lift each piece of equipment out of the pump station vertically.

#### **4.7.9 Emergency Storage and Emergency Power**

Emergency storage capacity will be provided to accommodate a minimum of one (1) hour of peak hour design flow. The wet well, collection system and/or auxiliary containment can all function as the emergency storage provided that the one (1) hour requirement is met without any



spill occurring. Additional storage time may be required by the City based on the project specifics.

Standby electric power generator shall be provided. The Consulting Engineer must review full requirements of the electrical power system and controls with the Director of Engineering. For small stations of less than 5 horse power combined power (excluding standby unit) and serving less than 50 lots, standby power may not be required at the sole discretion of the Director of Engineering, provided that adequate emergency storage is available and a Crouse-Hinds receptacle with reverse contacts and manual transfer switch suitable for connecting emergency electric standby power generator is included.

#### **4.7.10 Electrical Controls**

There will be a Programmable Logic Controller (PLC) and telemetering system, compatible with the City SCADA System. The controller will be the Allen-Bradley Model 5/03 PLC or approved later model of PLC based on the City's standard.

Pump stations shall be designed to run on 3-phase service (600V or 208V) and equipped with a VFD (variable frequency drive) unless otherwise directed by the City.

The Pump Station Control Kiosk shall be located adjacent to the pump station wet well, no further than 3 m away. The control side of the kiosk is to face the pump station wet well. The enclosure will be NEMA 4X classification. All switches, breakers and wires will be clearly marked or labeled. Standard control panel layout for 2 or more pumps will be provided with the following section of panels at a minimum:

- City Electrical/BC Hydro metering and main breakers
- Automatic transfer switch
- Circuit breakers and starters for unit heaters, portable pump, main
- Wastewater pumps, fans, etc., station power transformer
- Pump controls including cycle counters and running time clocks
- Solid-state reduced voltage starters for constant speed main wastewater pumps

#### **4.7.11 Ventilation**

Pump stations shall be provided with a separate ventilating system sized to provide a minimum of 10 air changes per hour and to meet or exceed Worker Compensation Board (WCB) requirements for ventilation of a confined space. Ventilation shall be accomplished by the introduction of fresh air into the pump station under positive pressure.

Odour control may be required at the request of the City and specific to the project criteria. Where required, a suitable odour control system shall be provided and be approved by the Director of Engineering.

#### **4.7.12 Pump Station Testing**

Pump Stations will be tested using water where sewage is not available. The pump stations will be tested through the operating range of the pump station to simulate and verify emergency operation, pumps, controls, alarms, backup power and manual operation. Testing and Commissioning of the station shall be conducted under the supervision of the Consulting Engineer, Manufacturer's representative and City representative.

## **4.8 Force Mains**

The following criteria apply to force main design:

- The Consulting Engineer shall provide maximum time the sewerage will be stagnant inside the force main in order for the City to assess potential for septic conditions.
- An automatic air relief and/or vacuum valve will be placed at high points in the force main. Odour control devices shall be installed on air vents unless otherwise approved by the Director of Engineering.
- Isolation valves will be provided at least every 1,000 m. Valves shall be full port type to allow for pigging. A resilient seated gate valve is required on a force main prior to tie-in to a trunk force main.
- Provisions shall be made to allow for force main cleaning. This will include pig launching and receiving points and selection of appropriate bends and pipe sizes to allow for pigging of the forcemain.

Mechanical thrust restraint shall be provided for all valves, tees, bends, and caps. The required length of restrained pipe will be shown on the design drawings. The Consulting Engineer shall design mechanical thrust restraint systems with due regard for pipeline pressure transients and expected test pressures. Thrust block restraints are not permitted.

## **4.9 Restrictive Covenant and Sanitary Right of Way**

The land title for each legal lot served by a private pump station unit on the subject lot shall include a restrictive covenant, filed by the Owner, requiring the Owner to undertake in perpetuity operation, maintenance and renewal of the pump unit and service connection to the City forcemain or manhole, including the section of the service connection within the road right-of-way.

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**BYLAW 8128, 2019**

**5. WATER DISTRIBUTION SYSTEM**

**5.1 General**

Water works design shall be prepared by the Consulting Engineer with qualified expertise in water distribution systems. Design criteria only specify the minimum requirements and the Consulting Engineer shall confirm with the City on the design requirements. Water system shall conform to City master waterworks plans, local government bylaws, regulations, guidelines, policies, regional Drinking Water Management Plan and federal and provincial statutes.

The location of pressure zone boundaries, pressure reducing valve stations and pumping stations will be pre-determined by the Director of Engineering.

Water system designs shall be approved by Fraser Health Authority.

**5.2 Demands**

The water distribution system shall be designed to meet peak domestic consumption and fire protection demands at a desirable pressure.

Consumption demand will be based on all land uses (i.e. residential, industrial, commercial and institutional) during the high demand summer season including irrigation or lawn sprinkling.

**5.2.1 Consumption Demand**

Design demand will be based on ultimate saturation population and land use designations in accordance with the City's Official Community Plan (OCP) and related neighbourhood community plans for the subject service area. Refer to General Requirements: Table for Design Population by Land Use including provision for secondary suites, coach houses and laneway houses.

	<b>Demand (L/capita/day)</b>	
<b>Land Use</b>	<b>Maximum Day</b>	<b>Peak Hour</b>
Residential	800	1,600
Commercial	72	72
Institutional	60	48

For Commercial and Institutional Use, see Design Population by Land Use Table in Section 1: General Requirement

For Industrial Use, the water demand will be based on the greater of the existing consumption or proposed development consumption. The minimum is 10,000 Litre/hectare/day.

Note that the above rates do not include outdoor irrigation.

### 5.2.2 Fire Flow

Fire flow requirements shall be determined using the latest edition of “Water Supply for Public Fire Protection – A Guide to Recommended Practice” published by the Fire Underwriters Survey. The minimum acceptable values are in the following table:

Land Use	Required Fire Flow (L/s)
Single and Two Family Residential	60
Townhouse & Multi-Family	150
Apartments 6-8 Suite	120
High Rise Apartment	200
Commercial, Institutional	150
Industrial	225

Design fire flow shall be available to the furthest distance within the site from the service location and/or at the point of highest elevation.

If the maximum available fire flow is less than the required flow for the fire protection of the site, the Developer is responsible to either upgrade the water system sufficiently to provide the required fire flow or take whatever other measures necessary within the development to reduce fire protection requirements to match the level of protection available from the City’s distribution system.

All commercial and multi-family developments are to be reviewed by the City’s Fire Department.

### 5.2.3 Design Demand

The water distribution system shall be capable of providing the greater of:

- Maximum Day Demand (MDD) plus the fire flow in L/s; or
- Peak Hour Demand (PHD) in L/s.

## 5.3 Hydraulics

### 5.3.1 Level of Service

The water distribution system shall be designed to convey the design flow at a residual output head in excess of the minimum permissible pressure as follow:

Maximum Allowable Pressure	1035 kPa
Minimum Pressure at Peak Hour Demand	280 kPa
Minimum Pressure anywhere in the system during design fire flow and Maximum Day Demand	140 kPa

All systems shall be looped in the distribution system. Dead ends will only be permitted upon approval of the Director of Engineering.

### 5.3.2 Source Nodes Analysis

The input head into the network analysis will be the head at the near pressure reducing valve station or reservoir. The Consulting Engineer shall conduct a flow test to confirm the existing system pressure. The analysis including pipe and node data, domestic flows and fire flows shall be submitted to the City for approval.

For local distribution systems, sources may be assumed to be the nearest water mains that are 300 mm diameter or larger continually tied to the supply source. Available heads and flows will be confirmed by hydrant flow tests and approved by the Director of Engineering.

### 5.3.3 Design Calculation

The analysis of the proposed distribution system shall be carried out using the Hazen-Williams formula:

Force Mains analysis shall be conducted using the Hazen Williams formula:

$$Q = \frac{C \cdot D^{2.63} \cdot S^{0.54}}{278780}$$

Where:

- Q = Rate of flow in L/s
- D = Internal pipe diameter in mm
- S = Slope of hydraulic grade line in m/m
- C = 125 for all water mains 250mm diameter and larger
- C = 100 for all water mains 200mm diameter and smaller

### **5.3.4 Velocity and Head Loss**

In all water distribution system analysis, the Consulting Engineer shall consider the impacts of surge pressures. For mains 400mm and larger, the Consulting Engineer shall keep velocities below 3.0 m/s.

## **5.4 Piping**

### **5.4.1 Minimum Diameter, Material and Pressure Rating**

The minimum size of water mains shall be 150 mm diameter in single family residential areas and 200 mm in multi-family, commercial or industrial areas.

All water mains shall be ductile iron meeting MMCD specifications. All pipe and appurtenances shall be a minimum of 235 psi pressure class rated.

### **5.4.2 Water Main Location**

Water mains shall be located within public road right-of-way in accordance with the Supplementary Detail Drawings - "Typical Roadway Cross Section". If the location shown is impractical, the offset may be varied with the approval of the Director of Engineering but in all cases it shall be located under the road pavement and clear of curbs and gutters. Water mains will be kept parallel to the property line as much as possible and the offset distance from the property line shall be shown on the design drawings.

The minimum grade on a water main shall be 0.1%. The minimum cover of any water main, including service connections, will be designed to prevent freezing and not less than 1.0 meter.

When the slope of a water main equals or exceeds 10%, provisions shall be made to anchor the pipe. Curvilinear pipe installation will not be permitted.

A 3.0 meter horizontal separation from sewer mains shall be maintained. For utility crossings, the water main is to be located a minimum of 0.5 m above storm sewers and sanitary sewers. If the water main is less than 0.5 m above the sewer, the water main must be installed so that the crossing is made midway between the joints on a full length of water main pipe. If this is not attainable the water main joints are to be wrapped with heat shrink plastic or packed with compound and wrapped with tape. If the water main is beneath the sewer, there shall be a minimum of 300 mm vertical separation. The crossing shall be made midway on the full length of the water main pipe and the water main joints shrink wrapped over length extending 3m either side of sewer (as per specification below).

Standards: ANSI/AWWA C214 (factory applied)

ANSI/AWWA C209 (field applied)  
ANSI/AWWA C217-90 (petrolatum tape)  
all materials to have zero Health Hazard.

For crossing of gas mains or similar installations, the water main normally will be laid above such installations, with a minimum of 300 mm vertical clearance between the water main and the other installation unless otherwise approved. Consult with FortisBC and other utilities to establish their minimum clearances.

Where the water main is parallel to utilities other than storm and sanitary, the water main shall have a minimum clear separation of 1.0 metre from the other utility.

Water mains 200mm and larger will be designed to minimize high points.

The elevations of all existing underground utilities crossing the proposed water mains shall be confirmed in the field and shown on the plan and profile design.

The design of invert grades of water mains shall ensure proper clearance between top of valves and valve box covers.

The water main must extend across the full width of each lot to the boundary of the development plan; thus allowing future extension and connection beyond the development where such extension is possible.

### **5.4.3 Crossings**

Wherever the water main crosses a railway, a Provincial Highway, an Arterial Road as determined by the Director of Engineering or a major watercourse, the pipe shall be installed in an encasement carrier pipe to the approval of the relevant authority. The size of the casing pipe shall be a minimum of 25% larger than the outside diameter of the water main pipe bell. Service connections crossing Provincial highways and railroads should be avoided.

## **5.5 Appurtenances**

### **5.5.1 Thrust/Joint Restraints**

Thrust restraint shall be provided for all valves, tees, bends, and caps. The mechanical joint restraint systems shall be designed with due regard for pipeline pressure transients and expected test pressures. The required length of restrained pipe must be shown on the design drawings.



### **5.5.2 Line Valves**

The maximum length of water main between isolation line valves is:

- a) 200 m in residential districts and 150 m in all other districts for mains 350mm diameter or less;
- b) 800 m for mains larger than 350 mm or as approved by the Director of Engineering.

Line valves shall be located such that no more than one fire hydrant and/or 20 service connections will be affected during isolation of a section of the water main. The following number of valves shall be provided at network intersections either in a cluster or at projected property lines to avoid conflicts with curbs and sidewalks:

- i) 3 valves at Cross “X” intersection
- ii) 2 valves at Tee “T” intersection

New valves will be installed with water main replacement works.

All valves on water mains 300mm and smaller shall be resilient seated gate valves at the same diameter of the pipe. Line valves for 350mm and 400mm diameter water mains may be smaller by one size. Line valves for 450mm diameter water mains and larger may be smaller by two sizes. Geared operators with risers and extensions and a valve by-pass for equalizing pressure shall be provided on main line gate valves 350mm and larger.

Butterfly valves shall not be used unless approved by the Director of Engineering.

### **5.5.3 Hydrants**

Hydrants shall be spaced at maximum 200 m apart, including both sides of the road.

A fire hydrant shall be located not more than 150 m from a single family residential building, 100 m from the principal entrance of all other buildings, and 45 m from Siamese or Fire Department Connection (FDC). Sufficient number of hydrants shall be provided ensure the required fire flow can be delivered.

New hydrants shall be installed with water main replacement works.

Hydrants shall be completely accessible and in such a manner that the possibility of damage from vehicles or injury to pedestrians are minimized. Where possible, hydrants will be located at the end of curb returns at road intersections, in mid-block locations and at the boundaries between properties. A gate valve shall be provided at the main on all hydrant connections.

Hydrants shall be offset a minimum of 1.0 m from the adjacent property line, at least 3.0 m away from lamp standard, utility pole or driveway and 1.0 m from service connection pipes and ditches. Hydrant shall be located within the furnishing or landscape boulevard zone where parking prohibitions are generally located and will not conflict with pedestrian movement zone.

In general, if the flow from the hydrant does not exceed 60 L/s, the hydraulic head required at the water main upstream of the hydrant is 14m. If the flow exceeds 60 L/s, the hydraulic head must be greater to account for the head losses through the hydrant. The minimum hydraulic head immediately upstream of the water main required for a single hydrant delivering fire flows is as follows:

Flow (L/s)	Minimum Hydraulic Head at Water Main/Nearest Node Required (m)
45	14.0
60	14.0
90	15.8
120	22.6
150	31.4

For flow rates not detailed above, and for situations where multiple hydrants are required to deliver the fire flow, the minimum hydraulic head can be calculated as the greater of 14m and 7m plus the head loss through the hydrant. However, regardless of the fire flow delivered, the minimum hydraulic head at the water main or the nearest node must be 14m.

Head loss through the hydrant(s) should be calculated as:

$$HL = 1,083 \times Q^2$$

Where: HL is head loss (m)  
Q is fire flow (m<sup>3</sup>/s)

#### 5.5.4 Air Valves

Combination air valves will be installed at the summits of all mains of 200mm diameter and larger except as follows:

- Where the difference in elevation between the summit and valley is less than 600mm
- Where it can be shown that air pockets will be carried by typical flows
- Where active service connections are suitably located to dissipate entrapped air.

Typical air valve sizes, subject to design analysis, are as follows:

- i. 25mm for water mains 250mm to 350mm diameter
- ii. 50mm for water mains 350mm to 600mm diameter
- iii. Special design for water mains larger than 600mm diameter.

Air valves shall be vented to an appropriate above-grade location to eliminate any potential for cross connection in a flooded or contaminated chamber.

#### **5.5.5 Flushouts / Blow-offs**

Blow-offs shall be provided at the end of all dead-end mains. For 200mm and larger mains, blow-offs require special design. On all mains greater than 350mm diameter, install blowdowns at the lowest point in the pipeline profile between the line valves.

Flushing ports are to be of adequate size to permit a minimum flushing velocity of 0.8 m/s in the mains.

#### **5.5.6 Service Connections**

The Owner shall comply with connection requirements contained in the Waterworks Regulation Bylaw, as amended from time to time. Service connections shall be installed in accordance with the City approved edition of the MMCD and Supplementary Specifications and Detail Drawings.

##### Location

Water service connections shall be kept clear of sewer connections and driveways and installed at 90 degrees to the property line. Service connection shall be no more than 30 m in length. Where service location will conflict with fire hydrants or other obstructions, the locations may be specifically offset. Service connections will not be connected to 400 mm or larger mains unless specifically permitted by the Director of Engineering.

For water main replacements, all existing service connections shall be replaced up to the property line. For single family residential lots, service connection shall be one continuous pipe.

Service connections shall have a minimum cover of 0.75 m and a maximum of 1.5 m.

##### Size

Service connections shall be provided to each lot and sized to meet water demands. The minimum size is 19mm diameter for each single family parcel. Properties designed for a fire sprinkler system will have a minimum service connection of 50mm diameter.

Service connections 75mm or larger shall be specifically designed for the particular requirements. All connections 100mm and larger shall be joint restrained with a tee and a gate valve assembly at main to property line.

Service connections to parks, where required, shall be in accordance with Parks Department requirements.

#### **5.5.7 Water Meters**

All service connections shall have provisions for metering. Water meters are required for all connections as set out in the Waterworks Regulation Bylaw No.7631. The location, size and the remote reading device of the flow meter will be as specified by the Director of Engineering.

Where the on-site water system is looped between two connections to City water mains, a gate valve will be required at each connection and on the property side of a double check valve assembly.

Each service connection of 100 mm diameter or larger requires premise isolation. All residential service connections shall have provisions for metering and backflow prevention. Single Family residential lots shall be provided with water meter setter including backflow preventers and service box at the property line.

#### **5.5.8 Street Ends**

At the end of a street which may be extended in the future, the water main shall extend at least 1.5 metres beyond the end of the paving.

Water mains shall be terminated with a gate valve, followed by a 6 metre length of pipe, thrust restraint and blow-off assembly. Refer to Section 5.5.5 for blow-off sizing.

#### **5.5.9 Cul-de-sacs**

Water mains shall be looped unless otherwise approved by the Director or Engineering. If so approved, water mains at a cul-de-sac shall be terminated by 150 mm cap end complete with blow-off assembly.

### **5.6 Pressure Reducing Valve Station**

Pressure Reducing Valve station design parameters will be reviewed and approved by the Director of Engineering before proceeding with detailed design.

### **5.6.1 Preliminary Design Parameters**

- Design Flows:
  - i. Peak hour
  - ii. Maximum day plus fire
- Continuous, emergency or fire flow operation
- Location
- Chamber Details:
  - i. Structure and access
  - ii. Controls and monitoring
  - iii. HVAC

### **5.6.2 Design Features**

- Minimum chamber size: 3m x 2m x 2m (inside dimensions)
- Structure and piping in accordance with Chambers, Reservoir Valve Chambers and Pump Stations sections
- External bypass with closed valve
- Parallel pressure reducing valves sized for peak hour and maximum day plus fire flow
- Isolating valves
- Air release valves
- Basket strainers upstream of each control valve
- Upstream and downstream pressure gauges
- Flowmeter
- Interior and exterior of pipework coated to AWWA standards, or use stainless steel
- Forced air ventilation plus heat and light, subject to local authority review
- External kiosk, if electrical and electronic equipment is included.
- PLC-controlled with connection to SCADA system, if applicable, including:
  - i. Discharge and suction pressure transmitters
  - ii. Flow transmitter
  - iii. Uninterruptible power supply (UPS)
  - iv. Operator interface panel

Consulting Engineer is to provide three copies of a comprehensive Operating and Maintenance Manual.

## **5.7 Corrosion Protection**

Where there is a potential for encountering corrosive soils, a geotechnical analysis on the water main alignment shall be conducted to determine the corrosiveness of the native soils.

Corrosive soil analysis shall be carried out based on the 10-point method given under Appendix A of AWWA C105. Cathodic protection or equivalent protection will be required along the pipeline and appurtenances if the cumulative total based on the above soil test evaluation equal or exceed ten points.

Polyethylene encasement alone is not considered as an acceptable method of corrosion protection.

### **5.8 Connection to Existing Water Mains**

All tie-in's to existing water mains will be performed by or under the supervision of the City at the Developer's cost.

### **5.9 Water Main Seismic Design**

All water mains shall be designed to reduce the risk of leakage or loss of service resulting from permanent ground deformations. Most earthquake damage to buried water mains result from pipe deformation caused by surrounding soil movements. These ground displacements may be caused by either temporary seismic wave propagation or permanent ground displacements from moderate or high soil liquefaction or slope instability.

#### **5.9.1 Affected Areas**

Areas of potential water system seismic vulnerability are generally located within the Fraser River floodplain and the Glenbrook Ravine.

#### **5.9.2 Pipeline Design**

In all areas subject to seismic vulnerability, the following design requirements shall apply:

- i. The axial strain, joint slip-out resistance and joint deflection requirements as defined in ISO 16134 Earthquake- and Subsidence - Resistant Design of Ductile Iron Pipelines Standard
  - Axial Strain –Class S-2
  - Deflection Angle –Class M-3
  - Slip-out Resistance –Class A
- ii. All pipe fittings, valves, hydrants and related components shall demonstrate the same restraining performance capacities as the pipeline design.
- iii. Water mains shall be restrained ductile iron. PVC mains are not be permitted.

- iv. All ductile iron pipe joints shall be integrally restrained with seismic provision.
- v. To minimize the interaction between soil and the water main, all ductile iron pipes shall be installed in Polyethylene Encasement as per AWWA C105 Standard.
- vi. The Consulting Engineer shall calculate the expected differential movement between pipe and the connecting structure and provide a design that will accommodate the anticipated movement.
- vii. Provide an offset or loop in the service connection to accommodate movement up to 0.5 m of the pipeline through the soil.

## **6. STREET LIGHTING AND TRAFFIC SIGNALS**

### **6.1 General**

This document is intended to provide lighting and electrical criteria guidelines to aid in the design of street lighting in the City of New Westminster. The Consultant shall be fully knowledgeable with the Illuminating Engineering Society of North America (IESNA) standards and the most current edition of the Transportation Association of Canada (TAC) Guide for the Design of Roadway Lighting. The City intends to apply sections of these documents to outdoor lighting within the City as determined by the Director of Engineering.

In this document, the New Westminster Electrical Utility is referred to as the Supply Authority.

### **6.2 Visual and Environmental Issues**

Obtrusive light, light trespass, light pollution and environmental zones are key project design issues that will be considered by the City. Engineering Consultants and Architects will utilize luminaires and design techniques that will mitigate these issues. The City prefers fixtures that have full cut-off optics, but if a full cut-off optical system is not available in the selected fixture, then the Director of Engineering may consider the use of a partial cut-off optical system.

### **6.3 Codes, Rules and Permits**

For all projects, the Consultant shall:

- a) Comply with the rules of the latest edition of the Canadian Electrical Code and any bulletins published by the Electrical Safety Branch, of the Province of BC.
- b) Comply with the laws, rules and recommendations of agencies, including the Canadian Standards Association (CSA), the Supply Authority, Workers Compensation Board and regulatory City and governmental authorities.
- c) Construct the lighting and traffic signal system in accordance with the City approved edition of the Master Municipal Construction Documents (MMCD) and the City's Supplementary Specifications and Detail Drawings for lighting and traffic signals.
- d) Coordinate all works with the Supply Authority to ensure minimum clearances from their overhead and underground systems are achieved and exact service locations are confirmed.
- e) Have all submitted plans sealed by a Professional Engineer registered with the Association of Professional Engineers and Geoscientists of British Columbia.



## **6.4 Illuminance Levels**

Roadways, parking facilities, pedestrian walkways and bikeways shall be illuminated for safety and to produce accurate and comfortable nighttime visibility.

The City has standardized the illuminance method for its lighting designs. The recommended minimum average maintained horizontal illuminance levels, uniformity ratios and veiling luminance ratios used by the City are listed in the ANSI/IES RP-8-00 – National Standard Practice for Roadway Lighting. Luminance and small target visibility (STV) methods shall be used where a specific circumstance warrants their use. Use of these alternate methods must meet the approval of the Director of Engineering.

Tables in RP-8-00 to be referenced for roadway lighting are:

Table 2:	Illuminance Method - Recommended Values.
Table 9:	Recommended Illuminance for the Intersection of Continuously Lighted Urban Streets.

Tables in RP-8-00 to be referenced for pedestrian walkway and bikeway lighting are:

Table 5:	Recommended Values for High Pedestrian Conflict Areas.
Table 6:	Recommended Values for Medium Pedestrian Conflict Areas.
Table 7:	Recommended Values for Low Pedestrian Conflict Areas.
Table 8:	Recommended Values for the Pedestrian Portion of Pedestrian Vehicular Underpasses and Exclusive Pedestrian Underpasses.

Prior to starting a project, the Consultant shall verify the Road Classification (i.e. arterial, collector, local, etc.) and the Pedestrian Conflict Area Classification with the City.

The road classifications, illuminance levels, ratios, road and pedestrian conflict areas proposed for each roadway and pedestrian walkway/bikeway shall be listed in a table format on the design drawings.

The Consultant shall calculate all illuminance levels and ratios as noted under Section 6.8 Lighting Calculations. For calculations where the roadway surface is asphalt, R3 road surface classification shall be used and for calculations where the surface is concrete, R1 road surface classification shall be used. Refer to RP-8-00 – Table 1: Road Surface Classifications.

Parking facilities shall be illuminated in accordance with the IESNA RP-20-98 – National Standard Practice for Lighting of Parking Facilities.

Tables in RP-20-98 to be referenced are:

Table 1: Recommended Maintained Illuminance Values for Parking Lots.

Table 2: Recommended Maintained Illuminance Values for Parking Garages.

## **6.5 Light Pole Spacing**

All poles shall be davit style, unless decorative poles are requested by the Director of Engineering. Davit pole heights shall be 7.5m and 9.0m. Taller poles, 11.0m or 13.5m high, can be use on arterial roadways only with the City's approval.

Poles along the roadway shall be located at the outer edges behind curb and gutter or edge of pavement, or in special circumstances, in the median of the street. Where median lighting is being considered, the lighting levels on any sidewalks shall be met or additional supplemental sidewalk lighting maybe required. The exact offset of the pole (behind curb, edge of pavement or sidewalk) is typically defined on City's Standard Detail Drawings.

Poles at intersections shall be located to accommodate intersections, property corners and pedestrian walkways. Spacing shall be governed by roadway width, road configuration and intersecting property lines. Generally, where possible, poles shall be located close to property lines and shall avoid being placed in front of residential windows. Poles shall be located at a minimum of 1.5m from the start/end of curb returns and at a minimum of 1.5m from the widest part of the driveway, including the flare.

Pole spacing patterns include staggered, opposite, one side and median mount arrangements, depending on the roadway classification and road geometrics. The pole arrangements shall generally be as follows:

- 1) Roads 8.5m and narrower – One sided spacing
- 2) Roads over 8.5m wide – Staggered or opposite spacing
- 3) One sided spacing may be allowed when power line clearances cannot be met
- 4) Poles can be located in medians if a clearance of 0.5m from the pole to curb face can be maintained and posted speed is 60 km/h or less. A minimum of 2 consecutive poles should be required before considering poles in median islands
- 5) Maintain clearances of 3.0 m from overhead primary power lines to luminaires

Where trees are proposed lights may have to be installed on davit arms which extend out over the roadway beyond the ultimate tree canopy. Additional pedestrian scale lighting may be required for the sidewalk. The proposed locations, spacing, pole height, arm length and frequency of the trees may also need to be adjusted in conjunction with the lighting pole spacing. The minimum

separation between poles and trees shall be 6.0m. The placement of poles shall have priority over the placement of trees.

## **6.6 Luminaires, Light Source and Smart City**

### Luminaires

The Consultant shall select the most effective IESNA luminaire distribution type (i.e.; Type 2, Type 3 etc.) and also meet the Roadway Lighting energy performance standard CAN/CSA-C653, Performance Standard for Roadway Lighting Luminaires, to suit the roadway geometrics. Cobra head luminaires shall be used for all roadway lighting applications with the exception of those defined by the Director of Engineering as Decorative Street Lighting areas (refer to Section 6.7). Cobra head roadway luminaires shall be Ministry of Transportation and Infrastructure recognized product.

The preferred operating voltage for the street lighting system is 120/240V, single phase, 3 wire. Alternate voltages must meet the approval of the Director of Engineering and the Supply Authority.

### Light Source

The light source for luminaires used on roadways, parking facilities, pedestrian walkways, bikeways, pedestrian crossings, pedestrian actuated traffic signals and decorative street lights shall be Light Emitting Diode (LED). High pressure sodium (HPS) may be required under certain circumstances as approved by the Director of Engineering.

### Smart City

Design of street lighting and controls shall consider future technological advances (e.g. Intelligent City fibre network, electrical vehicle charging stations, autonomous vehicle systems, etc.) and include opportunities to implement smart/intelligent city applications, as deemed appropriate.

For development projects requiring pedestrian walkway/bikeway lighting, the cost for the supply and installation of the lighting system shall be borne by the Developer. The Consultant shall ensure the compliance of these design criteria and consult the Director of Engineering for specific fixture type, colour and model number information.

## **6.7 Decorative Street Lighting**

The City has designated areas in which Decorative Street Lighting and other electrical features such as pole and tree receptacles and irrigation systems are utilized to enhance the streetscape. The City shall provide the Developer with generic details of the decorative lighting, the requirements for any other electrical features and a list of approved suppliers.

Decorative poles may be suitable for roadways not exceeding 11 m width. Where decorative poles are required, the poles and anchor bolts shall meet all applicable codes and standards.

The following details are required as part of the decorative lighting design:

- 1) Shop drawings of the street light poles proposed complete with pole design criteria
- 2) Signature and seal by the Professional Engineer, registered in the Province of B.C.
- 3) Detailed information and specifications of the luminaires proposed
- 4) Detailed information on pole accessories (decorative bases, banner arms, receptacles, etc.)
- 5) Drawings detailing assembled pole and luminaire units; and
- 6) Full size design drawings detailing the complete site installation.

## **6.8 Lighting Calculations**

Lighting design requires a computer lighting design software or Visual Roadway and lighting supplier photometric files from lighting suppliers in the IESNA format. Typically luminaire photometric files are based on a lamp which can vary from actual lamp used in the test, provided it is similar. This is referred to as “relative” photometry. LED photometric files must be “absolute” which means the photometric file must be for the exact luminaire being tested.

The designer shall select luminaires with optical systems which efficiently light the intended area and properly illuminate the roadway and sidewalks as well as provide maximum spill light control beyond the sidewalk in order to reduce spill light and glare impacts on local residents. This shall be done by analyzing luminaire optical systems using the BUG method defined in Illuminating Engineering Society TM-15 Classification System for Outdoor Luminaires and Addendum A: Backlight, Uplight, and Glare (BUG) Ratings. The maximum nominal BUG rating of luminaires shall be B2-U1-G2 however lower BUG rating should be used where possible.

The designer shall apply Light Loss Factor to the lighting design. For LED's the Light Loss Factor (LLF) is a combination of several factors representing deterioration of the lamp and luminaire over their life-spans which is applied to a lighting design. Several individual factors combine to form the overall LLF. The LLF then is incorporated into the design calculations.

$$LLF = LLD \times LDD \times LATF$$

Where:

Lamp Lumen Depreciation (LLD) = 0.85.

Luminaire Dirt Depreciation (LDD) = 0.90

Luminaire Ambient Temperature Factor (LATF) = 1.04 (+10° C).

For LED's the range of LLF shall be 0.8.

Electrical design requirements include:

- 1) Allow for possibility of future expansion. Stub out conduit(s) at the last streetlight pole and / or into a temporary junction box at end of the development.
- 2) 1-75mm RPVC traffic signal interconnection conduit in conjunction with roadway lighting for all Arterial and Collector Roads. The conduit shall be common trenched with the street lighting system conduits.
- 3) All empty conduits shall have a 6 mm nylon pull string installed and capped ends.
- 4) Where required, include loads for pole receptacles (100 W/receptacle for LED's), tree lights, traffic signal controllers, electrical vehicle chargers (EVC) and other devices connected to the service panel.

## **6.9 Power Supply and Distribution**

The designer shall confirm voltage and locations of suitable power sources for the proposed lighting system. The designer shall confirm if a new service is required or an existing lighting system in the area is suitable for extension. Lighting systems are typically serviced from a 120/240 Volt single phase 3 wire system. Use of other voltages must meet City approval.

Services are to be "Underground Dip" type or will tie into a service box. The designer shall select a suitable service location based on availability and what meets the City standards and the electrical utility

The power supply shall feed into a service base containing panel boards, breakers, lighting contactor(s) and switch. The lighting is controlled by a single photocell located on a luminaire. The service base shall be located:

- 1) Off the roadway where not likely to be impacted by motor vehicles;
- 2) Where it will not be a hazard or obstruction to pedestrians;
- 3) Where it can be accessed for easy servicing;
- 4) To accommodate extension to future lights and other possible loads (i.e. EVC.)

Power distribution requirements include:

- 1) Wiring to be installed in minimum 35mm Rigid PVC conduit.
- 2) Wiring to be stranded copper with RW90 insulation.
- 3) Wiring to be colour coded per Canadian Electrical Code (CEC).
- 4) Conduit burial depth as per Canadian electrical codes.

Conduit alignments shall be designed to avoid tree roots.

## **6.10 Traffic Signals**

Traffic signal details are standardized throughout British Columbia to avoid potential confusion

to the travelling public, both local and visiting. They are defined in the BC Motor Vehicle Act. Items standardized include:

- Vertical mounted signal heads
- Left side secondary heads
- Order of signal indication.

The Standard Construction documents shall be used in conjunction with the B.C. Motor Vehicle Act Regulations - Division (23) Traffic Control Devices and the B.C. Motor Vehicle Act R.S.B.C. 1996, Chapter 318.

Refer to Part B - Traffic Signals of the most current edition of the Manual of Uniform Traffic Control Devices for Canada (MUTCD) for information on traffic signal specifications, concepts and terminology.

- 1) General locations of signal heads are as follows:
  - a. Primary: Mounted over the roadway which a vehicle is to enter
  - b. Secondary: Mounted to the left of the roadway which a vehicle is to enter
  - c. Auxiliary: Mounted to the right of the primary head, or other location to enhance visibility
  - d. Pedestrian: Mounted on the far side of the intersection in line with the painted crosswalk.
- 2) Traffic signal designs are highly specialized and shall therefore be prepared by a qualified Consultant recognized by the City. Prior to starting a traffic signal design the Consultant shall contact the City to confirm specific requirements of the signal, timing and coordination plans, operational requirements and specific issues or concerns.
- 3) In instances where the project capital costs are borne by the City, traffic signal controllers and specialty signal equipment shall be supplied by the City. The Consultant shall consult the City to determine exactly what equipment shall be supplied. In the case of private development projects requiring traffic signals, the cost for the design and the supply and installation of traffic controllers and specialty signal equipment shall be borne by the Developer. Traffic signal controllers and specialty signal equipment shall be supplied by the City at the Developer's cost. Traffic Engineering and timing/coordination plans shall be provided by the Developer and prepared by a qualified Consultant, recognized by the City.
- 4) If traffic signal control devices, pre-ducting of future traffic signal control devices or traffic signal communications conduit/cable are required for a proposed development, at the discretion of the Director of Engineering, these may be designed by City staff and their construction may be included with other City work related to the project. The City

requires the Developer to retain an electrical consulting firm to prepare the design drawings and the Consultant shall have sound knowledge of traffic signal design. All design and construction costs shall be the responsibility of the Developer.

- 5) All drawings submitted to the City for review and approval shall be sealed by a Professional Engineer registered with the Association of Professional Engineers and Geoscientists of British Columbia.
- 6) All traffic signal pole standards and luminaries shall be confirmed with the Director of Engineering. Decorative traffic signal poles shall be used in designated areas, as directed by the Director of Engineering.
- 7) The City requires that every effort be made to incorporate the traffic signal controller cabinet/base into the architecture and/or the landscaping of the new development without losing sight of the need to have the cabinet located so that clear visibility can be maintained between the signalized intersection and the cabinet.

#### **6.11 Conduit**

Conduits shall generally be parallel or perpendicular to the roadway, and routed to run in a direct line between adjacent poles or junction boxes. The exception would be where existing trees conflict with the conduit run.

Street lighting conduits shall be minimum 30mm diameter RPVC. Signal conduits shall be minimum 50mm RPVC and minimum 25mm RPVC for loop stub-outs. Service conduits shall be minimum 50mm RPVC.

#### **6.12 Interconnect Conduit**

The Consultant shall confirm the requirements for and coordinate the design of a traffic signal interconnect system if required with the Director of Engineering. Traffic signals in close proximity to rail crossings require interconnection with the rail crossing controls to ensure maximum driver safety.

#### **6.13 Power Supply**

The designer shall confirm voltage and locations of suitable power sources for the proposed signal system. Signals systems are typically serviced from a 120/240 Volt single phase 3 wire system. Alternately, 120/208 volt 3 phase 4 wire systems may be used if necessary and if approved by the Director of Engineering.

#### **6.14 Uninterruptible Power Supplies (UPS's)**

UPS's shall be considered where potential power outage is a concern or the intersection is located in a high collision or high risk area. UPS's shall be installed on the back of the traffic controller cabinet. The use of UPS shall be confirmed with the Director of Engineering.

#### **6.15 Junction Boxes**

Approved plastic junction boxes shall be used as follows:

- 1) Where the maximum number of 90° bends in a conduit run is exceeded.
- 2) Where branch conduit runs are required.
- 3) In conduit runs over 100m.
- 4) At service panels.

Approved junction boxes shall be used for traffic signal installations only in the quadrant where the traffic controller is to be installed.

#### **6.16 Conductors**

For the purpose of standardization and to accommodate future expansion, street lighting feeder conductors shall be No. 6 RW90 copper red, black, and white. The bonding conductor is to be No. 8 RW90 and green in colour. The use of alternate conductor sizes will require the approval of the Director of Engineering.

For traffic signal installations, multi-conductor cable shall be used. The cable shall run continuous from the traffic controller to each pole with no splices.

#### **6.17 Service Equipment**

- a) Electrical service shall be determined in consultation with the Supply Authority.
- b) Street lighting systems are to be controlled with a lighting contactor and photocell in which case the photocell would be located on the luminaire nearest to the service panel. Under certain circumstances individual photocell located on each luminaire may be allowed. The use of lighting contactors shall meet the approval of the Director of Engineering.
- c) Service panels for street lighting systems shall have a minimum of 60A – 2P breaker and shall be mounted in a service base as shown on the MMCD Standard Drawings. Traffic signal and street lighting systems shall be fed from the same service panel. The combination street lighting and traffic signal service panel shall have a minimum of 100A -2P main breaker, 2 x 60A –1P sub-breaker for street lighting and 1 x 40A –1P sub-breaker for traffic



controller power. The service panel shall be mounted in a service base or on the side of a streetlight pole or post located near the traffic controller; no signal equipment shall be mounted on the same pole as the service panel. Refer to MMCD Standard Drawings.

- d) All services shall be 120/240V single phase, 3 wire system.

## **6.18 Concrete Bases**

When selecting pole base locations, search out proposed or existing utility locations and identify sensitive tree root zones to avoid conflicts. The pole base shall be positioned outside the drip line of trees proposed for retention. The Consultant shall coordinate the design with the Landscape Architect where applicable. The placement of poles shall have priority over the placement of trees.

- 1) The Consultant shall select a concrete base to suit the required pole from those shown in the MMCD Standard Drawings. Where a custom base is required to accommodate unusual soils conditions or to avoid underground utilities, the custom base design shall be sealed by a Professional Engineer and meet the approval of the Director of Engineering.
- 2) Avoid running more than two conduits into a streetlight pole base. Where required, a junction box shall be used. An exception to this requirement may be granted where the pole base functions as the service base. Additional conduit may be required to facilitate future technology.
- 3) Ground rods/plates shall be incorporated into each concrete base utilizing a 25mm RPVC conduit sleeve.
- 4) Spread footing shape bases may be required at poor soil area determined by the Consultant.

## **7. TRANSPORTATION**

### **7.1 General**

Deleted & Replaced with new content -  
see amendment bylaw Section 7.1

~~The Official Community Plan, Area Plans, Trail and Greenway Master Plan, Bicycle Plan, Long Range Transportation Plan and any other related planning documents shall be consulted to ensure long term transportation plans and objectives are addressed by each design.~~

~~The City has the following road classifications:~~

~~Major Arterial Road/Major Road Network (MRN) (divided and undivided)  
Local Arterial Road  
Collector Streets  
Local Streets (residential; commercial; industrial)  
Lanes~~

~~The classification of all impacted roads shall be confirmed with the Director of Engineering. An up to date road classification map is available.~~

### **7.2 Transportation Impact Study**

Deleted & Replaced with new content -  
see amendment bylaw Section 7.2

~~Major development proposals may require the Developer to engage the services of a traffic engineering consultant for the preparation of a Transportation Impact Study of the proposed development.~~

~~If the Director of Engineering determines that a study is required, the Consultant will submit a proposed terms of reference for approval and may include all or some of the following requirements:~~

#### **7.2.1 General Requirements**

- ~~b) General description of location; local area (surrounding roads) and distribution system (regional transportation system leading to location).~~
- ~~c) Identification of other development sites using same distribution system.~~
- ~~d) Focus should be on City concerns but regional facilities must be critically analyzed as well.~~

#### **7.2.2 Data Requirements**

- ~~a) Data requirements should be identified along with availability and sources (City of New Westminster, GVRD, etc.).~~
- ~~b) Data collection from sources or unavailable data may have to be gathered by the Consultant.~~

### **7.2.3 ~~Transportation Analysis~~**

#### ~~Existing Situation~~

- ~~a) Weekday and weekend (Saturday) traffic volumes for peak hour a.m., p.m. and Saturday.~~
- ~~b) Distribution of trips (origin and destination of trips for New Westminster and surrounding areas).~~
- ~~c) Transportation System performance (intersection, laning configuration, capacity analysis).~~
- ~~d) Identification of existing problems (delays, both local and regional, e.g., bridges).~~
- ~~e) Transit service.~~
- ~~f) Cycling Facilities/Routes.~~
- ~~g) Pedestrian Facilities.~~

#### ~~Development Analysis~~

- ~~a) Development description (floor space, employees, services, type of establishments, etc.).~~
- ~~b) Description of other developments and adjacent land use.~~
- ~~c) Site plan/layout: interaction with surrounding road system.~~
- ~~d) Parking, internal circulation and loading design.~~

#### ~~Traffic Generation~~

- ~~a) By site.~~
- ~~b) By other area developments.~~
- ~~c) Identify distribution of trips (origin and destination within City and external).~~
- ~~d) Growth rates based on population, land use, labour force and employment projections.~~

#### ~~Future Situations~~

- ~~a) Projected traffic volumes for weekday and weekend peak hour a.m., p.m. and Saturday.~~
- ~~b) Distribution of projected traffic volumes and origin and destination of trips.~~
- ~~c) Transportation System performance (intersection, laning configuration, progression and capacity) under projected volume conditions.~~
- ~~d) Identification of transportation system requirements for future conditions.~~

- ~~e) Future transit needs/services.~~
- ~~f) Cycling Facilities.~~
- ~~g) Pedestrian Facilities.~~

### Conclusions

- ~~a) Impact on transportation system both in New Westminster and externally.~~
- ~~b) Transportation System requirements for all modes of transportation – automobile, transit, bicycle and pedestrian.~~
- ~~c) Off site transportation impacts; and~~
- ~~d) Mitigation measures (included traffic calming).~~

~~Periodic reviews should accompany the progress of the study so that periodic evaluation by the Director of Engineering can contribute to the various study stages.~~

### **~~7.2.4 Concerns to be Addressed~~**

~~Some of the concerns which should be emphasized in the transportation impact study are:~~

- ~~a) Focus on City concerns~~
- ~~b) Identify and quantify total trips generated by proposed developments~~
- ~~c) Assignment of the likely distribution of origins and destination to City and regional network within New Westminster~~
- ~~d) Impact on traffic operations on adjacent roads. All intersections and regional facility approach roads should be assessed where the volume of traffic generated by the proposed development will exceed 100 vehicles per hour for peak periods~~
- ~~e) Impact on adjacent neighbourhoods. Identify the potential for short cutting traffic and other impacts on adjacent neighbourhoods, and identify appropriate traffic calming measures to mitigate these impacts~~
- ~~f) Accessibility by transit, cycling and walking. Identify appropriate transit, bicycle and pedestrian facilities to accommodate and encourage access by no automobile modes, and maximize safety for these modes.~~
- ~~g) Traffic conditions assumed should be in accordance with land use, population, labour force and employment projections.~~

### **7.3 Transit**

Deleted & Replaced with new content -  
see amendment bylaw section Section 7.11

~~The Consultant shall confirm the requirements for transit service and other amenities, as outlined by TransLink, for all roads designated as existing or future bus routes. The Consultant shall also identify areas where other design objectives, including traffic calming and bicycle and pedestrian access, that may conflict with the requirements of TransLink. These requirements shall be reviewed and approved by the Director of Engineering.~~

### **7.4 Traffic Calming**

Numbering Change -  
see amendment bylaw Section 7.15

Appropriate traffic calming measures shall be considered and may be required by the Director of Engineering. Traffic calming design shall conform to the latest edition of the Transportation Association of Canada (TAC) / Canadian Institute of Transportation Engineers (CITE) "Guide to Neighbourhood Traffic Calming."

Alternative street designs may be considered as an option in lieu of traffic calming as approved by the Director of Engineering.

### **7.5 Bicycles**

Deleted & Replaced with new content -  
See amendment bylaw section Section 7.10

~~All bicycle facilities (wide curb lanes, bicycle lanes and pathways) shall be designed in accordance with the Geometric Design Guide for Canadian Roads published by the Transportation Association of Canada (TAC), latest edition, the City's Bicycle Plan and all regional or provincial bicycle facility guidelines (i.e. TransLink Regional Bike Plan and Provincial Cycling Design Guidelines). Requirements for bicycle facilities shall be confirmed with the Director of Engineering.~~

### **7.6 Access Limitations**

Deleted & Replaced with new content -  
See amendment bylaw section Section xxx

~~Certain access restrictions apply to new and existing streets in New Westminster as outlined in this section.~~

#### **7.6.1 Existing Major Intersections**

Deleted & Replaced with new content -  
See amendment bylaw section Section xxx

~~Major intersections are those of two adjoining arterial roads or one arterial and one collector road.~~

~~Vehicular accesses to corner sites at Major Intersections shall be strictly controlled pursuant to City Bylaws and TAC Guidelines. Specifically:~~

- ~~a) Consolidation of lands at Major Intersections is encouraged and subdivision of lands is discouraged.~~

- ~~b) Where re-development occurs at a Major Intersection, the Developer shall minimize the number of access points to the road network.~~
- ~~c) Vehicular accesses off arterial roads are to be minimized or avoided.~~
- ~~d) On arterial or collector streets, all vehicular accesses shall be in accordance with TAC Guidelines.~~
- ~~e) For sites located at the intersection of two roads of different hierarchical ranks, vehicular access shall be off the lower ranked road.~~
- ~~f) Where a development is on an arterial road and near a Major Intersection, it shall allow for future road widening at the intersection.~~

#### **7.6.2 Driveways**

Deleted & Replaced with new content -  
See amendment bylaw section Section 7.5

~~Certain roads have access restrictions. New driveway access onto such arterial roads will not be permitted. Alternate access via lanes, frontage road, etc.~~

#### **7.6.3 Intersections at Major Arterial Roads**

Deleted & Replaced with new content -  
See amendment bylaw section Section 7.14

~~The Engineering Department shall be consulted with regard to the need for traffic signals, pedestrian signals, left and right turn lanes and pre ducts for future signals.~~

~~If pre ducting is necessary for future traffic signal or pedestrian signal installation, the pre ducting layout should be shown on the street light construction plans.~~

#### **7.6.4 Cul-de-Sacs**

Deleted & Replaced with new content -  
See amendment bylaw section Section 7.4.2  
New supplementary drawing has been included.

~~The length of the panhandle of a cul de sac shall be not more than 90 metres. Any increase in this will require Fire Department approval and provision of an emergency access.~~

~~Where space permits in residential areas, on-site parking may be provided at the central island of the cul de sac on a local residential road. The central island shall be complete with selected trees, paving blocks or a combination of both. The proposed treatment shall reflect a low maintenance cost.~~

#### **7.6.5 Lanes**

Replaced with new content -  
See amendment bylaw section Section 7.4.4

~~Lanes are generally required for all residential properties that front an arterial road.~~

#### **7.6.6 Pedestrians**

Deleted & Replaced with new content -  
See amendment bylaw section Section 7.6 and 7.7, 7.8 and 7.14 of the amended bylaw.

~~Adequate consideration should be given to the needs of pedestrians and transit passengers.~~

~~The internal pedestrian circulation system should be designed, in consultation with City staff.~~

#### **7.6.7 Disabled Access**

Replaced with new content -  
See amendment bylaw section Section 7.6.8

~~Standard wheel chair ramps shall be provided and located at the curb returns at all road intersections. Two separate sidewalk letdowns are preferred to the single wrap around let down design.~~

~~Standard wheel chair ramps shall also be provided wherever walkways or crosswalks intersect roads.~~

~~Sidewalks across driveways should be designed so as to avoid a crossfall of more than 2%. Design options include placing the slope of the driveway between the sidewalk and curb or at the back of the sidewalk, rather than across the sidewalk, or dropping the elevation of sidewalk to meet the elevation of the driveway.~~

#### **7.6.8 Emergency Access**

Replaced with new content -  
See amendment bylaw section Section 7.3.1

~~In consultation with the Fire Department, the Director of Engineering may require the construction of emergency access in urban developments. Any emergency access must be able to support a wheel axle bearing load of nine decimal one (9.1) tonnes.~~

#### **7.7 Road Cross Sections**

Replaced with new content -  
See amendment bylaw section Section 7.3

~~The road standard drawings provide a guide for road cross section requirements. The Consultant shall also consult the relevant local area plans for area specific requirements and obtain approval for the proposed road cross section with the Director of Engineering.~~

~~For roads that are designated as bicycle routes in the Bicycle Plan, the dedicated rights of way shown in the Table, shall be widened to accommodate cyclists in accordance with section 7.5.~~

~~If the proposed works involve extending an existing road, at the Director of Engineering's discretion the existing road width and characteristics may take precedence over these cross sections for the remainder of the block.~~

## **8. ROADWORKS SYSTEM**

Deleted & Replaced with new content -  
see amendment bylaw Section 7.1

### **8.1 General**

~~This section is to be read in conjunction with Section 7 Transportation. This section expands on the contents of Section 7 to provide additional geometric and structural requirements.~~

~~The design of roads and highways shall conform to these guidelines and:~~

- ~~1) Geometric Design Guide for Canadian Roads published by the Transportation Association of Canada (TAC), latest edition;~~
- ~~2) City of New Westminster Bylaws, and~~
- ~~3) Provincial legislation including the Motor Vehicle Act.~~

~~The Consultant shall submit a geotechnical report with each road design that outlines the existing road conditions and recommended road structure. Due to the unique soil and topographic conditions of Queensborough area of New Westminster, it is essential that roads be designed to provide adequate drainage and added safety in areas having unstable soil stratas. If the underlying material is peat, a special stabilization method should be investigated, i.e., pre load or peat removal. For this reason, the City stipulates the basic minimum required asphalt concrete, gravel and road base thicknesses (these thicknesses are shown on typical road cross sections. The Consultant shall verify road structure design based on the geotechnical report, to the satisfaction of the Director of Engineering. The Director of Engineering reserves the right to change the asphalt concrete and road base thicknesses, if deemed necessary, as the result of unstable sub grade.~~

~~The surface course of asphalt concrete is usually placed at a later date (one year) after all the service connections, etc., are completed.~~

### **8.2 Geometric Design Requirements**

Numbering Change -  
See amendment bylaw Section 7.16.1

#### **8.2.1 Design Speeds**

The following minimum design speeds must be provided for both vertical and horizontal alignment, unless otherwise approved by the Director of Engineering:

<u>Road Classification</u>	<u>Design Speed</u>
<del>Major Arterial Road - Divided</del>	<del>70 kph</del>
<del>Major Arterial Road - Undivided</del>	<del>60 kph</del>
<del>Local Arterial Road</del>	<del>60 kph</del>
<del>Collector Street</del>	<del>50 kph</del>
<del>Local Street</del>	<del>50 kph</del>
<del>Lanes</del>	<del>30 kph</del>

Road Classification  
and Design Speed  
have been updated  
- See amendment  
bylaw Section  
7.16.1



### **8.2.2 Design Gradients**

Section has been renumbered & New content has been added -  
See amendment bylaw Section #7.16.2

A smooth grade line with gradual changes, consistent with the class of road and the character of the terrain, is preferable to an alignment with numerous breaks and short lengths of grade. The “roller-coaster” or “hidden dip” type of profile shall be avoided.

At intersections of roads of unequal classification, the grade of the road centreline of higher designation will be maintained and the grade of the other road centreline will be altered to conform to the crown of the more major road.

At intersections of roads of equal classification, the grade of the road centreline of each road will be constructed level for the width of the intersection.

### **8.2.3 Cross Slopes and Superelevation**

Section has been renumbered to Section #7.16.3  
A sentence has been added to this section. Refer to  
Section 7.16.3 of the amended bylaw for details

Cross slopes for all roadways shall not be less than 2% or more than 4% in the direction indicated on the appropriate Road Cross Sections. The crown shall be in the centre of the pavement. A standard “V-Shaped” cross section should be used for lane design.

~~Superelevation is to be provided as per appropriate TAC Standards unless otherwise directed by the Director of Engineering.~~

### **8.2.4 Drainage**

Numbering Change -  
See amendment bylaw Section 7.16.4

On roadways with curbs, drainage is the essential consideration. Longitudinal gradients must be set to eliminate excessive accumulation of water on the pavements.

Unless otherwise specified the following minimum gutter line gradients shall be used:

Road	0.36%
Cul-de-Sac	0.50%.

To provide drainage for flat roads that require false grading, the maximum gradient should not exceed 0.56% for roads and 1% for cul-de-sacs.

Unless otherwise directed by the Director of Engineering, these gradients shall be used for all normal conditions of rainfall and outlet spacing. In special cases, a hydraulic analysis should be made to determine whether water will flow at an undesirable depth in the gutter.

### **8.2.5 Vertical Curves**

Numbering Change -  
See amendment bylaw Section 7.16.5

Vertical curves shall be designed in accordance with the latest edition of TAC, governed by the design speed of the road or laneway.

"Geometric Design Guide for Canadian Roads" has been added after "TAC"

### **8.2.6 Horizontal Curves**

Numbering Change -  
See amendment bylaw Section 7.16.6

Horizontal curves shall also be designed in accordance with the latest version of TAC, governed by the design speed of the road or laneway.

"Geometric Design Guide for Canadian Roads" has been added after "TAC"

### **8.2.7 Driveways**

Deleted & Replaced with new content -  
See amendment bylaw Section 7.5

~~Driveways are to be designed in accordance with City bylaws and the Supplementary Specifications and Detail Drawings. For access requirements refer to Section 7.~~

~~All driveways are to include a landing area at the entrance. This landing area is to be 3 metres long, measured from the furthest of the, existing or future, rear sidewalk or curb edge into the site, at a maximum grade of 5%. The maximum grade of the remainder of the driveway may be up to 15%. The Consultant must ensure that grade transitions provide for all reasonable vehicle clearances so that vehicles will not "hang up" or "bottom out". Vertical curves may be required.~~

~~All driveways are to be asphalt or concrete up to property line. Existing driveways are to be reinstated with asphalt to property line on City rights of way and with material to match existing on the private property side.~~

~~The minimum distance between the start of the curb letdown should be as follows: 1.5 m to the nearest street light pole; 1.5 m to the nearest hydrant; and 2.0 m to the nearest tree.~~

~~Sidewalks across driveways should be designed so as to avoid a crossfall of more than 5%. Design options include placing the slope of the driveway between the sidewalk and curb or at the back of the sidewalk, rather than across the sidewalk, or dropping the elevation of sidewalk to meet the elevation of the driveway.~~

### **8.2.8 Intersections**

Deleted & Replaced with new content -  
See amendment bylaw Section 7.6

~~Geometric design of all intersections shall be in accordance with the last version of TAC. For access requirements refer to Section 7.~~

~~Intersection designs shall ensure that pedestrian, bicycle, transit and vehicular concerns are addressed.~~

~~The following table lists typically recommended curb return radii. The Consultant shall confirm the required curb return radii based on traffic volumes, turning movements, and vehicle types to be approved by the Director of Engineering. Reduced diameter curb returns may be approved by the Director of Engineering based on traffic calming and pedestrian safety issues.~~

**Table 8.1 Curb Return Radii**

	<b>Intersection with</b>		
	<b>Local/Frontage</b>	<b>Collector</b>	<b>Arterial</b>
<b>Local</b>	7 m	7 m	9 m
<b>Industrial Local</b>	9 m	9 m	9 m
<b>Collector</b>		7 m	9 m
<b>Arterial</b>			9 m

### 8.2.9 Railway Crossings

Deleted & Replaced with new content -  
See amendment bylaw Section 7.12

~~Whenever roadworks cross an existing railway or railway right of way appropriate permits and approvals must be obtained.~~

~~If these roadworks involve improvements to arterials, collectors, or roadways with designated bicycle routes, a rubber or pre-cast concrete railway crossing shall be used at the railway crossing.~~

### 8.3 Structural Design Requirements

Deleted & Replaced with new content -  
See amendment bylaw Section #7.17

~~The basic road pavement structural design shall be adequate for an expected road life of 20 years under the expected traffic conditions for the class of road. This shall be determined by the results of soils tests and analysis of the results of deflection testing performed on the surface of the road base gravel by a registered Professional Engineer. The minimum total flexible pavement structure thickness for any road shall be in accordance with standard drawings or greater if determined by the testing.~~

~~The Director of Engineering may require the submission of a geotechnical report to confirm the structural adequacy of any existing or proposed street.~~

#### 8.3.1 Existing Pavement

Numbering Change & minor edits-  
See amendment bylaw Section 7.18.2

Overlay of existing pavement shall be based on analysis of the results of Benkleman Beam tests, or other approved method, carried out on the existing road which is to be upgraded.

The Benkleman Beam testing shall be carried out in accordance with current standards, published by the ~~Roads and Transportation Association of Canada (RTAC)~~.

Transportation Association of Canada (TAC).

The maximum Benkleman Beam deflection corrected for seasonal variation shall not be greater than:

- |                                    |         |
|------------------------------------|---------|
| • Industrial and Arterial streets  | 1.00 mm |
| • Collector and Commercial streets | 1.25 mm |
| • All other road classifications   | 1.50 mm |

The overlay thickness shall be determined by both the Benkleman Beam testing and by the shape of the cross-section of the existing pavement, so that an adequate crossfall on the existing pavement is obtained. The structure and/or grade of the existing pavement may indicate complete removal and reconstruction, which shall be carried out at the discretion of the Director of Engineering.

All joints between existing and new asphalt surfaces shall be lap joints. The location and specifications of all joints shall be shown on the Consultant's drawings.

### 8.3.2 Asphalt-Concrete Pavement

Numbering Change & minor edits-  
See amendment bylaw Section 7.18.3

The following minimum pavement, gravel and sand thickness presented in Table 8.2 shall be maintained.

**BYLAW 8128, 2019**

**Table 8.2 – Pavement and Gravel Thickness**

Road Classification	75 mm Granular Subbase (mm)	19 mm Crushed Granular Base (mm)	Asphalt-Concrete	
			Lower Course (mm)	Upper Course (mm)
Major Road Network	500 (Crushed)	150	100 mm super pave (19mm)	50 mm super pave (12.5 mm)
Major Arterial	500 (Crushed)	150	100 mm super pave (19mm)	50 mm super pave (12.5 mm)
Arterial	400 (Crushed)	150	75 mm super pave (19mm)	50 mm super pave (12.5 mm)
Collector	300 (Select)	125	60 mm Lower Course 1	40 mm Upper Course 1
<del>Local Road</del>	<del>300 (Select)</del>	<del>100</del>	<del>45 mm Lower Course 2</del>	<del>40 mm Upper Course 2</del>
<del>Non-Residential Lanes &amp; Driveways</del>	<del>100 (Select)</del>	<del>100</del>	<del>40mm Lower Course 2</del>	<del>35 mm Upper Course 2</del>
<del>Residential Driveways</del>	<del>100 (Select)</del>	<del>100</del>		<del>65 mm Upper Course 2 (1 Lifts)</del>

### **8.3.3 Sidewalks and Cross Walks**

Deleted & Replaced with new content -  
See amendment bylaw Sections 7.7 and 7.8 of  
amended bylaw

~~Sidewalk width shall be a minimum of 1.50 metres, except as shown in the Trail and Greenway Master Plan. For multi family residential areas or areas with moderate pedestrian or wheelchair traffic, the minimum width should be 1.8m, with 2.0m preferred. In commercial areas or areas with higher pedestrian or wheelchair traffic such as schools and playgrounds, the minimum width should be 2.5m and scaled up according to the anticipated maximum volume of pedestrians. Where local area plans exist, the requirements outlined therein shall govern.~~

~~Sidewalks shall be designed to maximize pedestrian safety. No obstructions, including hydrants or utility poles, shall be placed within existing or proposed sidewalks. Where parkade entrances meet sidewalks, a 3m by 3m view corridor shall be provided to ensure adequate stopping sight distance and avoid conflicts between drivers and pedestrians.~~

~~Where decorative materials are specified under City design guidelines, surface treatments should minimize vibrations for those using wheelchairs, scooters or strollers. If there is doubt concerning the impact of crossfalls and surface treatments on those with special needs, the Special Services and Access committee should be consulted.~~

~~Sidewalks shall be sufficiently wide to accommodate a transit stop pad at all current and potential bus stop locations in order that waiting passengers do not obstruct passing pedestrians and that rain protection can be provided. Where possible, the width should accommodate a standard transit shelter and amenities such as trash cans and benches.~~

~~Longitudinal grades on sidewalks shall remain constant and not exceed 10% where possible.~~

~~Finished sidewalk elevation at the back of the sidewalk shall be shown on the construction plan at locations corresponding to the gutter high and low point. Intermediate finished grade elevation shall also be shown at 10 m intervals corresponding to roadway cross sections.~~

### **8.3.4 Curb/gutter**

Numbering Change & minor edits-  
See amendment bylaw Section 7.17.3 of  
amended bylaw

All roads shall be complete with wide base barrier concrete curbs and gutters in accordance with the City approved edition of the MMCD and Supplementary Specifications and Detail Drawings.

Traffic circle and lane curb and gutter requirements shall be approved by the Director of Engineering.

### **8.3.5 Medians**

Numbering Change -  
See amendment bylaw Section 7.17.4 of  
amended bylaw

Medians shall be sized in accordance with the Road Cross Sections and landscaped as outlined in Section 9.

### **8.3.6 Utility Relocations**

Deleted & Replaced with new content -  
See amendment bylaw Section 7.17.5

~~Many utilities (surface and sub-surface) must be relocated as the result of road widening and reconstruction.~~

~~It will be the responsibility of the Consultant to liaise with the City's Electrical Utility at the preliminary design stage, to resolve the new locations and off-sets of the utilities and to meet the requirements of all parties.~~

~~The City's Electrical department shall assist with notification of other utility companies on matters such as annual proposed programs and construction schedules so that adequate time is given to them for scheduling and costing.~~

### **8.3.7 Road Embankment Grading**

Deleted & Replaced with new content -  
See amendment bylaw Section 7.17.6

Road embankment shall be shaped to a slope of 1 vertical to 3 horizontal with sand fill and shall be finished with a seeded topsoil meeting the existing ground level or suitable alternative in accordance with Section 9.

If the embankment slope is causing inconvenience to property owners and is adversely affecting drainage and driveways, retaining walls complete with top hand rail shall be used. The use of retaining walls should be avoided except in extreme cases.

### **8.4 Postal Service**

Replaced with new content -  
See amendment bylaw Section 7.13

~~The Developer shall set the location of community mail boxes within the development and shall obtain agreement in writing from Canada Post regarding the location(s). The Developer shall provide the required additional street right-of-way at the community box locations to enable Canada Post to install the box.~~

### **8.5 Traffic Signs and Street Markings**

Replaced with new content -  
See amendment bylaw Section 7.14

~~If traffic signs are required for a proposed development, these will be designed by City staff and their construction will be included with the installation of the City services. If pavement markings are required for proposed developments these will be designed by the Developer and their construction will be included with the installation of the City services.~~

## **9. STREET TREES & LANDSCAPING**

### **9.1 General**

Trees and landscaping are to be planted on all city road right of ways and within new subdivisions. The location of all civil works shall be shown in relation to the street trees and landscape areas.

#### **9.1.1 Approval**

The species of trees to be planted as street trees and plant material shall be reviewed and approved by the City Parks Department.

### **9.2 Design Criteria**

#### **9.2.1 Landscaping Medians and Boulevards**

The area between the back of curb or sidewalk and the property line (boulevard area) and the non-travelled central portions of divided arterial roads (medians) normally shall be finished to a lawn or grassed surface using sod unless otherwise approved by the Parks and Engineering Departments. The non-travelled central portions of divided arterial roads (medians) shall be finished to a hard surfaced standard (brushed concrete or brick) or landscaped finish (grassed surface with trees, shrubs or combination of these) or alternative as approved by the Parks and Engineering Departments.

The City Parks Department will plant all trees on City property. The developer/contractor is responsible for all site preparation for the street trees and other landscape areas as noted above.

#### **9.2.2 Minimum Standards**

Trees planted along all streets typically shall be:

- Columnar in shape in commercial and high-density areas and of a broader, spreading shape elsewhere;
- Of a size, type and method of planting to be specified by the City Parks Department;
- Spaced at approximately 6.0 m – 10.0 m intervals; and
- Planted in a single row, centered in boulevard along both sides of the street or a second parallel row of trees of equal spacing. Trees may be planted on private property in a right-of-way at the City's discretion.



Unless required or pre-approved by the City, trees will not be planted within:

- a) 6 m from Street Lighting;
- b) 2 m from Catch Basins;
- c) 8 m from Street Intersections (measured from the curb return);
- d) 3 m from Hydrants;
- e) 2 m from Manholes
- f) 2 m from Driveways;
- g) 3 m from Electrical Junction Boxes;
- h) 2 m from Kiosks.

### **9.2.3 Selection of Trees Species**

The City Parks Department shall select and plant all street trees at the Developers cost. The designer will identify tree spacing requirements.

### **9.2.4 Grating Requirements**

For planting in hard surfaced areas such as concrete or paving stone, unless otherwise specified, concrete grates are required.

### **9.2.5 Tree Root Restraints**

A root restraint mechanism approved by the Parks Department shall be provided where tree roots may interfere with service corridors for underground utilities or sidewalks if they are within 1 meter of the tree. The restraint mechanism will be designed such that the major root structure will be restrained from extending into other utility corridors, but still allow for the normal growth of the tree.

### **9.2.6 Growing Medium**

In grassed boulevards the growing medium shall be installed to the satisfaction of the City Parks Department. Where native material is suitable the growing medium will be 25% native material and 75% amended soil or as otherwise specified by the City Parks Department. The amended soil is to be approved by the City Parks Department. Under hard surfaced areas such as under sidewalks, a structural soil mixture shall be installed to the City Parks Department specifications.

### **9.2.7 Irrigation**

Where required by the City Parks Department for the maintenance of trees, grass or other landscaping located in boulevards or medians in the road right-of-way, an underground sprinkler system shall be provided by the Developer. The system must be capable of providing the necessary irrigation as required and shall be automatically activated through a timed control system. Under hard surfaced areas with structural soil mix, irrigation is required from an independent supply. In grassed boulevards (with the exception of single family parcels ) irrigation is required and shall be provided from the on-site irrigation system at the Developer's cost.

### **9.2.8 Drainage**

Drainage shall be installed where required and tied into the catchbasins. The drainage system shall be 100mm perforated PVC drainage pipe surrounded by 150mm of drain rock and wrapped with filter cloth. A clean out shall be installed every 15m and at the high end of the system with a Nelson box style lid.

### **9.2.9 Drawings**

The following are required on all drawings:

- a) Typical Cross-section with drainage detail;
- b) Tree Planting and Staking Detail;
- c) Tree Grate Detail;
- d) Proposed Tree and Shrub Species Table  
Species to be reviewed by the City;
- e) Plan showing curb gutter and sidewalk, driveway locations including street lights and proposal trees with the chainages;
- f) Irrigation and timer details; and
- g) All civil works within the proximity of trees and shrub root zones.



**CITY OF  
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**SUPPLEMENTARY  
SPECIFICATIONS  
AND DETAIL DRAWINGS**

May 29, 2006.

May 29, 2006.

[illegible]

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SDS-2	Swale
SDS-3	Typical Lot Service Connection
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This document contains additions, amendments, and deletions to the Master Municipal Construction Documents. Section 1 addresses Supplementary Specifications, Section 2 outlines a List of Approved Materials and Products outlining clarification as to acceptable types and manufacturers for materials, and Section 3 contains Supplementary Detail Drawings.

## 1. SUPPLEMENTARY SPECIFICATIONS

<b>General</b>		
1.0		The List of Approved Materials and Products shall take precedence over the Master Municipal Construction Documents and shall be read in conjunction with the Supplementary Specifications and Supplementary Detail Drawings.
<b>Section 02666 – Waterworks</b>		
<b>Delete the following</b>		
2.2.2		
2.2.3		
2.2.4.4		
2.2.4.5		
2.2.4.11		
2.3.2.3		
<b>Add the following</b>		
3.2.3	Connection to Existing Mains	The Consulting Engineer is responsible for bacteriological testing and review of the chlorination, flushing and pressure testing.
<b>Section 02732 – Sewage Force mains</b>		
<b>Delete the following</b>		
2.2.2		
2.2.4		
2.2.5.4		
2.2.5.5		
2.2.5.11		
2.2.6		
2.2.7		
<b>Add the following</b>		
3.15	Pressure Testing	Minimum test pressure is 700 kPa.
<b>Section 2721 – Storm Sewers</b>		
<b>Add the following</b>		
3.18	Video	Mains must be lamp tested prior to video inspection with a

	Inspection	minimum of 75% of the pipe diameter exposed. Video inspection must be completed prior to acceptance of the works.
<b>Section 2723 – Pipe Culverts</b>		
<b>Delete the following</b>		
2.1		
<b>Section 2731 – Sanitary Sewers</b>		
<b>Add the following</b>		
3.12	Leakage Testing – General	Required tests: 1) exfiltration and/or infiltration (as directed by the Consultant); and 2) light; and 3) ball (as directed by the city)(final)
3.18	Video Inspection	Video inspection must be completed prior to the completion of the maintenance period.
<b>Section 16550 – Electrical</b>		
<b>Add the following</b>		
1.5	Contractor Qualifications and Personnel	.3 All electrical work shall be undertaken by a registered electrical contractor with a valid City of New Westminster business license. Contractor shall be responsible for obtaining all electrical permits, arrange for all electrical utility disconnects and connections, and notify the City of New Westminster Electrical Operations Department of the proposed scheduling. .4 All traffic signal installation work shall be undertaken under the direct supervision of a qualified signal superintendent who must be on-site at all times when work is taking place, and have an alternate when superintendent is not on site. .5 As a minimum the signal superintendent shall have IMSA Level 1 Signals Certification and/or have completed at least 3 similar signal projects.
1.11	Work Schedule	.1 The Contractor shall submit for approval to the City Representative prior to commencement of construction a schedule of work setting out the order in which he/she intends to undertake the work. The City Representative may specify the order of work or alter the schedule of work as submitted by the Contractor at any time during the term of the contract. .2 The Contractor shall arrange a pre-construction meeting with



		the City Representative prior to construction. .3 The Contractor shall not receive the "Notice to Proceed" until the Schedule of Work is submitted to the City Representative.
<b>2.0 Products</b>		
<b>Add the following</b>		
2.1	General	.6 The City will supply and install the traffic controller and cabinet. .7 The City will supply the Contractor, free of all charges, the following: a) Street name signs; b) Padlocks. This equipment will be made available to the Contractor at the City Works Yard. The Contractor shall make all arrangements and pay all costs necessary for the collection of the materials and its delivery to the job site. The Contractor shall assume responsibility for all materials from the time they are picked up and shall provide suitable storage and protection for these materials until they are installed. At the time the materials are picked up, the Contractor shall complete a Materials Release Form, and shall check the quantities and verify the correctness of the materials supplied. Any discrepancies or shortages shall be reported immediately to the City Representative. The Contractor shall give the City Representative a minimum of 7 days notice (in writing) prior to the time the equipment is required.
<b>3.0 Execution</b>		
<b>Delete the following</b>		
3.15	Traffic Controller	.1 through .8
<b>Add the following</b>		
3.15	Traffic Controller	.1 The City of New Westminster shall install the traffic controller cabinet on the concrete base. .2 Contractor to ensure that all conductors and loop cables have a length that can be extended 2m above the cabinet base. All conductors to be coiled in main vault prior to City of New Westminster installing cabinet. .3 Prior to installation of the cabinet by the City of New Westminster, the Contractor shall flash all signal and pedestrian displays. Contractor to also verify continuity of each push button circuit (with pedestrian button depressed).

City of New Westminster

Supplementary Specifications  
And Detail Drawings

May 29, 2006.

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Add the following		
3.19	Grounding	.5 All poles shall be grounded by way of a 20mm x 3.0m long galvanized ground rod.

**2. LIST OF APPROVED MATERIALS AND PRODUCTS**

<b>Products</b>	<b>Manufacturers and/or Distributors</b>	<b>Specification</b>	<b>Exceptions</b>
<b>Section 02666 – Waterworks</b>			
<b>Section 02732 – Sewer Force mains</b>			
Mainline Pipe and Fittings	No restrictions	Only ductile iron pipe and cast iron/ductile iron fittings are permitted	
Gate Valves	No restrictions	Only AWWA C500 wedge valves are permitted	
Hydrants	Terminal City	TC1 painted red or approved equal	
<b>Section 02721 – Storm Sewers</b>			
<b>Section 02723 – Pipe Culverts</b>			
Non-reinforced Concrete Pipe	No restrictions	- 150mm to 375mm ONLY - Minimum Class 3	
Reinforced Concrete Pipe	No restrictions	- 450mm and larger pipe ONLY - Minimum Class III	
PVC Pipe and fittings	No restrictions	Up to 300mm ONLY	
<b>Section 02731 – Sanitary Sewers</b>			
Non-reinforced Concrete Pipe	No restrictions	200mm and 250mm ONLY	
Reinforced Concrete Pipe	No restrictions	- 300mm and larger pipe ONLY - minimum Class II	
PVC Pipe and fittings	No restrictions	Up to 300mm ONLY	
Drawing S9 - Inspection Chamber	No restrictions	Contractor to remove factory installed plug and place in the upstream end of a plain end pipe stub installed on the upstream side of the inspection chamber.	

<b>Section 02725 – Manholes and Catchbasins</b>			
Manholes	No restrictions	Only precast manholes are permitted with galvanized steps	
<b>Section 16550 – Electrical</b>			
<b>Products</b>	<b>Manufacturers and/or Distributors</b>	<b>Specification</b>	<b>Exceptions</b>
Cobra Head Luminaires	No restrictions	M.o.T. (Flat Glass)	High Pressure Sodium or Pulse Start Metal Halide as Noted on Contract Drawings
HID Lamps	No restrictions	M.o.T.	
Concrete Junction Boxes	No restrictions	M.o.T.	Labelled "ELEC."
Plastic Junction Boxes	West Coast Eng.	Model No. WCE 1324	Plastic Lid
Poles, Service Bases and Anchor Bolts	No restrictions	M.o.T./MMCD	
Signal and Pedestrian Heads	No restrictions	M.o.T.	Aluminum
LED Displays	No restrictions	M.o.T.	
LED Pedestrian Displays	No restrictions		
Overhead Adjustable Brackets	No restrictions	"Astro" Bracket	
Spring Cushion Hangers	No restrictions	M.o.T.	
Side Mount Brackets	No restrictions	M.o.T.	
Pedestrian Pushbuttons	No restrictions	Bull Dog c/w LED & Globe Sign Unit	Black on Yellow
Service Panels	No restrictions	City of New Westminster/MMCD	No Contactor and Bypass Switch

City of New Westminster

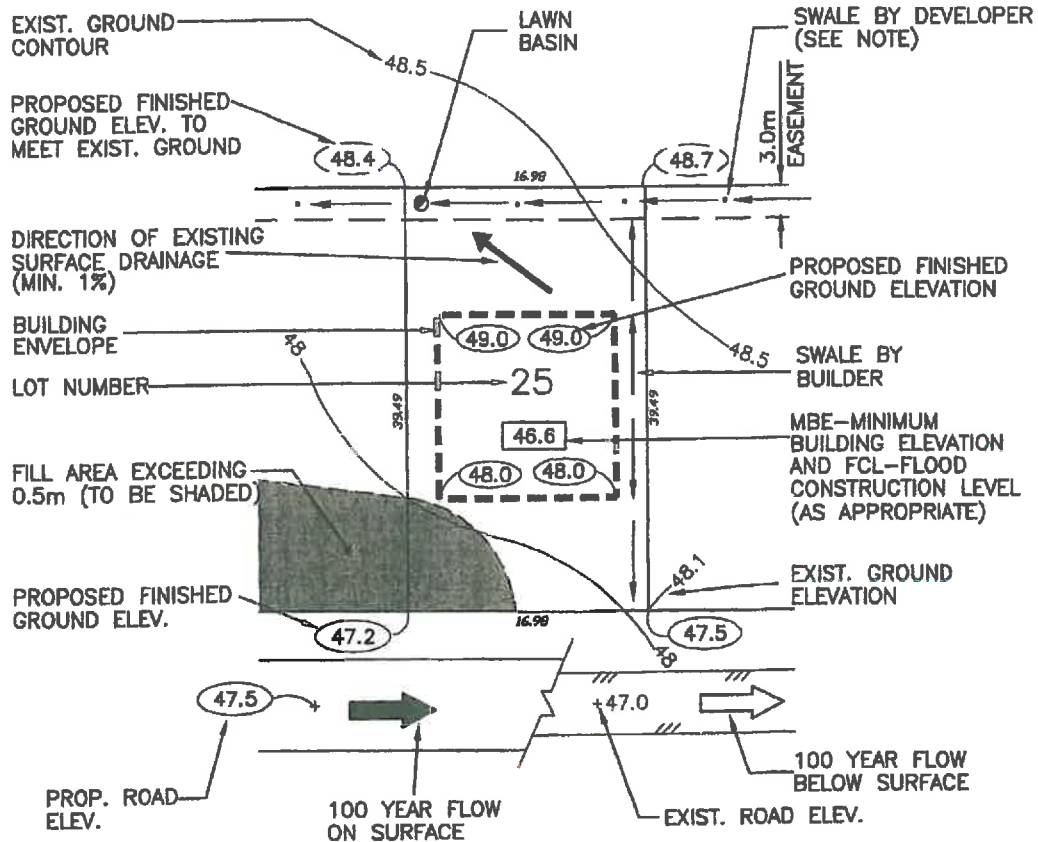
**Supplementary Specifications  
And Detail Drawings**

May 29, 2006.

<b>Audible Signals</b>	<b>No restrictions</b>	<b>DS2000</b>	
<b>Signal Cables</b>	<b>No restrictions</b>	<b>CLMTO</b>	
<b>Safety Cable</b>	<b>No restrictions</b>	<b>No. 3 Loop-end</b>	
<b>Illuminated Pedestrian X- Walk Signs</b>	<b>No restrictions</b>	<b>M.o.T.</b>	<b>Down Light to be 150W M.H. Pulse Start Ballast and Lamp</b>


Deleting Section 3 of "Supplementary Specifications and Detail Drawings" in its entirety and replacing it with Schedule A attached to and forming part of the amendment bylaw no 8369, 2023.

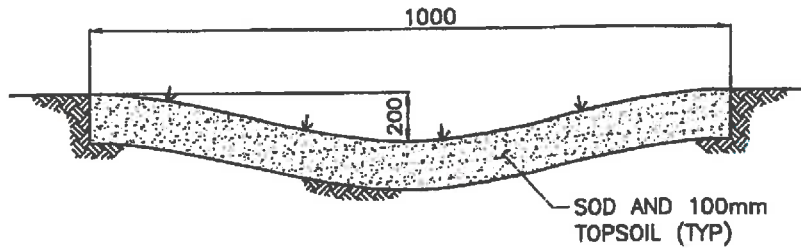
### **3. SUPPLEMENTARY DETAIL DRAWINGS**



#### LOT GRADING NOTES:

1. MBE - minimum building elevation is defined in the building bylaw.
2. All roof leaders are to discharge onto splash pads.
3. Rough lot grading is to be completed by the developer and the finished grading is to be done by the house builder.
4. Sodded swales located in easements and/or rights-of-ways are to be constructed by the developer.
5. Driveways are to be located a minimum 1.0 metre from street lights, fire hydrants, power/telephone kiosks and utility boxes.
6. All swales are to be graded at a minimum 1.0%.
7. Should a driveway be located over a sanitary I.C. or water curb stop, the builder shall be responsible for installing a concrete pull box and cast iron cover to protect the services.
8. The developer's engineer is to certify the rough lot grading prior to issuance of building permits.

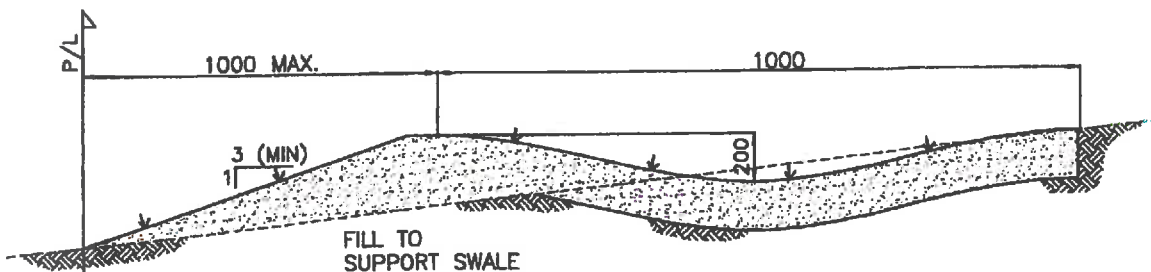
			Title:		<b>The City of New Westminster</b> 	
			<b>Lot Grading Plan Requirements</b>			
No.	Revision	Approved			Suppl. Drawing No.	
Scale: N.T.S.		Date: Oct, 2004				



TYPE 'A'

**NOTES:**

1. Swale typically centred on 3.0m R.O.W.
2. Sod to be placed on 100mm topsoil.
3. All dimensions shown are in millimetres unless otherwise stated.




TYPE 'B'

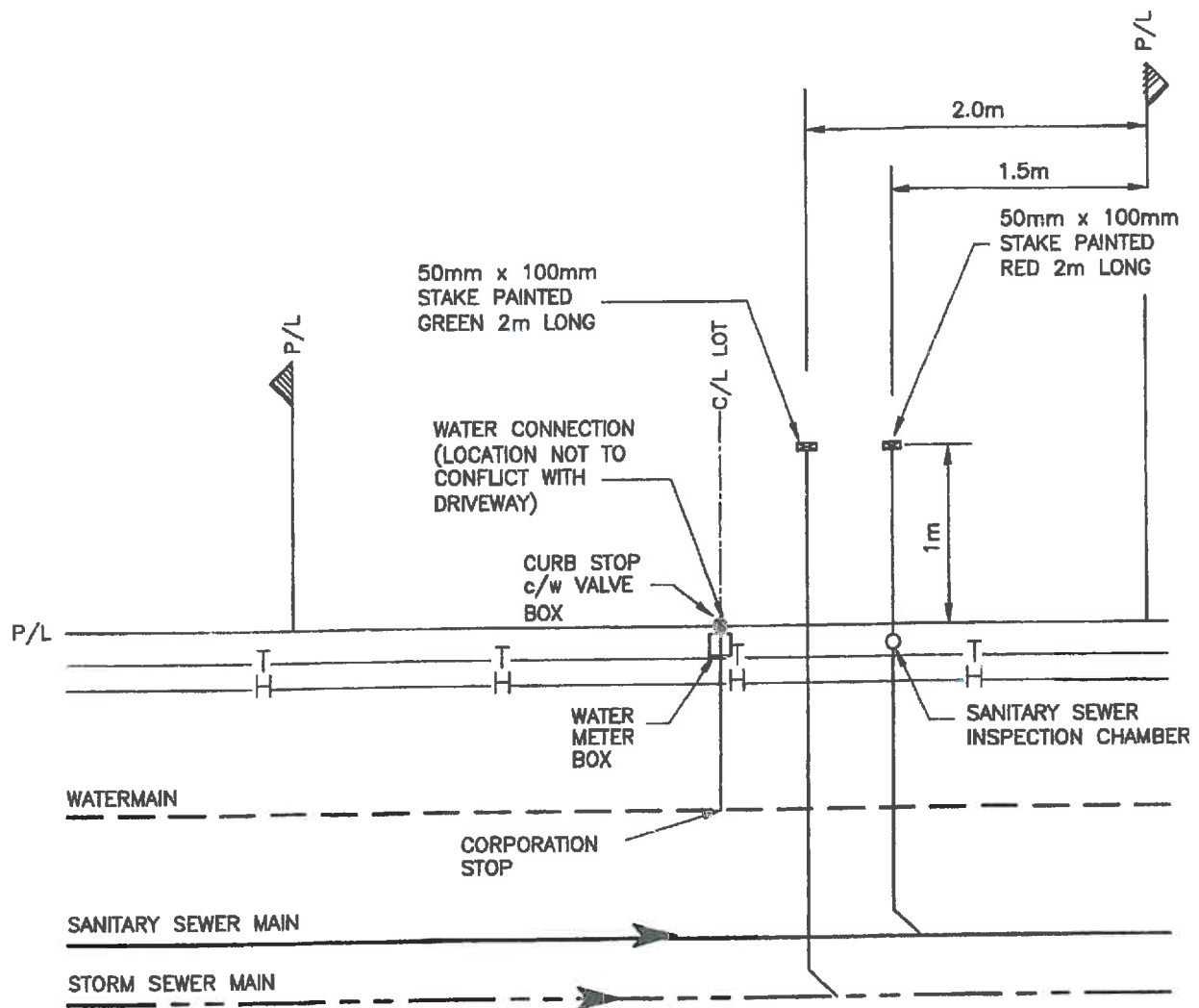
**NOTE:**

1. Easement width as required to support proposed swale.

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			Title:  <b>Swale</b>	The City of New Westminster 
No.	Revision	Approved		
Scale: N.T.S.	Date: Oct., 2004			
			Suppl. Drawing No.	SDS-2

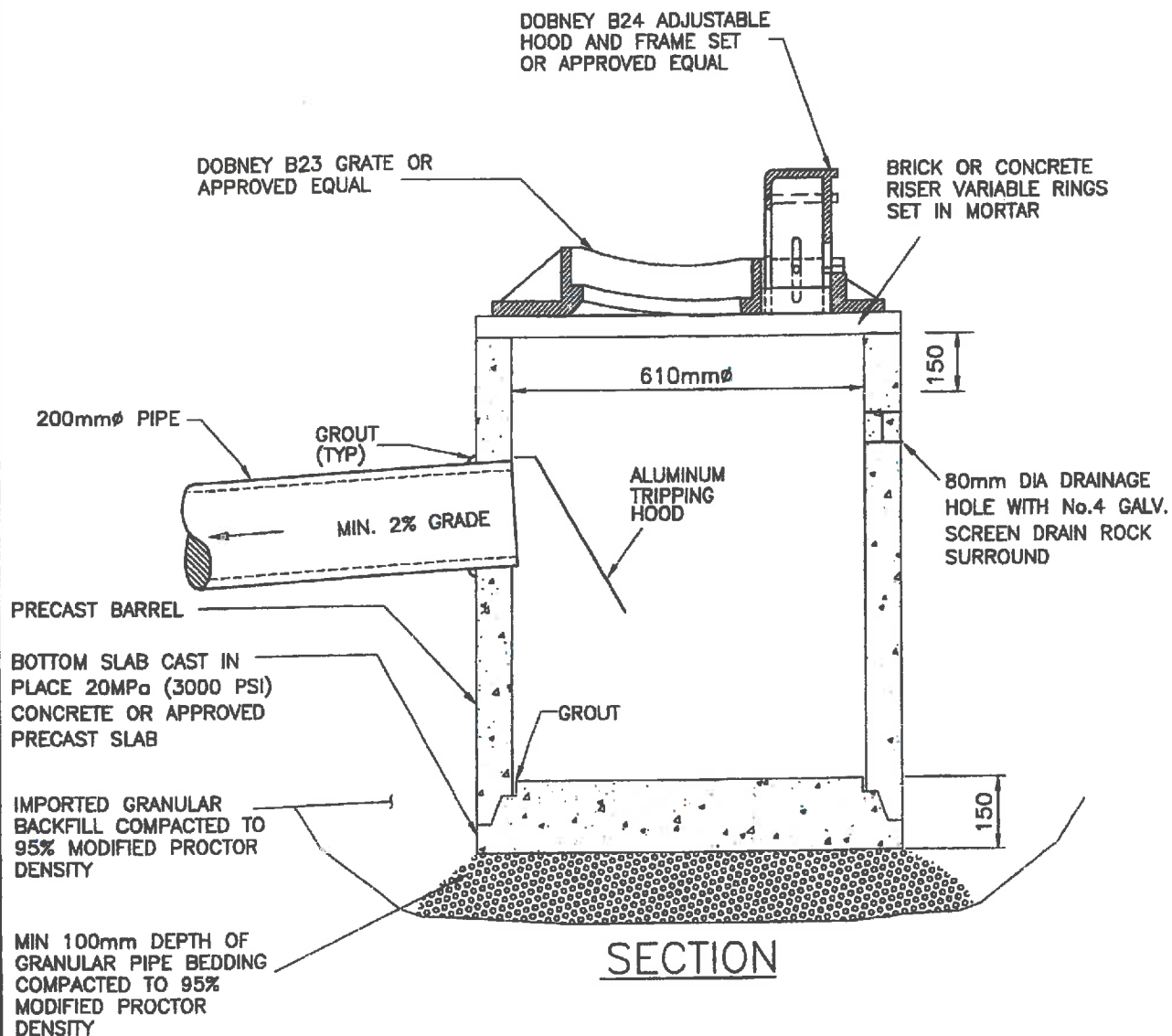




DETAIL PLAN

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			Title: <b>Typical Lot Service Connection</b>		<b>The City of New Westminster</b>	
No.	Revision	Approved	Scale: <b>N.T.S.</b>		Date: <b>Oct., 2004</b>	
			Suppl. Drawing No.		<b>SDS-3</b>	



**NOTES:**

1. Precast units c/w base approved by Contract Administrator are acceptable.
2. Refer to Contract Drawings and Section 02725 for Detailed Specifications.

No.	Revision	Approved
Scale: N.T.S.	Date: Oct., 2004	

Title:

**Standard Side Inlet  
Catch Basin Detail**

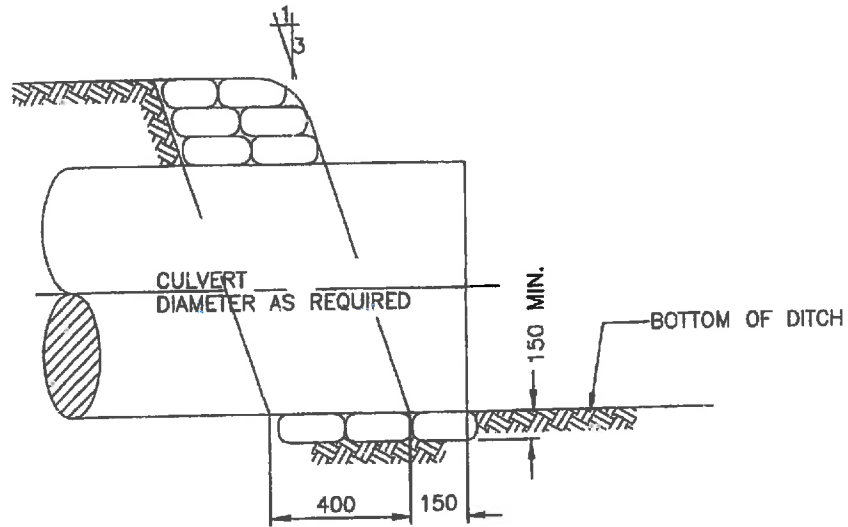
**The City of  
New Westminster**



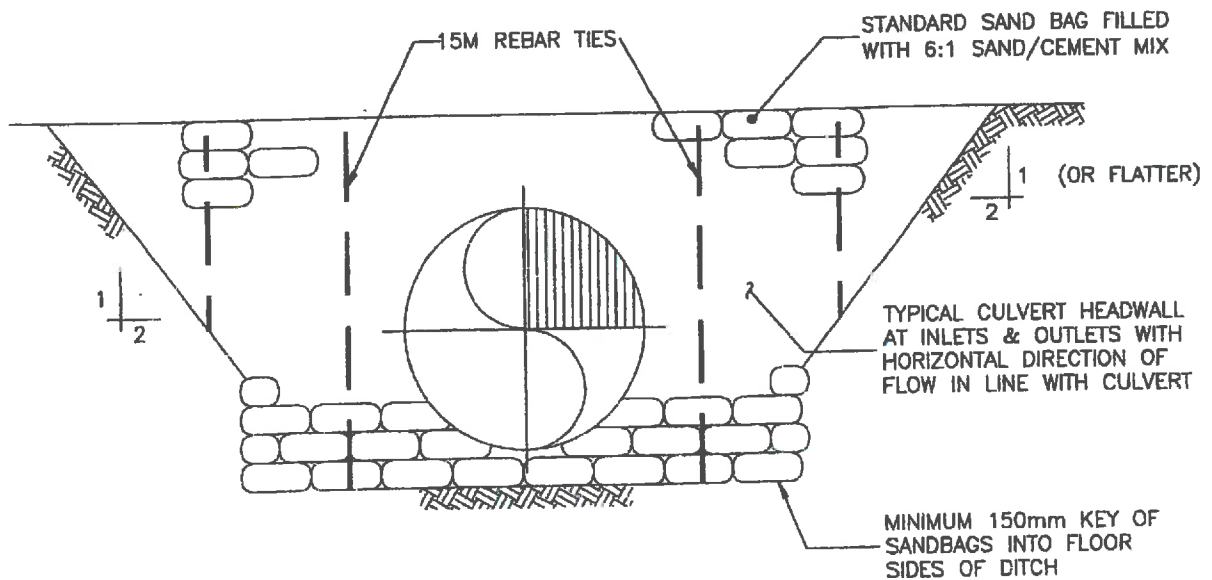
Suppl. Drawing No.

**SDS-4**

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SECTION



Title:

## Sandbag Type Culvert Headwall

The City of  
New Westminster



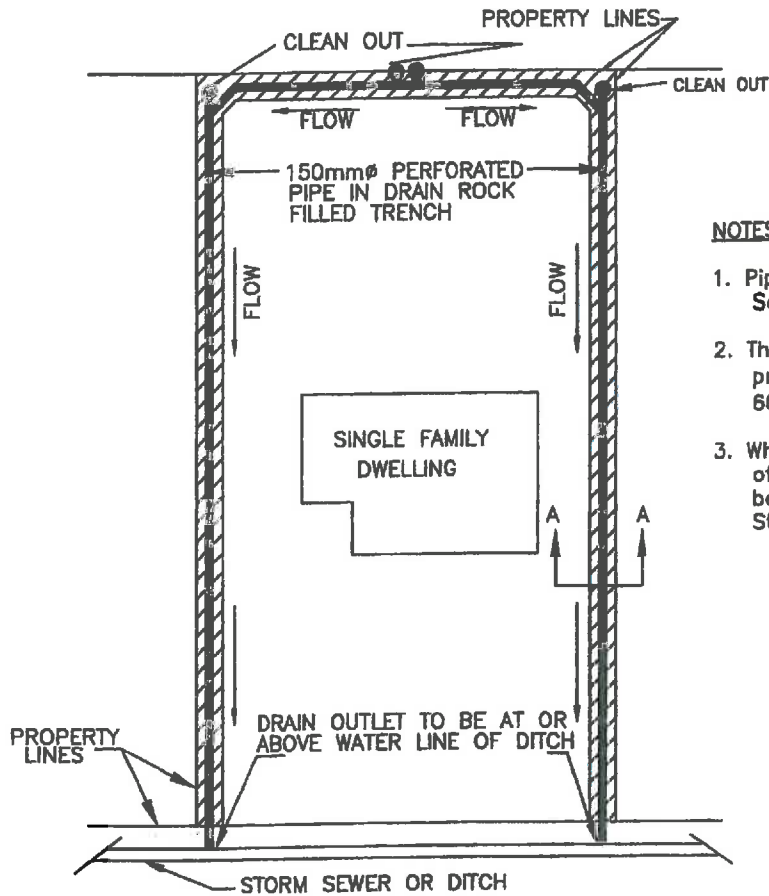
No.	Revision	Approved
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Scale: N.T.S.

Date: Oct., 2004

Suppl. Drawing No.

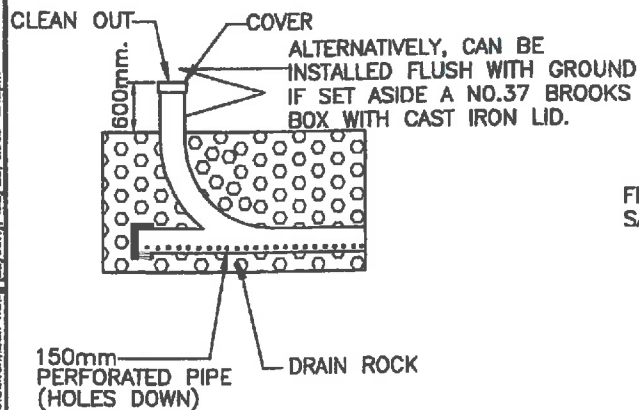
SDS-5



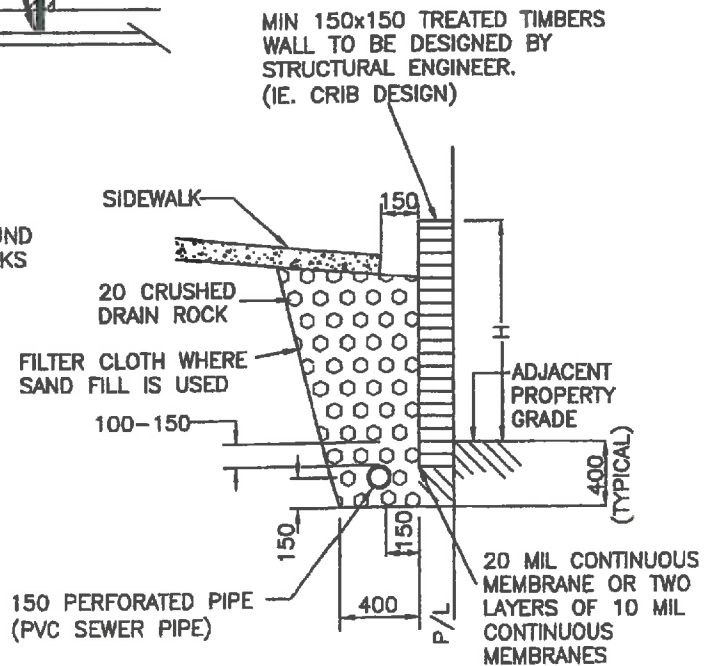
PLAN

**NOTES:**

1. Piping, to be 150mm Perforated P.V.C. Sewer pipe.
2. The Plumbing Inspector must be consulted prior to commencement of installation (Tel. 604-527-4580).
3. Where fence is to be installed at the top of the retaining wall, the fence posts must be incorporated in the design by the Structural Engineer.

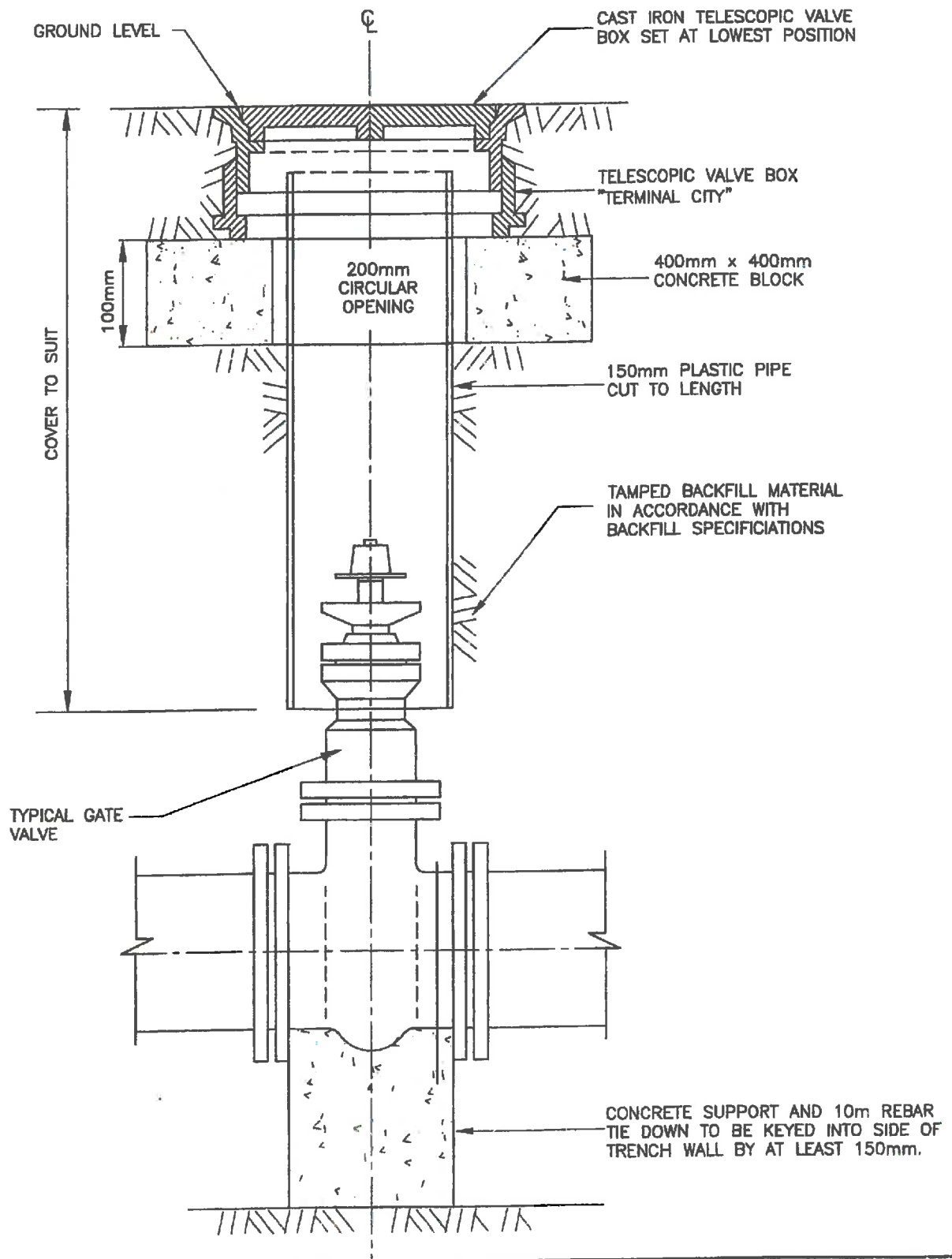


CLEAN OUT DETAIL



Acad 16.3 (2003) (16.3 Tech) L:\Projects\_VAN1127\1001\001\Drawings\Current\Site\1.dwg (Layout1) May 29, 2006 - 2:12pm

			Title:		<b>The City of New Westminster</b>
			<b>Site Perimeter Drainage for Infill Lots</b>		
No.	Revision	Approved			
Scale: <b>N.T.S.</b>		Date: <b>Oct., 2004</b>			Suppl. Drawing No. <span style="float: right;"><b>SDS-6</b></span>



Asst (C... 418 Tech) LHP Projects VAN1271007/101/Digital/Cammi/Wes-1.dwg (Layout1) May 29, 2006 - 2:12pm

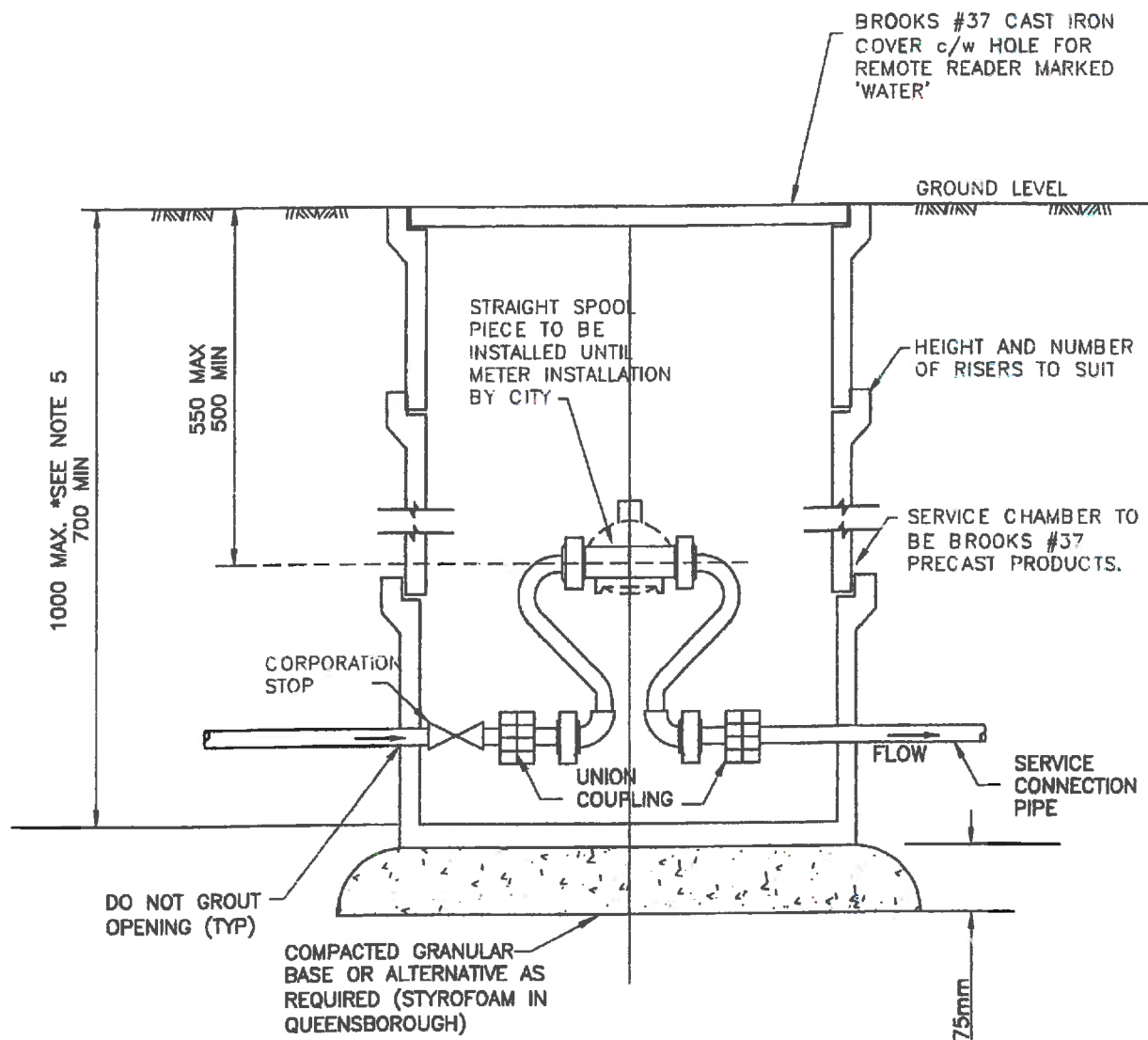
No.	Revision	Approved
Scale: N.T.S.		Date: Oct., 2004

Title:

**Gate Valve Cover Installation**

The City of  
New Westminster

Suppl. Drawing No. **SDW-1**



#### NOTES:

1. Meter to be supplied and installed by City.
2. Meter setters to be equipped with lockable inlet valve, single check outlet valve, and solder clamp and pack joint connection both ends.
3. For 19mm connections preapproved meter setters to be Ford VH92-15 or Ford VH82.
4. For 25mm connections preapproved meter setters to be Ford VH94-15 or Ford VH84.
5. Refer to contract drawings and section 02666 for Detailed Specifications.
6. Refer to MMCD Standard Drawings for detail of service connection to watermain.

Acad 16 (2-2004) US Projects VAN127A001 4010 Digital Camera (Wet 2.4mm) Layout (1), May 28, 2008 - 2:13pm

No.	Revision	Approved
Scale: N.T.S.	Date: Oct, 2004	

Title:

### Water Meter for 19mm & 25mm Service Connection

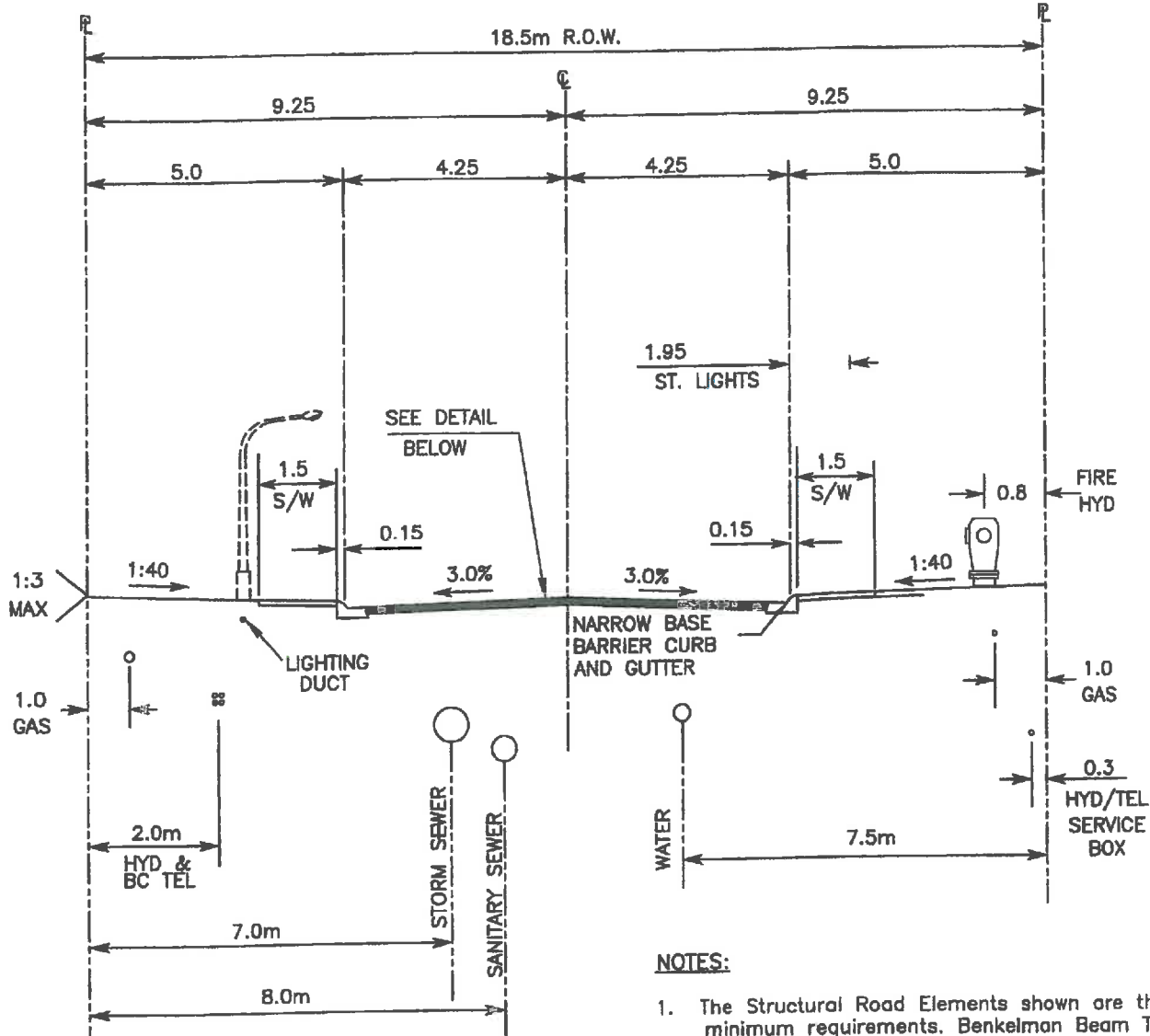
The City of  
New Westminster



Suppl. Drawing No.

**SDW-2**





#### NOTES:

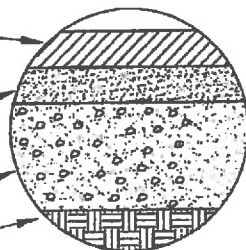
1. The Structural Road Elements shown are the minimum requirements. Benkelman Beam Test results or an equivalent technique shall be used to design the road structure.
2. All Utility Services and Service Connections shall be installed prior to final road paving.
3. All Intersection Radii shall be 6.0m, unless otherwise specified.
4. When infilling Existing Ditches or construction services in Fill Sections, fill material to be 100mm Pit Run Gravel compacted to 95% Modified Proctor.
5. Boulevard X-Fall to be 1:40 except in areas of large cuts or fills, where special boulevard design shall be required.

Min. 100mm Asphaltic Concrete

Min. 100mm Granular Base  
Compacted to 95% Modified Proctor

Min. 200mm Select Granular Sub-base  
Compacted to 95% Modified Proctor

Subgrade to be compacted to 95%  
Modified Proctor



Title:

## 18.5m Right-of-Way Local Road

The City of  
New Westminster



No. Revision Approved

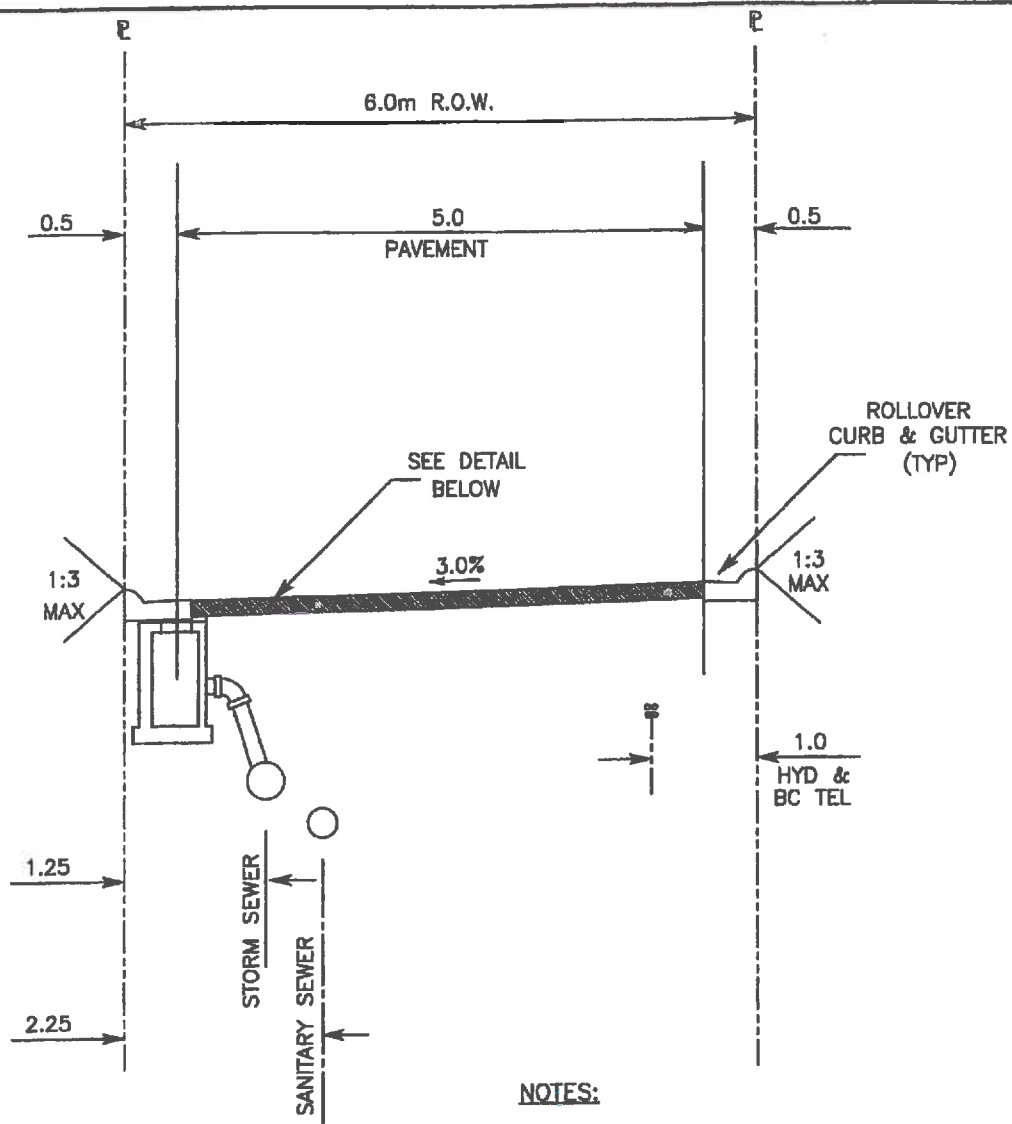
Scale: N.T.S.

Date: Oct, 2004

Suppl. Drawing No.

SDR-2





#### NOTES:

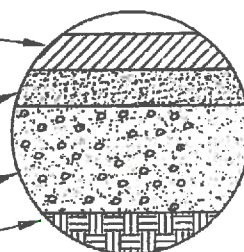
1. The Structural Road Elements shown are the minimum requirements. Benkelman Beam Test results or an equivalent technique shall be used to design the road structure.
2. All Intersection Radii shall be 7.5m, unless otherwise specified.
3. When infilling Existing Ditches or construction services in Fill Sections, fill material to be 100mm Pit Run Gravel compacted to 95% Modified Proctor.
4. Boulevard X-Fall to be 1:40 except in areas of large cuts or fills, where special boulevard design shall be required.

Min. 100mm Asphaltic Concrete

Min. 100mm Granular Base  
Compacted to 95% Modified Proctor

Min. 200mm Select Granular Sub-base  
Compacted to 95% Modified Proctor

Subgrade to be compacted to 95%  
Modified Proctor



No.	Revision	Approved
Scale: N.T.S.	Date: Oct., 2004	

Title:

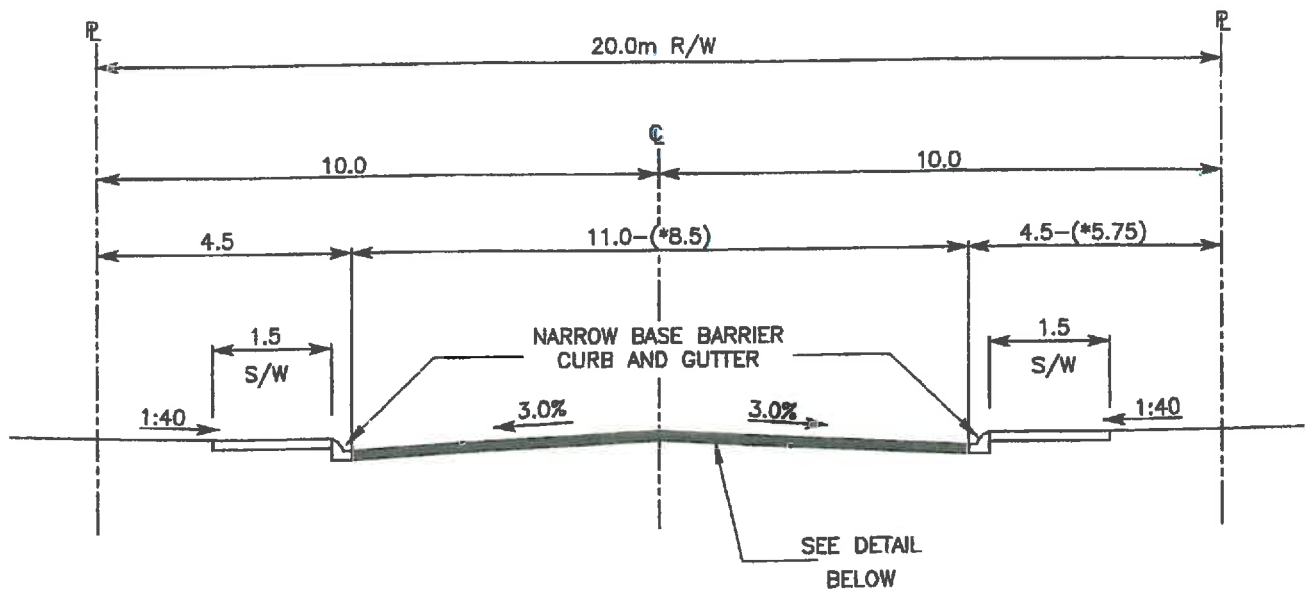
### Pavement on 6m Lane Allowance

The City of  
New Westminster



Suppl. Drawing No.

SDR-3



#### NOTES:

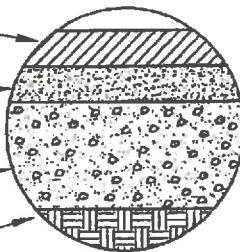
1. The Structural Road Elements shown are the minimum requirements. Benkelman Beam Test results or an equivalent technique shall be used to design the road structure.
2. \*For Cul-De-Sac.
3. The thickness of gravel subbase may change depending on integrity of subgrade soil.

Min 100mm Asphaltic Concrete

Min. 100mm Granular Base  
Compacted to 95% Modified Proctor

Min. 300mm Select Granular Sub-base  
Compacted to 95% Modified Proctor

Subgrade to be compacted to 95%  
Modified Proctor



Title:

## 20m Right-of-Way Local Roads

The City of  
New Westminster



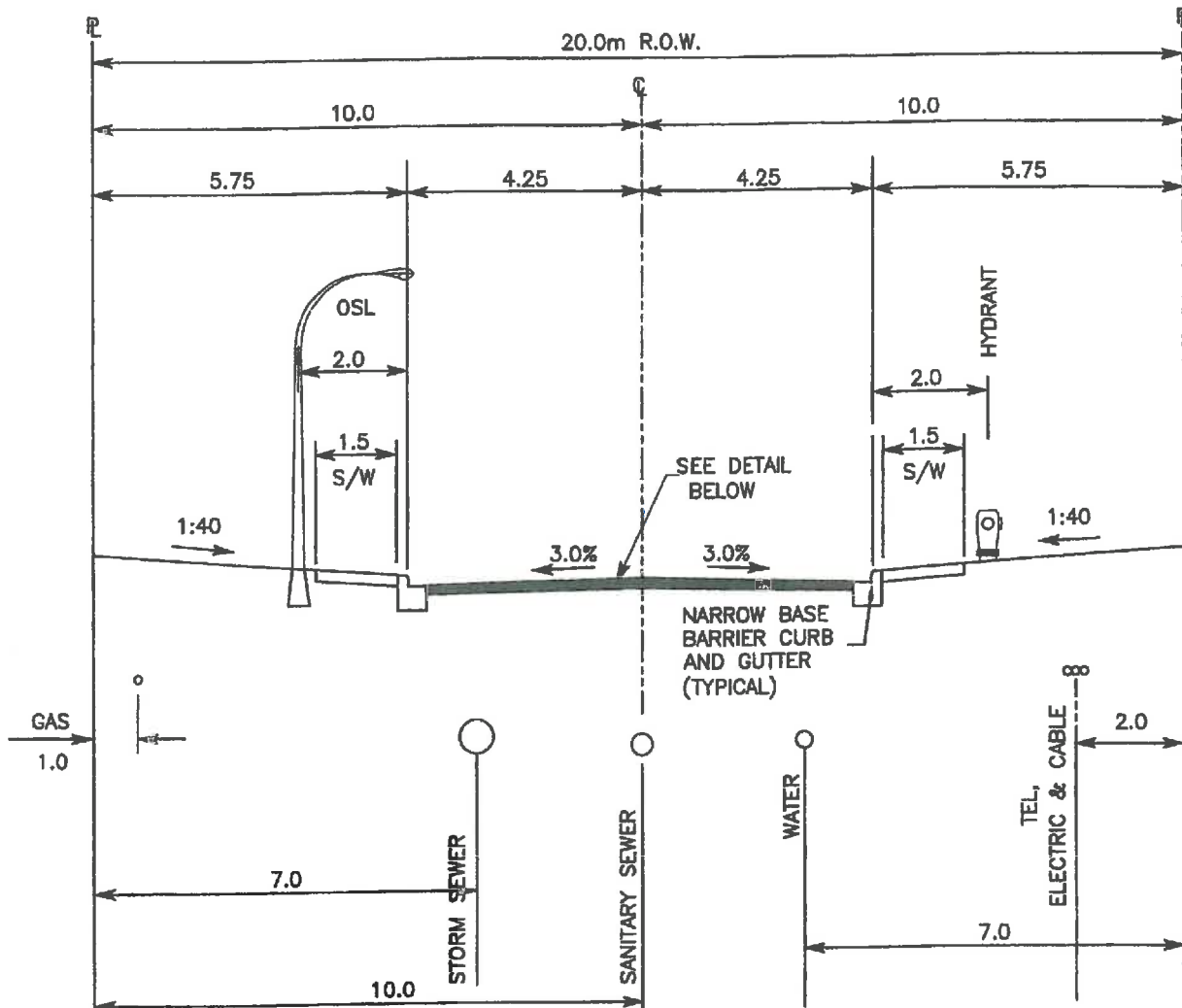
No. Revision Approved

Scale: N.T.S.

Date: Oct., 2004

Suppl. Drawing No.

SDR-8



#### NOTES:

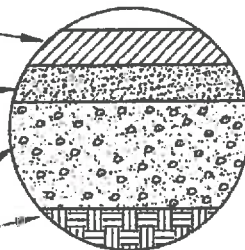
1. The Structural Road Elements shown are the minimum requirements. Benkelman Beam Test results or an equivalent technique shall be used to design the road structure.
2. When infilling Existing Ditches or construction services in Fill Sections, fill material to be 100mm Pit Run Gravel compacted to 95% Modified Proctor.
3. Boulevard X-Fall to be 1:40 except in areas of large cuts or fills, where special boulevard design shall be required.

Min. 100mm Asphaltic Concrete

Min. 100mm Granular Base  
Compacted to 95% Modified Proctor

Min. 300mm Select Granular Subbase  
Compacted to 95% Modified Proctor

Subgrade to be compacted  
to 95% Modified Proctor



Title:

## Minor Local Roads 20m Right -of-Way

The City of  
New Westminster



No. Revision Approved

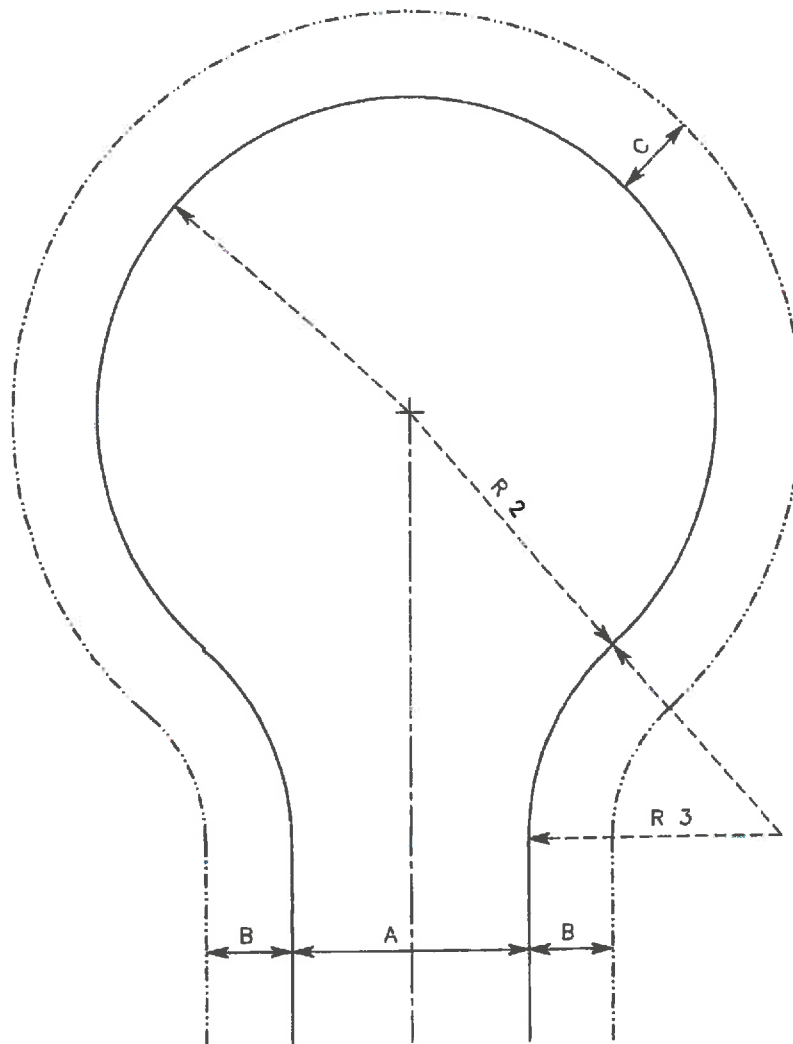
Scale: N.T.S.

Date: Oct., 2004

Suppl. Drawing No.

SDR-9





CLASSIFICATION	A	B	C	R1	R2	R3
URBAN CUL-DE-SAC OR 'P'-LOOP	7.5	$\frac{4.5}{16.5\text{m}}$ R/W	3.0	7.0	11.0	7.0
URBAN LIMITED LOCAL	8.0	$\frac{5.0}{18.0\text{m}}$ R/W	3.0	7.0	11.0	7.0
URBAN THROUGH LOCAL	8.5	$\frac{5.75}{20.0\text{m}}$ R/W	3.0	7.0	11.0	7.0
RURAL	6.8	$\frac{6.6}{20.0\text{m}}$ R/W	4.5	9.0	11.0	9.0
RURAL	7.4	$\frac{6.3}{20.0\text{m}}$ R/W	4.5	9.0	11.0	9.0

**Title:**

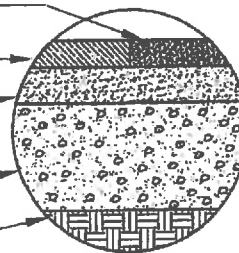
## Cul-de-Sac


**The City of  
New Westminster**

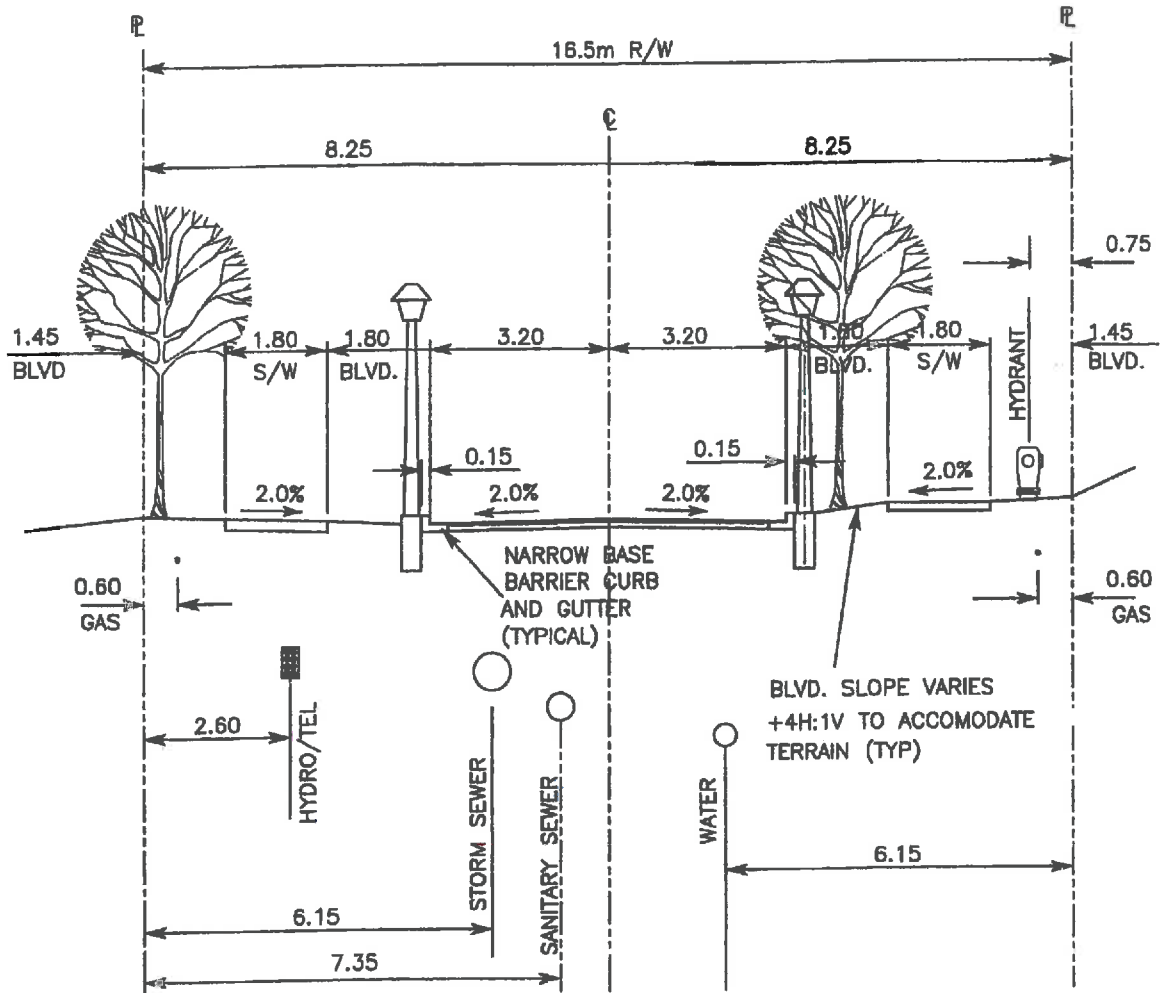




1. The Structural Road Elements shown are the minimum requirements. Soils and test results shall be used to design the road structure.
2. All utility services and service connections shall be installed prior to final paving.
3. Any permanent works on private property must be protected by a registered easement or right-of-way.
4. Pavement width shall be as specified by the Director of Engineering.
5. Ditches shall be piped past utility poles and fire hydrants where required.



<p><b>The City of</b></p> <p><b>New Westminster</b></p>		
<p>Suppl. Drawing No.</p>		<p><b>SDR-12</b></p>



**NOTE:**

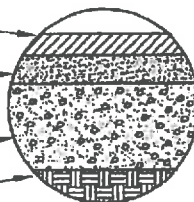
1. The Structural Road Elements shown are the minimum requirements. Benkelman Beam Test results or an equivalent technique shall be used to design the road structure.

Min. 100mm Asphaltic Concrete

Min. 100mm Granular Base  
Compacted to 95% Modified Proctor

Min. 300mm Select Granular Sub-base  
Compacted to 95% Modified Proctor

Subgrade to be compacted  
to 95% Modified Proctor



No.	Revision	Approved
Scale: N.T.S.	Date: Oct, 2004	

Title:

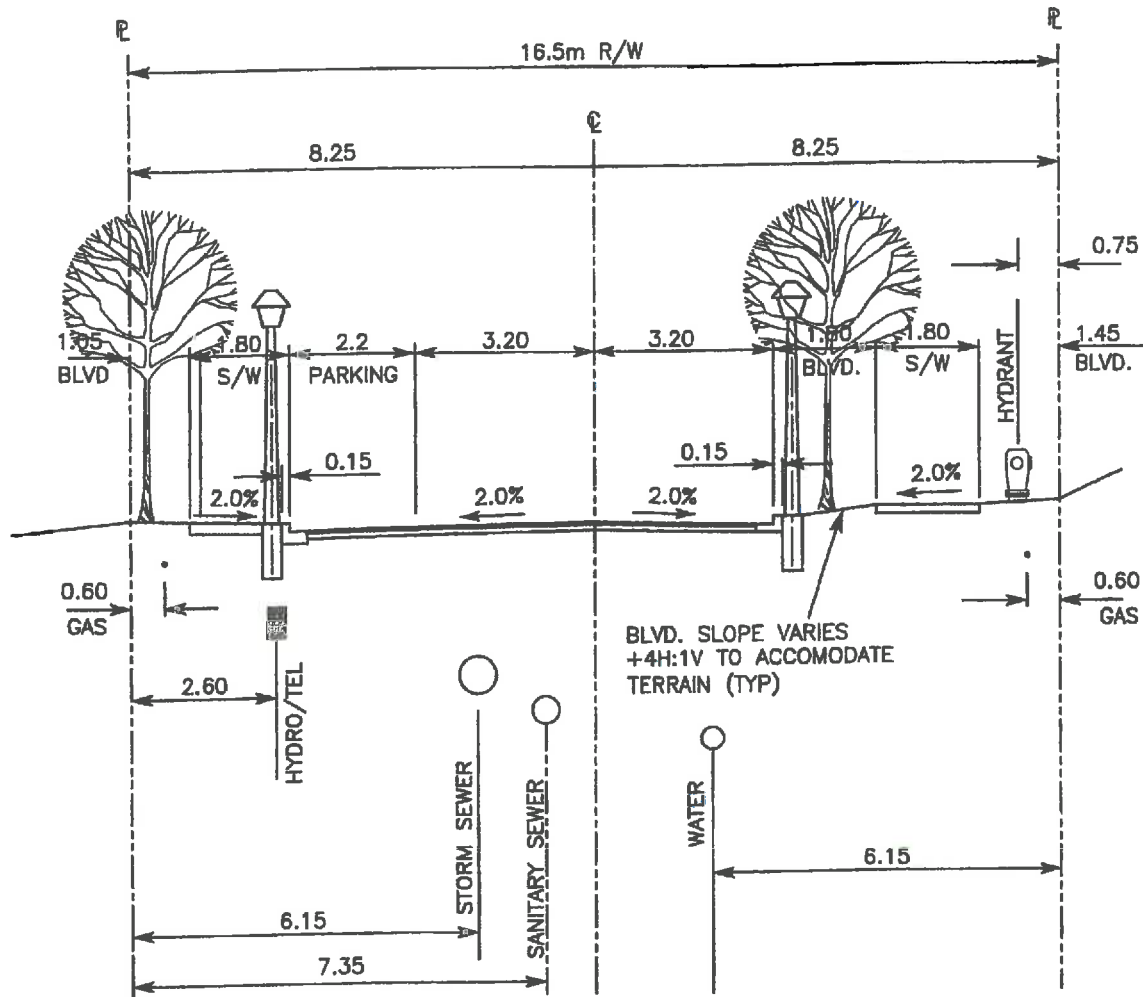
**Alternative Road  
16.5m Right-of-Way**

The City of  
New Westminster



Suppl. Drawing No.

**SDR-13**

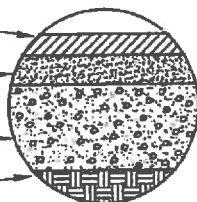


Min. 100mm Asphaltic Concrete

Min. 75mm Granular Base  
Compacted to 95% Modified Proctor

Min. 300mm Select Granular Sub-base  
Compacted to 95% Modified Proctor

Subgrade to be compacted  
to 95% Modified Proctor




#### NOTE:

1. The Structural Road Elements shown are the minimum requirements. Benkelman Beam Test results or an equivalent technique shall be used to design the road structure.

Acad 10... (S. Tech) L:\Projects - VAN1127\001\401\1401\Drawings\Current\RD14-Typ-section.dwg (Layout1), May 26, 2006 - 2:15pm

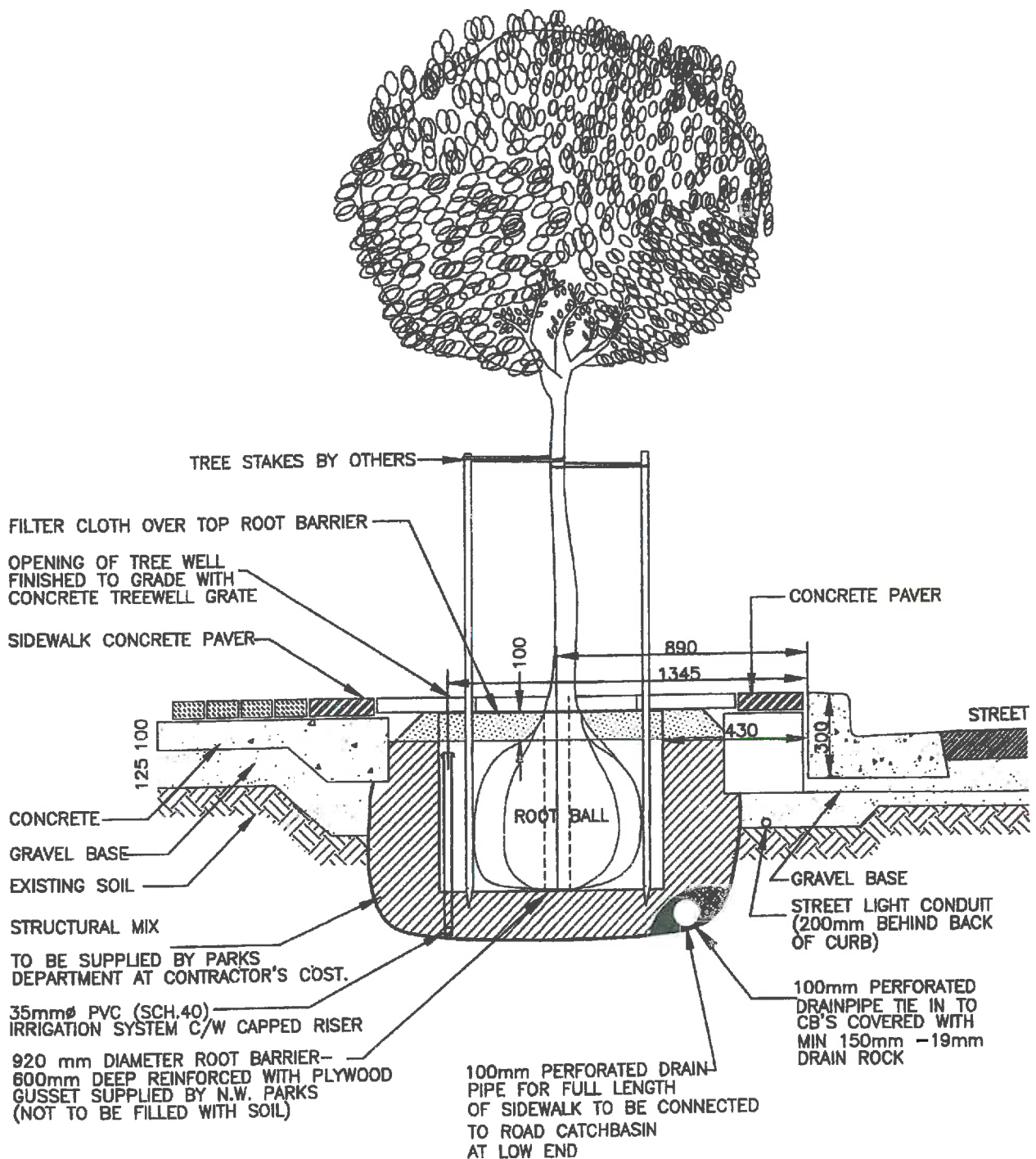
No.	Revision	Approved
Scale: N.T.S.	Date: Oct., 2004	

Title:  
**Secondary Road  
with Left Side Parking**

The City of  
New Westminster 

Suppl. Drawing No. **SDR-14**





Aged 15... (ch8 Tech) U:\Projects\VAN\1274\001\407\Drawings\Tree-1.dwg [Layout1], May 29, 2006 - 2:15pm

No.	Revision	Approved
Scale: N.T.S.	Date: May, 2006	

Title:

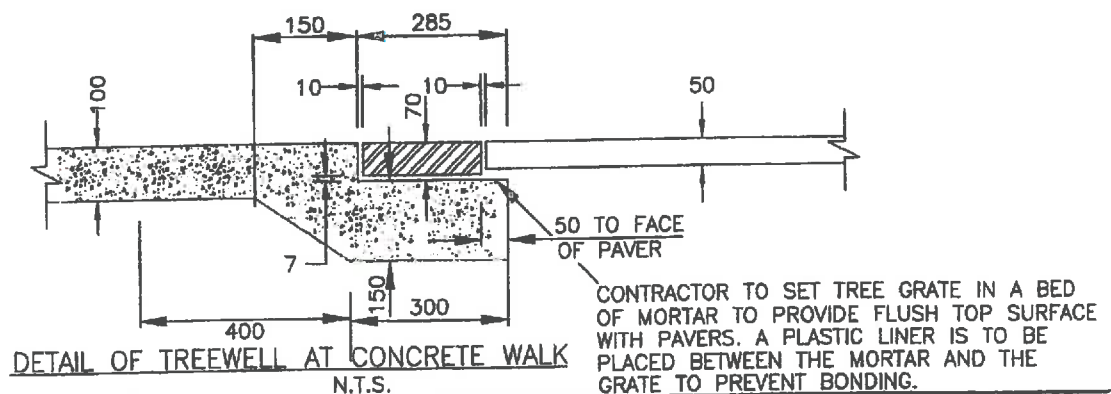
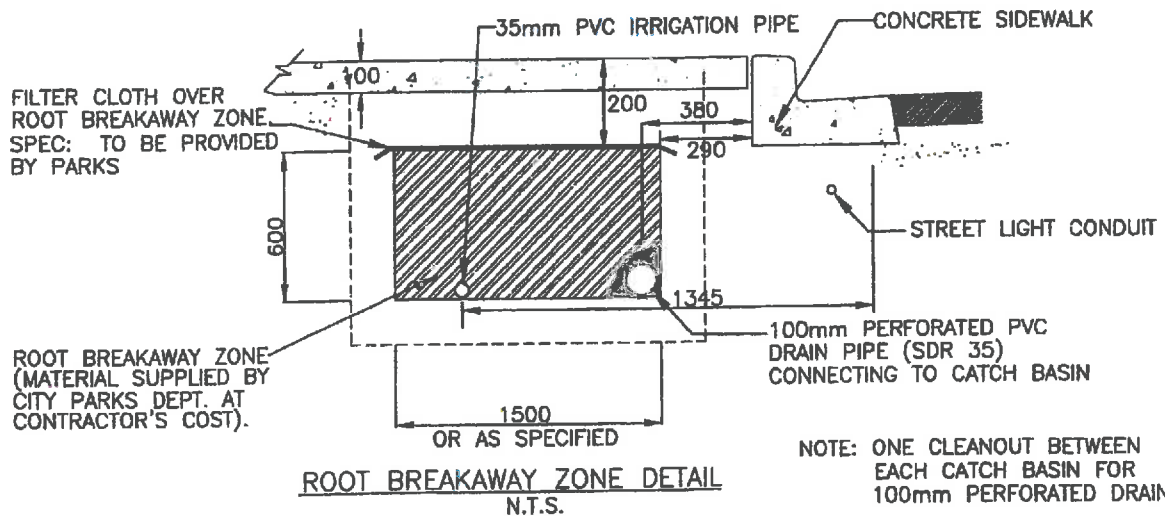
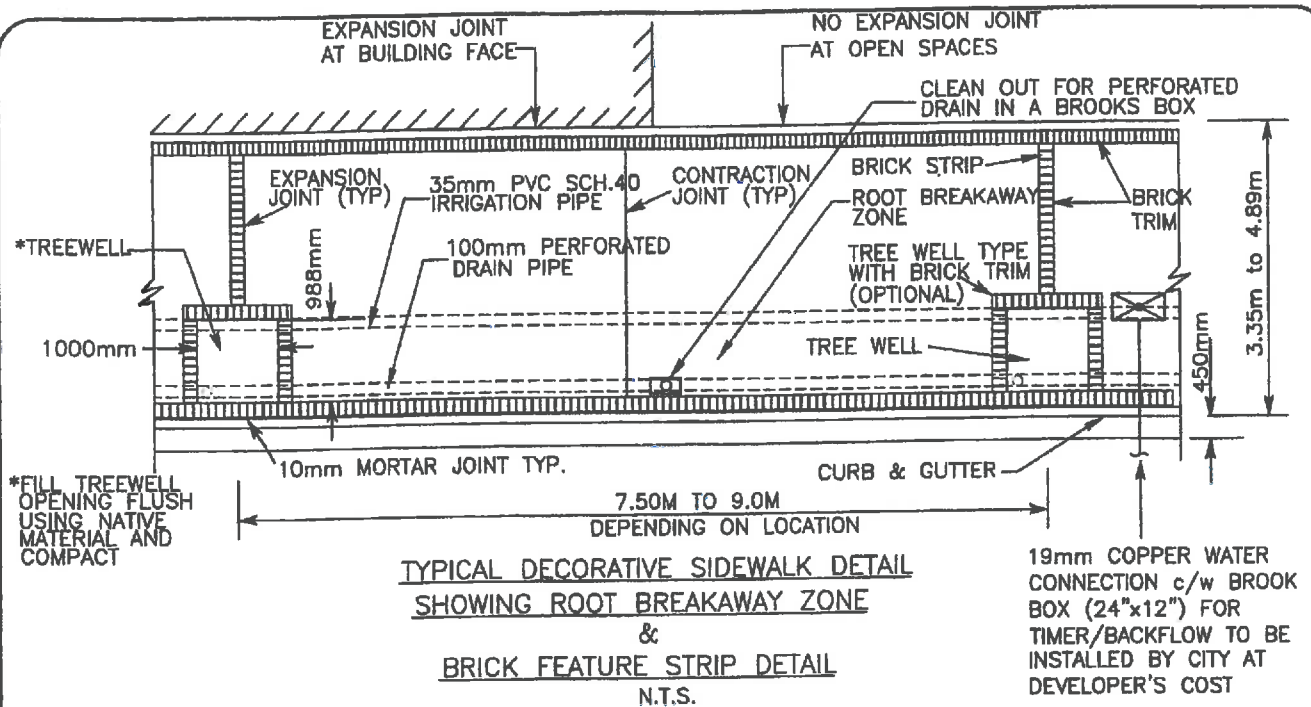
**Detail of  
Tree well at Brick Paver**

**The City of  
New Westminster**



Suppl. Drawing No.

**SDC-1**



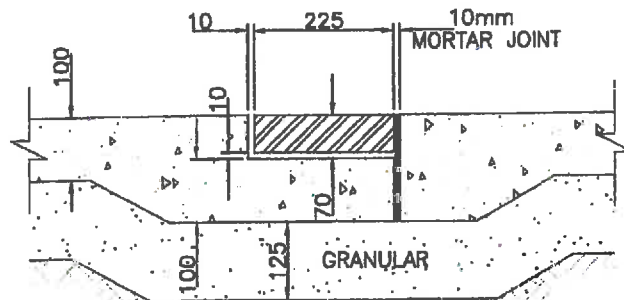
No.	Revision	Approved
Scale: N.T.S.	Date: MAY, 2006	

Title:

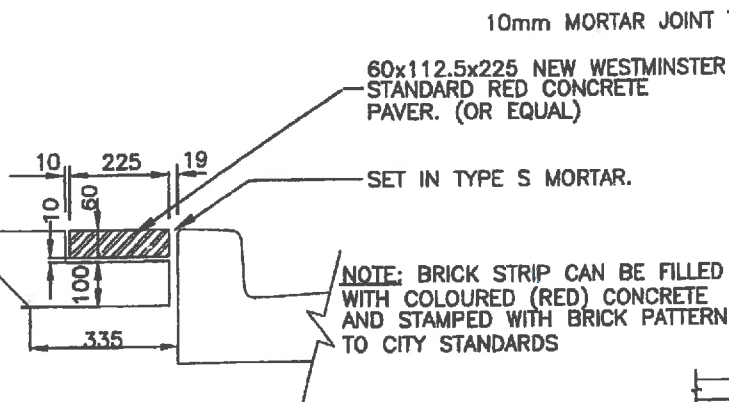
**Detail of  
Decorative Sidewalk,  
Root Zone and  
Tree Well at Concrete Walk**

The City of  
New Westminster

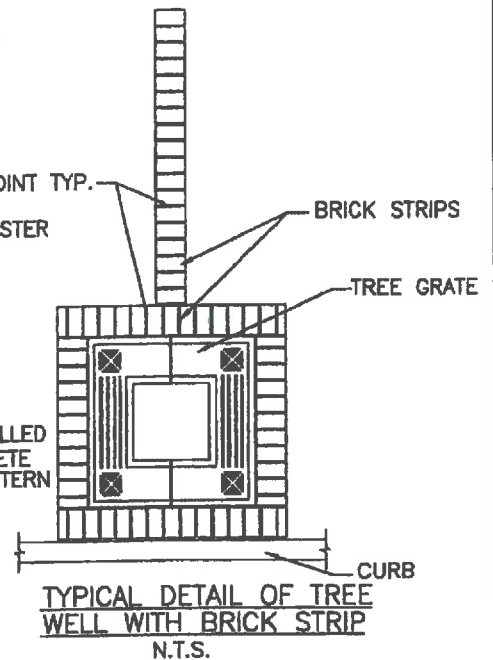
Suppl. Drawing No. **SDC-2**



**DETAIL OF TRANSVERSE PAVER STRIP**  
N.T.S.



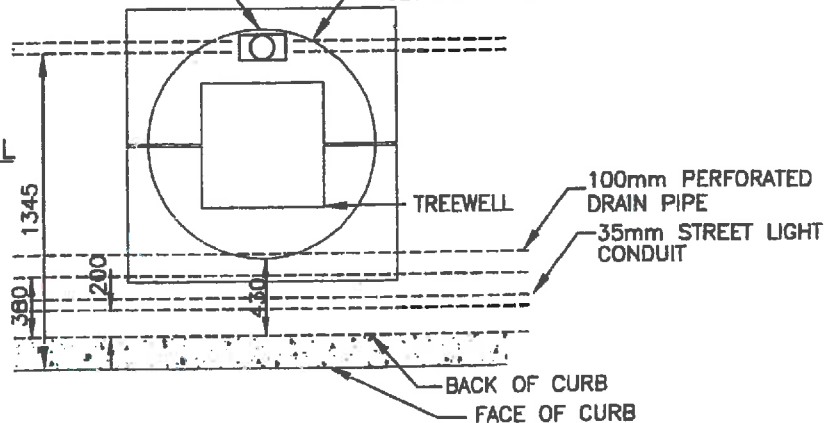
**DETAIL OF PAVER STRIP AT CURB**  
N.T.S.



ROOT BARRIER 920 mm DIAMETER  
(SUPPLIED BY N.W. PARKS)

35mm (SCH.40) PVC IRRIGATION PIPE C/W  
C/W CAPPED RISER AT EACH TREETWELL  
SET JUST INSIDE ROOT BARRIER

**IRRIGATION CONDUIT DETAIL**  
N.T.S.



100mm PERFORATED  
DRAIN PIPE  
35mm STREET LIGHT  
CONDUIT

BACK OF CURB  
FACE OF CURB

No.	Revision	Approved
Scale: N.T.S.	Date: Oct, 2004	

Title:

## Detail of Paver Strip and Irrigation Conduit

The City of  
New Westminster

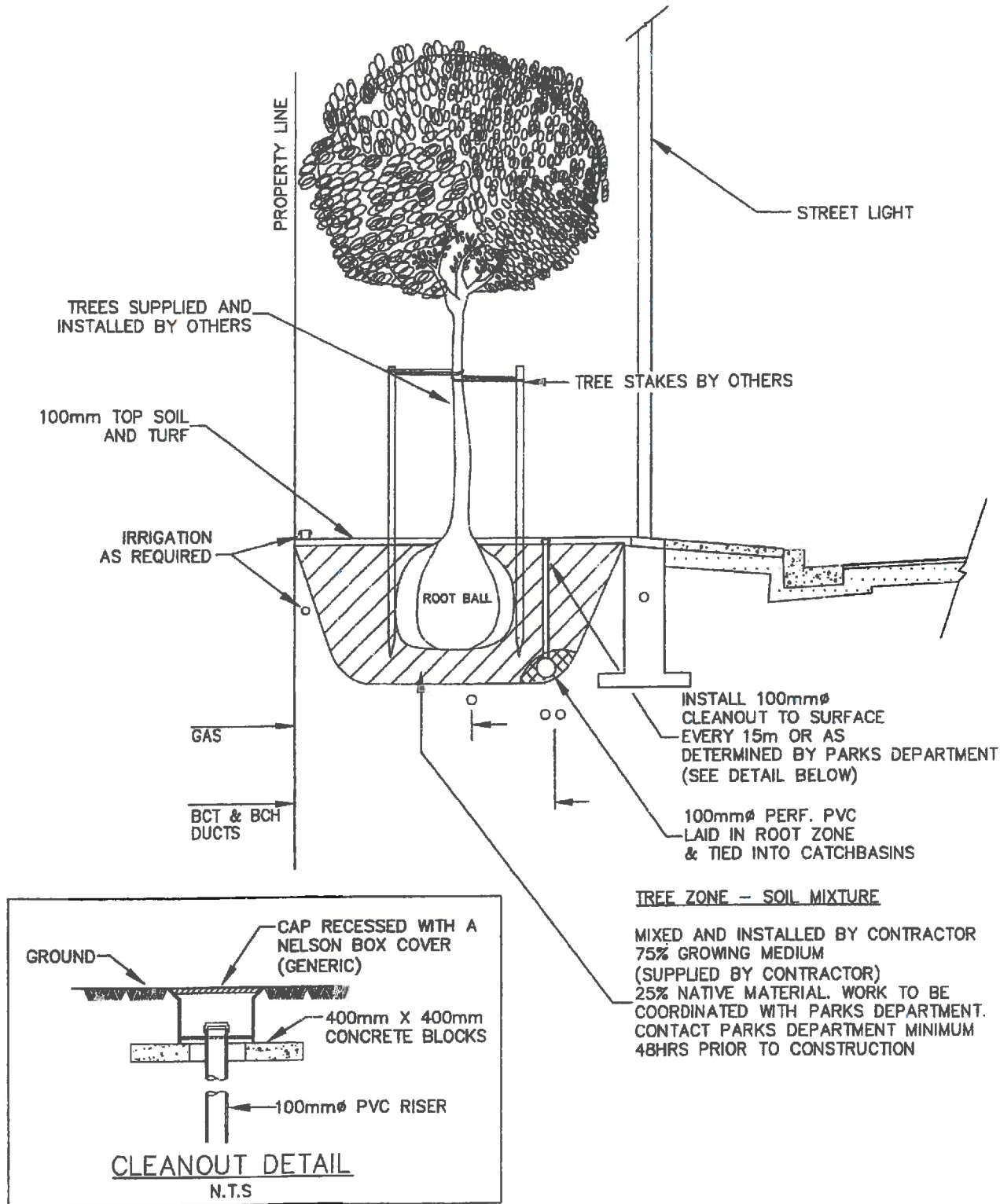


Suppl. Drawing No.

**SDC-3**



Acad 16.2a (LMS Tech) U:\Projects - VAN1127\10014101\Drawings\TreeWell-5.dwg [Layout1] May 29, 2006 - 2:16pm



No.	Revision	Approved
Scale: N.T.S.	Date: May, 2006	

Title:

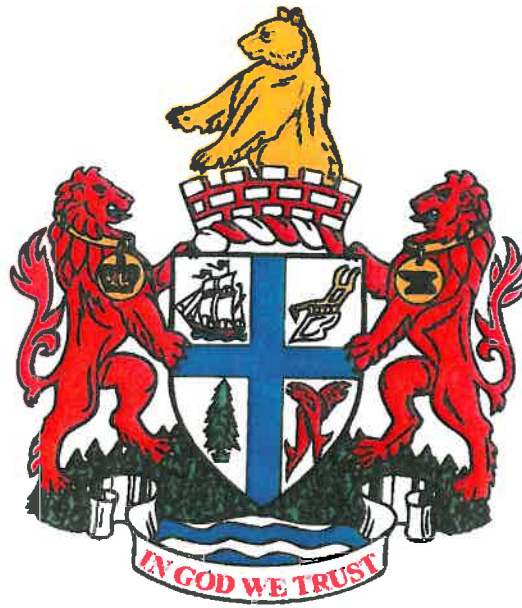
## Detail of TreeWell

The City of  
 New Westminster



Suppl. Drawing No.

SDC-5



**City of  
New Westminster**

# **CITY OF NEW WESTMINSTER**

## **Drafting and Drawing Submission Standards**

**June 8 2006**



# **The Corporation of the City Of New Westminster**

## **Engineering Department Drafting Standards**

**May 2006  
V1.0**





## CORPORATION OF THE CITY OF NEW WESTMINSTER

511 Royal Avenue, New Westminster, B.C. V3L 1H9

FAX No. 527-4564

Engineering Dept. 527-4592

### ENGINEERING DEPARTMENT

## Introduction

These standards are prepared for developers and consultants to assist in the preparation of construction and as-built drawings required by the City of New Westminster.

Adherence to these standards will save time in the preparation of drawings and expedite their review and approvals. Since all services will become part of the City's Geographic Information System (GIS), the location of every element must be defined and plotted without having to 'guess' and approximate the location.

These standards will be updated from time to time. Any suggested improvements or clarifications will be appreciated. Please forward suggestions to the attention of Nicole Jung, GIS Technologist Engineering Department, City of New Westminster

[gis@newwestcity.ca](mailto:gis@newwestcity.ca)

A CD rom containing a New Westminster prototype drawing complete with settings, colours, and layers is enclosed.

Also included on the CD is

- New Westminster A-1 size border including title block
- Symbol library
- Linetype folder
- Detail drawings



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## ***A. General Standards***

All as constructed drawings and as-built drawings will be designed in model space and plotted in paper space using layouts. Each drawing layout is to include and limited to one drawing sheet.

The drawing sheet will include single or multiple view ports depending on the amount of design detail to be shown.

### ***1. Survey Requirements***

1. All surveys shall be integrated with the control monuments in the vicinity of the area under survey. Survey ties must be made to no fewer than two (2) ISA #49 control monuments. The control monuments used must be shown on the plan by the appropriate symbol, together with the number or designation of each control monument. The plan must show all ties made to control monuments, all intermediary stations, and the measurements (distance and bearing) between them.
2. All surveys shall be located within the geographic coordinate system used by the City of New Westminster (UTM NAD 83 zone 10) in accordance with the City of New Westminster GIS Standards Document.
3. Surveys of all surface work (roads, buildings, hydrants, etc.) shall be done in accordance with the following standards and must be shown on the drawings. Symbols not included in the these standards can be derived from MMCD standards shall be explained or accompanied by a data dictionary that explains all the names of layers and all the graphic symbols used.

### ***2. Basic Requirements for Legal Surveys:***

1. All legal surveys must be certified by a registered British Columbia Land Surveyor.
2. All legal surveys must comply with the General Survey Instructions to British Columbia Land Surveyors issued by the Office of the Surveyor General.
3. All legal surveys submitted for approval to the City of New Westminster's Subdivision Approving Officer must be submitted on paper and in CAD/DXF format allowing a simple "cut-and-paste" operation that correctly positions, scales and rotates the new legal parcel drawing elements within the City of New Westminster's UTM, NAD83 design plane.

### ***3. Drafting Standards***

Size:	A1 (594x841mm)
Material:	24lb plotter bond paper
Format:	½ plan and ½ profile (plan at top of sheet)
Profile:	Minimum 1:50 vertical by 1:500 horizontal grid unless otherwise specified by authorized person
Minimum lettering:	Height 2.0mm and 1.5mm for field pickup
Title block:	A title block is to be filled in and located in the lower right hand corner of each sheet

### ***4. "As-constructed" Drawing Submission***

- a) Check copy – 1 set of paper prints  
A check copy (paper) is required before "as-constructed" drawings are submitted. These prints will be checked for completeness and compliance with these standards. Once the set of drawings is checked they will be returned for correction.  
Once any deficiencies are corrected, the final prints are to be submitted

b) Final set of drawings are to include

- Vellum as-built
- Corrected set of paper prints sealed by the engineer of record
- Original marked up set of prints
- Second set of paper prints sealed
- Set of purged digital drawings submitted on CD in AutoCAD Map 2004 or newer format

The as-built will also show:

- The date of completion of the construction on the drawings
- As-constructed in the revision box
- Service connection record (ie long and short)

Please note that

- a) All drawings with incomplete , non-standard or confusing information will be returned for clarification and/or correction
- b) All as-constructed drawings will remain the property of the City of new Westminster after their acceptance.

## **5. "GIS Ready" Drawing Submission**

- 1) Unless the requirements are reduced or waived by the Authorized Person depending on his/her consideration of the extent, complexity and nature of the new infrastructure servicing provided for the subdivision or development, the engineer shall submit "GIS-ready" digital plans in accordance with the requirements herein.
- 2) A "GIS-ready" digital plan drawing (AutoCAD MAP) depicting new infrastructure construction shall conform to drawing symbol, block and layering requirements as shown in Appendix A and B of this document
- 3) The digital data requirement for the "GIS-ready" Site Plan are as follows:
  - (a) Format: spatial data shall be stored in AutoCAD Map 2004 or Shape file format;
  - (b) Metadata: data shall have metadata attached including author, date of creation and accuracy;
  - (c) Projection and datum: all data shall be in UTM NAD 83 zone 10. The coordinate units shall be in meters and stored without offsets;
  - (d) Precision: Data shall be created in double precisions coordinates;
  - (e) Topology:
    - I. All data shall be topologically clean and correct;
    - II. All polygon boundaries shall meet exactly and be closed;
    - III. Arcs shall not contain pseudo-nodes;
  - (f) Data registration: Existing features should be copied, rather than digitized to form features where applicable.

## **B. Drawing Preparation – general**

### **1. General Notes**

- (a) "**Proposed**" denotes those services to be installed on the project
- "**Existing**" denotes those services that, at the time the project is submitted, are in the ground

**"New"** denotes those proposed services installed as part of the project when submitted as "As-Built" drawings.

- (b) Key plans are to show "as built" information for those services not shown on another drawing when submitted with the "as-built" drawings.
- (c) Name, address and phone number of the consultant and client are to be on all drawings. All designs and requirements as per **City of New Westminster Design Criteria and Supplementary Specifications and Detail Drawings**.
- (d) On projects in existing roads, statutory rights-of-ways and easements, the plan view will show all the following existing services including offset dimensions and sizes.
  - water, appurtenances, valves and connections
  - sanitary sewers, inspection chambers, manholes and connections
  - storm sewers, inspection chambers, manholes and connections
  - catchbasins
  - ditches and existing drains
  - driveway culverts
  - utility poles
  - gas lines
  - underground cables, eg. Electrical, telephone, cable and fibre optics, MOT, remote control cable
  - buildings
  - property pins
  - trees
- (f) Each new service shall be highlighted and all other works on the project shall be shown. Road drawings need only show surface features (eg. Manholes, valves, etc.)
- (g) Notes pertaining to the construction of a service are to be shown on that service drawing.
- (h) All dimensions and elevations are to be in meters.

## 2. Chainages

- (a) Chainage stations will be at 10 meter intervals (+20, +30 etc.) and measured along the centerline of road. 1+00 is to be tied to a legal pin or monument.
- (b) Chainage intersections and starting points are to be related to lot corners.
- (c) One property line chainage is to be placed on each plan view on each sheet on each side of the road.

## 3. Plan View

- (a) The plan view is to be drawn at a scale of 1:500 **except traffic signal design drawings which are to be plan view 1:200 and profile view 1:50**. The profile is to be drawn to scales: horizontal 1:500, vertical 1:50. All symbols to be used on the drawings to be as per City of New Westminster symbol block libraries.
- (b) All offsets of series, existing, proposed, and new will be indicated to the nearest 0.1m and referenced to and along property lines.
- (c) Benchmarks (including TBM's) are to be noted in the legend with location and elevation. Survey monuments are to be shown on the plan view.
- (d) The plan view will show the legal layout of roads and properties showing lot numbers and addresses. Also show all registered statutory rights-of-way.
- (e) The names of streets are to be indicated outside of the road boundaries. Road widths are to be annotated. No temporary street names (eg. A, B or C) will be accepted.
- (f) All work done must be shown (eg. removal of clean out or replacement of a clean out by a manhole, removal of existing blowdowns, lines abandoned, etc.) and clearly noted on the appropriate drawing.
- (g) An offset from lot corners must be shown for all service connections (the note "centerline of lot" or "typical" is not acceptable). If the connection is not perpendicular to the main, the location of each bend is to be shown.

- (h) The invert and depth (where applicable) are to be shown for all service connections and are to be "boxed" in. Where there are existing connections, the field-measured inverts are to be shown. Information obtained from an "as built" drawing must be clearly noted, as such.
- (i) The location of manholes as shown on the drawings are to be the location of the intersection of the pipes within the manhole, not the location of the lid. When there is a major difference, a note stating the offset of the manhole lid should be added to the drawing.  
Each change of direction (pipe deflections) must be noted with chainages; or noted as follows:
  - Pipe pulled from sta. \_\_\_\_ to sta. \_\_\_\_.
  - BC at sta. \_\_\_\_
  - EC at sta. \_\_\_\_.
  - Bend at sta. \_\_\_\_.
- (j) Proposed works are to be drafted in bold lines as specified in the standards
- (k) On curves, clearly locate all fitting with chainages and offsets.
- (l) All drawings will include a **true north arrow**

#### **4. Profile**

- (a) The profile view will show:
  - Chainage, inverts and profile along the centerline of pipe.
  - elevations of proposed and existing works.
  - proposed and existing service connections and their respective invert elevations.
  - services being crossed by the proposed works (and their elevations).
  - all data pertaining to the design of the works.
- (b) Elevations at all grade changes are to be shown with a chainage or ties to lot corners.
- (c) All elevations are to be geodetic and rounded to the nearest 0.01m with the exception of Sewers where the elevations are to be round to the nearest 0.001m.

### **C. Drawing Preparation – Specific Services**

#### **1. Storm and Sanitary Services**

- (a) Connections greater than 100mm diameter shall be shown and noted on the plan with ties to lot corners.
- (b) Main size and material and manhole size and material are to be shown as well as all elevations.
- (c) Where a new main ties to an existing stub, the balance of the distance to the existing manhole (from the new main) is to be shown.
- (d) All private and Municipal inspection chambers (either offset and chainage or two ties to property lines) to the centerline of the rim are to be shown.
- (e) Type of backfill material is to be shown
- (f) Storm sewer catchbasin locations (either offset and chainage or two ties to property lines) to the centerline of the rim are to be shown. Where chainage is used, the base line must be shown and referenced to legal and curve data.
- (g) Profiles are required for all storm and sanitary drawings.

#### **2. Roads**

- (a) A typical cross-section of the designed roads will be shown on every drawing.
- (b) A table showing curve and curb return data is to be shown on the road drawings.
- (c) Pavement tapers are to be dimensioned to legal with length of taper and the offset to existing pavement.

### **3. Water**

- (a) All fittings used are to be noted and tied to chainages and lot corners. Show on the 'plan' portion of the drawing. Fittings will have the description of hub, flange, etc.; eg. 150H x 150 H x 150 FL TEE.
- (b) All fittings are to be shown in the profile with the elevations and chainages indicated.
- (c) Water connections larger than 20mm diameter shall be annotated. Water connections 100mm diameter and larger shall be annotated complete with elevation at property line on plan view.
- (d) A list of material fittings used is to be shown in a material fittings table.
- (e) The location of all bend points along curves must be shown and dimensioned to legal.
- (f) Profiles are required for all water drawings.
- (g) Dimension detailed to the nearest 0.01m

### **4. Street Light Works & Traffic Communications Conduit**

- (a) The drawings will only include plan views. All improvements (service boxes, poles, etc.) are to be tied to property lines.
- (b) Street lights are to be numbered, consecutively beginning at number 1.
- (c) Note wattage of street lights, base information, height of pole, manufacturer

### **5. Cross Sections**

In relation to road works and sidewalks, cross-sections at 20 meter intervals, may be required for the proposed works. For road works, this will involve cross-sections across at least the full width of the road allowance. The cross-section shall show property lines, ditches, edges of existing road and centerline of road. It shall indicate chainages and elevations of each break in the cross-section. The proposed road works shall be drafted in bold lines with the emphasis on the finished surface of the road. Elevations of the proposed road shall be indicated. Road measurements off set of the centerline referenced from the baseline are also to be indicated.

Cross-sections shall be drafted using scales as follows:

Horizontal 1:200                      Vertical 1:20

Elevations shall be rounded off to the nearest centimeter.

### **6. Signalized Road Intersections**

Drafting Standards

Size:                      A1(594 x 841mm).

Material:                High grade 20lb erasable vellum or 3 mil polyester film.

Plan view:              Scale 1:200 (U/G Utility inset in top right corner of sheet is 1:500)

(North is oriented to top of sheet)

Profiles:                Scale 1:50.

Lettering:                Minimum height of 1.5mm.

Dwg. Units:              1 drawing unit is equal to 1mm.

### **7. Sediment and Erosion Control Plan**

- Vicinity map showing location of site in relation to the surrounding area.
- Site plan details. This should include
  - existing vegetation,
  - existing and proposed ground contours,
  - existing and proposed drainage patterns,
  - limits of clearing and grading,
  - limits of cut and fill,

- external drainage to be addressed, and
  - locations of sediment control best management practices.
- The elevations of underground utilities, which are crossing the proposed storm sewer line shall be shown on the profile.
- A plan showing sub-catchment areas, catchment boundaries, external drainage and the drainage system.
- A plan identifying the specific land uses modeled for each development condition analyzed.

### **8. Storm Water Management Plan/ Lot Grading Plans**

- Existing and proposed tributary areas in the catchment along with existing and ultimate land uses;
- The development area within the drainage catchment including all features such as roads, ditches, drainage control structures, storm sewers, culverts, drainage facilities, and grading;
- Pre and post development hydrologic and hydraulic calculations summarized in table form and supporting parameters (if not in report)
- Ensure consistency with all existing City Master Drainage Plans (MDP) or equivalent
- Identify major and minor system flow directions. Include surface flow path if not consistent with the major system flow path.
- Downstream conveyance capacity limitations (if not in report)
- Design details and supporting information for all proposed SWM facilities (i.e. detention ponds, onsite retention measures, water quality treatment facilities, etc) if not in report
- External drainage patterns if they impact the proposed development (if not in report)
- Show floodplain line if applicable and any mitigation measures
- Easements required
- Include lot corner elevations, elevation indicated where grade changes occur, minimum building elevation(MBE) and Flood Construction Level (FCL) shall be depicted on all lot grading plans
- Include elevations of service locations
- Include lot corner elevations of adjacent properties

## Appendix A – Symbol sets



### Sanitary and Combined Sewer Symbols

Insertion Layer		Description	Block Name		Symbol	
Existing	Proposed		Existing	Proposed	Existing	Proposed
E-SAN	AB-SAN	CLEAN OUT	ESCO	PSCO		
E-SAN	AB-SAN	MANHOLE	ESMH	PSMH		
E-SAN	AB-SAN	INSPECTION CHAMBER	ESIC	PSIC		
E-SAN	AB-SAN	VALVE	ESVL	PSVL		

### Storm Drainage Symbols

Insertion Layer		Description	Block name		Symbol	
Existing	Proposed		Existing	Proposed	Existing	Proposed
E-STM	AB-STM	CATCHBASIN	EDCB	PDCB		
E-STM	AB-STM	CATCH BASIN ROUND	EDCBR	PDCBR		
E-STM	AB-STM	CLEAN OUT	EDCO	PDCO		
E-STM	AB-STM	DITCH	DDI			
E-STM	AB-STM	HEAD WALL	DHW			
E-STM	AB-STM	MAHOLE	EDMH	PDMH		

### Water Symbols

Insertion Layer		Description	Block Name		Symbol	
Existing	Proposed		Existing	Proposed	Existing	Proposed
E-WAT	AB-WAT	VALVE	EWVL	PWVL		
E-WAT	AB-WAT	TEE	WTEE			
E-WAT	AB-WAT	CROSS	WCROSS			
E-WAT	AB-WAT	HYDRANT	EWWH	PWWH		

## Appendix B - Layer List

## Appendix B - Layer List

GIS LAYER	ENTITY	Layer	Color	Width	Height	Style	Notes
ENG SEWER COMBINED	Combined Gravity	SWR COMBINED	continuous	1	0.15	100	n/a
		SWR COMBINED AB	continuous	14	0.25	100	n/a
		SWR COMBINED T	continuous	1	0.25	100	NW DEFAULT
		SWR SANITARY	continuous	3	0.15	100	n/a
ENG SEWER SANITARY	Sanitary Gravity	SWR SANITARY AB	continuous	70	0.25	100	n/a
		SWR SANITARY T	continuous	3	0.15	100	NW DEFAULT
		SWR FORCEMAIN	continuous	202	0.15	100	n/a
ENG SEWER FORCE	Sanitary Force	SWR FORCEMAIN AB	continuous	205	0.25	100	n/a
		SWR FORCEMAIN T	continuous	202	0.25	100	NW DEFAULT
		SWR STORM	dashed (0.25)	133	0.15	100	n/a
ENG SEWER STORM	Storm	SWR STORM AB	dashed (0.25)	130	0.25	100	
		SWR STORM T	continuous	133	0.25	100	NW DEFAULT
ENG SEWER GVRD	GVSD	GVSD	GVSD	52	0.25	100	
ENG WATER MAIN	Water	WTR MAIN	continuous	5	0.15	100	
		WTR MAIN AB	continuous	172	0.25	100	
ENG WATER VALVE	Water valve	WTR VALVE	CONTINUOUS	7	0.25	100	ENG WATER VALVE
		WTR VALVE AB	continuous	7	0.25	100	ENG WATER VALVE
ENG WATER TEE	T or X tee intersection connections	WTR TEE	continuous	7	0.15	100	ENG WATER TEE T or
		WTR TEE AB	continuous	7	0.15	100	ENG WATER TEE X
ENG WATER GVRD	GVWD	GVWD	GVWD	52	0.15	100	
	Hydro	E HYD	HYDRO	52	0.15	100	
	Gas	E GAS	GAS MAIN	52	0.15	100	
	Cable	E CAB	Cable TV	52	0.15	100	
	Telephone	E TEL	TELEPHONE	52	0.15	100	
	Electrical	E ELC	continuous	9	0.15	100	
		AB ELC	continuous	2	0.25	100	
ENG PARCEL EASEMENT	Easement	LGL EASEMENT	PHANTOM2	7	0.15	100	
ENG PARCEL ROW	RIGHT OF WAY	LGL ROW	PHANTOM2	7	0.15	100	
ENG PARCEL LEGAL	PROPERTY LINE	LGL PL	continuous	7	0.15	100	
		LGL PL AB	continuous	253	0.25	100	
ENG ISA MONUMENTS	Survey Monument	LEGAL	continuous	7	0.25	100	SEE FIGURE ?
ENG TOPOGRAPHY MINOR	Minor Contours	TOP-MIN	continuous	253	0.15	100	
ENG TOPOGRAPHY MAJOR	Major Contours	TOP-MAJ	continuous	253	0.15	100	
ENG TOPOGRAPHY SPOT	Spot elevation	TOP-SPT	continuous	253	0.15	100	ENG TOPP SPOT
ENG TOPOGRAPHY SPOT ANNO	spot elevation text	TOP-SPT T	continuous	253	0.15	100	
ENG ROAD FEATURE CURB	ROAD CURB	RD CURB	continuous	3	0.35	100	
		RD CURB AB	continuous	4	0.45	100	
ENG ROAD FEATURE SIDEWALK	SIDEWALK	RD SWLK	continuous	2	0.25	100	
		RD SWLK AB	continuous	3	0.35	100	
	SIDEWALK HATCH	RD SWLK HATCH	continuous	31	0.1	30	
		RD SWLK HATCH AB	continuous	32	0.1	60	
ENG ROAD FEATURE ROAD EDGE	EDGE OF PAVEMENT	RD EOP	continuous	6	0.2	75	
		RD EOP AB	continuous	6	0.2	100	
ENG ROAD FEATURE DRIVEWAY	DRIVEWAY	RD DWY	HIDDEN	46	0.15	75	
		RD DWY AB	HIDDEN	44	0.25	100	
ENG ROAD FEATURE TRAFFIC MARKING	TRAFFIC MARKING	RD TRAF MARK	continuous	9	0.15	100	
		RD TRAF MARK AB	continuous	6	0.2	100	
ENG ROAD FEATURE TRACKS	RAILWAY	RD RAIL	TRACKS	254	0.15		
		RD RAIL AB	TRACKS	255	0.25		
ENG ROAD FEATURE STRUCT	ROAD STRUCTURES	RD STRUCTURE	continuous	5	0.15		
	Includes bridges, docks, pad overpasses, culvert bridges, bridge ramps, pad bridges,	RD STRUCTURE AB	continuous	5	0.25		
PLN BUILDING OUTERPOLY	BUILDING	BLD FOOTPRINT	continuous	7	0.15	100	
		BLD FOOTPRINT AB	continuous	15	0.2	100	
ENG ROAD FEATURE TRAIL	TRAIL	RD TRAIL	dashed (0.25)	12	0.15	100	
		RD TRAIL AB	dashed (0.25)	14	0.2	100	
	DETAILS	DETAIL	continuous	7	0.15	100	DIM
	DIMENSIONS	DIM	continuous	7	0.1	100	DIM
	MISC NOTE 1.5MM	NOTE1.5	continuous	7	0.25	100	NOTES1.5
	MISC NOTE 2.0MM	NOTE2.0	continuous	7	0.25	100	NOTES2.5
	MISC NOTE 3.0MM	NOTE3.0	continuous	7	0.25	100	NOTES3.0
	TEXT MASK	MASK	continuous	255	0.25	20	
	SHADING	SHADE	continuous	254	0.25	50	
	TRAVERSE POINTS	PNTS	continuous	254	0.25	100	SEE FIGURE ?
	TEST HOLES AND TEST PITS	GEO	continuous	254	0.25	100	SEE FIGURE ?

CORPORATION OF THE CITY OF NEW WESTMINSTER

BYLAW NO. 7142, 2007

SCHEDULE "E"

INFORMATION SHEET

RE: IRREVOCABLE STANDBY LETTER OF CREDIT  
- REQUIRED MINIMUM CONTENT

Corporation of the City of New Westminster  
511 Royal Avenue  
New Westminster, BC V3L 1H9

IRREVOCABLE CLEAN LETTER OF CREDIT NO.

We hereby authorize you to draw on \_\_\_\_\_

\_\_\_\_\_ for account of \_\_\_\_\_

\_\_\_\_\_ up to an aggregate amount of Canadian \$ \_\_\_\_\_

( \_\_\_\_\_ ) available by drafts at sight of 100% of value.

This Letter of Credit is required in connection with \_\_\_\_\_

1. Drawings are to be made in writing to \_\_\_\_\_
2. Partial drawings may be made.
3. The Bank will not inquire as to whether or not the Corporation has a right to make demand of the Letter of Credit.
4. It is a condition of this Letter of Credit that it shall be deemed to be automatically extended without amendment for one year from the present or any future expiration date hereof unless thirty days prior to any such date we shall notify you in writing by registered mail that we elect not to consider this Letter of Credit renewed for any such additional period.

**DRAFTS MUST BE DRAWN AND NEGOTIATED NOT LATER THAN \_\_\_\_\_**

The drafts drawn under this credit are to be endorsed hereon and shall state on their face that they are drawn under Letter of Credit No. \_\_\_\_\_

\_\_\_\_\_  
Banker's Signature