DISTRICT OF NORTH VANCOUVER

355 West Queens Road
North Vancouver, BC V7N 4N5
604-990-2311
DNV.org

Single Family Building Permit

Stormwater Management Plan & Geotechnical Report Requirements

Master Requirement SPE112

Stormwater Management Plans and Geotechnical Reports are required for the following:

- All new builds including coach houses
- Any project where the functionality of the existing storm drainage system is to be altered so that flow to the DNV storm sewer system or to an on-site infiltration system is to be increased or an existing on-site infiltration system is to be altered
- Any project where the impermeable surface area on the property is more than 50% of the property's total area
- For additions, if it can be demonstrated on a site plan that the additional stormwater runoff can be conveyed to permeable ground surface on private property where it will not cause any flooding, nuisance, or slope stability issues, it may be acceptable to proceed without an engineered Stormwater Management Plan

Storm Water Management Plan submissions require the following:

- To be signed and sealed by a P.Eng.
- Surface runoff to the DNV storm sewer system is to be controlled as described in Development Servicing Bylaw 8145, Schedule A, Part 1, Section 4, Tables 4c and 4d. Use the Modified Rational Rate Method Analysis given on page 4. Refer to the "Release Rate and Detention Volume Calculations" document on page 3 for more details
- If the property does not have a connection to the DNV storm sewer system, all storm water and groundwater is to be controlled on site to the maximum of a post construction 10-year rainfall event. Use the Modified Rational Method Analysis given on page 4
- Groundwater is not to be discharged to the DNV storm sewer system except as described in Sewer Bylaw 6656 Sections 7.1-7.3
- Detailed design calculations
- On site infiltration has been considered where possible
- Infiltration systems are compliant with Development Servicing Bylaw 8145, Schedule A, Part 1, Section 4.11.5. If there's no risk of intercepting groundwater or to slope stability, design a detention/ infiltration system, even if the permeability of native soil is less than 15mm/hr. This will help groundwater recharge
- All relevant elevations, sump sizing, pipe sizing and grade, separation requirements, etc. are included
- Include on the design, "Prior to cover and after professional field review has been submitted, contractor to arrange for District inspection"
- System maintenance requirements
- Include a site plan showing the predevelopment and proposed post development surface areas on the site. Include a table showing all surface areas and corresponding runoff coefficients

Geotechnical Report submissions require the following:

- To be signed and sealed by a P.Eng.
- Test hole as deep as the proposed foundation footings or the bottom of the proposed infiltration system, whichever is deepest
- Monitoring well installed in the test hole
- Rainy/snowmelt season groundwater conditions noted. Monitoring is to occur over a suitable period and duration so as to be able to accurately and reliably establish groundwater conditions on site
- Percolation test results at the bottom depth and location of any proposed infiltration system
- The elevation of any observed groundwater seepage of any source/type (e.g., static groundwater, perched, transient, seasonal, etc.), as per the definition of groundwater in Sewer Bylaw 6656
- Predicted perimeter drainage flow rate
- Soil profile
- Photographs of test hole investigation

Release Rate & Detention Volume Calculations

Project Name:		**Project #:**	
Description:		**Date:**	

PREDEVELOPMENT CATCHMENT AREA

Input required for cells*

Impervious Area ____ m^2 Runoff Coefficient = 0.95 (roof, concrete, ashphalt, etc.)
Pervious Area ____ m^2 Runoff Coefficient = 0.3 (grass, garden beds, etc.)
Total ____ m^2
Weighted Average Runoff Coefficient **R =** ____
% Impervious: ____
Design Impervious: ____

Predevelopment Peak Flows
Catchment Area (**A**)hectares ____
Rainfall Zone ____
Soil Adjustment Factor ____
MAR Rainfall Intensity(Use 2-Year 24-Hour) **I =** ____ mm/h

$Q = RAIN$ **Qrel =** ____ m^3/s **Q_{rel}= 2-year 24-hour release rate**

POSTDEVELOPMENT CATCHMENT AREA

Impervious Area ____ m^2 Runoff Coefficient = 0.95 (roof, concrete, ashphalt, etc.)
Pervious Area ____ m^2 Runoff Coefficient = 0.3 (grass, garden beds, etc.)
Total ____ m^2
Weighted Average Runoff Coefficient **R =** ____
% Impervious: ____

Postdevelopment Peak Flows
Catchment Area (**A**)hectares ____
Time of Concentration (T_c) ____ *Refer to MMCD Design Guidelines 2014

MAR Rainfall Intensity (**I**) **I =** ____ mm/h
Soil Adjustment Factor ____
$Q = RAIN$ **Qp1 =** ____ m^3/s **Q_p1 = Peak flow for storm duration $T_r = T_c$**

GEOTECHNICAL PARAMETERS

Geotechnical Engineer ____
Date of Report ____
Infiltratrion rate of soil ____ m/min
Maximum Groundwater flowrate from perimeter drains ____ m^3/min

DETAIN POST-DEVELOPMENT STORM EVENT AND RELEASE AT ALLOWABLE RATE

Duration T_r (min)	Intensity (mm/h)	Peak Flow Q_p2 (m^3/s)	Inflow Runoff Volume(m^3)	Max Release Rate Q_{rel} (m^3/s)	Volume (Modified Rational Method) (m^3)	Volume of Water Exfiltrated into the Ground (m^3)	Volume of Groundwater In (m^3)	Required Storage Volume(m^3)
5								
10								
15								
20								
30								
60								
120								
240								
360								
480								
600								
720								
900								
1200								
1440								

*Use the rainfall intensities given in Bylaw 8145 Schedule A, Part 1, Section 4.7.3. For durations not given in Bylaw 8145 use the rainfall intensities given on the rainfall intensity table provided on this document

*Required Storage Volume(for any given duration) = Volume(Modified Rational Method)-Volume of Water Exfiltrated Into the Ground+Volume of Groundwater In

* Volume of Water Exfiltrated into the Ground must be greater than or equal to Volume of Groundwater In

*For systems without a connection to the DNV storm sewer all water is to be controlled on-site to the maximum of a 10-year rainfall event minimum. Qrel=flowrate of water exfiltrated into the ground

Rainfall Intensity-Duration-Frequency (IDF) Curves for the 2 Year and 10 Year Return Period Storm Durations

Rainfall Intensity (mm/hr)						
Duration (min)	Lower Zone		Mid Zone		Upper Zone	
	2yr-event	10yr-event	2yr-event	10yr-event	2yr-event	10yr-event
5	61.9	104.8	80.5	130.4	99.1	156.1
10	49.1	81.3	63.8	101.5	78.5	121.7
15	36.3	57.8	47.1	72.6	57.8	87.3
20	32.3	51.1	42.9	65.3	53.4	79.4
30	24.4	37.6	34.5	50.7	44.6	63.7
60	16.6	24.4	24.6	34	32.5	43.6
120	12.5	17.8	18.7	25.1	24.8	32.3
240	10.7	15.3	15.6	21.2	20.4	27.2
360	8.9	12.7	12.4	17.3	16	22
480	8.2	11.7	11.5	16	14.8	20.4
600	7.5	10.8	10.5	14.8	13.6	18.9
720	6.8	9.8	9.6	13.5	12.4	17.3
900	6.3	9.1	8.9	12.6	11.6	16.2
1200	5.5	7.9	7.8	11.1	10.1	14.4
1440	4.8	7	6.9	9.9	9	12.9

Rational Method Analysis - Refer to MMCD Design Guidelines 2014

Q= RAIN (measured in cubic meters per second)

R = Runoff Coefficient x Soil Adjustment Factor (SAF)
A = drainage area in hectares (ha)
I = rainfall intensity in mm/h
N = 0.00278

Modified Rational Method Analysis

$$\text{Storage Volume } (m^3) = Tr(Qp2 - Qrel) + 0.5TcQrel^2\left(\frac{1}{Qp2} - \frac{1}{Qp1}\right)$$

Tr = duration of specified storm (seconds)
Tc = time of concentration (seconds)
Qp1 = peak flow for storm duration Tr=Tc (m^3/s)
Qp2 = peak flow for specified storm duration (m^3/s)
Qrel = maximum release rate (m^3/s)