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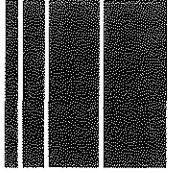

STORMWATER MANAGEMENT PLAN

Chau Property Development
1884 Forest Avenue
Portland, Maine

Prepared for

John Chau
75 Acadia Street
Portland, ME 04103

March 6, 2012

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STORMWATER MANAGEMENT PLAN

Chau Property Development
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I. Introduction

This Stormwater Management Plan has been prepared for Chau Property Development to evaluate potential impacts associated with this project due to the proposed modification in stormwater runoff characteristics. The 1.6-acre project site is located at 1884 Forest Avenue, Portland, Maine. The property will be developed in two phases; the total development at full build-out will result in 1.15 acres of new impervious surface. The initial phase development will consist of a 5,250 square foot (sf) convenience store/gas station with a donut shop and a drive through window. There is also space for a 3,600 sf future bank or similar type business. The stormwater management controls that are outlined in this plan have been designed to best suit the proposed development and to comply with applicable regulatory requirements.

II. Existing Conditions

The parcel is located on a vacant parcel of land bordered by Riverton Drive to the west, Presumpscot Grange parking lot to the east and Riverton Park housing development to the south. Tortilla Flats Restaurant is across Forest Avenue to the north.

A. Land Cover

The site is mostly forested with mature pine growth with some open field areas closer to Forest Ave. There is a drainage swale that conveys from the eastern portion of the site's stormwater runoff to the Riverton Drive catch basin system.

B. Site Topography

Topography on the site generally slopes gently across the parcel towards Riverton Park with some steeper embankments along Riverton Drive.

C. Surface Water Features

There are no natural water surface features on the site. Stormwater runoff that is collected in the City's stormwater system in Riverton Drive eventually drains through a tributary stream to the Presumpscot River.

D. Soils

Soil characteristics were obtained from the Soil Conservation Service (SCS) Medium Intensity Soil Survey of Cumberland County. The Technical Release (TR) 55 of the Soil Conservation Service classifies the soils characteristics. Soils

identified on the site are identified below in Table 1. These soil boundaries have been identified on the attached watershed map.

Table 1: Soil Characteristics		
Soil Type	HSG	K Factor
Windsor	A	0.17

The hydrologic soil group (HSG) designation is based on a rating of the relative permeability of a soil, with group "A" being extremely permeable such as coarse sand, to group "D" having low permeability such as clay.

The K factor is an erodibility index that relates each soil family based on a slight erosion potential of 0.10 to a high erosion potential of 0.64. An index number, greater than 0.32, indicates that a high level of erosion control measures must be taken in order to control erosion of this soil.

E. Historic Flooding

The Federal Emergency Management Agency (FEMA) has not identified any flood hazard area on the project site (FEMA Community Panel Number 230051 0006 C, dated December 03, 1998). A copy of the FEMA Flood Map is included in this permit application.

III. Proposed Development

The applicant plans to develop the property in two phases. The initial phase of development will consist of a 5,250 sf convenience store, paved vehicle circulation drives and associated parking. There is also space for a future 3,600 sf bank or similar type business. The second phase will be built when a tenant becomes available. The net increase in impervious area is limited to approximately 1.15 acres. A complete summary of development areas is attached (see the Stormwater Calculations section following this report). Treatment of stormwater runoff will be provided by use of bioretention filter basins, Filterra filter basin, and a detention pond.

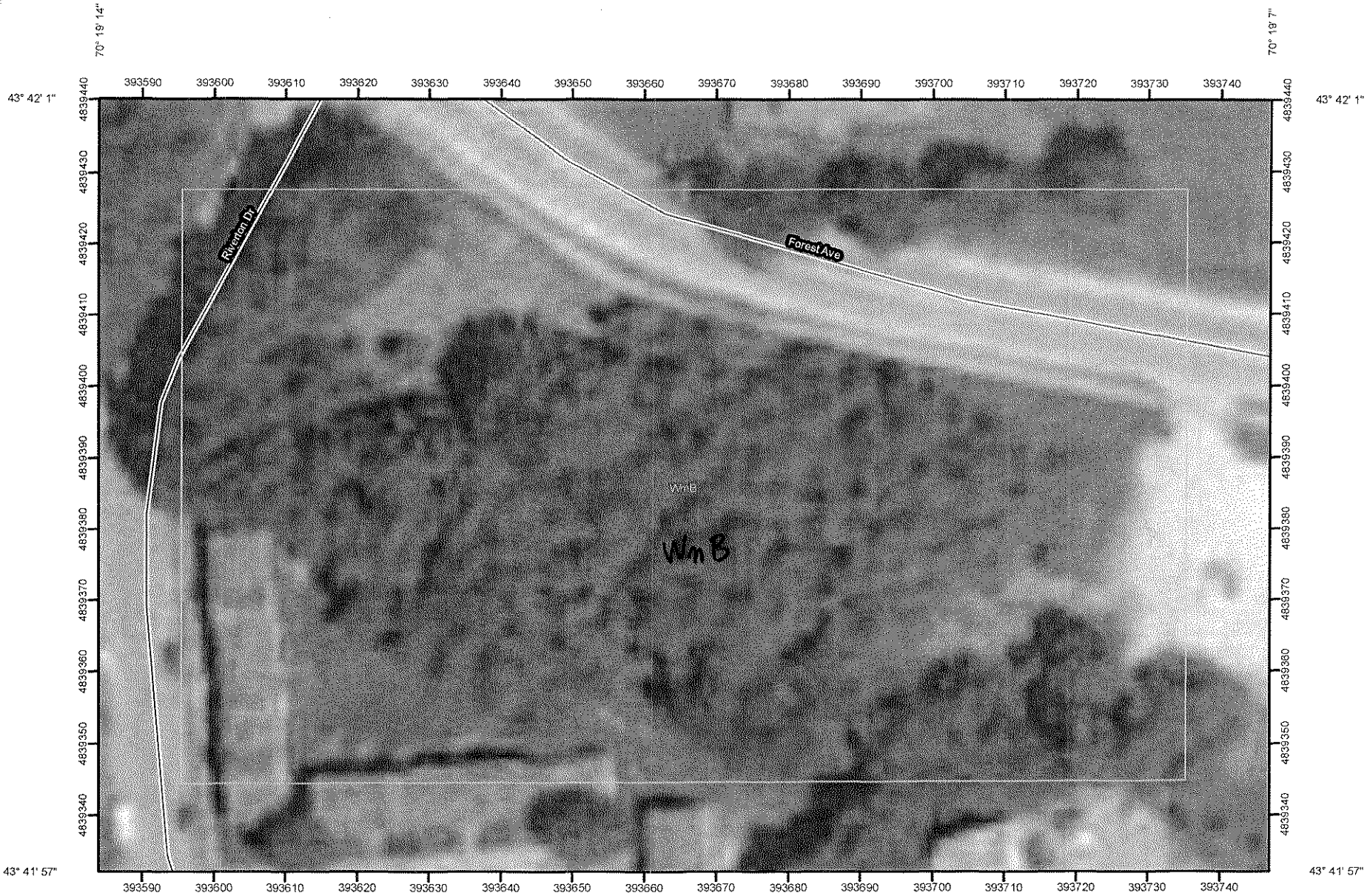
A. Alterations to Land Cover

The proposed site will result in a total impervious area of 1.15 acres. This area includes the proposed building, access drive and parking areas. The proposed development will result in a total of 1.6 acres of disturbed area.

IV. Downstream Ponds and Waterbodies

Stormwater runoff that is collected in the City's stormwater system in Riverton Drive eventually drains through a tributary stream to the Presumpscot River. The stormwater outfall pipe from Riverton Drive shows no signs of erosion.

Soil Map—Cumberland County and Part of Oxford County, Maine
(Chall Property Development)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:774 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

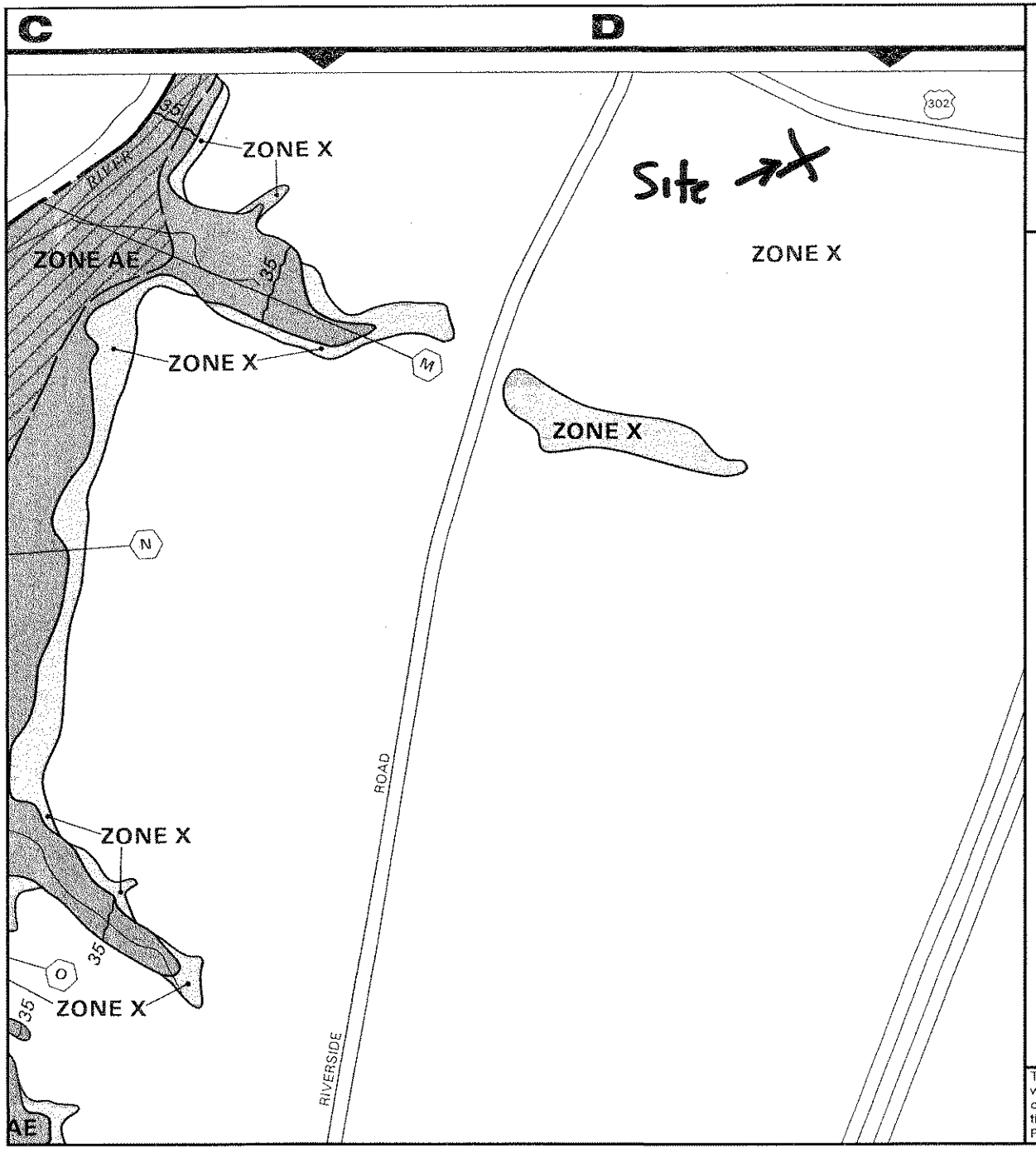
Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 7, Jan 8, 2009

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Cumberland County and Part of Oxford County, Maine (ME005)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
WmB	Windsor loamy sand, 0 to 8 percent slopes	2.9	100.0%
Totals for Area of Interest		**2.9**	**100.0%**



APPROXIMATE SCALE

400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

CITY OF
PORTLAND,
MAINE
CUMBERLAND COUNTY

PANEL 6 OF 17
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
230051 0006 C

MAP REVISED:
DECEMBER 8, 1998

Federal Emergency Management Agency

V. Regulatory Requirements

City of Portland, Maine

Water Quality, Stormwater Management and Erosion Control:

a. All development must demonstrate that the proposed site improvements are designed to minimize the amount of stormwater leaving the site. This must include consideration of the design and location of improvements to minimize the total area of impervious surface on the site and stormwater management techniques to minimize both the volume and rate of runoff from the lot. The Stormwater Management Plan must demonstrate the following:

(i) Any stormwater draining onto or across the lot in its pre-improvement state will not be impeded or re-directed so as to create ponding on, or flooding of, adjacent lots;

(ii) Any increase in volume or rate of stormwater draining from the lot onto an adjacent lot following the improvement can be handled on the adjacent lot without creating ponding, flooding or City of Portland Land Use Code of Ordinances Chapter 14 Sec. 14-526 Rev.7-6-11 14-745 other drainage problems and that the owner of the lot being improved has the legal right to increase the flow of stormwater onto the adjacent lot;

(iii) Any increase in volume or rate of stormwater draining from the lot onto City property following the improvement can be handled without creating ponding, flooding or other drainage problems and that the owner of the lot being improved has the legal right to increase the flow of stormwater onto the City's property; and

(iv) Any increase in volume or rate of stormwater draining from the lot into the City's separate storm sewer system can be accommodated in the system without creating downstream problems or exceeding the capacity of the storm sewer system.

b. All development, except Level I minor residential development, shall comply with the standards of Section 5 of the Technical Manual including Basic, General and Flooding Standards, as applicable, to prevent and control the release of pollutants to waterbodies, watercourses, wetlands and groundwater, and reduce adverse impacts associated with increases or changes in flow, soil erosion and sedimentation.

c. All development, except Level I minor residential development, that are located within the watershed of an Urban Impaired Stream shall comply with the Urban Impaired Stream Standards pursuant to Maine Department

of Environmental Protection (Maine DEP) Chapter 500 Stormwater Management Rules, as described in Section 5 of the Technical Manual.

VI. Stormwater Management (Best Management Practices (BMPs)

Chau Property utilizes two types of soil filters for stormwater treatment; Filterra bioretention basins and traditional bioretention basins. To mitigate peak stormwater flow, a detention basin is utilized to detain stormwater runoff. Both treatment and detention BMPs are designed in accordance with the criteria in the current edition of the Maine DEP publication, "Stormwater Management for Maine".

A. The Filterra® Bioretention System Sizing Criteria

Subarea Id	Proposed Subarea impervious surface	Sizing criteria in acres to treat 90% of the annual runoff volume. Maximum acreage	Filterra® Model Number
2	0.21	0.32	6' x 4' Filterra
3	0.28	0.32	6' x 4' Filterra
4	0.35	0.42	8' x 4' Filterra
5	0.15	0.32	6' x 4' Filterra

B. Bioretention Basins

These basins provide both stormwater quality and quantity control for the project. The underdrained filtration basins have been designed to treat the volume of at least 1.0" of runoff from tributary impervious areas and 0.4" of runoff from non-impervious landscaped areas tributary to the basin

VII. Water Quality Analysis

The City of Portland Standards and Maine DEP Standards for a Post-Construction Stormwater Management Plan requires treatment from 95% of the site's impervious surface and 80% percent of runoff from developed areas. The project meets these standards using Filterra bioretention basins and traditional bioretention basins to treat and detain stormwater runoff.

The filtration basin Pond-1 has been designed to treat runoff from 5,663 sf of impervious parking area and 2,540 sf of landscaped area, which are tributary to the basin.

The "Filterra" filtration basin Pond-2 has been designed to treat runoff from 9,148 sf of impervious parking and rooftop and 1,742 sf of landscaped area, which are tributary to the basin.

The "Filterra" filtration basin Pond-3 has been designed to treat runoff from 12,197 sf of impervious parking and rooftop and 1,306 sf of landscaped area, which are tributary to the basin.

The "Filterra" filtration basin Pond-4 has been designed to treat runoff from 15,246 sf of impervious parking and rooftop and 871 sf of landscaped area, which are tributary to the basin.

The "Filterra" filtration basin Pond-5 has been designed to treat runoff from 6,534 sf of impervious parking and rooftop and 160 sf of landscaped area, which are tributary to the basin.

Water Quality Volume (WQV) and BMP sizing volume calculations are included in Attachment A. The calculations are summarized as follows:

Table 1: Post-Construction Stormwater Management Plan Calculations - Impervious Area/Developed Area Summary

Table 2: Post-Construction Stormwater Management Plan Calculations - Impervious Area Treatment Summary

Table 2 summarizes the total impervious area receiving treatment. In addition, it also indicates which BMP is treating which watershed. At the end of the table, it tabulates the percentage of impervious area being treated.

The results of this tabulation indicate the following:

- The post-development condition of the site will contain approximately 50,094 sf of impervious (paved/rooftop) surfaces.

- Treatment is provided for 48,788 sf, equal to 97.0% of the site impervious area.

Tables 3: Post-Construction Stormwater Management Plan Calculations - BMP Sizing Calculations

Tables 3, included in Attachment A, presents calculations to determine the required WQV for the proposed underdrained soil filter basins UDP-1 and UDP-2. Included in the stormwater water quality calculations are stage-storage tables developed for the BMP demonstrating its capacity.

Tables 4: Construction Stormwater Management Plan Calculations – Pre- & Post-Development Peak Stormwater Flows Calculations

This section has been prepared to discuss the proposed modifications to peak flow rates as a result of the development.

A. Modeling Technique

The SCS TR-20 methodology was used to analyze pre-development and post-development conditions. A 24-hour, SCS Type III storm distribution for the 2, 10, and 25-year storm frequencies were used for analysis. The corresponding rainfall amounts for these storms are based on published data for Cumberland County are 3.0", 4.7", and 5.5", respectively.

Land use cover, watershed delineations, flow paths, and hydrologic soils data were obtained using the following sources:

1. Topographic survey with 2' contour intervals.
2. Field reconnaissance.
3. Soil Conservation Service, Medium Intensity Soil Survey for Cumberland County.

B. Points of Interest

The pre-development and post-development watershed has one primary points of analysis regarding peak flow. The point of analysis is a 12" diameter storm drain pipe located in Riverton Drive. This storm drain discharges to a drainage channel that is a tributary stream to the Presumpscot River. The stormwater outfall pipe from Riverton Drive shows no signs of erosion.

C. Pre-development

- Attached to this report is a "Pre-Development Watershed Map" that depicts the site's associated watershed areas delineated prior to development (pre-development).
- Subcatchment 1 depicts the runoff boundaries from the western portion of the watershed. Most of the runoff infiltrates naturally through the sandy soils before reaching a catch basin outfall in Riverton Drive.
- Subcatchment 2 depicts the runoff boundaries from the eastern portion of the watershed. Stormwater calculation suggests that most of the runoff infiltrates naturally through the sandy soils before reaching the easterly boundary with Riverton Park.
- Subcatchment 10 depicts the off-site stormwater runoff from Forest Avenue and Riverton Drive.
- The watershed areas and BMP locations are shown on the *Stormwater Treatment Plan* and the *Pre-Development Watershed Plan* included in the plan set. The detailed TR-20 stormwater calculations for the pre-development stormwater model are attached to this report.

D. Post-development

- In the proposed condition, the development was divided into eight subcatchments.
- Subcatchment 1 depicts a drainage area which flows to a bioretention basin (Pond 1).
- Subcatchments 2, 3, 4, and 5 depict drainage areas which flow to Filterra Soil Filters (Ponds 2, 3, 4 and 5)
- Subcatchment 6 depicts the surrounding drainage area and the detention pond.
- Subcatchment 10 depicts the off-site stormwater runoff from Forest Avenue and Riverton Drive.
- Subcatchment 1, 2, 3, 4 and 5 will be routed through a Filterra Soil Filter and a bioretention pond and piped to detention basins for attenuation of peak runoff.
- The watershed areas and BMP locations are shown on the *Stormwater Treatment Plan* and the *Post-Development Watershed Plan* included in the plan set. The detailed TR-20 stormwater calculations for the post-development stormwater model are attached to this report.

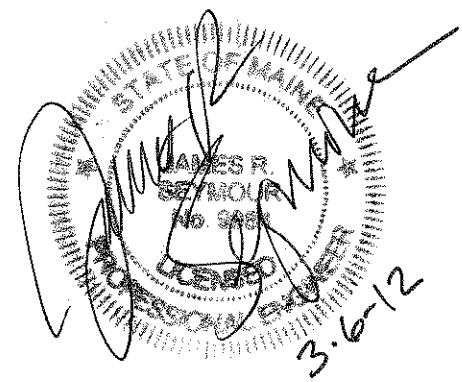
VIII. Conclusions

Erosion and sedimentation controls, inspection and maintenance procedures and general housekeeping requirements have been outlined to prevent unreasonable impacts on the site and to the surrounding environment. By utilizing BMPs, stormwater quality treatment has been provided for at least 95% of the total site impervious area.

Prepared by,

SEBAGO TECHNICS, INC.

Steven Groves
Sr. Design Engineer
March 6, 2012



Attachment A

Stormwater Quality Calculations

7.5.2 Design and Installation Criteria

The Filterra® system is considered an approved alternative to the General Standard BMPs described in the Chapter 500 Stormwater Manual Rules when it is designed as a stormwater treatment train that uses a combination of Filterra® systems draining in series to a StormTech Isolator Row (and chamber system when channel protection volume attenuation is required). It must be designed, installed and maintained in accordance with the following criteria.

1. The Filterra® system is installed with the inlet slot invert slightly below pavement grade. Captured flows percolate through the mulch; plant and soil filter media and eventually discharge via a perforated under-drain to an adjacent StormTech Isolator Row (Figure 2). Several inches of headspace is provided above the mulch surface layer to permit ponding of flows during high-intensity runoff events, and to collect trash and debris.

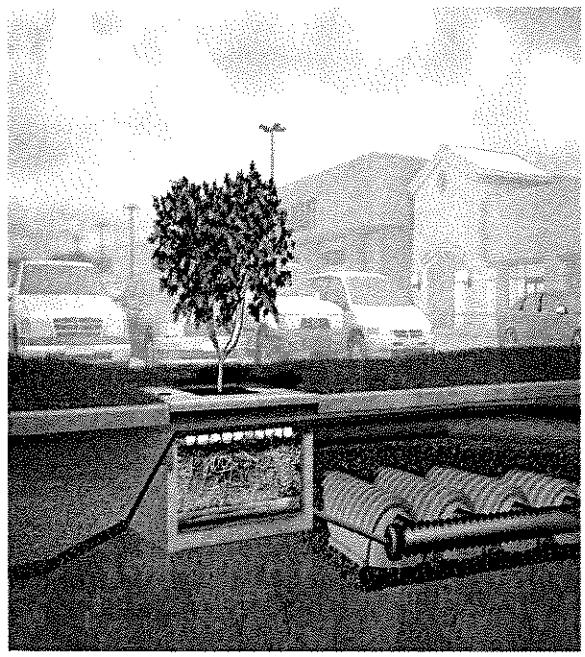


Figure 2. Typical Filterra® Design and Installation

2. When designed with the standard curb inlet design, the Filterra® will be configured "off-line" with the surface elevation at the Filterra® system being up gradient of an overflow inlet. In the grated inlet design, the Filterra® system will incorporate an internal bypass and does not require an overflow inlet. More specific installation information is provided in the Filterra® Installation, Operation and Maintenance (IOM) Manual also found on the Filterra® website. The applicant must demonstrate that the design meets all the manufacturer's specifications and shall be reviewed by the manufacturer prior to submission for DEP approval. Review and approval of the design by the manufacturer will be sufficient to demonstrate conformance with the manufacturer's specifications.

3. The Filterra® system will be configured in series upstream of a StormTech Isolator Row. The treated and bypass flow will be combined and directed to the Isolator Row which shall be sized to treat the flow from a 1-year, 24-hour storm event.

4. For proper trash collection ensure a minimum 4" and maximum 6" Filterra® throat opening depth. Positive drainage of each Filterra® system's effluent treatment pipe is required to prevent free standing water from accumulating in the system or under drain. This could occur due to tidal influences or improper connection of Filterra's® effluent pipe to the StormTech Isolator Row.

6. Plans and the completed Filterra® Project Information Form located in the Filterra® DAKit must be sent to Americast for Filterra® placement review. Plans sheets should include grading, drainage areas, stormwater schedules or profiles, landscape sheets and Filterra® detail sheets. This review is mandatory for warranty to apply and helps ensure that each Filterra® system operates efficiently to maximize performance and minimize maintenance.

Chau Property
1884 Forest Ave
Portland, Maine

TABLE 1
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN CALCULATIONS
IMPERVIOUS AREA / DEVELOPED AREA SUMMARY

Area ID	Watershed Area	Site Imp Area (s.f.)	Site Landscaped Area (s.f.)	Site Developed Area (s.f.)	Notes
1	8203	5663	2540	8203	
2	10890	9148	1742	10890	
3	13503	12197	1306	13503	
4	16117	15246	871	16117	
5	6534	6534	0	6534	
5a	9018	872	0	872	
6	7405	570	3050	3620	
	71670	**50230**	**9509**	**59739**	

TOTAL NEW IMPERVIOUS AREA =	50,230	sq.ft.
	1.15	Acre
TOTAL NEW DEVELOPED AREA =	59,739	sq.ft.
	1.37	Acre

Chau Property
1884 Forest Ave
Portland, Maine

TABLE 2
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN CALCULATIONS
IMPERVIOUS AREA TREATMENT SUMMARY

Area ID	Site Impervious (S.F.)	Receives Treatment (Yes/No)	Impervious Area Treated (S.F.)	TREATMENT BMP
1	5663	YES	5663	Bioretention-1
2	9148	YES	9148	Filterra-2
3	12197	YES	12197	Filterra-3
4	15246	YES	15246	Filterra-4
5	6534	YES	6534	Filterra-5
5a	872	NO	0	NONE
6	570	NO	0	NONE
	50,230		**48,788**	

TOTAL IMPERVIOUS AREA	**50,230**
TOTAL IMPERVIOUS AREA REQUIRING TREATMENT (90%)	**45,207**
TOTAL IMPERVIOUS AREA RECEIVING TREATMENT	**48,788**
% OF IMPERVIOUS AREA RECEIVING TREATMENT	**97%**

Chau Property
1884 Forest Ave
Portland, Maine

TABLE 3
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN CALCULATIONS
BIORETENTION POND UDP-1

Area ID	Watershed Area (s.f.)	New Site Impervious (s.f.)	New Site Landscape (s.f.)	Receives Treatment from UDP-1	Site Impervious Treated (s.f.)	Site Landscaped Treated (s.f.)	WATER QUALITY VOLUME (cubic feet)	FILTER BED AREA (s.f.)
1	8203	5663	2540	YES	5663	2540	557	529
					WATER QUALITY VOLUME REQUIRED		557	CF
					FILTER BED AREA REQUIRED		529	SF

*SEE POST-DEVELOPMENT STORMWATER PLAN FOR DESCRIPTION LOCATIONS

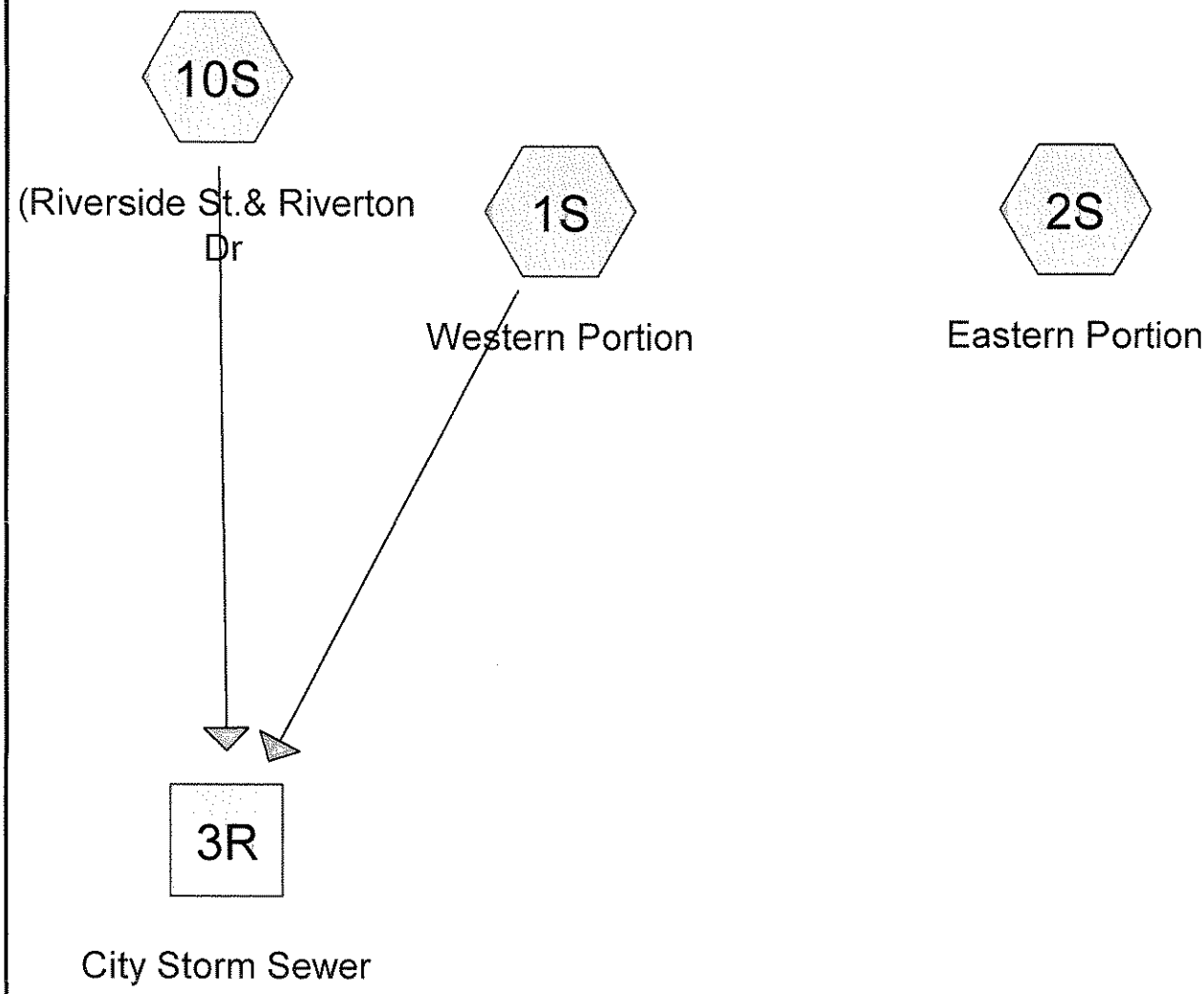
Note:
1. Water quality volume is equal to1.0" times the BMP's tributary impervious area, plus 0.4" times the BMP's tributary landscaped area.
2. Filter Bed Area is equal to 8% of impervious surface plus 3% of landscaped surface tributary to the BMP

Table 4 – Pre-Development vs. Post-Development Peak Flow Summary at Reach #3

12" Storm Drain-Reach 3	2-year	10-year	25-year
	Peak Flow (cfs)	**Peak Flow (cfs)**	**Peak Flow (cfs)**
Pre-Development	0.48	0.76	0.89
Post-Development	0.46	0.65	0.74
Change	-0.02	-0.11	-0.15

Attachment B

HydroCAD Output – Post-Development TR-20 Model



Subcat Reach Pond Link

Drainage Diagram for Chau Property Development-pre
Prepared by {enter your company name here} 3/1/2012
HydroCAD® 8.00 s/n 001856 © 2006 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcats)
1.500	43	Woods/grass comb., Fair, HSG A (1S,2S)
0.163	98	Paved parking & roofs (10S)
1.663		

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Western Portion Runoff Area=0.800 ac Runoff Depth>0.00"
Flow Length=302' Tc=26.1 min CN=43 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Eastern Portion Runoff Area=0.700 ac Runoff Depth>0.00"
Flow Length=220' Tc=18.6 min CN=43 Runoff=0.00 cfs 0.000 af

Subcatchment 10S: (Riverside St.& Riverton Dr Runoff Area=7,115 sf Runoff Depth>2.59"
Tc=5.0 min CN=98 Runoff=0.48 cfs 0.035 af

Reach 3R: City Storm Sewer Inflow=0.48 cfs 0.035 af
Outflow=0.48 cfs 0.035 af

Total Runoff Area = 1.663 ac Runoff Volume = 0.036 af Average Runoff Depth = 0.26"
90.18% Pervious Area = 1.500 ac 9.82% Impervious Area = 0.163 ac

Subcatchment 1S: Western Portion

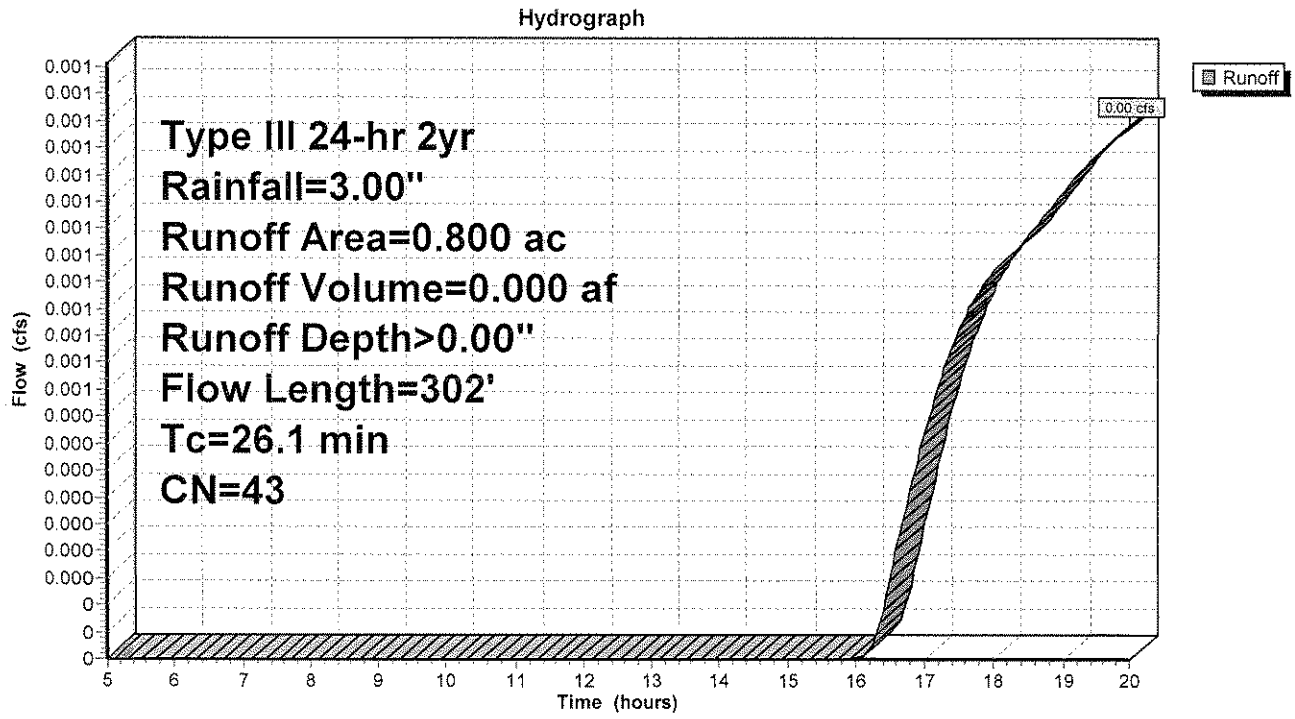
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (ac)	CN	Description
0.800	43	Woods/grass comb., Fair, HSG A
0.800		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	100	0.0200	0.08		**Sheet Flow, Pine Forest** Woods: Light underbrush n= 0.400 P2= 3.00"
3.0	112	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	50	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
26.1	302	Total			

Subcatchment 1S: Western Portion



Subcatchment 2S: Eastern Portion

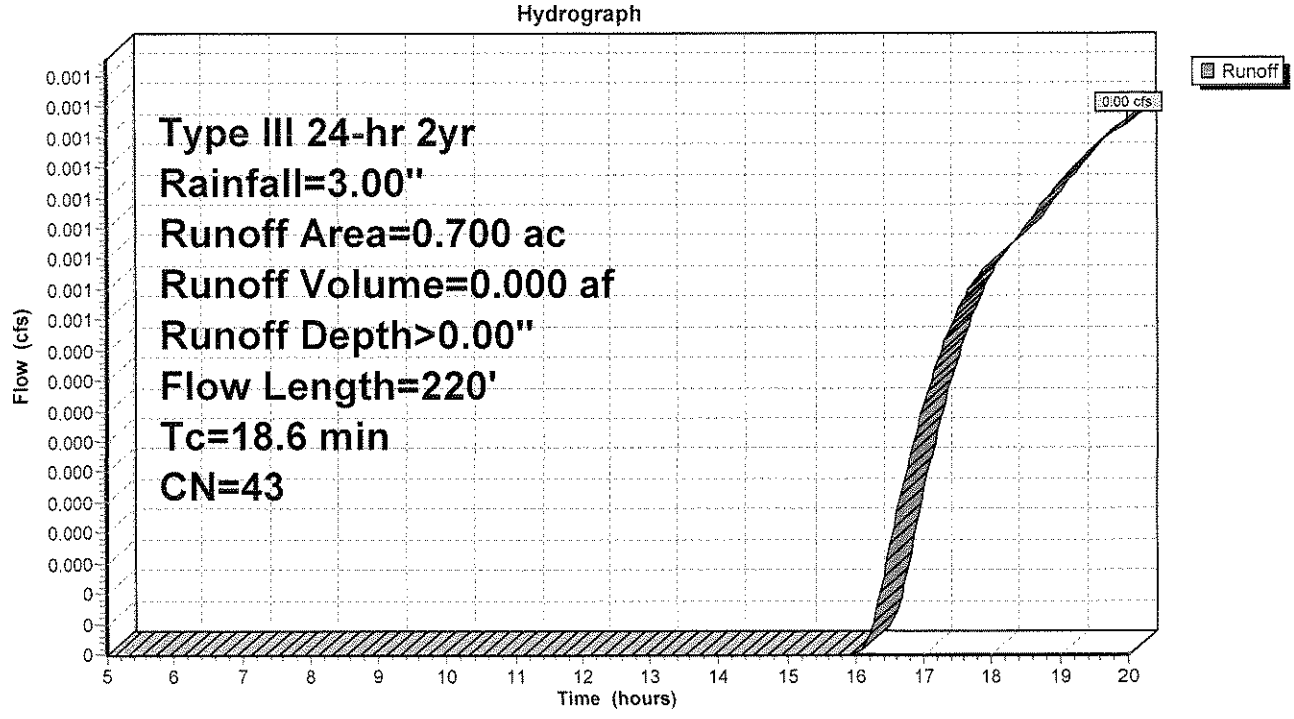
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (ac)	CN	Description
0.700	43	Woods/grass comb., Fair, HSG A
0.700		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	70	0.0286	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
4.1	150	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.6	220	Total			

Subcatchment 2S: Eastern Portion



Subcatchment 10S: (Riverside St.& Riverton Dr

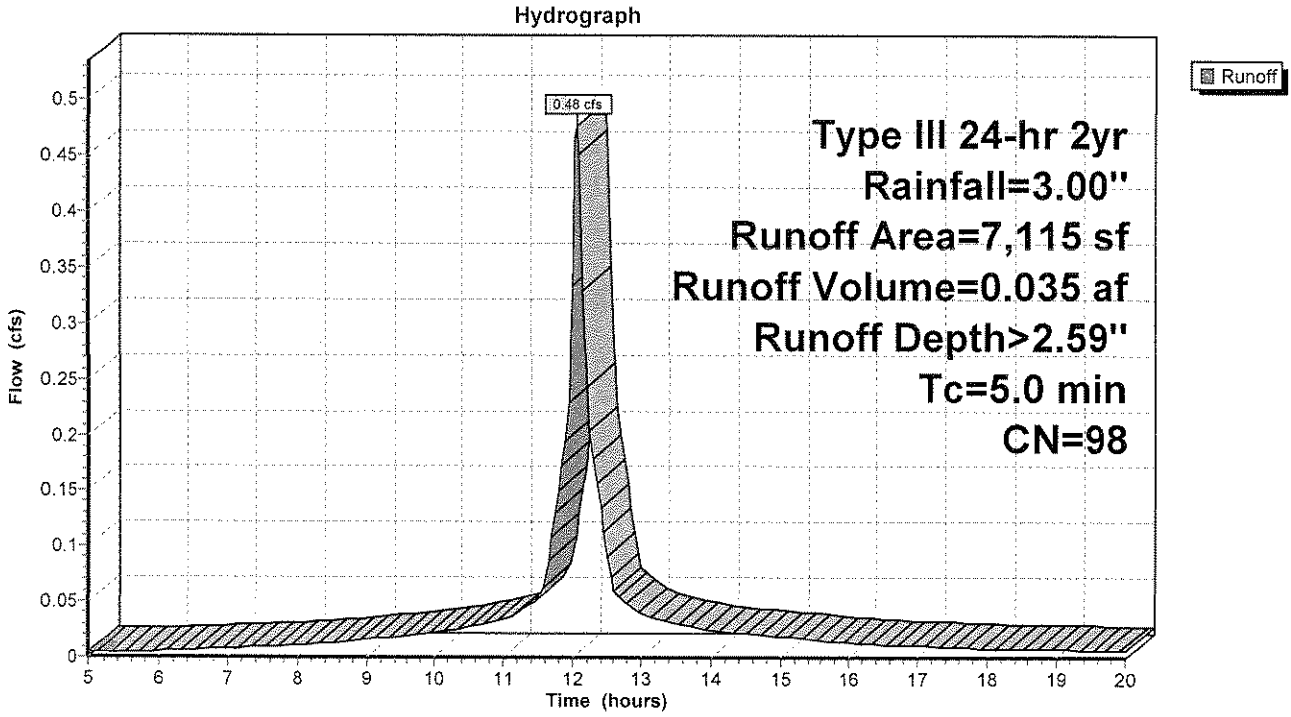
Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.035 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (sf)	CN	Description
7,115	98	Paved parking & roofs
7,115		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S: (Riverside St.& Riverton Dr

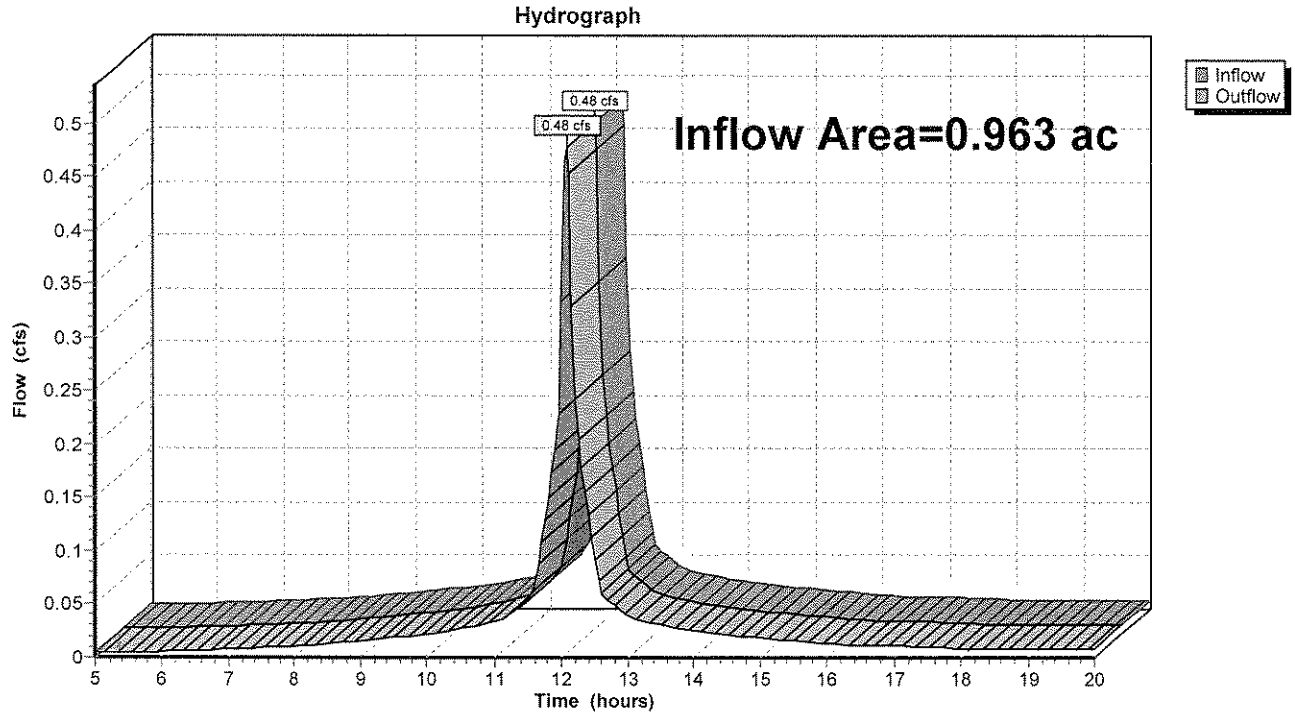


Reach 3R: City Storm Sewer

Inflow Area = 0.963 ac, Inflow Depth > 0.44" for 2yr event
Inflow = 0.48 cfs @ 12.07 hrs, Volume= 0.035 af
Outflow = 0.48 cfs @ 12.07 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 3R: City Storm Sewer



Area Listing (all nodes)

Area (acres)	CN	Description (subcats)
1.500	43	Woods/grass comb., Fair, HSG A (1S,2S)
0.163	98	Paved parking & roofs (10S)
1.663		

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Western Portion Runoff Area=0.800 ac Runoff Depth>0.22"
Flow Length=302' Tc=26.1 min CN=43 Runoff=0.05 cfs 0.015 af

Subcatchment 2S: Eastern Portion Runoff Area=0.700 ac Runoff Depth>0.22"
Flow Length=220' Tc=18.6 min CN=43 Runoff=0.05 cfs 0.013 af

Subcatchment 10S: (Riverside St.& Riverton Dr Runoff Area=7,115 sf Runoff Depth>4.15"
Tc=5.0 min CN=98 Runoff=0.76 cfs 0.056 af

Reach 3R: City Storm Sewer Inflow=0.76 cfs 0.071 af
Outflow=0.76 cfs 0.071 af

Total Runoff Area = 1.663 ac Runoff Volume = 0.084 af Average Runoff Depth = 0.61"
90.18% Pervious Area = 1.500 ac 9.82% Impervious Area = 0.163 ac

Subcatchment 1S: Western Portion

Runoff = 0.05 cfs @ 12.70 hrs, Volume= 0.015 af, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.70"

Area (ac)	CN	Description
0.800	43	Woods/grass comb., Fair, HSG A
0.800		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	100	0.0200	0.08		**Sheet Flow, Pine Forest** Woods: Light underbrush n= 0.400 P2= 3.00"
3.0	112	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	50	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
26.1	302	Total			

Subcatchment 2S: Eastern Portion

Runoff = 0.05 cfs @ 12.58 hrs, Volume= 0.013 af, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.70"

Area (ac)	CN	Description
0.700	43	Woods/grass comb., Fair, HSG A
0.700		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	70	0.0286	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
4.1	150	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.6	220	Total			

Subcatchment 10S: (Riverside St.& Riverton Dr

Runoff = 0.76 cfs @ 12.07 hrs, Volume= 0.056 af, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.70"

Area (sf)	CN	Description
7,115	98	Paved parking & roofs
7,115		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Reach 3R: City Storm Sewer

Inflow Area = 0.963 ac, Inflow Depth > 0.89" for 10yr event
Inflow = 0.76 cfs @ 12.07 hrs, Volume= 0.071 af
Outflow = 0.76 cfs @ 12.07 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Western Portion Runoff Area=0.800 ac Runoff Depth>0.42"
Flow Length=302' Tc=26.1 min CN=43 Runoff=0.15 cfs 0.028 af

Subcatchment 2S: Eastern Portion Runoff Area=0.700 ac Runoff Depth>0.42"
Flow Length=220' Tc=18.6 min CN=43 Runoff=0.14 cfs 0.025 af

Subcatchment 10S: (Riverside St.& Riverton Dr Runoff Area=7,115 sf Runoff Depth>4.87"
Tc=5.0 min CN=98 Runoff=0.89 cfs 0.066 af

Reach 3R: City Storm Sewer Inflow=0.89 cfs 0.094 af
Outflow=0.89 cfs 0.094 af

Total Runoff Area = 1.663 ac Runoff Volume = 0.119 af Average Runoff Depth = 0.86"
90.18% Pervious Area = 1.500 ac 9.82% Impervious Area = 0.163 ac

Subcatchment 1S: Western Portion

Runoff = 0.15 cfs @ 12.60 hrs, Volume= 0.028 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.50"

Area (ac)	CN	Description
0.800	43	Woods/grass comb., Fair, HSG A
0.800		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	100	0.0200	0.08		**Sheet Flow, Pine Forest** Woods: Light underbrush n= 0.400 P2= 3.00"
3.0	112	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	50	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
26.1	302	Total			

Subcatchment 2S: Eastern Portion

Runoff = 0.14 cfs @ 12.49 hrs, Volume= 0.025 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.50"

Area (ac)	CN	Description
0.700	43	Woods/grass comb., Fair, HSG A
0.700		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	70	0.0286	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
4.1	150	0.0150	0.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.6	220	Total			

Subcatchment 10S: (Riverside St.& Riverton Dr

Runoff = 0.89 cfs @ 12.07 hrs, Volume= 0.066 af, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.50"

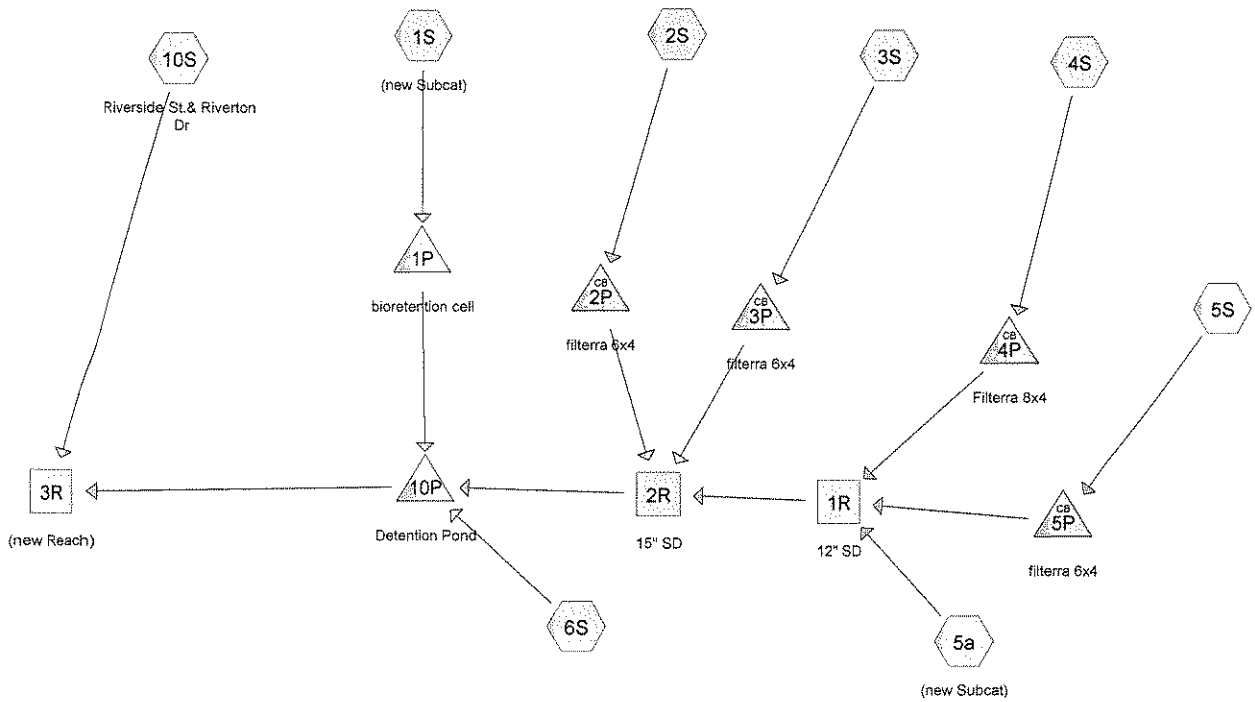
Area (sf)	CN	Description
7,115	98	Paved parking & roofs
7,115		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Reach 3R: City Storm Sewer

Inflow Area = 0.963 ac, Inflow Depth > 1.18" for 25yr event
Inflow = 0.89 cfs @ 12.07 hrs, Volume= 0.094 af
Outflow = 0.89 cfs @ 12.07 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Subcat Reach Pond Link

Drainage Diagram for Chau Property Development-3
Prepared by {enter your company name here} 3/1/2012

Area Listing (all nodes)

Area (acres)	CN	Description (subcats)
0.050	36	Woods, Fair, HSG A (10S)
0.288	39	>75% Grass cover, Good, HSG A (1S,2S,3S,4S,6S)
1.185	98	Paved parking & roofs (1S,2S,3S,4S,5S,6S,10S)
0.020	98	Paved roads w/curbs & sewers (5a)
1.543		

Time span=5.00-20.00 hrs, dt=0.01 hrs, 1501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: (new Subcat) Runoff Area=8,203 sf Runoff Depth>1.15"
Tc=5.0 min CN=80 Runoff=0.28 cfs 0.018 af

Subcatchment 2S: Runoff Area=10,890 sf Runoff Depth>1.78"
Tc=5.0 min CN=89 Runoff=0.57 cfs 0.037 af

Subcatchment 3S: Runoff Area=13,503 sf Runoff Depth>2.04"
Tc=5.0 min CN=92 Runoff=0.80 cfs 0.053 af

Subcatchment 4S: Runoff Area=16,117 sf Runoff Depth>2.31"
Tc=5.0 min CN=95 Runoff=1.05 cfs 0.071 af

Subcatchment 5a: (new Subcat) Runoff Area=0.020 ac Runoff Depth>2.59"
Tc=5.0 min CN=98 Runoff=0.06 cfs 0.004 af

Subcatchment 5S: Runoff Area=6,534 sf Runoff Depth>2.59"
Tc=5.0 min CN=98 Runoff=0.45 cfs 0.032 af

Subcatchment 6S: Runoff Area=0.153 ac Runoff Depth>0.01"
Tc=5.0 min CN=44 Runoff=0.00 cfs 0.000 af

Subcatchment 10S: Riverside St.& Riverton Dr Runoff Area=4,430 sf Runoff Depth>0.56"
Tc=5.0 min CN=68 Runoff=0.06 cfs 0.005 af

Reach 1R: 12" SD Avg. Depth=0.48' Max Vel=4.11 fps Inflow=1.56 cfs 0.108 af
D=12.0" n=0.010 L=249.0' S=0.0050 '/' Capacity=3.28 cfs Outflow=1.53 cfs 0.108 af

Reach 2R: 15" SD Avg. Depth=0.59' Max Vel=4.97 fps Inflow=2.86 cfs 0.198 af
D=15.0" n=0.010 L=60.0' S=0.0055 '/' Capacity=6.23 cfs Outflow=2.85 cfs 0.198 af

Reach 3R: (new Reach) Inflow=0.46 cfs 0.157 af
Outflow=0.46 cfs 0.157 af

Pond 1P: bioretention cell Peak Elev=80.04' Storage=249 cf Inflow=0.28 cfs 0.018 af
Outflow=0.10 cfs 0.018 af

Pond 2P: filterra 6x4 Peak Elev=80.81' Inflow=0.57 cfs 0.037 af
Outflow=0.57 cfs 0.037 af

Pond 3P: filterra 6x4 Peak Elev=82.54' Inflow=0.80 cfs 0.053 af
Outflow=0.80 cfs 0.053 af

Pond 4P: Filterra 8x4 Peak Elev=84.63' Inflow=1.05 cfs 0.071 af
Outflow=1.05 cfs 0.071 af

Pond 5P: filterra 6x4 Peak Elev=79.56' Inflow=0.45 cfs 0.032 af
Outflow=0.45 cfs 0.032 af

Pond 10P: Detention Pond Peak Elev=77.55' Storage=2,460 cf Inflow=2.88 cfs 0.216 af
Discarded=0.23 cfs 0.064 af Primary=0.44 cfs 0.152 af Outflow=0.67 cfs 0.216 af

Total Runoff Area = 1.543 ac Runoff Volume = 0.221 af Average Runoff Depth = 1.72"
21.90% Pervious Area = 0.338 ac 78.10% Impervious Area = 1.205 ac

Subcatchment 1S: (new Subcat)

Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.018 af, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (sf)	CN	Description
5,663	98	Paved parking & roofs
2,540	39	>75% Grass cover, Good, HSG A
8,203	80	Weighted Average
2,540		Pervious Area
5,663		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S:

Runoff = 0.57 cfs @ 12.07 hrs, Volume= 0.037 af, Depth> 1.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (sf)	CN	Description
9,148	98	Paved parking & roofs
1,742	39	>75% Grass cover, Good, HSG A
10,890	89	Weighted Average
1,742		Pervious Area
9,148		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S:

Runoff = 0.80 cfs @ 12.07 hrs, Volume= 0.053 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (sf)	CN	Description
12,197	98	Paved parking & roofs
1,306	39	>75% Grass cover, Good, HSG A
13,503	92	Weighted Average
1,306		Pervious Area
12,197		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S:

Runoff = 1.05 cfs @ 12.07 hrs, Volume= 0.071 af, Depth> 2.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (sf)	CN	Description
15,246	98	Paved parking & roofs
871	39	>75% Grass cover, Good, HSG A
16,117	95	Weighted Average
871		Pervious Area
15,246		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5a: (new Subcat)

Runoff = 0.06 cfs @ 12.07 hrs, Volume= 0.004 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (ac)	CN	Description
0.020	98	Paved roads w/curbs & sewers
0.020		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S:

Runoff = 0.45 cfs @ 12.07 hrs, Volume= 0.032 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (sf)	CN	Description
6,534	98	Paved parking & roofs
6,534		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S:

Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (ac)	CN	Description
0.140	39	>75% Grass cover, Good, HSG A
0.013	98	Paved parking & roofs
0.153	44	Weighted Average
0.140		Pervious Area
0.013		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10S: Riverside St.& Riverton Dr

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.005 af, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2yr Rainfall=3.00"

Area (sf)	CN	Description
2,270	98	Paved parking & roofs
2,160	36	Woods, Fair, HSG A
4,430	68	Weighted Average
2,160		Pervious Area
2,270		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

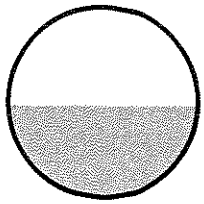
Reach 1R: 12" SD

Inflow Area = 0.540 ac, Inflow Depth > 2.40" for 2yr event
Inflow = 1.56 cfs @ 12.07 hrs, Volume= 0.108 af
Outflow = 1.53 cfs @ 12.10 hrs, Volume= 0.108 af, Atten= 2%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.11 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.54 fps, Avg. Travel Time= 2.7 min

Peak Storage= 93 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 3.28 cfs

12.0" Diameter Pipe, n= 0.010
Length= 249.0' Slope= 0.0050 '/'
Inlet Invert= 77.80', Outlet Invert= 76.55'



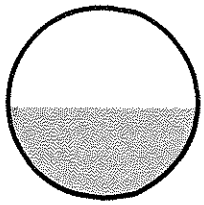
Reach 2R: 15" SD

Inflow Area = 1.100 ac, Inflow Depth > 2.16" for 2yr event
Inflow = 2.86 cfs @ 12.09 hrs, Volume= 0.198 af
Outflow = 2.85 cfs @ 12.09 hrs, Volume= 0.198 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.97 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.83 fps, Avg. Travel Time= 0.5 min

Peak Storage= 35 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 1.25', Capacity at Bank-Full= 6.23 cfs

15.0" Diameter Pipe, n= 0.010
Length= 60.0' Slope= 0.0055 '/'
Inlet Invert= 76.50', Outlet Invert= 76.17'



Reach 3R: (new Reach)

Inflow Area = 1.543 ac, Inflow Depth > 1.22" for 2yr event
Inflow = 0.46 cfs @ 12.36 hrs, Volume= 0.157 af
Outflow = 0.46 cfs @ 12.36 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs

Pond 1P: bioretention cell

Inflow Area = 0.188 ac, Inflow Depth > 1.15" for 2yr event
Inflow = 0.28 cfs @ 12.08 hrs, Volume= 0.018 af
Outflow = 0.10 cfs @ 12.38 hrs, Volume= 0.018 af, Atten= 64%, Lag= 18.1 min
Primary = 0.10 cfs @ 12.38 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 80.04' @ 12.38 hrs Surf.Area= 532 sf Storage= 249 cf

Plug-Flow detention time= 71.4 min calculated for 0.018 af (100% of inflow)
Center-of-Mass det. time= 70.9 min (876.2 - 805.3)

Volume	Invert	Avail.Storage	Storage Description
#1	79.50'	523 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.50	396	0	0
80.50	650	523	523

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	80.00'	**0.75' x 0.75' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=0.10 cfs @ 12.38 hrs HW=80.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)
└—**2=Orifice/Grate** (Weir Controls 0.07 cfs @ 0.63 fps)

Pond 2P: filterra 6x4

Inflow Area = 0.250 ac, Inflow Depth > 1.78" for 2yr event
Inflow = 0.57 cfs @ 12.07 hrs, Volume= 0.037 af
Outflow = 0.57 cfs @ 12.07 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.07 hrs, Volume= 0.037 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 80.81' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	78.77'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.57 cfs @ 12.07 hrs HW=80.80' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.57 cfs @ 6.57 fps)

Pond 3P: filterra 6x4

Inflow Area = 0.310 ac, Inflow Depth > 2.04" for 2yr event
Inflow = 0.80 cfs @ 12.07 hrs, Volume= 0.053 af
Outflow = 0.80 cfs @ 12.07 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Primary = 0.80 cfs @ 12.07 hrs, Volume= 0.053 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 82.54' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	78.77'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.80 cfs @ 12.07 hrs HW=82.53' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.80 cfs @ 9.13 fps)

Pond 4P: Filterra 8x4

Inflow Area = 0.370 ac, Inflow Depth > 2.31" for 2yr event
Inflow = 1.05 cfs @ 12.07 hrs, Volume= 0.071 af
Outflow = 1.05 cfs @ 12.07 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min
Primary = 1.05 cfs @ 12.07 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 84.63' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	78.27'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.04 cfs @ 12.07 hrs HW=84.62' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.04 cfs @ 11.97 fps)

Pond 5P: filterra 6x4

Inflow Area = 0.150 ac, Inflow Depth > 2.59" for 2yr event
Inflow = 0.45 cfs @ 12.07 hrs, Volume= 0.032 af
Outflow = 0.45 cfs @ 12.07 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min
Primary = 0.45 cfs @ 12.07 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 79.56' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	78.40'	**4.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Primary OutFlow Max=0.45 cfs @ 12.07 hrs HW=79.56' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.45 cfs @ 5.18 fps)

Pond 10P: Detention Pond

Inflow Area = 1.441 ac, Inflow Depth > 1.80" for 2yr event
Inflow = 2.88 cfs @ 12.09 hrs, Volume= 0.216 af
Outflow = 0.67 cfs @ 12.52 hrs, Volume= 0.216 af, Atten= 77%, Lag= 25.4 min
Discarded = 0.23 cfs @ 12.52 hrs, Volume= 0.064 af
Primary = 0.44 cfs @ 12.52 hrs, Volume= 0.152 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 77.55' @ 12.52 hrs Surf.Area= 1,665 sf Storage= 2,460 cf

Plug-Flow detention time= 25.3 min calculated for 0.216 af (100% of inflow)
Center-of-Mass det. time= 25.1 min (796.1 - 771.1)

Volume	Invert	Avail.Storage	Storage Description
#1	75.40'	11,943 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
75.40	674	0	0
76.00	919	478	478
77.00	1,374	1,147	1,624
78.00	1,904	1,639	3,263
79.00	2,523	2,214	5,477
80.00	3,223	2,873	8,350
81.00	3,963	3,593	11,943

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**6.000 in/hr Exfiltration over Surface area**
#2	Primary	73.00'	**12.0" x 46.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 70.24' S= 0.0600 '/' Cc= 0.900 n= 0.010
#3	Device 2	74.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	79.60'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.6' Crest Height

Discarded OutFlow Max=0.23 cfs @ 12.52 hrs HW=77.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=0.44 cfs @ 12.52 hrs HW=77.55' (Free Discharge)
└**2=Culvert** (Passes 0.44 cfs of 7.61 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.44 cfs @ 8.91 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Area Listing (all nodes)

Area (acres)	CN	Description (subcats)
0.050	36	Woods, Fair, HSG A (10S)
0.288	39	>75% Grass cover, Good, HSG A (1S,2S,3S,4S,6S)
1.185	98	Paved parking & roofs (1S,2S,3S,4S,5S,6S,10S)
0.020	98	Paved roads w/curbs & sewers (5a)
1.543		

Time span=5.00-20.00 hrs, dt=0.01 hrs, 1501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: (new Subcat) Runoff Area=8,203 sf Runoff Depth>2.46"
Tc=5.0 min CN=80 Runoff=0.60 cfs 0.039 af

Subcatchment 2S: Runoff Area=10,890 sf Runoff Depth>3.29"
Tc=5.0 min CN=89 Runoff=1.03 cfs 0.069 af

Subcatchment 3S: Runoff Area=13,503 sf Runoff Depth>3.59"
Tc=5.0 min CN=92 Runoff=1.36 cfs 0.093 af

Subcatchment 4S: Runoff Area=16,117 sf Runoff Depth>3.88"
Tc=5.0 min CN=95 Runoff=1.71 cfs 0.120 af

Subcatchment 5a: (new Subcat) Runoff Area=0.020 ac Runoff Depth>4.14"
Tc=5.0 min CN=98 Runoff=0.10 cfs 0.007 af

Subcatchment 5S: Runoff Area=6,534 sf Runoff Depth>4.14"
Tc=5.0 min CN=98 Runoff=0.71 cfs 0.052 af

Subcatchment 6S: Runoff Area=0.153 ac Runoff Depth>0.26"
Tc=5.0 min CN=44 Runoff=0.02 cfs 0.003 af

Subcatchment 10S: Riverside St.& Riverton Dr Runoff Area=4,430 sf Runoff Depth>1.53"
Tc=5.0 min CN=68 Runoff=0.20 cfs 0.013 af

Reach 1R: 12" SD Avg. Depth=0.65' Max Vel=4.59 fps Inflow=2.52 cfs 0.178 af
D=12.0" n=0.010 L=249.0' S=0.0050 '/' Capacity=3.28 cfs Outflow=2.48 cfs 0.178 af

Reach 2R: 15" SD Avg. Depth=0.82' Max Vel=5.60 fps Inflow=4.80 cfs 0.339 af
D=15.0" n=0.010 L=60.0' S=0.0055 '/' Capacity=6.23 cfs Outflow=4.79 cfs 0.339 af

Reach 3R: (new Reach) Inflow=0.65 cfs 0.268 af
Outflow=0.65 cfs 0.268 af

Pond 1P: bioretention cell Peak Elev=80.14' Storage=306 cf Inflow=0.60 cfs 0.039 af
Outflow=0.55 cfs 0.038 af

Pond 2P: filterra 6x4 Peak Elev=84.97' Inflow=1.03 cfs 0.069 af
Outflow=1.03 cfs 0.069 af

Pond 3P: filterra 6x4 Peak Elev=89.45' Inflow=1.36 cfs 0.093 af
Outflow=1.36 cfs 0.093 af

Pond 4P: Filterra 8x4 Peak Elev=94.96' Inflow=1.71 cfs 0.120 af
Outflow=1.71 cfs 0.120 af

Pond 5P: filterra 6x4 Peak Elev=81.29' Inflow=0.71 cfs 0.052 af
Outflow=0.71 cfs 0.052 af

Pond 10P: Detention Pond Peak Elev=78.98' Storage=5,429 cf Inflow=5.33 cfs 0.380 af
Discarded=0.35 cfs 0.125 af Primary=0.52 cfs 0.255 af Outflow=0.87 cfs 0.380 af

Total Runoff Area = 1.543 ac Runoff Volume = 0.394 af Average Runoff Depth = 3.07"
21.90% Pervious Area = 0.338 ac 78.10% Impervious Area = 1.205 ac

Time span=5.00-20.00 hrs, dt=0.01 hrs, 1501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: (new Subcat) Runoff Area=8,203 sf Runoff Depth>3.12"
Tc=5.0 min CN=80 Runoff=0.76 cfs 0.049 af

Subcatchment 2S: Runoff Area=10,890 sf Runoff Depth>4.02"
Tc=5.0 min CN=89 Runoff=1.25 cfs 0.084 af

Subcatchment 3S: Runoff Area=13,503 sf Runoff Depth>4.32"
Tc=5.0 min CN=92 Runoff=1.63 cfs 0.112 af

Subcatchment 4S: Runoff Area=16,117 sf Runoff Depth>4.62"
Tc=5.0 min CN=95 Runoff=2.02 cfs 0.142 af

Subcatchment 5a: (new Subcat) Runoff Area=0.020 ac Runoff Depth>4.87"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.008 af

Subcatchment 5S: Runoff Area=6,534 sf Runoff Depth>4.87"
Tc=5.0 min CN=98 Runoff=0.84 cfs 0.061 af

Subcatchment 6S: Runoff Area=0.153 ac Runoff Depth>0.48"
Tc=5.0 min CN=44 Runoff=0.04 cfs 0.006 af

Subcatchment 10S: Riverside St.& Riverton Dr Runoff Area=4,430 sf Runoff Depth>2.07"
Tc=5.0 min CN=68 Runoff=0.27 cfs 0.018 af

Reach 1R: 12" SD Avg. Depth=0.74' Max Vel=4.72 fps Inflow=2.97 cfs 0.211 af
D=12.0" n=0.010 L=249.0' S=0.0050 '/' Capacity=3.28 cfs Outflow=2.92 cfs 0.211 af

Reach 2R: 15" SD Avg. Depth=0.94' Max Vel=5.75 fps Inflow=5.71 cfs 0.407 af
D=15.0" n=0.010 L=60.0' S=0.0055 '/' Capacity=6.23 cfs Outflow=5.70 cfs 0.407 af

Reach 3R: (new Reach) Inflow=0.74 cfs 0.319 af
Outflow=0.74 cfs 0.319 af

Pond 1P: bioretention cell Peak Elev=80.17' Storage=323 cf Inflow=0.76 cfs 0.049 af
Outflow=0.72 cfs 0.047 af

Pond 2P: filterra 6x4 Peak Elev=87.74' Inflow=1.25 cfs 0.084 af
Outflow=1.25 cfs 0.084 af

Pond 3P: filterra 6x4 Peak Elev=93.91' Inflow=1.63 cfs 0.112 af
Outflow=1.63 cfs 0.112 af

Pond 4P: Filterra 8x4 Peak Elev=101.47' Inflow=2.02 cfs 0.142 af
Outflow=2.02 cfs 0.142 af

Pond 5P: filterra 6x4 Peak Elev=82.37' Inflow=0.84 cfs 0.061 af
Outflow=0.84 cfs 0.061 af

Pond 10P: Detention Pond Peak Elev=79.56' Storage=6,986 cf Inflow=6.45 cfs 0.460 af
Discarded=0.40 cfs 0.158 af Primary=0.55 cfs 0.302 af Outflow=0.96 cfs 0.460 af

Total Runoff Area = 1.543 ac Runoff Volume = 0.479 af Average Runoff Depth = 3.73"
21.90% Pervious Area = 0.338 ac 78.10% Impervious Area = 1.205 ac

Attachment C

Inspection, Maintenance and Housekeeping Plan

INSPECTION, MAINTENANCE, AND HOUSEKEEPING PLAN

Chau Property Development
1884 Forest Avenue
Portland, Maine

Introduction

The developer responsible for this Inspection, Maintenance and Housekeeping Plan is Chau Property Development. The owner's address is 75 Acadia Street, Portland, Maine; the telephone number is (207) 761-0858. The owner of the proposed project will be responsible for the maintenance of all stormwater management structures, and the keeping of records and maintenance logbook.

The project is subject to the standards for a Post-Construction Stormwater Management Plan defined in Section 32-38 of the City of Portland Code of Ordinances. The owner is responsible for conducting maintenance and maintaining records in accordance with this Inspection, Maintenance, and Housekeeping Plan and any conditions of approval imposed by the City of Portland Planning Board. Records of all inspections and maintenance work accomplished must be maintained. The owner shall, by June 30 of each year, provide a completed and signed certification to the Department of Public Works certifying that the owner has inspected, cleaned and maintained the stormwater management facilities, describing any deficiencies found during the inspection for the stormwater management facilities and certifying that the owner has repaired any deficiencies in the stormwater management facilities noted during the inspections.

The following plan outlines the anticipated inspection, maintenance, and housekeeping procedures for the erosion and sedimentation controls as well as stormwater management devices for the project site. Also, this plan outlines several housekeeping requirements that shall be followed during and after construction. These procedures should be followed in order to ensure the intended function of the designed measures and to prevent unreasonable adverse impacts to the surrounding environment.

The procedures outlined in this Inspection, Maintenance, and Housekeeping Plan are provided as an overview of the anticipated practices to be used on this site. In some instances, additional measures may be required due to unexpected conditions. For additional details on any of the erosion and sedimentation control measures or stormwater management devices to be utilized on this project, refer to the most recently revised edition of the "Maine Erosion and Sedimentation Control BMP" manual and/or the "Stormwater Management for Maine: Best Management Practices" manual as published by the Maine Department of Environmental Protection (Maine DEP).

During Construction

1. **Inspection:** During the construction process, it is the Contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. These

responsibilities include inspecting disturbed and impervious areas, erosion control measures, materials storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall be inspected at least once a week, as well as before and after a storm event, and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in any applicable permits, shall conduct the inspections.

2. **Maintenance:** All measures shall be maintained in an effective operating condition until areas are permanently stabilized. If Best Management Practices (BMPs) need to be maintained or modified, additional BMPs are necessary, or other corrective action is needed, implementation must be completed within seven (7) calendar days and prior to any storm event (rainfall).

3. **Documentation:** A log summarizing the inspections and any corrective action taken must be maintained on-site. The log must include the name(s) and qualifications of the person making the inspections, the date(s) of the inspections, and major observations about the operation and maintenance of erosion and sedimentation controls, material storage areas, and vehicle access points to the site. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and locations where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken. The log must be made accessible to the appropriate regulatory agency upon request. The permittee shall retain a copy of the log for a period of at least five (5) years from the completion of permanent stabilization.

4. **Specific Inspection and Maintenance Tasks:** The following is a list of erosion control and stormwater management measures and the specific inspection and maintenance tasks to be performed during construction.

   A. Sediment Barriers:

   - Hay bale barriers, silt fences, and filter berms shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
   - If the fabric on a silt fence or filter barrier should decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, it shall be replaced.
   - Sediment deposits should be removed after each storm event. They must be removed before deposits reach approximately one-half the height of the barrier.
   - Filter berms shall be reshaped as needed.
   - Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required should be dressed to conform to the existing grade, prepared, and seeded.

B. Riprap Materials:

- Once a riprap installation has been completed, it should require very little maintenance. It shall, however, be inspected periodically to determine if high flows have caused scour beneath the riprap or dislodged any of the stone.

C. Stone Check Dams:

- Inspect the center of the dam to make sure it is lower than the edges. Erosion caused by high flows around the edges of the dam must be corrected.
- Sediment accumulation shall be removed prior to reaching half of the original design height.
- Areas beneath stone check dams must be seeded and mulched upon removal.

D. Stabilized Construction Entrances/Exits:

- The exit shall be maintained in a condition that will prevent tracking of sediment onto public right-of-ways.
- When the control pad becomes ineffective, the stone shall be removed along with the collected soil material. The entrance should then be reconstructed.
- Areas that have received mud-tracking or sediment deposits shall be swept or washed. Washing shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device (not into storm drains, ditches, or waterways).

E. Temporary Seed and Mulch:

- Mulched areas should be inspected after rain events to check for rill erosion.
- If less than 90% of the soil surface is covered by mulch, additional mulch shall be applied in bare areas.
- In applications where seeding and mulch have been applied in conjunction with erosion control blankets, the blankets must be inspected after rain events for dislocation or undercutting.
- Mulch shall continue to be reapplied until 95% of the soil surface has established temporary vegetative cover.

F. Stabilized Temporary Drainage Swales:

- Sediment accumulation in the swale shall be removed once the cross-section of the swale is reduced by 25%.
- The swales shall be inspected after rainfall events. Any evidence of sloughing of the side slopes or channel erosion shall be repaired and corrective action should be taken to prevent reoccurrence of the problem.
- In addition to the stabilized lining of the channel (i.e. erosion control blankets), stone check dams may be needed to further reduce channel velocity.

5. **Housekeeping:** The following general performance standards apply to the proposed project.

   A. Spill Prevention: Controls must be used to prevent pollutants from being discharged from materials on-site, including storage practices to minimize exposure of the materials to stormwater, and appropriate spill prevention, containment, and response planning and implementation.

   B. Groundwater Protection: During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors, accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials.

   C. Fugitive Sediment and Dust: Actions must be taken to insure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control.

   D. Debris and Other Materials: Litter, construction debris, and chemicals exposed to stormwater must be prevented from becoming a pollutant source.

   E. Trench Dewatering: Trench dewatering is the removal of water from trenches, foundations, cofferdams, ponds, and other areas within the construction area that retain water after excavation. In most cases, the collected water is heavily silted and hinders correct and safe construction practices. The collected water must be removed from the ponded area, either through gravity or pumping, and must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved.

After Construction

1. **Inspection:** After construction, it is the responsibility of the owner or assigned heirs to comply with the inspection, maintenance, and housekeeping procedures outlined in this section. All measures must be maintained in effective operating condition. A person with knowledge of erosion and stormwater control, including the standards and conditions in all applicable permits, shall conduct the inspections.

2. **Specific Inspection, Maintenance, and Housekeeping Tasks:** The following is a list of permanent erosion control and stormwater management measures and the inspection, maintenance, and housekeeping tasks to be performed after construction.

A. Vegetated Areas:

- Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems.
- Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

B. Culverts:

- Inspect culverts in the spring, in the late fall, and after heavy rains to remove any obstructions to flow.
- Remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit.
- Inspect and repair any erosion damage at the culvert's inlet and outlet.

C. Catch Basins:

- Inspect and, if required, clean-out catch basins at least once a year, preferably in early spring.
- Clean out must include the removal and legal disposal of accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes between basins.

D. Winter Sanding:

- Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring.
- Accumulations on pavement may be removed by pavement sweeping.
- Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader or other acceptable method.

E. Bioretention Basin:

- During the first year, the basin will be inspected semi-annually and following major storm events. Debris and sediment buildup shall be removed from the forebay and basin as needed. Mowing of a grassed basin can occur semiannually to a height no less than 6 inches. Any bare area or erosion rills shall be repaired with new filter media or sandy loam then seeded and mulched. Maintaining good grass cover will minimize clogging with fine sediments and if ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity.

- Soil Filter Inspection: The soil filter should be inspected after every major storm in the first year to be sure it is functioning properly. Thereafter, the filter should be inspected at least once every six months to ensure that it is draining within 48 hours following a 1-inch storm or greaterand following storms that fill the system to overflow, it drains in no less than 36 to 6o hours. If the system drains too fast, an orifice may need to be added on the underdrain outlet or, if already present, may need to be modified.
- Soil Filter Replacement: The top several inches of the filter shall be replaced with fresh material when water ponds on the surface of the bed for more than 72 hours. The removed sediments should be disposed of in an acceptable manner.
- Sediment Removal: Sediment and plant debris should be removed from the pretreatment structure at least annually.
- Mowing: If mowing is desired, only handheld string trimmers or push-mowers are allowed on the filter (no tractor) and the grass bed should be mowed no more than 2 times per growing season to maintain grass heights of no less than 6 inches.
- Fertilization: Fertilization of the underdrained filter area should be avoided unless absolutely necessary to establish vegetation.
- Harvesting and Weeding: Harvesting and pruning of excessive growth will need to be done occasionally. Weeding to control unwanted or invasive plants may also be necessary. Add new mulch only as necessary for bioretention cell.

F. Filterra Bioretention System:

- Routine clearing of accumulated trash and debris is required to prevent clogging of the inlet opening (just as with any catch basin, inlet or other in-curb unit). Americast includes a one-year maintenance plan with each Filterra® system to ensure the systems are operating per specifications.
- Long-term maintenance to be performed on at least a semiannual basis (generally spring and fall servicing) to help preserve Filterra® flow-through rates and treatment performance also found in the Filterra® IOM. Each maintenance session should include, at a minimum, the following:
  - Inspection of the system structure and media;
  - Removal of trash and silt from the filter surface;
  - Replacement of the surface mulch layer. Complete replacement of the soil media is generally required only as part of a spill clean-up;
  - Pruning of vegetation. If the vegetation is in dead or in poor health, it will require replacement; and
  - Appropriate disposal of all refused items.

3. **Documentation:** A log summarizing the inspections and any corrective action taken must be maintained. The log must include the name(s) and qualifications of the person making the inspections, the date(s) of the inspections, and major observations about the operation and maintenance of controls. Major observations must include BMPs that need

maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and locations where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken. The log must be made accessible to the appropriate regulatory agency upon request. A sample "Stormwater Inspection and Maintenance Form" has been included as Attachment 1 of this Inspection, Maintenance, and Housekeeping Plan.

4. **City of Portland Certification:** Any person owning, operating, or otherwise having control over a BMP required by a Post-Construction Stormwater Management Plan shall maintain the BMPs in accordance with the approved plan and shall demonstrate compliance with the plan.

   A. The owner or operator of a BMP shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMPs, including but not limited to any parking areas, catch basins, drainage swales, detention basins and ponds, pipes and related structures, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved Post-Construction Stormwater Management Plan.

   B. If the BMP requires maintenance, repair or replacement to function as intended by the approved Post-Construction Stormwater Management Plan, the owner or operator of the BMP shall take corrective action(s) to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall provide a record of the deficiency and corrective action(s) to the department of public services ("DPS") in the annual report.

   C. The owner or operator of a BMP or a qualified post-construction stormwater inspector hired by that person, shall, on or by June 30 of each year, provide a completed and signed certification to DPS in a form provided by DPS, certifying that the person has inspected the BMP(s) and that they are adequately maintained and functioning as intended by the approved Post-Construction Stormwater Management Plan, or that they require maintenance or repair, including the record of the deficiency and corrective action(s) taken.

   D. Any persons required to file and annual certification under this section shall include with the annual certification a filing fee established by DPS to pay the administrative and technical costs of review of the annual certification.

   E. In order to determine compliance with this article and with the Post-Construction Stormwater Management Plan, DPS may enter upon property at reasonable hours with the consent of the owner, occupant or agent to inspect the BMPs.

Attachments

Attachment 1 – Sample Stormwater Inspection and Maintenance Log

ATTACHMENT 1

STORMWATER INSPECTION AND MAINTENANCE LOG

Chau Property Development
1884 Forest Avenue
Portland, Maine

This log is intended to accompany the stormwater Inspection, Maintenance and Housekeeping Plan for the Chau Property Development, 1884 Forest Avenue in Portland, Maine. The following items shall be checked, cleaned and maintained on a regular basis as specified in the Maintenance Plan and as described in the table below. This log shall be kept on file for a minimum of five (5) years and shall be available for review by the municipality. Qualified personnel familiar with drainage systems and soils shall perform all inspections. Attached is a copy of the construction and post-construction maintenance logs.

Item	Maintenance Required & Frequency	Date Completed	Maintenance Personnel	Comments
Vegetated Areas	Inspect Slopes			
	Replant Bare Areas			
	Check after Major Storms			
Culverts	Inspect culverts monthly or after rainfall of >1"			
	Clean culverts when sediment occupies more than 20% of pipe diameter			
	Repair any erosion at inlet and outlet pipes			
	Replace displaced riprap at least once a year			
	Remove vegetation growing through riprap at least once a year			
Catch Basins	Inspect and cleanout basins at least annually, (Spring)			
Winter Sanding	Clean annually (Spring)			
	Remove sand and sediment from roadway shoulders			
Bioretention Filtration Pond	Remove or prune unwanted vegetation as necessary.			
	Inspect embankment for erosion settling and structural failure			
	Inspect filter every 6 months to ensure drain times between 24-48 hours.			
	Replace top several inches of the filter if drain time is more than 72 hours.			

Item	Maintenance Required & Frequency	Date Completed	Maintenance Personnel	Comments
	Inspect inlet and outlet control structure for blockage.			
	Mow filter bed vegetation no more than twice a year to a height no less than 6 inches.			
Filterra Bioretention System	Routine clearing of accumulated trash and debris is required to prevent clogging of the inlet opening/			
	Inspection of the system structure and media.			
	Removal of trash and silt from the filter surface.			
	Replacement of the surface mulch layer. Complete replacement of the soil media is generally required only as part of a spill clean-up.			
	Pruning of vegetation. If the vegetation is in dead or in poor health, it will require replacement.			
	Appropriate disposal of all refused items.			