EXHIBIT 13

STORMWATER MANAGEMENT REPORT
&
OPERATION AND MAINTENANCE MANUAL

STORMWATER MANAGEMENT REPORT

midtown
PORTLAND, MAINE

PREPARED FOR:

THE FEDERATED COMPANIES
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(Draft 11/14/14 subject to ongoing
FST review and City of Portland comments)

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ATTACHMENTS

1.0 INTRODUCTION

Fay, Spofford, and Thorndike has been retained by The Federated Companies to prepare civil designs and assist with the preparation of technical studies and site permit applications for the proposed midtown project which will be located along Somerset Street in Portland, Maine. The project area is approximately 3.45 acres in size and will be highly developed with parking garages and buildings. Offsite areas contribute to the watersheds which are affected by this project resulting in a total area of 4.44 acres which is examined as part of this plan.

This report presents the stormwater management for the project including prescriptive post development stormwater requirements. This report is intended to summarize the project design's compliance with the storm water requirements for the project.

The project is being designed to comply with MeDEP Chapter 500 standards and Chapter 5 of the City of Portland's Technical Standards, which mirror MeDEP Chapter 500 standards. This project will develop greater than 3 acres of impervious area thus a Site Location of Development Law permit will be required, and MeDEP Chapter 500 water quality standards are required to be met. These permit requirements will be reviewed by the City of Portland under their delegated authority from the MeDEP. A waiver is being requested from the City of Portland and MeDEP flooding standards due to the projects discharge location to back cove and the capacity of the city storm drain systems being discharged to.

FST believes that the information presented herein describes a design that fully complies with the City of Portland and MeDEP chapter 500 stormwater standards.

2.0 REFERENCES

The following reference sources were reviewed during preparation of the storm water analysis:

1. Technical Release Number 20 – Computer Program for Project Formulation – Hydrology, USDA Soil Conservation Service, May 1983.

2. Section 4 – Hydrology, USDA Soil Conservation Service, March 1985.

3. Technical Release Number 55 – Urban Hydrology for Small Watersheds, USDA Soil Conservation Service, June 1986.

4. Hydro CAD Technical Reference Manual, Applied Micro-Computer System, 2001.

5. Urban Hydrology for Small Watersheds from the USDA SCS; Technical Release 55, dated 1986

6. USDA SCS Medium Intensity Soils Map for Cumberland County (Map 82).

7. Chapter 5, City of Portland Technical Manual, May 11, 2010

8. Chapter 32, City of Portland Technical Manual, May 11, 2010

9. Chapter 500 Stormwater Management 38 M.R.S.A. § 420-D, Amended December 27, 2011

Computer programs used to assist in the various components of this analysis include:

1. HydroCAD Stormwater Modeling System, version 7.1, Applied Microcomputer Systems – used for modeling watersheds for pre and postdevelopment conditions;

2. Microsoft Excel, Microsoft Corporation – used for spreadsheet computations.

Resources used to obtain the hydrologic input data for the stormwater models were:

- Existing Conditions Survey prepared by SGC and Owen Haskell, Inc.
- City of Portland Department Public Works Contract Drawings (Sewer Separation Franklin Arterial, Marginal Way, Bayside Trail and Somerset Street)
- Field Reconnaissance

3.0 OVERVIEW OF STORMWATER RUNOFF MODELING

The stormwater analysis evaluates the following:

1. Predevelopment stormwater runoff and peak discharge rates for the watersheds.

2. Postdevelopment stormwater runoff and peak discharge rates at areas of hydrologic interest (aka POI's).

3. The effect of land cover modifications including increased impervious coverage and changes to the boundary of catchment areas.

4.0 METHODS OF ANALYSIS – STORMWATER QUANTITY

The hydrologic analyses for predevelopment and postdevelopment conditions have been conducted based upon the methodology contained in the USDA Soil Conservation Service's Technical Releases No. 20 and 55 (SCS TR-20 and TR-55) as modified for special site conditions. For this area of Cumberland County, a 24-hour SCS Type III storm distribution was used for the analysis based upon the NRCS Rainfall Distribution Map. The rainfall amounts for various storm events are as follows:

TABLE 1

Storm Event	24-Hour Rainfall
2-Year Storm	3.0
10-Year Storm	4.7
25-Year Storm	5.5

The HydroCAD computer program was used in the analysis. This program determines the critical points of the project watershed and uses SCS TR-20 methodology for evaluation of the anticipated conditions at these points. Drainage areas are defined with runoff curve numbers, times of concentration, and travel time data based on methods outlined in the USDA TR-55 Manual. To assess storage and kinematic effects of runoff, the model uses reservoirs and pipes to imitate actual conditions. Specific hydrologic characteristics including travel times, storage capacity, and the effects of hydraulic head are considered for analysis with this program.

To model any watershed, the drainage system is represented by a system network consisting of four basic components:

- **Subcatchment:** A relatively homogenous area of land that drains into a single reach or pond. Each subcatchment generates a runoff hydrograph.

- **Reach:** A uniform stream, channel, or pipe which conveys water from one point to another reach or pond. The outflow of each reach is determined by a hydrograph routing calculation.

- **Pond:** A pond, swamp, dam, or other impoundment which fills with water from one or more sources and empties in a manner determined by a weir, culvert or other device(s) at its outlet. A pond may empty into a reach or into another pond. The outflow of each pond is also determined by a hydrograph routing calculation.

To calculate the outflow for each structure, HydroCAD automatically performs these steps:

1. If there is more than one inflow, the inflows are summed together to produce a single hydrograph. If a pipe is being re-sized, its diameter will be calculated to handle the peak inflow.

2. The inflow is routed through the structure using the description and method previously specified. For subcatchments, the specified storm type and rainfall are used.

3. For a reach, the peak depth, peak velocity, contact time, etc. is calculated.

4. For a pond, the peak elevation, peak storage, etc. are calculated.

5. Any warning messages are displayed.

6. For the inflow and outflow, the peak flow and time of peak are calculated by interpolating between the three highest points.

7. The total volumes of inflow and outflow are calculated.

8. The results are stored in a database for subsequent calculations or to be examined at any time.

The process is automatically repeated for each structure until the design point is reached. HydroCAD is a hydrograph routing model. It is designed specifically to handle time varying flows, as required for pond design and other volume-sensitive calculations. As such, HydroCAD routes completely through one structure at a time. Only after determining the outflow hydrograph from a given structure does it consider the next structure downstream.

5.0 EXISTING STORM DRAIN, INLET, AND CONVEYANCE CONDITIONS

This portion of the study reviews current conditions and attempts to review 1975 predevelopment conditions.

There is a difference between the predevelopment (1975 conditions) and the current conditions plan since the area has been extensively disturbed since 1975. The following assumptions have been made to attempt to generate the predevelopment condition:

- The soils are Hydrologic Group "C" soils based upon the USDA Cumberland County Medium Intensity Soils Map (Map #82) which shows the area as Au Gres soils and Appendix B of TR55 which lists the hydrologic soil group for various soils.

- All areas within the project and its vicinity are assumed to have been "industrial areas". TR55 assigns a land use curve number of 91 to industrial districts with 28 percent pervious areas. Fay, Spofford and Thorndike believes that a CN of 91 is a conservative characterization of the predevelopment conditions. A CN of 91 is likely to be low because it is based upon pervious area of 28 percent. Therefore, since it is likely the pervious area less than 28 percent the CN value was likely higher than 91.

- The site is assumed to have had drainage patterns similar to what exist today.

- This assumption does not become significant based upon the low hydrologic times of concentration.

- It is assumed that stormwater drained from the areas studied in the pre 1975 condition instead of ponding in surface depressions as it does in current conditions.

The storm drainage includes a system that serves the easterly end of the project area which was constructed around 2003 as part of a sewer separation project. This drainage system ultimately discharges to Back Cove on the northerly side of I-295 near the Franklin Arterial Interchange. This new system starts at a manhole at the intersection of Marginal Way and Franklin Arterial with the existing 72 inch diameter storm drain downstream of the tide gate and combined sewer overflow structure for the Franklin Street Pumping Station. The 72 inch storm drain has an invert of about -4.43 at this location. The new system included approximately 556 feet of 30 to 42 inch storm drain between Marginal Way and Somerset Street with inverts ranging from approximately -1.5 to 2.1 The drain continues in a westerly direction along Somerset Street and is approximately 1013 feet in length with 18 to 30 inch storm drains along Somerset Street to the end of the drainage system. This catchment area limit is located about 40 feet westerly of the intersection of Somerset and Chestnut Street. A branch line feeding the "A" system was constructed along the pedestrian trail which runs along the northerly side of this project. This branch includes piping up to 18 inches in diameter and drains portions of the rear of the subject parcel and along the trail behind the project site.

The second drainage system serves the westerly portion of the project site. Drainage from Somerset Street flows to Elm Street and then continues northerly to Preble Street to a 60 inch diameter line that crosses under Interstate 295 and discharges to Back Cove.

Finally, there is a small catchment that enters the Chestnut Street system identified as System "C".

The new storm drains installed around 2003 included stubs for service to the midtown project area. The approximate locations of the storm drain stubs are as follows:

- 200 feet westerly of Chestnut Street (10" diameter)
- 210 feet easterly of Chestnut Street (15" diameter)
- Opposite of Pearl Street (15 inch diameter)
- 250 feet west of Franklin Arterial (15 inch diameter)

A schematic of the storm drain system and a predevelopment watershed map are provided as Figure S-2 and Drawing C-14.0.

Currently, the site is stable except for some limited rill erosion on the driveway apron of Catchment B-1.

6.0 STORMWATER MODEL RESULTS

Predevelopment Flows:

Three small catchments within or near the midtown project are tributary to the "A" System, three areas are tributary to the "B" System, and one area is tributary to the "C" system in Chestnut Street. The catchment areas and the hydraulic flow paths for these areas are depicted on Drawing C-14.0, the current conditions watershed plan. Under current conditions, two of these areas are tributary to the drainage system along Somerset Street and one is tributary to the branch of the storm drain network that runs behind the site along the trail.

Predevelopment conditions were run using HydroCAD. The convolution of the flows from Area A, Area B, and Area C were also modeled. The piping system in the model is based upon the size, length, and inverts of the existing storm lines shown on the City's 2003 sewer separation plans.

The "B" System which serves the westerly end of the project was also modeled to a point where the subcatchments converge. This is located at the intersection of Elm and Somerset Street. The segments of this drainage system downstream of the project area were originally designed as an 84 inch corrugated aluminum metal pipe and were installed when I-295 was constructed. A combination of ash and salt was very corrosive to this pipe. The line was determined to be severely corroded and was sliplined in 2004 using a smooth wall plastic pipe.

The projected flows for the small tributary area to Chestnut Street designated as Catchment C were also modeled at the inlet catch basin as shown on the pre-development watershed map C-14.0.

The predevelopment flows for this area are summarized in the table below for the 2, 10, and 25, year storm events:

TABLE 2
midtown
PREDEVELOPMENT (1975) RUNOFF AND PEAK DISCHARGE

Catchment	**2 Year (3.00" Rainfall)**			**10 Year (4.70" Rainfall)**			**25 Year (5.50" Rainfall)**		
	Area (ac.)	**Runoff Depth**	**Peak Flow (cfs)**	**Area (ac.)**	**Runoff Depth**	**Peak Flow (cfs)**	**Area (ac.)**	**Runoff Depth**	**Peak Flow (cfs)**
A-1	1.30	2.07"	2.99	1.30	3.69"	5.20	1.30	4.47"	6.23
A-2	0.56	2.07"	1.34	0.56	3.69"	2.33	0.56	4.47"	2.79
A-3	0.24	2.07"	0.57	0.24	3.69"	1.00	0.24	4.47"	1.19
B-1	1.37	2.07"	3.28	1.37	3.69"	5.69	1.37	4.47"	6.82
B-2	0.16	2.07"	0.38	0.16	3.69"	0.66	0.16	4.47"	0.80
B-3	0.43	2.07"	1.03	0.43	3.69"	1.79	0.43	4.47"	2.14
C-1	0.38	2.07"	0.91	0.38	3.69"	1.58	0.38	4.47"	1.89
Total	**4.44**	**2.07"**	**10.50**	**4.44**	**3.69"**	**18.25**	**4.44**	4.47"	**21.86**

The range of flows per acre under predevelopment conditions for the various catchment areas is as follows:

TABLE 3 RANGE OF UNIT DISCHARGES FOR PREDEVELOPMENT CONDITIONS			
Storm Event	**Low Range (cfs/acre)**	**High Range (cfs/acre)**	**Ratio High: Low**
2 year	2.30	2.40	1.043
10 year	4.00	4.17	1.043
25 year	4.79	5.00	1.044

The reason the range of flows per acre is not significant and in the order of a 4 percent difference is because the hydrologic travel times only varied between from 6 and 7.1 minutes.

The runoff depths for current conditions are 2.07, 3.69, and 4.47 inches for the 2, 10, and 25 year storms respectively. This compares with rainfall of 3.0, 4.7, and 5.5 inches for the respective storms.

The actual travel time in the pipelines may be slightly different because flows from other portions of the City are tributary to the pipelines and are not included in the model. Consequently, the velocity computed during flood routing by the model is slightly different and probably slower than if the other drainage was included in the model. However, even with the reduced velocity there is little attenuation that results from travel time and routing through the storm drains. This is demonstrated by comparing the sum of the peak flows from each catchment to the convoluted flows for the overall catchment as shown below:

TABLE 4 PREDEVELOPMENT FLOW COMPARISON		
Catchment	**2 Year Peak Flow (cfs)**	**25 year Peak Flow (cfs)**
A-1	2.99	6.23
A-2	1.34	2.79
A-3	<u>0.57</u>	<u>1.19</u>
Sum A1 to A3	**4.90**	**10.21**
Convoluted Flow for Watershed A	4.89	10.17
B-1	3.28	6.82
B-2	0.38	0.80
B-3	<u>1.03</u>	<u>2.14</u>
Sum B1-B3	**4.69**	**9.76**
Convoluted Flow for Watershed B	4.69	9.75
C-1	0.91	1.89

Predevelopment computations can be found in Attachment A.

<u>Postdevelopment Flows:</u>

The Federated site will be redeveloped with mostly rooftop and parking garage deck hard surfaces. The following assumptions have been made:

- The site can be characterized by an RCN of 96. This would permit 95 percent of the 3.45± acre site to be covered with impervious materials and 5 percent (about 0.17) to be covered as lawn.

- The time of concentration will be the minimum permitted by the HydroCAD model (i.e. 6 minutes).
- Discharge locations will use the stubs installed for the property when the City of Portland's 2003 sewer separation project was constructed to the extent possible.
- Detention (if required) will be provided above the storage elevations of the water quality volume.

Since the time of concentration is being set at the minimum, the hydraulic points of connection to the system have the same per acre discharges for different areas are shown in the table below:

TABLE 5 ILLUSTRATION OF PEAK DISCHARGE PER ACRE WHEN CN IS 96 AND HYDROLOGIC TIME OF CONCENTERATION IS 6 MINUTES				
Watershed Size (arbitrary)	**Peak Discharge 2 Year (cfs)**	**Peak Discharge Per Acre**	**Peak Discharge 25 year (cfs)**	**Peak Discharge Per Acre**
¼ acres	0.68	2.73	1.33	5.30
1 acre	2.73	2.73	5.30	5.30
4 acres	10.92	2.73	21.2	5.30

Therefore, the analysis can be conducted with the postdevelopment flows computed on the following basis without requiring formal modeling:

TABLE 6 POSTDEVELOPMENT RUNOFF AND PEAK DISCHARGE VALUES		
Storm Event	**Discharge Per Acre (cfs)**	**Runoff Volume (in.)**
2	2.73	2.41
10	4.50	4.23
25	5.30	5.03

Peak flows for post development flows compared with predevelopment flows for the same catchment areas would be as follows:

TABLE 7 COMPARISON OF PRE AND POSTDEVELOPMENT RUNOFF AND PEAK FLOWS												
Catchment Area	**2 Year 3.00" Rainfall**				**10 Year 4.70" Rainfall**				**25 Year Rainfall 5.50"**			
	Runoff		**Peak Discharge**		**Runoff**		**Peak Discharge**		**Runoff**		**Peak Discharge**	
	Pre (in.)	**Post (in.)**	**Pre (cfs)**	**Post (cfs)**	**Pre (in.)**	**Post (in.)**	**Pre (cfs)**	**Post (cfs)**	**Pre (in.)**	**Post (in.)**	**Pre (cfs)**	**Post (cfs)**
A-1	2.07	2.41	2.99	3.55	3.69	4.23	5.20	5.85	4.47	5.03	6.23	6.89
A-2	2.07	2.41	1.34	0.15	3.69	4.23	2.33	2.52	4.47	5.03	2.79	2.97
A-3	2.07	2.41	0.57	0.66	3.69	4.23	1.00	1.08	4.47	5.03	1.19	1.27
B-1	2.07	2.41	3.28	3.74	3.69	4.23	5.69	6.17	4.47	5.03	6.82	7.26
B-2	2.07	2.41	0.38	0.44	3.69	4.23	0.66	0.72	4.47	5.03	0.80	0.85
B-3	2.07	2.41	1.03	1.17	3.69	4.23	1.79	1.94	4.47	5.03	2.14	2.28

TABLE 7 COMPARISON OF PRE AND POSTDEVELOPMENT RUNOFF AND PEAK FLOWS												
Catchment Area	2 Year 3.00" Rainfall				10 Year 4.70" Rainfall				25 Year Rainfall 5.50"			
	Runoff		Peak Discharge		Runoff		Peak Discharge		Runoff		Peak Discharge	
	Pre (in.)	Post (in.)	Pre (cfs)	Post (cfs)	Pre (in.)	Post (in.)	Pre (cfs)	Post (cfs)	Pre (in.)	Post (in.)	Pre (cfs)	Post (cfs)
C-1	2.07	2.41	0.91	1.04	3.69	4.23	1.58	1.71	4.47	5.03	1.89	2.01

As demonstrated previously, the routing through the storm drain system does not attenuate the peak discharge flows by any significant amount.

7.0 DETENTION REQUIREMENTS

The changes in peak flows for the overall 4.44 acre watershed analyzed would be approximately 1.71 cubic feet per second for the 25 year storm event. The storm drains along Somerset and Franklin Arterial and their full flow capacity are summarized in the table below:

TABLE 8 STORM DRAIN LINES ON SOMERSET STREET FULL FLOW CAPACITY					
Location	Pipe Dia. (in.)	Lowest Slope	Highest Slope	Lowest Capacity (cfs)	Highest Capacity (cfs)
Somerset Street	12	0.005	0.005	2.65	2.73
	18	0.003	0.003	6.23	6.23
	24	0.003	0.003	13.42	13.42
Franklin & Somerset Street	30	0.003	0.004	24.30	28.10
Franklin Street	36	0.004	0.005	45.70	51.10
	42	0.005	0.005	77.10	77.10
10" Stub*		0.005		1.67	
15" Stub*		0.005		4.94	

*Stubs were installed to project property lines as part of the 2003 sewer separation project.

The location of the project relative to the overall Marginal Way watershed which starts at Congress Street and discharges to Back Cove is near the bottom of the watershed. Consequently, it is better to discharge flows from the base of the watershed as quickly as possible to provide additional capacity in the storm drain system for upstream flows which arrive later during the storm event.

The project conveys stormwater exclusively in a piped system directly into the ocean which is why the applicant is requesting the waiver of Chapter 5, Section E.2 Flooding Standards of the Technical Manual. It should be noted that the planning board granted a waiver for this standard on the previously approved Master Development Plan Approval dated January 28th, 2014. As shown in this report, FST believes that the amendments to the site plan have had a minimal impact on the overall storm water management for this project and the same reasons as to why the waiver was granted on the original site plan are still valid.

8.0 STORMWATER QUALITY TREATMENT

Since this project requires a Site Location Development Law permit, it is required to meet MeDEP Chapter 500 Standards for water quality. The project must treat 80% of developed area and 95% of re-developed impervious area. For the water quality purposes all of the area on the project site was assumed to be impervious, thus treatment of 95% of project developed area is required.

Approach:

- **Wet Ponds –** Wet ponds are common stormwater treatment devices that retain the water quality volume of storms and also provide detention to control peak flows. A wet pond was ultimately determined unfeasible due to size constraints on the site and for tidal effects that would need to be analyzed.
- **Buffers –** Buffers were not considered as part of the site's stormwater management due to insufficient space. As an example, a minimum forested or meadow buffer width needs to be 75 ft., 100 ft. or 150 ft. with a slope of 0% - 8%, none of which is attainable on the site. Additionally, buffers are required to be encumbered by a conservation easement and deed restrictions.
- **Infiltration** – Our office has reviewed the Geotechnical Report for the site and the USDA medium intensity soil survey. The medium intensity soil survey maps the site as predominantly Au Gres soils. These soils (hydrologic soil group C) are commonly found to be somewhat excessively drained to poorly drained. Infiltration requires well-draining soils, which are not found on this site.
- **Filter** – Filters cover a broad range of techniques including pre-approved proprietary stormwater treatment devices. The preliminary stormwater management strategy presented herein focuses on proprietary filter systems to meet the General Standard requirements.

Implementation:

Our office has laid out a plan which utilizes proprietary water quality treatment filters as described in Chapter 7.0 Filtration BMPs of the MeDEP Volume III BMPs Technical Design Manual to meet the minimum treatment standards as required by the General Standards.

There are 3 different types of filter treatment units that have been utilized in the design.

- **Tree-Box Filterra Units and "Box-less" Filterra Units**

  Tree-Box Filterra units are utilized to treat micro subcatchments. For this project, the Filterras are designed to treat existing roadway flow on Somerset Street, Pearl Street and Chestnut Street. Roof runoff from midtownThree will be treated by depressed Filterras on Somerset Street which allows for water to be piped underground directly into the units. Filterras are sized based on total tributary area according to MeDEP volume III BMP's section 7.5. The following table breaks down the sizing criteria for Filterra units.

TABLE 9 FILTERRA SIZING REQUIREMENTS	
Filterra Size	**Maximum Tributary Area Allowed (Acres)**
4’x6’ or 6’x4’	0.32
4’x8’ or 8’x’4	0.42
6’x’6	0.47
6’x8’ or 8’x’6	0.64
6’x10’ or 10’x’6	0.79
6’x’12’ or 12’x6’	0.95
13’x’7 or 7’x13’	1.20

See water quality computations in Attachment B for sizing of project Tree Box Filterra and boxless Filterra units.

According to the design criteria, Filterra units must be located upstream of an isolator row and designed to treat flow from the Filterra and the bypass overflow. Isolator rows are sized based upon StormTech chambers. For a SC-740 StormTech Chamber the amount of chambers required is equal to: 1-Year flow computed for tributary area (cfs)/0.2.

For example: If the 1-year flow tributary to a Filterra system was = 1.07 CFS, the amount of isolator row chambers required would be: 1.07/0.20 = 5.35 Chambers.

For this project Brentwood Tanks have been used in place of StormTech Chambers. The amount of Brentwood Tanks required has been computed by taking the amount of volume computed for the StormTech chambers and converted to accommodate the different chamber configuration. It should be noted that the isolator row is still providing the same treatment volume using a different storage model.

Full isolator row sizing can be found on the Water Quality Computations in Attachment B.

- **<u>Storm Treats- (Subcatchment D)</u>**

Storm Treats have been designed to treat runoff from midtown Four and the area surrounding the building. The total drainage area tributary to the storm treats is approximately 19,671 sf, all of which is considered impervious.

To meet Chapter 500, the water quality provided must be equal to or greater than the following:

1”/12 x impervious area (19,761 ac) plus 0.4”/12 x landscaped area (0 ac) = Water Quality Volume (1,647 cubic feet)

Computations of the water quality volume are appended in Attachment B.

1,650 cubic feet of storage is provided in a sub-surface storage system which exceeds the required 1,647 CF water quality volume. The sub-surface storage requirements can be found in the Water Quality Calculations found in Attachment B.

Based on the revisions made to Chapter 7 of the MeDEP Best Stormwater Practices in October 2010 the StormTreat™ treatment units shall be sized to treat the entire water quality volume in 24 to 72 hours at a discharge rate of approximately 2 gpm per tank. The system must have at least one StormTreat™ tank per 1,155 cubic feet of water quality volume. Based on the required volume per tank 1,647/1155= 1.48 tanks are required for this project. Two tanks will be used.

The discharge must pass through the StormTreat™ tanks at a rate less than 2.0 gallons per minute per tank. The discharge from the 2 tanks are piped to a common 4" header and controlled with an orifice plate sized to meet the cumulative 4 gpm flow rate. The orifice drawdown computations are appended in Attachment B.

Discharge from larger storm events overflow over a broad crested weir housed in a precast concrete outlet control structure set at elevation 6.90 (i.e. the basin stage when water quality volume has been reached). The overflow piping network is sized to handle runoff from a 25-year storm event. A rain event exceeding the storm drainage network capacity would flood the channel protection basin and detention basin and discharge over the reinforced turf overflow spillway at the northeast corner of the basin.

Pretreatment for flow entering from all inlet pipes to the storage area will be provided by a Vortex pre-treatment system.

Therefore, water quality goals for the StormTreat™ Proprietary System meet the General Stormwater Standards of the November 2005 Chapter 500 Rules of MeDEP (rev. October 2010).

9.0 CHAPTER 500 TREATMENT PERCENT COMPLIANCE

The proposed redevelopment project creates 3.45 acres of redeveloped impervious area that is required to be treated under state of Maine Site Location of Development Law. All of the area on this site is considered to be impervious area, hence 95% of all developed area on this project must be treated.

Of the 3.45 acres of developed area the proposed Stormwater Management Plan provides treatment for 3.50 acres or 101.44 percent. The stormwater strategy also treats off-site area that is tributary to the designed treatment systems, which explains why the treatment area is greater than the total developed area. Hence, the strategies proposed herein meet the minimum requirements stated in the General Standards.

10.0 EROSION CONTROL

An Erosion Control Narrative, Plan, and Details have been prepared for the project and accompanies this submission in Exhibit 14.

11.0 OPERATIONS AND MAINTENANCE

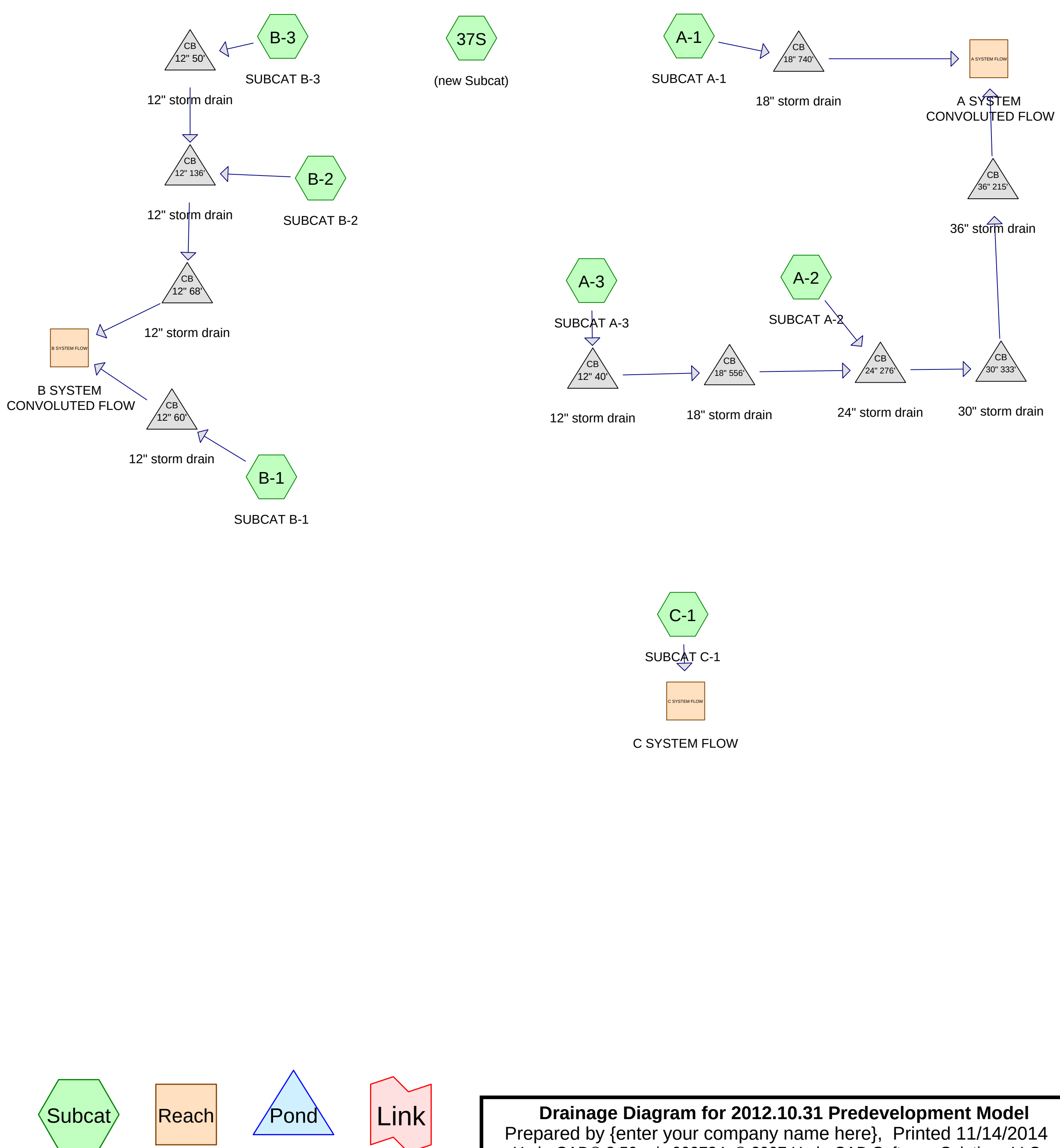
An Operations & Maintenance Manual has been prepared and accompanies this application in Attachment C.

12.0 ATTACHMENTS

Attachment A – Predevelopment Computations
Attachment B – Water Quality Computations
Attachment C – Orifice Drawdown Computations
Attachment D – Operations & Maintenance Manual

ATTACHMENT A

PREDEVELOPMENT COMPUTATIONS



Drainage Diagram for 2012.10.31 Predevelopment Model
Prepared by {enter your company name here}, Printed 11/14/2014
HydroCAD® 8.50 s/n 000734 © 2007 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.440	91	(A-1,A-2,A-3,B-1,B-2,B-3,C-1)
4.440	96	(37S)
8.880		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
8.880	Other	37S, A-1, A-2, A-3, B-1, B-2, B-3, C-1
8.880		**TOTAL AREA**

Time span=1.00-72.00 hrs, dt=0.02 hrs, 3551 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 37S: (new Subcat) Runoff Area=4.440 ac 0.00% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=96 Runoff=12.40 cfs 0.944 af

Subcatchment A-1: SUBCAT A-1 Runoff Area=1.300 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=416' Tc=7.1 min CN=91 Runoff=2.99 cfs 0.224 af

Subcatchment A-2: SUBCAT A-2 Runoff Area=0.560 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=180' Tc=6.0 min CN=91 Runoff=1.34 cfs 0.097 af

Subcatchment A-3: SUBCAT A-3 Runoff Area=0.240 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=166' Tc=6.0 min CN=91 Runoff=0.57 cfs 0.041 af

Subcatchment B-1: SUBCAT B-1 Runoff Area=1.370 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=329' Tc=6.0 min CN=91 Runoff=3.28 cfs 0.236 af

Subcatchment B-2: SUBCAT B-2 Runoff Area=0.160 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=86' Slope=0.0273 '/' Tc=6.0 min CN=91 Runoff=0.38 cfs 0.028 af

Subcatchment B-3: SUBCAT B-3 Runoff Area=0.430 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=121' Slope=0.0124 '/' Tc=6.0 min CN=91 Runoff=1.03 cfs 0.074 af

Subcatchment C-1: SUBCAT C-1 Runoff Area=0.380 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=203' Tc=6.0 min CN=91 Runoff=0.91 cfs 0.066 af

Reach A SYSTEM FLOW: A SYSTEM CONVOLUTED FLOW Inflow=4.89 cfs 0.362 af
Outflow=4.89 cfs 0.362 af

Reach B SYSTEM FLOW: B SYSTEM CONVOLUTED FLOW Inflow=4.69 cfs 0.338 af
Outflow=4.69 cfs 0.338 af

Reach C SYSTEM FLOW: C SYSTEM FLOW Inflow=0.91 cfs 0.066 af
Outflow=0.91 cfs 0.066 af

Pond 12" 136': 12" storm drain Peak Elev=5.08' Inflow=1.41 cfs 0.102 af
12.0" x 136.0' Culvert Outflow=1.41 cfs 0.102 af

Pond 12" 40': 12" storm drain Peak Elev=5.96' Inflow=0.57 cfs 0.041 af
12.0" x 40.0' Culvert Outflow=0.57 cfs 0.041 af

Pond 12" 50': 12" storm drain Peak Elev=6.85' Inflow=1.03 cfs 0.074 af
12.0" x 50.0' Culvert Outflow=1.03 cfs 0.074 af

Pond 12" 60': 12" storm drain Peak Elev=4.81' Inflow=3.28 cfs 0.236 af
12.0" x 60.0' Culvert Outflow=3.28 cfs 0.236 af

Pond 12" 68': 12" storm drain Peak Elev=4.31' Inflow=1.41 cfs 0.102 af
12.0" x 68.0' Culvert Outflow=1.41 cfs 0.102 af

Pond 18" 556': 18" storm drain Peak Elev=5.28' Inflow=0.57 cfs 0.041 af
18.0" x 556.0' Culvert Outflow=0.57 cfs 0.041 af

Pond 18" 740': 18" storm drain Peak Elev=5.46' Inflow=2.99 cfs 0.224 af
18.0" x 740.0' Culvert Outflow=2.99 cfs 0.224 af

Pond 24" 276': 24" storm drain Peak Elev=3.88' Inflow=1.91 cfs 0.138 af
24.0" x 276.0' Culvert Outflow=1.91 cfs 0.138 af

Pond 30" 333': 30" storm drain Peak Elev=2.80' Inflow=1.91 cfs 0.138 af
30.0" x 333.0' Culvert Outflow=1.91 cfs 0.138 af

Pond 36" 215': 36" storm drain Peak Elev=1.40' Inflow=1.91 cfs 0.138 af
36.0" x 215.0' Culvert Outflow=1.91 cfs 0.138 af

Total Runoff Area = 8.880 ac Runoff Volume = 1.711 af Average Runoff Depth = 2.31"
100.00% Pervious = 8.880 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 37S: (new Subcat)

Runoff = 12.40 cfs @ 12.08 hrs, Volume= 0.944 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2yr Rainfall=3.00"

	Area (ac)	CN	Description
*	4.440	96	
	4.440		Pervious Area

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

Summary for Subcatchment A-1: SUBCAT A-1

Runoff = 2.99 cfs @ 12.10 hrs, Volume= 0.224 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2yr Rainfall=3.00"

	Area (ac)	CN	Description
*	1.300	91	
	1.300		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	105	0.0152	1.21		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.9	86	0.0023	0.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.7	225	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.1	416	Total			

Summary for Subcatchment A-2: SUBCAT A-2

Runoff = 1.34 cfs @ 12.09 hrs, Volume= 0.097 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2yr Rainfall=3.00"

	Area (ac)	CN	Description
*	0.560	91	
	0.560		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	54	0.0056	0.71		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.6	76	0.0171	2.11		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	50	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment A-3: SUBCAT A-3

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2yr Rainfall=3.00"

	Area (ac)	CN	Description
*	0.240	91	
	0.240		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	85	0.0188	1.26		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	61	0.0049	1.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	20	0.0685	4.21		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.1	166	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-1: SUBCAT B-1

Runoff = 3.28 cfs @ 12.09 hrs, Volume= 0.236 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2yr Rainfall=3.00"

	Area (ac)	CN	Description
*	1.370	91	
	1.370		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	114	0.0184	1.32		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	99	0.0121	1.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	116	0.0026	1.04		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	329	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-2: SUBCAT B-2

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2yr Rainfall=3.00"

	Area (ac)	CN	Description
*	0.160	91	
	0.160		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	86	0.0273	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	86	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-3: SUBCAT B-3

Runoff = 1.03 cfs @ 12.09 hrs, Volume= 0.074 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2yr Rainfall=3.00"

	Area (ac)	CN	Description
*	0.430	91	
	0.430		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	121	0.0124	1.14		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.8	121	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment C-1: SUBCAT C-1

Runoff = 0.91 cfs @ 12.09 hrs, Volume= 0.066 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2yr Rainfall=3.00"

	Area (ac)	CN	Description
*	0.380	91	
	0.380		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	121	0.0107	1.08		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	82	0.0073	1.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	203	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach A SYSTEM FLOW: A SYSTEM CONVOLUTED FLOW

Inflow Area = 2.100 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 4.89 cfs @ 12.09 hrs, Volume= 0.362 af
Outflow = 4.89 cfs @ 12.09 hrs, Volume= 0.362 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach B SYSTEM FLOW: B SYSTEM CONVOLUTED FLOW

Inflow Area = 1.960 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 4.69 cfs @ 12.09 hrs, Volume= 0.338 af
Outflow = 4.69 cfs @ 12.09 hrs, Volume= 0.338 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach C SYSTEM FLOW: C SYSTEM FLOW

Inflow Area = 0.380 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 0.91 cfs @ 12.09 hrs, Volume= 0.066 af
Outflow = 0.91 cfs @ 12.09 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 12" 136': 12" storm drain

Inflow Area = 0.590 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af
Outflow = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.0 min
Primary = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.08' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.30'	**12.0" x 136.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 3.58' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.39 cfs @ 12.09 hrs HW=5.07' TW=4.31' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.39 cfs @ 2.94 fps)

Summary for Pond 12" 40': 12" storm drain

Inflow Area =	0.240 ac,	0.00% Impervious, Inflow Depth = 2.07"	for 2yr event	
Inflow =	0.57 cfs @	12.09 hrs, Volume=	0.041 af	
Outflow =	0.57 cfs @	12.09 hrs, Volume=	0.041 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.57 cfs @	12.09 hrs, Volume=	0.041 af	

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.96' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5.53'	**12.0" x 40.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 4.83' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.57 cfs @ 12.09 hrs HW=5.96' TW=5.28' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.57 cfs @ 1.76 fps)

Summary for Pond 12" 50': 12" storm drain

Inflow Area =	0.430 ac,	0.00% Impervious, Inflow Depth = 2.07"	for 2yr event	
Inflow =	1.03 cfs @	12.09 hrs, Volume=	0.074 af	
Outflow =	1.03 cfs @	12.09 hrs, Volume=	0.074 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.03 cfs @	12.09 hrs, Volume=	0.074 af	

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 6.85' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.25'	**12.0" x 50.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 4.30' S= 0.0390 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.02 cfs @ 12.09 hrs HW=6.85' TW=5.07' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.02 cfs @ 2.08 fps)

Summary for Pond 12" 60': 12" storm drain

Inflow Area = 1.370 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 3.28 cfs @ 12.09 hrs, Volume= 0.236 af
Outflow = 3.28 cfs @ 12.09 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.0 min
Primary = 3.28 cfs @ 12.09 hrs, Volume= 0.236 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 4.81' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.06'	**12.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.79' S= 0.0045 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.26 cfs @ 12.09 hrs HW=4.80' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 3.26 cfs @ 4.15 fps)

Summary for Pond 12" 68': 12" storm drain

Inflow Area = 0.590 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af
Outflow = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.0 min
Primary = 1.41 cfs @ 12.09 hrs, Volume= 0.102 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 4.31' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.58'	**12.0" x 68.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.79' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.40 cfs @ 12.09 hrs HW=4.31' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.40 cfs @ 2.29 fps)

Summary for Pond 18" 556': 18" storm drain

Inflow Area = 0.240 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af
Outflow = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.28' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.83'	**18.0" x 556.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 3.17' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.57 cfs @ 12.09 hrs HW=5.28' TW=3.87' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.57 cfs @ 1.90 fps)

Summary for Pond 18" 740': 18" storm drain

Inflow Area = 1.300 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 2.99 cfs @ 12.10 hrs, Volume= 0.224 af
Outflow = 2.99 cfs @ 12.10 hrs, Volume= 0.224 af, Atten= 0%, Lag= 0.0 min
Primary = 2.99 cfs @ 12.10 hrs, Volume= 0.224 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.46' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.53'	**18.0" x 740.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= -0.16' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.99 cfs @ 12.10 hrs HW=5.46' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.99 cfs @ 2.59 fps)

Summary for Pond 24" 276': 24" storm drain

Inflow Area = 0.800 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af
Outflow = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 3.88' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.17'	**24.0" x 276.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.16' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.89 cfs @ 12.09 hrs HW=3.87' TW=2.79' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.89 cfs @ 2.86 fps)

Summary for Pond 30" 333': 30" storm drain

Inflow Area = 0.800 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af
Outflow = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 2.80' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	2.16'	**30.0" x 333.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 0.82' S= 0.0040 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.90 cfs @ 12.09 hrs HW=2.79' TW=1.40' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.90 cfs @ 2.92 fps)

Summary for Pond 36" 215': 36" storm drain

Inflow Area = 0.800 ac, 0.00% Impervious, Inflow Depth = 2.07" for 2yr event
Inflow = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af
Outflow = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.91 cfs @ 12.09 hrs, Volume= 0.138 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 1.40' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	0.82'	**36.0" x 215.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= -0.16' S= 0.0046 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.90 cfs @ 12.09 hrs HW=1.40' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.90 cfs @ 3.01 fps)

Time span=1.00-72.00 hrs, dt=0.02 hrs, 3551 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 37S: (new Subcat) Runoff Area=4.440 ac 0.00% Impervious Runoff Depth=4.23"
Tc=6.0 min CN=96 Runoff=20.00 cfs 1.567 af

Subcatchment A-1: SUBCAT A-1 Runoff Area=1.300 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=416' Tc=7.1 min CN=91 Runoff=5.20 cfs 0.400 af

Subcatchment A-2: SUBCAT A-2 Runoff Area=0.560 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=180' Tc=6.0 min CN=91 Runoff=2.33 cfs 0.172 af

Subcatchment A-3: SUBCAT A-3 Runoff Area=0.240 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=166' Tc=6.0 min CN=91 Runoff=1.00 cfs 0.074 af

Subcatchment B-1: SUBCAT B-1 Runoff Area=1.370 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=329' Tc=6.0 min CN=91 Runoff=5.69 cfs 0.421 af

Subcatchment B-2: SUBCAT B-2 Runoff Area=0.160 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=86' Slope=0.0273 '/' Tc=6.0 min CN=91 Runoff=0.66 cfs 0.049 af

Subcatchment B-3: SUBCAT B-3 Runoff Area=0.430 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=121' Slope=0.0124 '/' Tc=6.0 min CN=91 Runoff=1.79 cfs 0.132 af

Subcatchment C-1: SUBCAT C-1 Runoff Area=0.380 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=203' Tc=6.0 min CN=91 Runoff=1.58 cfs 0.117 af

Reach A SYSTEM FLOW: A SYSTEM CONVOLUTED FLOW Inflow=8.49 cfs 0.646 af
Outflow=8.49 cfs 0.646 af

Reach B SYSTEM FLOW: B SYSTEM CONVOLUTED FLOW Inflow=8.14 cfs 0.603 af
Outflow=8.14 cfs 0.603 af

Reach C SYSTEM FLOW: C SYSTEM FLOW Inflow=1.58 cfs 0.117 af
Outflow=1.58 cfs 0.117 af

Pond 12" 136': 12" storm drain Peak Elev=5.58' Inflow=2.45 cfs 0.181 af
12.0" x 136.0' Culvert Outflow=2.45 cfs 0.181 af

Pond 12" 40': 12" storm drain Peak Elev=6.12' Inflow=1.00 cfs 0.074 af
12.0" x 40.0' Culvert Outflow=1.00 cfs 0.074 af

Pond 12" 50': 12" storm drain Peak Elev=7.11' Inflow=1.79 cfs 0.132 af
12.0" x 50.0' Culvert Outflow=1.79 cfs 0.132 af

Pond 12" 60': 12" storm drain Peak Elev=7.19' Inflow=5.69 cfs 0.421 af
12.0" x 60.0' Culvert Outflow=5.69 cfs 0.421 af

Pond 12" 68': 12" storm drain Peak Elev=4.75' Inflow=2.45 cfs 0.181 af
12.0" x 68.0' Culvert Outflow=2.45 cfs 0.181 af

Pond 18" 556': 18" storm drain Peak Elev=5.44' Inflow=1.00 cfs 0.074 af
18.0" x 556.0' Culvert Outflow=1.00 cfs 0.074 af

Pond 18" 740': 18" storm drain Peak Elev=5.87' Inflow=5.20 cfs 0.400 af
18.0" x 740.0' Culvert Outflow=5.20 cfs 0.400 af

Pond 24" 276': 24" storm drain Peak Elev=4.12' Inflow=3.32 cfs 0.246 af
24.0" x 276.0' Culvert Outflow=3.32 cfs 0.246 af

Pond 30" 333': 30" storm drain Peak Elev=3.01' Inflow=3.32 cfs 0.246 af
30.0" x 333.0' Culvert Outflow=3.32 cfs 0.246 af

Pond 36" 215': 36" storm drain Peak Elev=1.59' Inflow=3.32 cfs 0.246 af
36.0" x 215.0' Culvert Outflow=3.32 cfs 0.246 af

Total Runoff Area = 8.880 ac Runoff Volume = 2.933 af Average Runoff Depth = 3.96"
100.00% Pervious = 8.880 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 37S: (new Subcat)

Runoff = 20.00 cfs @ 12.08 hrs, Volume= 1.567 af, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10yr Rainfall=4.70"

	Area (ac)	CN	Description
*	4.440	96	
	4.440		Pervious Area

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

Summary for Subcatchment A-1: SUBCAT A-1

Runoff = 5.20 cfs @ 12.10 hrs, Volume= 0.400 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10yr Rainfall=4.70"

	Area (ac)	CN	Description
*	1.300	91	
	1.300		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	105	0.0152	1.21		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.9	86	0.0023	0.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.7	225	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.1	416	Total			

Summary for Subcatchment A-2: SUBCAT A-2

Runoff = 2.33 cfs @ 12.08 hrs, Volume= 0.172 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10yr Rainfall=4.70"

	Area (ac)	CN	Description
*	0.560	91	
	0.560		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	54	0.0056	0.71		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.6	76	0.0171	2.11		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	50	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment A-3: SUBCAT A-3

Runoff = 1.00 cfs @ 12.08 hrs, Volume= 0.074 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10yr Rainfall=4.70"

	Area (ac)	CN	Description
*	0.240	91	
	0.240		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	85	0.0188	1.26		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	61	0.0049	1.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	20	0.0685	4.21		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.1	166	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-1: SUBCAT B-1

Runoff = 5.69 cfs @ 12.08 hrs, Volume= 0.421 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10yr Rainfall=4.70"

	Area (ac)	CN	Description
*	1.370	91	
	1.370		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	114	0.0184	1.32		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	99	0.0121	1.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	116	0.0026	1.04		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	329	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-2: SUBCAT B-2

Runoff = 0.66 cfs @ 12.08 hrs, Volume= 0.049 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10yr Rainfall=4.70"

	Area (ac)	CN	Description
*	0.160	91	
	0.160		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	86	0.0273	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	86	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-3: SUBCAT B-3

Runoff = 1.79 cfs @ 12.08 hrs, Volume= 0.132 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10yr Rainfall=4.70"

	Area (ac)	CN	Description
*	0.430	91	
	0.430		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	121	0.0124	1.14		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.8	121	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment C-1: SUBCAT C-1

Runoff = 1.58 cfs @ 12.08 hrs, Volume= 0.117 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10yr Rainfall=4.70"

	Area (ac)	CN	Description
*	0.380	91	
	0.380		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	121	0.0107	1.08		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	82	0.0073	1.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	203	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach A SYSTEM FLOW: A SYSTEM CONVOLUTED FLOW

Inflow Area = 2.100 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 8.49 cfs @ 12.09 hrs, Volume= 0.646 af
Outflow = 8.49 cfs @ 12.09 hrs, Volume= 0.646 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach B SYSTEM FLOW: B SYSTEM CONVOLUTED FLOW

Inflow Area = 1.960 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 8.14 cfs @ 12.08 hrs, Volume= 0.603 af
Outflow = 8.14 cfs @ 12.08 hrs, Volume= 0.603 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach C SYSTEM FLOW: C SYSTEM FLOW

Inflow Area = 0.380 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 1.58 cfs @ 12.08 hrs, Volume= 0.117 af
Outflow = 1.58 cfs @ 12.08 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 12" 136': 12" storm drain

Inflow Area = 0.590 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 2.45 cfs @ 12.08 hrs, Volume= 0.181 af
Outflow = 2.45 cfs @ 12.08 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Primary = 2.45 cfs @ 12.08 hrs, Volume= 0.181 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.58' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.30'	**12.0" x 136.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 3.58' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.38 cfs @ 12.08 hrs HW=5.56' TW=4.75' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 2.38 cfs @ 3.10 fps)

Summary for Pond 12" 40': 12" storm drain

Inflow Area =	0.240 ac,	0.00% Impervious, Inflow Depth = 3.69"	for 10yr event	
Inflow =	1.00 cfs @	12.08 hrs, Volume=	0.074 af	
Outflow =	1.00 cfs @	12.08 hrs, Volume=	0.074 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.00 cfs @	12.08 hrs, Volume=	0.074 af	

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 6.12' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5.53'	**12.0" x 40.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 4.83' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.99 cfs @ 12.08 hrs HW=6.12' TW=5.44' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.99 cfs @ 2.06 fps)

Summary for Pond 12" 50': 12" storm drain

Inflow Area =	0.430 ac,	0.00% Impervious, Inflow Depth = 3.69"	for 10yr event	
Inflow =	1.79 cfs @	12.08 hrs, Volume=	0.132 af	
Outflow =	1.79 cfs @	12.08 hrs, Volume=	0.132 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.79 cfs @	12.08 hrs, Volume=	0.132 af	

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 7.11' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.25'	**12.0" x 50.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 4.30' S= 0.0390 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.78 cfs @ 12.08 hrs HW=7.10' TW=5.56' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.78 cfs @ 2.48 fps)

Summary for Pond 12" 60': 12" storm drain

Inflow Area = 1.370 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 5.69 cfs @ 12.08 hrs, Volume= 0.421 af
Outflow = 5.69 cfs @ 12.08 hrs, Volume= 0.421 af, Atten= 0%, Lag= 0.0 min
Primary = 5.69 cfs @ 12.08 hrs, Volume= 0.421 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 7.19' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.06'	**12.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.79' S= 0.0045 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.66 cfs @ 12.08 hrs HW=7.15' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 5.66 cfs @ 7.20 fps)

Summary for Pond 12" 68': 12" storm drain

Inflow Area = 0.590 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 2.45 cfs @ 12.08 hrs, Volume= 0.181 af
Outflow = 2.45 cfs @ 12.08 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Primary = 2.45 cfs @ 12.08 hrs, Volume= 0.181 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 4.75' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.58'	**12.0" x 68.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.79' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.44 cfs @ 12.08 hrs HW=4.75' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.44 cfs @ 3.10 fps)

Summary for Pond 18" 556': 18" storm drain

Inflow Area = 0.240 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 1.00 cfs @ 12.08 hrs, Volume= 0.074 af
Outflow = 1.00 cfs @ 12.08 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
Primary = 1.00 cfs @ 12.08 hrs, Volume= 0.074 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.44' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.83'	**18.0" x 556.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 3.17' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.98 cfs @ 12.08 hrs HW=5.44' TW=4.12' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.98 cfs @ 2.15 fps)

Summary for Pond 18" 740': 18" storm drain

Inflow Area = 1.300 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 5.20 cfs @ 12.10 hrs, Volume= 0.400 af
Outflow = 5.20 cfs @ 12.10 hrs, Volume= 0.400 af, Atten= 0%, Lag= 0.0 min
Primary = 5.20 cfs @ 12.10 hrs, Volume= 0.400 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.87' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.53'	**18.0" x 740.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= -0.16' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.20 cfs @ 12.10 hrs HW=5.87' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 5.20 cfs @ 3.11 fps)

Summary for Pond 24" 276': 24" storm drain

Inflow Area = 0.800 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af
Outflow = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min
Primary = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 4.12' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.17'	**24.0" x 276.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.16' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.28 cfs @ 12.08 hrs HW=4.12' TW=3.01' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 3.28 cfs @ 3.28 fps)

Summary for Pond 30" 333': 30" storm drain

Inflow Area = 0.800 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af
Outflow = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min
Primary = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 3.01' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	2.16'	**30.0" x 333.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 0.82' S= 0.0040 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.29 cfs @ 12.08 hrs HW=3.01' TW=1.59' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 3.29 cfs @ 3.36 fps)

Summary for Pond 36" 215': 36" storm drain

Inflow Area = 0.800 ac, 0.00% Impervious, Inflow Depth = 3.69" for 10yr event
Inflow = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af
Outflow = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min
Primary = 3.32 cfs @ 12.08 hrs, Volume= 0.246 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 1.59' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	0.82'	**36.0" x 215.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= -0.16' S= 0.0046 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.30 cfs @ 12.08 hrs HW=1.59' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.30 cfs @ 3.48 fps)

Time span=1.00-72.00 hrs, dt=0.02 hrs, 3551 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 37S: (new Subcat) Runoff Area=4.440 ac 0.00% Impervious Runoff Depth=5.03"
Tc=6.0 min CN=96 Runoff=23.55 cfs 1.861 af

Subcatchment A-1: SUBCAT A-1 Runoff Area=1.300 ac 0.00% Impervious Runoff Depth=4.47"
Flow Length=416' Tc=7.1 min CN=91 Runoff=6.23 cfs 0.484 af

Subcatchment A-2: SUBCAT A-2 Runoff Area=0.560 ac 0.00% Impervious Runoff Depth=4.47"
Flow Length=180' Tc=6.0 min CN=91 Runoff=2.79 cfs 0.209 af

Subcatchment A-3: SUBCAT A-3 Runoff Area=0.240 ac 0.00% Impervious Runoff Depth=4.47"
Flow Length=166' Tc=6.0 min CN=91 Runoff=1.19 cfs 0.089 af

Subcatchment B-1: SUBCAT B-1 Runoff Area=1.370 ac 0.00% Impervious Runoff Depth=4.47"
Flow Length=329' Tc=6.0 min CN=91 Runoff=6.82 cfs 0.510 af

Subcatchment B-2: SUBCAT B-2 Runoff Area=0.160 ac 0.00% Impervious Runoff Depth=4.47"
Flow Length=86' Slope=0.0273 '/' Tc=6.0 min CN=91 Runoff=0.80 cfs 0.060 af

Subcatchment B-3: SUBCAT B-3 Runoff Area=0.430 ac 0.00% Impervious Runoff Depth=4.47"
Flow Length=121' Slope=0.0124 '/' Tc=6.0 min CN=91 Runoff=2.14 cfs 0.160 af

Subcatchment C-1: SUBCAT C-1 Runoff Area=0.380 ac 0.00% Impervious Runoff Depth=4.47"
Flow Length=203' Tc=6.0 min CN=91 Runoff=1.89 cfs 0.142 af

Reach A SYSTEM FLOW: A SYSTEM CONVOLUTED FLOW Inflow=10.17 cfs 0.782 af
Outflow=10.17 cfs 0.782 af

Reach B SYSTEM FLOW: B SYSTEM CONVOLUTED FLOW Inflow=9.75 cfs 0.730 af
Outflow=9.75 cfs 0.730 af

Reach C SYSTEM FLOW: C SYSTEM FLOW Inflow=1.89 cfs 0.142 af
Outflow=1.89 cfs 0.142 af

Pond 12" 136': 12" storm drain Peak Elev=6.35' Inflow=2.94 cfs 0.220 af
12.0" x 136.0' Culvert Outflow=2.94 cfs 0.220 af

Pond 12" 40': 12" storm drain Peak Elev=6.19' Inflow=1.19 cfs 0.089 af
12.0" x 40.0' Culvert Outflow=1.19 cfs 0.089 af

Pond 12" 50': 12" storm drain Peak Elev=7.26' Inflow=2.14 cfs 0.160 af
12.0" x 50.0' Culvert Outflow=2.14 cfs 0.160 af

Pond 12" 60': 12" storm drain Peak Elev=8.77' Inflow=6.82 cfs 0.510 af
12.0" x 60.0' Culvert Outflow=6.82 cfs 0.510 af

Pond 12" 68': 12" storm drain Peak Elev=5.05' Inflow=2.94 cfs 0.220 af
12.0" x 68.0' Culvert Outflow=2.94 cfs 0.220 af

Pond 18" 556': 18" storm drain Peak Elev=5.51' Inflow=1.19 cfs 0.089 af
18.0" x 556.0' Culvert Outflow=1.19 cfs 0.089 af

Pond 18" 740': 18" storm drain Peak Elev=6.14' Inflow=6.23 cfs 0.484 af
18.0" x 740.0' Culvert Outflow=6.23 cfs 0.484 af

Pond 24" 276': 24" storm drain Peak Elev=4.22' Inflow=3.98 cfs 0.298 af
24.0" x 276.0' Culvert Outflow=3.98 cfs 0.298 af

Pond 30" 333': 30" storm drain Peak Elev=3.09' Inflow=3.98 cfs 0.298 af
30.0" x 333.0' Culvert Outflow=3.98 cfs 0.298 af

Pond 36" 215': 36" storm drain Peak Elev=1.67' Inflow=3.98 cfs 0.298 af
36.0" x 215.0' Culvert Outflow=3.98 cfs 0.298 af

Total Runoff Area = 8.880 ac Runoff Volume = 3.514 af Average Runoff Depth = 4.75"
100.00% Pervious = 8.880 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 37S: (new Subcat)

Runoff = 23.55 cfs @ 12.08 hrs, Volume= 1.861 af, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25yr Rainfall=5.50"

	Area (ac)	CN	Description
*	4.440	96	
	4.440		Pervious Area

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

Summary for Subcatchment A-1: SUBCAT A-1

Runoff = 6.23 cfs @ 12.10 hrs, Volume= 0.484 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25yr Rainfall=5.50"

	Area (ac)	CN	Description
*	1.300	91	
	1.300		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	105	0.0152	1.21		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.9	86	0.0023	0.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.7	225	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.1	416	Total			

Summary for Subcatchment A-2: SUBCAT A-2

Runoff = 2.79 cfs @ 12.08 hrs, Volume= 0.209 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25yr Rainfall=5.50"

	Area (ac)	CN	Description
*	0.560	91	
	0.560		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	54	0.0056	0.71		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.6	76	0.0171	2.11		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	50	0.0040	1.02		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	180	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment A-3: SUBCAT A-3

Runoff = 1.19 cfs @ 12.08 hrs, Volume= 0.089 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25yr Rainfall=5.50"

	Area (ac)	CN	Description
*	0.240	91	
	0.240		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	85	0.0188	1.26		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	61	0.0049	1.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	20	0.0685	4.21		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.1	166	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-1: SUBCAT B-1

Runoff = 6.82 cfs @ 12.08 hrs, Volume= 0.510 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25yr Rainfall=5.50"

	Area (ac)	CN	Description
*	1.370	91	
	1.370		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	114	0.0184	1.32		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	99	0.0121	1.77		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	116	0.0026	1.04		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.2	329	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-2: SUBCAT B-2

Runoff = 0.80 cfs @ 12.08 hrs, Volume= 0.060 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25yr Rainfall=5.50"

	Area (ac)	CN	Description
*	0.160	91	
	0.160		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	86	0.0273	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	86	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment B-3: SUBCAT B-3

Runoff = 2.14 cfs @ 12.08 hrs, Volume= 0.160 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25yr Rainfall=5.50"

	Area (ac)	CN	Description
*	0.430	91	
	0.430		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	121	0.0124	1.14		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.8	121	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment C-1: SUBCAT C-1

Runoff = 1.89 cfs @ 12.08 hrs, Volume= 0.142 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25yr Rainfall=5.50"

	Area (ac)	CN	Description
*	0.380	91	
	0.380		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	121	0.0107	1.08		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	82	0.0073	1.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	203	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach A SYSTEM FLOW: A SYSTEM CONVOLUTED FLOW

Inflow Area = 2.100 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 10.17 cfs @ 12.09 hrs, Volume= 0.782 af
Outflow = 10.17 cfs @ 12.09 hrs, Volume= 0.782 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach B SYSTEM FLOW: B SYSTEM CONVOLUTED FLOW

Inflow Area = 1.960 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 9.75 cfs @ 12.08 hrs, Volume= 0.730 af
Outflow = 9.75 cfs @ 12.08 hrs, Volume= 0.730 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach C SYSTEM FLOW: C SYSTEM FLOW

Inflow Area = 0.380 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 1.89 cfs @ 12.08 hrs, Volume= 0.142 af
Outflow = 1.89 cfs @ 12.08 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond 12" 136': 12" storm drain

Inflow Area = 0.590 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 2.94 cfs @ 12.08 hrs, Volume= 0.220 af
Outflow = 2.94 cfs @ 12.08 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.0 min
Primary = 2.94 cfs @ 12.08 hrs, Volume= 0.220 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 6.35' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.30'	**12.0" x 136.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 3.58' S= 0.0053 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.86 cfs @ 12.08 hrs HW=6.30' TW=5.04' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 2.86 cfs @ 3.64 fps)

Summary for Pond 12" 40': 12" storm drain

Inflow Area =	0.240 ac,	0.00% Impervious, Inflow Depth = 4.47"	for 25yr event
Inflow =	1.19 cfs @	12.08 hrs, Volume=	0.089 af
Outflow =	1.19 cfs @	12.08 hrs, Volume=	0.089 af, Atten= 0%, Lag= 0.0 min
Primary =	1.19 cfs @	12.08 hrs, Volume=	0.089 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 6.19' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5.53'	**12.0" x 40.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 4.83' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.19 cfs @ 12.08 hrs HW=6.19' TW=5.51' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.19 cfs @ 2.18 fps)

Summary for Pond 12" 50': 12" storm drain

Inflow Area =	0.430 ac,	0.00% Impervious, Inflow Depth = 4.47"	for 25yr event
Inflow =	2.14 cfs @	12.08 hrs, Volume=	0.160 af
Outflow =	2.14 cfs @	12.08 hrs, Volume=	0.160 af, Atten= 0%, Lag= 0.0 min
Primary =	2.14 cfs @	12.08 hrs, Volume=	0.160 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 7.26' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.25'	**12.0" x 50.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 4.30' S= 0.0390 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.13 cfs @ 12.08 hrs HW=7.26' TW=6.30' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.13 cfs @ 2.71 fps)

Summary for Pond 12" 60': 12" storm drain

Inflow Area = 1.370 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 6.82 cfs @ 12.08 hrs, Volume= 0.510 af
Outflow = 6.82 cfs @ 12.08 hrs, Volume= 0.510 af, Atten= 0%, Lag= 0.0 min
Primary = 6.82 cfs @ 12.08 hrs, Volume= 0.510 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 8.77' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.06'	**12.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.79' S= 0.0045 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=6.78 cfs @ 12.08 hrs HW=8.72' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 6.78 cfs @ 8.63 fps)

Summary for Pond 12" 68': 12" storm drain

Inflow Area = 0.590 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 2.94 cfs @ 12.08 hrs, Volume= 0.220 af
Outflow = 2.94 cfs @ 12.08 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.0 min
Primary = 2.94 cfs @ 12.08 hrs, Volume= 0.220 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.05' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.58'	**12.0" x 68.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.79' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.92 cfs @ 12.08 hrs HW=5.04' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.92 cfs @ 3.72 fps)

Summary for Pond 18" 556': 18" storm drain

Inflow Area = 0.240 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 1.19 cfs @ 12.08 hrs, Volume= 0.089 af
Outflow = 1.19 cfs @ 12.08 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min
Primary = 1.19 cfs @ 12.08 hrs, Volume= 0.089 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 5.51' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.83'	**18.0" x 556.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 3.17' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.18 cfs @ 12.08 hrs HW=5.51' TW=4.22' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 1.18 cfs @ 2.23 fps)

Summary for Pond 18" 740': 18" storm drain

Inflow Area = 1.300 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 6.23 cfs @ 12.10 hrs, Volume= 0.484 af
Outflow = 6.23 cfs @ 12.10 hrs, Volume= 0.484 af, Atten= 0%, Lag= 0.0 min
Primary = 6.23 cfs @ 12.10 hrs, Volume= 0.484 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 6.14' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.53'	**18.0" x 740.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= -0.16' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=6.22 cfs @ 12.10 hrs HW=6.14' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 6.22 cfs @ 3.52 fps)

Summary for Pond 24" 276': 24" storm drain

Inflow Area = 0.800 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 3.98 cfs @ 12.08 hrs, Volume= 0.298 af
Outflow = 3.98 cfs @ 12.08 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min
Primary = 3.98 cfs @ 12.08 hrs, Volume= 0.298 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 4.22' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.17'	**24.0" x 276.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2.16' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.93 cfs @ 12.08 hrs HW=4.22' TW=3.09' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 3.93 cfs @ 3.42 fps)

Summary for Pond 30" 333': 30" storm drain

Inflow Area = 0.800 ac, 0.00% Impervious, Inflow Depth = 4.47" for 25yr event
Inflow = 3.98 cfs @ 12.08 hrs, Volume= 0.298 af
Outflow = 3.98 cfs @ 12.08 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min
Primary = 3.98 cfs @ 12.08 hrs, Volume= 0.298 af

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 3.09' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	2.16'	**30.0" x 333.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 0.82' S= 0.0040 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.94 cfs @ 12.08 hrs HW=3.09' TW=1.66' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 3.94 cfs @ 3.51 fps)

Summary for Pond 36" 215': 36" storm drain

Inflow Area =	0.800 ac,	0.00% Impervious, Inflow Depth = 4.47"	for 25yr event	
Inflow =	3.98 cfs @	12.08 hrs, Volume=	0.298 af	
Outflow =	3.98 cfs @	12.08 hrs, Volume=	0.298 af,	Atten= 0%, Lag= 0.0 min
Primary =	3.98 cfs @	12.08 hrs, Volume=	0.298 af	

Routing by Dyn-Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 1.67' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	0.82'	**36.0" x 215.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= -0.16' S= 0.0046 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.96 cfs @ 12.08 hrs HW=1.66' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 3.96 cfs @ 3.65 fps)

ATTACHMENT B

WATER QUALITY COMPUTATIONS

Midtown Water Quality Summary, Isolator Row Sizing and Summary of Peak Discharges													
System	Tributary Area (SF)	Tributary Area (acres)	Treatment Approach	Required Filterra Sizing (sf)/Number of Storm Treats (ea)	Filterra Size (sf)/Storm Treats Provided (ea)	Water Quality Volume (CF)	1 Yr. Peak Flow (CFS)	# Chambers (SC740) Required	Storage Volume Required (CF)*	"Brentwood Tanks Required (See Plan for Dimension)"	"Brentwood Tanks Provided (1.5' x 3' x 2)"	"Peak Flow 2 Year Storm (CFS)"	"Peak Flow 25 Year Storm (CFS)"
A	36,988	0.85	Subsurface Filterra Media	12'x8'	12'x15'	3,082	2	10	682	76	84	2.32	4.50
B	13,078	0.30	Boxless Filterra	4'x'6'	4'x'6	1,090	0.71	4	273	31	30*	0.82	1.59
C	13,103	0.30	Boxless Filterra	4'x'6'	4'x'6	1,092	0.71	4	273	31	30*	0.82	1.59
D	19,761	0.45	StormTreat Units	2.00	2.00	1,647	1.07	6	409	126	126	1.24	2.40
E	3,624	0.08	Filterra	4'x'6'	4'x'6	302	0.2	1	68	8	16	0.23	0.44
F	6,373	0.15	Filterra	4'x'6'	4'x'6	531	0.34	2	136	16	16	0.40	0.78
G	2,688	0.06	Filterra	4'x'6'	4'x'6	224	0.15	1	68	8	8	0.17	0.33
H	3,184	0.07	Filterra	4'x'6'	4'x'6	265	0.17	1	68	8	8	0.20	0.39
I	5,497	0.13	Filterra	4'x'6'	4'x'6	458	0.3	2	136	16	16	0.34	0.67
J	4,160	0.10	Filterra	4'x'6'	4'x'6	347	0.22	2	136	16	16	0.26	0.51
K	7,318	0.17	Filterra	4'x'6'	4'x'6	610	0.4	2	136	16	16	0.46	0.89
L	5,295	0.12	Filterra	4'x'6'	4'x'6	441	0.29	2	136	16	16	0.33	0.64
M	3,292	0.08	Filterra	4'x'6'	4'x'6	274	0.18	1	68	8	16	0.21	0.40
N	4426	0.10	Filterra	4'x'6'	4'x'6	369	0.24	2	136	16	16	0.28	0.54
O	3,115	0.07	Filterra	4'x'6'	4'x'6	260	0.22	2	136	16	16	0.20	0.38
P	4,700	0.11	Filterra	4'x'6'	4'x'6	392	0.25	2	136	16	16	0.29	0.57
Q	5,295	0.12	Filterra	4'x'6'	4'x'6	441	0.29	2	136	16	16	0.33	0.64
R	4,173	0.10	Filterra	4'x'6'	4'x'6	348	0.23	2	136	16	16	0.26	0.51
S	6,447	0.15	Filterra	4'x'6'	4'x'6	537	0.35	2	136	16	16	0.40	0.78
*Based on StormTech 740 chambers storage capacity of 68.2 CF per chamber													
*Additional Storage is provided in inspection manholes.													
Systems A & D have 18" storm drain downstream of roof drain connection.													

ATTACHMENT C

ORIFICE DRAWDOWN COMPUTATIONS

ORIFICE DIAMETER FOR STORMTREATS

Depth (ft)	Surface Area (sq.ft)	Area End (sq.ft)	Area End Depth (ft)	Volume (c.f)	Head (ft)	Orifice Flow (cfs)	Drawdown Time (secs)	Drawdown Time (hours)
3.00	565.00	565.00	1.00	565.00	3.42	0.0090	62943.71	17.484
2.00	565.00	565.00	1.00	565.00	2.42	0.0076	74826.89	20.785
1.00	565.00	565.00	1.00	565.00	1.42	0.0058	97683.50	27.134
0.00	565.00	0.00	0.00	0.00	0.42	0.0031	0.00	0.000
							TOTAL	***65.404***

$CA(2gh)^{1/2}$

Orifice Diameter	0.43	inch	
Area	0.0010	sq.ft	
Head	2.53	feet	
g	32.174	ft/s^2	
C	0.6		Orifice/Grate

DESIRED ORIFICE FLOW = 0.089CFS WHICH IS EQUAL TO 2GPM PER STORMTREAT (I.E. 4GPM = 0.0089CFS)

<u>ATTACHMENT D</u>

OPERATIONS & MAINTENANCE MANUAL

INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT AND RELATED STORMWATER FACILITIES

midtown
PORTLAND, MAINE

PREPARED FOR:

THE FEDERATED COMPANIES
3301 NE 1ST AVENUE, SUITE M-302
MIAMI, FLORIDA 33137

PREPARED BY:

FAY, SPOFFORD & THORNDIKE
778 MAIN STREET, SUITE 8
SOUTH PORTLAND, MAINE 04106
(207) 775-1121

NOVEMBER 2014

TABLE OF CONTENTS

APPENDICES

I. INTRODUCTION

Relatively complex stormwater management facilities are commonly installed in development projects including, commercial facilities, and many other developments. The complexity and goals of these systems vary with the nature of the receiving water, as well as the type of development. Runoff from developed areas of the project, including rooftops, paved, or lawn areas typically contain materials that can impact the receiving waters. Source control and the installation of wet ponds, infiltration galleries, and proprietary water quality units such as StormFilter®, Filterra®, and StormTreat™ units are often combined with pretreatment measures or vegetated buffer strips and other best management practices are also among the options that can significantly reduce the non-point pollution discharge from the developed area. These measures are particularly important to projects in the watersheds of sensitive water bodies, or projects with potential impacts to groundwater. With the increased cost of land and development, there is an increased tendency to construct portions of the stormwater management systems underground.

The effectiveness of water quality management provisions and other components of the stormwater management system are dependent on their design, upkeep, and maintenance to assure they meet their intended function over an extended period of years. It is critical that the stormwater management facilities are regularly inspected, and that maintenance is performed on an as-needed basis. It must also be recognized that the effectiveness of these facilities, and their maintenance requirements, are related to the stormwater drainage facilities that collect and transport the flow to the ponds, infiltration galleries, and other treatment measures. Thus, maintenance should be directed to the total system, not just the pond or primary stormwater management facility. Chapter 32 of the City of Portland's Standards require the applicant perform the Operations and Maintenance for project BMP's and maintain records as suggested herein.

The purpose of this document is to define, in detail, the inspection and maintenance requirements deemed necessary to assure that the stormwater management facilities function as intended when they were designed. Subsequent sections identify individual maintenance items, give a brief commentary of the function and need for the item, a description of the work required, and a suggested frequency of accomplishment. While the suggested programs and schedules must be adapted to specific projects, the material presented should provide guidance for a successful long-term program for operation and maintenance. Certain facilities, specifically the potential water quality volume storage or treatment measures such as infiltration, StormFilters®, Filterra®, and StormTreat® are not intended to be placed in service until the tributary catchment area has the permanent cover in place and any contributing turf areas have achieved a 90% catch of vegetation (i.e. established).

A. <u>GUIDELINES OVERVIEW</u>

A summary of the individual components of stormwater management facilities for this project has been prepared. The format used in the summary is as follows:

<u>Preface</u>: A general description of what function/benefit the element is intended to provide. This is a short summary and not intended to provide the design basis, which can be found in other sources.

<u>Inspection</u>: This section provides the inspection requirements for the individual component.

<u>Maintenance</u>: The section provides general information on the routine maintenance requirements of this element.

<u>Frequency</u>: This section outlines the best judgment of the designer on the system to the frequency of maintenance.

<u>Comments</u>: This section provides any particular comment on the site-specific features of this element. This is a summary only. The owner/operator should review the design drawings and documents carefully to understand the particular elements of the project. The end of this section should allow the owner/operator to make notes on the specific program. This may include the selected maintenance procedure, cross-references to applicable design drawings, etc.

A list of the individual inspection/maintenance elements is provided in the table of contents. The guidelines are proposed for initial use with adjustments made as appropriate based upon specific project experience.

This report includes the Operation and Maintenance requirements for any potential BMP identified in the Stormwater Management Report for this project. Many of these will not be required for the final stormwater management option selected for this project.

II. <u>PROJECT OVERVIEW</u>

Key permits issued (or applied for) on the project include:

- City of Portland Site Plan Approvals
- City of Portland Approval for Stormwater Management Plan

A copy of the permits and Stormwater Management Report should be appended to this manual as Attachment B. The Owner/Operator of the stormwater management system should review these permits for a general description and background of the project, as well as any specific permit conditions or requirements of the project.

The applicant has retained Fay, Spofford & Thorndike (FST) for civil engineering for the midtown project. FST has prepared the design for the stormwater management facilities and may be contacted at:

Fay, Spofford & Thorndike
778 Main Street, Suite 8
South Portland, Maine 04106
(207) 775-1121

It is recommended the preparer of the plan be contacted with any particular questions on the design intent or similar issues.

The applicable plans and design documents which apply to the project are:

1. Civil Site Plans Prepared by Fay, Spofford & Thorndike.
2. The Erosion Control/Sedimentation Control Plan for the project.
3. The Stormwater Management Plan for the project.

A copy of these documents should be retained with this manual.

The proposed design may include inlets, stormwater conveyance lines, vortex type pretreatment systems proprietary treatment units, wet ponds, outlet control structures, and backwater isolation valves.

The project is subject to the requirements of the City of Portland Code of Ordinances, Chapter 32. Specifically the post construction stormwater management plan. The City requirements have been reiterated for ease of reference; however, the owner shall be responsible to meet the current City code.

"Any person owning, operating or otherwise having control over a BMP required by a post construction stormwater management plan shall maintain the BMP's in accordance with the approved plan and shall demonstrate compliance with that plan as follows:

(a) Inspections. The owner of operator of a BMP shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMP's, 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) Maintenance and repair. 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) Annual report. 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) Filing fee. Any persons required to file an 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) Right of entry. 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 BMP's."

III. STANDARD INSPECTION/MAINTENANCE DESCRIPTIONS

The following narratives describe the inspection/maintenance provisions for the Stormwater Management system. These O&M procedures will complement scheduled sweeping of the parking deck which are anticipated to occur at least twice per year. Proper O&M is necessary to make sure the system will provide its intended purpose of conveying runoff, removing a substantial amount of the suspended solids, and other contaminants in the stormwater runoff.

A. STORMWATER INLETS

Preface: The success of any stormwater facility relies on the ability to intercept stormwater runoff at the design locations. Stormwater inlets may include catch basins, open culverts, culverts with bar screens, roof scuppers, plaza scuppers, trench drains, and field inlets. Inlets exist throughout the system. The inlets contain oil sorbent booms to capture oil or petroleum/hydrocarbons and avoid discharge to downgradient areas. These will clog over time and require replacement. However, since most of the contributing surface area is rooftop or parking deck, the replacement is anticipated to be infrequent.

Inspection: The inspection of inlet points will need to be coordinated with other maintenance items, these include:

- Parking decks
- Building maintenance areas
- Grounds maintenance

The key elements of the inspection are to assure the inlet entry point is clear of debris and will allow the intended water entry.

Maintenance: The key maintenance is the removal of any blockage which restricts the entry of stormwater to the inlet. The removed material should be taken out of the area of the inlet and placed where it will not reenter the runoff collection system. Snow should be removed from inlets on parking decks or plaza areas. Grass clippings and leaves should be bagged and removed particularly near the yard inlets near the building.

Frequency: All inlets should be inspected on a quarterly basis, and after/during significant storm events. Inspection of the parcel including rooftops and upper level parking decks is required.

Maintenance/Inspection Responsibility:

Maintenance Personnel: The maintenance personnel will perform the normal maintenance/inspections of the inlets and tributary drainage system.

Comments: Maintenance of inlets is critical on this project.

POORLY STABILIZED INLET ALLOWS ENTRANCE OF DEBRIS AND REDUCED CAPACITY

STABILIZED INLETS REDUCE DEBRIS ACCUMULATION AND MAINTAIN DESIGN CAPACITY

B. SORBENT BOOMS

Preface: During construction, sorbent booms will be installed in the catch basins which have pavement areas. The intent of these is to absorb oil and runoff from new pavement surfaces. These will be removed and replaced when construction of the project is complete and should be inspected quarterly for the first year and annually thereafter.

Inspection: The sorbent boom should be raised out of the inlet, inspected, and replaced if necessary. Inspection should occur for the first year and annually thereafter concurrent with the catch basin cleaning.

Recommendation: It is recommended this project have additional sorbent booms or pillows onsite in the event of an unexpected spill or if oil sheen is observed frequently on any inlet.

Maintenance: The inspection and replacement should be conducted as part of a third party O&M contract and require disposal of used sorbent booms as "special wastes".

C. TRIBUTARY DRAINAGE SYSTEM

Preface: Stormwater from most of the project will be directed through a conveyance system which transports the flow to water quality storage units, the vortex based separators, or the City storm drain network. This conveyance system will be principally overland flow discharging to piped drain systems. Most of the sediment is carried by the drainage system is intended to be trapped near the inlets or in pretreatment devices. Maintenance of this system can play a major role in the long-term maintenance costs and the effectiveness of the pond system.

Inspection: The tributary drainage system should be periodically inspected to assure that it is operating as intended, and that its carrying capacity has not been diminished by accumulations of debris and sediment or other hydraulic impediments. On piped systems, the inlets must be inspected to ensure the rims are set at the proper elevation to optimize flow entry and are not clogged with debris. The inlet catch basins are normally equipped with sumps and hooded outlets which will remove gross floatables and large sediment particles from the flow stream.

The level of sediment in the sumps should be checked to assure their effectiveness. Pipelines connecting the inlets should be checked to determine if siltation is occurring. This will be most critical on drain lines laid at minimal slopes. This can usually be accomplished by a light and mirror procedure.

In some projects most of the stormwater is carried in open swales, channels, or ditches. These conveyance channels may be rip rapped or vegetated, depending on the gradient and expected flow velocities. These facilities must be inspected to insure debris or sedimentation does not reduce their carrying capacity. Excess vegetative growth must also be noted. The surface protection for the channels, either stone or vegetation, must be inspected to insure its integrity. Any areas subject to erosion should be noted.

Maintenance: Maintenance of the storm drainage system must assure that it continues to serve its design function on a long-term basis, and that its operation does not transport excessive sedimentation to any downstream detention pond, or the receiving waters. Elevations on the rim of catch basins should be adjusted as needed to assure optimal water entry. Depending on the frost susceptibility of the soil, the rims may become elevated over time causing flow to circumvent the inlet. If a filter bag has been designated for the inlet silt or other deleterious materials, can significantly reduce capacity and the bags should be removed with the sediment and replaced. Catch basin cleaning would normally be accomplished with vacuum trucks contracted as a maintenance service for the retail center. The removed material must be disposed of at an approved site for such materials.

If sediment in the pipeline is observed, it should be removed. This may be accomplished by hydraulic flushing, or by mechanical means. If hydraulic flushing is used the downstream conditions should be analyzed. The tidal influence can aggregate sedimentation since there are periods of no flow. Backwater valves and connection points are intended to reduce this occurrence.

Frequency: The piped drainage system should be inspected on an annual basis. Adjustment of inlet rim elevations should be on an as needed basis. Cleaning catch basin sumps and pipelines will depend on the rate of accumulation.

Maintenance/Inspection Responsibility:

Maintenance Personnel: The Federated Companies Maintenance Personnel.

Special Services: The owner may elect to contract with an independent agent for cleaning of replacement of sorbent booms, catch basins, sumps, and pipelines. Remedial source control measures may be performed by the owner or an outside service depending upon the nature of the particular situation.

Comments: Maintenance of inlets of utmost importance to the project to avoid unintended roof loading, ice accumulation, and cleanliness of the floors of the building.

A WELL STABILIZED VEGETATED SWALE SHOWS LITTLE SIGNS OF EROSIVE VELOCITIES OR FLOWS. THIS SWALE ALSO FUNCTIONS AS A POND SPILLWAY

D. SETTLING TANKS

Preface: In some cases, settling tanks are used ahead of the water quality storage or pretreatment. The units typically have at least a 2:1 length to width ratio and are designed based upon Stokes Law for settlement. The units also have a baffle to retain floatable materials. These units are typically buried with two or three manhole risers at finish grade or access and operate with a relatively deep water depth which is equal to the outlet elevation. The inlet is typically about 3 inches higher. These operate similar to a wet pond sediment sump or a swirl concentrator to capture and reduce the suspended solids before flowing to the storage portion of the management system.

Inspection: A probe or a "sludge judge" can be used to check the depth or sediment in the tank. Typically, the accumulation is highest near the inlet and lowest on the distal end of the tank. If this is not what is observed, it may be necessary to install a tee and vertical drop from the inlet and perhaps some baffles to promote enhanced settlement.

Maintenance: Removal of discernible sediment is recommended. The floatables should be vacuumed from the surface, the clearer water decanted and pumped, and the sediment pumped with a vacuum truck. Dispose of sediment in accordance with local, State, and Federal statutes.

Frequency: Twice per year, unless experience shows little accumulation in which case the frequency can be decreased.

Maintenance Responsibility: The Federated Companies, their assigns, or subcontracted services for SWPP Plan compliance.

E. WATER QUALITY UNITS USING VORTEX BASED DEVICES

Preface: Certain vendors provide pre-manufactured systems which are effective in removal of suspended sediment particularly sand used for winter maintenance. Most units operate on a vortex principal with the sediment being swept from the stormwater stream and stored in the base of the unit. The units are constructed of durable materials requiring little maintenance of the physical component and typically are accessible via an at grade manhole cover.

The vendor of the unit should provide information on suggested maintenance which should be appended to this manual. In certain cases, the vendor will execute an inspection and maintenance agreement for the initial years of operation.

These units typically do not remove nutrients, metals, and dissolved materials.

Inspection: Most water quality units have an access manhole cover for inspection. The sediment storage zone is the bottom of the system and lies below the vortex. Because of the depth, a pole staff, or sludge judge is helpful in determining the depth of the sediment. Inspection should comply with applicable confined space regulations and vendor recommendations.

Maintenance: The typical unit maintenance is the removal of sediment. DeLuca Hoffman Associates, Inc. typically recommends the units be inspected in the spring and late fall with adjustments based on historic operating experience.

The vendor may have specific scheduled maintenance schedules which should be followed.

The structural components of the system are principally stainless steel, concrete, and or climate resistant plastics.

Frequency: Twice per year or as outlined above.

Applicability: Vortex based units are among the devices that may or may not be employed in the final design.

Special Notes: These units are designed for a specific flow and catchment area. If the contributing watershed is increased, the need for design modifications or supplements to the water quality units should be examined.

MAXIMUN IMPERVIOUS TRIBUTARY AREA (ACRES)				
MODEL NUMBER	80% TSS REMOVAL	70% TSS REMOVAL	60% TSS REMOVAL	50% TSS RENOVAL
STC 2400	1.65	2.00	2.50	3.35
STC 3600	2.60	3.15	3.95	5.30
STC 4800	3.60	4.30	5.40	7.25
STC 6000	4.60	5.55	6.95	9.25
STC 7200	5.55	6.70	8.40	11.25

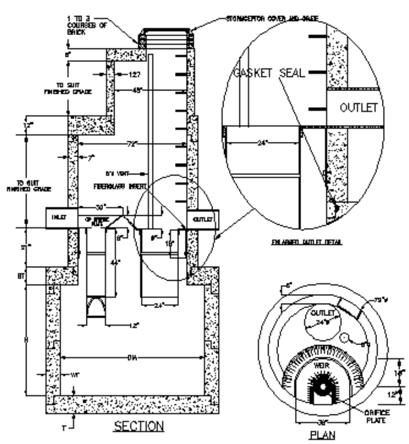
STORMCEPTOR IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS:
Canadian Patent No. 2,009,208
Canadian Patent No. 2,137,942
U.S. Patent No. 4,985,148
U.S. Patent No. 5,498,331
U.S. Patent No. 5,725,760
U.S. Patent No. 5,753,115

Notes :
1. Dimensions may vary regionally due to different manufacturer's.
2. Access way is offset to allow access to the fibreglass bypass slab and to allow inspection and maintenance from the surface.
3. Pipe installation by grouting or flexible boots.
4. Flexible boots may not be suitable for all installations. Please contact your sales representative for further information.
5. 24" outlet to be used for cleanout access to the treatment chamber.
6. Safety grates for the 24" outlet are available.

MODEL NUMBER	STORAGE CAPACITY	ST	H	T	WT	OP	DIA
STC 2400	2400 U.S. GALLONS	13"	60"	10"	9"	8"	96"
STC 3600	3600 U.S. GALLONS	13"	100"	10"	9"	8"	96"
STC 4800	4800 U.S. GALLONS	17"	90"	12"	10"	10"	120"
STC 6000	6000 U.S. GALLONS	17"	112"	12"	10"	10"	120"
STC 7200	7200 U.S. GALLONS	17"	96"	12"	12"	12"	144"

PRECAST CONCRETE STORMCEPTOR DETAIL - LARGE UNIT

N.T.S.



These units are employed for this project for pretreatment and in lieu of a sediment forebay ahead of the pocket (wet) pond.

F. DEWATERING WATER QUALITY STORAGE TANK OR WET PONDS

Preface: Dewatering water quality storage tanks or wet ponds periodically is desirable in order to check sediment accumulations, side slope conditions and debris accumulation. Typically, dewatering will not be required for water quality storage areas if the outlet control structure is functioning properly. However, wet ponds (if used) will require dewatering.

Dewatering should be done under dry conditions.

Inspection: The purpose of dewatering is to allow observation of sediment buildup and the accumulation of debris. Pump suction should be kept above the sediment level to minimize silt transfer. Filter fabric over the suction or a stone sump may be required to prevent excessive silt from being discharged. The pumping rate should be designed by a professional engineer if over 50 gallons per minute.

Upon draining the tank or pond, the sediment level should be measured at multiple locations to determine a representative depth.

Maintenance: If the volume of sediment recorded exceeds 5% of the normal operating volume designated for water quality storage or 15% of the volume of a wet pond, the sediment should be removed. Prior to removal, the material should be sampled and analyzed in accordance with current practice as promulgated by appropriate regulatory agencies. Upon documentation of its chemical characteristics, the material should be removed by appropriate means for trucking from the site. Disposal of removed material must be in compliance with all regulatory requirements which will vary with the documented characteristics with material. Guidance should be sought from appropriate regulatory agencies.

Frequency: Draining and inspection should be made after the first three years of operation. The rate of recorded sediment buildup will then be utilized to schedule subsequent drainings. Sediment removal will be accomplished when the sediment occupies 5% of the normal water quality storage volume or 15% of the normal wet pond operating volume. Sediment removal once every 15 to 20 years may be expected in most instances. Upon completion of sediment removal, a survey should be accomplished to document pond shape and elevation or depths of storage capacity.

POND HAS BEEN DRAINED TO ALLOW REMOVAL OF SEDIMENTS ACCUMULATED DURING CONSTRUCTION

Comments: If a wet pond is used, it would have a Linear Low-Density Polyethylene Liner. If the pond is excavated to remove sediment, the liner may be damaged. It is recommended the liner specialists be consulted prior to excavation for repair solutions and monitoring.

RECENTLY CONSTRUCTED WET POND

Note: Permanent pool elevation is maintained to allow settlement of suspended solids.

G. CONTROL STRUCTURES

Preface: If water quality measures do not meet the Site Location of Development Permit standards, outlet control structures will be required. These structures regulate the slow discharge of the water quality volume to meet MeDEP Chapter 500 Standards. Flow is anticipated to be released during and every storm event over about 0.10 inches.

The control structure will be designed to be inspected by removing the manhole covers and inspection of the orifices, weir, and channels. Debris should be removed whenever observed and reported to key maintenance personnel since any debris would indicate lack of proper system O&M in the collection and conveyance system. Entry may require CONFINED SPACE ENTRY procedures and appropriately trained personnel.

Inspection: The outlet control structures must be inspected to assure it maintains its intended hydraulic characteristics. The inspection would note any debris or sediment which may accumulate in the structure and in the inlet and outlet pipes. It is noted that it does not take much debris or silt to alter the hydraulic characteristics of the discharge. The inlet should be inspected to assure it is not blocked or restricted or there is sediment to the extent that its flow characteristics may be altered.

Maintenance: Maintenance of the control structure will consist primarily of removing debris which may accumulate and sealing the bulkhead if leakage occurs.

Frequency: The control structure should be inspected quarterly, and after a rainfall event (in excess of 1½ inches in a 24-hour period).

Maintenance/Inspection Responsibility:

Inspection Personnel: The Maintenance Personnel of The Federated Companies will perform the scheduled maintenance/inspection.

Dates of inspections, maintenance performed, and any observed problems should be noted in the logs/records maintained by The Federated Companies

Outside Contract Services: The outlet structure should be opened/inspected by the Maintenance Personnel of The Federated Companies on a quarterly basis. The logs and records of inspections and maintenance of the control structures should also be reviewed by the contract agent if The Federated Companies elects to retain an outside agent for assistance in operation and maintenance of the system.

Replacement Parts/Repairs: No normal replacement parts are repaired. Inspection personnel should have a bucket to remove debris from the structure. If leakage of the bulkhead occurs, it is recommended that repairs be made by a professional contractor familiar with hydraulic grouts. If clogging of small orifices occur, it may be necessary to add a protective vertical grate to reduce the frequency of clogging. However, water is generally filtered before the release through very small outlet orifices (StormFilters® or under drains).

VEGETATION PROVIDES WATER QUALITY TREATMENT AND AESTHETIC ENHANCEMENT OF THE POND

H. IN-LINE STORAGE

Preface: In-line storage may be used for strict detention, storage of water ahead of infiltration systems, for buried under drained filters or proprietary treatment system. Because of the difficulty in access for inspection and maintenance, the units will be preceded with pretreatment to remove sediment.

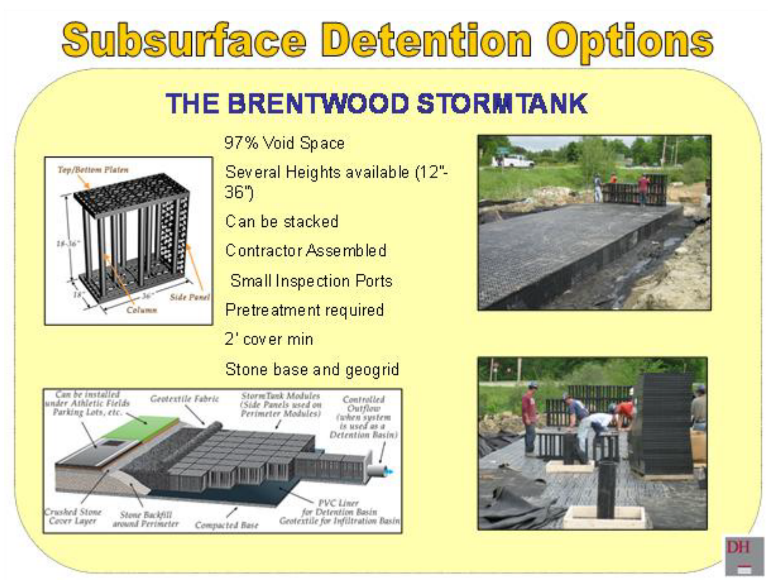
The underground storage options for this project include buried Brentwood Storm Tanks or buried reinforced Portland Cement Concrete tanks or water quality treatment ahead of water quality treatment units.

In-line storage systems typically have a restrictive outlet when used for detention. This outlet is a separate downstream appurtenance with orifices, weirs, and overflows. The stone storage above the exfiltration surfaces do not have hydraulic restrictions and the disbursement of flow is actually preferred.

Specific design cautions should be considered if in line storage is used as part of a stormwater management system. In-line storage systems have multiple inspection ports. The locations should consider the need for confined space entry.

Inspection: Inspection of in-line storage systems should follow all protocols for confined space entry. Inspections should include:

- Observations of standing water and monitoring drainage to make sure drainage is achieved 48 hours after a rainfall of 1 inches or greater (annually).
- Sedimentation
- Outlet Controls
- Inlets
- Inspection of each isolated tank series, run of pipe, distribution of manhole, and header pipe



Maintenance: Maintenance of in-line storage systems will vary depending upon the extent of pretreatment, the nature of the receiving bodies, and the design. Leakage, accumulated sediment, and repairs of any damaged portion of the system should be performed immediately upon discovery.

Maintaining Responsibility: The Federated Companies, their assigns, or subcontracted services for SWPP Plan compliance.

Frequency: After successful operation of the in-line storage system for one year or two major storms (whichever is longer), quarterly inspections are recommended **except the**

drawdown test after a one-inch rain may be annually only. Maintenance repairs should be performed as soon as possible.

Applicability: Underground detention will be employed on this project for recharge and to reduce discharge rates.

I. STORMTREAT™ UNITS

During the first year, the basin should be inspected semi-annually and following major storm events. Recommended maintenance procedures for the first year are as follows:

- Watering may be necessary to aid plant establishment if rainfall intervals are longer than one week;
- Debris and weeds shall be removed from the bio-filter area as needed;
- Tank lids should be removed and sediment depth checked and recorded;
- Maintenance schedule should be designed based on the sediment loading of the first maintenance visits;
- Sediment should be removed at or before reaching a depth of 5 inches;
- Outflow rate should be checked and reset if necessary; (recommend 2 gpm per tank)
- Perimeter plants should be trimmed or harvested periodically to a minimum height of 6 inches.

The operation and maintenance of the StormTreat™ System, after the first year, is limited to semi-annual inspections and solids removal on an as-needed basis.

The annual inspections should include the following steps:

1. Check the discharge flow rate: The outlet is designed to discharge at a rate of 2.0 gallons/minute per tank. This provides for a retention time of approximately three days for the full tank to empty following a runoff event. The discharge rate can be checked by directly measuring a timed-discharge volume if the outlet is "daylighted" or through "falling-level" measurements inside the central sedimentation chambers (the total static volume of each tank is 1,390 gallons and the height of the tank is 4 feet, therefore a 2.0 gallons/minute discharge rate can be observed as the water level in the tank falling at a rate of one inch per hour). If the falling level test is used, the inlet pipe must be temporarily plugged to avoid filling the underground storage chambers.

2. Change the inlet grit filter inside the sedimentation chamber.

3. Measure sediment depth inside the sedimentation chamber and schedule a pump-out if depth reaches 6 inches in depth. A future pump-out date can be estimated by projecting based upon sediment accumulation rates since the last measurement or since original installation. On average, StormTreat™ Systems need to have sediment removed once every three years. This can be done using a standard septic system suction pumper or with a vacuum-pumping unit.

4. Observe wetland plant conditions and height (during growing season). Wetland plants may need to be supplemented during the first three growing seasons depending upon local site conditions.

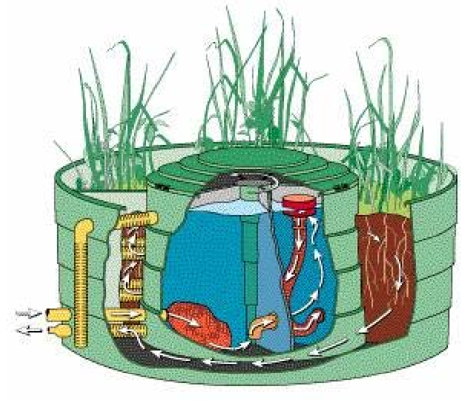
5. Perform (maintenance of) pretreatment devices as required in this manual.

The Federated Companies, their assigns, or subcontracted services for SWPP Plan compliance.

Frequency: Semi-annually or as outlined above.

Applicability: StormTreat™ units are proposed for this project.

Special Note: 1.) These units are designed for a specific flow and catchment area. If the contributing watershed is increased, the need for design modifications or additional StormTreat™ units should be examined. 2.) Fertilization of the planting on the structure must be avoided.



J. FILTERRA® UNITS

Preface: The Filterra units consist of a concrete container with an underdrain at the base, proprietary filtration media, a top layer of mulch and plants specifically selected for nutrient transformation and uptake. Access is provided through a surficial tree grate. Water enters through a curb inlet and discharges through the underdrain at the base of the tank. The Filterra tree box type soil filter is installed upstream of a StormTech Isolator Row to filter pollutants from runoff.

Inspection: Inspection of the Filterra unit should include review of the health and condition of the plant material, the surficial mulch for degradation and accumulation of debris and litter, and the curb inlet for clogging and debris. The access manholes and inspection ports on the Isolator Row should be inspected for evidence of clogging and sediment build-up.

Maintenance: Prune plant material during the spring and fall and replace top layer of mulch annually. The first year's maintenance on the Filterra unit shall be provided by the Manufacturer to ensure the systems are operating as intended. Ongoing inspection and maintenance shall be performed by a professional with knowledge of erosion and stormwater control, including a working knowledge of the Filterra and StormTech products.

Frequency: Inspect quarterly and at any time when sustained ponding is observed near the inlet.

Maintenance/Inspection Responsibility:

Maintenance Personnel: midtown project

Comments: Maintenance of units are critical on this project to prevent short term clogging and replacement.

Applicability: There is one Filterra unit for the project.

K. STORMFILTER® UNITS

Preface: The CONTECH StormFilter® is a water quality treatment device which relies on a proprietary filter cartridge to remove pollutants. The filter must be inspected and maintained annually to prevent sediment accumulation from blocking the flow through the device.

Inspection: At least one scheduled inspection activity should take place per year with maintenance following as warranted.

First, inspection should be done before the winter season. During which, the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, maintenance should be performed during periods of dry weather.

In addition, you should check the condition of the StormFilter® unit after major storms for potential damage caused by high flows and for high sediment accumulation. It may be necessary to adjust the inspection/maintenance activity schedule depending on the actual operating conditions encountered by the system.

Generally, inspection activities can be conducted at any time, and maintenance should occur when flows into the system are unlikely.

It is desirable to inspect during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH immediately.

To conduct an inspection:

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.

5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

Maintenance: The need for maintenance is typically based on results of the inspection. Use the following as a general guide. (Other factors, such as regulatory requirements, may need to be considered).

1. Sediment loading on the vault floor. If >4" of accumulated sediment, then go to maintenance.
2. Sediment loading on top of the cartridge. If > 1/4" of accumulation, then go to maintenance.
3. Submerged cartridges. If >4" of static water in the cartridge bay for more than 24 hrs after end of rain event, then go to maintenance.
4. Plugged media. If pore space between media granules is absent, then go to maintenance.
5. Bypass condition. If inspection is conducted during an average rain fall event and StormFilter® remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), then go to maintenance.
6. Hazardous material release. If hazardous material release (automotive fluids or other) is reported, then go to maintenance.
7. Pronounced scum line. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, then go to maintenance.
8. Calendar lifecycle. If system has not been maintained for 3 years, then go to maintenance.

   Assumptions:

   - No rainfall for 24 hours or more.
   - No upstream detention (at least not draining into StormFilter®).
   - Structure is online. Outlet pipe is clear of obstruction. Construction bypass is plugged.

Depending on the configuration of the particular system, workers will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flow is occurring.

Replacement cartridges can be delivered to the site or customers' facility. Contact CONTECH for more information.

Warning: In the case of a spill, the worker should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH immediately.

To conduct cartridge replacement and sediment removal:

1. If applicable, set up safety equipment to protect workers and pedestrians from site hazards.
2. Visually inspect the external conditions of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs each) and set aside.
7. Remove used cartridges from the vault using of the following methods:

   Method 1:

   A. This activity will require that workers enter the vault to remove the cartridges from the under drain manifold and place them underdrain manifold and place them under the vault opening for lifting (removal). Unscrew (counterclockwise rotations) each filter cartridge from the underdrain connector. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

      Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact CONTECH for suggested attachment devices.

      Important: Cartridges contain leaf media (CSF) do not require unscrewing from their connectors. Do not damage the manifold connectors. They should remain installed in the manifold and can be capped during the maintenance activity to prevent sediments from entering the underdrain manifold.

   B. Removed the used cartridges (up to 250 lbs) from the vault.

      Important: Avoid damaging the cartridges during removal and installation.

   C. Set the used cartridge aside or load onto the hauling truck.

   D. Continue Steps A through C until all cartridges have been removed.

Method 2:

A. Enter the vault using appropriate confined space protocols.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood screws (3) hood and float.

D. At location under structure access, tip the cartridge on its side.

   Important: Note that cartridges containing media other than the leaf media require unscrewing from their threaded connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and capped if necessary.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps A through E until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. Use vacuum truck for highest effectiveness.

9. Once the sediments are removed, assess the condition of the vault and the connectors. The connectors are short sections of 2-inch schedule 40 PVC, or threaded schedule 80 PVC that should protrude about 1" above the floor of the vault. Lightly wash down the vault interior.

   a. If desired, apply a light coating of FDA approved silicon lube to the outside of the exposed portion of the connectors. This ensures a watertight connection between the cartridge and the drainage pipe.

   b. Replace any damaged connectors.

10. Using a vacuum truck boom, crane, or tripod, lower and install the new cartridges. Take care not to damage connections.

11. Close and fasten the door.

12. Remove safety equipment.

13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used empty cartridges to CONTECH.

Material Disposal: The accumulated sediment must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals. Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with applicable waste disposal regulations. Coordinate disposal of solids and liquids as part of your maintenance procedure. Contact the local public works department to inquire how they dispose of their street waste residuals.

L. BACKWATER VALVES

Preface: The purpose of the backwater valves is to avoid unnecessary periods of slow velocities in the drainage pipelines, protect water quality storage systems, and certain proprietary devices including planted systems that function better without substantial saltwater mixing.

Inspection: The backwater valve can be inspected during periods without rainfall and rising tides. Manholes both upstream and downstream of the backwater valves can be inspected to determine if there is backwater caused by rising tides. A measurement of water depth or depth to water can be taken near the beginning of the rising tide cycle and a couple hours later and in advance of high tide. Increased water depths would indicate the valve may not be functioning properly.

Maintenance: If the backwater valve is not functioning as intended, maintenance will be required. This could include removing debris that prohibits the valve from seating or damage to the hinge mechanism. The project submittal drawings for the backwater valves should be attached to this manual and reviewed to see if any special maintenance is required by the manufacturer of the valve.

Frequency: Annually.

M. PARKING DECK

To protect the stormwater system, the parking decks should be swept at mid winter and spring and power washing with an appropriate vacuum/power wash vehicle once a year.

Maintenance: It is recommended this service be contract with the firm that maintains the other stormwater management facilities.

M. LITTER

Litter should be removed as a matter of course by workers and a part of the grounds maintenance contract.

N. STORMWATER PUMPS

Preface: Storm water pumps are considered an option for pumping the water quality volume and potentially for dewatering of pits and below grade tanks. These pumps may be permanent (sumps or designated water quality pumps) or temporary and used for occasional drawdown of storm water tanks.

If the pumps are permanent, it is recommended:

- The pumps have slide rails for removal if the water depth is over 3 feet;
- The control panels record events and elapsed time; and
- If the pumps are for protection of building related mechanical systems, provisions be afforded for a connection to an emergency generator.

The project shop drawings and submittals will include information on the operation and maintenance for the pump.

Inspection: Any alarm events and quarterly inspection including recording the total running hours and events from the control panel warrant an inspection. If the run time, events, or alarm condition warrant, the pump should be removed and inspected. Also, refer to the pump manufacturers O&M manual.

Frequency: See inspection recommendations.

Maintenance Responsibility: The Federated Company, their assigns, or subcontracted services for SWPP Plan compliance.

O. SUMMARY CHECKLIST

The above described inspection and maintenance items have been summarized on a checklist attached hereto as Attachment C.

IV. PROGRAM ADMINISTRATION

A. GENERAL

A reliable administrative structure must be established to assure implementation of the maintenance programs described in the foregoing section. Key factors that must be considered in establishing a responsive administrative structure include:

1. Administrative body must be responsible for long-term operation and maintenance of the facilities.

2. Administrative body must have the financial resources to accomplish the inspection and maintenance program over the life of the facility.

3. The administrative body must have a responsible administrator to manage the inspection and maintenance programs.

4. The administrative body must have the staff to accomplish the inspection and maintenance programs, or must have authority to contract for the required services.

5. The administrative body must have a management information system sufficient to file, retain, and retrieve all inspection and maintenance records associated with the inspection and maintenance programs.

6. ***A qualified post construction inspector shall be retained by the Owner. His duties shall include preparing schedules for the Owner's maintenance, summarizing the results of this maintenance and preparing an annual report on the operation, maintenance, and repair of the stormwater system which must be copied to the City. (The Owner shall be responsible for retaining a separate entity to perform maintenance which cannot be performed by the management of building and property grounds.) This person shall also participate in troubleshooting of the stormwater management system if a problem develops.***

If any of the above criteria cannot be met by the entity assigned inspection and maintenance responsibilities, it is likely that the system will fail to meet its water quality objectives at some point during its life. While each of the above criteria may be met by a variety of formats, it is critical to clearly establish the assigned administrative body in a responsible and sustainable manner.

B. **<u>RECORD KEEPING</u>**

Records of all inspections and maintenance work accomplished must be kept and maintained to document facility operations. These records should be filed and retained for a minimum 5-year time span. The filing system should be capable of ready retrieval of data for periodic reviews by appropriate regulatory bodies. Where possible, copies of such records should also be filed with the designated primary regulatory agency for their review for compliance with permit conditions. Typical inspection and maintenance record forms are attached hereto as Attachment B.

C. **<u>CONTRACT SERVICES</u>**

In some instances or at specific times, the Maintenance Personnel may not have the staff to conduct the required inspection and/or maintenance programs as outlined in this document. In such cases, the work should be accomplished on a contractual basis with a firm or organization that has the staff and equipment to accomplish the required work.

The service contract for inspection and maintenance should be formal, well written legal document which clearly defines the services to be provided, the contractual conditions that will apply, and detailed payment schedules. Liability insurance should be required in all contracts.

REVISED TEXT TO OPERATION & MAINTENANCE MANAUL (ATTACHED TO RESPONSE TO WOODARD & CURRAN'S COMMENTS)

NOTE: THE REVISED TEXT ABOVE IS PROVIDED IN BOLD FACE AND ITALIZED TEXT

<u>ATTACHMENT A</u>

Sample Inspection Logs

midtown
PORTLAND, MAINE

STORMWATER MANAGEMENT
WATER QUALITY STORAGE OR WET POND
ANNUAL INSPECTION & MAINTENANCE LOG

FACILITY:		**YEAR:**	
LOCATION:		**CONTRACTOR:**	
FUNCTION:		**INSPECTOR:**	
DATE OF INSPECTION:			
ITEM IDENTIFICATION	**DESCRIPTION OF CONDITIONS**	**MAINTENANCE ACCOMPLISHED**	**DATE OF MAINTENANCE**
GENERAL COMMENTS:			

SAMPLE

midtown
PORTLAND, MAINE

STORMWATER MANAGEMENT
STORAGE AREA
MONTHLY INSPECTION & MAINTENANCE LOG

FACILITY:			YEAR:			
LOCATION:			CONTRACTOR:			
FUNCTION:						
				OVERFLOW WEIR		
MONTH	DAY	INSPECTOR	WATER DEPTH	CLEAR	DEBRIS	WEIR CONDITION
JANUARY						
FEBRUARY						
MARCH						
APRIL						
MAY						
JUNE						
JULY						
AUGUST						
SEPTEMBER						
OCTOBER						
NOVEMBER						
DECEMBER						
LIST SPECIAL MAINTENANCE UNDERTAKEN:						

midtown
PORTLAND, MAINE

STORMWATER MANAGEMENT
STORAGE
SEMI-ANNUAL INSPECTION & MAINTENANCE LOG

SEMI-ANNUAL INSPECT 1.2	FACILITY:
DATE:	LOCATION:
INSPECTOR:	FUNCTION:
WEIR CONDITION:	
OUTLET CONDITION	

FORE BAY SUMP	EST. DEPTH SED.	REMOVED? Y/N	EST. VOL. CY	WHERE DISPOSED OF	STRUCTURAL CONDITION

CONTROL STRUCTURE:
DESCRIBE CONDITIONS FOUND & MAINTENANCE ACCOMPLISHED:

<u>ATTACHMENT B</u>

Permits for Project

(To be Added at a Subsequent Time)

ATTACHMENT C

Summary Checklist
Inspection and Maintenance

Stormwater Management System Maintenance Program Summary Checklist						
Item	**Commentary**	**Frequency**				
		Monthly	**Quarterly**	**Semi-Annual**	**Annual**	**Long Term**
Stormwater Inlets	Stormwater inlets allow flow entry from a surface swale to a piped system. Entry may or may not be equipped with a bar rack. Inspect entry for debris accumulation. Remove debris to allow unimpeded entry. Lawn clippings and leaves should be removed from yard areas.		X		X Clearing	
Sorbent Booms	Sorbent boom should be raised out of the inlet, inspected, and replaced if necessary.		X For 1st 12 months		X After 1st year	
Tributary Drainage System	Inspect to assure that the carrying capacity has not been diminished by debris, sediment or other hydraulic impediments.				X	
Settling Tanks	Remove discernible sediment.			X		
Water Quality Units using Vortex Based Devices	Solids removal on an as-needed basis.				X	
Dewatering Water Quality Storage Tank or Wet Ponds	Biofilter should be inspected when normal landscape maintenance is performed. Remove and replace dead vegetation. Remove sediment when it occupies 15% of volume; For wet ponds – 5% for water quality	X		X		X 10-15 yrs
Control Structures	Inspect outlet control to assure it maintains its hydraulic characteristics. Inspect inlets for blockage.		X			
In-Line Storage (Underground detention)	Inspect for standing water, sedimentation, outlet control, inlets.					
StormTreat™ Units	Check units for debris			X After 1st year	X For 1st year	
Filterra® Units	Inspect quarterly and at any time when sustained ponding is observed near the inlet. Inspect landscaping and replace mulch.		X		X	
StormFilter® Units	First inspection before winter season Second inspection, if warranted, during periods of dry weather. Check units after major storm events				X	
Backwater Valves						
Parking Deck	Parking decks should be swept at mid winter and spring. Power washing with an appropriate vacuum/power wash vehicle be done once a year.			X	X	
Litter	Litter should be removed daily.					
Stormwater Pumps		X				

<u>ATTACHMENT D</u>

Pump Maintenance History

PUMP MAINTENANCE HISTORY

PUMP NO.____

LOCATION:____

EVENT NO.____

DATE	TOTAL RUNNING HOURS	RUNNING HOURS THIS PERIOD	EQUIVALENT ARRIVAL RATE	EVENTS	EVENTS THIS PERIOD	EQUIVALENT ANNUAL NO.	MAINTENANCE PERFORMED	PART(S) USED	SYMBOL NUMBER(S)

**PUMP MANUAL TO BE APPENDED (IF APPLICABLE)
SHOULD RECOMMEND TO ADD UPON RECEIPT FROM
CONTRACTOR DURING SUBMITTAL REVIEWS AND
PRIOR TO OCCUPANCY OF THE BUILDING**