

**SUPPLEMENTAL STORMWATER MANAGEMENT REPORT  
FOR HOTEL (LOT 6) LEVEL III SITE PLAN APPLICATION  
(GENERAL AND BASIC STANDARDS)**

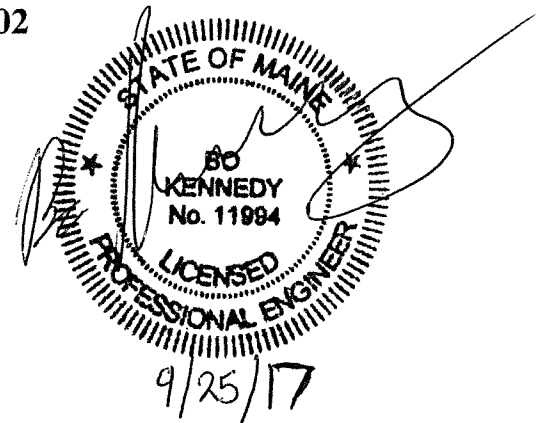
**THE FOREFRONT AT THOMPSON'S POINT  
FOREFRONT HOTEL  
PORTLAND, ME**

**PREPARED FOR:**

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**SEPTEMBER 2017**

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## **SUPPLEMENTAL STORMWATER MANAGEMENT REPORT**

### **1.0 Introduction**

The proposed hotel is depicted on the Master Development Plan (approved Jan. 2015) and more specifically referenced on the Overall Subdivision Plan (approved January 12, 2016) in a linear configuration on development lots 4 & 5. The proposed hotel as presented here-in is configured in an L shape on development lot 6 in place of the previously contemplated educational building. The hotel plans contained in a standalone City of Portland Level III site plan application dated September 25, 2017 provides additional construction details and refines another area of the evolving Master Development Plan.

This supplemental report relies upon assumptions and design approaches previously discussed and approved as part of previous Stormwater Management Reports associated with The Forefront at Thompson's Point Master Development Plan Application, Subdivision Application, and Level II or III Site Plan applications. Some of these assumptions pertinent to this report include but are not limited the following list:

- A waiver from the Flooding Standards was previously approved;
- A waiver from Channel Protection requirements (such as isolator row requirements associated with Filterra Treebox filters or additional detention associated with FocalPoint systems) was previously approved; and
- Prorated treatment credits for treatment of stormwater runoff from on-site existing impervious surfaces (MeDEP Chapter 500 rules dated 2010) that have been retained (primarily consisting of renovated buildings) are applicable to the overall treatment percentage computation.

This supplemental report details the stormwater management systems proposed for the site plan improvements associated with the Forefront Hotel at Thompson's Point as well as demonstrates the integration of stormwater treatment and conveyance infrastructure approved under the Master Development and Subdivision Plans Stormwater Management Strategy. The enclosed computations show that this phase of the project has been designed to meet the Portland Stormwater Management Standards adopted 7/19/10, General Stormwater Standards of MeDEP (revised 2015), and Maine Stormwater Management Design Manual Technical Design Manual (Dated May 2016) and are consistent with the overall goals presented in previous Stormwater Reports. The intent and principals of the stormwater management design, erosion and sediment control, and Inspection and Maintenance Manual have remained the same as approved in June 5, 2012 and include full compliance with Chapter 32 of the City's Technical Manual Stormwater rules and Chapter 500 of the MeDEP Stormwater law.

This phase of the project will have a cumulative redeveloped area of 1.46 acres of which 1.14 acres are newly constructed impervious surfaces.

### **2.0 Stormwater Management Zone Revisions**

This supplemental report summarizes the changes to the water quality treatment zones and provides detailed land cover computations of development tributary to the respective stormwater management systems sized to convey and treat stormwater runoff from the proposed re-development.

The proposed hotel site plan is divided into two major drainage discharge zones identified as Zone D and Zone C on the Overall Stormwater Management Plan C-4.1 dated 09.16.16 and

approved under the Subdivision application. The Stormwater Management Zones are organized and labeled based on tributary treatment area and discharge location.

A portion of the property between the new hotel building and the existing Brick South building will be an improved event lawn area with patio and walkways as well as and a portion of the existing Brick South Roof drains to the Zone D discharge. The drainage infrastructure from this subcatchment (D27) will be connected to an existing 12” storm drain stub installed as part of the roadway constructed during the summer of 2017 and discharge to the Fore River through an existing 36” SD pipe labeled as D0.

The new hotel roof (including a potential future expansion area), driveway loop, and adjacent pedestrian alley will be collected in a closed storm drainage system and discharge to a new storm drainage trunk line identified as Zone C on the Overall Stormwater Management Plan C-4.1 dated 09.16.16 and approved under the Subdivision application. The Zone C discharge will be a newly constructed piece of infrastructure discharging to the Fore River on the easterly side of the Thompson’s Point peninsula. The trunk line is sized to accommodate stormwater runoff from stormwater management zones C and B.

The area of proposed development included with this application affects the zones and subzones identified on the Overall Stormwater Management Plan as Zone D and C and summarized in Table 1 below:

<b>Subdivision Plan Discharge Zone ID</b>	<b>CB Inlet ID</b>	<b>Description of Change</b>
C – 501	C15A (roof)	The proposed roof area has been adjusted to reflect the currently proposed building size. The roof area has been broken into two drainage areas shown to minimize length of internal roof drainage piping. A portion of this area previously shown as roof will be developed as driveway and drain to Catch basin C7.
C – 502	D27	The developed area between the two buildings has been redirected to drainage to Zone D so it does not need to pass under the building.
C – 503	C-15B	This is the easterly portion of the proposed roof.
C - 703	C9 thru C13	The pedestrian alley drainage area discharging to Zone C has grown in size and will enter through a series of inlets with-in the hardscape. The larger Zone C area will reduce the overall size shown to be part of Zone B area 403.
B – 403	C 14	A portion of the Zone B area 403 that has been regraded to drain to Zone C.
C – 1	D27 and C13	A portion of the Brick South Building area previously included entirely in Zone C is now included in both Zone D and C treatment areas.

The C-5.1 Stormwater Management Plan – 1 shows the updated stormwater management zones and proposed stormwater infrastructure and is attached in Appendix E. An updated Water Quality Treatment table is shown on plan Sheet C-5.2 Stormwater Management Plan-2 and enclosed in Appendix D.

### 3.0 Stormwater Quality Treatment (General Standards)

#### 3.1 Zone D (Event Lawn and Brick South Roof):

##### Zone D – Area D27

The stormwater treatment approach to this subcatchment utilizes a proprietary high-performance bio-filtration system known as FocalPoint manufactured and distributed by ACF Environmental. The proposed FocalPoint system has been sized and configured in accordance with the preapproval letter from Maine DEP to ACF Environmental dated February 2, 2017 and enclosed for reference in Appendix A. A FocalPoint system is required to be sized based on three main criteria:

- 174 SF of filter area per prorated acre based on MeDEP Chapter 500 prescribed water quality of volume of 1” from all impervious surfaces and 0.4” from all pervious surfaces;
- Storage volume provided for a 0.95-inch Type III 24-hr rainfall event; and
- Flow rate (CFS) from 1 yr-24 hr storm

The resultant sizing computations are detailed in Appendix D and conclude a minimum filter surface of 86 Sq. Ft. and 7 Cultec 150XLHD (or approved equal) separator chambers are required. The design layout specifies a 96 Sq. Ft filter and 7 Cultec 150XLHD (or approved equal) are used. The additional 10 Sq. Ft. of filter area will provide two functions:

- City of Portland Stormwater Fee Credits - Immediately, the system is oversized such that additional City of Portland Stormwater Fee Credits can be applied to the owner’s monthly bill.
- Future Design Changes - Secondly, should the event lawn area design change to include a higher percentage of impervious area. The oversized filter area equates to the conversion of approximately 2,175 Sq. Ft. of pervious surface to impervious surface and still meet all the design standards.

The proposed FocalPoint design considers ground water protection measures in the construction details as shown on the plan sheets Stormwater Details FocalPoint Separator Row C-7.3 & Stormwater Details FocalPoint System Details C-7.4 of the Level III Site Plan set. Separation of stormwater runoff from groundwater is a requirement of the MeDEP VRAP Groundwater Management Work Plan prepared by Credere Associates. The construction details provide for a separation between ground water and stormwater runoff passing through the FocalPoint system by wrapping the filter and adjacent separator row chambers with a heavy duty 30 mil PVC impervious liner.

The FocalPoint filter is considered adequate to meet and exceed the Chapter 500 General Standards for water quality treatment.

#### 3.2 Zone C (Hotel Roof, Driveway, Landscaping, and Pedestrian Hardscapes):

##### Zone C - Areas C7 thru C15

The Zone C subcatchment areas numbered C7 through C15 associated with the Hotel Site Plan are tributary to a Contech Jellyfish™ Treatment Unit.

Jellyfish™ units are precast concrete manholes that utilize membrane filtration treatment cartridges. Flow enters the Jellyfish™ from an upstream storage chamber system and flows into a

settling tank portion of the unit. Once the settling tank is filled, flow from the bottom of the tank is forced up through hi-flow cartridges and continues to the outlet on the by-pass conveyance trunk line. A baffle wall is located between the inlet and outlet compartments to ensure that untreated flow from small storm events is not mixed with treated flow. When the hi-flow treatment cartridge has filled, a drain down cartridge(s) is activated treating the remaining water quality volume. Horizontal orifices are located on top of the cartridges to control the outflow of the system. Each Jellyfish™ cartridge unit is designed to discharge the water quality volume at a rate not to exceed 80 GPM/cartridge.

To meet Chapter 500, the Water Quality Volume provided with-in a Jellyfish™ System must be equal to or greater than the following:

$$1''/12 \times \text{impervious area} + 0.4''/12 \times \text{landscaped area} = \text{Water Quality Volume (cubic feet)}$$

Computations of Water Quality Volume for Zone C can be found in Appendix D. It is noted that the Zone C Jellyfish™ system is oversized to accommodate a potential future building expansion.

The water quality volume is provided in a subsurface arched chamber storage system. This portion of the design is identical to the system installed as part of the Brick North and Brick South development projects.

Jellyfish™ units are designed based on a mass sediment loading calculation. Each treatment hi-flow cartridge has a mass capacity of 125 lbs and each low-flow (draindown) cartridge has a capacity of 63 lbs. The mass loading for each zone was determined by Maine DEP sediment loading standards, assuming a 50% sediment removal from a designed pre-treatment StormTech® Isolator row.

Discharge from larger storm events are controlled over a broad crested weir housed in a precast concrete outlet control structure set above the water quality volume. The overflow piping network is sized to handle runoff from a 25-year storm event. A rain event exceeding the storm drainage network would likely flood the catch basin inlet, into the parking lot and over the curb line to the river.

Pretreatment for flow entering from all inlet pipes to the storage area will be provided via the installation of a StormTech® Isolator row(s).

Therefore, water quality goals for the Jellyfish™ Proprietary Systems meet the General Stormwater Standards of the November 2005 Chapter 500 Rules of MeDEP (rev. January 2015).

The Jellyfish™ treatment systems and Filterra® are considered adequate to meet the Chapter 500 General Standards.

#### **4.0 Conclusion**

The stormwater management strategy for this phase of the project presented herein are consistent with the Master Development Plan and Subdivision Plan Strategies. The overall Thompson's Point stormwater management strategy provides a blue print for treating a minimum of 95% of the net new redeveloped impervious area and 80% of the net new developed area. This phase of the amended site plan treats greater than 100% or 1.64 ac of the 1.46 ac. redeveloped area and greater than 100% or 1.33 ac. of the 1.14 ac. redeveloped impervious area. When a 60% credit is taken for the treatment of a portion of the existing Brick South Building the Hotel Phase of the amended site plan treats 112.64% of the net developed area and 116.15% of the net developed impervious area. The individual systems have been adjusted to accommodate current detailed site

plan revisions but ultimately the design strategies remain the same and meets or exceeds the City of Portland Stormwater Management Requirements.

## **5.0 Appendices**

Appendix A – FocalPoint Approval and Sizing letter from MeDEP

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## **APPENDIX A**

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### **FocalPoint Approval and Sizing letter from MeDEP**





STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



PAUL R. LEPAGE  
GOVERNOR

PAUL MERCER  
COMMISSIONER

February 2, 2017

Stormwater Systems ACF-Convergent Water Technologies Alliance  
23 Faith Drive  
Gorham, ME 04038  
ATTN: Robert Woodman and Scott Gorneau

Dear Mr. Woodman and Mr. Gorneau:

This letter replaces the May 16, 2016 approval from the Department of Environmental Protection (Department) that authorized the use of the FocalPoint system. The FocalPoint system (a high performance modular biofiltration system), when installed in series with a subsurface chamber-based treatment row, meets the requirements of the General Standards (Section 4.C.) of the Stormwater Management Rules (Chapter 500), provided that the system is filled with the FocalPoint engineered filter media; it is sized to meet the requirements of the General Standards (Section 4.B.); and it is installed, operated and maintained in accordance with the following provisions:

1. The FocalPoint system must be sized in accordance with the manufacturer's latest field test results with the goal of treating 90% of the annual runoff volume. To accomplish this, the system must be modelled in HydroCAD (or similar TR-55 modelling software) to demonstrate that the entire volume of a 0.95 inch Type III 24-hr storm is treated prior to activation of the bypass/overflow (typically set at 6" to 12" above the mulch surface). When sizing the FocalPoint system to meet Chapter 500, note that runoff from the entire contributing drainage area, including pervious areas, must be included in the modeled runoff values.
2. The surface area of the media within the FocalPoint must be a minimum of 174 square feet per 1 acre of impervious area treated (26 sq. ft. per 0.15 acres). The thickness of the media is to be no less than 1.5 ft. (18 inches) and the ratio of the surface area of the filter media bed in square feet to the ponding volume in cubic feet must be no less than 1 to 5.
3. The FocalPoint system consists of five components that include: 1) an open cell underdrain; 2) a wide aperture separation mesh wrap around the underdrain; 3) a layer of clean washed, 3/8" diameter bridging stone; 4) advanced high flow rate engineered media with an infiltration rate of 100 inches per hour; and 5) double shredded hardwood mulch. These components are built from the bottom up to create a mostly permeable profile that measures 3 feet from bottom of underdrain to top of mulch. The ponding

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1235 CENTRAL DRIVE, SKYWAY PARK  
PRESQUE ISLE, MAINE 04769  
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depth above the mulch surface is typically 6 to 12 inches and varies based on site conditions. An overflow outlet should be placed above the ponding depth.

4. The FocalPoint system requires the establishment of vegetation that is tolerant of wet and dry conditions. Plants that are not performing as desired should be replaced as needed. A list of appropriate plants for use in the FocalPoint system is provided at: <http://www.acfenvironmental.com/products/stormwater-management/filtration/focal-point/>.

5. The FocalPoint biofiltration system must be placed in-line with a subsurface chamber-based treatment row that is approved by the Department such that both the treated discharge and the bypass discharge from the FocalPoint system drain to the treatment row. The treatment row must be sized to treat the peak flow from a 1-year, 24-hour storm event. The treatment row structure must be continuous and without obstacle for cleaning, and must have access at both ends for the removal of accumulated sediment and debris. The treatment row must be underlain with a bottom surface consisting of 2 layers of woven geotextile (e.g., ACF S300) that extends 18 to 24 inches beyond all sides of the bottom of the structure.

6. Additional storage downstream of the FocalPoint and treatment row will be required to store at least the sum of 1.0 inch of runoff from the impervious areas and 0.4 inches of runoff from the lawn and landscaped areas that drain to the system unless attenuation of the channel protection volume is not required (i.e. direct discharge to a lake, tidal waters, or a major river). An external outlet control structure must control the flow out of a downstream storage system, sized for the entire channel protection volume, and drain in no less than 24 hours or more than 48 hours.

7. If required for flooding control, the storage system can be sized to provide for the storage and release of the peak flow with a regulated flow rate from 24-hour storms of the 2, 10, and 25-year frequencies such that the peak flows from the project site do not exceed the peak flow prior to undertaking the project.

8. The applicant must demonstrate that the design meets all the manufacturer's specifications and shall be reviewed by the manufacturer prior to submission to the Department for approval. Review and approval of the design by the manufacturer will be sufficient to demonstrate conformance with the manufacturer's specifications. The FocalPoint system must be installed by a manufacturer's certified installer or under the supervision of a manufacturer's representative.

9. Components of the system that are delivered in bulk (i.e., mulch, high flow media and clean washed bridging stone), should be contained in nylon super sacks to promote ease of storage and protection during on-site construction activities.

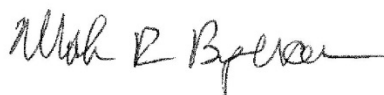
10. The FocalPoint and treatment row system should be inspected and maintained if necessary at least once every six months to maintain the established efficiency for pollutant removal. Prior to construction, a five-year binding inspection and maintenance contract must be provided prior to the Department for review and approval, and must be renewed before contract expiration. The contract will be with a professional with knowledge of erosion and stormwater control, including experience with the proposed system.

11. The overall stormwater management design must meet all Department criteria and sizing specifications and will be reviewed and approved by the Department prior to use.

12. This approval is conditional on full-scale, cold climate field testing results, performed in accordance with the Department's protocols, confirming that the pollutant removal efficiency and sizing of the FocalPoint system are appropriate. The "permit shield" provision (Section 14) of the Chapter 500 rules will apply, and the Department will not require the replacement of the system if, with proper maintenance, pollutant removals do not satisfy the General Standard Best Management Practices.

Questions concerning this decision should be directed to David Waddell at (207) 215-6932 or Jeff Dennis at (207) 215-6376.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark R. Bergeron". The signature is fluid and cursive, with a long horizontal stroke at the end.

Mark Bergeron, P.E.  
Director  
Bureau of Land Resources

cc: Don Witherill, Maine DEP



# FocalPoint

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## BIOFILTRATION SYSTEMS

HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM (HPMBS)

Operations & Maintenance



## GENERAL DESCRIPTION

The following general specifications describe the general operations and maintenance requirements for the FocalPoint® High Performance Modular Biofiltration System (HPMBS). The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, modular, constructed in place system designed to treat contaminated runoff.

Stormwater enters the FocalPoint® HPMBS, is filtered by the High Flow Biofiltration Media and passes through to the underdrain/storage system where the treated water is detained, retained or infiltrated to sub-soils, prior to discharge to the storm sewer system of any remaining flow.

Higher flows bypass the FocalPoint® HPMBS via a downstream inlet or other overflow conveyance. Maintenance is a simple, inexpensive and safe operation that does not require confined space entry, pumping or vacuum equipment, or specialized tools. Properly trained landscape personnel can effectively maintain FocalPoint® HPMBS by following instructions in this manual.



## BASIC OPERATIONS

FocalPoint® is a modular, high performance biofiltration system that often works in tandem with other integrated management practices (IMP). Contaminated stormwater runoff enters the biofiltration bed through a conveyance swale, planter box, or directly through a curb cut or false inlet. Energy is dissipated by a rock or vegetative dissipation device and is absorbed by a 3-inch layer of aged, double shredded hardwood mulch, with fines removed, (when specified) on the surface of the biofiltration media.

As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the biofiltration media where the finer particles are removed and numerous chemical reactions take place to immobilize and capture pollutants in the soil media.

The cleansed water passes into the underdrain/storage system and remaining flows are directed to a storm sewer system or other appropriate discharge point. Once the pollutants are in the soil, bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a variety of very complex biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

## DESIGN AND INSTALLATION

Each project presents different scopes for the use of FocalPoint® HPMBs. To ensure the safe and specified function of this stormwater BMP, Convergent Water Technologies and/or its Value Added Resellers (VAR) review each application before supply. Information and design assistance is available to the design engineer during the planning process. Correct FocalPoint® sizing is essential to optimum performance. The engineer shall submit calculations for approval by the local jurisdiction when required. The contractor and/or VAR is responsible for the correct installation of FocalPoint® HPMBs units as described in approved plans. A comprehensive installation manual is available at [www.convergentwater.com](http://www.convergentwater.com).





## MAINTENANCE

### *Why Maintain?*

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons for maintenance include:

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the lifespan of your FocalPoint® HPMBS.
- Avoid costly repairs.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the FocalPoint® HPMBS is required to continue effective pollutant removal from stormwater runoff before any discharge into downstream waters. This procedure will also extend the longevity of the living biofiltration system. The unit will recycle and accumulate pollutants within the biomass, but may also be subjected to other materials entering the surface of the system. This may include trash, silt and leaves etc. which will be contained above the mulch and/or biofiltration media layer. Too much silt may inhibit the FocalPoint's® HPMBS flow rate, which is a primary reason for system maintenance. Removal of accumulated silt/sediment and/or replacement of the mulch layer (when specified), is an important activity that prevents over accumulation of such silt/sediment.

### *When to Maintain?*

Convergent Water Technologies and/or its VAR includes a 1-year maintenance plan with each system purchased. Annual included maintenance consists of two (2) scheduled maintenance visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as when the site is appropriately stabilized, the unit is installed and activated (by VAR), i.e., when mulch (if specified) and plantings are added.

Activation should be avoided until the site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after storm events of greater than (1) one inch total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency.



Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the VAR/Maintenance contractor and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the VAR/Maintenance contractor of any damage to the plant(s), which constitute(s) an integral part of the biofiltration technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance of the FocalPoint® HPMBs to the VAR/Maintenance contractor (i.e. no pruning or fertilizing).

### EXCLUSION OF SERVICES

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant(s) in the FocalPoint® HPMBs.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the VAR/Maintenance contractor maintenance contract. Should a major contamination event occur, the Owner must block off the outlet pipe of the FocalPoint® (where the cleaned runoff drains to, such as drop-inlet) and block off the point where water enters of the FocalPoint® HPMBs. The VAR/Maintenance contractor should be informed immediately.

### MAINTENANCE VISIT SUMMARY

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of FocalPoint® HPMBs and surrounding area
2. Removal of debris, trash and mulch
3. Mulch replacement
4. Plant health evaluation (including measurements) and pruning or replacement as necessary
5. Clean area around FocalPoint® HPMBs
6. Complete paperwork, including date stamped photos of the tasks listed above.

### MAINTENANCE TOOLS, SAFETY EQUIPMENT AND SUPPLIES

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes.





**Inspection of FocalPoint® HPMBS and surrounding area**

Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

<input type="checkbox"/> Standing Water	yes   no	<input type="checkbox"/> Damage to HPMBS System to Overflow conveyance	yes   no
<input type="checkbox"/> Is Bypass Inlet Clear?	yes   no		yes   no

**Removal of Silt / Sediment / Clay**

Dig out silt (if any) and mulch and remove trash & foreign items.

<input type="checkbox"/> Silt / Clay Found?	yes   no	<input type="checkbox"/> Leaves?	yes   no
<input type="checkbox"/> Cups / Bags Found?	yes   no	<input type="checkbox"/> Volume of material removed _____	(volume or weight)

**Removal of debris, trash and mulch**

After removal of mulch and debris, measure distance from the top of the FocalPoint® HPMBS engineered media soil to the flow line elevation of the adjacent overflow conveyance. If this distance is greater than that specified on the plans (typ. 6" - 12"), add media (not top soil or other) to recharge to the distance specified.

Distance to media surface to flow line of overflow conveyance (inches) \_\_\_\_\_

# of Buckets of Media Added \_\_\_\_\_

**Mulch Replacement**

Most maintenance visits require only replacement mulch (if utilized) which must be, aged, double shredded hardwood mulch with fines removed. For smaller projects, one cubic foot of mulch will cover four square feet of biofiltration bed, and for larger projects, one cubic yard of mulch will cover 108 square feet of biofiltration bed. Some visits may require additional FocalPoint® HPMBS engineered soil media available from the VAR/Contractor.

- Add double shredded, aged hardwood mulch which has been screened to remove fines, evenly across the entire biofiltration media bed to a depth of 3".
- Clean accumulated sediment from energy dissipation system at the inlet to the FocalPoint® HPMBS to allow for entry of trash during a storm event.

**Plant health evaluation and pruning or replacement as necessary**

Examine the plant's health and replace if dead or dying.  
Prune as necessary to encourage growth in the correct directions

<input type="checkbox"/> Height above Grate (feet) _____	<input type="checkbox"/> Health	alive   dead
<input type="checkbox"/> Width at Widest point (feet) _____	<input type="checkbox"/> Damage to Plant	yes   no

**Clean area around FocalPoint® HPMBS**

- Clean area around unit and remove all refuse to be disposed of appropriately.

**Complete paperwork**

- Deliver Maintenance Report and photographs as appropriate.
- Some jurisdictions may require submission of maintenance reports in accordance with approvals.
- It is the responsibility of the Owner to comply with local regulations.



## FocalPoint Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.



# Maintenance Checklist

<b>Element</b>	<b>Problem</b>	<b>What To Check</b>	<b>Should Exist</b>	<b>Action</b>
<b>Inlet</b>	Excessive sediment or trash accumulation	Accumulation of sediment or trash impair free flow of water into FocalPoint	Inlet free of obstructions allowing free flow into FocalPoint System	Sediments or trash should be removed
<b>Mulch Cover</b>	Trash and floatable debris accumulation	Excessive trash or debris accumulation.	Minimal trash or other debris on mulch cover	Trash and debris should be removed and mulch cover raked level. Ensure that bark nugget
<b>Mulch Cover</b>	Ponding of water on mulch cover	Ponding in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils	Stormwater should drain freely and evenly over mulch cover.	Contact VAR for advice.
<b>Plants</b>	Plants not growing, or in poor condition	Soil/mulch too wet, evidence of spill. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact VAR for advice.
<b>Plants</b>	Plant growth excessive	Plants should be appropriate to the species and location of FocalPoint		Trim/prune plants in accordance with typical landscaping and

## APPENDIX B

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### **FocalPoint Design Checklist and HydroCAD Model Summary**

ACF Environmental  
2831 Cardwell Rd  
Richmond, VA 23234



Bo Kennedy, PE  
*Placemaker Partners, LLC*  
501 Danforth Street  
Portland, ME 04102

September 29, 2017,

SUBJECT: The Forefront at Thompson's Point – Forefront Hotel – Portland, Maine  
Plan Review and Construction Oversight Commitment

Dear Bo,

Thank you for forwarding the permit plans for the proposed The Forefront at Thompson's Point – Forefront Hotel – Portland, Maine project to ACF environmental for review of the proposed FocalPoint biofiltration system.

Our team has reviewed the plans (with latest revision date of 9/25/2017) and made the following observations:

- There is one 96 sf FocalPoint system shown on the plans.
- The system has the approved FocalPoint section (3" mulch, 18" media, 6" bridging stone and 9" modular underdrain).
- The system has a peak elevation of less than 6 inches of temporary ponding volume for the 0.95" storm – which is within the recommended temporary ponding range for the system.
- The volume associated with the 0.95" 24hr storm is treated prior to activation of the overflow device (WQ goal met). (per review of HydroCAD output). A pair of 12" dia PVC domed risers with a filter insert is proposed for bypass.
- A 7 chamber Cultec 150XLHD separator row is proposed as required by the MeDEP FocalPoint design guidance.
- It is our understanding that Channel Protection and Flood Control is not needed for this project.

Overall, ACF takes no exceptions to the location and application of the FocalPoint system for this project.

It appears that the system has been designed in accordance with the design criteria set forth by Maine DEP in the FocalPoint system approval letter and meet the system specifications etc.

With regard to the installation, ACF Environmental will host a preconstruction meeting with the site contractor and will be on-site during the entire installation to ensure that the installation is being conducted in accordance with our standard installation procedures.

ACF Environmental will also provide the first year's maintenance on the FocalPoint bed area.

Please review and contact me with any questions from your office.

We look forward to working with you on this project.

Sincerely,



Robert J Woodman,  
Senior Stormwater Engineer  
ACF Environmental

Cc: Lee Jones, ACF Environmental

# FOCALPOINT

## HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM

### MAINE – CHAPTER 500 DESIGN WORKSHEET/CHECKLIST

**1. FocalPoint Bed Area (min 174 square feet per acre of impervious area (e.g. 0.2 acres = 35 sf))**

- Tributary Impervious area = 0.38 ac. (A)
- Tributary Pervious area = 0.34 ac. (B)
- Min FocalPoint bed area req'd =  $(((A) \times 1.0) + ((B) \times 0.4)) * 174$  = 89.8 sf.
- FocalPoint Bed Area provided \* = 96 sf.
- Dimensions of Proposed FocalPoint = 8 ft x 12 ft

\* see criteria 2. to determine if minimum size is appropriate.

**2. A 0.95 inch Type III 24hr rainfall event shall be modelled to demonstrate the entire storm volume is treated prior to activation of the overflow (typically set at 6-12" above the mulch)**

- Temporary storage depth provided = 3" \_\_\_\_\_ inches (typ 6" to 12")
- Temporary storage volume provided at above depth = 129 \_\_\_\_\_ cubic feet.
- Peak ponding depth from 0.95" 24hr storm event = \_N/A\_\_\_\_\_ inches

**3. Ratio of the surface area of the filter media (sf) to the temporary ponding volume (cf) shall be no less than 1:5**

- Ratio of FocalPoint Bed Area : Temporary Storage Vol = 1:1.34

**4. Subsurface Chamber Treatment Row must be sized to treat the peak flow from a 1 yr-24hr storm event.**

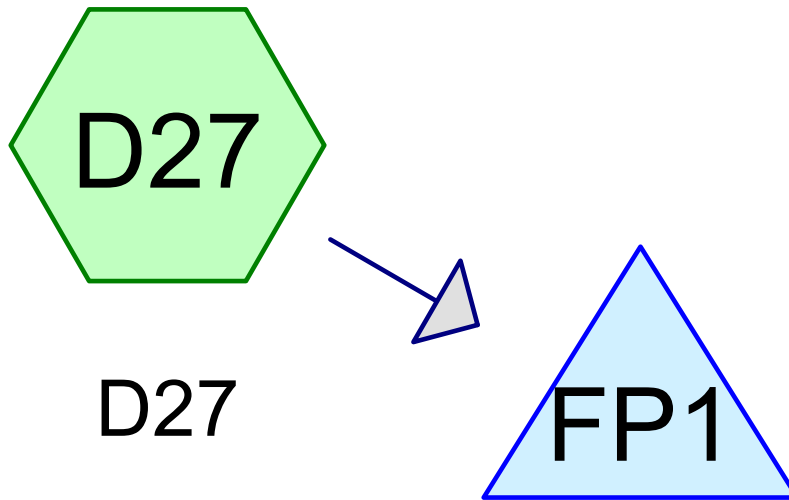
- 1yr 24hr Peak Flowrate = 1.19 \_\_\_\_\_ cfs
- Chamber model selected
  - Cultec 330 XLHD (1 chamber per 0.227 cfs)
  - Cultec 150XLHD (1 chamber per 0.185 cfs)
- Number of Chambers required =  $1.19 / 0.185 = 6.43$  ch
- Number of Chambers Provided = 7 EA Cultec 150XLHD

**5. Controlled release of the Channel Protection over 24-48 hrs ---\*N/A\***

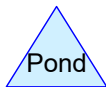
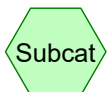
- Controlled release of the channel protection volume is being achieved by: \*N/A\*
  - Expanded subsurface storage basin with OCS \*N/A\*
  - Surface detention basin with OCS \*N/A\*

**6. The Design shall be reviewed by the manufacturer's representative prior to submission and installation will be overseen by the manufacturer's representative.**

- The Design has been reviewed by ACF Environmental
- Engineer will coordinate installation inspection with ACF



FocalPoint 96sf





## 2017.09.01 Hotel Focal Point - Zone D

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### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
14,750	74	>75% Grass cover, Good, HSG C (D27)
16,530	98	Unconnected pavement, HSG C (D27)
<b>31,280</b>	<b>87</b>	<b>TOTAL AREA</b>

**2017.09.01 Hotel Focal Point - Zone D**

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**Ground Covers (all nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	14,750	0	0	14,750	>75% Grass cover, Good
0	0	16,530	0	0	16,530	Unconnected pavement
<b>0</b>	<b>0</b>	<b>31,280</b>	<b>0</b>	<b>0</b>	<b>31,280</b>	<b>TOTAL AREA</b>

Sub  
Num

**2017.09.01 Hotel Focal Point - Zone D**

*Type III 24-hr 0.95inch Rainfall=0.95"*

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment D27: D27**

Runoff Area=31,280 sf 52.85% Impervious Runoff Depth=0.20"  
Tc=6.0 min CN=87 Runoff=0.14 cfs 515 cf

**Pond FP1: FocalPoint 96sf**

Peak Elev=11.78' Storage=1 cf Inflow=0.14 cfs 515 cf  
Primary=0.14 cfs 515 cf Secondary=0.00 cfs 0 cf Outflow=0.14 cfs 515 cf

**Total Runoff Area = 31,280 sf Runoff Volume = 515 cf Average Runoff Depth = 0.20"**  
**47.15% Pervious = 14,750 sf 52.85% Impervious = 16,530 sf**

**Summary for Subcatchment D27: D27**

Runoff = 0.14 cfs @ 12.11 hrs, Volume= 515 cf, Depth= 0.20"

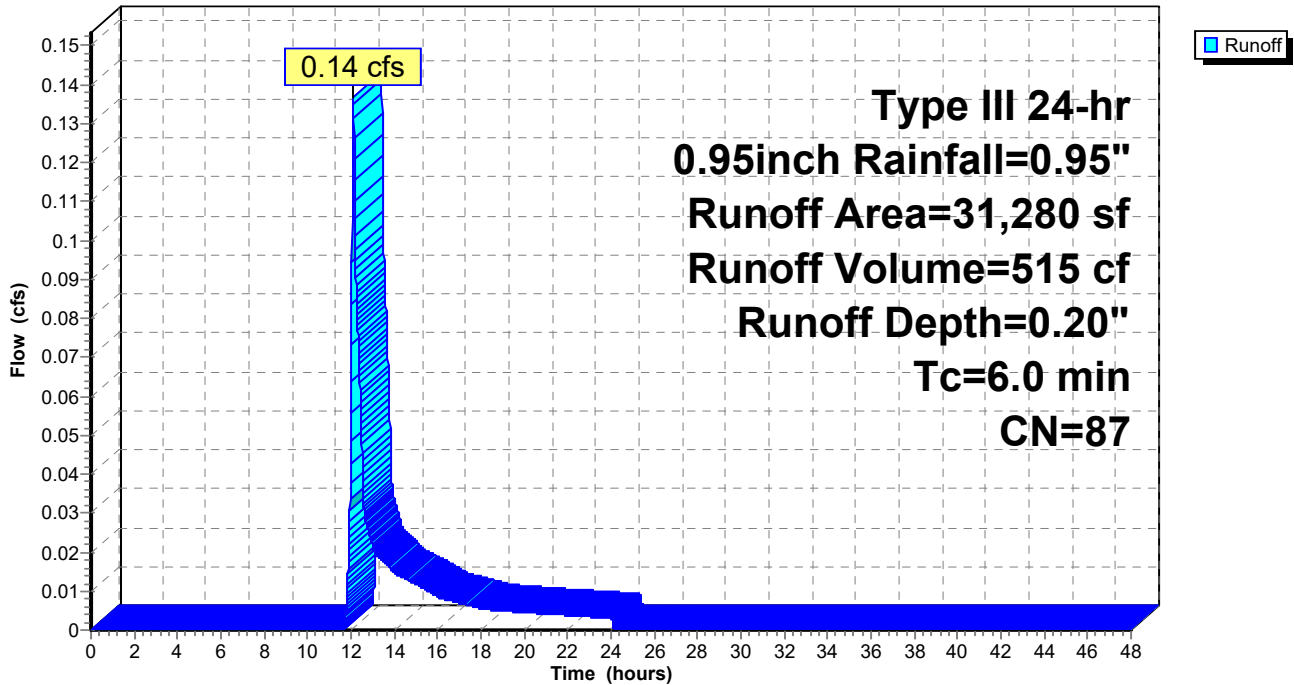
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 0.95inch Rainfall=0.95"

Area (sf)	CN	Description
16,530	98	Unconnected pavement, HSG C
14,750	74	>75% Grass cover, Good, HSG C
31,280	87	Weighted Average
14,750		47.15% Pervious Area
16,530		52.85% Impervious Area
16,530		100.00% Unconnected

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

**Subcatchment D27: D27**

Hydrograph



**Summary for Pond FP1: FocalPoint 96sf**

Inflow Area = 31,280 sf, 52.85% Impervious, Inflow Depth = 0.20" for 0.95inch event  
 Inflow = 0.14 cfs @ 12.11 hrs, Volume= 515 cf  
 Outflow = 0.14 cfs @ 12.11 hrs, Volume= 515 cf, Atten= 0%, Lag= 0.2 min  
 Primary = 0.14 cfs @ 12.11 hrs, Volume= 515 cf  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 11.78' @ 12.11 hrs Surf.Area= 216 sf Storage= 1 cf

Plug-Flow detention time= 0.1 min calculated for 515 cf (100% of inflow)  
 Center-of-Mass det. time= 0.1 min ( 889.1 - 889.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	11.75'	97 cf	<b>18.00'W x 12.00'L x 2.25'H FocalPoint</b> 486 cf Overall x 20.0% Voids
#2	14.00'	267 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc) -Impervious
		365 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.00	96	40.0	0	0	96
14.50	250	65.0	83	83	307
15.00	500	96.0	184	267	706

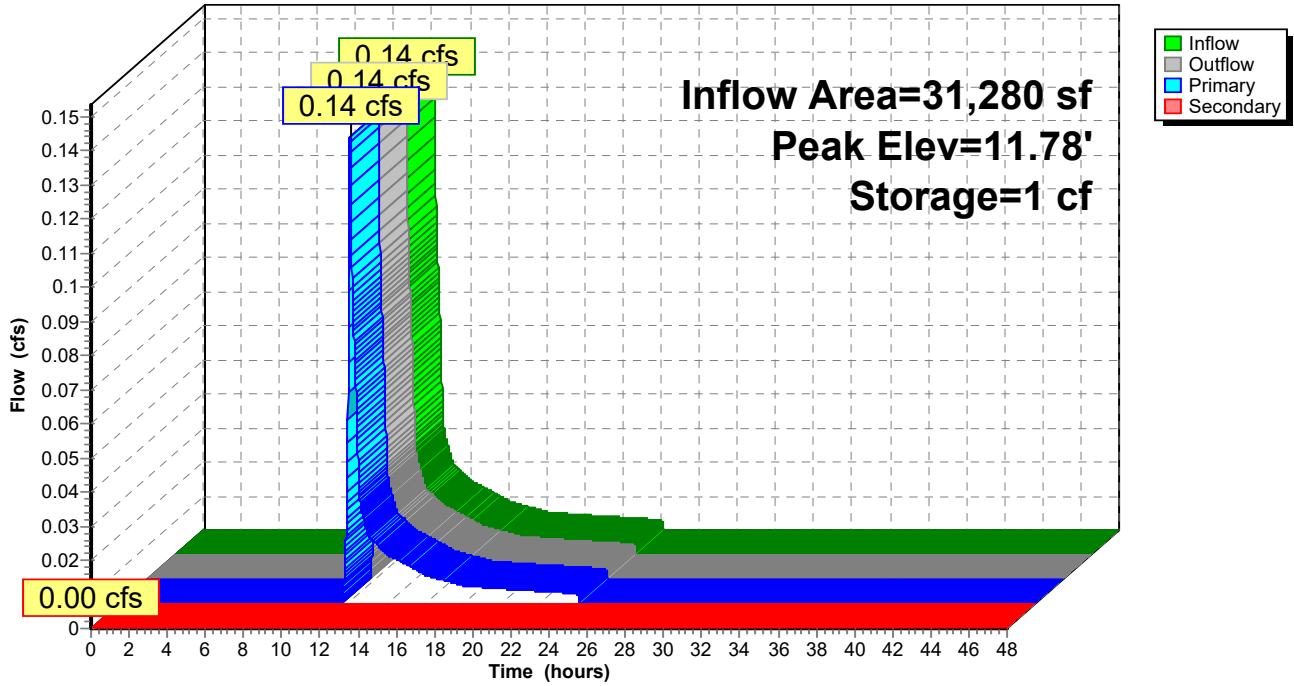
Device	Routing	Invert	Outlet Devices
#1	Primary	11.75'	<b>100.000 in/hr Exfiltration over Surface area</b> Phase-In= 0.10'
#2	Secondary	14.25'	<b>12.0" Horiz. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.14 cfs @ 12.11 hrs HW=11.78' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.14 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=11.75' (Free Discharge)  
 ↑2=Orifice/Grate ( Controls 0.00 cfs)

Pond FP1: FocalPoint 96sf

Hydrograph



**2017.09.01 Hotel Focal Point - Zone D**

Type III 24-hr 1yr Rainfall=2.62"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment D27: D27**

Runoff Area=31,280 sf 52.85% Impervious Runoff Depth=1.41"  
Tc=6.0 min CN=87 Runoff=1.19 cfs 3,681 cf

**Pond FP1: FocalPoint 96sf**

Peak Elev=14.35' Storage=148 cf Inflow=1.19 cfs 3,681 cf  
Primary=0.50 cfs 3,413 cf Secondary=0.68 cfs 267 cf Outflow=1.18 cfs 3,681 cf

**Total Runoff Area = 31,280 sf Runoff Volume = 3,681 cf Average Runoff Depth = 1.41"**  
**47.15% Pervious = 14,750 sf 52.85% Impervious = 16,530 sf**

**2017.09.01 Hotel Focal Point - Zone D**

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Type III 24-hr 1yr Rainfall=2.62"

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**Summary for Subcatchment D27: D27**

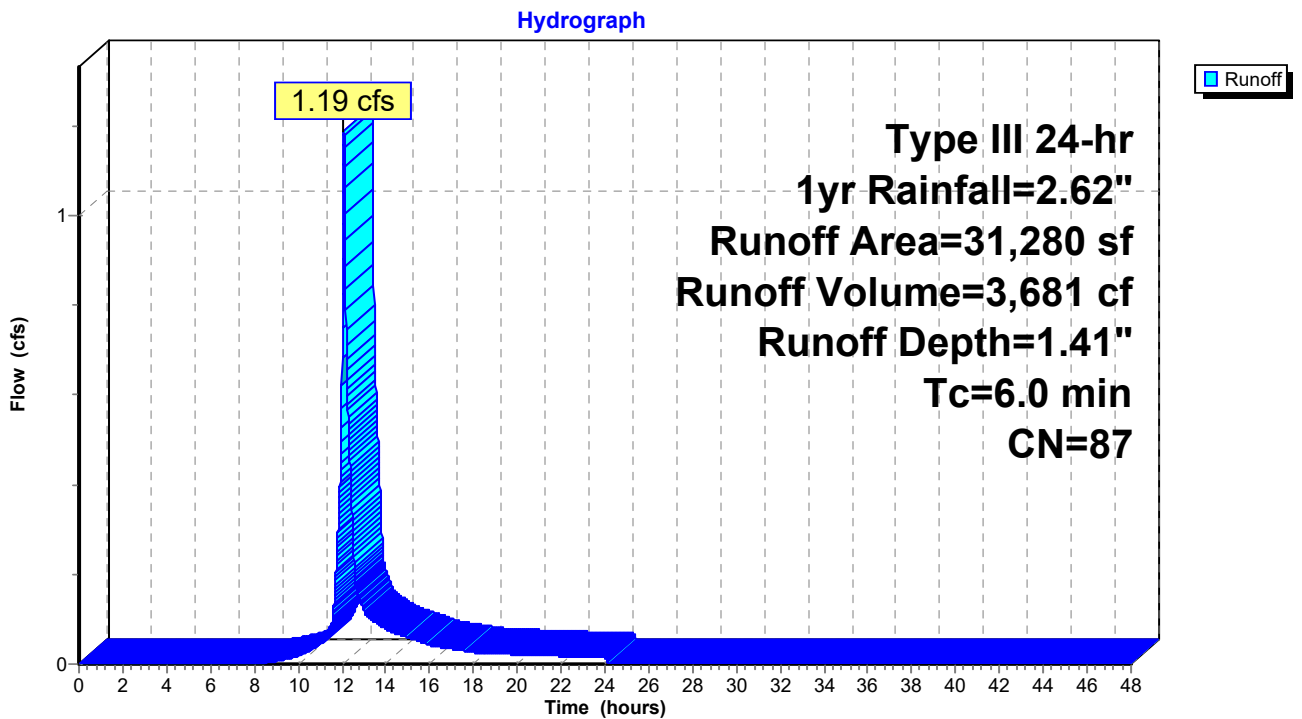
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 3,681 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1yr Rainfall=2.62"

Area (sf)	CN	Description
16,530	98	Unconnected pavement, HSG C
14,750	74	>75% Grass cover, Good, HSG C
31,280	87	Weighted Average
14,750		47.15% Pervious Area
16,530		52.85% Impervious Area
16,530		100.00% Unconnected

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

**Subcatchment D27: D27**





**2017.09.01 Hotel Focal Point - Zone D**

Type III 24-hr 1yr Rainfall=2.62"

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**Summary for Pond FP1: FocalPoint 96sf**

Inflow Area = 31,280 sf, 52.85% Impervious, Inflow Depth = 1.41" for 1yr event  
 Inflow = 1.19 cfs @ 12.09 hrs, Volume= 3,681 cf  
 Outflow = 1.18 cfs @ 12.10 hrs, Volume= 3,681 cf, Atten= 1%, Lag= 0.7 min  
 Primary = 0.50 cfs @ 11.98 hrs, Volume= 3,413 cf  
 Secondary = 0.68 cfs @ 12.10 hrs, Volume= 267 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 14.35' @ 12.10 hrs Surf.Area= 216 sf Storage= 148 cf

Plug-Flow detention time= 1.1 min calculated for 3,680 cf (100% of inflow)  
 Center-of-Mass det. time= 1.1 min ( 828.7 - 827.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	11.75'	97 cf	<b>18.00'W x 12.00'L x 2.25'H FocalPoint</b> 486 cf Overall x 20.0% Voids
#2	14.00'	267 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc) -Impervious
		365 cf	Total Available Storage

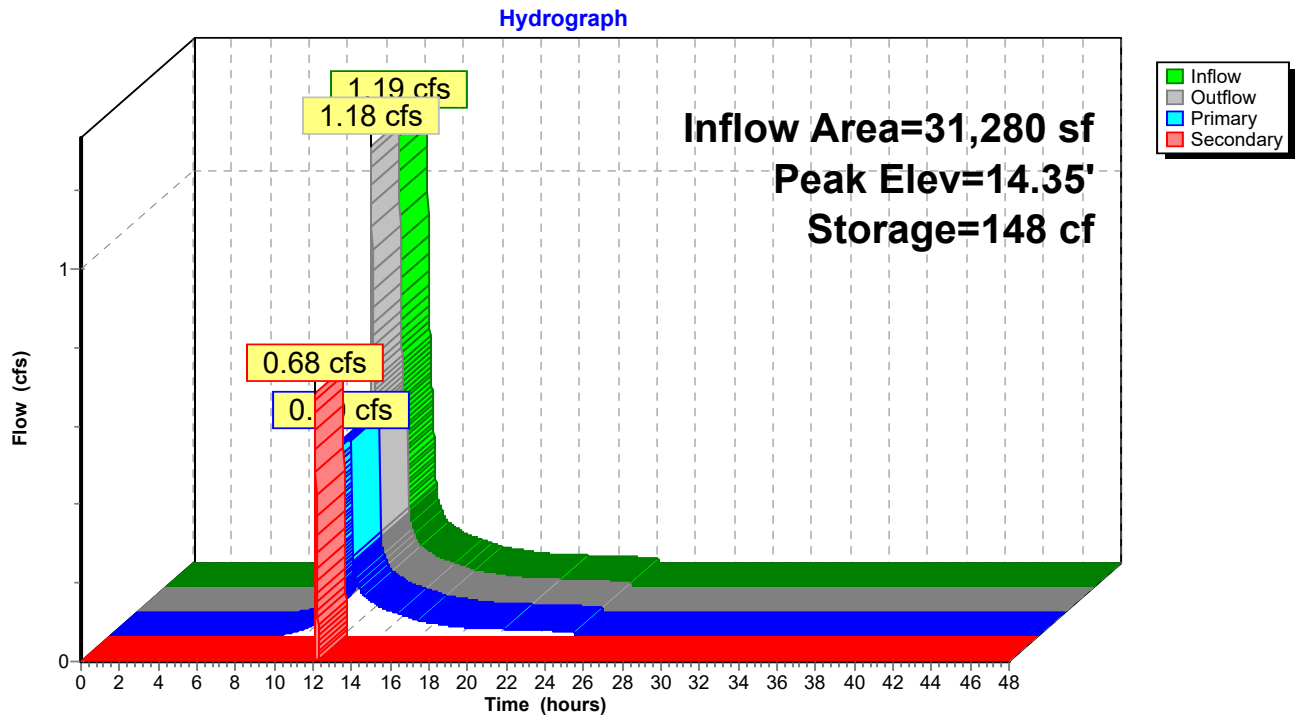
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.00	96	40.0	0	0	96
14.50	250	65.0	83	83	307
15.00	500	96.0	184	267	706

Device	Routing	Invert	Outlet Devices
#1	Primary	11.75'	<b>100.000 in/hr Exfiltration over Surface area</b> Phase-In= 0.10'
#2	Secondary	14.25'	<b>12.0" Horiz. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.50 cfs @ 11.98 hrs HW=11.90' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.50 cfs)

**Secondary OutFlow** Max=0.68 cfs @ 12.10 hrs HW=14.35' (Free Discharge)  
 ↑2=Orifice/Grate (Weir Controls 0.68 cfs @ 1.05 fps)

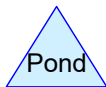
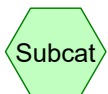
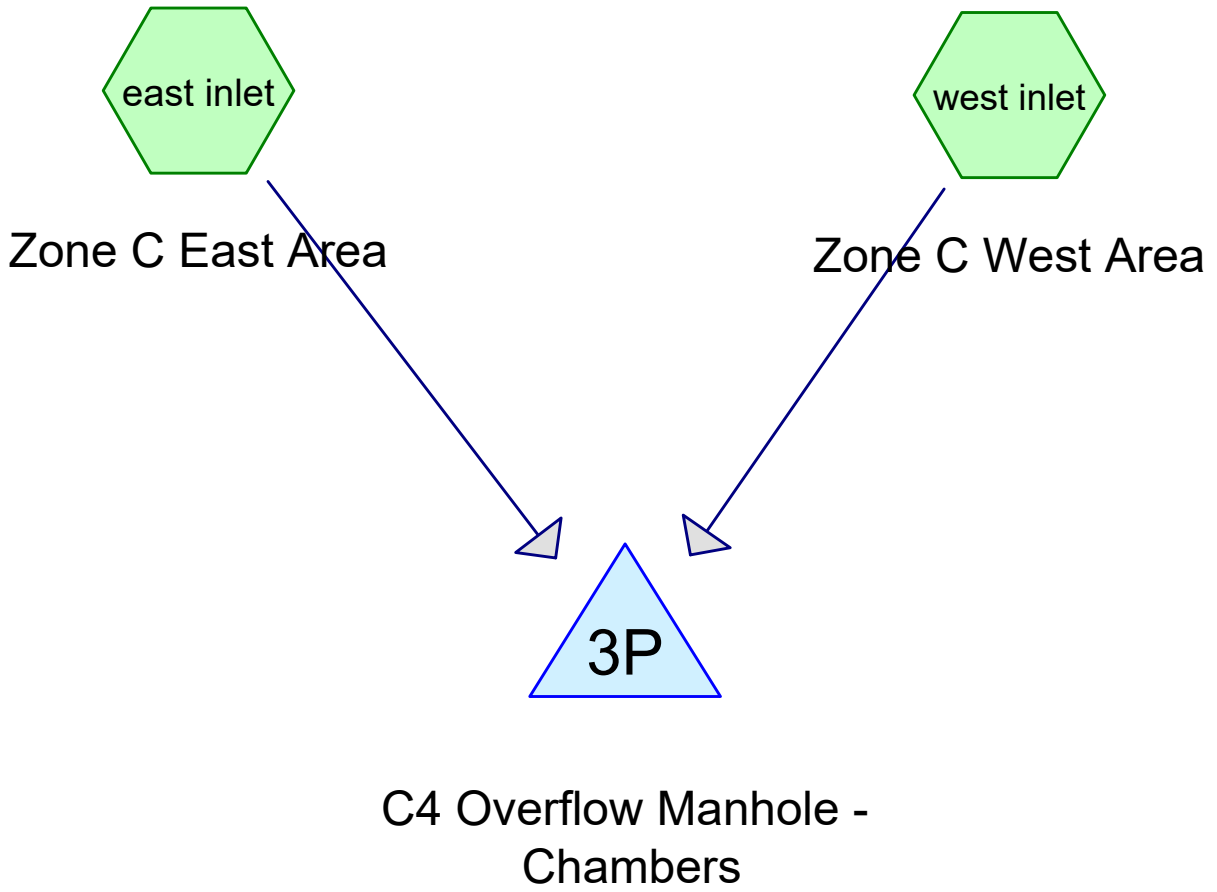
Pond FP1: FocalPoint 96sf



## APPENDIX C

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### **JellyFish™ HydroCAD Model Summary**



## 2017.09.14 Hotel Jelly Fish - Zone C

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### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,800	74	>75% Grass cover, Good, HSG C (east inlet, west inlet)
46,594	98	Paved parking, HSG C (east inlet, west inlet)
<b>49,394</b>	<b>97</b>	<b>TOTAL AREA</b>

**2017.09.14 Hotel Jelly Fish - Zone C**

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**Ground Covers (all nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	2,800	0	0	2,800	>75% Grass cover, Good	
0	0	46,594	0	0	46,594	Paved parking	
<b>0</b>	<b>0</b>	<b>49,394</b>	<b>0</b>	<b>0</b>	<b>49,394</b>	<b>TOTAL AREA</b>	

**2017.09.14 Hotel Jelly Fish - Zone C**

*Type III 24-hr 0.95inch Rainfall=0.95"*

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment east inlet: Zone C East Area** Runoff Area=26,486 sf 96.69% Impervious Runoff Depth=0.66"  
Tc=6.0 min CN=97 Runoff=0.46 cfs 1,454 cf

**Subcatchment west inlet: Zone C West** Runoff Area=22,908 sf 91.60% Impervious Runoff Depth=0.59"  
Tc=6.0 min CN=96 Runoff=0.36 cfs 1,117 cf

**Pond 3P: C4 Overflow Manhole - Chambers** Peak Elev=11.58' Storage=2,571 cf Inflow=0.82 cfs 2,571 cf  
Outflow=0.00 cfs 0 cf

**Total Runoff Area = 49,394 sf Runoff Volume = 2,571 cf Average Runoff Depth = 0.62"**  
**5.67% Pervious = 2,800 sf 94.33% Impervious = 46,594 sf**

**Summary for Subcatchment east inlet: Zone C East Area**

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 1,454 cf, Depth= 0.66"

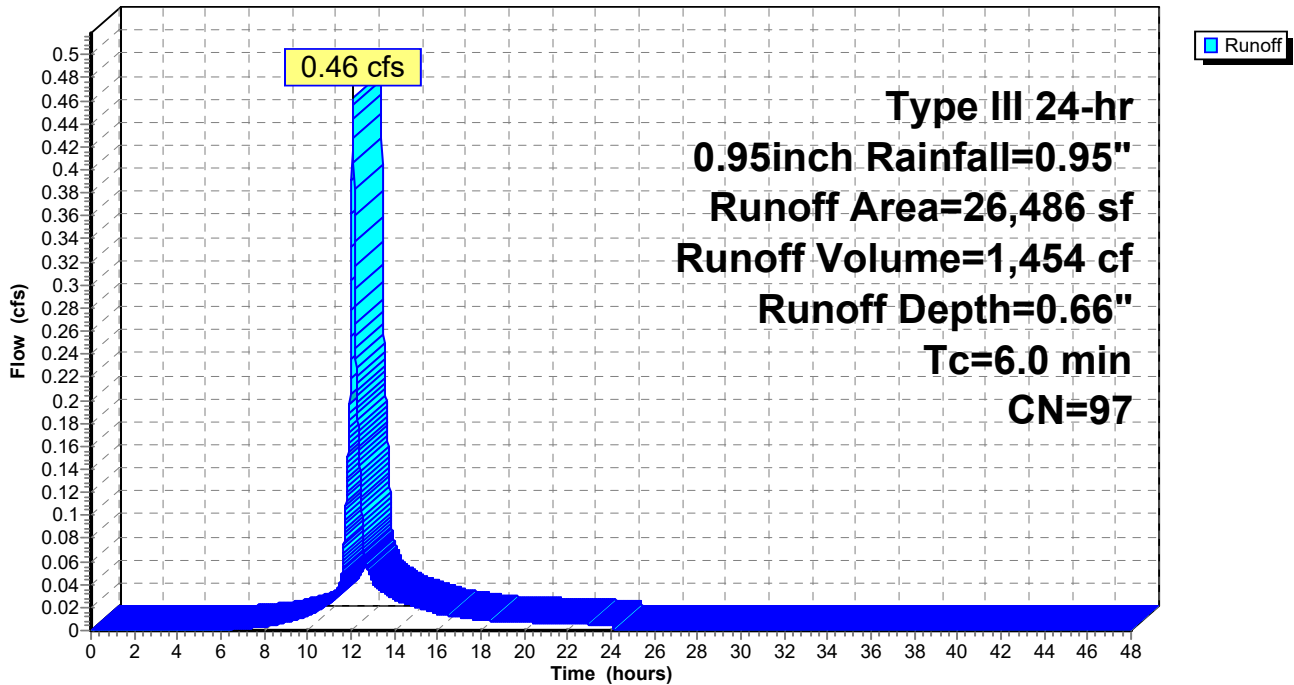
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type III 24-hr 0.95inch Rainfall=0.95"

Area (sf)	CN	Description
25,610	98	Paved parking, HSG C
876	74	>75% Grass cover, Good, HSG C
26,486	97	Weighted Average
876		3.31% Pervious Area
25,610		96.69% Impervious Area

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

**Subcatchment east inlet: Zone C East Area**

Hydrograph





**Summary for Subcatchment west inlet: Zone C West Area**

Runoff = 0.36 cfs @ 12.09 hrs, Volume= 1,117 cf, Depth= 0.59"

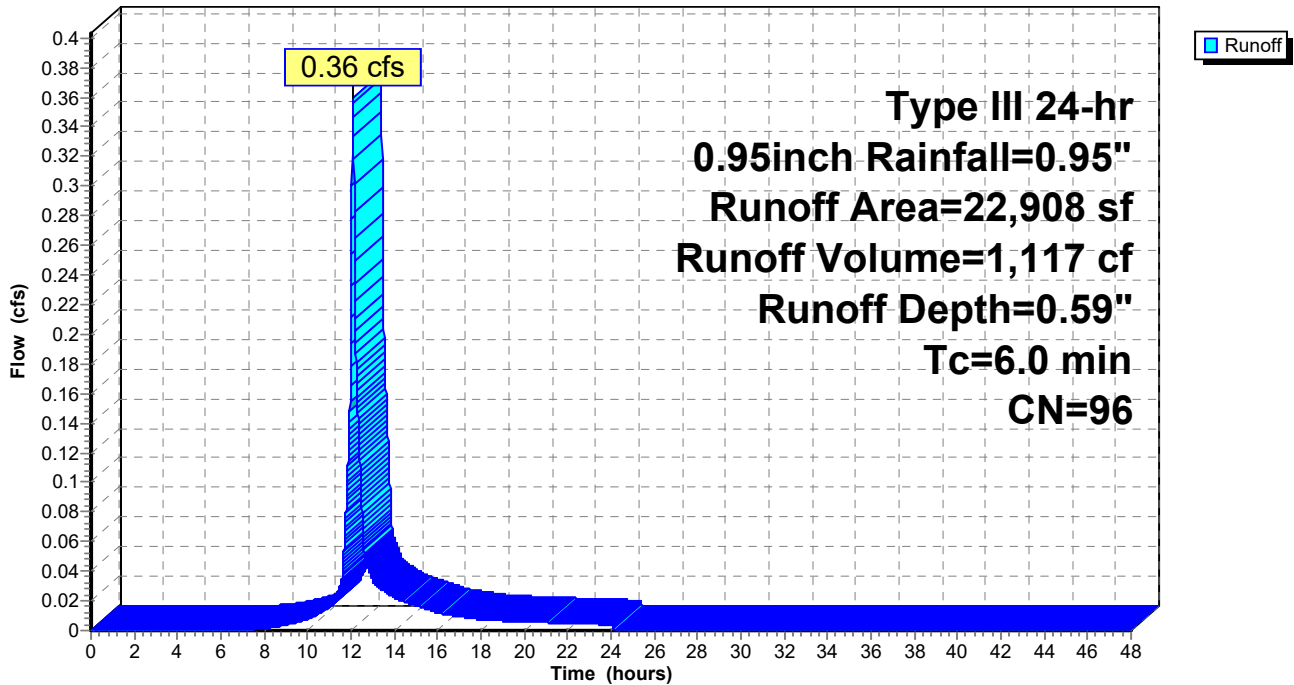
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 0.95inch Rainfall=0.95"

Area (sf)	CN	Description
20,984	98	Paved parking, HSG C
1,924	74	>75% Grass cover, Good, HSG C
22,908	96	Weighted Average
1,924		8.40% Pervious Area
20,984		91.60% Impervious Area

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

**Subcatchment west inlet: Zone C West Area**

Hydrograph



**Summary for Pond 3P: C4 Overflow Manhole - Chambers**

Inflow Area = 49,394 sf, 94.33% Impervious, Inflow Depth = 0.62" for 0.95inch event  
 Inflow = 0.82 cfs @ 12.09 hrs, Volume= 2,571 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 11.58' @ 24.34 hrs Surf.Area= 2,444 sf Storage= 2,571 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	10.02'	810 cf	<b>14.75'W x 60.58'L x 3.50'H Field A</b> 3,127 cf Overall - 1,103 cf Embedded = 2,025 cf x 40.0% Voids
#2A	10.52'	1,103 cf	<b>ADS_StormTech SC-740 +Cap x 24 Inside #1</b> Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 8 Chambers
#3B	10.02'	1,399 cf	<b>29.00'W x 53.46'L x 3.50'H Field B</b> 5,426 cf Overall - 1,929 cf Embedded = 3,496 cf x 40.0% Voids
#4B	10.52'	1,929 cf	<b>ADS_StormTech SC-740 +Cap x 42 Inside #3</b> Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Rows of 7 Chambers
		5,240 cf	Total Available Storage

Storage Group A created with Chamber Wizard  
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	13.02'	<b>7.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=10.02' (Free Discharge)  
 ↑1=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Pond 3P: C4 Overflow Manhole - Chambers - Chamber Wizard Field A**

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length

3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 6.0" Side Stone x 2 = 14.75' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

24 Chambers x 45.9 cf = 1,102.6 cf Chamber Storage

3,127.3 cf Field - 1,102.6 cf Chambers = 2,024.7 cf Stone x 40.0% Voids = 809.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,912.4 cf = 0.044 af

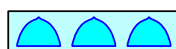
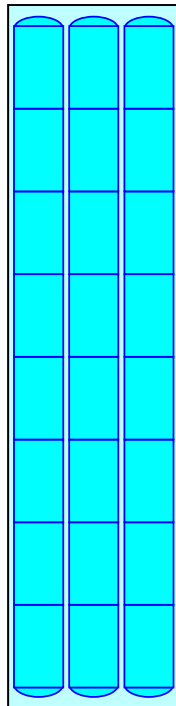
Overall Storage Efficiency = 61.2%

Overall System Size = 60.58' x 14.75' x 3.50'

24 Chambers

115.8 cy Field

75.0 cy Stone



**Pond 3P: C4 Overflow Manhole - Chambers - Chamber Wizard Field B**

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length

6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 6.0" Side Stone x 2 = 29.00' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

42 Chambers x 45.9 cf = 1,929.5 cf Chamber Storage

5,425.9 cf Field - 1,929.5 cf Chambers = 3,496.4 cf Stone x 40.0% Voids = 1,398.5 cf Stone Storage

Chamber Storage + Stone Storage = 3,328.0 cf = 0.076 af

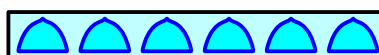
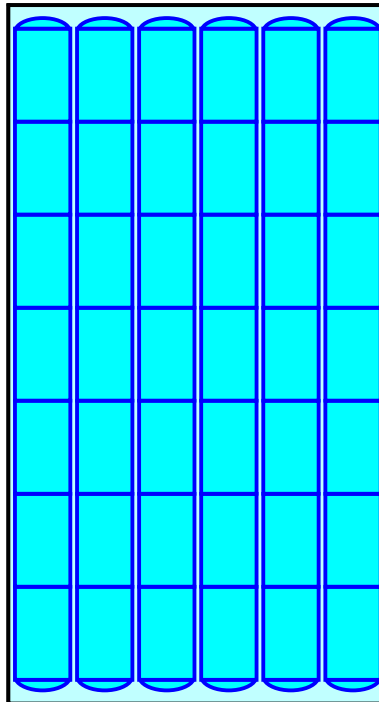
Overall Storage Efficiency = 61.3%

Overall System Size = 53.46' x 29.00' x 3.50'

42 Chambers

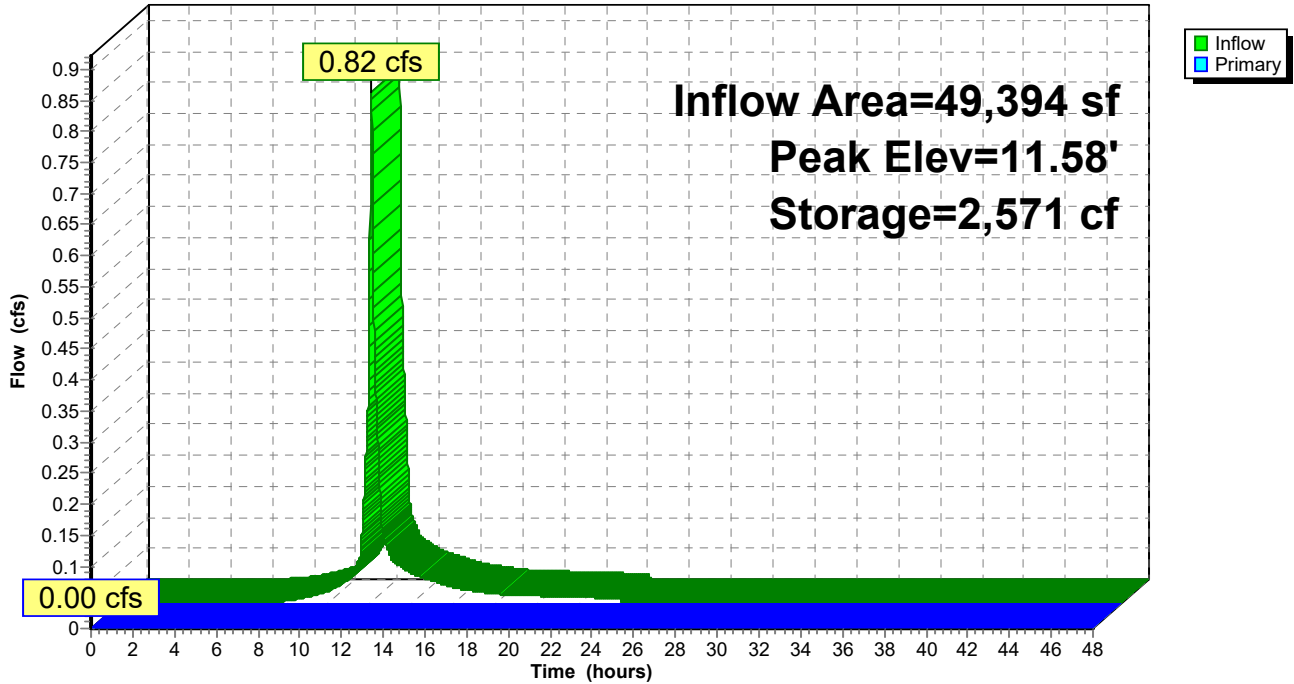
201.0 cy Field

129.5 cy Stone



### Pond 3P: C4 Overflow Manhole - Chambers

Hydrograph



**2017.09.14 Hotel Jelly Fish - Zone C**

Prepared by Hewlett-Packard Company

HydroCAD® 10.00-19 s/n 09708 © 2016 HydroCAD Software Solutions LLC

Type III 24-hr 1yr Rainfall=2.62"

Printed 9/28/2017

Page 11

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment east inlet: Zone C East Area** Runoff Area=26,486 sf 96.69% Impervious Runoff Depth=2.28"  
Tc=6.0 min CN=97 Runoff=1.50 cfs 5,037 cf

**Subcatchment west inlet: Zone C West** Runoff Area=22,908 sf 91.60% Impervious Runoff Depth=2.18"  
Tc=6.0 min CN=96 Runoff=1.27 cfs 4,159 cf

**Pond 3P: C4 Overflow Manhole - Chambers** Peak Elev=13.18' Storage=4,905 cf Inflow=2.77 cfs 9,197 cf  
Outflow=1.22 cfs 4,445 cf

**Total Runoff Area = 49,394 sf Runoff Volume = 9,197 cf Average Runoff Depth = 2.23"**  
**5.67% Pervious = 2,800 sf 94.33% Impervious = 46,594 sf**

**Summary for Subcatchment east inlet: Zone C East Area**

Runoff = 1.50 cfs @ 12.08 hrs, Volume= 5,037 cf, Depth= 2.28"

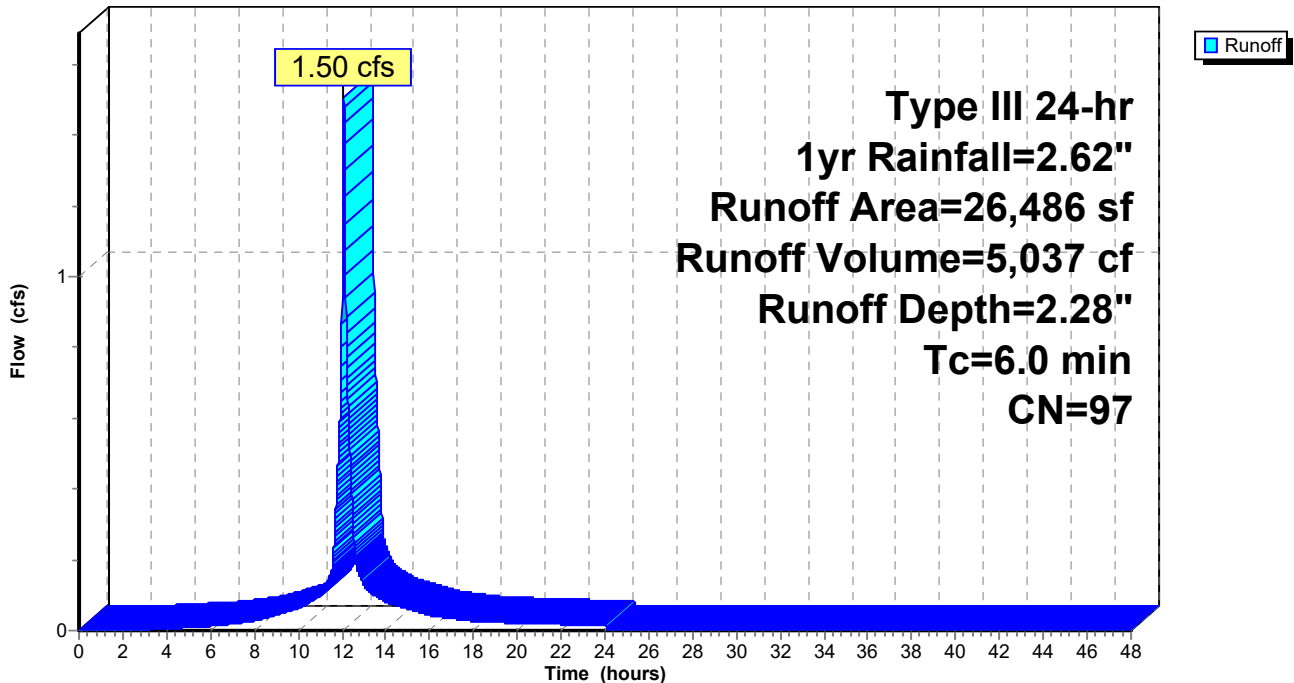
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 1yr Rainfall=2.62"

Area (sf)	CN	Description
25,610	98	Paved parking, HSG C
876	74	>75% Grass cover, Good, HSG C
26,486	97	Weighted Average
876		3.31% Pervious Area
25,610		96.69% Impervious Area

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

**Subcatchment east inlet: Zone C East Area**

Hydrograph



**Summary for Subcatchment west inlet: Zone C West Area**

Runoff = 1.27 cfs @ 12.08 hrs, Volume= 4,159 cf, Depth= 2.18"

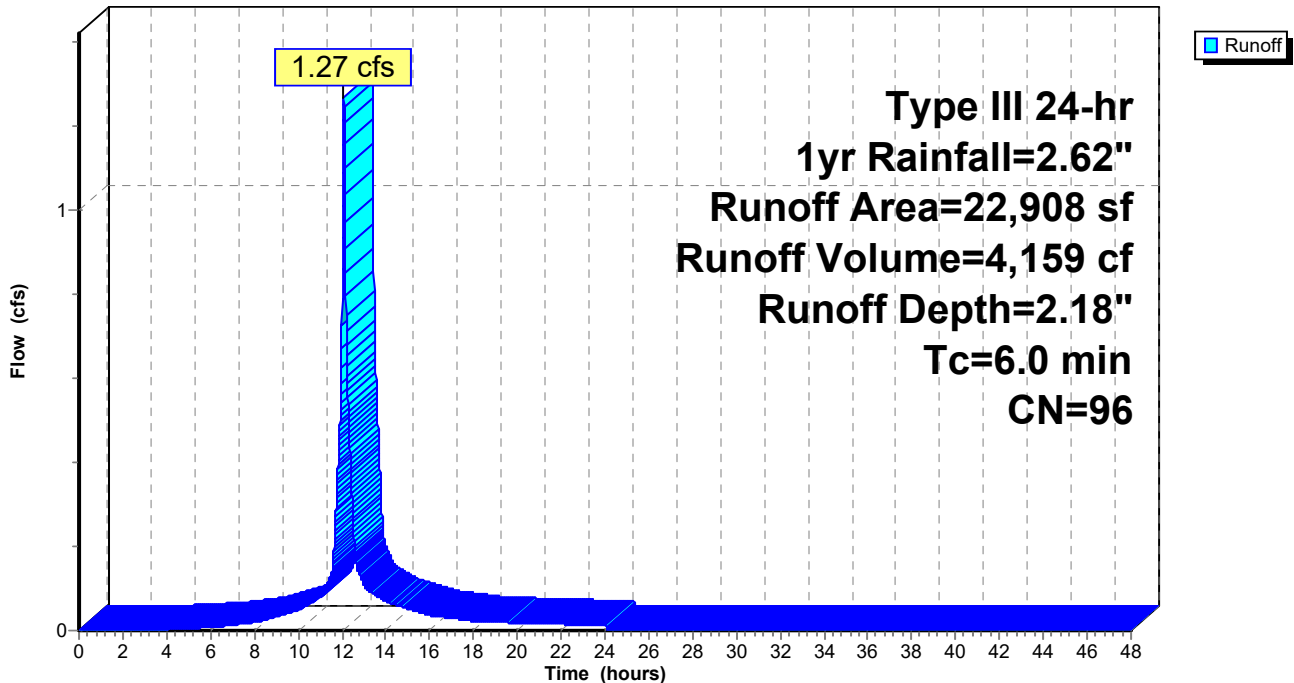
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 1yr Rainfall=2.62"

Area (sf)	CN	Description
20,984	98	Paved parking, HSG C
1,924	74	>75% Grass cover, Good, HSG C
22,908	96	Weighted Average
1,924		8.40% Pervious Area
20,984		91.60% Impervious Area

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

**Subcatchment west inlet: Zone C West Area**

Hydrograph





**Summary for Pond 3P: C4 Overflow Manhole - Chambers**

Inflow Area = 49,394 sf, 94.33% Impervious, Inflow Depth = 2.23" for 1yr event  
 Inflow = 2.77 cfs @ 12.08 hrs, Volume= 9,197 cf  
 Outflow = 1.22 cfs @ 12.27 hrs, Volume= 4,445 cf, Atten= 56%, Lag= 10.9 min  
 Primary = 1.22 cfs @ 12.27 hrs, Volume= 4,445 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 13.18' @ 12.27 hrs Surf.Area= 2,444 sf Storage= 4,905 cf

Plug-Flow detention time= 246.3 min calculated for 4,444 cf (48% of inflow)  
 Center-of-Mass det. time= 126.9 min ( 902.2 - 775.2 )

Volume	Invert	Avail.Storage	Storage Description
#1A	10.02'	810 cf	<b>14.75'W x 60.58'L x 3.50'H Field A</b> 3,127 cf Overall - 1,103 cf Embedded = 2,025 cf x 40.0% Voids
#2A	10.52'	1,103 cf	<b>ADS_StormTech SC-740 +Cap x 24 Inside #1</b> Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 8 Chambers
#3B	10.02'	1,399 cf	<b>29.00'W x 53.46'L x 3.50'H Field B</b> 5,426 cf Overall - 1,929 cf Embedded = 3,496 cf x 40.0% Voids
#4B	10.52'	1,929 cf	<b>ADS_StormTech SC-740 +Cap x 42 Inside #3</b> Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Rows of 7 Chambers
		5,240 cf	Total Available Storage

Storage Group A created with Chamber Wizard  
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	13.02'	<b>7.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=1.22 cfs @ 12.27 hrs HW=13.18' (Free Discharge)  
 ↳1=Broad-Crested Rectangular Weir (Weir Controls 1.22 cfs @ 1.11 fps)

**Pond 3P: C4 Overflow Manhole - Chambers - Chamber Wizard Field A**

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length

3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 6.0" Side Stone x 2 = 14.75' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

24 Chambers x 45.9 cf = 1,102.6 cf Chamber Storage

3,127.3 cf Field - 1,102.6 cf Chambers = 2,024.7 cf Stone x 40.0% Voids = 809.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,912.4 cf = 0.044 af

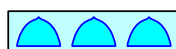
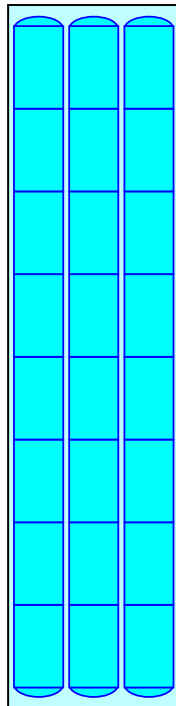
Overall Storage Efficiency = 61.2%

Overall System Size = 60.58' x 14.75' x 3.50'

24 Chambers

115.8 cy Field

75.0 cy Stone



**Pond 3P: C4 Overflow Manhole - Chambers - Chamber Wizard Field B**

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length

6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 6.0" Side Stone x 2 = 29.00' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

42 Chambers x 45.9 cf = 1,929.5 cf Chamber Storage

5,425.9 cf Field - 1,929.5 cf Chambers = 3,496.4 cf Stone x 40.0% Voids = 1,398.5 cf Stone Storage

Chamber Storage + Stone Storage = 3,328.0 cf = 0.076 af

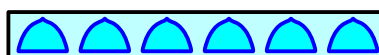
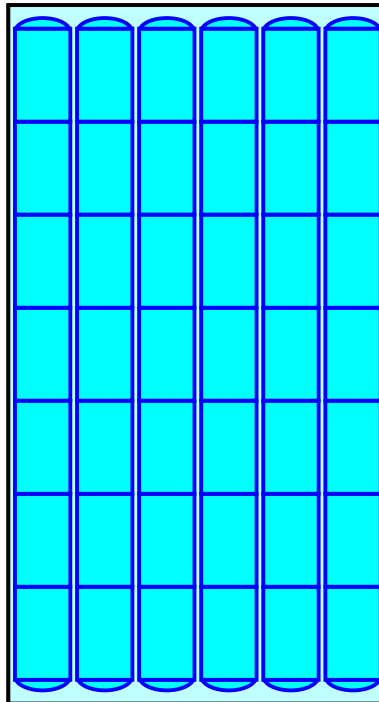
Overall Storage Efficiency = 61.3%

Overall System Size = 53.46' x 29.00' x 3.50'

42 Chambers

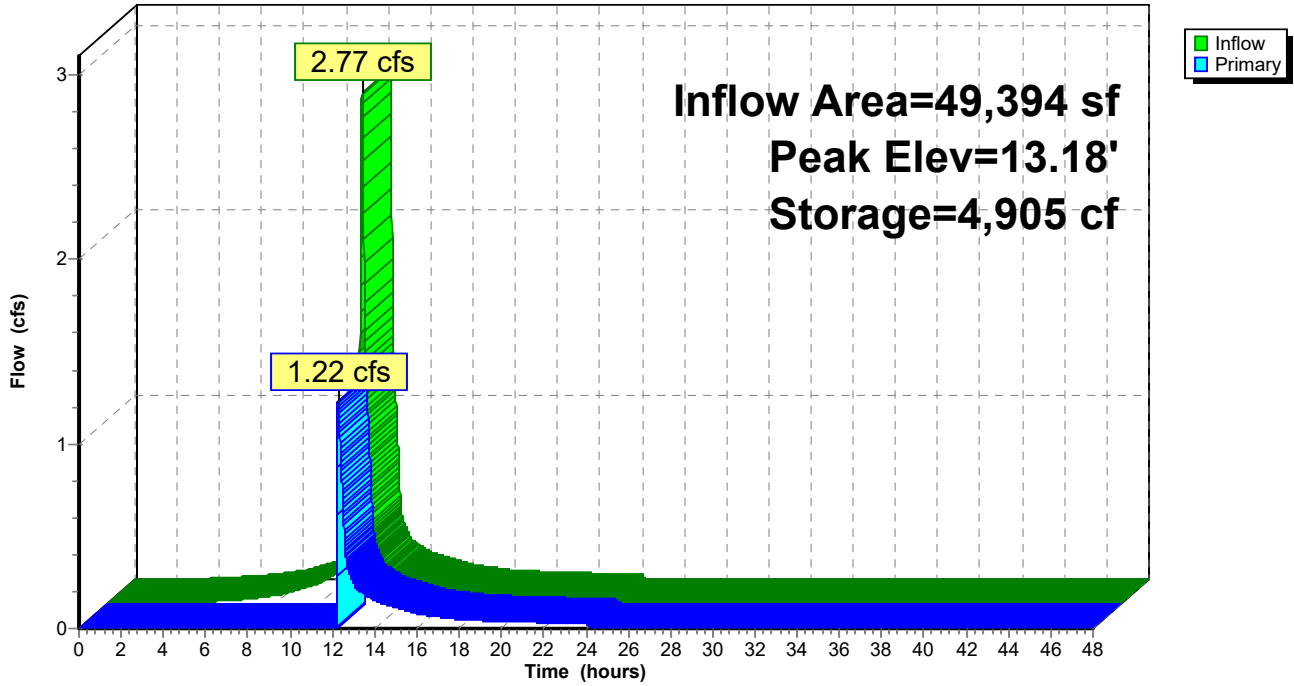
201.0 cy Field

129.5 cy Stone



### Pond 3P: C4 Overflow Manhole - Chambers

Hydrograph



## **APPENDIX D**

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### **Summary of Water Quality Treatment Zones C & D(partial)**

### Summary of Water Quality Treatment - Lot 6 (Hotel)

Zone	Inlet ID	Impervious Area (sf)	Pervious Area (sf)	Total Area (sf)	Total Area (Acres) <sup>1</sup>	Required Water Quality Volume (CF) <sup>2</sup>	Existing Developed Area Mitigation Credits (SF) <sup>9</sup>	Treatment Approach <sup>6</sup>	Filter Size Area Required <sup>6</sup> (SF)	Jellyfish Unit Provided <sup>5</sup>	1 Yr 24-hr Storm Event Peak Flow Rate (cfs) <sup>3</sup>	Required Isolator Row Chambers (Stormtech SC-740 (JF) or Cultec 150 XLHD (Focal Point) <sup>4</sup>	Provided Filter Bed (SF)/Water Quality Volume (CF) <sup>7</sup>	Isolator Row Chambers (Stormtech SC-740 or Cultec 150 XLHD) Provided (EA) <sup>8</sup>
Zone D	D-27	6,135.00	14,749.00	20,884.00	0.48	1002.88	-	FocalPoint Biofiltration System	89	N/A	1.19	6.43	96.00	7
	D - 27 Brick South (Partial South Side)	10,395.00	0.00	10,395.00	0.24	866.25	6237.00	FocalPoint Biofiltration System		N/A				
<b>Zone D Totals (Lot 6 Portion)</b>		<b>16,530.00</b>	<b>14,749.00</b>	<b>31,279.00</b>	<b>0.72</b>	<b>1,869.13</b>	<b>6,237.00</b>	<b>None</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Zone C Developed Area	Disturbed Perimeter Area	0.00	0.00	0.00	0.00	-	-	None		-	-	-	-	-
	C-14	7,447.00	876.00	8,323.00	0.19	649.78	0.00	Contech Jellyfish Filter	N/A	JF4 2-1	0.47	2.33	4051 CF	16
	C-7	7,195.00	1,924.00	9,119.00	0.21	663.72	0.00				0.46	2.32		
	C-10	1,926.00	0.00	1,926.00	0.04	160.50	0.00				0.12	0.59		
	C-11	2,649.00	0.00	2,649.00	0.06	220.75	0.00				0.16	0.81		
	C-13 (non-roof portion)	933.00	0.00	933.00	0.02	77.75	0.00				0.06	0.28		
	C-15A (Roof)	10,055.00	0.00	10,055.00	0.23	837.92	0.00				0.61	3.07		
	C-15B (Roof)	9,660.00	0.00	9,660.00	0.22	805.00	0.00				0.59	2.95		
	C-15C (Future)	3,734.00	0.00	3,734.00	0.09	311.17	0.00				0.23	1.14		
Disturbed Perimeter Area	0.00	0.00	0.00	0.00	0.00	0.00	N/A		-	-	-	-	-	
<b>Zone C Developed Area Subtotals</b>		<b>43,599.00</b>	<b>2,800.00</b>	<b>46,399.00</b>	<b>1.07</b>	<b>3,726.58</b>	<b>0.00</b>	<b>-</b>		<b>-</b>	<b>2.70</b>	<b>13.49</b>	<b>N/A</b>	<b>N/A</b>
Zone C Existing Buildings	C-13 BS-South Side (Partial)	2,995.00	0.00	2,995.00	0.00	249.58	1,797.00	Contech Jellyfish Filter	N/A	JF4 2-1 (included in above)	0.18	0.91	Included in Zone C above	Included in Zone C above
<b>Zone C Existing Building Subtotal</b>		<b>-</b>	<b>0.00</b>	<b>2,995.00</b>	<b>0.00</b>	<b>249.58</b>	<b>1,797.00</b>	<b>-</b>		<b>-</b>	<b>0.18</b>	<b>0.91</b>	<b>0.00</b>	<b>-</b>
<b>Zone C Totals</b>		<b>46,594.00</b>	<b>2,800.00</b>	<b>49,394.00</b>	<b>1.07</b>	<b>3,976.17</b>	<b>1,797.00</b>	<b>-</b>	<b>0.00</b>	<b>0.00</b>	<b>2.88</b>	<b>14.41</b>	<b>N/A</b>	<b>N/A</b>

**\*\*Previously Approved Filterra Box**

Developed Area Breakdown	
A.) Total New Developed Area Treated (SF)	63,549.00
B.) Total New Developed Area untreated (SF)	0.00
C.) Total New Developed Area (SF) = A+B	63,549.00
D.) Existing Developed Area Treated (SF)	13,390.00
E.) Adjusted Existing Developed Area Treated (SF)	8,034.00
F.) Total Net Developed Area Treated (SF) = A+E	71,583.00
Impervious Area Breakdown	
G.) Total New Impervious Area treated (SF)	49,734.00
H.) Total New Impervious Area untreated (SF)	0.00
I.) Total New Impervious Area (SF) = G+H	49,734.00
J.) Existing Impervious Area Treated (SF)	13,390.00
K.) Adjusted Existing Impervious Area Treated (SF)	8,034.00
L.) Total Net Impervious Area Treated (SF) = G+K	57,768.00

Treatment Breakdown	Required	Provided
% of Net Developed Area Treated = F/C	80.00%	112.64%
% of Net Impervious Area Treated = L/I	95.00%	116.15%

**NOTES AND ASSUMPTIONS:**

1. All areas are based on the Placemaker Partners Permit drawings dated September 2017
2. The required water quality volumes have been computed based on Sections 7.4, 7.5 and 7.6 of the Maine DEP Volume III BMP's Technical Design Manual. The volume is computed to be 1" times the subcatchments impervious area and 0.4" times the subcatchments vegetated area. Existing buildings to remain are not required to be treated.
3. The 1 year peak flow rates have been computed using the rational method. The rainfall intensities are derived from the Cumberland County IDF curve.
4. Subsurface storage system sizing is based on a Stormtech SC-740 chamber system. All isolator rows have been computed per a 7/29/2016 letter from State of Maine to Stormtech re: Pretreatment Isolator Row of the Maine DEP Volume III BMP's Technical Manual. One chamber is required for each 0.2 cfs of the computed tributary 1 year peak flow rate.
5. The required number of Jelly Fish treatment units have been computed based on Contech Sizing requirements. The water quality volume for each unit is storage up stream and the amount of treatment cartridges are computed based sediment mass loading.
6. Focal Point system was sized using the 2/2/201 approval letter from the State of Maine to Stormwater Systems ACF. See attached computations and separate focal point checklist for sizing.
7. Provided Water Quality Volume for stormtreat storage system computed using 61.38 CF of storage per chamber based on Storm Tech Chamber Design Manual
8. Vacant
9. According to Chapter 500 Maine DEP stormwater rules Dated 2015; the department allows applicants to take credit for the treatment of existing impervious areas on site. For existing roofs the credit can be calculated by multiplying the total treated area by 0.6. The overall project was approved using this methodology.
10. Vacant

Rational Method Flow Computations										
ZONE	INLET ID	IMPERVIOUS (SF)	PERVIOUS (SF)	TOTAL AREA (SF)	TOTAL AREA (ACRES)	WEIGHTED C	25-YEAR FLOW	10-YEAR FLOW	2-YEAR FLOW	1-Year Flow
Zone D	D-24	8,527.00	600.00	9,127.00	0.21	0.90	1.18	1.04	0.75	0.53
	D-25	19,009.00	2,393.00	21,402.00	0.49	0.87	2.66	2.34	0.00	1.19
	D-26	6,135.00	14,749.00	20,884.00	0.48	0.42	1.26	1.11	0.00	0.56
	D - 26 Brick South (Partial South Side)	10,395.00	0.00	10,395.00	0.24	0.95	1.42	1.25	0.00	0.63
<b>Zone D Sub-totals</b>		<b>44,066.00</b>	<b>17,742.00</b>	<b>61,808.00</b>	<b>1.42</b>	<b>-</b>	<b>6.52</b>	<b>5.73</b>	<b>0.75</b>	<b>2.92</b>
Zone C	C-3	7,447.00	876.00	8,323.00	0.19	0.87	1.04	0.92	0.67	0.47
	C-7	7,195.00	1,924.00	9,119.00	0.21	0.79	1.04	0.91	0.66	0.46
	C-9	1,926.00	0.00	1,926.00	0.04	0.95	0.26	0.23	0.17	0.12
	C-10	2,649.00	0.00	2,649.00	0.06	0.95	0.36	0.32	0.23	0.16
	C-11 (non-roof portion)	933.00	0.00	933.00	0.02	0.95	0.13	0.11	0.08	0.06
	C-12A (Roof)	10,055.00	0.00	10,055.00	0.23	0.95	1.37	1.21	0.88	0.61
	C-12B (Roof)	9,660.00	0.00	9,660.00	0.22	0.95	1.32	1.16	0.84	0.59
	C-12C (Future)	3,734.00	0.00	3,734.00	0.09	0.95	0.51	0.45	0.33	0.23
<b>Zone C Sub-totals</b>		<b>46,594.00</b>	<b>2,800.00</b>	<b>49,394.00</b>	<b>1.13</b>	<b>-</b>	<b>6.43</b>	<b>5.66</b>	<b>4.12</b>	<b>2.88</b>

Assumptions	
Pervious C	0.2
Impervious C	0.95
I-1 Year	2.8 in/hr
I-2 Year Storm	4 in/hr
I-10 Year Storm	5.5 in/Hr
I-25 Year Storm	6.25 in/Hr
Notes:	
1. Rainfall intensity based on Cumberland County IDF curve using a TC of 5 min.	

**Zone C Required StormTech Chamber Storage Computation**

Weir Wall Height	13.02	EL	
Bottom of Chamber Elevation	10.52	EL	
Total Chamber Height	30	Inches	30 (max chamber height)
Total Storage per chamber	61.38	CF	
Total WQV for Zone C	3,976.00	CF	
Total Chambers Required	64.8	#	
Total Chambers Provided	66	#	
Total Storage Provided	4051.08	CF	

Hotel Project Water Quality Volume (CF) 3,976.00  
 (includes Future Building Expansion, 3,734 SF building area )

Notes:

1. Height of weirwall based based on WQv. See sheet "rational method flow computations". Structure C4 in which weir wall is located was modeled using HydroCad. See attached computations.

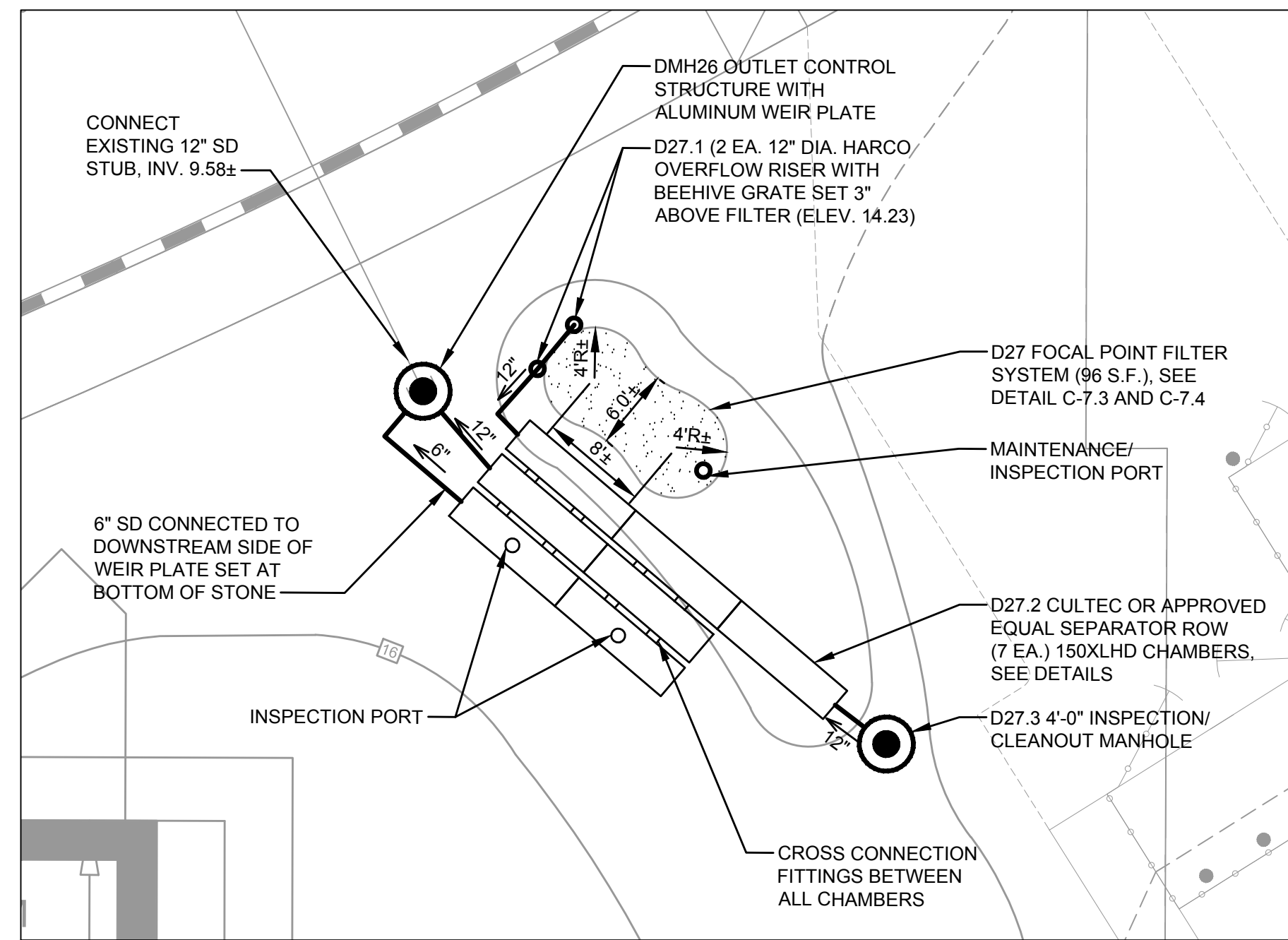
	Impervious Area	Pervious Area	1 yr Peak Flow (CFS)	Flow Per Chamber	Required Isolator Row Chambers	Provided Isolator Row Chambers
Trib. To East Inlet	25610	876	1.5	0.2	7.5	8
Trib. To West Inlet	20984	1924	1.2	0.2	6	8



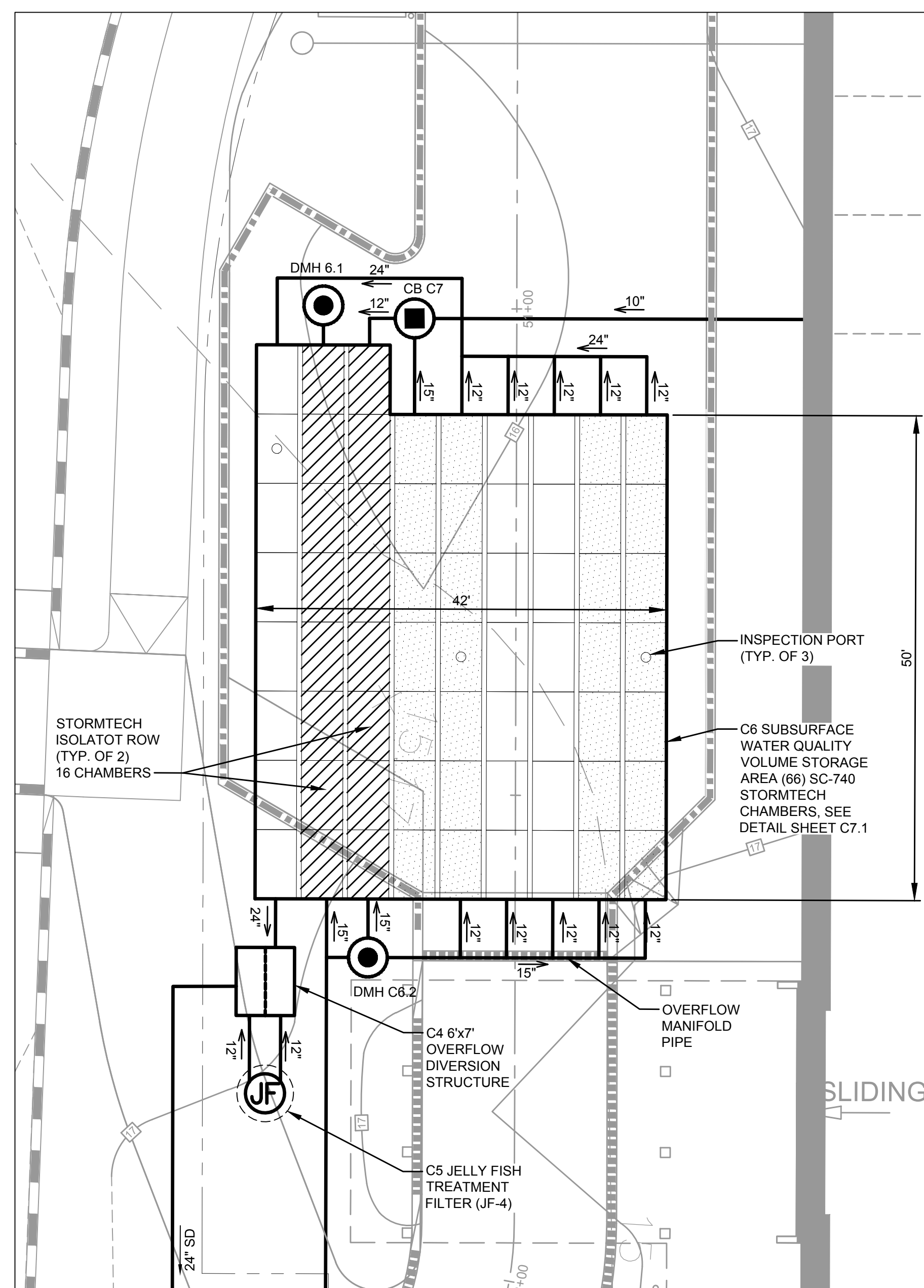
**APPENDIX E**

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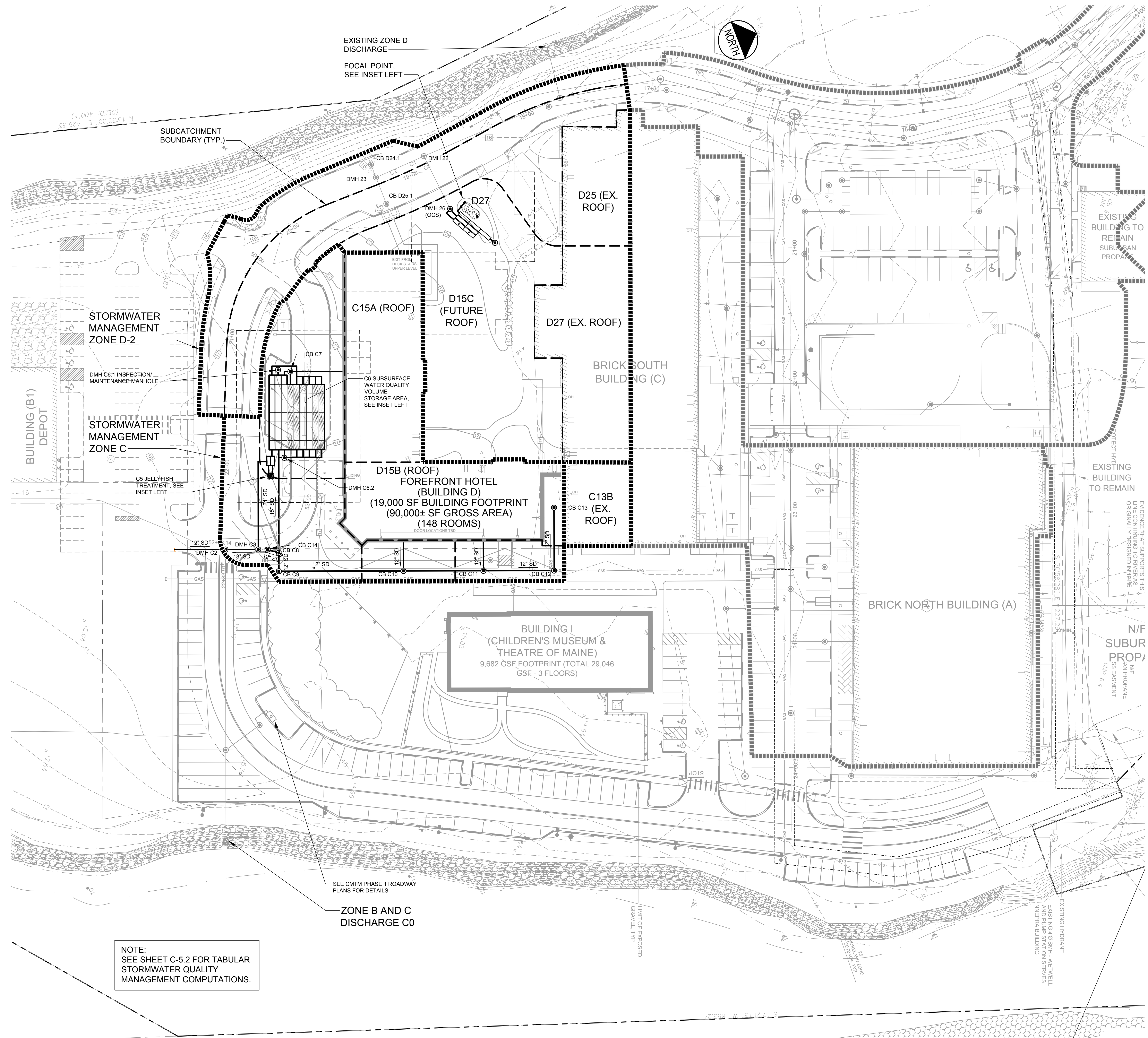
**Stormwater Management Plan-1 C-5.1**



**FOCAL POINT AREA  
ENLARGED VIEW**  
SCALE: 1"=10'

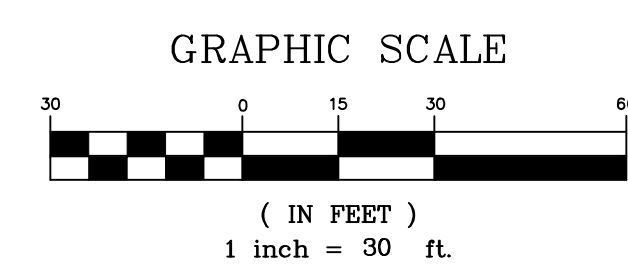


**SUBSURFACE WATER QUALITY STORAGE AREA  
ENLARGED VIEW**  
SCALE: 1"=10'

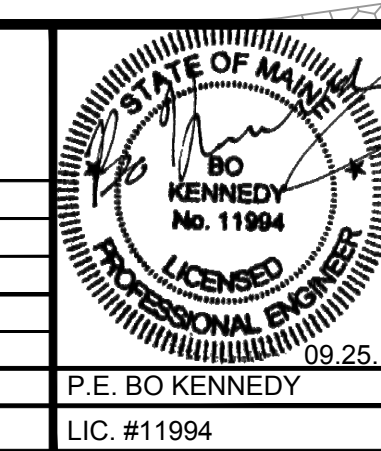


NOTE:  
SEE SHEET C-5.2 FOR TABULAR  
STORMWATER QUALITY  
MANAGEMENT COMPUTATIONS.

PRELIMINARY – NOT  
FOR CONSTRUCTION



REV	DATE	DESCRIPTION
1	9/25/2017	FINAL SITE PLAN SUBMISSION



PROJECT  
THE FOREFRONT AT THOMPSON'S POINT  
FOREFRONT HOTEL

SHEET TITLE  
**STORMWATER  
MANAGEMENT PLAN - 1**

CLIENT  
FOREFRONT HOTELIERS, LLC

PLACEMAKER PARTNERS, LLC  
501 DANFORTH STREET  
PORTLAND, ME 04102  
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DRAWN: DB DATE: AUG. 2017  
DESIGNED: BEK SCALE: 1" = 30'  
FILE NAME: HOTEL-SMP.dwg  
SHEET C-5.1