

**ATTACHMENT D**

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**Stormwater Management Report &  
Supplemental Information**

**SUPPLEMENTAL STORMWATER MANAGEMENT REPORT  
IN SUPPORT OF SUBDIVISION PLAN APPLICATION  
(GENERAL STANDARDS)**

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

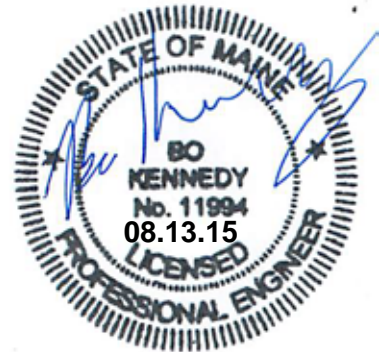
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## SUPPLEMENTAL STORMWATER MANAGEMENT REPORT

### 1.0 INTRODUCTION

FST was retained by Forefront Partners I, LP for preparation of a City of Portland Subdivision Application for the proposed mixed-use development of Thompson’s Point in Portland, Maine. The proposed Subdivision Plan dated March 25, 2015 is consistent with the March 2014 approved Master Plan; however, includes a few modifications to the overall site plan and consequently the stormwater management system.

Over the course of this project, FST has prepared multiple Stormwater Management Reports in support of the Forefront at Thompson’s Point project. These reports are summarized in the table below.

<b>TABLE 1 SUMMARY OF STORMWATER MANAGEMENT REPORTS</b>				
<b>Title</b>	<b>Application Description</b>	<b>Date</b>	<b>Last Revision Date</b>	<b>Approved Date</b>
Stormwater Management Report (General Standards)	Level III Site Plan/Subdivision	March 2012	April 2012	June 2012
Inspection and Maintenance Manual For Stormwater Management and Related Stormwater Facilities	Level III Site Plan/Subdivision	March 2012	April 2012	June 2012
Supplemental Stormwater Management Report (General Standards)	Amended Level III Site Plan/Subdivision	May, 10 2013	May, 10 2013	June 2013
Master Stormwater Management Strategy Schematic	Master Development Plan	October, 2013	January 23, 2014	March 2014
Supplemental Stormwater Management Report for Phase 1A Brick North Level III Site Plan Application (General Standards)	Amended Level III Site Plan/ Phase 1A Sectional Subdivision Plat	June 30, 2014	June 30, 2014	Dec. 4, 2014
Supplemental Stormwater Management Report In Support of Amended Subdivision Plan (General Standards)	Amended Subdivision	August 11, 2015	August 11, 2015	Pending

The development will still include an event center with outside concert space, hotel, restaurant, office, sports medicine facility, surface parking, and a multiple story parking structure. The most significant change from the May 2013 report is the inclusion of approximately 3.3 acres of land currently occupied by Suburban Propane and Northern New England Rail Authority (NNEPRA). The acquisition of this land provides greater flexibility to the site development and has added an element of open green space which reduces the overall amount of impervious area on the site from both the existing conditions and the previously permitted development. Additionally, the acquisition of this land will provide an opportunity to retain and renovate four existing buildings previously scheduled to be razed.

This supplemental report is intended to describe the changes from the May 2013 Site Plan approval and March 2014 approved Master Plan as well as show that the project is still in compliance with the Portland Stormwater Management Standards adopted July 19, 2010 and General Stormwater Standards of MaineDEP (revised January 2015). Since the original permit approval in 2012, the name of stormwater zones and treatment strategies have changed. This supplemental report will describe the treatment of each stormwater discharge zone and show that the project is still in compliance with the stormwater standards as mentioned above. The intent of the Stormwater Management design, Erosion & Sediment Control, and Inspection and Maintenance Manual have remained the same as approved in June 2012. The overall development area has increased to 23.24 acres of which 21.40 acres are redeveloped area. The development will have a total of 16.29 acres of impervious surfaces of which 14.45 acres are redeveloped impervious area. Revisions to the site plan and how it relates to each Stormwater Management Discharge Zone is outlined below and tabulated in the spreadsheet included in Appendix A.

## **2.0 STORMWATER MANAGEMENT REVISIONS**

### **Existing Building Mitigation Credit**

As discussed in the April 2012 Stormwater Management Report, the current conditions (which existed prior to 2005) consist of a nearly all impervious developed project area with a mixed land cover of gravel, pavement, and buildings. As part of the new Forefront site redevelopment shown on the project drawings dated August 2015, four of the existing buildings that were previously scheduled to be razed are now part of a building renovation plan.

This is a major shift from the previously approved stormwater management approach since the change affects the water quality treatment percentage compliance computations two-fold. First, the existing impervious surfaces remaining in place (that existed prior to 1975) which will not be redeveloped, do not need to be included in the total redeveloped area or redeveloped impervious area, thus reducing the total area requiring treatment. The stormwater management strategy presented herein has assumed that 95% of all redeveloped impervious area will need to be treated with a BMP included in the MaineDEP Technical Stormwater Manual. Secondly, MaineDEP Chapter 500 permits a prorated credit to be applied to existing impervious areas which are treated to meet the water quality treatment standards.

All four of the existing buildings to remain will be tributary to a treatment system as shown on Sheet C-4.1 Overall Stormwater Management Plan. Because of uncertainties with the Suburban Propane Brick Building (Portion of Building H) Redevelopment Plan, only three of the four buildings have been used as credits in the stormwater management treatment computations. The small Suburban Propane Building has been considered redeveloped impervious area in the attached computations. The proposed treatment systems have been sized to treat the full area of existing rooftop.

According to Section 6 of the MaineDEP Chapter 500 Stormwater Rules, projects may claim onsite treatment credits for the treatment of existing impervious surfaces. The rule allows credit for 60% of existing rooftops that become tributary to treatment. The following table is a breakdown of the rooftop credit applied to this project:

<b>TABLE 2 EXISTING BUILDING ROOF TOP MITIGATION CREDIT</b>					
<b>Existing Building Name</b>	<b>Zone(s)</b>	<b>Treatment Approach</b>	<b>Mitigation Credit</b>	<b>Area (sf)</b>	<b>Total Credit (sf)</b>
Depot Building (Building B1)	A/B	Grassed Soil Filter	0.6	11,051	6,631
Brick North (Building A)	F	Gravel Drip Edge	0.6	33,340	20,004
Brick South (Building C1)	C/F	Jellyfish® Filter	0.6	32,849	19,709
<b>Total Credit of Building Treatment Area (SF)</b>					<b>46,344</b>

See the attached water quality treatment summary table for computations incorporating the credits noted above. MaineDEP stipulates that credits can be counted towards total treated impervious area and the building area is not required to be included in the total new developed area.

### **Filtterra Sizing Criteria**

As of January 21, 2015, StormTech™ isolator rows are no longer required to accompany Filtterra® Tree Box units as stated in a letter sent from the MaineDEP to Contech and included in Appendix B. Along with removing the isolator row, MaineDEP also redefined the maximum allowable tributary for each filter. The following table summarizes the new sizing criteria:

<b>TABLE 3 FILTERRA® SIZING CRITERIA</b>	
<b>Filtterra® Model Number</b>	<b>Area in Acres</b>
4x6 or 6x4	Up to 0.17
4x8 or 8x4	0.18-0.22
6x6	0.23-0.25
6x8 or 8x6	0.26-0.33
6x10 or 10x6	0.34-0.42
6x12 or 12x6	0.43-0.50
7x13 or 13x7	0.51-0.63

There are two Filtterra® box units that were previously approved during the Brick North Stand Alone (Phase 1A) Level III Site Plan Application (PEZ 2014-120) that was approved on December 4, 2014. The Filtterra tree box units designed for sub-catchments D-18 and D-19 were sized using the previous MaineDEP BMP Filtterra® sizing standards. At the time of approval, FST had received a letter from the MaineDEP to Filtterra® Bioretention Systems on June 27, 2014 that Filtterra® units would no longer require StormTech™ isolator rows. See Filtterra® sizing changes confirmation letter from the MaineDEP included in Appendix C.

### **Jellyfish® Filter Units**

As of January 21, 2015 MaineDEP has approved the use of a Jellyfish® filter unit as an acceptable BMP for stormwater treatment. Jellyfish® units are designed to treat zones that were previously treated by StormTreat™ units. MaineDEP approves the use of the Jellyfish units when sized, installed, and maintained in accordance with the following provisions:

- Each treatment cartridge is approved for a maximum flow rate of 80 GPM for each 54-inch long membrane cartridge and 40 GPM for each drawdown cartridge.
- Upstream water quality volume equal to 1.0 inch of runoff from impervious surfaces and 0.4 inch of runoff from landscaped areas to be stored and hydraulically isolated from any other storage on site. Water quality volume must also be drained in 24-48 hours.
- All systems must provide means to maintain the system
- System must be inspected every 6 months
- Review and approval by the manufacturer for the proposed use and sizing of the jellyfish to ensure conformance with the manufacturer's design specifications

See Appendix D for MaineDEP Jellyfish® unit approval Letter.

Jellyfish® units sizing for this project have been designed by the manufacturer's engineers and checked thoroughly by FST. See Jellyfish® unit details on Sheet 7.3. Also, see Appendix E for attached Jellyfish® unit computations.

### **Zone A – Treatment Approach: Grassed Under Drained Soil Filter**

Zone A is comprised of a portion of the existing depot building (Building B1), Buildings B2 and B3, grass/landscaped open space and impervious walkways. The proposed developed area will be constructed in a previously developed area with a compacted gravel impervious surface. A portion of Zone A that will be redeveloped as primarily grass area for concert viewing will go untreated. The treated portion of Zone A includes buildings B2, B3 and part of the retrofitted depot building. The treatment approach for Zone A is the utilization of a grassed under drained soil filter:

Underdrained soil filters are required to treat 1" of the total impervious area and .4" of total pervious area tributary to the system.

For the area tributary to the treatment filter in this zone, the required water quality volume is calculated to be:

$$\begin{aligned} \text{Total Pervious Area} &= 15,892 \text{ SF} \\ \text{Total Impervious Area} &= 15,178 \text{ SF} \\ \text{Water Quality Volume} &= (15,892 \times 0.4/12) + (15,178 \times 1/12) = 1,795 \text{ CF} \end{aligned}$$

According to MaineDEP Best Management Practices Under Drained Soil Filters must have a minimum surface area of 5% of total impervious area + 2% of total pervious area.

$$\text{Total Required Surface Filter Surface Area for Zone A} = 15,892 \times .02 + 15,178 \times .05 = 1,077 \text{ SF}$$

MaineDEP rules state that soil filters shall have a maximum ponding depth of 1.5'. Based on this, the required surface for the filter must be at least the:

Water Quality Volume/Maximum Ponding Depth = 1,795 (CF)/1.5' = 1,196 SF

The total provided filter area for Zone A is 1,500 SF.

The Underdrain Soil Filter criterion has been met.

Therefore, water quality goals for Water Quality Zone A meet the General Stormwater Standards of the November 2005 Chapter 500 Rules of MeDEP (Rev January 2015).

### **Zones B, C, D, E and F – Treatment Approach: Jellyfish® Treatment Units**

The Jellyfish® treatment units have been designed to treat Zones B, C, D, and F. For Zones B, D and F the Jellyfish® system is the primary method of treatment however; they have been supplemented with treatment measures such as Tree Box Filters, Stone Drip Edge with gravel filter and rain gardens, as discussed later in this report, to treat smaller isolated portions of the sub catchments.

Jellyfish® units are manholes that utilize membrane filtration treatment cartridges. Flow enters the Jellyfish® from an upstream storage chamber and flows down 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 routes to the outlet. A baffle wall is located between the inlet and outlet compartments to ensure that un-treated flow is not mixed with treated flow. When the hi-flow treatment cartridge has filled, a drain down cartridges 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® unit is designed to discharge the water quality volume within 24 – 48 hours.

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 the water quality volume for Zones B, C, D, E and F are included in Appendix A.

The water quality volume is provided in a subsurface arched chambers storage system.

Jellyfish® units are designed based on a mass sediment loading calculation. Each treatment high flow cartridge has a capacity of 125 pounds and each low-flow (drain down) cartridge has a capacity of 63 pounds. 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.



The following table breaks down the required Jellyfish® units for each zone.

<b>TABLE 4</b>			
<b>JELLYFISH® SIZING TABLE</b>			
<b>Zone</b>	<b>Manhole Size</b>	<b>High Flow Cartridges</b>	<b>Low Flow Cartridges</b>
B	4	2	1
C	4	2	1
D	6	5	1
D1	4	2	1
E	4	2	1
F	6	4	1

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 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 MaineDEP (rev. January 2015).

**Zones B and D – Treatment Approach: Tree Box or Box Less Filterra's®**

The Filterra® system has been designed to treat subcatchments in zone's B, D and H.

As described before, two tree box filters were sized and previously approved with the Phase 1A Level III Site Plan. To meet Chapter 500, the previous tree box filter sizing was required to be sized based on the tributary area as stated in the following table:

<b>TABLE 5</b>	
<b>Filterra® Model Number</b>	<b>Area in Acres</b>
4x6 or 6x4	0.32
4x8 or 8x4	0.42
6x6	0.47
6x8 or 8x6	0.64
6x10 or 10x6	0.79
6x12or 12x6	0.95
7x13 or 13x7	1.20

<b>TABLE 6 PREVIOUSLY APPROVED FILTERRA SIZING</b>		
<b>Filtterra® ID Number</b>	<b>Tributary Area (ac)</b>	<b>Filtterra® Model Number Selected</b>
D-18	0.30	4X6
D-19	0.19	4X6

As of January 2015 Filtterra® systems must be designed based on the following tributary area to meet Chapter 500 Standards:

<b>TABLE 7</b>	
<b>Filtterra® Model Number</b>	<b>Area in Acres</b>
4x6 or 6x4	Up to 0.17
4x8 or 8x4	0.18-0.22
6x6	0.23-0.25
6x8 or 8x6	0.26-0.33
6x10 or 10x6	0.34-0.42
6x12 or 12x6	0.43-0.50
7x13 or 13x7	0.51-0.63

The following table summarizes the remaining designed tree-box filters that must be designed in accordance with MaineDEP's new requirements:

<b>TABLE 8</b>		
<b>Filtterra® ID Number</b>	<b>Tributary Area (ac)</b>	<b>Filtterra® Model Number Selected</b>
H-202	0.39	6x10
B-402	0.20	2-4X6
B-403	0.69	2-6X10
D-603	0.24	2-4X6
D-604	0.08	4X6
D-605	0.37	1-4X6, 1-4X8
D-20	0.24	2-4X6
D-21	.50	2-6x6
D-18	0.30	4X6
D-19	0.19	4X6

**Zone D – Treatment Approach: Rain Garden (Bio Retention Cell)**

Rain Gardens are required to treat 1” of the total impervious area and .4” of total pervious area tributary to the system.

For this zone, the required water quality volume is calculated to be:

Total Pervious Area = 10,428 SF  
Total Impervious Area = 10,264 SF  
Water quality volume =  $(10,428 \times 0.4/12) + (10,264 \times 1/12) = 1,203$  CF

According to MaineDEP Best Management Practices, Bio Retention Cells must have a minimum surface area of 7% of total impervious area + 3% of total pervious area.

Total Required Surface Filter Surface Area for Zone D =  $10,428 \times .03 + 10,264 \times .07 = 1,031$  SF

The Total provided filter area for Zone D is 1,500 SF.

The Rain Garden criterion has been met.

Therefore, water quality goals for the Rain Garden Bio Retention Cells meet the General Stormwater Standards of the November 2005 Chapter 500 Rules of MaineDEP (rev. October 2010).

### **Zone F Treatment Approach – Gravel Drip Edge**

Building A (Brick North) will remain and undergo renovation for mixed-uses such as office, studio and other. The Brick North and Brick South Buildings were constructed prior to 1975 and therefore not subject to the MaineDEP Chapter 500 treatment regulations. However, as stipulated in Section 6 of the Chapter 500 Stormwater Manual the applicant is proposing the use of mitigation credit at a rate of 60% of the total rooftop area treated to offset an untreated parking lot elsewhere on the site.

The applicant has elected to install a stone drip edge with gravel filter to treat the runoff from the existing roof. The roof is pitched down the center, splitting the building on its east-west axis; therefore, the drip edge treatment is proposed on the north and south sides of the building as shown on the Phase 1A Brick North Design drawings. The stone reservoir is 6 feet wide by 2.48 feet thick as shown in the attached computations. The stone reservoir has been sized to store the water quality volume computed to be 1" of runoff from the rooftop area.

### **Zone H Treatment Approach – Underdrained Subsurface Sand Filter**

The underdrained subsurface sand filter has been designed to treat Zone H.

To meet Chapter 500, Channel Protection Volume provided must be equal to or greater than the following:

1" x impervious area plus 0.4" x landscaped area

Tributary Impervious Area = 3.45 AC  
Tributary Pervious Area = 0.40 AC

1" x 3.45 ac =	12,511 CF
0.4" x 0.40 =	574 CF
<b>Total</b>	<b>13,085 CF</b>

Based on the revisions made to Chapter 7 of the MaineDEP Best Stormwater Practices in April 2007, the surface area of the water quality filter must be no less than the sum of 5% of the impervious area and 2% of the landscaped area draining to the filter.

Surface Area Required:

5% of impervious area	= 0.05 x 3.45 AC	= 7,514 SF
2% of landscaped area	= 0.02 x 0.40 AC.	= 349 SF
	Total	= 7,863 SF

Surface Area Provided:

7,930 SF

This criterion has been met.

The discharge must pass through a soil filter; the maximum outlet pipe shall be 8”.

**3.0** CONCLUSION

The stormwater management strategy for the Subdivision Plan presented herein provides treatment for 18.09 acres of 21.40 acres of total redeveloped area, thus treating 84.5 % of redeveloped area.

The development will have a total of 16.29 acres of impervious surfaces of which 14.45 acres are redeveloped impervious area. The proposed strategy treats 12.87 acres of redeveloped impervious area plus 1.83 acres of existing buildings. After applying the treatment credit adjustment for treating existing impervious area, the overall stormwater treatment strategy will treat 96.40% of redeveloped impervious area created by the project. The Stormwater Management Plan created for the subdivision application herein meets or exceeds the City of Portland Stormwater Management Requirements. See Appendix A for full water quality calculations.

The storm drainage piping is sized for a 25 year storm event. The Rational Method was used to compute peak flows and sizing of the storm drain pipe size. Computations are included in Appendix F.

**4.0** APPENDICES

Appendix A – Tabulated Summary of Stormwater Management Water Quality Treatment

Appendix B – MaineDEP Correspondence to Contech Regarding Filterra® Tree Box Units

Appendix C – Filterra® Sizing Changes Confirmation Letter from the MaineDEP

Appendix D – MaineDEP Correspondence to Contech Regarding Jellyfish® Unit Approval

Appendix E – Jellyfish® Unit Computations

Appendix F – Rational Method 25 Year Storm Frequency Peak Flow Computations & Schematic

**APPENDIX A**

**TABULATED SUMMARY OF  
STORMWATER MANAGEMENT CHANGES**

**Summary of Water Quality Treatment**

Storm Water Management Zone	Inlet Subcatchment	Total Developed Area (sf)	Total Impervious Area (sf)	Total Pervious Area (sf)	Total New Developed Area (Acres)	Required Water Quality Volume (cf) <sup>2</sup>	Existing Roof Mitigation Credit (sf) <sup>9</sup>	Treatment Approach	Required Water Quality Filter Surface Area (sf) (When applicable) <sup>10</sup>	Required Surface Area Volume controlled by Maximum Pond Depth	Tree Box Filter Size or Provided Filter Size	1 Yr 24-hr Storm Event Peak Flow Rate (cfs) <sup>3</sup>	Stormtech Isolator Row Chambers Required (EA) <sup>4</sup>	Stormtreat Units Required (EA) or StormFilters (EA) (Where Applicable) <sup>5,11</sup>	Stormtreat Units/Storm Filter Units Provided (EA)	Provided Water Quality Volume (cf) <sup>4,7</sup>
Zone A	301	23,093.00	10,798.00	12,295.00	0.53	1,310	0	UD Grass Filter	786	873	900	-	-	-	-	1,350
	<b>Sub-Total Zone A New Treated Area</b>	<b>23,093.00</b>	<b>10,798.00</b>	<b>12,295.00</b>	<b>0.53</b>	<b>1309.67</b>	<b>0.00</b>	-	<b>785.80</b>	<b>873.11</b>	-	-	-	-	-	-
	Existing Depot Building*	7,720.00	7,720.00	0.00	0.18	643	4,632	UD Grass Filter	386	429	600	-	-	-	-	900
	<b>Sub-Total Zone A Existing Treated Roof Area</b>	<b>7,720.00</b>	<b>7,720.00</b>	<b>0.00</b>	<b>0.18</b>	<b>643.33</b>	<b>4632.00</b>	-	<b>386.00</b>	<b>428.89</b>	-	-	-	-	-	-
	302	27,818.00	5,591.00	22,227.00	0.64	-	-	Untreated	-	-	-	-	-	-	-	-
	Zone A New Untreated Area-Perimeter Grades	14,729.00	0.00	14,729.00	0.34	-	-	Untreated	-	-	-	-	-	-	-	-
	<b>Sub-Total Zone A Untreated Areas</b>	<b>42,547.00</b>	<b>5,591.00</b>	<b>36,956.00</b>	<b>0.98</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Zone A Total Area Discharge</b>	<b>73,360.00</b>	<b>24,109.00</b>	<b>49,251.00</b>	<b>1.68</b>	<b>1953.00</b>	<b>4632.00</b>	-	<b>1171.80</b>	<b>1302.00</b>	-	-	<b>0</b>	<b>0.00</b>	-	<b>2,250</b>	
Zone B	401	46,664.00	17,081.00	29,583.00	1.07	2,410	0	Boxless Filtera	-	-	13x7'	1.17	-	-	-	-
	402	7,588.00	6,241.00	1,347.00	0.17	565	0	Boxless Filtera	-	-	4x6'	0.42	-	-	-	-
	403	26,630.00	9,865.00	16,765.00	0.61	1,381	0	Boxless Filtera	-	-	6x8	0.73	-	-	-	-
	<b>Sub-Total Zone B New Treated Area</b>	<b>80,882.00</b>	<b>33,187.00</b>	<b>47,695.00</b>	<b>1.86</b>	<b>4355.42</b>	<b>0.00</b>	-	-	-	-	-	-	-	-	-
	Existing Depot Building* (trib to 401)	3,400.00	3,400.00	0.00	0.08	283	2,040	Boxless Filtera	-	-	see 401	0.21	-	-	-	-
	<b>Sub-Total Zone B Existing Treated Roof Area</b>	<b>3,400.00</b>	<b>3,400.00</b>	<b>0.00</b>	<b>0.08</b>	<b>283.33</b>	<b>2040.00</b>	-	-	-	-	<b>0.21</b>	-	-	-	-
	Zone B New Untreated Area-Perimeter Grades	9,443.00	0.00	9,443.00	0.22	-	0	Untreated	-	-	-	-	-	-	-	-
<b>Zone B Total Area Discharge</b>	<b>93,725.00</b>	<b>36,587.00</b>	<b>57,138.00</b>	<b>2.15</b>	<b>4638.75</b>	<b>2040.00</b>	-	-	-	-	-	-	-	-	-	
Zone C	501	11,805.00	11,805.00	0.00	0.27	984	0	Stormtreat	-	-	-	0.72	3.60	0.85	5	5,738
	502	7,523.00	7,523.00	0.00	0.17	627	0	Stormtreat	-	-	-	0.46	2.30	0.54		
	503	31,390.00	31,390.00	0.00	0.72	2,616	0	Stormtreat	-	-	-	1.92	9.58	2.26		
	<b>Sub-Total Zone C New Treated Area</b>	<b>50,718.00</b>	<b>50,718.00</b>	<b>0.00</b>	<b>1.16</b>	<b>4226.50</b>	<b>0.00</b>	-	-	-	-	-	<b>15.49</b>	<b>3.66</b>		
	South Side Brick South (C1)*	18,141.00	18,141.00	0.00	0.42	1,512	10,885	Storm Treat	-	-	-	1.11	5.54	1.31		
	<b>Sub-Total Zone C Existing Treated Roof Area*</b>	<b>18,141.00</b>	<b>18,141.00</b>	<b>0.00</b>	<b>0.42</b>	<b>1511.75</b>	<b>10884.60</b>	-	-	-	-	<b>N/A</b>	<b>5.54</b>	<b>1.31</b>		
	Zone C New Untreated Area-Perimeter Grades	0.00	0.00	0.00	0.00	0	0	Untreated	-	-	-	0.00	0.00	0.00	-	-
<b>Zone C Total Treated Area Discharge</b>	<b>68,859.00</b>	<b>68,859.00</b>	<b>0.00</b>	<b>1.58</b>	<b>5738.25</b>	<b>10884.60</b>	-	-	-	-	-	<b>21.02</b>	<b>4.97</b>	<b>5</b>	<b>5,738</b>	
Zone D	601	21,057.00	11,803.00	9,254.00	0.48	1,292	0	Filterra	48	48	6x8'	0.81	4.04	-	-	-
	602	13,308.00	7,527.00	5,781.00	0.31	820	0	Boxless Filtera	24	24	4x6'	0.55	2.73	-	-	-
	603	3,244.00	1,359.00	1,885.00	0.07	176	0	Filterra	24	24	4x6'	N/A	N/A	-	-	-
	604	5,691.00	3,131.00	2,560.00	0.13	346	0	Filterra	24	24	4x6'	N/A	N/A	-	-	-
	D-21	9,052.00	8,280.00	772.00	0.21	716	0	Filterra	60	60	6x8'	0.52	2.61	-	-	-
	D-20	16,178.00	12,517.00	3,661.00	0.37	1,165	0	Filterra				0.81	4.05	-	-	-
	D-18	9,604.00	5,763.00	3,841.00	0.22	608	0	Filterra	24	24	4x6'	0.43	2.16	-	-	-
	D-19	8,103.00	6,430.00	1,673.00	0.19	592	0	Filterra	24	24	4x6'	0.43	2.17	-	-	-
	D-11	18,614.00	13,989.00	4,625.00	0.43	1,320	0	StormTreat	-	-	-	0.90	4.52	1.14	-	-
	D-16	14,498.00	12,267.00	2,231.00	0.33	1,097	0	StormTreat	-	-	-	0.78	3.90	0.95	-	-
	D-12	11,149.00	4,926.00	6,223.00	0.26	618	0	Filterra	24	24	4x6'	0.41	0.00	0.00	-	-
	D-13	8,299.00	2,563.00	5,736.00	0.19	405	0	StormTreat	-	-	-	0.29	1.47	0.35	-	-
	606	77,903.00	77,903.00	0.00	1.79	6,492	0	Stormtreat	N/A	-	-	4.76	23.79	5.62	-	-
	607	11,831.00	11,831.00	0.00	0.27	986	0	Stormtreat	N/A	-	-	0.72	3.61	0.85	-	-
	608	20,692.00	10,264.00	10,428.00	0.48	1,203	0	Rain Garden	1,031	-	1,500	-	N/A	N/A	-	-
	<b>Sub-Total Zone D New Treated Area</b>	<b>249,223.00</b>	<b>190,553.00</b>	<b>58,670.00</b>	<b>5.72</b>	<b>17835.08</b>	<b>0.00</b>	-	<b>1283.32</b>	-	-	-	<b>55.06</b>	<b>8.92</b>	<b>9</b>	<b>10,300</b>
	Zone D New Untreated Area - Perimeter Grades	7,580.00	0.00	7,580.00	0.17	-	-	None	-	-	-	-	-	-	-	-
	605	7,186.00	4,988.00	2,198.00	0.16	-	-	None	-	-	-	-	-	-	-	-
	609	8,000.00	5,752.00	2,248.00	0.18	-	-	None	-	-	-	-	-	-	-	-
	<b>Sub-Total Zone D Untreated Area</b>	<b>22,766.00</b>	<b>10,740.00</b>	<b>12,026.00</b>	<b>0.52</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Zone D Total Treated Area Discharge</b>	<b>271,989.00</b>	<b>201,293.00</b>	<b>70,696.00</b>	<b>6.24</b>	<b>17835.08</b>	<b>0.00</b>	-	-	-	-	-	-	<b>55.06</b>	<b>8.92</b>	<b>9</b>	-

Zone E	801	47,912.00	33,272.00	14,640.00	1.10	3,261	-	Storm Filter	-	-	-	-	-	11.00	11	-	
	802	13,445.00	13,445.00	0.00	0.31	1,120	-	Storm Filter	-	-	-	-	-	3.09	4	-	
	<b>Sub-Total Zone E New Treated Area</b>	<b>61,357.00</b>	<b>46,717.00</b>	<b>14,640.00</b>	<b>1.41</b>	<b>4381.08</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>14.09</b>	<b>15</b>	<b>-</b>	
	Zone E New Untreated Area-Perimeter Grades	7,123.00	0.00	7,123.00	0.16	-	-	None	-	-	-	-	-	-	-	-	-
	<b>Zone E Total Area Discharge</b>	<b>68,480.00</b>	<b>46,717.00</b>	<b>21,763.00</b>	<b>1.57</b>	<b>4,381</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>14.09</b>	<b>15</b>	<b>-</b>	
Zone F	701	19,005.00	9,599.00	9,406.00	0.44	1,113	0	Storm Treats	-	-	-	0.69	3.43	0.96	6	6240	
	702	7,244.00	7,244.00	0.00	0.17	604	0	Storm Treats	-	-	-	0.44	2.21	0.52			
	CB F-8	3,323.00	2,515.00	808.00	0.08	237	0	Storm Treats	-	-	-	0.20	1.01	0.20			
	CB F-7	17,327.00	13,385.00	3,942.00	0.40	1,247	0	Storm Treats	-	-	-	0.86	4.31	1.08			
	CB F-3	3,548.00	186.00	3,362.00	0.08	128	0	Storm Treats	-	-	-	0.20	1.00	0.11			
	CB F-4	1,039.00	256.00	783.00	0.02	47	0	Storm Treats	-	-	-	0.17	0.83	0.04			
	CB F-5	4,131.00	256.00	3,875.00	0.09	151	0	Storm Treats	-	-	-	0.20	1.02	0.13			
	CB F-6	2,102.00	348.00	1,754.00	0.05	87	0	Storm Treats	-	-	-	0.19	0.94	0.08			
	703	9,136.00	6,623.00	2,513.00	0.21	636	0	Storm Treats	-	-	-	0.46	2.30	0.55			
	704	6,653.00	2,910.00	3,743.00	0.15	367	0	Storm Treats	-	-	-	0.29	1.45	0.32			
	705	19,473.00	19,473.00	0.00	0.45	1,623	0	Storm Treats	-	-	-	1.19	5.95	1.40			
	<b>Sub-Total Zone F New Treated Area</b>	<b>92,981.00</b>	<b>62,795.00</b>	<b>30,186.00</b>		<b>6239.12</b>	<b>0.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>24.45</b>	<b>5.40</b>	<b>6</b>	<b>6240</b>	
	Brick South North Side*	16,323.00	16,323.00	0.00	0.37	1,360	9,794	Storm Treats	-	-	-	1.00	4.98	1.18	1	1360	
	Brick North (Treated)*	34,000.00	34,000.00	0.00	0.78	2,833	20,400	Gravel Drip Strip	-	-	-	-	0.00	-	-	2,920	
	<b>Sub-Total Zone F Existing Treated Roof Area</b>	<b>50,323.00</b>	<b>50,323.00</b>	<b>0.00</b>	<b>1.16</b>	<b>4193.58</b>	<b>30193.80</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>4.98</b>	<b>1.18</b>	<b>1</b>	<b>4,280.00</b>	
Zone F New Untreated Area - Perimeter Grades	8,725.00	0.00	8,725.00	0.20	-	0	None	-	-	-	-	NA	NA	-	-		
<b>Zone F Total Area Discharge</b>	<b>152,029.00</b>	<b>113,118.00</b>	<b>38,911.00</b>	<b>1.36</b>	<b>10,433</b>	<b>30,194</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>29.43</b>	<b>6.58</b>	<b>7</b>	<b>10,520</b>		
Zone G	<b>Sub-Total Zone G New Treated Area</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>-</b>	<b>-</b>	
	901	2,025.00	2,025.00	0.00	0.05	-	0	Untreated	-	-	-	-	-	-	-	-	
	902	3,222.00	3,222.00	0.00	0.07	-	0	Untreated	-	-	-	-	-	-	-	-	
	903	9,906.00	9,906.00	0.00	0.23	-	0	Untreated	-	-	-	-	-	-	-	-	
	904	6,904.00	5,865.00	1,039.00	0.16	-	0	Untreated	-	-	-	-	-	-	-	-	
	905	42,624.00	34,000.00	8,624.00	0.98	-	0	Untreated	-	-	-	-	-	-	-	-	
	<b>Sub-Total Zone G New Untreated Area</b>	<b>64,681.00</b>	<b>55,018.00</b>	<b>9,663.00</b>	<b>1.48</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	
<b>Zone G Total Area Discharge</b>	<b>64,681.00</b>	<b>55,018.00</b>	<b>9,663.00</b>	<b>1.48</b>	<b>-</b>	<b>0.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>		
Zone H (Panhandle)	200	94,355.00	81,191.00	13,164.00	2.17	7,205	0	Subsurface Sand Filter	4,323	-	4,400	4.99	24.9	-	-	-	
	201	72,966.00	68,924.00	4,042.00	1.68	5,878	0	Subsurface Sand Filter	3,527	-	3,530	4.22	21.1	-	-	-	
	202	16,863.00	16,013.00	850.00	0.39	1,363	0	Boxless Filtera	32	-	4'x8'	-	-	-	-	-	
	<b>Sub-Total Zone H New Treated Area</b>	<b>184,184.00</b>	<b>166,128.00</b>	<b>18,056.00</b>	<b>4.23</b>	<b>14445.87</b>	<b>0.00</b>	<b>-</b>	<b>7881.87</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>46.0</b>	<b>-</b>	<b>-</b>	<b>-</b>	
	Zone H New Untreated Area - Perimeter Grades	36,487.00	2,174.00	34,313.00	0.84	1,325	0	Untreated	-	-	-	-	N/A	-	-	-	
<b>Zone H Total Area Discharge</b>	<b>220,671.00</b>	<b>168,302.00</b>	<b>52,369.00</b>	<b>5.07</b>	<b>14445.87</b>	<b>0.00</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>46.0</b>	<b>-</b>	<b>-</b>	<b>-</b>		

Developed Area Breakdown	
A.) Total New Developed Area Treated (SF)	742,438.00
B.) Total New Developed Area untreated (SF)	191,772.00
C.) Total New Developed Area (SF) = A+B	934,210.00
D.) Existing Developed Roof Area Treated (SF)	79,584.00
E.) Adjusted Existing Developed Area Treated (SF)	47,750.4
F.) Total Net Developed Area Treated (SF) = A+E	790,188.40
Impervious Area Breakdown	
G.) Total New Impervious Area Treated (SF)	560,896.00
H.) Total New Impervious Area untreated (SF)	73,523.00
I.) Total New Impervious Area (SF) = G+H	634,419.00
J.) Existing Impervious Roof Area Treated (SF)	79,584.00
K.) Adjusted Existing Impervious Area Treated (SF)	47,750.40
L.) Total Net Impervious Area Treated (SF) = G+K	608,646.40

Treatment Breakdown	Required	Provided
% of Net Developed Area Treated = F/C	80.00%	84.58%
% of Net Impervious Area Treated = L/I	95.00%	95.94%

- All areas are based on the FST sub division drawings dated September 2014
- 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.
- The 1 year peak flow rates have been computed using the rational method. The rainfall intensities are derived from the Cumberland County IDF curve.
- Subsurface storage system sizing is based on a Stormtech SC-740 chamber system. All isolator rows have been computed per section 7.3.3 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.
- The required number of Stormtreat treatment units have been computed based on Section 7.4 of the Maine DEP Volume III BMP's Technical Design Manual. The number of units is computed to be the water quality volume divided by 1155 cubic feet and always rounded up.
- The owner reserves the right to use an alternate tree box filter device provided it has been approved by the Maine DEP Chapter 500 delegated review authority of the City of Portland.
- Provided Water Quality Volume for stormtreat storage system computed using 61.38 CF of storage per chamber based on Storm Tech Chamber Design Manual
- The Stone Drip Edge was based on section 7.6 of the Maine DEP Volume III BMP's Technical Design Manual. The Width of stone is derived from a required WQV based off 1" of runoff and a desired stone resevoir depth. See sizing computations on separate sheet.
- According to Chapter 500 Maine DEP stormwater rules; 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 required surface area for filter treatment system has been sized based on Sections, 7.1, 7.2 and 7.3 of the Maine DEP Volume III BMP's Technical Design Manual. Surface area for Grassed Underdrain Soil Filters and sub-surface sand filters can be computer by taking .05 of the impervious area + .02 of the pervious area, while Bio Retention Cells (Rain Garden can be computer by taking .07 of the impervious area + .03 of the pervious area.
- The MEDEP will now accept a Filterra tree box filter as a stand alone treatment unit and does not require an Isolator Row for eligible projects. This project meets the eligibility criteria noted in a letter dated June 27th, 2014 from the MEDEP



**APPENDIX B**

**MAINEDEP CORRESPONDENCE TO  
CONTECH REGARDING FILTERRA® TREE BOX UNITS**



STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



PAUL R. LEPAGE  
GOVERNOR

PATRICIA W. AHO  
COMMISSIONER

January 21, 2015

Stormwater Regulatory Manager  
Filterra Bioretention Systems  
Contech Engineered Solutions  
11352 Virginia Precast Road  
Ashland, VA 23005  
ATTN: Chris French

Dear Mr. French:

The Filterra Bioretention System (FBS) was permitted for use by the Department of Environmental Protection (Department) on November 12, 2009, as part of a stormwater treatment train that included the use a StormTech Isolator Row following the structure as an approved alternative to the General Standards (Section 4.B.) of the Stormwater Management Rules (Chapter 500), and as described in Chapter 7.5 of Volume III of the Maine Stormwater Management BMP Manual.

Based on the testing data provided, the currently approved FBS provides sufficient treatment without the use of the StormTech Isolator Row. And pending establishment of an appropriate rainfall intensity rate that would allow for the full treatment of 90% of an average annual runoff volume, this letter is to inform you that the Department will review and approve, on a case-by-case basis, the interim use of the FBS when sized, installed and maintained in accordance with the following provisions:

1. The structure may be a standard concrete box or a soft shell system that is filled with the Filterra engineered filter media, provided it is sized to meet the requirements of the General Standards (Section 4.B.) and is installed, operated and maintained in accordance with the manufacturer's specifications.
2. The FBS must be sized in accordance with the manufacturer's standard New England testing results and revised sizing guidelines outlined in the following table to treat 90% of the annual runoff volume:

Filterra Model Number	Area in Acres
4'x6' or 6'x4'	Up to 0.17
4'x8' or 8'x4'	0.18 - 0.22
6'x6'	0.23 - 0.25
6'x8' or 8'x6'	0.26 - 0.33
6'x10' or 10'x6'	0.34 - 0.42
6'x12' or 12'x6'	0.43 - 0.50
7'x13' or 13'x7'	0.51 - 0.63

AUGUSTA  
17 STATE HOUSE STATION  
AUGUSTA, MAINE 04333-0017  
(207) 287-7688 FAX: (207) 287-7826

BANGOR  
106 HOGAN ROAD, SUITE 6  
BANGOR, MAINE 04401  
(207) 941-4570 FAX: (207) 941-4584

PORTLAND  
312 CANCO ROAD  
PORTLAND, MAINE 04103  
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE  
1235 CENTRAL DRIVE, SKYWAY PARK  
PRESQUE ISLE, MAINE 04769  
(207) 764-0477 FAX: (207) 760-3143

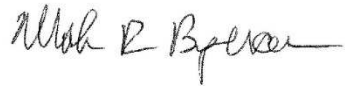
3. When designed with the standard curb inlet design, the FBS must be configured “off-line” with the surface elevation at the FBS unit being up gradient of an overflow inlet. When designed with the grated inlet design, the FBS must incorporate an internal bypass and will not require an overflow inlet. The applicant must demonstrate that the proposed design meets all the manufacturer’s specifications prior to submission for Department approval. Review and approval of the proposed design by the manufacturer will be sufficient to demonstrate conformance with the manufacturer’s specifications.
4. The treated flow and bypass flow must be combined and directed to a detention system/structure that will store the water quality/channel protection volume (WQv) consisting of the first 1.0 inch of runoff from impervious areas and 0.4 inch of runoff from lawns and landscaped areas. An external outlet control structure must control the flow out of the system and the WQv must be detained for a minimum of 24 hours and a maximum of 48 hours.
5. When a boxed structure is proposed, the FBS must be delivered to the site with the engineered filter media and plumbing fully installed. The concrete box must be sealed to prevent debris and sediment from entering the system during construction. The activation of the FBS and opening of the protective mesh cover, installation of plant(s) and mulch layers as necessary, can be performed only by the supplier (Americast or its authorized dealer). The activation process must not commence until the project site is fully stabilized and cleaned (i.e., full landscaping, grass cover, final paving and street sweeping completed), minimizing the risk of construction materials contaminating the FBS system.
6. When a soft shell structure is proposed, the FBS(s) must be built on site and must include all the components of a boxed structure. The FBS must be designed per the manufacturer’s specifications and must be installed on-site by the manufacturer’s representative.
7. A five-year binding inspection and maintenance contract must be provided prior to review and approval by the Department, and must be renewed before contract expiration. The first year’s maintenance must be provided by the manufacturer to ensure that the system is operating according to the established specifications. Said contract will be with a professional with knowledge of erosion and stormwater control, including a detailed working knowledge of the proposed Best Management Practices.
8. The overall stormwater management design must meet all Department criteria and sizing specifications and shall be reviewed and approved by the Department prior to use.
9. This approval is conditional to on-the-ground experience confirming that the FBS’s pollutant removal efficiency and sizing 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 pollutant removals do not satisfy the General Standard Best Management Practices.

We look forward to working with you as these stormwater management structures are installed on new projects. And, we hope that this stormwater BMP will be included in our manual in the near future.

Letter to Chris French  
January 21, 2015  
Page 3 of 3

Questions concerning this decision should be directed to Marianne Hubert at (207) 215-6485 or Jeff Dennis at (207) 215-6376.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark R. Bergeron". The signature is written in a cursive style with a horizontal line extending to the right.

Mark Bergeron, P.E.  
Director, Division of Land Resource Regulation  
Bureau of Land & Water Quality

C: Don Witherill, Maine DEP

**APPENDIX C**

**FILTERRA® SIZING CHANGES  
CONFIRMATION LETTER FROM THE MaineDEP**

June 27, 2014

Chris French  
Stormwater Regulatory Manager  
Filtterra Bioretention Systems  
11352 Virginia Precast Road  
Ashland, VA 23005

Dear Mr. French,

The Filtterra structure was permitted for use by DEP in 2009 as part of a stormwater treatment train that included the use a StormTech Isolator Row following the structure as an approved alternative to the General Standard BMPs described in the Chapter 500 Stormwater Management Rules and as describe in Chapter 7. 5 found in Volume III of the Maine Stormwater Management BMP Manual.

Based on additional testing data, we are pleased to inform you that the Department of Environmental Protection will authorize, on a case-by-case basis, the request from applicants to use the currently approved Filtterra structure independently of the StormTech Isolator Row. The structure may be a standard concrete box or a soft shell system that is filled with the Filtterra engineered filter media, provided it is sized to meet the requirements of the General Standards (Section 4.B.) and is installed, operational and maintained in accordance with the criteria listed below. Chapter 7.5 will be revised accordingly in the near future to incorporate these changes.

1. The Filtterra Bioretention System must be sized in accordance with the manufacturer's standard New England testing results and sizing guidelines outlined in the following table to treat 90% of the annual runoff volume.

Filtterra Model Number	Area in Acres
4x6 or 6x4	0.32
4x8 or 8x4	0.42
6x6	0.47
6x8 or 8x6	0.64
6x10 or 10x6	0.79
6x12 or 12x6	0.95
7x13 or 13x7	1.20

2. When designed with the standard curb inlet design, the Filtterra must be configured "off-line" with the surface elevation at the Filtterra unit being up gradient of an overflow inlet. In the grated inlet design, the Filtterra will incorporate an internal bypass and does not require an overflow inlet. The applicant must demonstrate that the design meets all the manufacturer's specifications and shall be reviewed by the manufacturer prior to submission for DEP approval. Review and

approval of the design by the manufacturer will be sufficient to demonstrate conformance with the manufacturer's specifications.

3. The treated and bypass flow will be combined and directed to a detention system/structure that will store at least the sum of 1.0 inch of runoff from the impervious areas and 0.4 inches from the 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 the system and should be sized for the entire channel protection volume to drain in no less than 24 hours or more than 48 hours.
4. In a boxed structure, the Filtterra Bioretention System(s) must be delivered to the site with the engineered filter media and plumbing fully installed. The concrete box must be sealed to prevent debris and sediment from entering the system during construction. The activation of the unit and opening of the protective mesh cover, installation of plant(s) and mulch layers as necessary can be performed ONLY by the Supplier (Americast or its authorized dealer). The activation process cannot commence until the project site is fully stabilized and cleaned (full landscaping, grass cover, final paving and street sweeping completed), minimizing the risk of construction materials contaminating the Filtterra system.
5. In a soft shell structure, the system must be built from the ground up and must include all the components of a boxed structure. The structure will be designed per the manufacturer's specifications and will be installed on-site by the manufacturer's representative.
6. The first year's maintenance must be provided by the manufacturer to ensure that the system is operating per the established specifications. In addition, the owner will provide an executed 5-year inspection and maintenance contract prior to final DEP approval. Said contract will be with a professional with knowledge of erosion and stormwater control, including a detailed working knowledge of the proposed BMP's.

Thank you for your work in proposing, evaluating and altering this BMP as the system was found to meet Maine treatment expectations with your additional testing. We look forward to working with you as we continue developing the design and installation specifications of the box-less Filtterra biofilter, and hope that this design will provide an effective alternative to the General Standard BMPs.

Questions concerning this decision should be directed to Marianne Hubert at (207) 215-6485 or Jeff Dennis at (207) 215-6376.

Sincerely,

Donald T. Witherill, Director  
Division of Watershed Management  
Bureau of Land & Water Quality

**APPENDIX D**

**MAINEDEP CORRESPONDENCE TO  
CONTECH REGARDING JELLYFISH® UNIT APPROVAL**





STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



PAUL R. LEPAGE  
GOVERNOR

PATRICIA W. AHO  
COMMISSIONER

January 21, 2015

CONTECH Engineered Solutions LLC  
71 US Route 1, Suite F  
Scarborough, ME 04074  
ATTN: Derek Berg

Dear Mr. Berg:

This letter is to inform you that the Department of Environmental Protection (Department) will review and approve, on a case-by-case basis, applicants' requests to use the Jellyfish Filter, manhole or vault housing, a cartridge deck supporting membrane filtration cartridges, as a low flow rate filter meeting the requirements of the General Standards (Section 4.B.) of the Stormwater Management Rules (Chapter 500) when sized, installed and maintained in accordance with the following provisions:

1. The Jellyfish Filter must be sized in accordance with the tested hydraulic loading rate, and is approved for a maximum rate of 80 gallons per minute (gpm) for each 54-inch long membrane filter cartridge (1.48 gpm per inch of cartridge length). The structure must include at least one draindown cartridge, which is approved for a hydraulic loading rate of 40 gpm per 54" cartridge (0.74 gpm per inch of cartridge length).
2. Upstream storage must be provided for the water quality/channel protection volume (WQv) consisting of the first 1.0 inch of runoff from impervious areas and 0.4 inch of runoff from lawns and landscaped areas. The WQv should be hydraulically isolated from any additional storage provided onsite by weirs or other means so that only the WQv is routed through the Jellyfish Filter. Additionally, the WQv must be detained for a minimum of 24 hours and a maximum of 48 hours (emptying time). Storage can typically be provided in an underground facility such as corrugated metal pipe, polypropylene chambers, concrete vaults or similar means.
3. All storage systems must include sufficient maintenance access for the removal of accumulated sediment and debris. It is desirable that a pretreatment structure be located upstream of the WQv storage to facilitate capture of coarse solids and trash.
4. The Jellyfish Filter must be delivered to the site and installed under the supervision of the manufacturer's representative.
5. The system must be inspected at least once every six months, and the filters maintained yearly per the manufacturer's guidelines to maintain the established efficiency for pollutant removal. A five-year binding inspection and maintenance contract must be provided prior to review and approval by the Department, and must be renewed before contract expiration.
6. The overall stormwater management design must meet all Department criteria and sizing specifications and shall be reviewed and approved by the Department prior to use.
7. Review and approval by the manufacturer for the proposed use and sizing of the Jellyfish Filter at each specific project is required to ensure conformance with the manufacturer's design specifications.

AUGUSTA  
17 STATE HOUSE STATION  
AUGUSTA, MAINE 04333-0017  
(207) 287-7688 FAX: (207) 287-7826

BANGOR  
106 HOGAN ROAD, SUITE 6  
BANGOR, MAINE 04401  
(207) 941-4570 FAX: (207) 941-4584

PORTLAND  
312 CANCO ROAD  
PORTLAND, MAINE 04103  
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE  
1235 CENTRAL DRIVE, SKYWAY PARK  
PRESQUE ISLE, MAINE 04769  
(207) 764-0477 FAX: (207) 760-3143

8. This approval is conditional to on-the-ground experience confirming that the Jellyfish Filter's pollutant removal efficiency and sizing 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 pollutant removals do not satisfy the General Standard Best Management Practices.

We look forward to working with you as these stormwater management structures are installed on new projects. And, we hope that this stormwater BMP will be included in our manual in the near future.

Questions concerning this decision should be directed to Marianne Hubert at (207) 215-6485 or Jeff Dennis at (207) 215-6376.

Sincerely,

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

Mark Bergeron, P.E.  
Director, Division of Land Resource Regulation  
Bureau of Land & Water Quality

C: Don Witherill, Maine DEP

**APPENDIX E**

**JELLYFISH® UNIT COMPUTATIONS**



# Determining Jellyfish Size for Mass Based Loading

CONTECH Engineered Solutions Engineer:

CJA

Date Prepared:

3/11/2015

## Site Information

Project Name	Thompsons Point Zone C
Project State	ME
Project City	Portland
Project County	Cumberland
Total Drainage Area, Ad	1.46 ac
Post Development Impervious Area, Ai	1.23 ac
Pervious Area, Ap	0.23 ac
% Impervious	84%
Runoff Coefficient, Rc	0.81
Detention credit	50%

## Mass Loading Calculations

Mean Annual Rainfall, P	45 in
Agency Required % Removal	85%
Percent Runoff Capture	85%
MEDEP Mean Annual Runoff, Vt	183522 ft <sup>3</sup>
Event Mean Concentration of Pollutant, EMC	70 mg/l
Annual Mass Load, M total	801.51 lbs

## Filter System

Filtration Brand	Jellyfish
Cartridge Length	54 in

## Jellyfish Filter Sizing

Mass removed by pretreatment system, Mpre	400.75 lbs
Mass load to filters after pretreatment, Mpass1	400.75 lbs
Estimate the required filter efficiency, Efilter	0.70
Mass to be captured by filters, Mfilter	280.53
Water Quality Flow	0.075 cfs

## Method to Use

MASS LOADING

Summary		
Mass	Nearest Jellyfish Mass Capacity	313.00 lbs
	Required Size	JF4-2-1



## Determining Jellyfish Size for Mass Based Loading

CONTECH Engineered Solutions Engineer:

CJA

Date Prepared:

3/11/2015

### Site Information

Project Name	Thompsons Point Zone D
Project State	ME
Project City	Portland
Project County	Cumberland
Total Drainage Area, Ad	3.27 ac
Post Development Impervious Area, Ai	2.83 ac
Pervious Area, Ap	0.43 ac
% Impervious	87%
Runoff Coefficient, Rc	0.83
Detention credit	50%

### Mass Loading Calculations

Mean Annual Rainfall, P	45 in
Agency Required % Removal	85%
Percent Runoff Capture	85%
MEDEP Mean Annual Runoff, Vt	417577 ft <sup>3</sup>
Event Mean Concentration of Pollutant, EMC	70 mg/l
Annual Mass Load, M total	1823.71 lbs

### Filter System

Filtration Brand	Jellyfish
Cartridge Length	54 in

### Jellyfish Filter Sizing

Mass removed by pretreatment system, Mpre	911.85 lbs
Mass load to filters after pretreatment, Mpass1	911.85 lbs
Estimate the required filter efficiency, Efilter	0.70
Mass to be captured by filters, Mfilter	638.30
Water Quality Flow	0.168 cfs

### Method to Use

**MASS LOADING**

Summary		
<b>Mass</b>	Nearest Jellyfish Mass Capacity	688.00 lbs
	Required Size	<b>JF6-5-1</b>



# Determining Jellyfish Size for Mass Based Loading

CONTECH Engineered Solutions Engineer:

CJA

Date Prepared:

3/11/2015

## Site Information

Project Name	Thompsons Point Zone E
Project State	ME
Project City	Portland
Project County	Cumberland
Total Drainage Area, Ad	0.99 ac
Post Development Impervious Area, Ai	0.91 ac
Pervious Area, Ap	0.07 ac
% Impervious	93%
Runoff Coefficient, Rc	0.88
Detention credit	50%

## Mass Loading Calculations

Mean Annual Rainfall, P	45 in
Agency Required % Removal	85%
Percent Runoff Capture	85%
MEDEP Mean Annual Runoff, Vt	130744 ft <sup>3</sup>
Event Mean Concentration of Pollutant, EMC	70 mg/l
Annual Mass Load, M total	571.01 lbs

## Filter System

Filtration Brand	Jellyfish
Cartridge Length	54 in

## Jellyfish Filter Sizing

Mass removed by pretreatment system, Mpre	285.50 lbs
Mass load to filters after pretreatment, Mpass1	285.50 lbs
Estimate the required filter efficiency, Efilter	0.70
Mass to be captured by filters, Mfilter	199.85
Water Quality Flow	0.062 cfs

## Method to Use

MASS LOADING

Summary		
Mass	Nearest Jellyfish Mass Capacity	313.00 lbs
	Required Size	JF4-2-1



# Determining Jellyfish Size for Mass Based Loading

CONTECH Engineered Solutions Engineer:

CJA

Date Prepared:

3/11/2015

## Site Information

Project Name	Thompsons Point Zone F
Project State	ME
Project City	Portland
Project County	Cumberland
Total Drainage Area, Ad	2.51 ac
Post Development Impervious Area, Ai	1.82 ac
Pervious Area, Ap	0.69 ac
% Impervious	72%
Runoff Coefficient, Rc	0.70
Detention credit	50%

## Mass Loading Calculations

Mean Annual Rainfall, P	45 in
Agency Required % Removal	85%
Percent Runoff Capture	85%
MEDEP Mean Annual Runoff, Vt	290687 ft <sup>3</sup>
Event Mean Concentration of Pollutant, EMC	70 mg/l
Annual Mass Load, M total	1269.54 lbs

## Filter System

Filtration Brand	Jellyfish
Cartridge Length	54 in

## Jellyfish Filter Sizing

Mass removed by pretreatment system, Mpre	634.77 lbs
Mass load to filters after pretreatment, Mpass1	634.77 lbs
Estimate the required filter efficiency, Efilter	0.70
Mass to be captured by filters, Mfilter	444.34
Water Quality Flow	0.105 cfs

## Method to Use

MASS LOADING

Summary		
Mass	Nearest Jellyfish Mass Capacity	563.00 lbs
	Required Size	JF6-4-1



## Determining Jellyfish Size for Mass Based Loading

CONTECH Engineered Solutions Engineer:

CJA

Date Prepared:

3/25/2015

### Site Information

Project Name	Thompsons Point Zone D2
Project State	ME
Project City	Portland
Project County	Cumberland
Total Drainage Area, Ad	0.60 ac
Post Development Impervious Area, Ai	0.42 ac
Pervious Area, Ap	0.18 ac
% Impervious	70%
Runoff Coefficient, Rc	0.68
Detention credit	50%

### Mass Loading Calculations

Mean Annual Rainfall, P	45 in
Agency Required % Removal	85%
Percent Runoff Capture	85%
MEDEP Mean Annual Runoff, Vt	68063 ft <sup>3</sup>
Event Mean Concentration of Pollutant, EMC	70 mg/l
Annual Mass Load, M total	297.26 lbs

### Filter System

Filtration Brand	Jellyfish
Cartridge Length	54 in

### Jellyfish Filter Sizing

Mass removed by pretreatment system, Mpre	148.63 lbs
Mass load to filters after pretreatment, Mpass1	148.63 lbs
Estimate the required filter efficiency, Efilter	0.70
Mass to be captured by filters, Mfilter	104.04
Water Quality Flow	0.025 cfs

### Method to Use

FLOW BASED

Summary		
<b>Mass</b>	Nearest Jellyfish Mass Capacity	188.00 lbs
	Required Size	JF4-1-1





## Determining Jellyfish Size for Mass Based Loading

CONTECH Engineered Solutions Engineer:

CJA

Date Prepared:

3/25/2015

### Site Information

Project Name	Thompsons Point Zone B
Project State	ME
Project City	Portland
Project County	Cumberland
Total Drainage Area, Ad	1.12 ac
Post Development Impervious Area, Ai	0.48 ac
Pervious Area, Ap	0.64 ac
% Impervious	42%
Runoff Coefficient, Rc	0.43
Detention credit	50%

### Mass Loading Calculations

Mean Annual Rainfall, P	45 in
Agency Required % Removal	85%
Percent Runoff Capture	85%
MEDEP Mean Annual Runoff, Vt	101664 ft <sup>3</sup>
Event Mean Concentration of Pollutant, EMC	70 mg/l
Annual Mass Load, M total	444.00 lbs

### Filter System

Filtration Brand	Jellyfish
Cartridge Length	54 in

### Jellyfish Filter Sizing

Mass removed by pretreatment system, Mpre	222.00 lbs
Mass load to filters after pretreatment, Mpass1	222.00 lbs
Estimate the required filter efficiency, Efilter	0.70
Mass to be captured by filters, Mfilter	155.40
Water Quality Flow	0.037 cfs

### Method to Use

FLOW BASED

Summary		
Mass	Nearest Jellyfish Mass Capacity	188.00 lbs
	Required Size	JF4-1-1

**APPENDIX F**

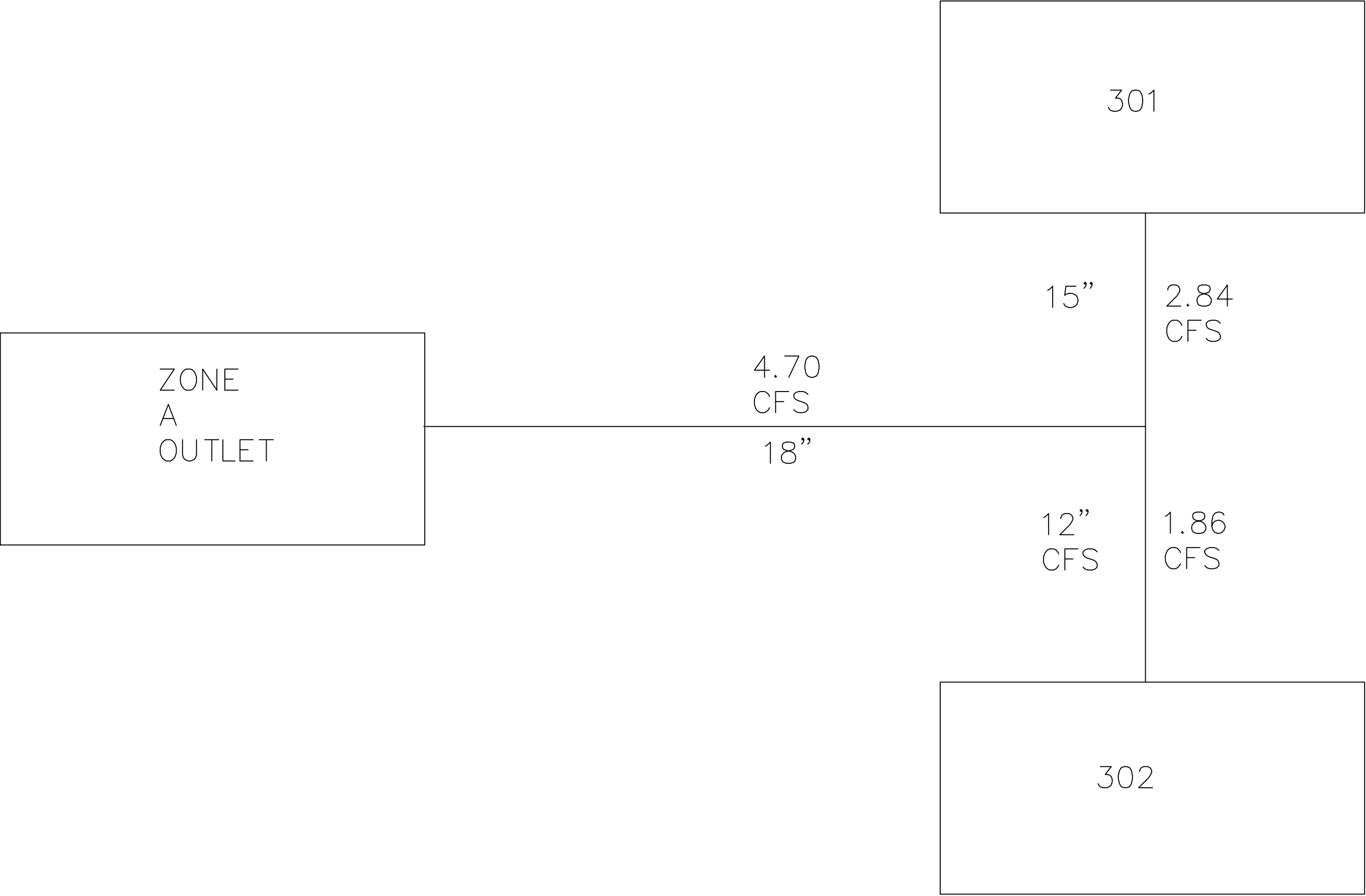
**RATIONAL METHOD 25 YEAR STORM  
FREQUENCY PEAK FLOW COMPUTATIONS &  
STORMWATER PIPING SIZING FLOW SCHEMATIC**

THE FOREFRONT AT THOMPSON'S POINT  
 RATIONAL METHOD 25 YEAR FLOW CALCULATIONS

Storm Water Management Zone	Area Trib To Discharge	Total Developed Area (sf)	Total Impervious Area (sf)	Total Pervious Area (sf)	Total Area (acres)	Weighted C	25 Year Flow (CFS)
Zone A	301	23,093.00	10,798.00	12,295.00	0.53	0.55	1.82
	302	27,818.00	5,591.00	22,227.00	0.64	0.35	1.40
	Existing Depot Building*	10,860.00	10,860.00	0.00	0.25	0.95	1.48
	<b>Totals</b>	<b>61,771.00</b>	<b>27,249.00</b>	<b>34,522.00</b>	<b>1.42</b>	<b>1.85</b>	<b>4.70</b>
Zone B	401	46,664.00	17,081.00	29,583.00	1.07	0.47	3.18
	402	7,588.00	6,241.00	1,347.00	0.17	0.82	0.89
	403	26,630.00	9,865.00	16,765.00	0.61	0.48	1.83
	Existing Depot Building* (trib to 401)	3,400.00	3,400.00	0.00	0.08	0.95	0.46
<b>Totals</b>	<b>84,282.00</b>	<b>36,587.00</b>	<b>47,695.00</b>	<b>1.93</b>	<b>2.72</b>	<b>6.36</b>	
Zone C	501	11,805.00	11,805.00	0.00	0.27	0.95	1.61
	502	7,523.00	7,523.00	0.00	0.17	0.95	1.03
	503	31,390.00	31,390.00	0.00	0.72	0.95	4.28
	South Side Brick South (C1)*	18,141.00	18,141.00	0.00	0.42	0.95	2.47
<b>Totals</b>	<b>68,859.00</b>	<b>68,859.00</b>	<b>0.00</b>	<b>1.58</b>	<b>3.80</b>	<b>9.39</b>	
Zone D	601	21,057.00	11,803.00	9,254.00	0.48	0.62	1.87
	602	13,308.00	7,527.00	5,781.00	0.31	0.62	1.19
	603	3,244.00	1,359.00	1,885.00	0.07	0.51	0.24
	604	5,691.00	3,131.00	2,560.00	0.13	0.61	0.50
	605	7,186.00	4,988.00	2,198.00	0.16	0.72	0.74
	D-21	9,052.00	8,280.00	772.00	0.21	0.89	1.15
	D-20	16,178.00	12,517.00	3,661.00	0.37	0.78	1.81
	D-18	9,604.00	5,763.00	3,841.00	0.22	0.65	0.90
	D-19	8,103.00	6,430.00	1,673.00	0.19	0.80	0.92
	D-11	18,614.00	13,989.00	4,625.00	0.43	0.76	2.04
	D-16	14,498.00	12,267.00	2,231.00	0.33	0.83	1.74
	D-12	11,149.00	4,926.00	6,223.00	0.26	0.53	0.85
	D-13	8,299.00	2,563.00	5,736.00	0.19	0.43	0.51
	606	77,903.00	77,903.00	0.00	1.79	0.95	10.62
607	11,831.00	11,831.00	0.00	0.27	0.95	1.61	
608	20,692.00	10,264.00	10,428.00	0.48	0.57	1.70	
609	8,000.00	5,752.00	2,248.00	0.18	0.74	0.85	
<b>Totals</b>	<b>256,409.00</b>	<b>195,541.00</b>	<b>60,868.00</b>	<b>5.89</b>	<b>11.24</b>	<b>29.25</b>	
Zone E	801	47,912.00	33,272.00	14,640.00	1.10	0.72	4.96
	802	13,445.00	13,445.00	0.00	0.31	0.95	1.83
	<b>Totals</b>	<b>61,357.00</b>	<b>46,717.00</b>	<b>14,640.00</b>	<b>1.41</b>	<b>1.67</b>	<b>6.79</b>
Zone F	701	19,005.00	9,599.00	9,406.00	0.44	0.58	1.58
	702	7,244.00	7,244.00	0.00	0.17	0.95	0.99
	CB F-8	3,323.00	2,515.00	808.00	0.08	0.77	0.37
	CB F-7	17,327.00	13,385.00	3,942.00	0.40	0.78	1.94
	CB F-3	3,548.00	186.00	3,362.00	0.08	0.24	0.12
	CB F-4	1,039.00	256.00	783.00	0.02	0.38	0.06
	CB F-5	4,131.00	256.00	3,875.00	0.09	0.25	0.15
	CB F-6	2,102.00	348.00	1,754.00	0.05	0.32	0.10
	703	9,136.00	6,623.00	2,513.00	0.21	0.74	0.97
	704	6,653.00	2,910.00	3,743.00	0.15	0.53	0.50
	705	19,473.00	19,473.00	0.00	0.45	0.95	2.65
Brick South North Side*	16,323.00	16,323.00	0.00	0.37	0.95	2.22	
Brick North (Treated)*	34,000.00	34,000.00	0.00	0.78	0.95	4.63	
<b>Totals</b>	<b>143,304.00</b>	<b>113,118.00</b>	<b>30,186.00</b>	<b>3.29</b>	<b>8.39</b>	<b>16.28</b>	
Zone G	901	2,025.00	2,025.00	0.00	0.05	0.95	0.28
	902	3,222.00	3,222.00	0.00	0.07	0.95	0.44
	903	9,906.00	9,906.00	0.00	0.23	0.95	1.35
	904	6,904.00	5,865.00	1,039.00	0.16	0.84	0.83
	905	42,624.00	34,000.00	8,624.00	0.98	0.80	4.88
<b>Totals</b>	<b>64,681.00</b>	<b>55,018.00</b>	<b>9,663.00</b>	<b>1.48</b>	<b>4.49</b>	<b>7.78</b>	
Zone H	200	94,355.00	81,191.00	13,164.00	2.17	0.85	11.44
	201	72,966.00	68,924.00	4,042.00	1.68	0.91	9.51
	202	16,863.00	16,013.00	850.00	0.39	0.91	2.21
	<b>Totals</b>	<b>184,184.00</b>	<b>166,128.00</b>	<b>18,056.00</b>	<b>4.23</b>	<b>2.67</b>	<b>23.16</b>

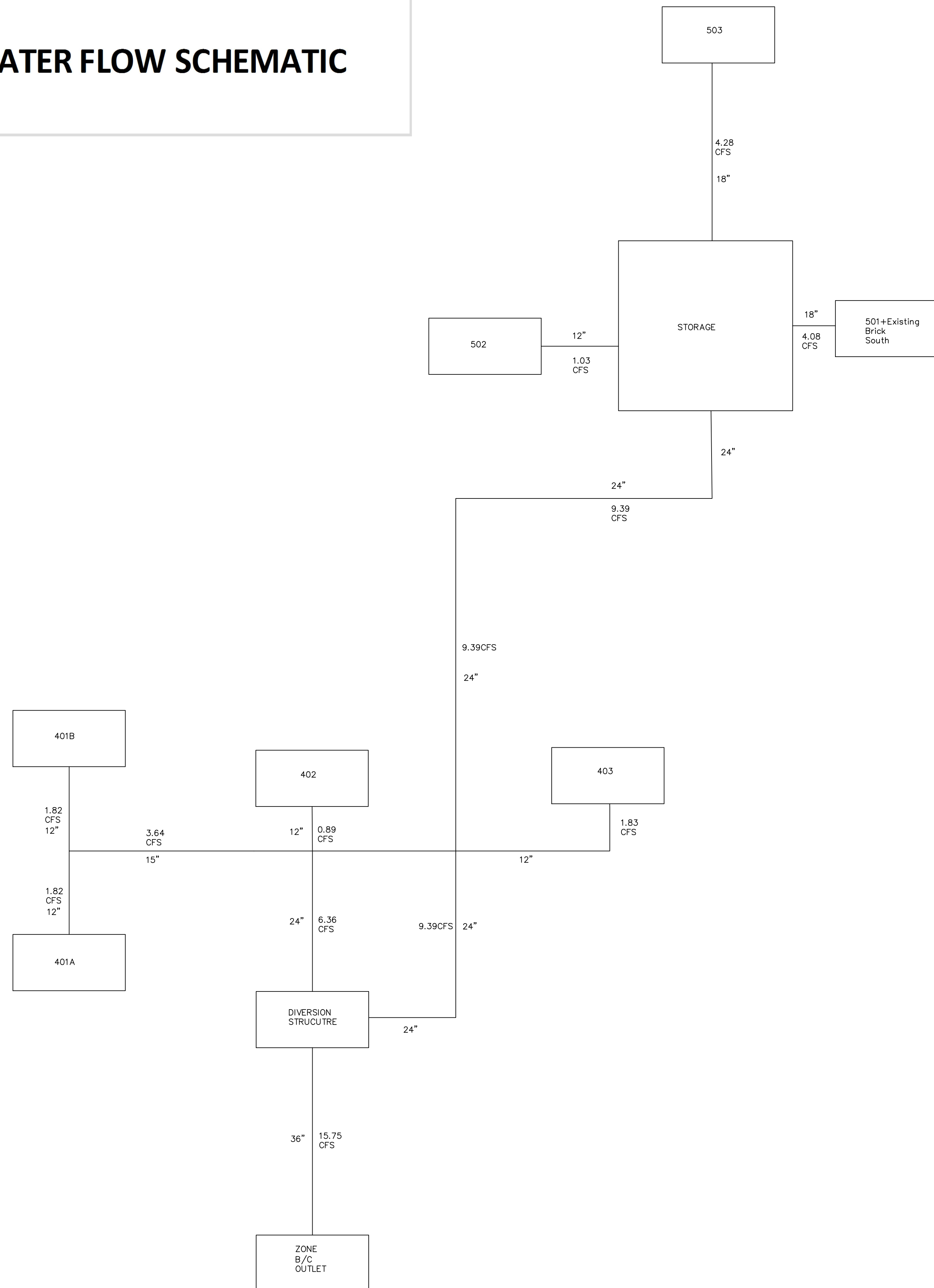
<b>Assumptions</b>	
Pervious C	0.2
Impervious C	0.95
I-25 Year Storm	6.25 In/Hr
<b>RATIONAL FLOW = I*C*A</b>	
<b>Notes:</b>	
1. Rainfall intensity based on Cumberland County IDF curve using a TC of 5 min.	

# ZONE A STORM WATER FLOW SCHEMATIC



Pipe Size (IN)	Slope (FT/FT)	Velocity (FT/Sec)	Full Flow Capacity** (CFS)
12"	0.0038	3	2.38
15"	0.0028	3	3.7
18"	0.0022	3	5.33
24"	0.0015	3	9.49
36"	0.0009	3	21.67
** Based on Mannings equation for full flowing pipes			
Pipe Sizes in Zone A Sized based on min. slope			

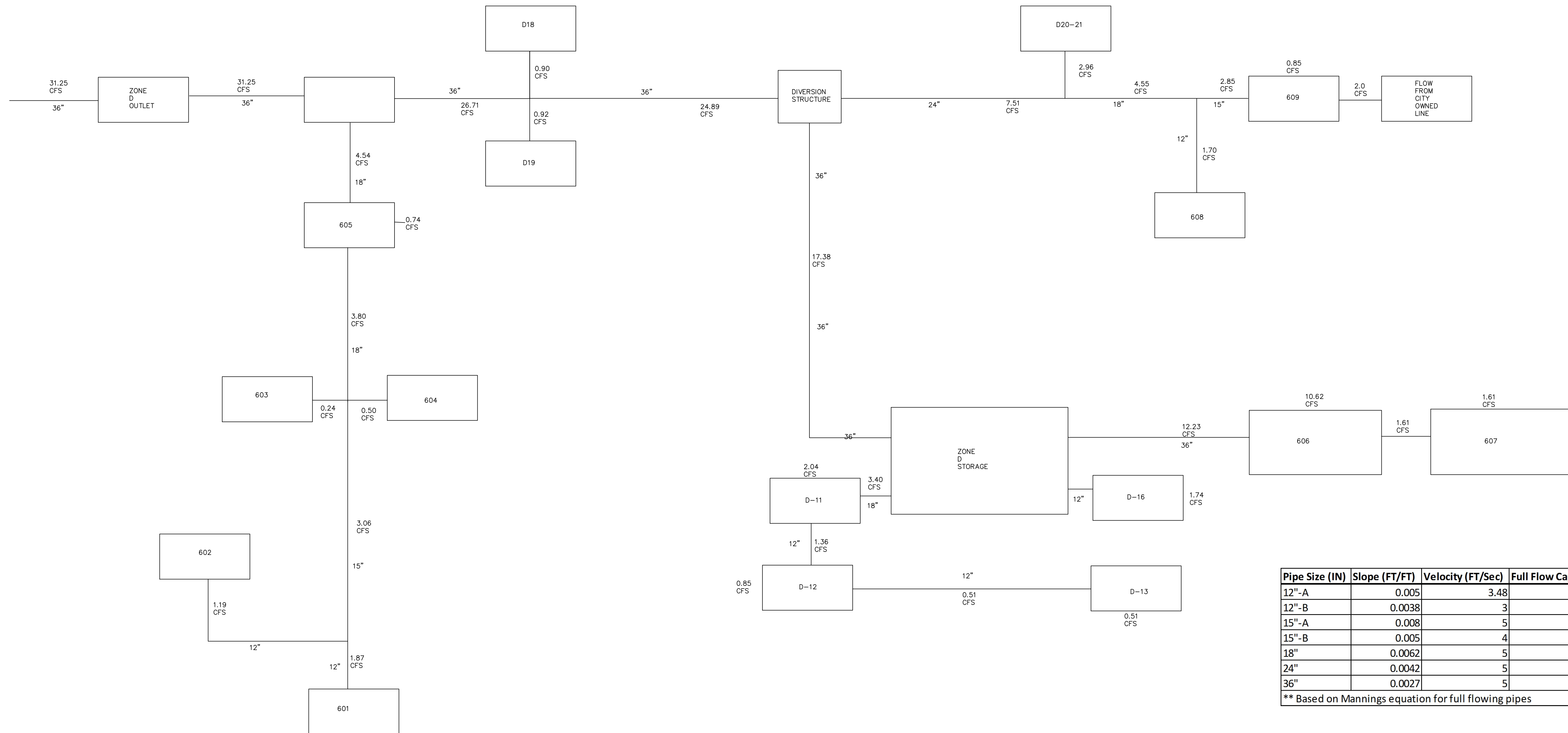
# ZONE B/C STORM WATER FLOW SCHEMATIC



Pipe Size (IN)	Slope (FT/FT)	Velocity (FT/Sec)	Full Flow Capacity** (CFS)
12"-	0.0038	3	2.38
15"-	0.0028	3	3.7
18"	0.0022	3	5.33
24"	0.0015	3	9.49
36"	0.0009	3	21.67

\*\* Based on Mannings equation for full flowing pipes  
Pipe Sizes in Zones B/C Sized based on min. slope

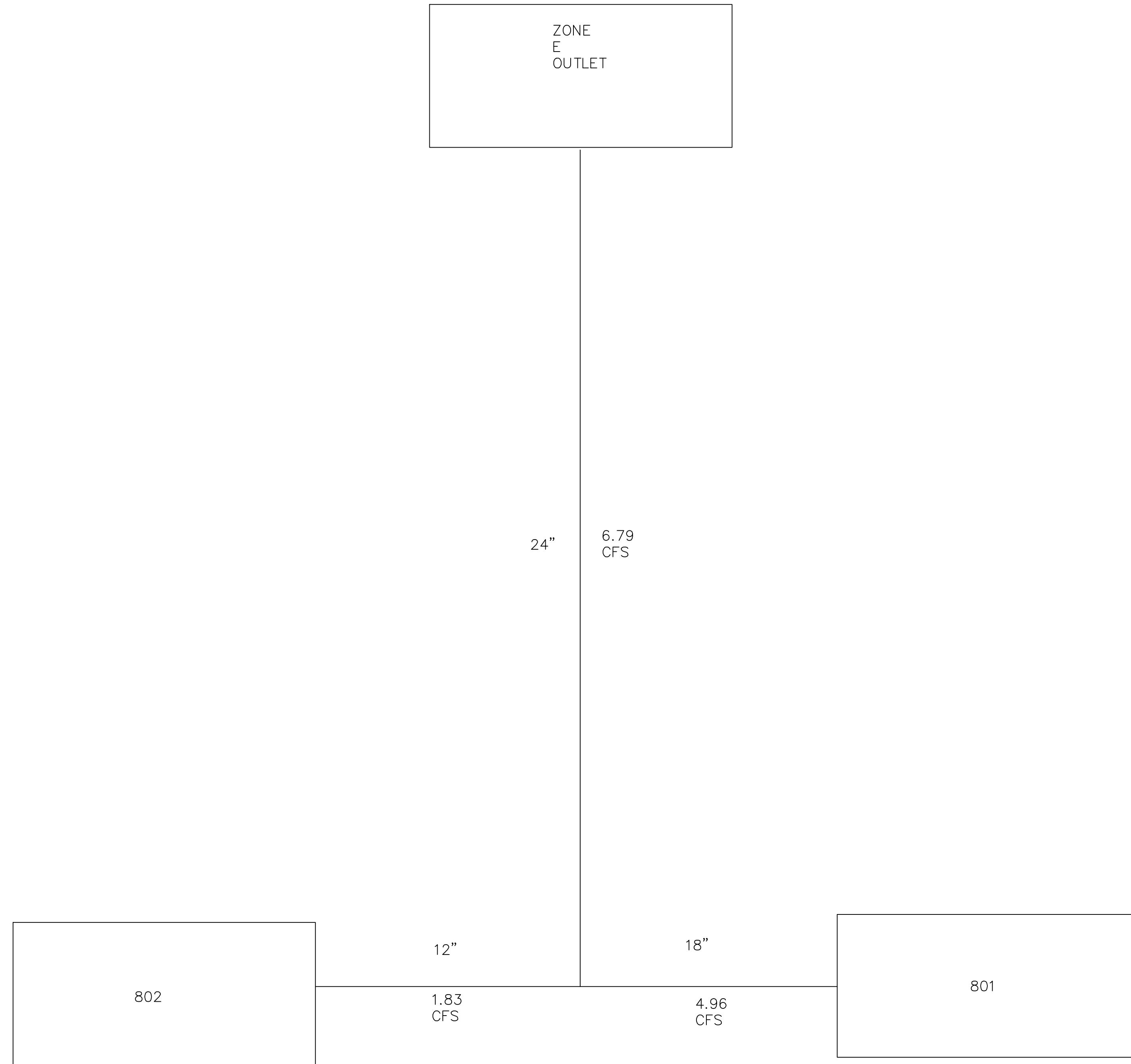
# ZONE D STORM WATER FLOW SCHEMATIC



Pipe Size (IN)	Slope (FT/FT)	Velocity (FT/Sec)	Full Flow Capacity** (CFS)
12"-A	0.005	3.48	2.73
12"-B	0.0038	3	2.38
15"-A	0.008	5	6.26
15"-B	0.005	4	4.95
18"	0.0062	5	8.96
24"	0.0042	5	15.93
36"	0.0027	5	37.54

\*\* Based on Mannings equation for full flowing pipes

# ZONE E STORM WATER FLOW SCHEMATIC

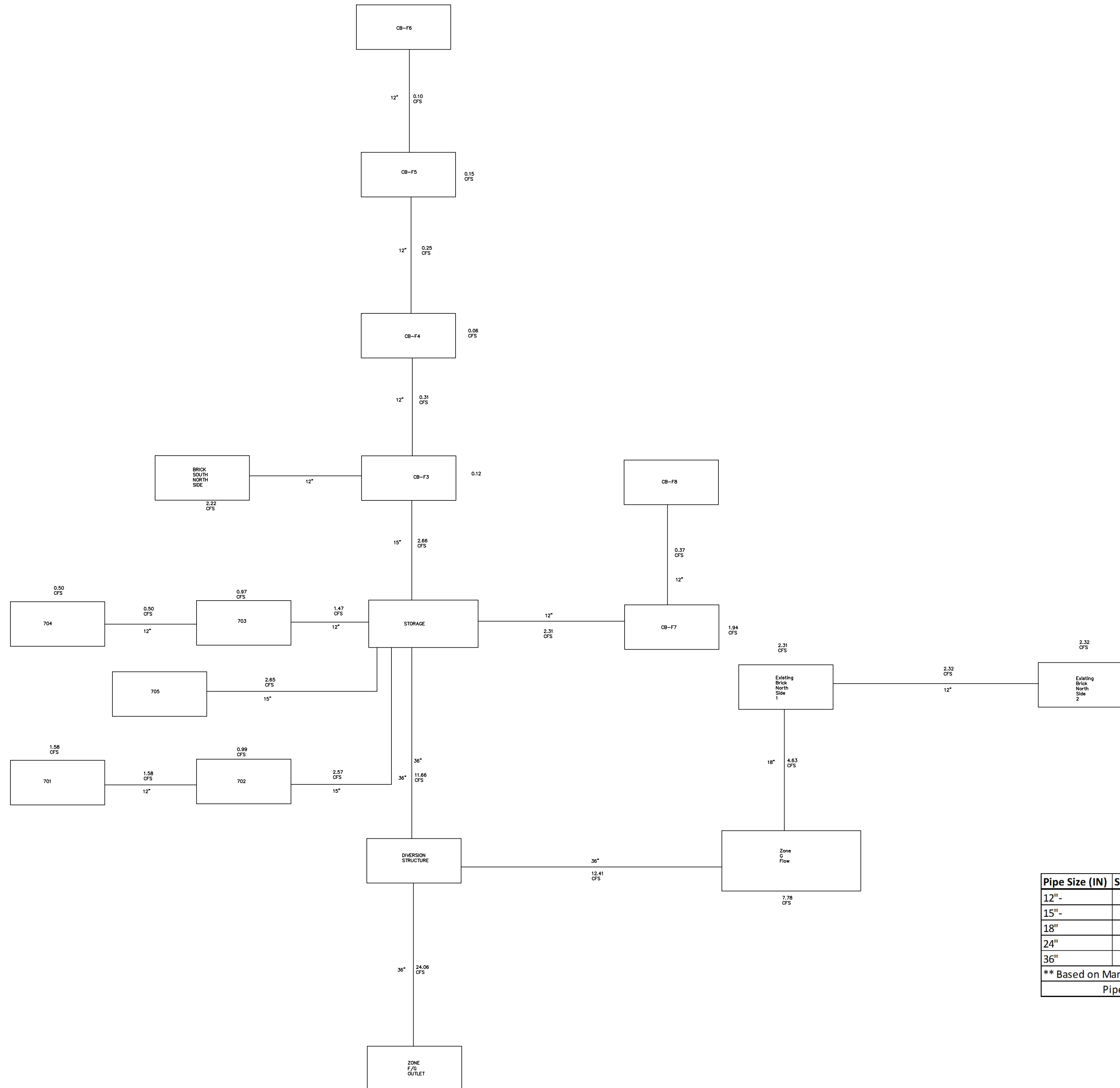


Pipe Size (IN)	Slope (FT/FT)	Velocity (FT/Sec)	Full Flow Capacity** (CFS)
12"	0.0038	3	2.38
15"	0.0028	3	3.7
18"	0.0022	3	5.33
24"	0.0015	3	9.49
36"	0.0009	3	21.67

\*\* Based on Mannings equation for full flowing pipes

Pipe Sizes in Zones E Sized based on min. slope

# ZONE F/G STORM WATER FLOW SCHEMATIC



Pipe Size (IN)	Slope (FT/FT)	Velocity (FT/Sec)	Full Flow Capacity** (CFS)
12"	0.0038	3	2.38
15"	0.0028	3	3.7
18"	0.0022	3	5.33
24"	0.0015	3	9.49
36"	0.0009	3	21.67

\*\* Based on Mannings equation for full flowing pipes  
Pipe Sizes in Zones F/G Sized based on min. slope



<b>Summary of Storm Water Discharges</b>					
<b>Discharge ID</b>	<b>Approximate Drainage Area (Ac)</b>	<b>Full Build Out 25 Yr Peak Flow (CFS)</b>	<b>Outlet Pipe Size (In)</b>	<b>Description</b>	<b>*Minimum Required Riprap D<sub>50</sub> (IN)</b>
Zone A	1.42	4.7	18	RCP Flared End W/ Bar Rack, Riprap Plunge Pool	12
Zone B/C	3.51	15.75	36	RCP Flared End W/ Bar Rack, Riprap Slope	12
Zone D	5.89	31.25	36	RCP Flared End W/ Bar Rack, Riprap Slope	12
Zone E	1.41	6.79	24	RCP Flared End, Riprap Slope Apron	12
Zone F/G	4.77	24.06	36	RCP Flared End W/ Bar Rack, Riprap Slope	12
Zone H	4.23	23.16	48	RCP Flared End W/ Bar Rack, Riprap Plunge Pool	12

\* D<sub>50</sub> is a median rock size. Riprap should be a well graded mix of angular rock from about 1.5 to 0.25 times the size of the D<sub>50</sub>. The contractor shall protect existing riprap slope or replace rock to the meet the minimum required D<sub>50</sub> stone size.