

COLBY AND CHERRY AVENUE FILTERRA SYSTEMS

TAKOMA PARK, MARYLAND

LEGEND

LEGEND

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	EXISTING	PROPOSED
IMBRICATED RIP RAP		
RIVER JACK ROCK/ RIP RAP		
#57 STONE		
BRICK		
CONCRETE		
EARTH		
MULCH		
C-33 / SAND		
BIO PLANTING SOIL		

EXISTING LINES	
EXISTING HIDDEN LINES	
EXISTING LINES	
EXISTING HIDDEN LINES	
LIMIT OF DISTURBANCE	
GAS LINE	
WATER LINE	
SEWER LINE	
GEO FABRIC	

A. Khalilian

SECTION
Filterra®– Vault Configuration
Bioretention System Standard Specification

1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the Filterra® Bioretention System by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 Contractor shall furnish all labor, materials, equipment and incidentals necessary to install the bioretention system, appurtenances and incidentals in accordance with the Drawings and as specified herein.

1.3 Bioretention system shall utilize the physical, chemical and biological mechanisms of an engineered biofiltration media, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system shall be a fully equipped, pre constructed, drop in place unit designed for applications in the urban landscape to treat contaminated runoff from impervious surfaces.

1.4 Bioretention system shall be capable of stand alone stormwater treatment. No pretreatment to biofiltration media shall be required.

1.5 The bioretention system shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The Manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering design and production of systems deployed for the treatment of storm water runoff and which have a history of successful production, acceptable to the City Engineer or the approving Jurisdiction. The Manufacturer of the Filterra Bioretention System shall be, without exception:

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West Chester, OH, 45069
Tel: 1 800 338 1122

1.6 Applicable provisions of any Division shall govern work in this section.

1.7 American Society for Testing and Materials (ASTM) Reference Specifications

1.7.1 ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

1.7.2 ASTM C858: Standard Specification of Underground Precast Concrete Utility Structures

1.7.3 ASTM C990: Standard Specification for Joints for Precast Box Sections Using Preformed Flexible Joint Sealants

1.7.4 ASTM C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars

1.8 Manufacturer or authorized supplier to submit shop drawings for bioretention System with the vault, engineered biofiltration media and accessory equipment. Drawings shall include principal dimensions, engineered biofiltration media placement, location of piping and unit foundation.

1.8.1 Manufacturer or authorized supplier shall submit installation instructions to the contractor.

1.8.2 Manufacturer or authorized supplier shall submit Operations and Maintenance Manual to the contractor.

1.8.3 Before installation of the bioretention system, Contractor shall obtain the written approval of the Engineer of Record for the system drawings.

1.9 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

2.0 MATERIALS

2.1 All internal components including engineered biofiltration media, underdrain stone, PVC underdrain piping, mulch, dissipation stone, and vegetation must be included as part of the bioretention system and shall be provided by Contech Engineered Solutions LLC.

2.1.1 Engineered biofiltration media shall consist of both organic and inorganic components. Stormwater shall be directed to flow vertically through the media profile, saturating the full media profile without downstream flow control.

2.1.2 Underdrain stone shall be of size and shape to provide adequate bridging between the media and stone for the prevention of migration of fine particles. Underdrain stone must also be able to convey the design flow rate of the system without restriction and be approved for use in the Filterra Bioretention System by Contech Engineered Solutions LLC.

2.1.3 PVC Underdrain Piping shall be SDR35 with perforation pattern designed to convey system design flow rate without restriction.

2.1.4 Mulch shall be double shredded wood or bark mulch approved for use with the Filterra Bioretention System by Contech Engineered Solutions LLC.

2.1.5 Vegetation shall comply with the type and size required by the approved drawings and shall be alive and free of obvious signs of disease.

2.1.6 Dissipation stone shall be 3” 6” diameter washed stones or cobbles.

2.2 Precast concrete vault shall be provided by Manufacturer or authorized supplier according to ASTM C857 and C858.

2.2.1 Vault joint sealant shall be Conseal CS 101 or approved equal. Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.

2.2.2 If interior concrete baffle walls are provided, baffle walls shall be cast in or sealed to the interior vault walls and floor with a polyurethane construction sealant rated for use below the waterline, SikaFlex 1a or equal. Contractor to provide sealant material and installation unless completed prior to shipment.

2.3 Tree grates and access covers shall be cast iron. Tree grate frames shall be galvanized steel.

2.4 Curb Nosing (where applicable) shall be galvanized steel and where specified shall be cast into a top slab designed to support AASHTO HS 20 loading at the curb.

2.5 All contractor provided components shall meet the requirements of this section, the plans specifications and contract documents. In the case of conflict, the more stringent specification shall apply.

2.5.1 Crushed rock base material shall be six inch minimum layer of ¾ inch minus rock. Compact undisturbed sub grade materials to 95% of maximum density at +/- 2% of optimum moisture content. Unsuitable material below sub grade shall be replaced to engineer’s approval.

2.5.2 Concrete shall have an unconfined compressive strength at 28 days of at least 3000 psi, with ¾ inch round rock, a 4 inch slump maximum, and shall be placed within 90 minutes of initial mixing.

2.5.3 Silicone Sealant shall be pure RTV silicone conforming to Federal Specification Number TT S001543A or TT S00230C or Engineer approved.

2.5.4 Grout shall be non shrink grout meeting the requirements of Corps of Engineers CRD C588. Specimens molded, cured and tested in accordance with ASTM C 109 shall have minimum compressive strength of 6,200 psi. Grout shall not exhibit visible bleeding.

2.5.5 Backfill material shall be ¾ inch minus crushed rock, or approved equal.

3.0 PERFORMANCE

3.1 Treatment Capabilities shall be verified via third party reports following TAPE or TARP protocols.



PORJECT NAME:
COLBY & CHERRY AVENUE
NEW FILTERRA SYSTEM
City of Takoma Park, MD
Department of Public Works

PORJECT TYPE:
NEW FILTERRA
SYSTEM
PORJECT TITLE:
CONSTRUCTION NOTES

DESIGNED BY: A. Khalilian, P.E.
DRAWN BY: Z. Mathewos
APPROVED BY: A. Khalilian, P.E.
DATE APPROVED: December 29, 2017
SCALE: NTS



SHEET No.
F-2

SHEET
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3.1.1 Engineered biofiltration Media flow rate shall be verified via third party report following TAPE or TARP protocols. The minimum treatment flow rate based on target pollutant shall be as follows:
TSS: 100"/hr
Phosphorus: 100"/hr
Oil/Grease: 50"/hr
Metals: 35"/hr

The system shall be designed to ensure that high flow events shall bypass the Engineered biofiltration media preventing erosion and resuspension of pollutants.

- 3.1.2 The system shall remove a minimum of 86% Total Suspended Solids (TSS) based on aggregated data from at least four third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 3.3 mg/L.
- 3.1.3 The system shall remove a minimum of 70% Total Phosphorus (TP) based on aggregated data from at least two third party field studies following TAPE protocols. Aggregated median effluent concentration shall be less than 0.05 mg/L.
- 3.1.4 The system shall remove a minimum of 70% Total Phosphorus (TP) based on aggregated data from at least two third party field studies following TAPE protocols. Aggregated median effluent concentration shall be less than 0.05 mg/L.
- 3.1.5 The system shall remove a minimum of 55% Total Copper based on aggregated data from at least two third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.004 mg/L.
- 3.1.6 The system shall remove a minimum of 43% Dissolved Copper based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.003 mg/L.
- 3.1.7 The system shall remove a minimum of 56% Total Zinc based on aggregated data from at least three third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.04 mg/L.
- 3.1.8 The system shall remove a minimum of 54% Dissolved Zinc based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.003 mg/L.
- 3.1.9 The system shall remove a minimum of 87% Total Petroleum Hydrocarbons based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.71 mg/L.

3.2
The system shall have General Use Level Designation from Washington Department of Ecology for Basic (TSS), Phosphorus, Enhanced (Metals), and Oil/Grease and have Certification by New Jersey Department of Environment.

3 Quality Assurance and Quality Control procedures shall be followed for all batches of engineered biofiltration media produced. Engineered biofiltration media shall be certified by the Manufacturer for performance and composition.

3.3.1 Media particle size distribution and composition shall be verified as per relevant ASTM Standards.

3.3.2 Media pollutant removal performance shall be verified as per relevant ASTM Standards as well as a minimum of one scientific method approved by the USEPA.

3.3.3 Media hydraulic performance shall be verified as per relevant ASTM Standards.

3.3.4 Media fertility shall be verified as per a minimum of one published scientific method.

3.4 The Manufacturer shall ensure through third party full scale field testing of installed units that the design flow rate of the system is not reduced over time. Studies shall be performed on a minimum of 10 systems of various ages, maintenance frequencies, and land uses. At least 80% of the tested systems shall have been installed 2.5 or more years. At least 50% of the systems shall have previous maintenance intervals greater than 2 times the manufacturer's recommendation.

4.0 EXECUTION

- 4.1 Set precast vault on crushed rock base material that has been placed in maximum 6 inch lifts, loose thickness, and compacted to at least 95 percent of the maximum dry density as determined by the standard Proctor compaction test, ASTM D698, at moisture content of +/- 2% of optimum water content.
- 4.2 Inlet and outlet pipes shall be attached to provided couplers or grouted in and connected to precast concrete vault according to Engineer's requirements and specifications. All connections to be water tight.

4.3 All throat and grate protection covers shall remain in place until the system is activated.

4.4 Contractor to cast in place throat inlet to convey stormwater into bioretention System according to Engineer's requirements and specifications.

4.5 Engineered biofiltration media shall be delivered installed in the vault, unless otherwise agreed upon with the Manufacturer. Contractor shall take appropriate action to protect the media from sediment and other debris during construction. The method ultimately selected shall be at Contractor's discretion and Contractor's risk.

4.5.1 If media is shipped separately from vault, Manufacturer or a Manufacturer's certified representative shall install media into the vault or be present to supervise installation in order to ensure proper installation.

4.6 The bioretention system shall not be placed in operation (activated) until the project site is clean and stabilized (construction erosion control measures no longer required). The project site includes any surface that contributes storm drainage to the system. All impermeable surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediment. Activation shall be provided by Manufacturer or authorized supplier.

4.7 Each correctly installed system shall be maintained by Manufacturer or authorized supplier for a minimum period of one year. The cost of this service shall be included in the price of the system.

4.7.1 Annual maintenance consists of a maximum of two [2] scheduled visits.

4.7.2 Each routine maintenance visit shall consist of only the following items: system inspection; removal of foreign debris, silt, loose plant material and trash; mulch removal; engineered biofiltration media evaluation; plant health evaluation and pruning; replacement of mulch; disposal of all maintenance refuse items; and updating of maintenance records

4.8 To ensure long term performance of the bioretention system, continuing annual maintenance programs should be performed or purchased by the owner per the latest Filterra Bioretention System Operation and Maintenance manual.

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**COLBY & CHERRY AVENUE
NEW FILTERRA SYSTEM**
City of Takoma Park, MD
Department of Public Works

PORJECT TYPE:
**NEW FILTERRA
SYSTEM**

PORJECT TITLE:
CONSTRUCTION NOTES

DESIGNED BY: A. Khalilian, P.E.
DRAWN BY: Z. Mathewos
APPROVED BY: A. Khalilian, P.E.
DATE APPROVED: December 29, 2017
SCALE: NTS



SHEET No.
F-3

SHEET
3 OF 10

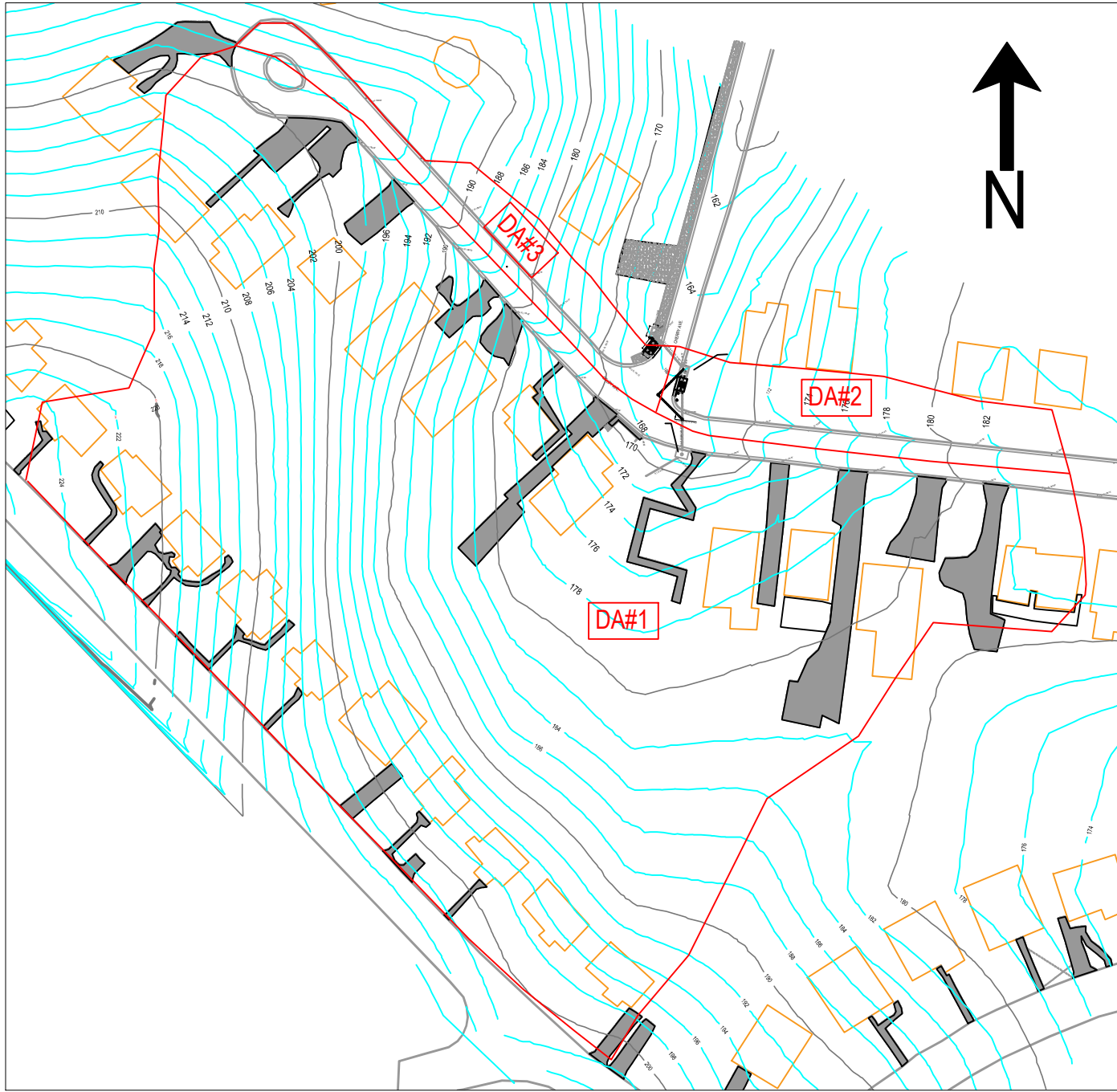


TABLE-1

SUMMARY OF DRAINAGE AREA PER INDIVIDUAL STURUCTUE/FACILITY				
AD #	DRAINAGE AREA (ACRES)			
	IMP	PER	DA	
DA#1	1.0	3.6	4.6	
DA#2	0.08	0.20	0.28	
DA#3	0.12	0.11	0.23	

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PORJECT NAME:
COLBY & CHERRY AVENUE FILTERRA SYSTEM
CITY OF TAKOMA PARK
DEPARTMENT OF PUBLIC WORKS
TAKOMA PARK, MARYLAND

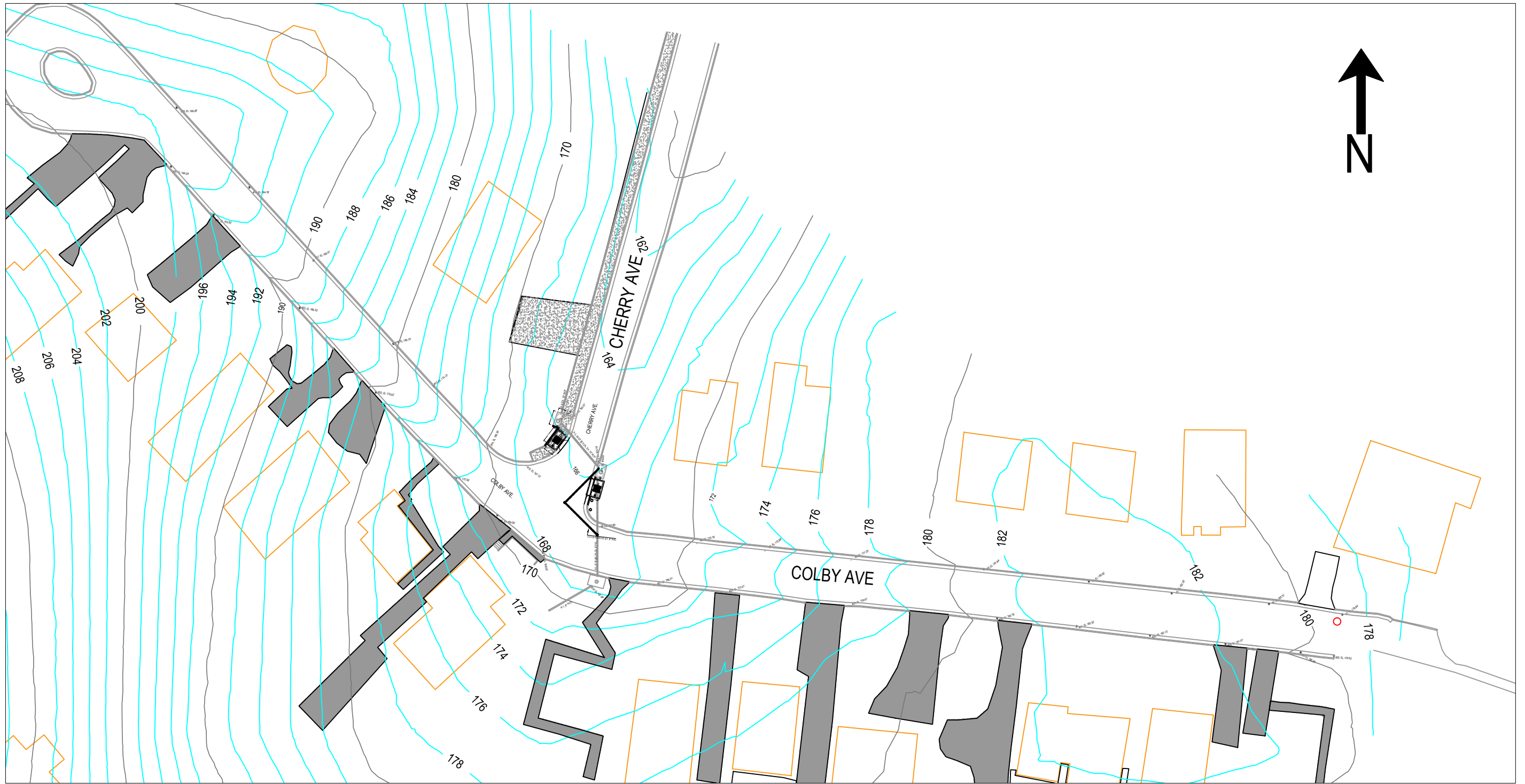
PORJECT TYPE:
NEW FILTERRA SYSTEM
PORJECT TITLE:
DRAINAGE AREA SURVEY PLAN

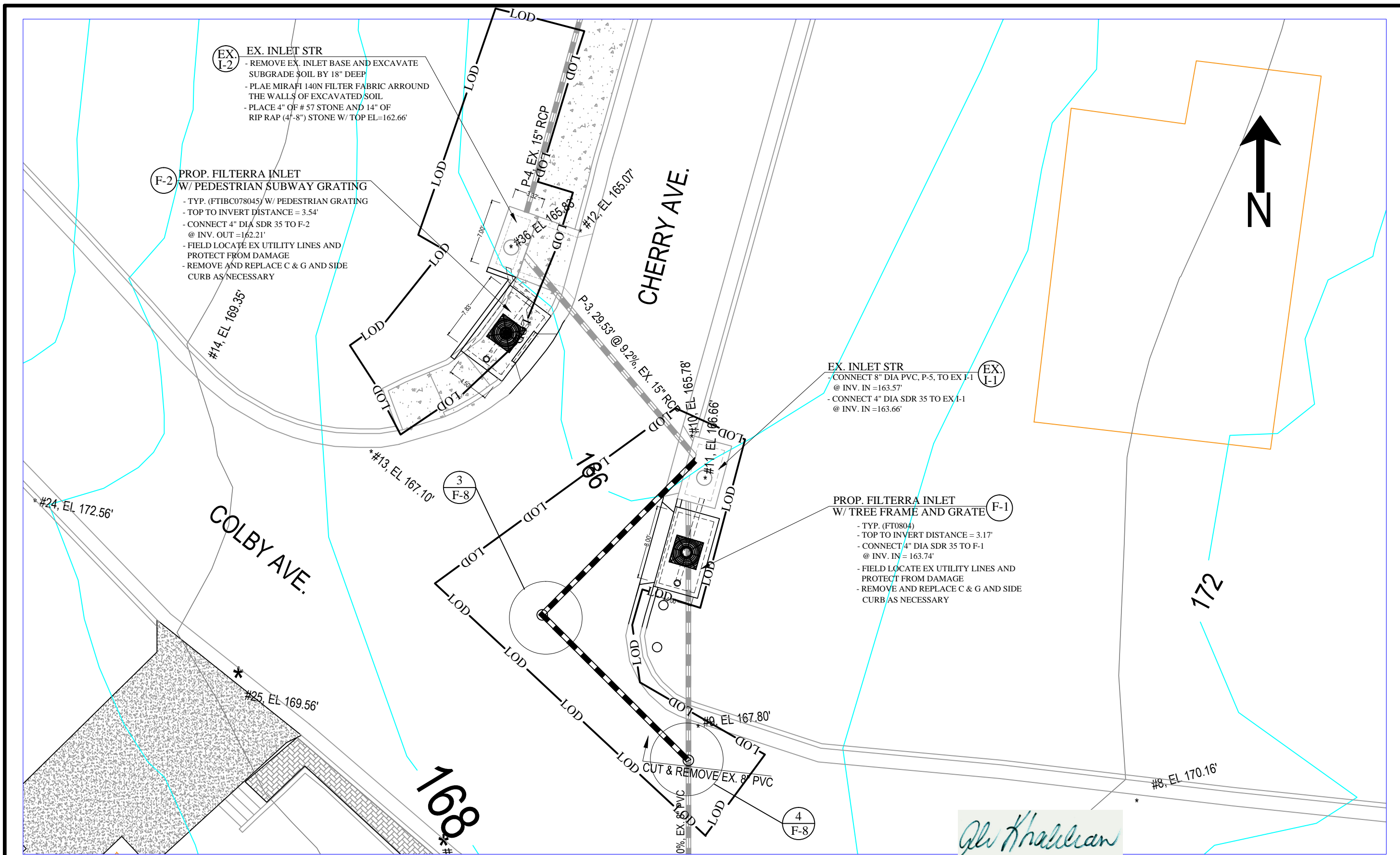
DESIGNED BY: A. Khalilian, P.E.
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DATE APPROVED: December 29, 2017
SCALE: 1" = 100'-0"



SHEET No.
F-4

SHEET
4 OF 10





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PROJECT NAME:

COLBY & CHERRY AVENUE FILTERRA SYSTEM
CITY OF TAKOMA PARK
DEPARTMENT OF PUBLIC WORKS
TAKOMA PARK, MARYLAND

PROJECT TYPE:

NEW FILTERRA SYSTEM

PROJECT TITLE:

FILTERRA SITE PLAN

DESIGNED BY:

A. Khalilian, P.E.

DRAWN BY:

Z. Mathewos

APPROVED BY:

A. Khalilian, P.E.

DATE APPROVED:

December 29, 2017

SCALE: 1" = 10'-0"

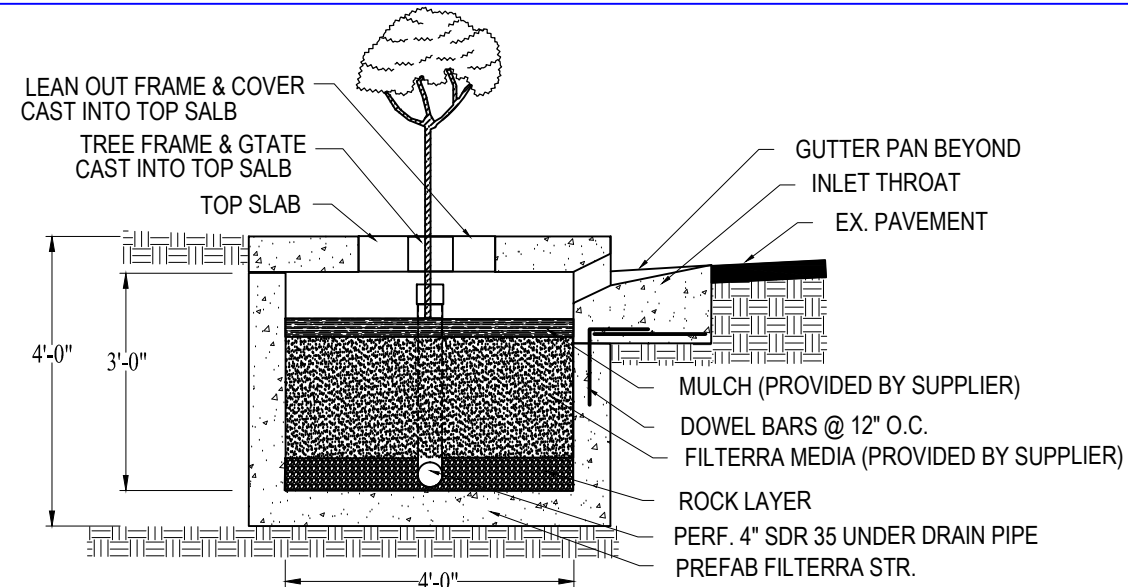


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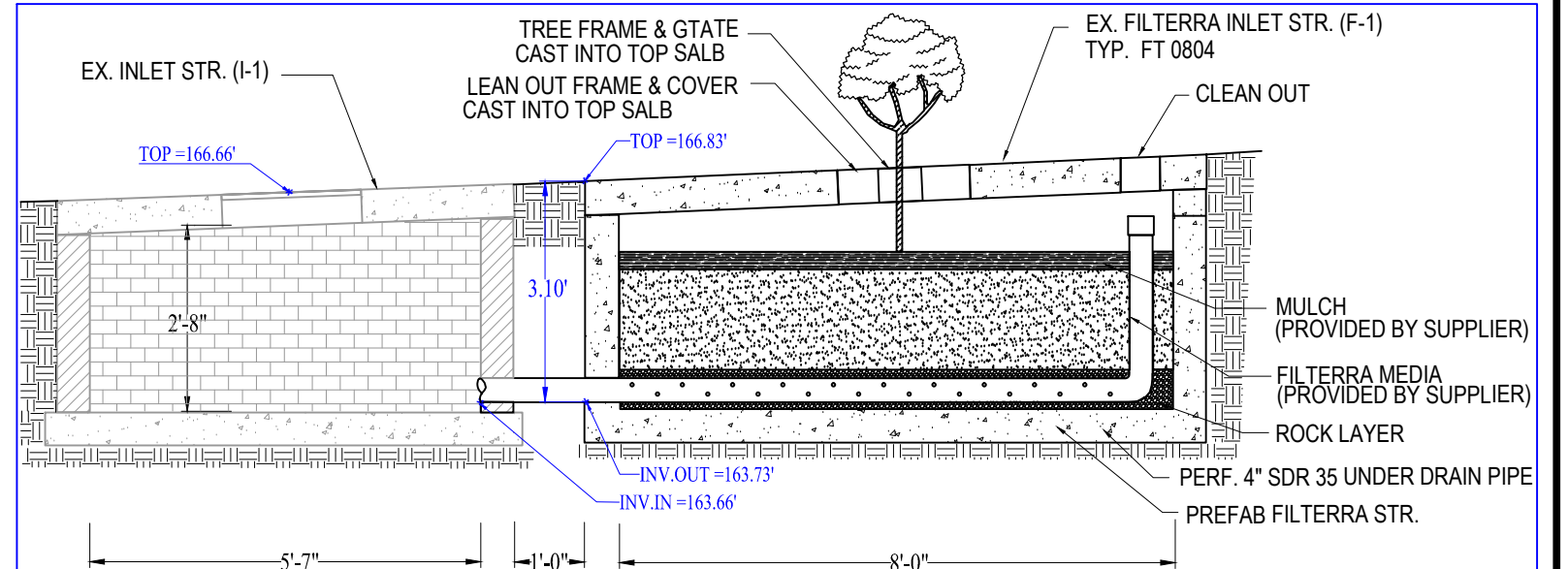
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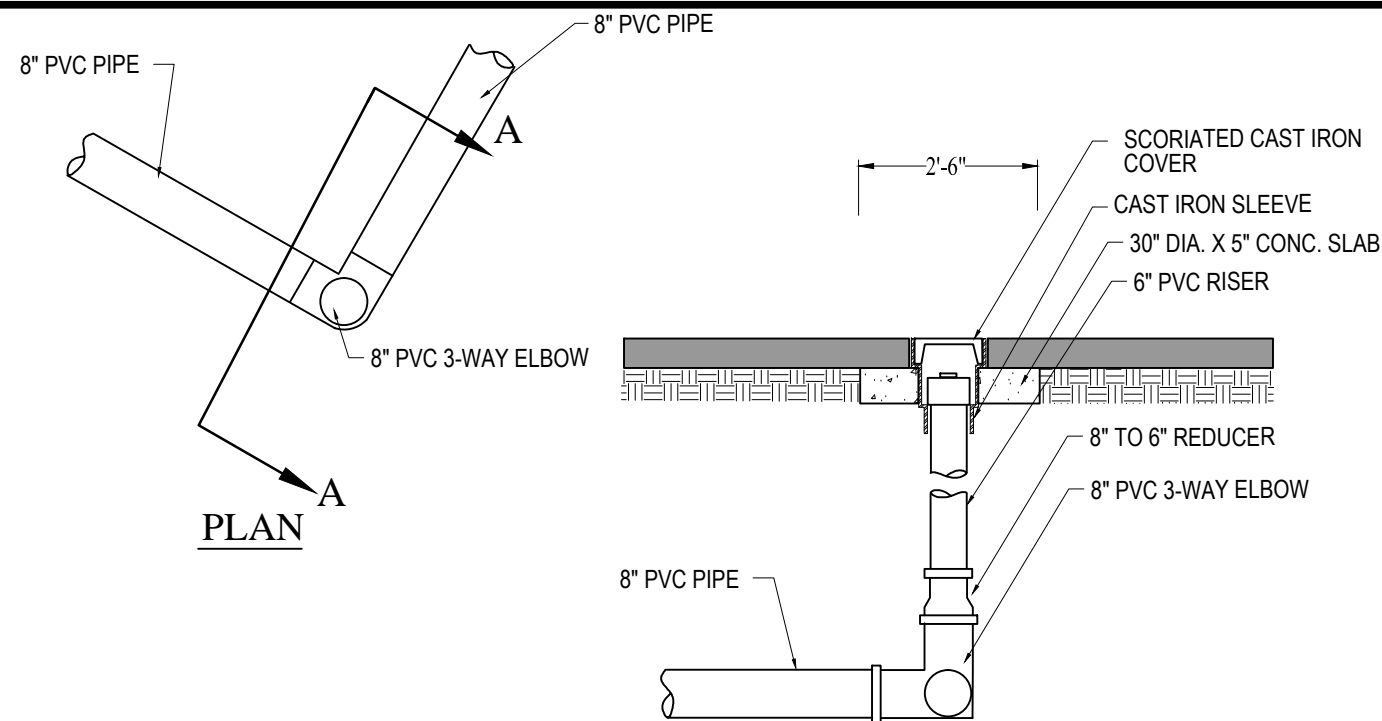
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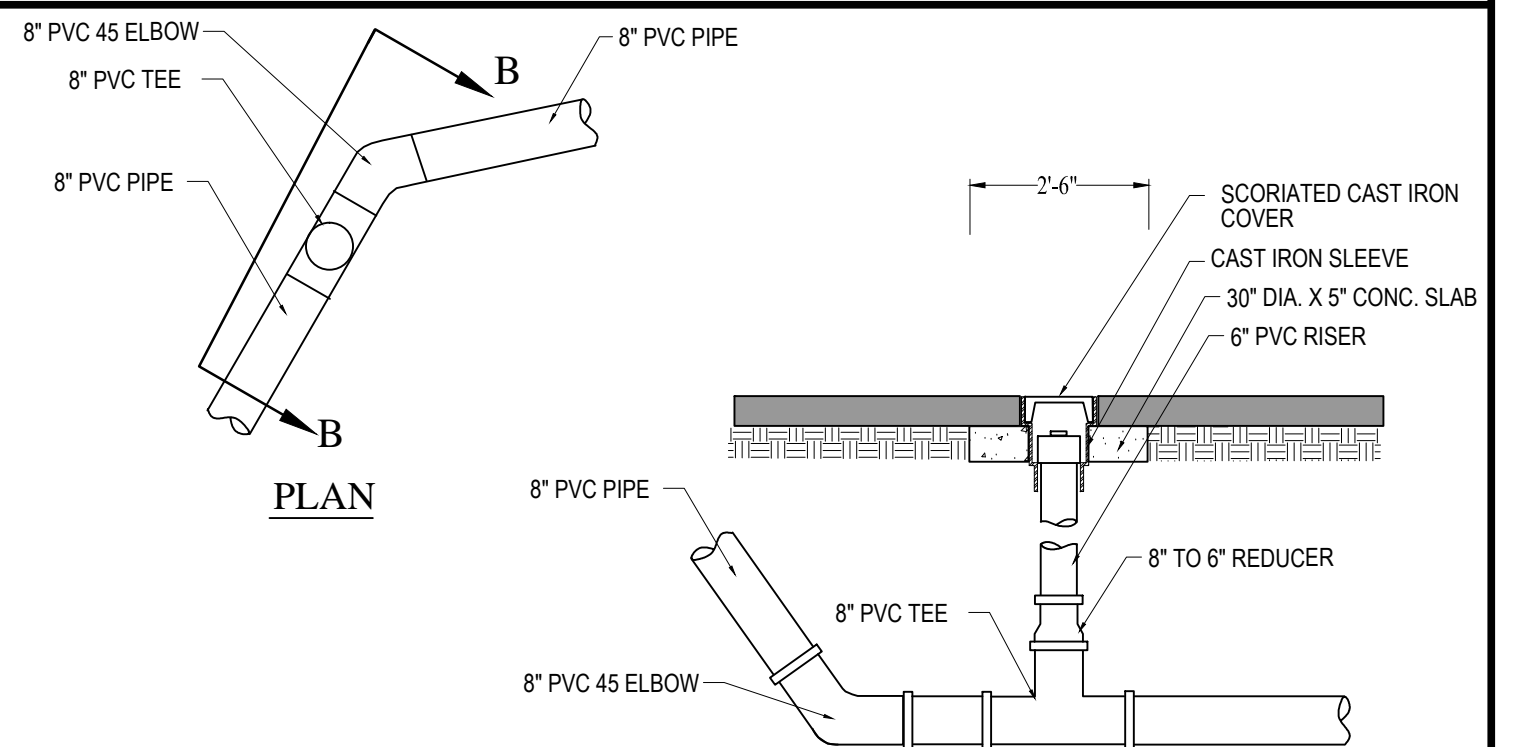
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F-8 **CROSS SECTION THRU FILTERRA (F-1)**
SCALE: 3/8" = 1'-0"



2
F-8 **LONGITUDINAL SECTION THRU FILTERRA (F-1) AND EX. INLET (I-1)**
SCALE: 3/8" = 1'-0"



3
F-8 **CLEAN OUT DETAIL-1**
SCALE: 3/8" = 1'-0"



4
F-8 **CLEAN OUT DETAIL-2**
SCALE: 3/8" = 1'-0"



TABLE-2

STORM DRAIN STRUCTURE SCHEDULE							
STR #	DESCRIPTION	INTERIOR DIMENSION (FT)	STR INV (ft)	TOP/RIM ELEV. (ft)	INVERTS		LOCATION
					PIPE #, IN/OUT	ELEV. (ft)	
EX MH-1	Ex. Manhole, BRICK STR	6.00' x 3.5'	164.80	167.59	(P-1) In, 12" PVC	164.97	Existing rectangular manhole structure w/ brick walls and conc. top & base
					(P-2) Out, 12" PVC	164.72	
EX I-1	Ex. "A-5" Inlet, BRICK STR	5.00' x 2.67'	163.49	166.66	(P-2) In, 12"PVC	163.75	Existing A-5 Inlet w/ brick walls and conc. top & base
					(P-3) Out, 15" RCP	163.50	
EX I-2	Ex. "A-5" Inlet, BRICK STR	5.58' x 4.00'	162.66	165.83	(P-3) In, 15" RCP	162.66	Existing A-5 Inlet w/ extended throat under sidewalk; with brick walls and conc. top & base.
					(P-4) Out, 15" RCP	162.66	

TABLE-3

STORM DRAIN PIPE SCHEDULE						
SD PIPE No.	INV. EL @ STR #		PIPE INFORMATION			REMARKS
	AT PIPE OUT	AT PIPE IN	LENGTH (ft)	SLPOE (%)	SIZE/TYPE	
P-1	N/A	MH-1 @ 164.97	N/A	N/A	8" PVC	
P-2	MH-1 @ 164.72	I-1 @ 163.75	47.16	2.0%	8" PVC	
P-3	I-1 @ 163.50	I-2 @ 160.42	33.53	9.2%	15" RCP	
P-4	I-2 @ 160.17	N/A	N/A	N/A	15" RCP	

TABLE-3

PROPOSED FILTERRA STRUCTURE SCHEDULE										
STR #	DESCRIPTION	VAULT DIMENSION (ft) (W X L)	TOP ELEV (ft)	TOP TO INV. DISTANCE (ft)	INVERT OUT	UNDERDRAIN PIPE		GRATE TYPE		REMARKS
					ELEV. (ft)	DIA. (in)	DESCRIPTION	SIZE (ft)	DESCRIPTION	
F-1	FILTERRA (FT0804) "FT" LONG SIDE INLET CONFIGURATION	8.00' x 4.00'	166.83	3.10'	163.73'	4"	SDR-35	3.00' x 3.00'	TREE FRAME AND GRATE	
F-2	FILTERRA (FTIBC 078045) "FTIBC" LONG SIDE CURB INLET CONFIGURATION	7.83' x 4.50'	166.25'	3.54'	162.71'	4"	SDR-35	3.00' x 3.00'	PEDESTRIAN SUBWAY GRATING	

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