Innovative Bioretention and Rainwater Harvesting Treatment Train

PROJECT LOCATION:

5171 SOUTH DAKOTA AVE NE, WASHINGTON DC 20017
N 38° 57' 13.5" W 76° 59' 51.0"
SQUARE # 3757
LOT # 0802
WATERSHED: ANACOSTIA
SEWER SYSTEM: MS4

THE FOLLOWING PROJECT IS FUNDED THROUGH A DEPARTMENT OF ENERGY AND ENVIRONMENT RESEARCH GRANT: DOEE # 2018-1808-WPD

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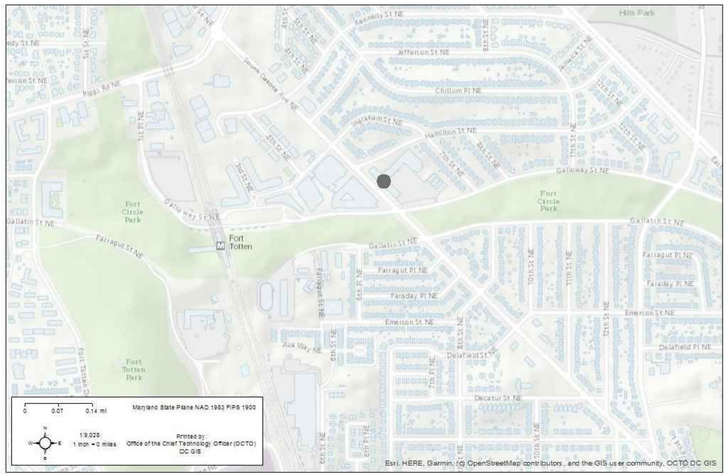
ABBREVIATED OUTCOMES:

1. IMPERVIOUS AREA TREATED: 14,905 SQUARE FEET (0.34 AC)
2. STORM EVENT TREATED: 15,005 GAL TREATED PER 1.7" RAIN EVENT
3. AREA OF DISTURBANCE: 1,070 SQUARE FEET
4. WATERSHED: ANACOSTIA
5. SUBWATERSHED: MS4



INDEX OF SHEETS	
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CIV003	SITE INVENTORY - PHASE III
CIV004	EROSION & SEDIMENT CONTROL PLANS
CIV005	EROSION & SEDIMENT CONTROL SPECIFICATIONS
CIV006	PROPOSED CONDITIONS - PHASES I & II
CIV007	PROPOSED CONDITIONS - PHASE III
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CIV009	BIORETENTION DETAILS
CIV010	RAINWATER HARVESTING SYSTEM DETAILS
CIV011	DETAILS
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PROJECT NARRATIVE:

THE EXTENT OF THE PROPOSED PROJECT IS THE INSTALLATION OF AN INNOVATIVE TREATMENT TRAIN FOR RESEARCH CONSISTING OF AN ENGINEERED BIORETENTION CELL AND RAINWATER HARVESTING SYSTEM. NINE TREES WERE ALSO PLANTED ON THE EASTERN PORTION OF THE PARCEL AS PART OF THE PROJECT. THE PROPOSED PROJECT WILL NOT ALTER WHAT CURRENTLY EXISTS AS THE STORMWATER SYSTEM; THUS THE PROPOSED PROJECT IS CONSIDERED A SITE ALTERATION. THE PROPOSED TREATMENT TRAIN WILL REDUCE AND RETAIN STORMWATER RUNOFF FROM IMPERVIOUS SURFACES ON THE SITE.

THE PROPOSED PROJECT WILL NOT ALTER THE CURRENT DEVELOPED FOOTPRINT OF THE SITE AND AS SUCH, THE PROPOSED PROJECT WILL NOT IMPACT ANY KNOWN NATURAL OR CULTURAL RESOURCES. IN ADDITION, THERE ARE NO KNOWN ENVIRONMENTAL PROBLEMS ASSOCIATED WITH THE SITE AND THUS THE PROPOSED PROJECT DOES NOT REQUIRE AND ENVIRONMENTAL IMPACT STATEMENT. SHOULD ANY NATURAL, CULTURAL, OR ENVIRONMENTAL ISSUES BE IDENTIFIED DURING THE COURSE OF THE PROJECT, THE DOEE AND ALL OTHER APPROPRIATE AGENCIES WILL BE NOTIFIED AND PROPER RESPONSES WILL BE EMPLOYED.

SUBSURFACE INFILTRATION TESTING INDICATES AN IN SITU INFILTRATION RATE (Ksat) OF 0.06 IN/HR. MOREOVER, THE GROUNDWATER TABLE DEPTH EXCEEDED 10 FT DURING GEOTECHNICAL SURVEY. AS AN ALTERATION TO THE SITE, THE PROPOSED PROJECT DOES NOT CONSTITUTE EITHER NEW CONSTRUCTION OR A SUBSTANTIAL IMPROVEMENT TO THE SITE. THE PROPOSED PROJECT WILL HAVE NO EFFECT ON THE FLOODPLAIN NOR WILL IT INCREASE THE BASE FLOOD ELEVATION.

THE PROPOSED PROJECT WILL BE CONSTRUCTED IN THREE PHASES. PHASE ONE WILL INCLUDE THE INSTALLATION OF THE BIORETENTION, RAINWATER HARVESTING SYSTEM, AND CONSERVATION AREA PREPARATION. PHASE ONE IS ESTIMATED TO CONCLUDE BY 09/30/2020. PHASE TWO WILL CONSIST OF PLANTING THE LANDSCAPED AREAS AND IS ESTIMATED TO CONCLUDE BY 10/31/2020. PHASE THREE WILL CONSIST OF THE NINE TREE PLANTINGS ON THE EASTERN EDGE OF THE SITE AND IS ESTIMATED TO CONCLUDE BY 3/31/2021

SEQUENCE OF CONSTRUCTION:

1. ON-SITE PRE-CONSTRUCTION MEETING
2. COORDINATE EQUIPMENT/ACCESS/SCHEDULE
3. COMPLETE SURVEY STAKEOUT
4. CONFIRM UTILITY MARKINGS
5. CLEAR AND GRUB AREAS FOR PERIMETER CONTROLS
6. SETUP AND INSTALL INLET PROTECTION AND SILT FENCING
7. EXCAVATE AREA FOR CISTERN AND WET WELL ACCORDING TO PROJECT PLANS
8. INSTALL CISTERN, WET WELL, AND PLUMBING
9. CUT AND REMOVE ASPHALT PAVING FROM PROJECT SITE
10. BEGIN EXCAVATION OF BIORETENTION AREA
11. BACKFILL GRAVEL SUMP
12. INSTALL OUTLET STRUCTURE, UNDERDRAIN PIPES, AND CONNECTIONS AS SHOWN ON PROJECT PLANS
13. BACKFILL WITH GRAVEL AND WASHED SAND THAT IS DETERMINED TO BE ACCEPTABLE BY UDC, NCSU, OR DOEE REPRESENTATIVES
14. BACKFILL AND GRADE BIORETENTION AREA WITH MEDIA ON-SITE THAT IS DETERMINED TO BE ACCEPTABLE BY UDC, NCSU, OR DOEE REPRESENTATIVES
15. INSTALL RIVER ROCK VERGE AND APPLY TRIPLE SHREDDED HARDWOOD MULCH TO BIORETENTION AREA SURFACE
16. INSTALL CURB SURROUNDING BIORETENTION AREA ACCORDING TO PROJECT PLANS
17. INSTALL ASPHALT DIVERSION BUMP ACCORDING TO PROJECT PLANS
18. INSTALL ELECTRIC CONNECTIONS FOR WET WELL
19. SEED AND STRAW DISTURBED AREAS
20. INSTALL VEGETATION IN LANDSCAPED AREAS - INCLUDING NINE ADDITIONAL TREES ON THE EASTERN PORTION OF THE SITE
21. REMOVE EROSION AND SEDIMENT CONTROLS AND RESIDUAL DEBRIS FROM SITE
22. DEMOBILIZE FROM SITE FOLLOWING ACCEPTANCE OF FINAL WORK BY UDC AND NCSU PERSONNEL

GENERAL CONTRACTOR NOTES:

1. PRIOR TO DIGGING, CALL "MISS UTILITY" TOLL FREE AT 1-800-257-7777 FOR UTILITY LOCATION AT LEAST 48 HOURS BEFORE BEGINNING CONSTRUCTION, PRIOR TO STARTING ANY WORK SHOWN IN THESE PLANS.
2. THE **CONTRACTOR** IS RESPONSIBLE FOR COMPLYING WITH AND OBTAINING ALL REQUIRED CONSTRUCTION PERMITS AND MUST ARRANGE FOR ANY NECESSARY PRE, DURING, AND POST CONSTRUCTION MEETINGS AS REQUIRED BY PERMITS, REGULATIONS, LANDOWNERS, AND/OR IN ACCORDANCE WITH LOCAL CODES, ORDINANCES, OR AS CLEARLY AGREED TO BY **UDC** IN WRITING PRIOR TO START OF PROJECT CONSTRUCTION.
3. THE FOLLOWING NOTE APPLIES TO ALL **UDC** DRAFTED/ORIGINATED DOCUMENTS:
   A. ALL ELEVATIONS/MATERIAL QUANTITIES AS SHOWN ON **UDC** PLANS OR DETAILS ARE INTENDED FOR CONCEPTUAL USE ONLY.
   B. PROPOSED PROJECT PLANS, ELEVATIONS, QUANTITIES, AND/OR DETAILS ARE ONLY INTENDED TO COMMUNICATE **UDC'S** INTENDED PROJECT VISION TO GUIDE THE PROJECT TO FINAL OUTCOME AND TO DELIVER **UDC'S** DESIGN VISION AND EXPECTED LEVEL OF WORKMANSHIP.
   C. ALL ELEVATIONS AND MATERIAL QUANTITIES MUST BE CONFIRMED AND FIELD VERIFIED AS NECESSARY BY **CONTRACTOR** TO DELIVER IN ACCORDANCE WITH **UDC'S** INTENDED DESIGN AND PER SIGNED CONTRACT AGREEMENT TO CONSTRUCT.
   D. **UDC** IS NOT RESPONSIBLE FOR **CONTRACTOR** MATERIAL QUANTITY SHORTFALLS OR SURPLUSES RESULTING IN THE CONSTRUCTION OF THE PROJECT.
4. ALL PROJECT DRAWINGS DRAFTED, SEALED, AND APPROVED BY CONSULTANTS/ENGINEERS AS HIRED BY **UDC** ARE TO BE FOLLOWED IN ACCORDANCE TO PROFESSIONAL, LICENSED ENGINEER/ARCHITECT INSTRUCTIONS/DETAILS AS RELAYED AND/OR AS PERMITTED PER APPROVED AND/OR PROVIDED PLANS. DEVIATION FROM PLANS MUST BE APPROVED BY AN **UDC** REPRESENTATIVE WITH CONSENT AND/OR WRITTEN NOTIFICATION WITH EXPLANATION TO LICENSED ENGINEER/ARCHITECT SEALING PLANS.
5. ANY TEMPORARY TRAFFIC CONTROL AND PERMANENT TRAFFIC SIGNS SHALL CONFORM TO THE LATEST EDITION OF THE FEDERAL HIGHWAY ADMINISTRATION'S MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
6. IT SHALL BE THE RESPONSIBILITY OF THE **CONTRACTOR** TO REMOVE AND PROPERLY DISPOSE OF UNSUITABLE MATERIAL AND TO REPLACE IT WITH SUITABLE MATERIAL AS NECESSARY TO PERFORM CONTRACTED SERVICES AND/OR PROPERLY CONSTRUCT.
7. POSITIVE DRAINAGE SHALL BE MAINTAINED THROUGHOUT THE AREA COVERED BY THIS PROJECT'S LIMIT OF DISTURBANCE WITHOUT ADVERSE EFFECT TO ADJACENT PROPERTY FRONTAGES.
8. ALL LOOSE SOILS/MATERIALS LEFT DURING CONSTRUCTION ARE TO BE COVERED WHEN NO CONSTRUCTION ACTIVITY IS TAKING PLACE.
9. ALL UNPAVED AND DISTURBED AREAS RESULTING FROM CONSTRUCTION ACTIVITIES AND/OR ACCESS TO SITE WITHIN THE RIGHT-OF-WAY SHALL BE SODDED.
10. **CONTRACTOR** SHALL REPAIR (LEFT RESTORED AND CLEANED TO PRE-CONSTRUCTION CONDITIONS) OR REPLACE EXISTING GROUND, PATHS, WALKWAYS, ETC. DISTURBED OR DAMAGED DURING CONSTRUCTION.
11. **CONTRACTOR** MUST ENSURE THAT ANY PROPOSED TREE PLANTINGS ARE NO CLOSER THAN ONE (1) FOOT TO THE RIGHT-OF-WAY LINE, IN AN OPEN SPACE SECTION CONFIGURATION, AND NO CLOSER THAN FIFTEEN (15) FEET FROM STREET LIGHTS OR POLES, AND OR APPROPRIATE HEIGHT AS TO NOT INTERFERE WITH EXISTING OR PROPOSED OVERHEAD UTILITY LINES. PROPOSED CHANGES MUST BE PRE-APPROVED BY AN **UDC** REPRESENTATIVE PRIOR TO RELOCATION BY **CONTRACTOR**.
12. AT PROJECT'S END AND UPON FINAL PAYMENT, A PROOF STATEMENT THAT ALL FINANCIAL MATTERS HAVE BEEN SETTLED WITH RELEASE OF ANY RIGHT TO LIEN ON **UDC** FOR ANY UNPAID **SUBCONTRACTORS**, **SUPPLIERS**, AND/OR **PROJECT COSTS**.
13. TOPOGRAPHY SOURCE: SITE SURVEY
14. LANDOWNER INFORMATION:
    LANDOWNER: DISTRICT OF COLUMBIA
    PROPERTY ADDRESS: 5171 SOUTH DAKOTA AVE, NW, WASHINGTON, DC 20017
    TOTAL LOT AREA: 4.9 ACRES
15. WATERSHED INFORMATION:
    WATERSHED: ANACOSTIA
    STORMWATER SYSTEM: MS4
16. INFORMATION CONCERNING UNDERGROUND UTILITIES WAS OBTAINED FROM AVAILABLE RECORDS. IT IS THE **CONTRACTOR'S** RESPONSIBILITY DETERMINE EXACT LOCATION AND ELEVATION OF THE MAINS BY DIGGING TEST PITS BY HAND OR VACUUM AT UTILITY CROSSING WELL IN ADVANCE OF TRENCHING OR CONNECTION TO LINES. IF CLEARANCES TO WATER AND SEWER LINES ARE NOT SHOWN IN PLAN AND/OR SHOWN ON THIS PLAN LESS THAN TWELVE (12) INCHES, CONTACT THE DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION OR APPLICABLE AGENCY BEFORE PROCEEDING WITH CONSTRUCTION. CLEARANCE LESS THAN NOTED MAY REQUIRE REVISION PLAN AND MUST BE APPROVED BY **UDC** PRIOR TO REVISIONS.
17. LOCATION OF PRIVATE UTILITIES AND SITE DRAINAGE SYSTEMS ARE APPROXIMATE AND ARE THE RESPONSIBILITY OF **CONTRACTOR** TO LOCATE PRIOR TO ANY CONNECTIONS OR ALTERATIONS TO SYSTEM.

INNOVATIVE TREATMENT TRAIN BIORETENTION/RWH WASHINGTON, DC CONSTRUCTION PLANS

PLAN TYPE: TITLE SHEET

SHEET NUMBER CIV001

NC STATE UNIVERSITY
DEPT. OF BIO & AG ENGINEERING
CAMPUS BOX 7625
RALEIGH, NC 27695
919-515-7475

DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS: UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851 | NC STATE UNIVERSITY

DRAWN:	J.P. JOHNSON
DESIGN:	J.P. JOHNSON
CHECK:	
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	1/18/2023

PROJECT # 566763 / 02660
PHASE #

DRAINAGE AREA SUMMARY - PHASE I & II

THE CONTRIBUTING DRAINAGE AREA (CDA) TO THE PROPOSED TREATMENT TRAIN CONSISTS OF THE MAJORITY OF THE PARKING AREA SHOWN IN THE AERIAL. THE CDA IS DELINEATED IN THE SITE INVENTORY. A PORTION OF THE PARKING LOT EXCLUDED DRAINS TO AN OPEN GRATE. AN EXISTING CATCH BASIN EXISTS WITHIN AN ENCLOSED HVAC AREA; HOWEVER, IT IS PROPOSED TO DIVERT WATER TO THE TREATMENT TRAIN VIA A TRENCH DRAIN OR DIVERTER BUMP. TOTAL DISTURBED AREA FOR THE PROJECT IS APPROXIMATELY 738 SF.

PREDOMINANT SOILS ON THE PROJECT SITE ARE INDICATED BY USDA SOIL SURVEY AS URBAN LAND. A GEOTECHNICAL SURVEY WAS PERFORMED OF THE SITE WITH SOIL TESTS INDICATING SANDY LOAM SOILS (65.0% SAND, 21.6% SILT, AND 13.4% CLAY).

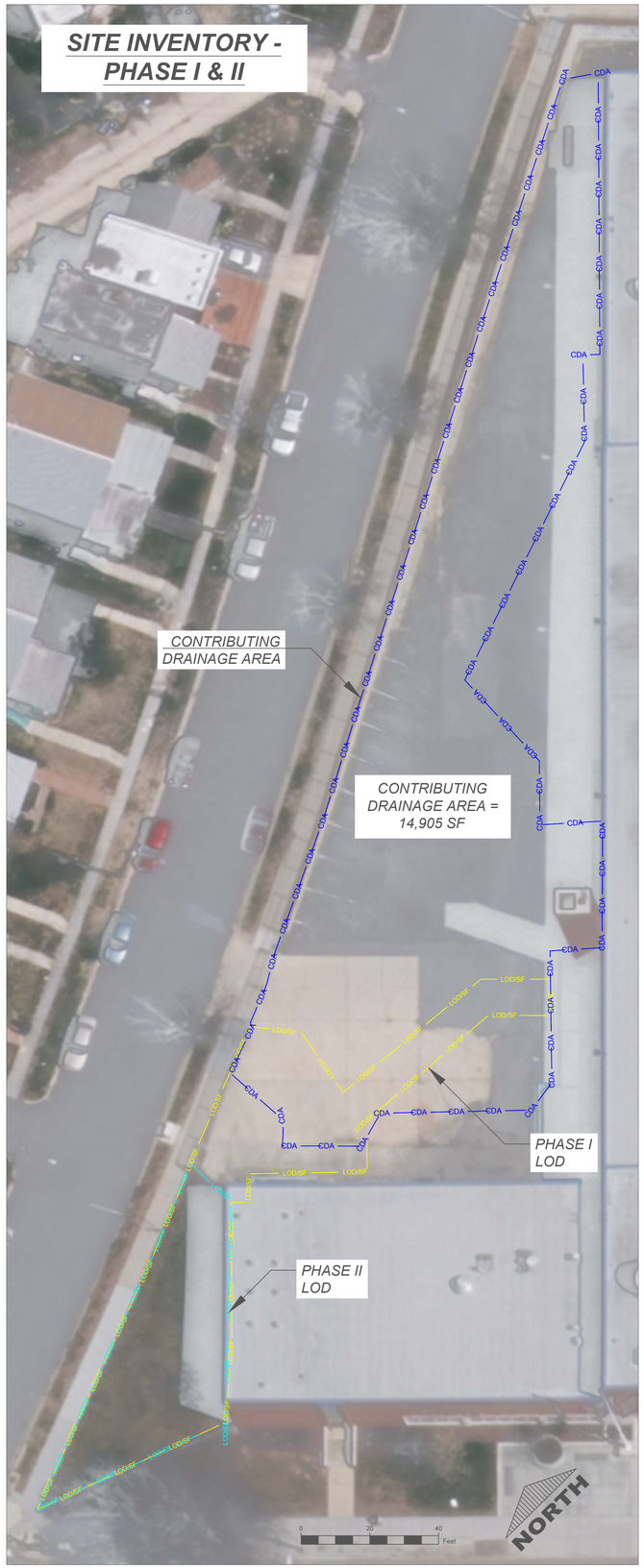
RUNOFF VOLUME

CONTRIBUTING DRAINAGE AREA	= 14,905 SF
RUNOFF COEFFICIENT	= 0.95
GALLONS GENERATED BY 1.7-INCH STORM (1.7 IN X 0.95 X 14,905 SF X 7.48) / 12	= 15,005 GAL = 2,006 CF

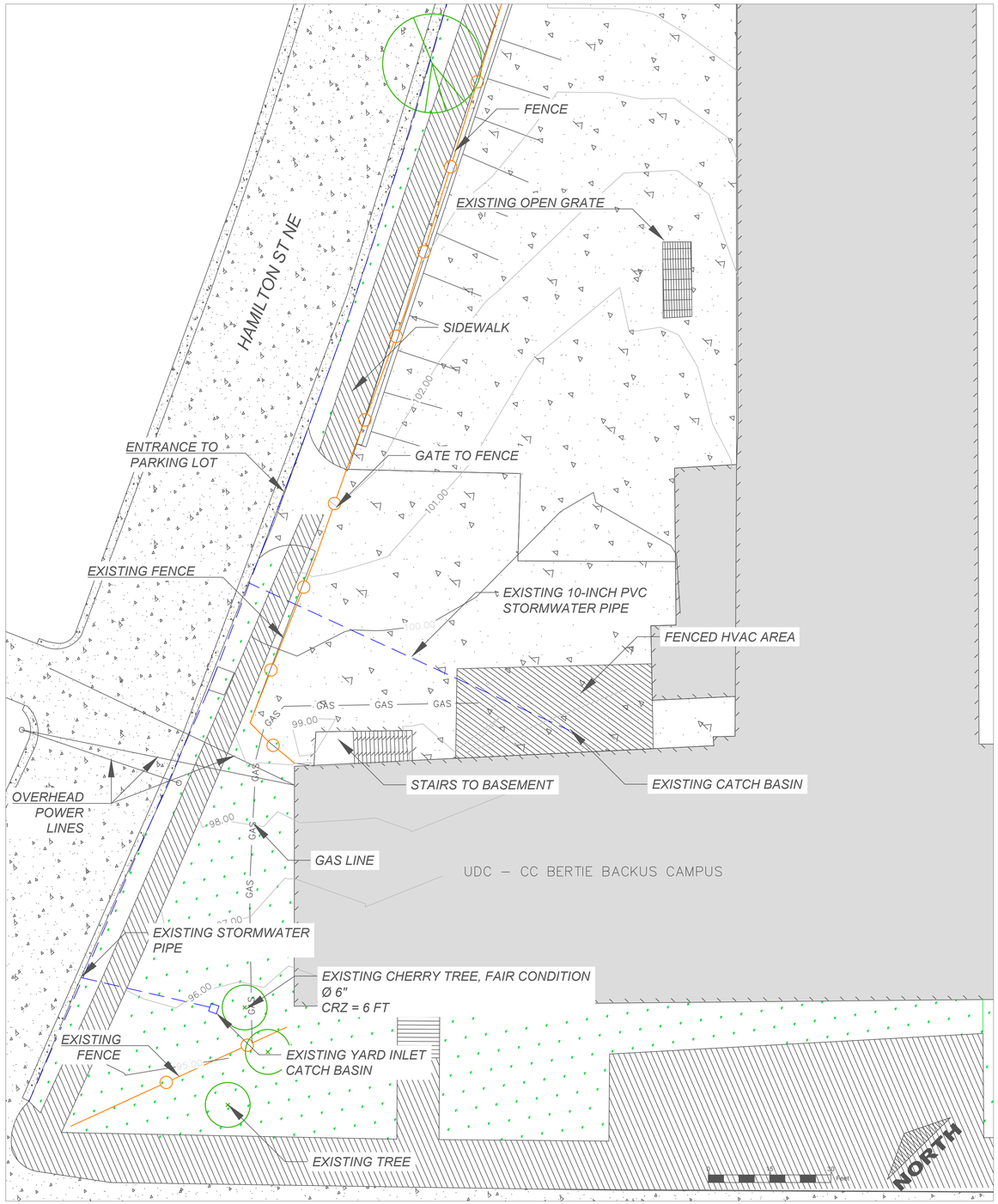
PEAK FLOW RATES

FLOW LENGTH	= 350 FT
SLOPE	= 1.9 %
TIME OF CONCENTRATION	= 6 MIN
2 YEAR STORM:	
Qp RATIONAL METHOD	= 1.87 CFS
Qp TR-55 METHOD	= 1.55 CFS
15-YEAR STORM	
Qp RATIONAL METHOD	= 2.34 CFS
Qp TR-55 METHOD	= 4.39 CFS

SITE INVENTORY - PHASE I & II



EXISTING CONDITIONS - PHASE I & II



INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

SHEET NUMBER: CIV002
PLAN TYPE: SITE INVENTORY

NC STATE UNIVERSITY
DEPT. OF BIO & AG ENGINEERING
CAMPUS BOX 7625
RALEIGH, NC 27695
919-515-7475

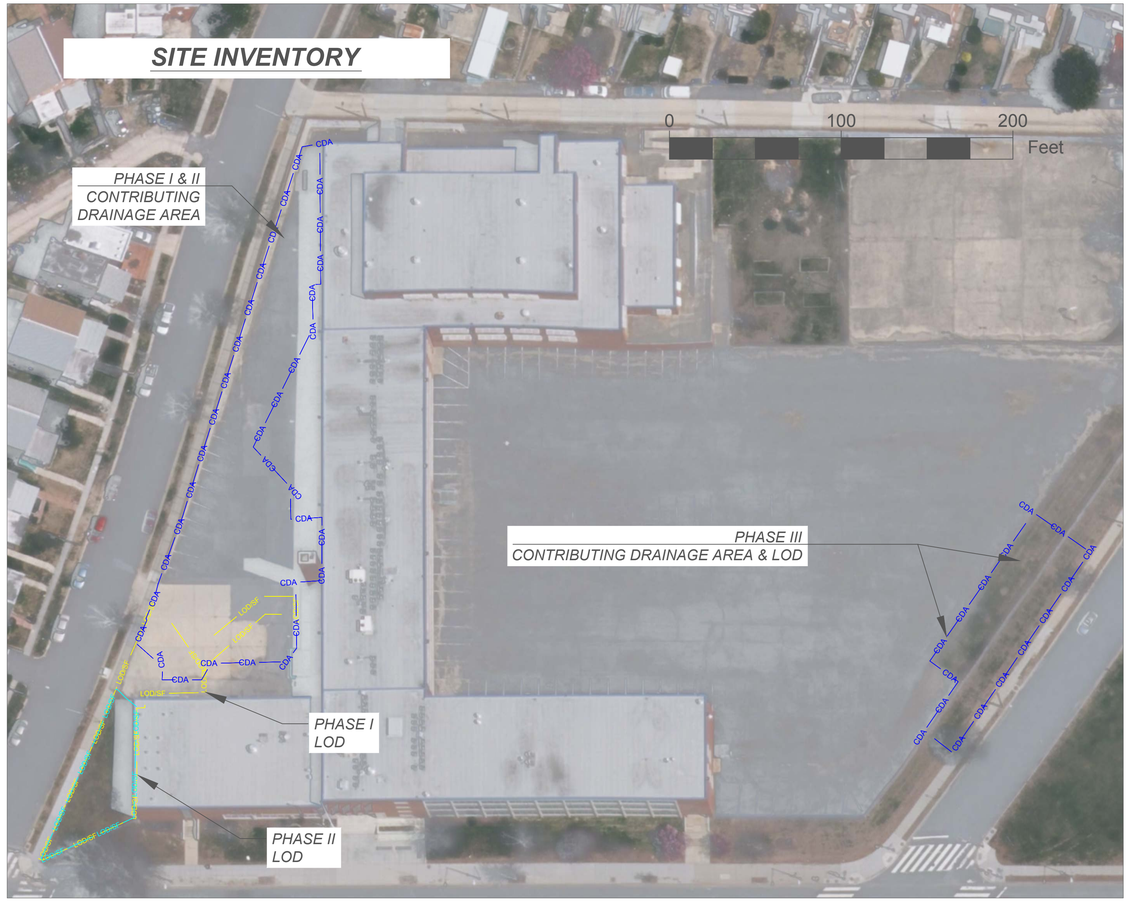
DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS:
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851
NC STATE UNIVERSITY

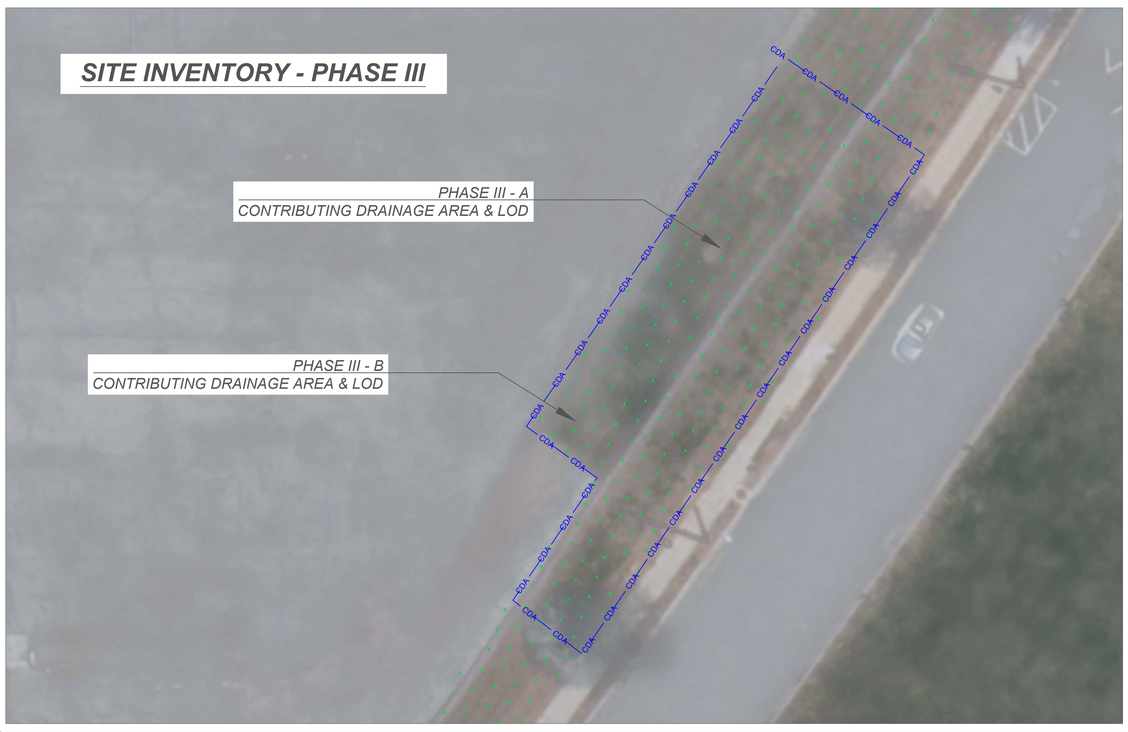
DRAWN:	J.P. JOHNSON
DESIGN:	J.P. JOHNSON
CHECK:	
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	1/18/2023

PROJECT # 596763
PHASE # 02660

SITE INVENTORY



SITE INVENTORY - PHASE III



DRAINAGE AREA SUMMARY - PHASE III

THE CONTRIBUTING DRAINAGE AREA (CDA) TO THE PROPOSED TREE PLANTINGS IS ALL COMPACTED LAWN AS SHOWN IN THE AERIAL. THE CDA IS DELINEATED IN THE SITE INVENTORY, AND IS 5000 SF. DISTURBED AREA WILL BE LIMITED TO THE TREE PLANTINGS THEMSELVES, SUCH THAT ONLY AN AREA APPROXIMATELY 2X THE DIAMETER OF THE ROOTBALL FOR EACH TREE BE DISTURBED. THE TOTAL DISTURBED AREA IS APPROXIMATELY150 SF.

PREDOMINANT SOILS ON THE PROJECT SITE ARE INDICATED BY USDA SOIL SURVEY AS URBAN LAND. A GEOTECHNICAL SURVEY WAS PERFORMED OF THE SITE WITH SOIL TESTS INDICATING SANDY LOAM SOILS (65.0% SAND, 21.6% SILT, AND 13.4% CLAY).

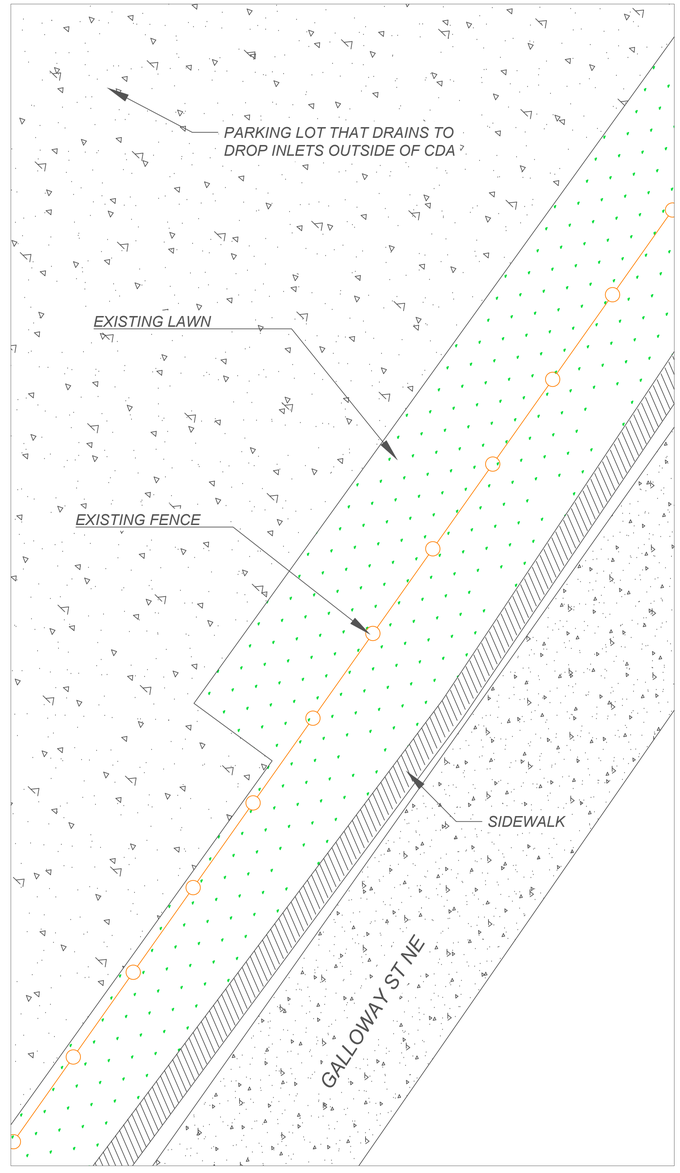
RUNOFF VOLUME

CONTRIBUTING DRAINAGE AREA	= 5,000 SF
RUNOFF COEFFICIENT (COMPACTED COVER)	= 0.25
GALLONS GENERATED BY 1.7-INCH STORM (1.7 IN X 0.25 X 5,000 SF X 7.48) / 12	= 1,325 GAL = 177 CF

PEAK FLOW RATES

FLOW LENGTH	= 40 FT
SLOPE	= 3 %
TIME OF CONCENTRATION	= 6 MIN
2 YEAR STORM:	
Qp RATIONAL METHOD	= 0.17 CFS
Qp TR-55 METHOD	= 0.23 CFS
15-YEAR STORM	
Qp RATIONAL METHOD	= 0.21 CFS
Qp TR-55 METHOD	= 1.06 CFS

EXISTING CONDITIONS - PHASE III



INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

SHEET NUMBER: CIV003

PLAN TYPE: SITE INVENTORY

NC STATE UNIVERSITY
DEPT. OF BIO & AG
ENGINEERING
CAMPUS BOX 7625
RALEIGH, NC 27695
919-515-7475

DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

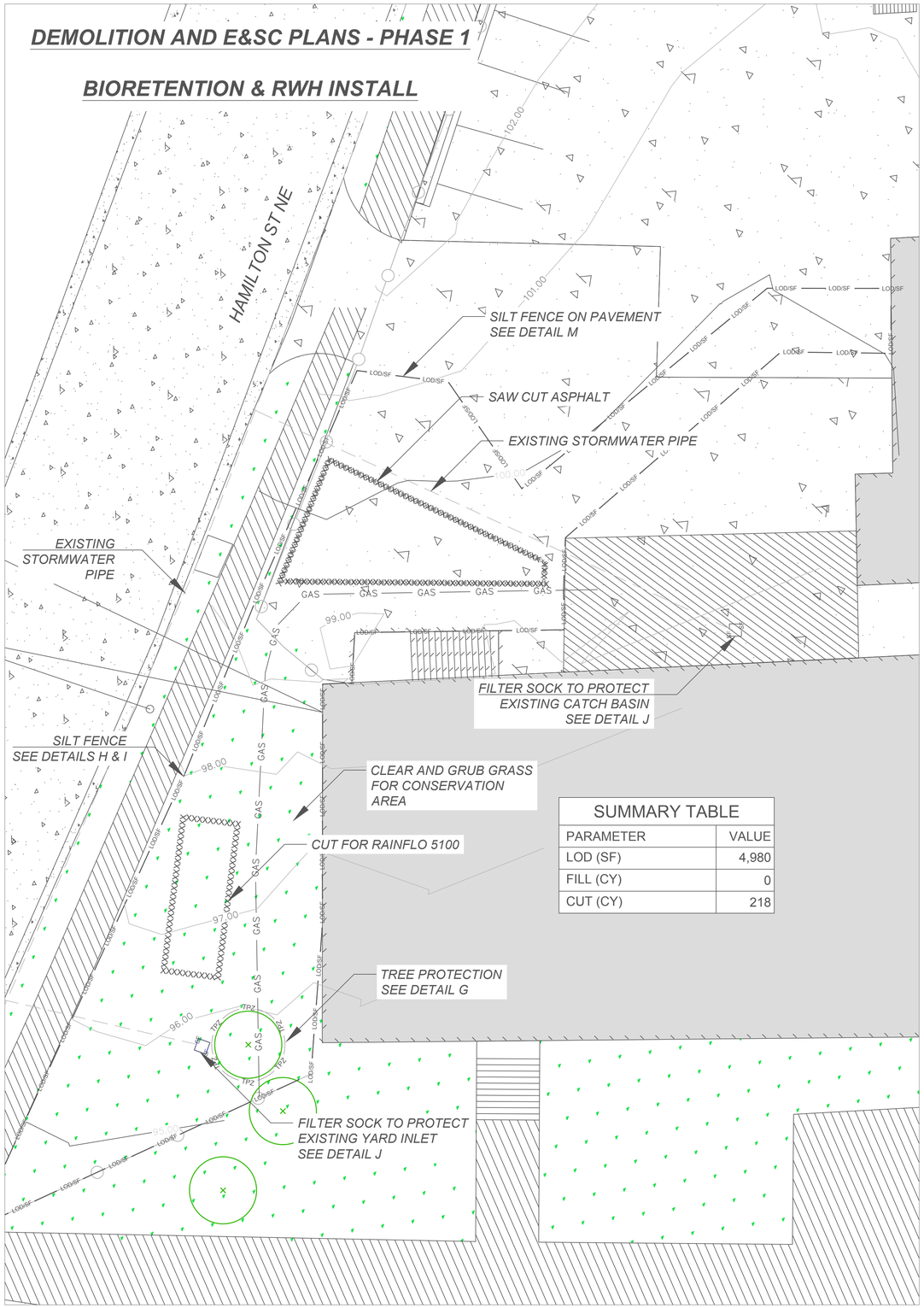
PROJECT PARTNERS:
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851
NC STATE UNIVERSITY

DRAWN:	A.D. ELLIS
DESIGN:	J.P. JOHNSON
CHECK:	
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	1/18/2023

PROJECT # 566763 02660
PHASE #

DEMOLITION AND E&SC PLANS - PHASE 1

BIORETENTION & RWH INSTALL



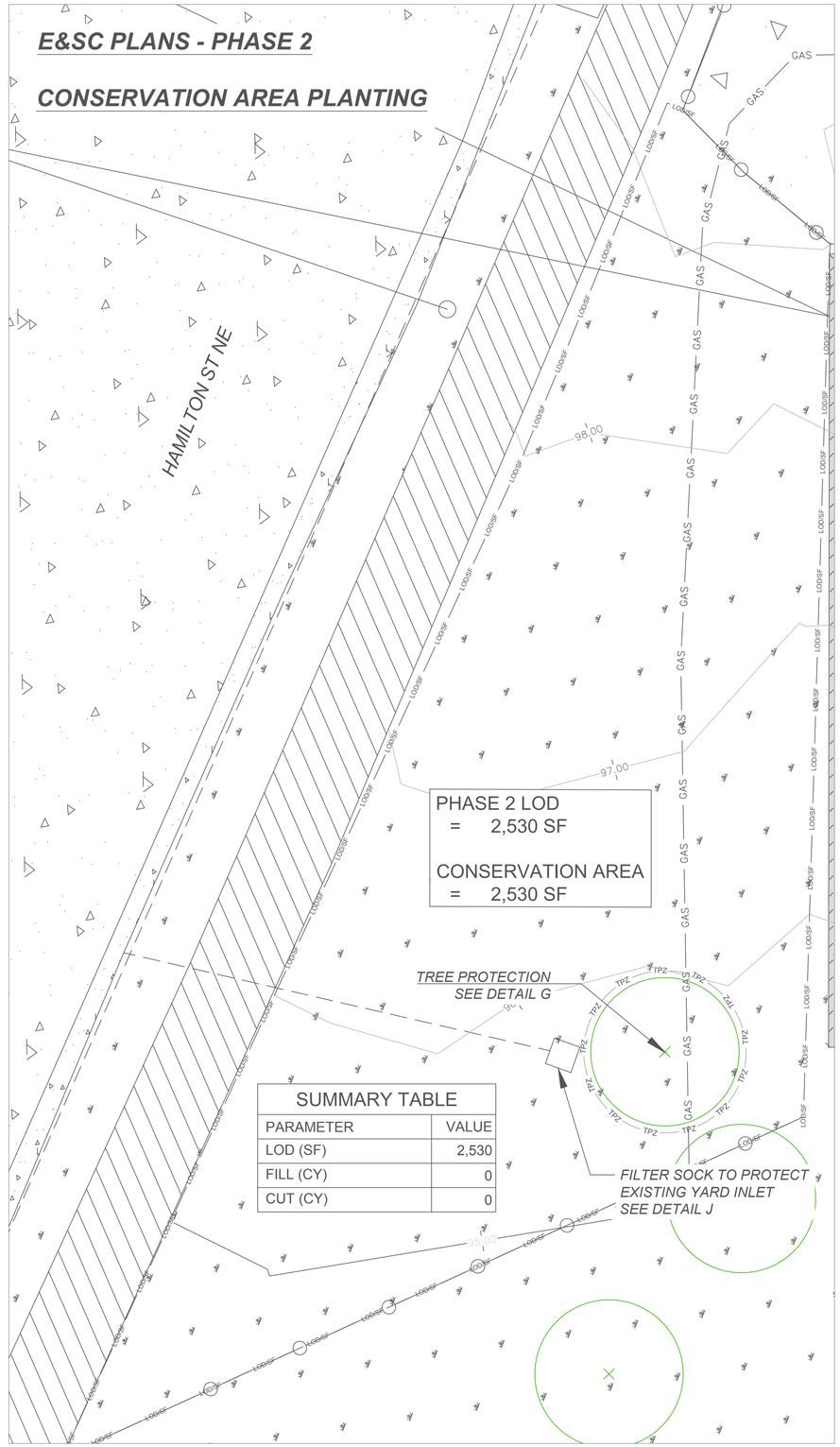
SUMMARY TABLE	
PARAMETER	VALUE
LOD (SF)	4,980
FILL (CY)	0
CUT (CY)	218

0 15 30 Feet

NORTH

E&SC PLANS - PHASE 2

CONSERVATION AREA PLANTING



SUMMARY TABLE	
PARAMETER	VALUE
LOD (SF)	2,530
FILL (CY)	0
CUT (CY)	0

0 10 20 Feet

NORTH

INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

SHEET NUMBER: CIV004

PLAN TYPE: E&SC

NC STATE UNIVERSITY
DEPT. OF BIO & AG ENGINEERING
CAMPUS BOX 7625
RALEIGH, NC 27695
919-515-7475

DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS:
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851
NC STATE UNIVERSITY

DRAWN:	J.P. JOHNSON
DESIGN:	J.P. JOHNSON
CHECK:	
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	11/8/2023

PROJECT # 566763
PHASE # 02960

SOIL EROSION AND SEDIMENT CONTROL SPECIFICATIONS

DOEE SOIL EROSION AND SEDIMENT CONTROL PLAN GENERAL NOTES
1. Following initial land disturbance or re-disturbance, permanent or interim stabilization must be completed within seven (7) calendar days for the surfaces of all perimeter controls, dikes, swales, ditches, perimeter slopes, and slopes greater than three (3) horizontal to one (1) vertical (3:1); and fourteen (14) days for all other disturbed or graded areas on the project site. These requirements do not apply to areas shown on the plan that are used for material storage other than stockpiling, or for those areas on the plan where actual construction activities are being performed. Maintenance shall be performed as necessary so that stabilized areas continuously meet the appropriate requirements of the District of Columbia Standards and Specifications for Soil Erosion and Sediment Control (ESC). [21 DCMR § 542.9 (o)]
2. ESC measures shall be in place before and during land disturbance. [21 DCMR § 543.6]
3. Contact DOEE Inspection (202) 535-2977 to schedule a preconstruction meeting at least three (3) business days before the commencement of a land-disturbing activity. [21 DCMR § 503.7 (a)]
4. A copy of the approved plan set will be maintained at the construction site from the date that construction activities begin to the date of final stabilization and will be available for DOEE inspectors. [21 DCMR § 542.15]
5. ESC measures shall be in place to stabilize an exposed area as soon as practicable after construction activity has temporarily or permanently ceased but no later than fourteen (14) days following cessation, except that temporary or permanent stabilization shall be in place at the end of each day of underground utility work that is not contained within a larger development site. [21 DCMR § 543.7]
6. Stockpiled material being actively used during a phase of construction shall be protected against erosion by establishing and maintaining perimeter controls around the stockpile. [21 DCMR § 543.16 (a)]
7. Stockpiled material not being actively used or added to shall be stabilized with mulch, temporary vegetation, hydro-seed or plastic within fifteen (15) calendar days after its last use or addition. [21 DCMR § 543.16 (b)]
8. Fill material must be free of contamination levels of any pollutant that is, or may be considered to represent, a possible health hazard to the public or may be detrimental to surface or ground water quality, or which may cause damage to property or the drainage system. All fill material must be free of hazardous materials and comply with all applicable District and federal regulations.
9. Protect best management practices from sedimentation and other damage during construction for proper post construction operation. [21 DCMR § 543.5]
10. Request a DOEE inspector's approval after the installation of perimeter erosion and sediment controls, but before proceeding with any other earth disturbance or grading. [21 DCMR § 542.12 (a)]
11. Request a DOEE inspector's approval after final stabilization of the site and before the removal of erosion and sediment controls. [21 DCMR § 542.12 (b)]
12. Final stabilization means that all land-disturbing activities at the site have been completed and either of the following two criteria have been met: (1) a uniform (for example, evenly distributed, without large bare areas) perennial vegetative cover with a density of seventy percent (70%) of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or (2) equivalent permanent stabilization measures have been employed (such as the use of riprap, gabions, or geotextiles). [21 DCMR § 542.12 (b.1, b.2)]
13. Follow the requirements of the United States Environmental Protection Agency approved Stormwater Pollution Prevention Plan (SWPPP) and maintain a legible copy of this SWPPP on site. [21 DCMR § 543.10 (b)]
14. Post a sign that notifies the public to contact DOEE in the event of erosion or other pollution. The sign will be placed at each entrance to the site or as directed by the DOEE inspector. Each sign will be no less than 18 x 24 inches in size and made of materials that will withstand weather for the duration of the project. Lettering will be at least 1 inch in height and easily readable by the public from a distance of twelve feet (12 ft). The sign must direct the public, in substantially the following form: "To Report Erosion, Runoff, or Stormwater Pollution" and will provide the construction site address, DOEE's telephone number (202-535-2977), DOEE's e-mail address (IEB.scheduling@dc.gov), and the 311 mobile app heading ("Construction-Erosion Runoff"). [21 DCMR § 543.22]
If a site disturbs 5,000 square feet of land or greater, the ESC plan must contain the following statement:
15. A *Responsible Person* must be present or available while the site is in a land-disturbing phase. The *Responsible Person* is charged with being available to (a) inspect the site and its ESC measures at least once biweekly and after a rainfall event to identify and remedy each potential or actual erosion problem, (b) respond to each potential or actual erosion problem identified by construction personnel, and (c) speak on site with DOEE to remedy each potential or actual erosion problem. A *Responsible Person* shall be (a) licensed in the District of Columbia as a civil or geotechnical engineer, a land surveyor, or architect; or (b) certified through a training program that DOEE approves, including a course on erosion control provided by another jurisdiction or professional association. During construction, the *Responsible Person* shall keep on site proof of professional licensing or of successful completion of a DOEE-approved training program. [21 DCMR § 547]

Pollution Prevention Good Housekeeping Stamp Notes	
Fuels and Oils	On-site refueling will be conducted in a dedicated location away from access to surface waters. Install containment berms and, or secondary containments around refueling areas and storage tanks. Spills will be cleaned up immediately and contaminated soils disposed of in accordance with all federal and District of Columbia regulations. Petroleum products will be stored in clearly labeled tightly sealed containers. All vehicles on site will be monitored for leaks and receive regular preventive maintenance activities. Any asphalt substances used on site will be applied according to manufacturer's recommendations. Spill kits will be included with all fueling sources and maintenance activities.
Solid Waste	No solid materials shall be discharged to surface water. Solid materials including building materials, garbage and paint debris shall be cleaned up daily and deposited into dumpsters, which will be periodically removed and deposited into a landfill.
Abrasive Blasting	Water blasting, sandblasting, and other forms of abrasive blasting on painted surfaces built prior to 1978 may only be performed if an effective containment system prevents dispersal of paint debris.
Fertilizer	Fertilizers will be applied only in the minimum amounts recommended by the manufacturer, worked into the soil to limit exposure to stormwater, and stored in a covered shed. Partially used bags will be transferred to a sealable bin to avoid spills.
Paint and Other Chemicals	All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharges to the storm sewers, but will be properly disposed of according to manufacturer's recommendations. Spray guns will be cleaned on a removable tarp. Chemicals used on site are kept in small quantities and in closed containers undercover and kept out of direct contact with stormwater. As with fuels and oils, any inadvertent spills will be cleaned up immediately and disposed of according federal and District of Columbia regulations.
Concrete	Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash on site, except in a specially designated concrete disposal area. Form release oil for decorative stone work will be applied over a pallet covered with an absorbent material to collect excess fluid. The absorbent material will be replaced and disposed of properly when saturated.
Water Testing	When testing and, or cleaning water supply lines, the discharge from the tested pipe will be collected and conveyed to a completed stormwater conveyance system for ultimate discharge into a stormwater best management practice (BMP).
Sanitary Waste	Portable lavatories located on site will be services on a regular basis by a contractor. Portable lavatories will be located in an upland area away from direct contact with surface waters. Any spills occurring during servicing will be cleaned immediately and contaminated soils disposed of in accordance with all federal and District of Columbia regulations.

DUST CONTROL CONSTRUCTION SPECIFICATIONS

1. THE CONTRACTOR MUST CONDUCT OPERATIONS AND MAINTAIN THE PROJECT SITE SO AS TO MINIMIZE THE CREATION AND DISPERSION OF DUST. USE DUST CONTROL THROUGHOUT THE WORK AT THE SITE.
2. THE CONTRACTOR MUST PROVIDE CLEAN WATER, FREE FROM SALT, OIL, AND OTHER DELETERIOUS MATERIAL TO BE USED FOR ON-SITE DUST CONTROL.
3. THE CONTRACTOR SHALL SUPPLY WATER-SPRAYING EQUIPMENT CAPABLE OF ACCESSING ALL WORK AREAS.
4. THE CONTRACTOR SHALL IMPLEMENT STRICT DUST CONTROL MEASURES DURING ACTIVE CONSTRUCTION PERIODS ON-SITE. THESE CONTROL MEASURES SHALL GENERALLY CONSIST OF WATER APPLICATIONS THAT SHALL BE APPLIED A MINIMUM OF ONCE PER DAY DURING DRY WEATHER OR MORE OFTEN AS REQUIRED TO PREVENT DUST EMISSIONS.
5. FOR WATER APPLICATION TO UNDISTURBED SOIL SURFACES, THE CONTRACTOR SHALL:
   (A) APPLY WATER WITH EQUIPMENT CONSISTING OF TANK, SPRAY BAR, AND PUMP WITH DISCHARGE PRESSURE GAUGE.
   (B) ARRANGE SPRAY BAR HEIGHT, NOZZLE SPACING AND SPRAY PATTERN TO PROVIDE COMPLETE COVERAGE OF GROUND WITH WATER.
   (C) DISPERSE WATER THROUGH NOZZLES ON SPRAY BAR AT 20 PSI (137.8 KPA) MINIMUM. KEEP AREAS DAMP WITHOUT CREATING NUISANCE CONDITIONS SUCH AS PONDING.
6. FOR WATER APPLICATION TO SOIL SURFACES DURING DEMOLITION AND/OR EXCAVATION, THE CONTRACTOR SHALL:
   A) APPLY WATER WITH EQUIPMENT CONSISTING OF A TANK, PUMP WITH DISCHARGE GAUGE, HOSES AND MIST NOZZLES.
   B) LOCATE TANK AND SPRAYING EQUIPMENT SO THAT THE ENTIRE EXCAVATION AREA CAN BE MISTED WITHOUT INTERFERING WITH DEMOLITION AND/OR EXCAVATION EQUIPMENT OR OPERATIONS. KEEP AREAS DAMP WITHOUT CREATING NUISANCE CONDITIONS SUCH AS PONDING.
   C) APPLY WATER SPRAY IN A MANNER TO PREVENT MOVEMENT OF SPRAY BEYOND THE SITE BOUNDARIES

INNOVATIVE TREATMENT TRAIN BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

PLAN TYPE: E&SC - PHASE 2

SHEET NUMBER: CIV005

NC STATE UNIVERSITY
DEPT. OF BIO & AG ENGINEERING
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RALEIGH, NC 27695
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DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS:
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851
NC STATE UNIVERSITY

DRAWN:	J.P. JOHNSON
DESIGN:	J.P. JOHNSON
CHECK:	
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	11/8/2023

PROJECT # 566763 02660
PHASE #

PROPOSED CONDITIONS
PHASES I & II

HAMILTON ST NE

4 FT X 3 FT CONCRETE OUTLET
STRUCTURE FOR BYPASS FLOW
SEE DETAIL F

10-INCH DUAL WALL HDPE BYPASS PIPE
CONNECT TO EXISTING 10-INCH PVC PIPE VIA INSERTA TEE OR SIMILAR

PROPOSED FLOW DIVERTER BUMP
SEE DETAIL M

PROPOSED BIORETENTION (516 SF)

UNDERDRAIN CLEANOUTS/OBSERVATION WELLS (3)
SEE DETAIL K

5 FT WIDE REMOVABLE STEEL GRATE
WALKWAY FOR EMERGENCY
EGRESS FROM UDC
SEE DETAIL L

BORING LOCATION FOR INFILTRATION TESTING

BORING LOCATION FOR GROUNDWATER
TABLE ELEVATION

4-INCH SCHED. 40 PVC
U/S ELEV. = 94.33 FT

OVERHEAD POWER LINES

PROPOSED TREES
BALD CYPRESS
SEE LANDSCAPE PLAN

KEY IN IMPERMEABLE LINER ALONG DEPTH
OF CUT ON BUILDING SIDE OF BIORETENTION
TO PREVENT SEEPAGE TO BASEMENT

4-INCH PERFORATED
SCHED. 40 PVC UNDERDRAIN
SLOPE = 0%

APPROX. 42 FT
4-INCH SCHED. 40 PVC
1% SLOPE
D/S ELEV. = 93.91 FT

PHASE 2 - 2,530 SF CONSERVATION AREA
PROPOSED SHRUB PLANTINGS
IN CONSERVATION AREA
(OAKLEAF HYDRANGEA,
INKBERRY HOLLY, VIRGINIA
SWEETSPIRE)
SEE DETAIL D

SUBSURFACE RAINFLO 5100 PRO GRAF
RAINWATER COLLECTION SYSTEM
SEE DETAIL DRAWINGS

PROPOSED TREES IN
CONSERVATION AREA
(BALD CYPRESS - 4)
SEE DETAIL D

4-INCH PVC BYPASS FROM RAINFLO 5100
TO EXISTING YARD INLET
SEE DETAIL E

0 10 20 Feet

NORTH

INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

SHEET NUMBER: CIV006

PLAN TYPE: PROPOSED

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DESIGN: J.P. JOHNSON
CHECK:
APPROVED:

PROJECT NAME: UDC TREATMENT TRAIN
SCALE: AS NOTED
DATE: 1/18/2023

PROJECT # 566763
PHASE # 02660

PROPOSED CONDITIONS
PHASE III

TREE SPECIES			
SYMBOL	COMMON NAME	SCIENTIFIC NAME	NUMBER
	AMERICAN WITCH-HAZEL	*Hamamelis virginiana*	4
	BALD CYPRESS	*Taxodium distichum*	5

INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

PLAN TYPE: PROPOSED

SHEET NUMBER: CIV007

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PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	1/19/2023

PROJECT # 568763
PHASE # 02660

BIORETENTION CALCUATIONS

RUNOFF VOLUME

CONTRIBUTING DRAINAGE AREA	= 14,905 SF
GALLONS GENERATED BY 1.7-INCH STORM	
(1.7 IN X 0.95 X 14,905 SF X 7.48) / 12	= 15,005 GAL
	= 2,006 CF
BIORETENTION SURFACE AREA	= 494 SF
MEDIA DEPTH	= 2.5 FT
MULCH DEPTH	= 0.25 FT
GRAVEL DEPTH	= 0.83 FT
SUMP DEPTH	=0.9 FT
PONDING DEPTH	= 0.25 FT

Sv

494 SF X [((2.5 FT + 0.25 FT) X 0.25) + ((0.83 FT + 0.9 FT) X 0.4)] + 494 SF X 0.25 FT

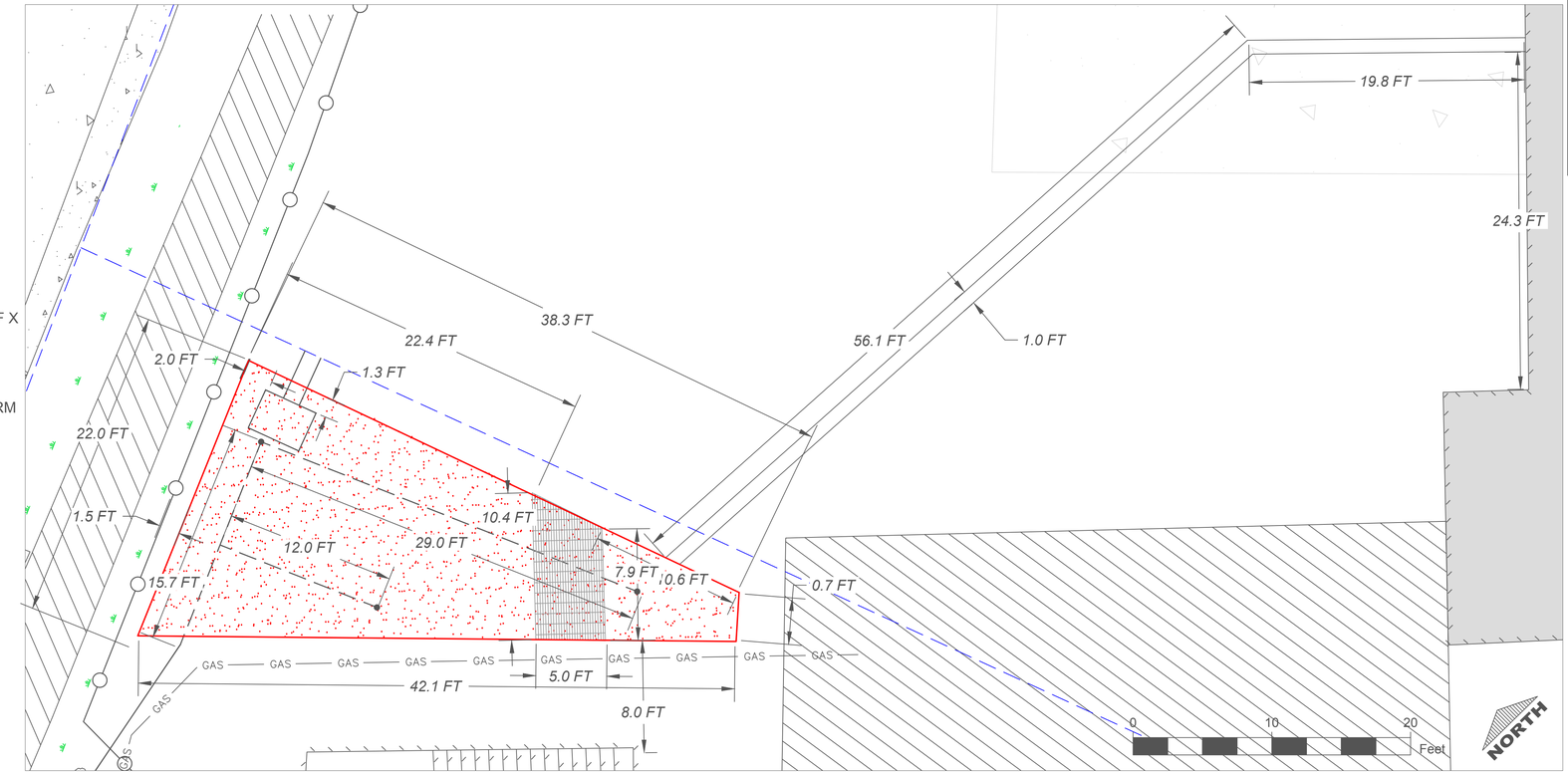
= 804 CF
= 6,022 GAL

THUS, THE BIORETENTION ALONE CAN CAPTURE THE 0.68 INCH STORM

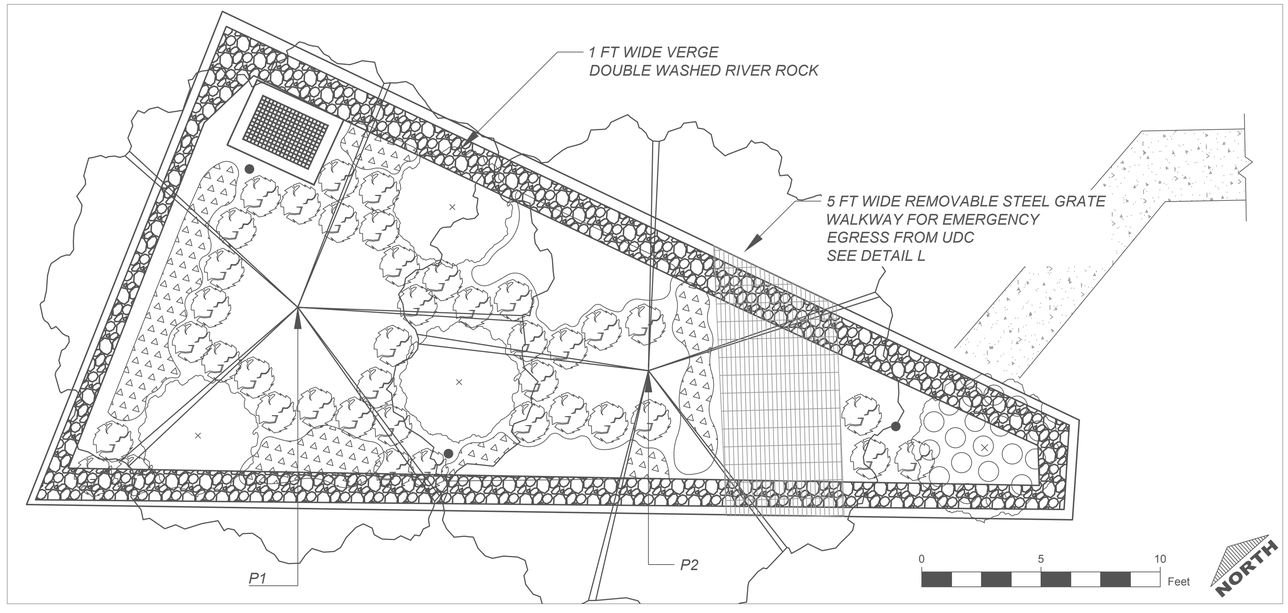
PEAK FLOW RATES

FLOW LENGTH	= 350 FT
SLOPE	= 1.9 %
TIME OF CONCENTRATION	= 6 MIN
BIORETENTION OUTLET STRUCTURE DIMENSIONS	= 3 FT X 2 FT INNER
FREEBOARD	= 0.25 FT
2 YEAR STORM:	
Qp IN - RATIONAL METHOD	= 1.87 CFS
Qp OUT - CHAINSAW ROUTING	= 1.87 CFS
MAX DEPTH OVER GRATE	= 0.21 FT
15-YEAR STORM	
Qp IN - RATIONAL METHOD	= 2.34 CFS
Qp OUT - CHAINSAW ROUTING	= 2.34 CFS
MAX DEPTH OVER GRATE	= 0.24 FT

BIORETENTION PLAN VIEW



BIORETENTION LANDSCAPING PLAN

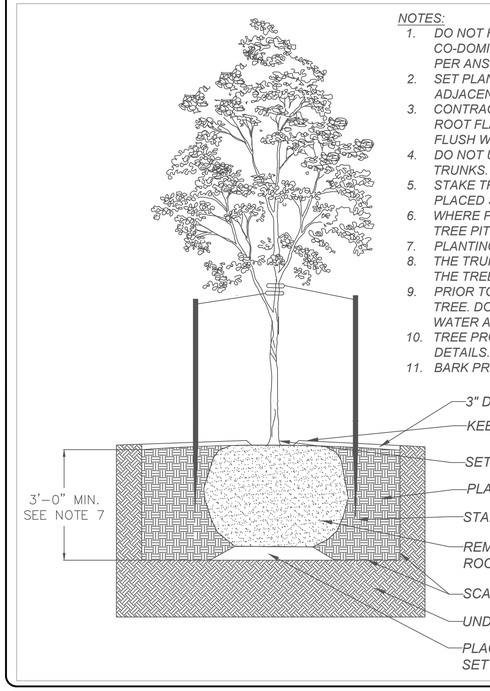


TREE DETAILS							
SYMBOL	COMMON NAME	BOTANICAL NAME	CATEGORY	MATURE SPREAD	Rv (CF)	SOIL VOLUME REQUIRED (CF)	SOIL VOLUME PROVIDED (CF)
P1	BALD CYPRESS	TAXODIUM DISTICHUM	PLANTED - SMALL	1	5	600	645
P1	BALD CYPRESS	TAXODIUM DISTICHUM	PLANTED - SMALL	1	5	600	645

LANDSCAPE LEGEND

- RED TWIG DOGWOOD (3) CORNUS SERICEA 2 GAL; SPACING = 2-3 FT
- OAKLEAF HYDRANGEA (1) HYDRANGEA QUERCIFOLIA 1 QUART
- PENNSYLVANIA SEDGE (42) CAREX PENSYLVANICA 1 QUART; SPACING = 1 FT
- BALDCYPRESS (2); TAXODIUM DISTICHUM B&B; 2" CAL; SPACING = 15 FT MAX HEIGHT = 50 FT
- HERBACEOUS PLANTINGS TO BE DETERMINED FROM UDC NURSERY

TYPICAL TREE PLANTING DETAIL



NOTES:

1. *DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY TO REMOVE CO-DOMINANT LEADERS, DEAD, AND BROKEN BRANCHES. PRUNE WITH A CLEAN CUT PER ANSI A300 & ISA (2008) STANDARDS. DO NOT CUT TREE'S CENTRAL LEADER.*
2. *SET PLANTS PLUMB AND FACE TO GIVE THE BEST APPEARANCE OR RELATIONSHIP TO ADJACENT AREAS.*
3. *CONTRACTOR SHALL REMOVE EXCESS SOIL FROM TOP OF ROOT BALL TO EXPOSE ROOT FLARE PRIOR TO PLANTING TO ENSURE THAT THE BASE OF THE TRUNK FLARE IS FLUSH WITH ADJACENT GRADE AND PLUMB IN ALL DIRECTIONS.*
4. *DO NOT USE TREE WRAP. REMOVE TREE WRAP OR CARDBOARD TUBING FROM ALL TREE TRUNKS. DO NOT LEAVE MATERIALS IN THE TREE PIT.*
5. *STAKE TREES OVER 2" CAL, SET STAKES VERTICAL AND AT SAME HEIGHT. STAKES TO BE PLACED STREET SIDE AND OPPOSITE OF STREET SIDE.*
6. *WHERE PLANTING SOIL MEETS UNDISTURBED SOIL, SCARIFY SIDES AND BOTTOM OF TREE PIT UP TO THE BOTTOM OF ROOT BALL.*
7. *PLANTING SOIL SHALL BE A MINIMUM DEPTH OF 3'-0" UNLESS OTHERWISE SPECIFIED.*
8. *THE TRUNK OF THE TREE SHALL NOT BE USED AS A LEVER IN POSITIONING OR MOVING THE TREE. CONTRACTOR SHALL LEAVE NURSERY/CONTRACTOR SEAL IN PLACE.*
9. *PRIOR TO MULCHING, LIGHTLY TAMP SOIL AROUND ROOT BALL IN 6" LIFTS TO BRACE TREE. DO NOT OVER COMPACT. WHEN PLANTING HOLE HAS BEEN BACKFILLED, POUR WATER AROUND ROOT BALL TO SETTLE THE SOIL.*
10. *TREE PROTECTION, WHERE REQUIRED, SHALL BE AS SHOWN ON TREE PROTECTION DETAILS.*
11. *BARK PROTECTORS MAY BE REQUESTED BY PWD ON A PROJECT BY PROJECT BASIS.*

- *3" DOUBLE SHREDDED HARDWOOD MULCH*
- *KEEP MULCH 3" AWAY FROM TRUNK*
- *SET ROOT FLARE ABOVE FINISHED GRADE, SEE NOTE 3*
- *PLANTING SOIL, SEE NOTE 9*
- *STAKES TO EXTEND 1'-6" MIN. BELOW SURFACE INTO UNDISTURBED SOIL*
- *REMOVE BURLAP AND WIRE BASKET. SCARIFY EDGES OF ROOTBALL BEFORE BACKFILLING.*
- *SCARIFY SUBGRADE, SEE NOTE 6*
- *UNDISTURBED SOIL*
- *PLACE ROOTBALL ON FIRMLY PACKED SOIL PEDESTAL TO PREVENT SETTLING AND PROVIDE TREE STABILITY*

INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

SHEET NUMBER CIV008

PLAN TYPE: BIORETENTION

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DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS:
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851
NC STATE UNIVERSITY

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DESIGN:	J.P. JOHNSON
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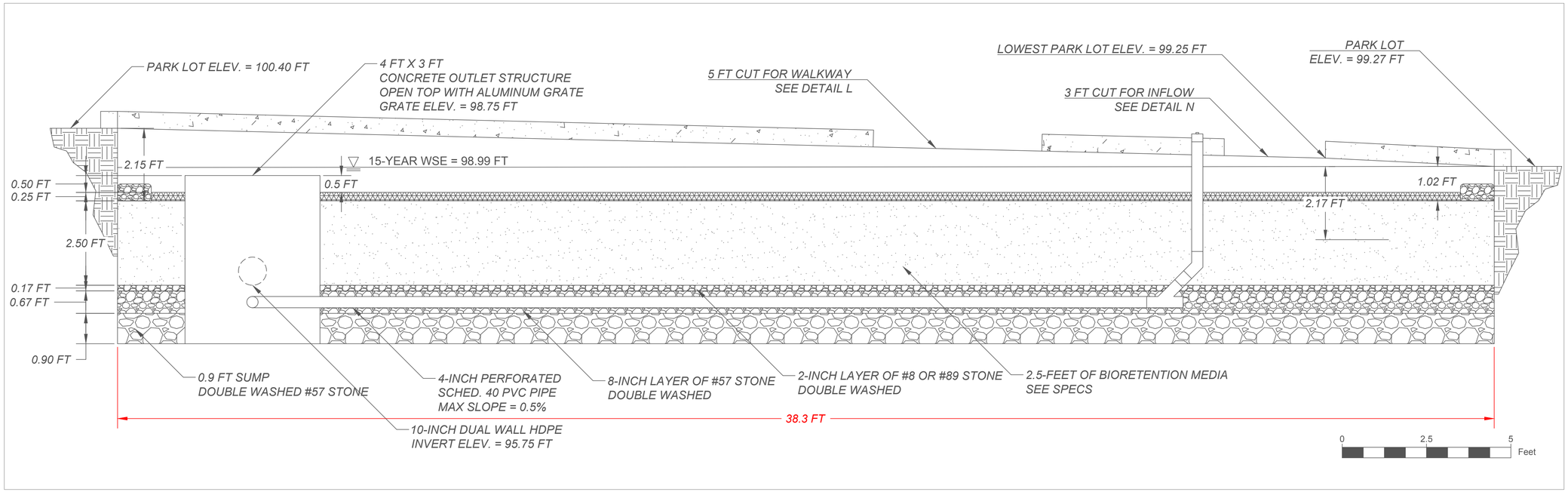
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	11/8/2023

PROJECT # 562763 02960
PHASE #

DETAIL A: BIORETENTION CROSS SECTION



BIORETENTION MEDIA SPECIFICATIONS

SUMMARY OF FILTER MEDIA CRITERIA FOR BIORETENTION	
CRITERION	STANDARD(S)
GENERAL COMPOSITION	80%–90% SAND;10%–20% SOIL FINES; MAXIMUM OF 10% CLAY; AND 3%–5% ORGANIC CONTENT. MUST MEET FINAL FILTER MEDIA GRAIN SIZE DISTRIBUTION OR HAVE A SATURATED HYDRAULIC CONDUCTIVITY OF 2–6 INCHES PER HOUR
SAND	BASED ON FINAL FILTER MEDIA GRAIN SIZE DISTRIBUTION
LOAM SOIL	USDA TEXTURAL TRIANGLE
ORGANIC AMMENDMENTS	APPENDIX K
P-INDEX OR PHOSPHORUS CONTENT	P-INDEX OF 10-30 OR P CONTENT = 5-15 MG/KG (MEHLICH I) OR 18-40 MG/KG (MEHLICH III)
CATION EXCHANGE CAPACITY	CEC > 5 MILLIEQUIVALENTS PER 100 GRAMS
PH	BETWEEN 6.0 AND 7.5
SOLUABLE SALTS	LESS THAN 500 PPM OR LESS THAN 0.5 MMHOS/CM

BIORETENTION MAINTENANCE TASKS

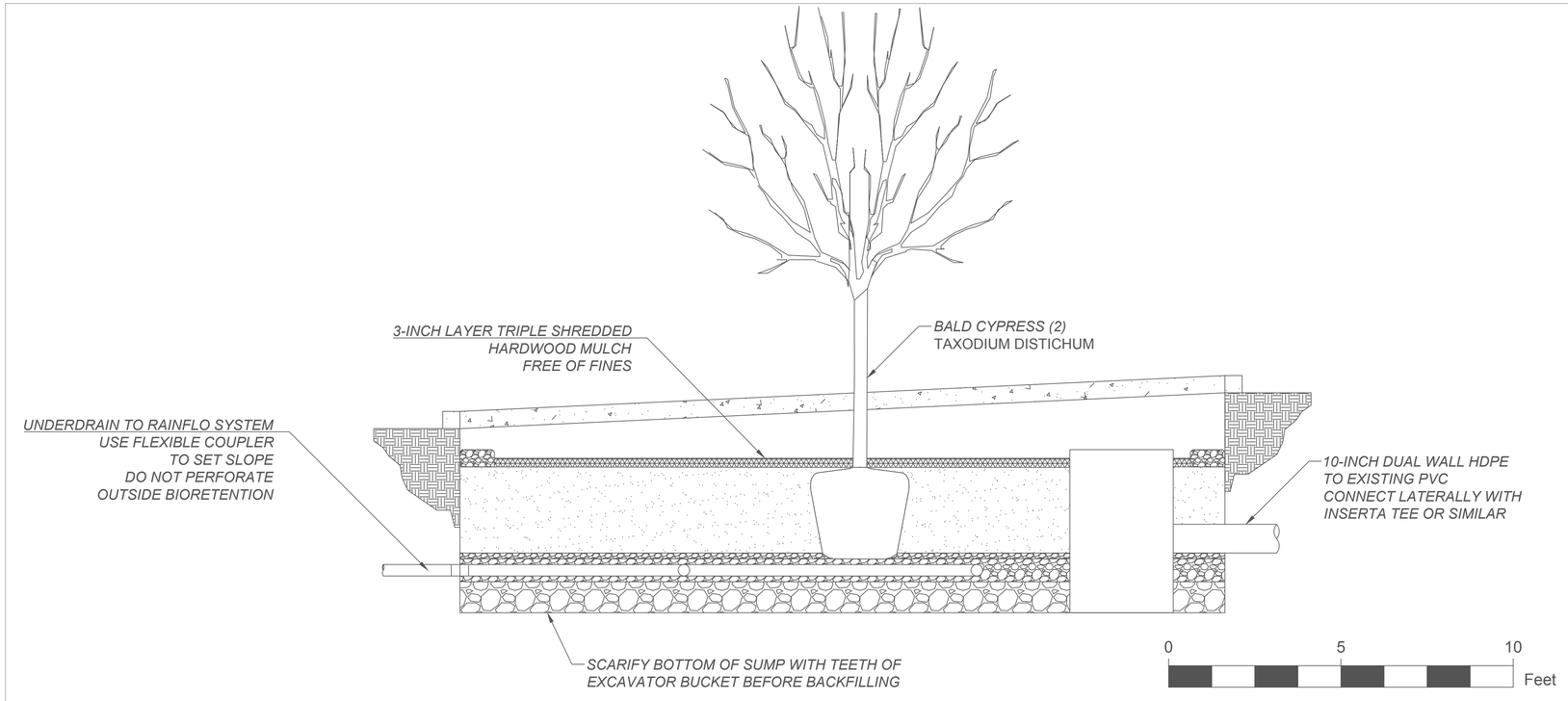
TYPICAL MAINTENANCE TASKS FOR BIORETENTION PRACTICES	
FREQUENCY	MAINTENANCE TASKS
UPON ESTABLISHMENT	FOR THE FIRST 6 MONTHS FOLLOWING CONSTRUCTION, THE PRACTICE AND CDA SHOULD BE INSPECTED TWICE AFTER STORM EVENTS THAT EXCEED 0.5 INCH OF RAINFALL. CONDUCT ANY NEEDED REPAIRS OR STABILIZATION. INSPECTORS SHOULD LOOK FOR BARE OR ERODING AREAS IN THE CDA OR AROUND THE BIORETENTION AREA AND MAKE SURE THEY ARE IMMEDIATELY STABILIZED WITH GRASS COVER. ONE-TIME, SPOT FERTILIZATION MAY BE NEEDED FOR INITIAL PLANTINGS. WATERING IS NEEDED ONCE A WEEK DURING THE FIRST 2 MONTHS, AND THEN AS NEEDED DURING FIRST GROWING SEASON (APRIL THROUGH OCTOBER), DEPENDING ON RAINFALL. REMOVE AND REPLACE DEAD PLANTS. UP TO 10% OF THE PLANT STOCK MAY DIE OFF IN THE FIRST YEAR, SO CONSTRUCTION CONTRACTS SHOULD INCLUDE A CARE AND REPLACEMENT WARRANTY TO ENSURE THAT VEGETATION IS PROPERLY ESTABLISHED AND SURVIVES DURING THE FIRST GROWING SEASON FOLLOWING CONSTRUCTION.
AT LEAST 4 TIMES/YEAR	MOW GRASS FILTER STRIPS AND BIORETENTION WITH TURF COVER. CHECK CURB CUTS AND INLETS FOR ACCUMULATED GRIT, LEAVES, AND DEBRIS THAT MAY BLOCK INFLOW.
TWICE DURING GROWING SEASON	SPOT WEED, REMOVE TRASH, AND RAKE MULCH
ANNUALLY	CONDUCT A MAINTENANCE INSPECTION. SUPPLEMENT MULCH IN DEVOID AREAS TO MAINTAIN A 3-INCH LAYER. PRUNE TREES AND SHRUBS. REMOVE SEDIMENT IN PRETREATMENT AREAS.
ONCE EVERY 2-3 YEARS	REMOVE SEDIMENT IN PRETREATMENT AREAS. REMOVE AND REPLACE MULCH LAYER.
AS NEEDED	ADD REINFORCEMENT PLANTING TO MAINTAIN DESIRED VEGETATION DENSITY. REMOVE INVASIVE PLANTS USING RECOMMENDED CONTROL METHODS. REMOVE ANY DEAD OR DISEASED PLANTS. STABILIZE THE CDA TO PREVENT EROSION.

BIORETENTION TREE MAINTENANCE TASKS

WATER NEWLY PLANTED TREES REGULARLY (AT LEAST ONCE PER WEEK) DURING FIRST GROWING SEASON, THEN MONTHLY DURING SUBSEQUENT TWO. TREES NEED 1" (25 GAL) OF RAINFALL PER WEEK DURING FIRST GROWING SEASON. WATER TREES DEEPLY AND SLOWLY NEAR THE ROOTS.

IF PRUNING IS NECESSARY, PRUNE ONLY DEAD, DISEASED, BROKEN OR CROSSING BRANCHES AT PLANTING. AS TREE GROWS, LOWER BRANCHES MAY BE PRUNED TO PROVIDE CLEARANCE ABOVE GROUND, OR TO REMOVE DEAD OR DAMAGED LIMBS.

DETAIL B: BIORETENTION CROSS SECTION



INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

SHEET NUMBER: CIV009

PLAN TYPE: BIORET DETAILS

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DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS: UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851 | NC STATE UNIVERSITY

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APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	1/19/2023

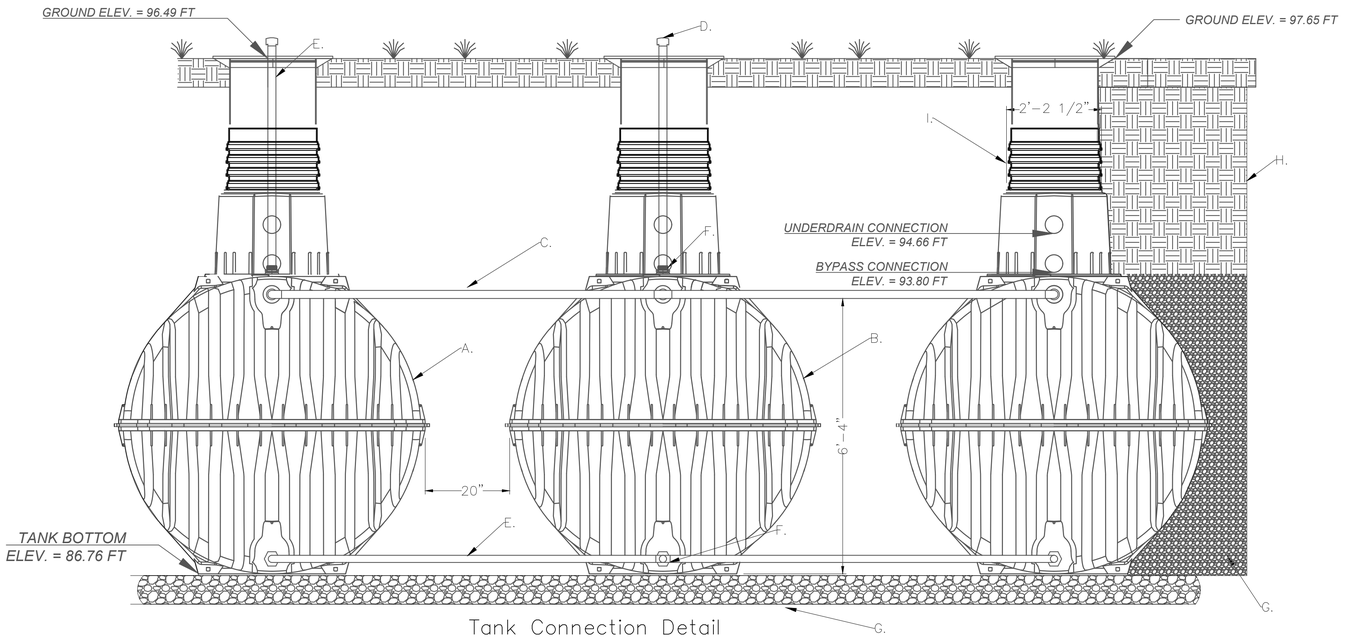
PROJECT # 566793 02560

PHASE #

DETAIL C: RAINHARVEST RAINFLO 5100 PRO GRAF RAINWATER COLLECTION SYSTEM

Legend A	
A.	GRAF Carat S 1700 Gallon Underground Tank (1)
B.	GRAF Carat S 1700 Gallon Underground Extension Tank (2)
C.	Upper Tank Connection
D.	2" Screened Tank Vent (2)
E.	2" Lower Balancing Lines
F.	2" Banjo Bulkhead Fitting
G.	Gravel Base (#57) and Backfill (#89 or Pea)
H.	Native Soil Backfill (Above Tank)
I.	12" Riser Extension for Tank Access

Legend B	
1.	GRAF Carat S 1700 Gallon Underground Tank.
2.	GRAF Optimax Pro Internal Filter with Opticlean Spray Head.
3.	Tank Dome with Sealing Gasket.
4.	RainFlo FI–2500 Flow Inducer Pump System.
5.	2" Floating Pump Extractor with Suction Hose and Air Filled Ball.
6.	2" Bulkhead Fitting for plumbing thru tank or riser assembly.
7.	Overflow siphon with mosquito and rodent stop.
8.	4" Overflow drain to yard inlet. Schedule 40 Pipe.
9.	Control Box and Water Level Sensor for Aqua Control (Rainwater System Controller).
10.	Calming inlet to prevent the disturbance of the fine sediment layer at bottom of tank.
11.	GRAF 4" Pipe Gasket Supplied with Dome Seal Kit.
12.	4" PVC from Bioretention.
13.	1–1/2" Pump Discharge Hose.
14.	Power Cable to Pump from Control Panel.
15.	Adjustable Riser and Childproof Lid.
16.	Clean water Outlet On Graf Optimax to Rain Collection Tank.
17.	1" Reduced Pressure Principle Assembly (RPZ).
18.	Brass 3Way Valve with 24v Motorized Actuator and 1–1/2" Connections.
19.	Output to Irrigation.

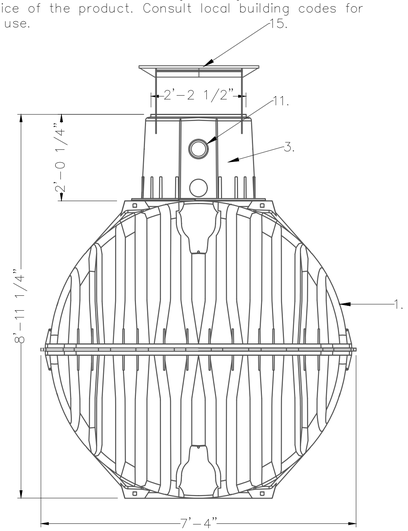


Tank Connection Detail

GRAF Carat S 1700 Gallon Tank Specifications:

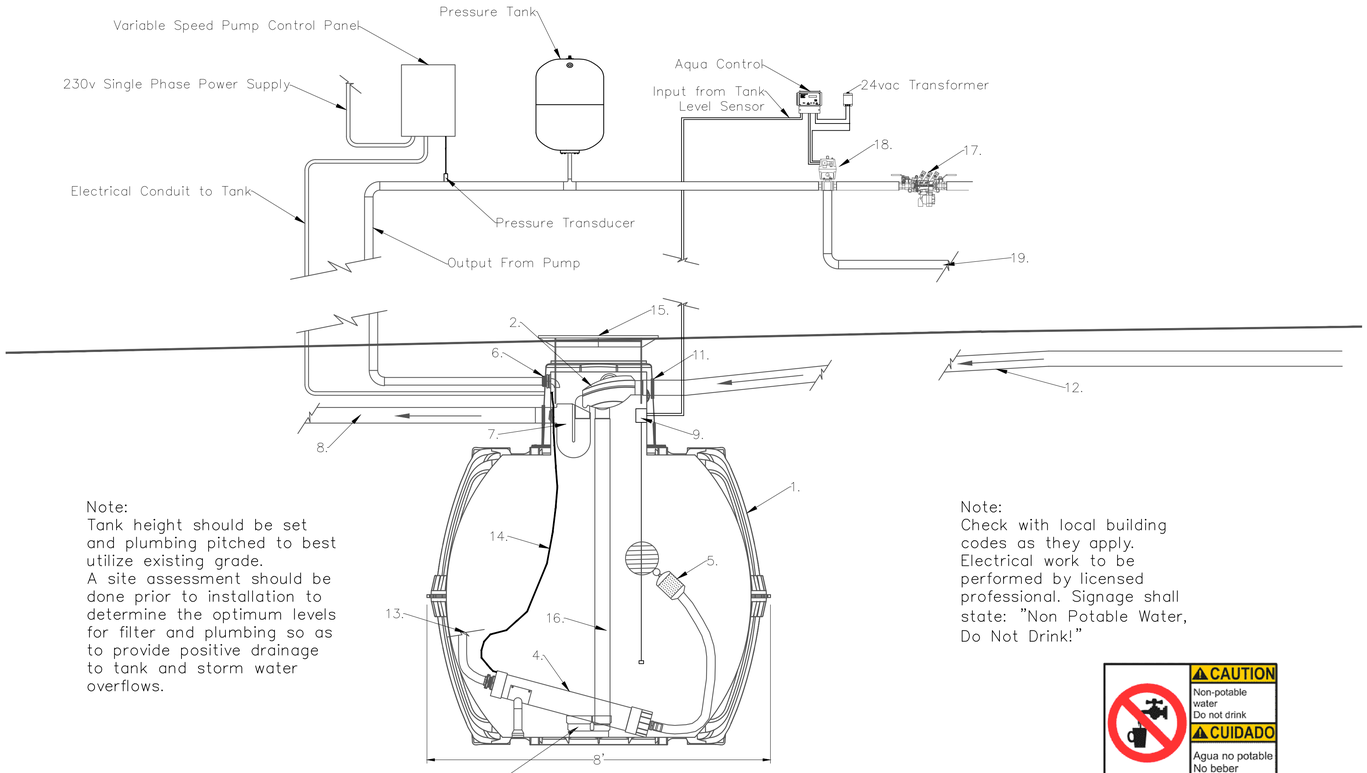
- Variable burial depth: 30" to 42" (59" Max. with optional dome extension and "Maxi" telescopic riser)
- Unique in the world! –unique manufacturing process produces the highest stability due to latest techniques
- Unique fit accuracy of the components thanks to new production process
- Consistent quality due to TÜV safety testing and production monitoring
- Vehicle–bearing (with telescopic cast iron manway kit)
- Groundwater stable up to the middle of the tank due to extremely rigid construction
- Secure investment with market leading 15–year warranty
- Made from high quality Duralene; easy to recycle
- Can be expanded as required

USER'S Responsibility
Untreated Rainwater is NON–Potable water. Warning do not drink water supplied from RainHarvest Systems rainwater systems and related equipment. We will be happy to offer suggestions on the use of our various products either by way of printed material or through direct contact with RainHarvest Systems team members. However, since we have no control over the use of our products once they are shipped, NO WARRANTY WHETHER OF MERCHANTABILITY, FITNESS FOR PURPOSE, OR OTHERWISE is made beyond the repair, replacement, or refund of purchase price at the sole discretion of RainHarvest Systems. Users shall determine the suitability of the product for the intended application before using, and the users assume all risk and liability whatsoever in connection therewith, regardless of any team members suggestions or statements as to the application or construction. In no event shall any remedy exceed the purchase price of the product. Consult local building codes for the system use.



Tank End View

Pump Control and 3 Way Valve Control Detail



Tank Side View

Note:
Tank height should be set and plumbing pitched to best utilize existing grade.
A site assessment should be done prior to installation to determine the optimum levels for filter and plumbing so as to provide positive drainage to tank and storm water overflows.

Note:
Check with local building codes as they apply.
Electrical work to be performed by licensed professional. Signage shall state: "Non Potable Water, Do Not Drink!"

INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION

SHEET NUMBER: CIV010
PLAN TYPE: RWH SYSTEM

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DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

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DESIGN:	J.P. JOHNSON
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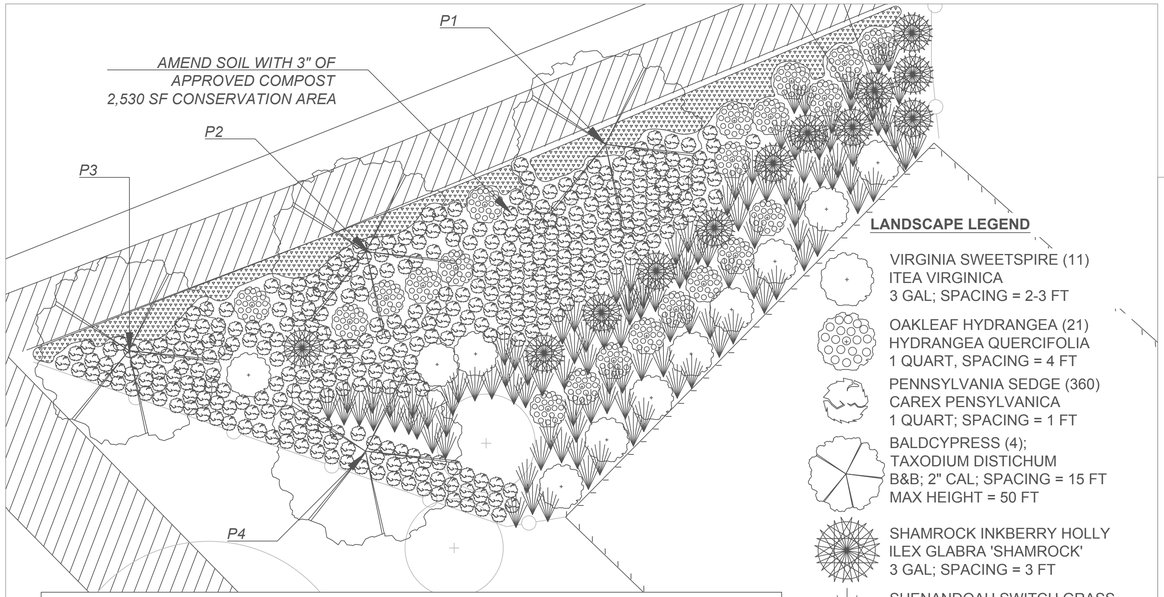
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	1/18/2023

PROJECT # 566763 02660
PHASE #

DETAIL D: CONSERVATION AREA LANDSCAPING PLAN



LANDSCAPE LEGEND

- VIRGINIA SWEETSPIRE (11)
  ITEA VIRGINICA
  3 GAL; SPACING = 2-3 FT
- OAKLEAF HYDRANGEA (21)
  HYDRANGEA QUERCIFOLIA
  1 QUART, SPACING = 4 FT
- PENNSYLVANIA SEDGE (360)
  CAREX PENSYLVANICA
  1 QUART; SPACING = 1 FT
- BALDCYPRESS (4);
  TAXODIUM DISTICHUM
  B&B; 2" CAL; SPACING = 15 FT
  MAX HEIGHT = 50 FT
- SHAMROCK INKBERRY HOLLY
  ILEX GLABRA 'SHAMROCK'
  3 GAL; SPACING = 3 FT
- SHENANDOAH SWITCH GRASS
  PANICUM VIRGATUM
  'SHENANDOAH'
  2 GAL; SPACING = TBS
- HERBACEOUS PLANTINGS
  TO BE DETERMINED FROM
  UDC NURSERY

TREE DETAILS							
SYMBOL	COMMON NAME	BOTANICAL NAME	CATEGORY	MATURE SPREAD	Rv (CF)	SOIL VOLUME REQUIRED (CF)	SOIL VOLUME PROVIDED (CF)
P1	BALD CYPRESS	TAXODIUM DISTICHUM	PLANTED - SMALL	1	5	600	1,898
P1	BALD CYPRESS	TAXODIUM DISTICHUM	PLANTED - SMALL	1	5	600	1,898
P3	BALD CYPRESS	TAXODIUM DISTICHUM	PLANTED - SMALL	1	5	600	1,898
P4	BALD CYPRESS	TAXODIUM DISTICHUM	PLANTED - SMALL	1	5	600	1,898

CONSERVATION AREA COMPOST SPECIFICATIONS

1. 100% OF THE MATERIAL MUST PASS THROUGH A HALF-INCH SCREEN.
2. THE pH OF THE MATERIAL SHALL BE BETWEEN 6 AND 8.
3. MANUFACTURED INERT MATERIAL SHALL BE LESS THAN 1.0% BY WEIGHT.
4. THE ORGANIC MATTER CONTENT SHALL BE BETWEEN 35% AND 65%.
5. SOLUBLE SALT CONTENT SHALL BE LESS THAN 6.0 MMHOS/CM.
6. MATURITY MUST BE GREATER THAN 80%.
7. STABILITY SHALL BE 7 OR LESS.
8. CARBON/NITROGEN RATIO SHALL BE LESS THAN 25:1.
9. TRACE METAL TEST RESULT = "PASS".
10. THE COMPOST MUST HAVE A DRY BULK DENSITY RANGING FROM 40 TO 50 LB/FT^3.

TREE PLANTING TECHNIQUES		
PLANT MATERIAL	PLANTING TECHNIQUE	PLANTING SEASON
BARE ROOT	HAND PLANT	SPRING OR FALL WHEN TREE IS DORMANT
CONTAINER GROWN	HAND PLANT OR USE MECHANICAL PLANTING TOOLS (E.G., AUGER)	SPRING OR FALL, SUMMER IF IRRIGATED
BALLED AND BURLAPPED	USE BACKHOE (OR OTHER SPECIALIZED EQUIPMENT) OR HAND PLANT	SPRING OR FALL

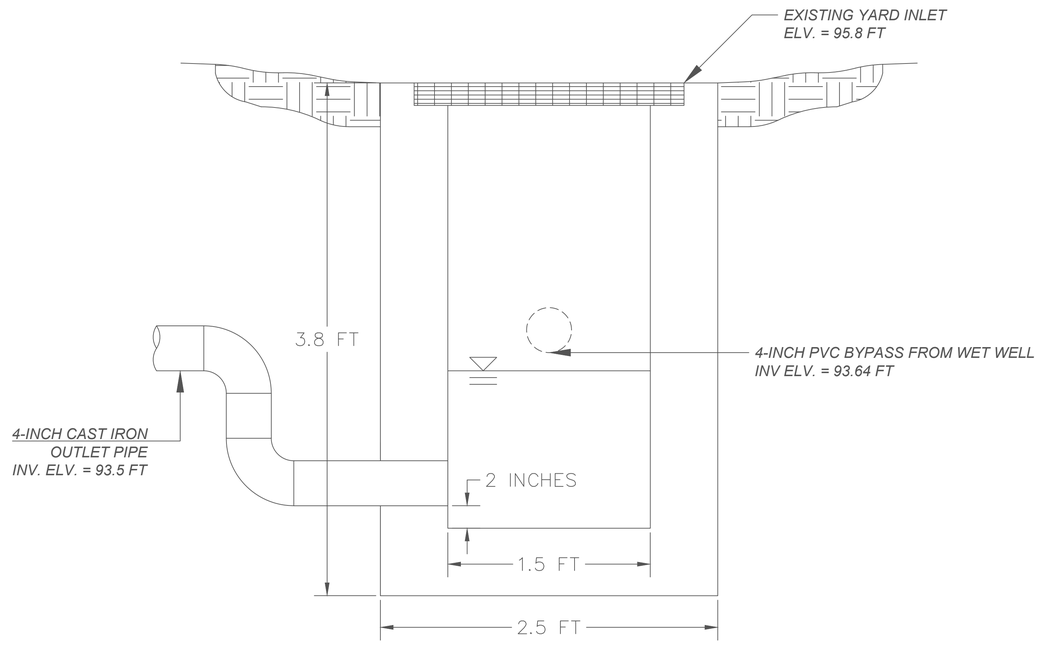
CONSERVATION AREA MAINTENANCE

1. SITE SHOULD BE INSPECTED FOLLOWING 0.5" RAINFALL EVENTS DURING FIRST 6 MONTHS
2. VEGETATION SHOULD BE REPLACED AS NECESSARY
3. SPOT FERTILIZATION AS NEEDED DURING FIRST GROWING SEASON

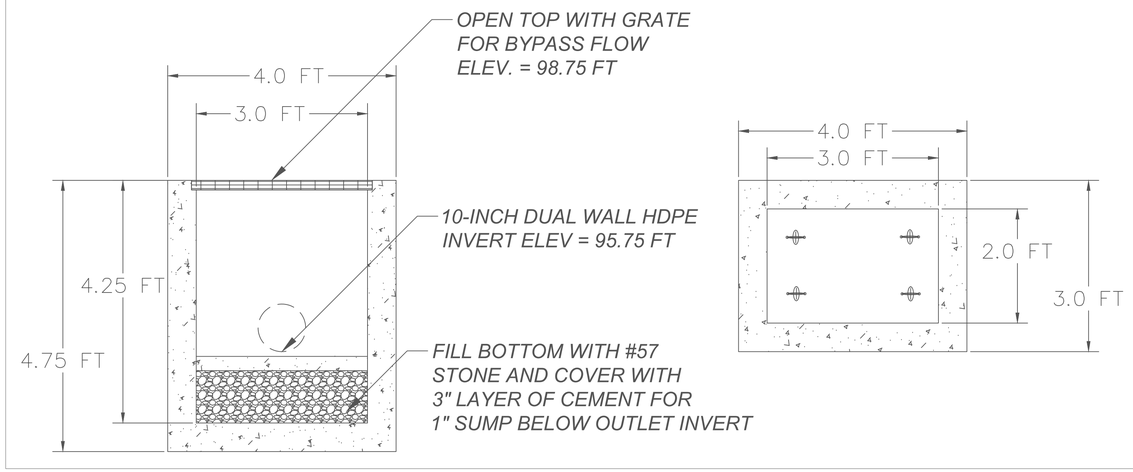
CONSERVATION AREA CONSTRUCTION SEQUENCE

1. SOIL EROSION AND SEDIMENT CONTROL
2. DEEP TILL AREA TO DEPTH OF 12-18"
3. WAIT FOR DRY CONDITIONS
4. INCORPORATE AMENDMENT TO DEPTH OF 3"
5. PLANT VEGETATION
6. CONSTRUCTION INSPECTION

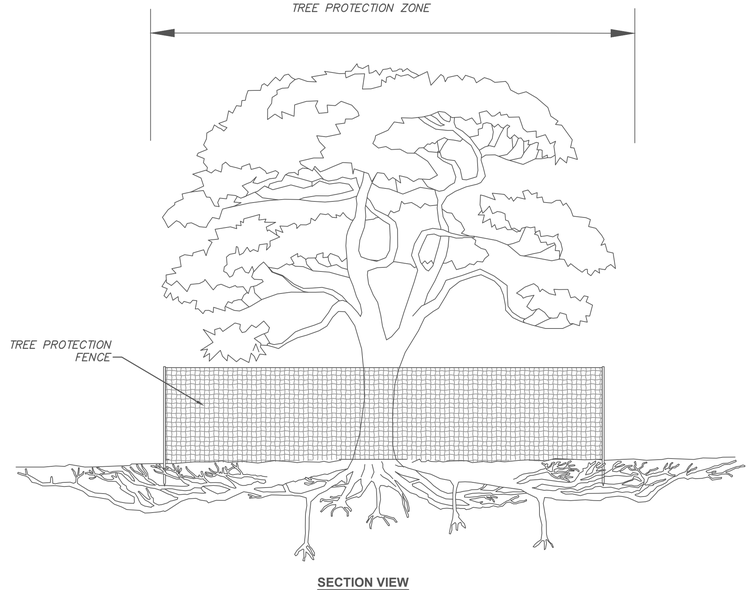
DETAIL E: YARD INLET CROSS SECTION



DETAIL F: OUTLET STRUCTURE



DETAIL G: TREE PROTECTION



SECTION VIEW

TREE PROTECTION

INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

SHEET NUMBER: CIV011

PLAN TYPE: DETAILS 1

NC STATE UNIVERSITY
DEPT. OF BIO & AG
ENGINEERING
CAMPUS BOX 7625
RALEIGH, NC 27695
919-515-7475

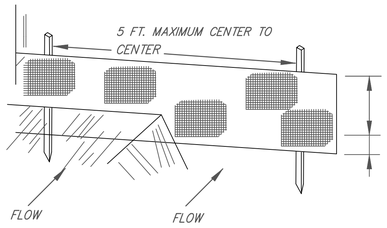
DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS:
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851
NC STATE UNIVERSITY

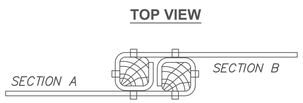
DRAWN:	J.P. JOHNSON
DESIGN:	J.P. JOHNSON
CHECK:	
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	1/19/2023

PROJECT # 566763
PHASE # 02560

DETAIL H: SILT FENCE - 1

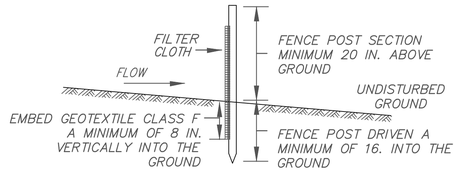


PERSPECTIVE VIEW



TOP VIEW

JOINING TWO ADJACENT SILT FENCE SECTIONS



CROSS SECTION

1. FENCE POSTS MUST BE A MINIMUM OF 36 IN. LONG DRIVEN 16 IN. MINIMUM INTO THE GROUND. WOOD POSTS MUST BE OF SOUND QUALITY HARDWOOD WITH 1–1/2 IN. MINIMUM WIDTH WHEN SQUARE CUT, OR 1–3/4 IN. MINIMUM DIAMETER WHEN ROUND. STEEL POSTS MUST BE STANDARD T OR U SECTION WEIGHING NOT LESS THAN 1.00 POUND PER LINEAR FOOT.
2. FASTEN GEOTEXTILE SECURELY TO EACH FENCE POST WITH WIRE TIES OR STAPLES AT TOP AND MID–SECTION. GEOTEXTILE MUST MEET THE FOLLOWING REQUIREMENTS (GEOTEXTILE CLASS F):

PROPERTY	VALUE	TEST METHOD
TENSILE STRENGTH	50 LBS/IN (MIN.)	ASTM D–4595
TENSILE MODULUS	20 LBS/IN (MIN.)	ASTM D–4595
FLOW RATE	0.3 GAL/FT^2 /MINUTE (MAX.)	ASTM D–5141
FILTERING EFFICIENCY	75% (MIN.)	ASTM D–5141

3. WHERE ENDS OF GEOTEXTILE FABRIC COME TOGETHER, OVERLAP, FOLD, AND STAPLE THEM TO PREVENT SEDIMENT BYPASS.
4. INSPECT SILT FENCE AFTER EACH RAINFALL EVENT, AT LEAST DAILY DURING SUSTAINED RAINFALL EVENTS, AND MAINTAIN WHEN BULGES OCCUR OR WHEN SEDIMENT ACCUMULATION REACHES 30% OF THE FABRIC HEIGHT.

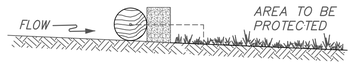
DETAIL I: SILT FENCE - 2

SILT FENCE DESIGN CRITERIA:

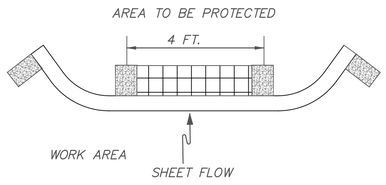
TABLE 3.1: SILT FENCE SLOPE LENGTH AND FENCE LENGTH CONSTRAINTS

SLOPE STEEPNESS	SLOPE LENGTH (MAXIMUM) (FEET)	SILT FENCE LENGTH (MAXIMUM) (FEET)
FLATTER THAN 50:1 (2%)	UNLIMITED	UNLIMITED
> 50:1 TO 10:1 (2% to 10%)	125	1,000
> 10:1 TO 5:1 (10% to 20%)	100	750
> 5:1 TO 3:1 (20% to 33%)	60	500
> 3:1 TO 2:1 (33% to 50%)	40	250
> 2:1 (> 50%)	20	125

DETAIL J: FILTER SOCK



HARD SURFACE INSTALLATION SECTION

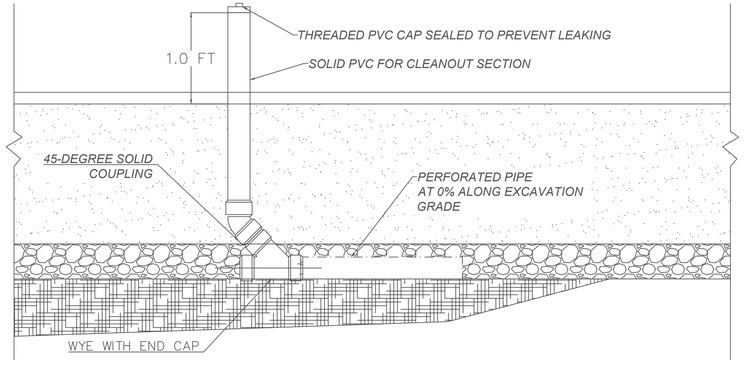


HARD - SURFACE INSTALLATION PLAN VIEW

CONSTRUCTION SPECIFICATIONS

1. BEFORE INSTALLING, CLEAR ALL OBSTRUCTIONS INCLUDING ROCKS, CLODS, AND DEBRIS GREATER THAN 1–INCH THAT MAY INTERFERE WITH PROPER FUNCTION OF THE FILTER SOCK.
2. FILL SOCK UNIFORMLY WITH COMPOST OR ALTERNATE FILTER MEDIA TO DESIRED LENGTH, WITH ENOUGH MATERIAL THAT THE SOCKS DO NOT DEFORM.
3. PLACE SOCKS ALONG CONTOURS, WITH THE ENDS TURNED UPSLOPE AT 30 TO 45 DEGREES FOR A LENGTH OF AT LEAST 5 FEET TO PREVENT RUNOFF BYPASS.
4. FOR UNTRENCHED INSTALLATION, BACKFILL MULCH OR COMPOST ON THE UPSTREAM SIDE OF THE SOCK AND TAMP TO PREVENT UNDERCUTTING AND PIPING.
5. ANCHORING MUST CONFORM TO THE FOLLOWING LIST: (a) MINIMUM 2–INCH SQUARE CROSS SECTION HARDWOOD; (b) DRIVEN AT LEAST 12 INCHES BELOW GRADE, OR 8 INCHES IF IN DENSE CLAY SOILS; (c) PROTRUDE ABOVE FILTER SOCKS AT LEAST 3 INCHES; (d) DRIVEN IN AT 45–DEGREE ANGLE UPSLOPE; (e) SPACED AT NO MORE THAN 4 FEET APART, OR 8 FEET APART IF THE FILTER SOCK IS ENTRENCHED 4 INCHES INTO THE GROUND.
6. DO NOT USE ENTRENCHED INSTALLATION ON FILTER SOCKS SMALLER THAN 12 INCHES IN DIAMETER.
7. FOR HARD SURFACE INSTALLATION, SUCH AS ON PAVEMENT, ANCHORING MAY BE NECESSARY WHERE STRAIGHT SECTIONS EXCEED 4 FEET. SEE DETAIL ABOVE, AND GREATER INSTRUCTION IN THE FILTER SOCK SPECIFICATION. WHEN NO ANCHORING IS USED, THE PRACTICE MUST BE CHECKED DAILY, REGARDLESS OF WHETHER RAINFALL OCCURS. ANCHORED INSTALLATION IS ALWAYS PREFERRED TO NON–ANCHORED INSTALLATION, IF POSSIBLE.
8. FOR AT–GRADE INLET PROTECTION, FILTER SOCKS MUST COMPLETELY ENCLOSE THE DRAIN. IF USED AS CURB INLET PROTECTION, THE EFFECTIVE HEIGHT OF THE FILTER SOCK MUST NOT BE HIGHER THAN THE HEIGHT OF THE CURB; USE 8–INCH DIAMETER FILTER SOCK FOR STANDARD HIGHWAY APPLICATIONS.
9. IF MULTIPLE SECTIONS OF FILTER SOCK ARE NEEDED FOR A CONTINUOUS RUN, OVERLAP ENDS OF SEPARATE SECTIONS A MINIMUM OF 2 FEET AND STAKE ENDS.
10. TO REACH TALLER HEIGHTS, IT IS POSSIBLE TO STACK FILTER SOCKS. SEE SPECIFICATION FOR MORE DETAIL.
11. REMOVE SEDIMENT WHEN IT HAS ACCUMULATED TO A DEPTH OF HALF THE EXPOSED HEIGHT OF SOCK AND REPLACE SOCK. REPLACE FILTER SOCK IF TORN. REINSTALL FILTER SOCK IF UNDERMINING OR DISLODGING OCCURS. REPLACE CLOGGED FILTER SOCKS.
12. FOR VEGETATED, PERMANENT OR SEMI–PERMANENT INSTALLATIONS, MAINTAIN THE PLANTS AS IS APPROPRIATE FOR THE SPECIES USED.

DETAIL K: UNDERDRAIN CLEANOUTS/OBSERVATION WELLS



INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

SHEET NUMBER: CIV012

PLAN TYPE: DETAILS - 2

NC STATE UNIVERSITY
DEPT. OF BIO & AG ENGINEERING
CAMPUS BOX 7625
RALEIGH, NC 27695
919-515-7475

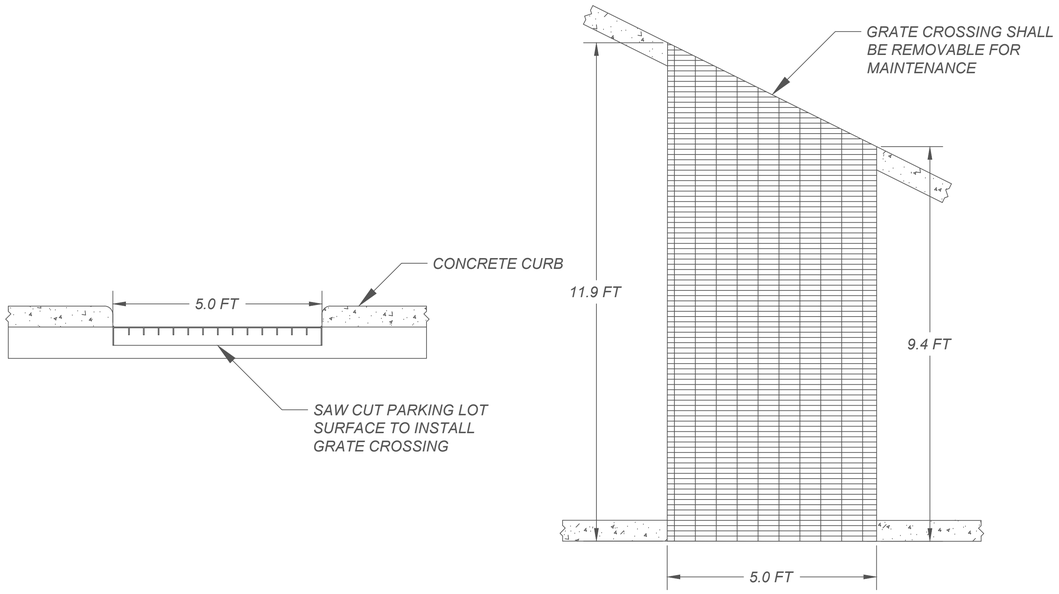
DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS:
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851
NC STATE UNIVERSITY

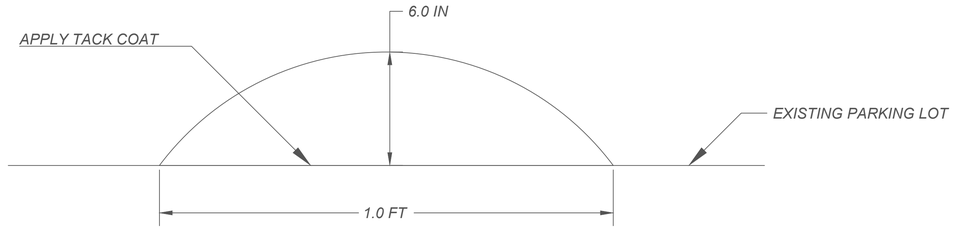
DRAWN:	J.P. JOHNSON
DESIGN:	J.P. JOHNSON
CHECK:	
APPROVED:	
PROJECT NAME:	UDC TREATMENT TRAIN
SCALE:	AS NOTED
DATE:	11/8/2023

PROJECT # 560763
PHASE # 02060

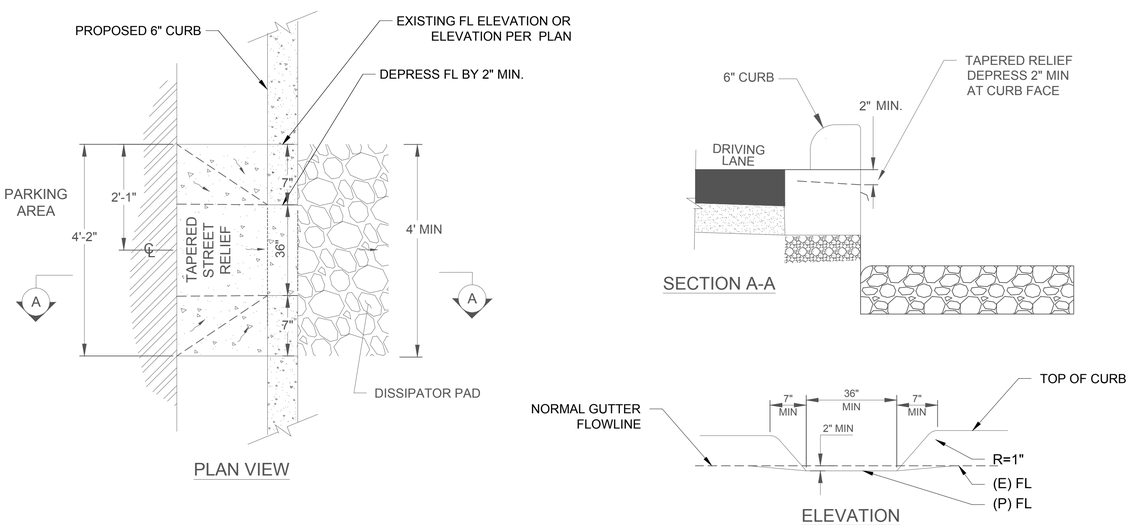
DETAIL L: GRATE CROSSING



DETAIL M: FLOW DIVERTER BUMP

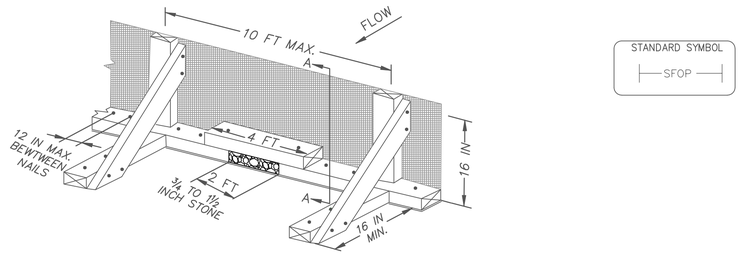


DETAIL N: CURB CUT



NOT TO SCALE

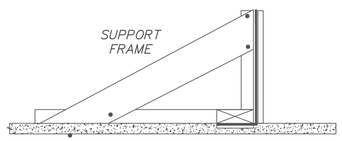
DETAIL M: SILT FENCE ON PAVEMENT



STANDARD SYMBOL
SFOP

ISOMETRIC VIEW

JOINING ADJACENT SECTIONS OF GEOTEXTILE



SECTION A-A

CONSTRUCTION SPECIFICATIONS

1. USE NOMINAL 2 INCH BY 4 INCH LUMBER.
2. USE WOVEN SLIT FILM GEOTEXTILE, AS SPECIFIED IN APPENDIX A.
3. SPACE UPRIGHT SUPPORTS NO MORE THAN 10 FEET APART.
4. PROVIDE A 2–FOOT OPENING BETWEEN EVERY SET OF SUPPORTS AND PLACE STONE IN THE OPENING OVER GEOTEXTILE.
5. KEEP SILT FENCE TAUT AND SECURELY STAPLE TO THE UPSLOPE SIDE OF UPRIGHT SUPPORTS. EXTEND GEOTEXTILE UNDER 2x4.
6. WHERE TWO SECTIONS OF GEOTEXTILE ADJOIN – OVERLAP, FOLD, AND STAPLE TO POST IN ACCORDANCE WITH THIS DETAIL. ATTACH LATHE.
7. PROVIDE A MASTIC SEAL BETWEEN PAVEMENT, GEOTEXTILE, AND 2x4 TO PREVENT SEDIMENT–LADEN WATER FROM ESCAPING BENEATH SILT FENCE INSTALLATION.
8. SECURE BOARDS TO PAVEMENT WITH 40D 5–INCH MINIMUM LENGTH NAILS.
9. REMOVE ACCUMULATED SEDIMENT AND DEBRIS WHEN BULGES DEVELOP IN SILT FENCE OR WHEN SEDIMENT REACHES 25% OF FENCE HEIGHT. REPLACE GEOTEXTILE IF TORN. MAINTAIN WATER TIGHT SEAL ALONG BOTTOM. REPLACE STONE IF DISPLACED.

INNOVATIVE TREATMENT TRAIN
BIORETENTION/RWH
WASHINGTON, DC
CONSTRUCTION PLANS

PLAN TYPE: DETAILS - 3
SHEET NUMBER: CIV013

NC STATE UNIVERSITY
DEPT. OF BIO & AG ENGINEERING
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RALEIGH, NC 27695
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DEPARTMENT OF ENERGY & ENVIRONMENT
GOVERNMENT OF THE DISTRICT OF COLUMBIA

PROJECT PARTNERS:
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851
NC STATE UNIVERSITY

DRAWN: J.P. JOHNSON
DESIGN: J.P. JOHNSON
CHECK:
APPROVED:

PROJECT NAME: UDC TREATMENT TRAIN
SCALE: AS NOTED
DATE: 11/6/2023

PROJECT # 566763 02660
PHASE #

Stormwater Management Plan Compliance Data

Site Address	5171 South Dakota Avenue NE	Plan number	6728
Stormwater Management Plan?	Yes	Green Area Ratio?	No - GAR does not apply to this property
Soil Erosion and Sediment Control?	Yes	Floodplain Review?	No
Type of Activity	Unregulated	AWDZ?	
Is the entire site in the CSS?	No		

	Total Area (sf)	Site Area	PROW
Natural	2,530	2,530	
Compacted	5,108	5,108	
Impervious	14,751	14,751	
BMP	494	494	
Total	22,883	22,883	

Curve Numbers

☐ Additional Detention Provided

Pre-development	70	2-year storm adjusted CN
Pre-project		15-year storm adjusted CN
		100-year storm adjusted CN

Requirements Summary (total is the sum of PROW and Parcel)	PROW (ft3)	Parcel (ft3)	Total (ft3)	Total (Gallons)
SWRv		0		0
WQTv		0	0	0
On-site retention achieved		879	879	6,575
On-site treatment achieved		0	0	0
% of SWRv met on-site				
SRC eligibility				7,245
Offv				0

Compliance data last updated: 10-18-2022 12:25 PM
Plan 6728 Page 1 of 4

Site Drainage Area Compliance Data

Site Drainage Area ID	Public Right of Way	Total area (square feet)	Natural (square feet)	Compacted (square feet)	Impervious (square feet)	BMP (square feet)	Vehicular access area	SWRv (cubic feet)	WQTv (cubic feet)	Volume retained (cubic feet)	Volume treated (cubic feet)	2-year storm adjusted Curve Number	15-year storm adjusted Curve Number	100-year storm adjusted Curve Number	SDA Minimum Compliance
6728-2	☐	5,108	0	5,108	0	0	0	0	0	45	0				N/A
6728-1	☐	17,775	2,530	0	14,751	494	14,751	0	0	834	0				N/A

Site BMP Compliance Data

Compliance data last updated: 10-18-2022 12:25 PM
Plan 6728 Page 2 of 4

BMP ID number	Type	Total CDA (square feet)	Natural (square feet)	Compacted (square feet)	Impervious (square feet)	BMP (square feet)	Total Post project vehicular access area	Volume received from upstream BMPs (cubic feet)	Max volume received by BMP (cubic feet)	Storage volume (cubic feet)	Retention calculation	Volume retained (cubic feet)	Volume treated (cubic feet)	Downstream BMP ID Numbers
6728-1-1	Traditional bioretention - Enhanced with underdrain	14,905			14,411	494		0	2,006	804	100% of storage volume	804	0	
6728-1-2	Tree planting - Average spread < 40 feet	0						0	0		5 cubic feet per tree	10	0	
6728-1-3	Tree planting - Average spread < 40 feet	0						0	0		5 cubic feet per tree	20	0	
6728-2-1	Tree planting - Average spread < 40 feet	0						0	0		5 cubic feet per tree	45	0	

PROW Drainage Area Compliance Data

No records were retrieved.

Compliance data last updated: 10-18-2022 12:25 PM
Plan 6728 Page 3 of 4

PROW BMP Compliance Data

No records were retrieved.

Compliance data last updated: 10-18-2022 12:25 PM
Plan 6728 Page 4 of 4

STATEMENT BY PROFESSIONAL ENGINEER REGISTERED IN THE DISTRICT OF COLUMBIA

This is to certify that the engineering features of all stormwater best management practices (BMPs) which include Erosion and Sediment Control Plan, Bioretention System and Rainwater Harvesting Treatment Train and land covers (collectively the "Facility") have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of stormwater pollutants. I further certify that the Facility has been designed in accordance with the specifications required under Chapter 5 Title 21 of the District of Columbia Municipal Regulations. It is also stated the undersigned has furnished the applicant with a set of instruction for maintenance and operation of the site's Facility.

Dr. Pradeep K Behera, PE, Consulting Engineer

Name and Title (please type)

12617 Hallman Court, Gaithersburg, MD 20878

Address

Date ___11/04/2022____ Phone No:___301-728 2115___

Affix Seal