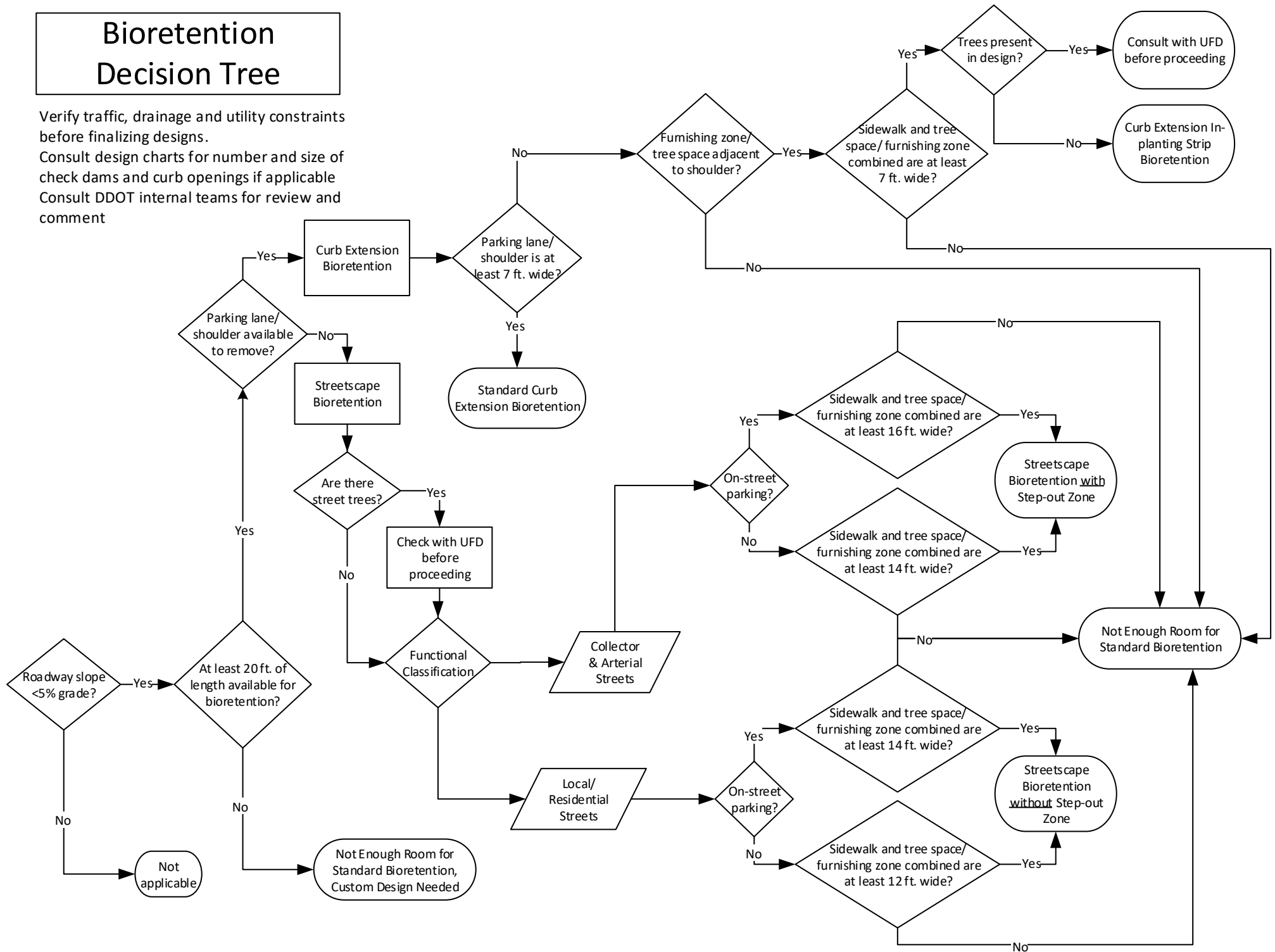


| Master Category                     | Bioretention   |   | Tree Planting   |  | Impervious Removal   | Permeable Pavement   |
|-------------------------------------|--|---|---|--|--|--|
| Design Situations                   | Bioretention Curb Extension  | Streetscape Bioretention (New Design for 65% deliverable)   | Street Tree Curb Extension  | Street Tree Curb Extension with Permeable Sidewalk and Structural Soil   | Impervious Removal Provide standardized notes and details to be combined with custom site sketch) (New Design for 65% deliverable) | Permeable Alley  |
| Scenarios                           | 7 and 8 foot parking lane verions in 15, 20-foot lengths and No Check Dams, (Road slopes 0-1.2%)   | 20-foot long by 5-foot wide with a 2-foot wide step out zone for areas with parking. Longer facilities maybe made of multiple 20 foot cells with 6-foot pedestrian walkways between them. |   | 40-foot long practice for Large Trees (require 1500 cf of soil volume)   | Removed closed slip lane   | 0-2% Slope; Depressed Center Alley (Permeable on the full width) |
|                                     | 7 and 8 foot parking lane verions in 15, 20-foot lengths and 10-foot spacing (Road slopes 1.5-5%)  | 20-foot long by 5-foot wide adjacent to the back of curb for areas without parking. Longer facilities maybe made of multiple 20 foot cells with 6-foot pedestrian walkways between them.  |   | 34-foot long extension for Medium Trees (require 1000 cf of soil volume) | Landscaped Refuge Islands  | 2-5% Slope; Depressed Center Alley (Permeable on the full width) |
|                                     | 7 and 8 foot parking lane verions in, 40, 60, 80, and 100-foot lengths and No Check Dams, 10, 20, 40, 60, 80 spacing (Road slopes 0-1.2%)                                  |   | 40-foot long extension for Small Trees (require 600cf of soil volume)   | 20-foot long extension for Small Trees (require 600cf of soil volume)    | Narrow Roadways to minimum section   |  |
|                                     | 7 and 8 foot parking lane verions in 40, 60, 80, and 100-foot lengths and 10, 20, and 30-foot spacing (Road slopes 1.5-5%)   |   |   |  | Corner Curb Extension  |  |
| Options available for all Scenarios | Options (May be added on to each scenario as required):  | Options (May be added on to each scenario as required):   | Options (May be added on to each scenario as required):   |  |  |  |
|                                     | Pretreatment Inlet to remove sediment and route high flows around the facility (Allows larger drainage areas with more offsite drainage. Reduces maintenance requirements) | BSM/Structural Soil under sidewalks and (Reduces required facility length). Includes calculations for 6, 8, and 10 foot wide sidewalks.   | Structural Soil under sidewalks and (Reduces required facility length). Includes calculations for 6, 8, and 10 foot wide sidewalks. |  |  |  |
|                                     | BSM/Structural Soil under sidewalks (Reduces required facility length). Includes calculations for 6, 8, and 10 foot wide sidewalks.  | Connected underdrains and soil volumes between multiple cells   |   |  |  |  |
|                                     | Include Furnishing Zone/Planting Strip 0-4-feet  |   |   |  |  |  |
|                                     | Pedestrian Crossing  |   |   |  |  |  |

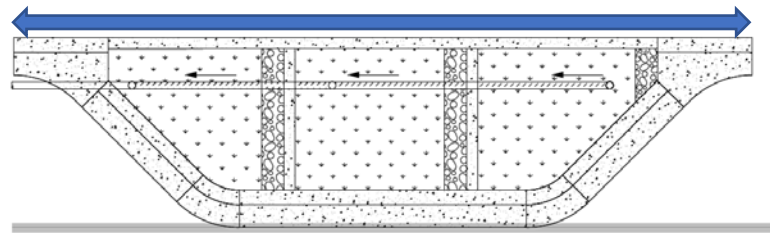
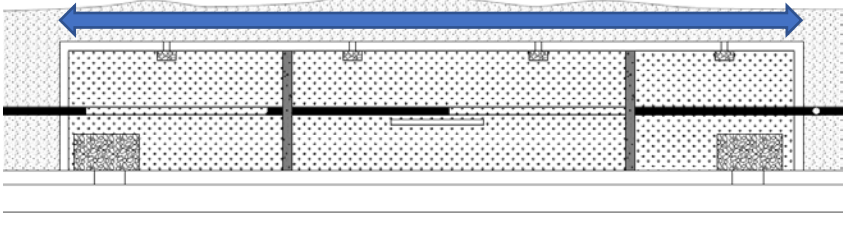
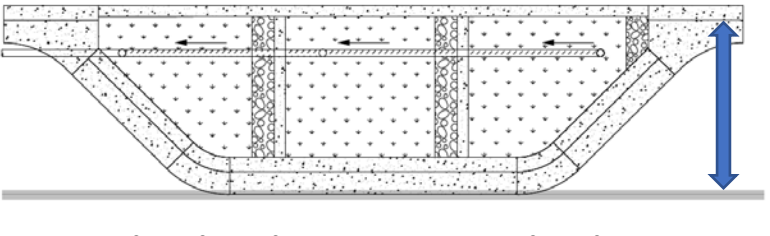
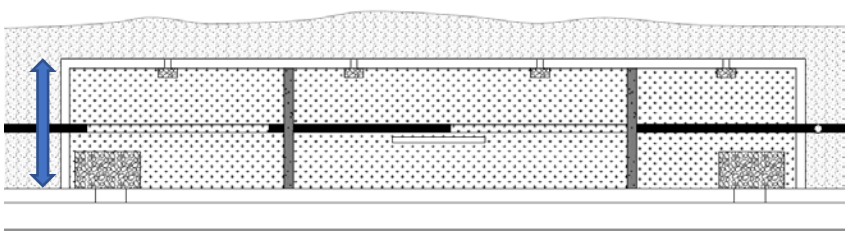
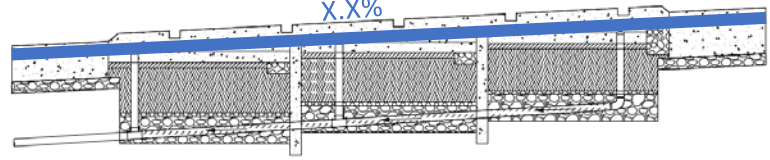
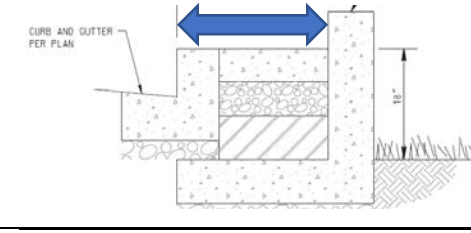
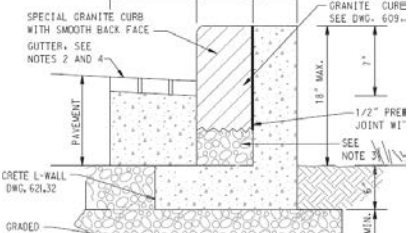
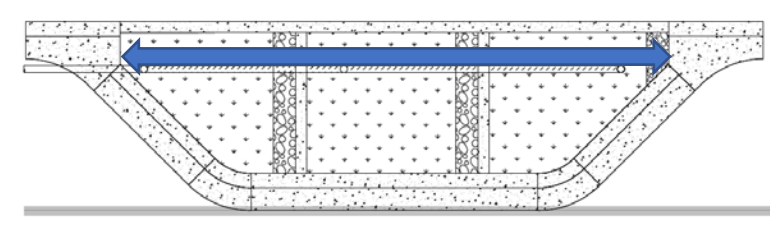
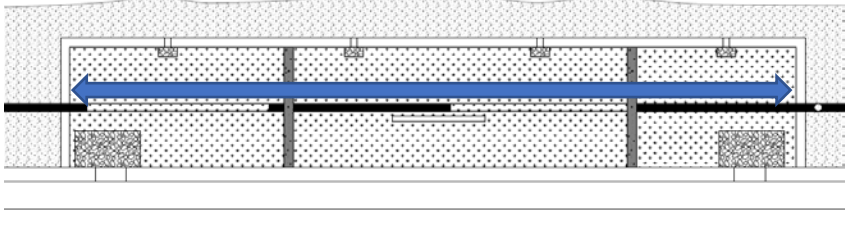
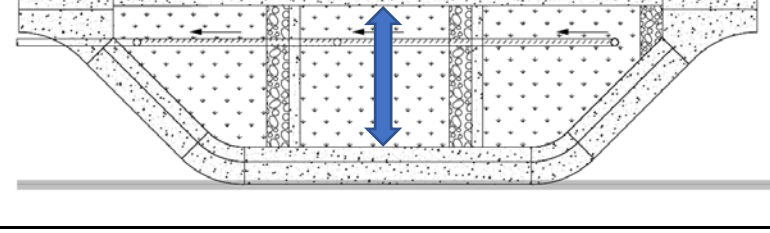
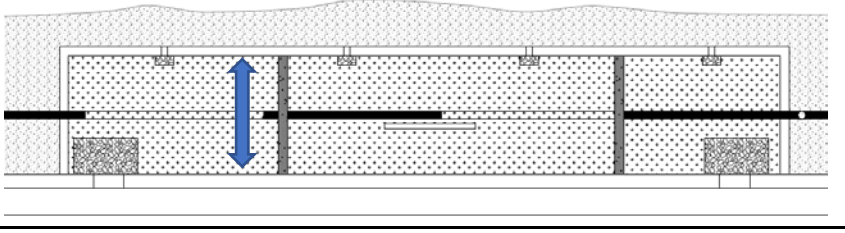
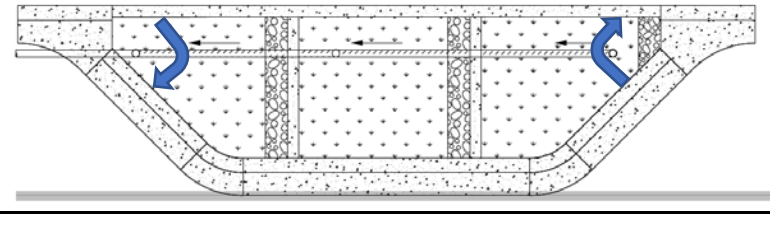
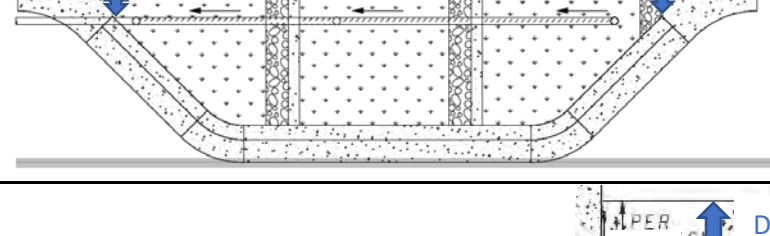
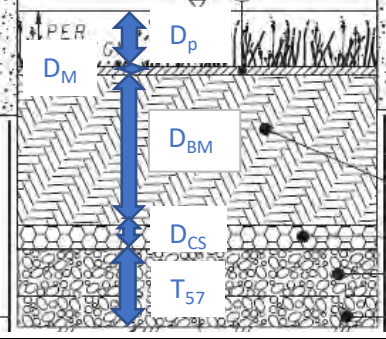
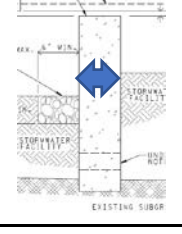
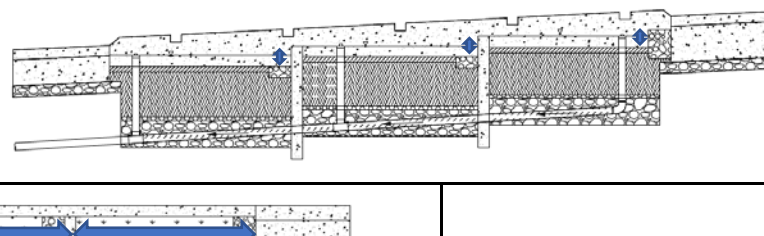
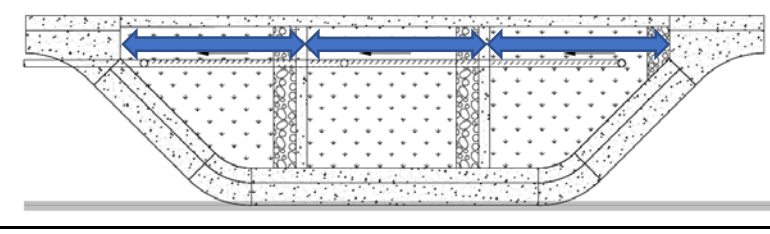
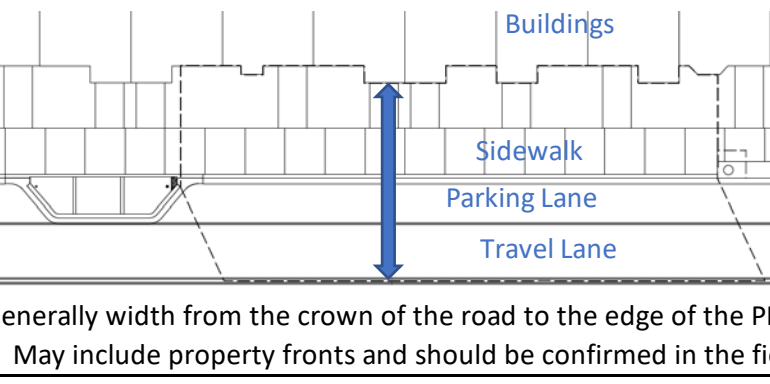
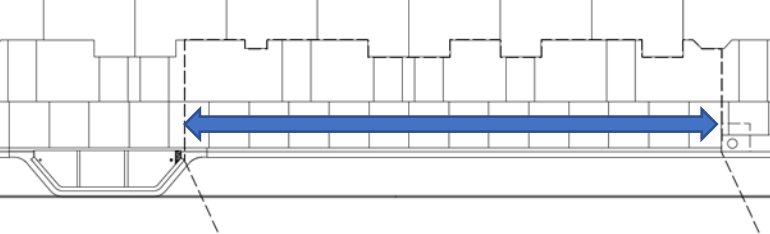
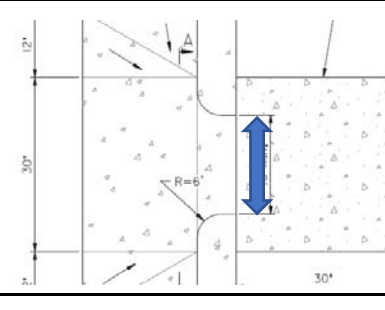
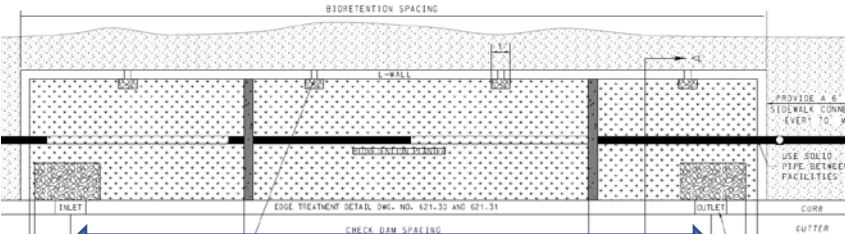
# Bioretention Decision Tree

Verify traffic, drainage and utility constraints before finalizing designs.  
Consult design charts for number and size of check dams and curb openings if applicable  
Consult DDOT internal teams for review and comment





User Input Cells  
Output Values for the Planset

| Variable                                      |                          |        |             | Bioretention Design Inputs   |   | Equations  |
|---|--------------------------|--------|-------------|--|---|--|
| Bioretention Type                             | Symbol                   | Value  | Units       | Curb Extension Bioretention  | Streetscape Bioretention  |  |
| Length Available                              | L                        | 35     | feet        |     |    |  |
| Parking Lane Width                            | W                        | 7      | feet        |     |    |  |
| Roadway Slope (5% is the Maximum allowed)     | S                        | 3.0%   |             |    |   |  |
| Step Out Zone (Yes/No)?                       |                          | Yes    |             | Not Applicable   |    |  |
| Step Out Zone Width                           |                          | 18     | inches      |  |   | Minimum value is 18" from the DDOT GI Standards DWG. No. 621.23  |
| Granite Curb                                  |                          | No     |             |    |   |  |
| L Wall On Streetside (Yes/No)?                |                          | Yes    |             |  |   |  |
| Filterbed Length                              | L <sub>f</sub>           | 26.4   | feet        |     |    | Curb Extension: L <sub>f</sub> =L-2*Curb Transition Piece (4.3228 feet for 45-degree angle)<br>Streetscape: L <sub>f</sub> =L-2*6 inches   |
| Filterbed Width                               | W <sub>f</sub>           | 4.1    | feet        |     |    | Curb Extension: W=(Curb Width; 8")-(Width of Curb and Gutter; 12"+0.5"+8")-(L-Wall thickness 6")<br>Curb Extension with L-Wall (Granite Curb): W=(Curb Width; 8")-(Width of Curb and Gutter; 12"+0.5"+8")-2*(L-Wall thickness; 6")<br>Streetscape (Thickened Curb and Gutter): W=(L-Wall thickness 6")<br>Streetscape with L-Wall (Granite Curb): W-2*(L-Wall thickness 6")<br>Streetscape with Step Out Zone: W-2*(L-Wall thickness 6")-(Step out Width - Curb Width; 24"-8") |
| Transition Angle                              |                          | 45     | degrees     |   | Not Applicable  | Standardized value for these calculations. Do not change   |
| Upstream/Downstream Curb Cut Width            |                          | 15     | inches      |   | Not Applicable  | Standardized value for these calculations. Do not change   |
| Maximum Checkdam Height                       | H <sub>CDmax</sub>       | 12     | inches      |  |   | Standardized value for concrete check dams from DDOT GI Standards DWG. No. 621.60. Do not change   |
| Ponding Depth                                 | D <sub>p</sub>           | 6      | inches      |  |   | Standardized value for these calculations. Do not change   |
| Mulch depth                                   | D <sub>m</sub>           | 3      | inches      |  |   | Standardized value for these calculations. Do not change   |
| Bioretention Media Depth                      | D <sub>BM</sub>          | 30     | inches      |  |   | Standardized value for these calculations. Do not change   |
| Choker Stone Depth                            | D <sub>CS</sub>          | 3      | inches      |  |   | Standardized value for these calculations. Do not change   |
| AASHTO #57 Thickness                          | T <sub>57</sub>          | 12.2   | inches      |  |   | T <sub>57</sub> =S*L <sub>CD</sub> (or L <sub>f</sub> if L <sub>CD</sub> =0)+UD (4")+UD Cover and Bedding (3"+2"), Minimum of 12"  |
| Media Porosity                                | η <sub>Media</sub>       | 0.25   |             |  |   | Standardized value from DOE SWM Guidebook Equation 3.5. Do not change.   |
| Gravel Porosity                               | η <sub>Gravel</sub>      | 0.4    |             |  |   | Standardized value from DOE SWM Guidebook Equation 3.5. Do not change.   |
| Checkdam width                                |                          | 6      | inches      |  |   | Standardized value for these calculations. Do not change   |
| Filter bed drop                               | H <sub>f</sub>           | 12.60  | inches      |  |   | H <sub>f</sub> =5*L <sub>f</sub>   |
| # of checkdams                                | #CD                      | 2      |             |  |   | #CD=Truncate(H <sub>f</sub> /((H <sub>CDmax</sub> -D <sub>p</sub> +0.1))) Note: Truncate removes the decimal portion to give a whole number of check dams  |
| Downstream Checkdam Height                    | H <sub>CD</sub>          | 10.2   | inches      |  |   | H <sub>CD</sub> =H <sub>f</sub> /(#CD+1) Note: the +1 accounts for the first drop from the gutter to the first cell's surface  |
| Checkdam Spacing                              | L <sub>CD</sub>          | 8.8    | feet        |   |   | L <sub>CD</sub> =L <sub>f</sub> /(#CD+1)   |
| Surface Area                                  | SA <sub>surface</sub>    | 103.5  | square feet |  |   | Surface area of the filter bed minus the check dam's footprints and minus the triangular expansion and contraction areas for curb extensions   |
| Bench for Edge Treatment Width                | W <sub>b</sub>           | 6      | inches      |  |   |  |
| Subsurface Area                               | SA <sub>subsurface</sub> | 69.6   | square feet |  |   | Surface area minus the 6-inch bench for edge treatments  |
| Provided Storage                              | S <sub>p</sub>           | 134.8  | cubic feet  |  |   | S <sub>p</sub> =SA <sub>surface</sub> *D <sub>p</sub> +SA <sub>subsurface</sub> *η <sub>Media</sub> *(D <sub>m</sub> +D <sub>BM</sub> )+η <sub>Gravel</sub> *(D <sub>CS</sub> +T <sub>57</sub> )   |
| Provided Storage                              | S <sub>p</sub>           | 1008.7 | gallons     |  |   |  |
| Required Rainfall Depth for Treatment         |                          | 1.2    | inches      |  |   | Standardized value for these calculations. Do not change   |
| Recommended Maximum CDA Allowable             | CDA                      | 1419.6 | square feet |  |   | Assumed drainage area is 100% impervious and solved Equation 2.1 in the DOE SWM Guidebook for Impervious Cover Area.   |
| Assumed Average ROW/Drainage Area Width       | DA <sub>width</sub>      | 30     | feet        |   |   |  |
| Maximum distance to Upstream inlet/Hill crest |                          | 47     | feet        |   |   | Max. Distance = CDA/DA <sub>width</sub>  |
| Curb Opening Width                            |                          | 24     | inches      | Not Applicable   |  |  |
| # of Curb Openings                            |                          | 4      |             | Not Applicable   |   |  |
| Inlet Spacing                                 |                          | 7.7848 | feet        | Not Applicable   |  |  |

Note: This sheet provides backgournd calculations to determine the number of curb openings required to capture 100% of the Stormwater Retention Volume following guidance in the DOEE SWM Guidebook Appendix I.6 and the FHWA HEC-22 Manual

|                                     | Variable           | Value   | Units  | Notes  |
|-------------------------------------|--------------------|---------|--------|--|
| Rainfall Depth                      | P                  | 1.20    | in     |  |
| Treatment Volume Provided           | SWR <sub>v</sub>   | 134.85  | cf     |  |
| Drainage Area                       | CDA                | 1419.57 | sf     |  |
| Water Quality Inches                | Q <sub>a</sub>     | 1.14    | in     |  |
| Required CN                         | CN                 | 99.48   |        | From DOEE SWM Guidebook  |
|                                     | I <sub>a</sub>     |         |        | I <sub>a</sub> values for 100% impervious are outside of the range from TR-55, however they values result in a Qu of 1000 from Exhibit 4-II in TR-55 |
|                                     | I <sub>a</sub> /P  |         |        |  |
|                                     | Qu                 | 1000.00 | csm/in | Assumes I <sub>a</sub> /P< 0.10  |
| Stormwater Retention Peak Discharge | qp <sub>SWRV</sub> | 0.06    | cfs    |  |
|                                     | K <sub>u</sub>     | 0.60    |        | Constant from HEC-22   |
| Roadway Slope                       | S <sub>L</sub>     | 0.03    | ft/ft  |  |
| Roadway Manning's Roughnesss        | n                  | 0.015   |        |  |
| Roadway Cross slope                 | S <sub>x</sub>     | 0.02    | ft/ft  |  |
| Curb Cut Opening                    |                    | 24      | inches |  |

| Interception Capacity based on FHWA HEC-22 manual |                |              |                       |
|---|----------------|--------------|-----------------------|
| Discharge (cfs)                                   | ed for 100% Ca | Curb Opening | Interception Capacity |
| Q   | L <sub>T</sub> | E            | Q <sub>i</sub>        |
| 0.06  | 8.24           | 0.39         | 0.02                  |
| 0.04  | 6.68           | 0.47         | 0.02                  |
| 0.02  | 5.10           | 0.59         | 0.01                  |
| 0.01  | 3.50           | 0.78         | 0.01                  |
| 0.00  | 1.84           | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| #NUM!   | #NUM!          | #NUM!        | #NUM!                 |
| Number of Openings                                | 4              |              |                       |

Pasword                XXXX



GENERAL NOTES

| REG | STATE | PROJECT | SHEET NO. | TOTAL SHEETS |
|-----|-------|---------|-----------|--------------|
| 3   | D.C.  |         |           |              |

GOVERNING SPECIFICATIONS

THE 2013 DISTRICT OF COLUMBIA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND STRUCTURES, OR CURRENT; THE CONTRACT DOCUMENTS INCLUDING CONTRACT PLANS, SPECIAL PROVISIONS AND BID TABULATIONS ARE THE GOVERNING PROVISIONS APPLICABLE TO THIS PROJECT.

SCOPE OF WORK

THE CONTRACT INCLUDES ROADWAY RESTORATION, DRAINAGE, SIDEWALK RECONSTRUCTION, SIGNING, PAVEMENT MARKING, AND LANDSCAPE.

THE CONTRACTOR SHALL COORDINATE HIS/HER WORK WITH THE ENGINEER AT ALL TIMES. NO COMPENSATION WILL BE MADE TO THE CONTRACTOR BY THE DEPARTMENT FOR WORK PERFORMED WITHOUT AUTHORIZATION FROM THE ENGINEER.

TOPOGRAPHIC MAPPING

PROPERTY LINES AND RIGHT OF WAY LINES SHOWN ARE BASED ON RECORD DRAWINGS AND DO NOT REPRESENT A BOUNDARY SURVEY.

CONTRACTOR COORDINATION

THE CONTRACTOR IS HEREBY INFORMED THAT OTHER CONTRACTORS MAY BE WORKING IN THE AREA. THE CONTRACTOR SHALL COORDINATE HIS MAINTENANCE OF TRAFFIC AND SIGNING AND OTHER ACTIVITIES WITH OTHER CONTRACTORS TO AVOID ANY CONFLICT.

SITE GRADING

ALL DISTURBED AREAS NOT ON THE STREET SHALL BE SITE GRADED TO ACHIEVE POSITIVE DRAINAGE USING FILL MATERIAL. ALL DISTURBED AREAS NOT PAVED OR PLANTED SHALL BE SEEDED/SODDED ACCORDING TO THE SEED/SOD REQUIREMENTS SET FORTH IN THE SPECIFICATIONS.

MAINTENANCE OF TRAFFIC

DURING ALL PHASES OF PROJECT OPERATIONS AND FOR THE DURATION OF THE CONTRACT, VEHICULAR AND PEDESTRIAN TRAFFIC SHALL BE MAINTAINED IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS.

IF THE CONTRACTOR DOES NOT WISH TO USE THE MAINTENANCE OF TRAFFIC PLANS (MOT) IN THE CONTRACT DRAWINGS, ALTERNATE MOT PLANS SHALL BE SUBMITTED TO THE CHIEF ENGINEER FOR APPROVAL.

WATER AND SEWER

WATER AND SEWER WORK SHALL CONFORM TO THE DC WATER STANDARD SPECIFICATIONS AND STANDARD DETAILS CONTAINED IN THE APPENDIX TO THE PROJECT SPECIAL PROVISIONS.

ALL EXISTING DC WATER ITEMS SUCH AS CATCH BASIN TOPS, AND MANHOLE FRAMES & COVERS RELATED ASSEMBLIES THAT ARE NOT REUSED, SHALL BE SALVAGED AND RETURNED TO DC WATER.

REMOVE FRAME AND COVER OF SEWER STRUCTURES AND WATER MAIN VALVE CASINGS TO BE ABANDONED AND FILL TO GRADE (SEE STANDARD SPECIFICATION 303 AND 313).

THE CONTRACTOR SHALL EXCAVATE AND LOCATE, VERTICALLY AND HORIZONTALLY, ALL EXISTING UTILITIES IN CLOSE PROXIMITY TO THE PROPOSED WATER AND SEWER FACILITIES.

THE CONTRACTOR IS RESPONSIBLE FOR ADJUSTING ALL UTILITY COVER ELEVATION REQUIRED TO MEET NEW ROADWAY GRADE.

UTILITIES

THE FOLLOWING UTILITIES ARE KNOWN TO HAVE FACILITIES IN THE CONTRACT AREA:

1. DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY/DC WATER  
OFFICE OF ENGINEERING AND TECHNICAL SERVICES  
5000 OVERLOOK AVENUE, S.W.  
WASHINGTON D.C. 20032  
(202) 787-2442
2. WASHINGTON GAS DISTRIBUTION DEPARTMENT  
6801 INDUSTRIAL ROAD  
SPRINGFIELD, VIRGINIA 22151  
(703) 750-4556
3. POTOMAC ELECTRIC AND POWER COMPANY (PEPCO)  
1900 PENNSYLVANIA AVENUE, N.W.  
WASHINGTON D.C. 20006  
(202) 388-2602
4. VERIZON COMMUNICATIONS  
935 V STREET, N.E.  
WASHINGTON D.C. 20018  
(202) 636-0246

THE EXISTENCE OF OTHER UTILITIES IS UNKNOWN. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL EXISTING UTILITIES AND PROVIDE TEMPORARY SUPPORT AS REQUIRED DURING CONSTRUCTION. FOR FULL INFORMATION REGARDING UTILITIES PROTECTION, SEE STANDARD SPECIFICATION 107.16 "PROTECTIVE UTILITY ALERT".

NOTIFY MISS UTILITY @ 1-800-257-7777 AT LEAST SEVENTY TWO HOURS PRIOR TO CONSTRUCTION.

NO UTILITY LOCATIONS ARE SHOWN ON THE PLANS. AVAILABLE RECORD DRAWINGS OF THE ORIGINAL LOCATIONS CAN BE PROVIDED IF NEEDED. THE INFORMATION SHOWN IS NOT COMPLETE AND THE LOCATION OF THE UTILITIES ARE APPROXIMATE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE OF ALL THE UTILITIES WELL IN ADVANCE OF CONDUCTING CONSTRUCTION OPERATIONS WHICH COULD DAMAGE THESE FACILITIES. IN AREAS WHERE PROPOSED CONSTRUCTION MAY CONFLICT WITH EXISTING UTILITIES, THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO EXISTING UTILITIES.

IF AN UNDERGROUND UTILITY IS DAMAGED, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND THE OWNER OF SAID UTILITY. ANY DAMAGE SUSTAINED TO THE UTILITIES ABOVE OR BELOW GROUND SHALL BE REPAIRED BY OR UNDER THE DIRECTION OF THE UTILITY OWNER AT THE CONTRACTOR'S EXPENSE. UNDER NO CIRCUMSTANCE SHALL THE CONTRACTOR BACK FILL AN EXCAVATION AFFECTING SAID UTILITY WITHOUT FIRST RECEIVING PERMISSION FROM THE UTILITY OWNER.

UTILITY RELOCATION

THE CONTRACTOR IS ALERTED THAT PORTIONS OF GAS LINE, POWER AND COMMUNICATION DUCT BANKS MAY HAVE BEEN RECENTLY OR ARE BEING RELOCATED BY THEIR RESPECTIVE UTILITY COMPANY. THE CONTRACTOR SHALL OBTAIN INFORMATIONAL DRAWINGS FROM THE UTILITY COMPANIES AND COORDINATE SUCH RELOCATIONS AS PART OF THE WORK.

NO ADDITIONAL TIME WILL BE GRANTED FOR THIS WORK, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

TREE PLANTING NOTES

THERE ARE EXISTING MATURE TREES ALONG THESE STREETS. UNLESS OTHERWISE NOTED, ALL EXISTING TREES SHALL BE PRESERVED IN PLACE ACCORDING TO DDOT STANDARD SPECIFICATION 107.12 TREE PROTECTION AND REPLACEMENT. THE CONTRACTOR SHALL BE CAREFUL WHILE WORKING AROUND TREES AND IS LIABLE IN FIXED LIQUIDATED DAMAGES PER 107.12-B.8. CONTRACTOR SHALL CONTACT THE URBAN FORESTRY DIVISION AT (202) 671-5133 FOR ALL ISSUES CONCERNING TREES.

TREE PLANTING SHALL COMPLY WITH THE CURRENT VERSION OF THE DISTRICT DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND STRUCTURES AND STANDARD DRAWINGS NO. 611.18 AND 611.19. DECIDUOUS TREES SHALL ONLY BE PLANTED BETWEEN OCTOBER 15 AND MAY 1 AS PER THE SPRING AND FALL PLANTING SEASON DATES. PEAT MOSS IS NOT ALLOWED FOR USE AS A SOIL AMENDMENT.

TREE STAKING SHALL BE AS PER SECTION 608.02 (2013 DDOT SPECIFICATIONS). ONLY TWO STAKES SHALL BE INSTALLED WITH ARBOR TIES. DETAIL AND SPECIFICATION SHALL BE PROVIDED BY UFD.

DO NOT PLANT GRASS/SOD WITHIN 4 FT. OF THE ROOT FLARE OF A TREE. FINISH OFF THE ROOT FLARE WITH A 2-3" LAYER OF MULCH, BUT DO NOT PLACE UP AGAINST OR MOUND AROUND ROOT FLARE.

CONTRACTOR SHALL CONTACT THE UFD WARD ARBORIST WHEN THE TREES ARE READY TO BE PLANTED, PROVIDING AT LEAST 48 HOURS NOTICE.

DDOT STANDARD SPECIFICATIONS CALL FOR 2-YEAR WARRANTY ON ALL PLANT MATERIAL. WATERING SHALL BE PART OF THE CONTRACTORS STANDARD WARRANTY.

TREE PROTECTION NOTES

EXCAVATIONS WITHIN THE DRIPLINE OF EXISTING TRESS SHALL PROCEED WITH CARE BY USE OF HAND TOOLS. THE DRIPLINE IS DEFINED AS THE GROUND AREA UNDER THE CANOPY TO THE TREE.

NO ROOTS LARGER THAN TWO (2) INCHES IN DIAMETER ARE TO BE CUT WITHOUT UFD PERMISSION.

EXPOSED ROOTS TWO (2) INCHES AND LARGER IN DIAMETER SHALL BE WRAPPED IN BURLAP OR OTHER APPROVED MATERIAL AND KEPT MOIST AT ALL TIMES.

TRESS THAT ARE PROTECTED ARE TO BE WATERED EVERY TEN (10) DAYS FROM APRIL THROUGH SEPTEMBER.

SECTIONS 608.07 TREE PROTECTION AND REPLACEMENT AND 608.08 TREE ROOT PROTECTION OF THE 2013 DISTRICT DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND STRUCTURES WILL APPLY SHOULD ANY DAMAGE OCCUR TO THE EXISTING TREES.

ALL SEDIMENT AND EROSION CONTROL METHODS SHALL BE INSTALLED BEFORE THE START OF ANY EXCAVATION AND/OR CONSTRUCTION AS PER STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL FOR THE DISTRICT OF COLUMBIA. IF AN ON SITE INSPECTION REVEALS FURTHER EROSION CONTROL MEASURES ARE NECESSARY, THE SAME SHALL BE PROVIDED.

ALL DEBRIS IS TO BE REMOVED FROM THE SITE.

ALLEY AND/OR STREETS/SIDEWALKS SHALL BE SWEEPED CLEAN AT ALL TIMES DURING EXCAVATION AND CONSTRUCTION.

ALL CATCH BASINS AND DRAIN AREAS SHALL BE PROTECTED DURING EXCAVATION AND CONSTRUCTION.

IF ANY CATCH BASIN OR DRAIN AREA BECOMES CLOGGED AS A RESULT OF EXCAVATION OR CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ITS CLEANING.

TREES TO BE PROTECTED SHALL BE FENCED AROUND THE TREE BOX. CHAIN LINK FENCE SHALL BE USED WITH A MINIMUM HEIGHT OF 6.0 FEET ABOVE EXISTING GRADE.

ALL STABILIZATION/SEEDING WILL BE ACCOMPLISHED IN ACCORDANCE WITH THE 2003 DISTRICT OF COLUMBIA STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL, DEPARTMENT OF ENVIRONMENT.

THE CONTRACTOR SHALL INSPECT ALL EROSION AND SEDIMENT CONTROL MEASURES PERIODICALLY AND AFTER EACH RAINFALL EVENT. ANY REPAIR OR CLEAN UP NECESSARY TO MAINTAIN THE EFFECTIVENESS OF THE SEDIMENT AND EROSION CONTROL MEASURES SHALL BE MADE IMMEDIATELY.

PRIOR TO REMOVING ANY SEDIMENT AND EROSION CONTROL MEASURES, APPROVAL MUST BE GIVEN FROM DOEE/EHA.

NO AREA HAS BEEN IDENTIFIED BY DDOT FOR STORAGE. CONTRACTOR SHALL OBTAIN OFF SITE STORAGE.

|   |             |      |      |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |             |      |      |           |  |  |  |
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| DISTRICT OF COLUMBIA<br>DEPARTMENT OF TRANSPORTATION<br>INFRASTRUCTURE PROJECT MANAGEMENT DIVISION  |             |      |      |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |             |      |      |           |  |  |  |
| RETROFIT BIORETENTION<br>CURB EXTENSION   |             |      |      | PROJECT ENG. _____<br>DESIGNED BY _____<br>CHECKED BY _____<br>DRAWN BY _____<br>PROJECT MGR. _____ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |             |      |      |           |  |  |  |
| GENERAL NOTES   |             |      |      | DIVISION CHIEF _____<br><br>DATE _____<br>FILE _____<br>SHEET 1 OF 8                                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |     |             |      |      |           |  |  |  |
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| REG | STATE | PROJECT | SHEET NO. | TOTAL SHEETS |
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| 3   | D.C.  |         |           |              |

## STANDARD SYMBOLS

## ABBREVIATIONS

|  |  |  |   |
|--|--|--|---|
|  | EXISTING COMBINED SEWER MANHOLE                                      |  | PROPOSED 3'x3'x3' ELECTRICAL MANHOLE                |
|  | EXISTING STORM DRAIN MANHOLE   |  | PROPOSED 4'x4'x4' ELECTRICAL MANHOLE                |
|  | EXISTING GAS CUT-OFF   |  | PROPOSED #16 STREETLIGHT POLE                       |
|  | EXISTING SANITARY SEWER MANHOLE                                      |  | PROPOSED COMBINATION POLE                           |
|  | EXISTING WATER METER   |  | PROPOSED #18 TRAFFIC SIGNAL POLE ON STD. FOUNDATION |
|  | EXISTING WATER CUT-OFF   |  | PROPOSED TRAFFIC SIGNAL CONTROLLER                  |
|  | EXISTING FIRE HYDRANT  |  | DIRECTION OF TRAFFIC FLOW                           |
|  | EXISTING STORM, WATER OR SANITARY LINE LESS THAN 24"                 |  | PROPOSED LIMIT OF MAJOR WORK                        |
|  | EXISTING STORM, WATER OR SANITARY LINE 24" OR GREATER                |  | PROPOSED LIMIT OF REPAIR WORK                       |
|  | EXISTING UNDERGROUND ELECTRIC, GAS, TELEPHONE & COMBINED SEWER LINES |  | CURB INLET PROTECTION                               |
|  | UNDERGROUND TO BE ABANDONED  |  | RUNOFF FLOW   |
|  | PREVIOUSLY ABANDONED   |  | EXISTING TREE TO BE REMOVED                         |
|  | EXISTING LUMINAIRE & SUPPORT ARM INDICATING DIRECTION OF LIGHT       |  | EXISTING TREE TO BE PROTECTED                       |
|  | EXISTING TREE  |  | PROPOSED TREE                                       |
|  | EXISTING ELECTRIC VAULT  |  | PROPOSED CATCH BASIN                                |
|  | EXISTING CATCH BASIN   |  | PROPOSED PIPE                                       |
|  | RIGHT OF WAY LINE  |  | PROPOSED STORM DRAIN MANHOLE                        |
|  | EXISTING FENCE   |  | PROPOSED 2" PVC CONDUIT                             |
|  | EXISTING TRAFFIC SIGNAL CONTROLLER                                   |  | PROPOSED 2" & 4" PVC CONDUIT                        |
|  | EXISTING ELECTRIC, GAS, TELEPHONE & WATER MANHOLES                   |  | PROPOSED 4-4" PVC CONDUIT                           |
|  | EXISTING PEPCO MANHOLE   |  | PROPOSED 4" PVC CONDUIT(S)                          |
|  | EXISTING DDOT MANHOLE  |  | PROPOSED FIRE HYDRANT                               |
|  | EXISTING CATCH BASIN W/ SAFETY GRATE                                 |  | PROPOSED WATER VALVE                                |
|  | EXISTING TRASH/WASTE CAN   |  | PROPOSED PCC THRUST BLOCK                           |
|  | EXISTING TRAFFIC HAND BOX  |  | PROPOSED WATER METER                                |
|  | EXISTING 3'x3'x3' ELECTRICAL MANHOLE                                 |  |   |
|  | EXISTING 4'x4'x4' ELECTRICAL MANHOLE                                 |  |   |
|  | EXISTING 20 FOOT TRAFFIC SIGNAL POLE                                 |  |   |
|  | EXISTING # 14 STREETLIGHT POLE                                       |  |   |
|  | EXISTING PENDANT POLE  |  |   |
|  | EXISTING #16 STREETLIGHT POLE  |  |   |
|  | EXISTING WHEELCHAIR/BICYCLE RAMP                                     |  |   |

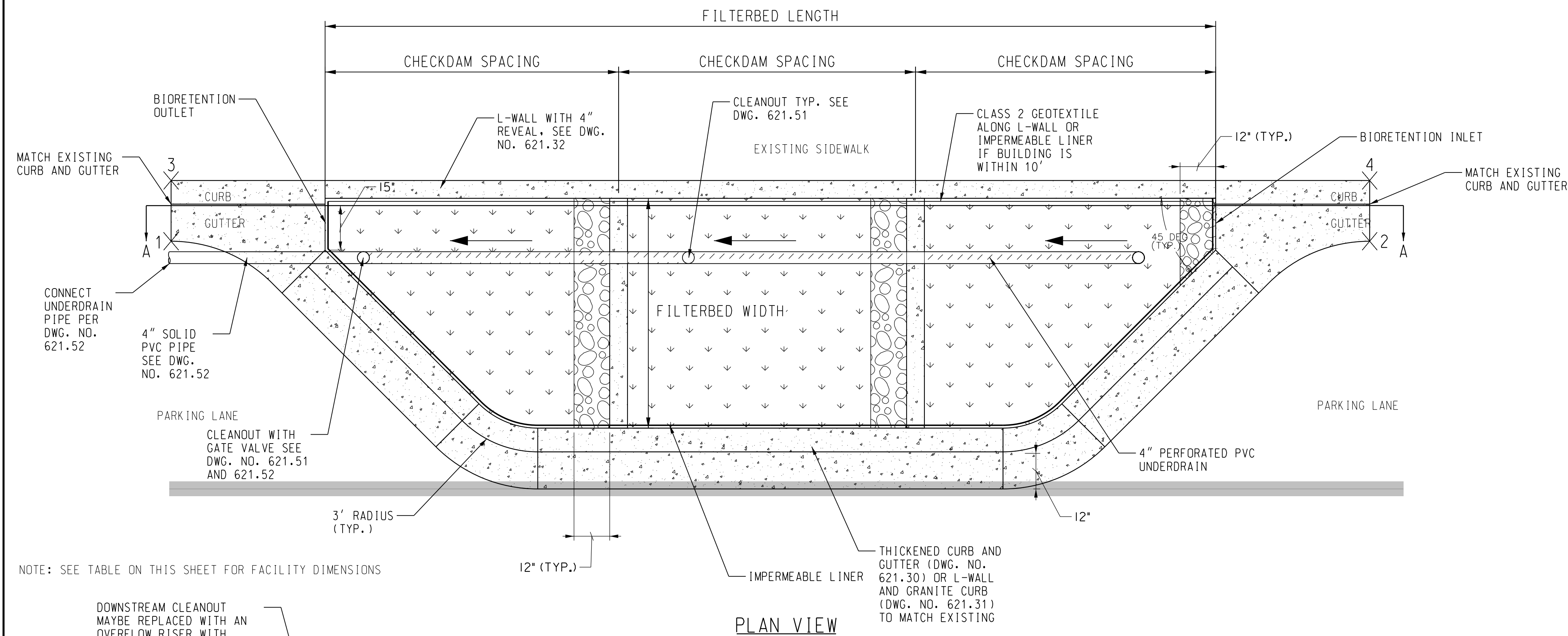
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|--------------|---|-------------|---|
| ASHTO        | American Association of State Highway<br>AND TRANSPORTATION OFFICIALS | M.U.T.C.D.  | MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES |
| AC           | ASPHALT CONCRETE  | MH/M.H.     | MANHOLE                                   |
| ADA          | AMERICANS WITH DISABILITIES ACT                                       | MAX.        | MAXIMUM                                   |
| &            | AND   | MIN.        | MINIMUM                                   |
| @            | AT  | MOT         | MAINTENANCE OF TRAFFIC                    |
| APPROX.      | APPROXIMATELY   | MOD.        | MODIFICATION                              |
| AWG          | AMERICAN WIRE GAUGE   | MTA         | MASS TRANSIT ADMINISTRATION               |
| AVE.         | AVENUE  | N           | NORTH                                     |
| ASTM         | AMERICAN SOCIETY FOR TESTING MATERIALS                                | NE/N.E.     | NORTH EAST                                |
|              |   | NEC         | NATIONAL ELECTRICAL CODES                 |
| B            | BASELINE  | N.I.C.      | NOT IN CONTRACT                           |
| B.C.         | BOLT CIRCLE   | N.T.S.      | NOT TO SCALE                              |
| BFD          | BLOCK FLOW DIAGRAM  | NO. OR #    | NUMBER                                    |
| BOT.         | BOTTOM  | NW/N.W.     | NORTH WEST                                |
|              |   | O.C.        | ON CENTER                                 |
| CI           | CAST IRON   |             |   |
| C/CL.        | CENTER LINE   | PB          | PULL BOX                                  |
| CONC.        | CONCRETE  | P.C.        | POINT OF CURVATURE                        |
| CS           | COMBINED SANITARY   | P.T./P.O.T. | POINT OF TANGENCY                         |
| CU.          | CUBIC   | PEPCO       | POTOMAC ELECTRIC AND POWER COMPANY        |
| CY           | CUBIC YARD  | PREF.       | PREFORMED                                 |
| C-C / C TO C | CENTER TO CENTER  | P.G.L.      | PROFILE GRADE LINE                        |
|              |   | R           | PLATE / PROPERTY LINE                     |
| DR.          | DRIVE   | PL.         | PLACE                                     |
| D.C. / DC    | DISTRICT OF COLUMBIA  | PLA         | PLASTIC                                   |
| DDOT         | DISTRICT OF COLUMBIA DEPARTMENT OF TRANSPORTATION                     | PCC         | PORTLAND CEMENT CONCRETE                  |
| DDOE         | DISTRICT DEPARTMENT OF THE ENVIRONMENT                                | PSI         | POUNDS PER SQUARE INCH                    |
| DI           | DUCTILE IRON  | PVC         | POLYVINYL CHLORIDE                        |
| DIA.         | DIAMETER  |             |   |
| DOH          | DEPARTMENT OF HEALTH  | R           | RADIUS                                    |
| DWG.         | DRAWING / DRAWINGS  | RD          | ROAD                                      |
| DCPDW        | DISTRICT OF COLUMBIA DEPARTMENT OF PUBLIC WORKS                       | RT          | RIGHT                                     |
| DCMR         | DISTRICT OF COLUMBIA MUNICIPAL REGULATION                             | R.O.W.      | RIGHT OF WAY                              |
| E            | EAST / ELECTRIC   | S           | SOUTH                                     |
| E.F.         | EACH FACE   | SS          | SANITARY SEWER                            |
| E.W.         | EACH WAY  | SAN.        | SANITARY                                  |
| EHA          | ENVIRONMENTAL HEALTH ASSOCIATION GROUP                                | SE/S.E.     | SOUTH EAST                                |
| EL./ELEV.    | ELEVATION   | SD          | STORM DRAIN                               |
| EXIST.       | EXISTING  | SF          | SQUARE FEET                               |
| EXP.         | EXPANSION   | SPEC        | SPECIFICATIONS                            |
|              |   | SL          | STREET LIGHTING                           |
| F.L.         | FLOW LINE   | SW/S.W.     | SOUTH WEST                                |
| FT.          | FEET / FOOT   | S/W         | SIDEWALK                                  |
| G            | GAS   | ST.         | STREET                                    |
| GALV.        | GALVANIZED  | STA.        | STATION                                   |
| GND.         | GROUND  | STD./ST'D   | STANDARD                                  |
|              |   | STL         | BARE STEEL                                |
|              |   | S.Y.        | SQUARE YARD                               |
| HB           | HAND BOX  | T           | TELEPHONE                                 |
| HDPE         | HIGH DENSITY POLYETHALINE   | TC          | TRAFFIC CONTROLLER                        |
| HR           | HOURL   | TYP.        | TYPICAL                                   |
| H.A.C.P.     | HOT ASPHALT CONCRETE PAVEMENT   | TS          | TRAFFIC SIGNALS                           |
| HPS          | HIGH PRESSURE SODIUM  | TRAV.       | TRAVERSE                                  |
| I.D.         | INSIDE DIAMETER   | W           | WEST / WATTS                              |
| IN.          | INCH  | W/          | WITH                                      |
| INC.         | INCORPORATED  | W/C         | WHEEL CHAIR                               |
| JT. / JTS.   | JOINT / JOINTS  | WASA        | WATER AND SEWER AUTHORITY / D.C. WATER    |
| L            | LUMINAIRE   | WRPD        | WRAPPED STEEL                             |
| LBS          | POUNDS  | WMATA       | WASHINGTON METROPOLITAN                   |
| LF           | LINEAR FEET   |             | TRANSIT AUTHORITY                         |
| LS           | LUMP SUM  |             |   |
| LT           | LEFT  |             |   |

DWG. NO.  
GN-02

**DISTRICT OF COLUMBIA**  
**DEPARTMENT OF TRANSPORTATION**

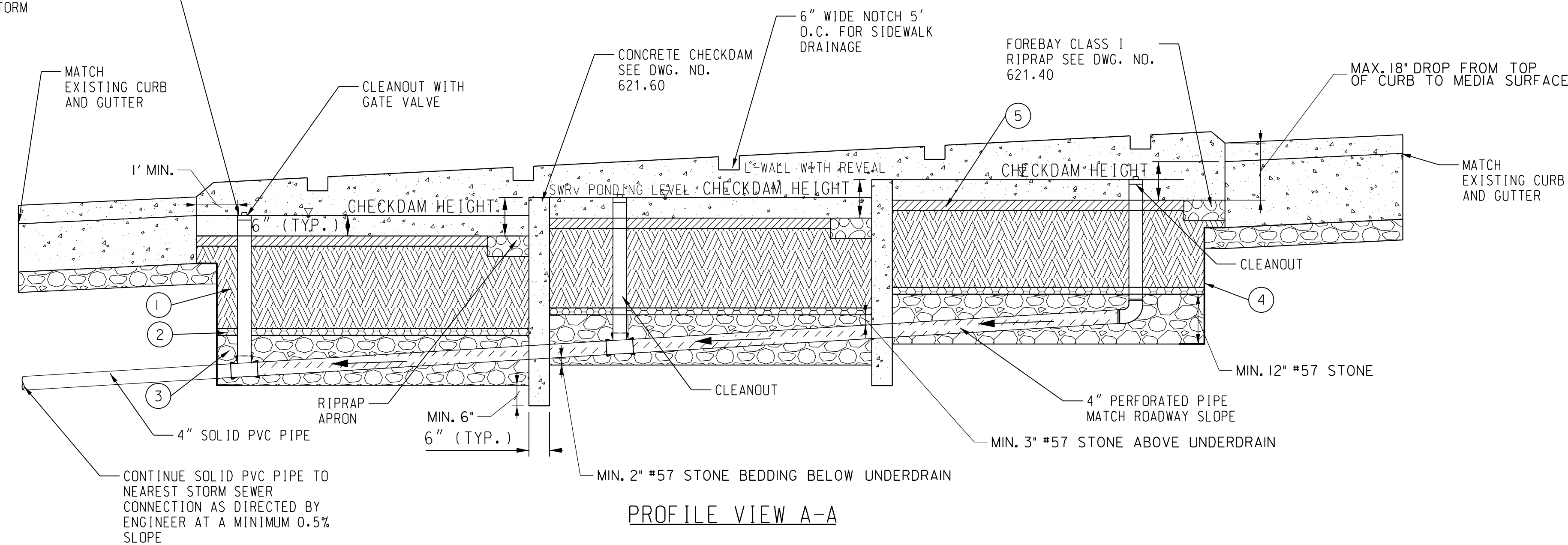
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| DISTRICT OF COLUMBIA<br>DEPARTMENT OF TRANSPORTATION<br>INFRASTRUCTURE PROJECT MANAGEMENT DIVISION |   |
| RETROFIT BIORETENTION<br>CURB EXTENSION  | PROJECT ENG. _____<br>DESIGNED BY _____<br>CHECKED BY _____<br>DRAWN BY _____<br>PROJECT MGR. _____ |
| STANDARD SYMBOLS AND<br>ABBREVIATIONS  | DIVISION CHIEF _____<br><br>DATE _____<br>FILE _____<br>SHEET 2 OF 8                                |



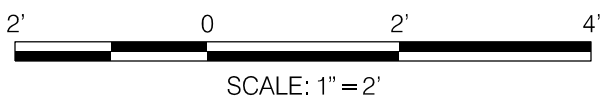
- NOTES:
- UNDERDRAIN PIPE SHALL BE A SOLID PVC PIPE 1' BEFORE IT LEAVES THE BIORETENTION GRAVEL AREA.
  - A CLEANOUT SHOULD BE INCLUDED AT EACH END OF THE BIORETENTION AND SHALL BE SPACED A MAXIMUM DISTANCE OF 100 FT APART.
  - SEE DWG. NO. 621.24 FOR CROSS SECTION
  - SEE DWG. NO. 621.25 FOR STRUCTURAL NOTES

| DIMENSION                   | VALUE | UNITS |
|-----------------------------|-------|-------|
| FILTERBED LENGTH            |       | FT    |
| FILTERBED WIDTH             |       | FT    |
| ROADWAY SLOPE               |       | FT/FT |
| AASHTO #57 THICKNESS        |       | IN    |
| NO. OF CHECK DAMS           |       |       |
| CHECKDAM SPACING            |       | FT    |
| CHECKDAM HEIGHT             |       | IN    |
| IMPERMEABLE LINER ON BOTTOM |       |       |



| SURVEY CONTROL POINTS |           |                        |
|-----------------------|-----------|------------------------|
| NUMBER                | ELEVATION | LOCATION               |
| 1                     |           | DOWNSTREAM GUTTER PAN  |
| 2                     |           | UPSTREAM GUTTER PAN    |
| 3                     |           | DOWNSTREAM TOP OF CURB |
| 4                     |           | UPSTREAM TOP OF CURB   |

- LEGEND:
- ① BIORETENTION SOIL, 30" DEPTH
  - ② CHOKER LAYER, SAND & GRAVEL, 3" DEPTH
  - ③ AASHTO #57 STONE, DOUBLE WASHED, SEE CONSTRUCTION TABLE
  - ④ IMPERMEABLE LINER
  - ⑤ MULCH LAYER, 3" DEPTH



| NO.       | DESCRIPTION | NAME | DATE |
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DWG. NO.  
SW-01

DISTRICT OF COLUMBIA  
DEPARTMENT OF TRANSPORTATION  
INFRASTRUCTURE PROJECT MANAGEMENT DIVISION

RETROFIT BIORETENTION  
CURB EXTENSION

PLAN & PROFILE VIEW

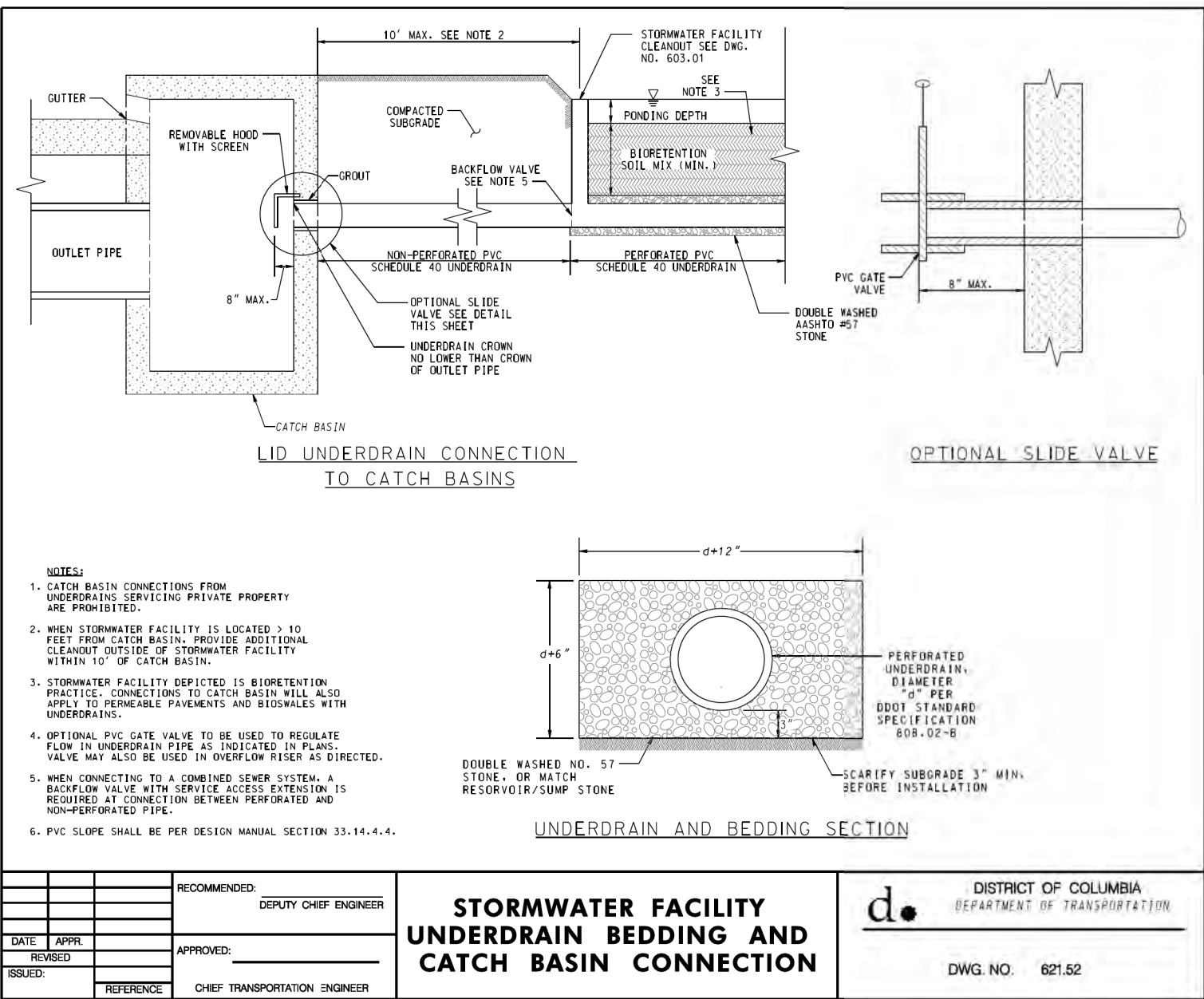
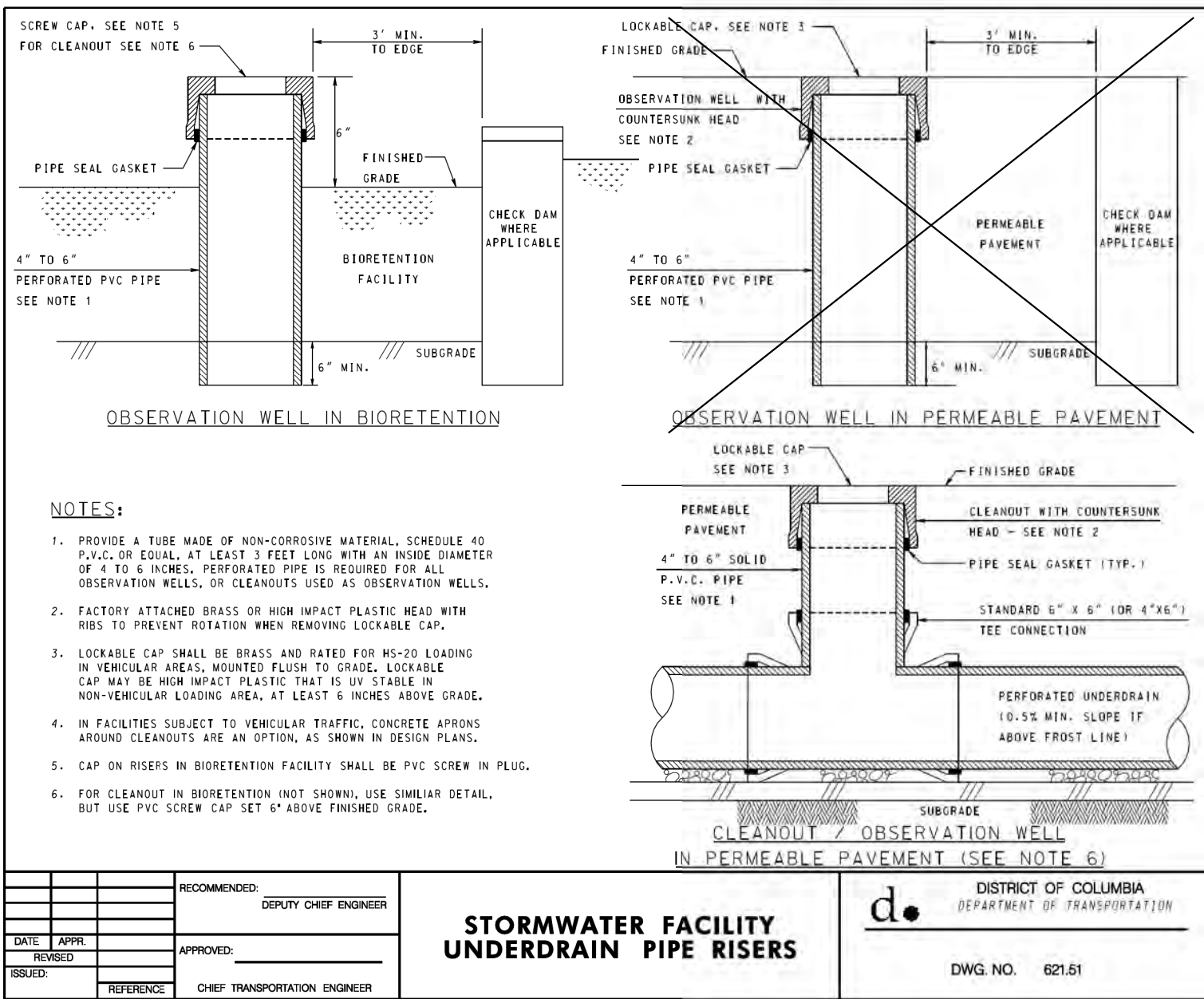
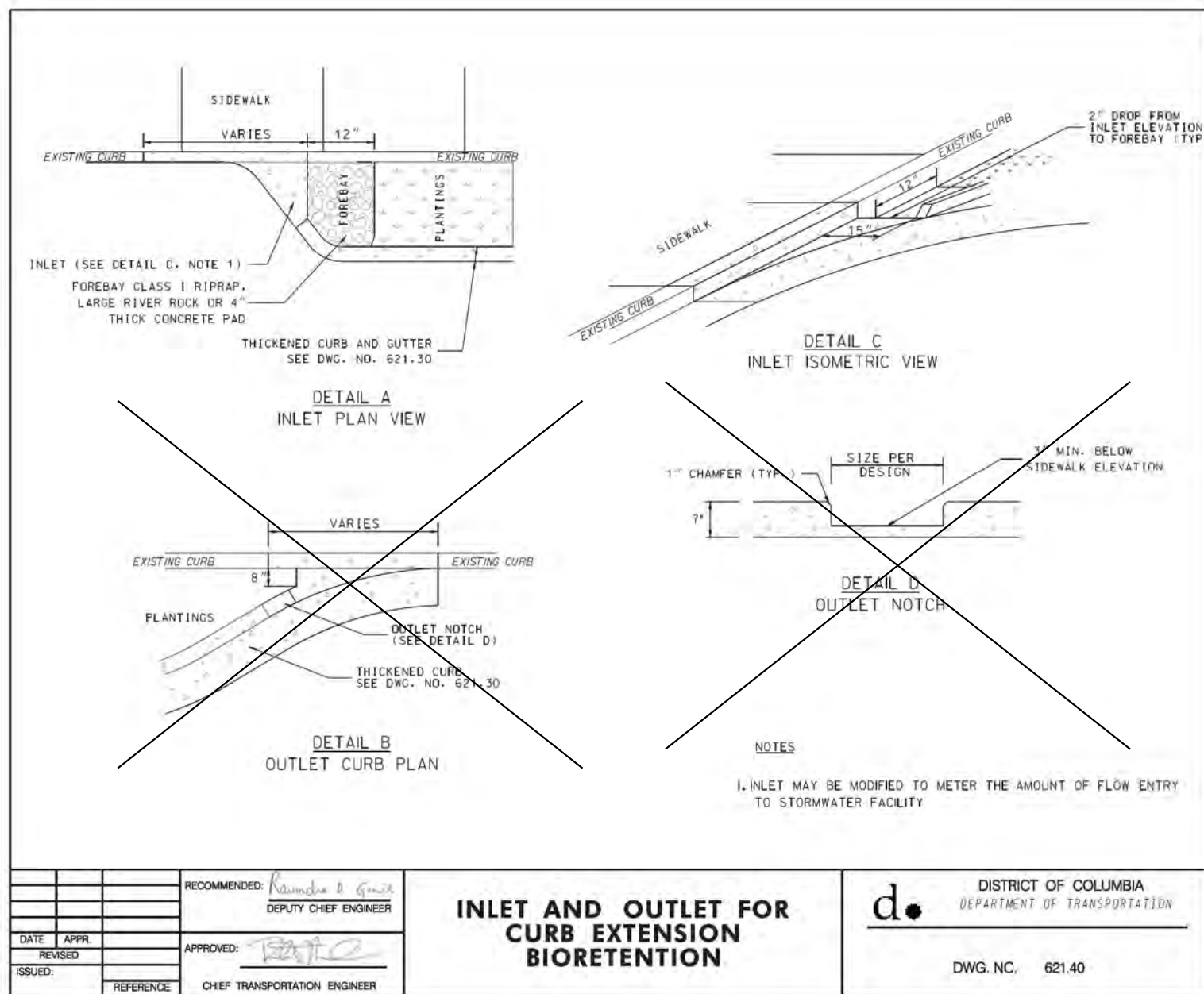
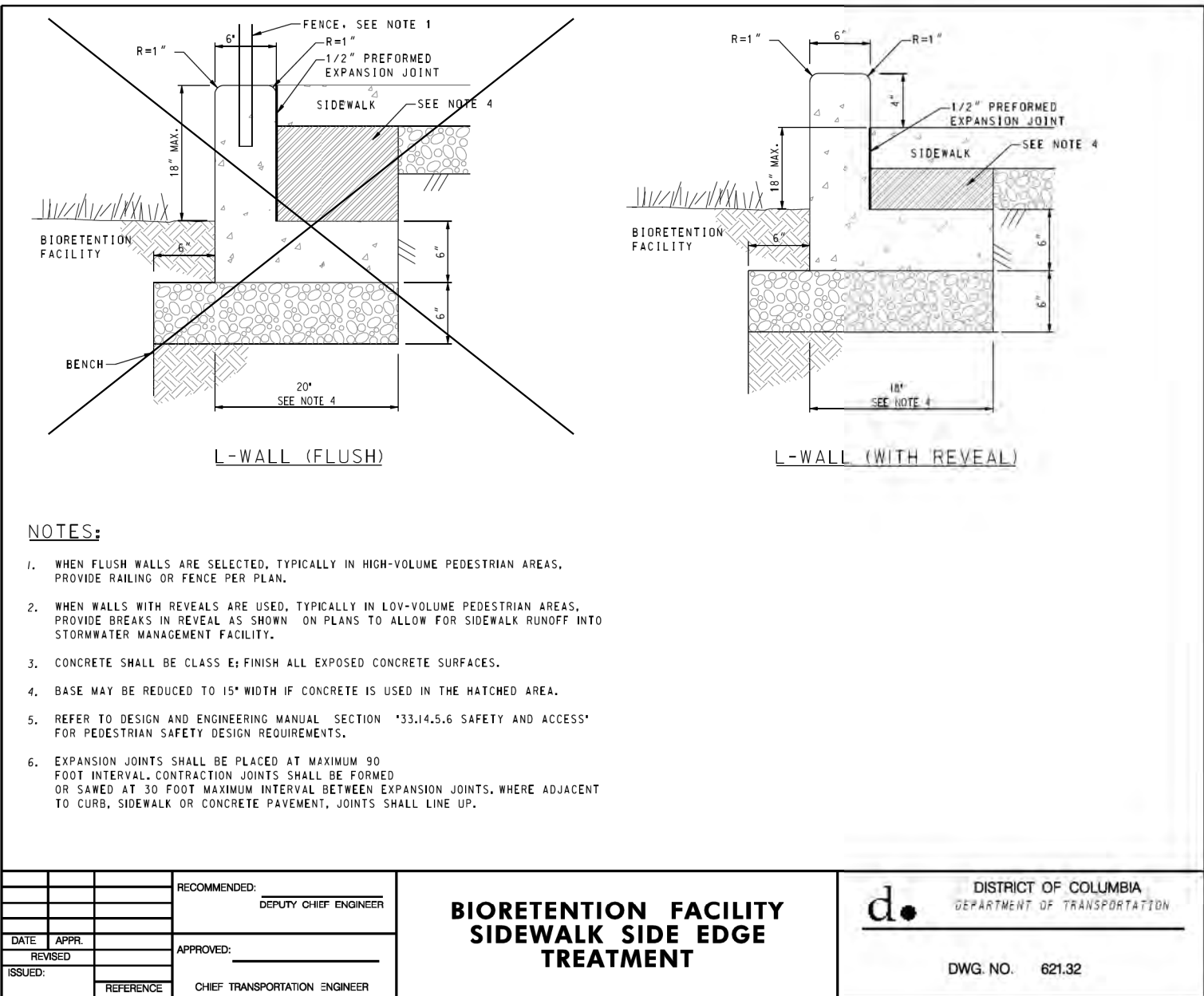
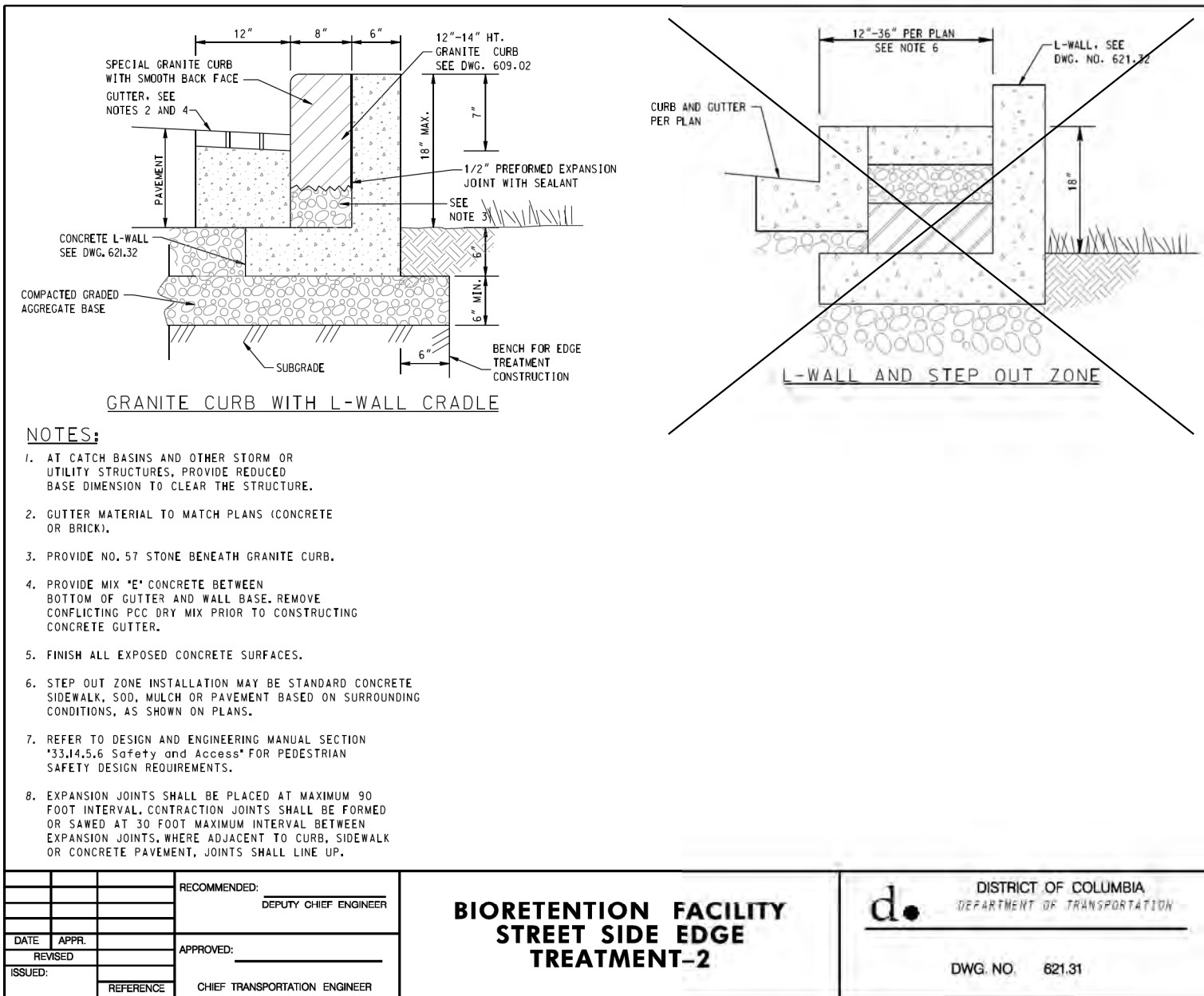
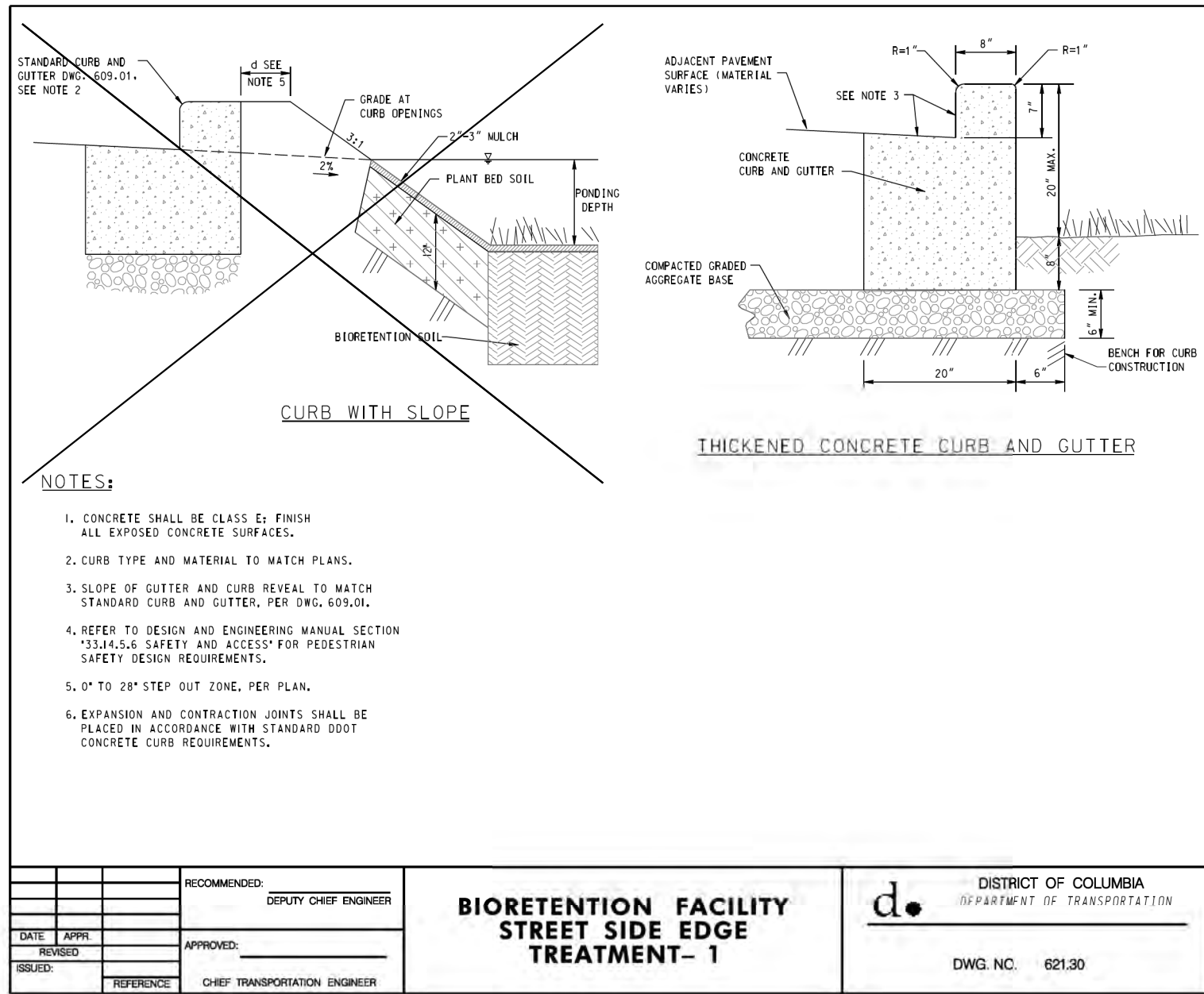
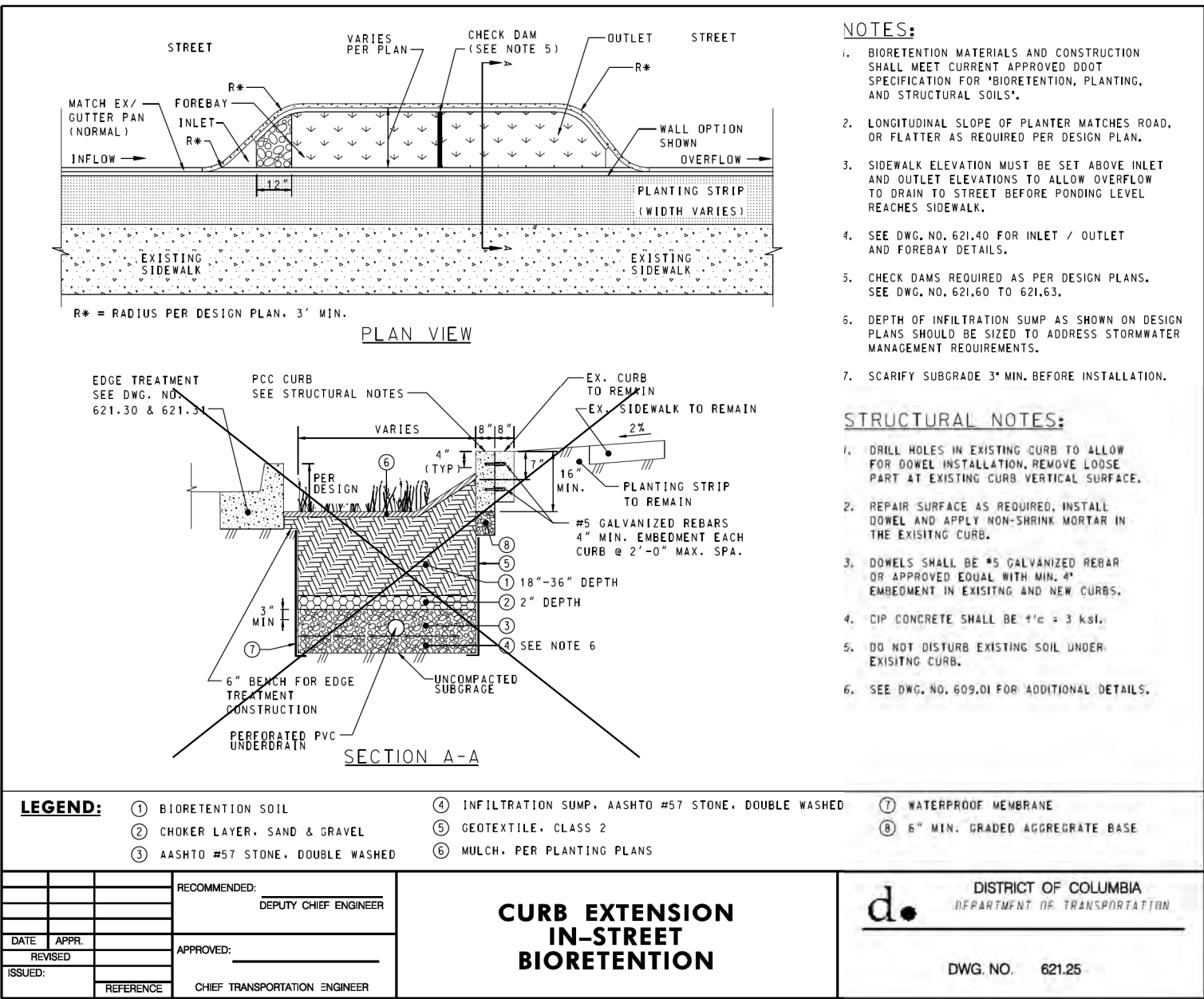
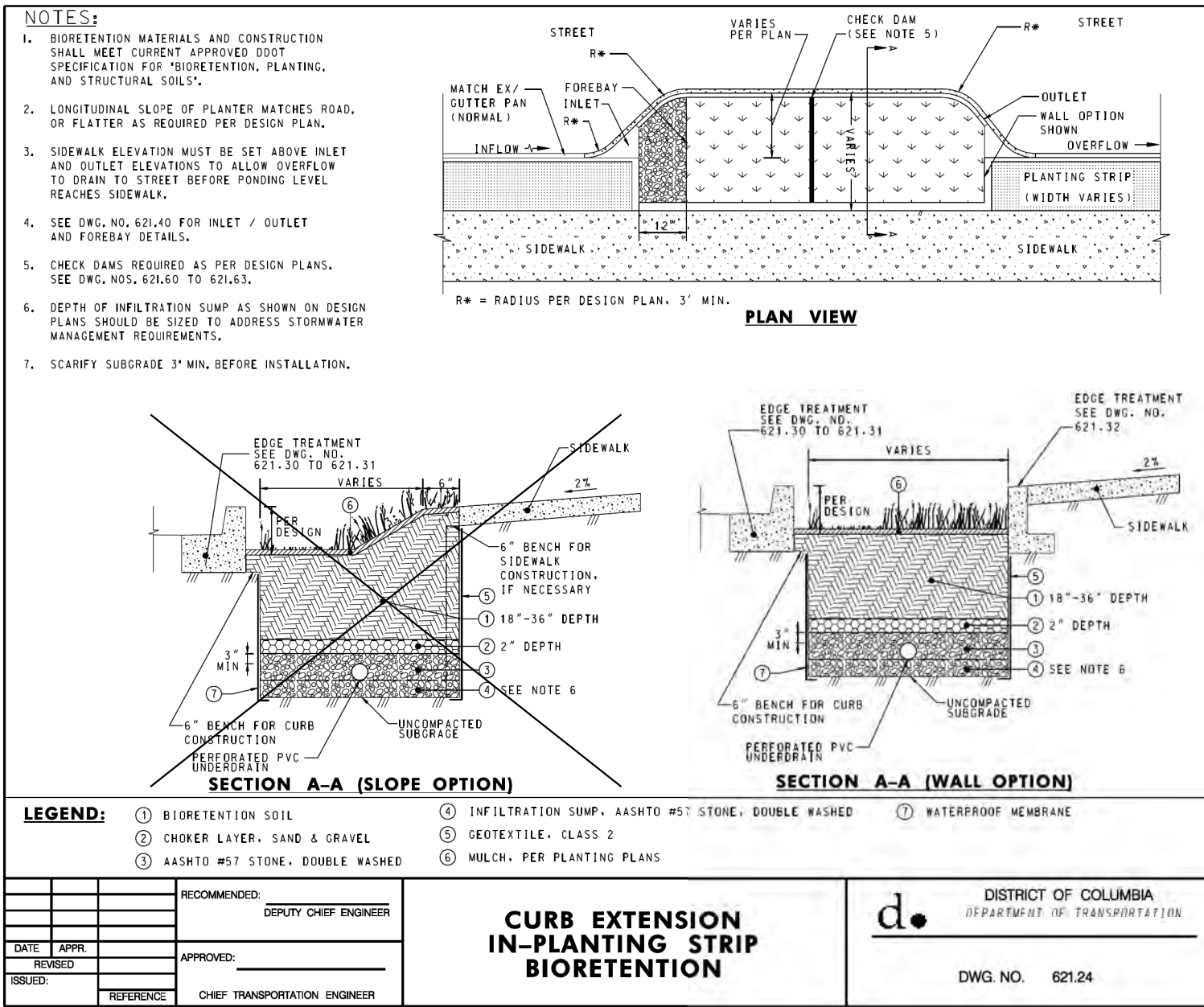
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PROJECT MGR. \_\_\_\_\_

DIVISION CHIEF

DATE \_\_\_\_\_  
FILE \_\_\_\_\_  
SHEET 3 OF 8



| REG | STATE | PROJECT | SHEET NO. | TOTAL SHEETS |
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| 3   | D.C.  |         |           |              |



DWG. NO.  
DE-01

DISTRICT OF COLUMBIA  
DEPARTMENT OF TRANSPORTATION  
INFRASTRUCTURE PROJECT MANAGEMENT DIVISION

RETROFIT BIORETENTION  
CURB EXTENSION

PROJECT ENG. \_\_\_\_\_  
DESIGNED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_  
DRAWN BY \_\_\_\_\_  
PROJECT MGR. \_\_\_\_\_

DIVISION CHIEF

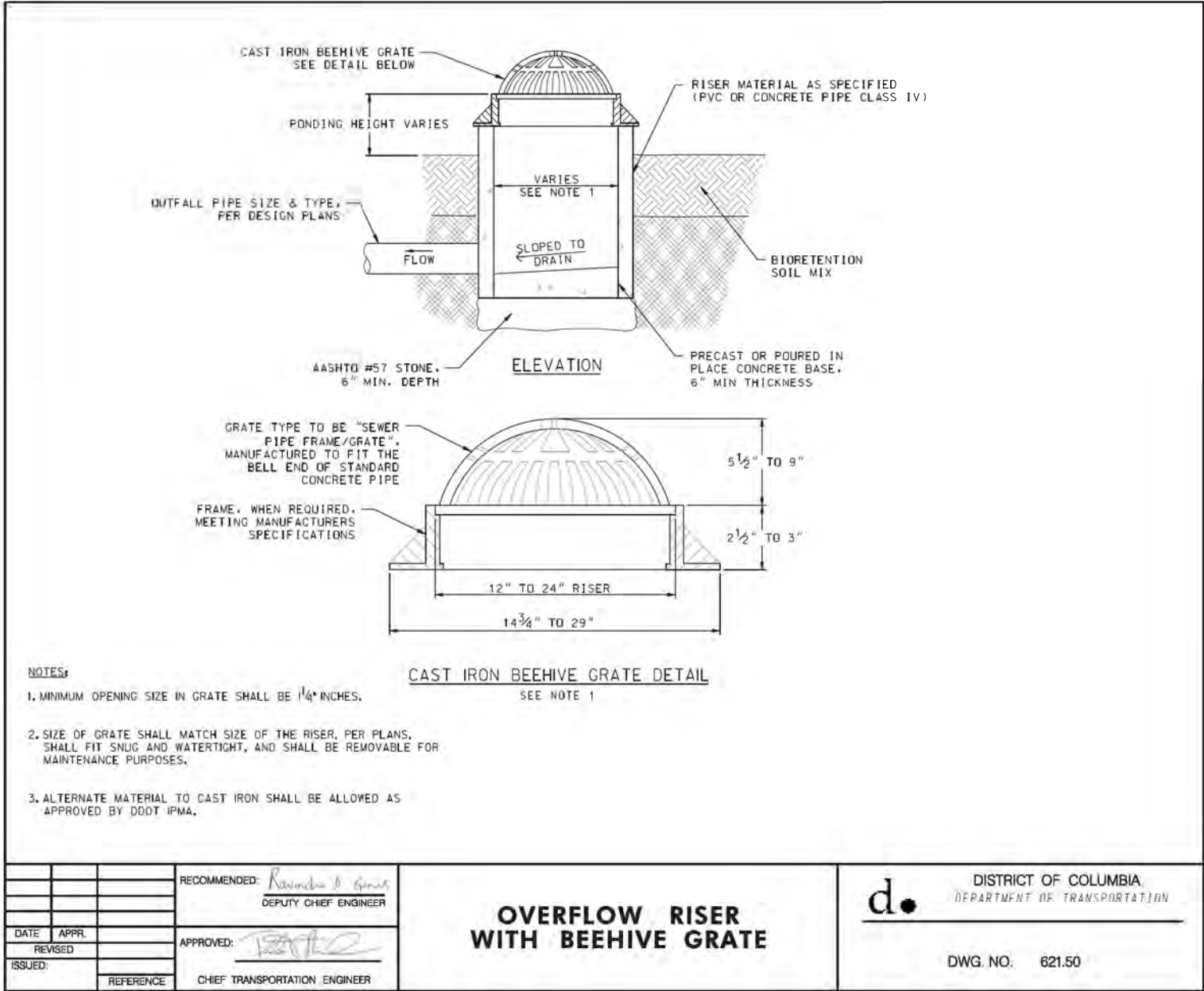
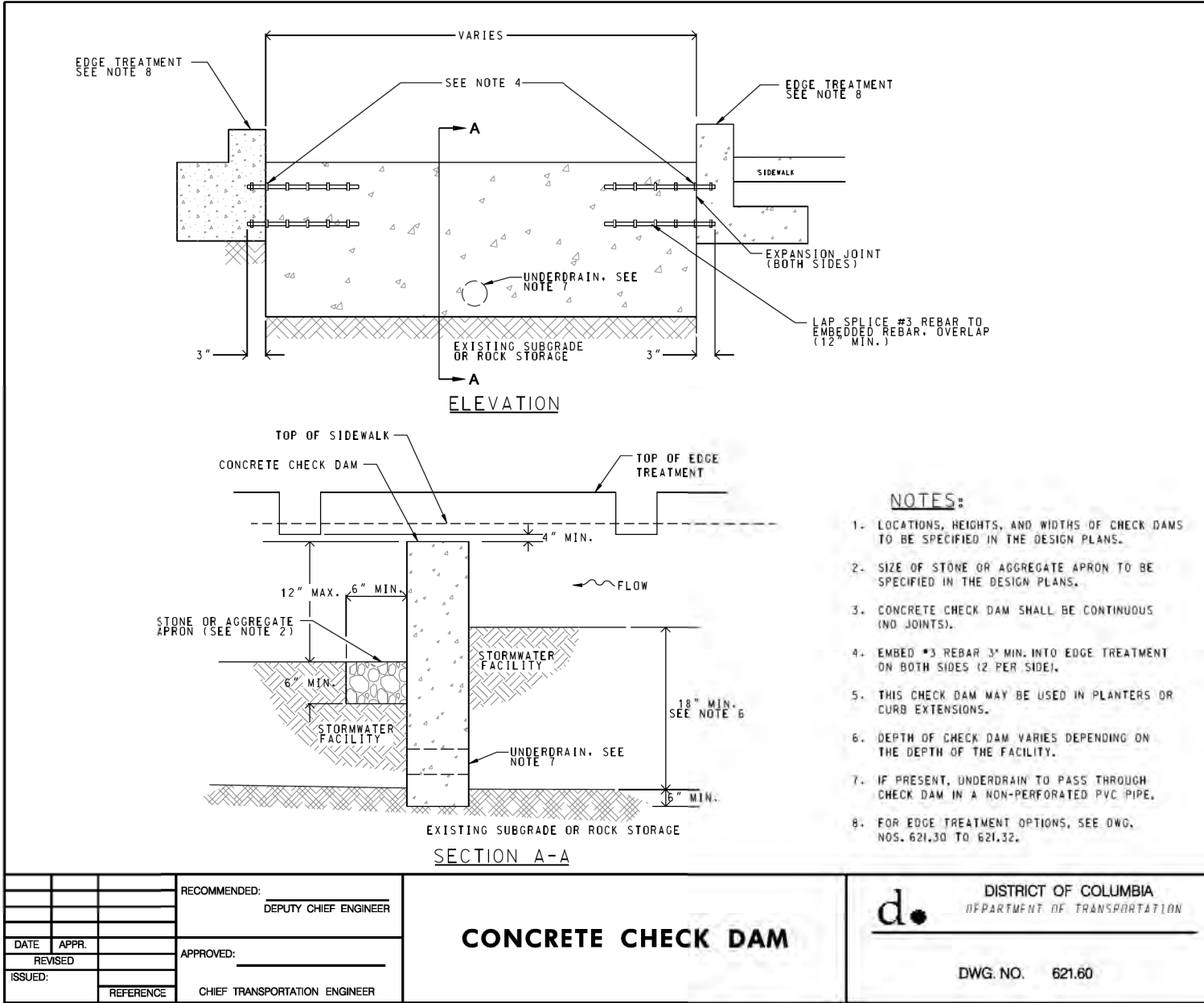
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SHEET 4 OF 8

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| REG | STATE | PROJECT | SHEET NO. | TOTAL SHEETS |
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NOTE:

THE STANDARDIZED DESIGNS WERE DEVELOPED WITH CONCRETE CHECK DAMS. ALTERNATE CHECK DAMS FROM DDOT GREEN INFRASTRUCTURE STANDARDS MAY BE USED IF THE MODIFIED FACILITY VOLUME AND GEOMETRY IS CONFIRMED BY A LICENSED ENGINEER.

DWG. NO.  
DE-02

DISTRICT OF COLUMBIA  
DEPARTMENT OF TRANSPORTATION  
INFRASTRUCTURE PROJECT MANAGEMENT DIVISION

RETROFIT BIORETENTION  
CURB EXTENSION

PROJECT ENG. \_\_\_\_\_  
DESIGNED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_  
DRAWN BY \_\_\_\_\_  
PROJECT MGR. \_\_\_\_\_

DIVISION CHIEF

DETAILS

DATE \_\_\_\_\_  
FILE \_\_\_\_\_  
SHEET 5 OF 8

| NO        | DESCRIPTION | NAME | DATE |
|-----------|-------------|------|------|
| REVISIONS |             |      |      |

| REG | STATE | PROJECT | SHEET NO. | TOTAL SHEETS |
|-----|-------|---------|-----------|--------------|
| 3   | D.C.  |         |           |              |

AS-BUILT CERTIFICATION BY PROFESSIONAL ENGINEER

Within 21 days after completion of construction of all stormwater best management practices (BMPs), stormwater infrastructure, and land covers (collectively the "Facility"), please send this page to the Regulatory Review Division of the Department of Energy and Environment.

1. Facility information:

Source Name: \_\_\_\_\_  
Source Location Street: \_\_\_\_\_  
City: \_\_\_\_\_  
DCRA Permit No.: \_\_\_\_\_  
Date Issued: \_\_\_\_\_

2. As Built Certification

I hereby certify that all stormwater best management practices (BMPs), stormwater infrastructure, and land covers have been built substantially in accordance with the approved plans and specifications and that any deviations noted below will not prevent the system from functioning in compliance with the requirements Chapter 5 of Title 21 of the District of Columbia Municipal Regulations when properly maintained and operated. These determinations have been based upon on-site observation of construction, scheduled and conducted by me or by a project representative under my direct supervision. I have enclosed one set of as-built engineering drawings.

|                       |                                  |
|-----------------------|----------------------------------|
| Signature of Engineer | Name (Please Type) D.C. Reg. No. |
| Affix Seal:           | _____                            |
|                       | Company Name                     |
|                       | Company Address                  |
|                       | Date: _____ Phone No.: _____     |

Substantial deviations from the approved plans and specifications (attach additional sheets if required).

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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), stormwater infrastructure, 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 specification required under Chapter 5 of Title 21 of the District of Columbia Municipal Regulations. It is also stated that the undersigned has furnished the applicant with a set of instructions for the maintenance and operation of the site's Facility.

|             |                              |
|-------------|------------------------------|
| Affix Seal: | Name and Title (please type) |
|             | Address                      |
|             | Date _____ Phone No. _____   |

STATEMENT BY PERSON RESPONSIBLE FOR MAINTENANCE

The undersigned agrees to maintain compliance with the performance requirements and other provisions of Chapter 5 of Title 21 of the District of Columbia Municipal Regulations (DCMR). This includes maintaining and operating stormwater best management practices (BMPs), stormwater infrastructure, and land covers as specified in the Stormwater Management Plan approved by the District Department of Energy and Environment (DOEE).

Responsibility for maintenance and operation may be transferred to another entity upon written notice to the Regulatory Review Division of DOEE from the undersigned and the entity assuming responsibility. This notice must certify that the transfer of responsibility for maintenance and operation is in compliance with 21 DCMR Chapter 5.

|   |
|---|
| Signature of the person responsible for maintenance (it may be the applicant) |
| Name and Title (please type)  |
| Address   |
| Date _____ Phone No. _____  |

DWG. NO.  
DE-03

DISTRICT OF COLUMBIA  
DEPARTMENT OF TRANSPORTATION  
INFRASTRUCTURE PROJECT MANAGEMENT DIVISION

RETROFIT BIORETENTION  
CURB EXTENSION

PROJECT ENG. \_\_\_\_\_  
DESIGNED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_  
DRAWN BY \_\_\_\_\_  
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\*THIS SHEET IS A PLACEHOLDER FOR:  
1. STORMWATER COMPLIANCE SHEETS  
2. MAINTENANCE STAMPS AND INSPECTION FORMS  
3. MAINTENANCE OF TRAFFIC

DWG. NO.  
DE-04

DISTRICT OF COLUMBIA  
DEPARTMENT OF TRANSPORTATION  
INFRASTRUCTURE PROJECT MANAGEMENT DIVISION

RETROFIT BIORETENTION  
CURB EXTENSION

PROJECT ENG. \_\_\_\_\_  
DESIGNED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_  
DRAWN BY \_\_\_\_\_  
PROJECT MGR. \_\_\_\_\_

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# Green Infrastructure Standardized Report

May 2022

PREPARED BY:



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- Appendix A. Existing Site Drainage Area Map
- Appendix B. Practice Sizing Calculations



## List of Acronyms

| Acronym     | Definition                            |
|-------------|---------------------------------------|
| <b>BMP</b>  | Best Management Practices             |
| <b>DDOT</b> | District Department of Transportation |
| <b>DOEE</b> | Department of Energy and Environment  |
| <b>LOD</b>  | Limits of Disturbance                 |
| <b>MEP</b>  | Maximum Extent Practicable            |
| <b>MS4</b>  | Municipal Separate Storm Sewer System |
| <b>PROW</b> | Public Right of Way                   |
| <b>SDA</b>  | Site Drainage Area                    |
| <b>SMM</b>  | Stormwater Management Map             |
| <b>Sv</b>   | Storage Volume                        |
| <b>SWMP</b> | Stormwater Management Plan            |
| <b>SWRv</b> | Stormwater Retention Volume           |
|             |                                       |
|             |                                       |
|             |                                       |

## 1. Background

The purpose of this report is to provide a template for the District of Columbia Department of Transportation (DDOT) to describe specific Green Infrastructure (GI) project locations within the Public Right-of-Way (PROW). The goal of the report template is to remove reporting variability to across the District and among departments, while providing a logical narrative form that identifies the existing project conditions, proposes an appropriate GI practice, and quantifies the provided stormwater retention volume (SWRv).

## 2. Introduction

The District of Columbia Department of Transportation (DDOT) proposes constructing green infrastructure practices as a voluntary mitigation project to improve the waters of the District. Projects constructed within the existing Public Right of Way (PROW) must adhere to District Department of Energy and Environment (DOEE) stormwater regulations to the Maximum Extent Practicable (MEP). These objectives are achieved by implementing BMPs that minimize stormwater runoff and maximize stormwater retention based on the opportunities and constraints of a project site (DOEE SWM, B-10). DDOT PROW projects are classified as Type 1 projects, which require a Stormwater Management Plan (SWMP) to be submitted along with the 30 percent, 65 percent, 90 percent and Final (100 percent) design packages (DDOT, 28-18). Each design package includes content of increasing detail and each SWMP includes a stormwater management map (SMM), MEP worksheet and a project narrative.

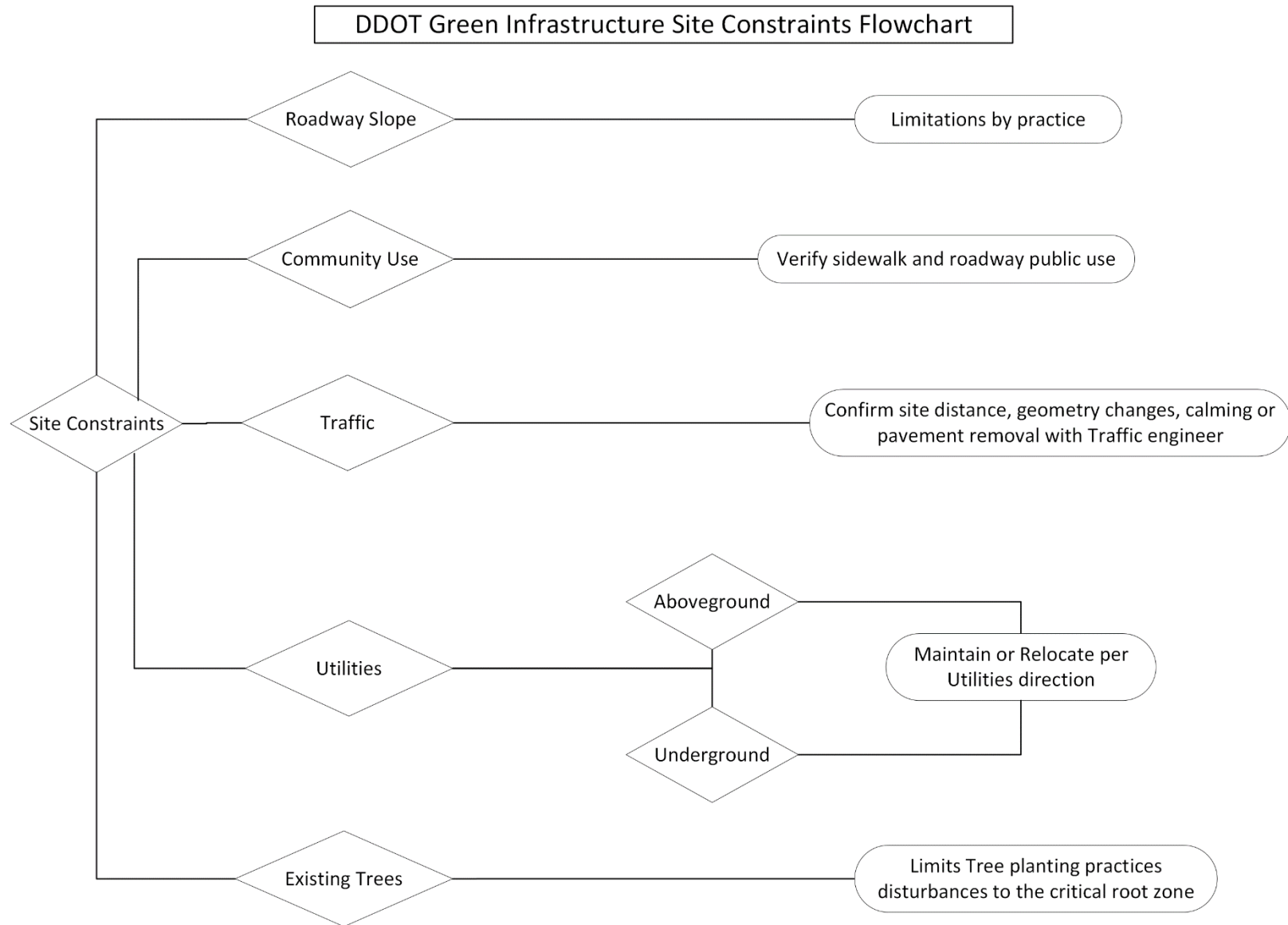
### 3. Standardized Designs

The list of proposed green infrastructure (GI) best management practices (BMPs) is provided below. The specific BMP selection, footprint, and sizing differs with the project location. The relevant site constraints for BMP selection in the public right of way is shown in Figure 1.

- Bioretention Curb Extension
- Streetscape Bioretention
  - With step out zone
  - Without step out zone
- Street Tree Bumpouts
  - Small tree (with or without permeable sidewalk and sand-based structural soil (SBSS))
  - Medium tree (with permeable sidewalk and SBSS)
  - Large tree (with permeable sidewalk and SBSS)
- Permeable Pavement in Alleys
- Impervious Removal
  - Refuge islands, landscaped
  - Slip lane, landscaped
  - Corner Curb, landscaped

With the identified site constraints, the project manager can specify applicable GI practices based on PROW location, existing utilities, traffic requirements, roadway slopes, tree plantings, and intended purposes. Once the practice is selected, the design moves into the design approach, a six-step process summarized in the next section. The template acts as a guide for the design to produce a GI practice that meets DDOT construction standards. Tables are left intentionally blank as each site and chosen practice is different. For instance, one site may have multiple drainage areas and the capacity for curb extension practices. Another site may be a refuge island with impervious removal and landscaping potential.





*Figure 1. Green Infrastructure Site Constraints.*

## 4. Design Approach

Type 1 PROW projects follow a 6-step design process.

### 4.1. General Design Process

- Step 1 – Identify Site Drainage Areas and Calculate SWRv
- Step 2 – Evaluate Infiltration
- Step 3 – Demonstrate Full Consideration of Existing Infrastructure
- Step 4 – Demonstrate Full Consideration of Land Cover Conversions and Optimum BMP Placement
- Step 5 – Size Selected BMPs based on the constraints identified

#### 4.1.1. Step 1 – Identify Site Drainage Areas and Calculate SWRv

The total drainage area, mapped in Appendix A is XX SF and the total SWRv is XX CF.

#### 4.1.2. Step 2 – Evaluate Infiltration

The following features should be identified at each site:

- Hydrologic Soil Group (HSG) data (*To be identified during Desktop Analyses*)
- Water Table Elevations (*To be obtained from Geotechnical Investigations*)
- Bedrock Conflicts (*To be obtained from Geotechnical Investigations*)
- Hot Spots, as listed in Appendix Q of the DDOE Stormwater Management Guidebook (DDOE, 2020) (*e.g., Vehicle Maintenance and Repair, Vehicle Fueling; To be identified during Field Investigations*)
- Infiltration Feasibility Test Results (*To be obtained from Geotechnical Investigations*)

The site drainage area conflicts and constraints are summarized in Table 1.

*Table 1 - Site Constraints*

| Site Constraints               | Status   |
|--------------------------------|----------|
| Water Table Elevation < 2 ft.? | (Yes/No) |
| Bedrock < 2 ft.?               | (Yes/No) |
| Hot Spots located at site?     | (Yes/No) |
| Is Infiltration feasible?      | (Yes/No) |

#### 4.1.3. Step 3 – Demonstrate Full Consideration of Existing Infrastructure

The existing utility infrastructure at the site should be avoided, if possible. However, if utility conflict must occur, the design should consult each affected utility company on recommended offsets to allow utility maintenance with minimal disturbance to the BMP. The designer should coordinate with the utility company to replace or relocate utilities in conjunction with the BMP installation. The BMP should provide sufficient soil coverage of the utility. Finally, assume that conflicting utility maintenance will temporarily impact the BMP but will be restored to its original condition.

For each SDA, the following utility information is presented in Table 2 based on desktop assessments and field investigations.

*Table 2 - Utility Conflicts*

| Utility | Minimum Elevation (FT) | Maximum Elevation (FT) | Potential Conflict |
|---------|------------------------|------------------------|--------------------|
|         |                        |                        | (Yes/No)           |
|         |                        |                        | (Yes/No)           |
|         |                        |                        | (Yes/No)           |

For each site, existing trees are identified based on desktop assessments and field investigations. The existing trees diameter breast height (DBH) and health are provided in Table 3 and noted as removal or maintenance. Tree preservation must be provided to the maximum extent practicable.

*Table 3 - Existing trees*

| Tree ID | DBH, in | Health | Removal? |
|---------|---------|--------|----------|
|         |         |        | (Yes/No) |
|         |         |        | (Yes/No) |
|         |         |        | (Yes/No) |

#### 4.1.4. Step 5 – Size Selected BMPs

Based on the results of the site analysis a BMP footprint of XX ft by XX ft can be constructed without interfering with utilities or roadway users. The BMP design targets treating the required 1.2 inches but may be oversized to the regulated ceiling of 1.7 inches. The proposed BMP



contributing drainage area (CDAs) is presented in appendix A. If the BMP cannot achieve the target for the CDA volume, document the constraints and provide of the largest volume treatable given the constraints.

The selected BMPs are sized and summarized in Table 4.

*Table 4 - Selected BMP sizing summary*

| SDA ID | BMP Type | Width (FT) | Length (FT) | Area (SF) | Storage depth (FT) |
|--------|----------|------------|-------------|-----------|--------------------|
|        |          |            |             |           |                    |

## 5. Conclusions

The site drainage area requires XX cf of stormwater retention volume. The selected BMPs [list selected BMPs] and land cover conversion [list land cover conversions] provide XX cf of stormwater retention volume. The project has a net/deficit volume of XX cf.

## 6. References

DDOE. (2020). *Stormwater Management Guidebook*. Washington, D.C.: Department of Energy and Environment.

DDOT. (2014). *DDOT Green Infrastructure Standards*. Washington, D.C.: District of Columbia Department of Transportation.

DDOT. (2019). *Design and Engineering Manual*. Washington, D.C.: DDOT.

## Appendices



## Appendix A. Existing Site Drainage Area Map

*Appendix A. Existing Site Drainage Area Map Checklists*

Includes existing features and constraints

- Sewer utilities
- Water utilities
- Electric utilities
- Gas utilities

## Appendix B. Practice Sizing Calculations

Insert PDF of the appropriate standardized design spreadsheets for bioretention, permeable pavement or street tree curb extensions