

Infiltration and Filter System Construction Specifications

Infiltration and filter systems either take advantage of existing permeable soils or create a permeable medium such as sand for infiltration, and are used in some instances where permeability is great, these facilities may be used for up to 100% of the total runoff. The most common systems include infiltration trenches, infiltration basins, sand filters, and organic filters.

When properly planted, vegetation will thrive and enhance the functioning of these systems. For example, pre-treatment buffers will trap sediments that often are bound with phosphorus and metals. Vegetation planted in the facility will aid in nutrient uptake and water storage. Additionally, plant roots will provide aeration for stormwater to permeate soil for groundwater recharge. Finally, successful infiltration provides aesthetic value and wildlife habitat making these facilities more desirable to the public.

- Design Constraints:**
- > Planting buffer strips of at least 20 feet will cause sediments to settle out before reaching the facility, thereby reducing the possibility of clogging.
 - > Determine areas that will be saturated with water and water table depth so that appropriate plants may be selected (hydrology will be similar to bioretention facilities, see Figure A.5 and Table A.4 for planting material guidelines).
 - > Plants known to send down deep taproots should be avoided in systems where filter fabric is used as part of facility design.
 - > Test soil conditions to determine if soil amendments are necessary.
 - > Plants shall be located so that access is possible for structure maintenance.
 - > Stabilize heavy flow areas with erosion control mats or sod.
 - > Temporary divert flows from encroached areas until vegetation is established.
 - > See Table A.5 for additional design considerations.

Soil Bed Characteristics

The characteristics of the soil for the bioretention facility are perhaps as important as the facility location, size, and treatment volume. The soil must be permeable enough to allow runoff to filter through the media, while having characteristics suitable to promote and sustain a robust vegetative cover crop. In addition, much of the nutrient pollution within (nitrogen and phosphorus) is accomplished through absorption and microbial activity within the soil profile. Therefore, soils must balance their chemical and physical properties to support biotic communities above and below ground.

The planting soil should be a sandy loam, loamy sand, loam (USDA), or a loam/sand mix (should contain a minimum 35 to 60% sand, by volume). The clay content for these soils should be less than 25% by volume (Environmental Quality Resources (EQ2), 1995; Engineering Technology Inc. and Hobbins, Inc. (ET&H), 1992). Soils should fall within the SM, ML, SC classifications or the Unified Soil Classification System (USCS) with a permeability of at least 1.0 feet per day (0.27 ft/hr) is required (a conservative value of 0.5 feet per day is used for design). The soil should be free of stones, stumps, roots, or other woody material over 1" in diameter. Brush or weeds from noxious weeds (e.g., Johnson Grass, Ragwort, Hedgehog, and Canada Thistle) or other noxious weeds as specified under COMAR 15.08.01.05 should not be present in the soil. Placement of the planting soil should be in 12 to 18 lifts that are loosely compacted (tamped lightly with a landscape bucket or trowel) by cover tracks. The specific characteristics are presented in Table A.3.

Parameter	Value
pH range	5.2 to 7.00
Organic matter	1.5 to 4.0% (by weight)
Magnesium	35 lbs. per acre, minimum
Phosphorus (phosphate - P2O5)	75 lbs. per acre, minimum
Potassium (potash - K2O)	85 lbs. per acre, minimum
Soluble salts	500 ppm
Clay	10 to 25 %
Silt	30 to 55 %
Sand	35 to 60%

Mulch Layer

The mulch layer plays an important role in the performance of the bioretention system. The mulch layer helps maintain soil moisture and reduces surface sealing, which reduces permeability. Mulch helps prevent erosion, and provides a microenvironment suitable for soil biota at the mulch/soil interface. It also serves as a pretreatment layer, trapping the finer sediments, which remain suspended after the primary pretreatment.

The mulch layer should be standard landscape style, single or double shredded hardwood mulch or chips. The mulch layer should be well aged (decomposed or stored for at least 12 months), uniform in color, and free of other materials, such as weed seeds, soil, rocks, etc. The mulch should be applied to a maximum depth of three inches. Grass clippings should not be used as a mulch material.

Planting Guidance

Plant material selection should be based on the goal of simulating a terrestrial forested community of native species. Bioretention simulates an upland-species ecosystem. The community should be dominated by trees, but have a distinct community of understory trees, shrubs and herbaceous materials. By creating a diverse, dense plant cover, a bioretention facility will be able to treat stormwater runoff and withstand urban stresses from insects, disease, drought, temperature, wind, and exposure. The middle elevation supports plants that like drier soil conditions, but can still tolerate occasional inundation by water. The outer edge is the highest elevation and generally supports plants adapted to drier conditions. A sample of appropriate plant materials for bioretention facilities are included in Table A.4. The layout of plant material should be flexible, but should follow the general principles described in Table A.5. The objective is to have a system, which resembles a random, and natural plant layout, while maintaining optimal conditions for plant establishment and growth. For a more extensive bioretention plan, consult EQ&R, 1995 or Chyster and Scherer, 1997.

OPERATION & MAINTENANCE SCHEDULE FOR PRIVATELY OWNED AND MAINTAINED, DISCONNECTION OF NONROOFTOP RUNOFF (N-2)

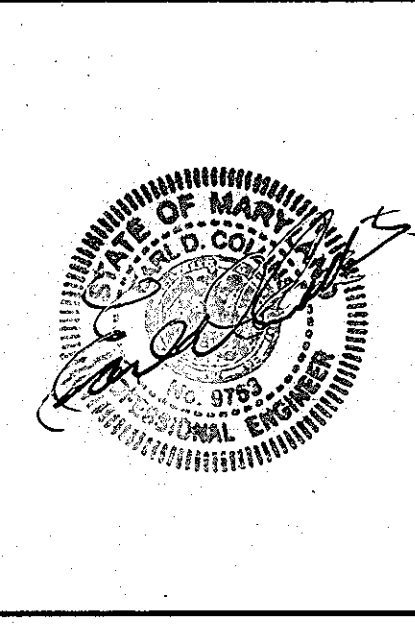
1. MAINTENANCE OF AREAS RECEIVING DISCONNECTION RUNOFF IS GENERALLY NO DIFFERENT THAN THAT REQUIRED FOR OTHER LAWN OR LANDSCAPED AREAS. THE AREAS RECEIVING RUNOFF SHOULD BE PROTECTED FROM FUTURE COMPACTOR OR INFLUENCE OF IMPERVIOUS AREA. IN COMMERCIAL AREAS FOOT TRAFFIC SHOULD BE DISCOURAGED AS WELL.

OPERATION AND MAINTENANCE SCHEDULE FOR BIO-RETENTION AREAS (M-6)

- Annual maintenance of plant material, mulch layer and soil layer is required. Maintenance of mulch and soil is limited to correcting areas of erosion or wash out. Any mulch replacement shall be done in the spring. Plant material shall be checked for disease and insect infestation and maintenance will address dead material and pruning.
- Schedule of plant inspection will be twice a year in spring and fall. This inspection will include removal of dead and diseased vegetation considered beyond treatment, treatment of all diseased trees and shrubs and replacement of all deficient spikes and wires.
- Mulch shall be inspected each spring. Remove previous mulch layer before applying new layer once every 2 to 3 years.
- Soil erosion will be addressed on an as needed basis, with a minimum of once per month and after heavy storm events.

FISHER, COLLINS & CARTER, INC.
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS
 CENTENNIAL SQUARE OFFICE BUILDING - 10725 BALTIMORE NATIONAL FILE
 ELLICOTT CITY, MARYLAND 21104
 (410) 461-2955

NO.	REVISION	DATE
1	M&A ADD GILMORE III & CARROLL HOUSE MODELS	1/10/14



ENGINEER'S CERTIFICATE

"I certify that this plan for erosion and sediment control represents a practical and workable plan based on my personal knowledge of the site conditions and that it was prepared in accordance with the requirements of the Howard Soil Conservation District."

Signature of Engineer: *Earl D. Collins* Date: 12-27-12
 EARL D. COLLINS Date

BUILDER/DEVELOPER'S CERTIFICATE

"I/We certify that all development and construction will be done according to this plan, for sediment and erosion control and that any responsible personnel involved in the construction project will have a Certificate of Attendance at a Department of the Environment Approved Training Program for the Control of Sediment and Erosion before beginning the project. I also authorize periodic on-site inspection by the Howard Soil Conservation District."

Signature of Developer: *John M. Reuver* Date: 1/10/14
 Signature of Developer Date

APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING

Chief, Division of Land Development: *John M. Reuver* Date: 2/13/13
 Chief, Development Engineering Division: *John M. Reuver* Date: 2/13/13
 Director - Department of Planning and Zoning: *John M. Reuver* Date: 2/13/13

OWNER/DEVELOPER
 WAVERLY BUILDERS AND DEVELOPERS LLC
 C/O MR. DONALD R. REUWER, JR.
 5300 DORSEY HALL DRIVE
 SUITE 102
 ELLICOTT CITY, MARYLAND 21104
 443-367-0422

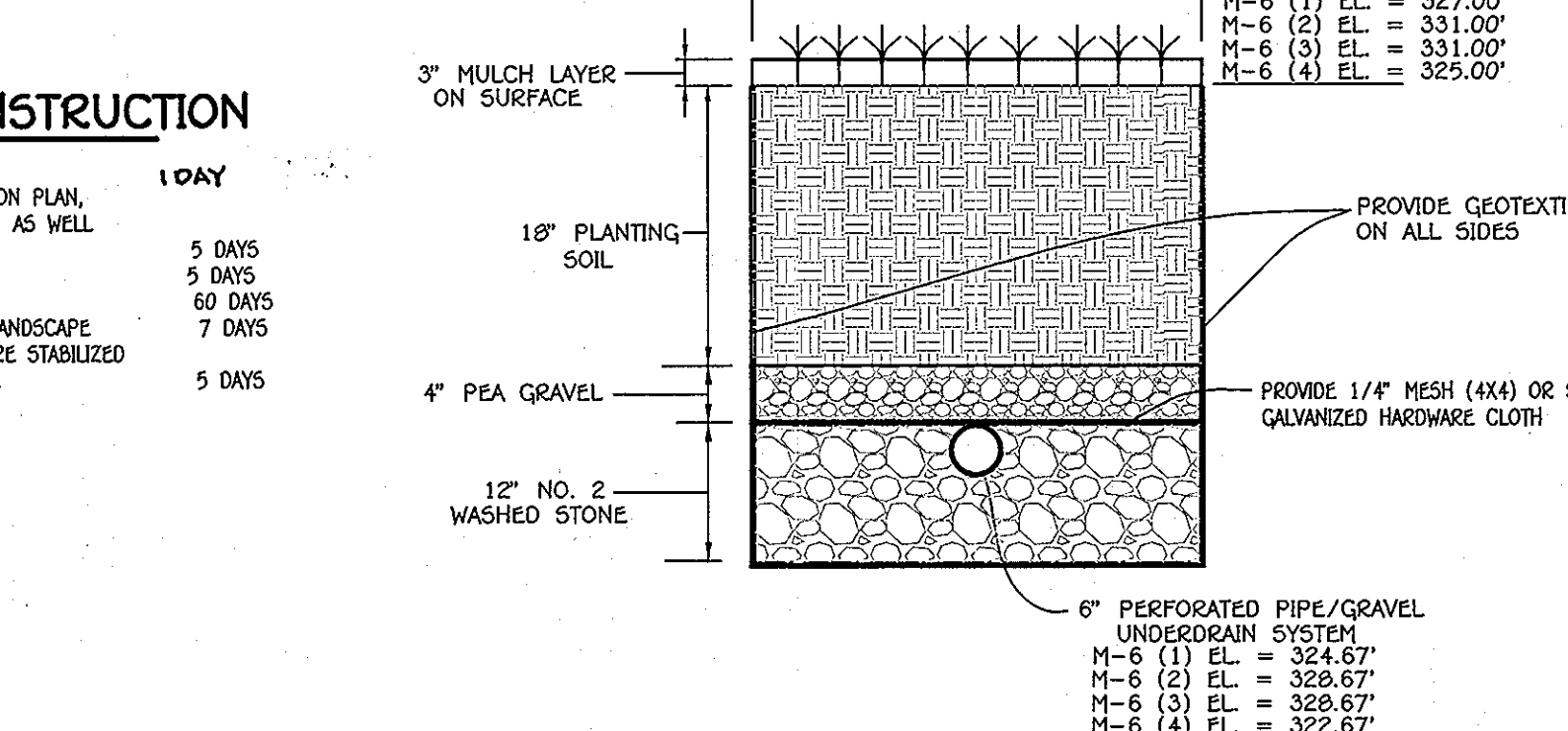
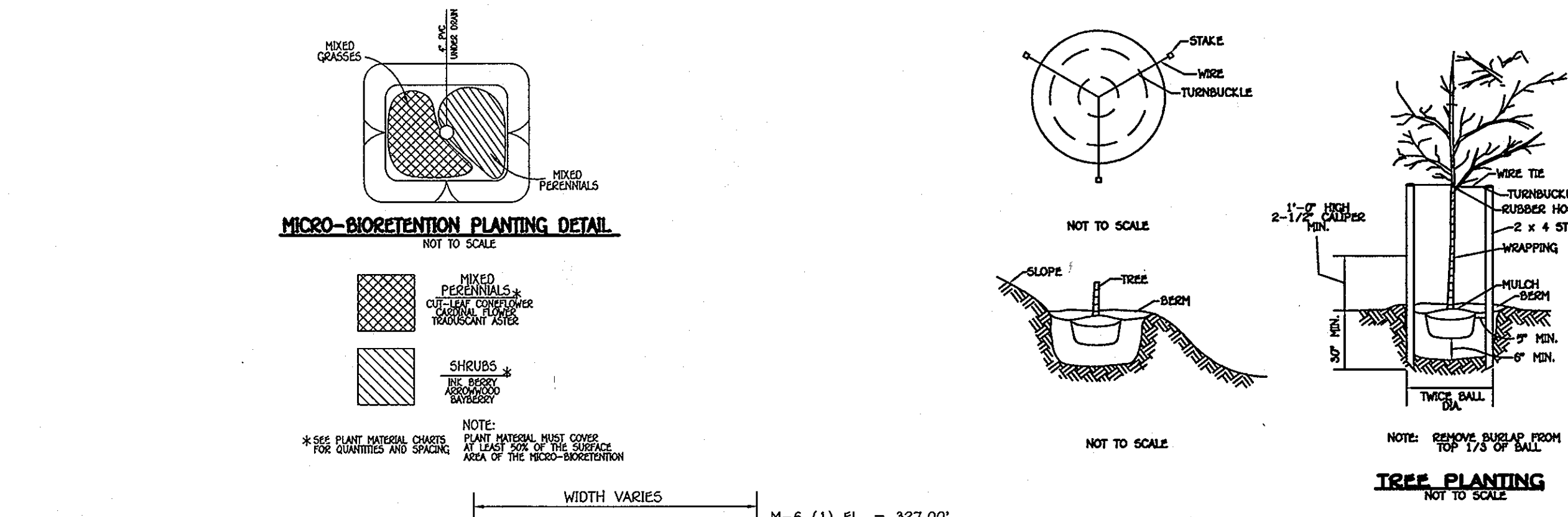
PROJECT	SECTION	LOT NO.			
ILCHESTER OAKS II	N/A	1 THRU 4			
PLAT	BLOCK NO.	ZONE	TAX/ZONE	ELEC. DIST.	CENSUS TR.
22074 22075	22	R-20	31	FIFTH	6068.02
WATER CODE	SEWER CODE				
N/A	N/A				

SEDIMENT/EROSION CONTROL PLAN

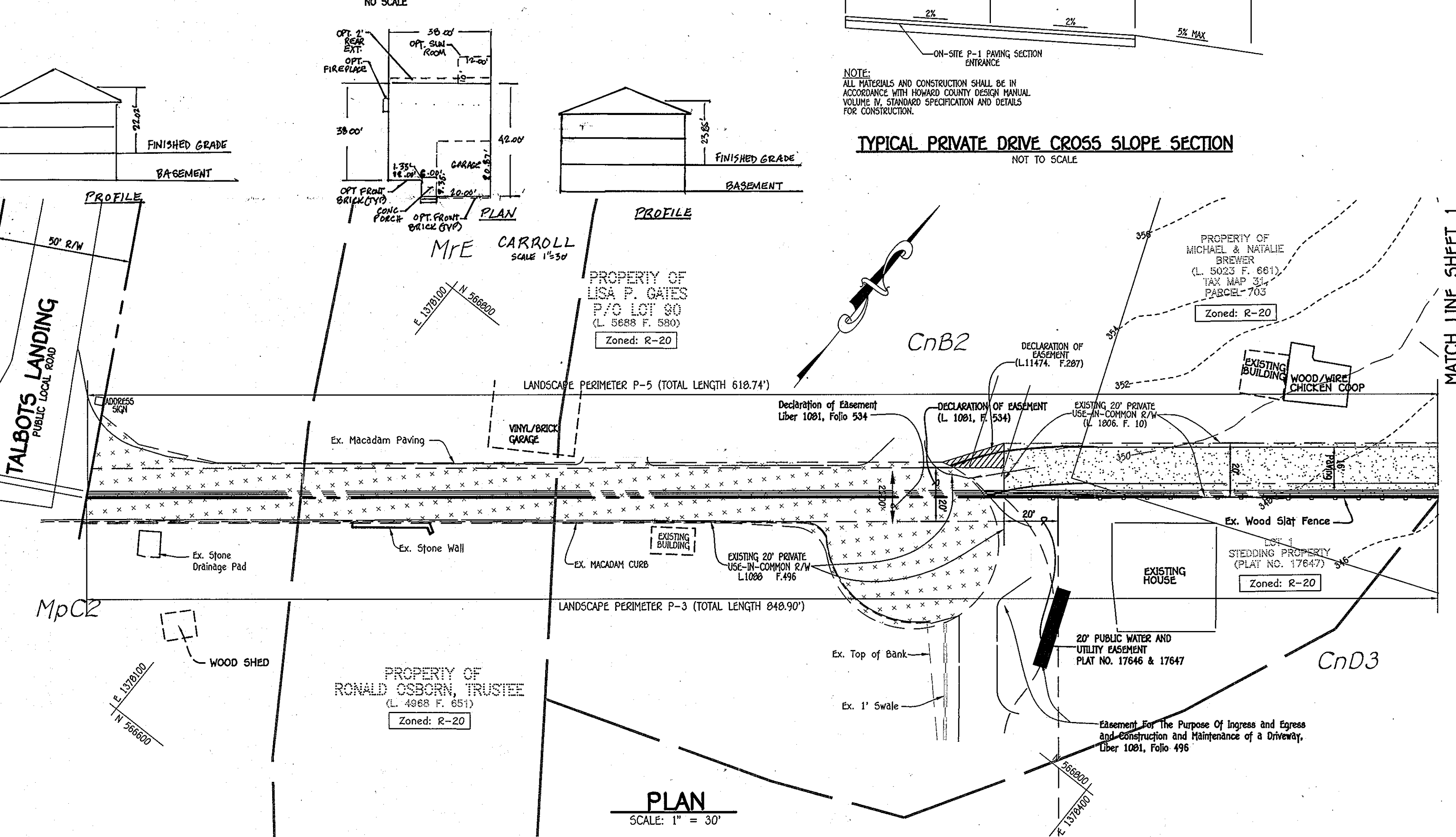
ILCHESTER OAKS II
 LOTS 1 THRU 4 & OPEN SPACE LOT 5
 ZONED: R-20

TAX MAP NO.: 31 PARCEL NO.: 702 GRID NO.: 22
 FIRST ELECTION DISTRICT HOWARD COUNTY, MARYLAND
 SCALE: AS SHOWN DATE: SEPTEMBER, 2012

SHEET 2 OF 3
 5DP-13-019



TYPICAL SECTION - BIO-RETENTION FACILITY (M-6)



PLAN SCALE: 1" = 30'

FOREST CONSERVATION WORKSHEET VERSION 1.0

NET TRACT AREA	ACRES
A. TOTAL TRACT AREA	2.98
B. DEDUCTIONS (AREA WITHIN 100 YEAR FLOODPLAIN)	0.07
C. AREA TO REMAIN IN AGRICULTURAL PRODUCTION	0.0
D. NET TRACT AREA	2.91
LAND USE CATEGORY: (FROM TABLE 32.1, PAGE 40, MANUAL)	
ARA MDR IDA HDR MPD CIA	X
E. AFFORESTATION THRESHOLD (PERCENTAGE)	0.15 0.44
F. CONSERVATION THRESHOLD (PERCENTAGE)	0.20 0.58
EXISTING FOREST COVER	
G. EXISTING FOREST COVER (EXCLUDING FLOODPLAIN)	0.66
H. AREA OF FOREST ABOVE AFFORESTATION THRESHOLD	0.08
I. AREA OF FOREST ABOVE CONSERVATION THRESHOLD	0.06
BREAKEVEN POINT	
J. FOREST RETENTION ABOVE THRESHOLD WITH NO MITIGATION	0.60
BREAKEVEN POINT	
K. CLEARING PERMITTED WITHOUT MITIGATION	0.06
PROPOSED FOREST CLEARING	
L. TOTAL AREA OF FOREST TO BE CLEARED OR RETAINED OUTSIDE FCE	0.18
M. TOTAL AREA OF FOREST TO BE RETAINED	0.48
PLANTING REQUIREMENTS	
N. REFORESTATION FOR CLEARING ABOVE THE CONSERVATION THRESHOLD	0.02
O. REFORESTATION FOR CLEARING BELOW THE CONSERVATION THRESHOLD	0.20
P. CREDIT FOR RETENTION ABOVE THE CONSERVATION THRESHOLD	0
R. TOTAL REFORESTATION REQUIRED	0.22
S. TOTAL AFFORESTATION REQUIRED	0
T. TOTAL PLANTING REQUIREMENT	0.22

At the Time of Plant Installation All Shrubs and Trees Listed And Approved On The Landscape Plan Shall Comply With The Proper Height Requirement In Accordance With The Howard County Landscape Manual. In Addition, No Substitutions Or Reductions Of The Required Plantings May Be Made Without Prior Review And Approval From The Department Of Planning And Zoning. Any Deviation From The Approved Landscape Plan May Result In Denial Or Delay In The Release Of Landscape Security Until Such Time As All Required Materials Are Planted And/or Retention Fee Paid To The Applicable Firm.

The Owner, Tenant And/or Their Agents Shall Be Responsible For Maintenance Of The Required Landscaping Including Both Plant Materials And Forms, Fences And Walls. All Plant Materials Shall Be Maintained In Good Growing Condition, And When Necessary, Replaced With New Materials To Ensure Continued Compliance With Applicable Regulations. All Other Required Landscaping Shall Be Permanently Maintained In Good Condition, And When Necessary, Replaced Or Replanted.



TYPICAL PRIVATE DRIVE SLOPE SECTION NOT TO SCALE

SOILS LEGEND		
SOIL	NAME	CLASS
CnB2	Chillum-Fairfax loams, 1 to 5 percent slopes, moderately eroded	C
CnD3	Chillum-Fairfax loams, 5 to 15 percent slopes, severely eroded	C
IuB	Iuka loam, local alluvium, 1 to 5 percent slopes	C
MpC2	Montalto silt loam, 0 to 15 percent slopes, moderately eroded	B
Mre	Montalto and Relay soils, 15 to 45 percent slopes	B
NeB2	Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded	B
NeC2	Neshaminy silt loam, 0 to 15 percent slopes, moderately eroded	B

NOTES:

- Hydric soils and/or contains hydric inclusions
- May contain hydric inclusions
- Generally only within 100-year floodplain areas

SOIL BORING LOG

The existing elevation of Boring #1 is 328.14'. The proposed elevation of Boring #1 is 327.00'. There was no rock or water encountered in the excavation. The proposed facilities in that area are approximately 3.5 in depth.

The existing elevation of Boring #2 is 328.00'. The proposed elevation of Boring #2 is 325.00'. There was no rock or water encountered in the excavation. The proposed facilities in that area are approximately 3.5 in depth.

The existing elevation of Boring #3 is 332.51'. The proposed elevation of Boring #3 is 331.00'. There was no rock or water encountered in the excavation. The proposed facilities in that area are approximately 3.5 in depth.

The existing elevation of Boring #4 is 327.33'. The proposed elevation of Boring #4 is 331.00'. There was no rock or water encountered in the excavation. The proposed facilities in that area are approximately 3.5 in depth.

Developer's/Builder's Certificate

I/We certify that the landscaping shown on this plan will be done according to Section 16.124 of the Howard County Code and the Howard County Landscape Manual. I/We further certify that upon completion of Certification of Landscape Installation accompanied by an executed one year guarantee of plant materials will be submitted to the Department of Planning and Zoning.

Mr. Donald R. Reuver, Jr. Date

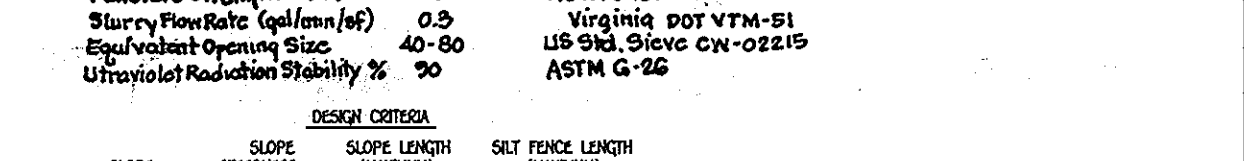


CONSTRUCTION SPECIFICATIONS

- FENCING SHALL BE 4" IN HEIGHT AND CONSTRUCTED IN ACCORDANCE WITH THE LATEST MD. STATE HIGHWAY ADMIN. STD. DETAIL G-0-01 AND G-0-02 FOR CHAIN LINK FENCING. THE SPECIFICATIONS FOR G-0-01 SHALL BE USED. SUBSTITUTIONS FOR PUBLIC AND PRIVATE FENCING SHALL BE PLACED WITHOUT CONCRETE BED MOUNT.
- CHAIN LINK FENCE SHALL BE INSTALLED TO THE CHAIN LINK FENCE WITH WIRE TIES OR STAPLES. THE LOWER TENSION WIRE, BRACE AND TENSION RODS, DRIVE ANCHORS AND POST CAPS ARE NOT REQUIRED EXCEPT ON THE ENDS OF THE FENCE.
- FENCE CLOTH SHALL BE FASTENED SECURELY TO THE CHAIN LINK FENCE WITH THE SPACED EVERY 4" AT THE TOP AND 10" SECTION.
- FENCE CLOTH SHALL BE EMBEDDED A MINIMUM OF 6" INTO THE GROUND.
- WHEN TWO SECTIONS OF FENCE CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
- POSTHOLE SHALL BE PROTECTED AS NOTED.

Fabric Properties	Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682
Mullen Burst Strength (PSI)	150	ASTM D1916
Puncture Strength (lbs)	40	ASTM D1715
Stirrup Flow Rate (gal/min/ft)	0.3	Virginia DOT VTM-51
Equivalent Opening Size	40-80	ASTM D1916
Ultraviolet Radiation Stability %	90	ASTM G-55

SUPER FENCE DIVERSION



SCALE: 1" = 30'

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