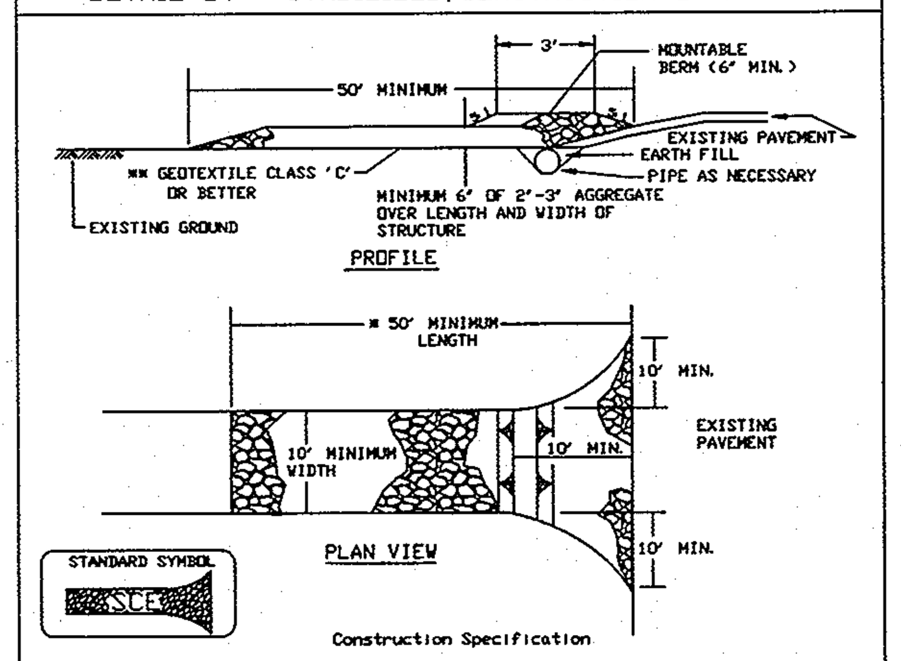
DETAIL 24 - STABILIZED CONSTRUCTION ENTRANCE



Construction Specification

1. Length - minimum of 50' (*30' for single residence lot).

2. Width - 10' minimum, should be flared at the existing road to provide a turning radius.

3. Geotextile fabric (filter cloth) shall be placed over the existing ground prior to placing stone. **The plan approval authority may not require single family residences to use geotextile.

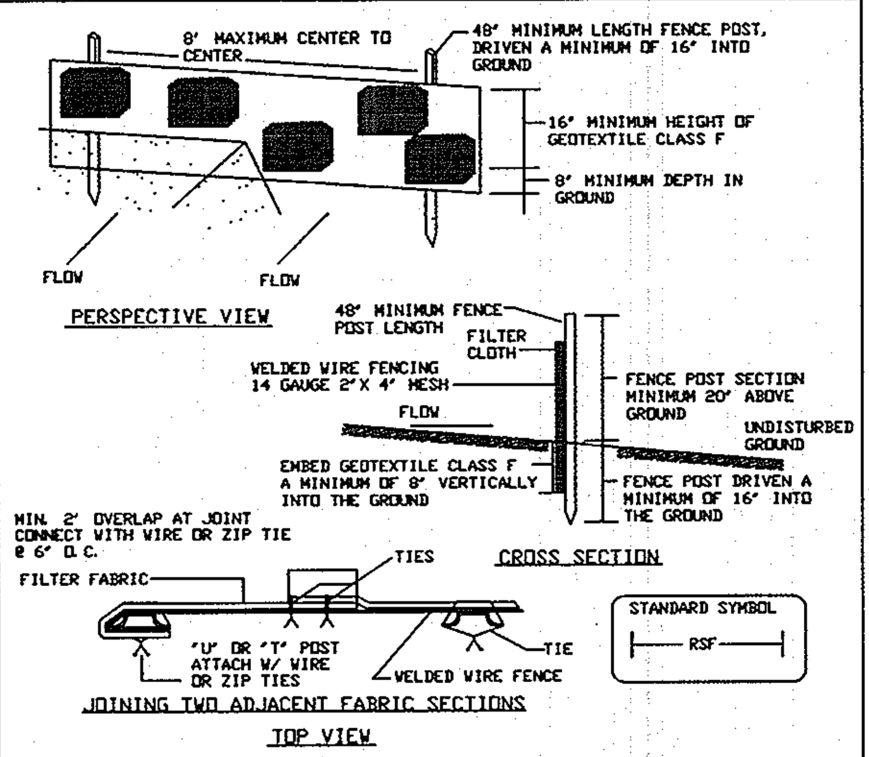
4. Stone - crushed aggregate (2" to 3") or reclaimed or recycled concrete equivalent shall be placed at least 6" deep over the length and width of the entrance.

5. Surface Water - all surface water flowing to or diverted toward construction entrances shall be piped through the entrance, maintaining positive drainage. Pipe installed through the stabilized construction entrance shall be protected with a mountable berm with 5:1 slopes and a minimum of 6" of stone over the pipe. Pipe has to be sized according to the drainage. When the SCE is located at a high spot and has no drainage to convey a pipe will not be necessary. Pipe should be sized according to the amount of runoff to be conveyed. A 6" minimum will be required.

6. Location - A stabilized construction entrance shall be located at every point where construction traffic enters or leaves a construction site. Vehicles leaving the site must travel over the entire length of the stabilized construction entrance.

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	PAGE F - 17 - 3	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL 22A - REINFORCED SILT FENCE APPROVED BY MDE 2-7-05



Construction Specifications

1. Metal fence post shall be a minimum of 48" long driven 16" minimum into the ground. Post shall be standard T or U section weighting not less than 1.00 pound per linear foot.

2. Geotextile shall be fastened securely to each fence post with wire ties or zip ties at top and mid section and shall meet the following requirements for geotextile Class F:

Tensile Strength	50 lbs/in (min.)	Test: MSMT 509
Tensile Modulus	20 lbs/in (min.)	Test: MSMT 509
Flow Rate	0.3 gal ft²/ minute (max.)	Test: MSMT 322
Filtering Efficiency	75% (min.)	Test: MSMT 322

3. Where ends of geotextile fabric come together, they shall be overlapped, folded and wired tied or zip tied to prevent sediment bypass.

4. Silt Fence shall be inspected after each rainfall event and maintained when bulges occur or when sediment accumulation reached 50% of the fabric height.

ANNE ARUNDEL SOIL CONSERVATION DISTRICT	PAGE E - 15 - 3B	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

SILT FENCE

Silt Fence Design Criteria

Slope Steepness	(Maximum) Slope Length	(Maximum) Silt Fence Length
Flatter than 50:1	unlimited	unlimited
50:1 to 10:1	125 feet	1,000 feet
10:1 to 5:1	100 feet	750 feet
5:1 to 3:1	60 feet	500 feet
3:1 to 2:1	40 feet	250 feet
2:1 and steeper	20 feet	125 feet

Note: In areas of less than 2% slope and sandy soils (USDA general classification system, soil Class A) maximum slope length and silt fence length will be unlimited. In these areas a silt fence may be the only perimeter control required.

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	PAGE E - 15 - 3C	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

IMPERVIOUS BREAKDOWN

1. EXISTING IMPERVIOUS AREA: 0.00 S.F. = 0.00 AC.
2. PROPOSED IMPERVIOUS: HOUSE: 1,768 S.F. = 0.0405 AC.
DRIVEWAY: 3,487 S.F. = 0.0801 AC.
CONC. WALK: 106 S.F. 0.0024 AC.
TOTAL: 5,361 S.F. = 0.1231AC.

LIMIT OF DISTURBANCE NOTE

THE TOTAL DISTURBED AREA FOR THE CONSTRUCTION SHOWN ON THIS PLAN IS 14,222 S.F. OR 0.326 AC.

SOIL DESCRIPTION

GhB (B) GLENELG-URBAN LAND COMPLEX, 0 TO 8 PERCENT SLOPES

SWM Narrative

Khann Property Lot 2

INTRODUCTION:

This report contains the required information to approve the stormwater management design. We have based the design on the site constraints and soil conditions.

EXISTING USE:

This is a 0.468 -acre site located at 8305 Church Lane Drive, Ellicott, MD. 21043. The site consists of a vacant single-family lot. No storm water management is present. The soils on this site are B soils. The slope of the site is very minor. The average slope on site is 1%. Ground cover is grass in good condition. The restrictions for this site are zoning setbacks only. There are no environmental features on this site.

PROPOSED USE:

The site use is to construct a new single-family dwelling. The drainage design for the proposed development is to utilize the rooftop and non-rooftop disconnect, grass swales and rain garden ESDs for the proposed impervious area. The proposed site impervious is 5,361 square feet. This is for the proposed house, driveway and concrete sidewalk.

THE TARGET Pe FOR THIS PROJECT IS 1.6 INCHES.

SUPPORTING INFORMATION FOR ADDRESSING SWM REQUIREMENTS USING ENVIRONMENTAL SITE DESIGN:

1. We have utilized the rooftop, non-rooftop disconnect, grass swale and raingarden ESDs to meet the target RCN of 55 as well as a portion of the target Pe of 1.6 inches. These approaches were the recommended ESDs to use to meet the target RCN and target Pe. The use of the rain garden and grass swale was determined by the lack of adequate disconnect for a portion of the proposed dwelling and driveway. With the ESDs provided meet the requirements, no other approach was explored.
2. The natural resources on the site are as follows: The areas that cannot be built on are the required setbacks per zoning.
3. The natural flow patterns were maintained by allowing the rooftop and non-rooftop runoff to sheet flows across the site to the same pre developed discharge point.
4. The proposed impervious area has been reduced by the utilization of nonstructural practices. The nonstructural practices that were utilized are rooftop and non-rooftop disconnect ESDs as well as a rain garden and grass swale.
5. The erosion and sediment control for this site is reinforced siltfence. This will stop any sediment from leaving the sited during construction

No waivers have been or are being applied for this site.

We are applying the rooftop, non-rooftop disconnect and raid garden and grass swale ESDs for this site.

Computations for determining ESDv:

Drainage Area "A" 0.275 ac. (11,979 sq.ft.)
Grass swale ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(21.5) or 0.2435
ESDV= (0.6)(0.2435)(11,979)/12 = 146 * .75 = 109.38 cu.ft., 120 cu.ft. provided.

The grass swale shall be 2' wide x 120' long 6" of depth.

Drainage Area "B" 0.3118 ac. (13,582 sq.ft.)
Grass swale ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(16.67) or 0.20
ESDV= (0.6)(0.20)(13,582)/12 = 136 * .75 = 102 cu.ft., 120 cu.ft. provided.

The grass swale shall be 2' wide x 120' long 6" of depth.

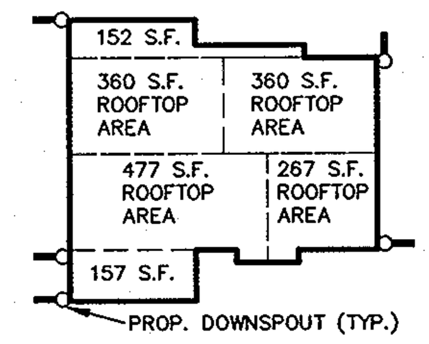
Drainage Area "C" 0.0152 ac. (663 sq.ft./Driveway)
Non-rooftop disconnect ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(100) or .95
ESDV= (0.6)(0.95)(663)/12 = 31.49 x .75 = 23.62 cu.ft., Volume provided via one raingarden located along the southern property line.

Drainage Area "D" 0.0024 ac. (106 sq.ft./sidewalk)
Non-rooftop disconnect ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(100) or .95
ESDV= (0.6)(0.95)(106)/12 = 5.03 x .75 = 3.8 cu.ft., Volume provided via one raingarden located along the southern property line.

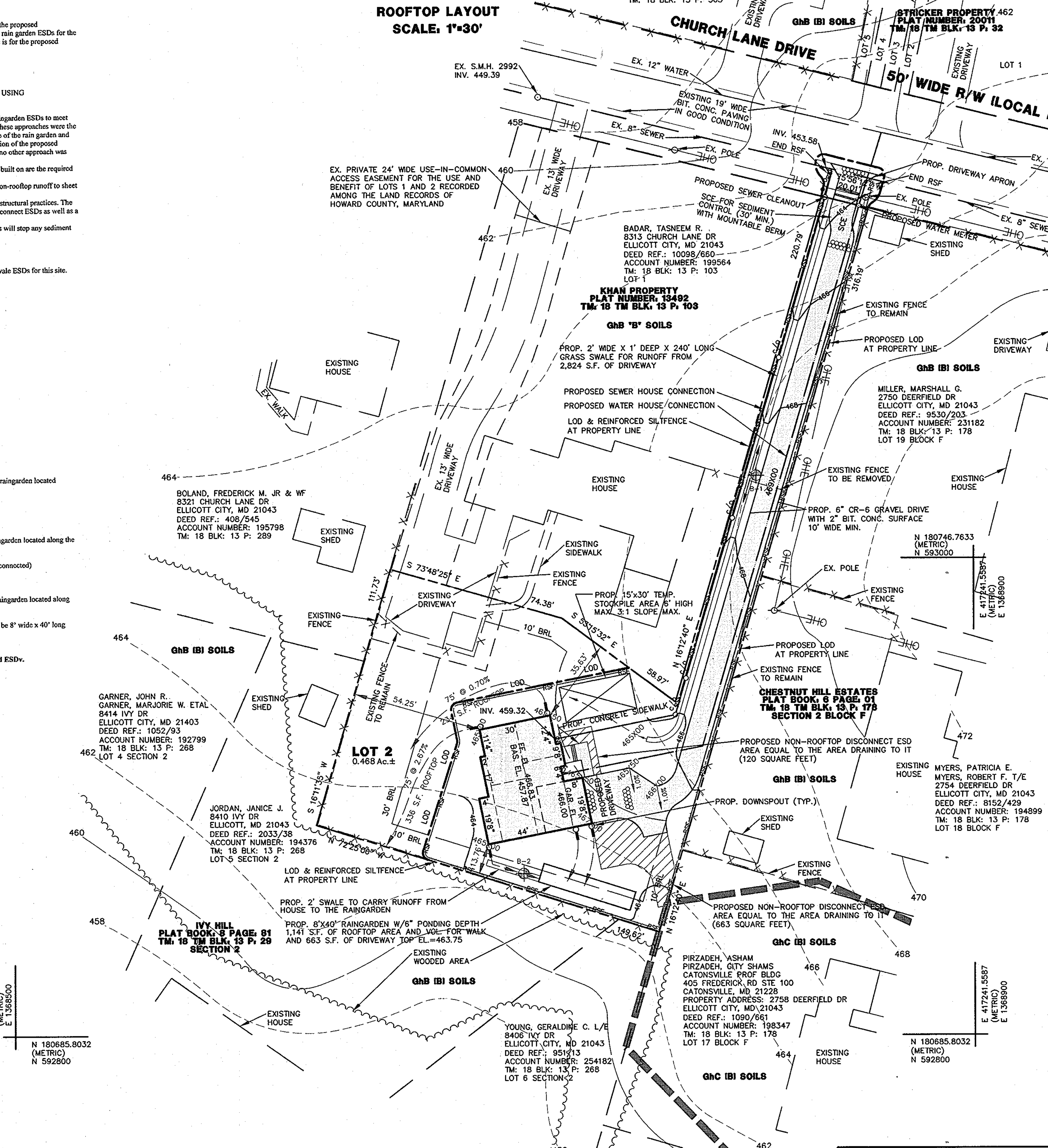
Drainage Area "E" 0.0262 ac. (1,141 sq.ft./remainder of the house that was not disconnected)
Non-rooftop disconnect ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(100) or .95
ESDV= (0.6)(0.95)(1,141)/12 = 144 x .75 = 108 cu.ft., Volume provided via one raingarden located along the southern property line.

The raingarden provide for the required volume of drainage areas C, D and E shall be 8' wide x 40' long with 6" of ponding depth.

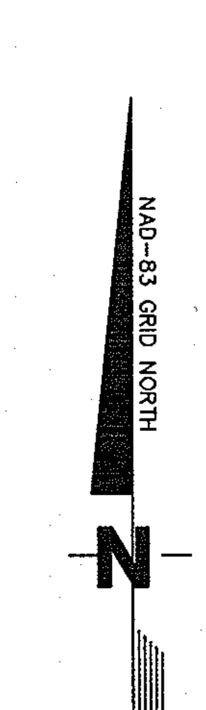
The above calculations provide for the target Pe of 1.6 inches and the required ESDv.



ROOFTOP LAYOUT
SCALE: 1"=30'

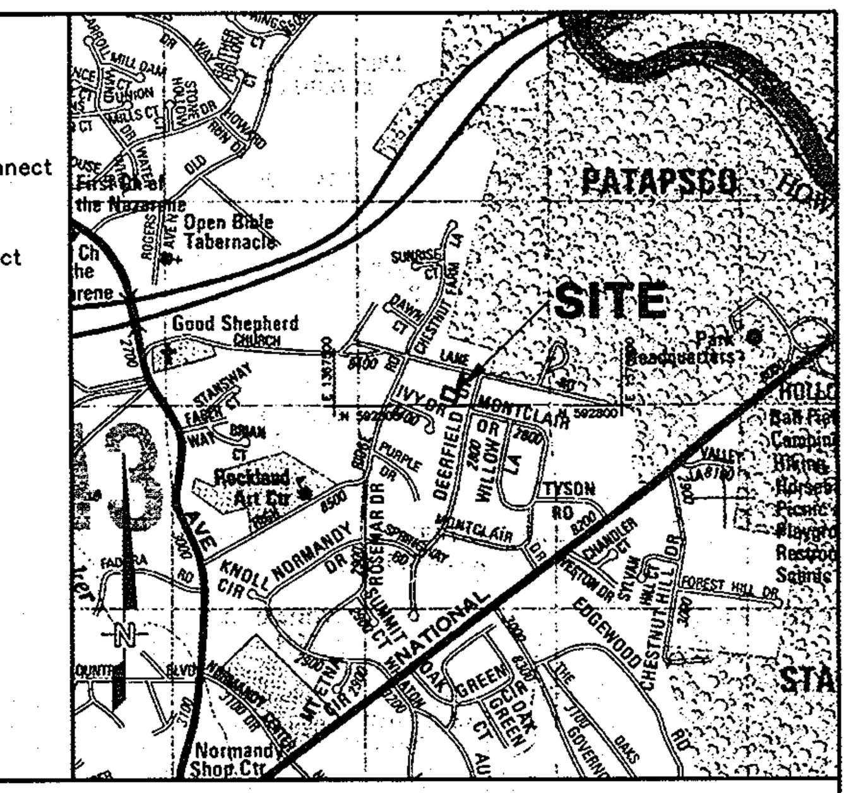


SCALE: 1"=30'



LEGEND

— —20— —	Existing Grade	(hatched box)	Area of Non-rooftop Disconnect
—[20]—	Proposed Grade	75' @ 2.40%	Proposed Rooftop Disconnect
LOD	Limit of Disturbance	—X—X—	Existing Fence
—RSF—	Reinforced Silt Fence	(wavy line)	Existing Treeline
— —	Existing Lot Line		Existing Structure
	Proposed Impervious	B-2	Boring Location
SCE	Stabilized Construction Entrance		
	Temporary Stockpile Area		



VICINITY MAP

SCALE: 1" = 2,000'
ADC MAP: 12, GRID: E4
Copyright ADC The Map People
Permitted Use Number 20811204

GENERAL NOTES:

1. SUBJECT PROPERTY ZONED R-20 PER THE 2/2/04 COMPREHENSIVE ZONING PLAN AND THE "COMP. LITE" ZONING AMENDMENTS EFFECTIVE 7/28/06.
2. COORDINATES BASED ON NAD '83, MARYLAND COORDINATE SYSTEM AS PROJECTED BY HOWARD COUNTY GEODETIC CONTROL STATIONS NO. H.C.M. 17EA AND NO. H.C.M. 17 EB
STA. NO. H.C.M. 17EA N 181150.5724 (METERS) E 413772.7247 (METERS)
STA. NO. H.C.M. 17 EB N 180994.8448 (METERS) E (413227.8979 (METERS)
3. BOUNDARY SURVEY COMPLETED BY FISHER, COLLINS AND CARTER, INC. ON OR ABOUT APRIL, 1998 PER RECORD PLAT (PB M.D.R. NO. 13492)
4. DRIVEWAY(S) SHALL BE PROVIDED PRIOR TO ISSUANCE OF A USE AND OCCUPANCY PERMIT TO ENSURE SAFE ACCESS FOR FIRE AND EMERGENCY VEHICLES PER THE FOLLOWING (MINIMUM) REQUIREMENTS:
A) WIDTH - 10 FEET (16 FEET SERVING MORE THAN ONE RESIDENCE);
B) SURFACE - SIX (6") INCHES OF COMPACTED CRUSHER RUN BASE WITH TAR AND CHIP COATING. (1-1/2" MINIMUM);
C) GEOMETRY - MAXIMUM 15' RADIUS
D) STRUCTURES (CULVERTS/BRIDGES) - CAPABLE OF SUPPORTING 25 GROSS TONS (H25-LOADING);
E) DRAINAGE ELEMENTS - CAPABLE OF SAFELY PASSING 100 YEAR FLOOD WITH NO MORE THAN 1 FOOT DEPTH OVER SURFACE;
F) STRUCTURE CLEARANCES - MINIMUM 12 FEET;
G) MAINTENANCE - SUFFICIENT TO ENSURE ALL WEATHER USE.
5. THE CONTRACTOR SHALL NOTIFY "MISS UTILITY" AT 1-800-257-7777 AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION WORK.
6. ANY DAMAGE TO THE COUNTYS RIGHT-OF-WAY SHALL BE CORRECTED AT THE DEVELOPERS EXPENSE.
7. CONTRACTOR SHALL CHECK SEWER HOUSE CONNECTION ELEVATION AT PROPERTY LINE PRIOR TO CONSTRUCTION.
8. FOR DRIVEWAY ENTERANCE DETAILS REFER TO HO. CO. DESIGN MANUAL VOL. IV DETAILS R.6.05.
9. SITE ANALYSIS DATA:
A. TOTAL PROJECT AREA: 20,423 S.F. OR 0.468 AC.
B. TOTAL AREA OF IMPERVIOUS SURFACE PROPOSED: 5,361 S.F. OR 0.1231 AC.
10. THIS PROJECT IS EXEMPT FROM FOREST CONSERVATION OBLIGATIONS IN ACCORDANCE WITH SECTION 16.1202(b)(1)(viii) OF THE HOWARD COUNTY CODE AND FOREST CONSERVATION MANUAL.
11. THE WATER HOUSE CONNECTONS SHALL BE FOR INSIDE METER SETTING.
12. THE WHC MUST BE INSTALLED WITH A MINIMUM 1.5-FOOT HORIZONTAL CLEARENCE AND 1-FOOT VERTICAL CLEARANCE, ABOVE THE SHC.

AUGER PROBE SUMMARY

Auger Probe #	Depth	Description	Infiltration Rates* in/hr
B-1	0.0'-1.0'	Brown sandy silt USC: (SM) USDA: (Sandy Loam)	1.02
	1.0'-6.0'	Brown silty sand with trace of silt, stone and mineral stone USC: (SM) USDA: (Loamy Sand)	2.41
		No water encountered	

- Based on USDA Guide lines

Auger Probe #	Depth	Description	Infiltration Rates* in/hr
B-2	0.0'-4.5'	Brown sandy silt USC: (SM) USDA: (Sandy Loam)	1.02
	4.5' -10.0'	Brown silty sand with trace of silt, stone and mineral stone USC: (SM) USDA: (Loamy Sand)	2.41
		No water encountered	

- Based on USDA Guide lines

INDEX OF SHEETS	
SHEET 1 OF 2	STANDARD SEDIMENT CONTROL PLAN, VICINITY MAP, GENERAL NOTES, AND SEDIMENT CONTROL DETAILS
SHEET 2 OF 2	STORMWATER MANAGEMENT NOTES & DETAILS AND PROPOSED DRAINAGE AREA MAP

ADDRESS CHART

LOT/PARCEL #	STREET ADDRESS
LOT 2/PARCEL 103	8305 CHURCH LANE DRIVE, ELLICOTT CITY, MD. 21043

PERMIT INFORMATION

SUBDIVISION NAME			SECTION/AREA		LOT/PARCEL#
KHAN PROPERTY					LOT 2/PARCEL 103
PLAT# OR L/F	GRID #	ZONING	TAX MAP NO.	ELECT. DISTRICT	CENSUS TRACT
13492	13	R-20	18	02-08	6026.00

APPROVED : HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING

[signature] 2-29-12
Chief, Division of Land Development — Date

[signature] 3/6/12
Chief, Development Engineering Division — Date

~~Director~~ — ~~Date~~

M.A.F. &
ASSOCIATES, LLC

526 HOODS MILL ROAD
WOODBINE, MD 21797
PHONE: 410-552-5541
FAX: 410-552-5546
EMAIL: MFORGEN@AOL.COM

Professional Certification: I, Michael J. Werner, hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Engineer under the laws of the State of Maryland, License No. 23380, Expiration date 8-19-12.

OWNER/DEVELOPER:

TREVILLIAN PROPERTIES, LLC
7865 QUARTERFIELD ROAD
SEVERN, MD. 21144
410-761-2430

ENVIRONMENTAL CONCEPT PLAN

PROJECT NUMBER:

KHAN PROPERTY
LOT 2
8305 CHURCH LANE DRIVE
ELLICOTT CITY MD 21043

TAX MAP 18 BLOCK 13 PARCEL 103 TAX ACCOUNT #: 2-392410 ZONING: R-20

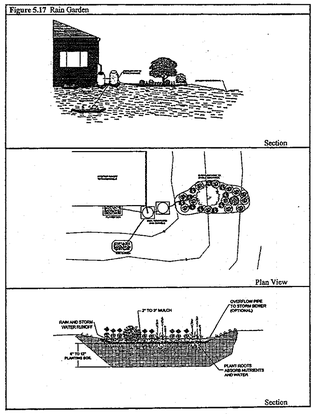
DATE: OCTOBER 26, 2011

SECOND ASSESSMENT DISTRICT HOWARD COUNTY, MARYLAND

SHEET ECP-1 of ECP-2

ECP-12-024

Figure 5.17 Rain Garden



M-7. Rain Gardens

A rain garden is a shallow, excavated landscape feature or a saucer-shaped depression that temporarily holds runoff for a short period of time. Rain gardens typically consist of an absorbent-planted soil bed, a mulch layer, and planting materials such as shrubs, grasses, and flowers. An overflow conveyance system is included to pass larger storms. Captured runoff from downspouts, roof drains, pipes, swales, or curb openings temporarily ponds and slowly filters into the soil over 24 to 48 hours.

Applications:

Rain gardens can be primary or secondary practices on residential, commercial, industrial, or institutional sites. This practice is typically used to treat runoff from small impervious areas like rooftops, driveways, and sidewalks. Rain gardens can also be used in retrofitting and redevelopment applications and in series where existing slopes require energy dissipation.

Performance:

The P_E values determined by Equation 5.3 may be applied to the ESD sizing criteria when rain gardens are designed according to the guidance provided below. R_V, requirements are also met when the P_E from Equation 5.3 meets or exceeds the soil specific recharge factor listed in Section 2.2.

Constraints:

The following constraints are critical when considering the use of rain gardens to capture and treat stormwater runoff:

- **Topography:** Rain gardens require relatively flat slopes (< 5%) to accommodate runoff filtering through the system. Some design modifications can address this constraint through the use of infiltration berms, terracing, and timber or block retaining walls on moderate slopes.
- **Soils:** Clayey soils or soils that have been compacted by construction equipment greatly reduce the effectiveness of this practice. Loosening of compacted soils may improve drainage capability.
- **Drainage Area:** The drainage area to a rain garden should be relatively small, typically less than 2,000 square feet.
- **Infrastructure:** The location of existing and proposed buildings and utilities (e.g., water supply wells, sewer, storm drains, electricity) will influence rain garden design and construction. Landscape designers should also consider overhead electrical and telecommunication lines when selecting trees to be planted.
- **Location:**
  - Lot-by-lot use of rain gardens is not recommended in residential subdivisions due to removal by homeowners. If used on a lot-by-lot basis, educating the homeowners will be needed to prevent removal.
  - Rain garden excavation in areas with heavy tree cover may damage adjacent tree root systems.

Design Guidance:

The following conditions should be considered when designing rain gardens:

- **Conveyance:** *Runoff shall enter, flow through, and exit rain gardens in a safe and non-ercsive manner. Energy dissipation shall be provided for downspout discharges using a plunge area, rocks, splash blocks, stone dams, etc. Runoff shall enter a rain garden at the surface through grass swales and/or a gravel bed.* A minimum internal slope of one percent should be maintained and a shallow berm surrounding the rain garden is recommended to avoid short-circuiting. For sloped applications, a series of rain gardens can be used as "scalloped" terraces to convey water non-erosively.
- **Treatment:** Rain gardens shall meet the following conditions:
  - *The drainage area to a rain garden serving a single lot in a residential subdivision shall be 2,000 ft² or less. The maximum drainage area to a rain garden for all other applications shall be 10,000 ft².* Micro-bioretention (M-6) or bioretention (F-6) should be considered when these requirements are exceeded.
  - *The surface area (As) of rain gardens shall be at least 2% of the contributing drainage area. A P_E value based on Equation 5.3 shall be applied to the contributing drainage area.* Temporary storage of the ESD_V may be provided above the facility with a surface ponding depth of 6 inches or less.

$$P_E = 10^* \times \frac{A_I}{DA} \quad \text{(Equation 5.3)}$$

  - Excavated rain gardens work best where HSG A and B are prevalent. In areas of HSG C and D, re-grade applications or soil amendments should be considered.
  - *A minimum six to twelve-inch layer of planting soil shall be provided.*
  - *A mulch layer two to three inches deep shall be applied to the planting soil to maintain soil moisture and to prevent premature clogging.*
  - *The planting soil and mulch shall conform to the specifications found in Appendix B.4.*
- **Landscaping:** *Landscaping plans shall clearly specify how vegetation will be established and managed.* A rain garden should be located in full to partial sun, at least two feet above the seasonal high water table and be 12 to 18 inches deep. Plants selected for use in a rain garden should tolerate both saturated and dry conditions and be native or adapted to Maryland. Neatly trimmed shrubs, a crisp lawn edge, stone retaining walls, and other devices can be used to keep a rain garden neat and visually appealing.

Construction Criteria:

The following items should be addressed during the construction of projects with rain gardens:

- **Erosion and Sediment Control:** *Rain gardens shall not be constructed until the contributing drainage area is stabilized.* During construction, runoff should be diverted and the use of heavy equipment avoided to minimize compaction.
- **Planting Soil:** Planting soil should be mixed on-site prior to installation. If poor soils are encountered beneath the rain garden, a four-inch layer of washed gravel (¾ to ½ inch gravel preferred) may be used below the planting soil mix.
- **Landscape Installation:** The optimum planting time is during the Fall. Spring planting is also acceptable but may require watering.

Inspection:

- Regular inspections shall be made during the following stages of construction:
  - *During excavation to subgrade and placement of planting soil.*
  - *Upon completion of final grading and establishment of permanent stabilization.*

Maintenance Criteria: The following items should be addressed to ensure proper maintenance and long-term performance of rain gardens:

- *Privately owned practices shall have a maintenance plan and be protected by easement, deed restriction, ordinance, or other legal measures preventing its neglect, adverse alteration, and removal.*
- Rain garden maintenance is generally no different than that required of other landscaped areas.
- The top few inches of the planting soil should be removed and replaced when water ponds for more than 48 hours. Silts and sediment should be removed from the surface of the bed as needed.
- Where practices are used to treat areas with higher concentrations of heavy metals (e.g., parking lots, roads), mulch should be replaced annually. Otherwise, the top two to three inches should be replaced as necessary.
- Occasional pruning and replacement of dead vegetation is necessary. If specific plants are not surviving, more appropriate species should be used. Watering may be required during prolonged dry periods.

M-8. Swales

Swales are channels that provide conveyance, water quality treatment, and flow attenuation of stormwater runoff. Swales provide pollutant removal through vegetative filtering, sedimentation, biological uptake, and infiltration into the underlying soil media. Three design variants covered in this section include grass swales, wet swales, and bio-swales. Implementation of each is dependent upon site soils, topography, and drainage characteristics.

Applications:

Swales can be used for primary or secondary treatment on residential, commercial, industrial, or institutional sites. Swales can also be used for retrofitting and redevelopment. The linear structure allows use in place of curb and gutter along highways, residential roadways, and along property boundaries. Wet swales are ideal for treating highway runoff in low-lying or flat terrain with high groundwater. Bio-swales can be used in all soil types due to the use of an underdrain. Grass swales are best suited along highway and roadway projects.

Performance:

The P_E values determined by the equations 5.2 and 5.3 (reprinted below) may be applied to the ESD sizing criteria when grass swales and bio-swales are designed according to the guidance provided below. For wet swales, P_E for the contributing drainage area is based on the volume captured. R_V, requirements are also met when the applicable P_E meets or exceeds the soil specific recharge factor listed in Section 2.2.

Swales should not be designed to meet Q_P or Q_T requirements except under extremely unusual conditions. Swales may be used to convey runoff for these larger storm events however, the ESD_V should be treated separately. This can be accomplished with a flow splitter or diversion so that the entire design storm is passed safely.

Constraints:

The following constraints are critical when considering the use of swales to capture and treat stormwater runoff:

- **Topography:** Steep slopes will increase velocity, erosion, and sediment deposition thus shortening the design life of the swale.
- **Soils:** Design variants are dependent upon soil types. Grass swales work best in HSG A, B, or C and wet swales are best suited for HSG C or D. Bio-swales typically include an underdrain and may be installed in all soil types. Extreme temperatures and frozen ground need to be considered when calculating design volumes.
- **Drainage Area:** The drainage area contributing to all design variants should be less than one acre. Practices in Chapter 3 should be considered for larger drainage areas.
- **Hotspot Runoff:** Swales should not be used to treat hotspots that generate higher concentrations of hydrocarbons, trace metals, or toxicants than are found in typical stormwater runoff and may contaminate groundwater.
- **Location:** The location of swales needs to be considered carefully. Wet swales are not recommended for residential developments due to the potential nuisance or mosquito breeding conditions. Swales along roadways can be damaged by off-street parking and are susceptible to winter salt applications. Also, the choice of vegetation and landscaping can be limited in adjacent areas.

Design Guidance:

The following conditions should be considered when designing swales:

- **Conveyance:** Stormwater discharged into and through swales needs to be non-erosive. Sheetflow should be promoted wherever possible using precise grading, level earthen weirs, or pea gravel diaphragms. If concentrated flow is delivered from curb cuts or storm drain pipes, some form of energy dissipation (e.g., plunge pools or rip-rap) is needed.
- **Treatment:** All swales shall meet the following criteria:
  - *Swales shall have a bottom width between two and eight feet.*
  - *The channel slope shall be less than or equal to 4.0%.*
  - *The maximum flow velocity for the ESD_V shall be less than or equal to 1.0 fps.*
  - *Swales shall be designed to safely convey the 10-year, 24-hour storm at a non-erosive velocity with at least six inches of freeboard.*
  - *Channel side slopes shall be 3:1 or flatter.*
  - *A thick vegetative cover shall be provided for proper function.*

The following criteria apply to each specific design variant:

Grass swales: *Grass swales shall be used for linear applications (e.g., roadways) only, and shall be as long as the treated surface. The surface area (As) of the swale bottom shall be at least 2% of the contributing drainage area, and a P_E value based on Equation 5.3 shall be applied to the contributing drainage area.* The maximum flow depth for ESD_V treatment should be 4 inches, and the channel should have a roughness coefficient (Manning's *n*) value of 0.15. This can be accomplished by either maintaining vegetation height equal to the flow depth or using energy dissipaters like check dams, infiltration berms, or riffle/pool combinations.

$$P_E = 10^* \times \frac{A_I}{DA} \quad \text{(Equation 5.3)}$$

SWM Narrative

Khann Property Lot 2

INTRODUCTION:

This report contains the required information to approve the stormwater management design. We have based the design on the site constraints and soil conditions.

EXISTING USE:

This is a 0.468 -acre site located at 8305 Church Lane Drive, Ellicott, MD. 21043. The site consists of a vacant single-family lot. No storm water management is present. The soils on this site are B soils. The slope of the site is very minor. The average slope on site is 1%. Ground cover is grass in good condition. The restrictions for this site are zoning setbacks only. There are no environmental features on this site.

PROPOSED USE:

The site use is to construct a new single-family dwelling. The drainage design for the proposed development is to utilize the rooftop and non-rooftop disconnect, grass swales and rain garden ESDs for the proposed impervious area. The proposed site impervious is 5,361 square feet. This is for the proposed house, driveway and concrete sidewalk.

THE TARGET Pe FOR THIS PROJECT IS 1.6 INCHES.

SUPPORTING INFORMATION FOR ADDRESSING SWM REQUIREMENTS USING ENVIRONMENTAL SITE DESIGN:

1. We have utilized the rooftop, non-rooftop disconnect, grass swale and raingarden ESDs to meet the target RCN of 55 as well as a portion of the target Pe of 1.6 inches. These approaches were the recommended ESDs to use to meet the target RCN and target Pe. The use of the rain garden and grass swale was determined by the lack of adequate disconnect for a portion of the proposed dwelling and driveway. With the ESDs provided meet the requirements, no other approach was explored.
2. The natural resources on the site are as follows: The areas that cannot be built on are the required setbacks per zoning.
3. The natural flow patterns were maintained by allowing the rooftop and non-rooftop runoff to sheet flows across the site to the same pre developed discharge point.
4. The proposed impervious area has been reduced by the utilization of nonstructural practices. The nonstructural practices that were utilized are rooftop and non-rooftop disconnect ESDs as well as a rain garden and grass swale.
5. The erosion and sediment control for this site is reinforced silt fence. This will stop any sediment from leaving the sited during construction

No waivers have been or are being applied for this site.

We are applying the rooftop, non-rooftop disconnect and raid garden and grass swale ESDs for this site.

Computations for determining ESDv:

Drainage Area "A" 0.225 ac. (11,979 sq.ft.)
Grass swale ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(21.5) or 0.2435
ESDv= (0.6)(0.2435)(11,979)/12 = 146 * .75 = 109.38 cu.ft., 120 cu.ft. provided.

The grass swale shall be 2' wide x 120' long 6" of depth.

Drainage Area "B" 0.3118 ac. (13,582 sq.ft.)
Grass swale ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(16.67) or 0.20
ESDv= (0.6)(0.20)(13,582)/12 = 136 * .75 = 102 cu.ft., 120 cu.ft. provided.

The grass swale shall be 2' wide x 120' long 6" of depth.

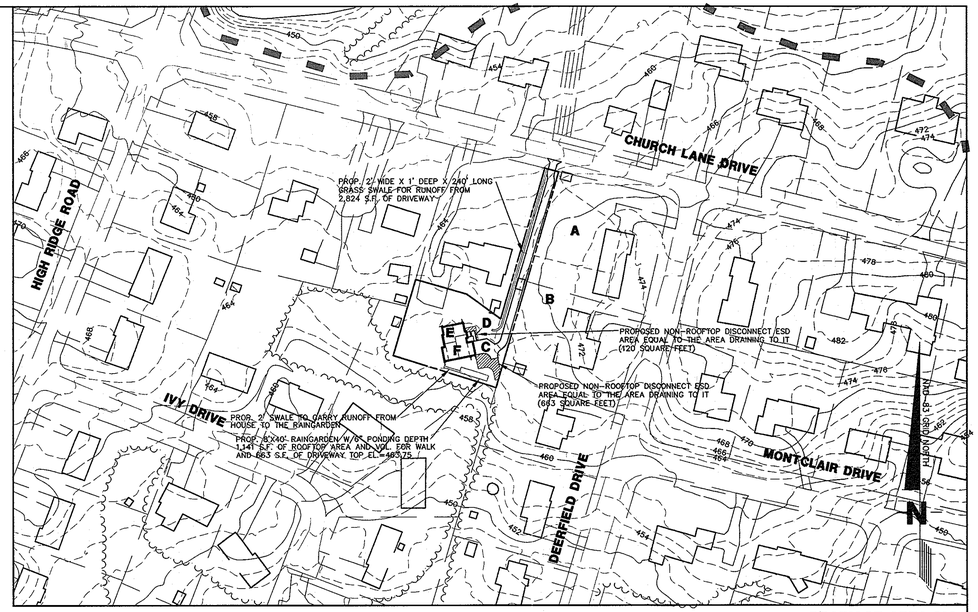
Drainage Area "C" 0.0152 ac. (663 sq.ft./Driveway)
Non-rooftop disconnect ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(100) or .95
ESDV= (0.6)(0.95)(663)/12 = 31.49 x .75 = 23.62 cu.ft., Volume provided via one raingarden located along the southern property line.

Drainage Area "D" 0.0024 ac. (106 sq.ft./sidewalk)
Non-rooftop disconnect ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(100) or .95
ESDV= (0.6)(0.95X106)/12 = 5.03 x .75 = 3.8 cu.ft., Volume provided via one raingarden located along the southern property line.

Drainage Area "E" 0.0262 ac. (1,141 sq.ft./remainder of the house that was not disconnected)
Non-rooftop disconnect ESD = Credit Pe of 1.0"
Remaining to be treated: .6"
Rv = .05+0.009(100) or .95
ESDV= (0.6)(0.95)(1,141)/12 = 144 x .75 = 108 cu.ft., Volume provided via one raingarden located along the southern property line.

The raingarden provide for the required volume of drainage areas C, D and E shall be 8' wide x 40' long with 6" of ponding depth.

The above calculations provide for the target Pe of 1.6 inches and the required ESDv.



PROPOSED DRAINAGE AREA

SCALE: 1"=100'

DRAINAGE AREA "A"
DRAINAGE AREA = 0.275 AC.

DRAINAGE AREA "B"
DRAINAGE AREA = 0.3118 AC.

DRAINAGE AREA "C"
DRAINAGE AREA = 0.0152 AC.

DRAINAGE AREA "D"
DRAINAGE AREA = 0.0024 AC.

DRAINAGE AREA "E"
DRAINAGE AREA = 0.0144 AC.

DRAINAGE AREA "F"
DRAINAGE AREA = 0.0262 AC.

ADDRESSING SWM REQUIREMENTS USING ENVIRONMENTAL SITE DESIGN

Treatment: ESD practices shall be used to treat the runoff from 1 inch of rainfall (i.e P_E = 1 inch) on all new developments and redevelopments where stormwater management is required.
ESD practices shall be used to the MEP to address CP_V (i.e. treat the runoff from the 1-year 24-hour design storm) for 1-year post development peak discharge using the reduced RCN from Table 5.3)

INPUT DATA ONLY IN GREEN SHADED AREAS
Site Data:
Site Location (County): Howard County MD
Site Area: 0.47 acres
Drainage Area: 0.47 acres
Soils: 0% A, 100% B, 0% C, 0% D
Impervious Area: 0.12 acres

Site Soil Distribution		AREA		RCN*	Percent
HSG					
A	Imp. Area	0.00	Acres	38	0%
	Tot. Area	0.00	Acres	38	0%
B	Imp. Area	0.12	Acres	55	26%
	Tot. Area	0.47	Acres	55	100%
C	Imp. Area	0.00	Acres	70	0%
	Tot. Area	0.00	Acres	70	0%
D	Imp. Area	0.00	Acres	77	0%
	Tot. Area	0.00	Acres	77	0%
Total Imp. Area		0.12	Acres		
Total Area		0.47	Acres		

(Percent = (Imp. Area/ Tot. Area)* 100)
(Percent = (Tot. Area/ Drainage Area)* 100)
(Percent = (Imp. Area/ Tot. Area)* 100)
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(Percent = (Tot. Area/ Drainage Area)* 100)

* RCN is for woods in good condition (Table 2-2, TR-55)

Step 1: Determine ESD Implementation Goals

A. Determine Pre-Developed Conditions

. *Soil Conditions and RCN for " woods in good condition".*

Site Soil Distribution		
HSG	RCN*	Area
A	n/a	0.00 acres
B	55	0.47 acres
C	n/a	0.00 acres
D	n/a	0.00 acres

* RCN is for woods in good condition (Table 2-2, TR-55)

. *Composite RCN for "woods in good condition".*

RCN_{woods} = ((0 x 0.0 acres) + (55 x 0.5 acres) + (0 x 0.0 acres) + (0 x 0.0 acres)) / 0.5 acres
= 55

The target RCN for "woods in good condition" is 55

B. Determine Target P_E Using Table 5.3

P_E = Rainfall Target from Table 5.3 used to determine EAD goals and size practices. NO NO

. **Determine % Impervious Area** NO NO
I = (Imp. Area/ Drainage Area) 25 30
I= (0.12 ac. / 0.47 ac.) NO NO
i = 26.3 % Based on entire DA NO NO
CHECK BOTH 25% AND 30%, AND USE THE MOST CONSERVATIVE RESULT. 25 30

. **Determine P_E form Table.**

Target PE				
HSG	PE for 25%		PE for 30%	
A	n/a	"	n/a	"
B	1.6	"	1.6	"
C	n/a	"	n/a	"
D	n/a	"	n/a	"

Target P_E = 1.6 inches

C. Compute Q_E

$Q_E = P_E \times R_V$
P_E = 1.6 inches
R_V = 0.05 + (0.009)(I)
= 0.287
Q_E = 1.6 inches x 0.29
Q_E = 0.46 inches

R_V = the dimensionless volumetric runoff coefficient

SWM Requirements After Using ESD

A. Calculate Reduced RCN's

. **Determine Reduced RCN for P_E after ESD Implementation**
P_E = 1.6 inches (Rainfall used to size ESD practices)

CPV HAS BEEN SATISFIED

Enter reduced RCN based on P_E after ESD Implementation and enter below

Reduced RCN				
HSG	I = 25%	I = 30%	USE
A	0.00	n/a	n/a	0
B	0.47	55	55	55
C	0.00	n/a	n/a	0
D	0.00	n/a	n/a	0

Composite RCN = 55 ⟶ USE RCN OF 55

B. Calculate Cp_v Requirements

. Composite RCN for "woods in good condition is 55
. The Reduced RCN after Implementing ESD's is 55

When $P_E \geq 1.0$ inches, Cp_v shall be the runoff from 1-year 24-hour design storm calculated using the reduced RCN. If the reduced RCN for a drainage area reflects "woods in good condition", then Cpv has been satisfied for that drainage area.

Calculate Cpv using design PE = 1.6 inches (RCN = 0):

$Cp_v = Q_1 \times A$

where: Q_1 is the runoff from the 1-year 24-hour design storm

$$Q1 = \frac{(P-0.2S)^2}{(P+0.8S)} \quad \text{(Equation 2.3, TR-55, USDA, NRCS 1986)}$$

where: P = 1-year 24 hour design storm
P = 2.7 inches
S = (1000/RCN) - 10
= (1000/55) - 10
= n/a

$Q_1 = \frac{n/a^2}{n/a} = \frac{n/a}{n/a} = n/a$ inches

Cp_v = n/a
= n/a ac.ft. or n/a cubic feet

Cpv Storage Requirements				
Rainfall (P_E)		Additional Cp_v Req. (ac.-ft.)	(cu.ft.)	Notes:
$P_E \geq$ 1.6 inches		n/a	n/a	Target P_E for RCN=Woods
$P_E =$ 1.6 inches		n/a	n/a	Design P_E

APPROVED : HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING

Chief, Division of Land Development — Date 7-29-12

Chief, Development Engineering Division — Date 3/6/12

M.A.F. & ASSOCIATES, LLC
526 HOODS MILL ROAD
WOODBINE, MD 21797
PHONE: 410-552-5541
FAX: 410-552-5546
EMAIL: MFORGEN@AOL.COM

Professional Certification: I, Michael J. Werner, hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Engineer under the laws of the State of Maryland, License No. 23380, Expiration date 8-19-12.

2/14/12

OWNER/DEVELOPER:
TREVILLIAN PROPERTIES, LLC
7865 QUARTERFIELD ROAD
SEVERN, MD. 21144
410-761-2430

ENVIRONMENTAL CONCEPT PLAN

PROJECT NUMBER:

KHAN PROPERTY
LOT 2
8305 CHURCH LANE DRIVE
ELLICOTT CITY MD 21043

TAX MAP 18 BLOCK 13 PARCEL 103 TAX ACCOUNT #: 2-392410 ZONING: R-20

DATE: OCTOBER 26, 2011

SECOND ASSESSMENT DISTRICT HOWARD COUNTY, MARYLAND

SHEET ECP-2 of ECP-2

ECP-12-024