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# FINAL ROAD CONSTRUCTION, GRADING AND SEDIMENT CONTROL PLANS GTW'S WAVERLY WOODS

## SECTION 14 BULK PARCELS 'A' & 'B' AND OPEN SPACE LOTS 1 & 2 Zoned: PSC & PEC

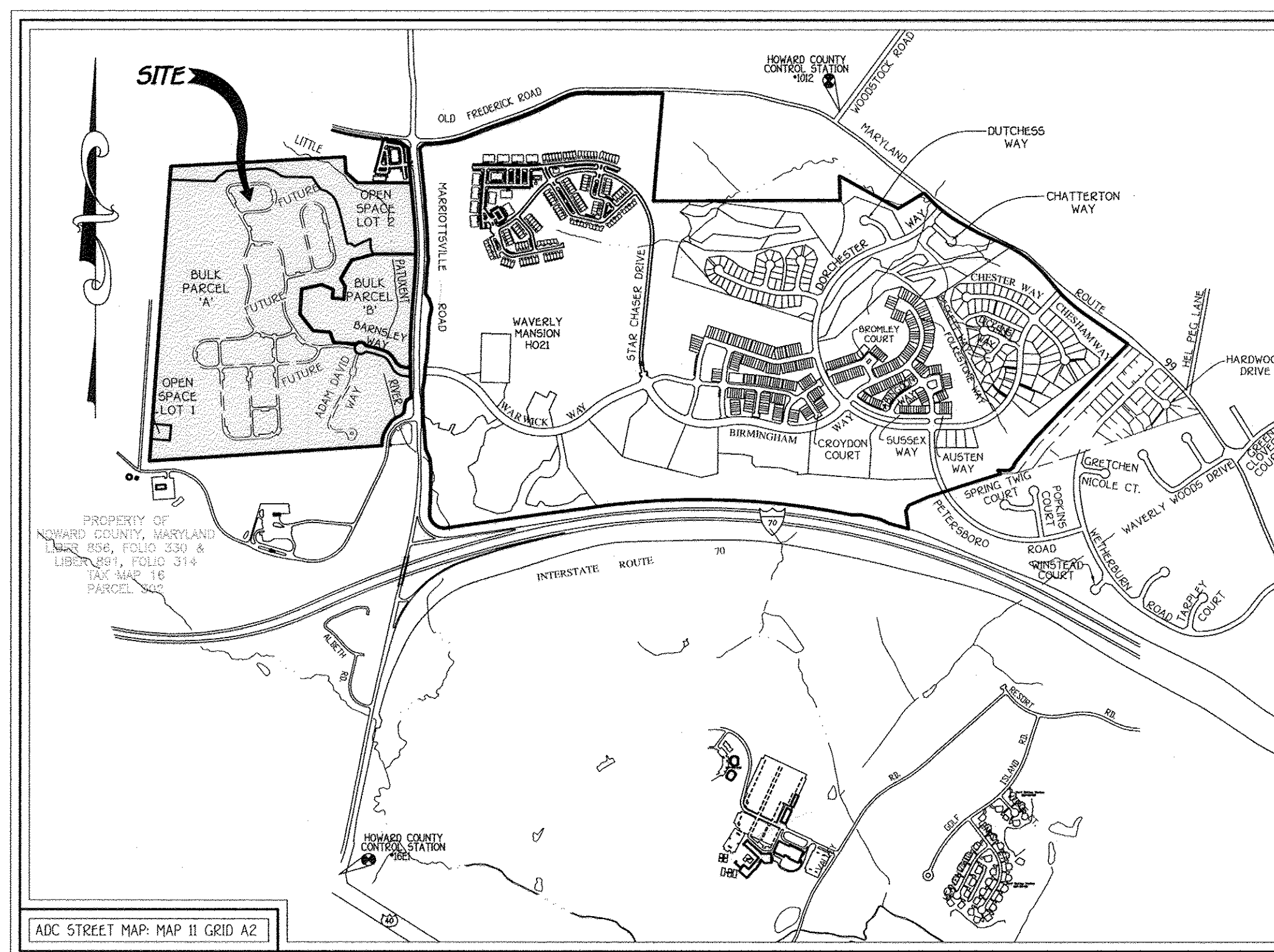
Tax Map: 16, Parcels: 120, 221 & P/O 249 Grids: 3 & 4

APPROVED: DEPARTMENT OF PUBLIC WORKS <i>With 2/10/09</i> CHIEF, BUREAU OF HIGHWAYS	9-27-09 DATE
APPROVED: DEPARTMENT OF PLANNING AND ZONING <i>Cindy Hamilton</i> CHIEF, DIVISION OF LAND DEVELOPMENT	9/29/09 DATE
<i>Bill Dennis</i> CHIEF, DEVELOPMENT ENGINEERING DIVISION	9/21/09 DATE
2 ADD FCE #8-0.195 ACRES RETENTION	7-10-09
1 REPLACE SHEETS 25 & 26, ADD SHEET 27	3-9-10
NO DESCRIPTION	DATE
REVISIONS	

ROAD CLASSIFICATION CHART		
ROAD	CLASSIFICATION	R/W WIDTH
BARNESLEY WAY	MINOR COLLECTOR	60'

STREET SIGN CHART				
STREET NAME	STATION	OFFSET	POSTING SIGN	SIGN CODE
BARNESLEY WAY	2+00	25R	SPEED LIMIT 30 MPH	R2-1
BARNESLEY WAY	0+68	02R	KEEP RIGHT	R4-7
BARNESLEY WAY	1+13	02R	KEEP RIGHT	R4-7
BARNESLEY WAY	2+55	23L	ADVANCE INTERSECTION LANE CONTROL	R3-8b
BARNESLEY WAY	4+00	23L	SIGNAL AHEAD	W3-30

STREET LIGHT CHART				
STREET NAME	STATION	OFFSET	FIXTURE/POLE TYPE	COMMENTS
BARNESLEY WAY	0+79	34R	150-WATT "PREMIER" H.P.S. VAPOR FIXTURE, POST TOP FIXTURE MOUNTED ON A 14-FOOT BLACK FIBERGLASS POLE.	---
	1+00	40L		
	2+15	35L		
	3+52	23R		
	4+15	23L		
ADAM DAVID WAY (FUTURE)	0+52	18R		



## THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND

### GENERAL NOTES CONTINUED

- THIS PROJECT IS SUBJECT TO WAIVER PETITION WP-09-210 TO WAIVE SUBDIVISION SECTIONS:
  - 16.120(c)(2)(ii), REQUEST TO NOT BE REQUIRED TO PROVIDE ANY OF THE REQUIRED MINIMUM "SINGLE FAMILY DETACHED" LOT FRONTAGE OF 20 FEET ON AN APPROVED PUBLIC STREET, AND;
  - 16.120(c)(4), REQUEST TO NOT BE REQUIRED TO PROVIDE ANY OF THE REQUIRED MINIMUM "SINGLE FAMILY ATTACHED" LOT FRONTAGE OF 15 FEET ON AN APPROVED PUBLIC STREET AND, BE PERMITTED TO HAVE THE "SINGLE FAMILY ATTACHED" LOTS FRONT ON A PRIVATE ROAD EXCEEDING 200 FEET IN LENGTH.
- THIS WAIVER HAS BEEN APPROVED SUBJECT TO COMPLIANCE WITH THE FOLLOWING CONDITIONS:
  - THE SUBMISSIONS OF THE PLATS TO CREATE THE INDIVIDUAL RESIDENTIAL LOTS FOR EACH PHASE OF THE PROJECT SHALL BE COORDINATED WITH THE SITE DEVELOPMENT PLANS SUBMITTED FOR EACH OF THE FIVE PHASES OF THE PROJECT.
  - ALL OF THE RESIDENTIAL LOTS SHALL FRONT ON AND OBTAIN ACCESS FROM THE PROPOSED PRIVATE ROADS WITHIN THE PROJECT AREA.
  - THE PROPOSED PRIVATE ROADS WITHIN THE PROJECT AREA SHALL BE LOCATED ON PROPERTY(IES) OWNED BY A HOMEOWNER'S ASSOCIATION (HOA) AND BE MAINTAINED BY THE SAME HOA.
  - THE PROPOSED PRIVATE ROADS WITHIN THE PROJECT AREA SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE DED AND DFRS.

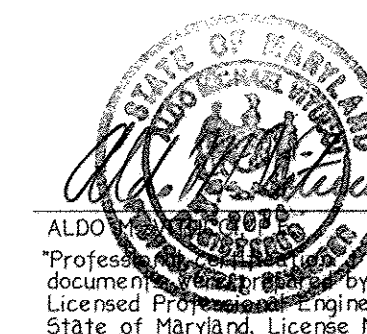
### GENERAL NOTES

- ALL ASPECTS OF THE PROJECT ARE IN CONFORMANCE WITH THE LATEST HOWARD COUNTY STANDARDS UNLESS WAIVERS ARE APPROVED.
- THE CONTRACTOR SHALL NOTIFY THE DEPARTMENT OF PUBLIC WORKS, DIVISION OF CONSTRUCTION INSPECTION AT 410-313-1080 AT LEAST (5) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION.
- THE CONTRACTOR SHALL NOTIFY "MISS UTILITY" AT 1-800-257-7777 AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION.
- LOCATION WESTSIDE OF MARBOTTSVILLE ROAD AND OPPOSITE OF WARWICK WAY. TAX MAP No.: 16, PARCEL Nos.: 120, 221 & P/O 249.
- SUBJECT PROPERTY ZONED PEC AND PSC PER 02/02/04 COMPREHENSIVE ZONING PLAN AND THE COMP-LITE ZONING AMENDMENTS DATED 07-28-06. BULK PARCEL 'B' IS ZONED PEC AND THE REST OF PROPERTIES IN THIS SUBDIVISION ARE ZONED PSC.
- TOPOGRAPHY SHOWN HEREON IS FROM AERIAL MAPS FLOWN WITH 2 FOOT CONTOUR INTERVALS PREPARED BY HARFORD AERIAL SURVEYS DATED NOVEMBER 1998 AND SUPPLEMENTED WITH FIELD RUN TOPOGRAPHY BY FISHER, COLLINS & CARTER, INC.
- PROPERTY IS LOCATED WITHIN METROPOLITAN DISTRICT.
- PUBLIC WATER AND SEWER WILL BE PROVIDED TO THE PROPOSED BUILDING UNITS UNDER CONTRACT NO. 24-4380-D. PRIVATE SEWER MAINS WILL BE PROVIDED WITH THE SITE DEVELOPMENT PLAN.
- STORMWATER MANAGEMENT WILL BE PROVIDED IN ACCORDANCE WITH HOWARD COUNTY AND MARYLAND 378 SPECIFICATIONS. FOR PHASE 1, WATER QUALITY WILL BE PROVIDED BY A MICRO-POOL FACILITY. THE STORMWATER MANAGEMENT POND IS PRIVATELY OWNED AND MAINTAINED BY THE HOA. NOTE: THE STORMWATER MANAGEMENT STUDY FOR GTW'S WAVERLY WOODS, SECTION 14, BULK PARCEL 'A', HAS BEEN COMPARED TO THE HYDROLOGY BASELINE STUDY PREPARED BY MILDENBERG ASSOCIATES, INC. OCTOBER, 1994, FOR CONTINUITY PURPOSES. THE SWM REPORT SUPPORTS SEVERAL PHASES OF DEVELOPMENT. FOR THIS PLAN, THE HOWARD COUNTY SOIL CONSERVATION DISTRICT HAS ONLY APPROVED POND No. 1. THE COMPUTATIONS AND DATA ASSOCIATED WITH POND Nos. 2 AND 3 HAVE BEEN REVIEWED AND APPROVED UNDER SDP-09-039.
- THIS HORIZONTAL AND VERTICAL DATUM SHOWN ARE BASED ON THE FOLLOWING NAD '83 HOWARD COUNTY CONTROL STATIONS:  
HOWARD COUNTY MONUMENT 012 N 601060.177 E 1345336.790 ELEV. = 445.977'  
HOWARD COUNTY MONUMENT 061 N 593250.932 E 134092.710 ELEV. = 509.924'
- AREA TABULATION:  
SUBMISSION LIMITS  
TOTAL NUMBER OF OPEN SPACE LOTS TO BE RECORDED 2  
TOTAL NUMBER OF BULK PARCELS TO BE RECORDED 2  
TOTAL AREA OF OPEN SPACE LOTS TO BE RECORDED 19,396 AC.  
TOTAL AREA OF BULK PARCELS TO BE RECORDED 19,251 AC.  
TOTAL AREA OF ROADWAY TO BE RECORDED 122 AC.  
TOTAL AREA OF PSC TO BE RECORDED 19,450 AC.  
TOTAL AREA OF PEC TO BE RECORDED 20,468 AC.  
TOTAL AREA TO BE RECORDED 171,768 AC.
- THE NOISE STUDY FOR THIS PROJECT WAS PREPARED BY MARS GROUP DATED MARCH, 2006 AND WAS APPROVED UNDER THE 5-06-03 PLAN DATED JANUARY 17, 2006. A REVISED NOISE STUDY WAS PREPARED BY MARS GROUP DATED MAY, 2008 AND APPROVED UNDER P-08-010 ON 10/16/08. THE 65 DBA NOISE CONTOUR LINE DRAWN ON THIS PLAN IS ADVISORY AS REQUIRED BY THE HOWARD COUNTY DESIGN MANUAL, CHAPTER 5, REVISED FEBRUARY, 1992 AND CANNOT BE CONSIDERED TO EXACTLY LOCATE THE 65 DBA NOISE EXPOSURE. THE 65 DBA NOISE LINE WAS ESTABLISHED BY HOWARD COUNTY TO ALERT DEVELOPERS, BUILDERS AND FUTURE RESIDENTS THAT AREAS BEYOND THIS THRESHOLD MAY EXCEED GENERALLY ACCEPTED NOISE LEVELS ESTABLISHED BY THE U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT.
- TOTAL FOREST CONSERVATION OBLIGATION FOR GTW'S WAVERLY WOODS, SECTION 14:  
a. AFTER THE RECORDING OF PRIOR GTW'S WAVERLY WOODS RECORD PLATS INCLUDING F-08-159, PROPERTY OF GTW JOINT VENTURE, THE REMAINING FOREST OBLIGATION IS 17.46 ACRES RETENTION (9.7 ACRES - 78.24 ACRES) AND 15.11 ACRES REFORESTATION (008.8 ACRES - 93.69 ACRES) TO BE PROVIDED WITH GTW'S WAVERLY WOODS, SECTION 14.  
b. ON-SITE RETENTION SURETY = 17.46 x 43960 x 0.20 = \$152,112.00  
c. ON-SITE REFORESTATION SURETY = 4.69 x 43960 x 0.50 = \$101,300.00  
d. OFF-SITE REFORESTATION SURETY = 10.43 x 43960 x 0.50 = \$227,365.00  
e. OFF-SITE REFORESTATION WILL BE PROVIDED ON THE PROPERTY OF WITCHING HOUR FARM, LLC, TAX MAP NO. 8, PARCEL NO. 249, GRID NO. 1, 4TH ELECTION DISTRICT, LIBER 1092, FOLIO 365.  
f. TOTAL FOREST CONSERVATION SURETY OF \$481,207.00 WILL BE PROVIDED WITH THE DEVELOPER'S AGREEMENT.
- THE ORIGINAL OR BASE MODEL FLOODPLAIN STUDY FOR GTW'S WAVERLY WOODS WAS PREPARED BY MILDENBERG, BOENDER & ASSOC., DATED OCT. 1994 AND WAS APPROVED UNDER 5-94-007 IN OCTOBER, 1994. A REVISED FLOODPLAIN STUDY WAS PREPARED BY FISHER, COLLINS & CARTER, INC. DATED NOVEMBER, 2006 AND APPROVED UNDER F-07-032. A REVISED FLOODPLAIN STUDY WAS PREPARED BY FISHER, COLLINS & CARTER, INC. DATED APRIL 17, 2008 THAT MODELS THE PROPOSED CULVERTS FOR THE BARNESLEY WAY STREAM CROSSING. THIS FLOODPLAIN STUDY WAS APPROVED FOR P-08-010 ON 10/16/08.
- THE PREVIOUS WETLANDS REPORT PREPARED BY ENVIRONMENTAL SYSTEMS ANALYSIS, INC. AND APPROVED WITH 5-94-07 ON NOVEMBER 30, 1993 HAS BEEN RE-CERTIFIED UNDER THIS PLAN BY ECO-SCIENCE PROFESSIONALS, INC. DATED APRIL, 2006 AND APPROVED WITH 5-06-013 ON JANUARY 17, 2006.
- A TRAFFIC STUDY WAS PREPARED BY THE TRAFFIC GROUP AND APPROVED ON JULY 14, 1994 AS PART OF 5-94-07 AND AMENDED UNDER 5-06-13 APPROVED ON NOVEMBER 17, 2008.
- SOILS INFORMATION TAKEN FROM SOIL MAP NO. 17, SOIL SURVEY, HOWARD COUNTY, MARYLAND, JULY, 1968 ISSUE. THE SOILS INVESTIGATION REPORT WAS PREPARED BY L.T.E., INC. ON JUNE 28, 1994.
- FOREST STAND DELINEATION PREPARED BY ENVIRONMENTAL SYSTEM ANALYSIS, INC. AND APPROVED ON NOVEMBER 30, 1995 UNDER 5-94-07.
- BOUNDARY OUTLINE IS BASED ON A FIELD MONUMENTED SURVEY PERFORMED BY FISHER, COLLINS & CARTER, INC. ON OR ABOUT AUGUST 1990.
- BARNESLEY WAY IS A PUBLIC ROAD AND MAINTAINED BY HOWARD COUNTY, MARYLAND.
- THE SKETCH PLAN NO. 5-94-07 WAS APPROVED ON NOVEMBER 30, 1993. THE PLANNING BOARD APPROVED, ON NOVEMBER 1, 2007, PB CASE NO. 381, GTW'S WAVERLY WOODS, SECTION 14, BULK PARCEL 'A', COMPREHENSIVE SKETCH PLAN (5-06-13) AND DEVELOPMENT CRITERIA FOR THE DEVELOPMENT OF 350 AGE-RESTRICTED ADULT HOUSING UNITS (139 SINGLE FAMILY ATTACHED UNITS AND 211 SINGLE FAMILY DETACHED UNITS) ON 14940 ACRES OF LAND ZONED PLANNED SENIOR COMMUNITY.
- STREET LIGHT PLACEMENT AND THE TYPE OF FIXTURES AND POLES SHALL BE IN ACCORDANCE WITH THE HOWARD COUNTY DESIGN MANUAL, VOLUME III (2006), SECTION 5.5.A. A MINIMUM OF 20' SHALL BE MAINTAINED BETWEEN ANY STREET LIGHT AND ANY TREE.
- PERMITS APPLICABLE FOR THIS SUBDIVISION ARE AS FOLLOWS: MDE TRACKING NUMBER 2009962/09-NT-3087
- ALL HANDICAP RAMPS SHALL MEET CURRENT ADA REQUIREMENTS.
- WP 95-23 WAS APPROVED ON 1/23/95 FOR DISTURBANCE TO WETLANDS, FLOODPLAIN, STREAMS, OR THEIR BUFFERS IN CERTAIN AREAS THROUGHOUT THE "WAVERLY WOODS" PROJECT. THE AREAS OF THIS SUBMISSION APPROVED UNDER THIS WAIVER FOR DISTURBANCE ARE AS FOLLOWS:  
a) SHEET 3 - FLOODPLAIN FOR BARNESLEY WAY ROADWAY AND STORM DRAIN CULVERT.  
b) SHEET 3 - WETLANDS AND BUFFER FOR BARNESLEY WAY ROADWAY AND STORM DRAIN CULVERT.
- PROPERTY SUBJECT TO PRIOR DEPARTMENT OF PLANNING AND ZONING FILE Nos. 5-94-07, 5-06-013, ZB CASE NO. 1027 M, ZB CASE NO. 929-M, PB CASE NO. 381, F-01-091, F-01-093, F-01-048, F-01-147, F-08-159, P-08-010, WP-95-23 & WP-09-210.
- TRAFFIC CONTROL DEVICES, MARKINGS AND SIGNING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
- ALL SIGN POSTS USED FOR TRAFFIC CONTROL SIGNS INSTALLED IN THE COUNTY RIGHT OF WAY SHALL BE MOUNTED ON A 2" GALVANIZED STEEL, PERFORATED, SQUARE TUBE POST (4 GAUGE) INSERTED INTO 1 2-1/2" GALVANIZED STEEL, PERFORATED, SQUARE TUBE SLEEVE (12 GAUGE) - 3' LONG. A GALVANIZED STEEL CAP SHALL BE MOUNTED ON TOP OF EACH POST.
- SOIL REQUIRING 95% COMPACTION IN FILL AREAS SHALL BE IN ACCORDANCE WITH AASHTO-T-180 STANDARDS.
- THE ACCESS TO OPEN SPACE LOT 1 (TO BE DEDICATED TO HOWARD COUNTY, MARYLAND) WILL BE ALONG THE EXISTING DRIVEWAY ON THE PROPERTY OF HOWARD COUNTY, MARYLAND, LIBER 896, FOLIO 330 & LIBER 891, FOLIO 314, TAX MAP NO. 16, ADJACENT TM PARCELS 220 & 302.
- LANDSCAPE OBLIGATIONS FOR BULK PARCELS 'A', 'B' AND OPEN SPACE LOTS 1 AND 2 WILL BE PROVIDED AT THE SITE DEVELOPMENT PLAN STAGE.

FISHER, COLLINS & CARTER, INC.  
CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
CENTENAL SQUARE OFFICE PARK - 10272 BALTIMORE NATIONAL PIKE  
ELLICOTT CITY, MARYLAND 21042  
(410) 451-2865

OWNERS  
WAVERLY WOODS DEVELOPMENT CORPORATION,  
HOLE IN THE DOUGHNUT, LLC, &  
GTW JOINT VENTURE  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
ELLICOTT CITY, MARYLAND 21042  
(443) 367-0422

DEVELOPER  
WAVERLY WOODS DEVELOPMENT CORP.  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
ELLICOTT CITY, MARYLAND 21042  
(443) 367-0422



7-29-09  
DATE



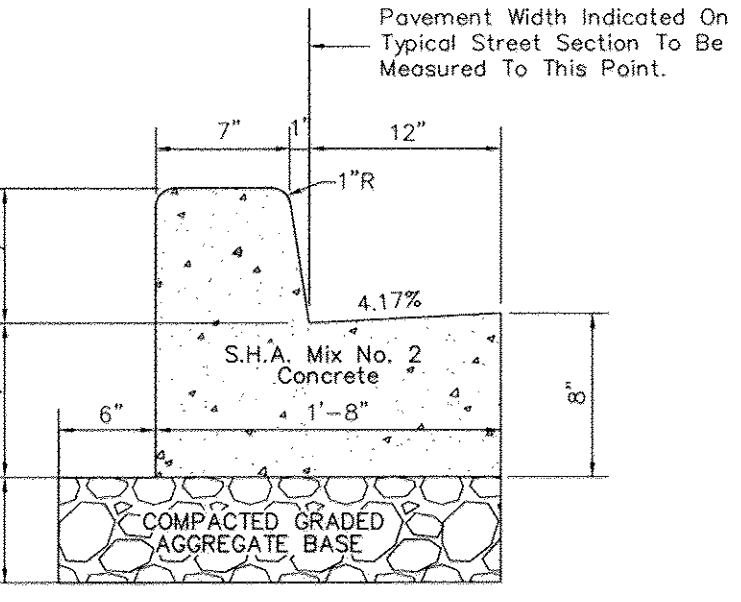
GTW'S WAVERLY WOODS  
SECTION 14  
BULK PARCELS 'A' & 'B' AND  
OPEN SPACE LOTS 1 & 2  
ZONING: PSC & PEC  
TAX MAP NO. 16 PARCEL Nos. 120, 221 & P/O 249 GRID Nos. 3 & 4  
THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
DATE: JULY 28, 2009  
SHEET 1 OF 27

F-09-057  
AS-BUILT



**CURVE DATA**  
**BARNESLEY WAY**  
 STA. 5+07.99 TO STA. 6+07.99  
 RADIUS = 950.00'  
 ARC LENGTH = 100.00'  
 TANGENT = 50.14'  
 DELTA = 102°20'00"  
 CHORD = N77°16'47"W, 99.86'

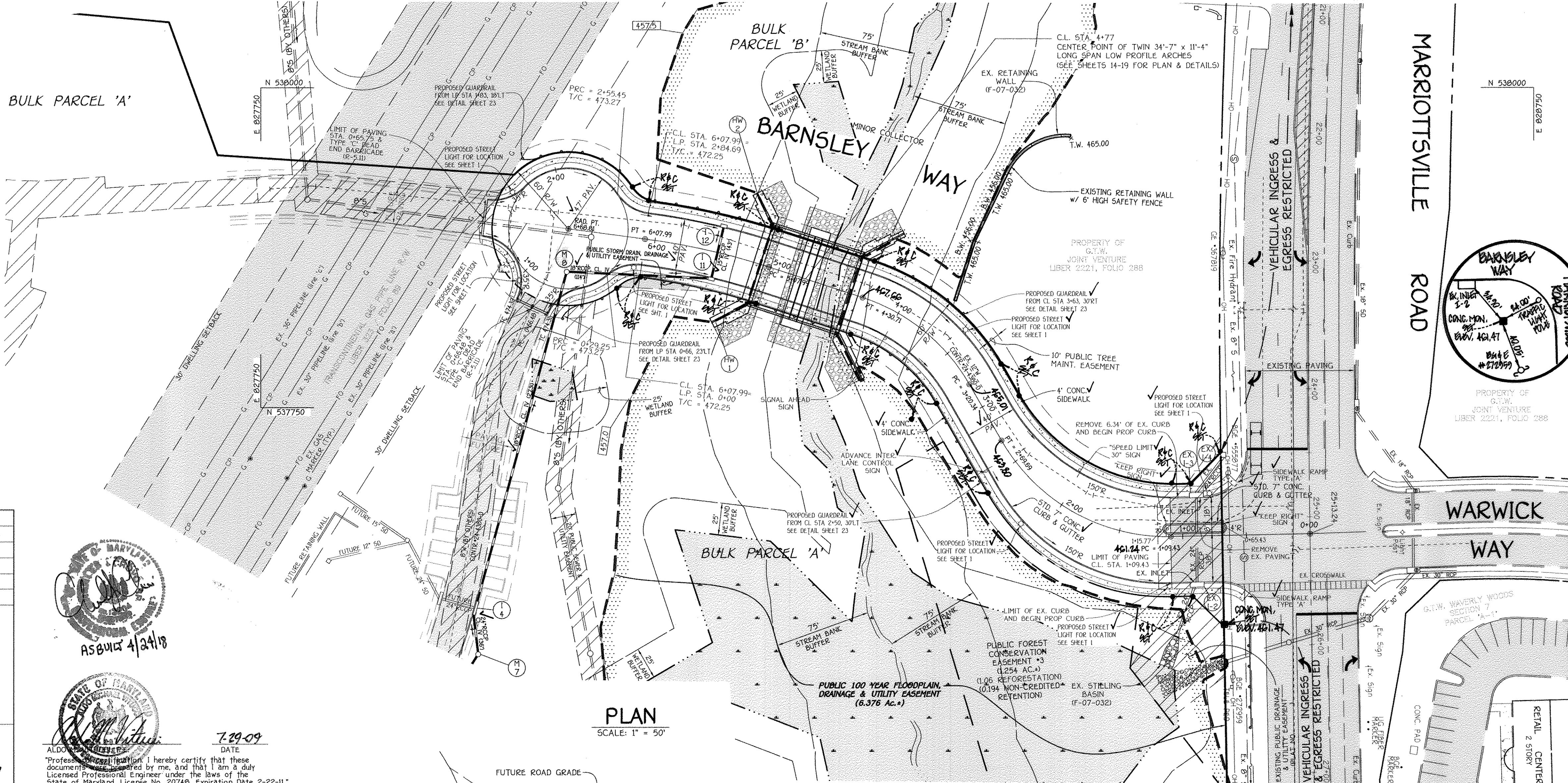
**CURVE DATA**  
**BARNESLEY WAY**  
 STA. 3+20.34 TO STA. 4+30.71  
 RADIUS = 150.00'  
 ARC LENGTH = 10.37'  
 TANGENT = 57.82'  
 DELTA = 42°09'24"  
 CHORD = N50°59'34"W, 107.89'



(DETAIL R=3.01)  
**STANDARD 7" COMB. CONC. CURB AND GUTTER**  
 NO SCALE

NO.	DESCRIPTION	DATE

APPROVED: DEPARTMENT OF PLANNING AND ZONING  
*Cindy Hester* 9/23/09  
 CHIEF, DIVISION OF LAND DEVELOPMENT  
*John Deane* 8/23/09  
 CHIEF, DEVELOPMENT ENGINEERING DIVISION  
 APPROVED: HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS  
*Willie Z. McNeil* 8-27-09  
 CHIEF, BUREAU OF HIGHWAYS



**PLAN**  
 SCALE: 1" = 50'

**CURVE DATA**  
**BARNESLEY WAY**  
 STA. 1+09.43 TO STA. 2+69.69  
 RADIUS = 150.00'  
 ARC LENGTH = 160.26'  
 TANGENT = 88.73'  
 DELTA = 61°12'50"  
 CHORD = N60°31'16"W, 152.74'

**CURB DATA - RIGHT SIDE**  
**BARNESLEY WAY**  
 STA. 1+03.09, 30' RT TO STA. 2+92.93, 20' RT  
 RADIUS = 150.00'  
 ARC LENGTH = 160.26'  
 TANGENT = 88.73'  
 DELTA = 61°12'50"  
 CHORD = N60°31'16"W, 152.74'

**CURB DATA - LEFT SIDE**  
**BARNESLEY WAY**  
 STA. 1+11.88, 36' LT TO STA. 2+43.41, 22.64' LT  
 RADIUS = 150.00'  
 ARC LENGTH = 160.26'  
 TANGENT = 88.73'  
 DELTA = 61°12'50"  
 CHORD = N60°31'16"W, 152.74'

**LEGEND**

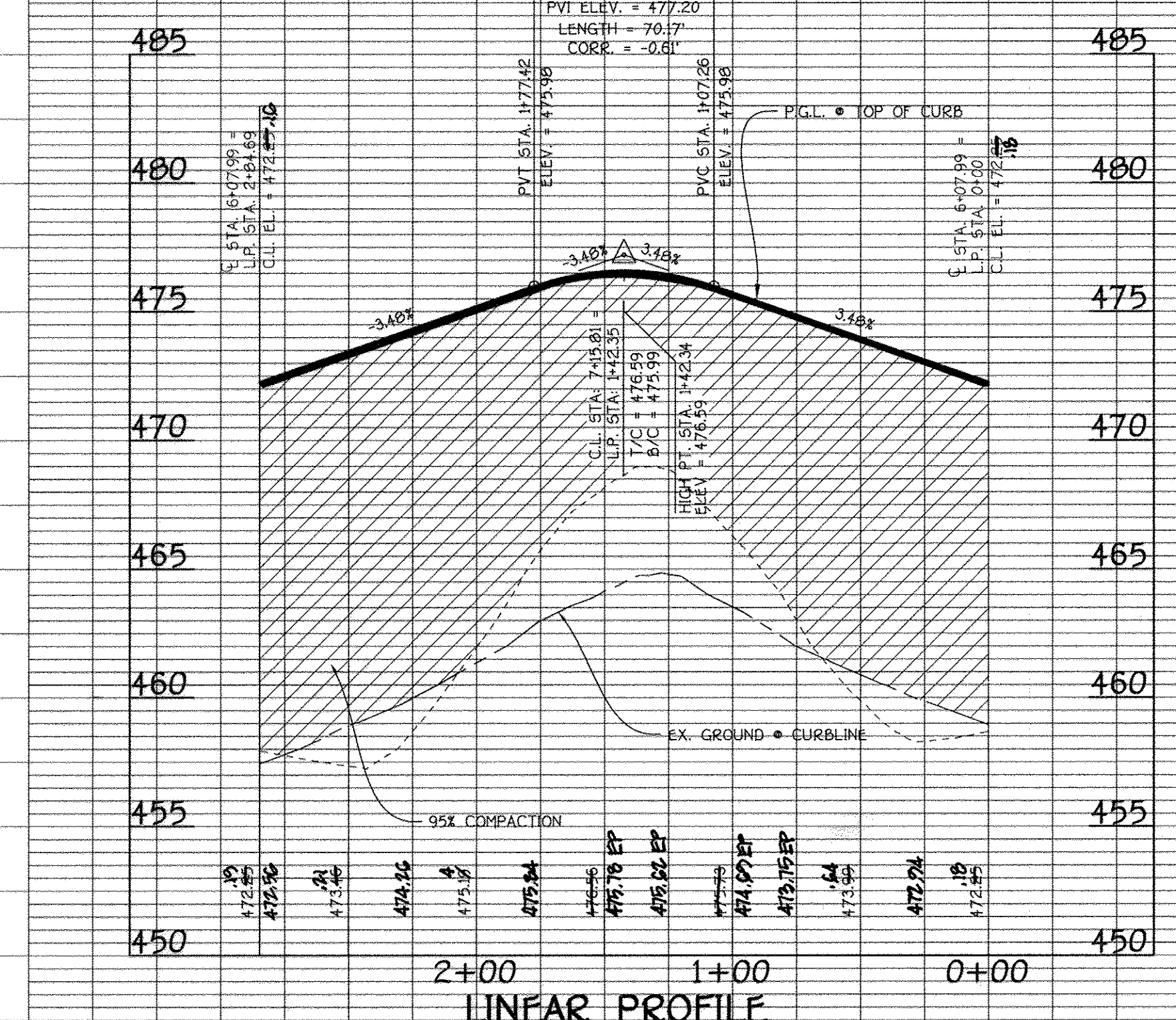
SYMBOL	DESCRIPTION
	EXISTING STREAM
	EXISTING FLOODPLAIN
	EXISTING WETLANDS
	EXISTING SEWER LINE
	EXISTING STORM DRAIN LINE
	EXISTING GAS LINE
	EXISTING WATER LINE
	EXISTING PAVING
	PROPOSED STORM DRAIN
	PROPOSED SIDEWALK
	PROPOSED LIGHT

**GTW'S WAVERLY WOODS**  
**SECTION 14**  
**BULK PARCELS 'A' & 'B' AND**  
**OPEN SPACE LOT 1**  
 TAX MAP NO. 16 PARCEL Nos. 120, 221 & P/O 249 GRID Nos. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
**BARNESLEY WAY**  
 PLAN AND PROFILE  
**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION  
 HOLE IN THE DOUGHNUT, LLC &  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)  
**DEVELOPER**  
 WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)  
 SCALE: AS SHOWN DATE: JULY 28, 2009 DWG. NO. 2 OF 27  
 DES. AMV / RAI DRN. JCL CHK. AMV  
**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTENAL SQUARE OFFICE PARK - 1872 BALTIMORE NATIONAL PIKE  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 461-2922

**BARNESLEY WAY**

**VERTICAL CURVE DATA**

PVI STA. = 1+42.34	PVI ELEV. = 477.20
LENGTH = 70.17'	CORR. = -0.81'
PVT STA. = 1+72.46	ELEV. = 475.98
PVC STA. = 1+07.26	ELEV. = 475.98



**LINEAR PROFILE**  
 SCALE: HOR. 1" = 50'  
 VER. 1" = 5'

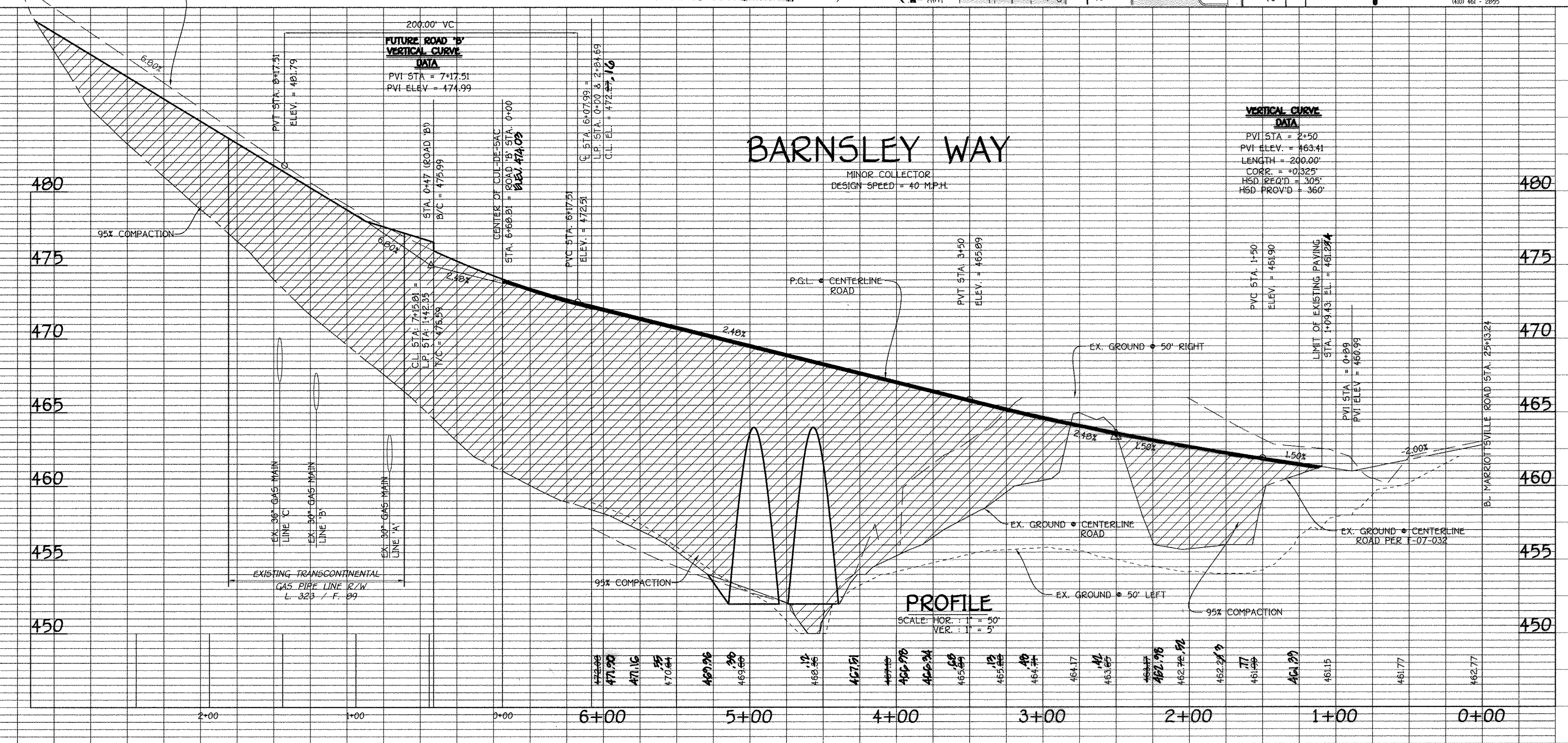
**BARNESLEY WAY**

**FUTURE ROAD 'B' VERTICAL CURVE DATA**

PVI STA. = 7+17.21	PVI ELEV. = 474.99
LENGTH = 160.00'	CORR. = -0.320'
PVT STA. = 7+47.21	ELEV. = 474.99
PVC STA. = 6+47.21	ELEV. = 474.99

**VERTICAL CURVE DATA**

PVI STA. = 2+50	PVI ELEV. = 463.41
LENGTH = 200.00'	CORR. = -0.320'
PVT STA. = 2+50	ELEV. = 463.41
PVC STA. = 1+50	ELEV. = 463.41



**PROFILE**  
 SCALE: HOR. 1" = 50'  
 VER. 1" = 5'



**ENGINEER'S CERTIFICATE**  
 I hereby certify that this Plan for Erosion and Sediment Control Represents a Feasible and Workable Plan Based on My Personal Knowledge Of The Site and That It Was Prepared in Accordance With the Requirements of the Howard Soil Conservation District.  
 Signature: *[Signature]* Date: 7-27-09

**DEVELOPER'S CERTIFICATE**  
 I/We Certify That All Development And Construction Will Be Done According To This Plan Of Development And Plan For Erosion And Sediment Control And That All Responsible Personnel Involved In The Construction Project Will Have A Certificate Of Attendance At A Department Of Natural Resources 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 Or Their Authorized Agents, As Are Deemed Necessary.  
 Signature Of Developer: *[Signature]* Date: 8/5/09

Approved: This Development Is Approved For Erosion And Sediment Control By The Howard Soil Conservation District.  
 District Howard Soil Conservation Dist. Date: 8/18/09

Approved: Department Of Planning And Zoning  
 Chief, Division Of Land Development Date: 9/29/09

Approved: Chief, Development Engineering Division Date: 8/31/09

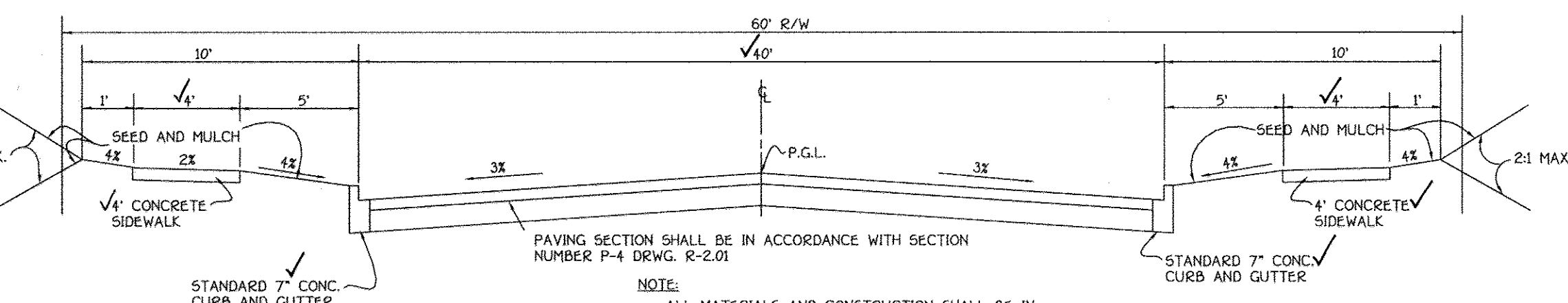
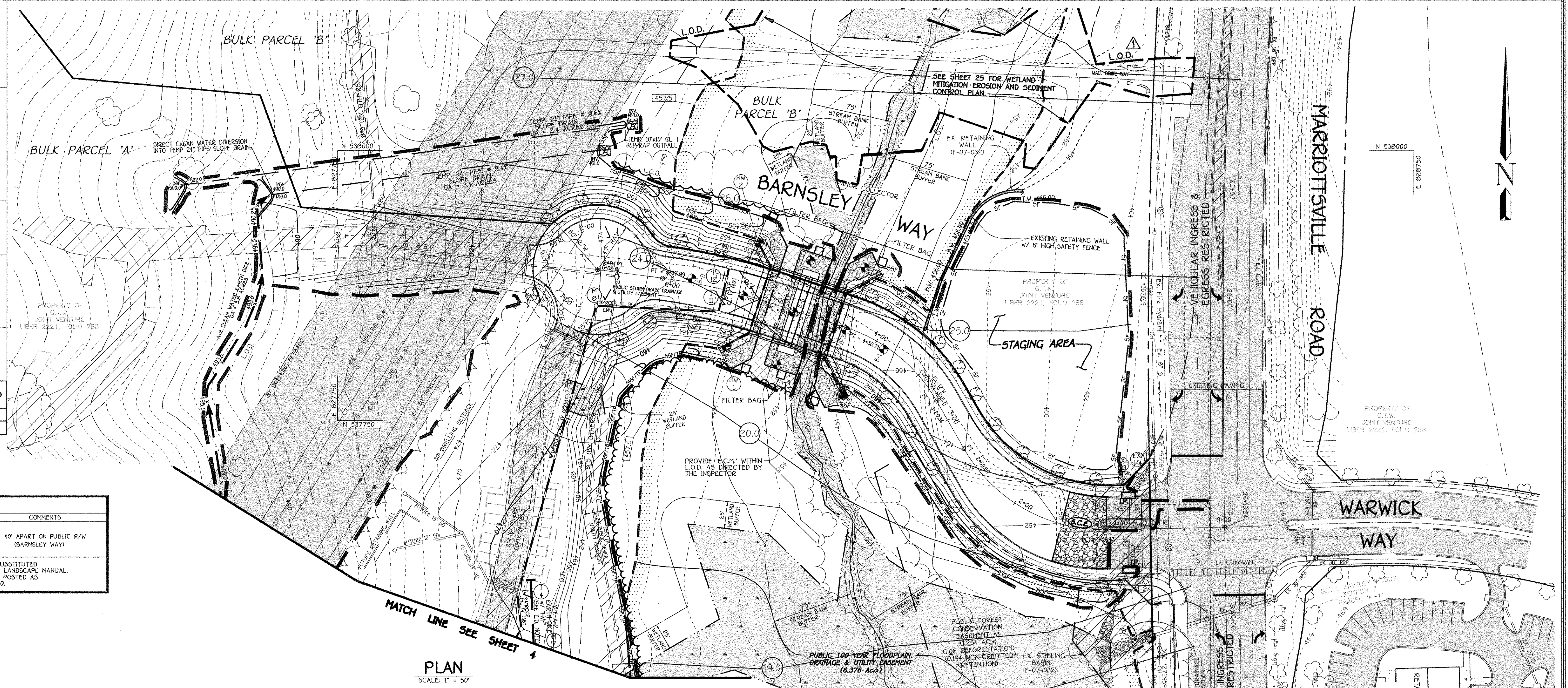
Approved: Howard County Department Of Public Works  
 Chief, Bureau Of Highways Date: 8-27-09

No	Description	Date
1	Replace Sheets 25 And 26, Added Sheet 27 & Revise L.O.D. For Wetland Mitigation per Changes to Sheet 26.	8-9-10

**STREET TREE SCHEDULE**

SYMBOL	QTY.	BOTANICAL AND COMMON NAME	SIZE	COMMENTS
	660/40 = 16.5 16.5 x 2 = 33 33 TREES	PLATANUS OCCIDENTALIS 'BLOODGOOD' LONDON PLANE TREE	2 1/2" - 3" CAL.	40' APART ON PUBLIC R/W (BARNSELY WAY)

NOTE: STREET TREE TYPES ARE ONLY A RECOMMENDATION AND MAY BE SUBSTITUTED WITH A COUNTY ACCEPTED EQUIVALENT FROM THE HOWARD COUNTY LANDSCAPE MANUAL. FINANCIAL SURETY FOR THE 33 REQUIRED STREET TREES HAS BEEN POSTED AS PART OF THE DEVELOPER'S AGREEMENT IN THE AMOUNT OF \$9,900.00.



TYPICAL ROADWAY SECTION (BARNSELY WAY)  
NO SCALE

ROADWAY INFORMATION CHART

ROAD NAME	CLASSIFICATION	DESIGN SPEED	ZONING	STATION LIMITS	PAVING SECTION
BARNSELY WAY	MINOR COLLECTOR	40 MPH	PSC	0+00 TO 6+68.81	P-4

SECTION NUMBER	ROAD AND STREET CLASSIFICATION	CALIFORNIA BEARING RATIO (CBR)	3 TO 4.5		5 TO 7		27	
			MIN HMA WITH GAB	HMA WITH CONSTANT GAB	MIN HMA WITH GAB	HMA WITH CONSTANT GAB	MIN HMA WITH GAB	HMA WITH CONSTANT GAB
P-4	MINOR COLLECTORS, NON-RESIDENTIAL MAJOR COLLECTORS	12.5 MM PG 64-22, LEVEL 2 (LOW ESAL)	2.0	2.0	2.0	2.0	2.0	2.0
		HMA SUPERPAVE INTERMEDIATE SURFACE 12.5 MM PG 64-22, LEVEL 2 (LOW ESAL)	2.0	2.0	2.0	2.0	2.0	2.0
		HMA SUPERPAVE BASE 19.0 MM PG 64-22, LEVEL 2 (LOW ESAL)	4.0	4.0	3.0	6.0	5.0	3.0
		GRADED AGGREGATE BASE (GAB)	13.0	7.0	4.0	6.0	6.0	6.0

NOTE: SEE SHEETS 25 AND 26 FOR WETLAND MITIGATION EROSION AND SEDIMENT CONTROL PLAN.

- LEGEND**
- SGF—SGF— SUPER-SILT FENCE
  - SGF/TP— SUPER-SILT FENCE / TREE PROTECTION
  - TP—TP—TP— TREE PROTECTION FENCE
  - STABILIZED CONSTRUCTION ENTRANCE
  - A-2 → EARTH DIKE
  - "HVF" HIGH VISIBILITY FENCING (PROVIDE WITH ALL INTERNAL EARTH DIKES)
  - LIMIT OF DISTURBANCE
  - GABION INFLOW PROTECTION
  - EROSION CONTROL MATTING

**EARTH DIKE (E.D.) NOTE:**  
 PROPOSED DIKES SUPPORTING GRADES ARE TO BE CONSTRUCTED TO THEIR FINAL ELEVATIONS PRIOR TO MASS GRADING THE SITE.

**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTRAL SQUARE OFFICE PARK - 10272 BALTIMORE NATIONAL PIKE  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 461-2895

**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE ROUGH, LLC, &  
 CTV JOINT VENTURE,  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443) 367-0422

**DEVELOPER**  
 WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443) 367-0422

**STATE OF MARYLAND**  
 PROFESSIONAL ENGINEER  
 ALDO M. [Signature]  
 7-27-09  
 I, the undersigned, hereby certify that these documents were prepared by me, and that I am a duly Licensed Professional Engineer under the laws of the State of Maryland, License No. 20748, Expiration Date 2-22-11.

**STATE OF MARYLAND**  
 PROFESSIONAL LAND SURVEYOR  
 [Signature]  
 7-27-09  
 AS BUILT 4/24/10

**STREET TREE, GRADING & SEDIMENT CONTROL PLAN**  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOTS 1 & 2  
 ZONING PSC & PEC  
 TAX MAP NO. 16 PARCEL Nos. 120, 221 & P/O 249 GRID Nos. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: JULY 28, 2009  
 SHEET 3 OF 27



**ENGINEER'S CERTIFICATE**  
 I hereby certify that this Plan For Erosion And Sediment Control Represents A Practical And Workable Plan Based On My Personal Knowledge Of The Site And That It Was Prepared In Accordance With The Requirements Of The Howard Soil Conservation District.  
 Signature: *[Signature]* Date: 7/29/09

**DEVELOPER'S CERTIFICATE**  
 I/We Certify That All Development And Construction Will Be Done According To This Plan Of Development And Plan For Erosion And Sediment Control And That All Responsible Personnel Involved In The Construction-Project Will Have A Certificate Of Attendance At A Department Of Natural Resources 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 Or Their Authorized Agents, As Are Deemed Necessary.  
 Signature Of Developer: *[Signature]* Date: 8/5/09

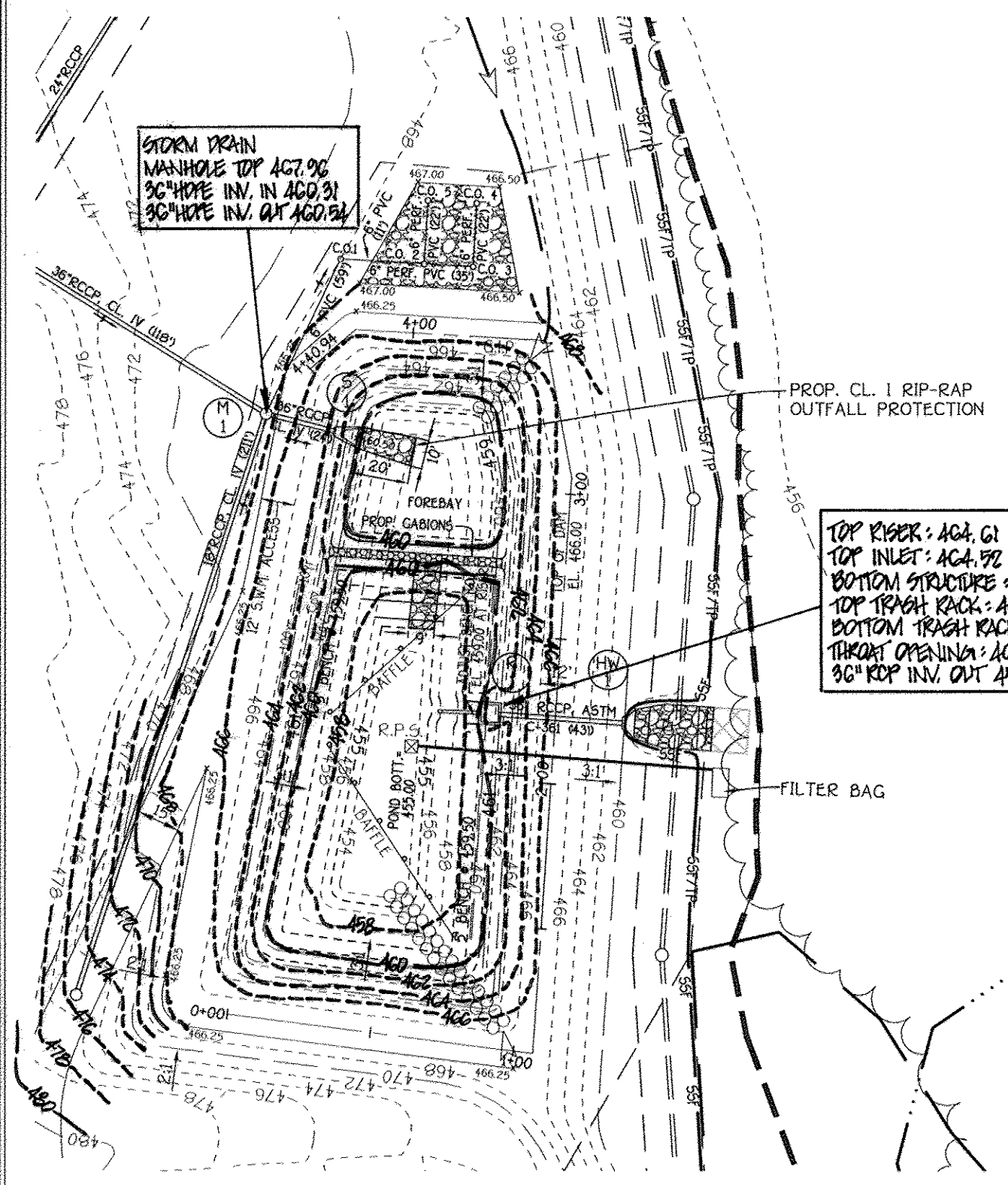
Approved: This Development Is Approved For Erosion And Sediment Control By The Howard Soil Conservation District.  
 District Howard Soil Conservation Dist. Date: 8/18/09  
 Approved: Department Of Planning And Zoning  
 Chief, Division Of Land Development Date: 9/29/09  
 Chief, Development Engineering Division Date: 8/31/09  
 Approved: Howard County Department Of Public Works  
 Chief, Bureau Of Highways Date: 8-27-09

**TEMPORARY SEDIMENT BASIN No. 1 @ BMP #1**  
 INITIAL D.A. = 11.02 AC.  
 FINAL D.A. = 16.62 AC.  
 STORAGE REQUIRED  
 WET = 1800 x 16.62 = 29,916 CUF.  
 DRY = 1800 x 16.62 = 29,916 CUF.  
 STORAGE PROVIDED  
 WET = 29,916 CUF. @ ELEV. 459.75  
 DRY = 29,916 CUF. @ ELEV. 462.10  
 BOTTOM ELEV. = 454.00  
 STORAGE DEPTH = 4.75'  
 TOP OF SETTLED EMBANKMENT = 466.00  
 CLEAN OUT ELEV. = 450.00  
 RISER CREST ELEV. = 462.70  
 1 YR. ORIFICE EL. = 459.75  
 Q1 exist. = 0.47 c.f.s.  
 Q1 prop. = 2.9 c.f.s. @ 462.71 (NON-EROSIVE)

**EARTH DIKE (E.D.) NOTE:**  
 PROPOSED DIKES SUPPORTING GRADES ARE TO BE CONSTRUCTED TO THEIR FINAL ELEVATIONS PRIOR TO MASS GRADING THE SITE.

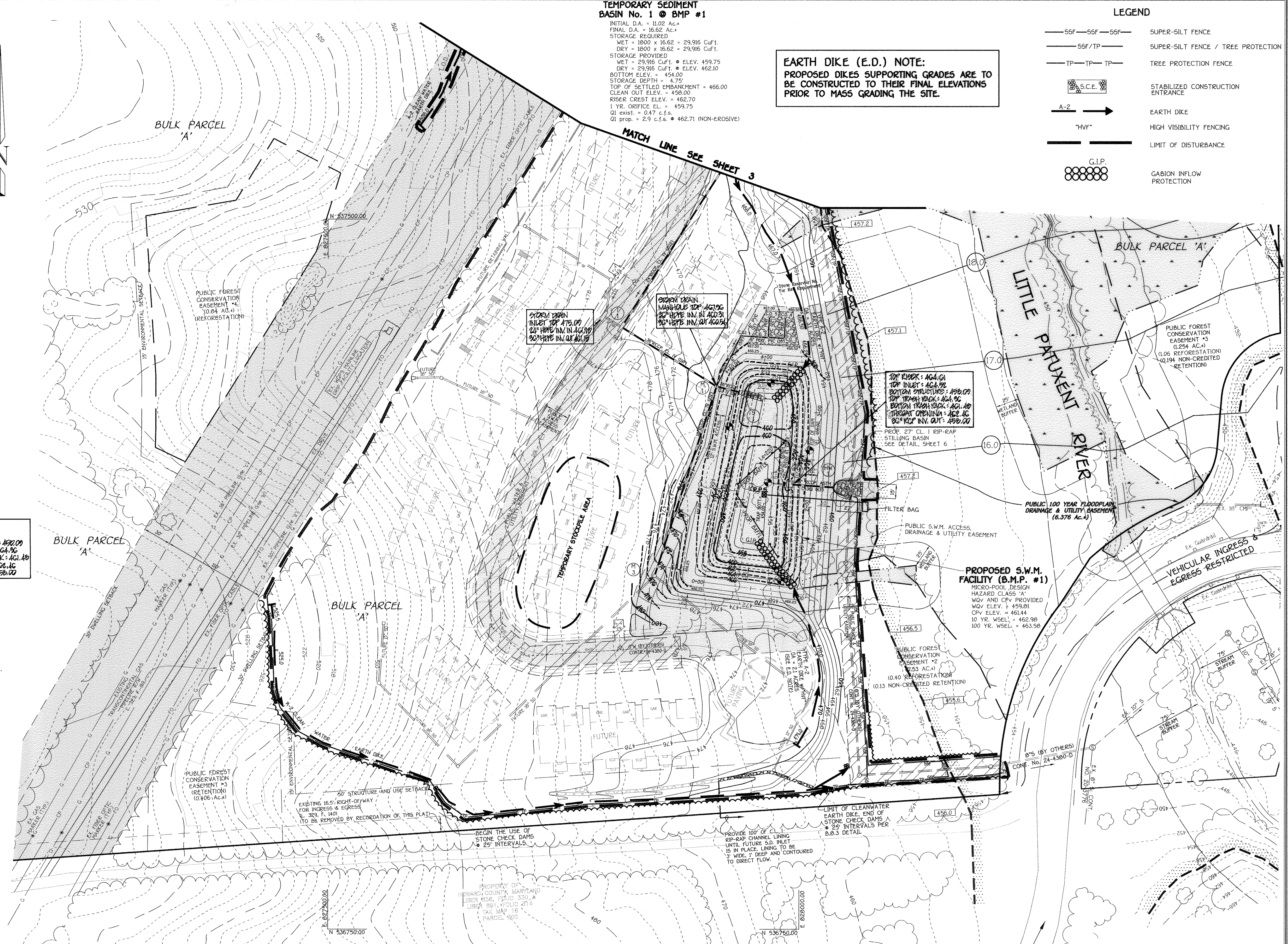
**LEGEND**

- SSF—SSF—SSF— SUPER-SILT FENCE
- SSF/TP— SUPER-SILT FENCE / TREE PROTECTION
- TP—TP—TP— TREE PROTECTION FENCE
- [S.C.E. symbol] STABILIZED CONSTRUCTION ENTRANCE
- A-2 → EARTH DIKE
- "HVF" HIGH VISIBILITY FENCING
- — — — — LIMIT OF DISTURBANCE
- G.I.P. symbol CAGION INFLOW PROTECTION



**FINAL B.M.P. No. 1 GRADING PLAN**  
 SCALE: 1" = 50'

**AS-BUILT CERTIFICATION**  
 I HEREBY CERTIFY THAT THE FACILITY SHOWN ON THIS PLAN WAS CONSTRUCTED AS SHOWN ON THE "AS-BUILT" PLANS AND METS THE APPROVED PLANS AND SPECIFICATIONS.  
 Signature: *Paul M. Radel* PE NO: 12043 DATE: 12/10/14  
 AS-BUILT INFORMATION ADDED: DECEMBER 10, 2014



**PLAN**  
 SCALE: 1" = 50'

**NOTE:**  
 FOR ACCESS TO OPEN SPACE LOT 1, SEE GENERAL NOTE 41 ON SHEET 1.

**STATE OF MARYLAND**  
 PROFESSIONAL ENGINEER  
 Signature: *[Signature]* Date: 7/29/09  
 ALSO: I hereby certify that these documents were prepared by me, and that I am a duly Licensed Professional Engineer under the laws of the State of Maryland, License No. 20748, Expiration Date 2-22-11.

**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTENNIAL SQUARE OFFICE PARK - 10722 BALTIMORE NATIONAL PIKE  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 461-2295

**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE DOUGHNUT, LLC, &  
 CTJV JOINT VENTURE  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 367-0422

**DEVELOPER**  
 WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 367-0422

**STREET TREE, GRADING & SEDIMENT CONTROL PLAN**  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOTS 1 & 2  
 ZONING PSC & PEC  
 TAX MAP NO. 16 PARCEL NOS. 120, 221 & P/O 249 GRID NOS. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: JULY 28, 2009  
 SHEET 4 OF 27

F-09-057  
 AS-BUILT 12/10/14



Approved: Department Of Planning And Zoning  
*Candy Ham* 8/29/09  
 Chief, Division of Land Development  
 Date

*W. J. Marshall* 8/23/09  
 Chief, Development Engineering Division  
 Date

Approved: Howard County Department Of Public Works  
*W. J. Marshall* 8-27-09  
 Chief, Bureau Of Highways  
 Date

**NOTES:**

"At the time of plant installation, all 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, to additions or relocations of the required plantings may be made without prior review and approval from the Department of Planning and Zoning. Any deviations from the approved Landscape Plan may result in denial or delay in the release of landscape survey until such time as all required materials are planted and/or revisions are made to the road drawing plan."

"The Owner, tenants and/or their agents shall be responsible for maintenance of the required perimeter landscaping. All plant materials shall be maintained in good growing condition, and when necessary, replaced with new materials to ensure continual compliance with applicable regulations. All the other required landscaping shall be permanently maintained in good condition and when necessary, repaired or replaced."

**PLANTING SPECIFICATIONS**

Plants, related material, and operations shall meet the detailed description as given on the plans and as described herein. All plant material, unless otherwise specified, shall be nursery grown, uniformly branched, have a vigorous root system, and shall conform to the species, size, root and shape shown on the plant list and the American Association of Nurserymen (AAN) Standards. Plant material shall be healthy, vigorous, free from defects, decay, debilitating roots, sun scald injuries, abrasions of the bark, plant disease, insect pest eggs, borers and all forms of insect infestations or objectionable infestations. Plant material that is weak or which has been cut back from larger grades to meet specific requirements will be rejected. Trees with forked leaders will not be accepted. All plants shall be freshly dug and no heated-in plants from cold storage will be accepted. Unless otherwise specified, all general conditions, planting operations, details and planting specifications shall conform to "Landscape Specification Guidelines for Baltimore-Washington Metropolitan Area" (hereinafter "Landscape Guidelines") approved by the Landscape Contractors Association of Metropolitan Washington and the Potomac Chapter of the American Society of Landscape Architects, latest edition, including all addenda.

Contractor shall be required to guarantee all plant material for a period of one year after date of acceptance in accordance with the appropriate section of the Landscape Guidelines. Contractor's attention is directed to the maintenance requirements found within the one year specifications including watering and replacement of specified plant material.

Contractor shall be responsible for notifying utility companies, utility contractors and "Miss Utility" a minimum of 48 hours prior to beginning any work. Contractor may make minor adjustments in spacing and location of plant material to avoid conflicts with utilities. Damage to existing structure and utilities shall be repaired at the expense of the Contractor.

Protection of existing vegetation to remain shall be accomplished by the temporary installation of 4 foot high snow fence or blaze orange safety fence at the drip line.

Contractor is responsible for installing all material in the proper planting season for each plant type. All planting is to be completed within the growing season of completion of site construction.

Bid shall be based on actual site conditions. No extra payment shall be made for work arising from site conditions differing from those indicated on drawings and specifications.

Plant quantities are provided for the convenience of the contractor only. If discrepancies exist between quantities shown on plan and those shown on the plant list, the quantities on the plan take precedence.

All shrubs shall be planted in continuous trenches or prepared planting beds and mulched with composted hardwood mulch as details and specified except where noted on plans.

Positive drainage shall be maintained in planting beds 2 percent slope.

Planting mix shall be as follows: Deciduous Plants - Two parts topsoil, one part well-rotted cow or horse manure. Add 3 lbs. of standard fertilizer per cubic yard of planting mix. Evergreen Plants - two parts topsoil, one part manure or other approved organic material. Add 3 lbs. of evergreen food/coco fertilizer per cubic yard of planting mix. Topsoil shall conform to the Landscape Guidelines.



Vegetation Control: Incorporate a pre-emergent herbicide into the planting bed following recommended rates on the label. Caution: Be sure to carefully check the chemical used to assure its adaptability to the specific ground cover to be treated.

All areas within contract limits disturbed during or prior to construction not designated to receive plants and mulch shall be fine graded and seeded. This plan is intended for landscape use only. See other plan sheets for more information on grading, sediment control, layout, etc.

**SCHEDULE D STORMWATER MANAGEMENT AREA LANDSCAPING**

LINEAR FEET OF TYPE 'B' PERIMETER	D-1 : 805'
NUMBER OF TREES REQUIRED & PROVIDED:	805' - 259' = 546'
SHADE TREES	11
EVERGREEN TREES	14
CREDIT FOR EXISTING VEGETATION (NO, YES AND %)	259'
CREDIT FOR OTHER LANDSCAPING (NO, YES AND %)	NO

**PLANT LIST**

SYMBOL	QTY.	BOTANICAL AND COMMON NAME	SIZE
	11	QUERCUS ALUTISSIMA SAWTOOTH OAK	2 1/2'-3' CAL.
	14	PINUS STROBUS EASTERN WHITE PINE	6' - 8' HT.

"THIS PLAN HAS BEEN PREPARED IN ACCORDANCE WITH THE PROVISIONS OF SECTION 16.124 OF THE HOWARD COUNTY CODE AND THE LANDSCAPE MANUAL. FINANCIAL SURETY FOR THE REQUIRED 11 SHADE & 14 EVERGREEN TREES HAS BEEN POSTED AS PART OF THE DEVELOPER'S AGREEMENT IN THE AMOUNT OF \$ 5,400.00"

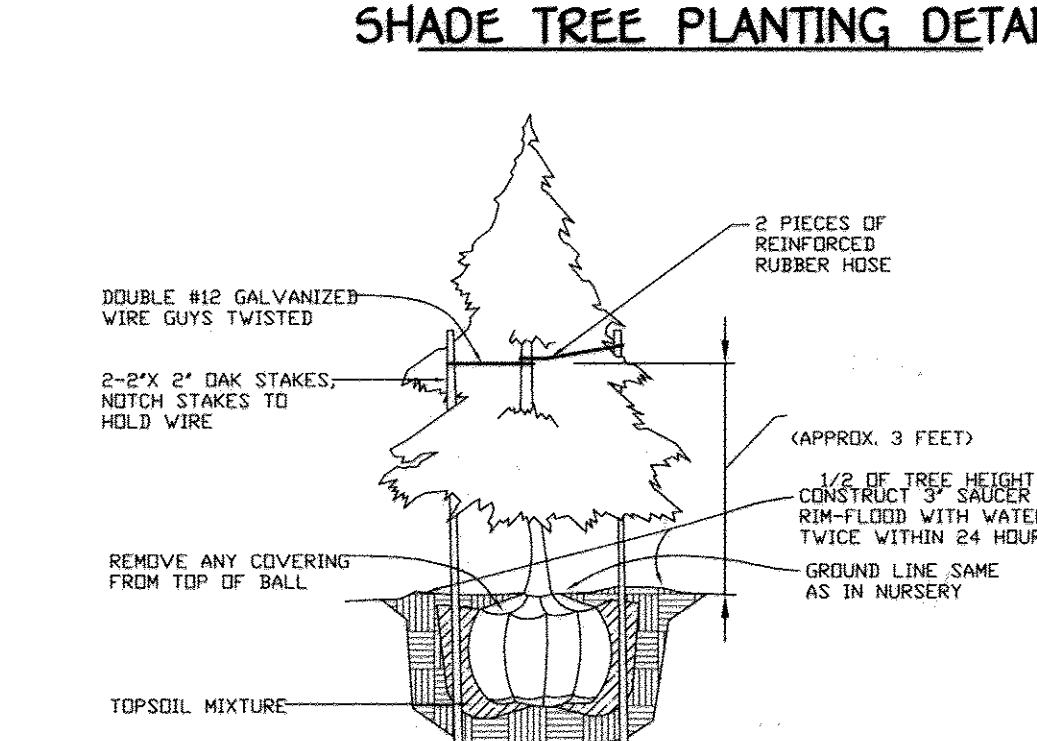
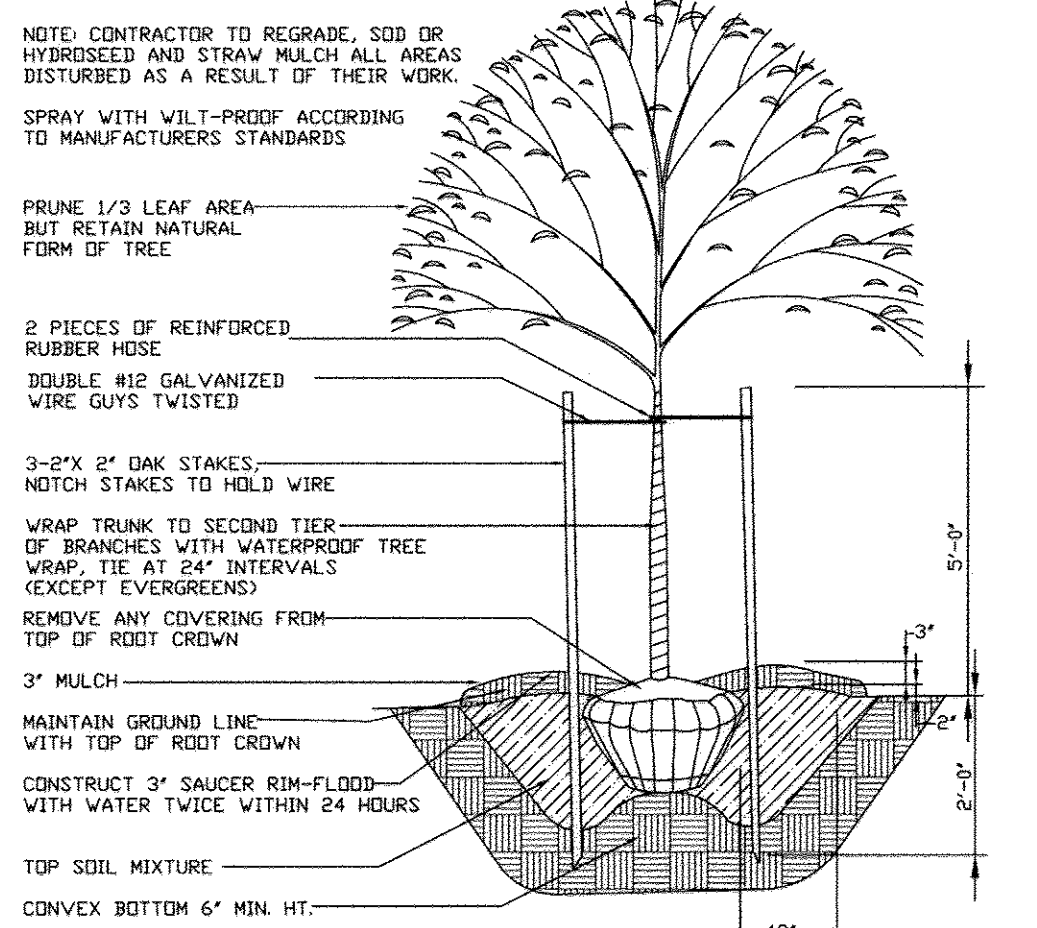
**INTERNAL POND PLANT LIST**

ZONE	PLANT AREA	PLANTING SPECIFICATIONS
ZONE 5 FLOODPLAIN TERRACE	ELEV. 499.50 TO ELEV. 462.00	PLANT AREA w/ SWITCH GRASS QUANTITY - N/A SPACING - N/A
ZONE 3 SHORELINE FENCE	ELEV. 499.50 TO BENCH PLANT BENCH AREA w/ THE FOLLOWING: NICKERBY, WITCHHAZEL & WINTERBERRY	QUANTITY - 9 EACH SPACING - 12' MAX.
ZONE 2 SHALLOW WATER BENCH	ELEV. 498.00 TO ELEV. 499.50	PLANT AREA w/ BUCKRUSH BIRCH QUANTITY - N/A SPACING - N/A
ZONE 1 DEEPWATER POOL	ELEV. 495.00 TO ELEV. 498.00	PLANT AREA w/ WISCONSIN GRASS QUANTITY - N/A SPACING - N/A

**LANDSCAPE DEVELOPER'S CERTIFICATE**

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

*W. J. Marshall* 8/29/09  
 Note Date



LANDSCAPE PLAN  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOTS 1 & 2

ZONING PSC & PEC  
 TAX MAP No. 16 PARCEL Nos. 120, 221 & P/O 249 GRID Nos. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: JULY 28, 2009  
 SHEET 5 OF 27

**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTRAL SQUARE OFFICE PARK - 2072 BALTIMORE NATIONAL PIKE  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 461 - 2895

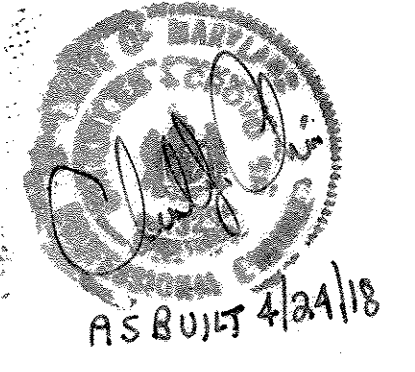
**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE DOUGHNUT, LLC, &  
 CTJ JOINT VENTURE  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 367-0422

**DEVELOPER**  
 WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 367-0422

PLAN  
 SCALE 1" = 50'

**HOWARD COUNTY**  
 DEPARTMENT OF PLANNING AND ZONING  
 I, *W. J. Marshall*, hereby certify that these documents were prepared by me, and that I am a duly Licensed Professional Engineer under the laws of the State of Maryland, License No. 20748, Expiration Date 2-22-11.

DATE: 8-29-09

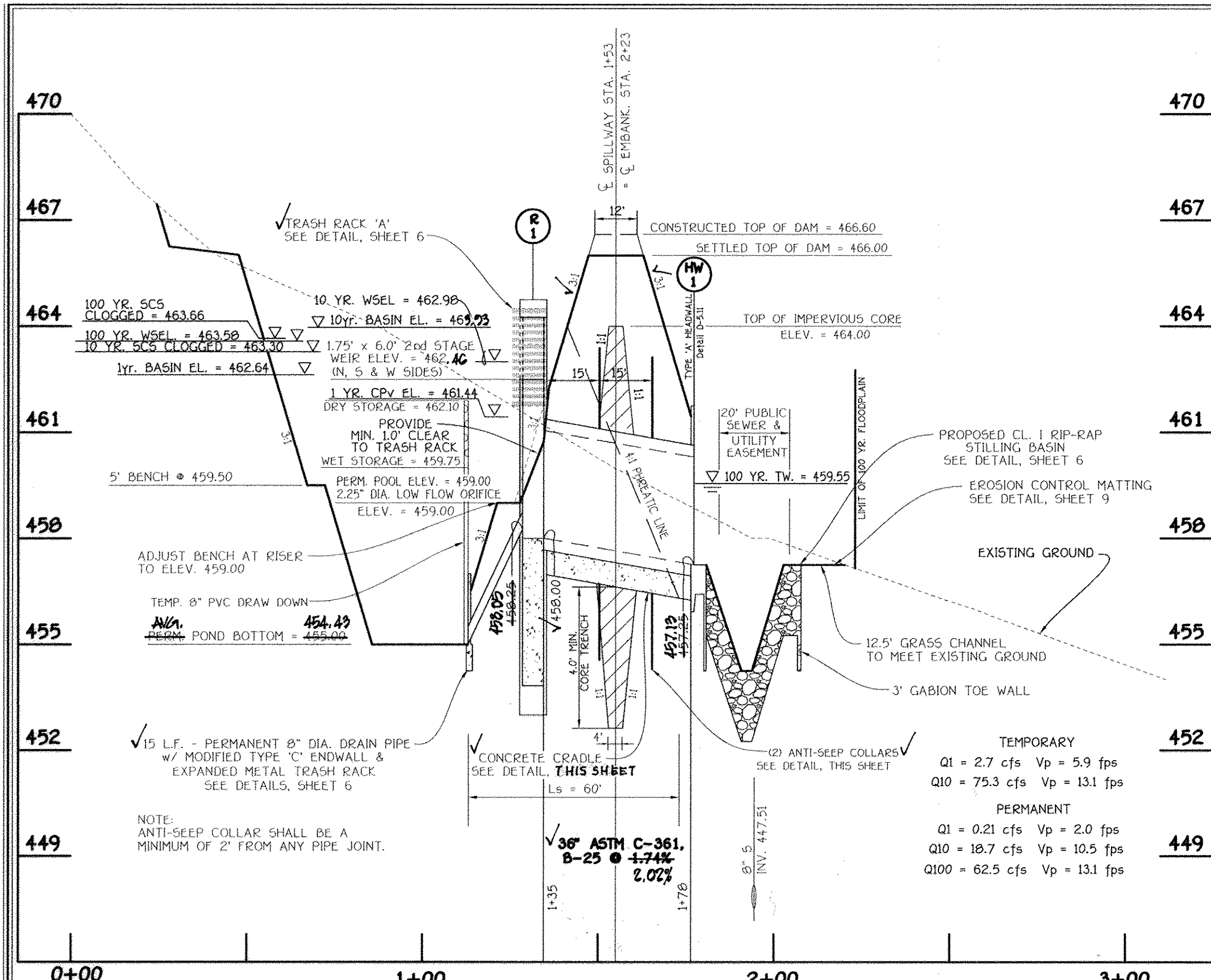


AS-BUILT F-09-057

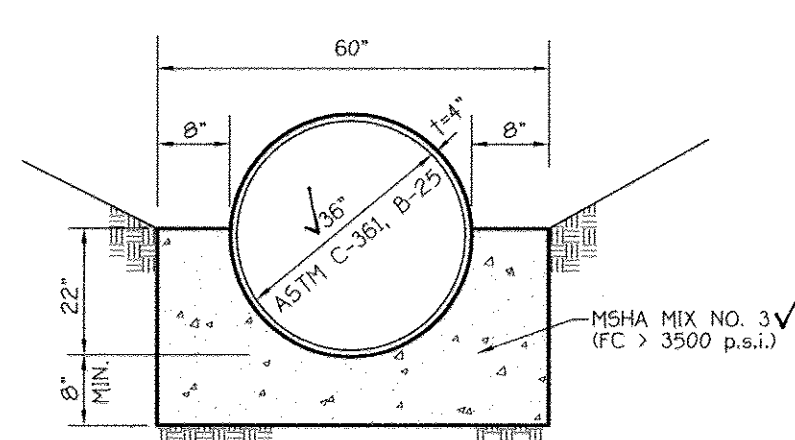




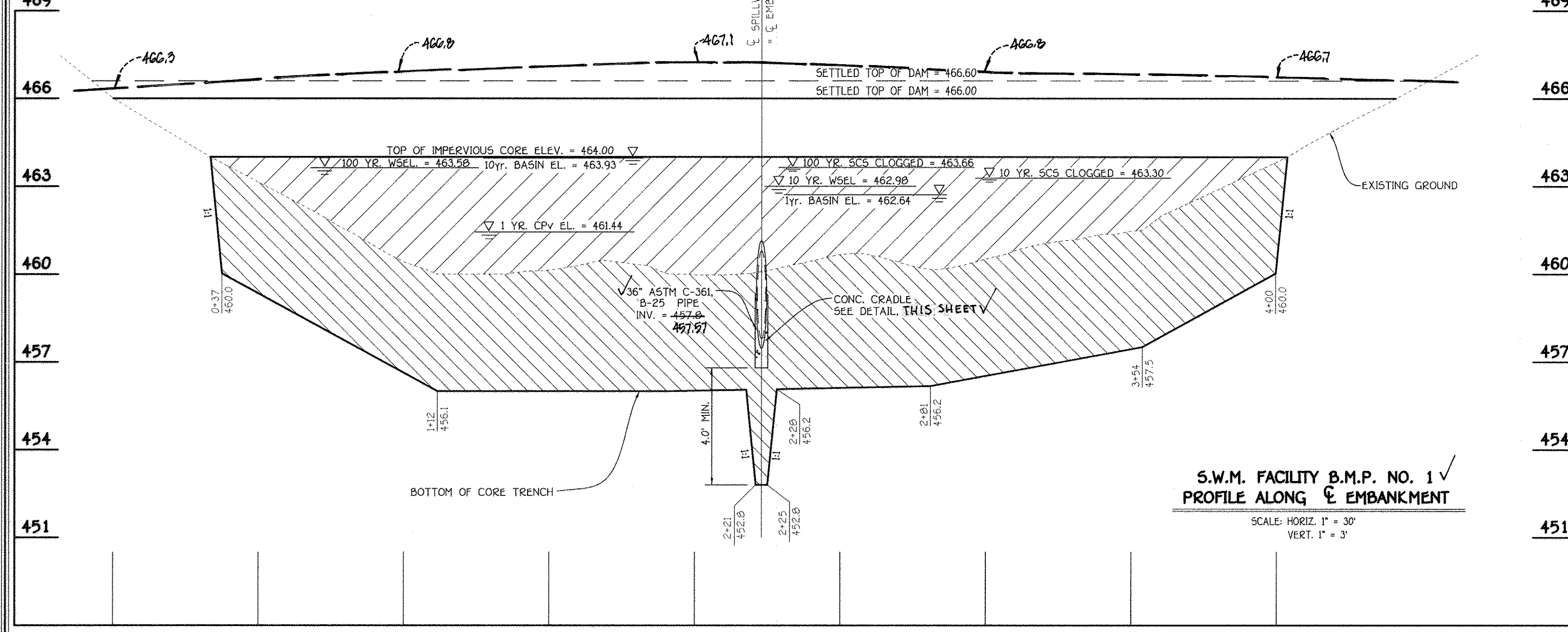




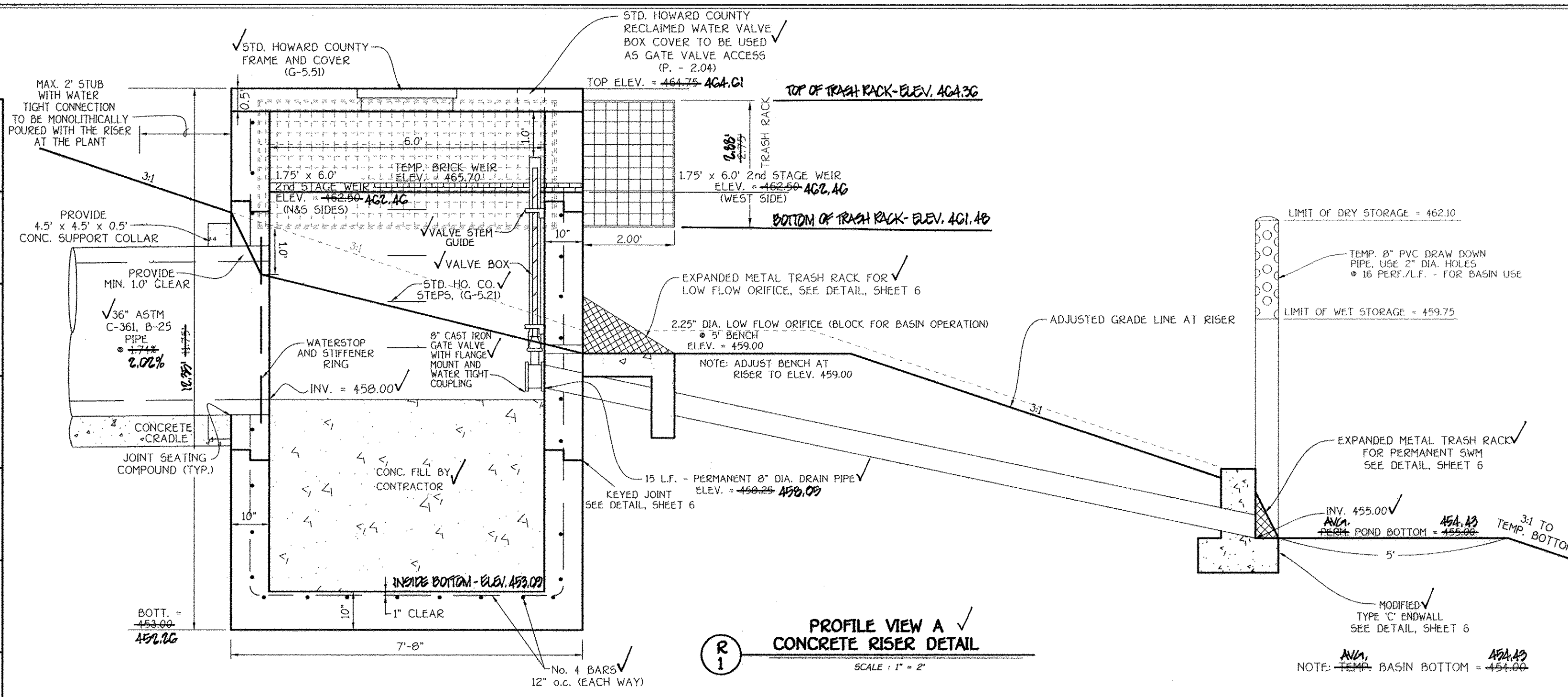
**PRINCIPLE SPILLWAY PROFILE**  
SCALE: HOR. : 1" = 30'  
VER. : 1" = 3'



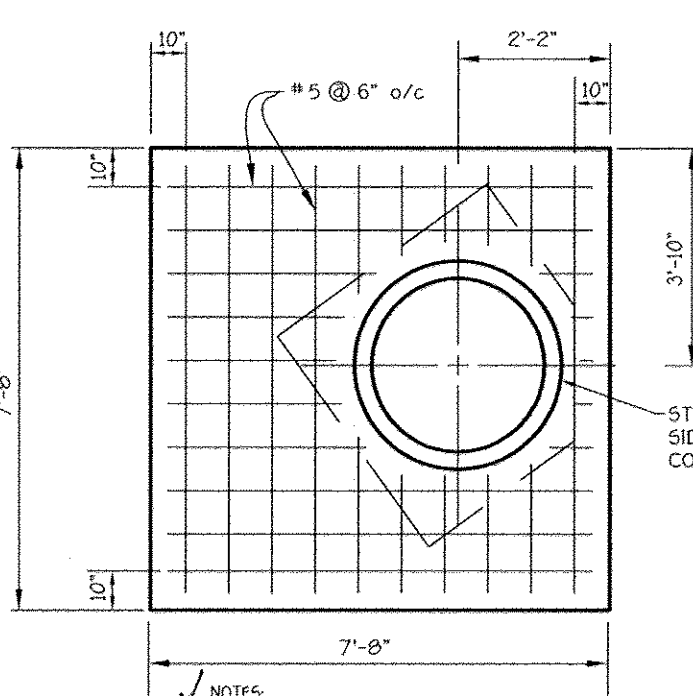
**SCS TR-46 A2 CONCRETE CRADLE**  
NO SCALE



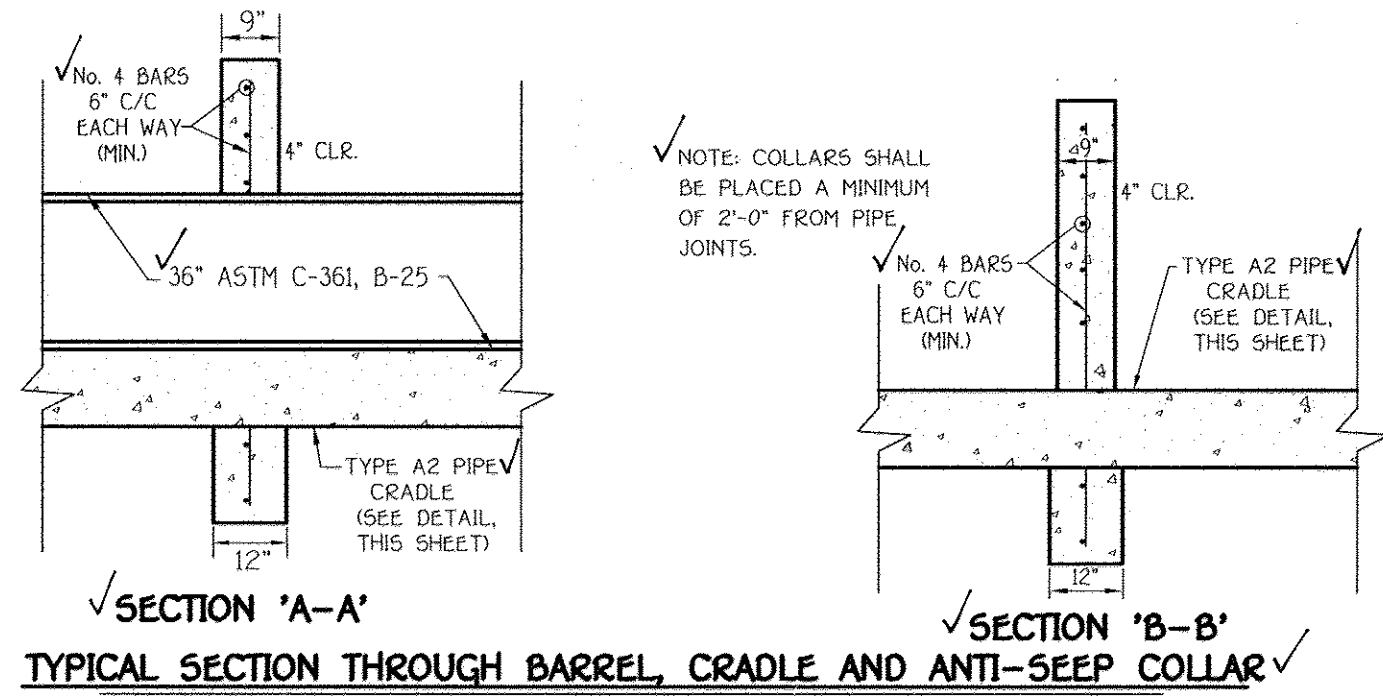
**S.W.M. FACILITY B.M.P. NO. 1 PROFILE ALONG EMBANKMENT**  
SCALE: HORIZ. 1" = 30'  
VERT. 1" = 3'



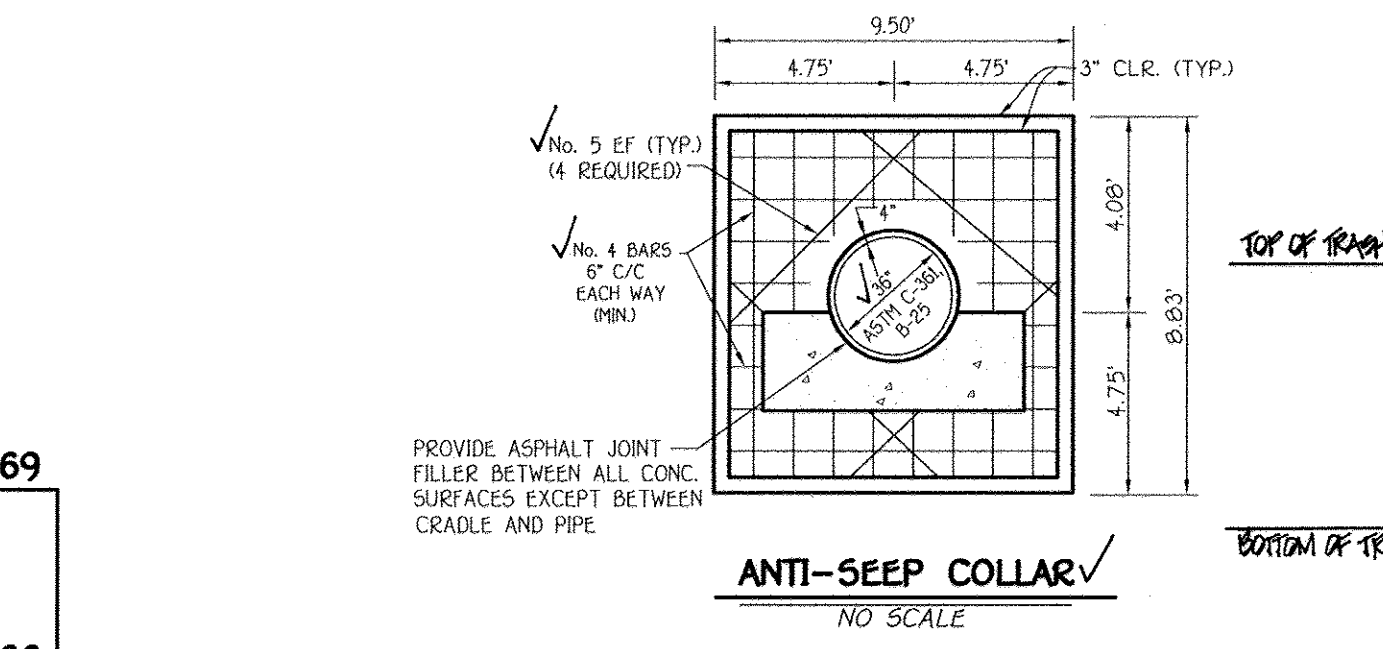
**PROFILE VIEW A CONCRETE RISER DETAIL**  
SCALE: 1" = 2'



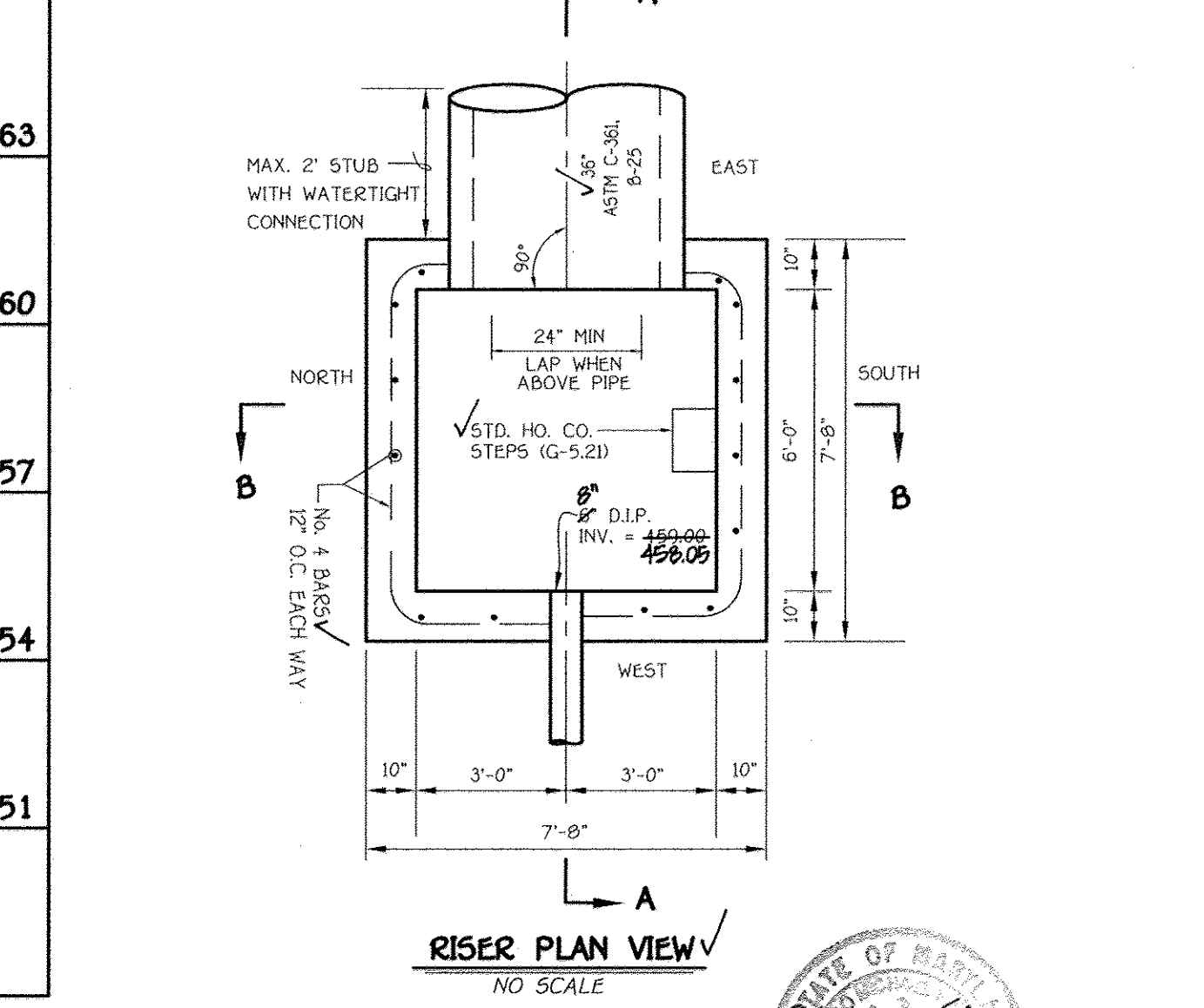
**TOP SLAB DETAIL**  
NO SCALE



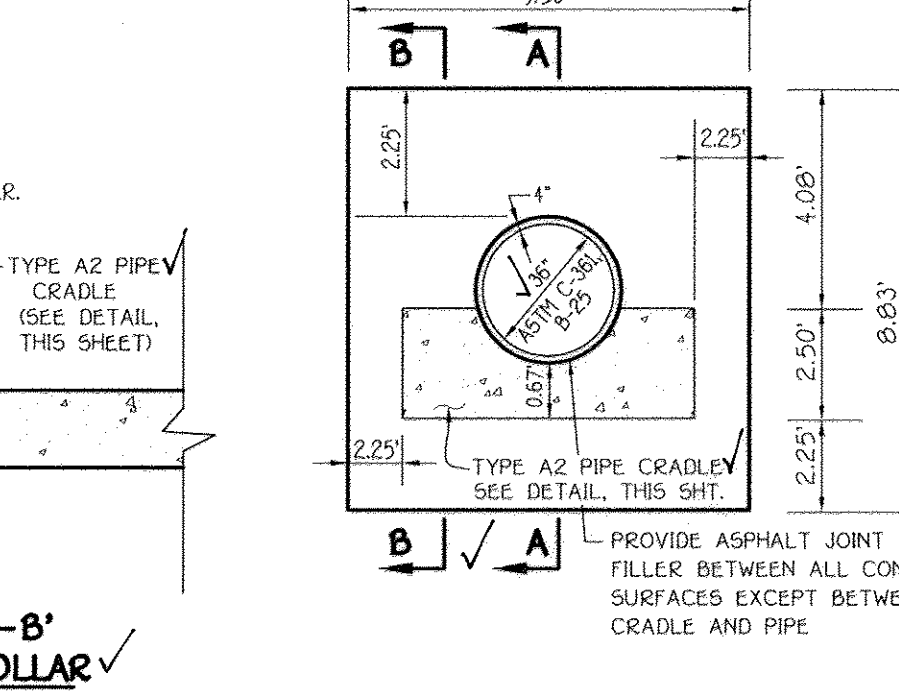
**SECTION A-A**  
**SECTION B-B**  
TYPICAL SECTION THROUGH BARREL, CRADLE AND ANTI-SEEP COLLAR  
NO SCALE



**ANTI-SEEP COLLAR**  
NO SCALE



**RISER PLAN VIEW**  
NO SCALE



**PROFILE VIEW B CONCRETE RISER DETAIL**  
SCALE: 1" = 2'

By The Developer:  
I/We Certify That All Development And/Or Construction Will Be Done According To These Plans. 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 Erosion And Sedimentation Before Beginning The Project. I Shall Engage A Registered Professional Engineer To Supervise Pond Construction And Provide The Howard Soil Conservation District With An "As-Built" Plan Of The Pond Within 30 Days Of Completion. I Also Authorize Periodic On-Site Inspections By The Howard Soil Conservation District.

Signature of Developer: *[Signature]* Date: 8/5/09

Printed Name of Developer: \_\_\_\_\_

By The Engineer:  
I Certify That This Plan For Pond Construction, Erosion And Sediment Control Represents A Practical And Feasible Plan Based On My Personal Knowledge Of The Site Conditions. This Plan Was Prepared In Accordance With The Requirements Of The Howard Soil Conservation District. I Have Reviewed The Plans And I Certify That The Plans Meet The Requirements Of The Howard Soil Conservation District. I Shall Engage A Registered Professional Engineer To Supervise Pond Construction And Provide The Howard Soil Conservation District With An "As-Built" Plan Of The Pond Within 30 Days Of Completion.

Signature of Engineer: *[Signature]* Date: 7/27/09

Printed Name of Engineer: \_\_\_\_\_

These Plans For Small Pond Construction Soil Erosion And Sediment Control Meet The Requirements Of The Howard Soil Conservation District.

Signature of Howard Soil Conservation District: *[Signature]* Date: 8/18/09

Approved: Department of Public Works  
Signature: *[Signature]* Date: 8-27-09  
Chief, Bureau of Highways

Approved: Department of Planning And Zoning  
Signature: *[Signature]* Date: 9/29/09  
Chief, Division of Land Development

Signature: *[Signature]* Date: 8/31/09  
Chief, Development Engineering Division

AS-BUILT CERTIFICATION  
I Herby Certify That The Facility Shown On This Plan Was Constructed As Shown On The "As-Built" Plans And Meets The Approved Plans And Specifications.

Signature: *[Signature]* Date: 12/03/14

Certify Means To State Or Declare A Professional Opinion Based Upon Onsite Inspections And Material Tests Which Are Conducted During Construction. The Onsite Inspections And Material Tests Are Those Inspections And Tests Deemed Sufficient And Appropriate Commonly Accepted Engineering Standards. Certify Does Not Mean Or Imply A Guarantee By The Engineer Nor Does An Engineer's Certification Relieve Any Other Party From Meeting Requirements Imposed By Contract, Employment, Or Other Means, Including Meeting Commonly Accepted Industry Practices.

AS-BUILT INFORMATION ADDED: NOVEMBER 20, 2014

**STORMWATER MANAGEMENT NOTES AND DETAILS**  
**GTW'S WAVERLY WOODS**  
SECTION 14  
BULK PARCELS 'A' & 'B' AND  
OPEN SPACE LOTS 1 & 2  
ZONING: PSC & PEC  
TAX MAP NO. 16 PARCEL NOS. 120, 221 & P/O 249 GRID NOS. 3 & 4  
THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
DATE: JULY 28, 2009  
SHEET 7 OF 27

*[Professional Seal]*  
ALDO M. VITUCCI, P.E.  
DATE: 7-27-09  
Professional certification: I hereby certify that these documents were prepared by me, and that I am a duly Licensed Professional Engineer under the laws of the State of Maryland, License No. 20748, Expiration Date 2-22-11.



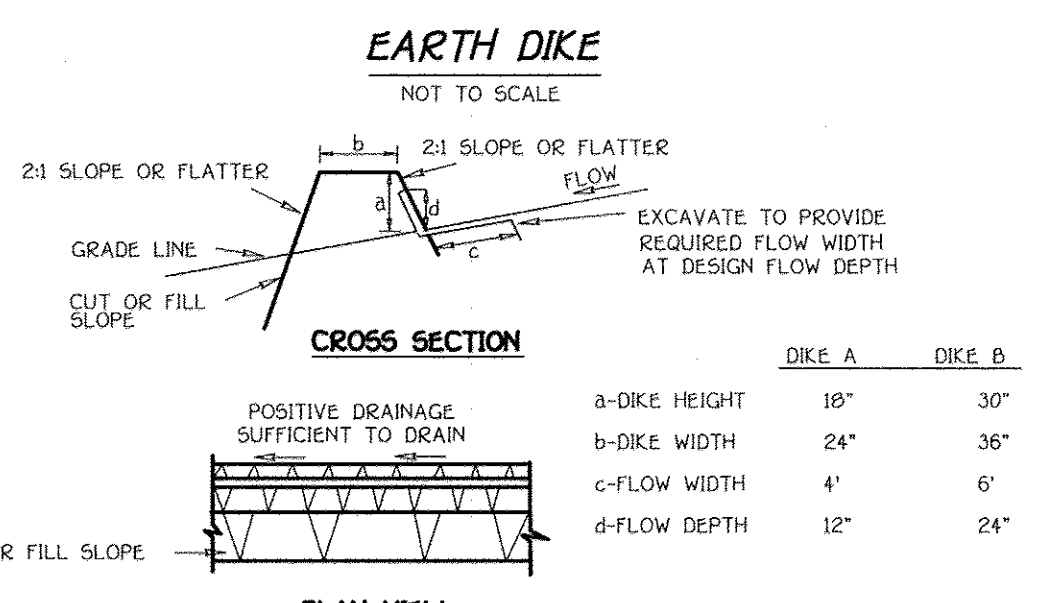
**ENGINEER'S CERTIFICATE**  
 I Herby certify that this Plan for Erosion and Sediment Control Represents a Feasible and Workable Plan Based on My Personal Knowledge of the Site and That it was Prepared in Accordance with the Requirements of the Howard Soil Conservation District.

Signature: *[Signature]* Date: 7-29-09

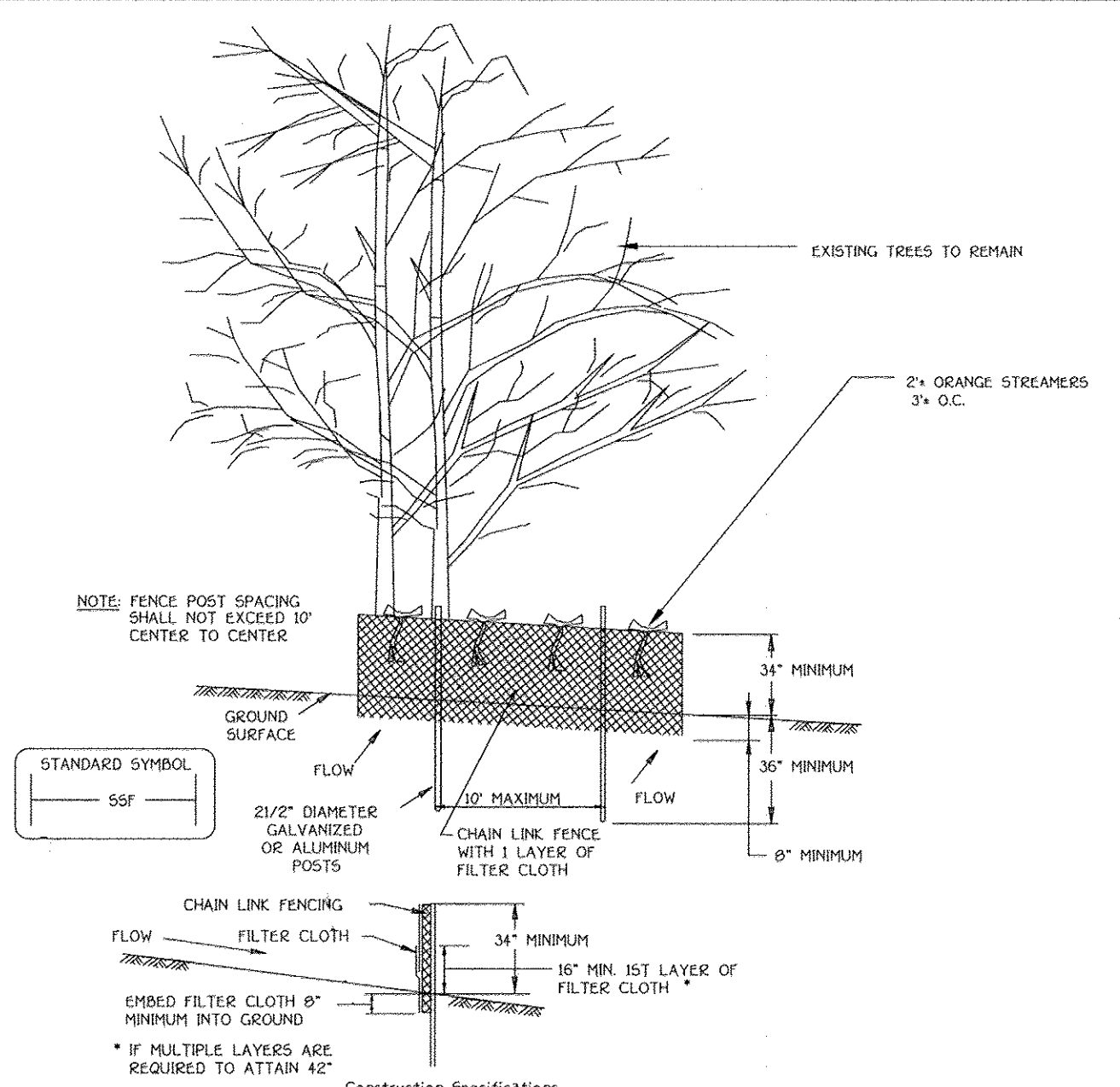
**DEVELOPER'S CERTIFICATE**  
 I/We Certify that All Development and Construction will be Done According to this Plan of Development and Plan for Erosion and Sediment Control and that All Responsible Personnel Involved in the Construction Project will Have a Certificate of Attendance at a Department of Natural Resources 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 or its Authorized Agents, as Are Deemed Necessary.

Signature of Developer: *[Signature]* Date: 8/5/09

Approved: This Development is Approved for Erosion and Sediment Control by the Howard Soil Conservation District.  
 District: Howard Soil Conservation Dist. Date: 8/18/09  
 Approved: Department of Planning and Zoning  
 Chief, Division of Land Development Date: 9/29/09  
 Chief, Development Engineering Division Date: 9/30/09  
 Approved: Howard County Department of Public Works  
 Chief, Bureau of Highways Date: 8-27-09



- Seed and cover with straw mulch.
  - Seed and cover with Erosion Control Matting or line with seed.
  - 4" - 7" stone or recycled concrete equivalent pressed into the soil 7" minimum.
- Construction Specifications**
- All temporary earth dikes shall have uninterrupted positive grade to an outlet. Spot elevations may be necessary for grades less than 1%.
  - Runoff diverted from a disturbed area shall be conveyed to a sediment trapping device.
  - Runoff diverted from an undisturbed area shall outlet directly into an undisturbed, stabilized area at a non-erosive velocity.
  - All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the dike.
  - The dike shall be excavated or shaped to line, grade and cross section as required to meet the criteria specified herein and be free of bark projections or other irregularities which will impede normal flow.
  - Fill shall be compacted by earth moving equipment.
  - All earth removed and not needed for construction shall be placed so that it will not interfere with the functioning of the dike.
  - Inspection and maintenance must be provided periodically and after each rain event.



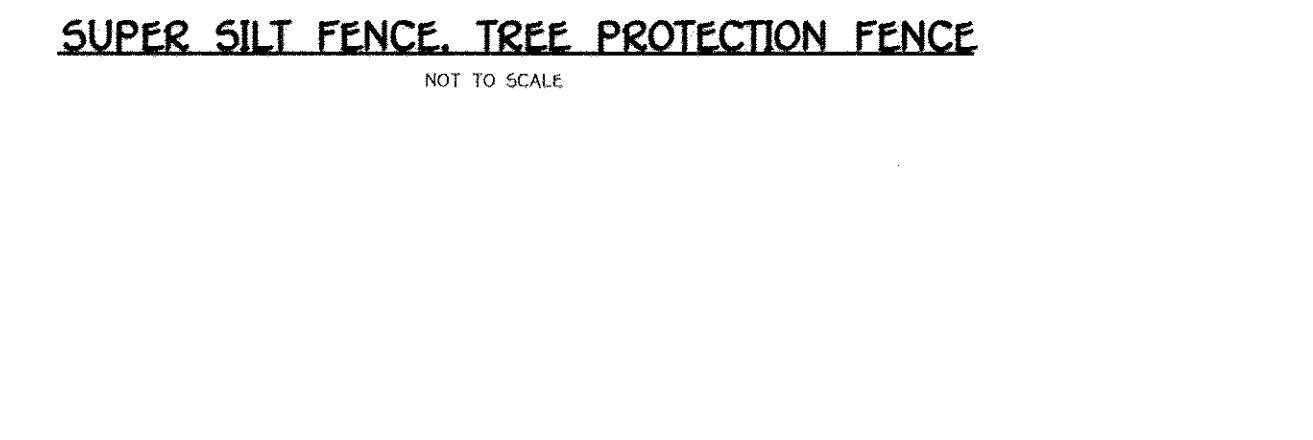
**Construction Specifications**

- Fencing shall be 42" in height and constructed in accordance with the latest Maryland State Highway Details for Chain Link Fencing. The specification for a 6' fence shall be used, substituting 42" fabric and 6' length posts.
- Chain link fence shall be fastened securely to the fence posts with wire ties. The lower tension wire, brace and tension wire, drive anchors and post caps are not required except on the ends of the fence.
- Filter cloth shall be fastened securely to the chain link fence with ties spaced every 24" at the top and mid section.
- Filter cloth shall be embedded a minimum of 6" into the ground.
- When two sections of filter cloth adjoin each other, they shall be overlapped by 6" and folded.
- Maintenance shall be performed as needed and silt buildup removed when "bulging" develop in the silt fence or when silt reaches 50% of fence height.
- Filter cloth shall be fastened securely to each fence post with wire ties or staples 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/ft (minute/ft <sup>2</sup> max)	Test: MSMT 322
	Filtering Efficiency	75% (min)	Test: MSMT 322

**Design Criteria**

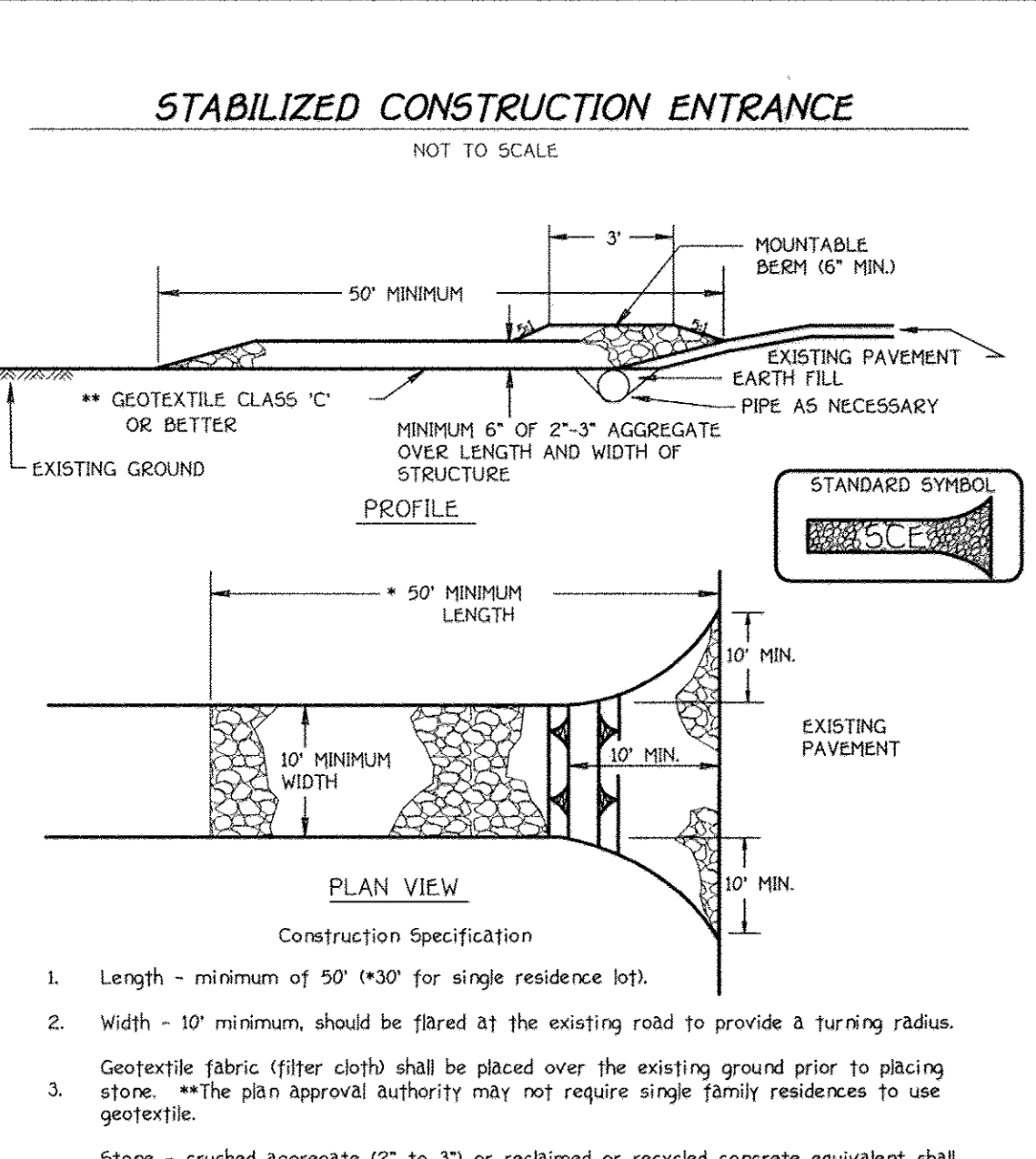
Slope	Slope Steepness	Slope Length (maximum)	Silt Fence Length (maximum)
0 - 10%	0 - 10:1	Unlimited	Unlimited
10 - 20%	10:1 - 5:1	200 feet	1,500 feet
20 - 33%	5:1 - 3:1	100 feet	1,000 feet
33 - 50%	3:1 - 2:1	50 feet	500 feet
50%	2:1	25 feet	250 feet



**Table 6 Design Criteria for Pipe Slope Drain**

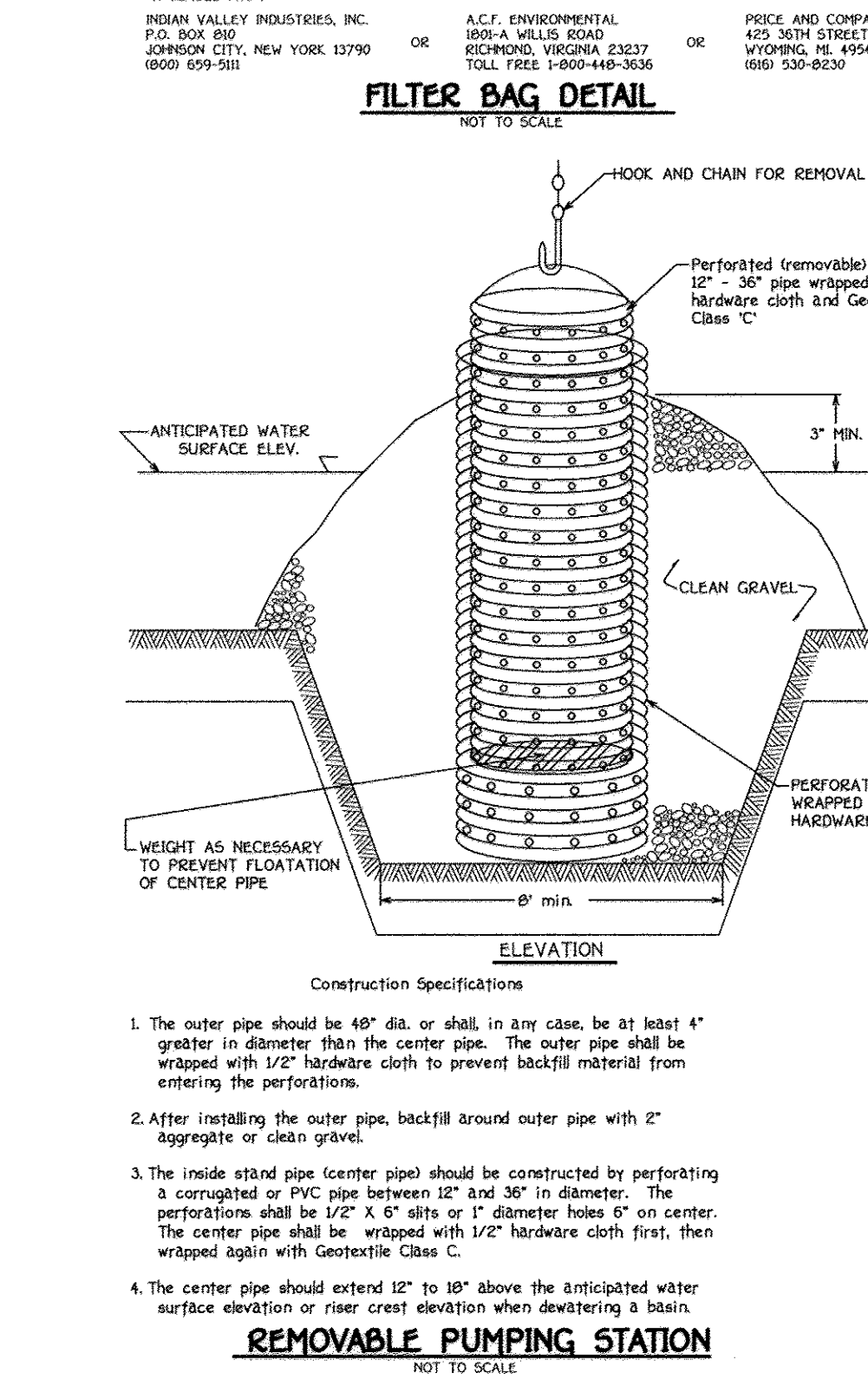
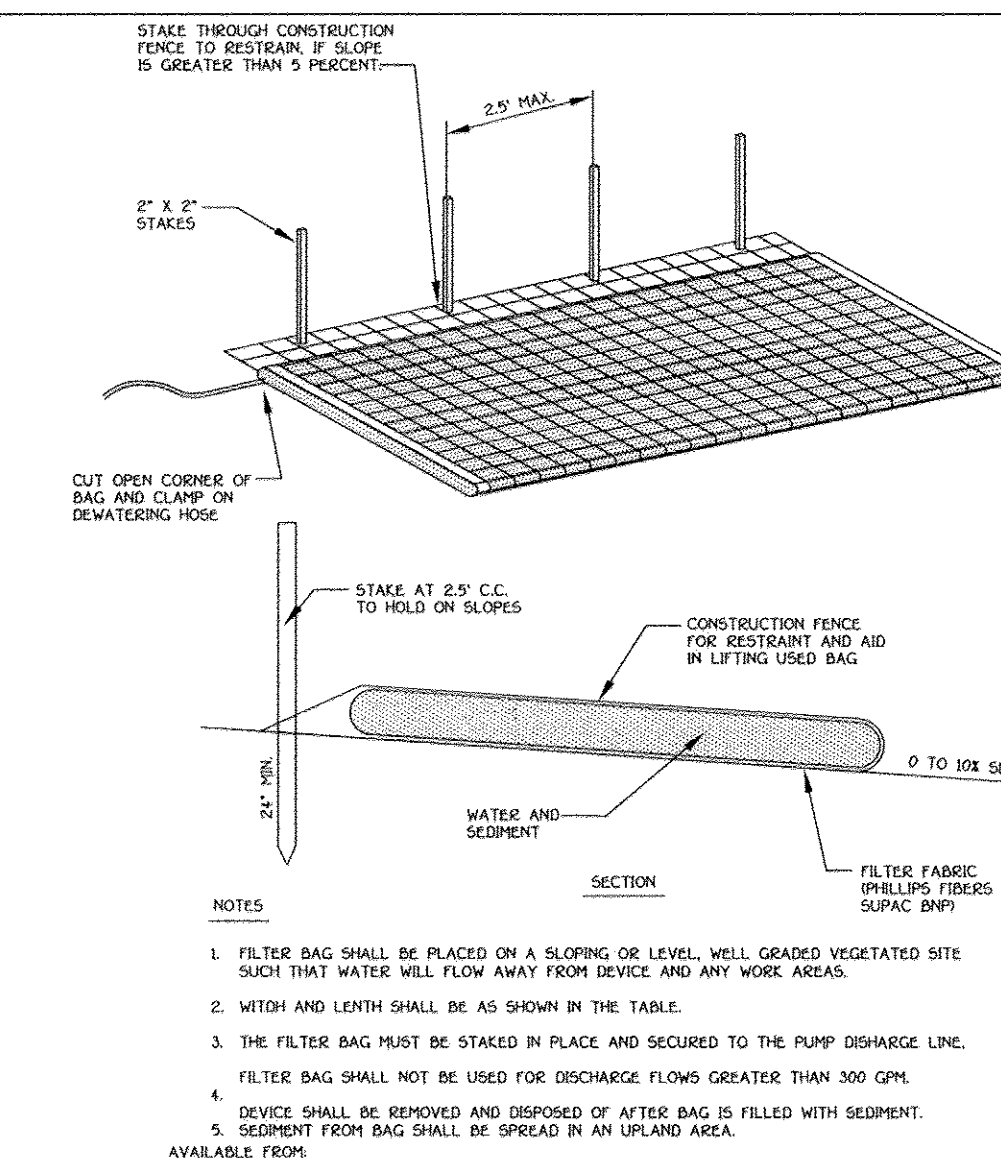
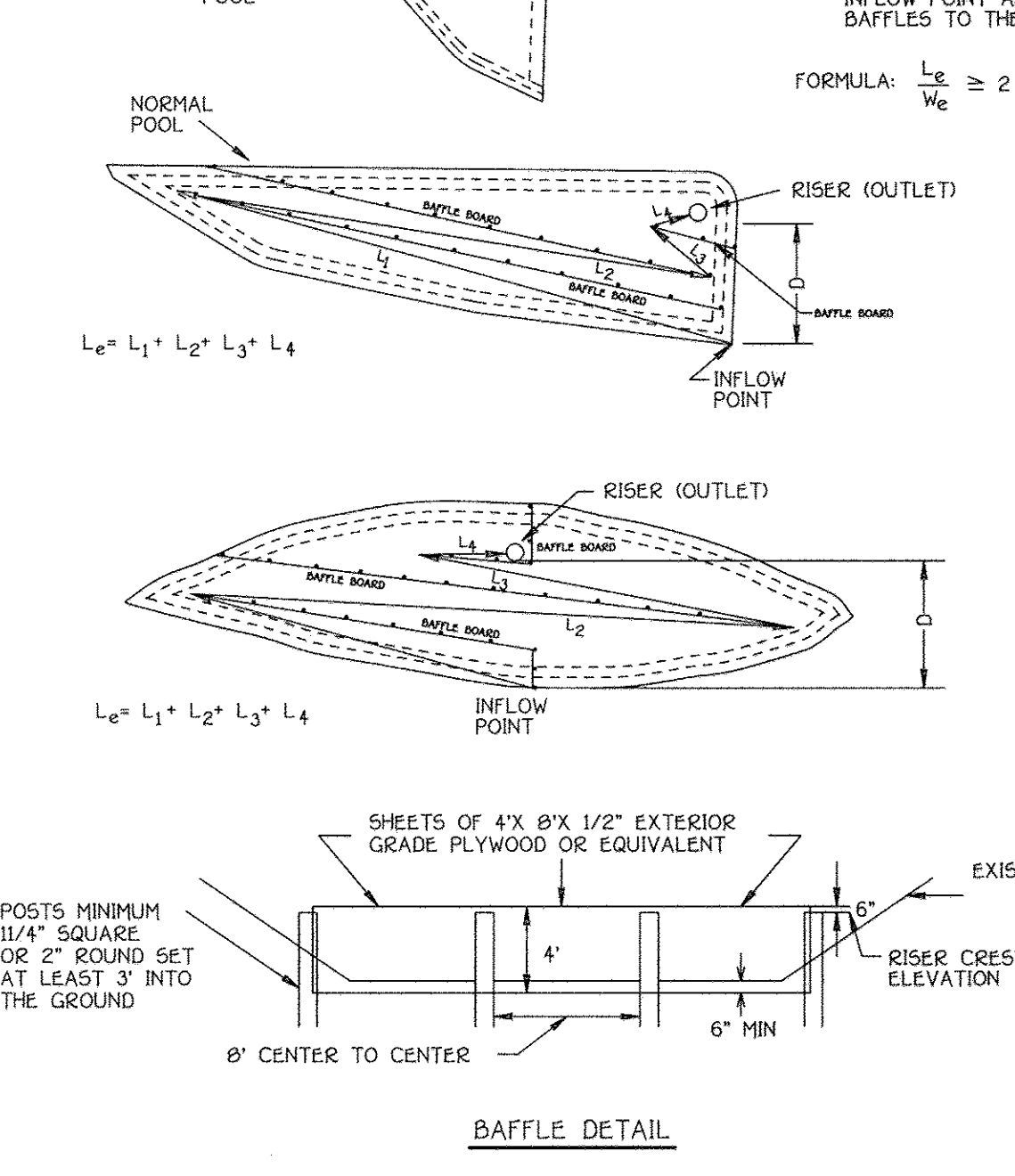
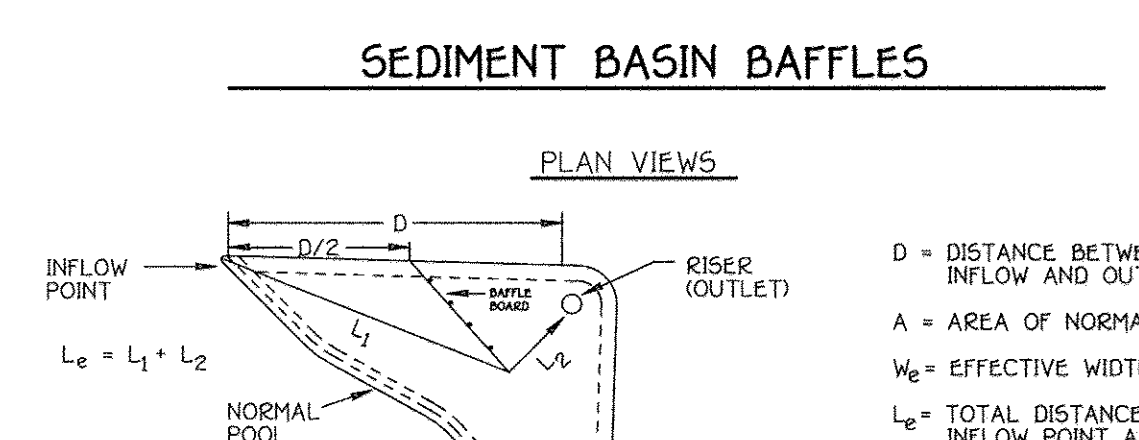
Size	Pipe/Tubing Diameter (in)	Maximum Drainage Area (Acres)
PSD-12	12	0.5
PSD-18	18	1.5
PSD-21	21	2.5
PSD-24	24	3.5
PSD-24 (2)	24	5.0

**PIPE SLOPE DRAIN**  
 NOT TO SCALE



**Construction Specifications**

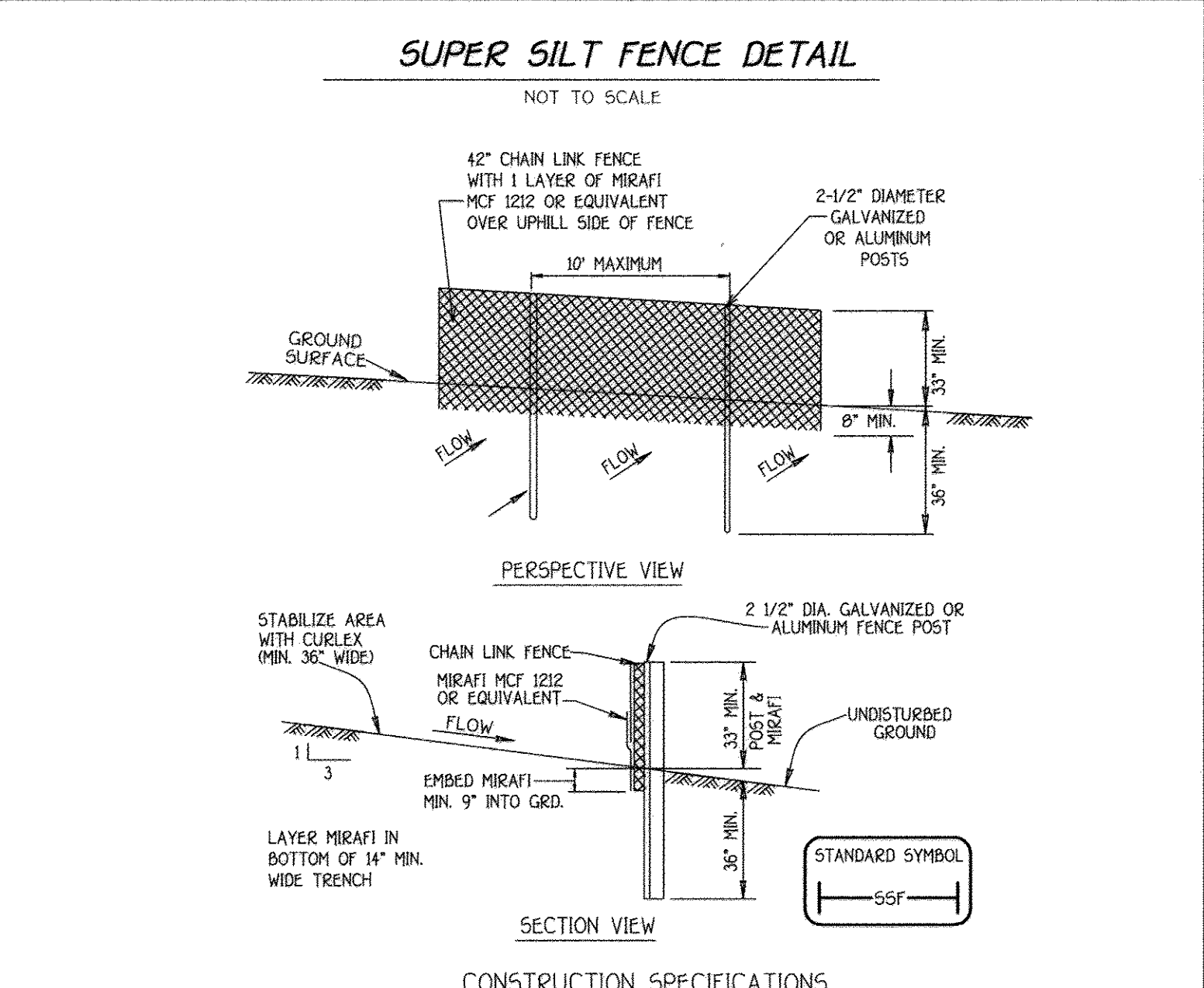
- Fencing shall be 42" high chain link constructed in accordance with the latest Maryland State Highway Administration Standard Details 690.01 and 690.02 for Chain U Fencing. The specifications for a 6'-0" fence shall be used, substituting 42" fabric and 6' posts. Posts shall be placed without concrete embedment.
- CHAIN LINK FENCE SHALL BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. THE LOWER TENSION WIRE, BRACE AND TRUSS RODS, ANCHORS AND POST CAPS ARE NOT REQUIRED EXCEPT ON THE ENDS OF THE FENCE.
- FILTER CLOTH TO BE FASTENED SECURELY TO CHAIN LINK FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
- FILTER CLOTH SHALL BE IMBEDDED A MINIMUM OF 9" INTO THE GROUND.
- WHEN TWO SECTIONS OF DIVERSION CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
- MAINTENANCE SHALL BE PERFORMED AS NEEDED.



**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTENNIAL SQUARE OFFICE PARK - 10272 BALTIMORE NATIONAL PIKE  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 461 - 2955

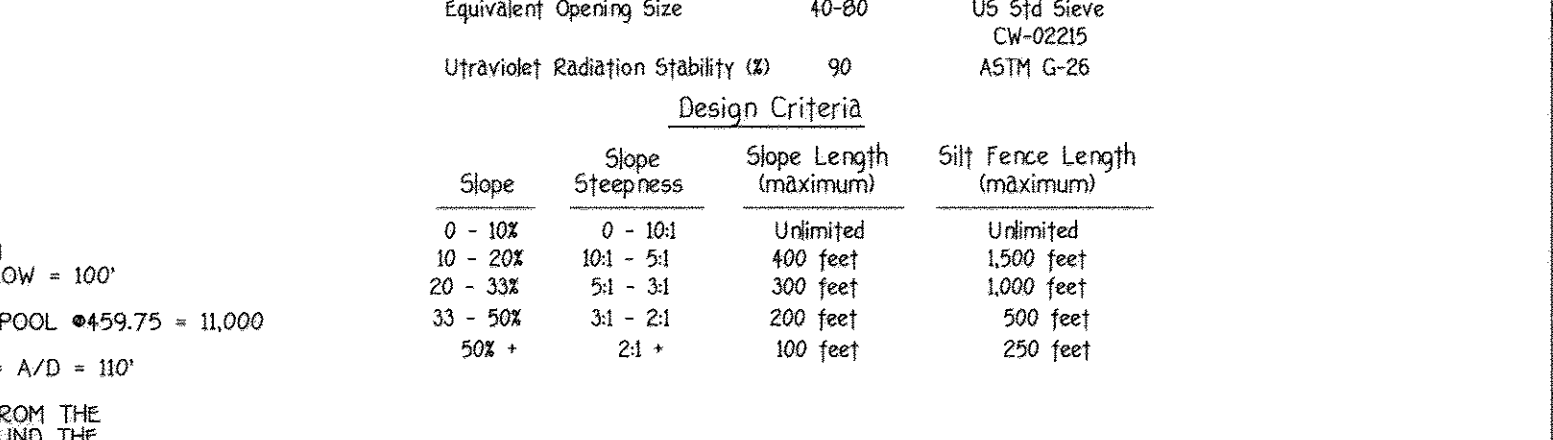
**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE DOUGHNUT, LLC, &  
 GTW JOINT VENTURE

**DEVELOPER**  
 WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 3300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443) 367-0422



**Construction Specifications**

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- MAINTENANCE SHALL BE PERFORMED AS NEEDED.



**SEDIMENT CONTROL NOTES AND DETAILS**  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOTS 1 & 2  
 ZONING: PSC & PEC  
 TAX MAP NO. 15 PARCEL Nos. 120, 221 & P/O 249 GRID Nos. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: JULY 28, 2009  
 SHEET 8 OF 27

**REMOVABLE PUMPING STATION**  
 NOT TO SCALE

**Construction Specifications**

- The outer pipe should be 48" dia. or shall, in any case, be at least 4" greater in diameter than the center pipe. The outer pipe shall be wrapped with 1/2" hardware cloth to prevent backfill material from entering the perforations.
- After installing the outer pipe, backfill around outer pipe with 2" aggregate or clean gravel.
- The inside 24" pipe (center pipe) should be constructed by perforating a corrugated or PVC pipe between 12" and 36" in diameter. The perforations shall be 1/2" x 6" slots or 1" diameter holes 6" on center. The center pipe shall be wrapped with 1/2" hardware cloth first, then wrapped again with Geotextile Class C.
- The center pipe should extend 12" to 18" above the anticipated water surface elevation or riser crest elevation when dewatering a basin.



**ENGINEER'S CERTIFICATE**

I Herewith Certify That This Plan For Erosion And Sediment Control Represents A Practical And Workable Plan Based On My Personal Knowledge Of The Site Condition And That It Was Prepared In Accordance With The Requirements Of The Howard Soil Conservation District.

Signature: *[Signature]* Date: 7/29/09

**DEVELOPER'S CERTIFICATE**

"We Certify That All Development And Construction Will Be Done According To This Plan Of Development And Plan For Erosion And Sediment Control And That All Responsible Personnel Involved In The Construction Project Will Have A Certificate Of Attendance At A Department Of Natural Resources 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 Or Their Authorized Agents, As Are Deemed Necessary."

Signature: *[Signature]* Date: 8/5/09

Approved This Development Is Approved For Erosion And Sediment Control By The Howard Soil Conservation District.

District: Howard Soil Conservation Dist. Date: 8/16/09

Approved: Department Of Planning And Zoning

Chief, Division Of Land Development Date: 9/26/09

Chief, Development Engineering Division Date: 8/31/09

Approved: Howard County Department Of Public Works

Chief, Bureau Of Highways Date: 8-27-09

**20.0 STANDARDS AND SPECIFICATIONS FOR VEGETATIVE STABILIZATION DEFINITION**

Using vegetation as cover for barren soil to protect it from forces that cause erosion.

**PURPOSE**

Vegetative stabilization specifications are used to promote the establishment of vegetation on exposed soil. When soil is stabilized with vegetation, the soil is less likely to erode and more likely to allow infiltration of rainfall, thereby reducing sediment loads and runoff to downstream areas, and improving wildlife habitat and visual resources.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice shall be used on denuded areas as specified on the plans and may be used on highly erodible or critically eroding areas. This specification is divided into Temporary Seeding, to quickly establish vegetative cover for short duration (up to one year) and Permanent Seeding, for long term vegetative cover. Examples of applicable areas for Temporary Seeding are temporary soil stockpiles, cleared areas being left idle between construction phases, earth dikes, and ditches, and for Permanent Seeding are lawns, dunes, cut and fill slopes and other areas at final grade, former stockpiles and storage yards, etc.

**EFFECTS ON WATER QUALITY AND QUANTITY**

Planting vegetation in disturbed areas will have an effect on the water budget, especially on volume and rates of runoff, infiltration, evaporation, transpiration, condensation, and groundwater recharge. Vegetation, over time, will increase organic matter content and improve the water holding capacity of the soil and subsequent water infiltration. Vegetation will help reduce the movement of sediment, nutrients, and other chemicals carried by runoff to receiving waters. Plants will also help protect against those substances present within the root zone.

Sediment control devices must remain in place during grading, seeded preparation, seeding, mulching and vegetative establishment to prevent large quantities of sediment and associated chemicals and nutrients from washing into surface waters.

**SECTION 1 - VEGETATIVE STABILIZATION METHODS AND MATERIALS**

A. Site Preparation

1. Install erosion and sediment control structures (either temporary or permanent) such as diversions, grade stabilization structures, berms, wireframes, or sediment control basins.
2. Perform all grading operations at right angles to the slope. Final grading and shaping is not usually necessary for temporary seeding.
3. Schedule required soil tests to determine soil amendment composition and application rates for sites having disturbed areas over 5 acres.

B. Soil Amendments - Fertilizer and Lime Specifications

1. Soil tests must be performed to determine the exact ratios and application rates for both lime and fertilizer on sites having disturbed areas over 5 acres. Soil analysis may be performed by the University of Maryland or a recognized commercial laboratory. Soil samples taken for engineering purposes may also be used for chemical analysis.
2. Fertilizers shall be uniform in composition, free flowing and suitable for accurate application by approved equipment. Fertilizer may be substituted for fertilizer with prior approval from the appropriate approval authority. Fertilizers shall be delivered to the site fully labeled according to the applicable state fertilizer laws and shall bear the name, trade name or trademark and warranty of the producer.
3. Lime materials shall be ground limestone (hydrated or burnt lime) may be substituted which contains at least 90% total calcium oxide plus magnesium oxide. Limestone shall be ground to such fineness that at least 50% will pass through a #100 mesh sieve and 90-100% will pass through a #20 mesh sieve.
4. Incorporate lime and fertilizer into the top 3-5" of soil by disking or other suitable means.

C. Seeded Preparation

Temporary Seeding

1. Seeded preparation shall consist of loosening soil to a depth of 3" to 5" by means of suitable agricultural or construction equipment, such as disc harrows, chisel plows or rippers mounted on construction equipment. After the soil is loosened it should not be reworked or dragged smoothly, but left in the roughened condition. Sloped areas lighter than 3:1 should be tracked leaving the surface in an irregular condition with ridges running parallel to the contour of the slope.
2. Apply fertilizer and lime as prescribed on the plans.
3. Incorporate lime and fertilizer into the top 3-5" of soil by disking or other suitable means.

Permanent Seeding

1. Minimum soil conditions required for permanent vegetative establishment:
  - a. Soil pH shall be between 6.0 and 7.0.
  - b. Soluble salts shall be less than 500 parts per million (ppm).
  - c. The soil shall contain less than 40% clay, but enough fine grained material (silt and clay) to provide the capacity to hold a moderate amount of moisture. An exception is if borax or arsenic impurities are to be planted, then a sandy soil (100% silt plus clay) would be acceptable.
  - d. Soil shall contain 1.5% minimum organic matter by weight.
  - e. Soil must contain sufficient pore space to permit adequate root penetration.
  - f. If these conditions cannot be met by soils on site, adding topsoil is required in accordance with Section 2.0 and specification for topsoil.
2. Areas previously graded in accordance with the drawings shall be maintained in a true and even grade, then scarified or otherwise loosened to a depth of 3-5" to permit boring of holes to the surface area and to create horizontal erosion check slots to prevent topsoil to the surface area and to create horizontal erosion check slots to prevent topsoil from sliding down slope.
3. Apply soil amendments as per soil test or as included on the plans.
4. Mix soil amendments into the top 3-5" of topsoil by disking or other suitable means. Lawn areas should be raked to smooth the surface, remove large objects like stones and branches, and ready the area for seed and application. Where site conditions will not permit normal seeded preparation, loosen surface soil by dragging with a heavy chain or other equipment to roughen the surface. Steep slopes (steeper than 3:1) should be tracked by a dozer leaving the soil in an irregular condition with ridges running parallel to the contour of the slope. The top 3-5" of soil should be loose and friable. Seeding loosening may not be necessary on newly disturbed areas.

D. Seed Specifications

1. All seed must meet the requirements of the Maryland State Seed Law. All seed shall be subject to re-testing by a recognized seed laboratory. All seed used shall have been tested within the 6 months immediately preceding the date of sowing such material on this job.
2. Note: Seed tags shall be made available to the inspector to verify type and rate of seed used.
3. Incubant - The incubant for testing to determine the seed germination shall be a pure culture of nitrogen fixing bacteria prepared specifically for the species. Incubant shall not be used later than the date indicated on the container. Add fresh incubant as directed on package. Use four times the recommended rate when hydroseeding. Note: It is very important to keep incubant as cool as possible until used. Temperatures above 75-80° F. can weaken bacteria and make the incubant less effective.

E. Methods of Seeding

1. Hydroseeding - Apply seed uniformly with hydroseeder (slurry includes seed and fertilizer, broadcast or drop seeded, or a cutlifter seeder).
  - a. If fertilizer is being applied all the time of seeding, the application rates mentioned will not exceed the following maximum: 100 lbs per acre total of soluble nitrogen; P2O5 (phosphorus) 200 lbs/acre; K2O (potassium) 200 lbs/acre.
  - b. Lime - Use only ground agricultural limestone, 100 to 3 tons per acre may be applied by hydroseeding. Normally, not more than 2 tons are applied by hydroseeding at one time. Do not use burnt or hydrated lime when hydroseeding.
2. Seed and fertilizer shall be mixed on site and seeding shall be done immediately and without interruption.

F. Dry Seeding - This includes use of conventional drop or broadcast spreaders.

1. Seed spread shall be incorporated into the subsoil at the rates prescribed on the Temporary or Permanent Seeding Summaries or Tables 265 or 26. The seeded area shall then be rolled with a weighted roller to provide good soil contact.
2. Where practical, seed should be applied in two directions perpendicular to each other. Apply half the seeding rate in each direction.

G. Drill or Cutlifter Seeding - Mechanized seeders that apply and cover seed with soil.

1. Cutlifter seeders are required to bury the seed in such a fashion as to provide at least 1/4 inch of soil covering. Seeded must be firm after planting.
2. Where practical, seed should be applied in two directions perpendicular to each other. Apply half the seeding rate in each direction.

H. Mulch Specifications - In order of preference:

1. Straw shall consist of thoroughly threshed wheat, rice or oat straw, reasonable bright in color, and shall not be musty, moldy, caked, decayed or excessively dusty and shall be free of noxious weed seeds as specified in the Maryland Seed Law.
2. Wood Cellulose Fiber Mulch (WCFM)
  - a. WCFM shall consist of specially prepared wood cellulose processed into a uniform fibrous physical state.
  - b. WCFM shall be deep green or contain a green dye in the package that will provide an appropriate color to facilitate visual inspection of the uniform spread slurry.
  - c. WCFM, including dye, shall contain no germination or growth inhibiting factors.
  - d. WCFM materials shall be manufactured and processed in such a manner that the wood cellulose fiber mulch will remain in uniform suspension in water under agitation and will blend with seed, fertilizer and other additives to form a homogeneous slurry. The mulch material shall form a batter-like ground cover, on application, having moisture absorption and percolation properties and shall cover and hold grass seed in contact with the soil without inhibiting the growth of the grass seedlings.
  - e. WCFM material shall contain no elements or compounds at concentration levels that will be phytotoxic.
  - f. WCFM must conform to the following physical requirements: fiber length to approximately 10 mm., diameter approximately 1 mm., pH range of 4.0 to 8.5, ash content of 10% maximum and water holding capacity of 90% minimum.

Note: Only sterile straw mulch should be used in areas where one species of grass is desired.

I. Mulching Seeded Areas - Mulch shall be applied to all seeded areas immediately after seeding.

1. If grading is completed outside of the seeding season, mulch along shall be applied as prescribed in this section and maintained until the seeding season returns and seeding can be performed in accordance with these specifications.
2. When straw mulch is used, it shall be spread over all seeded areas at the rate of 2 tons/acre. Mulch shall be applied to a uniform loose depth of between 1" and 2". Mulch applied shall achieve a uniform distribution and depth so that the soil surface is not exposed. If a mulch anchoring tool is to be used, the rate should be increased to 2.5 tons/acre.
3. Wood cellulose fiber used as a mulch shall be applied at a net dry weight of 1,500 lbs. per acre. The wood cellulose fiber shall be mixed with water, and the mixture shall contain a maximum of 50 lbs. of wood cellulose fiber per 100 gallons of water.
4. Securing Straw Mulch (Mulch Anchoring) - Mulch anchoring shall be performed immediately following mulch application to minimize loss by wind or water. This may be done by one of the following methods listed by preference, depending upon size of area and erosion hazard.
  - a. A mulch anchoring tool is a tractor drawn implement designed to punch and anchor mulch into the soil surface a minimum of two (2) inches. This practice is most effective on large areas, but is limited to flatter slopes where equipment can operate safely. If used on sloping areas, this practice should be used on the contour if possible.
  - b. Wood cellulose fiber may be used for anchoring straw. The fiber binder shall be applied at a net dry weight of 750 pounds/acre. The wood cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 pounds of wood cellulose fiber per 100 gallons of water.
5. Application of liquid binders should be heavier at the edges where wind catches mulch, such as in valleys and crest of banks. The remainder of area should be applied uniform after binder application. Synthetic binders - such as Acrylic DLR (Ago-Tex), DCA-70 Petro-Tex, Terra Tex or Terra Tech or other approved equal may be used at rates recommended by the manufacturer to anchor mulch.
6. Lightweight plastic netting may be staked over the mulch according to manufacturer's recommendations. Netting is usually available in rolls 4' to 19' feet wide and 300 to 3,000 feet long.

J. Incremental Stabilization - Cut Slopes

1. All cut slopes shall be dressed, prepared, seeded and mulched as the work progresses. Slopes shall be excavated and stabilized in equal increments not to exceed 15'.
2. Construction sequence (Refer to Figure 3) below:
  - a. Excavate and stabilize all temporary embankments, side ditches, or berms that will be used to convey runoff from the excavation.
  - b. Perform Phase 1 excavation, dress and stabilize.
  - c. Perform Phase 2 excavation, dress and stabilize. Overseed previously seeded areas as necessary.

**SECTION 2 - TEMPORARY SEEDING**

Vegetation - annual grass or grain used to provide cover on disturbed areas for up to 12 months. For longer duration of vegetative cover, Permanent Seeding is required.

A. Seed mixtures - Temporary Seeding

1. Select one or more of the species or mixtures listed in Table 26 for the appropriate Plant Hardness Zone (from Figure 5) and enter them in the Temporary Seeding Summary below. Along with application rates, seeding dates and seeding depths. If this summary is not put on the plans and completed, then Table 26 must be put on the plans.
2. For sites having soil tests performed, the rates shown on this table shall be deleted and the rates recommended by the testing agency shall be written in soil tests are not required for Temporary Seeding.

Seed Mixture (Hardness Zone _____ 6b.)		From Table 26		Fertilizer	Lime Rate
No.	Species	Application Rate (lb/acre)	Seeding Dates	Seeding Depth	Rate (10-10-10)
1	BARLEY	122	3/1 - 5/15	1" - 2"	
	OATS	96	8/15 - 10/15	1" - 2"	600 lb/acre (50 lb/1000sq ft)
	RYE	140			2 tons/acre (200 lb/1000sq ft)

**SECTION 3 - PERMANENT SEEDING**

Seeding grass and legumes to establish ground cover for a minimum of one year on disturbed areas generally receiving low maintenance.

A. Seed mixtures - Permanent Seeding

1. Select one or more of the species or mixtures listed in Table 25 for the appropriate Plant Hardness Zone (from Figure 5) and enter them in the Permanent Seeding Summary below, along with application rates and seeding dates. Seeding depths can be estimated using Table 26. If this summary is not put on the construction plans and completed, then Table 25 must be put on the plans. Additional planting specifications for exceptional sites such as streambanks, streambanks, or dunes or for special purposes, such as wildlife or aesthetic treatment may be found in USDA-SCS Technical Field Office Guide, Section 342 - Critical Area Planting. For special low maintenance areas, see Sections IV Sed and V Turfgrass.
2. For sites having disturbed areas over 5 acres, the rates shown on this table shall be deleted and the rates recommended by the soil testing agency shall be written in.
3. For areas receiving low maintenance, apply urea fertilizer (46-0-0) at 1/2 1/2 lb/1000 sq. ft. (100 lb/acre), in addition to the above soil amendments shown in the table below, to be performed at the time of seeding.

Seed Mixture (Hardness Zone _____ 6b.)		From Table 25		Fertilizer Rate	Lime Rate	
No.	Species	Application Rate (lb/acre)	Seeding Dates	Seeding Depth	N P2O5 K2O	
3	TALL FESCUE (9581)	125	3/1 - 5/15	1" - 2"	90 lb/acre (175 lb/acre)	175 lb/acre (14 lb/1000sq ft)
	PERENNIAL RYE GRASS (1028)	10	8/15 - 10/15	1" - 2"	14 lb/1000sq ft	175 lb/acre (14 lb/1000sq ft)
	KENTUCKY BLUEGRASS (103)	10			14 lb/1000sq ft	175 lb/acre (14 lb/1000sq ft)
10	TALL FESCUE (9581)	120	3/1 - 5/15	1" - 2"		
	HARD FESCUE (1200)	30	8/15 - 10/15	1" - 2"		

**Sequence of Construction**

1. OBTAIN A GRADING PERMIT AND MDE/CORPS OF ENGINEERS PERMITS AS REQUIRED, PER 6.41.23.
  2. NOTIFY MISS UTILITY AT LEAST 48 HOURS BEFORE BEGINNING ANY WORK AT 1-800-257-7777. NOTIFY THE HOWARD COUNTY OFFICE OF CONSTRUCTION/INSPECTION AT 410-313-1330 24-HOURS BEFORE STARTING WORK.
  3. CONTRACTOR SHALL UTILIZE THE EXISTING DRIVEWAY CROSSING FOR ACCESS TO THE WESTERN SIDE OF THE STREAM FOR CONSTRUCTION ACCESS. UPON COMPLETION OF THE TWIN ARCH BARNSLEY WAY ROADWAY REMOVAL OF THIS DRIVEWAY SHALL BE REMOVED, GRADED & STABILIZED IN ACCORDANCE WITH THE MDE PERMIT CONDITIONS OF APPROVAL AND ASSOCIATED FINAL MITIGATION PLAN. SEE S.O.C. SPECIFIC TO MITIGATION WORK ON SHEET 25.
  4. CLEAR AND GRUB FOR SEDIMENT CONTROL MEASURES ONLY. INSTALL STABILIZED CONSTRUCTION ENTRANCE FOR THE STAGING AREA NEAR THE INTERSECTION OF WARWICK WAY AND MARIOTTVILLE ROAD. (2 weeks)
  5. INSTALL THE REMAINING SEDIMENT CONTROL MEASURES. THIS WOULD INCLUDE THE SEDIMENT BASIN #1, TREE PROTECTION FENCE, EARTH DIKES AND SILT FENCE AS INDICATED ON THESE PLANS. (2 weeks)
  6. OBTAIN PERMISSION OF THE SEDIMENT CONTROL INSPECTOR PRIOR TO PROCEEDING.
  7. CLEAR AND GRUB FOR THE REMAINDER OF THE STAGING AREA SITE TO BE USED FOR THE STREAM CROSSING TWIN ARCH PIPES CONSTRUCTION. THE REMAINDER OF THE SITE MAY BE GRADED PRIOR TO THE STREAM CROSSING BASED ON THE CONTRACTORS PREFERENCE. (4 weeks)
  8. GRADE THE CUL-DE-SAC AREAS TO THE PROPOSED SUBGRADE AND INSTALL THE STORM DRAIN SYSTEM AND UTILITIES. STABILIZE ALL ROADWAY SLOPES IMMEDIATELY UPON COMPLETION OF GRADING AS SHOWN. SEQUENCE THE CONSTRUCTION OF STORM DRAIN FROM S-1 TO I-4 TO OCCUR AFTER THE MASS GRADING OF THIS AREA. (8 weeks)
  9. CONSTRUCT THE PROPOSED TWIN ARCHES AND ASSOCIATED SCOUR PROTECTION. GRADE THE PROPOSED BARNSLEY WAY TO THE PROPOSED SUBGRADE. INSTALL UTILITIES AS REQUIRED. (10 weeks)
  10. INSTALL BASE COURSE PAVING FOR THE PROPOSED ROADS. (2 weeks)
  11. STABILIZE ALL AREAS AND OBTAIN PERMISSION FROM THE SEDIMENT CONTROL INSPECTOR PRIOR TO PROCEEDING.
  12. APPLY TACK COAT TO BASE COURSE AND LAY SURFACE COURSE PAVING. (1 week)
  13. WHEN ALL CONTRIBUTING AREAS TO THE SEDIMENT CONTROL MEASURES HAVE BEEN STABILIZED AND WITH THE PERMISSION OF THE SEDIMENT CONTROL INSPECTOR, THE TEMPORARY DEVICE MAY BE REMOVED, BACKFILLED OR REGRADED TO THE PROPOSED FINAL GRADES. STABILIZE ALL REMAINING AREAS WITH PERMANENT SEEDING NOTES. (4 weeks)
  14. NOTIFY HOWARD COUNTY OFFICE OF INSPECTIONS AND PERMITS FOR A FINAL INSPECTION OF THE COMPLETED PROJECT.
- SEQUENCE NOTE: THE CONTRACTOR SHALL INSPECT AND PROVIDE NECESSARY MAINTENANCE ON ALL SEDIMENT AND EROSION CONTROL STRUCTURES SHOWN HEREON AFTER EACH RAINFALL EVENT AND ON A DAILY BASIS.

**TOPSOIL NOTES**

**Definition**

Placement of topsoil over a prepared subsoil prior to establishment of permanent vegetation.

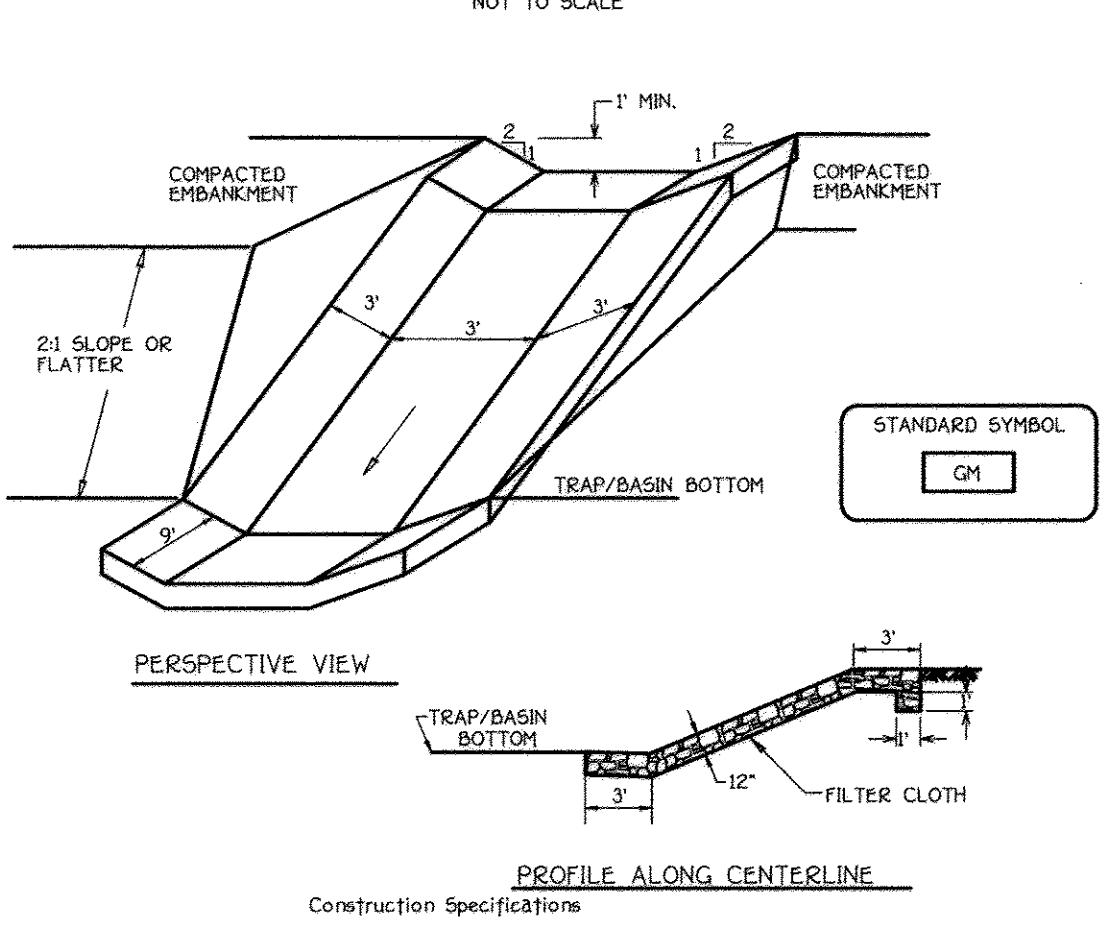
**Purpose**

To provide a suitable soil medium for vegetative growth. Soils of concern have low moisture content, low nutrient levels, low pH materials toxic to plants, and/or unacceptable soil gradation.

**Conditions Where Practice Applies**

1. This practice is limited to areas having 2:1 or flatter slopes where:
  - a. The texture of the exposed subsoil material is not adequate to produce vegetative growth.
  - b. The soil material is so shallow that the rooting zone is not deep enough to support plants or
  - c. The original soil to be treated contains material toxic to plant growth.
  - d. The soil is so acidic that treatment with limestone is not feasible.
2. For the purpose of these standards and specifications, areas having slopes steeper than 2:1 require special consideration and design for adequate stabilization. Areas having slopes steeper than 2:1 shall have the appropriate stabilization shown on the plans.

**GABION INFLOW PROTECTION**

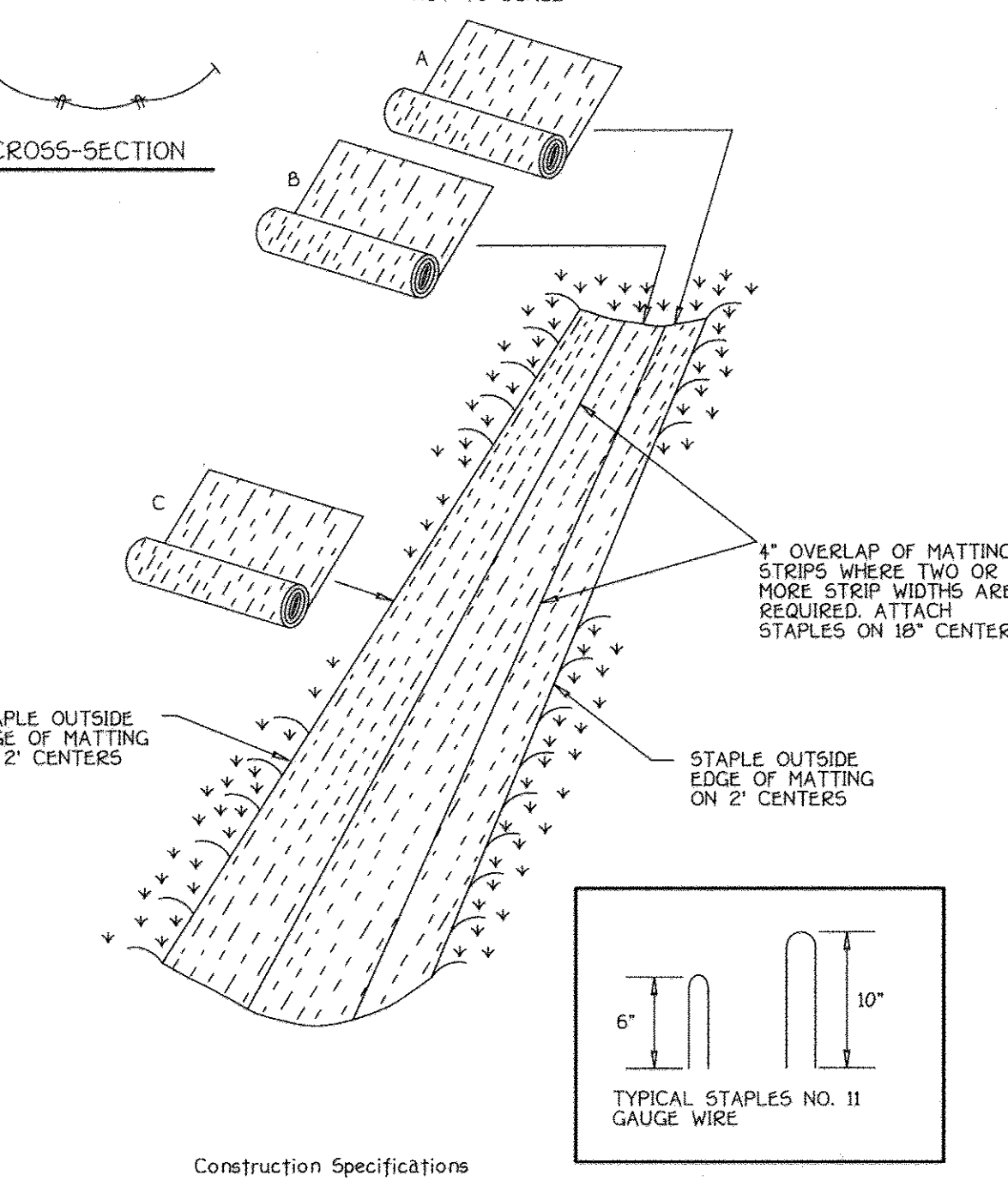


**Construction and Material Specifications**

1. Topsoil salvaged from the existing site may be used provided that it meets the standards as set forth in these specifications. Typically, the depth of topsoil to be salvaged for a given soil type can be found in the representative soil profile section in the Soil Survey published by USDA-SCS in cooperation with Maryland Agricultural Experimental Station.
2. Topsoil Specifications - Soil to be used as topsoil must meet the following:
  - i. Topsoil shall be a loam, sandy loam, clay loam, silt loam, sandy clay loam, loamy sand. Other soils may be used if recommended by an agronomist or soil scientist and approved by the appropriate approval authority. Regardless, topsoil shall not be a mixture of contrasting textured subsols and shall contain less than 2% by volume of cinders, stones, silt, clods, fragments, gravel, sticks, roots, trash, or other materials larger than 1/2" in diameter.
  - ii. Topsoil must be free of plants or plant parts such as burdock, grass, quackgrass, Johnsongrass, nutgrass, poison ivy, thistle, or other as specified.
  - iii. Where the subsoil is either highly acidic or composed of heavy clays, ground limestone shall be spread at the rate of 4-8 tons/acre (200-400 pounds per 1000 square feet) prior to the placement of topsoil. Lime shall be distributed uniformly over designated areas by hand or machine in conjunction with tillage operations as described in the following procedures.
  - iv. For sites having disturbed areas under 5 acres:
    - a. Place topsoil if required and apply soil amendments as specified in 20.0 Vegetative Stabilization - Section 1 - Vegetative Stabilization Methods and Materials.
    - b. For sites having disturbed areas over 5 acres:
      - i. At soil meeting topsoil specifications, obtain test results dictating fertilizer and lime amendments required to bring the soil into compliance with the following:
        - a. pH for topsoil shall be between 6.0 and 7.5. If the tested soil demonstrates a pH of less than 6.0, sufficient lime shall be prescribed to raise the pH to 6.5 or higher.
        - b. Organic content of topsoil shall be not less than 1.5 percent by weight.
      - c. Topsoil having soluble salt content greater than 500 parts per million shall not be used.
      - d. No sod or seed shall be placed on soil which has been treated with soil sterilants or chemicals used for weed control until sufficient time has elapsed (30 days min) to permit dissipation of phytotoxic material.
3. Topsoil shall not be placed while the topsoil or subsoil is in a frozen or muddy condition, when the subsoil is excessively wet or in a condition that may be detrimental to proper grading and seeded preparation.
4. Alternative for Permanent Seeding - Instead of applying the full amounts of lime and commercial fertilizer, composted sludge and amendments may be applied as specified below.
5. Composted sludge material for use as a soil conditioner for sites having disturbed areas over 5 acres shall conform to the following requirements and for sites having disturbed areas over 5 acres shall conform to the following requirements:
  - a. Composted sludge shall be supplied by, or originate from, a person or persons that are permitted at the time of acquisition of the compost by the Maryland Department of the Environment under COMAR 26.04.06.
  - b. Composted sludge shall contain at least 1 percent nitrogen, 15 percent phosphorus, and 0.2 percent potassium and have a pH of 7.0 to 8.0. If compost does not meet these requirements, the appropriate constituents must be added to meet the requirements prior to use.
  - c. Composted sludge shall be applied at a rate of 1 ton/1000 square feet.
  - d. Composted sludge shall be amended with a potassium fertilizer applied at the rate of 4 lb/1000 square feet, and 1/3 the normal lime application rate.

Reference: Guideline Specifications, Soil Preparation and Seeding, MD-VI, Pub. 1, Cooperative Extension Service, University of Maryland and Virginia Polytechnic Institute, Revised 1973.

**EROSION CONTROL MATTING**



**Construction Specifications**

1. Key-in the matting by placing the top ends of the matting in a narrow trench, 6" in depth. Backfill the trench and tamp firmly to conform to the channel cross-section. Secure with a row of staples spaced 4" down slope from the trench. Spacing between staples is 6".
2. Staple the 4" overlap in the channel center using an 18" spacing between staples.
3. Before stapling the outer edges of the matting, make sure the matting is smooth and in firm contact with the soil.
4. Staples shall be placed 2' apart with 4 rows for each strip, 2 outer rows, and 2 alternating rows down the center.
5. Where one roll of matting ends and another begins, the end of the top strip shall overlap the upper end of the lower strip by 4", shiplap fashion. Reinforce the overlap with a double row of staples spaced 6" apart in a staggered pattern on either side.
6. The discharge end of the matting line should be similarly secured with 2 double rows of staples.

Note: If flow will enter from the edge of the matting then the area effected by the flow must be key-in.

**SEDIMENT CONTROL NOTES AND DETAILS**

**GTW'S WAVERLY WOODS**

SECTION 14

BULK PARCELS 'A' & 'B' AND OPEN SPACE LOTS 1 & 2

ZONING: PSC & PEC

TAX MAP NO. 16 PARCEL NOS. 120, 221 & P/O 249 GRID NOS. 3 & 4

THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND

DATE: JULY 28, 2009

SHEET 9 OF 27

**FISHER COLLINS & CARTER, INC.**

CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS

CENTRAL SQUARE OFFICE PARK - 10272 BALTIMORE NATIONAL PIKE

ELLICOTT CITY, MARYLAND 21042

410.481.2955

**OWNERS**

WAVERLY WOODS DEVELOPMENT CORPORATION,

HOLE IN THE DOUGHERT, LLC, AND DEVELOPMENT, INC.

5300 DORSEY HALL DRIVE, SUITE 102

ELLICOTT CITY, MARYLAND 21042

(443-367-0422)

**DEVELOPER**

WAVERLY WOODS DEVELOPMENT CORP.

C/O LAND DESIGN AND DEVELOPMENT, INC.

5300 DORSEY HALL DRIVE, SUITE 102

ELLICOTT CITY, MARYLAND 21042

(443-367-0422)

**ENGINEER'S CERTIFICATE**

I Herewith Certify That This Plan For Erosion And Sediment Control Represents A Practical And Workable Plan Based On My Personal Knowledge Of The Site Condition And That It Was Prepared In Accordance With The Requirements Of The Howard Soil Conservation District.

Signature: *[Signature]* Date: 7/29/09

Approved: Department Of Planning And Zoning

Chief, Division Of Land Development Date: 9/26/09

Chief, Development Engineering Division Date: 8/31/09

Approved: Howard County Department Of Public Works

Chief, Bureau Of Highways Date: 8-27-09

THERE IS NO "AS-BUILT" INFORMATION PROVIDED ON THIS SHEET

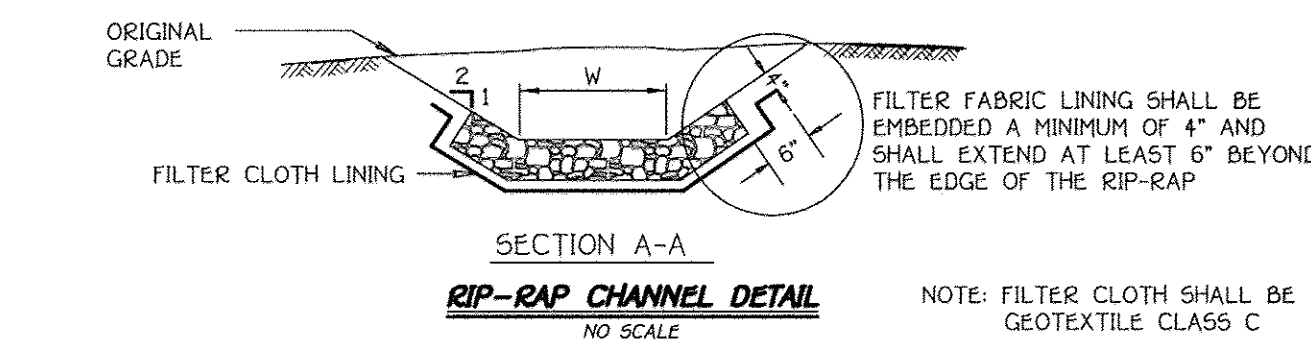
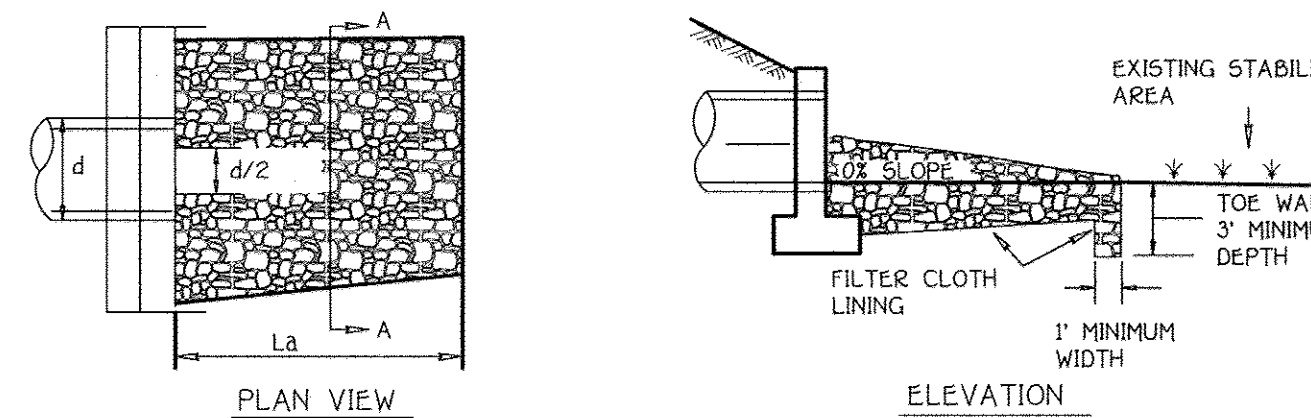


**STRUCTURE SCHEDULE**

STRUCTURE NO.	TOP ELEVATION	INV. IN	INV. OUT	LOCATION	ROAD STA./ COORDINATE	OFFSET	TYPE AND WIDTH	REMARKS
I-1	472.00	461.70	461.70	---	N 537305.44 E 827914.10	---	DOUBLE TYPE 'S'	D - 4.23
I-4	469.21	464.18	464.18	---	N 537305.44 E 827914.10	---	A-10V	D - 4.03
I-11	470.24	464.85	466.78	BARNESLEY WAY	5+50.36	12' R/R	A-5 (PUBLIC)	D - 4.01
I-12	470.24	464.85	467.59	BARNESLEY WAY	5+50.49	12' R/R	A-5 (PUBLIC)	D - 4.01
M-1	466.00	467.87	467.87	---	N 537305.44 E 827914.10	---	5' DIA. MANHOLE	G - 5.13
M-3	475.24	463.78	463.78	---	N 537305.44 E 827914.10	---	4' DIA. MANHOLE	G - 5.12
M-7	470.24	463.78	463.78	---	N 537305.44 E 827914.10	---	5' DIA. MANHOLE	G - 5.13
M-8	470.24	463.78	463.78	BARNESLEY WAY	6+65.16	30' CL	4' DIA. MH (PUBLIC)	G - 5.12
S-1	463.40	463.40	463.40	---	N 537305.44 E 827914.10	---	36" CONC. END SECTION	D - 5.51
HW-1	461.75	467.19	467.19	---	N 537305.44 E 827914.10	---	36" TYPE 'A' HEADWALL	D - 5.11
R-1	464.77	458.25	458.25	---	N 537305.44 E 827914.10	---	CONC. RISER	SEE SHEET 7

**CONSTRUCTION SPECIFICATIONS FOR RIP-RAP OUTFALLS**

- The subgrade for the filter, riprap or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.
- The rock or gravel shall conform to the specified grading limits when installed respectively in the riprap or filter.
- Filter cloth shall be protected from punching, cutting or tearing. Any damage other than an occasional hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.
- Stones for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The stone for riprap or gabion outlets shall be delivered and placed in a manner that will insure that it is reasonably homogeneous with the smaller stones and spalls filling the voids between the larger stones. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.



**RIP-RAP CHANNEL DESIGN DATA**

STRUCTURE	AREA (SQ. FT.)	WETTED PERIMETER	R	R <sup>2/3</sup>	S	S <sup>1/2</sup>	W	d	n	(f.p.s.)	Q	Q <sub>10</sub>	Q <sub>50</sub>	Q <sub>100</sub>	BLANKET THICKNESS	PIPE SIZE	L <sub>A</sub>
S-1	13.56	14.96	0.9064	0.9363	0.005	0.0707	10.00'	1.11'	0.04	2.46	33.13	9.5'	15'	19'	36"	20'	

**OPERATION AND MAINTENANCE SCHEDULE FOR PRIVATELY OWNED AND MAINTAINED STORMWATER INFILTRATION TRENCHES FOR REV (I-1)**

- The monitoring wells and structures shall be inspected on a quarterly basis and after every large storm event.
- Water levels and sediment build up in the monitoring wells shall be recorded over a period of several days to insure trench drainage.
- A logbook shall be maintained to determine the rate at which the facility drains.
- When the facility becomes clogged so that it does not drain down within the 72 hour time period, corrective action shall be taken.
- The maintenance logbook shall be available to Howard County for inspection to insure compliance with operation and maintenance criteria.
- Once the performance characteristics of the infiltration facility have been verified, the monitoring schedule can be reduced to an annual basis unless the performance data indicates that a more frequent schedule is required.

**PIPE SCHEDULE (PUBLIC)**

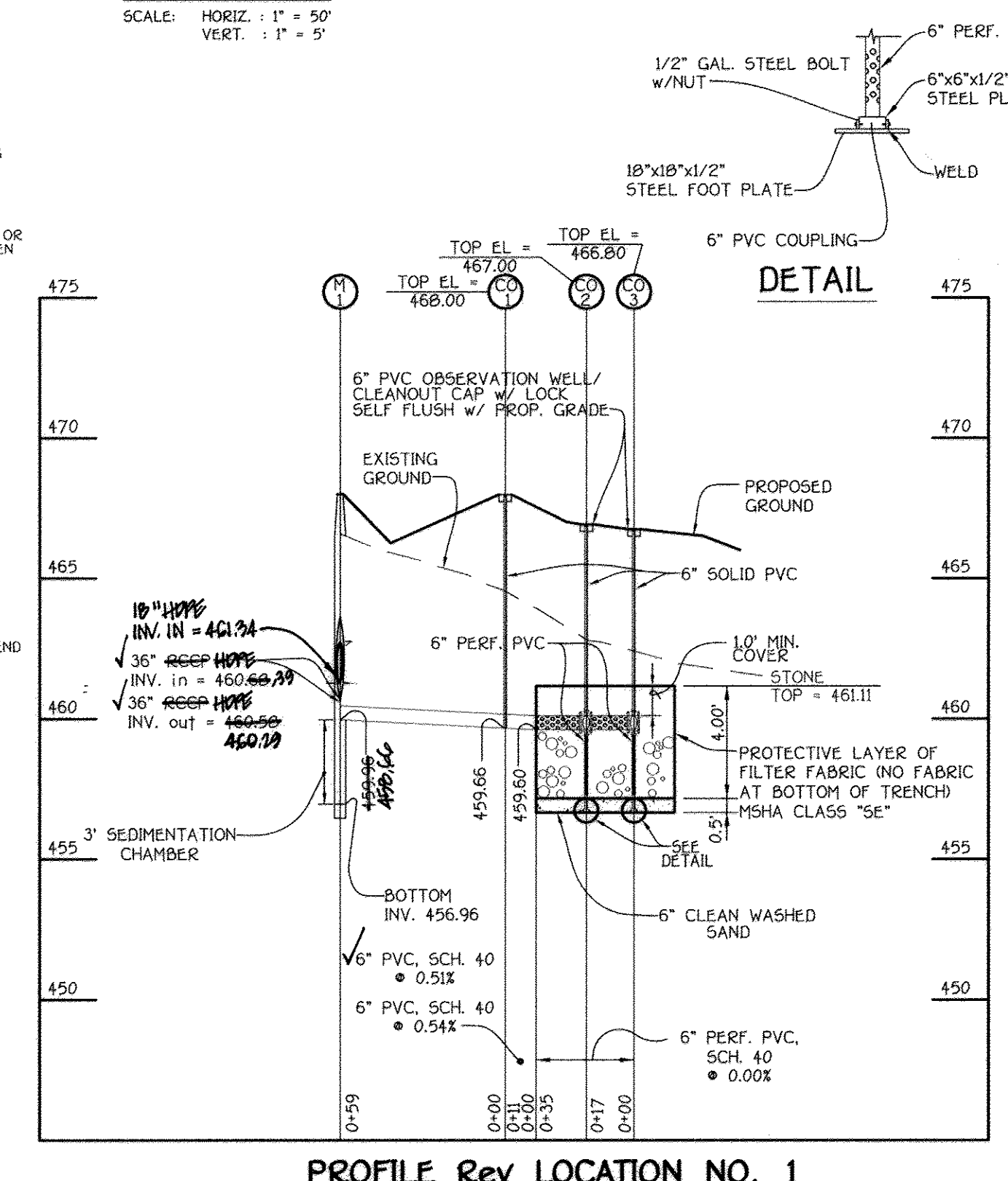
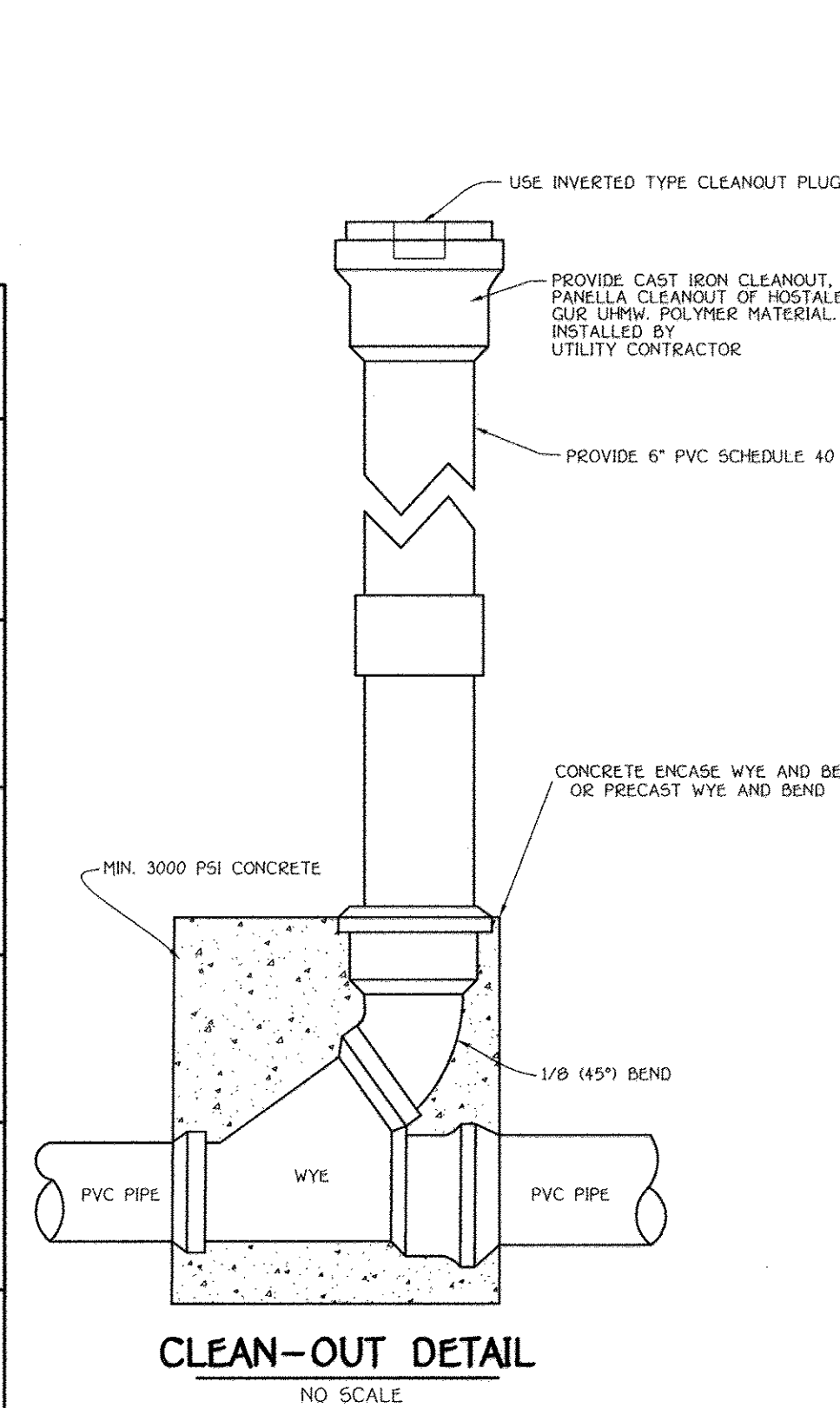
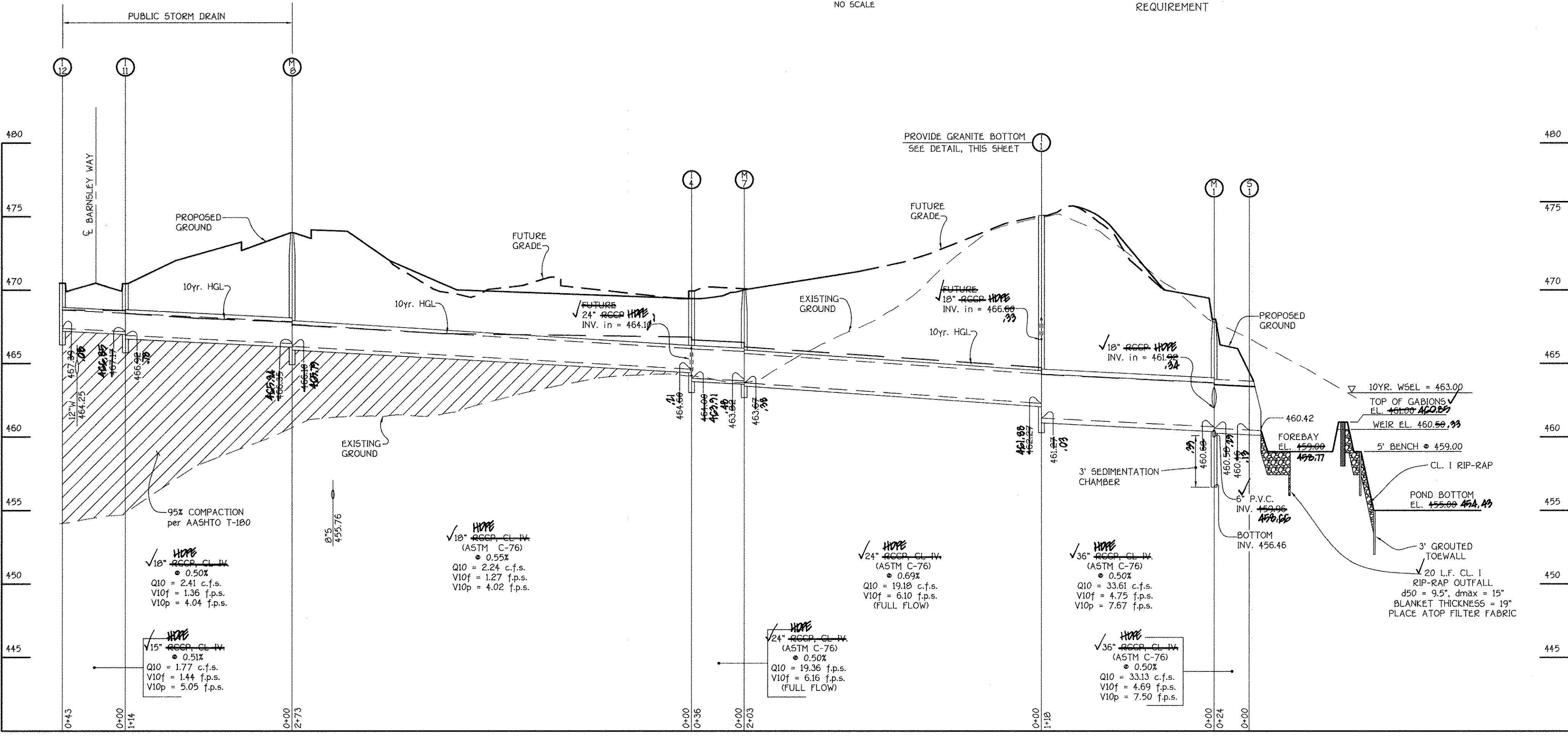
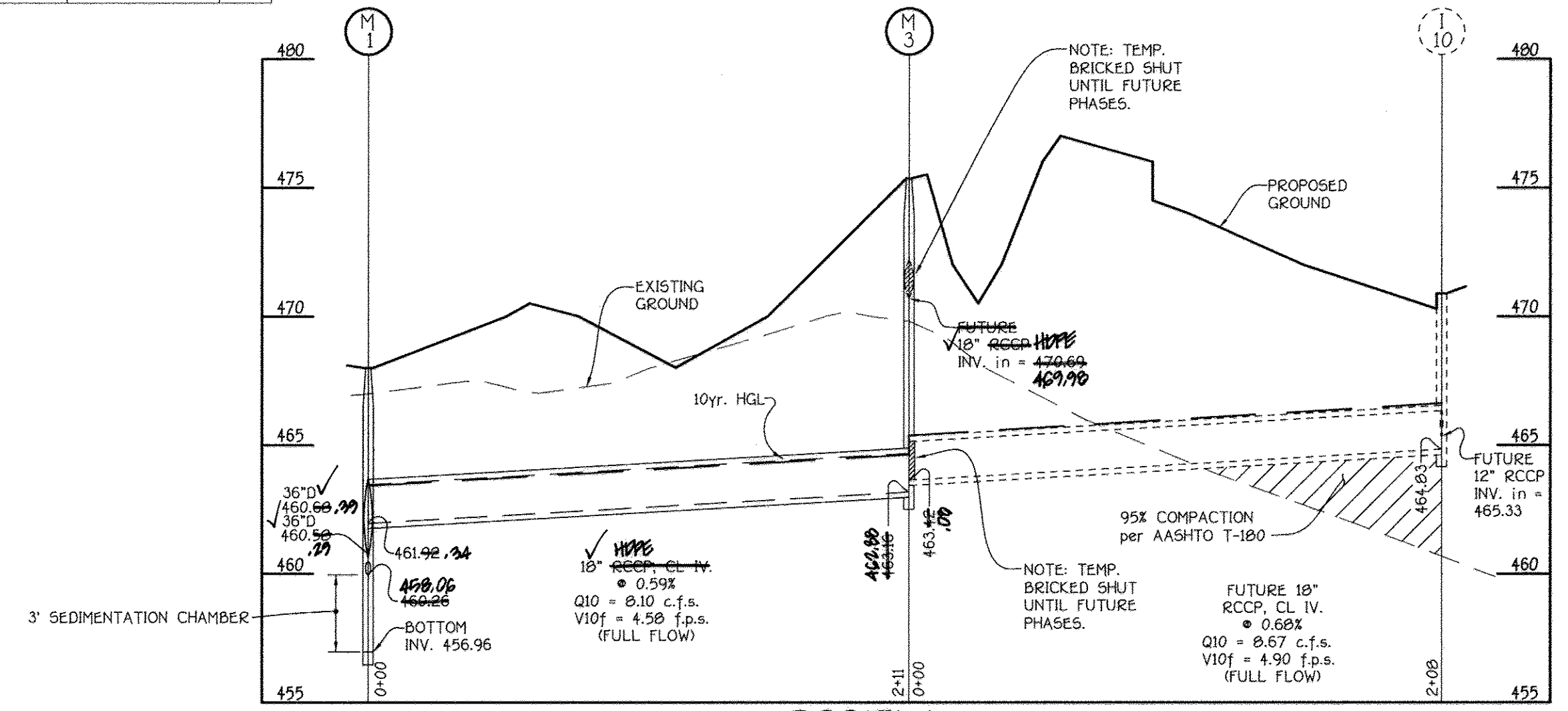
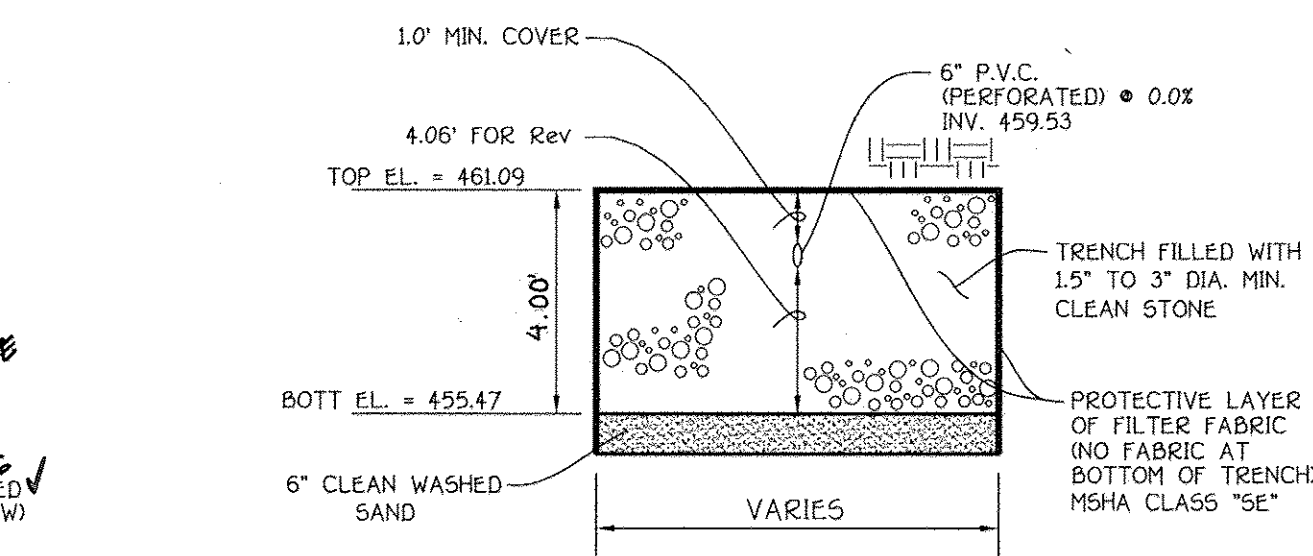
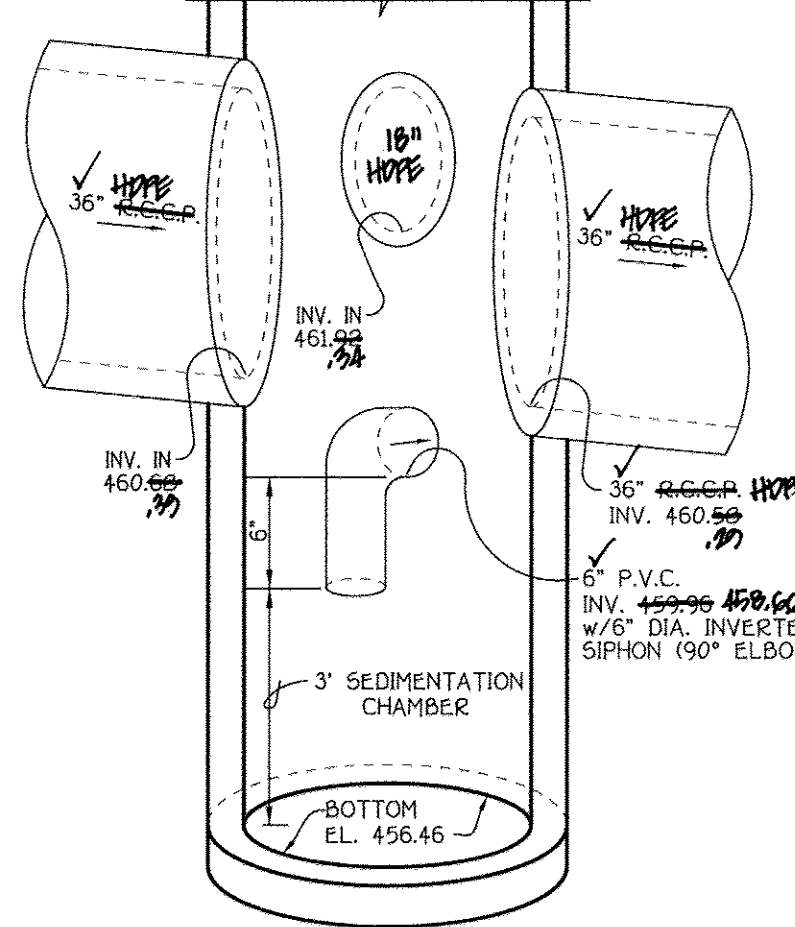
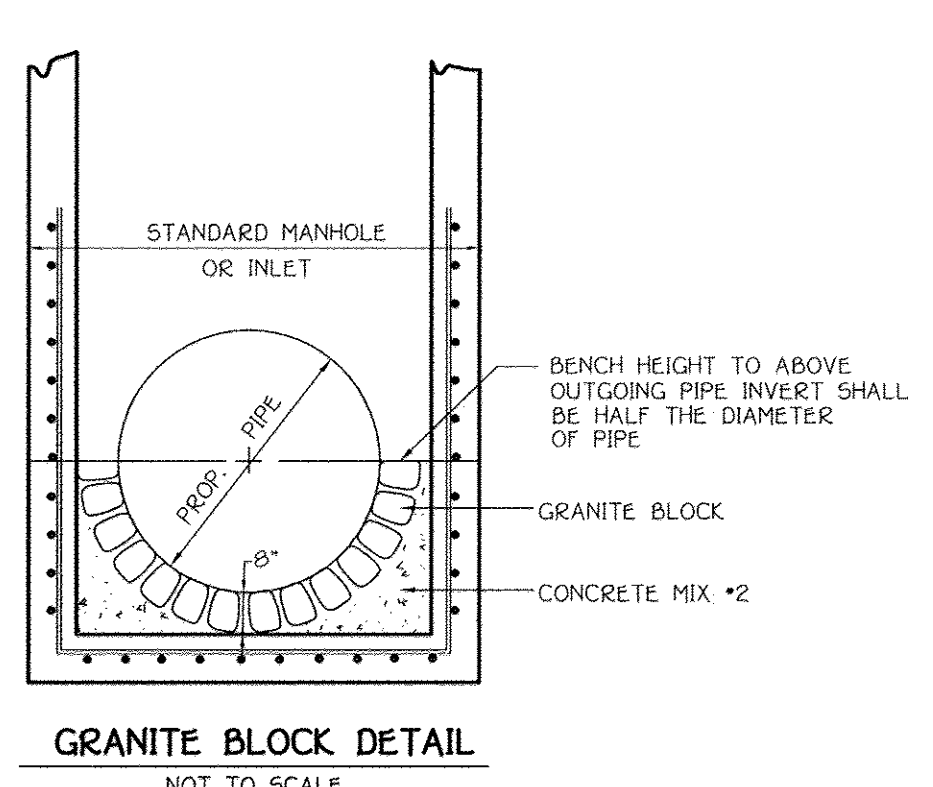
SIZE	CLASS	LENGTH
15"	RCCP, CL. IV	43 L.F.
18"	RCCP, CL. IV	114 L.F.

NOTE: RCCP, CL. IV MAY BE SUBSTITUTED WITH HDPE PIPE MATERIAL.

**PIPE SCHEDULE (PRIVATE)**

SIZE	CLASS	LENGTH
18"	RCCP, CL. IV	222 L.F.
18"	RCCP, CL. IV	262 L.F.
24"	RCCP, CL. IV	239 L.F.
36"	RCCP, CL. IV	142 L.F.
6"	PVC, SCH. 40	70 L.F.
8"	D.I.P. DRAIN PIPE	15 L.F.

NOTE: RCCP, CL. IV MAY BE SUBSTITUTED WITH HDPE PIPE MATERIAL.



**FISHER, COLLINS & CARTER, INC.**  
CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
CENTENAL SQUARE OFFICE PARK - 10272 BALTIMORE NATIONAL PRX  
ELICOTT CITY, MARYLAND 21042  
(410) 481 - 2955

**OWNERS**  
WAVERLY WOODS DEVELOPMENT CORPORATION  
HOLE IN THE DOUGHNUT, LLC & GTW JOINT VENTURE  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
ELICOTT CITY, MARYLAND 21042  
(443) 367-0422

**DEVELOPER**  
WAVERLY WOODS DEVELOPMENT CORP.  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
ELICOTT CITY, MARYLAND 21042  
(443) 367-0422

**ALDO M. WIPAC, P.E.**  
DATE: 7-27-07

I, the undersigned, hereby certify that these documents were prepared by me, and that I am a duly Licensed Professional Engineer under the laws of the State of Maryland. License No. 20748, Expiration Date 2-22-11.



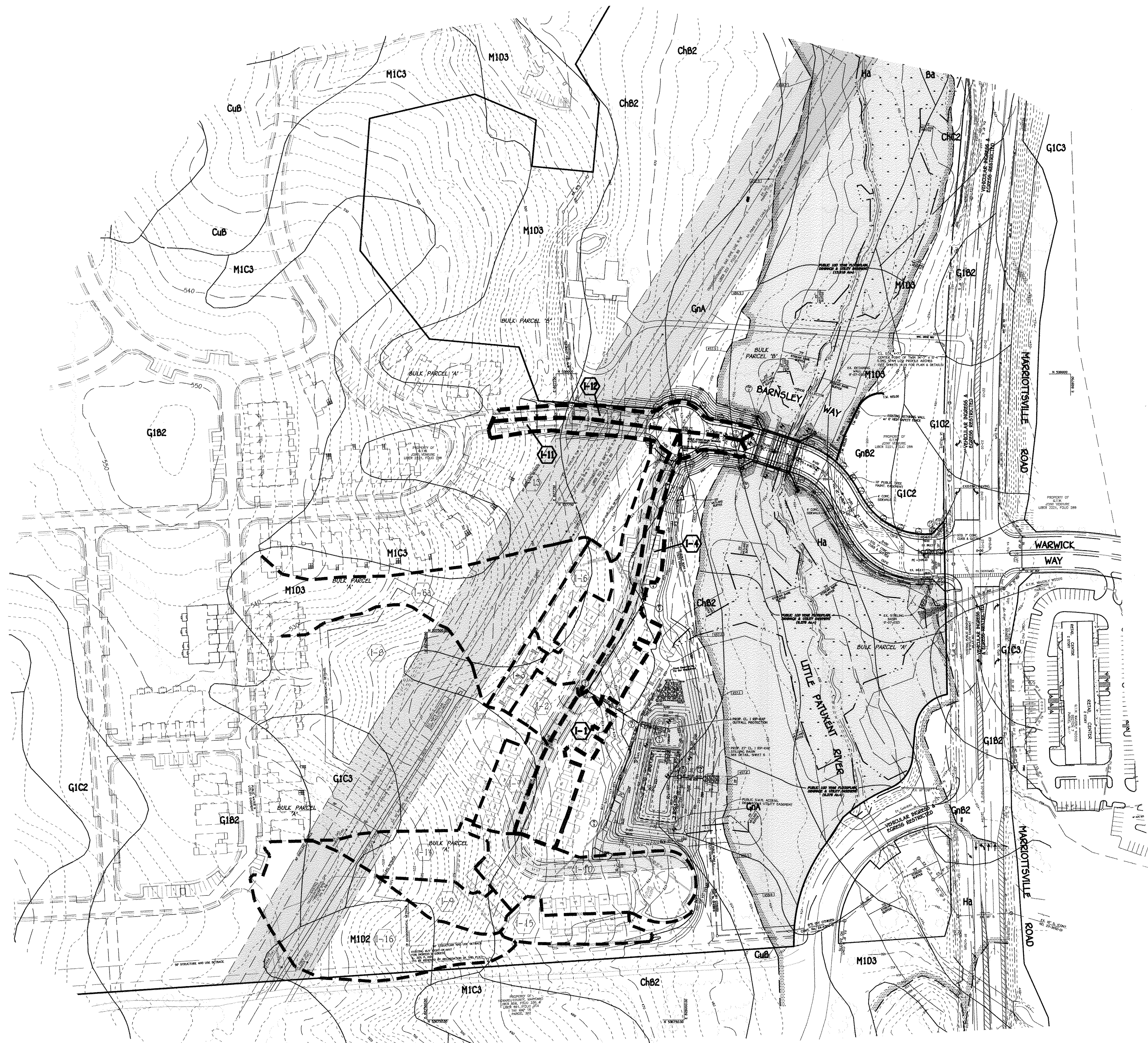
**STORM DRAIN PROFILES**  
**GTW'S WAVERLY WOODS**  
SECTION 14  
BULK PARCELS 'A' & 'B' AND  
OPEN SPACE LOTS 1 & 2  
ZONING: PSC & PEC  
TAX MAP NO. 16 PARCEL Nos. 120, 221 & P/O 249 GRID Nos. 3 & 4  
THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
DATE: JULY 28, 2009  
SHEET 10 OF 27



APPROVED: DEPARTMENT OF PUBLIC WORKS  
*Matthew F. Whittell* 8-27-09  
 CHIEF, BUREAU OF HIGHWAYS DATE

APPROVED: DEPARTMENT OF PLANNING AND ZONING  
*Cindy Hamer* 9/29/09  
 CHIEF, DIVISION OF LAND DEVELOPMENT DATE

*W. J. Dummer* 8/31/09  
 CHIEF, DEVELOPMENT ENGINEERING DIVISION DATE



**DRAINAGE AREA DATA**

STRUCTURE NO.	AREA (AC.)	C'	% IMP.
I-1	0.51	0.63	52
FUTURE I-2	0.23	0.92	95
FUTURE I-3	0.21	0.78	75
I-4	0.49	0.87	89
FUTURE I-5	0.79	0.78	75
FUTURE I-6	0.36	0.71	65
FUTURE I-7	0.30	0.81	80
FUTURE I-8	3.15	0.71	65
FUTURE I-9	0.39	0.71	65
FUTURE I-10	1.03	0.86	86
I-11	0.10	0.90	93
I-12	0.34	0.90	93
FUTURE I-13	2.40	0.71	65
FUTURE I-14	0.47	0.31	8
FUTURE I-6a	2.37	0.71	65
FUTURE I-15	0.45	0.45	29
FUTURE I-16	1.68	0.27	2

**SOIL CLASSIFICATION**

Soil Sym.	Name	HYDROLOGIC GROUP
* Ba	Belle silt loam	D
BrB2	Beltville silt loam	C
BrC2	Beltville silt loam	C
BrC3	Beltville silt loam	C
BrD2	Beltville silt loam	C
BrF	Brandwine loam	C
ChA	Chester silt loam	B
ChB2	Chester silt loam	B
ChC2	Chester silt loam	B
ChC3	Chester silt loam	B
ChG2	Chester silt loam	B
Co	Codorus silt loam	C
** Co	Codorus silt loam	C
CuB	Cornus silt loam	B
** DeA	Delanco silt loam	C
** DeB2	Delanco silt loam	C
ElB2	Eliak silt loam	B
ElC3	Eliak silty clay loam	B
ElD3	Eliak silty clay loam	B
ElB2	Elaboro loam	B
ElC2	Elaboro loam	B
ElC3	Elaboro loam	B
GlA	Glenns loam	B
GlB2	Glenns loam	B
GlC2	Glenns loam	B
GlC3	Glenns loam	B
GlD2	Glenns loam	B
GlD3	Glenns loam	B
** GlA	Glennville silt loam	C
** GlB2	Glennville silt loam	C
* Ha	Hatboro silt loam	D
* Kn	Kirkers silt loam	D
MgB2	Manor gravelly loam	B
MgC2	Manor gravelly loam	B
MIA	Manor loam	B
MIB2	Manor loam	B
MIC2	Manor loam	B
MIC3	Manor loam	B
MID2	Manor loam	B
MID3	Manor loam	B
MIE	Manor loam	B

\* HYDRIC SOILS  
 \*\* SOILS SUBJECT TO HYDRIC CONDITIONS  
 SOILS MAP - Pg 8 & Pg 9

PLAN  
 SCALE: 1" = 100'

**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTRAL SQUARE OFFICE PARK - 10272 BALTIMORE NATIONAL PIKE  
 ELLICOTT CITY, MARYLAND 21042  
 4103 461 - 2855

**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE ROUGH, LLC, &  
 GTW JOINT VENTURE,  
 C/O LAND DESIGN AND DEVELOPMENT, INC.,  
 5300 DORSEY HALL DRIVE, SUITE 102,  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)

**DEVELOPER**  
 WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT, INC.,  
 5300 DORSEY HALL DRIVE, SUITE 102,  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)

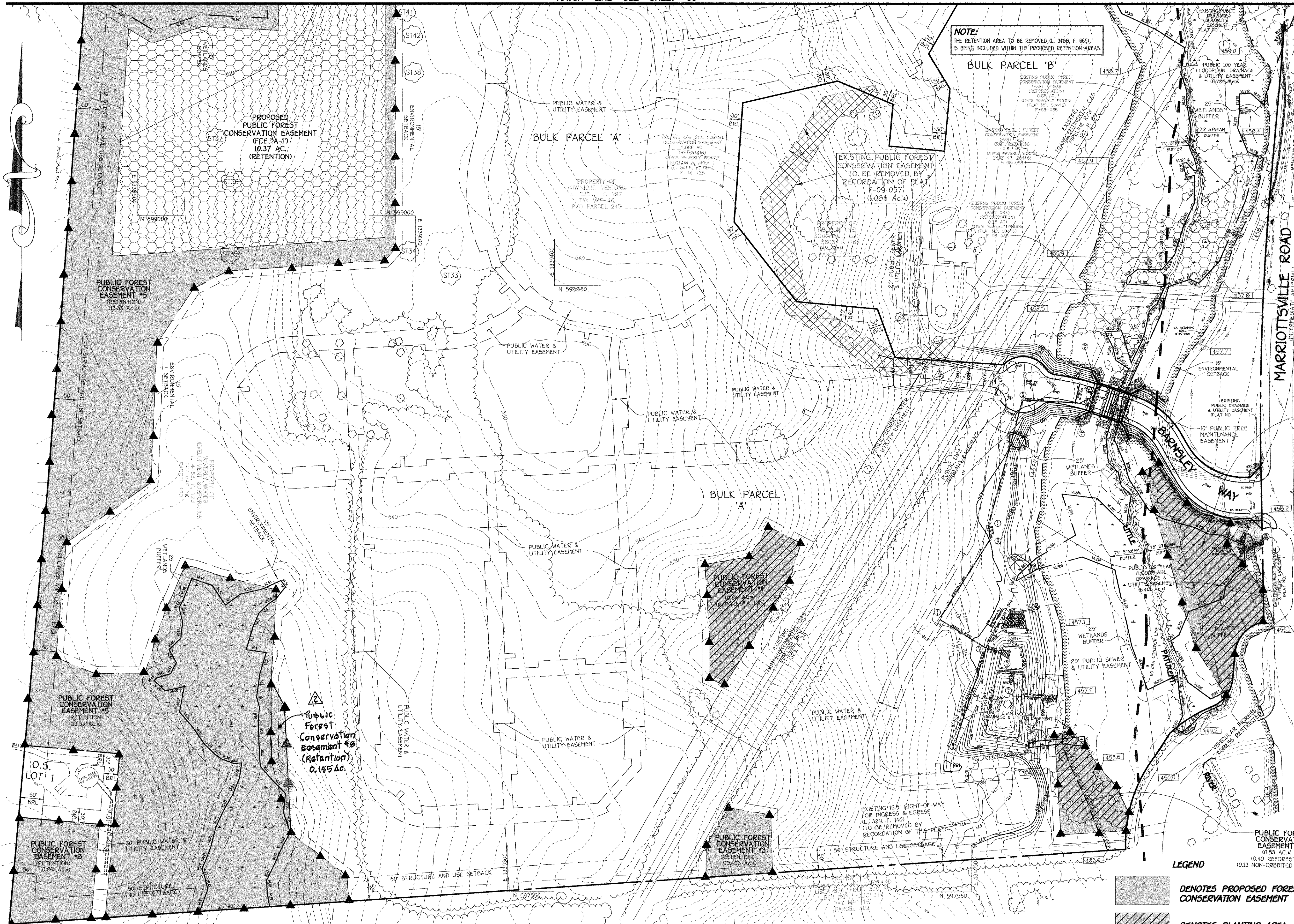
STATE OF MARYLAND  
 ALDO M. VITELLI  
 79909  
 DATE  
 "Professional certification" hereby certifies that these documents were prepared by me, and that I am a duly Licensed Professional Engineer under the laws of the State of Maryland, License No. 20748, Expiration Date 2-22-11."

STORM DRAIN DRAINAGE AREA MAP  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOTS 1 & 2  
 ZONING: P5C & PEC  
 TAX MAP NO. 16 PARCEL NOS. 120, 221 & P/O 249 GRID NOS. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: JULY 28, 2009  
 SHEET 11 OF 27

THERE IS NO "AS-BUILT" INFORMATION PROVIDED ON THIS SHEET F-09-057



APPROVED: DEPARTMENT OF PUBLIC WORKS  
 8-27-09  
 DATE  
 APPROVED: DEPARTMENT OF PLANNING AND ZONING  
 9/29/09  
 DATE  
 APPROVED: CHIEF, DIVISION OF LAND DEVELOPMENT  
 10/15/09  
 DATE



**FCE Planting Area # 1 - 1.06 acres**  
 Planting required (1350 WHPS PER ACRE) x 1.06 x 350 = 371 WHPS  
 Planting provided (1340 whps and 10 - 1" trees)

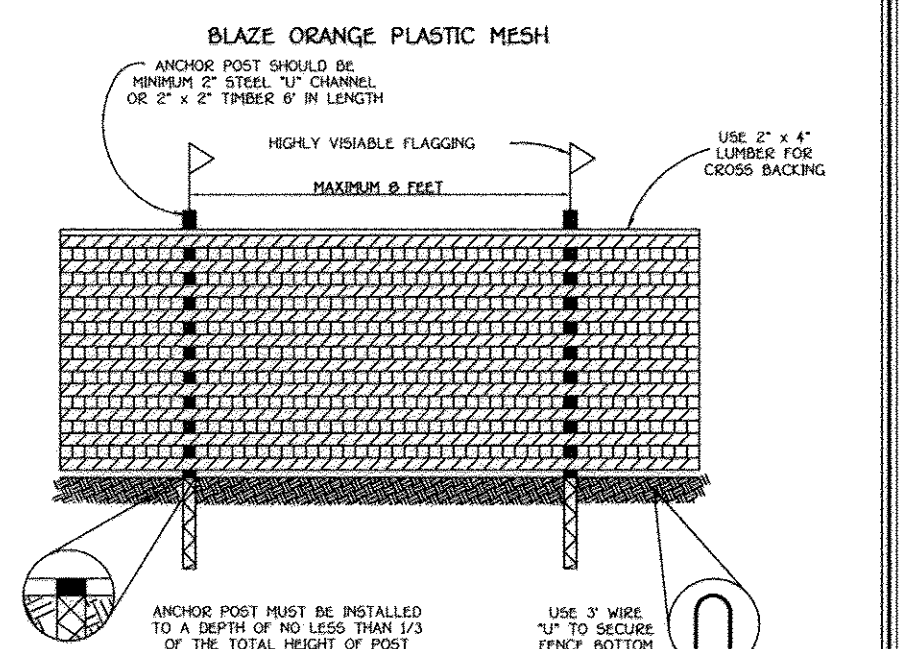
Qty	Species	Size	Spacing
6	Acer rubrum - Red maple	1" cal.	15' o.c.
12	Quercus alba - White oak	1" cal.	15' o.c.
75	Acer rubrum - Red maple	2-3" whp	12' o.c.
75	Cercis canadensis - Red bud	2-3" whp	12' o.c.
50	Cornus florida - Flowering dogwood	2-3" whp	12' o.c.
50	Liriodendron tulipifera - Tulip poplar	2-3" whp	12' o.c.
25	Prunus serotina - Black cherry	2-3" whp	12' o.c.
25	Robinia pseudo-acacia - Black locust	2-3" whp	12' o.c.
20	Quercus alba - White oak	2-3" whp	12' o.c.
20	Viburnum prunifolium - Blackhaw	2-3" whp	12' o.c.
140 Total whp plantings			

**FCE Planting Area # 2 - 0.40 acres**  
 Planting required (1350 WHPS PER ACRE) x 0.40 x 350 = 140 WHPS  
 Planting provided (140 whps)

Qty	Species	Size	Spacing
25	Acer rubrum - Red maple	2-3" whp	12' o.c.
25	Cercis canadensis - Red bud	2-3" whp	12' o.c.
25	Cornus florida - Flowering dogwood	2-3" whp	12' o.c.
15	Liriodendron tulipifera - Tulip poplar	2-3" whp	12' o.c.
15	Prunus serotina - Black cherry	2-3" whp	12' o.c.
15	Robinia pseudo-acacia - Black locust	2-3" whp	12' o.c.
10	Quercus alba - White oak	2-3" whp	12' o.c.
10	Viburnum prunifolium - Blackhaw	2-3" whp	12' o.c.
140 Total whp plantings			

**FCE Planting Area # 4 - 0.04 acres**  
 Planting required (1350 WHPS PER ACRE) x 0.04 x 350 = 254 WHPS  
 Planting provided (263 whps and 10 - 1" trees)

Qty	Species	Size	Spacing
6	Acer rubrum - Red maple	1" cal.	15' o.c.
12	Quercus alba - White oak	1" cal.	15' o.c.
50	Acer rubrum - Red maple	2-3" whp	12' o.c.
50	Cercis canadensis - Red bud	2-3" whp	12' o.c.
50	Cornus florida - Flowering dogwood	2-3" whp	12' o.c.
25	Liriodendron tulipifera - Tulip poplar	2-3" whp	12' o.c.
25	Prunus serotina - Black cherry	2-3" whp	12' o.c.
30	Quercus alba - White oak	2-3" whp	12' o.c.
33	Viburnum prunifolium - Blackhaw	2-3" whp	12' o.c.
263 Total whp plantings			



Note: THE FOREST CONSERVATION EASEMENT(S) WILL BE ESTABLISHED TO FULFILL THE REQUIREMENTS OF SECTION 16.1020 OF THE HOWARD COUNTY FOREST CONSERVATION ACT. NO CLEARING, GRADING OR CONSTRUCTION IS PERMITTED WITHIN THE FOREST CONSERVATION EASEMENT, EXCEPT AS SHOWN ON AN APPROVED ROAD CONSTRUCTION DRAWING. HOWEVER, FOREST MANAGEMENT PRACTICES AS DEFINED IN THE DEED OF FOREST CONSERVATION EASEMENT ARE ALLOWED.

No.	DESCRIPTION	DATE
2	ADD FCE #8 - 0.155 ACRES RETENTION	7-10-13

**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTRAL SQUARE OFFICE PARK - 1972 BALTIMORE NATIONAL PIKE  
 ELICOTT CITY, MARYLAND 21042  
 (410) 461-3992

**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE DOUGNUT, LLC, &  
 CITY JOINT VENTURE  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELICOTT CITY, MARYLAND 21042  
 (443-367-0422)

**DEVELOPER**  
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 5300 DORSEY HALL DRIVE, SUITE 102  
 ELICOTT CITY, MARYLAND 21042  
 (443-367-0422)

**Eco-Science Professionals, Inc.**  
 CONSULTING ECOLOGISTS

MD DNR Qualified Professional  
 USACOE Wetland Delineator  
 Certificate # PCP93MD06100448  
 JOHN F. ANOLES

STATE OF MARYLAND  
 NOTARY PUBLIC  
 7/29/09  
 DATE  
 I, *[Signature]*, hereby certify that these documents were prepared by me, and that I am a duly Licensed Professional Engineer under the laws of the State of Maryland, License No. 20748, Expiration Date 2-22-11.

**NOTE:**  
 SEE SHEET 21 FOR MASTER OVERALL FOREST CONSERVATION WORKSHEET.

**FOREST CONSERVATION PLAN**  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOTS 1 & 2  
 ZONING PSC & PFC  
 TAX MAP NO. 16 PARCEL NOS. 120, 221 & P/0 P/49 GRID NOS. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: JULY 28, 2009  
 SHEET 12 OF 27



**FCE Planting Area # 7 - 2.38 acres**

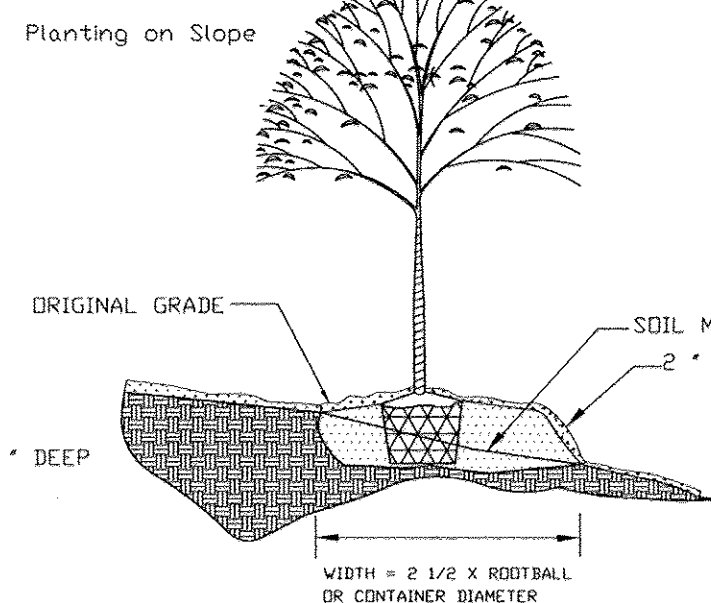
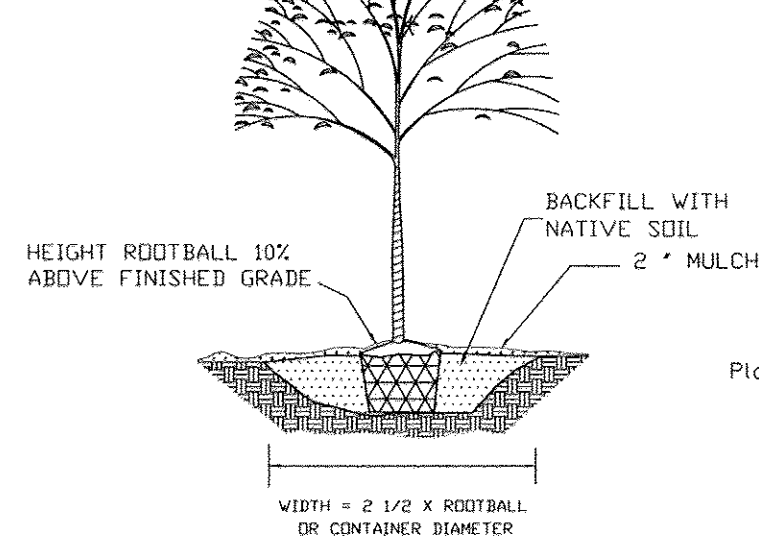
Planting required: 1350 WHPS PER ACRE x 2.38 = 3203 WHPS  
 Planting provided: 1790 whips and 25 - 1" trees

QTY	Species	Size	Spacing
10	Acer rubrum - Red maple	1" cal.	15' o.c.
15	Quercus alba - White oak	1" cal.	15' o.c.
25 Total 1" caliper trees			
125	Acer rubrum - Red maple	2-3" whip	11' o.c.
	Cercis canadensis - Red bud	2-3" whip	11' o.c.
75	Cornus florida - Flowering dogwood	2-3" whip	11' o.c.
75	Linderaea tulipifera - Tulip poplar	2-3" whip	11' o.c.
125	Prunus serotina - Black cherry	2-3" whip	11' o.c.
140	Robinia pseudo-acacia - Black locust	2-3" whip	11' o.c.
75	Quercus alba - White oak	2-3" whip	11' o.c.
50	Viburnum prunifolium - Blackhaw	2-3" whip	11' o.c.

1" CAL. TREES = 200/ACRE 125 TREES/2000 = 0.125 AC.  
 WHPS w/shifters = 350/ACRE = 1350 x 2.25 AC. @ 2.38 = 0.1250 = 790 WHPS

**NOTE:**  
 THE PLANTING AREAS SHOWN WITHIN F.C.E. No. 7 ARE AREAS THAT WILL HAVE FUTURE GRADING.

Undisturbed Soil



LINE	LENGTH	BEARING	LINE	LENGTH	BEARING	LINE	LENGTH	BEARING	LINE	LENGTH	BEARING	LINE	LENGTH	BEARING	LINE	LENGTH	BEARING	LINE	LENGTH	BEARING
M1	30.0	S 89°00'00" W	M45	14.74	N 87°00'00" E	M89	28.33	S 48°00'00" E	M133	30.72	N 89°00'00" W	M177	17.53	S 02°00'00" W	M221	18.35	S 20°00'00" E	M265	26.35	S 20°00'00" E
M2	30.0	S 23°00'00" W	M46	22.27	N 17°00'00" E	M90	22.24	S 48°00'00" E	M134	29.56	N 20°00'00" W	M178	29.54	S 22°00'00" W	M222	30.35	N 84°00'00" E	M266	26.04	N 50°00'00" E
M3	43.74	S 20°00'00" W	M47	36.81	N 17°00'00" E	M91	22.24	S 48°00'00" E	M135	29.56	N 20°00'00" W	M179	29.54	S 22°00'00" W	M223	30.35	N 84°00'00" E	M267	26.04	N 50°00'00" E
M4	43.74	S 20°00'00" W	M48	47.70	N 17°00'00" E	M92	19.50	S 33°00'00" E	M136	30.30	N 20°00'00" W	M180	30.30	S 22°00'00" W	M224	4.88	S 72°00'00" E	M268	36.00	S 20°00'00" E
M5	48.28	S 20°00'00" W	M49	47.70	N 17°00'00" E	M93	25.74	N 30°00'00" E	M137	25.74	N 30°00'00" E	M181	20.23	S 22°00'00" W	M225	23.68	S 20°00'00" E	M269	42.00	S 20°00'00" E
M6	50.85	S 20°00'00" W	M50	47.70	N 17°00'00" E	M94	19.51	N 30°00'00" E	M138	25.74	S 33°00'00" E	M182	20.22	S 22°00'00" W	M226	23.68	S 20°00'00" E	M270	24.95	S 43°00'00" E
M7	50.85	S 20°00'00" W	M51	47.70	N 17°00'00" E	M95	19.51	N 30°00'00" E	M139	25.74	S 33°00'00" E	M183	20.22	S 22°00'00" W	M227	23.68	S 20°00'00" E	M271	24.95	S 43°00'00" E
M8	50.77	S 20°00'00" W	M52	40.33	N 17°00'00" E	M96	30.90	S 44°00'00" E	M140	20.00	S 44°00'00" E	M184	40.08	S 20°00'00" E	M228	28.80	S 20°00'00" E	M272	14.01	S 43°00'00" E
M9	50.77	S 20°00'00" W	M53	40.33	N 17°00'00" E	M97	19.51	N 30°00'00" E	M141	21.72	S 22°00'00" W	M185	40.08	S 20°00'00" E	M229	28.80	S 20°00'00" E	M273	14.01	S 43°00'00" E
M10	49.41	S 19°00'00" W	M54	36.81	S 30°00'00" E	M98	47.45	S 03°00'00" E	M142	21.72	S 22°00'00" W	M186	40.08	S 20°00'00" E	M230	28.80	S 20°00'00" E	M274	14.01	S 43°00'00" E
M11	49.41	S 19°00'00" W	M55	36.81	S 30°00'00" E	M99	47.45	S 03°00'00" E	M143	21.72	S 22°00'00" W	M187	40.08	S 20°00'00" E	M231	28.80	S 20°00'00" E	M275	14.01	S 43°00'00" E
M12	44.30	S 44°00'00" E	M56	17.94	S 57°00'00" W	M100	48.98	S 03°00'00" E	M144	43.15	S 03°00'00" E	M188	40.08	S 20°00'00" E	M232	28.80	S 20°00'00" E	M276	14.01	S 43°00'00" E
M13	44.30	S 44°00'00" E	M57	17.94	S 57°00'00" W	M101	48.98	S 03°00'00" E	M145	43.15	S 03°00'00" E	M189	40.08	S 20°00'00" E	M233	28.80	S 20°00'00" E	M277	14.01	S 43°00'00" E
M14	44.70	S 40°00'00" E	M58	17.30	S 53°00'00" W	M102	48.98	S 03°00'00" E	M146	43.15	S 03°00'00" E	M190	40.08	S 20°00'00" E	M234	28.80	S 20°00'00" E	M278	14.01	S 43°00'00" E
M15	44.70	S 40°00'00" E	M59	17.30	S 53°00'00" W	M103	48.98	S 03°00'00" E	M147	43.15	S 03°00'00" E	M191	40.08	S 20°00'00" E	M235	28.80	S 20°00'00" E	M279	14.01	S 43°00'00" E
M16	42.53	S 20°00'00" W	M60	40.33	S 30°00'00" E	M104	33.07	S 71°00'00" E	M148	32.47	N 30°00'00" E	M192	25.74	S 20°00'00" E	M236	26.11	S 20°00'00" E	M280	40.72	S 70°00'00" E
M17	42.53	S 20°00'00" W	M61	40.33	S 30°00'00" E	M105	33.07	S 71°00'00" E	M149	32.47	N 30°00'00" E	M193	25.74	S 20°00'00" E	M237	26.11	S 20°00'00" E	M281	40.72	S 70°00'00" E
M18	27.08	S 20°00'00" W	M62	40.33	S 30°00'00" E	M106	33.07	S 71°00'00" E	M150	33.07	N 30°00'00" E	M194	25.74	S 20°00'00" E	M238	26.11	S 20°00'00" E	M282	40.72	S 70°00'00" E
M19	27.08	S 20°00'00" W	M63	40.33	S 30°00'00" E	M107	33.07	S 71°00'00" E	M151	33.07	N 30°00'00" E	M195	25.74	S 20°00'00" E	M239	26.11	S 20°00'00" E	M283	40.72	S 70°00'00" E
M20	27.08	S 20°00'00" W	M64	40.33	S 30°00'00" E	M108	33.07	S 71°00'00" E	M152	33.07	N 30°00'00" E	M196	25.74	S 20°00'00" E	M240	26.11	S 20°00'00" E	M284	40.72	S 70°00'00" E
M21	27.08	S 20°00'00" W	M65	40.33	S 30°00'00" E	M109	33.07	S 71°00'00" E	M153	33.07	N 30°00'00" E	M197	25.74	S 20°00'00" E	M241	26.11	S 20°00'00" E	M285	40.72	S 70°00'00" E
M22	27.08	S 20°00'00" W	M66	40.33	S 30°00'00" E	M110	33.07	S 71°00'00" E	M154	33.07	N 30°00'00" E	M198	25.74	S 20°00'00" E	M242	26.11	S 20°00'00" E	M286	40.72	S 70°00'00" E
M23	27.08	S 20°00'00" W	M67	40.33	S 30°00'00" E	M111	33.07	S 71°00'00" E	M155	33.07	N 30°00'00" E	M199	25.74	S 20°00'00" E	M243	26.11	S 20°00'00" E	M287	40.72	S 70°00'00" E
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M26	27.08	S 20°00'00" W	M70	40.33	S 30°00'00" E	M114	33.07	S 71°00'00" E	M158	33.07	N 30°00'00" E	M202	25.74	S 20°00'00" E	M246	26.11	S 20°00'00" E	M290	40.72	S 70°00'00" E
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M29	27.08	S 20°00'00" W	M73	40.33	S 30°00'00" E	M117	33.07	S 71°00'00" E	M161	33.07	N 30°00'00" E	M205	25.74	S 20°00'00" E	M249	26.11	S 20°00'00" E	M293	40.72	S 70°00'00" E
M30	27.08	S 20°00'00" W	M74	40.33	S 30°00'00" E	M118	33.07	S 71°00'00" E	M162	33.07	N 30°00'00" E	M206	25.74	S 20°00'00" E	M250	26.11	S 20°00'00" E	M294	40.72	S 70°00'00" E
M31	27.08	S 20°00'00" W	M75	40.33	S 30°00'00" E	M119	33.07	S 71°00'00" E	M163	33.07	N 30°00'00" E	M207	25.74	S 20°00'00" E	M251	26.11	S 20°00'00" E	M295	40.72	S 70°00'00" E
M32	27.08	S 20°00'00" W	M76	40.33	S 30°00'00" E	M120	33.07	S 71°00'00" E	M164	33.07	N 30°00'00" E	M208	25.74	S 20°00'00" E	M252	26.11	S 20°00'00" E	M296	40.72	S 70°00'00" E
M33	27.08	S 20°00'00" W	M77	40.33	S 30°00'00" E	M121	33.07	S 71°00'00" E	M165	33.07	N 30°00'00" E	M209	25.74	S 20°00'00" E	M253	26.11	S 20°00'00" E	M297	40.72	S 70°00'00" E
M34	27.08	S 20°00'00" W	M78	40.33	S 30°00'00" E	M122	33.07	S 71°00'00" E	M166	33.07	N 30°00'00" E	M210	25.74	S 20°00'00" E	M254	26.11	S 20°00'00" E	M298	40.72	S 70°00'00" E
M35	27.08	S 20°00'00" W	M79	40.33	S 30°00'00" E	M123	33.07	S 71°00'00" E	M167	33.07	N 30°00'00" E	M211	25.74	S 20°00'00" E	M255	26.11	S 20°00'00" E	M299	40.72	S 70°00'00" E
M36	27.08	S 20°00'00" W	M80	40.33	S 30°00'00" E	M124	33.07	S 71°00'00" E	M168	33.07	N 30°00'00" E	M212	25.74	S 20°00'00" E	M256	26.11	S 20°00'00" E	M300	40.72	S 70°00'00" E
M37	27.08	S 20°00'00" W	M81	40.33	S 30°00'00" E	M125	33.07	S 71°00'00" E	M169	33.07	N 30°00'00" E	M213	25.74	S 20°00'00" E	M257	26.11	S 20°00'00" E	M301	40.72	S 70°00'00" E
M38	27.08	S 20°00'00" W	M82	40.33	S 30°00'00" E	M126	33.07	S 71°00'00" E	M170	33.07	N 30°00'00" E	M214	25.74	S 20°00'00" E	M258	26.11	S 20°00'00" E	M302	40.72	S 70°00'00" E
M39	27.08	S 20°00'00" W	M83	40.33	S 30°00'00" E	M127	33.07	S 71°00'00" E	M171	33.07	N 30°00'00" E	M215	25.74	S 20°00'00" E	M259	26.11	S 20°00'00" E	M303	40.72	S 70°00'00" E
M40	27.08	S 20°00'00" W	M84	40.33	S 30°00'00" E	M128	33.07	S 71°00'00" E	M172	33.07	N 30°00'00" E	M216	25.74	S 20°00'00" E	M260	26.11	S 20°00'00" E	M304	40.72	S 70°00'00" E
M41	27.08	S 20°00'00" W	M85	40.33	S 30°00'00" E	M129	33.07	S 71°00'00" E	M173	33.07	N 30°00'00" E	M217	25.74	S 20°00'00" E	M261	26.11	S 20°00'00" E	M305	40.72	S 70°00'00" E
M42	27.08	S 20°00'00" W	M86	40.33	S 30°00'00" E	M130	33.07	S 71°00'00" E	M174	33.07	N 30°00'00" E	M218	25.74	S 20°00'00" E	M262	26.11	S 20°00'00" E	M306	40.72	S 70°00'00" E
M43	27.08	S 20°00'00" W	M87	40.33	S 30°00'00" E	M131	33.07	S 71°00'00" E	M175	33.07	N 30°00'00" E	M219	25.74	S 20°00'00" E	M263	26.11	S 20°00'00" E	M307	40.72	S 70°00'00" E
M44	27.08	S 20°00'00" W	M88	40.33	S 30°00'00" E	M132	33.07	S 71°00'00" E	M176	33.07	N 30°00'00" E	M220	25.74	S 20°00'00" E	M264	26.11	S 20°00'00" E	M308	40.72	S 70°00'00" E

APPROVED: DEPARTMENT OF PUBLIC WORKS  
 [Signature] 8-27-09  
 CHIEF, BUREAU OF HIGHWAYS DATE

APPROVED: DEPARTMENT OF PLANNING AND ZONING  
 [Signature] 9/29/09  
 CHIEF, DIVISION OF LAND DEVELOPMENT DATE

[Signature] 10/21/09  
 CHIEF, DEVELOPMENT ENGINEERING DIVISION DATE

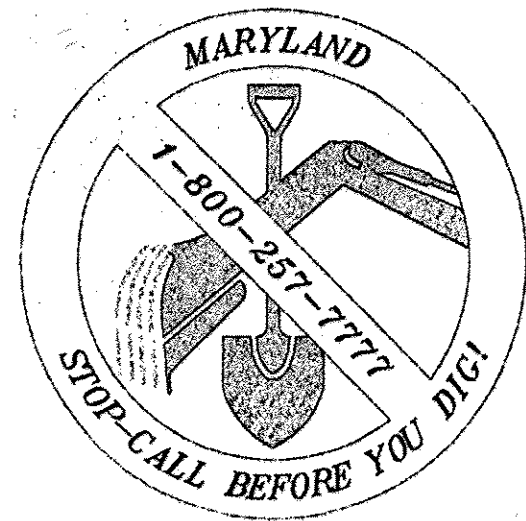
EASEMENT NO.	CREDITED RETENTION AREA	PLANTING AREA	NON-CREDITED RETENTION AREA	TOTAL EASEMENT AREA
1	---	1.06 AC.	0.194 AC.	1.254 AC.
2	---	0.40 AC.	0.13 AC.	0.53 AC.
3				



# GTW's WAVERLY WOODS, SECTION 14

BULK PARCELS 'A' & 'B' AND OPEN SPACE LOTS 1 & 2 ZONING: PSC & PEC  
 TAX MAP No. 16 PARCEL Nos. 120,221 & P/O 249 GRID Nos. 3 & 4  
 THIRD ELECTION DISTRICT, HOWARD COUNTY, MD

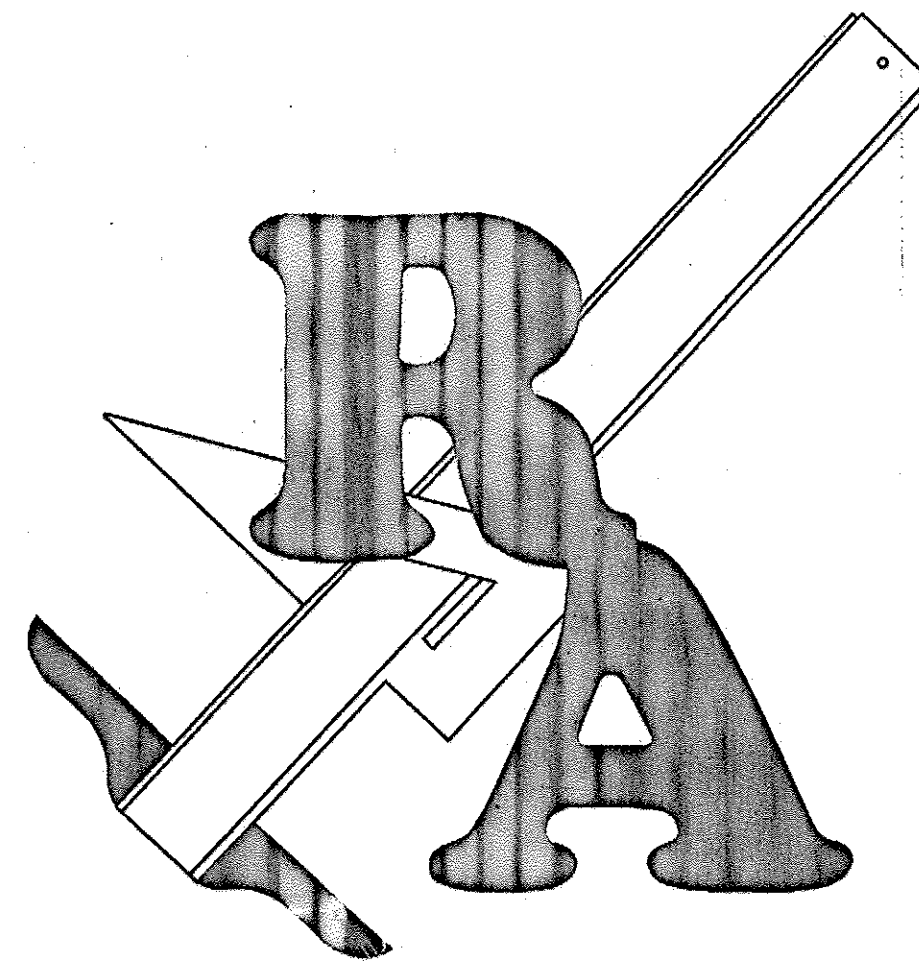
## 34'7"x11'4" 3ga PLATE ARCH CULVERT STRUCTURAL DESIGN



CALL "MISS UTILITY"  
 TELEPHONE 1-800-257-7777 FOR UTILITY LOCATIONS  
 AT LEAST 48 HOURS BEFORE CONSTRUCTION.



VICINITY MAP  
 SCALE: N.T.S.



### RYAN & ASSOCIATES

A Division of WKR Consulting, Inc.  
 CONSULTING & DESIGN ENGINEERS

**HAGERSTOWN, MD OFFICE**  
 1825 HOWELL RD, SUITE 3  
 HAGERSTOWN, MD 21740  
 PHONE: (301) 671-3200  
 FAX: (301) 360-9574

**FREDERICK, MD OFFICE**  
 2412 WYNFIELD CT.  
 FREDERICK, MD 21701  
 PHONE: (301) 360-9534  
 FAX: (301) 360-9574

e-mail: info@ryanandassociates.net

SPECIALIZING IN STRUCTURAL ENGINEERING, GEOTECHNICAL  
 ENGINEERING AND RETAINING WALL DESIGN

www.ryanandassociates.net

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WRITTEN DIMENSIONS ON THE DRAWINGS SHALL HAVE PRECEDENCE  
 OVER SCALE DIMENSIONS. CONTRACTORS SHALL VERIFY AND BE  
 RESPONSIBLE FOR ALL DIMENSIONS AND CONDITIONS ON THE JOB  
 AND THIS OFFICE MUST BE NOTIFIED OF ANY VARIATION FROM THE  
 DIMENSIONS AND CONDITIONS SHOWN BY THESE DRAWINGS.

Scope: The plate arch culvert engineer's (Ryan & Associates) scope consists of preparing the  
 culvert design to enable the contractor to obtain necessary permits and properly construct the  
 arch. The design considers the internal and local stability of the arch and is in accordance with  
 acceptable engineering practice and these specifications. Services outside this scope such as  
 responding to the owner's engineering firm (civil, structural, geotechnical or otherwise),  
 provision of quality control testing & inspection, certification of arch construction, investigation  
 of failed or non-conforming arches or any other services may be provided on a time &  
 materials basis or for a negotiated fee. The scope of Ryan & Associates (RA) for this project  
 does not include arch stakeout or any other civil engineering/surveying.

INSTALLATION MUST CONFORM TO THE ATTACHED "Ryan & Associates Structural  
 Specifications and Guidelines".

PLATE ARCH MATERIALS: Structural Plate Arch to be supplied by Lane Enterprises, Inc. and  
 to be 3 gauge steel (.249" thick). Structure type to be LA4108 low profile arch.

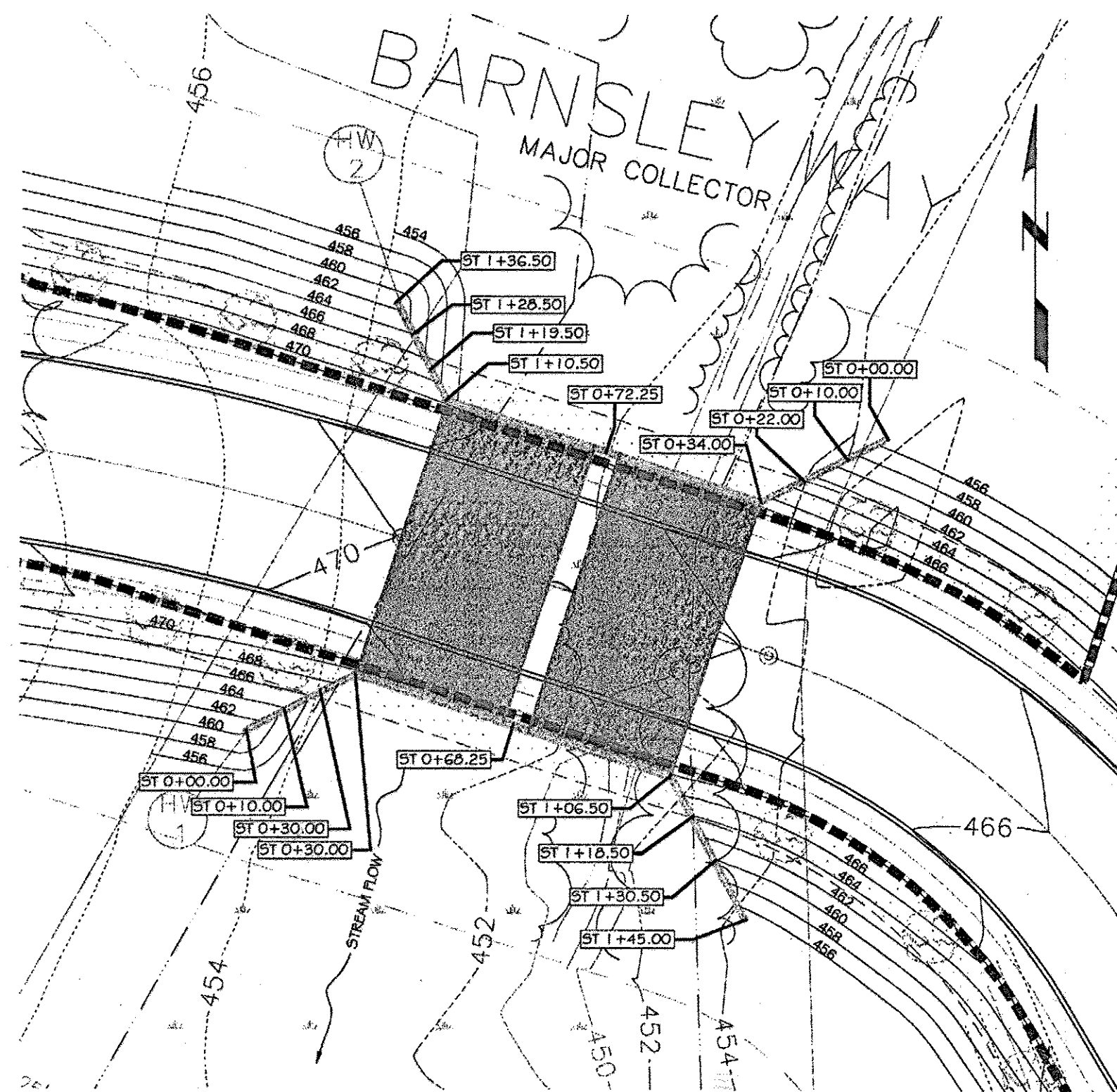
CONSTRUCTION REVIEW & CERTIFICATION: CONSTRUCTION INSPECTION, TESTING  
 AND CERTIFICATION BY A STRUCTURAL/GEOTECHNICAL ENGINEER QUALIFIED IN  
 THE DESIGN OF STEEL PLATE ARCH STRUCTURES IS A REQUIREMENT OF THESE  
 PLANS. ACCEPTANCE OF THE USE OF THESE PLANS INDICATES AGREEMENT FOR  
 PROFESSIONAL ENGINEERING CONSTRUCTION REVIEW AND CERTIFICATION

#### DRAWING INDEX

- Sheet 1 - Cover Sheet
- Sheet 2 - Head Walls, Wing Walls and Culvert Footings Plan
- Sheet 3 - Wall and Arch Profiles
- Sheet 4 - Culvert & Footing Cross-Sections
- Sheet 5 - Plate Arch Sections & Details
- Sheet 6 - Specifications

#### PROJECT INFORMATION

Project : Courtyards at Waverly Woods - West Stream Crossing  
 Location : Marriotsville Rd., North Side of I-70, Howard County, MD  
 Jurisdiction : Howard County, MD  
 Contractor : UNKNOWN  
 Site Civil Engineer : Fisher, Collins & Carter, Inc.  
 Owner/Developer : Land Design & Development, Inc.  
 RA Project Manager : Chris Heyrend



SITE PLAN  
 SCALE: 1" = 30'

#### OWNERS

WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE DOUGHNUT, LLC, &  
 GTW JOINT VENTURE  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)

#### DEVELOPER

WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT,  
 INC. 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)

APPROVED: DEPARTMENT OF PUBLIC WORKS

*William J. Mullen* 8-27-09  
 CHIEF, BUREAU OF HIGHWAYS DATE

APPROVED: DEPARTMENT OF PLANNING AND ZONING

*Cindy Harris* 7/29/09  
 CHIEF, DIVISION OF LAND DEVELOPMENT DATE

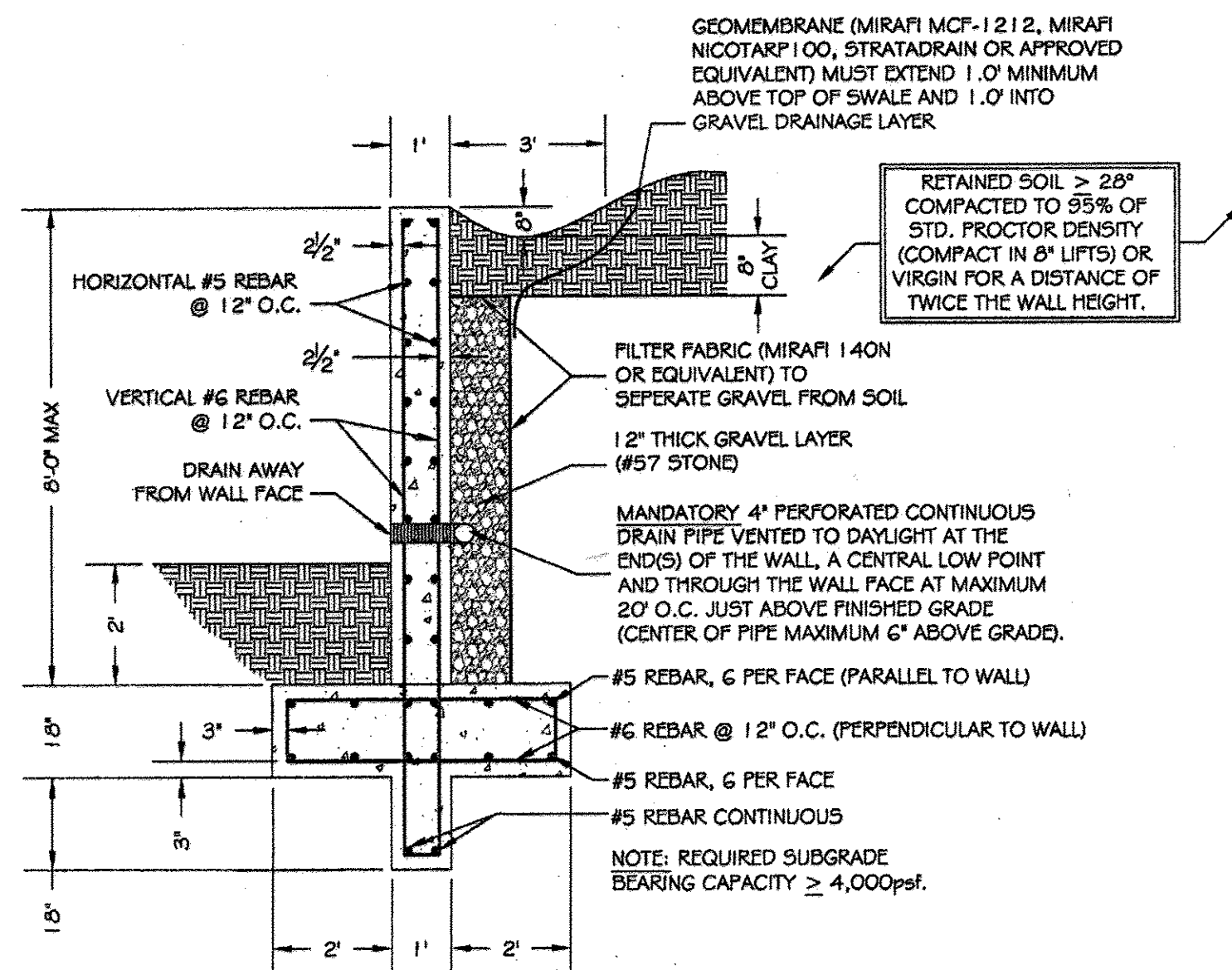
*William J. Mullen* 8/28/09  
 CHIEF, DEVELOPMENT ENGINEERING DIVISION DATE



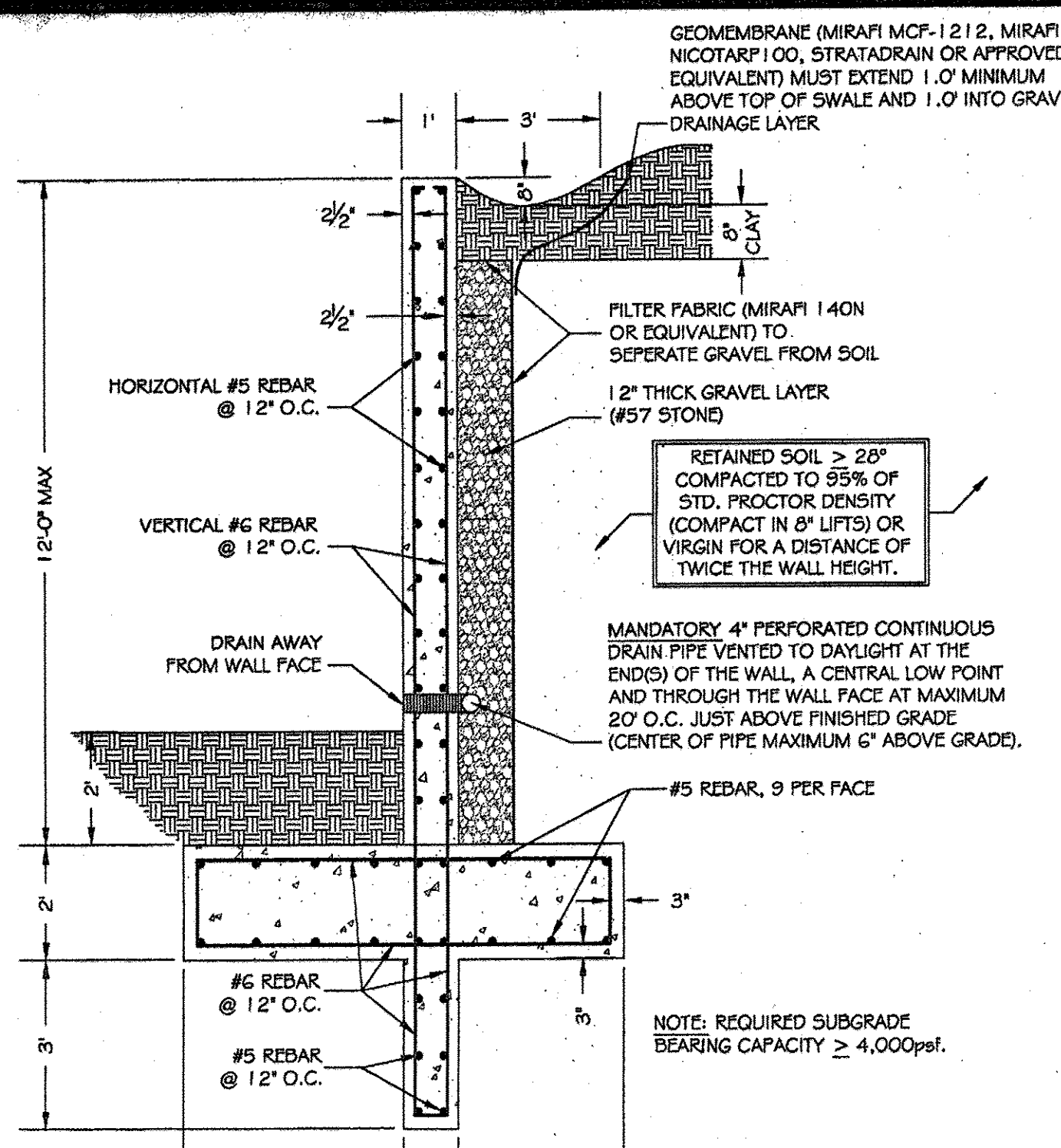
PROFESSIONAL CERTIFICATION  
 I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.  
 William K. Ryan, P.E.  
 License No. 21968  
 Expiration Date: 05/06/2011

SHEET  
 14 of 27

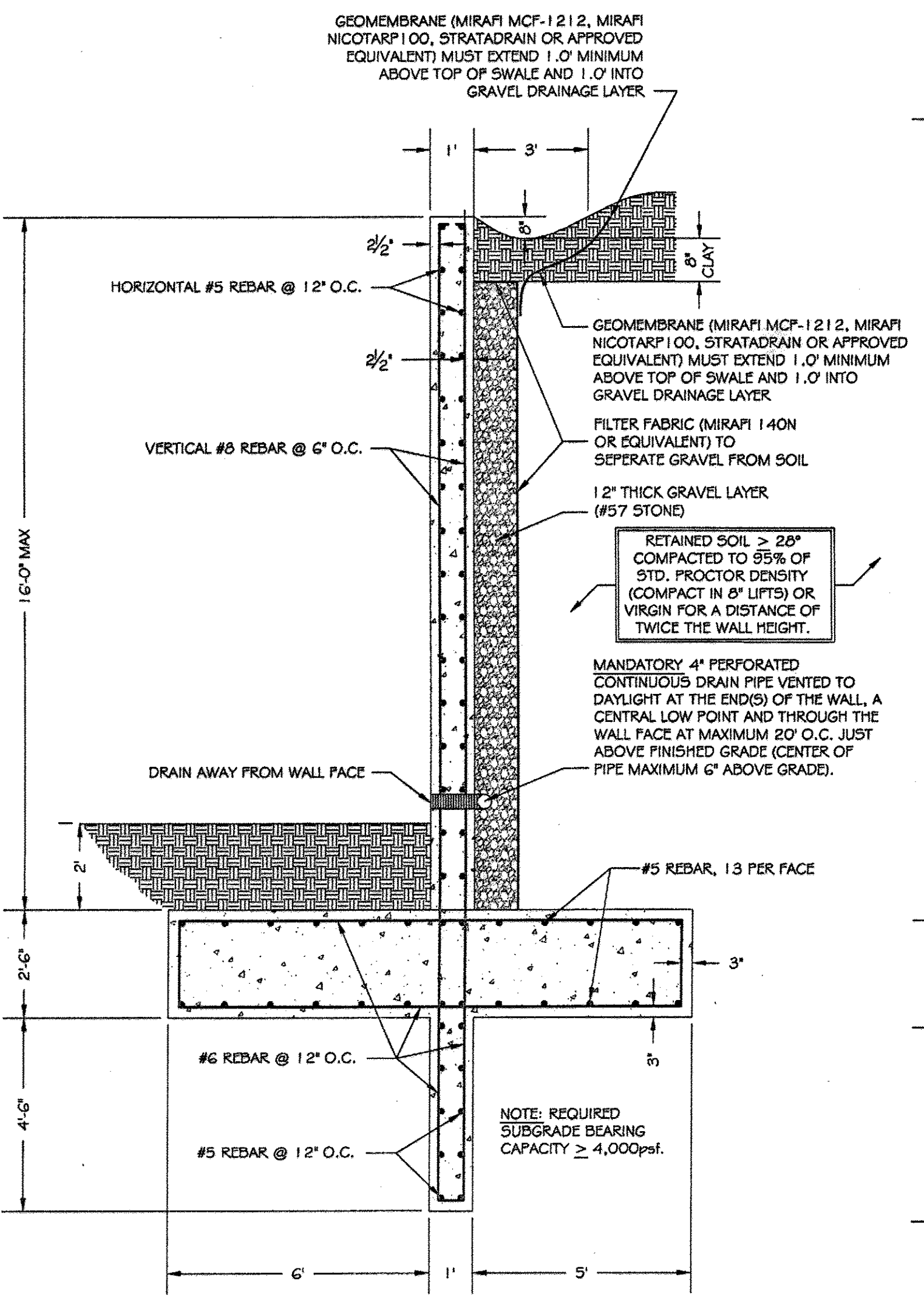




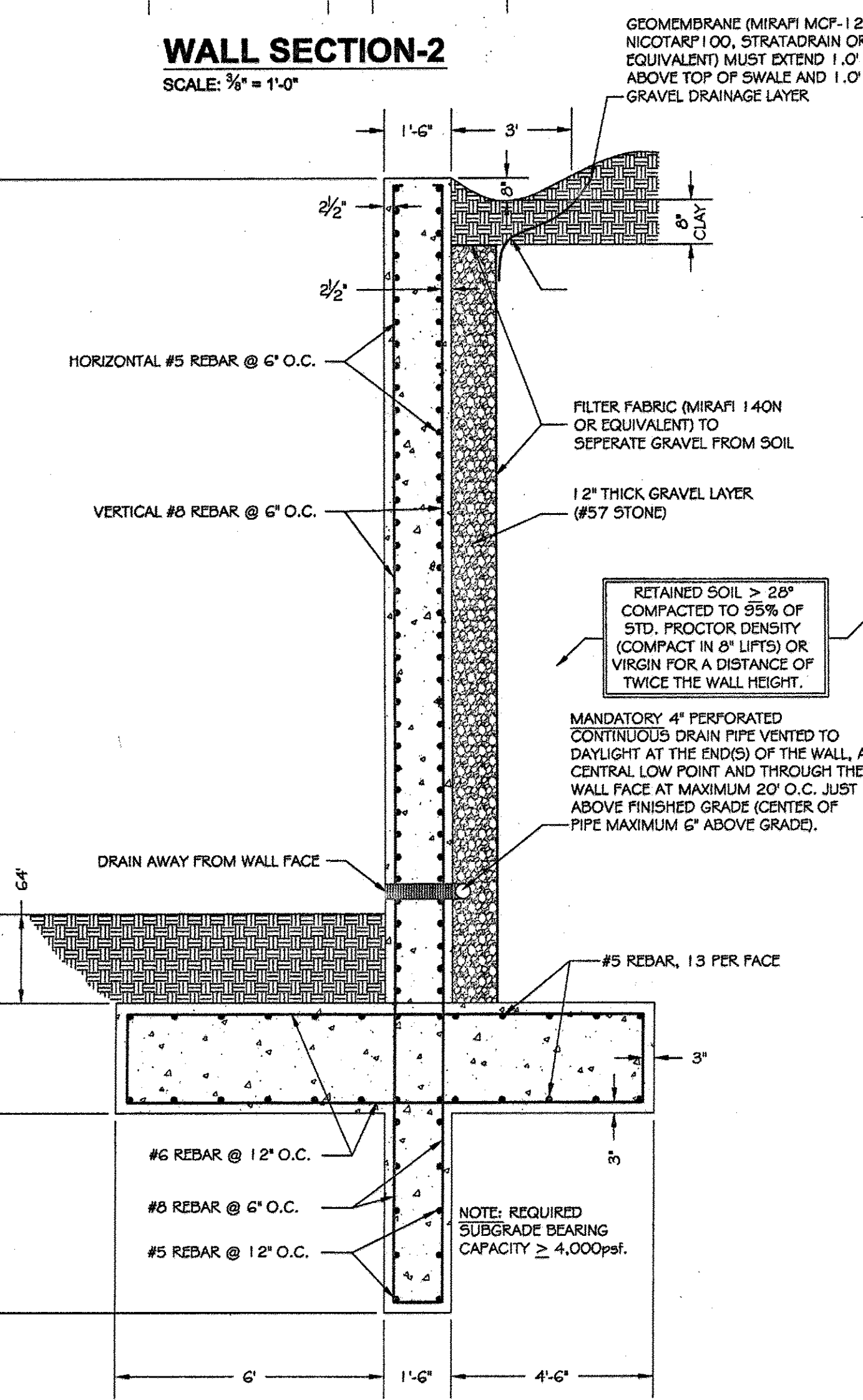
**WALL SECTION-1**  
SCALE: 3/8" = 1'-0"



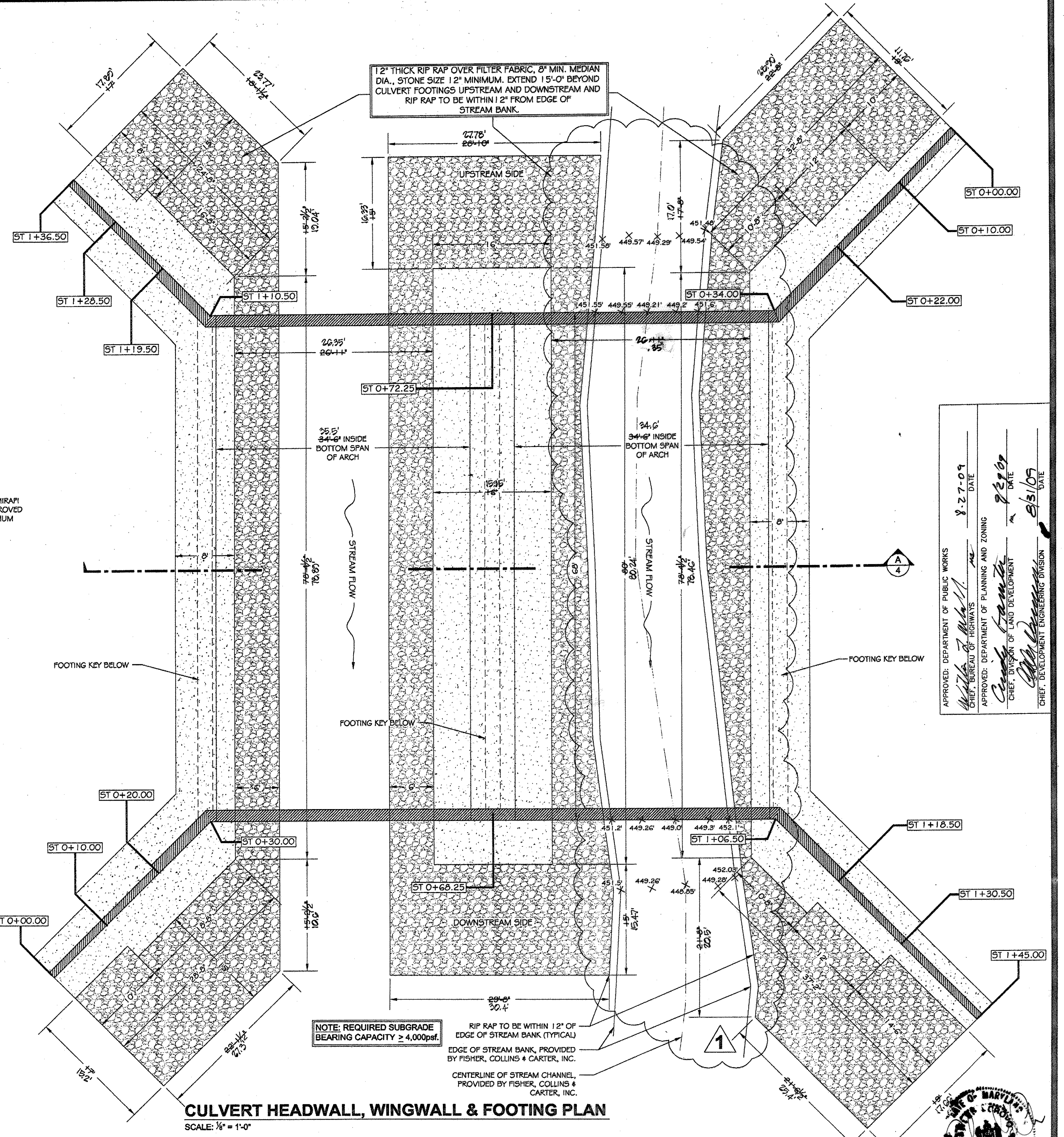
**WALL SECTION-2**  
SCALE: 3/8" = 1'-0"



**WALL SECTION-3**  
SCALE: 3/8" = 1'-0"



**WALL SECTION-4**  
SCALE: 3/8" = 1'-0"

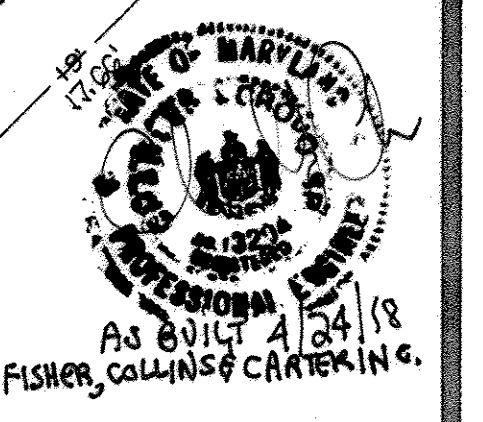


**CULVERT HEADWALL, WINGWALL & FOOTING PLAN**  
SCALE: 3/8" = 1'-0"

**OWNERS**  
WAVERLY WOODS DEVELOPMENT CORPORATION,  
HOLE IN THE DOUGHNUT, LLC, &  
GTW JOINT VENTURE  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
ELICOTT CITY, MARYLAND 21042  
(443-367-0422)

**DEVELOPER**  
WAVERLY WOODS DEVELOPMENT CORP.  
C/O LAND DESIGN AND DEVELOPMENT,  
INC. 5300 DORSEY HALL DRIVE, SUITE 102  
ELICOTT CITY, MARYLAND 21042  
(443-367-0422)

APPROVED: DEPARTMENT OF PUBLIC WORKS  
DATE: 8-27-09  
APPROVED: DEPARTMENT OF PLANNING AND ZONING  
DATE: 9-29-09  
APPROVED: DIVISION OF LAND DEVELOPMENT  
DATE: 8/31/09



No.	DATE	BY	DESCRIPTION
1	07/27/09	AJH	DESIGN MODIFICATIONS BASED ON REVISED TOPO AND MDE PERMIT REVISIONS FROM FISHER, COLLINS & CARTER

DRAWN BY: CJH  
DESIGN BY: CJH  
CHECKED BY: WKR  
DATE: 07/27/09

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CLIENT: LONG SPAN BRIDGE & CULVERT, LLC  
OWNER: LAND DESIGN & DEVELOPMENT, INC.  
JOB No: 1101-08-04

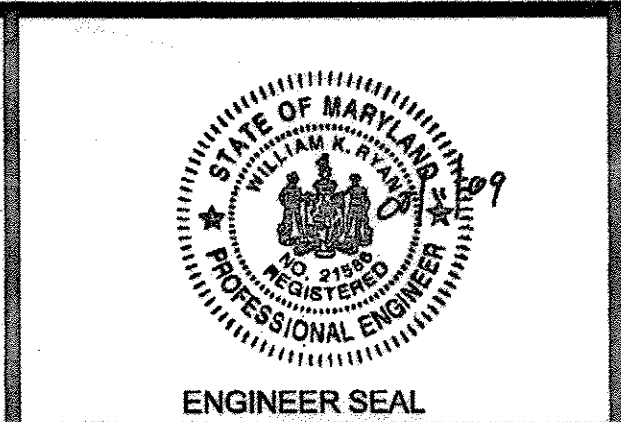
**Ryan & Associates**  
A Division of WKR Consulting Inc.

Hagerstown, MD Office  
1825 Howell Road, Suite 3  
Hagerstown, MD 21740  
301-671-3200 (ph)  
301-360-9574 (fx)

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2412 Wynfield Ct.  
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301-360-9534 (ph)  
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**PLATE ARCH CULVERT STRUCTURAL DESIGN**  
**CULVERT, HEADWALLS, WINGWALLS & FOOTINGS PLAN**

GTW's WAVERLY WOODS, SECTION 14  
BULK PARCELS 'A' & 'B' AND OPEN SPACE LOTS 1 & 2 ZONING: PSC & PEC  
TAX MAP NO. 16 PARCEL Nos. 120,221 & P/O 249 GRID Nos. 3 & 4  
THIRD ELECTION DISTRICT, HOWARD COUNTY, MD



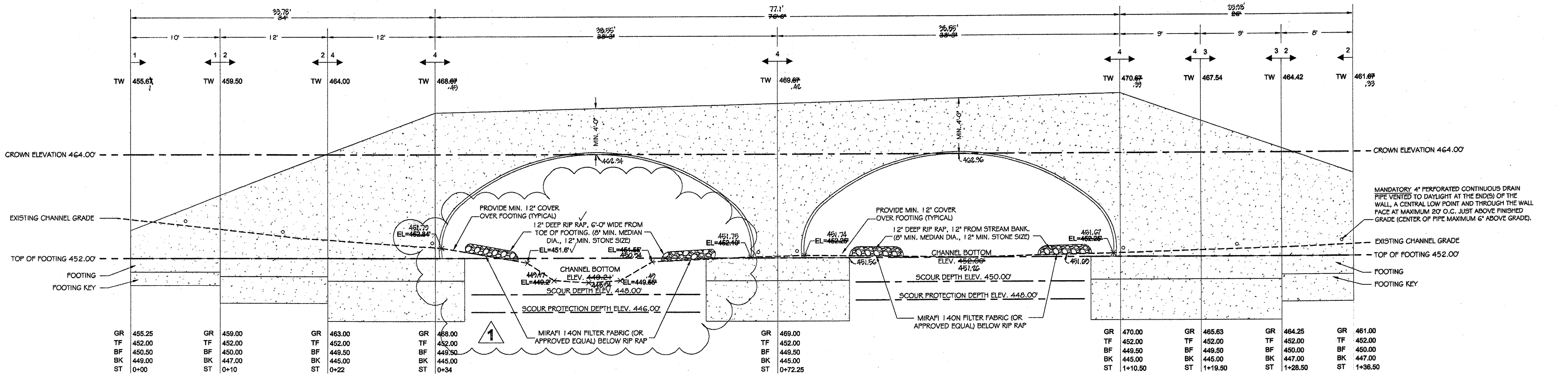
**PROFESSIONAL CERTIFICATION**

I 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.

William K. Ryan, P.E.  
License No. 21688  
Expiration Date: 03/08/2011

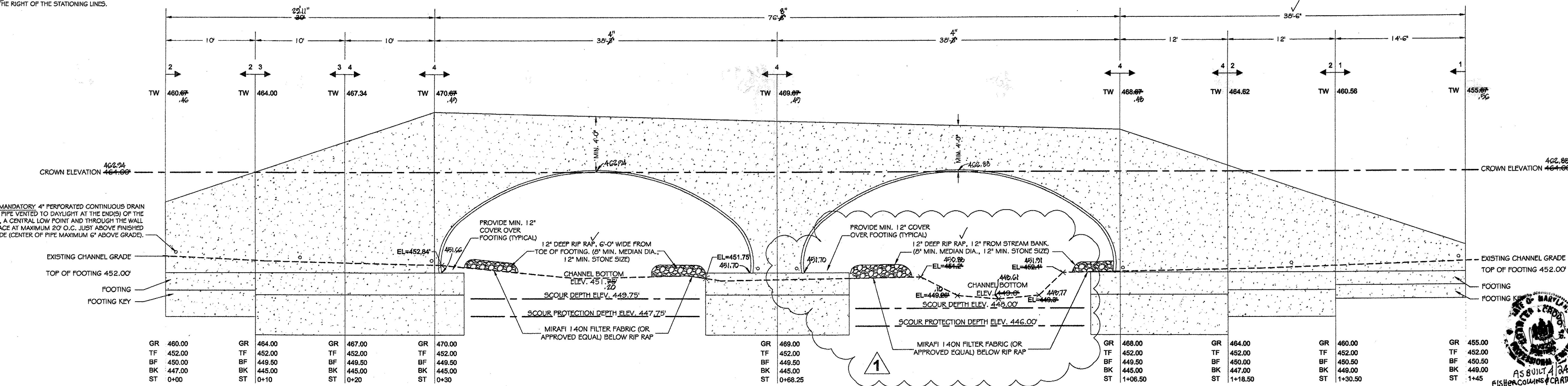
SHEET  
15 of 27





**KEY**  
GR - PROPOSED GRADE BEHIND WALL  
TF - TOP OF FOOTING  
BF - BOTTOM OF FOOTING  
BK - BOTTOM OF KEY  
ST - STATION  
NOTE: FOOTING AND KEY ELEVATIONS ARE TO THE RIGHT OF THE STATIONING LINES.

NOTE: SCOUR PROTECTION DEPTH IS AS INDICATED ON THESE PLANS OR 4' BELOW GRADE ELEVATION NEXT TO TOP OF FOOTING, WHICHEVER IS DEEPER. SCOUR DEPTH BASED ON SCOUR ANALYSIS REPORT BY RYAN AND ASSOCIATES DATED 06/19/08. AT A MINIMUM LEAN CONCRETE SHALL BE POURED TO SCOUR PROTECTION DEPTH.



MANDATORY 4" PERFORATED CONTINUOUS DRAIN PIPE VENTED TO DAYLIGHT AT THE ENDS OF THE WALL, A CENTRAL LOW POINT AND THROUGH THE WALL FACE AT MAXIMUM 20' O.C. JUST ABOVE FINISHED GRADE (CENTER OF PIPE MAXIMUM 6' ABOVE GRADE).

NOTE: SCOUR PROTECTION DEPTH IS AS INDICATED ON THESE PLANS OR 4' BELOW GRADE ELEVATION NEXT TO TOP OF FOOTING, WHICHEVER IS DEEPER. SCOUR DEPTH BASED ON SCOUR ANALYSIS REPORT BY RYAN AND ASSOCIATES DATED 06/19/08. AT A MINIMUM LEAN CONCRETE SHALL BE POURED TO SCOUR PROTECTION DEPTH.

NOTE: THE ROAD GRADES & ELEVATIONS SHOWN ON THESE PLANS ARE BASED ON THE CIVIL ENGINEERS DRAWINGS. IF A DISCREPANCY EXISTS BETWEEN THESE PLANS AND THE CIVIL ENGINEERS, THE CIVIL ENGINEERS GRADES GOVERN AND SHALL BE USED.

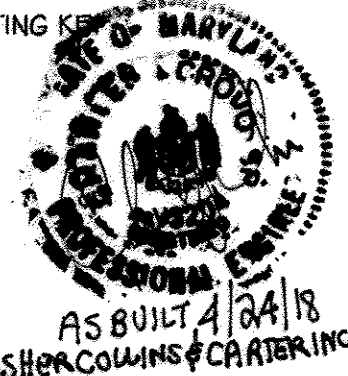
**OWNERS**  
WAVERLY WOODS DEVELOPMENT CORPORATION,  
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G/W JOINT VENTURE  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
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INC. 5300 DORSEY HALL DRIVE, SUITE 102  
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(443-367-0422)

APPROVED: DEPARTMENT OF PUBLIC WORKS  
*Walter J. Wall* 8-27-09  
CHIEF, BUREAU OF HIGHWAYS DATE

APPROVED: DEPARTMENT OF PLANNING AND ZONING  
*Candy Hamer* 7/29/09  
CHIEF, DIVISION OF LAND DEVELOPMENT DATE

*William K. Ryan* 8/31/09  
CHIEF, DEVELOPMENT ENGINEERING DIVISION DATE



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DESIGN BY: CJH  
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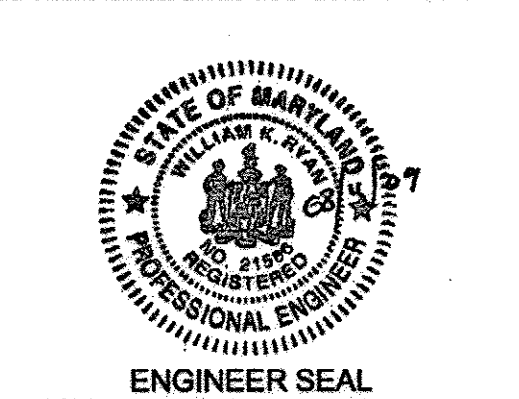
CLIENT: LONG SPAN BRIDGE & CULVERT, LLC  
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JOB No: 1101-08-04

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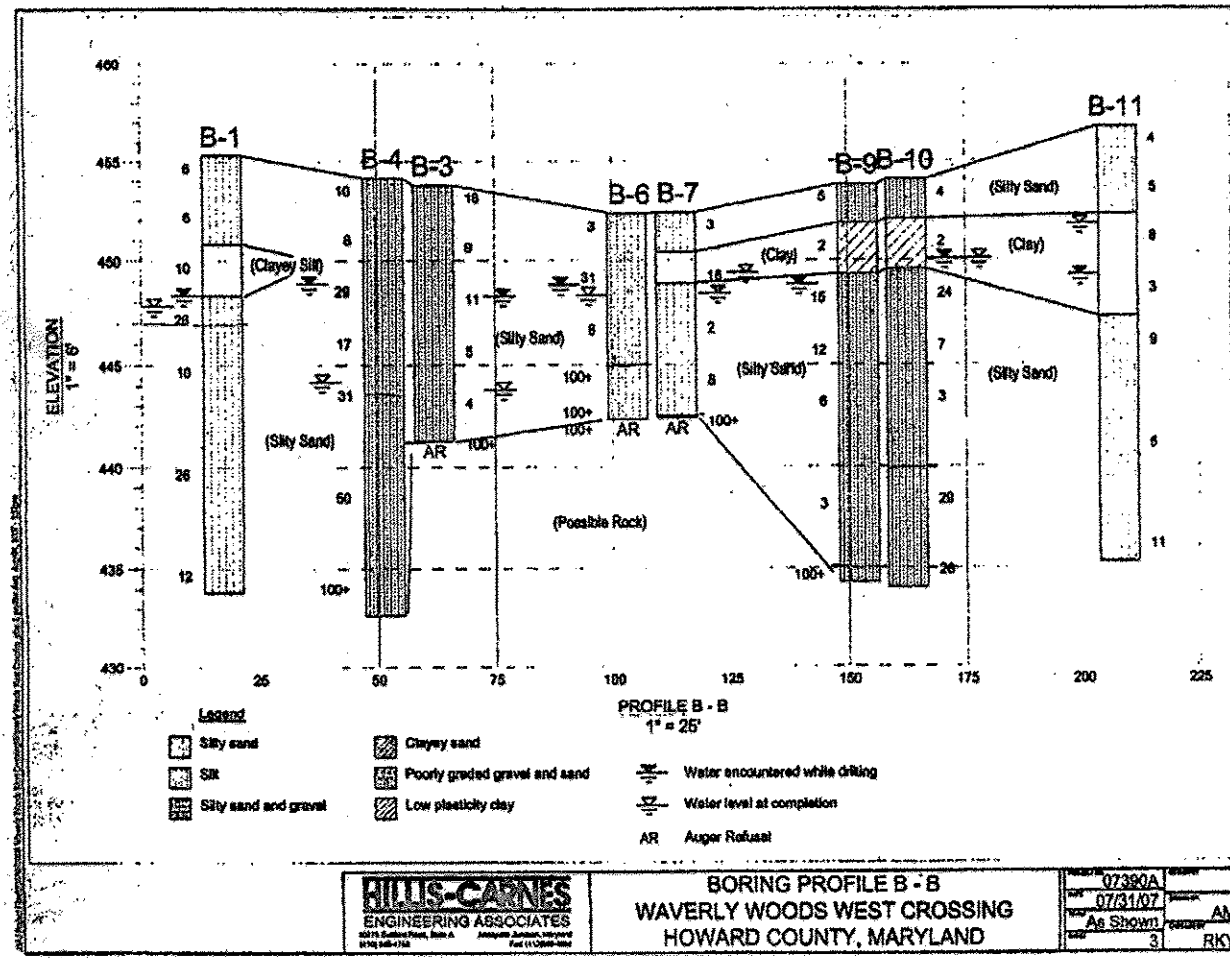
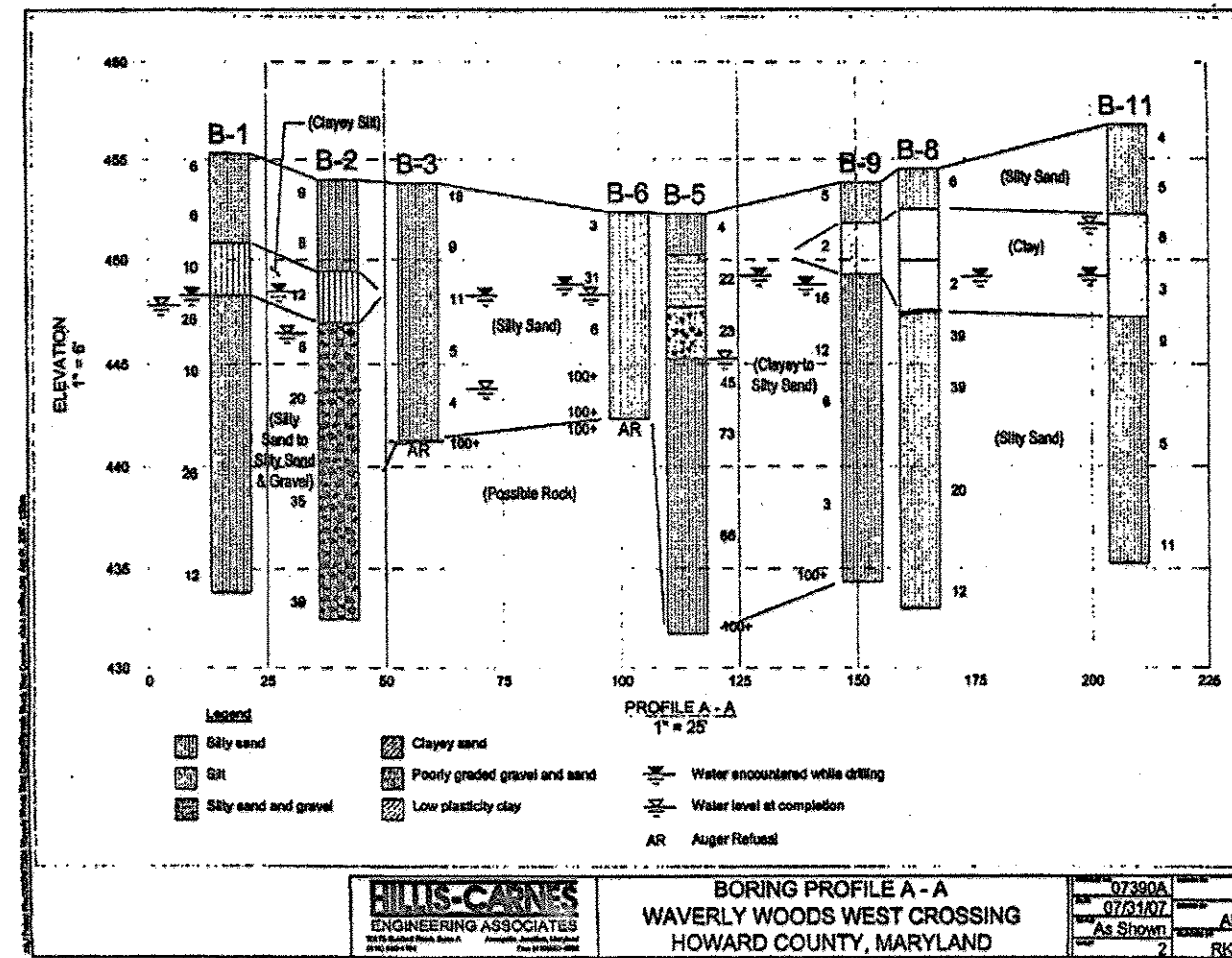
**PLATE ARCH CULVERT STRUCTURAL DESIGN**  
**WING WALL, HEAD WALL & ARCH PROFILES**  
GTW's WAVERLY WOODS, SECTION 14  
BULK PARCELS 'A' & 'B' AND OPEN SPACE LOTS 1 & 2 ZONING: PSC & PEC  
TAX MAP NO. 16 PARCEL Nos. 120,221 & P/O 249 GRID Nos. 3 & 4  
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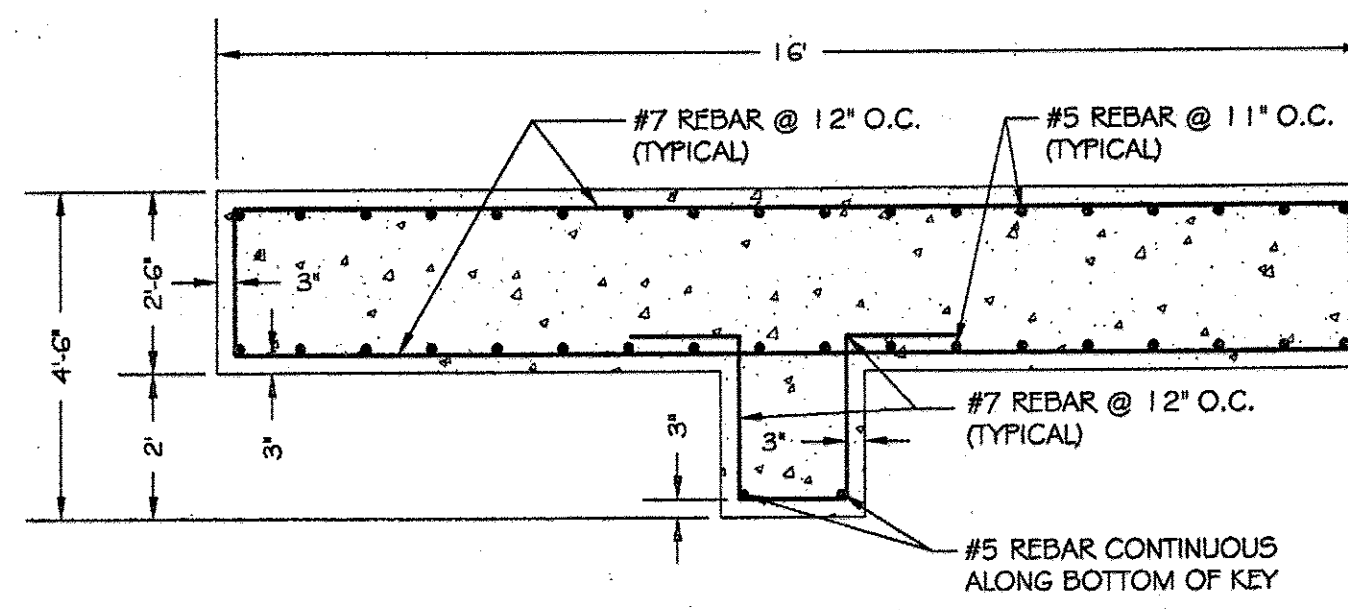
**PROFESSIONAL CERTIFICATION**  
I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.  
*William K. Ryan, P.E.*  
License No. 21588  
Expiration Date: 05/09/2011

SHEET  
16 of 27

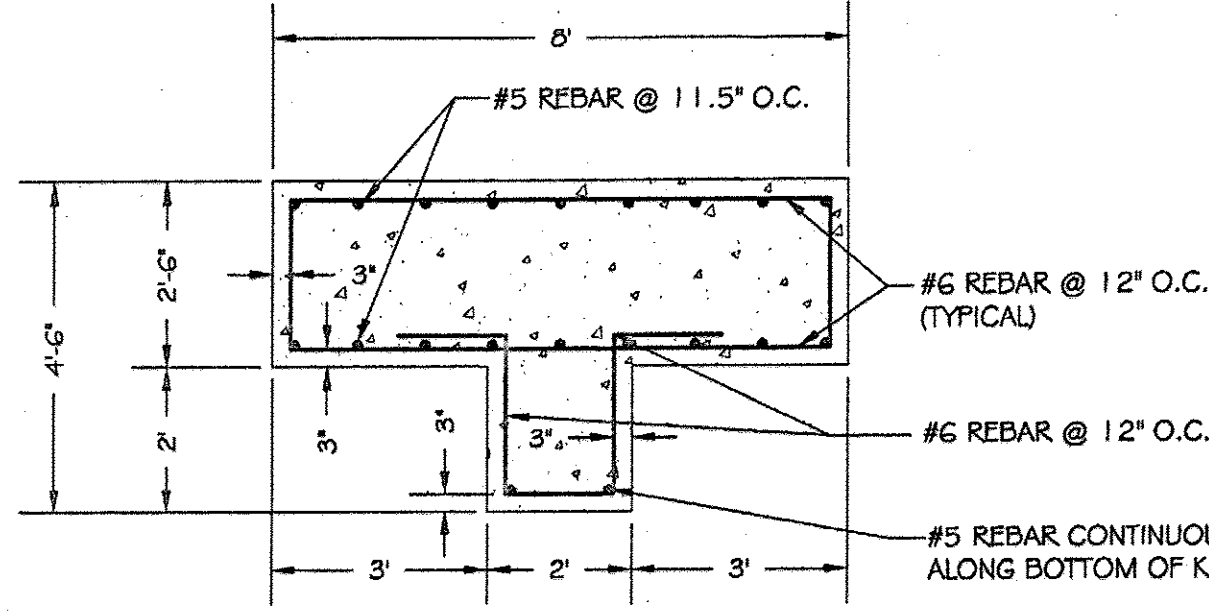




**BORING PROFILES**  
SCALE: N.T.S.  
(REFER TO SHEET-5 FOR LOCATION MAP)

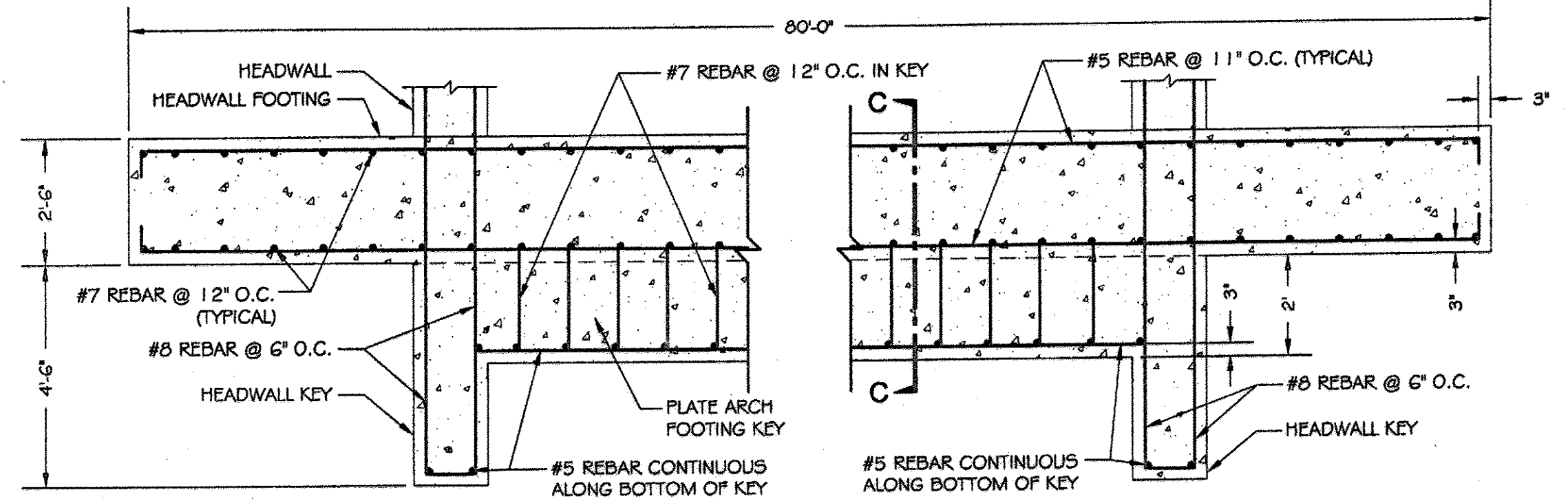


**COMBINED FOOTING CROSS-SECTION C-C**  
SCALE: 3/8" = 1'-0"

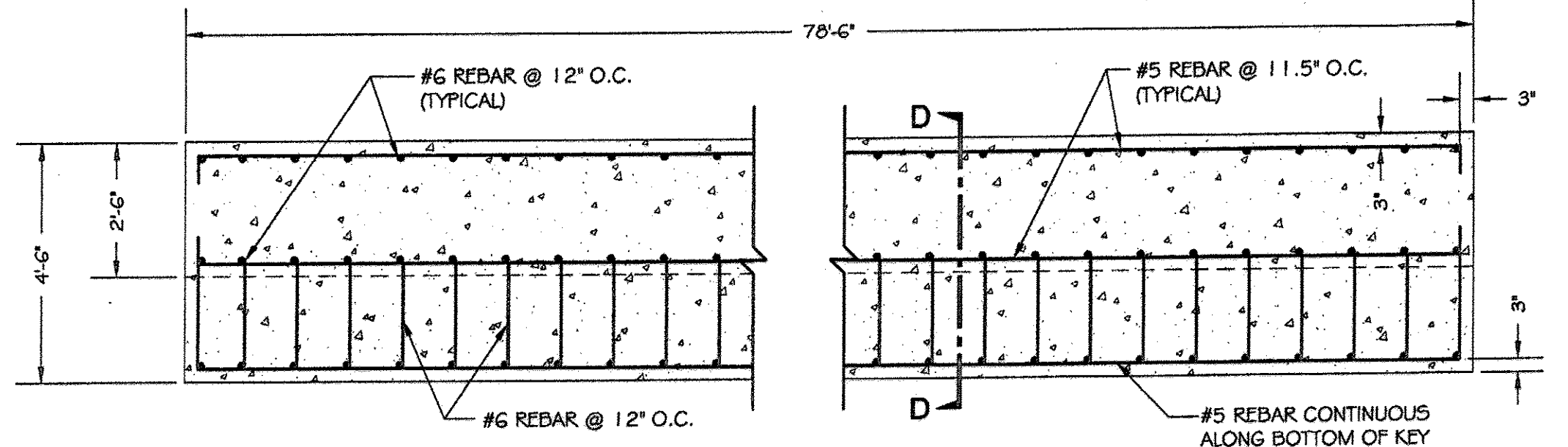


**FOOTING CROSS-SECTION D-D**  
SCALE: 3/8" = 1'-0"

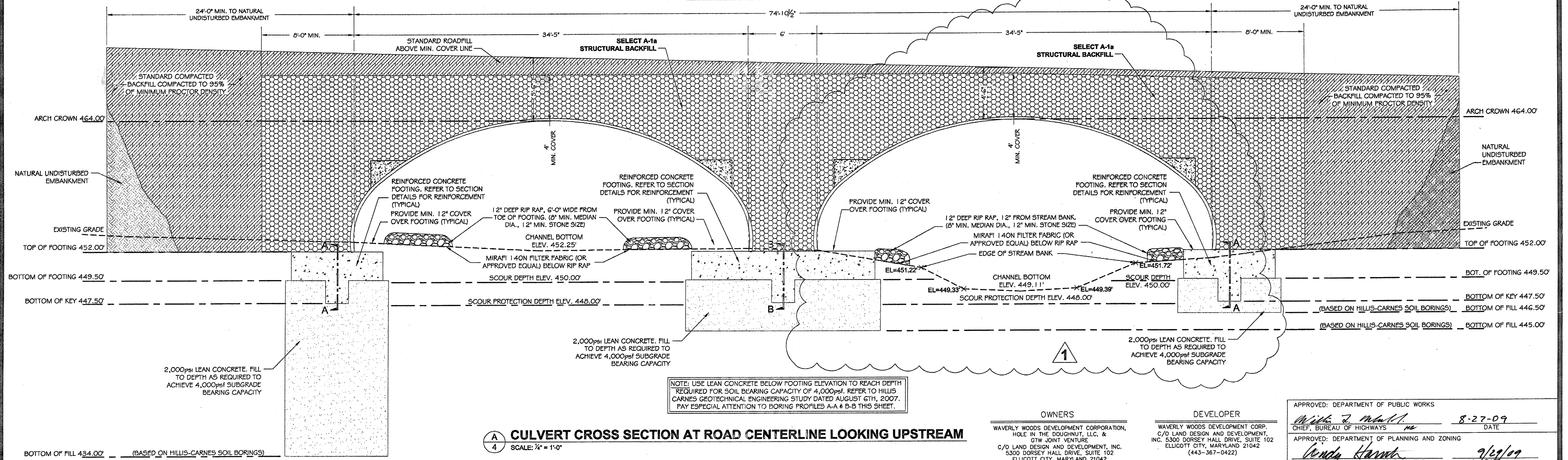
NOTE: NO BACKFILL MAY BE PLACED AGAINST THE LONGSPAN ARCH OR IN THE SELECT BACKFILL ZONE WITHOUT THE PRESENCE OF A TECHNICIAN UNDER THE SUPERVISION OF THE SITE PROFESSIONAL GEOTECH ENGINEER.



**LONGITUDINAL FOOTING SECTION B-B**  
SCALE: 3/8" = 1'-0"



**LONGITUDINAL FOOTING SECTION A-A**  
SCALE: 3/8" = 1'-0"



**CULVERT CROSS SECTION AT ROAD CENTERLINE LOOKING UPSTREAM**  
SCALE: 1/4" = 1'-0"

**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE DOUGHNUT, LLC, &  
 GTW JOINT VENTURE  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
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APPROVED: DEPARTMENT OF PUBLIC WORKS  
 Mike J. Wall 8-27-09  
 CHIEF, BUREAU OF HIGHWAYS  
 APPROVED: DEPARTMENT OF PLANNING AND ZONING  
 Wendy Hancock 9/29/09  
 CHIEF, DIVISION OF LAND DEVELOPMENT  
 APPROVED: DEPARTMENT OF DEVELOPMENT ENGINEERING DIVISION  
 8/31/09

REVISIONS			
No.	DATE	BY	DESCRIPTION
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 DESIGN BY: CJH  
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CLIENT: LONG SPAN BRIDGE & CULVERT, LLC  
 OWNER: LAND DESIGN & DEVELOPMENT, INC.  
 JOB No: 1101-08-04

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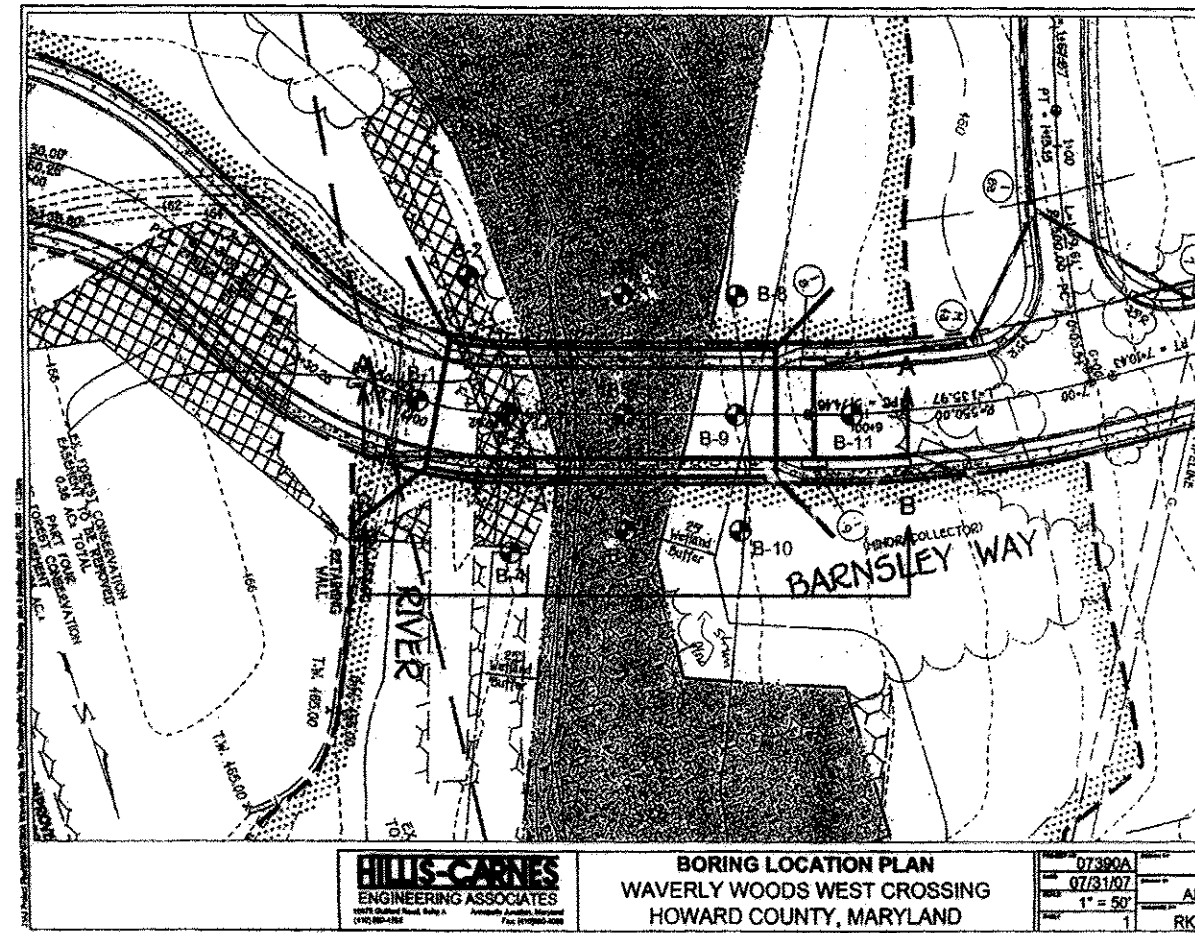
**PLATE ARCH CULVERT STRUCTURAL DESIGN**  
**CULVERT & FOOTING CROSS-SECTIONS**  
 GTW'S WAVERLY WOODS, SECTION 14  
 BULK PARCELS 'A' & 'B' AND OPEN SPACE LOTS 1 & 2 ZONING: PSC & PEC  
 TAX MAP NO. 16 PARCEL Nos. 120,221 & P/O 249 GRID Nos. 3 & 4  
 THIRD ELECTION DISTRICT, HOWARD COUNTY, MD

PROFESSIONAL CERTIFICATION  
 I 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.  
 William K. Ryan, P.E.  
 License No. 21086  
 Expiration Date: 05/09/2011

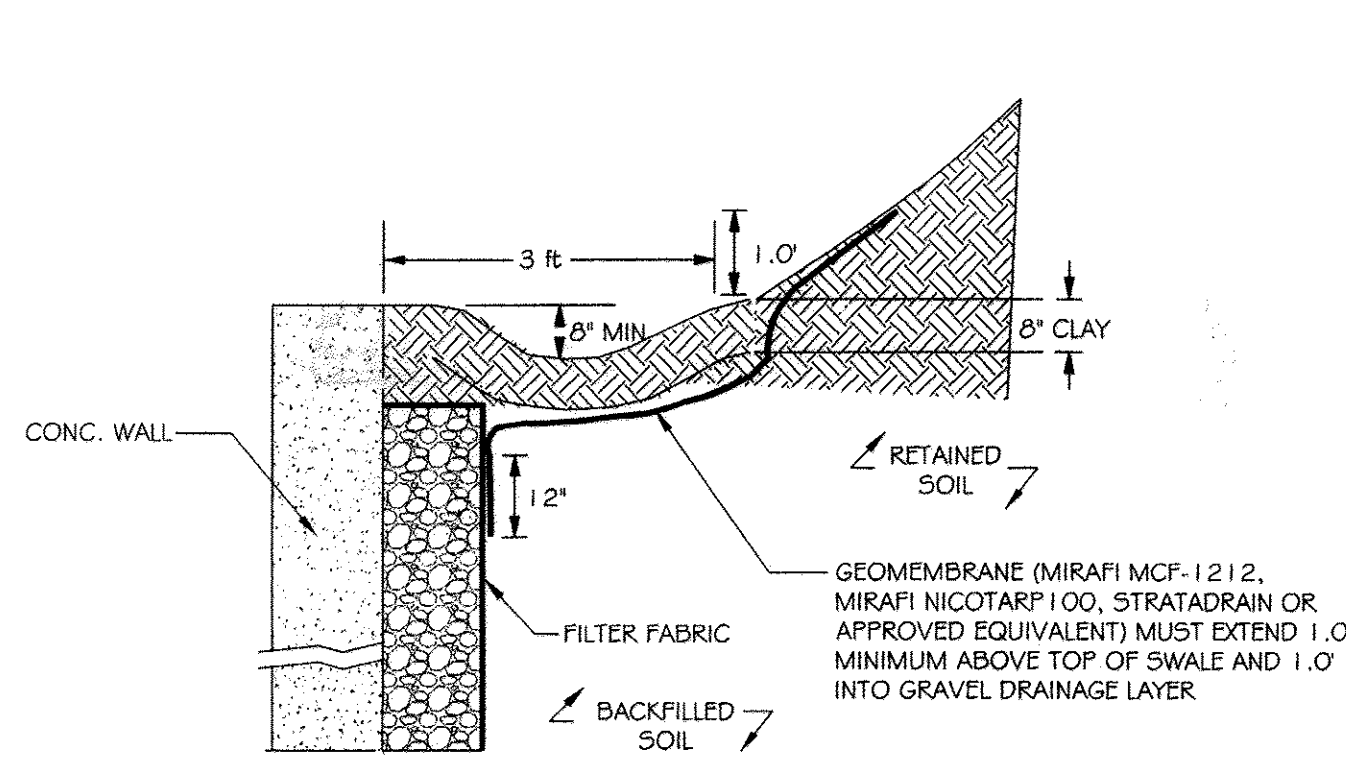
ENGINEER SEAL

SHEET  
 17 of 27

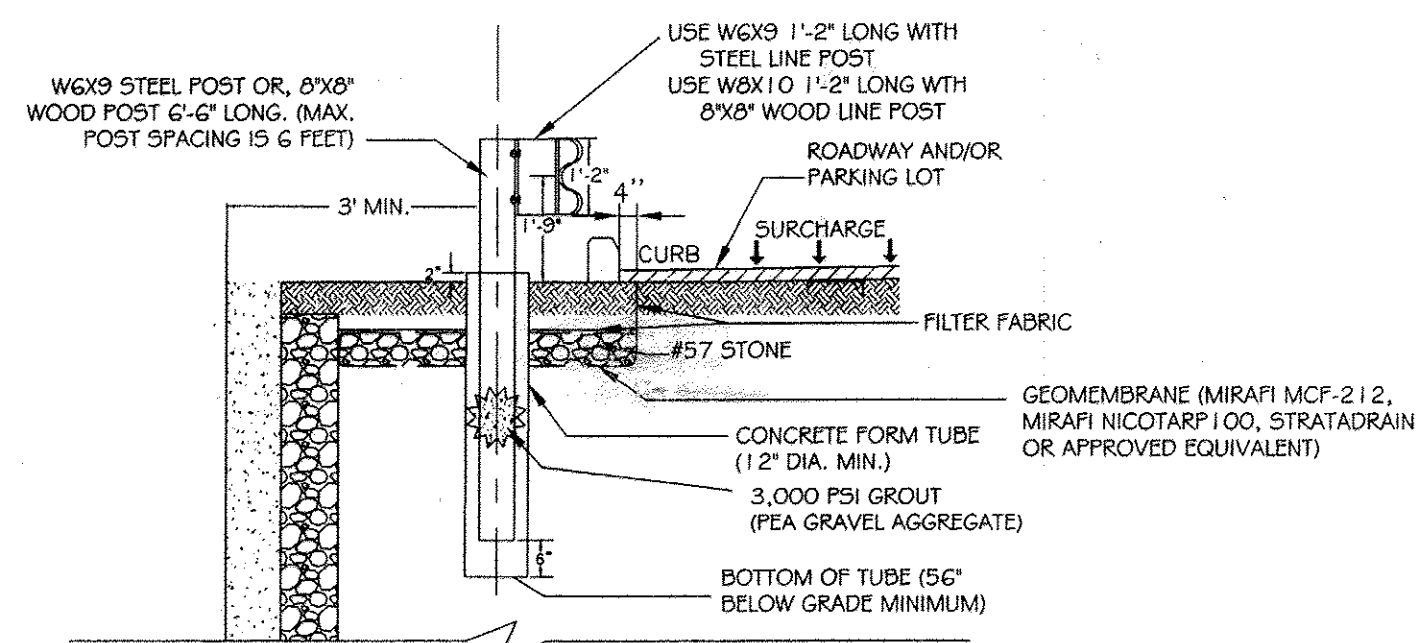




**BORING LOCATION MAP**  
SCALE: N.T.S.  
(REFER TO SHEET-4 FOR BORING PROFILES)

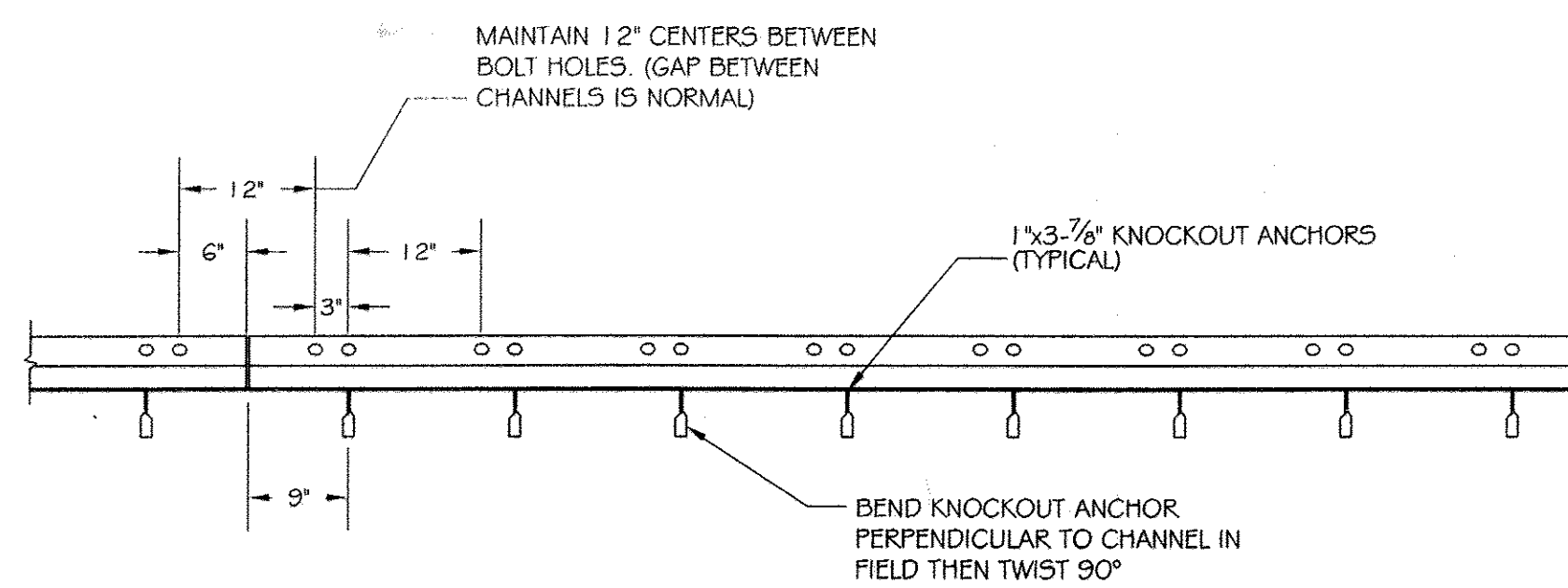


**GEOMEMBRANE LINED SWALE**  
N.T.S.

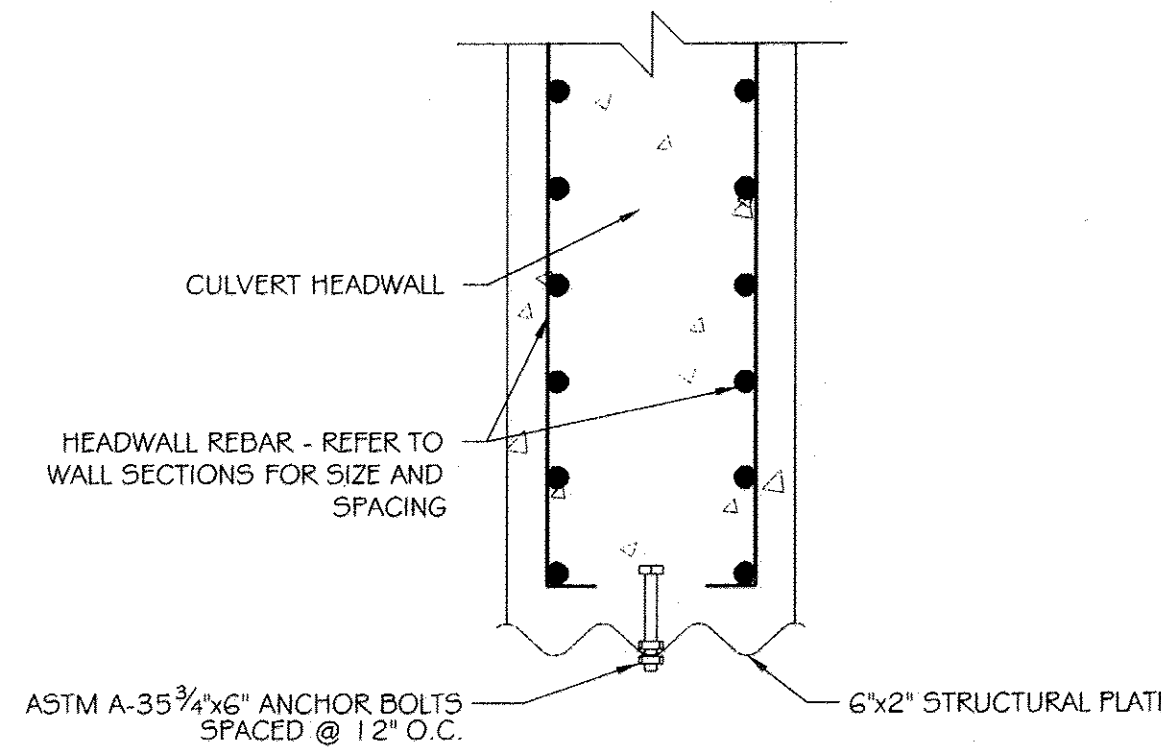


**NOTES:**  
1. ENSURE PROPER SLOPE BETWEEN GUARDRAIL AND WALL SO AS TO DIVERT WATER AWAY FROM WALL.  
2. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A36.  
3. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 3000 PSI AT 28 DAYS.  
4. THE WALL INSTALLER TO PLACE THE GUARD RAIL POST SONOTUBES IN ACCORDANCE WITH THIS DETAIL FOR THE FENCE INSTALLER TO INSTALL GAURDRAIL POSTS AT A LATER DATE. THE SONOTUBES MUST BE COVERED WITH A SECURED PLASTIC SHEET TO PREVENT RAINWATER OR WATER RUN-OFF TO ENTER THE POST HOLES. IT IS HIGHLY RECOMMENDED THAT THE GUARDRAIL BE INSTALLED WITHIN A FEW DAYS OF WALL CONSTRUCTION COMPLETION.

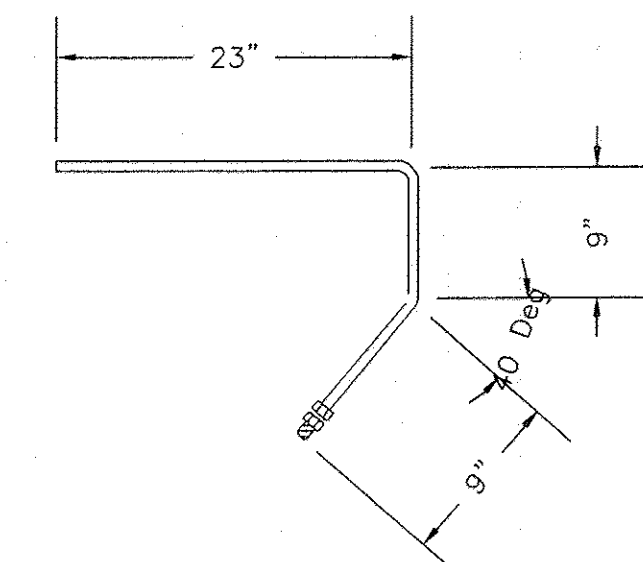
**GUARDRAIL DETAIL**  
N.T.S.



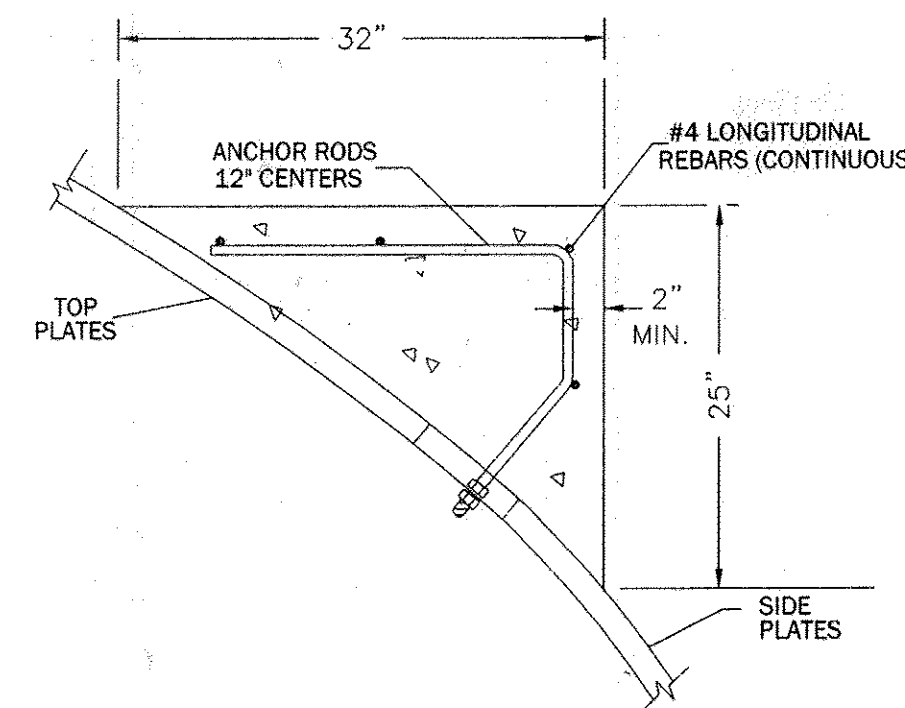
**BASE CHANNEL DETAIL**  
SCALE: 3/4" = 1'-0"



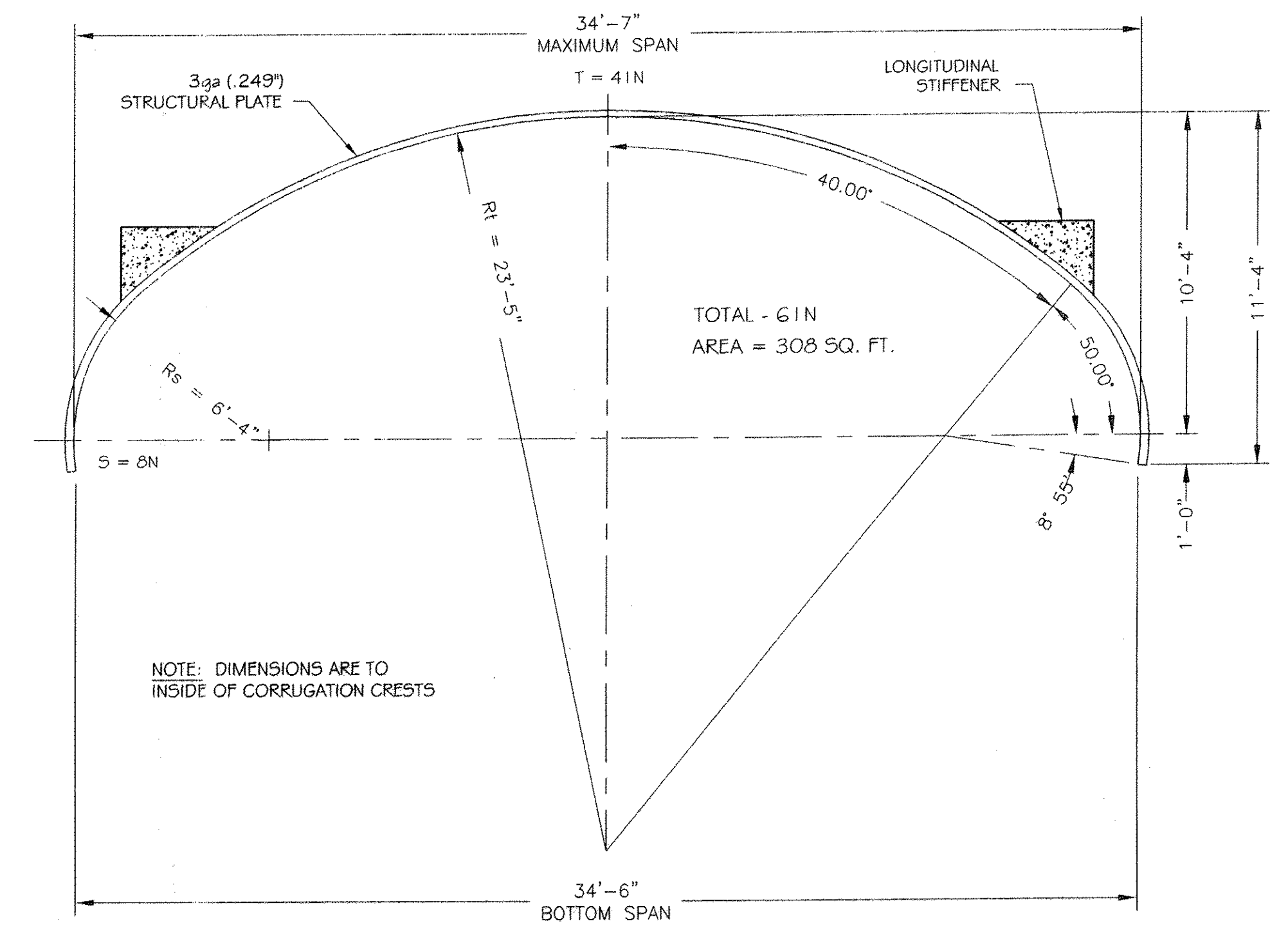
**HEADWALL CONNECTION DETAIL**  
SCALE: 1" = 1'-0"



**LONGITUDINAL STIFFENER BAR BENDING DETAIL**  
SCALE: N.T.S.

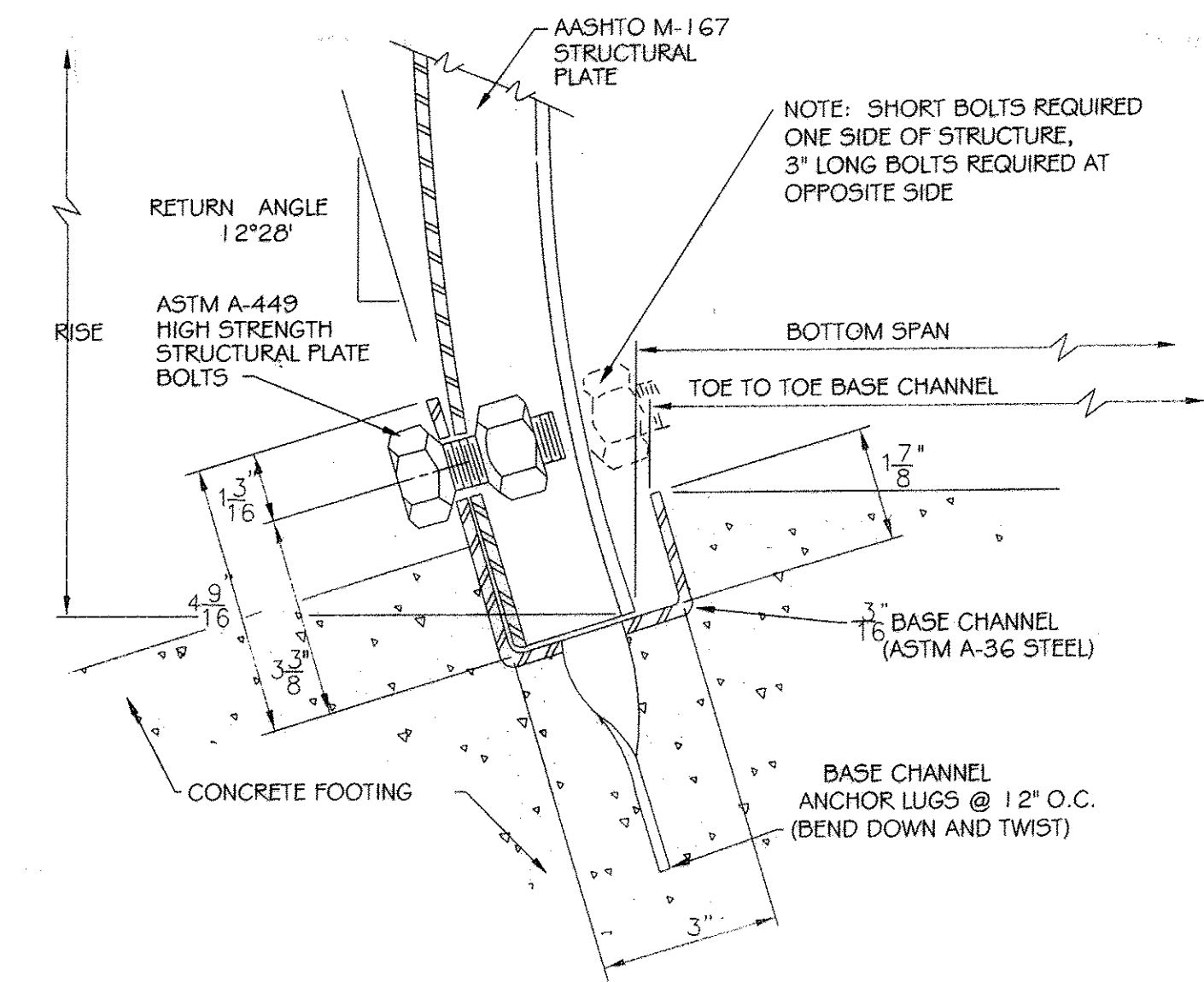


**LONGITUDINAL STIFFENER DETAIL**  
SCALE: N.T.S.



NOTE: DIMENSIONS ARE TO INSIDE OF CORRUGATION CRESTS

**PLATE ARCH CROSS-SECTION**  
SCALE: 1/4" = 1'-0"



**BASE CHANNEL SECTION**  
SCALE: N.T.S.

**OWNERS**  
WAVERLY WOODS DEVELOPMENT CORPORATION,  
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GTW JOINT VENTURE  
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ELLCOTT CITY, MARYLAND 21047  
(443-367-0422)

APPROVED: DEPARTMENT OF PUBLIC WORKS

*William R. Ham* 8-27-09  
CHIEF, BUREAU OF HIGHWAYS DATE

APPROVED: DEPARTMENT OF PLANNING AND ZONING  
*Chris Hamm* 9/29/09  
CHIEF, DIVISION OF LAND DEVELOPMENT DATE

*Chris Hamm* 9/29/09  
CHIEF, DEVELOPMENT ENGINEERING DIVISION DATE

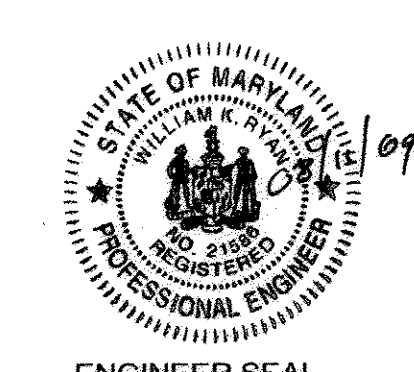
REVISIONS			
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**PLATE ARCH CULVERT STRUCTURAL DESIGN**  
**PLATE ARCH SECTIONS & DETAILS**  
GTW's WAVERLY WOODS, SECTION 14  
BULK PARCELS 'A' & 'B' AND OPEN SPACE LOTS 1 & 2 ZONING: PSC & PEC  
TAX MAP NO. 16 PARCEL Nos. 120,221 & P/O 249 GRID Nos. 3 & 4  
THIRD ELECTION DISTRICT, HOWARD COUNTY, MD



**PROFESSIONAL CERTIFICATION**  
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*William R. Ham*  
License No: 21586  
Expiration Date: 05/09/2011



# STRUCTURAL NOTES & SPECIFICATIONS

## 1: DEFINITIONS

- 1.01 Owner: Land Design and Development, Inc., Ellicott City, MD 21042
  - 1.02 Contractor: TBD
  - 1.03 Design Structural Engineer: Ryan & Associates, Hagerstown Office, MD 21740
  - 1.04 Site Civil Engineer: Fisher, Collins & Carter, Ellicott City, MD 21042
  - 1.05 Site Geotechnical Engineer: Hillis Carnes Engineering Associates, Inc., Annapolis Junction, MD 20701
- If any of the above responsibilities change it is the owner's responsibility to notify LSBC prior to the start of the work. It is the owner's responsibility to make sure all parties listed above are aware of their roles, requirements, responsibilities and final submittals.

## 1.06 Reference Standards

- A. ASTM 3034- Specification for Polyvinyl Chloride (PVC) Plastic Pipe
- B. ASTM C 140- Sampling and Testing Concrete Masonry Units and related units
- C. ASTM D 422- Gradation of Soils
- D. ASTM D 698- (AASHTO T99) Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort
- E. ASTM D 1248- Polyethylene Plastics Extrusion Materials for wire and Cable
- F. ASTM D 1557- (AASHTO T 180) Standard Test Method for Laboratory Compaction Characteristics of Soil using Modified Effort
- G. ASTM D 1586- Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils
- H. ASTM D 2166- Unconfined Compressive Strength of Cohesive Soil
- I. ASTM D 2487- Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- J. ASTM D 3080- Direct Shear Test of Soils Under Consolidated Drained Conditions
- K. ASTM D 4318- Liquid Limit, Plastic Limit and Plasticity Index of Soils
- L. ASTM D 2850- Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression
- M. ASTM A 615- Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- N. ACI 318-02- Concrete Building Design and Construction
- O. ACI 315-99 "Manual of Standard Practice for Detailing Reinforcing Concrete Structures"
- P. AASHTO LRFD Bridge Design Specifications, 3rd Edition, 2004
- Q. AASHTO Standard Specifications For Highway Bridges, 17th Edition, 2002
- R. AISI Handbook of Steel Drainage & Highway Construction Products, 1994 Edition

## 2: GENERAL

- 2.01 Contractor shall notify oversight review engineer responsible for construction certification of any discrepancies, omissions, or conflicts between the various elements of the working drawings and/or specifications before proceeding with any work involved. In all cases, unless otherwise directed by the engineer in writing, the most stringent requirements shall govern and be performed.
- 2.02 Contractor shall verify all conditions, dimensions and elevations, etc., at the site and shall coordinate work performed by all trades. Do not scale drawings.
- 2.03 Shop drawings shall be reviewed and approved by the structural engineer (RA) prior to fabrication.
- 2.04 Sizes, locations, loads, and anchorage of equipment shall be verified in the field with equipment manufacturers (suppliers) prior to fabrication or installation of supporting structures.
- 2.05 Temporary bracing designed by a professional bracing/structural engineer shall be provided wherever necessary to take care of all loads to which the structure may be subjected, including wind. Such bracing shall be left in place as long as may be required for safety or until all the structure elements are complete, as determined by the bracing engineer.
- 2.06 During and after construction the contractor and/or owner shall keep loads on the structure within the limits of the design load until turned over to the county or final owner, then the load restrictions shall be enforced by that entity. Maximum loading is HS 25 as determined by AASHTO.
- 2.07 Contractor shall be responsible for safety and protection within and adjacent to the job site.
- 2.08 Civil engineer is responsible for erosion and sediment control design.
- 2.09 Road pavement design and its appurtenance structure are civil engineer's responsibility. Refer to the civil drawings for all pavement and roadway drainage system information and questions thereby to the civil engineer.

## 3: CONCRETE

- 3.01 All foundation concrete (footings, walls etc.) shall be normal weight concrete with a compressive strength equal to at least 4,000 psi within 28 days after casting. The water/cement ratio shall be no greater than 0.50 and slump shall be 2-4 inches.
- 3.02 All concrete work shall be placed, cured, stripped and protected as directed by these specifications and ACI standards and practices.
- 3.03 Contractor is responsible for all shoring and formwork.
- 3.04 Concrete design and detailing shall conform to the requirements of ACI 318-08. Contractor shall submit mix designs to the oversight review engineer accompanied by appropriate graphs and background data for approval. Mix design shall indicate 7 and 28-day strengths, cement content, air content, water-cement ratio, amount of fine and coarse aggregates and admixtures.
  - a. Minimum ultimate compressive strength of concrete at 28 days shall be as follows, unless noted otherwise:
 

Footings and Walls concrete:	4000 PSI
Unreinforced concrete:	2000 PSI
- 3.05 All exterior concrete and concrete exposed to weather shall be air-entrained. (All concrete used on this project)
- 3.06 Use of additives shall not be permitted unless specifically approved by the oversight review engineer.
- 3.07 The concrete subcontractor shall not reproduce any portion of the structural contract drawings for utilization as shop drawings.

- 3.08 Concrete shall be consolidated by means of mechanical vibration. Vibrators shall be inserted and removed vertically at regular intervals not to exceed 18" to ensure uniform consolidation. In no case shall vibrators be used to transport the concrete inside the forms.
- 3.09 Formwork shall follow ACI 347 "Recommended practice for concrete form work". Forms shall conform to the working drawing to shape, line and dimensions members and shall be substantially free from surface defects and sufficiently tight to prevent leakage. They shall be properly braced and tied to maintain position and shape.

- 3.10 Fresh concrete will be protected from rain, flowing water and mechanical injury, sun, drying winds and freezing for a period of 7 days. The temperature of the concrete must be kept above 50 degrees F for at least 7 days.

- 3.11 Ground water and surface water within the subgrade excavation area must be maintained below the bottoms of the footer elevation and the bottoms of the excavation during preparation of the subgrade.

## 4: GEOTECHNICAL NOTES

- 4.01 Geotechnical site information provided by Hillis Carnes Engineering Associates, Inc.
- 4.02 All structural fill soils will have a minimum dry density of 105PCF unless indicated otherwise on this drawing set. Fill shall be compacted to at least 95% of the maximum dry density as determined by the standard proctor ASTM D698 (AASHTO T-99) with the exception of the top foot, which will be 100% of the maximum dry density.
- 4.03 All structural fill material will be placed in layers, which, before compaction, will not exceed eight inches. Each layer shall be spread to ensure conformity of materials in each layer.
- 4.04 Virgin/undisturbed soils are defined as soils with a minimum SPT "N" value of 12.

## 5: FOOTINGS

- 5.01 All footings are based on an allowable soil bearing pressure of 4,000 PSF. Any soil condition encountered during excavation that is contrary to those used for design of footings as outlined in these drawings shall be brought to the attention of the site Geotechnical Engineer for direction before proceeding.
- 5.02 Bottom of footings shall be a minimum of 30" below finished grade, unless a lower elevation is noted. Footing elevations noted are estimated based on available geotechnical and grading information. All footings adjacent to existing footings shall be lowered to match existing footing elevation.
- 5.03 All foundation subgrades shall be inspected and approved under the supervision of the registered professional site Geotechnical Engineer or their representative prior to pouring concrete. Footings may be lowered to achieve the minimum footing subgrade bearing capacity of 4,000 PSF. Undercut footing sub-grade as necessary to achieve 4,000psf bearing capacity and fill with unreinforced concrete.

## 6: REINFORCING STEEL

- 6.01 Reinforcing bars shall be deformed billet steel conforming to ASTM A615, grade 60. All welded wire fabric shall conform to ASTM A185. Bars shall be branded by the manufacturer with bar size and grade of steel and certified mill reports shall be submitted to oversight review engineer for approval and record. Reinforcing steel shall be detailed in accordance with the ACI 315-99 "Manual of Standard Practice for Detailing Reinforced Concrete Structures", latest edition. Provide corner bars at junctions of concrete walls and wall footings and lap 48 x bar diameters.
- 6.02 With wall reinforcing as shown in typical details, size and spacing of corner bars to be same as horizontal wall reinforcing, unless shown otherwise. Where continuous bars are called for, they shall run continuously around corners and lapped as necessary min. 48 x bar diameters. Provide standard hooks at discontinuous ends. Tension and compression lap splices shall not be less than the splice lengths as given in ACI 318. Generally lap top bars at mid span and bottom bars at supports. Provide placing accessories in accordance with ACI recommendations.

- 6.03 Provide the following minimum concrete cover for reinforcement:
  - a. Concrete cast against and permanently exposed to earth ...3"
  - b. Concrete exposed to earth or weather:
    - No. 6 through No. 18 bars ...2"
    - No. 5 bar, W31 or D31 wire, and smaller ...1 1/2"
  - c. Concrete slabs, walls and joists not exposed to the earth or weather:
    - No. 14 and No. 18 bars ...1 1/2"
    - No. 11 bar and smaller ...3/4"
  - d. Beams, columns:
    - Primary reinforcement, ties, stirrups and spirals ... 1 1/2"

## 7: EARTHWORK SPECIFICATIONS

- 7.01 The contractor shall furnish all labor, material and equipment for the earthwork. The contractor shall perform all work and services except those set out and furnished by Long Span Bridge & Culvert, LLC. (LSBC)
- 7.02 This work shall consist of all clearing and grading, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the project lines, grades, slopes and specifications.
- 7.03 This work is to be accomplished under the observation of the oversight review engineer or their representative. **Placement of the backfill material will not be permitted unless the Engineer or their representative is on site.**
- 7.04 Prior to bidding the work, the contractor shall examine, investigate and inspect the construction site as to the nature and location of the work and local conditions at the construction site including, without limitation, the character of the surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as they may deem necessary for the planning and proper execution of the work.
- 7.05 The professional Site Geotechnical Engineer or their representative in the field shall verify the subgrade soil condition, gravel, and the rock quality. All stone subgrade shall be compacted with a vibratory plate compactor in no more than 8" lifts and verified by the professional Site Geotechnical Engineer or their representative.
- 7.06 If conditions other than those indicated by the confirmatory subsurface boring program are encountered by the contractor, Long Span Bridge & Culvert, LLC (LSBC) should be notified immediately. The material, which the contractor believes to be a changed condition, should not be disturbed so that LSBC and/or their designated representative can investigate the condition.
- 7.07 The work for clearing and grubbing includes furnishing all labor, materials, transportation, supervision, tools and construction machinery, which may be necessary to accomplish the clearing and grubbing for this project area.
- 7.08 All trees, bushes, etc., shall be removed from the limits of the proposed areas to receive fill or other engineered structures. The areas may be extended outside the actual lines of construction only to the distance required to provide the contractor with sufficient space to perform the work.
- 7.09 All stumps, vegetation, brush, debris or deleterious materials shall be removed from the limits of the fill or other engineered structures.

- 7.10 The work for stripping includes furnishing all labor, materials, transportation, supervision, tools and construction machinery, which may be necessary to be provided by the contractor.

- 7.11 When the construction/operation sequence requires, the area of fill or other engineered structures shall be properly stripped. This stripping shall include topsoil and other deleterious materials. Topsoil shall be removed to its full depth and stockpiled for use in the final cover. Any rubbish, organic and objectionable soils and other deleterious material shall be properly disposed of at a site approved by owner or LSBC.

- 7.12 The lines and grades shall be established by using control benchmarks provided by licensed surveyors.

- 7.13 Soft or spongy cohesive or silty materials encountered at the base of the excavation shall be removed at the direction of the Site Geotechnical Engineer or their representative. The excavation for the footing wall foundations shall be observed and subgrade-bearing capacity certified by the Site Geotechnical Engineer upon completion of this task. At the direction of the Site Geotechnical Engineer or their representative, soft material will be removed to a depth directed by the Site Geotechnical Engineer or their representative, and replaced with granular backfill compacted at least 100% of the maximum dry unit weight density at a moisture content within 2% of optimum as determined by AASHTO T-99 method / ASTM D698.

- 7.14 If a shape control technician is supplied by LSBC, no select granular backfill may be placed, without being observed by LSBC's shape control technician.

- 7.15 Ground water and surface water within the subgrade excavation area must be maintained at least 3 feet below the footer elevation during preparation of the subgrade if additional excavation is required to remove unsuitable materials, the water must be maintained 3 feet below the deepest excavation elevation.

- 7.16 The subgrade shall be compacted with a soil vibratory compactor or equivalent with a dynamic force of 50,000 pounds (min.). The top 1 foot of the subgrade soil shall be compacted to at least 100% of the maximum dry unit weight at a moisture content within 2% of optimum as determined by AASHTO T-99 method (standard proctor). All compaction and subgrade bearing capacity to be verified by the site geotechnical engineer or representative.

- 7.17 All select granular backfill material around the culvert and above the footing shall consist of AASHTO M 145 A-1-a. Recycled concrete material shall not be allowed. The select backfill material shall have fines (pass no. 200 sieve material) maximum 15% by weight. See typical select backfill chart this sheet.

- 7.18 The select granular backfill material and site soil backfill for the adjoining embankment material shall be tested in the laboratory for grain size distribution (AASHTO T-27 for granular material; AASHTO T-88 for soil material) and moisture-density relationship (AASHTO T-99). The testing described above is for purposes of verification of site soil backfill parameters and is in addition to the general project specifications for the embankment backfill, but does not supersede project specifications that may be more stringent.

- 7.19 All backfill operations shall place the material evenly on both sides of the plate arch and each lift shall extend for the entire length of the plate arch prior to placement of the next sequential lift. Fill placement shall begin in the middle of the plate arch length and extend equally on both sides in the upstream and downstream directions.

- 7.20 The select granular backfill shall be placed in horizontal layers not to exceed 8" loose depth. The lift thickness may be reduced by the Site Geotechnical Engineer or their representative to obtain the required compaction, fill all the voids, achieve the proper seating of the backfill material and achieve the stability of the backfill material and the plate arch. The granular backfill shall be compacted to 95% of the maximum dry unit weight as determined by the standard proctor test (AASHTO T-99). Greater emphasis shall be given to a uniform degree of compaction throughout each lift than to achieving a degree of compaction greater than the minimum specified criteria. Site Geotechnical Engineer shall do testing of select granular backfill.

- 7.21 All granular material shall be compacted using mechanical devices, vibrating plates or other equipment approved by the Site Geotechnical Engineer. Compaction equipment weighing more than 24,000 pounds shall not be used within 2.5' of the corrugated metal structure. The compaction equipment shall be capable of compacting the material under the haunch of the plate arch (I.E.; below the spring line of the plate arch).

- 7.22 The soil backfill (compacted normal backfill) within 32'-0" or to natural undisturbed embankment backfill on each side shall be placed in layers not to exceed 8" loose depth. The lift thickness may be reduced by the Site Geotechnical Engineer to obtain the required compaction. The soil backfill shall be compacted to a minimum of 95% of the maximum dry unit weight as determined by the standard proctor test (AASHTO T-99) and to a moisture content within 2% of the optimum moisture content as determined by the same test. Field nuclear density test shall be performed at a minimum frequency of four tests per every other lift and every 25' on the soil backfill on each side of the structure. The testing described above is in addition to the general project specifications for the embankment backfill, but does not supersede project specifications that may be more stringent than those requirements. The Site Geotechnical Engineer is responsible for testing and recording measurements of the soil backfill.

- 7.23 If at any time longitudinal cracks develop in the backfill surrounding the pipe to a distance of 30' from the spring line of the plate arch, these features must be brought to the immediate attention of the field QA/QC personnel and the Site Geotechnical Engineer.

- 7.24 While compacting granular backfill material with a vibrator compactor and adjacent to the plate arch, the opposite side of the plate arch should be observed to note if vibrations are loosening the granular material on that side. This may be more prevalent at higher elevations of the backfill with respect to the plate arch. If this condition occurs, the field QA/QC technician and Site Geotechnical Engineer should be notified prior to placement of a sequential lift on either side.

- 7.25 The structure should not be crossed with equipment heavier than a D4 dozer. No other equipment or highway (HS25) loading shall be allowed to cross the structure until the asphalt pavement is placed unless there is a minimum of 12" of soil cover or span/8 inches of soil cover whichever is greater, covering the plate arch. Top filling should begin at the middle of the structure (lengthwise) with the backfill being pushed up and over the structure with a D4 or preferably smaller type dozer. The fill should be pushed over the structure in a manner 45 to 90 degrees to the axis of the structure. Field nuclear density test shall be performed at a minimum frequency of four tests per every lift on the soil backfill on each side of the structure. The testing described above is in addition to the general project specifications for the embankment backfill, but does not supersede project specifications that may be more stringent than those requirements. The contractor shall submit to the owner samples of all proposed soil backfill material for laboratory testing to verify moisture and density relationships (AASHTO T-99/ASTM D698) and grain size relationships (AASHTO T-27/ASTM C136).

- 7.26 All construction to be certified at the end of the job by a Professional Structural/Geotechnical Engineer (oversite review engineer) qualified in the design and construction of plate arch culverts (minimum 10 years experience) that all work performed by contractor meets these design requirements and specifications. Certification to be submitted to LSBC, RA and the local jurisdiction for record file.

## 8: REQUIRED SUBMITTALS

- 8.01 The contractor must submit the following items to the oversight review engineer for approval in writing at least 2 weeks prior to use:
  - a. Manufacturer certification for yield strength of reinforcing steel.
  - b. Manufacturer certification for concrete design.
  - c. Shop drawings of all concrete work.
  - d. Plate arch shop drawings.

## 9: DEWATERING REQUIREMENTS

- 9.01 Dewater footing excavations using sump pumps or well points as required. Footing excavation must be dewatered and maintained that way for a minimum of seven days or concrete strength of 3,000psi has been reached, whichever is greater

## 10: CONSTRUCTION OVERSIGHT CERTIFICATIONS

- 9.01 The plate arch construction requires engineering oversight and inspection. The oversight review, Civil, Structural and Geotechnical Engineers must provide LSBC certification reports of all footings and retaining wall/headwalls reinforcing placement and the following items:
  - a. Subgrade bearing capacity and backfill (select granular and compacted normal backfill) compaction testing, field reports, testing results, testing locations, and registered professional engineer's certification.
  - b. Field reports of concrete placement review, laboratory test results of concrete cylinder breaks at 7 and 28 days and certified by a Registered Professional Structural Engineer.
  - c. Final report of construction certification that the construction was performed in accordance with the design and the material testing and inspection verifying the same, stamped by a Registered Professional Structural/Geotechnical Engineer.

## 11: ENVIRONMENTAL PERMITTING

- 10.01 These plans do not address environmental permitting requirements, which must be addressed and applied for with the state and Army Corp of Engineers, as required.

## 12: SAFETY

- 11.01 All contractors (and owners), their representatives and their crew must be qualified/certified to perform all works within their scope. They must adhere to OSHA's health and safety laws. The General Contractor is solely responsible for all site safety.

## 13: RA'S RESPONSIBILITY

- 12.01 RA's scope of work for this project are design of plate arch (minimum steel thickness stress analysis), footings, headwalls and wingwalls and RA is responsible for that only. Acceptance of the plan drawings by our client & the owner means they agree to our scope and responsibilities.

## 14: LONG SPAN BRIDGE & CULVERT, LLC SCOPE OF WORK

- 13.01 Long Span Bridge & Culvert, LLC (LSBC) will deliver, furnish and assemble the Long Span low profile arch on footings designed by Ryan & Associates and prepared by Site Contractor. The base channel will be furnished by LSBC and installed in the concrete foundations by the Site Contractor in accordance with the plans. Structural plate for this job to be 3ga (.249" thick) steel.

- 13.02 LSBC will conduct a pre-construction meeting prior to foundation preparation and arch assembly. Attendance at the pre-construction meeting is mandatory for the owner or the owner's representative (e.g. Site Civil Engineer, Site Contractor and Concrete Contractor) and the oversight review Structural/Geotechnical Engineer. It is the owner's responsibility to have each party in attendance. If a party is not in attendance it is the owner's responsibility to inform that party of its responsibilities and duties prior to the start of work.

- 13.03 LSBC will provide a shape control technician to monitor structure's shape and observe the proper placement and compaction of the select fill material, unless provided otherwise and approved in writing by LSBC.

- 13.04 LSBC will require the Site Contractor to unload the structure plates and base channel. LSBC will require the Site Contractor to provide access to the structure for a rubber-tired crane. Parallel access roads shall be within 30' of the centerline of the structure on each side.

## BACKFILL CHART

AASHTO M 145- TABLE 2 (MODIFIED*)				
GROUP CLASSIFICATION	A-1		A-2 (MODIFIED)	
SIEVE ANALYSIS, PERCENT PASSING	A-1-a	A-1-b	A-2-4	A-2-5
NO. 10 (2.00 mm)	50 max	---	---	---
NO. 40 (1.00 mm)	30 max	50 max	---	---
NO. 100 (.150 mm)	---	---	50 max	50 max
NO. 200 (.075 mm)	15 max	25 max	20 max	20 max
Characteristics of fraction passing No. 40 (0.425 mm)				
Liquid Limit	---	---	40 max	41 max
Plasticity Index	6 max	6 max	10 max	10 max
Usual Material Types	Stone Fragments Gravel and Sand		Silty or Clayey Gravel and Sand	

\*Modified to be more select than M-145

OWNERS  
WAVERLY WOODS DEVELOPMENT CORPORATION,  
HOLE IN THE DOUGHNUT, LLC, &  
GTW JOINT VENTURE  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
ELLCOTT CITY, MARYLAND 21042  
(443-367-0422)

DEVELOPER  
WAVERLY WOODS DEVELOPMENT CORP.  
C/O LAND DESIGN AND DEVELOPMENT,  
INC. 5300 DORSEY HALL DRIVE, SUITE 102  
ELLCOTT CITY, MARYLAND 21042  
(443-367-0422)

APPROVED: DEPARTMENT OF PUBLIC WORKS	
<i>With J. Whitt</i>	8-27-09
CHIEF, BUREAU OF HIGHWAYS	DATE
APPROVED: DEPARTMENT OF PLANNING AND ZONING	
<i>Cindy Hahn</i>	9/29/09
CHIEF, DIVISION OF LAND DEVELOPMENT	DATE
<i>Chris Drummer</i>	8/31/09
CHIEF, DEVELOPMENT ENGINEERING DIVISION	DATE

REVISIONS			
No.	DATE	BY	DESCRIPTION
1	07/27/09	A/JH	DESIGN MODIFICATIONS BASED ON REVISED TOPO AND MDE PERMIT REVISIONS FROM FISHER, COLLINS & CARTER.

DRAWN BY: C.M.  
DESIGN BY: C.M.  
CHECKED BY: WKR  
DATE: 07/27/09

DO NOT SCALE THIS DRAWING'S DIMENSIONS AND NOTES. USE PRECEDENCE OVER DRAWING.

CLIENT: LONG SPAN BRIDGE & CULVERT, LLC

OWNER: LAND DESIGN & DEVELOPMENT, INC.

JOB No: 1101-08-04

**Ryan & Associates**  
A Division of WKR Consulting Inc.

Hagerstown, MD Office  
1825 Howell Road, Suite 3  
Hagerstown, MD 21740  
301-671-3200 (ph)  
301-360-9574 (fx)

Frederick, MD Office  
2412 Wynfield Ct.  
Frederick, MD 21702  
301-360-9534 (ph)  
301-360-9574 (fx)

**PLATE ARCH CULVERT STRUCTURAL DESIGN SPECIFICATIONS**

GTW's WAVERLY WOODS, SECTION 14  
BULK PARCELS 'A' & 'B' AND OPEN SPACE LOTS 1 & 2 ZONING: PSC & PEC  
TAX MAP NO. 16 PARCEL Nos. 120,221 & P/O 249 GRID Nos. 3 & 4  
THIRD ELECTION DISTRICT, HOWARD COUNTY, MD

STATE OF MARYLAND  
REGISTERED PROFESSIONAL ENGINEER  
WILLIAM K. RYAN, P.E.  
LICENSE NO. 21056  
EXPIRES DATE: 05/09/2011

ENGINEER SEAL

PROFESSIONAL CERTIFICATION

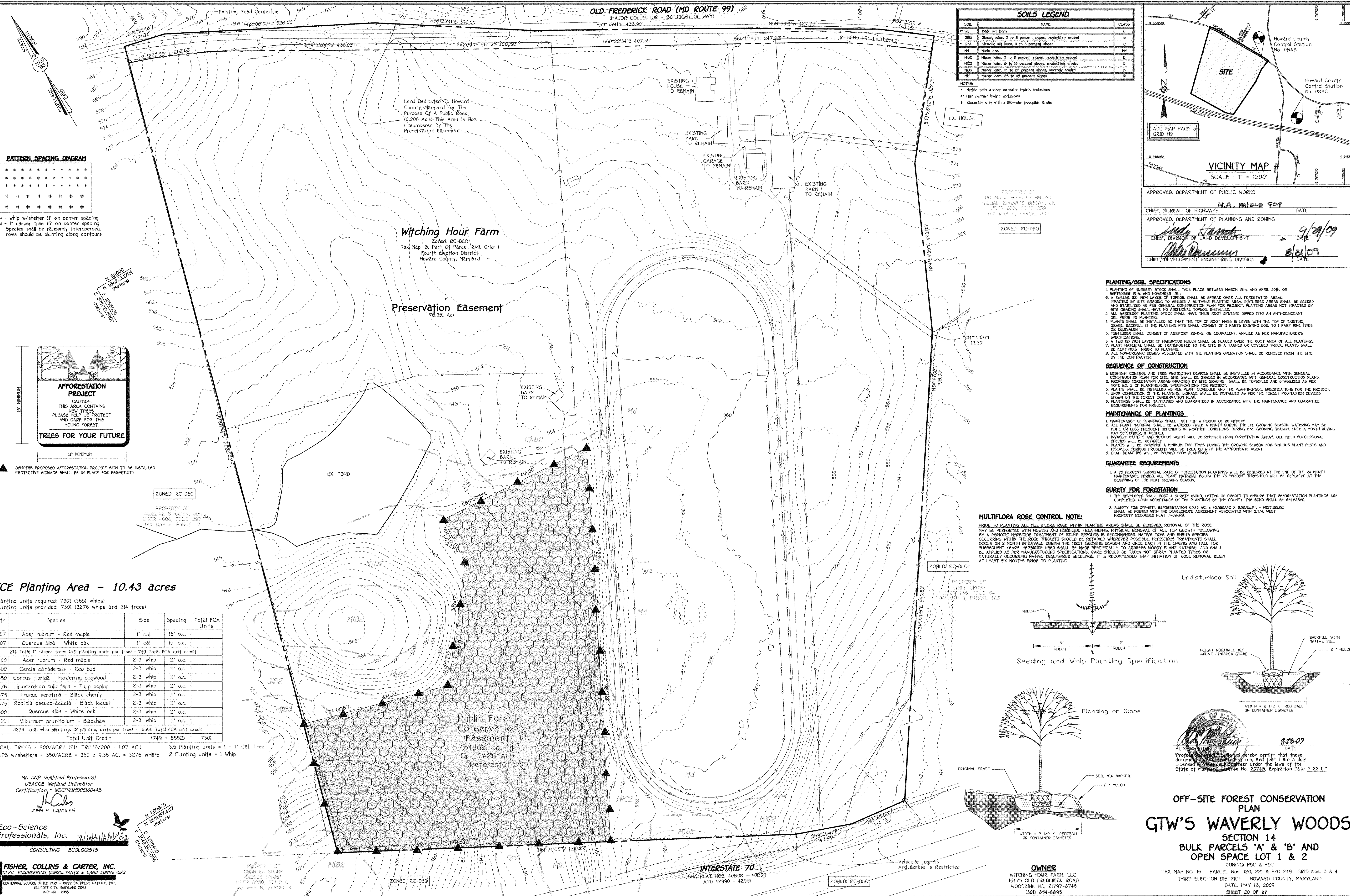
I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.

WKR

William K. Ryan, P.E.  
License No: 21056  
Expiration Date: 05/09/2011

SHEET  
19 of 27

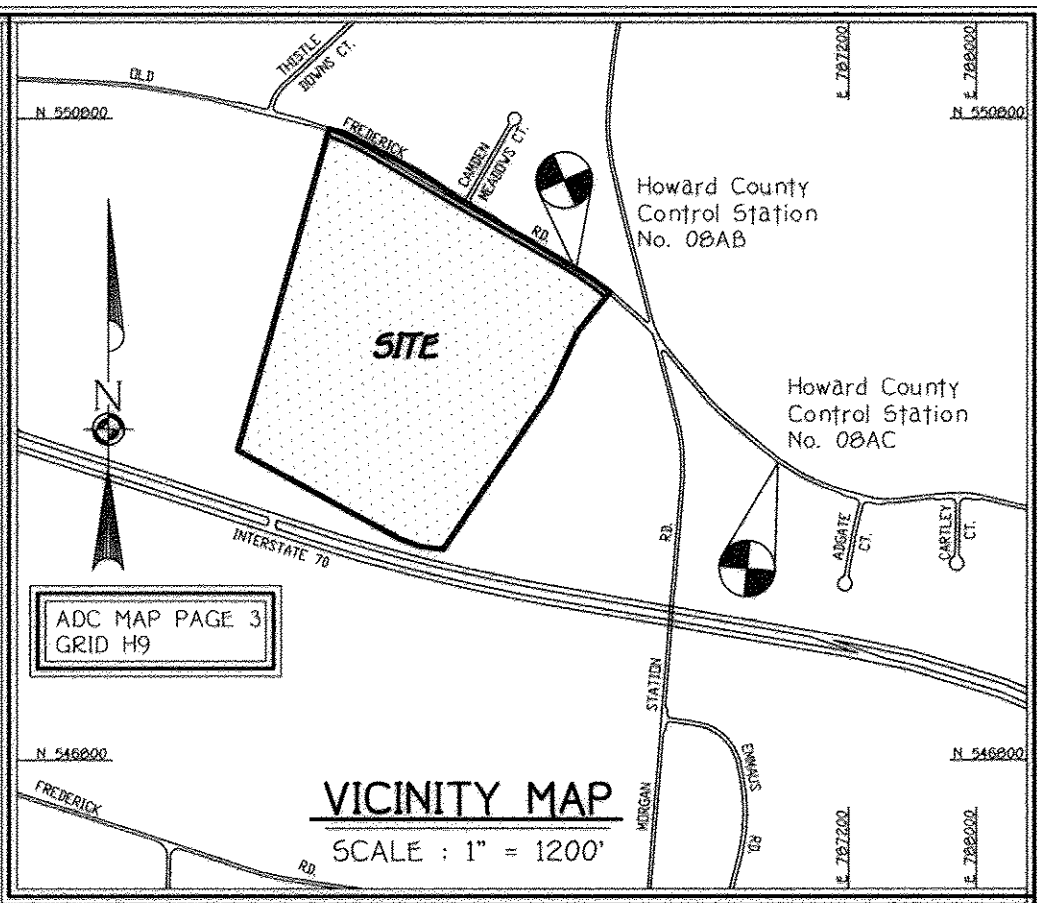




**SOILS LEGEND**

SOIL	NAME	CLASS
Ba	Bald soil loam	B
Gb2	Garnett loam, 3 to 8 percent slopes, moderately eroded	B
GnA	Garnett silt loam, 0 to 3 percent slopes	C
Md	Middle land	Md
Mb2	Minor loam, 3 to 8 percent slopes, moderately eroded	B
Mb3	Minor loam, 8 to 15 percent slopes, moderately eroded	B
Mb3	Minor loam, 15 to 25 percent slopes, severely eroded	B
Mb	Minor loam, 25 to 45 percent slopes	B

NOTES:  
 \* Hydric soils and/or contain hydric inclusions  
 \*\* May contain hydric inclusions  
 † Generally only within 100-year floodplain areas



APPROVED: DEPARTMENT OF PUBLIC WORKS  
**N.A. MIBLOD** DATE  
 CHIEF, BUREAU OF HIGHWAYS

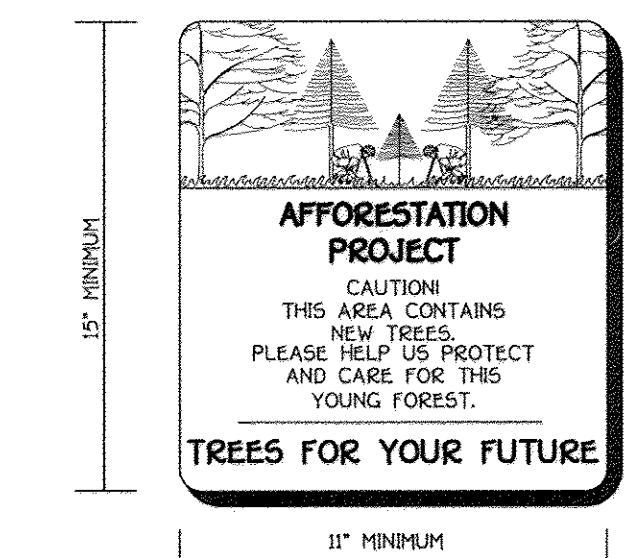
APPROVED: DEPARTMENT OF PLANNING AND ZONING  
**Judy Hamant** DATE **9/29/09**  
**W.D. DUNN** DATE **8/21/09**  
 CHIEF, DEVELOPMENT ENGINEERING DIVISION

**PATTERN SPACING DIAGRAM**

\*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*  
 \*\*\*\*\*

\* - whip w/shelter 11' on center spacing  
 \* - 1" caliper tree 15' on center spacing  
 Species shall be randomly interspersed, rows should be planting along contours

N 61000  
 N 106231724  
 (Material)  
 50000000  
 50000000



▲ DENOTES PROPOSED AFFORESTATION PROJECT SIGN TO BE INSTALLED  
 - PROTECTIVE SIGNAGE SHALL BE IN PLACE FOR PERPETUITY

ZONED: RC-DEO

PROPERTY OF  
 MADELINE STRUBER, et al  
 LIBER 4006, FOLIO 287  
 TAX MAP 8, PARCEL 2

**FCE Planting Area - 10.43 acres**

Planting units required: 7301 (3651 whips)  
 Planting units provided: 7301 (3276 whips and 214 trees)

Qty	Species	Size	Spacing	Total FCA Units
107	Acer rubrum - Red maple	1" cal.	15' o.c.	
107	Quercus alba - White oak	1" cal.	15' o.c.	
214 Total 1" caliper trees (3.5 planting units per tree) = 749 Total FCA unit credit				
500	Acer rubrum - Red maple	2-3' whip	11' o.c.	
500	Cercis canadensis - Red bud	2-3' whip	11' o.c.	
450	Cornus florida - Flowering dogwood	2-3' whip	11' o.c.	
476	Liriodendron tulipifera - Tulip poplar	2-3' whip	11' o.c.	
375	Prunus serotina - Black cherry	2-3' whip	11' o.c.	
375	Robinia pseudo-acacia - Black locust	2-3' whip	11' o.c.	
300	Quercus alba - White oak	2-3' whip	11' o.c.	
300	Viburnum prunifolium - Blackhaw	2-3' whip	11' o.c.	
3276 Total whip plantings (2 planting units per tree) = 6552 Total FCA unit credit				
Total Unit Credit (749 + 6552)				7301

1" CAL. TREES = 200/ACRE (214 TREES/200 = 1.07 AC) 3.5 Planting units = 1 - 1" Cal. Tree  
 WHIPS w/shelters = 350/ACRE = 350 x 9.36 AC. = 3276 WHIPS 2 Planting units = 1 Whip

MD DNR Qualified Professional  
 USACOE Wetland Designer  
 Certification: WDCPS3M006100448  
**John P. Canoles**

Eco-Science Professionals, Inc.  
 CONSULTING ECOLOGISTS

FISHER, COLLINS & CARTER, INC.  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTENNIAL SQUARE OFFICE PARK - 10775 BALTIMORE NATIONAL PIKE  
 ELICOTT CITY, MARYLAND 21042  
 (410) 468 - 2955

- PLANTING/SOIL SPECIFICATIONS**
- PLANTING OF NURSERY STOCK SHALL TAKE PLACE BETWEEN MARCH 15th AND APRIL 30th OR SEPTEMBER 15th AND NOVEMBER 30th.
  - A TWELVE (12) INCH LAYER OF TOPSOIL SHALL BE SPREAD OVER ALL FORESTATION AREAS IMPACTED BY SITE GRADING TO PROVIDE A SUITABLE PLANTING AREA. DISTURBED AREAS SHALL BE SEEDED AND STABILIZED AS PER GENERAL CONSTRUCTION PLAN FOR PROJECT. PLANTING AREAS NOT IMPACTED BY SITE GRADING SHALL HAVE NO ADDITIONAL TOPSOIL INSTALLED.
  - ALL BARE-ROOT PLANTING STOCK SHALL HAVE THEIR ROOT SYSTEMS DIPPED INTO AN ANTI-DESICCANT GEL PRIOR TO PLANTING.
  - PLANTS SHALL BE INSTALLED SO THAT THE TOP OF ROOT MASS IS LEVEL WITH THE TOP OF EXISTING GRADE. BACKFILL IN THE PLANTING PITS SHALL CONSIST OF 3 PARTS EXISTING SOIL TO 1 PART FINE FINES OR EQUIVALENT.
  - FERTILIZER SHALL CONSIST OF AGROFORM 22-0-2, OR EQUIVALENT, APPLIED AS PER MANUFACTURER'S SPECIFICATIONS.
  - A TWO (2) INCH LAYER OF HARDWOOD MULCH SHALL BE PLACED OVER THE ROOT AREA OF ALL PLANTINGS.
  - PLANT MATERIAL SHALL BE TRANSPORTED TO THE SITE IN A TARPED OR COVERED TRUCK. PLANTS SHALL BE KEPT MOIST PRIOR TO PLANTING.
  - ALL NON-ORGANIC DEBRIS ASSOCIATED WITH THE PLANTING OPERATION SHALL BE REMOVED FROM THE SITE BY THE CONTRACTOR.

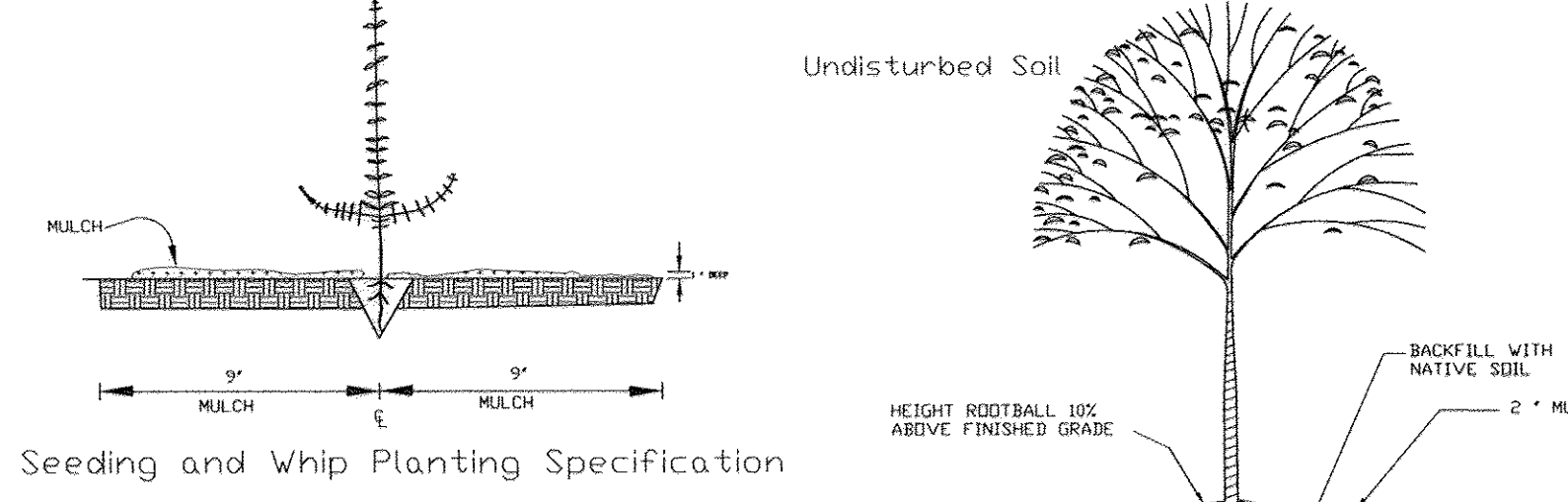
- SEQUENCE OF CONSTRUCTION**
- SEDIMENT CONTROL AND TREE PROTECTION DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH GENERAL CONSTRUCTION PLAN FOR SITE. SITE SHALL BE GRADED IN ACCORDANCE WITH GENERAL CONSTRUCTION PLANS.
  - PROPOSED FORESTATION AREAS IMPACTED BY SITE GRADING SHALL BE TOPSOILED AND STABILIZED AS PER NOTE NO. 2 OF PLANTING/SOIL SPECIFICATIONS FOR PROJECT.
  - PLANTS SHALL BE INSTALLED AS PER PLANT SCHEDULE AND THE PLANTING/SOIL SPECIFICATIONS FOR THE PROJECT.
  - UPON COMPLETION OF THE PLANTING, SEDIMENT SHALL BE INSTALLED AS PER THE FOREST PROTECTION DEVICES SHOWN ON THE FOREST CONSERVATION PLAN.
  - PLANTINGS SHALL BE MAINTAINED AND GUARANTEED IN ACCORDANCE WITH THE MAINTENANCE AND GUARANTEE REQUIREMENTS FOR PROJECT.

- MAINTENANCE OF PLANTINGS**
- MAINTENANCE OF PLANTINGS SHALL LAST FOR A PERIOD OF 26 MONTHS.
  - ALL PLANT MATERIAL SHALL BE WATERED TWICE A MONTH DURING THE 1st GROWING SEASON. WATERING MAY BE MORE OR LESS FREQUENT DEPENDING ON WEATHER CONDITIONS DURING 2nd AND 3rd GROWING SEASONS. MAY-SEPTEMBER, IF NEEDED.
  - INVASIVE EXOTICS AND NOXIOUS WEEDS WILL BE REMOVED FROM FORESTATION AREAS. OLD FIELD SUCCESSIONAL SPECIES WILL BE RETAINED.
  - PLANTS WILL BE EXAMINED A MINIMUM TWO TIMES DURING THE GROWING SEASON FOR SERIOUS PLANT PESTS AND DISEASES. SERIOUS PROBLEMS WILL BE TREATED WITH THE APPROPRIATE AGENT.
  - DEAD BRANCHES WILL BE PRUNED FROM PLANTINGS.

- GUARANTEE REQUIREMENTS**
- A 75 PERCENT SURVIVAL RATE OF FORESTATION PLANTINGS WILL BE REQUIRED AT THE END OF THE 24 MONTH MAINTENANCE PERIOD. ALL PLANT MATERIAL BELOW THE 75 PERCENT THRESHOLD WILL BE REPLACED AT THE BEGINNING OF THE NEXT GROWING SEASON.

- SURETY FOR FORESTATION**
- THE DEVELOPER SHALL POST A SURETY (BOND, LETTER OF CREDIT) TO ENSURE THAT REFORESTATION PLANTINGS ARE COMPLETED UPON ACCEPTANCE OF THE PLANTINGS BY THE COUNTY. THE BOND SHALL BE RELEASED.
  - SURETY FOR OFF-SITE REFORESTATION 1040 AC. x 435000/AC x 0.50/54/Ft. = \$22785000 SHALL BE POSTED WITH THE DEVELOPER'S AGREEMENT ASSOCIATED WITH C.I.W. WEST PROPERTY RECORDED PLAT 07-09-22.

**MULTIFLORA ROSE CONTROL NOTE:**  
 PRIOR TO PLANTING ALL MULTIFLORA ROSE WITHIN PLANTING AREAS SHALL BE REMOVED. REMOVAL OF THE ROSE MAY BE PERFORMED WITH MOWING AND HERBICIDE TREATMENTS. PHYSICAL REMOVAL OF ALL TOP GROWTH FOLLOWING BY A HERBICIDE TREATMENT OF STUMP/SPLITS IS RECOMMENDED. NATIVE TREE AND SHRUB SPECIES OCCURRING WITHIN THE ROSE THICKETS SHOULD BE RETAINED WHEREVER POSSIBLE. HERBICIDES TREATMENTS SHALL OCCUR ON 2 MONTH INTERVALS DURING THE FIRST GROWING SEASON AND ONCE EACH IN THE SPRING AND FALL FOR SUBSEQUENT YEARS. HERBICIDE USED SHALL BE MADE SPECIFICALLY TO ADDRESS WOODY PLANT MATERIAL AND SHALL BE APPLIED AS PER MANUFACTURER'S SPECIFICATIONS. CARE SHOULD BE TAKEN NOT TO SPRAY PLANTED TREES OR NATURALLY OCCURRING NATIVE TREE/SHRUB SPECIES. IT IS RECOMMENDED THAT INITIATION OF ROSE REMOVAL BEGIN AT LEAST SIX MONTHS PRIOR TO PLANTING.



**OFF-SITE FOREST CONSERVATION PLAN**  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOT 1 & 2

ZONING: PSC & PEC  
 TAX MAP NO. 16 PARCEL NOS. 120, 221 & P/O 249 GRID NOS. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: MAY 18, 2009  
 SHEET 20 OF 27

**OWNER**  
 WITCHING HOUR FARM, LLC  
 15475 OLD FREDERICK ROAD  
 WOODBINE MD, 21797-0745  
 (301) 654-6895

ALDOUS W. HARRIS  
 DATE: 8-20-09  
 "I, the undersigned, hereby certify that these documents were prepared by me, that I am a duly Licensed Professional Engineer under the laws of the State of Maryland, License No. 207746, Expiration Date 2-22-11."





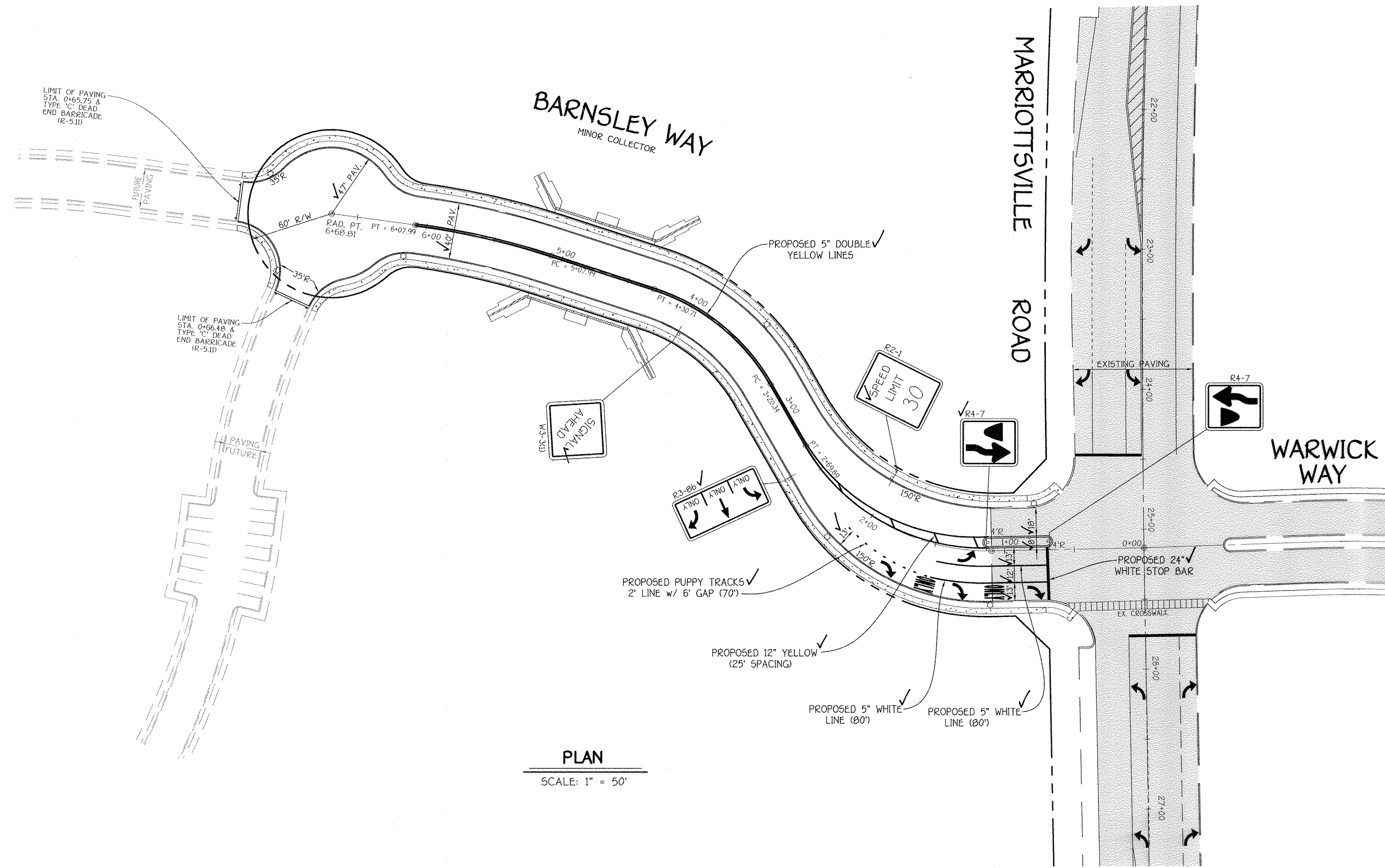


APPROVED: DEPARTMENT OF PUBLIC WORKS  
 [Signature] 8-27-09  
 CHIEF, BUREAU OF HIGHWAYS DATE

APPROVED: DEPARTMENT OF PLANNING AND ZONING  
 [Signature] 9/29/09  
 CHIEF, DIVISION OF LAND DEVELOPMENT DATE

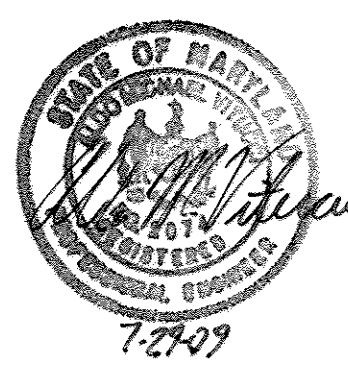
[Signature] 8/31/09  
 CHIEF, DEVELOPMENT ENGINEERING DIVISION DATE

- NOTES:**
1. ALL LANE DESIGNATION TO BE THERMOPLASTIC LINE STRIPING.
  2. ALL PAVEMENT MARKINGS SHALL BE 5" WIDE UNLESS NOTED OTHERWISE.
  3. ANY RELOCATED SIGNS ARE TO BE INSTALLED ON NEW 2" GALVANIZED STEEL, PERFORATED, SQUARE TUBE POSTS (14 GAUGE) INSERTED INTO A 2-1/2" GALVANIZED STEEL, PERFORATED, SQUARE TUBE SLEEVES (12 GAUGE) 3' LONG WITH A GALVANIZED STEEL CAP ON THE TOP OF POST.



**PLAN**  
 SCALE: 1" = 50'

NOTE: CONTRACTOR SHALL CONTACT PARRIS ZIEKENBACH AT (410) 313-2430 HOWARD COUNTY TRAFFIC PRIOR TO STARTING ANY PAVEMENT MARKINGS.



**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTRAL SQUARE OFFICE PARK - 10272 BALTIMORE NATIONAL PIKE  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 461-2895

**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE DOUGHNUT, LLC, &  
 GTW JOINT VENTURE  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)

**DEVELOPER**  
 WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT,  
 INC. 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)



**BARNESLEY WAY - STRIPING PLAN**  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOT 1 & 2  
 (A SUBDIVISION OF THE PROPERTY OF WAVERLY WOODS DEVELOPMENT CORPORATION, LIBER. 4879, FOLIO 307)  
 ZONING: PSC & REC  
 TAX MAP NO. 16 PARCEL Nos. 120, 221 & P/O 249 GRID Nos. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: JULY 28, 2009  
 SHEET 22 OF 27

AS-BUILT F-09-057

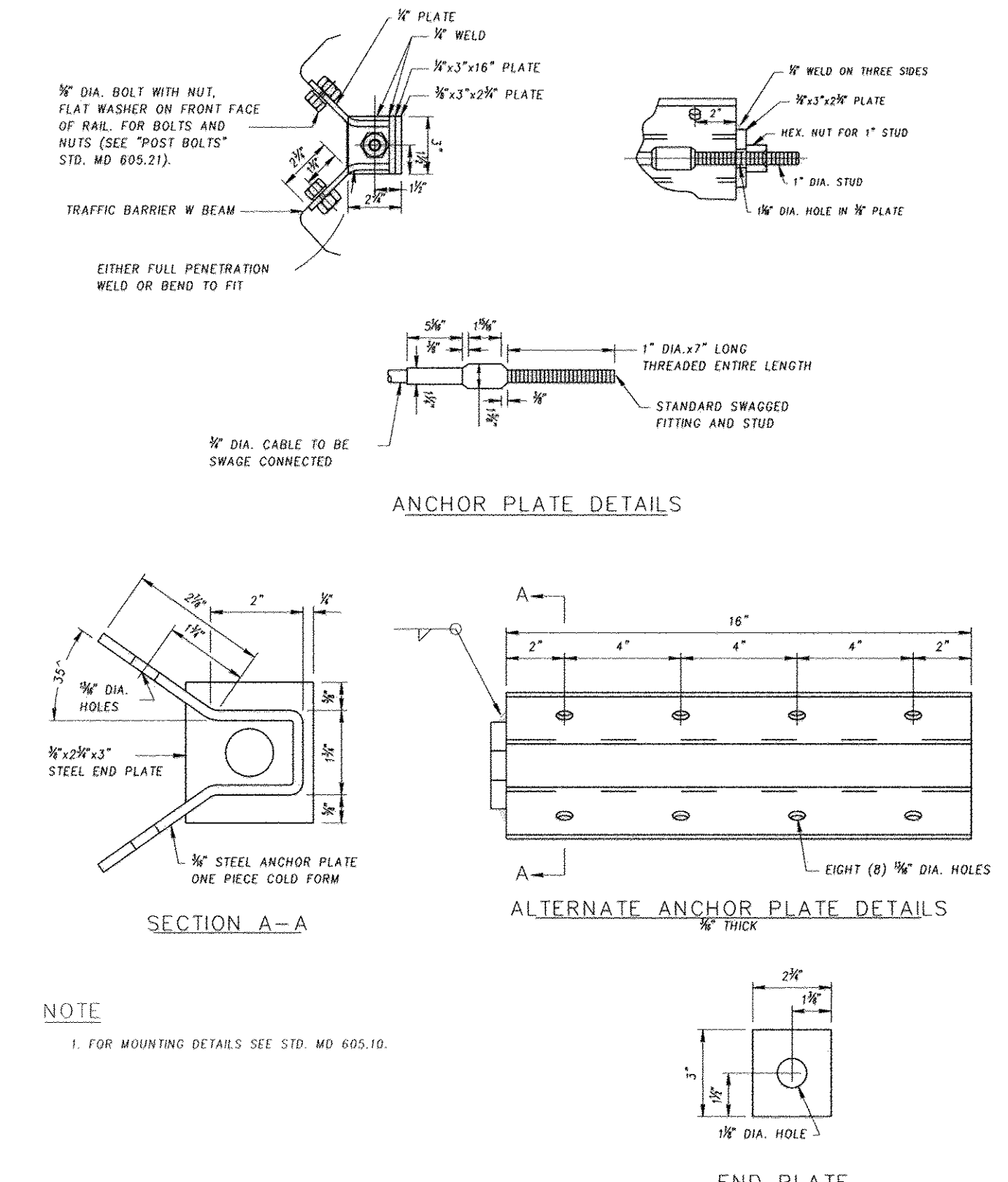
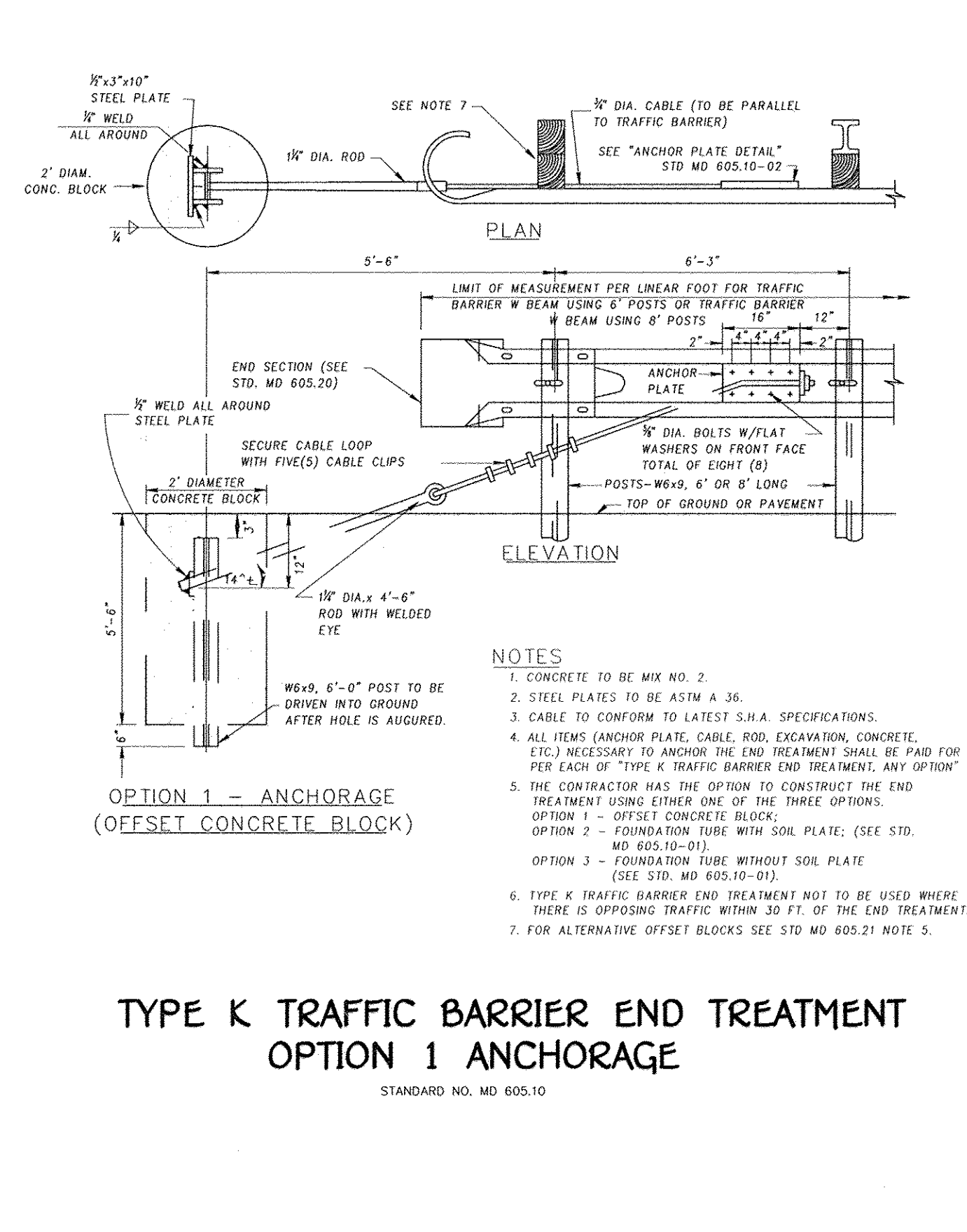
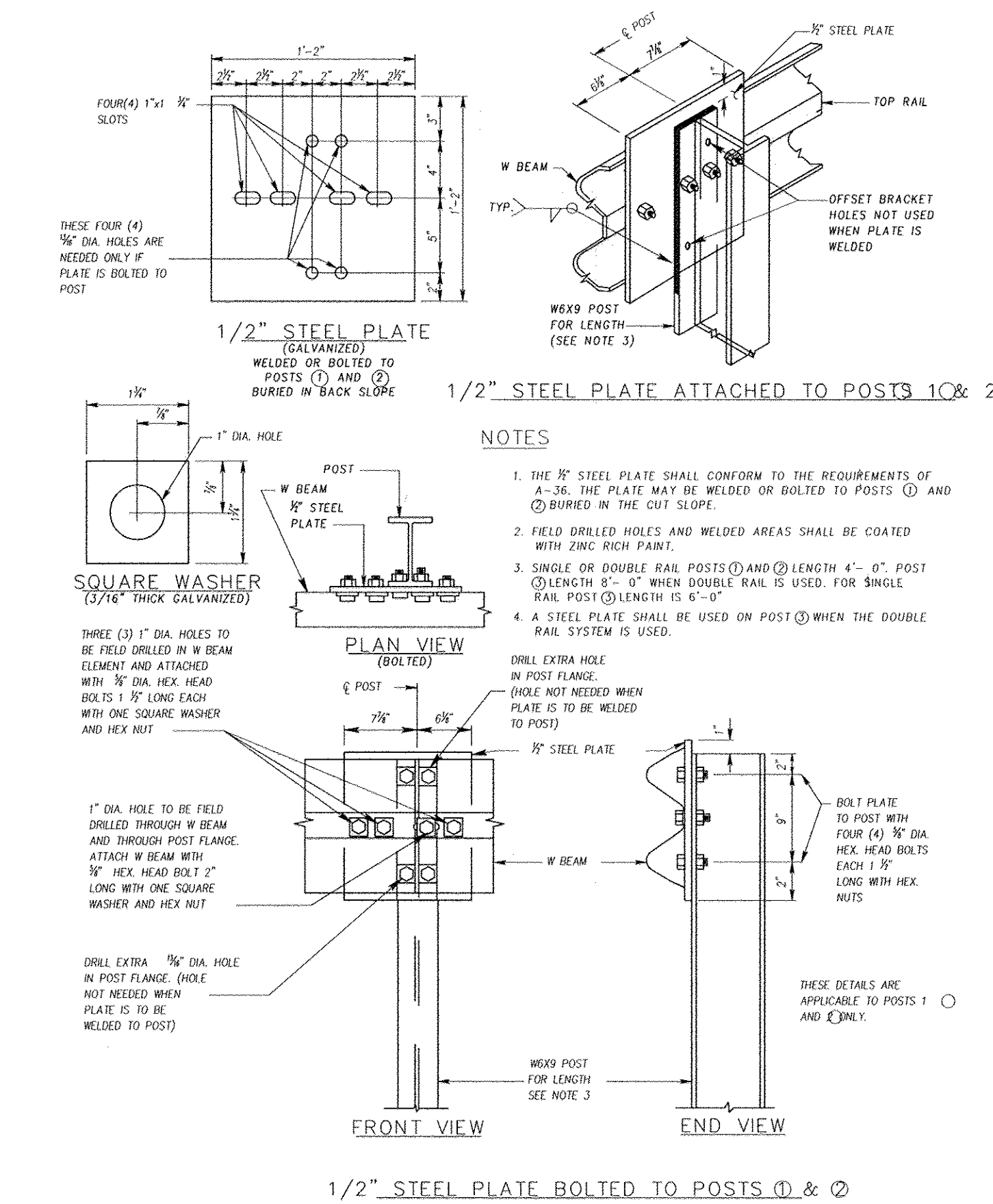
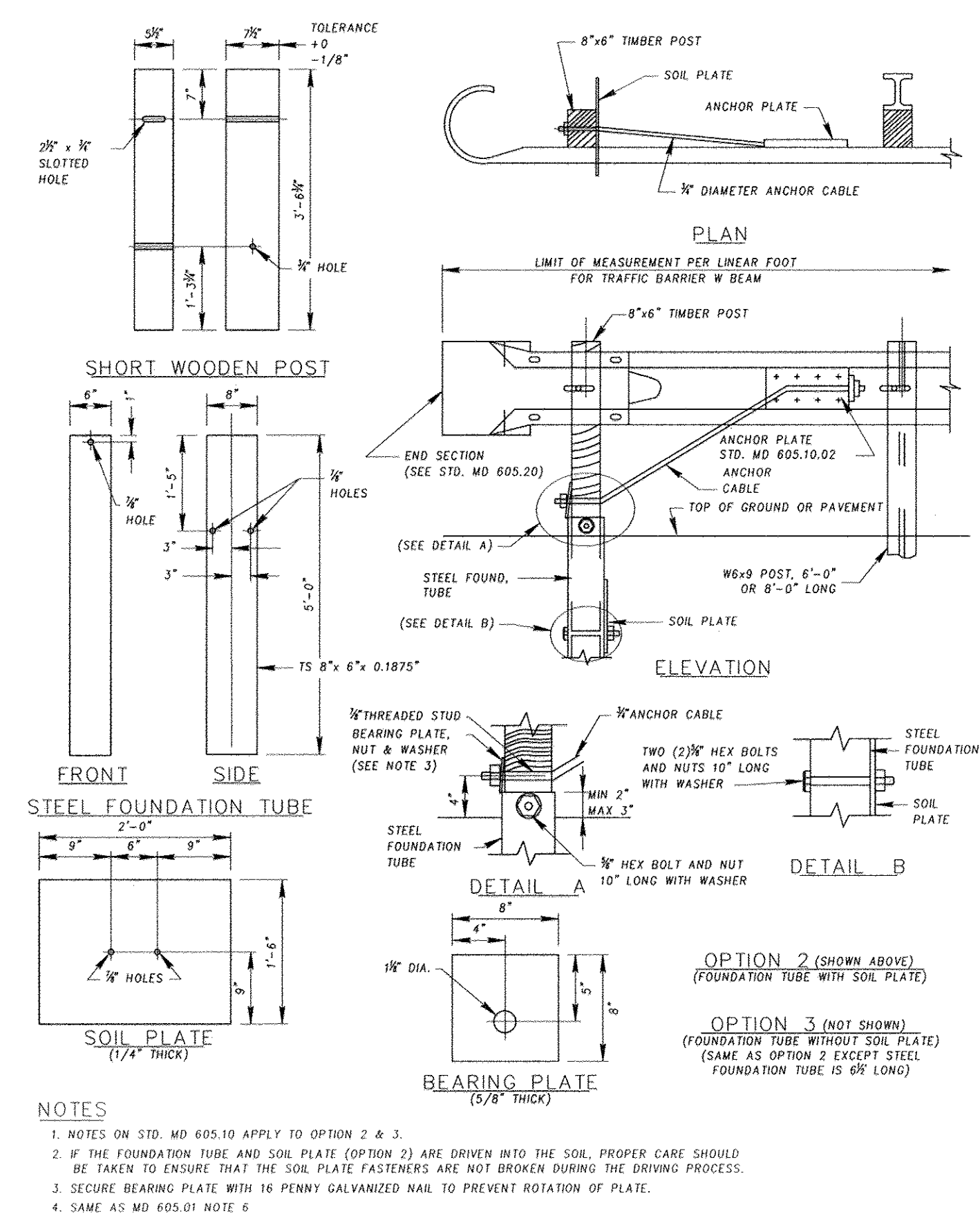
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Approved: Department Of Public Works  
*William R. ...* 8-27-09  
 Chief, Bureau Of Highways Date

Approved: Department Of Planning And Zoning  
*Andy ...* 9/2/09  
 Chief, Division Of Land Development Date

*Bill ...* 8/31/09  
 Chief, Development Engineering Division Date



**TYPE K TRAFFIC BARRIER END TREATMENT  
 ANCHORAGE DETAILS**  
 STANDARD NO. MD 605.10-02

**FISHER, COLLINS & CARTER, INC.**  
 CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
 CENTENAL SQUARE OFFICE PARK - 10772 BALTIMORE NATIONAL PKWY  
 ELLICOTT CITY, MARYLAND 21042  
 (410) 461-2055

**OWNERS**  
 WAVERLY WOODS DEVELOPMENT CORPORATION,  
 HOLE IN THE DOUGHRUIT, LLC, &  
 CTW JOINT VENTURE.  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)

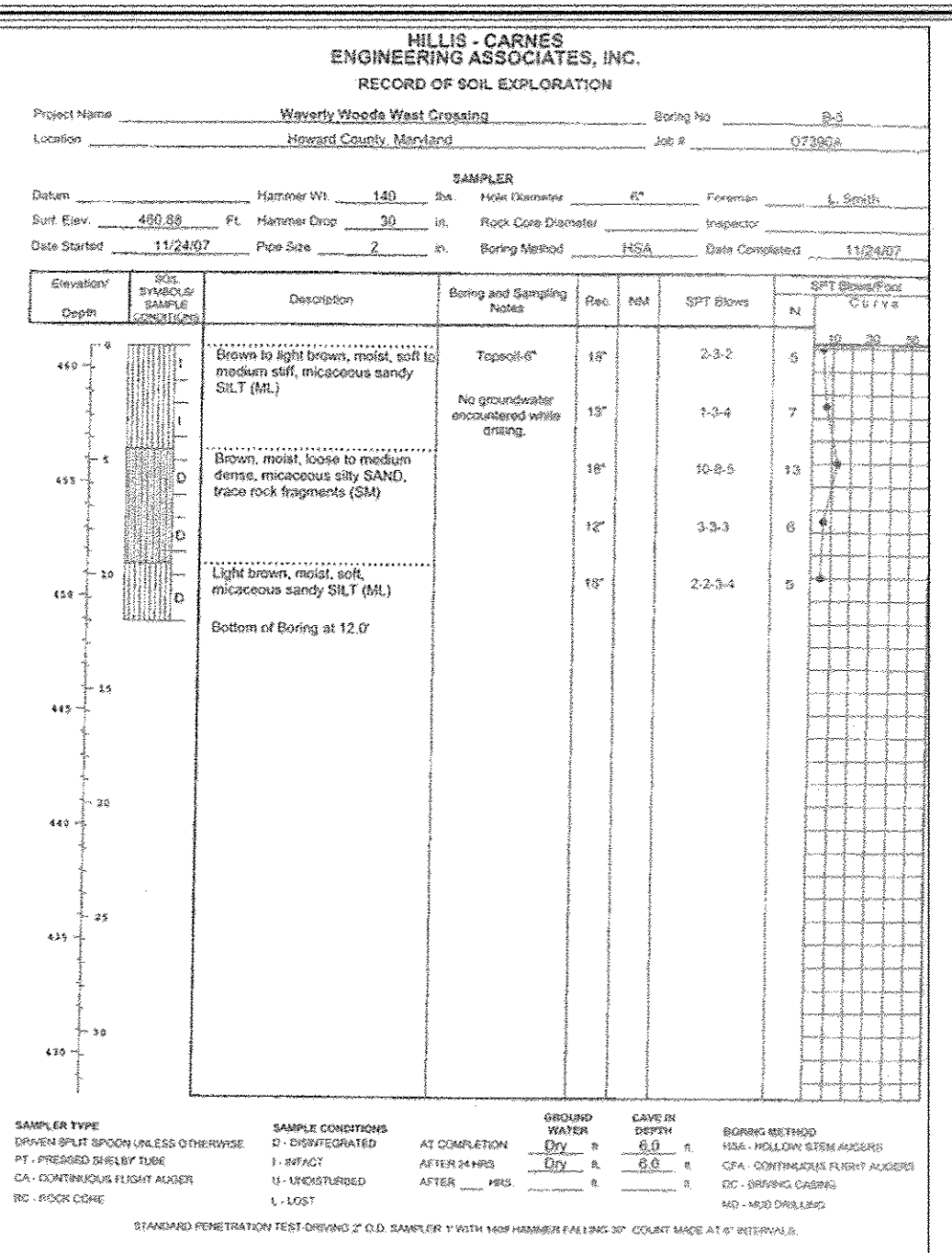
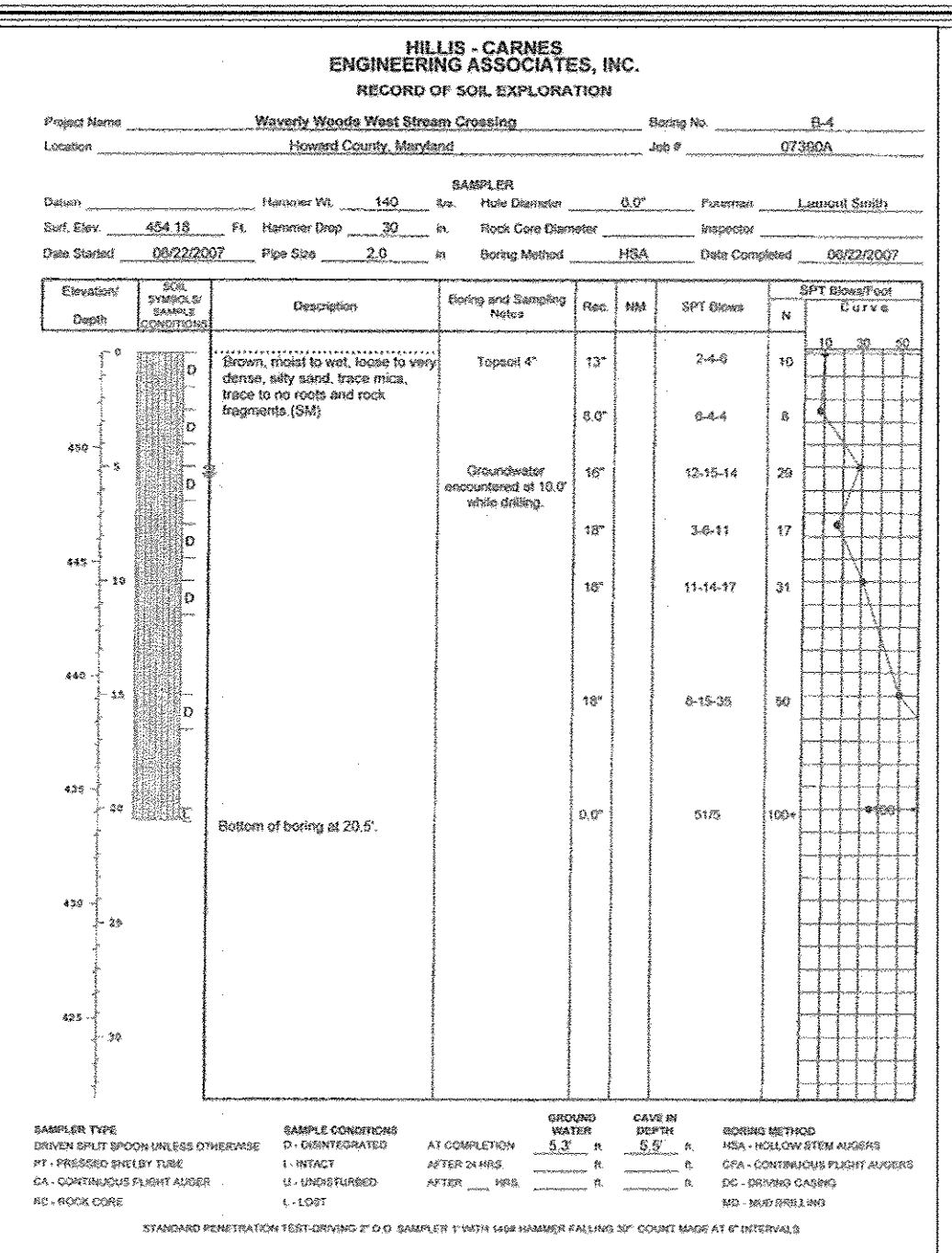
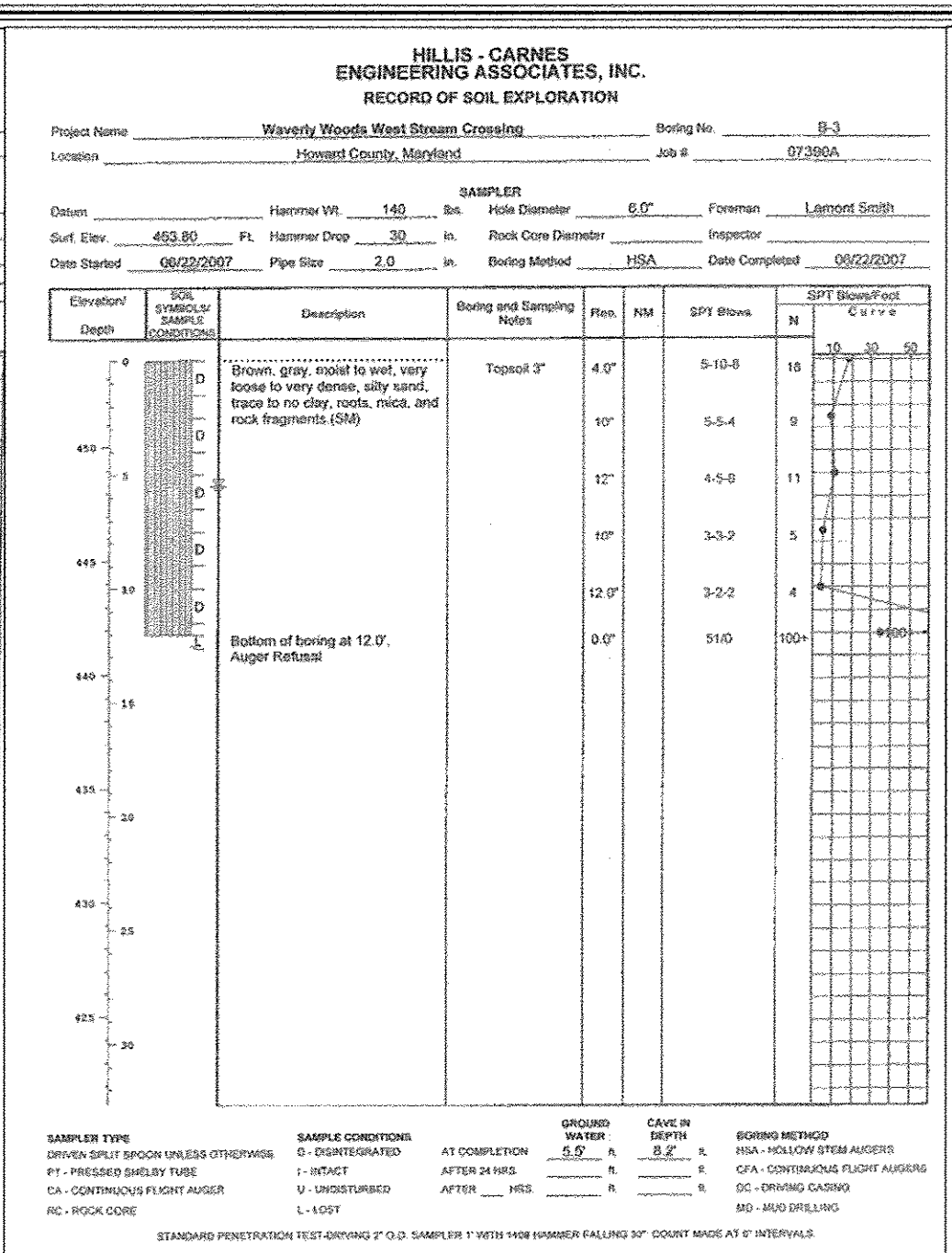
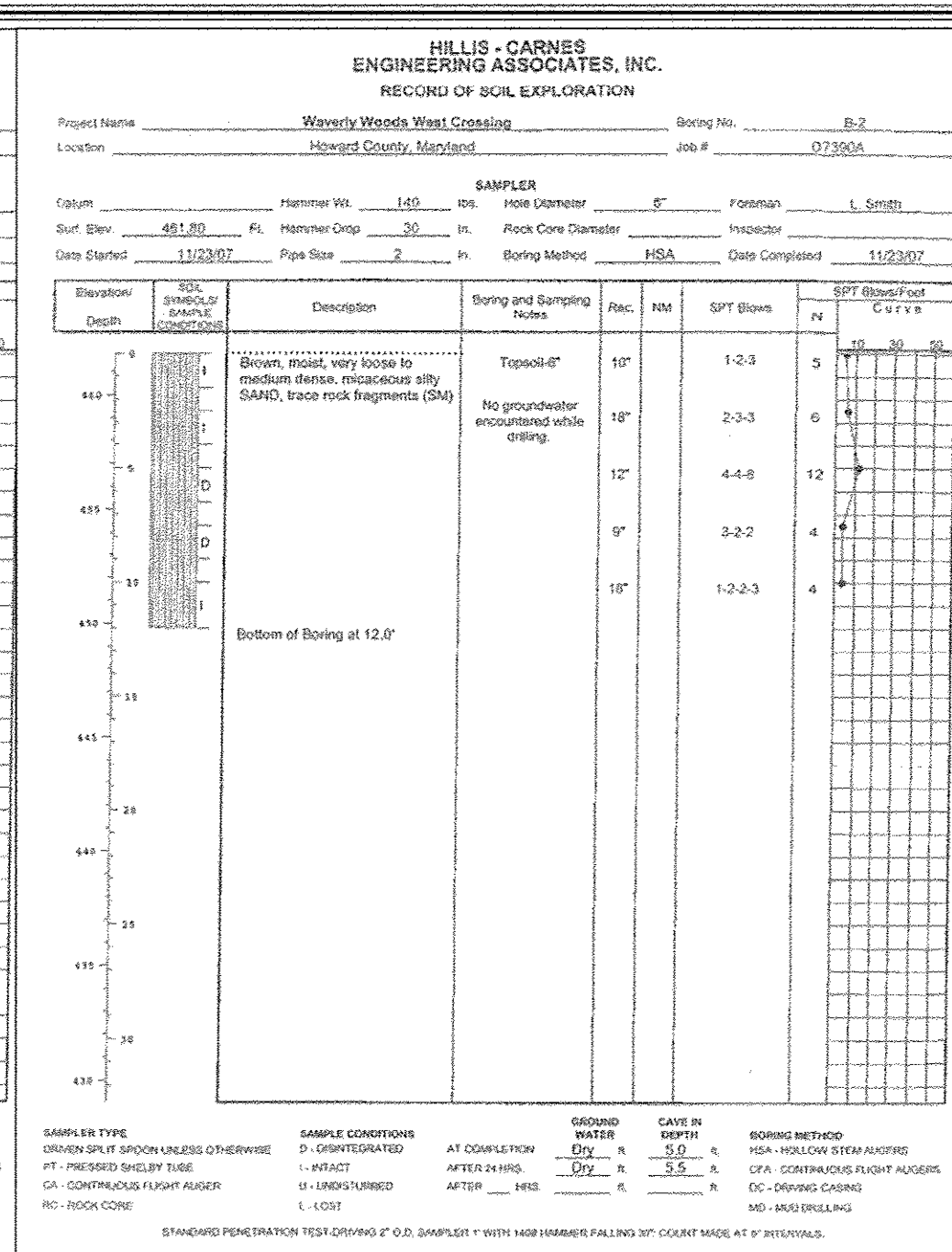
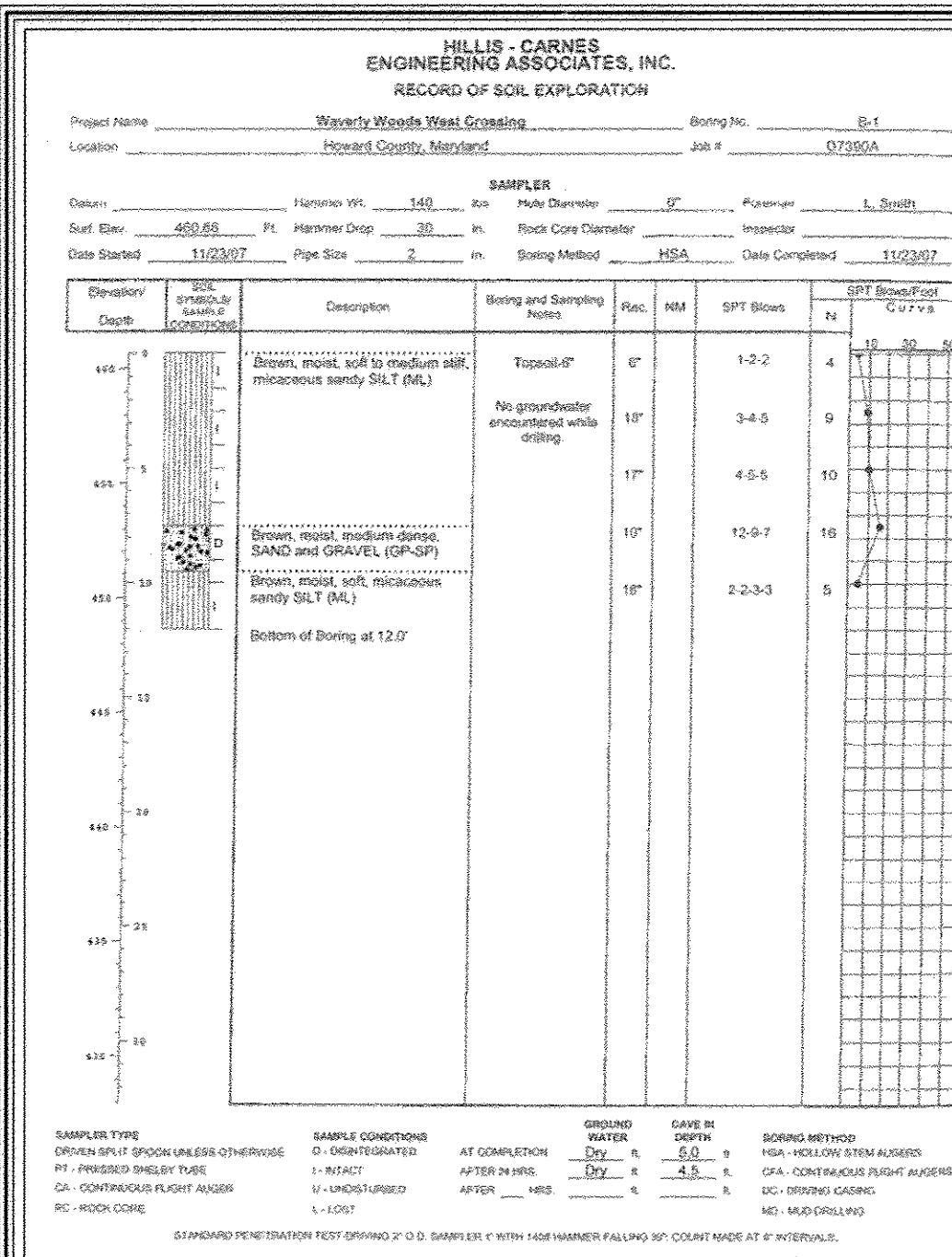
**DEVELOPER**  
 WAVERLY WOODS DEVELOPMENT CORP.  
 C/O LAND DESIGN AND DEVELOPMENT, INC.  
 5300 DORSEY HALL DRIVE, SUITE 102  
 ELLICOTT CITY, MARYLAND 21042  
 (443-367-0422)

*Almo M. ...*  
 ALMO M. ...  
 7/29/09  
 DATE  
 "Professional Engineer" hereby certify that these documents were prepared by me, and that I am a duly Licensed Professional Engineer under the laws of the State of Maryland, License No. 20748, Expiration Date 2-22-11."

**GUARDRAIL DETAILS**  
**GTW'S WAVERLY WOODS**  
 SECTION 14  
 BULK PARCELS 'A' & 'B' AND  
 OPEN SPACE LOTS 1 & 2  
 ZONING: PSC & PEC  
 TAX MAP NO. 16 PARCEL Nos. 120, 221 & P/O 249 GRID Nos. 3 & 4  
 THIRD ELECTION DISTRICT HOWARD COUNTY, MARYLAND  
 DATE: JULY 28, 2009  
 SHEET 23 OF 27

THERE IS NO "AS-BUILT" INFORMATION PROVIDED ON THIS SHEET F-09-057

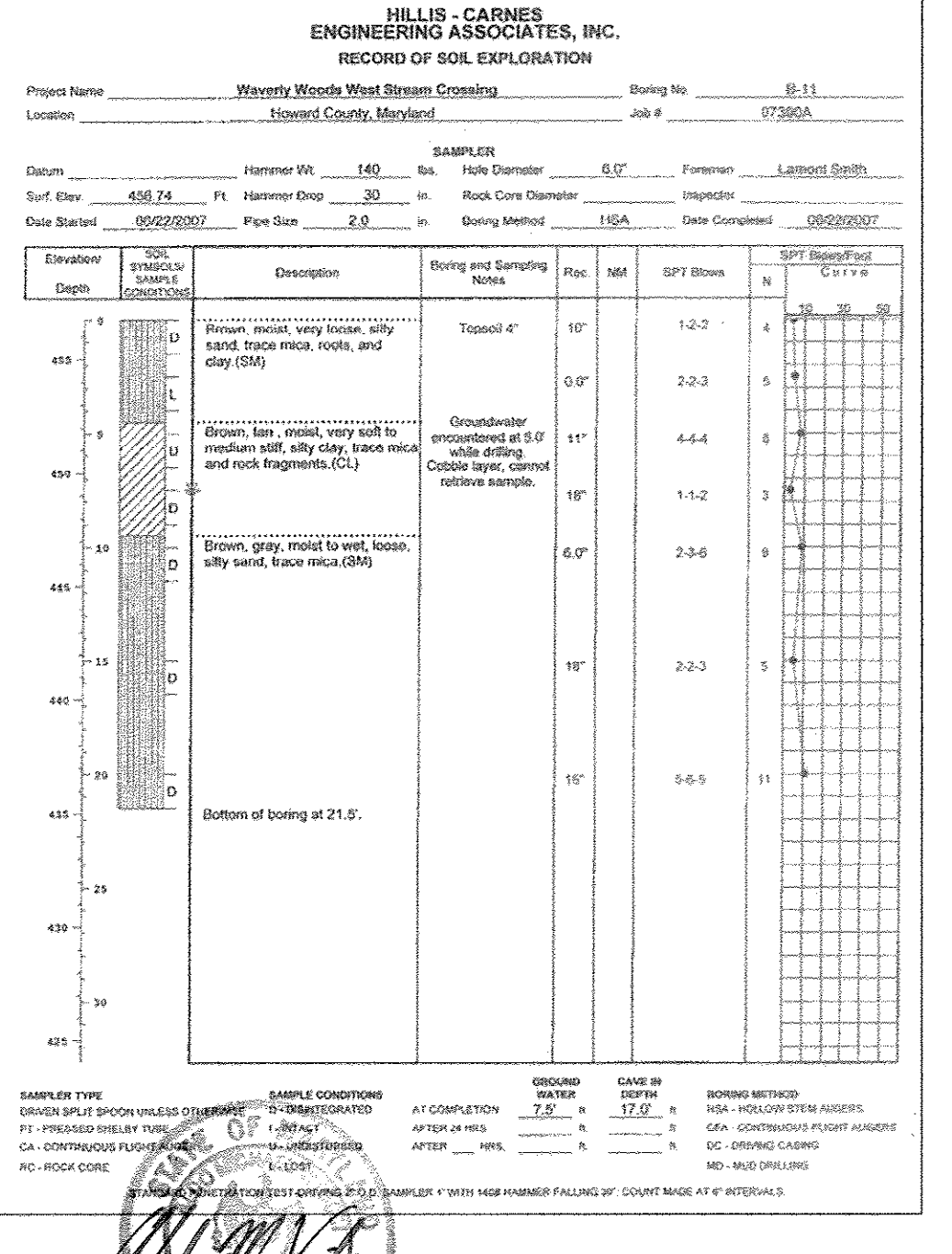
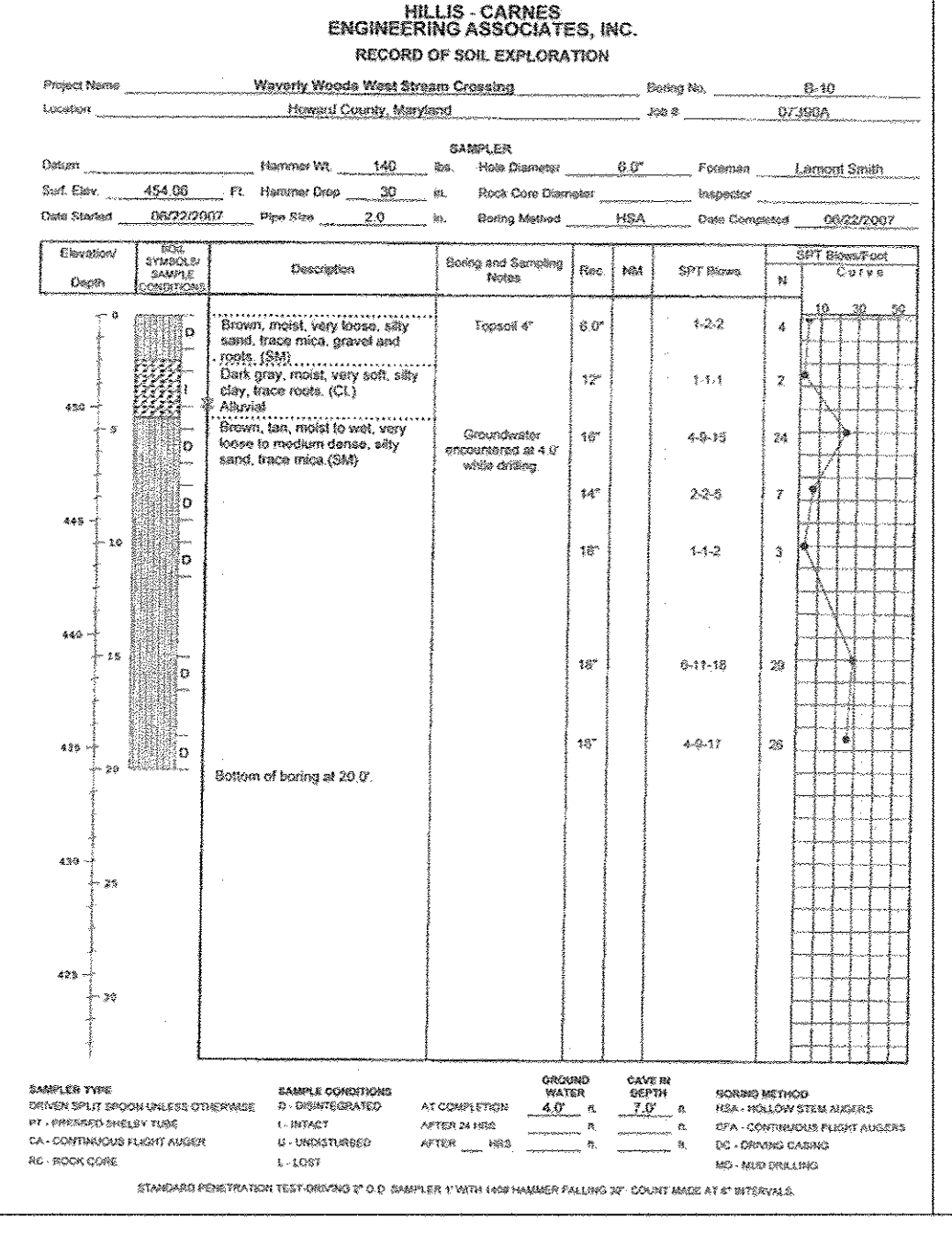
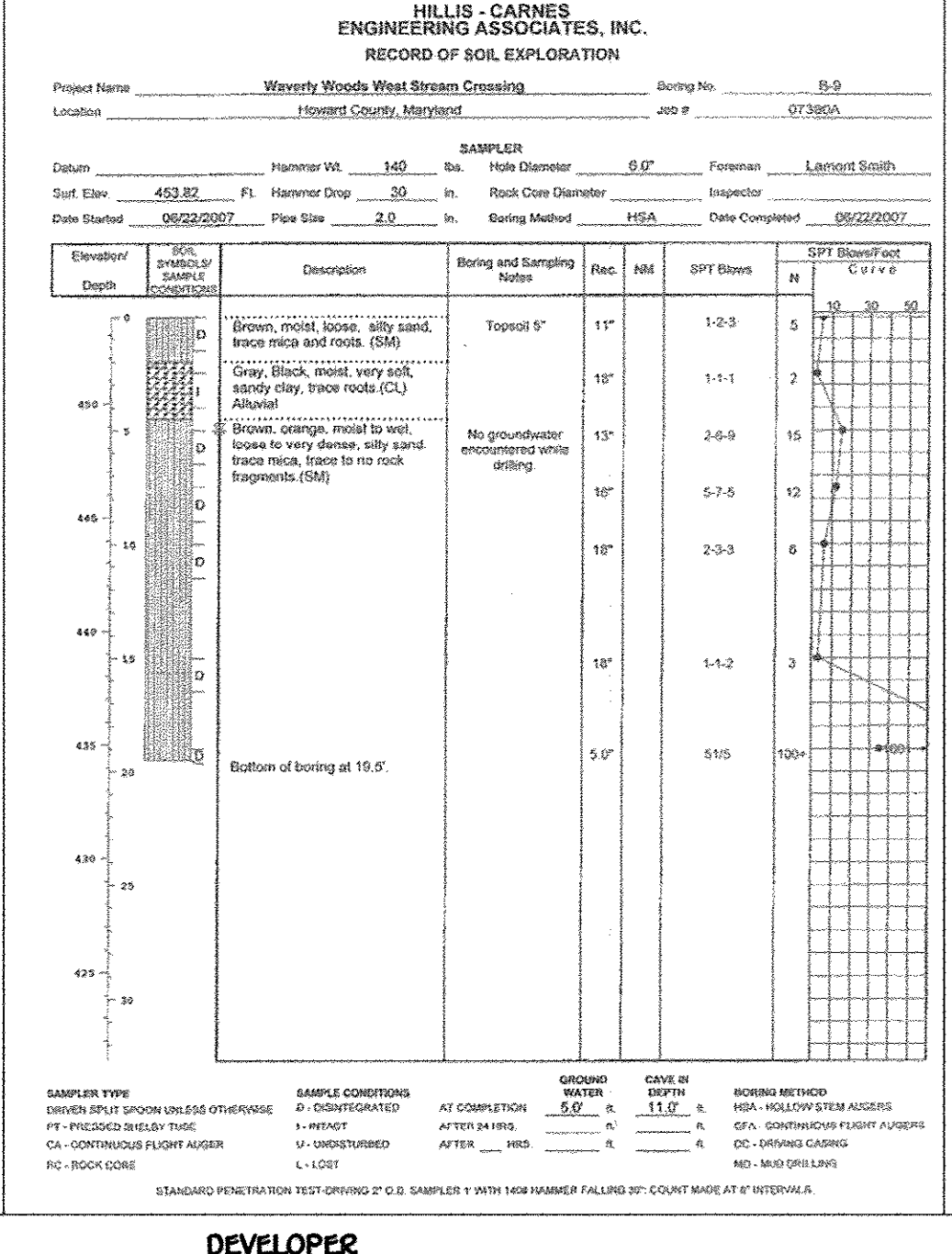
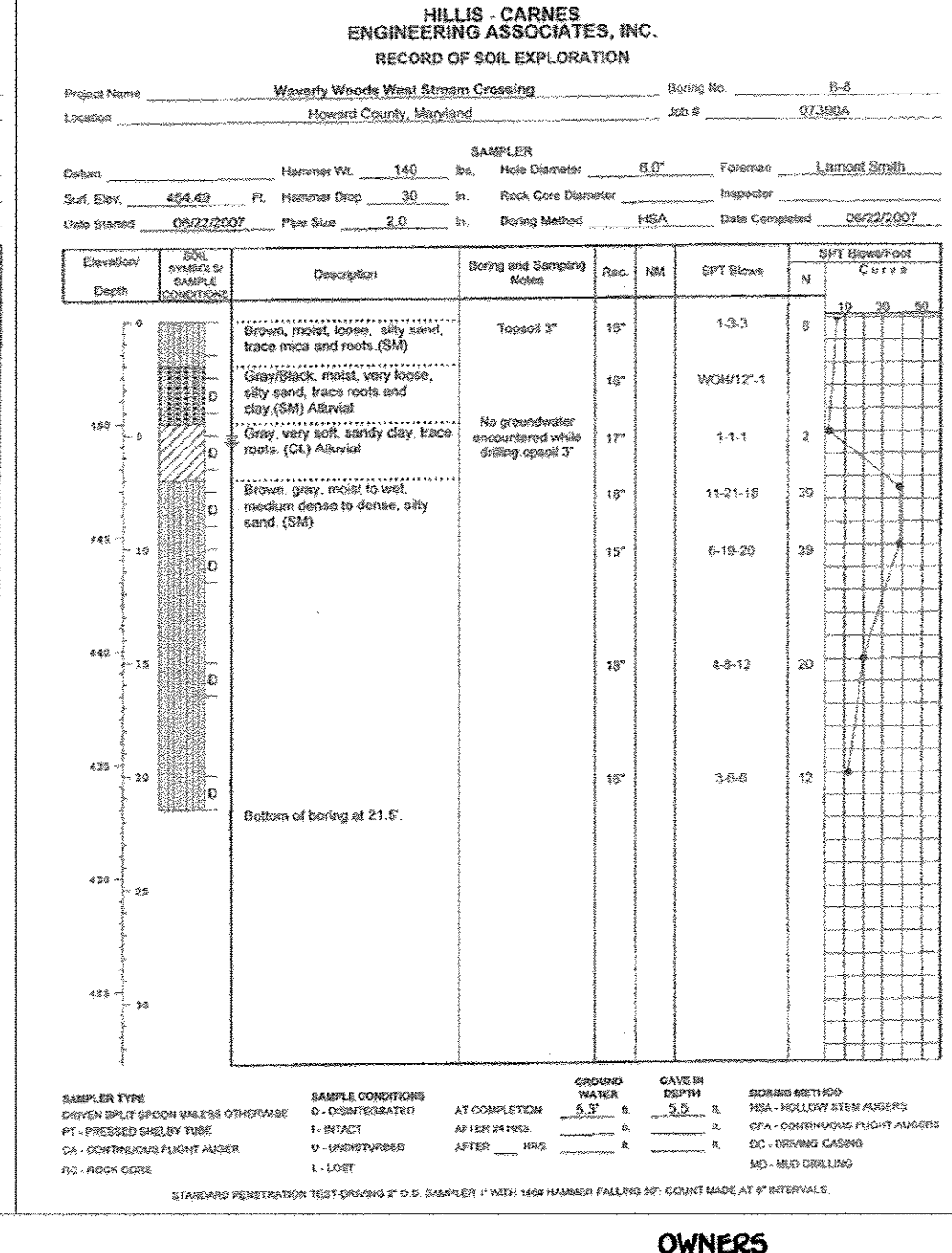
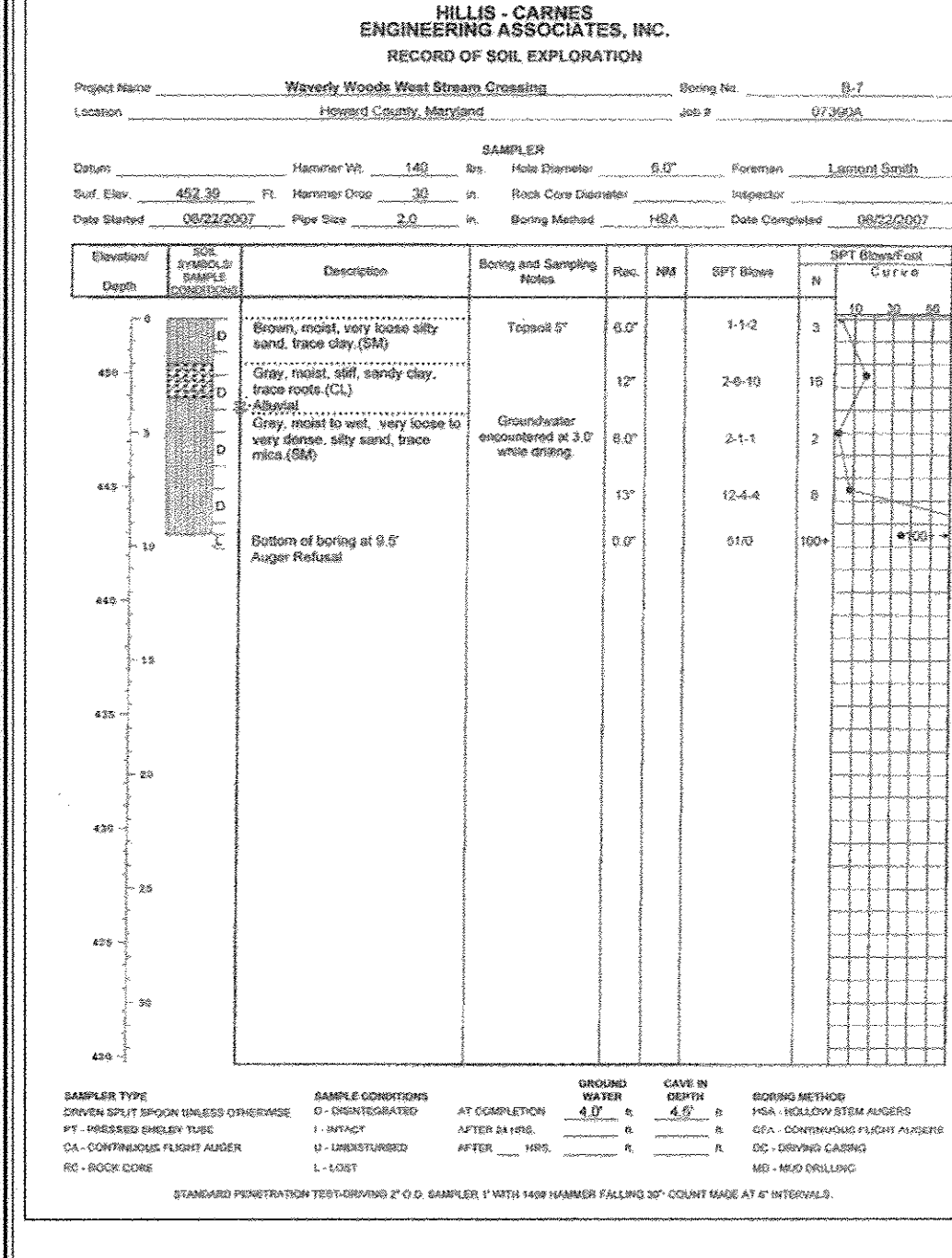
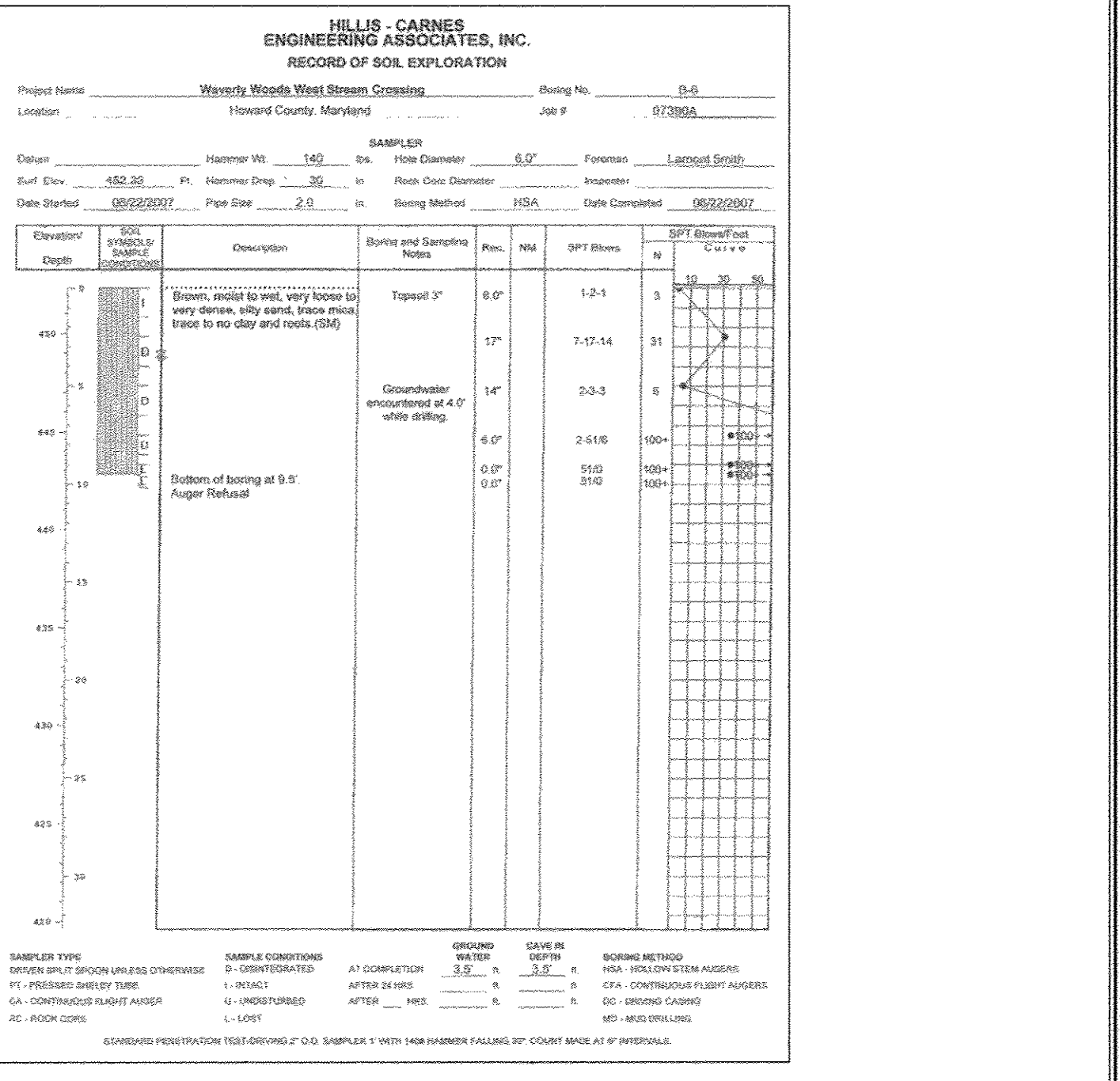
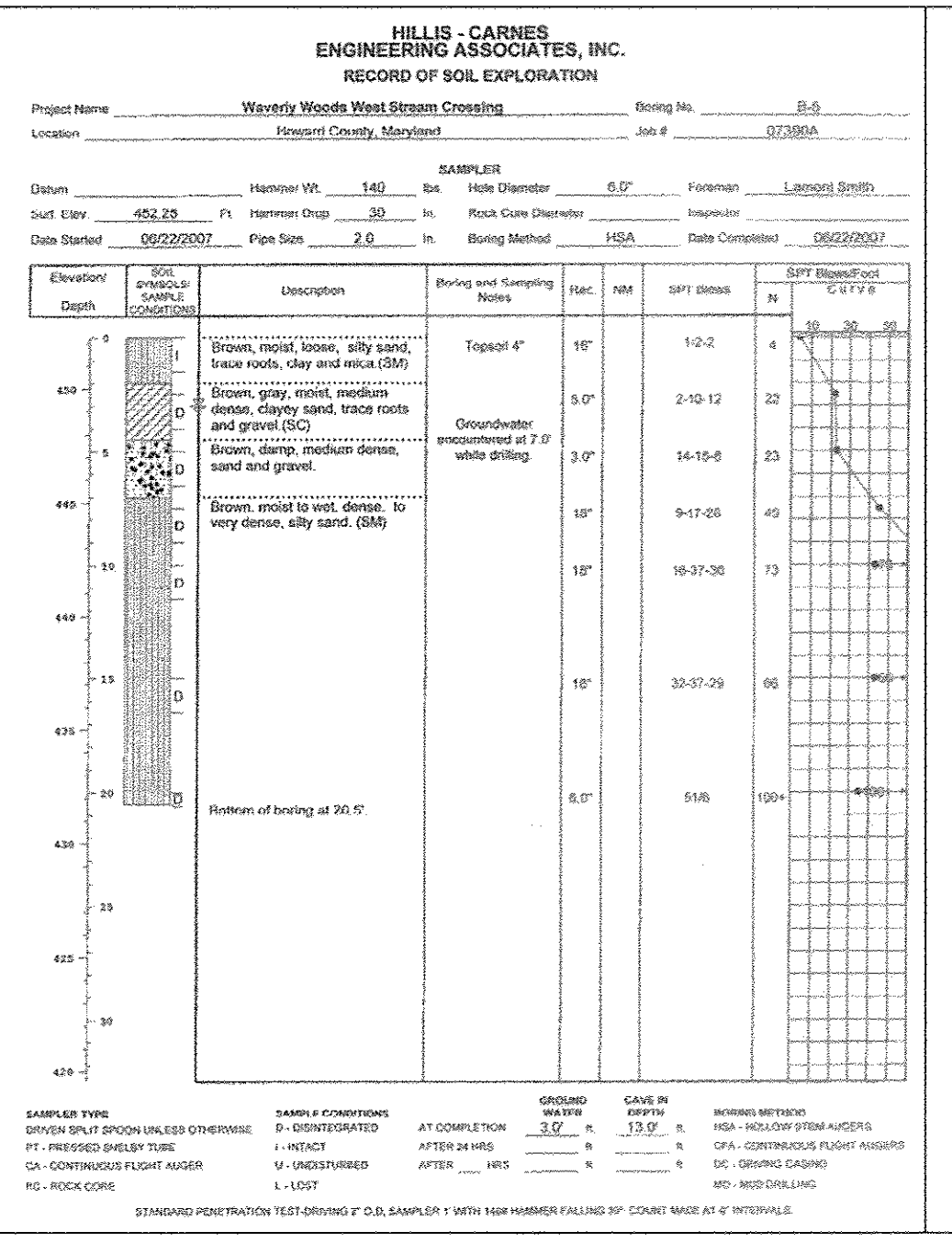
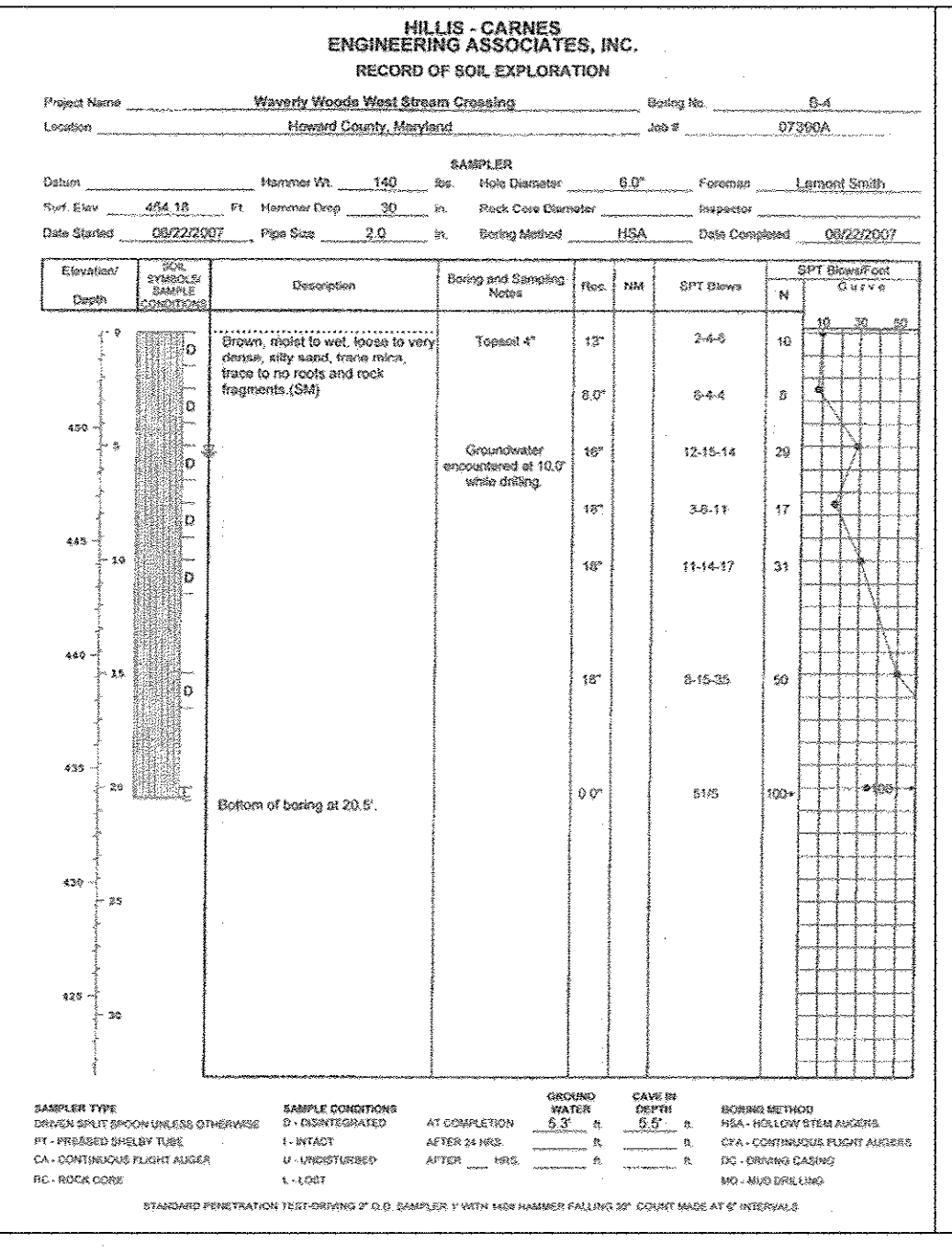
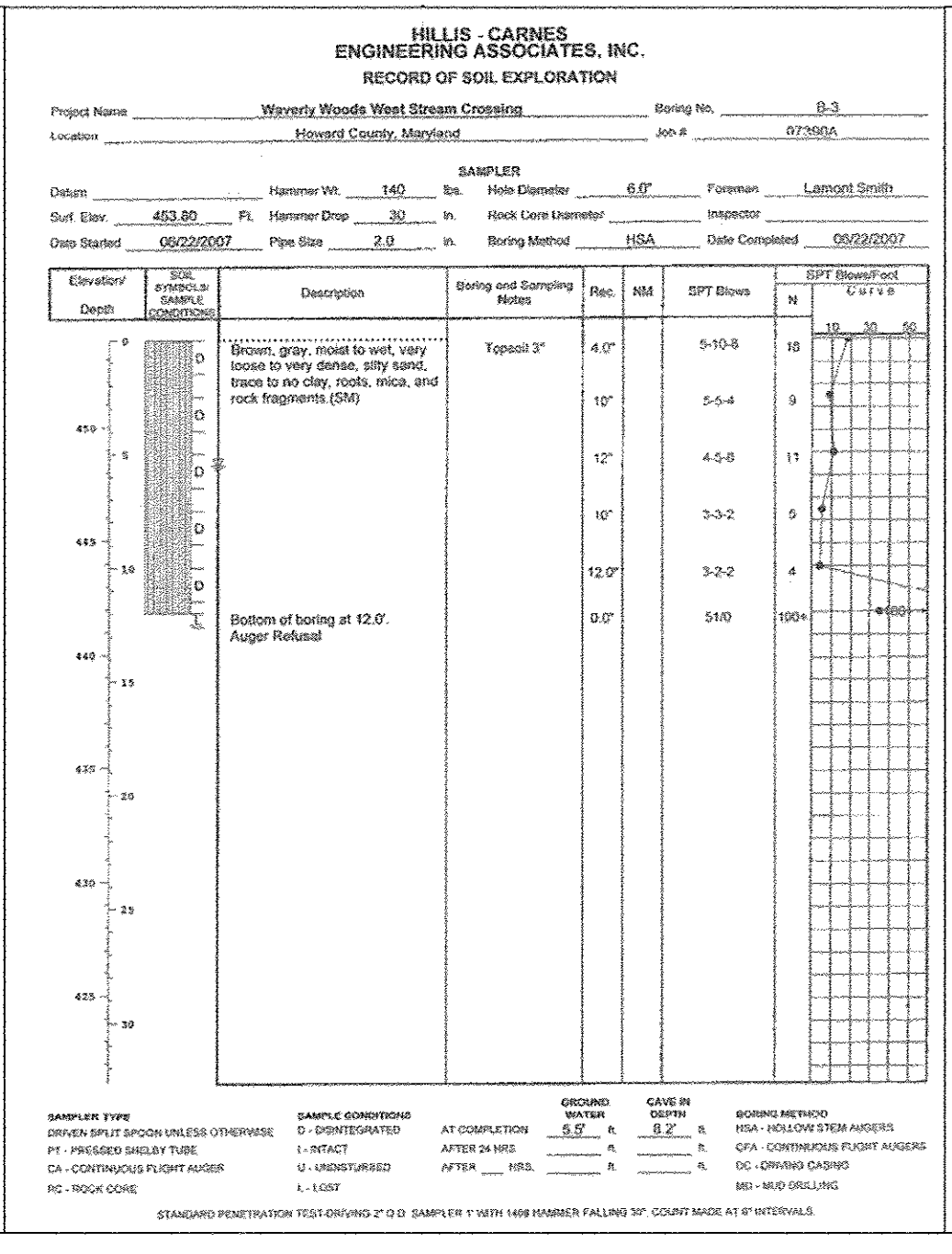
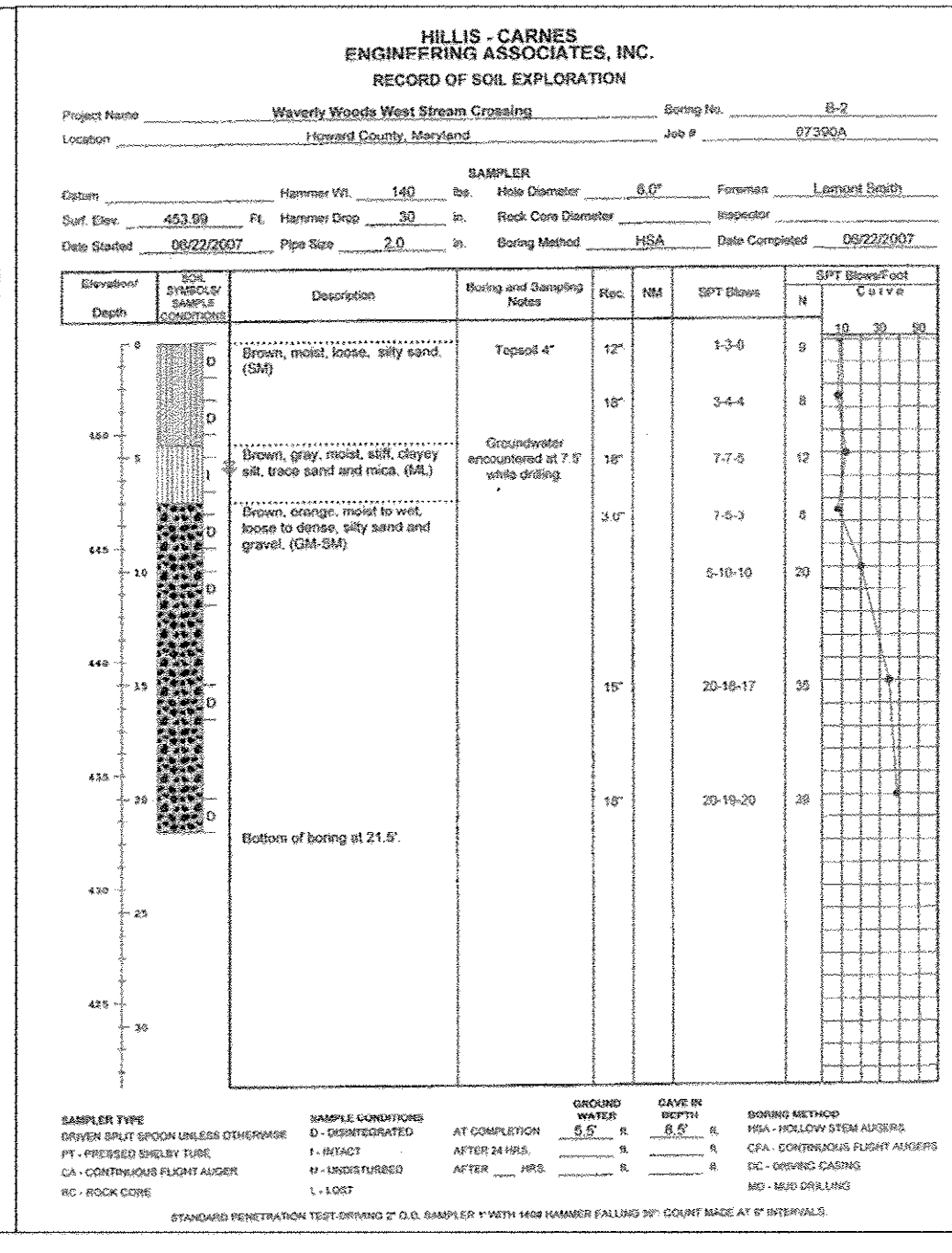
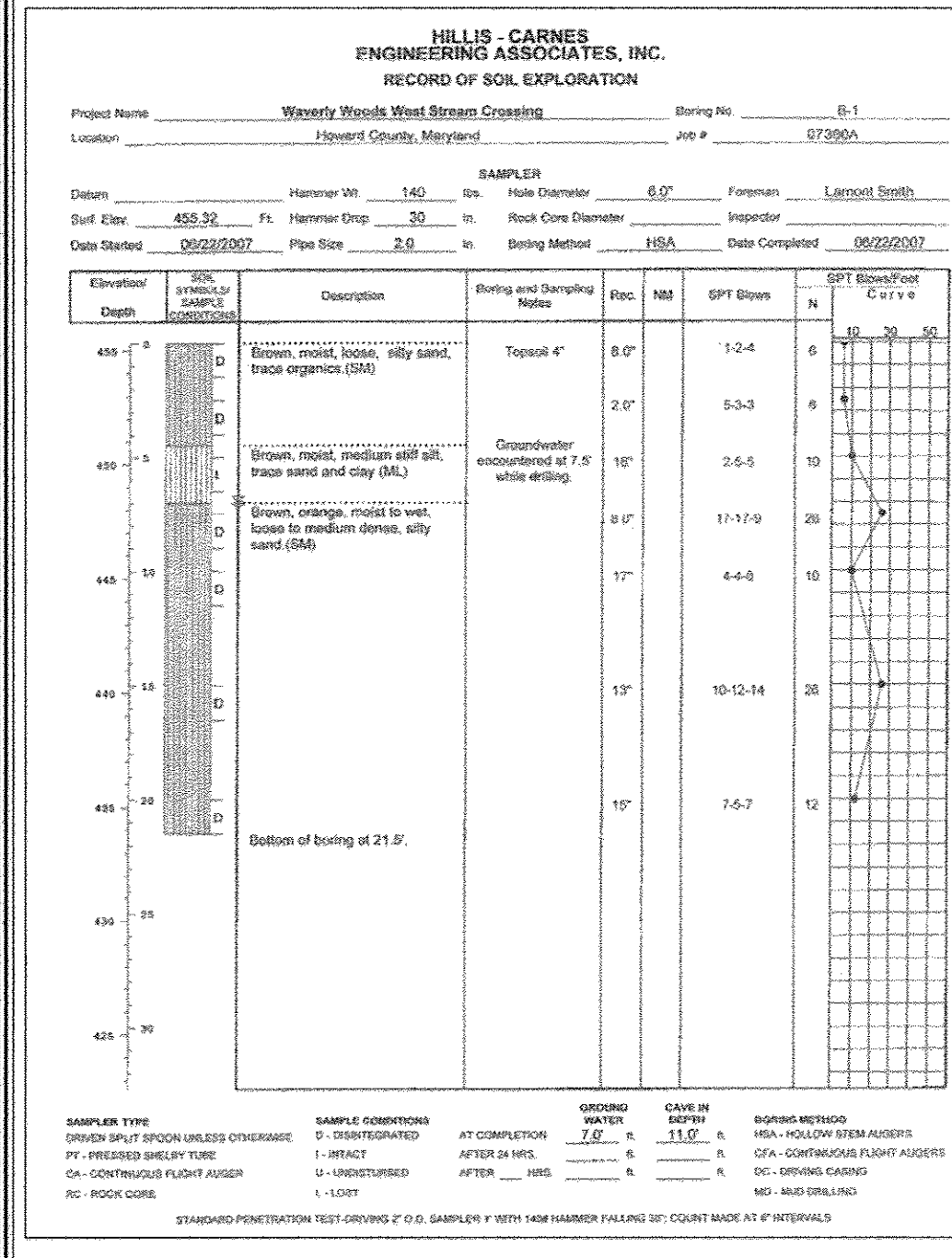




Approved: Department of Public Works  
Date: 9-27-09

Approved: Department of Planning And Zoning  
Date: 9/29/09

Approved: Chief, Development Engineering Division  
Date: 8/6/09



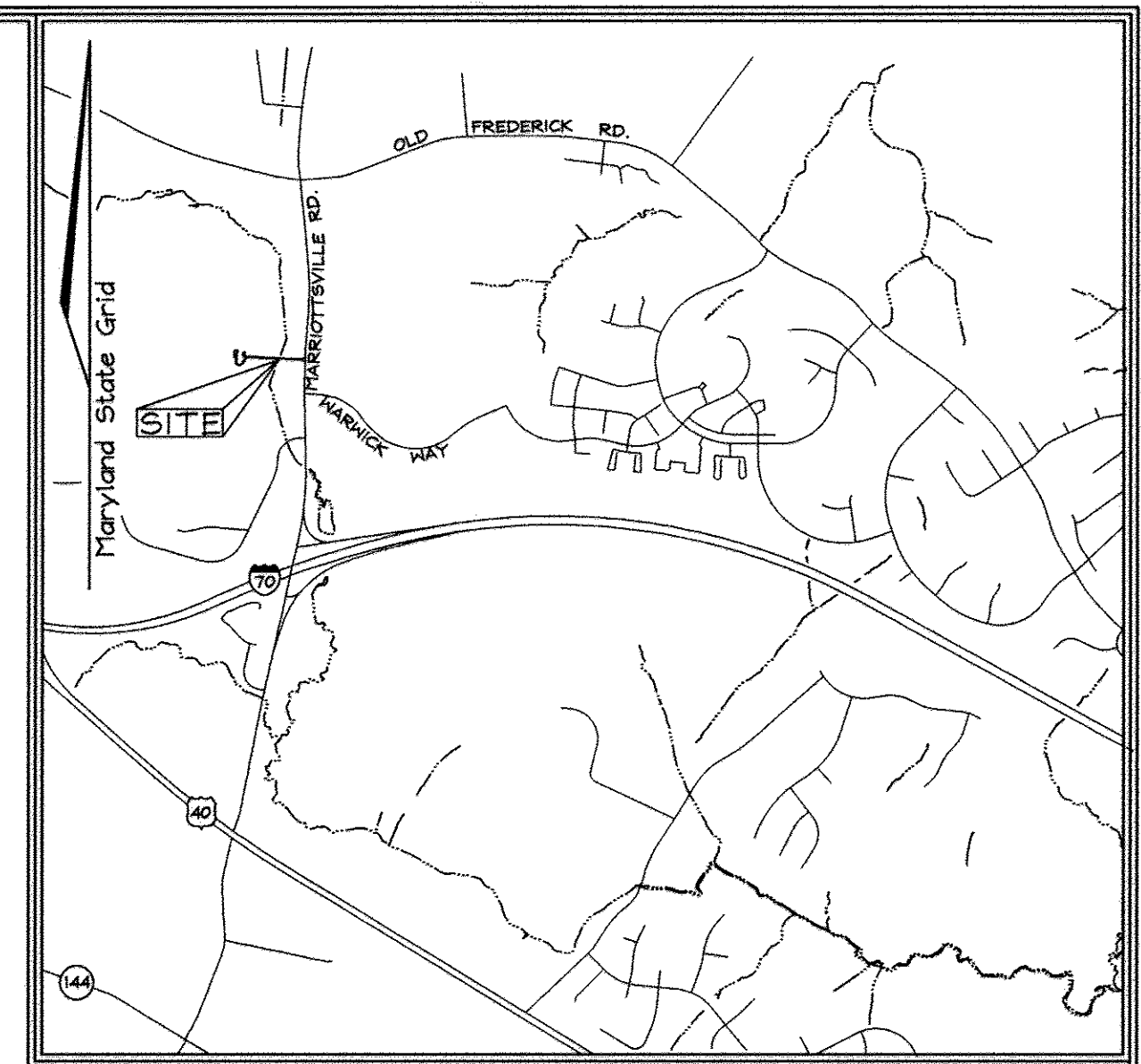
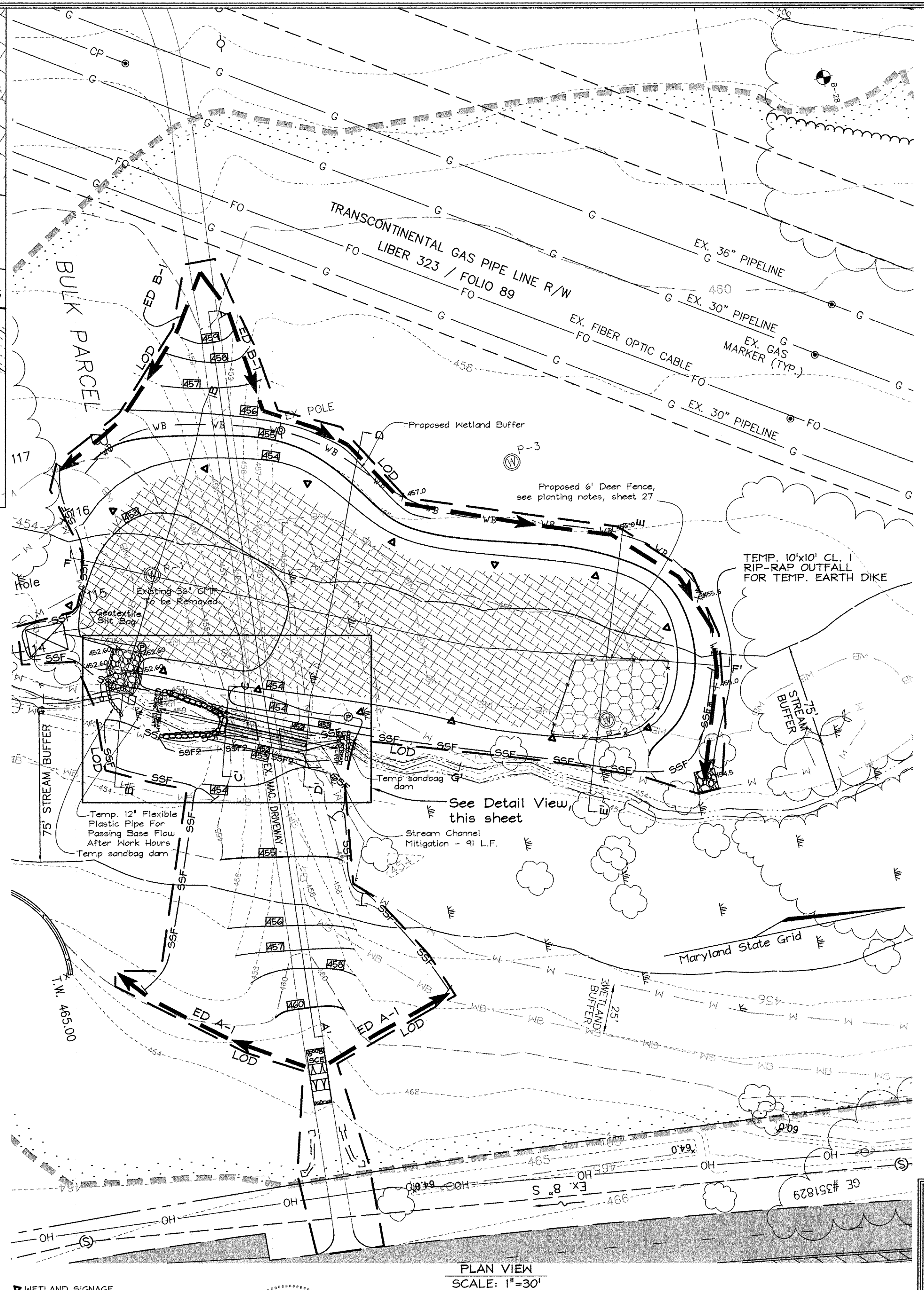
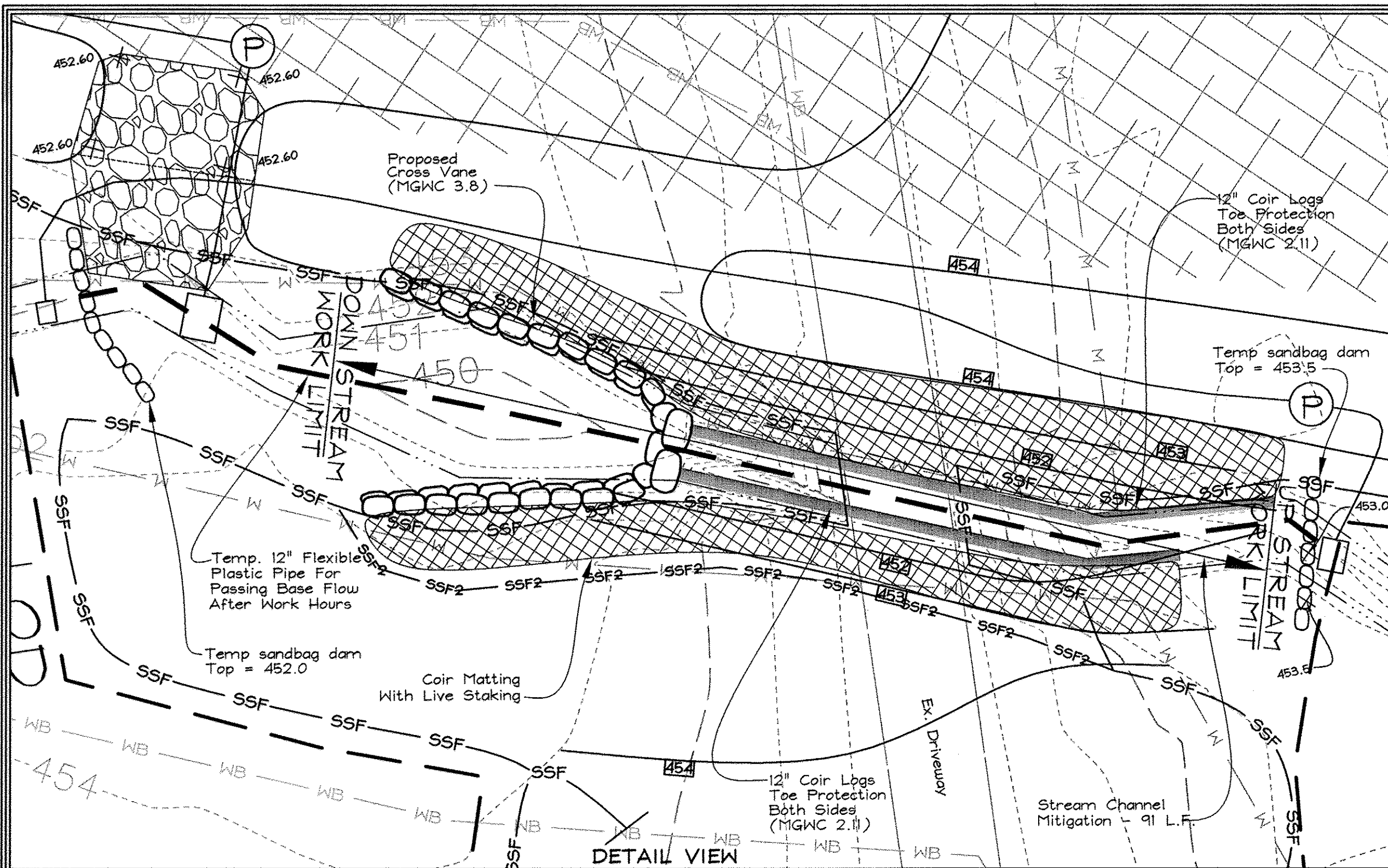
FISHER, COLLINS & CARTER, INC.  
CIVIL ENGINEERING CONSULTANTS & LAND SURVEYORS  
CENTRAL SQUARE OFFICE PARK - 1075 BALTIMORE NATIONAL PIKE  
ELLCOTT CITY, MARYLAND 21042  
410-461-2955

OWNERS  
WAVERLY WOODS DEVELOPMENT CORPORATION,  
HOLE IN THE DOUGHNUT, LLC, &  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
ELLCOTT CITY, MARYLAND 21042  
(410-367-0422)

DEVELOPER  
WAVERLY WOODS DEVELOPMENT CORP.  
C/O LAND DESIGN AND DEVELOPMENT, INC.  
5300 DORSEY HALL DRIVE, SUITE 102  
ELLCOTT CITY, MARYLAND 21042  
(410-367-0422)

Professional Engineer Seal  
Date: 7-27-09





**PLAN NARRATIVE**

The proposed wetland creation project will be designed to replace lost functions and values due to the unavoidable wetland impacts created as a result of construction of road widening along Marriottsville Road (Permit 20090925 / 04-NT-3085). The wetland impacts are 18,666 square feet (sf) of palustrine emergent (PEM) wetland, plus 761 sf of palustrine scrub/shrub (PSS) wetland. In addition, 1930 sf of emergent wetland is temporarily impacted within the mitigation site. The proposed wetland creation project will compensate for these impacts by creating approximately 22,120 sf of wetland, for a 1:1 replacement for the PEM wetland, a 2:1 replacement for the PSS wetland impacts, and a 1:1 restoration of the temporary PEM impact. The final required mitigation amount was reached by taking the initial area of mitigation required (18,666 + (761\*2) = 20,188), and adding 1,930 sf to compensate for the area of existing wetland within the proposed mitigation site.

The wetland creation will be located in an existing cropland and within an area of an existing culvert and driveway crossing, which are to be removed. This site was chosen due to its close proximity to the impact area, the fact that it lies within a riparian area adjacent to the stream, and appears to have ideal hydrologic and topographic attributes for successful creation.

A soils investigation of the site revealed redoxymorphic features including depletions and concentrations present within 15 feet of the surface. It is expected that this overburden may be removed to expose the underlying hydric soil profile and create the requisite seasonal hydrology likely to sustain hydrophytes. Surface water will be sequestered within the depressions created by grading.

See Sheet 27 for Wetland Mitigation Performance Standards (Construction Note number 17).

The vegetative establishment of palustrine emergent wetland species within the mitigation basin will be accomplished through the application of a wetland seed mix immediately following finish grading. This seed mix will include wetland species common to wetland impact areas including *Juncus effusus* (FACN) and *Carex vulpinoidea* (OBL). Palustrine scrub/shrub plantings will include *Cornus amomum* (FACN), *Viburnum dentatum* (FAC) and *Salix nigra* (FACN), which will provide a native mix of indigenous species common to this area.

**Soil Profile Descriptions by W. Lee Daniels, PhD, Professional Soil Scientist July 15, 2009**

TEST PIT #1 @ P-1	TEST PIT #2 @ P-2	TEST PIT #3 @ P-3
Ap 10YR 4/3 LDM	Ap 10YR 4/3 LDM	Ap 10YR 4/3 LDM
A 10YR 5/4 LDM FAINT REDOX	Bw 10YR 6/8 LDM	Ap 2 10YR 4/4 LDM
Bt 10YR 4/2.5 LDM/CLAY LDM w/ 5YR 4/6 CONCENTRATIONS	C 7.5YR 5/6 VERY GRAVELLY LDM w/ 5YR 5/2 AND 5YR 6/2 CONCENTRATIONS	Bc 7.5YR 6/8 AND 7.5 YR 6/6 VERY GRAVELLY LDM
Btg 7.5YR 5/6 SANDY CLAY LDM w/ 5YR 6/1 CONCENTRATIONS	Cg 10Y 6/1 VERY GRAVELLY SILT LDM	

**GROUNDWATER ELEVATION MONITORING TABLE**

Date	Well P-1 2.43' Casing Ht. 456.74 Casing Elev. Reading NL	Well P-2 2.43' Casing Ht. 457.59 Casing Elev. Reading NL	Well P-3 1.6' Casing Ht. 450.69 Casing Elev. Reading NL
2009 April 23	2.94' 453.8	3.57' 454.02	2.49' 456.20
2009 April 30	4.25' 452.54	4.6' 452.99	4.38' 454.31
2009 May 14	4.23' 452.51	4.57' 453.02	4.0' 454.69
2009 May 28	3.2' 453.54	3.8' 453.79	3.1' 455.59
2009 June 16	4.37' 452.37	4.62' 452.97	4.08' 454.61

**ENGINEERS CERTIFICATE**

I hereby certify that this plan for sediment and erosion 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: *Michael Taylor* Date: 4/30/10

APPROVED: HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS  
Chief, Bureau of Highways Date: 5-14-10

APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING & ZONING  
Chief, Division of Land Development Date: 5/19/10  
Chief, Development Engineering Division Date: 5/16/10

**LEGEND**

- EXISTING 1 FOOT CONTOUR
- EXISTING 5 FOOT CONTOUR
- EXISTING WETLAND LIMIT
- EXISTING WETLAND BUFFER
- EXISTING STREAM
- EXISTING STREAM BUFFER
- TREE LINE
- FLOODPLAIN (100 YEAR)
- LIMIT OF DISTURBANCE (LOD) (COINCIDENT WITH SSF)
- SSF SUPER SILT FENCE
- PROPOSED 1 FOOT CONTOUR
- PROPOSED 5 FOOT CONTOUR
- MONITORING WELL LOCATION
- COIR MATTING / LIVE STAKING
- WETLAND SEED MIX AREA
- SHRUB PLANTING AREA
- RIP RAP
- CROSS VANE BOULDERS
- EARTH DIKE
- SSF2 SUPER SILT FENCE, PHASE 2
- WETLAND SIGNAGE

**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 ALL 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 W. Taylor* Date: 5/10/10



**PROFESSIONAL CERTIFICATION**

I 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. 434689, Expiration Date: 07/08/11.

**OWNER/DEVELOPER**  
WAVERLY WOODS DEVELOPMENT CORP.  
c/o Land Design and Development, Inc.  
5300 Dorsey Hall Drive, Suite 102  
Ellicott City, MD 21042  
(443) 367-0422

**REVISED**

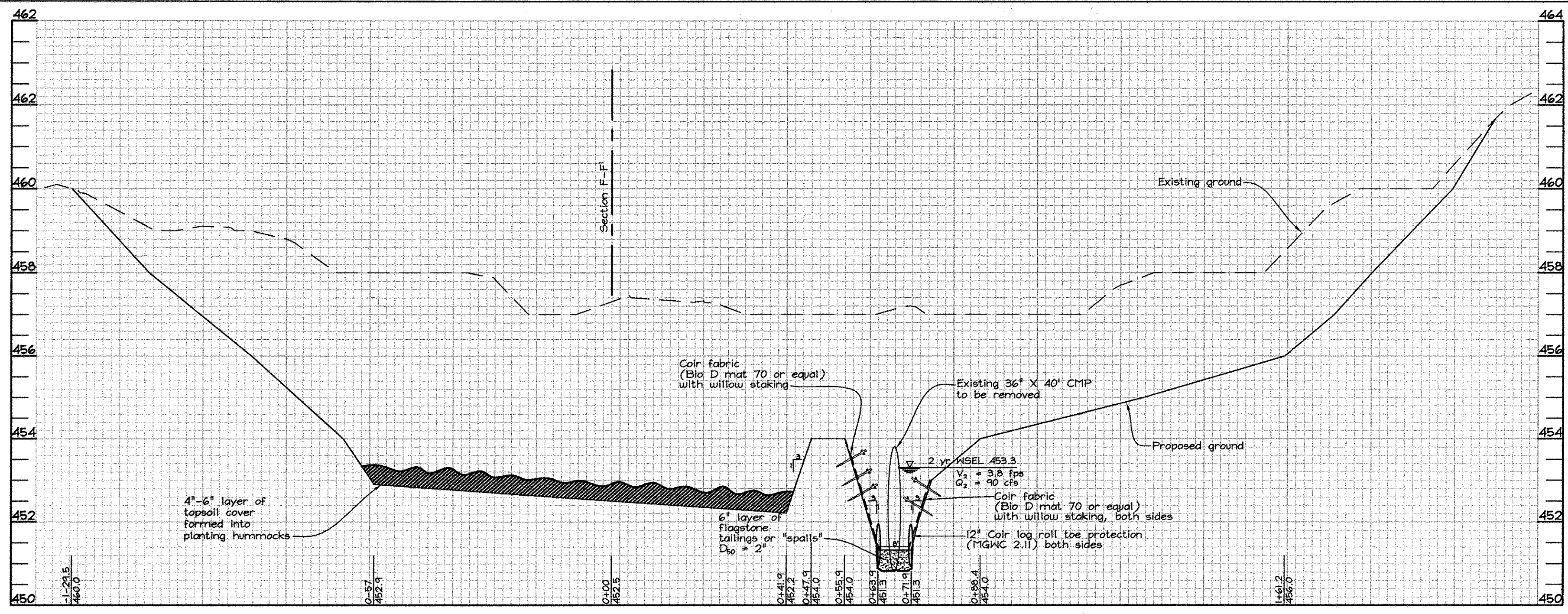
**GTW's WAVERLY WOODS Section 14 Wetland Mitigation Erosion and Sediment Control Plan**

TAX MAP 16 PARCELS 120, 221, & p/o 249  
3rd ELECTION DISTRICT HOWARD COUNTY, MARYLAND

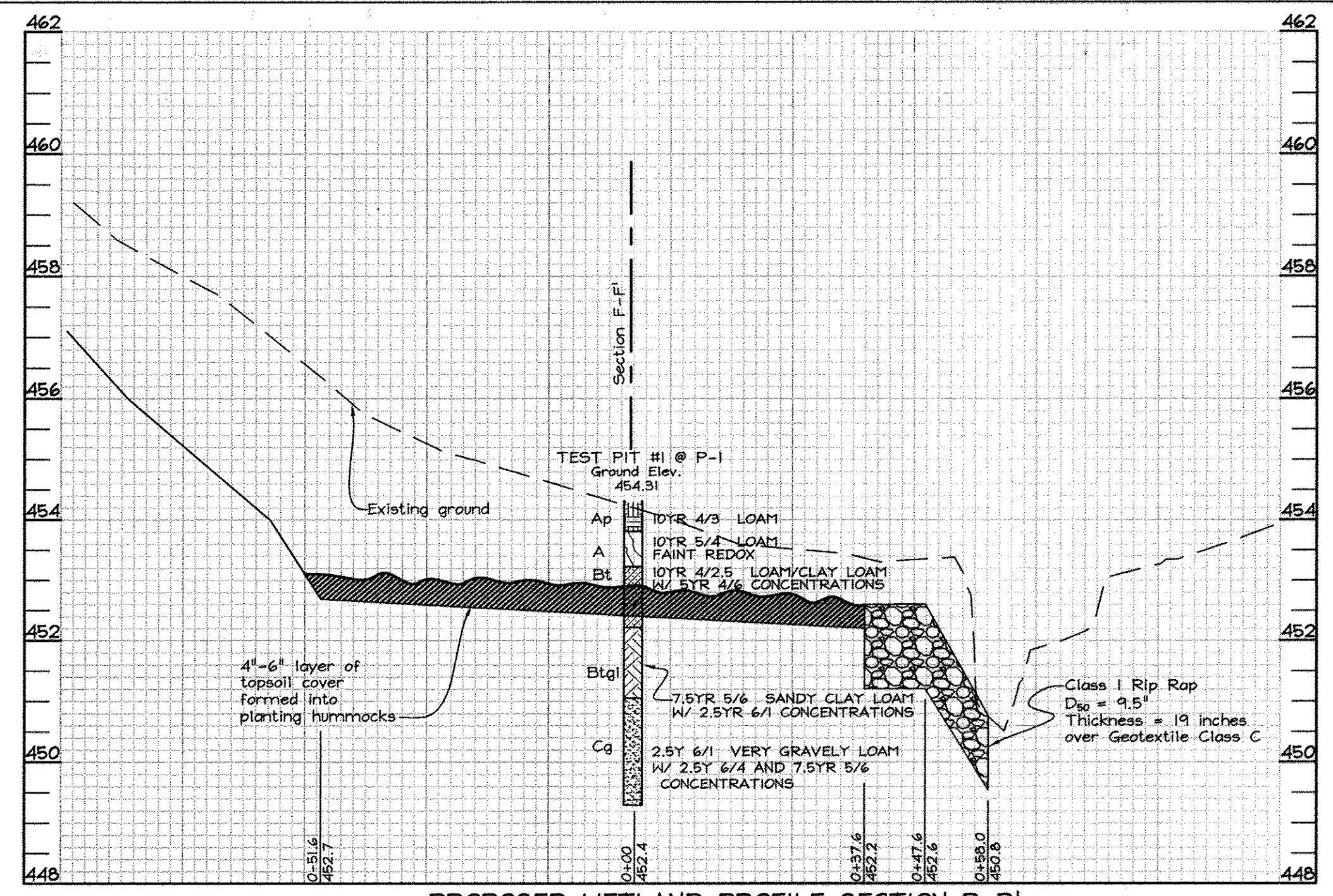
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DRAWN BY: SMM  
CHECKED BY: SLH  
SCALE: As shown  
DATE: Apr. 30, 2010  
W.O. No.: 2000  
SHEET No. 25 OF 27

**EXPLORATION RESEARCH, INC.**  
ENVIRONMENTAL CONSULTANTS  
6300 BOWDEN LANE  
FREDERICK, MARYLAND 21704  
TEL: (410) 587-6200 FAX: (410) 799-1888

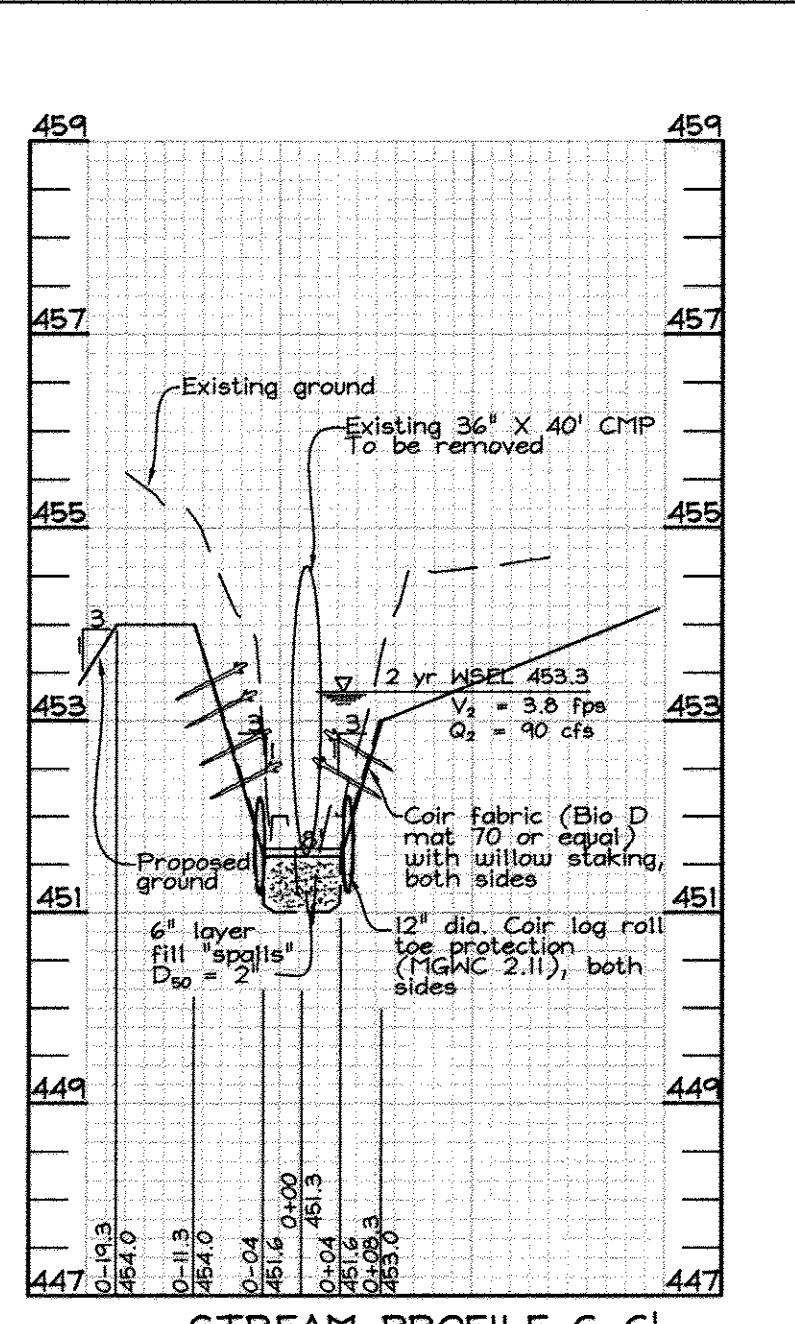




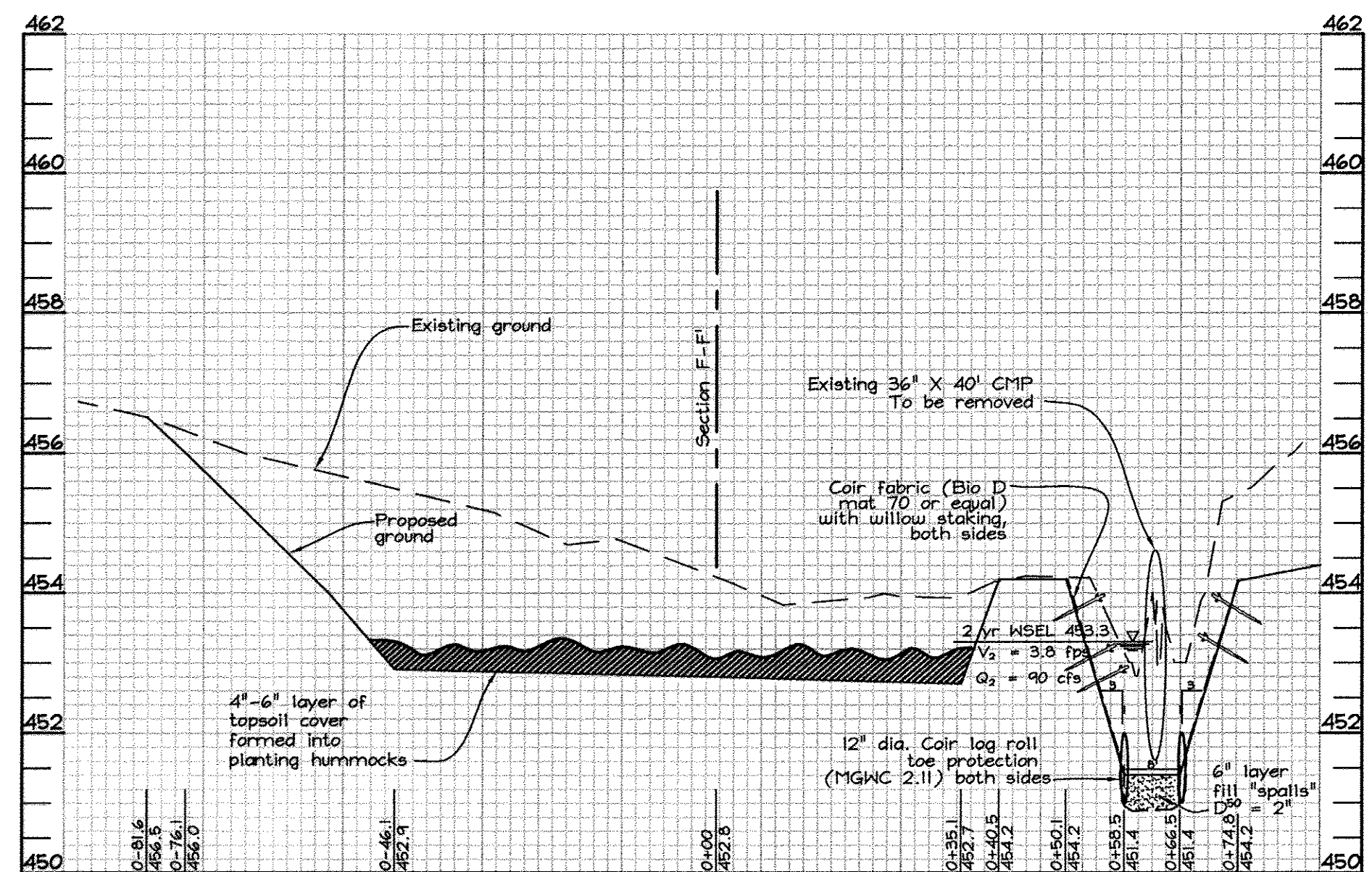
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Vertical: 1"=2'



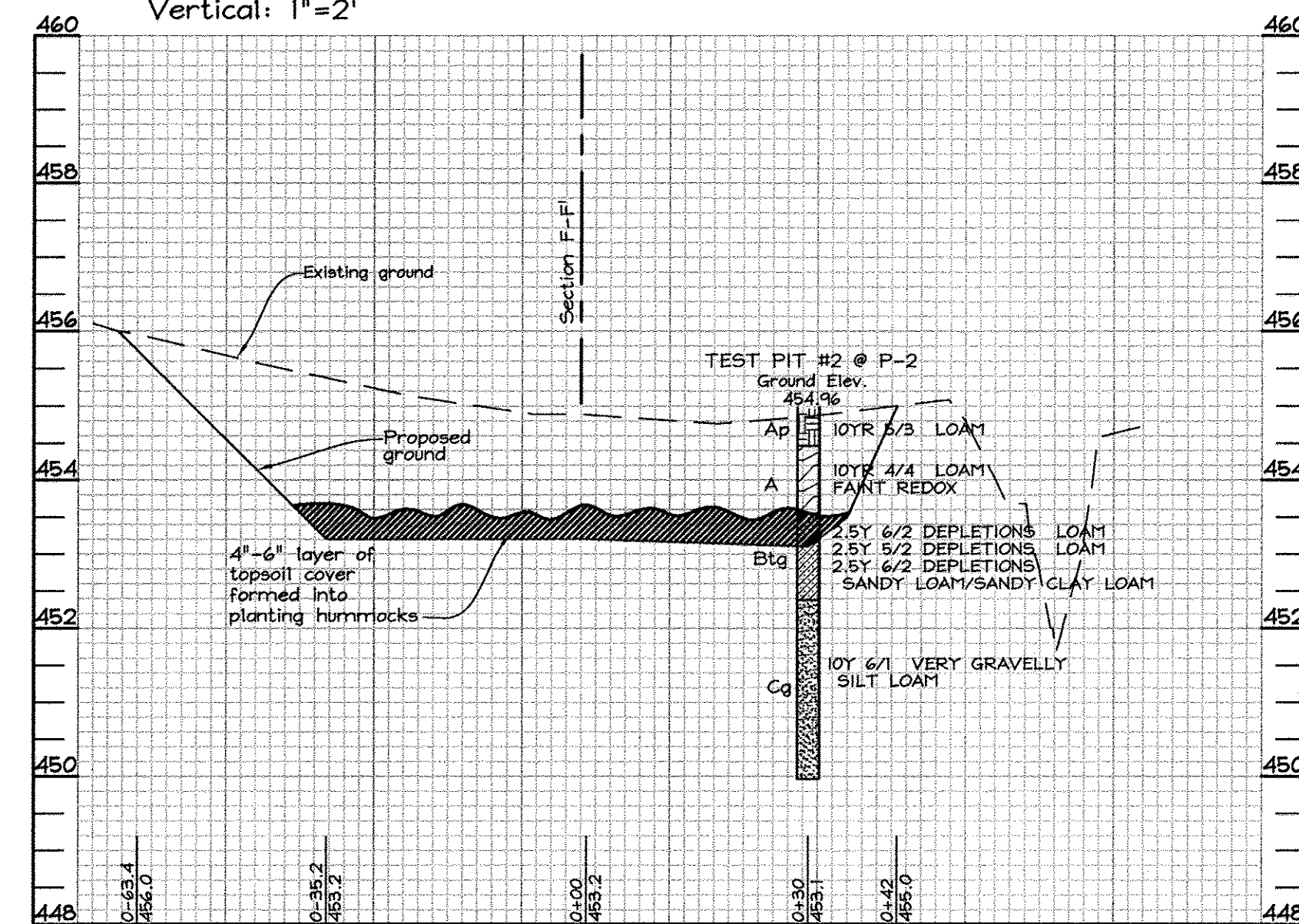
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SCALE: Horizontal: 1"=20'  
Vertical: 1"=2'



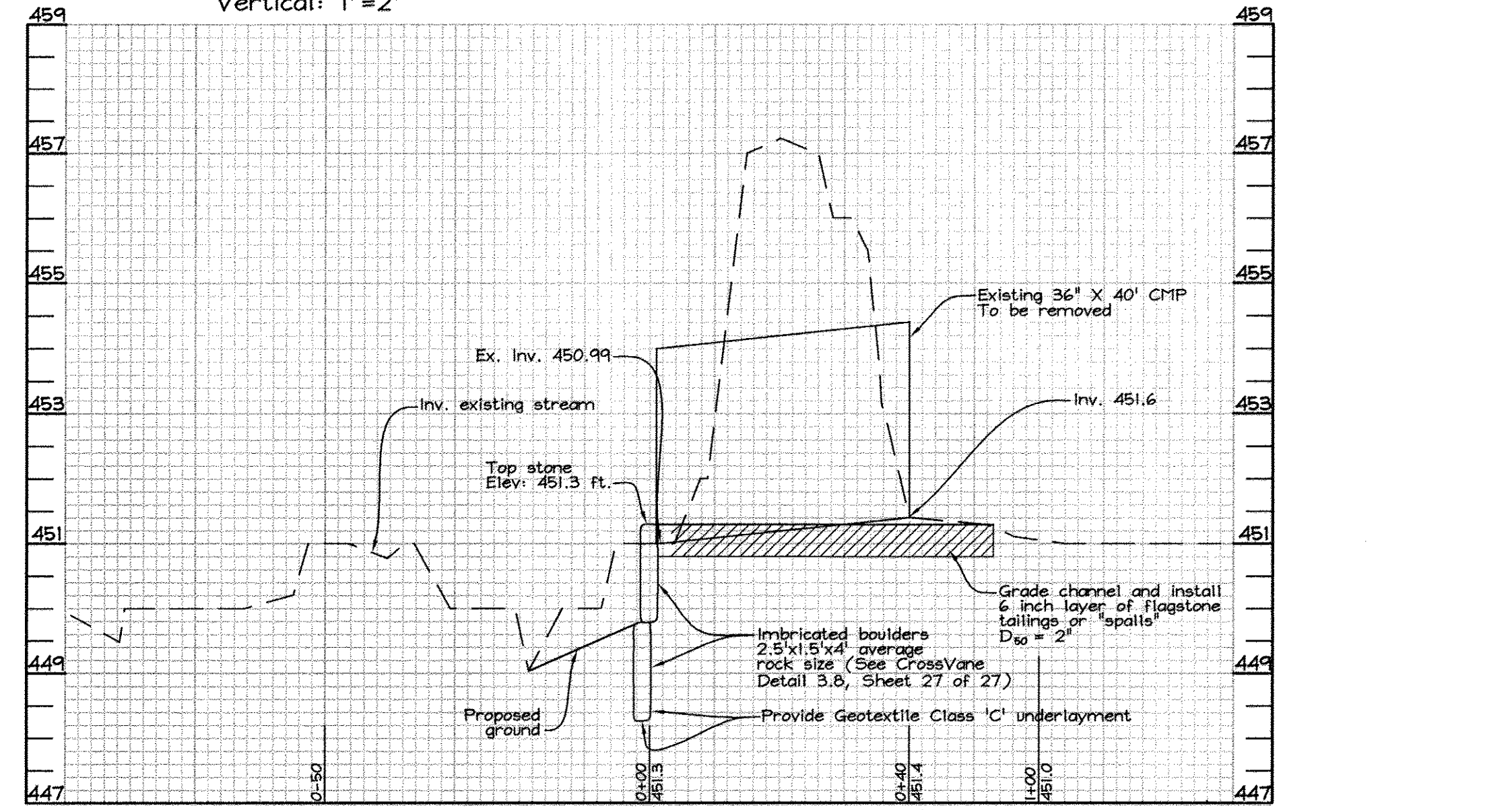
STREAM PROFILE C-C'  
SCALE: Horizontal: 1"=20'  
Vertical: 1"=2'



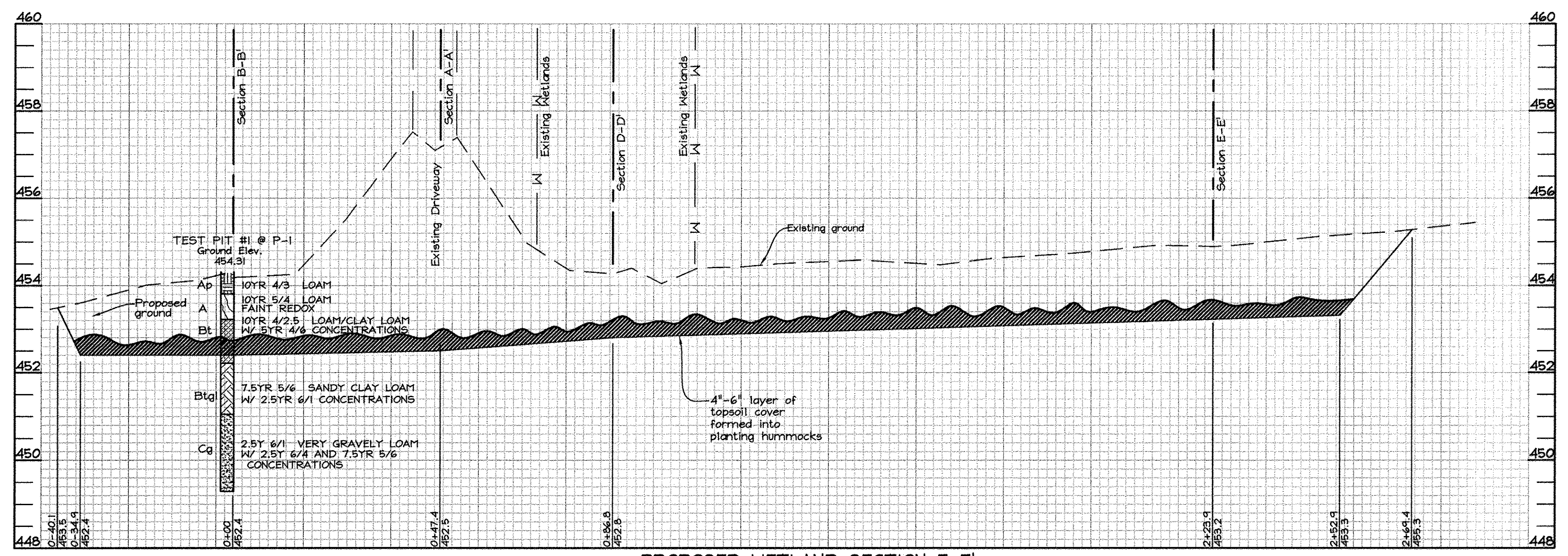
PROPOSED WETLAND AND EXISTING STREAM SECTION D-D'  
SCALE: Horizontal: 1"=20'  
Vertical: 1"=2'



PROPOSED WETLAND AND EXISTING STREAM SECTION E-E'  
SCALE: Horizontal: 1"=20'  
Vertical: 1"=2'



EXISTING STREAM SECTION G-G'  
SCALE: Horizontal: 1"=20'  
Vertical: 1"=2'



PROPOSED WETLAND SECTION F-F'  
SCALE: Horizontal: 1"=20'  
Vertical: 1"=2'

NOTE: Final grades shown at cross-section stations for wetland mitigation area are for subgrade beneath 4-6" of topsoil.

**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 ALL 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: [Signature]  
DATE: 4/30/10

**ENGINEER'S CERTIFICATE**  
I CERTIFY THAT THIS PLAN FOR SEDIMENT AND EROSION 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: [Signature]  
DATE: 4/30/10

APPROVED: HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS  
Chief, Bureau of Highways: [Signature]  
Date: 5-14-10

APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING & ZONING  
Director: [Signature]  
Chief, Division of Land Development: [Signature]  
Chief, Development Engineering Division: [Signature]  
Date: 5/10/10



PROFESSIONAL CERTIFICATION  
I 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. #34689, Expiration Date: 07/08/11.  
Signature: [Signature]  
DATE: 5/10/10

OWNER/DEVELOPER  
WAVERLY WOODS DEVELOPMENT CORP.  
c/o Land Design and Development, Inc.  
5300 Dorsey Hall Drive, Suite 102  
Ellicott City, MD 21042  
(443) 367-0422

REVISED  
**GTW's WAVERLY WOODS**  
Section 14  
Wetland Mitigation Erosion and Sediment Control Plan  
TAX MAP 16 PARCELS 120, 221, & p/o 249  
3rd ELECTION DISTRICT HOWARD COUNTY, MARYLAND

**EXPLORATION RESEARCH, INC.**  
ENVIRONMENTAL CONSULTANTS  
1500 HOWARD LANE  
BELTSVILLE, MARYLAND 20715  
TEL: (410) 587-8210 FAX: (410) 798-1868

DESIGN BY: SLH  
DRAWN BY: SHM  
CHECKED BY: SLH  
SCALE: As shown  
DATE: Apr. 30, 2010  
P.L.O. No.: 2000  
SHEET No.: 26 OF 27



**BEST MANAGEMENT PRACTICES**

**FOR WORKING IN NONTIDAL WETLANDS, WETLAND BUFFERS, WATERWAYS, AND 100-YEAR FLOODPLAINS**

1. NO EXCESS FILL, CONSTRUCTION MATERIAL, OR DEBRIS SHALL BE STOCKPILED OR STORED IN NONTIDAL WETLANDS, NONTIDAL WETLAND BUFFERS, WATERWAYS, OR 100 YEAR FLOODPLAIN.
2. PLACE MATERIALS IN A LOCATION AND MANNER WHICH DOES NOT ADVERSELY IMPACT SURFACE OR SUBSURFACE WATER FLOW INTO OR OUT OF NONTIDAL WETLANDS, NONTIDAL WETLAND BUFFERS, WATERWAYS, OR THE 100-YEAR FLOOD PLAN.
3. DO NOT USE THE EXCAVATED MATERIAL AS BACKFILL IF IT CONTAINS WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL OR ANY OTHER DELETERIOUS SUBSTANCE. IF ADDITIONAL BACKFILL IS REQUIRED, USE CLEAN MATERIAL FREE OF WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL, OR ANY OTHER DELETERIOUS SUBSTANCE.
4. PLACE HEAVY EQUIPMENT ON MATS OR SUITABLY OPERATE THE EQUIPMENT TO PREVENT DAMAGE TO NONTIDAL WETLANDS, NONTIDAL WETLAND BUFFERS, WATERWAYS, OR THE 100-YEAR FLOODPLAIN.
5. REPAIR AND MAINTAIN ANY SERVICEABLE STRUCTURE OR FILL SO THERE IS NO PERMANENT LOSS OF NONTIDAL WETLANDS, NONTIDAL WETLAND BUFFERS, OR WATERWAYS, OR PERMANENT MODIFICATION OF THE 100-YEAR FLOODPLAIN IN EXCESS OF THAT LOST UNDER THE ORIGINALLY AUTHORIZED STRUCTURE OR FILL.
6. RECTIFY ANY NONTIDAL WETLANDS, WETLAND BUFFERS, WATERWAYS OR 100-YEAR FLOODPLAIN TEMPORARILY IMPACTED BY ANY CONSTRUCTION.
7. ALL STABILIZATION IN THE NONTIDAL WETLAND AND NONTIDAL WETLAND BUFFER SHALL CONSIST OF THE FOLLOWING SPECIES: ANNUAL RYE GRASS (LOLIUM MULTIFLORUM) MILLET (SETARIA ITALICA) BARLEY (HORDEUM SPECIES) RYE (SECALE CEREALE)

THESE SPECIES WILL ALLOW FOR THE STABILIZATION OF THE SITE WHILE ALSO ALLOWING FOR THE VOLUNTARY REVEGETATION OF NATURAL WETLAND SPECIES. OTHER NON-PERSISTENT VEGETATION MAY BE ACCEPTABLE, BUT MUST BE APPROVED BY THE NONTIDAL WETLANDS AND WATERWAYS DIVISION. KENTUCKY 31 FESCUE SHALL NOT BE UTILIZED IN WETLAND OR BUFFER AREAS. THE AREA SHOULD BE SEEDED AND MULCHED TO REDUCE EROSION AFTER CONSTRUCTION ACTIVITIES HAVE BEEN COMPLETED.

8. AFTER INSTALLATION HAS BEEN COMPLETED, MAKE POST-CONSTRUCTION GRADES AND ELEVATIONS THE SAME AS THE ORIGINAL GRADES AND ELEVATIONS IN TEMPORARILY IMPACTED AREAS.
9. TO PROTECT AQUATIC SPECIES, IN-STREAM WORK IS PROHIBITED AS DETERMINED BY THE CLASSIFICATION OF THE STREAM  
USE 1/2 WATERS. IN STREAM WORK SHALL BE CONDUCTED DURING THE PERIOD MARCH 1 THROUGH JUNE 15, INCLUSIVE, DURING ANY YEAR.
10. STORMWATER RUNOFF FROM IMPERVIOUS SURFACES SHALL BE CONTROLLED TO PREVENT THE WASHING OF DEBRIS INTO THE WATERWAY.
11. CULVERTS SHALL BE CONSTRUCTED AND ANY RIPRAP PLACED SO AS NOT TO OBSTRUCT THE MOVEMENT OF AQUATIC SPECIES, UNLESS THE PURPOSE OF THE ACTIVITY IS TO IMPOUND WATER.

**PLANTING NOTES**

1. Riprap areas may be planted as soon as reasonable to do so. Late winter-early spring plantings are preferred. Earliest planting dates will vary from year to year but planting may generally begin as soon as the ground is no longer frozen. Alternate planting dates may be considered as condition warrants.
2. Soil amendments and fertilization recommendations will be made based upon the results of soil analysis for nitrogen, phosphorus, potassium, organic matter content and pH. If required, fertilizer will be provided using a slow release, soluble 16-8-8 analysis designed to last 5-8 years contained in polyethylene perforated bags such as manufactured by ADCO Works, P.O. Box 310 Halls, N.Y. 11429 or approved equal.
3. Plant materials will be planted in accordance with the Planting Distribution Diagram, Planting Details and plant schedule.
4. Plant material shall be nursery grown and inspected prior to planting. Plants not conforming to the American Standard for Nursery Stock specifications for size, form, vigor, or roots, or due to trunk wounds, breakage, desiccation, insect or disease must be replaced. Planting stock must be protected from desiccation at all times prior to planting. Materials held for planting shall be moistened and placed in cool shaded areas until ready for placement.
5. Newly planted trees may require watering at least once per week during the first growing season depending on rainfall in order to get established. The initial watering operation should allow for watering during installation to completely soak backfill material.
6. Planting holes should be excavated to a minimum diameter of 2.5 to 3 times the diameter of the root ball or container. Mechanical augering is preferred with scarification of the sides of each hole.
7. Mulch shall be applied in accordance with the diagram provided and shall consist of composted, shredded hardwood bark mulch, free of wood alcohol.
8. Eighty-five per cent (85%) survival of mitigation plantings shall be guaranteed for one (1) year. Replacement plantings shall be provided after first year's growing season.
9. Planting contractor must install 6' deer fence, Deerbusters Item DEE-8106 or approved equivalent, and implement a deer protection management plan to protect plant materials during the warranty period.

**ENGINEERS CERTIFICATE**

"I CERTIFY THAT THIS PLAN FOR SEDIMENT AND EROSION CONTROL REPRESENTS A PRACTICAL AND WORKABLE PLAN AND THAT ALL RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION AND THAT IT WAS PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF THE HOWARD SOIL CONSERVATION DISTRICT.

SIGNATURE OF ENGINEER: *Michael J. ...* DATE: 4/30/10

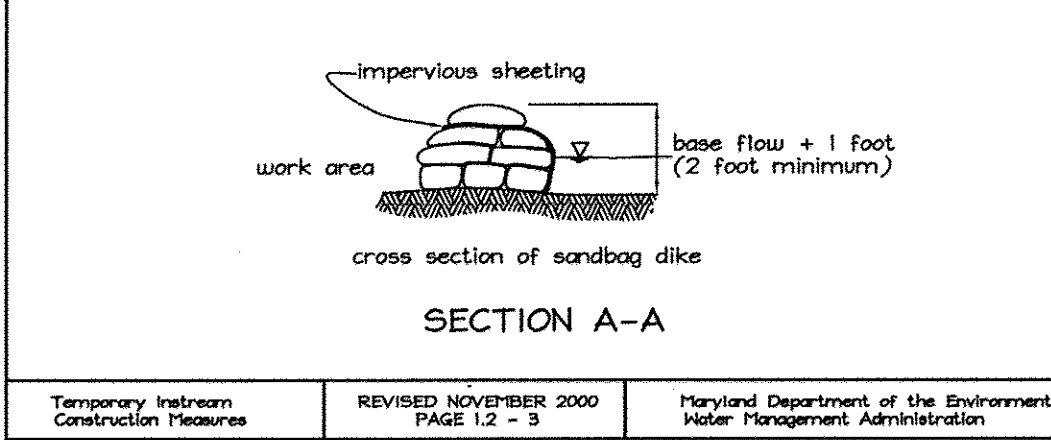
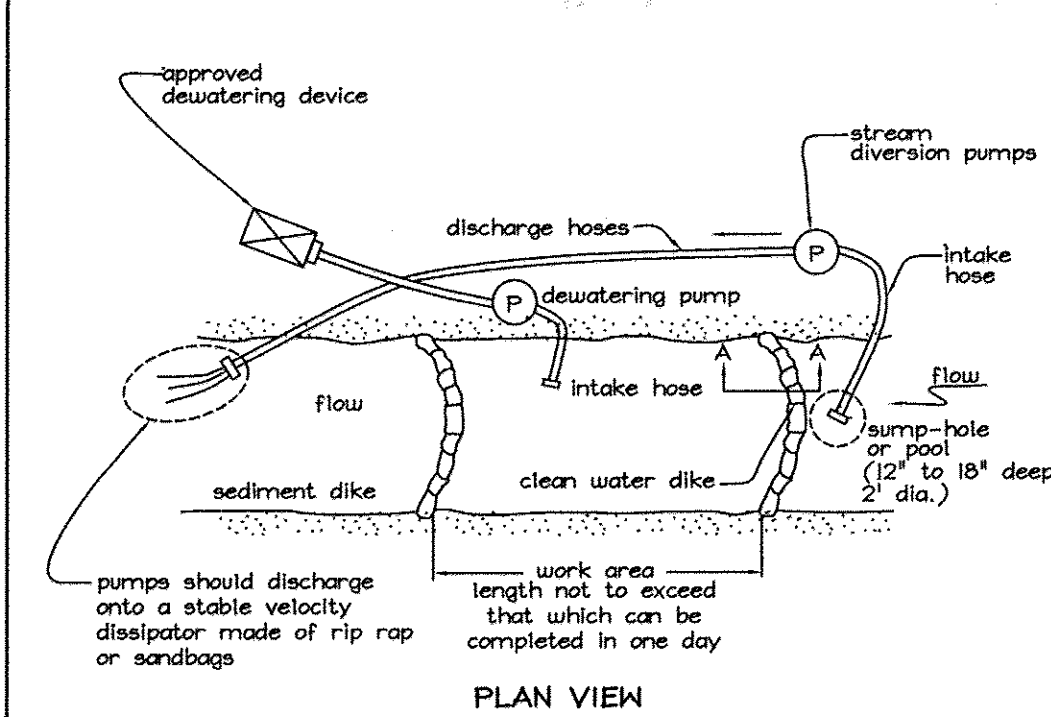
APPROVED: HOWARD COUNTY DEPARTMENT OF PUBLIC WORKS

Chief, Bureau of Highways: *...* DATE: 5/14/10

APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING & ZONING

Director: *...* DATE: 5/12/10  
Chief, Division of Land Development: *...* DATE: 5/10/10  
Chief, Development Engineering Division: *...* DATE: 5/10/10

**DETAIL 1.2: PUMP-AROUND PRACTICE**



**MONITORING PROTOCOL FOR MITIGATION PROJECTS LESS THAN OR EQUAL TO 0.5 ACRES**

A. Compensatory mitigation projects required as a condition of a State Nontidal Wetlands and Waterways Permit for wetland impacts should achieve the goals and objectives established in the mitigation project of less than or equal to one-half acres should conform to the following criteria, unless otherwise agreed to by the regulatory agencies.

1. After five (5) years, greater than 85% of the site shall be vegetated (either by planted or naturally revegetated plants) by native wetland species similar to those found in the nontidal wetland lost or by a species composition acceptable to the Nontidal Wetlands and Waterways Division and the permittee.
  2. The entire site should have wetland hydrology.
- B. An as-built design plan shall be submitted to the Nontidal Wetlands and Waterways Division within 120 days of the completion (this includes grading, planting and/or vegetative stabilization) of the mitigation project. If the project was built as planned, a notification stating that can substitute for the 'as-built' plan.
- C. The permittee will be responsible for submitting annual monitoring reports to the Nontidal Wetlands and Waterways Division, for a period of five (5) consecutive years from the completion of the construction of the mitigation site. If the U.S. Army Corps of Engineers requires a longer monitoring period, reports sent to them should also be sent to the Nontidal Wetlands and Waterways Division. In the case of long-term monitoring periods of more than five (5) years, the permittee must submit a monitoring report to the MDE and the Corps. Annual monitoring reports must be submitted to MDE by December 31 of each monitoring year. The first monitoring report is due the year the mitigation planting occurs, unless planting occurs after April 15, in which case the first monitoring report will not be due until the end of the next year. For each monitoring report, at least one monitoring visit should be conducted during the growing season for the vegetative monitoring (between May 1 and September 31 for forested/shrub-shade systems and between June 15 and September 31 for emergent systems). These site visits should preferably be during a period with normal precipitation and groundwater levels. The following information should be included with the annual monitoring report:

1. Date of site inspection.
2. A brief paragraph describing the purpose of the approved project, acreage and type of aquatic resources impacted, and mitigation acreage and type of aquatic resources authorized to compensate for the aquatic impacts. Include the dates the mitigation construction was started and the planting was completed.
3. A narrative description of the mitigation site addressing its position in the landscape, adjacent waterbodies, and adjacent land use.
4. A narrative description of how the mitigation site has achieved the goals, objectives and project standards established for the project.
5. Estimate the percent cover by dominant plant species (including volunteer plants) and any invasive plant species. Estimate percent cover by plants with a wetland indicator status of FAC or higher.
6. Estimate percent survival of woody planted material and estimate woody stem density per acre for trees/shrubs taller than 10 inches (including volunteers).
7. One set of photographs of the mitigation site taken at five time during the months of May through September of each monitoring year. Photo location points should be identified on the appropriate maps and labeled with the direction in which the photo was taken.
8. Where invasive species (ex. *Phragmites australis*) become a problem, it may be necessary to undertake eradication measures. If eradication is warranted, the permittee should submit a plan to the regulatory agency detailing the method to be used. A narrative description of the mitigation site addressing its position in the landscape, adjacent waterbodies, and adjacent land use.
9. Groundwater monitoring wells may be required as part of the monitoring plan. Water levels within each well should be measured, at a minimum, on a bi-monthly basis during the months of March through May and monthly from June through October. List these data (i.e., water levels and date measured) in the monitoring report.
10. Estimate percent cover of the site that is inundated or saturated to the surface on the dates of the site visits.
11. Stressors to the site (ex. deer browse, beaver, ATVs, etc.)
12. A description of any modifications which have been made or need to be made to implement the mitigation plan so as to meet the project standards.

1. Remedial measures proposed by the permittee are subject to review and approval by the regulatory agencies prior to implementation. In the event that remedial measures are implemented, the monitoring period may be extended on a case-by-case basis, but will not be extended for more than a three-year period. The treatment of non-native invasive plant species does not need the approval of the MDE Wetlands and Waterways Division, but should be completed at the correct time of year by someone with a current pesticide applicator certification and the required toxic materials permit.

1. REMOVE THE PLANT EITHER BY CUTTING OR INVERTING THE CONTAINER
2. MAKE A KNIFE TO CUT THROUGH BOTTOM HALF OF THE ROOT BALL
3. PLANT TREES AND SHRUBS ON FORMED UP MOUNDS 12" ABOVE THE EXISTING GRADE
4. PLANTING HOLE TO BE 2-3 TIMES THE DIAMETER OF THE CONTAINER.
5. BACKFILL 2/3 OF THE ROOT BALL AND WATER.
6. AFTER WATER PERCOLATES, BACKFILL HOLE TO TOP OF ROOT BALL AND GENTLY TAMP SOIL TO FIRM CONTACT WITH PLANT.
7. APPLY MULCH RING AROUND PLANT KEEPING A 6" IN CLEARANCE FROM STEM.

1. Date of site inspection.
2. A brief paragraph describing the purpose of the approved project, acreage and type of aquatic resources impacted, and mitigation acreage and type of aquatic resources authorized to compensate for the aquatic impacts. Include the dates the mitigation construction was started and the planting was completed.
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12. A description of any modifications which have been made or need to be made to implement the mitigation plan so as to meet the project standards.

D. Remedial measures proposed by the permittee are subject to review and approval by the regulatory agencies prior to implementation. In the event that remedial measures are implemented, the monitoring period may be extended on a case-by-case basis, but will not be extended for more than a three-year period. The treatment of non-native invasive plant species does not need the approval of the MDE Wetlands and Waterways Division, but should be completed at the correct time of year by someone with a current pesticide applicator certification and the required toxic materials permit.

**DEVELOPER'S CERTIFICATE**

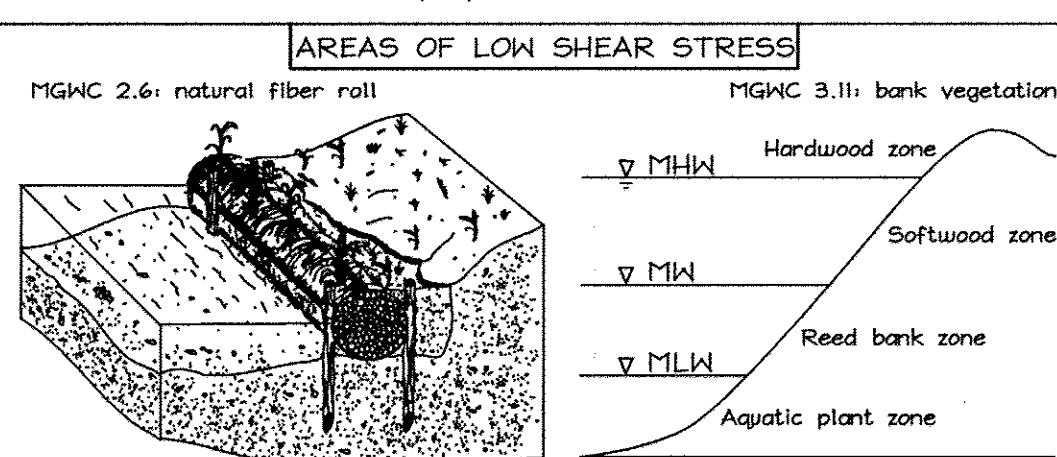
"I/WE CERTIFY THAT ALL DEVELOPMENT AND CONSTRUCTION WILL BE DONE ACCORDING TO THIS PLAN FOR SEDIMENT AND EROSION CONTROL, AND THAT ALL RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATE OF ATTENDANCE AT A DEPARTMENT OF THE ENVIRONMENT APPROVED TRAINING PROGRAM FOR THE CONTROL AND PREVENTION OF EROSION BEGINSING THE PROJECT. I/WE ALSO AUTHORIZE PERIODIC ON-SITE INSPECTION BY THE HOWARD SOIL CONSERVATION DISTRICT."

SIGNATURE OF DEVELOPER: *...* DATE: 4/30/10

THIS DEVELOPMENT PLAN IS APPROVED FOR SOIL EROSION AND SEDIMENT CONTROL BY THE HOWARD SOIL CONSERVATION DISTRICT

PROFESSIONAL CERTIFICATION: I 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. #34689, Expiration Date: 07/08/11.

**DETAIL 2.11(a): TOE PROTECTION**



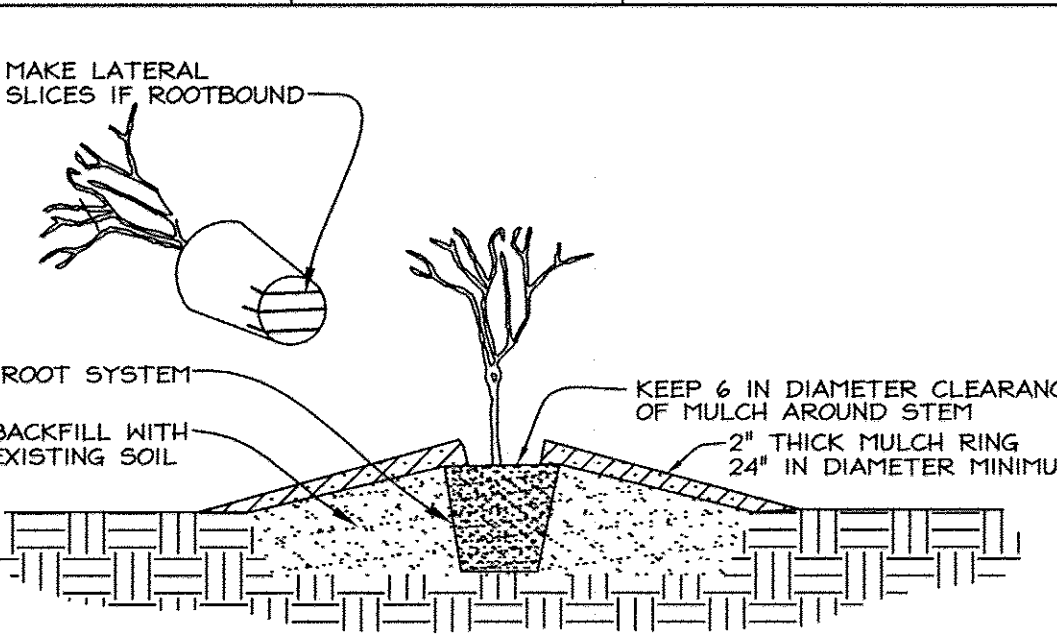
**MATERIAL SPECIFICATIONS**  
Plant species including woody varieties should be chosen by a plant specialist according to location within the riparian bank zone and adaptability to site-specific conditions and objectives. Refer to MGNC 2.4 (Live Stakes) for material and Detail 2.11 for placement and usage. The use of non-native plantings may result in reduced natural biodiversity.

**INSTALLATION GUIDELINES**  
1. The stream should be redirected by an approved temporary stream diversion (See section 1: Temporary Instream Construction Measures, Maryland's Guidelines to Waterway Construction), the construction area should be deaerated, and any disturbed banks should be stabilized.  
2. The appropriateness of toe stabilization measures should be based primarily upon the magnitude of the imposed shear stress at the reach of interest, among other considerations as shown in Detail 2.11. Installation will vary according to material used.  
3. Riprap a rock toe designed to withstand the near-bed velocities of the design storm event can be used to increase the effectiveness of toe protection measures in moderate to high shear stress areas. Rocks should be sized and filter layers designed according to MGNC 2.1: Riprap and Figure 2.1. Implicated Riprap Refer to MGNC 2.2: Implicated Riprap.  
4. Gabion Refer to MGNC 2.3: Gabion.  
5. The use of rock vanes (MGNC 3.3: Rock Vanes) should be considered to break up high velocities at the toe of any embankment where bank stabilization measures are to be employed. Additionally, grade control structures such as weirs and step pool sequences should be used to enhance channel bed stability in reaches that are actively incising or may be subjected to upstream migrating instabilities.  
6. Once construction is completed, the diversion should be removed from upstream to downstream. Sediment control devices, including perimeter erosion controls, are to remain in place until all disturbed areas are stabilized in accordance with an approved sediment and erosion control plan and the inspection authority approves their removal.

1. After five (5) years, greater than 85% of the site shall be vegetated (either by planted or naturally revegetated plants) by native wetland species similar to those found in the nontidal wetland lost or by a species composition acceptable to the Nontidal Wetlands and Waterways Division and the permittee.
  2. The entire site should have wetland hydrology.
- B. An as-built design plan shall be submitted to the Nontidal Wetlands and Waterways Division within 120 days of the completion (this includes grading, planting and/or vegetative stabilization) of the mitigation project. If the project was built as planned, a notification stating that can substitute for the 'as-built' plan.
- C. The permittee will be responsible for submitting annual monitoring reports to the Nontidal Wetlands and Waterways Division, for a period of five (5) consecutive years from the completion of the construction of the mitigation site. If the U.S. Army Corps of Engineers requires a longer monitoring period, reports sent to them should also be sent to the Nontidal Wetlands and Waterways Division. In the case of long-term monitoring periods of more than five (5) years, the permittee must submit a monitoring report to the MDE and the Corps. Annual monitoring reports must be submitted to MDE by December 31 of each monitoring year. The first monitoring report is due the year the mitigation planting occurs, unless planting occurs after April 15, in which case the first monitoring report will not be due until the end of the next year. For each monitoring report, at least one monitoring visit should be conducted during the growing season for the vegetative monitoring (between May 1 and September 31 for forested/shrub-shade systems and between June 15 and September 31 for emergent systems). These site visits should preferably be during a period with normal precipitation and groundwater levels. The following information should be included with the annual monitoring report:

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9. Groundwater monitoring wells may be required as part of the monitoring plan. Water levels within each well should be measured, at a minimum, on a bi-monthly basis during the months of March through May and monthly from June through October. List these data (i.e., water levels and date measured) in the monitoring report.
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11. Stressors to the site (ex. deer browse, beaver, ATVs, etc.)
12. A description of any modifications which have been made or need to be made to implement the mitigation plan so as to meet the project standards.

D. Remedial measures proposed by the permittee are subject to review and approval by the regulatory agencies prior to implementation. In the event that remedial measures are implemented, the monitoring period may be extended on a case-by-case basis, but will not be extended for more than a three-year period. The treatment of non-native invasive plant species does not need the approval of the MDE Wetlands and Waterways Division, but should be completed at the correct time of year by someone with a current pesticide applicator certification and the required toxic materials permit.



**CONTAINER PLANTING NOT TO SCALE**

1. REMOVE THE PLANT EITHER BY CUTTING OR INVERTING THE CONTAINER
2. MAKE A KNIFE TO CUT THROUGH BOTTOM HALF OF THE ROOT BALL
3. PLANT TREES AND SHRUBS ON FORMED UP MOUNDS 12" ABOVE THE EXISTING GRADE
4. PLANTING HOLE TO BE 2-3 TIMES THE DIAMETER OF THE CONTAINER.
5. BACKFILL 2/3 OF THE ROOT BALL AND WATER.
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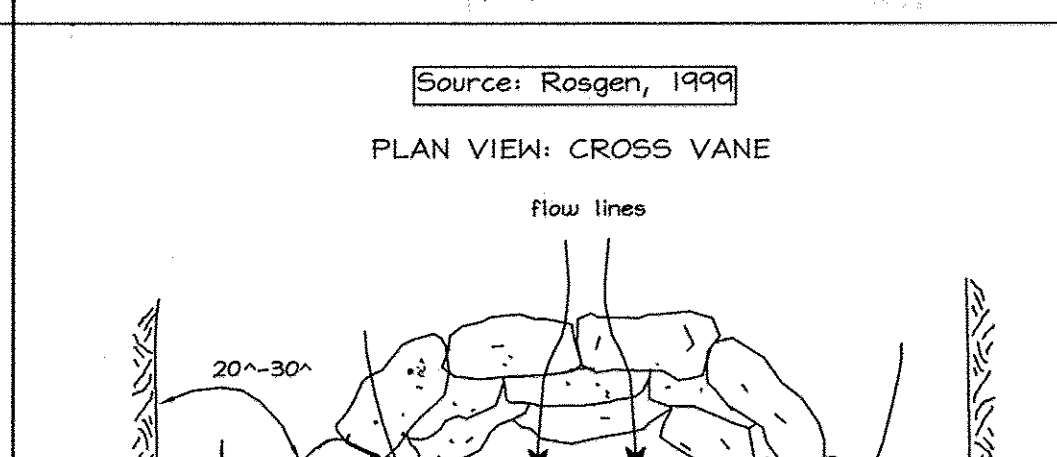
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SIGNATURE OF DEVELOPER: *...* DATE: 4/30/10

THIS DEVELOPMENT PLAN IS APPROVED FOR SOIL EROSION AND SEDIMENT CONTROL BY THE HOWARD SOIL CONSERVATION DISTRICT

PROFESSIONAL CERTIFICATION: I 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. #34689, Expiration Date: 07/08/11.

**DETAIL 3.8(a): CROSS VANES**



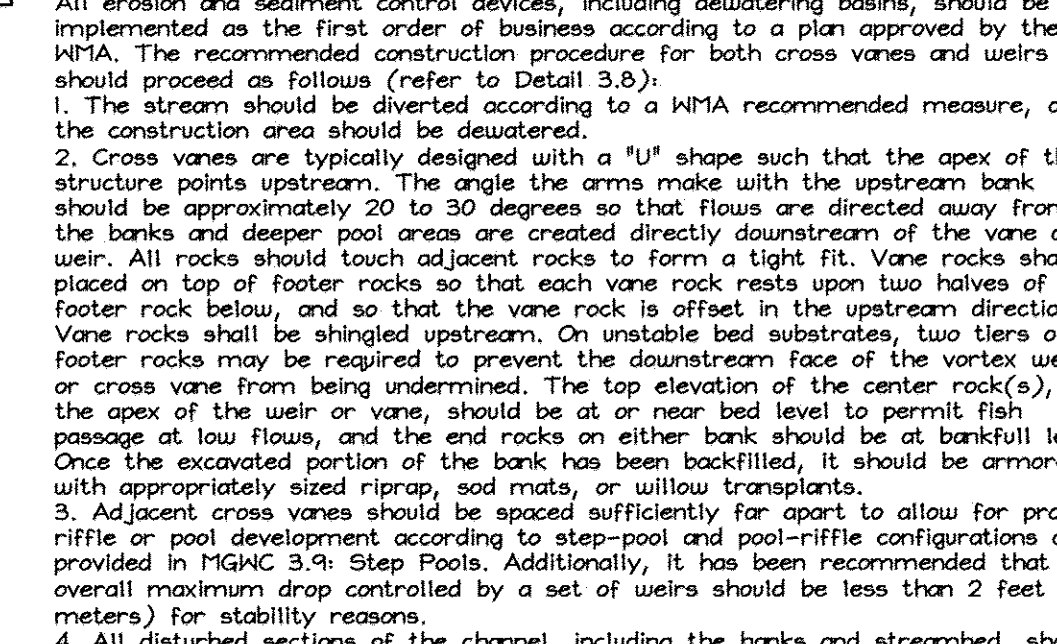
**MATERIAL SPECIFICATIONS FOR CROSS VANES (DETAIL 3.8)**  
Rock and boulder material for the construction of cross vanes should meet the following requirements:  
1. Riprap: Riprap a rock toe designed to withstand the near-bed velocities of the design storm event can be used to increase the effectiveness of toe protection measures in moderate to high shear stress areas. Rocks should be sized and filter layers designed according to MGNC 2.1: Riprap and Figure 2.1. Implicated Riprap Refer to MGNC 2.2: Implicated Riprap.  
2. Gabion Refer to MGNC 2.3: Gabion.  
3. The use of rock vanes (MGNC 3.3: Rock Vanes) should be considered to break up high velocities at the toe of any embankment where bank stabilization measures are to be employed. Additionally, grade control structures such as weirs and step pool sequences should be used to enhance channel bed stability in reaches that are actively incising or may be subjected to upstream migrating instabilities.  
4. Once construction is completed, the diversion should be removed from upstream to downstream. Sediment control devices, including perimeter erosion controls, are to remain in place until all disturbed areas are stabilized in accordance with an approved sediment and erosion control plan and the inspection authority approves their removal.

**INSTALLATION GUIDELINES FOR CROSS VANES (DETAIL 3.8)**  
1. The stream should be diverted according to a WMA recommended measure, and the construction area should be deaerated.  
2. Cross vanes are typically designed with a 'U' shape such that the apex of the structure points upstream. The angle the arms make with the upstream bank should be approximately 20 to 30 degrees so that flows are directed away from the banks and deeper pool areas are created directly downstream of the vane weir. All rocks should touch adjacent rocks to form a tight fit. Vane rocks shall be placed on top of footer rocks so that each vane rock rests upon two halves of each footer rock below, and so that the vane rock is offset in the upstream direction. Vane rocks shall be shingled upstream. On unstable bed substrates, two tiers of footer rocks may be required to prevent the downstream face of the vortex weir or cross vane from being undermined. The top elevation of the center rock(s), at the apex of the weir or vane, should be at or near bed level to prevent passage at low flows, and the end rocks on either bank should be at bankfull level. Once the excavated portion of the bank has been backfilled, it should be armored with appropriately sized riprap, rock mats, or willow transplants.  
3. Adjacent cross vanes should be spaced sufficiently far apart to allow for proper riffle or pool development according to step-pool and pool-riffle configurations as provided in MGNC 3.4: Step Pools. Additionally, it has been recommended that the overall maximum drop controlled by a set of weirs should be less than 2 feet (0.6 meters) for stability reasons.  
4. All disturbed sections of the channel, including the banks and streambed, should be stabilized with methods approved by the WMA.  
5. All cross vanes should be monitored to determine if:  
\* their orientation and geometry (e.g., the height of the drop) hinder fish migration,  
\* their performance is adversely affected by deposited sediment, and  
\* their placement causes bank instabilities and undesirable lateral stream overment especially in the vicinity of the plunge pools.

1. After five (5) years, greater than 85% of the site shall be vegetated (either by planted or naturally revegetated plants) by native wetland species similar to those found in the nontidal wetland lost or by a species composition acceptable to the Nontidal Wetlands and Waterways Division and the permittee.
  2. The entire site should have wetland hydrology.
- B. An as-built design plan shall be submitted to the Nontidal Wetlands and Waterways Division within 120 days of the completion (this includes grading, planting and/or vegetative stabilization) of the mitigation project. If the project was built as planned, a notification stating that can substitute for the 'as-built' plan.
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12. A description of any modifications which have been made or need to be made to implement the mitigation plan so as to meet the project standards.

D. Remedial measures proposed by the permittee are subject to review and approval by the regulatory agencies prior to implementation. In the event that remedial measures are implemented, the monitoring period may be extended on a case-by-case basis, but will not be extended for more than a three-year period. The treatment of non-native invasive plant species does not need the approval of the MDE Wetlands and Waterways Division, but should be completed at the correct time of year by someone with a current pesticide applicator certification and the required toxic materials permit.



**MATERIAL SPECIFICATIONS AND INSTALLATION GUIDELINES FOR LIVE STAKING**

1. All cuttings shall be freshly cut from live woody plants of the species indicated, such as willow, alder, and shrub dogwood, during the dormant season.
2. Basal end of stake should be cut on an angle with the top cut square.
3. Prepare cuttings from dormant 5 in. to 2 in. diameter stock cut in 16 in. to 3 feet long stakes.
4. Keep cuttings moist all times.
5. Install stakes with deadblow hammer, angled downstream, on 3.0 ft. centers.
6. Replace live stakes that have split or become mushroomed.
7. Install stakes with buds pointing upwards.

1. Date of site inspection.
2. A brief paragraph describing the purpose of the approved project, acreage and type of aquatic resources impacted, and mitigation acreage and type of aquatic resources authorized to compensate for the aquatic impacts. Include the dates the mitigation construction was started and the planting was completed.
3. A narrative description of the mitigation site addressing its position in the landscape, adjacent waterbodies, and adjacent land use.
4. A narrative description of how the mitigation site has achieved the goals, objectives and project standards established for the project.
5. Estimate the percent cover by dominant plant species (including volunteer plants) and any invasive plant species. Estimate percent cover by plants with a wetland indicator status of FAC or higher.
6. Estimate percent survival of woody planted material and estimate woody stem density per acre for trees/shrubs taller than 10 inches (including volunteers).
7. One set of photographs of the mitigation site taken at five time during the months of May through September of each monitoring year. Photo location points should be identified on the appropriate maps and labeled with the direction in which the photo was taken.
8. Where invasive species (ex. *Phragmites australis*) become a problem, it may be necessary to undertake eradication measures. If eradication is warranted, the permittee should submit a plan to the regulatory agency detailing the method to be used. A narrative description of the mitigation site addressing its position in the landscape, adjacent waterbodies, and adjacent land use.
9. Groundwater monitoring wells may be required as part of the monitoring plan. Water levels within each well should be measured, at a minimum, on a bi-monthly basis during the months of March through May and monthly from June through October. List these data (i.e., water levels and date measured) in the monitoring report.
10. Estimate percent cover of the site that is inundated or saturated to the surface on the dates of the site visits.
11. Stressors to the site (ex. deer browse, beaver, ATVs, etc.)
12. A description of any modifications which have been made or need to be made to implement the mitigation plan so as to meet the project standards.

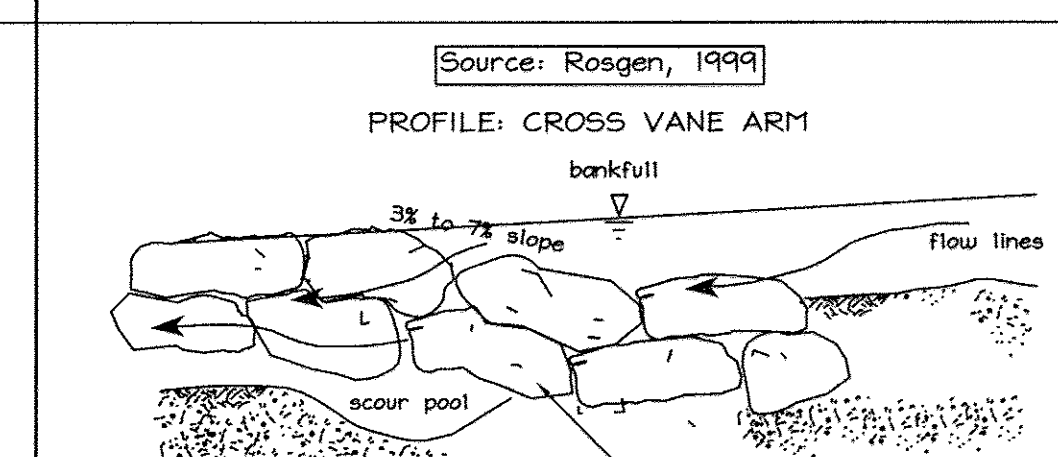
D. Remedial measures proposed by the permittee are subject to review and approval by the regulatory agencies prior to implementation. In the event that remedial measures are implemented, the monitoring period may be extended on a case-by-case basis, but will not be extended for more than a three-year period. The treatment of non-native invasive plant species does not need the approval of the MDE Wetlands and Waterways Division, but should be completed at the correct time of year by someone with a current pesticide applicator certification and the required toxic materials permit.

SIGNATURE OF DEVELOPER: *...* DATE: 4/30/10

THIS DEVELOPMENT PLAN IS APPROVED FOR SOIL EROSION AND SEDIMENT CONTROL BY THE HOWARD SOIL CONSERVATION DISTRICT

PROFESSIONAL CERTIFICATION: I 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. #34689, Expiration Date: 07/08/11.

**DETAIL 3.8(b): CROSS VANES**



**MATERIAL SPECIFICATIONS FOR CROSS VANES (DETAIL 3.8)**  
Rock and boulder material for the construction of cross vanes should meet the following requirements:  
1. Riprap: Riprap a rock toe designed to withstand the near-bed velocities of the design storm event can be used to increase the effectiveness of toe protection measures in moderate to high shear stress areas. Rocks should be sized and filter layers designed according to MGNC 2.1: Riprap and Figure 2.1. Implicated Riprap Refer to MGNC 2.2: Implicated Riprap.  
2. Gabion Refer to MGNC 2.3: Gabion.  
3. The use of rock vanes (MGNC 3.3: Rock Vanes) should be considered to break up high velocities at the toe of any embankment where bank stabilization measures are to be employed. Additionally, grade control structures such as weirs and step pool sequences should be used to enhance channel bed stability in reaches that are actively incising or may be subjected to upstream migrating instabilities.  
4. Once construction is completed, the diversion should be removed from upstream to downstream. Sediment control devices, including perimeter erosion controls, are to remain in place until all disturbed areas are stabilized in accordance with an approved sediment and erosion control plan and the inspection authority approves their removal.

**INSTALLATION GUIDELINES FOR CROSS VANES (DETAIL 3.8)**  
1. The stream should be diverted according to a WMA recommended measure, and the construction area should be deaerated.  
2. Cross vanes are typically designed with a 'U' shape such that the apex of the structure points upstream. The angle the arms make with the upstream bank should be approximately 20 to 30 degrees so that flows are directed away from the banks and deeper pool areas are created directly downstream of the vane weir. All rocks should touch adjacent rocks to form a tight fit. Vane rocks shall be placed on top of footer rocks so that each vane rock rests upon two halves of each footer rock below, and so that the vane rock is offset in the upstream direction. Vane rocks shall be shingled upstream. On unstable bed substrates, two tiers of footer rocks may be required to prevent the downstream face of the vortex weir or cross vane from being undermined. The top elevation of the center rock(s), at the apex of the weir or vane, should be at or near bed level to prevent passage at low flows, and the end rocks on either bank should be at bankfull level. Once the excavated portion of the bank has been backfilled, it should be armored with appropriately sized riprap, rock mats, or willow transplants.  
3. Adjacent cross vanes should be spaced sufficiently far apart to allow for proper riffle or pool development according to step-pool and pool-riffle configurations as provided in MGNC 3.4: Step Pools. Additionally, it has been recommended that the overall maximum drop controlled by a set of weirs should be less than 2 feet (0.6 meters) for stability reasons.  
4. All disturbed sections of the channel, including the banks and streambed, should be stabilized with methods approved by the WMA.