

Material	Specification	Size	Notes
Plantings	see Appendix A, Table A.4	n/a	plantings are site-specific
Planting soil (2' to 4' deep)	loamy sand (60-65%) & compost (35-40%) or sandy loam (30%), coarse sand (30%) & compost (40%)	n/a	USDA soil types loamy sand or sandy loam; clay content < 5%
Organic content	Min. 10% by dry weight (ASTM D 2974)		
Mulch	shredded hardwood		aged 6 months, minimum; no pine or wood chips
Pea gravel disphragm	pea gravel: ASTM-D-448	NO. 8 OR NO. 9 (1/8" TO 3/8")	
Curtain drain	ornamental stone: washed cobbles	stone: 2" to 5"	
Geotextile		n/a	PE Type 1 nonwoven
Gravel (underdrains and infiltration berms)	AASHTO M-43	NO. 57 OR NO. 6 AGGREGATE (3/8" to 3/4")	
Underdrain piping	F 758, Type PS 28 or AASHTO M-278	4" to 6" rigid schedule 40 PVC or SDR35	Slotted or perforated pipe; 3/8" perf. @ 6" on center, 4 holes per row; minimum of 3" of gravel cover pipes; not necessary underdrain pipes. Perforated pipe shall be wrapped with 1/2-inch galvanized hardware cloth.
Poured in place concrete (if required)	MSHA Mix No. 3; F _c = 3500 psi @ 28 days, normal weight, air-entrained, reinforcing to meet ASTM-615-60	n/a	on-site testing of poured-in-place concrete required: 28 day strength and slump test; all concrete design (cast-in-place or pre-cast) not using previously approved State or local standards requires design drawings sealed and approved by a professional structural engineer licensed in the State of Maryland - design to include meeting ACI Code 350.R.89; vertical loading [H-10 or H-20]; allowable horizontal loading (based on soil pressures); and analysis of potential cracking. Sand substitutions such as Diabase and Graystone (AASHTO) #10 are not acceptable. No calcium carbonated or dolomitic sand substitutions are acceptable. No "rock dust" can be used for sand.
Sand	AASHTO-M-6 or ASTM-C-33	0.02" to 0.04"	

Specifications for Micro-Bioretenion, Rain Gardens, Landscape Infiltration & Infiltration Berms

1. Material Specifications

The allowable materials to be used in these practices are detailed in Table B.4.1.

Planting Soil

The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the micro-bioretenion practice that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations. The planting soil shall be free of Bermuda grass, Quackgrass, Johnson grass, or other noxious weeds as specified under COMAR 15.08.01.05. The planting soil shall be tested and shall meet the following criteria:
 Soil Component - Loamy Sand or Sandy Loam (USDA Soil Textural Classification)
 Organic Content - Minimum 10% by dry weight (ASTM D 2974). In general, this can be met with a mixture of loamy sand (60%-65%) and compost (35% to 40%) or sandy loam (30%), coarse sand (30%), and compost (40%).
 Clay Content - Media shall have a clay content of less than 5%.
 pH Range - Should be between 5.5 - 7.0. Amendments (e.g., lime, iron sulfate plus sulfur) may be mixed into the soil to increase or decrease pH.

There shall be at least one soil test per project. Each test shall consist of both the standard soil test for pH, and additional tests of organic matter, and soluble salts. A textural analysis is required from the site stockpiled topsoil. If topsoil is imported, then a texture analysis shall be performed for each location where the topsoil was excavated.

Compaction

It is very important to minimize compaction of both the base of bioretention practices and the required backfill. When possible, use excavation hoers remove original soil. If practices are excavated using a loader, the contractor should use wide track or marsh track equipment, or light equipment with turf type tires. Use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high-pressure tires will cause excessive compaction resulting in reduced infiltration rates and is not acceptable. Compaction will significantly contribute to design failure.

Compaction can be alleviated at the base of the bioretention facility by using a primary tilling operation such as a chisel plow, ripper, or subsoiler. These tilling operations are to restructure the soil profile through the 12 inch compaction zone. Substitute methods must be approved by the engineer. Rototillers typically do not till deep enough to reduce the effects of compaction from heavy equipment.

Rototill 2 to 3 inches of sand into the base of the bioretention facility before backfilling the optional sand layer. Pump any ponded water before preparing (rototilling) base. When backfilling the topsoil over the sand layer, first place 3 to 4 inches of topsoil over the sand, then rototill the sand/topsoil to create a gradation zone. Backfill the remainder of the topsoil to final grade.

When backfilling the bioretention facility, place soil in lifts 12" to 18". Do not use heavy equipment within the bioretention basin. Heavy equipment can be used around the perimeter of the basin to supply soils and sand. Grade bioretention materials with light equipment such as a compact loader or a dozer/loader with marsh tracks.

Plant Installation

Compost is a better organic material source, is less likely to float, and should be placed in the invert and other low areas. Mulch should be placed in surrounding to a uniform thickness of 2" to 3". Shredded or chipped hardwood mulch is the only accepted mulch. Pine mulch and wood chips will float and move to the perimeter of the bioretention area during a storm event and are not acceptable. Shredded mulch must be well aged (6 to 12 months) for acceptance.

Rootstock of the plant material shall be kept moist during transport and on-site storage. The plant root ball should be planted so 1/8th of the ball is above final grade surface. The diameter of the planting pit shall be at least six inches larger than the diameter of the planting ball. Set and maintain the plant straight during the entire planting process. Thoroughly water ground bed cover after installation.

Trees shall be braced using 2" by 2" stakes only as necessary and for the first growing season only. Stakes are to be equally spaced on the outside of the tree ball.

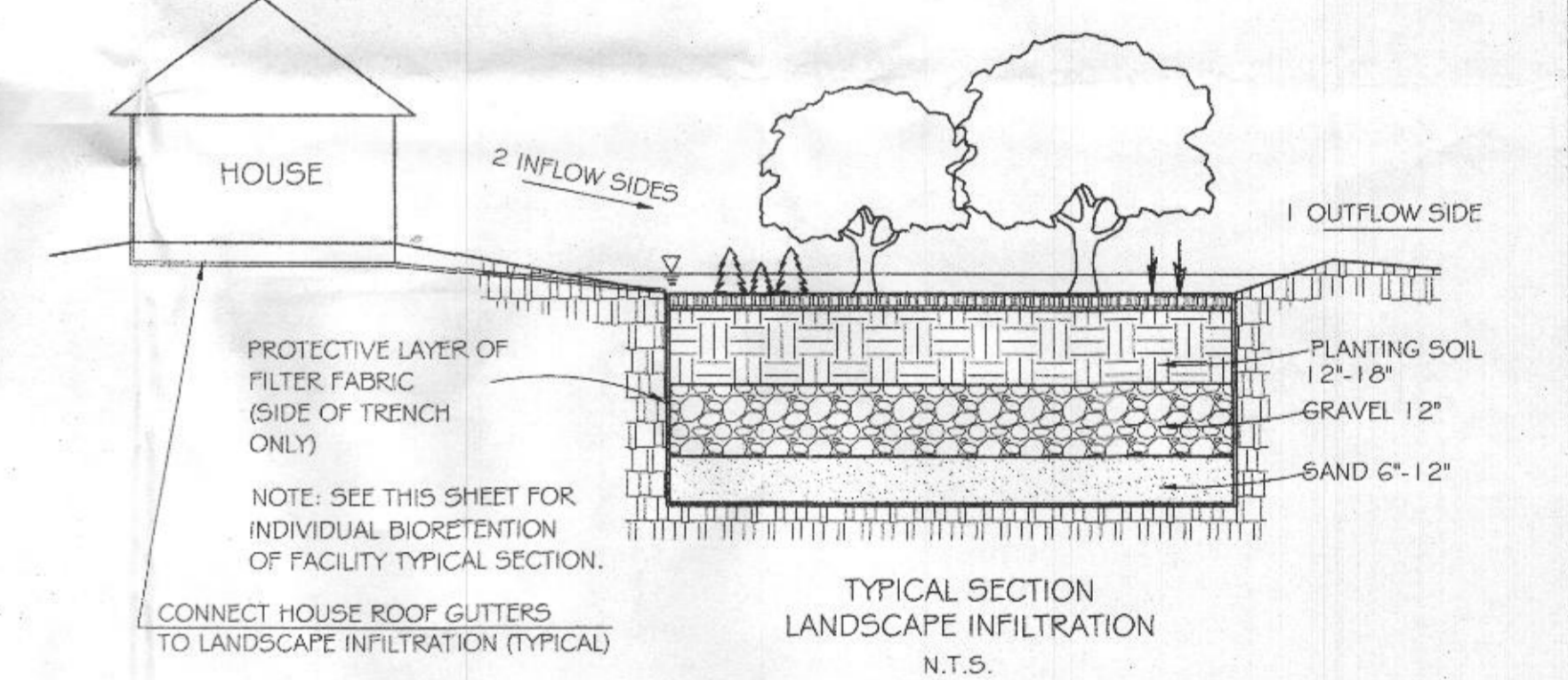
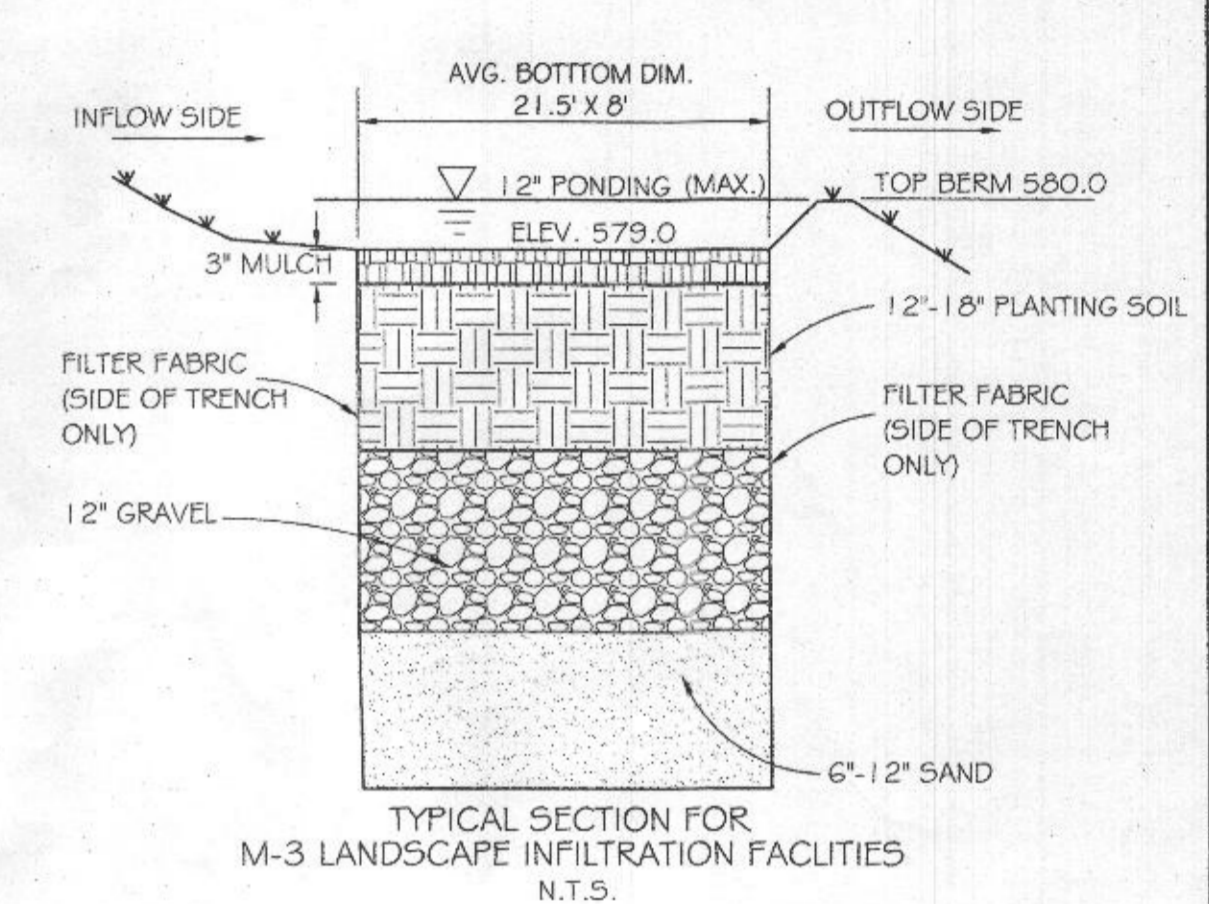
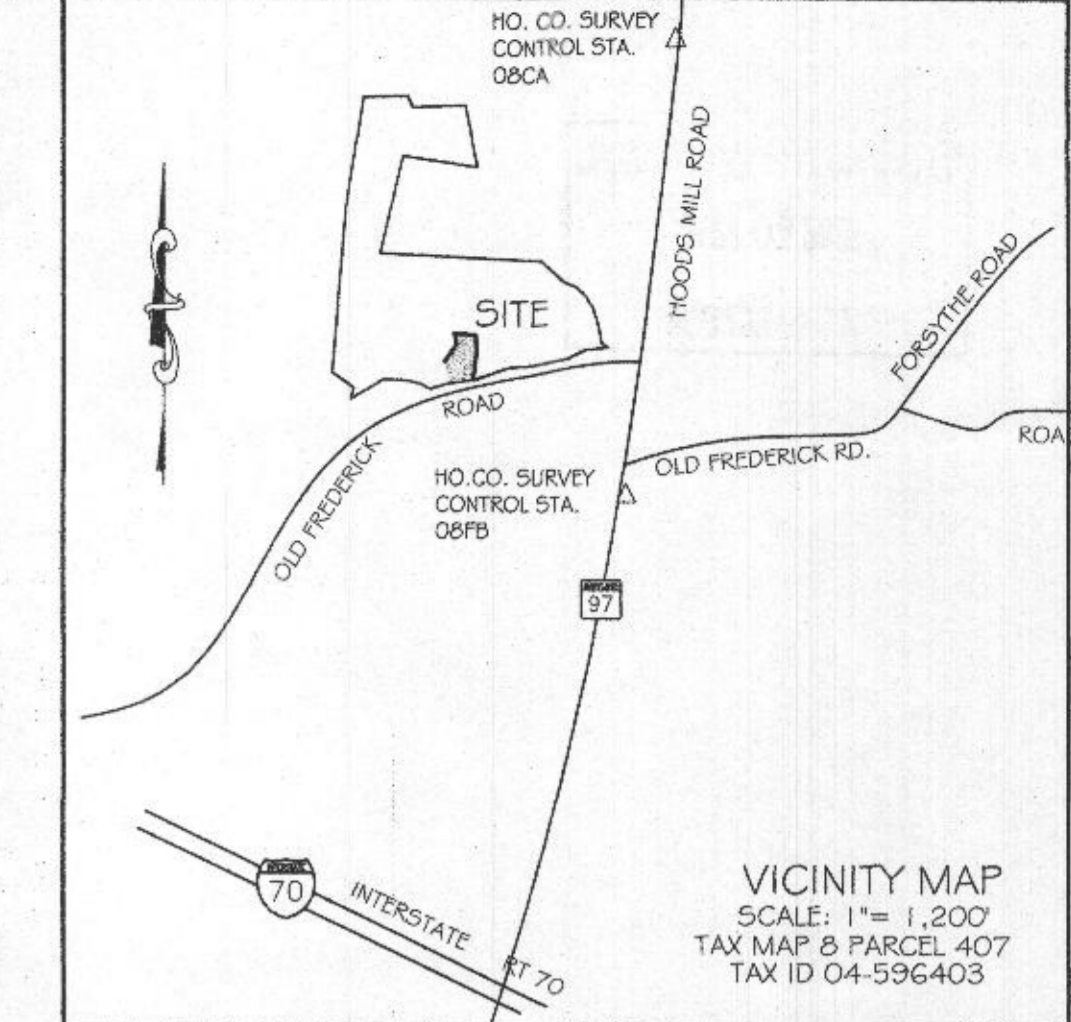
Grasses and legume seed should be drilled into the soil to a depth of at least one inch. Grass and legume plugs shall be planted following the non-grass ground cover planting specifications.

The topsoil specifications provide enough organic material to adequately supply nutrients from natural cycling. The primary function of the bioretention structure is to improve water quality. Adding fertilizers defeats, or at a minimum, impedes this goal. Only add fertilizer if wood chips or mulch are used to amend the soil. Rototill urea fertilizer at a rate of 2 pounds per 1000 square feet.

MAINTENANCE CRITERIA

- The following items should be addressed to ensure proper maintenance and long-term performance of landscape infiltration:
 - Privately owned practices shall have a maintenance plan and shall be protected by easement, deed restriction, ordinance, or other legal measures preventing its neglect, adverse alteration, and removal.
 - During the first year of operation, inspection frequency should be after every major storm and poorly established areas revegetated.
 - Sediment accumulation on the surface of the facility should be removed and the top two to three inches of surface layer replaced as needed.
 - The top few inches of the planting soil should be removed and replaced when water ponds for more than 48 hours or there is algal growth on the surface of the facility.
 - If standing water persists after filter media has been maintained, the gravel, soil, and sand may need to be cleaned and/or replaced.
 - Occasional pruning and replacement of dead vegetation is necessary. If specific plants are not surviving, more appropriate species should be used. Watering may be required during prolonged dry periods.

PRACTICE	DRAINAGE AREA	IMPERVIOUS AREA TREATED	METHODOLOGY	VOLUME (ESD) REQUIRED	VOLUME (ESD) PROVIDED
N-2 NON ROOFTOP DISCONNECTION	941 S.F.	941 S.F.	$ESD = P \times A \times R$ where $P = 1.0$ & $R = 0.35$	75 c.f.	75 c.f.
M-3 LANDSCAPE INFILTRATION	2,860 S.F.	2,860 S.F.	$ESD = P \times A \times R$ where $P = 1.0$ & $R = 0.35$	228 c.f.	228 c.f.
TOTAL ESD PROVIDED				303 c.f.	303 c.f.
ESD REQUIRED				303 c.f.	303 c.f.



M-3 LANDSCAPE INFILTRATION PLANT SIZING AND SPACING

- PLANT SPACING**
- PERENNIALS - 12" ON CENTER FOR QUART SIZE
 - 18" ON CENTER FOR GALLON SIZE
 - SHRUBS - 3'-4" ON CENTER FOR QUART / GALLON SIZE
- PLANT SPECIES**
- PLANT SPECIES SHALL BE SELECTED FROM "PLANT SPECIES APPROPRIATE FOR USE IN BIORETENTION AREAS", PRINCE GEORGE COUNTY DEP., MD. (www.hvwmapdevelopment.org)

SWM-5	M-3 LANDSCAPE INFILTRATION	21.5' X 8' - 12" PONDING
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OPERATION AND MAINTENANCE SCHEDULE FOR LANDSCAPE INFILTRATION (M-3)

- THE OWNER SHALL MAINTAIN THE PLANT MATERIAL, MULCH LAYER AND SOIL LAYER ANNUALLY. MAINTENANCE OF MULCH AND SOIL IS LIMITED TO CORRECTING AREAS OF EROSION OR WASH OUT. ANY MULCH REPLACEMENT SHALL BE DONE IN THE SPRING. PLANT MATERIAL SHALL BE CHECKED FOR DISEASE AND INSECT INFESTATION AND MAINTENANCE WILL ADDRESS DEAD MATERIAL AND PRUNING. ACCEPTABLE REPLACEMENT PLANT MATERIAL IS LIMITED TO THE FOLLOWING: 2000 MARYLAND STORMWATER DESIGN MANUAL VOLUME II, TABLE A.4.1 AND 4.2.
- THE OWNER SHALL PERFORM A PLANT IN THE SPRING AND IN THE FALL OF EACH YEAR. DURING THE INSPECTION, THE OWNER SHALL REMOVE DEAD AND DISEASED VEGETATION CONSIDERED BEYOND TREATMENT, REPLACE DEAD PLANT MATERIAL WITH ACCEPTABLE REPLACEMENT PLANT MATERIAL, TREAT DISEASED TREES AND SHRUBS, AND REPLACE ALL DEFICIENT STAKES AND WIRES.
- THE OWNER SHALL INSPECT THE MULCH EACH SPRING. THE MULCH SHALL BE REPLACED EVERY TWO TO THREE YEARS. THE PREVIOUS MULCH LAYER SHALL BE REMOVED BEFORE THE NEW LAYER IS APPLIED.
- THE OWNER SHALL CORRECT SOIL EROSION ON AN AS NEEDED BASIS, WITH A MINIMUM OF ONCE PER YEAR AND AFTER EACH HEAVY STORM.

DATE	REVISIONS

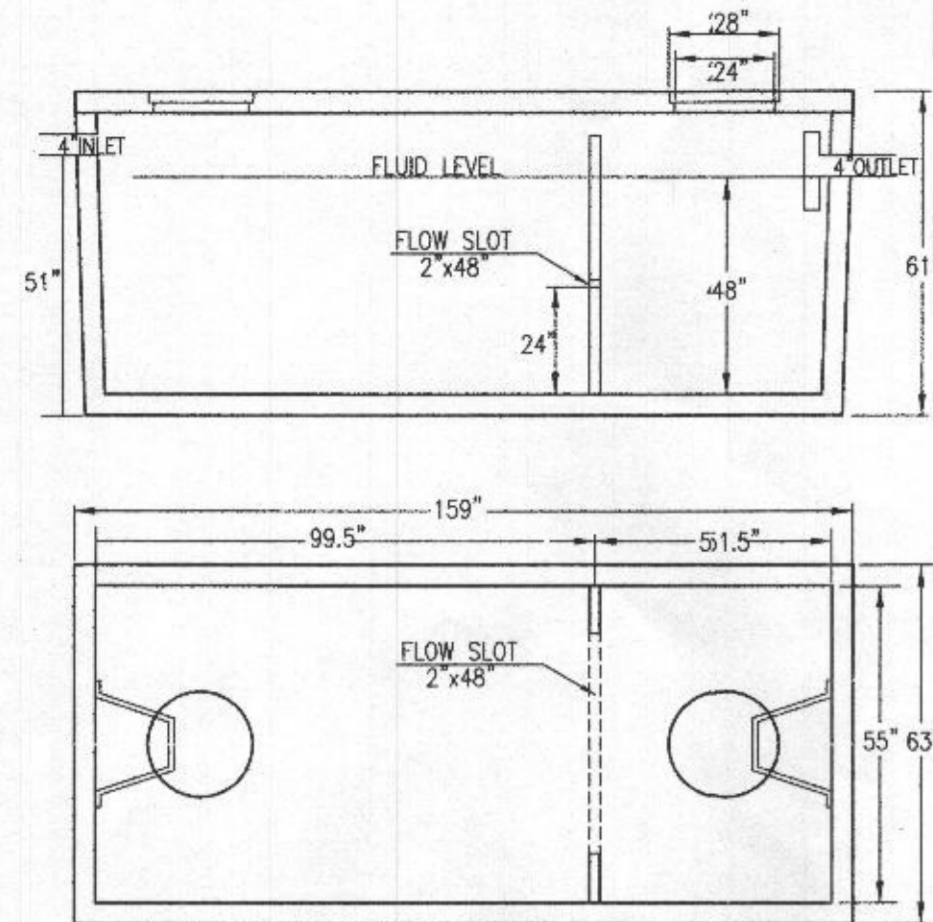
STORMWATER MANAGEMENT PLAN
 14550 OLD FREDERICK ROAD
 LOT 5
QUARTZ HILL III
 PLAT No. 22813-22815

14550 OLD FREDERICK ROAD
 FOURTH ELECTION DISTRICT
 HOWARD COUNTY, MARYLAND
 SCALE: 1" = 30' DECEMBER 2018

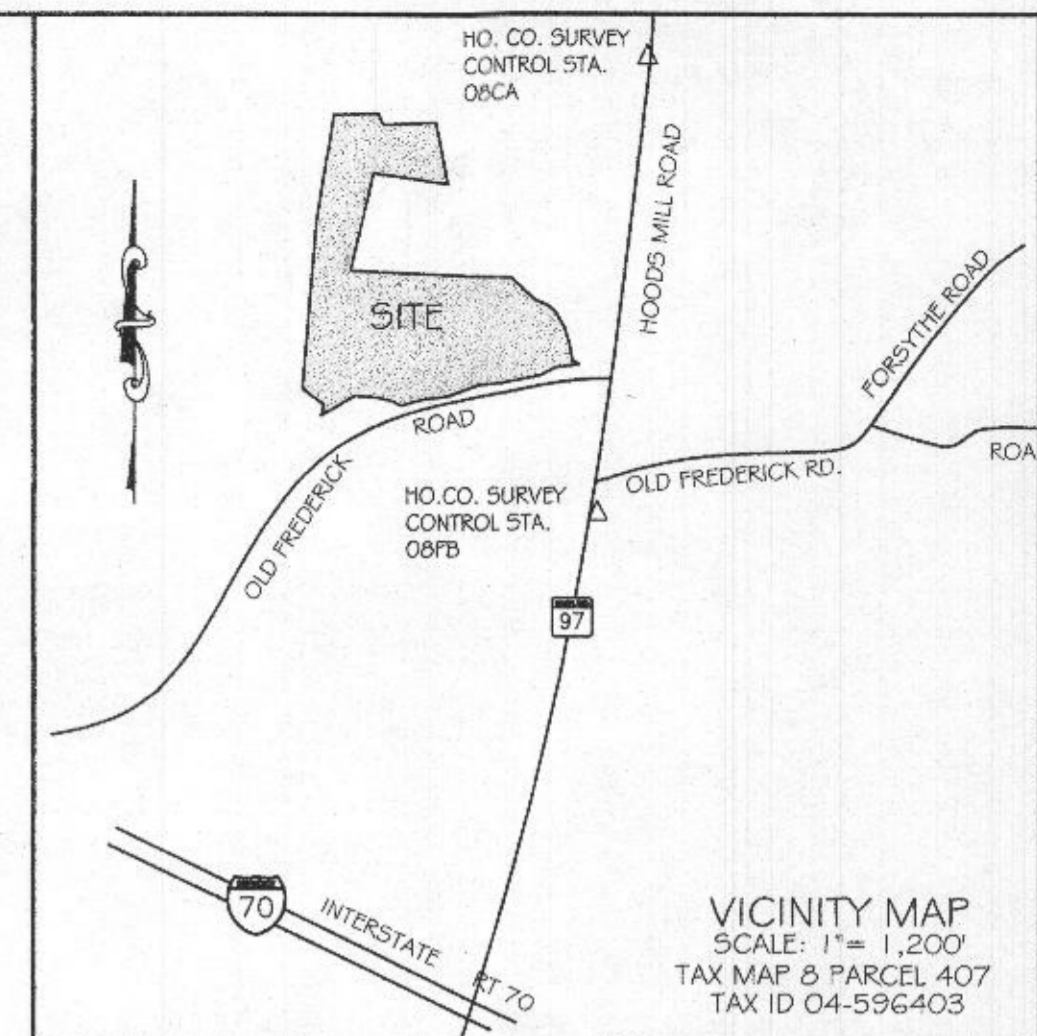
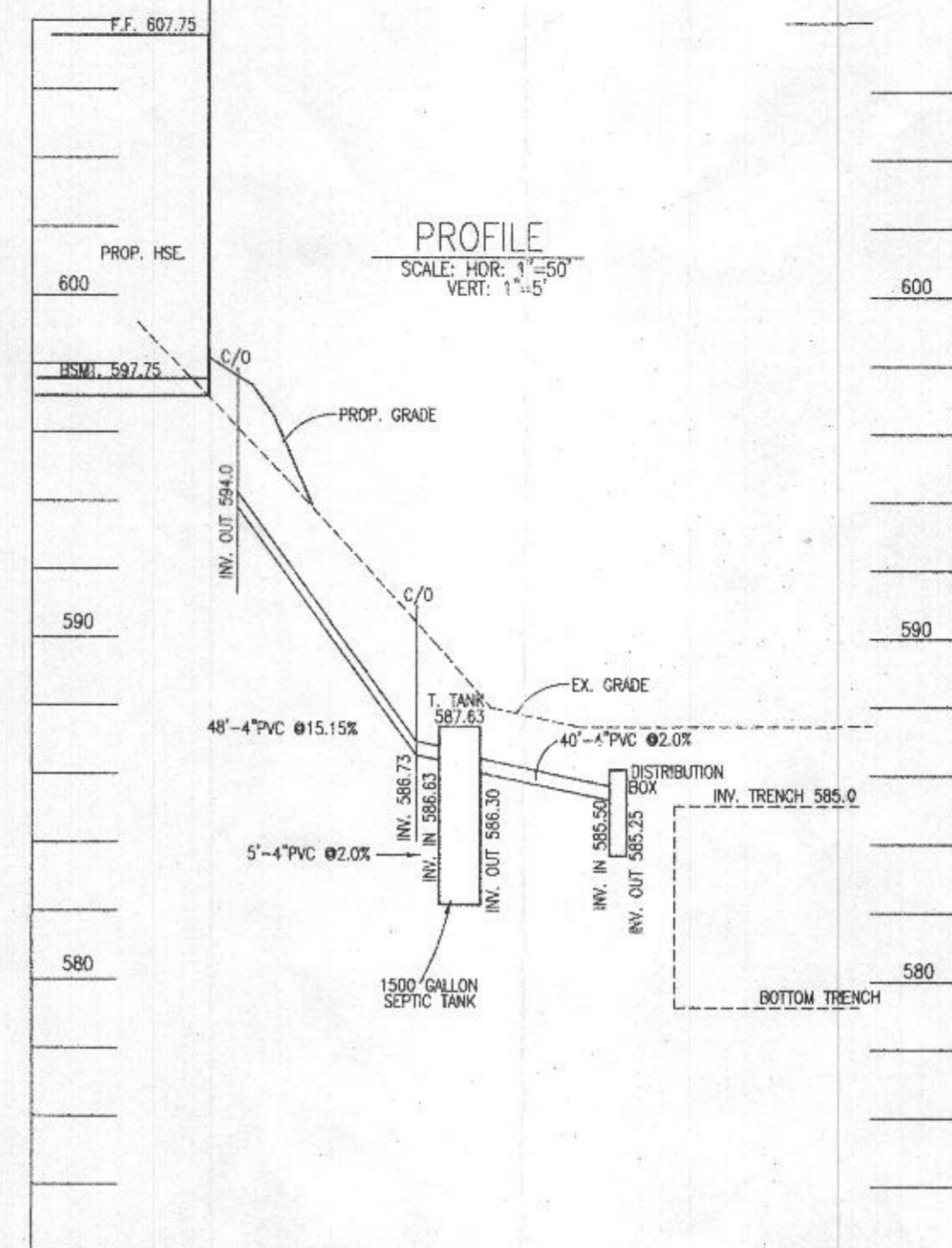
VANMAR ASSOCIATES, INC.
 Engineers Surveyors Planners
 310 South Main Street Mount Airy, Maryland 21771
 (301) 829-2890 (301) 831-5015 (410) 549-2751
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SHEET 2 OF 2

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. 18417, Expiration Date: 9-18-21.

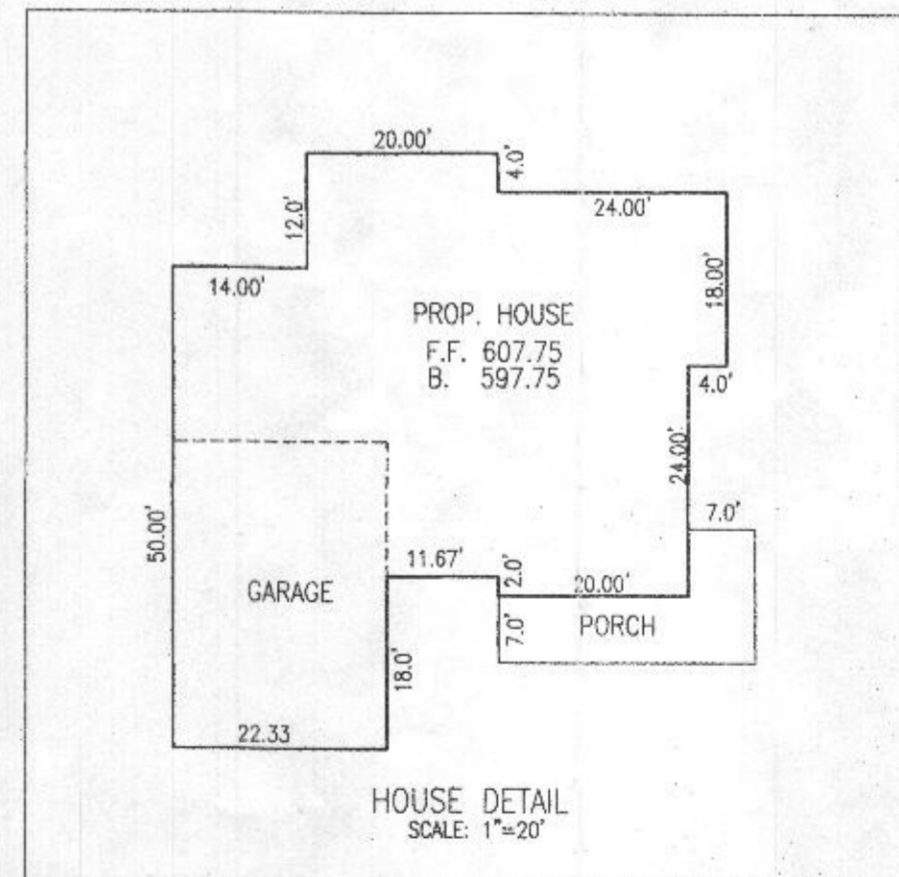
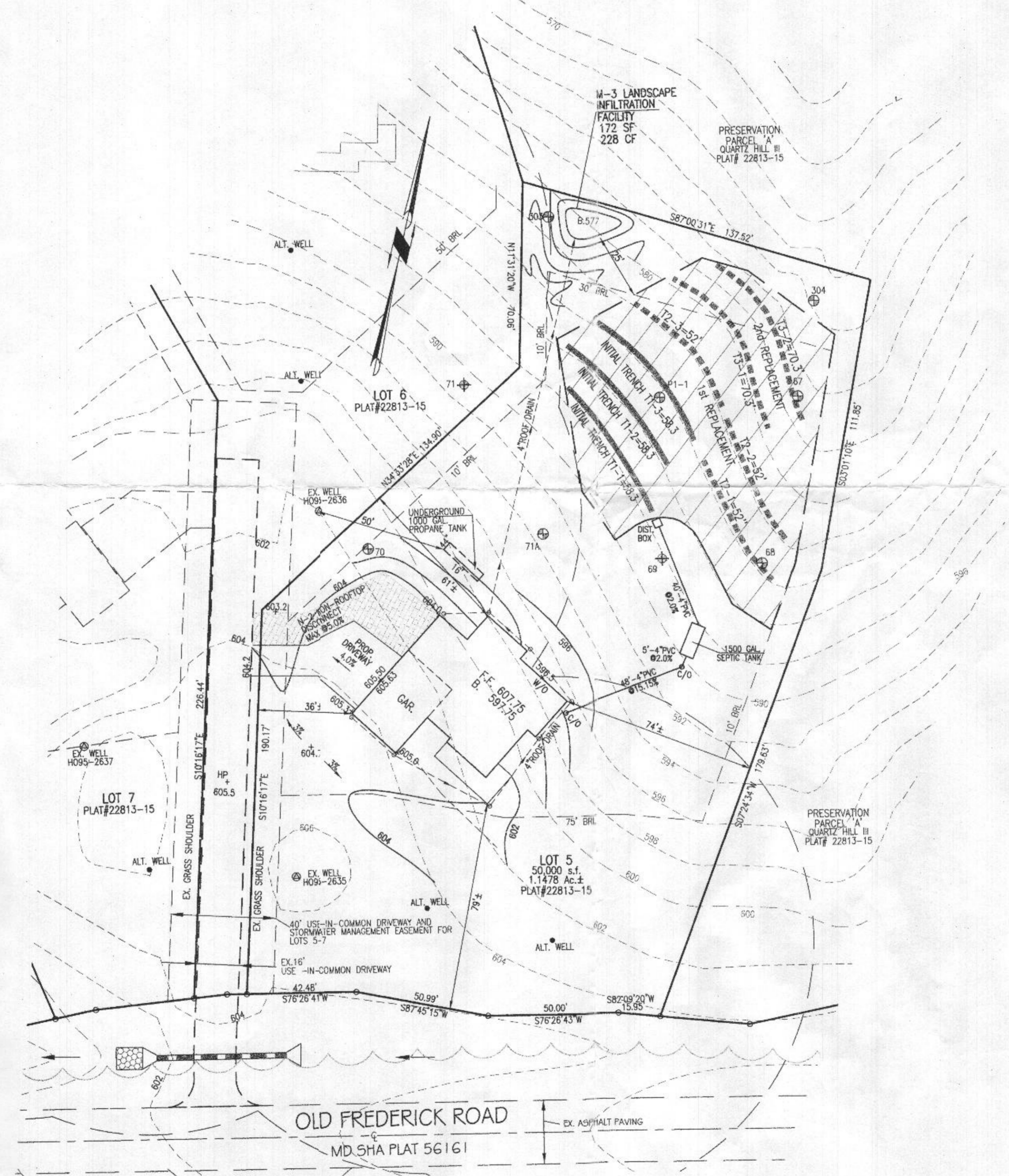


1500 GALLON
2-COMPARTMENT SEPTIC TANK
N.T.S.



- GENERAL NOTES:**
- TOPOGRAPHY & PLANIMETRIC FEATURES SHOWN HEREON TAKEN FROM COPYRIGHTED GIS DATA FROM HOWARD COUNTY, SUPPLEMENTED WITH FIELD LOCATIONS BY VANMAR ASSOCIATES, INC. CONTOUR INTERVAL IS 2 FEET. VERTICAL DATUM IS NAVD83.
 - THE EXISTING WELLS HO95-2635 SHOWN ON THIS PLAN HAVE BEEN FIELD LOCATED BY VANMAR ASSOCIATES OR TAKEN FROM AVAILABLE RECORDS AND ACCURATELY SHOWN.
 - ZONING DISTRICT: RC-DEO
 - LIMIT OF DISTURBANCE (LOD) = 22,500 SQ.FT.
 - THERE ARE NO STREAMS, PONDS, FLOODPLAINS OR WETLANDS ON THIS LOT.
 - STORM WATER MANAGEMENT FOR THIS LOT IS PROVIDED BY N-2 NON-ROOFTOP DISCONNECTION AND M-3 LANDSCAPE INFILTRATION.

- SEPTIC SYSTEM TRENCH DESIGN**
- INITIAL NUMBER OF BEDROOMS = 5
 APPLICATION RATE = 0.8 GPD / sq.ft.
 DESIGN FLOW: 150 GPD X 5 BEDROOMS = 750 GPD
 750 GPD / 0.8 GPD/sq.ft. = 937.5 sq.ft.
 937.5 sq.ft. / 3 ft. WIDE TRENCH = 312.5 LF TRENCH
 312.5 LF TRENCH X 0.56 REDUCTION CREDIT = 175 LF TRENCH
 TRENCH T1-1 EX. GRD=587.5 - INV. TRENCH=585.0 - B. TRENCH=579.5
 TRENCH T1-2 EX. GRD=585.8 - INV. TRENCH=583.3 - B. TRENCH=577.8
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 TRENCH T3-1 EX. GRD=579.5 - INV. TRENCH=577.0 - B. TRENCH=571.5
 TRENCH T3-2 EX. GRD=577.0 - INV. TRENCH=574.5 - B. TRENCH=569.0



- SITE PLAN NOTES:**
- ANY CHANGE TO THE LOCATIONS OR DEPTHS TO ANY COMPONENTS MUST BE APPROVED BY THE ENGINEER AND THE HOWARD COUNTY HEALTH DEPARTMENT PRIOR TO INSTALLATION. A REVISED SITE PLAN MAY BE REQUIRED.
 - MAXIMUM COVER OVER THE TANK IS 3 FEET. GREATER DEPTH WILL REQUIRE A HEAVY LOAD BEARING TANK.
 - ELECTRICAL WORK FOR THE INSTALLATION MUST BE PERFORMED BY A LICENSED ELECTRICIAN.
 - THE WELL (TAG #HO-95-2635) HAS BEEN FIELD LOCATED AND IS ACCURATELY SHOWN.
 - ALL WELLS AND SEPTIC SYSTEMS LOCATED WITHIN 100' OF THE PROPERTY BOUNDARIES AND 200' DOWN GRADIENT OF ANY WELLS AND OR SEPTIC SYSTEMS HAVE BEEN SHOWN.

Approved Septic System Plan
 Howard County Health Department
 1500-gal Septic Tank
 To Gravity Drainfield
 For 5-bedroom SFD
 Signature: [Signature]
 Pending approval of Perc Cert

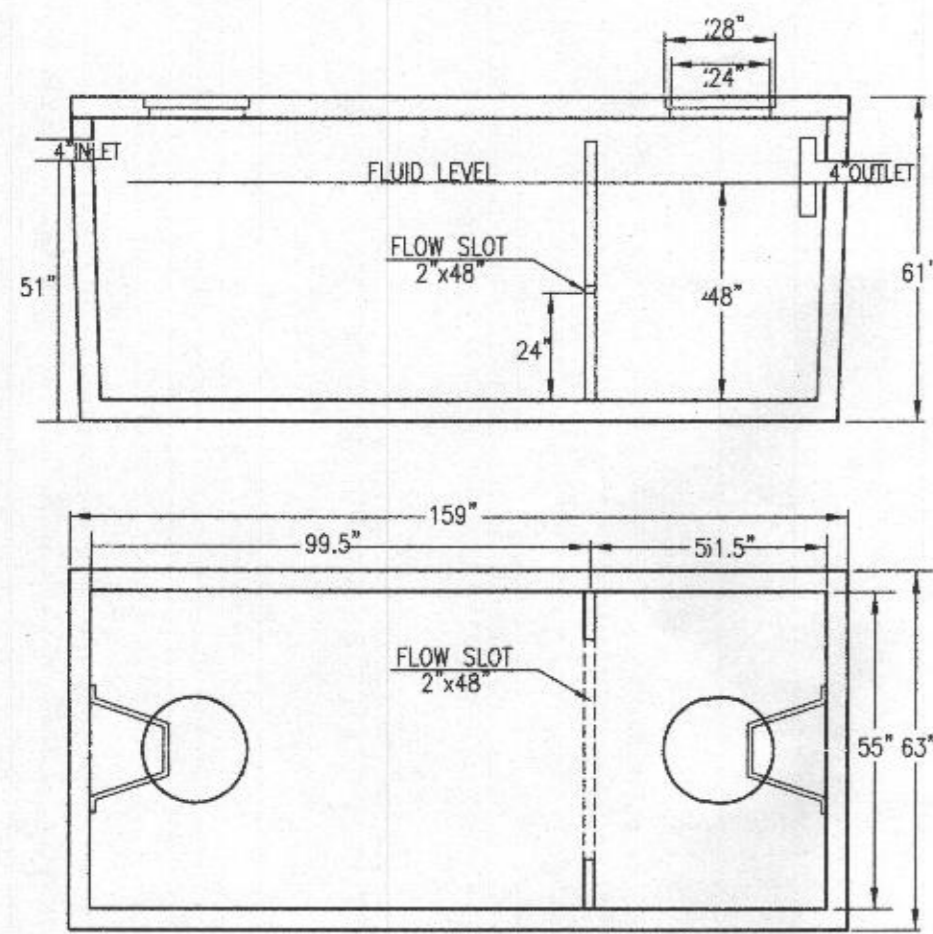
PROFESSIONAL CERTIFICATION
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DATE REVISIONS

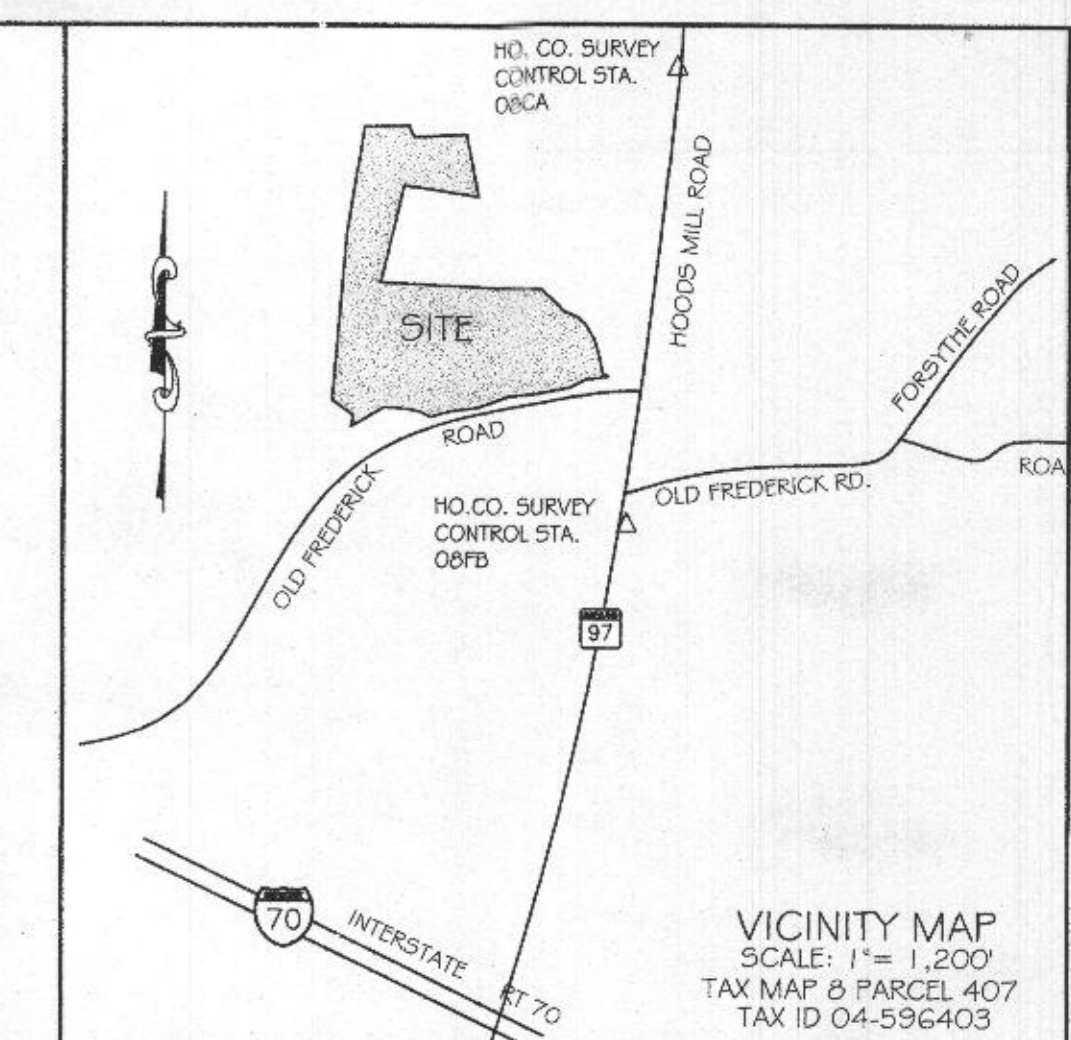
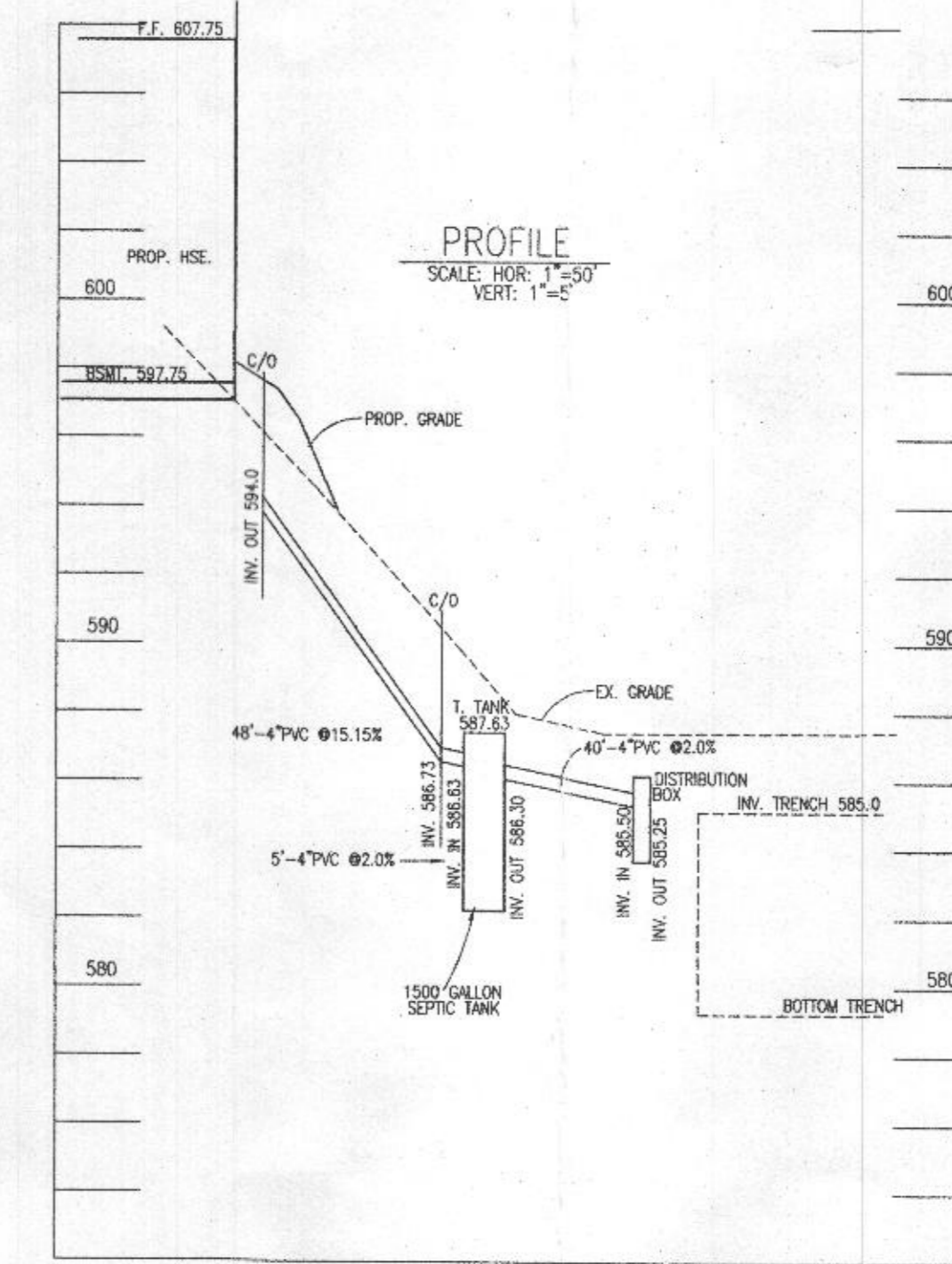
ON SITE SEWAGE DISPOSAL SYSTEM DESIGN PLAN
 14550 OLD FREDERICK ROAD
 LOT 5
 QUARTZ HILL III
 PLAT NO. 22813-22815
 14550 OLD FREDERICK ROAD
 FOURTH ELECTION DISTRICT
 HOWARD COUNTY, MARYLAND
 SCALE: 1" = 30' APRIL 2020

OWNER / DEVELOPER:
 CATONVILLE HOMES
 11175 STRATFIELD CT.
 MARRIOTTSVILLE, MD. 21104
 410-442-2211

VANMAR ASSOCIATES, INC.
 Engineers Surveyors Planners
 310 South Main Street Mount Airy, Maryland 21771
 (301) 829-2890 (301) 831-5015 (410) 549-2751
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1500 GALLON
2-COMPARTMENT SEPTIC TANK
N.T.S.



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- ZONING DISTRICT: RC-DEO
- LIMIT OF DISTURBANCE (LOD) = 22,500 SQ.FT.
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SEPTIC SYSTEM TRENCH DESIGN

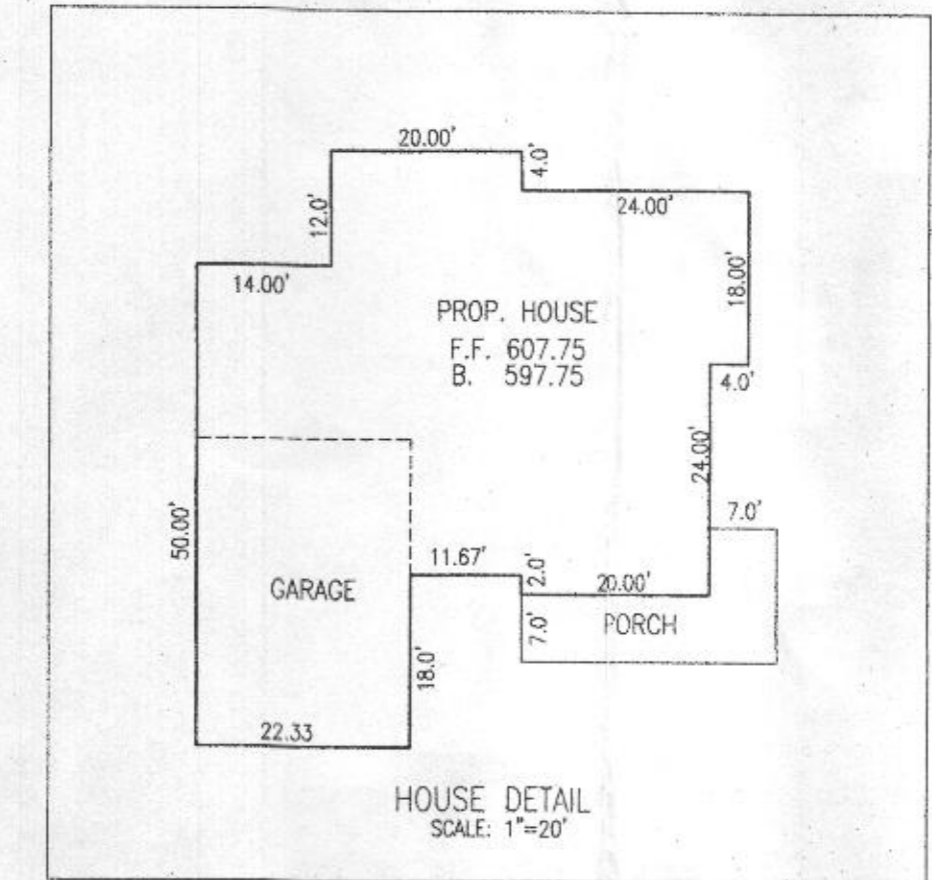
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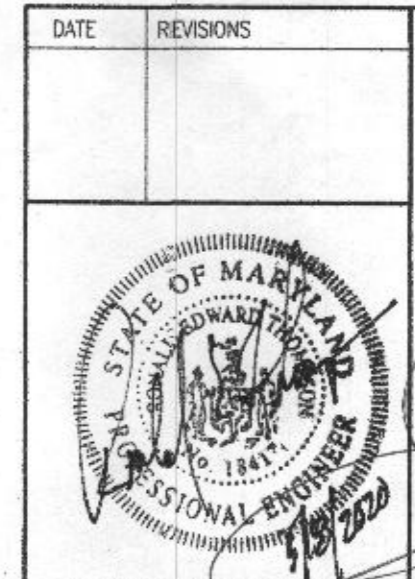
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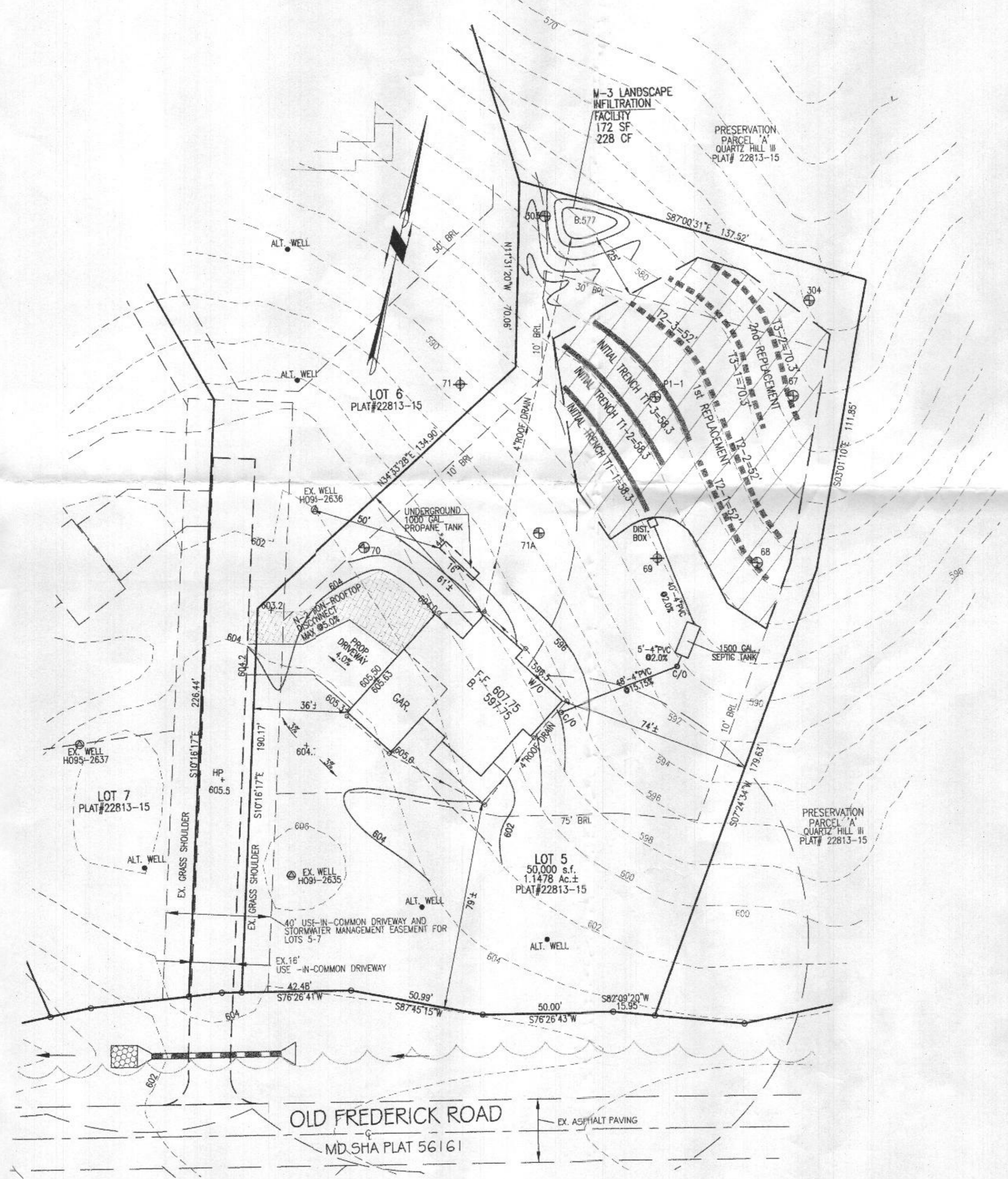
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Approved Septic System Plan
 Howard County Health Department
 1500 gal septic tank to
 Gravity Drained field
 for 5-Bedroom SFD
 Signature: [Signature] 5/26/2020
 Date: [Date]
 Pending Health Dept approval
 of Revised Perc Cert

