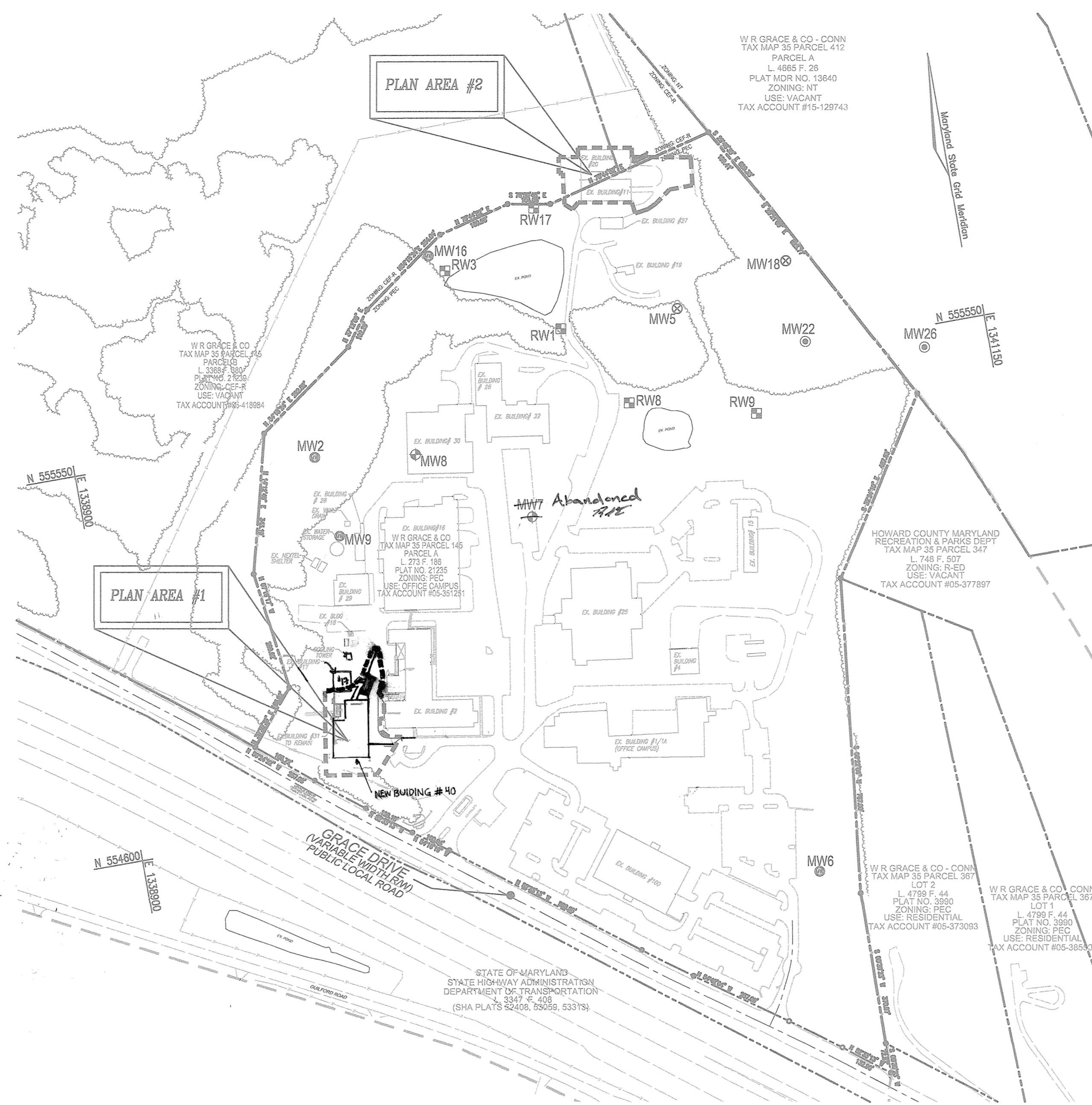


**GENERAL NOTES**

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST STANDARDS AND SPECIFICATIONS OF HOWARD COUNTY STANDARDS AND SPECIFICATIONS. ALL WORK AND MATERIALS SHALL COMPLY WITH MSHA STANDARDS.
2. THE CONTRACTOR SHALL NOTIFY "MISS UTILITY" AT 1-800-257-7777 AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION WORK.
3. THE CONTRACTOR IS TO NOTIFY THE FOLLOWING UTILITIES OR AGENCIES AT LEAST FIVE DAYS BEFORE STARTING WORK ON THESE DRAWINGS:  
 MISS UTILITY: 1-800-257-7777  
 VERIZON: 1-800-743-0033  
 BUREAU OF UTILITIES: 410-311-6927  
 AT&T: 1-800-252-1133  
 B.G.&E. (CONSTRUCTION SERVICES): 410-637-8713  
 B.G.&E. (EMERGENCY): 410-685-0123  
 STATE HIGHWAY ADMINISTRATION: 410-531-5533  
 COLONIAL PIPELINE CO.: 410-795-1390
4. SITE ANALYSIS:  
 TOTAL PARCEL AREA: 58.40 AC  
 TOTAL PROJECT AREA: 2.16 AC (LOD)  
 PRESENT ZONING: PEC  
 USE OF STRUCTURE: WAREHOUSE BUILDING  
 FIRST FLOOR (WAREHOUSE): 16,893 SF  
 PARTIAL SECOND FLOOR (STORAGE): 5,660 SF  
 TOTAL BUILDING COVERAGE (FOOTPRINT AREA): 16,920 SF (0.39 AC, OR 0.87% OF GROSS AREA)  
 PAVED PARKING LOT/AREA ON SITE (WITHIN LOD): 11,078 SF (0.25 AC, OR 0.43% OF GROSS AREA)  
 AREA OF LANDSCAPE ISLAND: 2,304 SF (0.05 AC, OR 0.08% OF GROSS AREA)  
 AREA OF STEEP SLOPES: 0.00 AC  
 AREA OF FLOODPLAIN: 0.00 AC  
 AREA OF EXISTING FOREST (WITHIN LOD): 0.00 AC  
 AREA OF ERODIBLE SOILS (WITHIN LOD): 0.00 AC  
 AREA OF WETLANDS (WITHIN LOD): 0.00 AC  
 AREA OF WETLAND BUFFERS (WITHIN LOD): 0.00 AC  
 AREA OF STREAMS AND THEIR BUFFERS (WITHIN LOD): 0.00 AC  
 LIMIT DISTURBED AREA: 1.84 AC  
 CUT: 1134 CY  
 FILL: 184 CY
5. PROJECT BACKGROUND:  
 LOCATION: COLUMBIA, MD.; TAX MAP 35, BLOCK 22, PARCEL 145, PARCEL A  
 ZONING: W R GRACE & CO.  
 SUBDIVISION: W R GRACE & CO.  
 SECTION/AREA: N/A  
 TOTAL PARCEL AREA: 58.40 AC  
 DPZ REFERENCES: SDP-84-255, SDP-84-256, SDP-85-208, SDP-87-032, SDP-87-042, SDP-87-237, SDP-88-42, SDP-88-193, ADP-80-037, SDP-90-118, SDP-94-001, SDP-94-002, SDP-94-003, SDP-94-004, SDP-94-005, SDP-94-006, SDP-94-007, SDP-94-008, SDP-94-009, SDP-94-010, SDP-94-011, SDP-94-012, SDP-94-013, SDP-94-014, SDP-94-015, SDP-94-016, SDP-94-017, SDP-94-018, SDP-94-019, SDP-94-020, SDP-94-021, SDP-94-022, SDP-94-023, SDP-94-024, SDP-94-025, SDP-94-026, SDP-94-027, SDP-94-028, SDP-94-029, SDP-94-030, SDP-94-031, SDP-94-032, SDP-94-033, SDP-94-034, SDP-94-035, SDP-94-036, SDP-94-037, SDP-94-038, SDP-94-039, SDP-94-040, SDP-94-041, SDP-94-042, SDP-94-043, SDP-94-044, SDP-94-045, SDP-94-046, SDP-94-047, SDP-94-048, SDP-94-049, SDP-94-050, SDP-94-051, SDP-94-052, SDP-94-053, SDP-94-054, SDP-94-055, SDP-94-056, SDP-94-057, SDP-94-058, SDP-94-059, SDP-94-060, SDP-94-061, SDP-94-062, SDP-94-063, SDP-94-064, SDP-94-065, SDP-94-066, SDP-94-067, SDP-94-068, SDP-94-069, SDP-94-070, SDP-94-071, SDP-94-072, SDP-94-073, SDP-94-074, SDP-94-075, SDP-94-076, SDP-94-077, SDP-94-078, SDP-94-079, SDP-94-080, SDP-94-081, SDP-94-082, SDP-94-083, SDP-94-084, SDP-94-085, SDP-94-086, SDP-94-087, SDP-94-088, SDP-94-089, SDP-94-090, SDP-94-091, SDP-94-092, SDP-94-093, SDP-94-094, SDP-94-095, SDP-94-096, SDP-94-097, SDP-94-098, SDP-94-099, SDP-94-100, SDP-94-101, SDP-94-102, SDP-94-103, SDP-94-104, SDP-94-105, SDP-94-106, SDP-94-107, SDP-94-108, SDP-94-109, SDP-94-110, SDP-94-111, SDP-94-112, SDP-94-113, SDP-94-114, SDP-94-115, SDP-94-116, SDP-94-117, SDP-94-118, SDP-94-119, SDP-94-120, SDP-94-121, SDP-94-122, SDP-94-123, SDP-94-124, SDP-94-125, SDP-94-126, SDP-94-127, SDP-94-128, SDP-94-129, SDP-94-130, SDP-94-131, SDP-94-132, SDP-94-133, SDP-94-134, SDP-94-135, SDP-94-136, SDP-94-137, SDP-94-138, SDP-94-139, SDP-94-140, SDP-94-141, SDP-94-142, SDP-94-143, SDP-94-144, SDP-94-145, SDP-94-146, SDP-94-147, SDP-94-148, SDP-94-149, SDP-94-150, SDP-94-151, SDP-94-152, SDP-94-153, SDP-94-154, SDP-94-155, 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SDP-94-986, SDP-94-987, SDP-94-988, SDP-94-989, SDP-94-990, SDP-94-991, SDP-94-992, SDP-94-993, SDP-94-994, SDP-94-995, SDP-94-996, SDP-94-997, SDP-94-998, SDP-94-999, SDP-94-1000.

# SITE DEVELOPMENT PLAN GRACE TECH PARK WAREHOUSE BUILDING

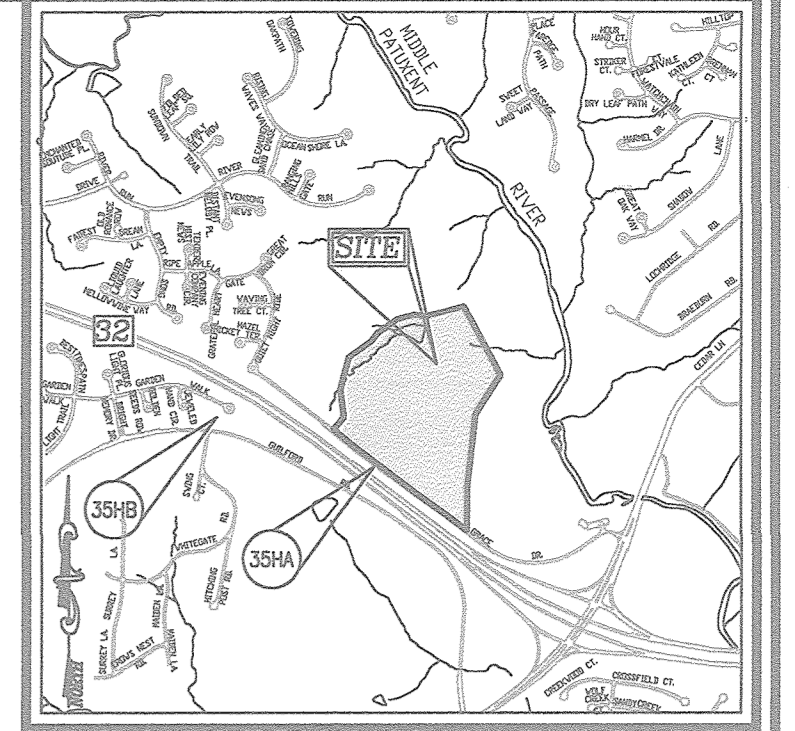


**BENCHMARKS**

HOWARD COUNTY BENCHMARK 35HA  
 N 55486.7457 E 1340478.9524 ELEV: 404.584  
 HOWARD COUNTY BENCHMARK 35HB  
 N 554836.4156 E 1337889.3861 ELEV: 449.689

**LEGEND**

- PROPERTY LINE
- RIGHT-OF-WAY LINE
- ADJACENT PROPERTY LINE
- EXISTING CURB AND CUTTER
- PROPOSED CURB AND CUTTER
- WELL TO BE MAINTAINED
- BEDROCK MONITORING WELL TO BE MAINTAINED
- OVERBURDEN MONITORING WELL TO BE MAINTAINED
- RECOVERY WELL (Removed)
- WELL TO BE ABANDONED



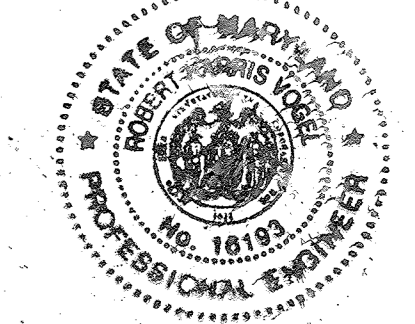
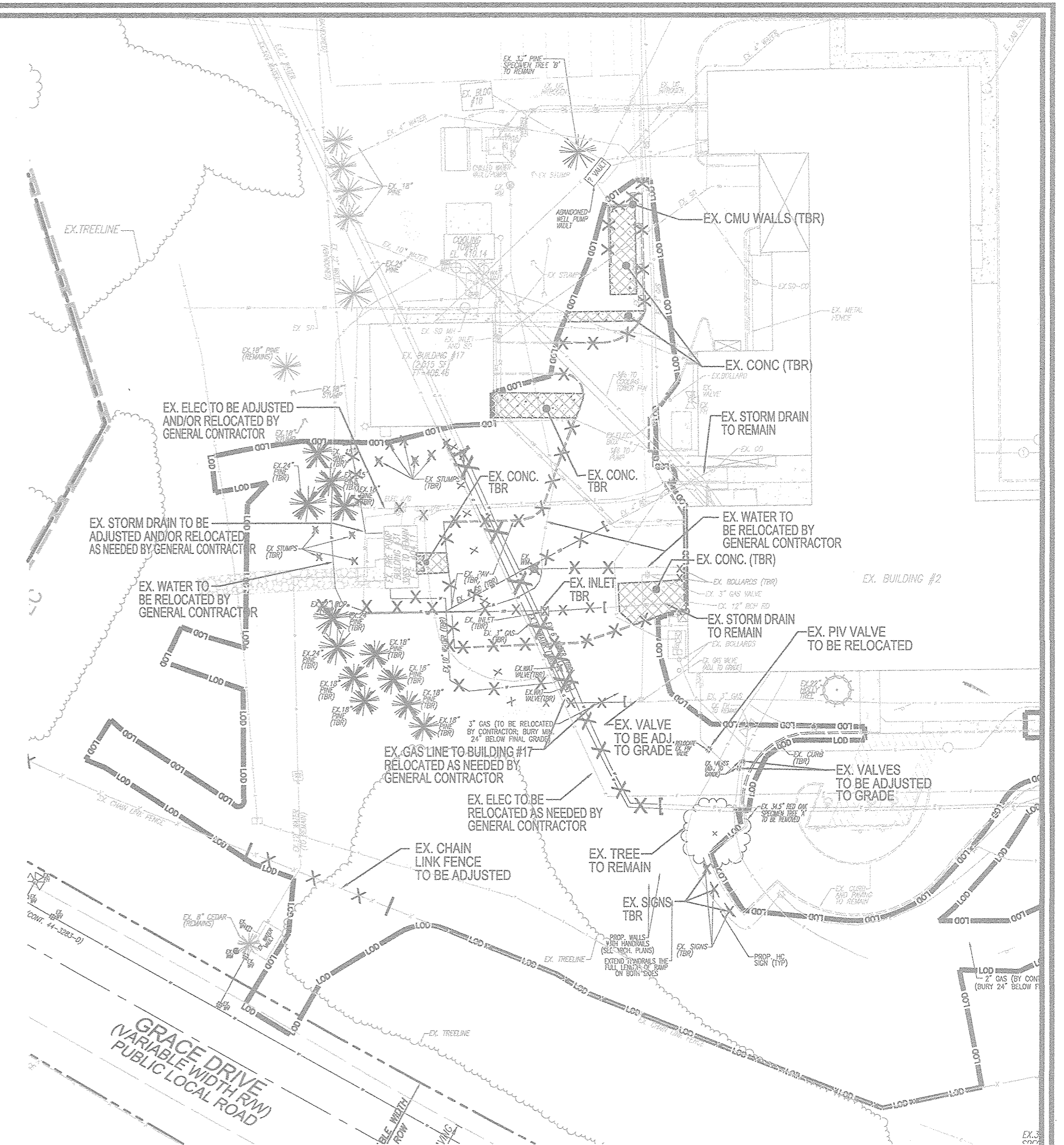
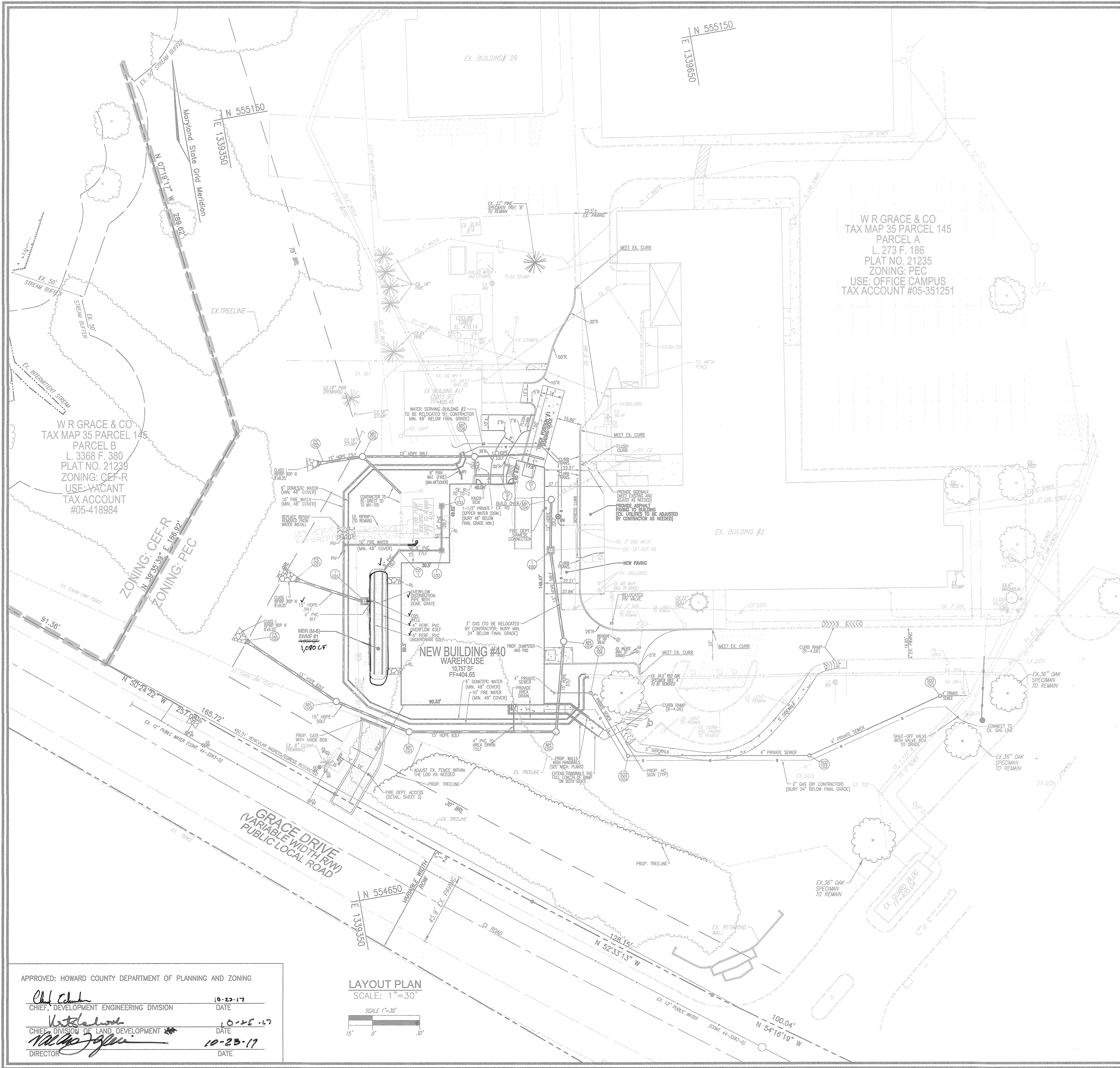
**VICINITY MAP**  
 SCALE: 1"=2000'  
 ADC MAP COORDINATE: 4934 E10 & F10

Forest Conservation Tracking Chart

Plan Number	Gross Area (ac)	Floodplain Area or Deductions (ac)	Net Tract Area (ac)	Existing Forest Area (ac)	Forest Cleared (ac)	Forest Retained (ac)	Reforestation/ Afforestation Required (ac)
SDP-12-077	8.40	0.00	8.40	0.30	0.00	0.00	1.60
SDP-17-006	2.19	0.88	1.31	0.00	0.00	0.00	0.20

**SHEET INDEX**

DESCRIPTION	SHEET NO.
COVER	1
SITE LAYOUT PLAN AND AREA#1 DEMO	2
SITE DETAILS	3
GRADING AND SEDIMENT CONTROL PLAN AND AREA#2 DEMO	4
SEDIMENT CONTROL NOTES AND DETAILS	5
STORM DRAIN DRAINAGE AREA MAP AND UTILITY PROFILES	6
STORMWATER MANAGEMENT DRAINAGE AREA MAP AND DETAILS	7
LANDSCAPE PLAN AND FOREST CONSERVATION PLAN	8



AS-BUILT CERTIFICATION FOR PSNMA  
I HEREBY CERTIFY THAT THE FACILITY SHOWN ON THIS PLAN WAS CONSTRUCTED AS SHOWN ON THE "AS-BUILT" PLANS AND COMPLIES WITH THE APPROVED PLANS AND SPECIFICATIONS. I HAVE VERIFIED THAT THE CONTRIBUTING DRAINAGE AREA IS SUFFICIENTLY STABILIZED TO PREVENT CLOSING OF THE UNDERGROUND SWM FACILITY.

16193 8/7/18  
P.E. # DATE

OWNER/DEVELOPER  
W R GRACE & CO.  
7500 GRACE DR.  
COLUMBIA, MD 21044-4098  
(410) 531-4000

- LEGEND:**
- EXISTING CURB AND GUTTER
  - PROPOSED CURB AND GUTTER
  - EXISTING UTILITY POLE
  - EXISTING LIGHT POLE
  - EXISTING SIGN
  - EXISTING SANITARY MANHOLE
  - EXISTING SANITARY LINE
  - EXISTING CLEANOUT
  - EXISTING FIRE HYDRANT
  - EXISTING WATER LINE
  - PROPOSED STORM DRAIN
  - PROPOSED STORM DRAIN INLET
  - EXISTING TREES (FIELD LOCATED)
  - EXISTING SPECIMEN TREE
  - EXISTING TREELINE
  - PROPOSED TREELINE
  - EXISTING WETLAND
  - EXISTING WETLAND BUFFER (FIELD LOCATED)
  - EXISTING FENCE
  - PROPERTY LINE
  - RIGHT-OF-WAY LINE
  - EXISTING STREAM
  - EXISTING STREAM BUFFER
  - ROOF LEADER LOCATION

NO.	REVISION	DATE
1	REVISE TO REDUCE THE BUILDING SIZE AND RECONFIGURE THE SITE	10/11/17

REVISED SITE DEVELOPMENT PLAN  
**SITE LAYOUT PLAN AND AREA #1 DEMO**  
GRACE TECH PARK  
WAREHOUSE BUILDING  
ZONED: PEC  
TAX MAP: 35 GRID: 22 PARCEL 145, PARCEL A  
5TH ELECTION DISTRICT PLAT 21235 (L. 273 / F. 186) HOWARD COUNTY, MARYLAND

**ROBERT H. VOGEL ENGINEERS - SURVEYORS - PLANNERS**  
8407 MAIN STREET ELICOTT CITY, MD 21043 TEL: 410.461.7666 FAX: 410.461.2611

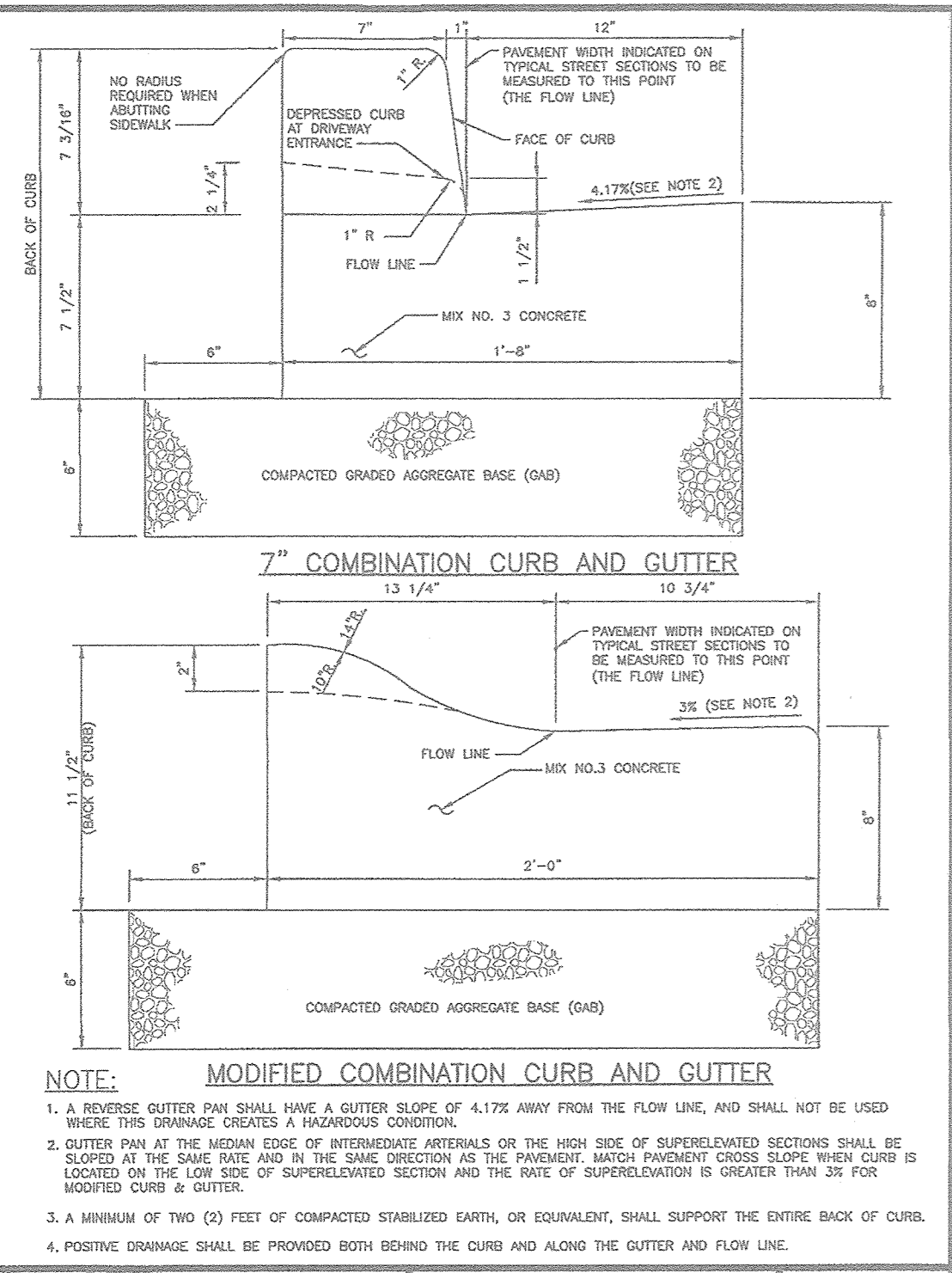
DESIGN BY: RHW/DZE  
DRAWN BY: KG/DZE  
CHECKED BY: RHW  
DATE: OCTOBER 2017  
SCALE: AS SHOWN  
W.O. NO.: 15-20

PROFESSIONAL CERTIFICATE  
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A FULLY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND. EXPIRES 06-27-2018

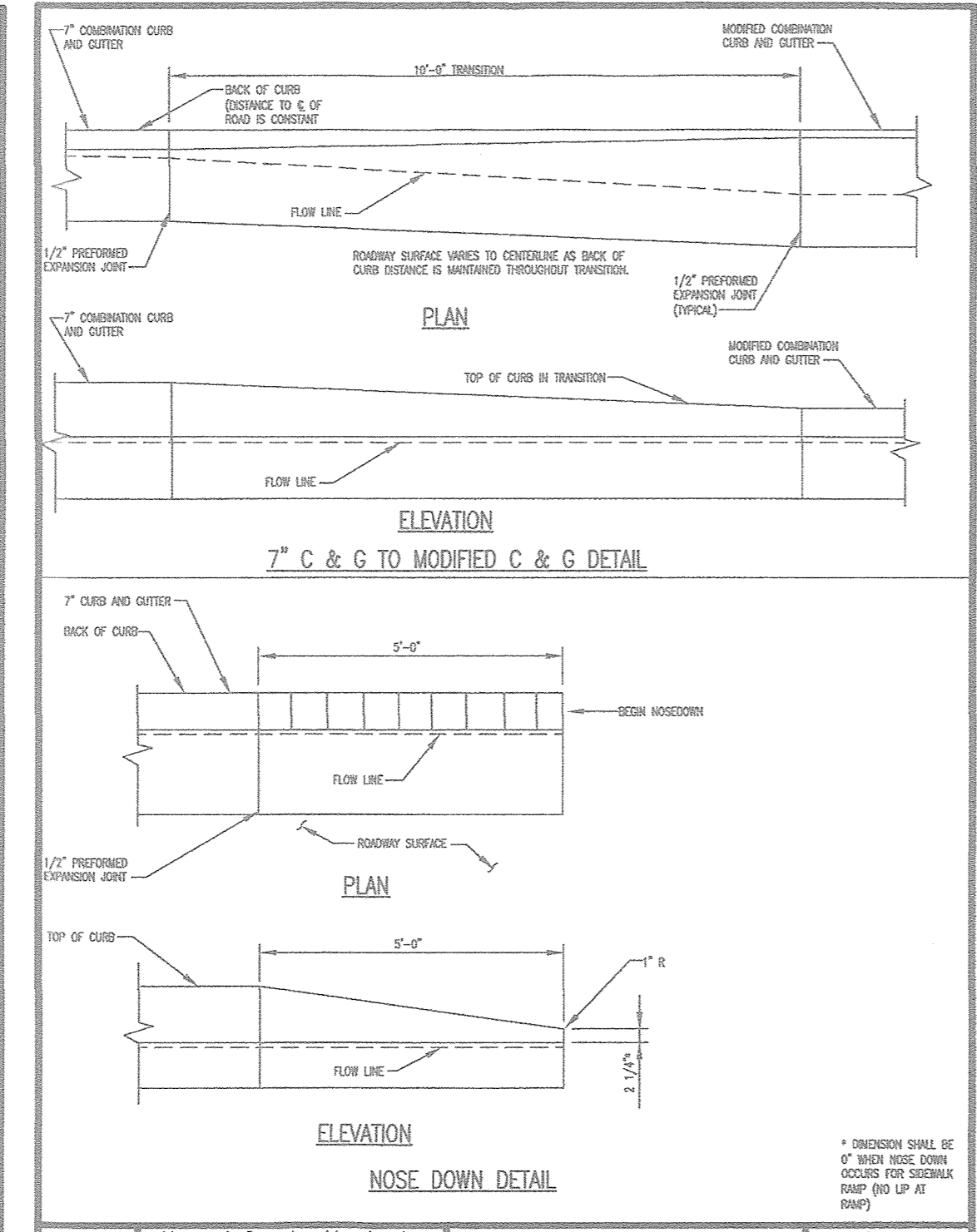
2 SHEET OF 8

APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING  
DATE: 10-23-17  
DATE: 10-25-17  
DATE: 10-25-17

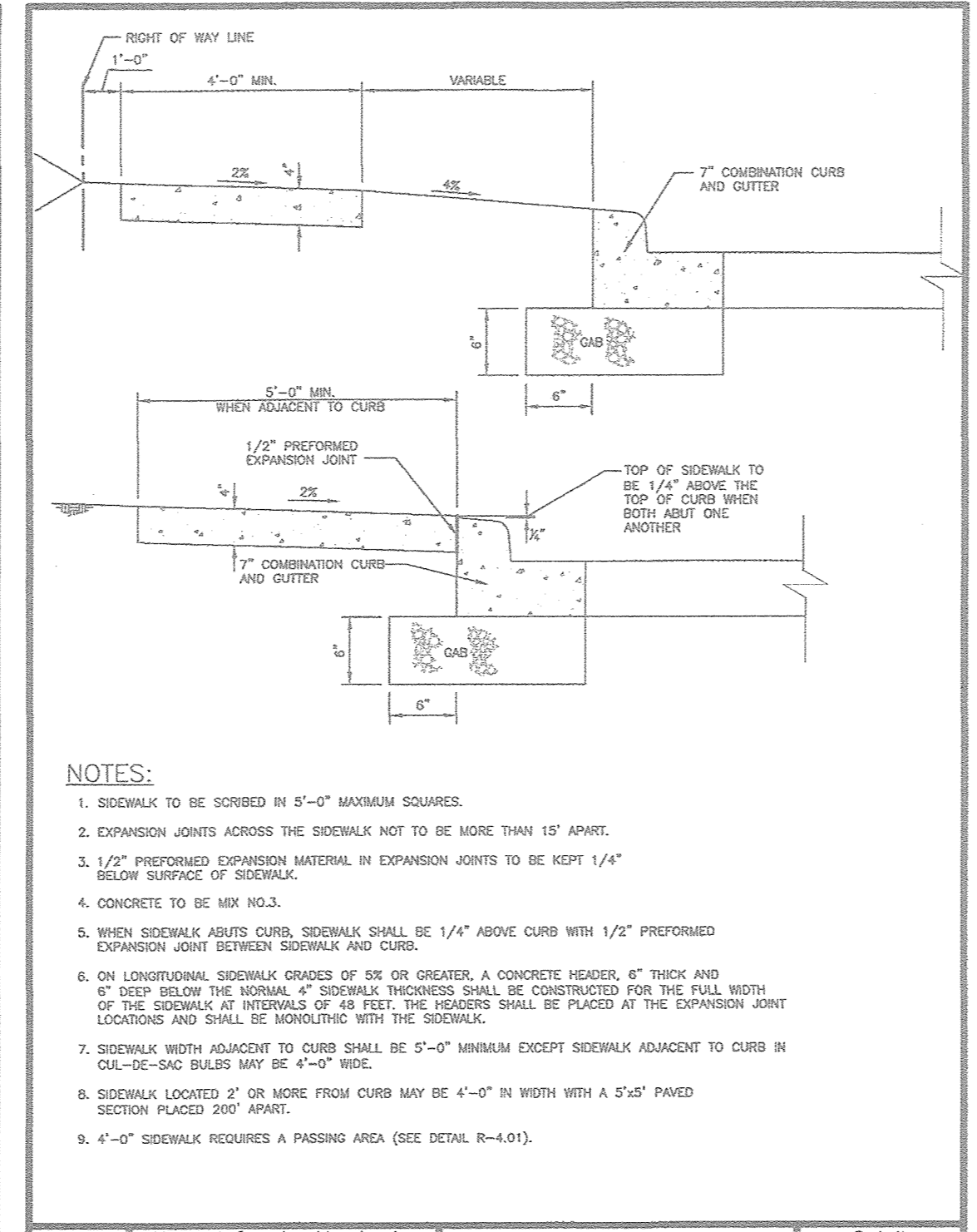
LAYOUT PLAN  
SCALE: 1"=30'



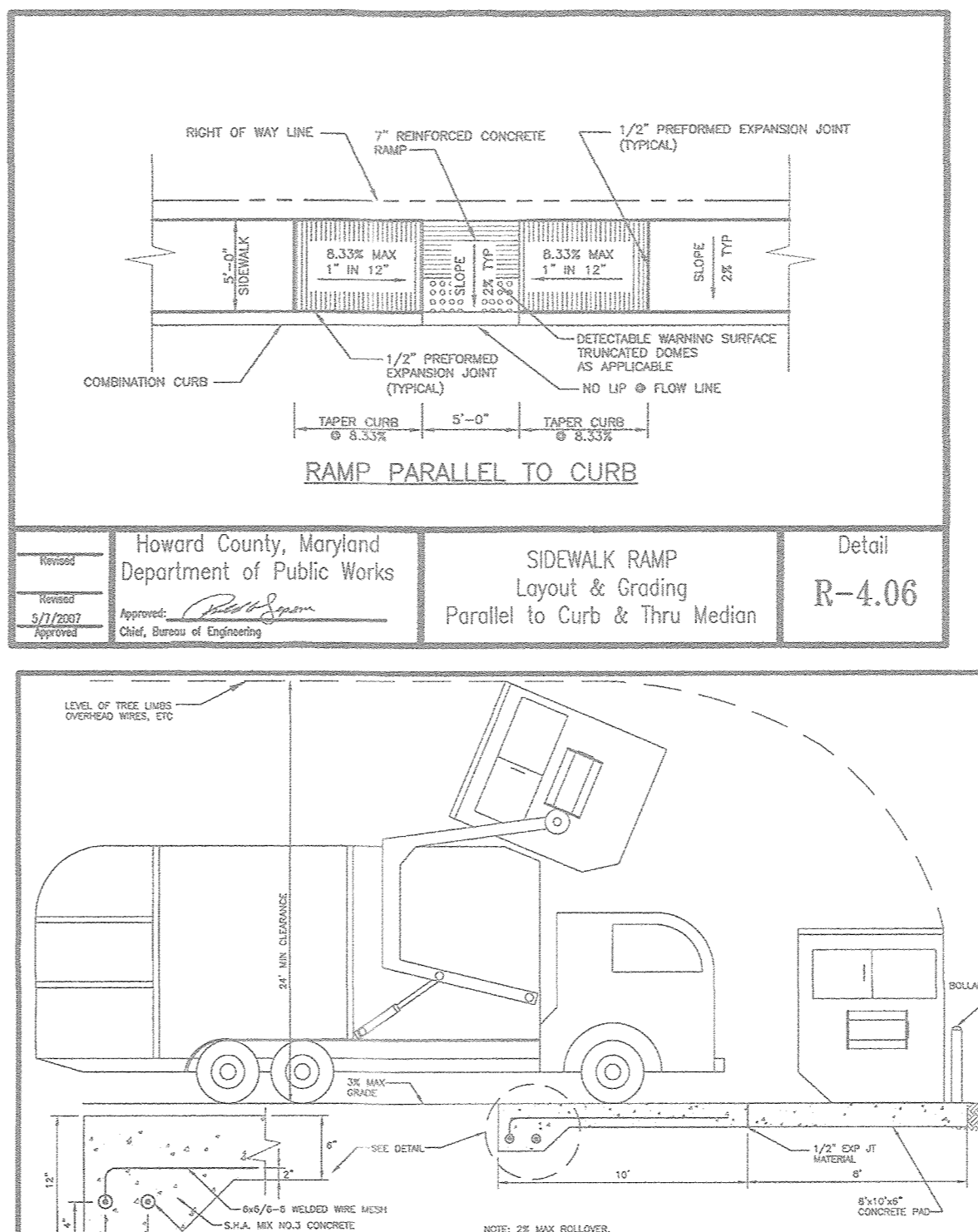
Howard County, Maryland Department of Public Works  
 CURB AND GUTTER  
 7" & Modified  
 Detail R-3.01



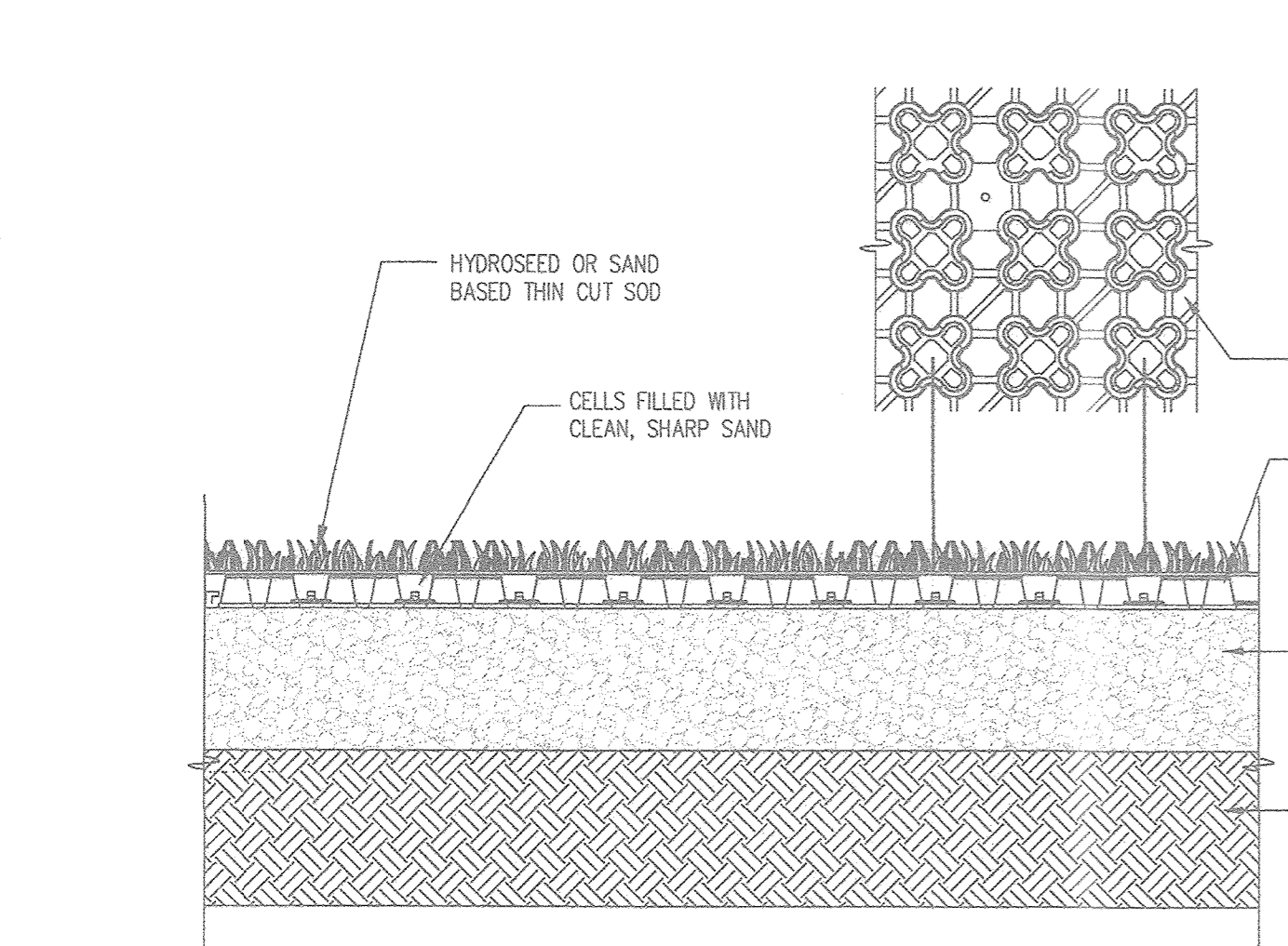
Howard County, Maryland Department of Public Works  
 CURB AND GUTTER  
 7" Transition to Modified & Nose Down  
 Detail R-3.02



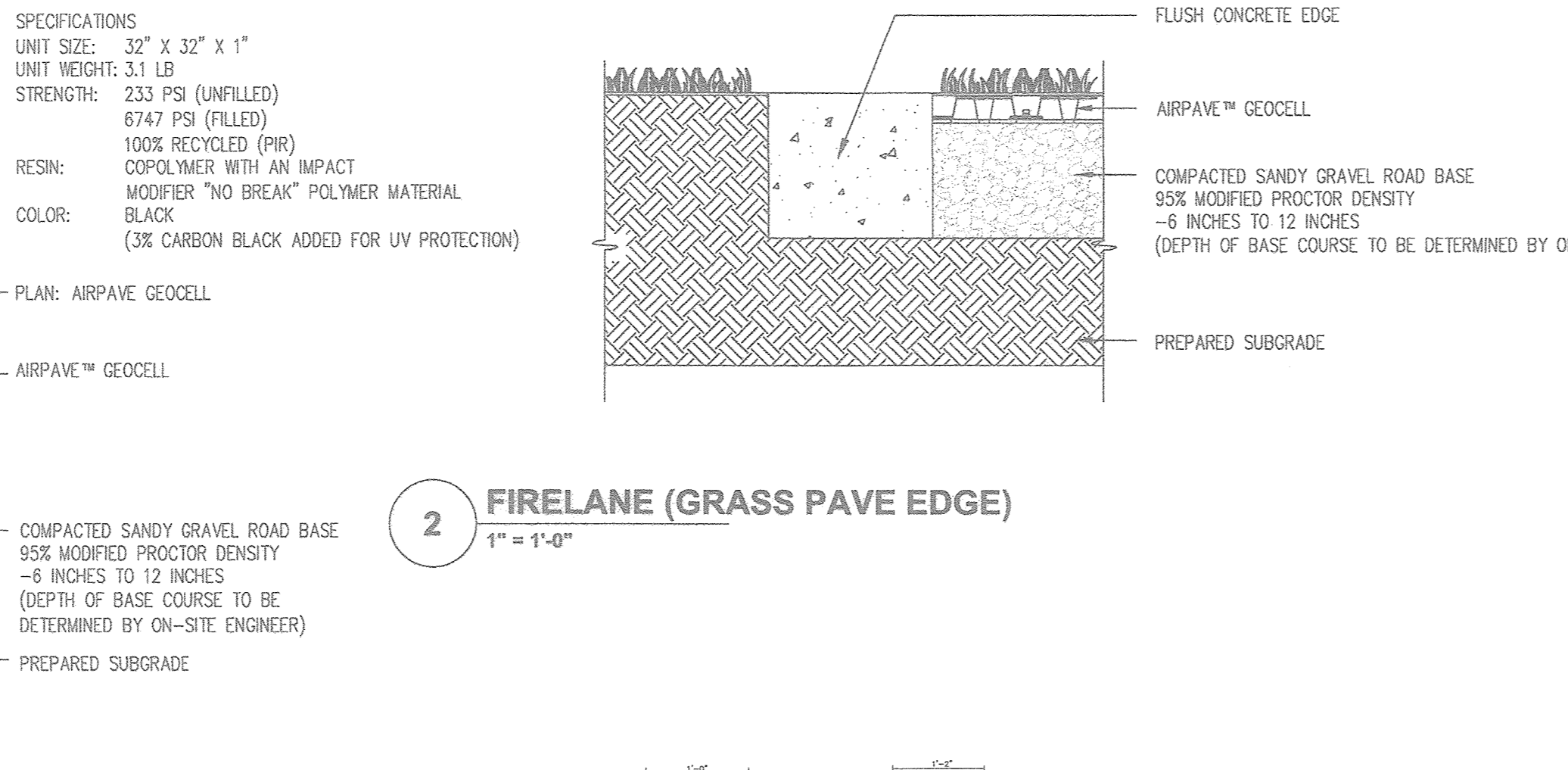
Howard County, Maryland Department of Public Works  
 Concrete Sidewalk  
 Detail R-3.05



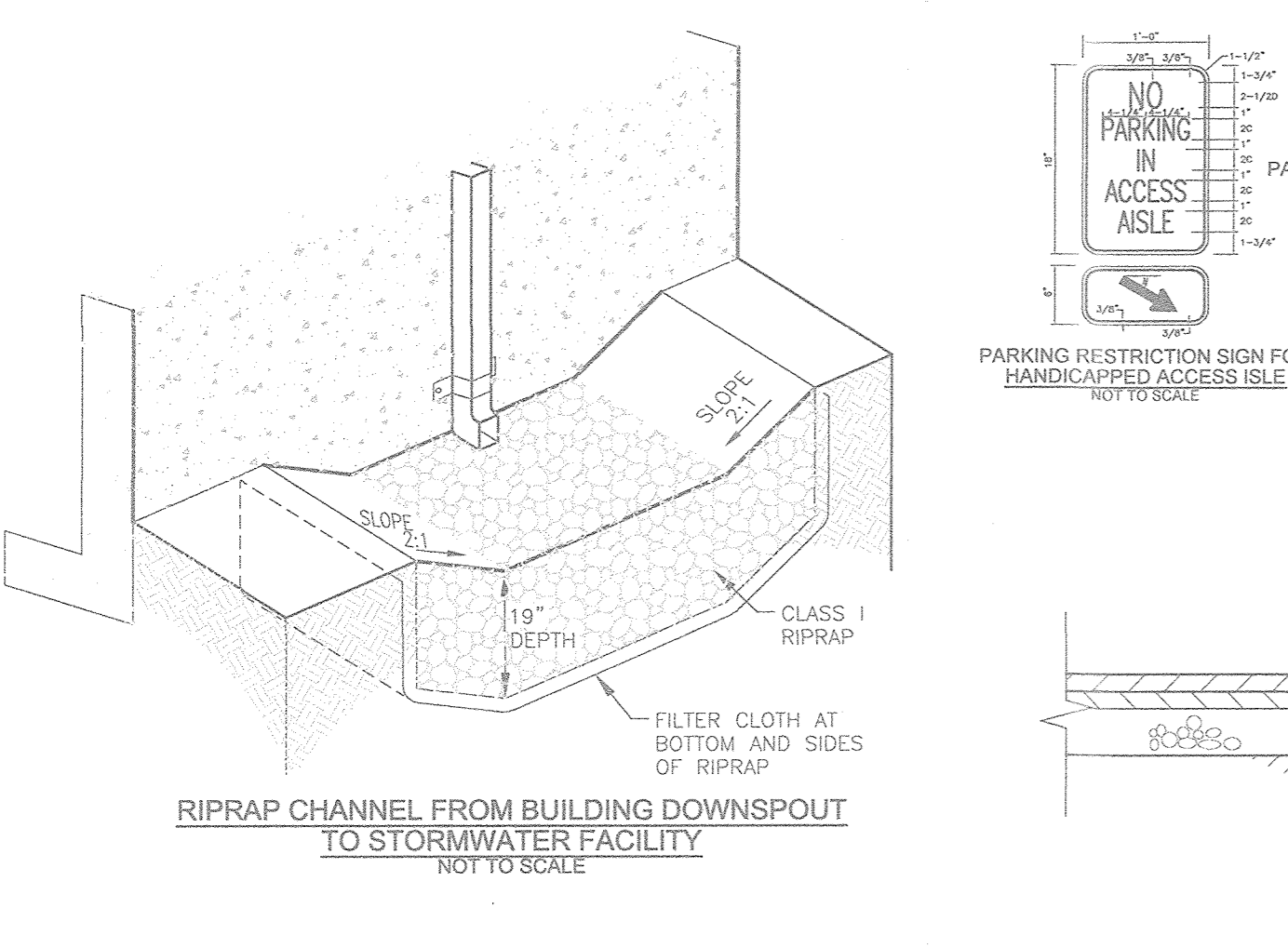
Howard County, Maryland Department of Public Works  
 Sidewalk Ramp Layout & Grading Parallel to Curb & Thru Median  
 Detail R-4.06



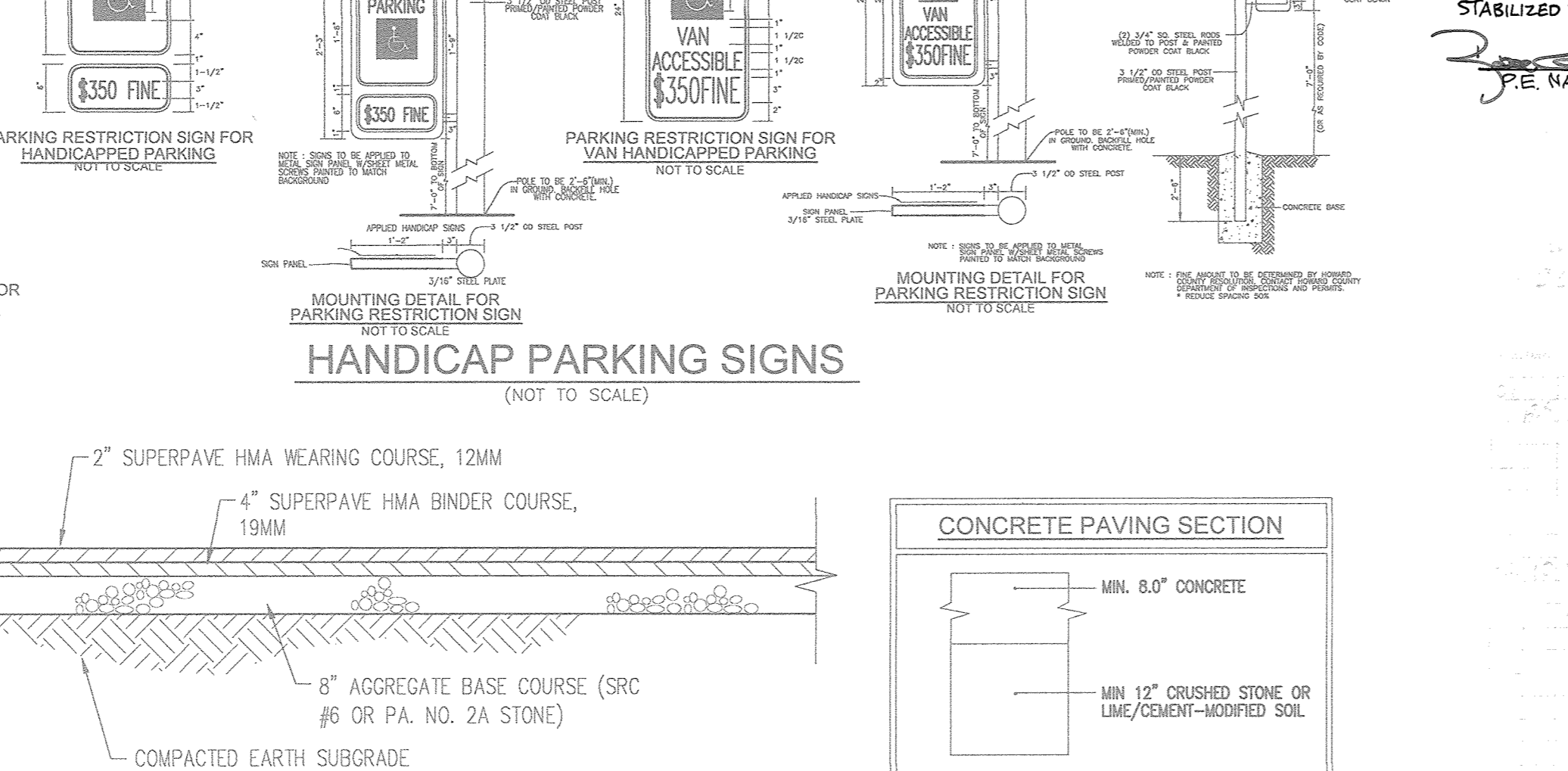
1 FIRELANE (GRASS PAVE)  
 1" = 1'-0"



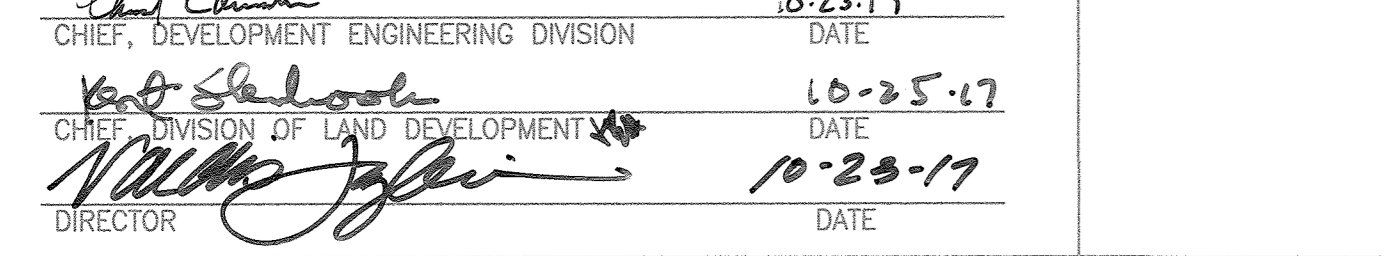
2 FIRELANE (GRASS PAVE EDGE)  
 1" = 1'-0"



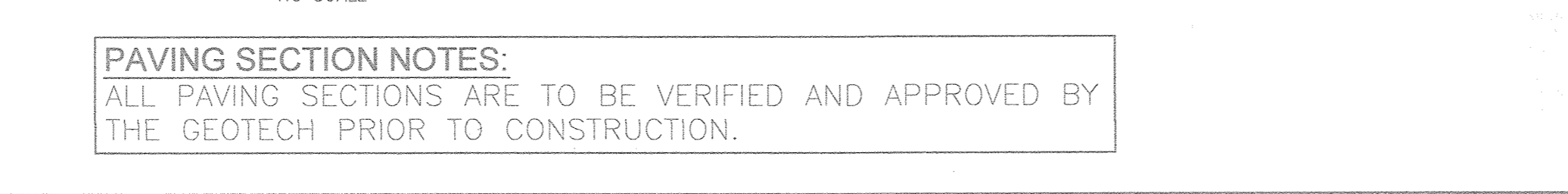
APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING  
 Chief, Development Engineering Division  
 Chief, Division of Land Development  
 Director



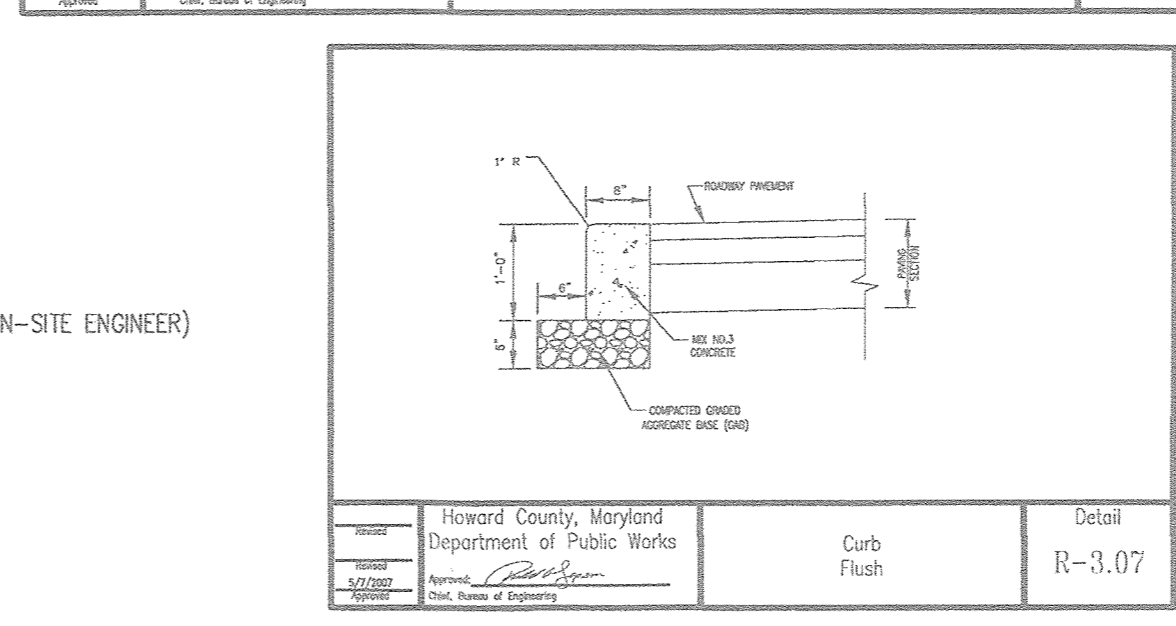
HANDICAP PARKING SIGNS  
 (NOT TO SCALE)



TYPICAL PAVING SECTION  
 NO SCALE



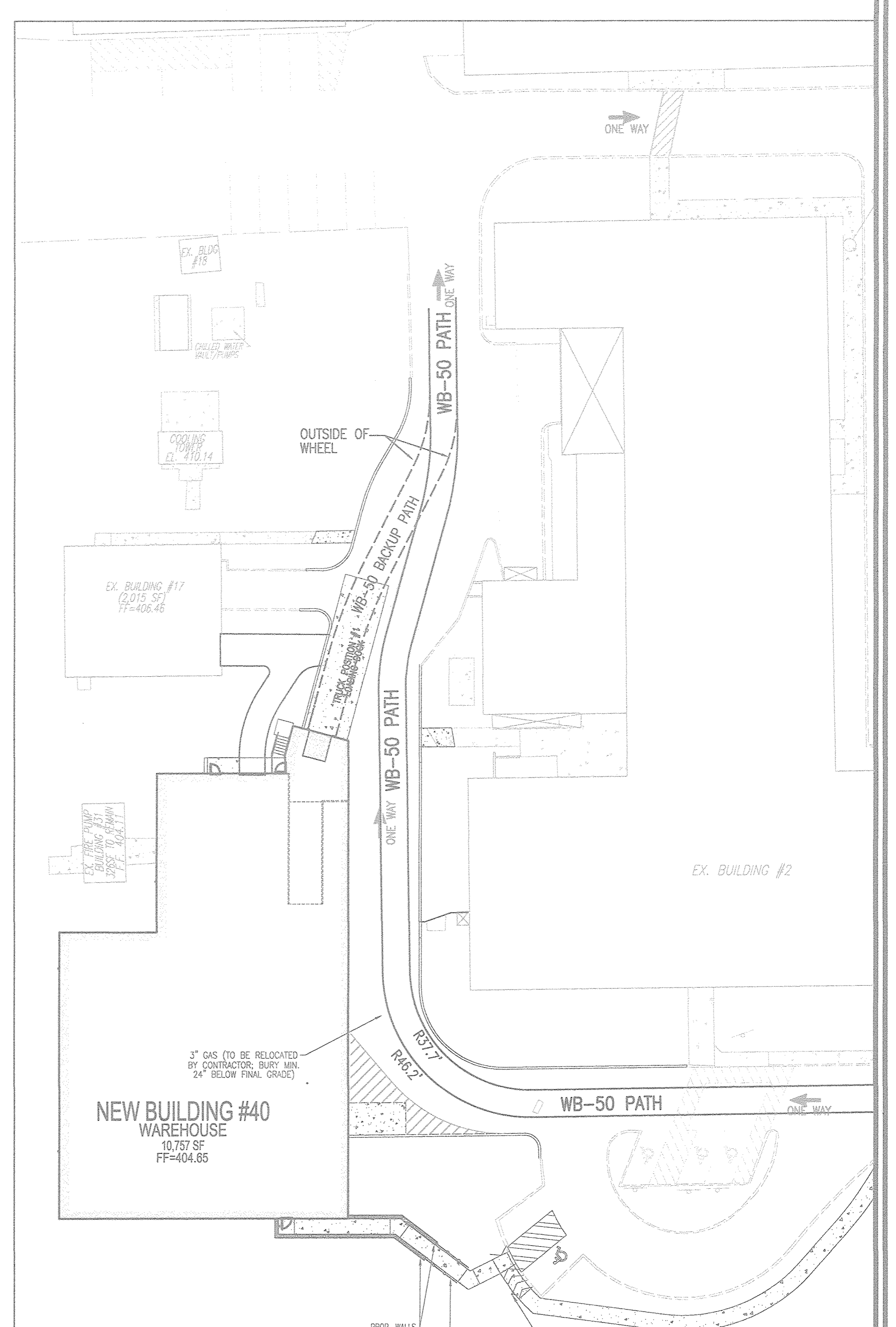
CONCRETE PAVING SECTION  
 NOTE: PAVING SECTIONS ARE TO BE VERIFIED AND APPROVED BY THE GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION.



Howard County, Maryland Department of Public Works  
 Curb Flush  
 Detail R-3.07



Howard County, Maryland Department of Public Works  
 Solid Waste Service Pad  
 Detail R-8.03



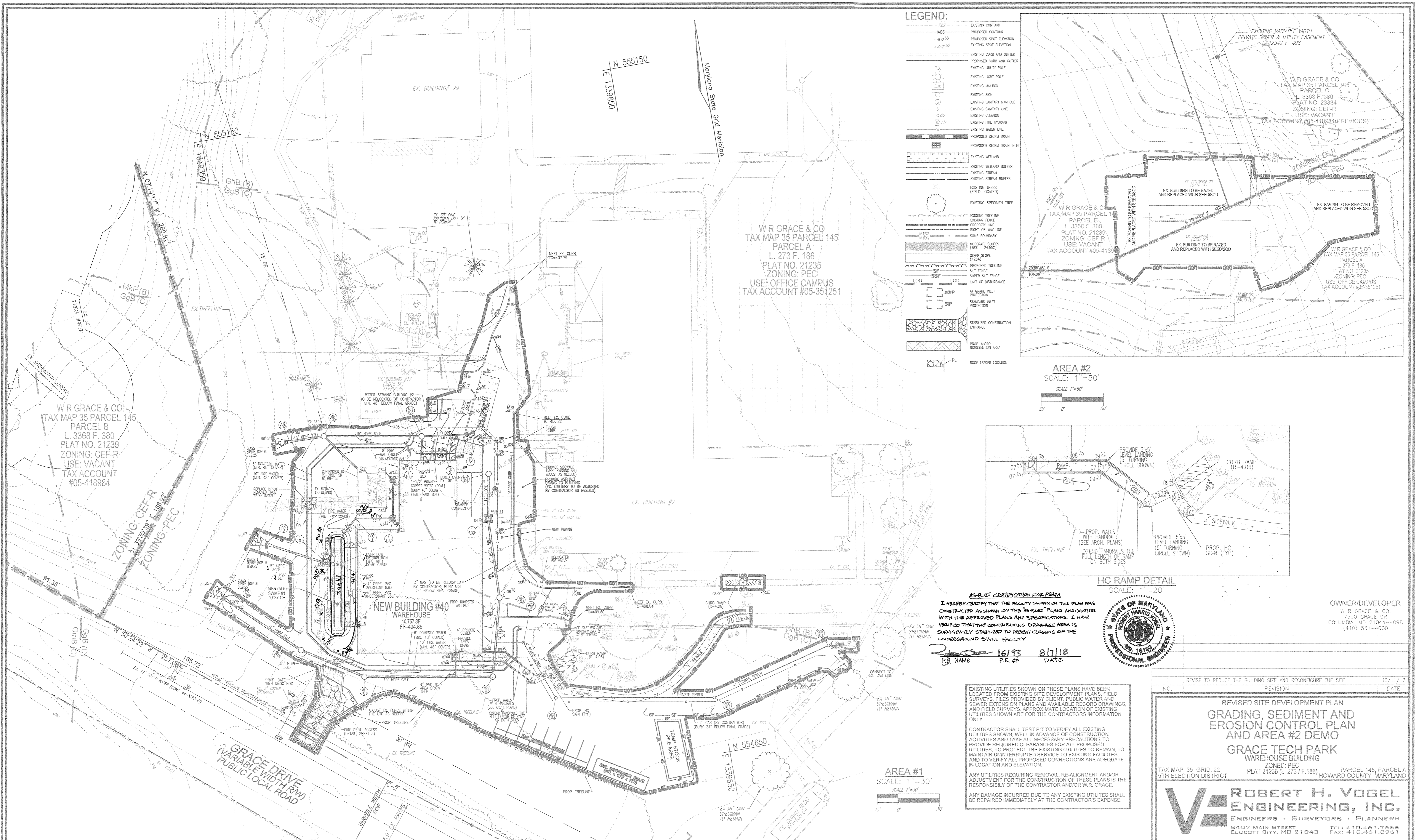
TURNING ANALYSIS AND PAVEMENT MARKINGS  
 SCALE: 1" = 30'

AS-BUILT CERTIFICATION FOR PSWM  
 I HEREBY CERTIFY THAT THE FACILITY SHOWN ON THIS PLAN WAS CONSTRUCTED AS SHOWN ON THE "AS-BUILT" PLANS AND COMPLIES WITH THE APPROVED PLANS AND SPECIFICATIONS. I HAVE VERIFIED THAT THE CONTRIBUTING DRAINAGE AREA IS SUFFICIENTLY STABILIZED TO PREVENT CLOGGING OF THE UNDERGRANDSWM FACILITY.  
 P.E. NAME: 16193 P.E.# DATE: 8/7/18  
 CONNELLY AND ASSOCIATES, INC. TEST BORING FIELD LOG

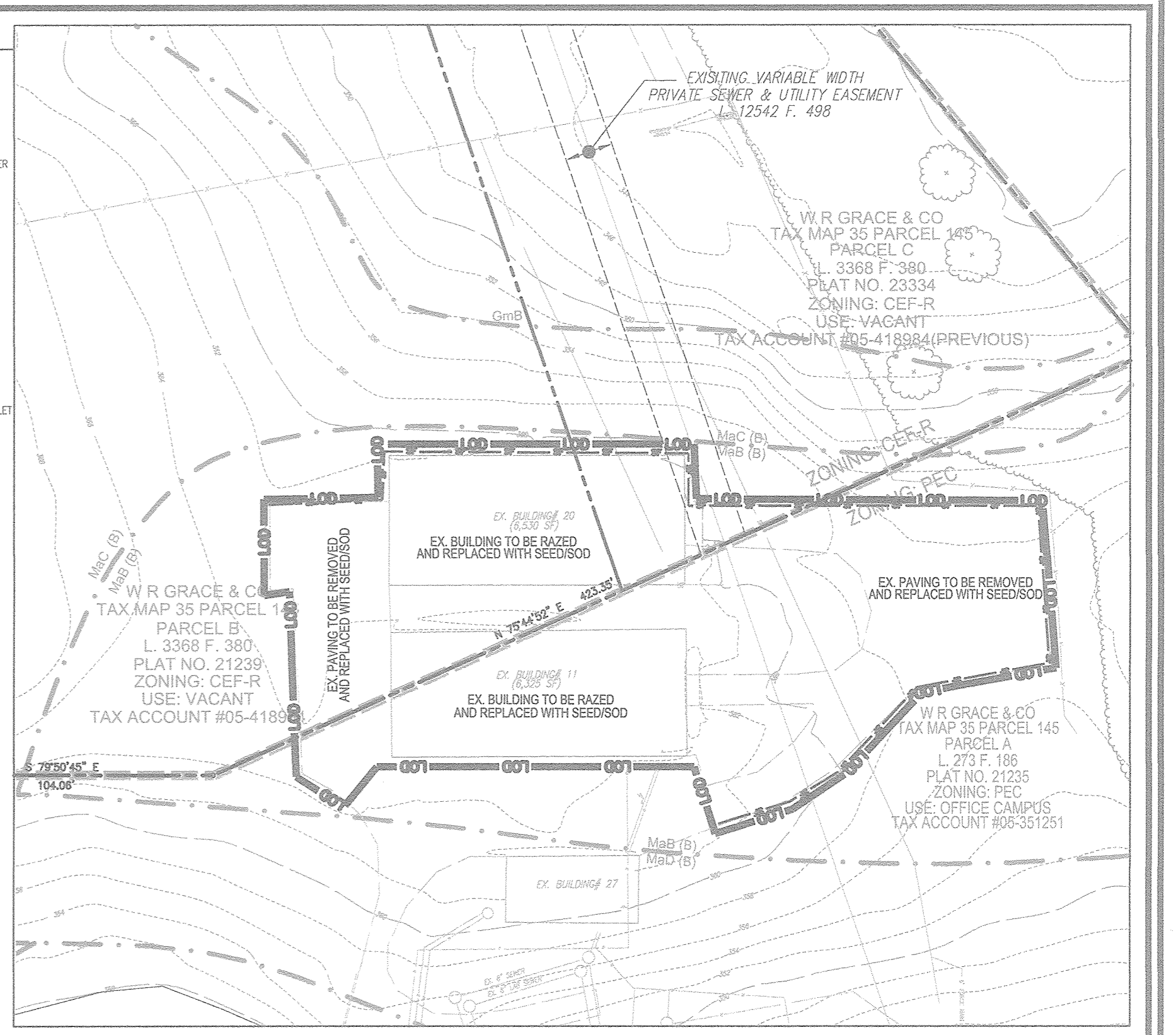
NO.	REVISION	DATE
1	REVISE TO REDUCE THE BUILDING SIZE AND RECONFIGURE THE SITE	10/11/17

REVISED SITE DEVELOPMENT PLAN  
 SITE DETAILS  
 GRACE TECH PARK WAREHOUSE BUILDING  
 ZONED: PEC  
 PLAT 21235 (L. 273 / F. 186)  
 TAX MAP: 35 GRID: 22 5TH ELECTION DISTRICT  
 PARCEL 145, PARCEL A HOWARD COUNTY, MARYLAND  
**ROBERT H. VOGEL ENGINEERING, INC.**  
 ENGINEERS • SURVEYORS • PLANNERS  
 8407 MAIN STREET ELLICOTT CITY, MD 21043 TEL: 410.461.7666 FAX: 410.461.8961

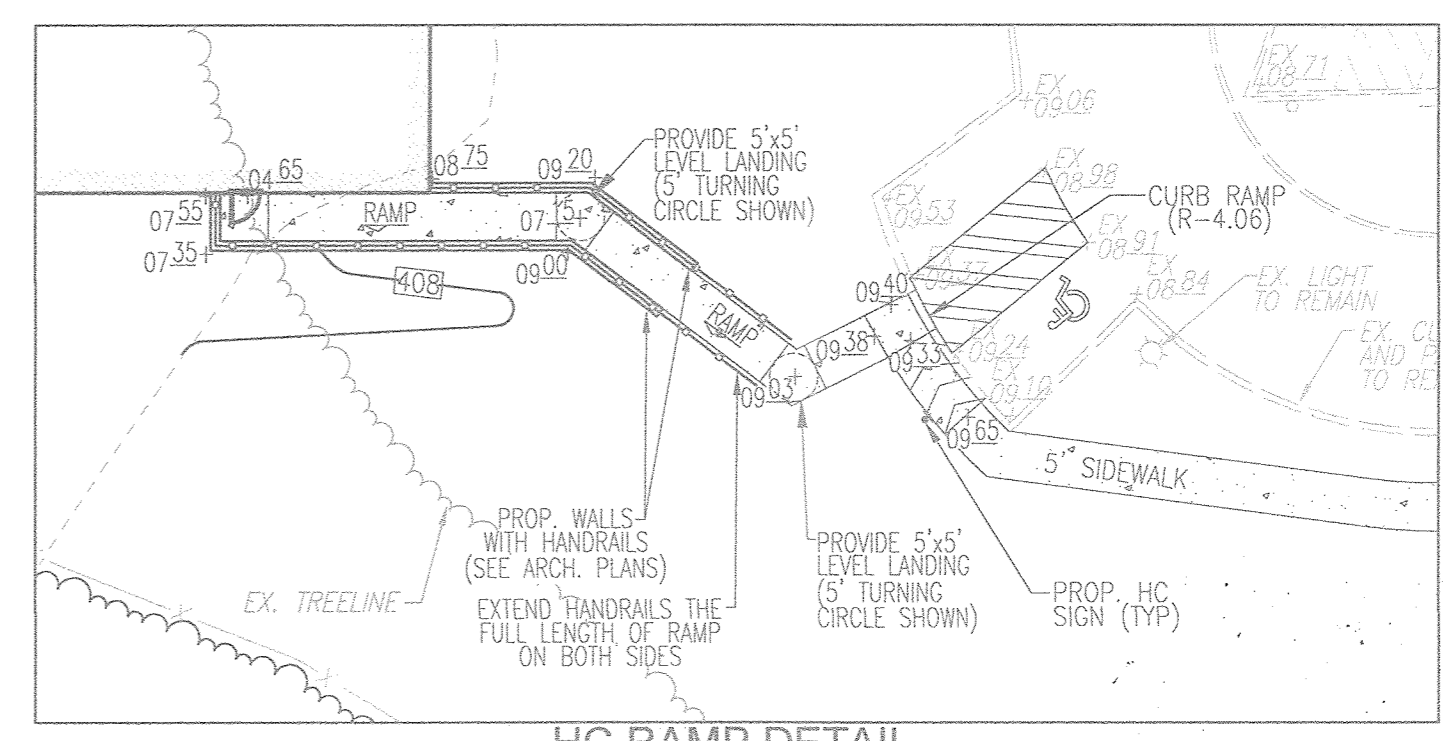
PROFESSIONAL CERTIFICATE  
 DESIGN BY: RHY/DZE  
 DRAWN BY: KG/DZE  
 CHECKED BY: RHY  
 DATE: OCTOBER 2017  
 SCALE: AS SHOWN  
 W.O. NO.: 15-20  
 I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A FULLY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 11143 EXPIRATION DATE: 09-27-2018  
 3 SHEET OF 8



- LEGEND:**
- EXISTING CONTOUR
  - PROPOSED CONTOUR
  - EXISTING SPOT ELEVATION
  - PROPOSED SPOT ELEVATION
  - EXISTING CURB AND GUTTER
  - PROPOSED CURB AND GUTTER
  - EXISTING UTILITY POLE
  - PROPOSED UTILITY POLE
  - EXISTING LIGHT POLE
  - PROPOSED LIGHT POLE
  - EXISTING SANITARY MANHOLE
  - PROPOSED SANITARY MANHOLE
  - EXISTING SANITARY LINE
  - PROPOSED SANITARY LINE
  - EXISTING FIRE HYDRANT
  - PROPOSED FIRE HYDRANT
  - EXISTING WATER LINE
  - PROPOSED WATER LINE
  - EXISTING STORM DRAIN
  - PROPOSED STORM DRAIN
  - EXISTING WETLAND
  - PROPOSED WETLAND
  - EXISTING WETLAND BUFFER
  - PROPOSED WETLAND BUFFER
  - EXISTING STREAM
  - PROPOSED STREAM
  - EXISTING TREELINE
  - PROPOSED TREELINE
  - EXISTING SPECIMEN TREE
  - PROPOSED SPECIMEN TREE
  - EXISTING FENCE
  - PROPOSED FENCE
  - PROPERTY LINE
  - RIGHT-OF-WAY LINE
  - SOILS BOUNDARY
  - MODERATE SLOPES (2-25%)
  - PROPOSED TRENCH
  - SOIL FENCE
  - SUPER SALT FENCE
  - LIMIT OF DISTURBANCE
  - AT GRADE INLET
  - STANDARD INLET PROTECTION
  - STABILIZED CONSTRUCTION ENTRANCE
  - PROP. MED. RETENTION AREA
  - ROOF LEADER LOCATION

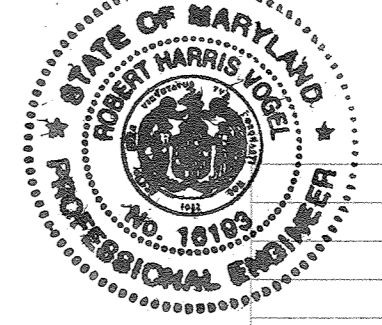


**AREA #2**  
SCALE: 1"=50'  
SCALE 1"=50'



**HC RAMP DETAIL**  
SCALE: 1"=20'

**AS-BUILT CERTIFICATION FOR PSWM**  
I HEREBY CERTIFY THAT THE FACILITY SHOWN ON THIS PLAN WAS CONSTRUCTED AS SHOWN ON THE AS-BUILT PLANS AND CONTAINS WITH THE APPROVED PLANS AND SPECIFICATIONS. I HAVE VERIFIED THAT THE CONTRIBUTING DRAINAGE AREA IS SUFFICIENTLY STABILIZED TO PREVENT CLOGGING OF THE UNDERGROUND SWM FACILITY.  
P.B. NAME: 16193 8/7/18  
P.E. # DATE



**OWNER/DEVELOPER**  
W.R. GRACE & CO.  
7500 GRACE DR.  
COLUMBIA, MD 21044-4098  
(410) 531-4000

EXISTING UTILITIES SHOWN ON THESE PLANS HAVE BEEN LOCATED FROM EXISTING SITE DEVELOPMENT PLANS, FIELD SURVEYS, FILES PROVIDED BY CLIENT, PUBLIC WATER AND SEWER EXTENSION PLANS AND AVAILABLE RECORD DRAWINGS, AND FIELD SURVEYS. APPROXIMATE LOCATION OF EXISTING UTILITIES SHOWN ARE FOR THE CONTRACTOR'S INFORMATION ONLY.  
CONTRACTOR SHALL TEST PIT TO VERIFY ALL EXISTING UTILITIES SHOWN, WELL IN ADVANCE OF CONSTRUCTION ACTIVITIES AND TAKE ALL NECESSARY PRECAUTIONS TO PROVIDE REQUIRED CLEARANCES FOR ALL PROPOSED UTILITIES. TO PROTECT THE EXISTING UTILITIES TO REMAIN, TO MAINTAIN UNINTERRUPTED SERVICE TO EXISTING FACILITIES, AND TO VERIFY ALL PROPOSED CONNECTIONS ARE ADEQUATE IN LOCATION AND ELEVATION.  
ANY UTILITIES REQUIRING REMOVAL, RE-ALIGNMENT AND/OR ADJUSTMENT FOR THE CONSTRUCTION OF THESE PLANS IS THE RESPONSIBILITY OF THE CONTRACTOR AND/OR W.R. GRACE.  
ANY DAMAGE INCURRED DUE TO ANY EXISTING UTILITIES SHALL BE REPAIRED IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.

**AREA #1**  
SCALE: 1"=30'  
SCALE 1"=30'

**SOILS LEGEND**  
HOWARD COUNTY SOILS MAP #17 & 23

SYMBOL	NAME/DESCRIPTION	SOIL TYPE	ERODIBLE*	K VALUE	HYDRIC
G9B	GLENELG LOAM, 3-8% SLOPES	C	NO	0.28	NO
G9H	GLENELG-URBAN LAND COMPLEX, 0-8% SLOPES	B	NO	0.28	NO
M9B	MANOR LOAM, 3-8% SLOPES	B	NO	0.28	NO
M9C	MANOR LOAM, 8-15% SLOPES	B	NO	0.28	NO

**SOILS NOTE:**  
HIGHLY ERODIBLE SOILS ARE THOSE SOILS WITH A SLOPE GREATER THAN 15 PERCENT OR THOSE SOILS WITH A SOIL ERODIBILITY FACTOR K GREATER THAN 0.35 AND WITH A SLOPE GREATER THAN 5 PERCENT.

APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING  
  
 CHIEF, DEVELOPMENT ENGINEERING DIVISION  
 DATE: 10-23-17  
  
 CHIEF, DIVISION OF LAND DEVELOPMENT  
 DATE: 10-23-17  
  
 DIRECTOR  
 DATE: 10-23-17

**OWNER/DEVELOPER CERTIFICATION:**  
I/WE CERTIFY THAT ANY CLEARING, GRADING, CONSTRUCTION OR DEVELOPMENT WILL BE DONE PURSUANT TO THIS APPROVED EROSION AND SEDIMENT CONTROL PLAN, INCLUDING INSPECTING AND MAINTAINING CONTROLS, AND THAT ALL RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATE OF ATTENDANCE AT A MARYLAND DEPARTMENT OF THE ENVIRONMENT (MDE) APPROVED TRAINING PROGRAM FOR THE CONTROL OF EROSION AND SEDIMENT PRIOR TO BEGINNING THE PROJECT. I CERTIFY RIGHT-OF-ENTRY FOR PERFORMING ON-SITE EVALUATION BY HOWARD COUNTY, THE HOWARD SOIL CONSERVATION DISTRICT AND/OR MARYLAND DEPARTMENT OF THE ENVIRONMENT.  
  
 NiZAMUSTA, Director  
 DATE: 10/23/17  
 PRINTED NAME & TITLE

**DESIGN CERTIFICATION:**  
I HEREBY CERTIFY THAT THIS PLAN HAS BEEN DESIGNED IN ACCORDANCE WITH CURRENT MARYLAND EROSION AND SEDIMENT CONTROL LAWS, REGULATIONS, AND STANDARDS, THAT IT REPRESENTS A PRACTICAL AND ACCEPTABLE 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.  
  
 ROBERT H. VOGEL  
 PRINTED NAME  
 MD REGISTRATION NO. 16193  
 P.E. R.L.S., OR R.L.A. (circle one)  
 DATE: 10/23/17

THIS DEVELOPMENT PLAN IS APPROVED FOR SOIL EROSION AND SEDIMENT CONTROL BY THE HOWARD SOIL CONSERVATION DISTRICT.  
  
 JOHN R. ROBERTS  
 DATE: 10/23/17

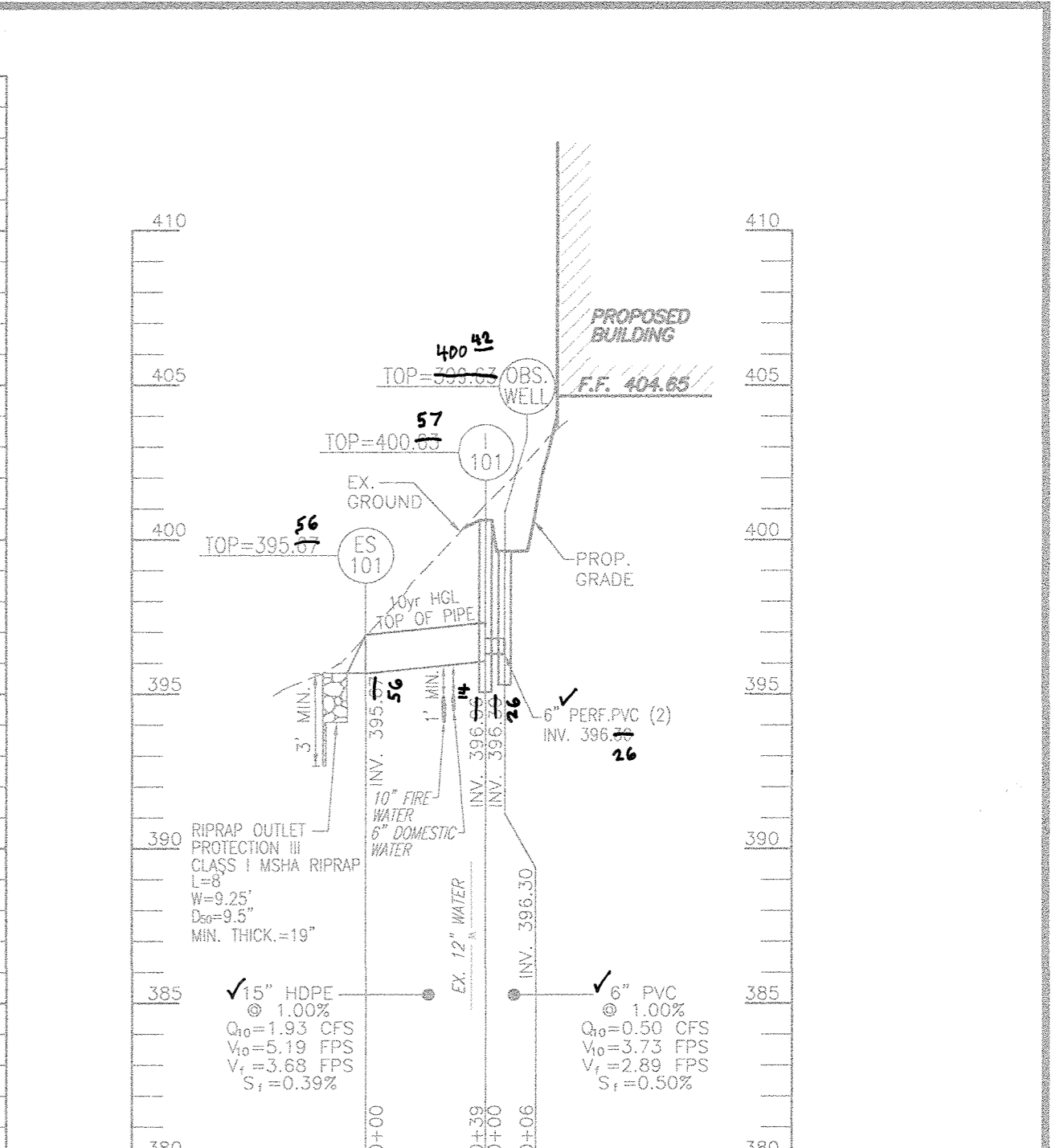
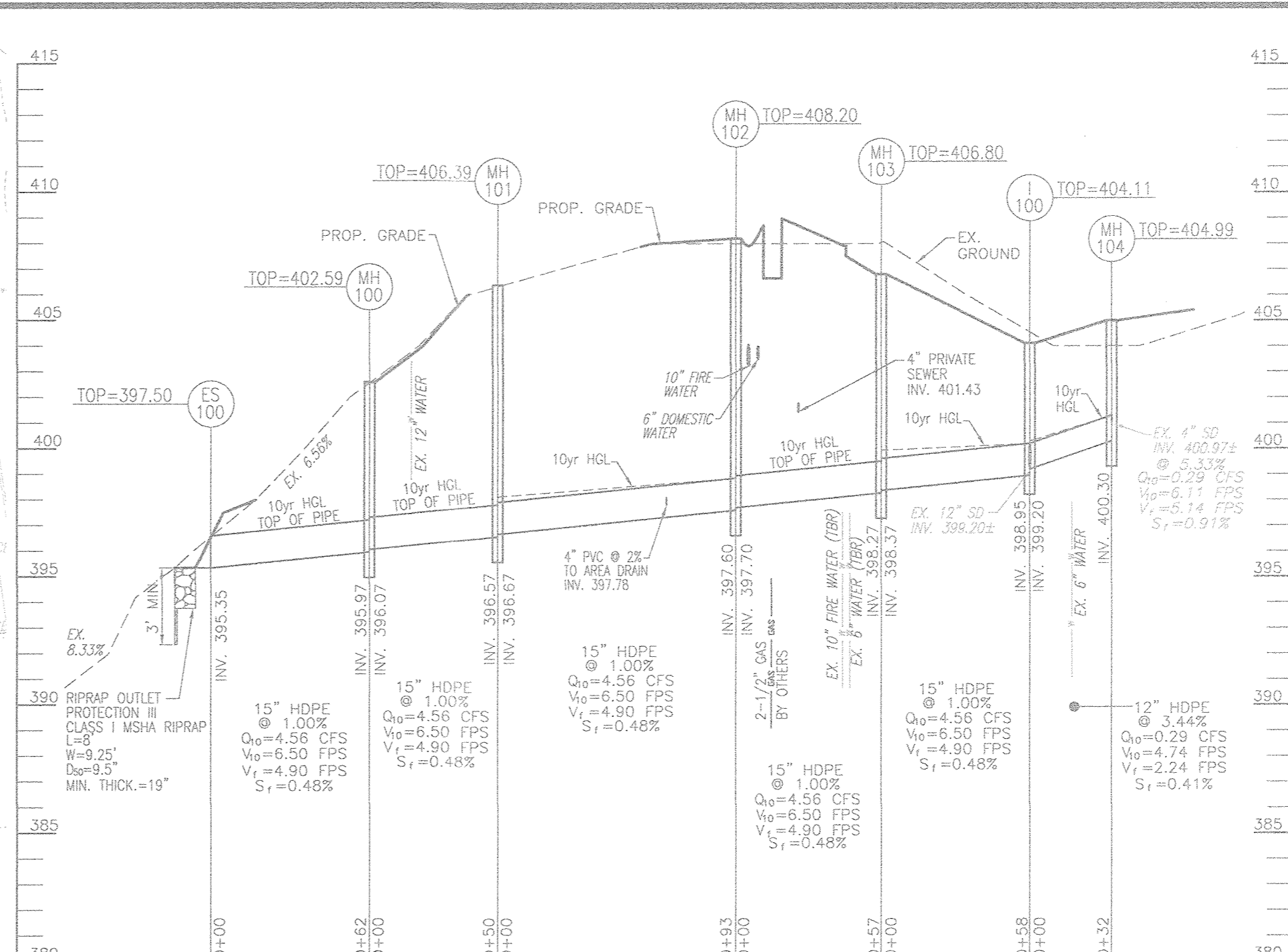
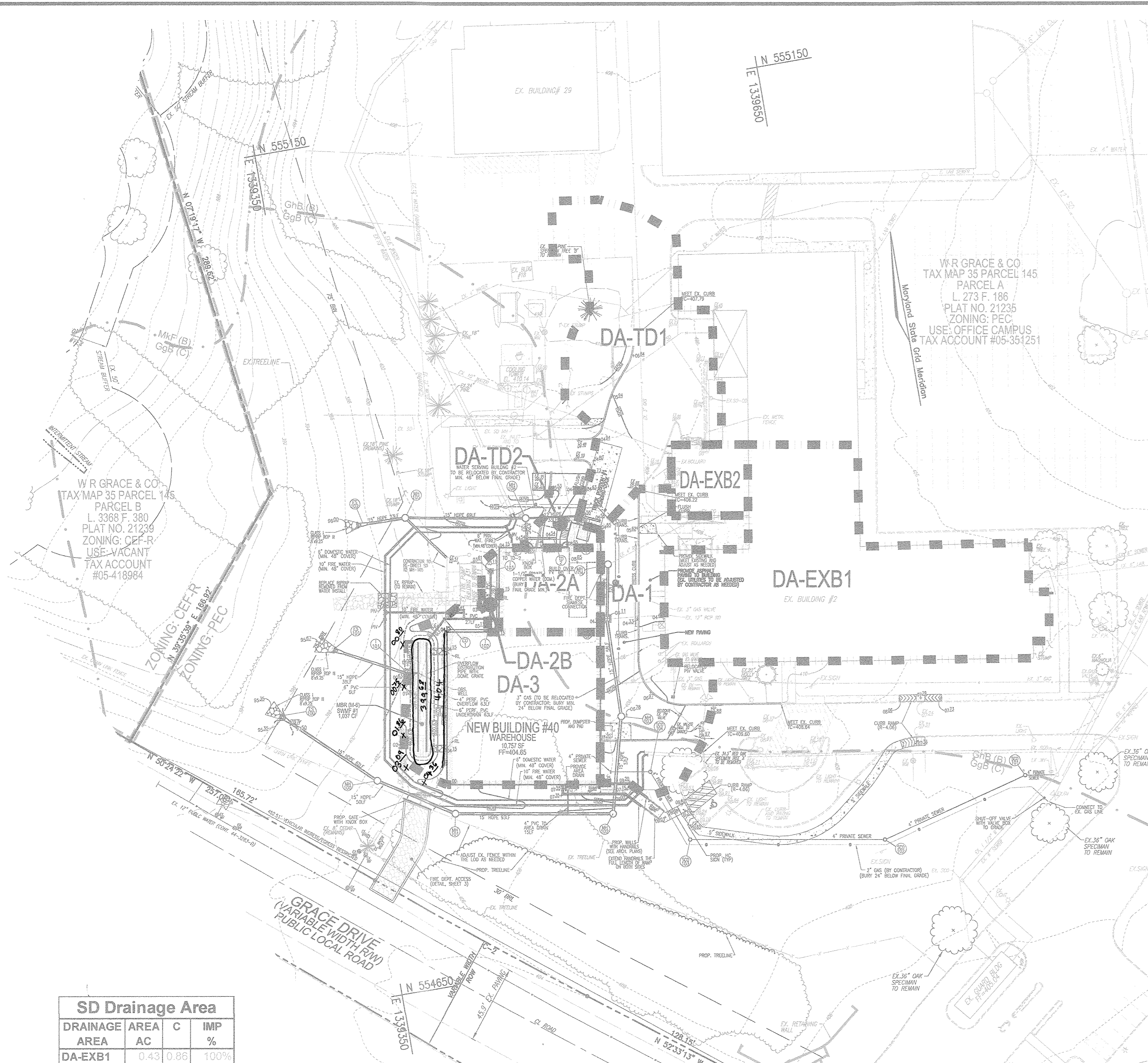
NO.	REVISION	DATE
1	REVISE TO REDUCE THE BUILDING SIZE AND RECONFIGURE THE SITE	10/11/17

REVISED SITE DEVELOPMENT PLAN  
**GRADING, SEDIMENT AND EROSION CONTROL PLAN AND AREA #2 DEMO**  
 GRACE TECH PARK WAREHOUSE BUILDING  
 ZONED: PEC  
 PLAT 21235 (L. 273 F. 186)  
 TAX MAP: 35 GRID: 22  
 5TH ELECTION DISTRICT  
 PARCEL 145, PARCEL A  
 HOWARD COUNTY, MARYLAND

**ROBERT H. VOGEL ENGINEERING, INC.**  
 ENGINEERS • SURVEYORS • PLANNERS  
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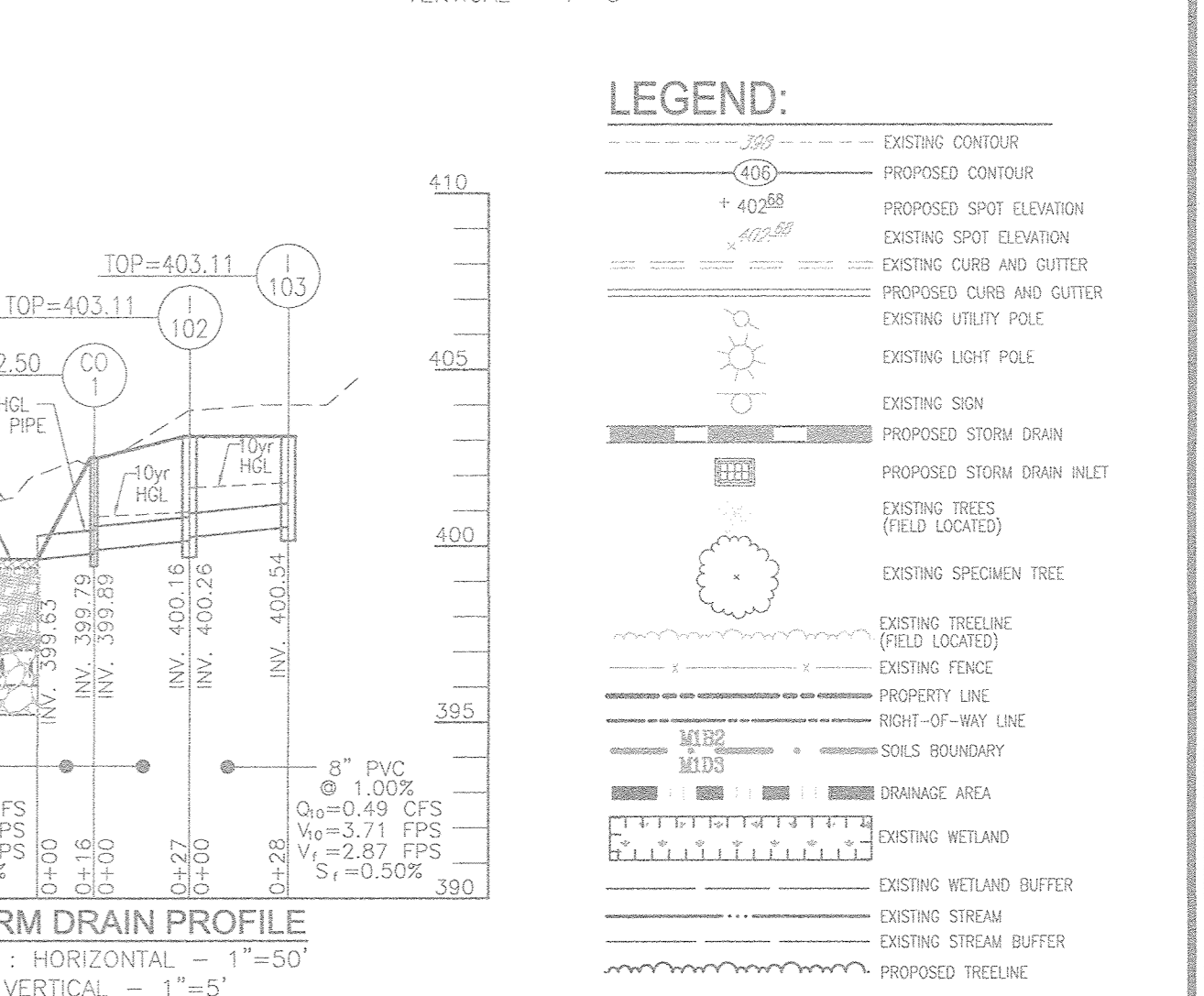
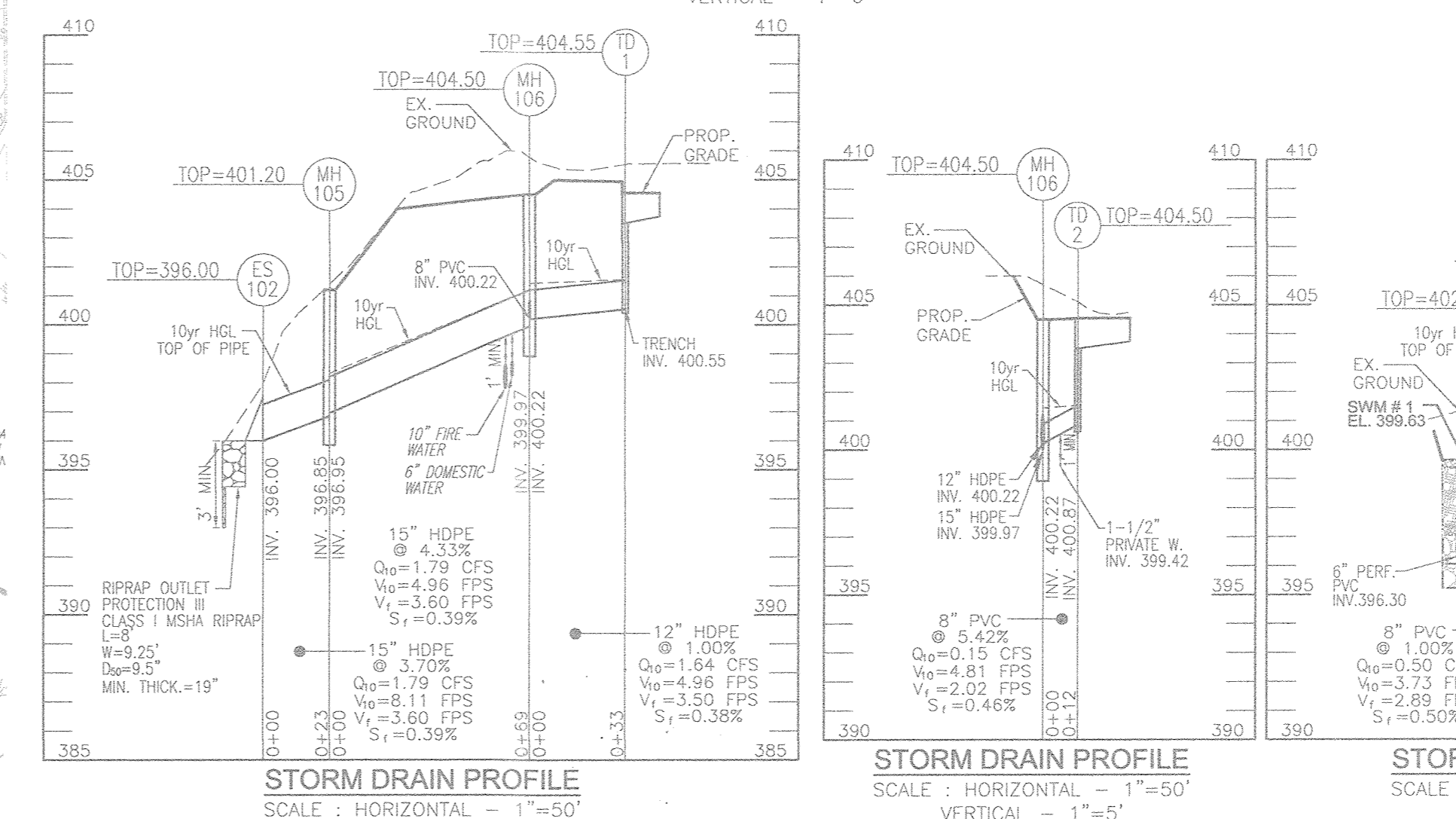
**PROFESSIONAL CERTIFICATE**  
 DESIGN BY: RHV/DZE  
 DRAWN BY: KG/DZE  
 CHECKED BY: RHV  
 DATE: OCTOBER 2017  
 SCALE: AS SHOWN  
 W.O. NO.: 15-20  
 SHEET 4 OF 8





STORM DRAIN PROFILE  
SCALE: HORIZONTAL - 1"=50'  
VERTICAL - 1"=5'

STORM DRAIN PROFILE  
SCALE: HORIZONTAL - 1"=50'  
VERTICAL - 1"=5'



STORM DRAIN PROFILE  
SCALE: HORIZONTAL - 1"=50'  
VERTICAL - 1"=5'

STORM DRAIN PROFILE  
SCALE: HORIZONTAL - 1"=50'  
VERTICAL - 1"=5'

**STORM DRAIN STRUCTURE SCHEDULE**

NO.	TYPE	LOCATION	THROAT	TOP	INV. IN	INV. OUT	COMMENTS
I-100	TYPE 'S' INLET	554846.44   1339507.11	404.11	399.20	EX. 399.20+	398.95	HO. CO. STD. D-4.22
I-101	TYPE 'S' INLET	554835.26   1339385.74	400.63	396.30	396.00	HO. CO. STD. D-4.22	
I-102	YARD INLET	554856.31   1339439.29	403.11	400.26	400.16	HO. CO. STD. D-4.14	
I-103	YARD INLET	554885.96   1339485.96	403.11	400.54	400.54	HO. CO. STD. D-4.14	
MH-100	STANDARD 4' PRECAST MANHOLE	554776.13   1339478.13	402.59	395.07	395.97	HO. CO. STD. G-5.12	
MH-101	STANDARD 4' PRECAST MANHOLE	554749.35   1339479.35	406.39	396.67	396.67	HO. CO. STD. G-5.12	
MH-102	STANDARD 4' PRECAST MANHOLE	554738.19   1339480.64	406.20	397.70	397.00	HO. CO. STD. G-5.12	
MH-103	STANDARD 4' PRECAST MANHOLE	554789.59   1339485.66	406.80	398.97	397.27	HO. CO. STD. G-5.12	
MH-104	STANDARD 4' PRECAST MANHOLE	554877.88   1339512.97	404.99	EX. 400.97+	400.30	HO. CO. STD. G-5.12	
MH-105	STANDARD 4' PRECAST MANHOLE	554925.30   1339400.26	401.20	396.95	396.85	HO. CO. STD. G-5.12	
MH-106	STANDARD 4' PRECAST MANHOLE	554913.01   1339469.95	404.50	400.22	399.97	HO. CO. STD. G-5.12	
ES-100	CONCRETE END SECTION (15")	554776.13   1339312.32	396.60	-	395.35	HO. CO. STD. D-5.51	
ES-101	CONCRETE END SECTION (15")	554853.34   1339350.92	396.92	-	395.67	HO. CO. STD. D-5.51	
ES-102	CONCRETE END SECTION (15")	1339400.28   1339377.70	397.25	-	396.00	HO. CO. STD. D-5.51	
TD-1	ACO TRENCH DRAIN (SLOPED CHANNEL)	554905.64   1339308.64	404.55	-	400.55	KLASSIKORAM K1-K6	
TD-2	ACO TRENCH DRAIN (SLOPED CHANNEL)	554901.22   1339489.55	404.54	-	400.87	KLASSIKORAM K1-K6	
CO-1	CLEANOUT	554863.01   1339412.71	402.50	399.89	399.79	HO. CO. STD. S-2.22	
SCO-101	CLEANOUT	554713.00   1339733.32	406.78+	399.48	399.38	HO. CO. STD. S-2.22	
SCO-102	CLEANOUT	554690.39   1339645.64	408.37+	400.03	399.93	HO. CO. STD. S-2.22	
SCO-103	CLEANOUT	554710.29   1339532.78	409.33+	400.71	400.61	HO. CO. STD. S-2.22	
SCO-104	CLEANOUT	554763.50   1339516.56	408.87+	401.04	401.84	HO. CO. STD. S-2.22	

NOTE: 1. TOP ELEVATIONS ARE AT CENTER TOP OF MANHOLE AND TOP OF MANHOLE COVER FOR PRECAST MANHOLES.  
2. FOR TOP SLAB SLOPES SEE GRADING PLAN.  
3. SEE ARCHITECTURAL PLANS FOR DOWNSPOUT AND ROOF DRAIN DETAILS.  
4. ALL CUSTOM AND NON-STANDARD STRUCTURES TO BE DESIGNED BY A QUALIFIED STRUCTURAL ENGINEER.

**PIPE SCHEDULE**

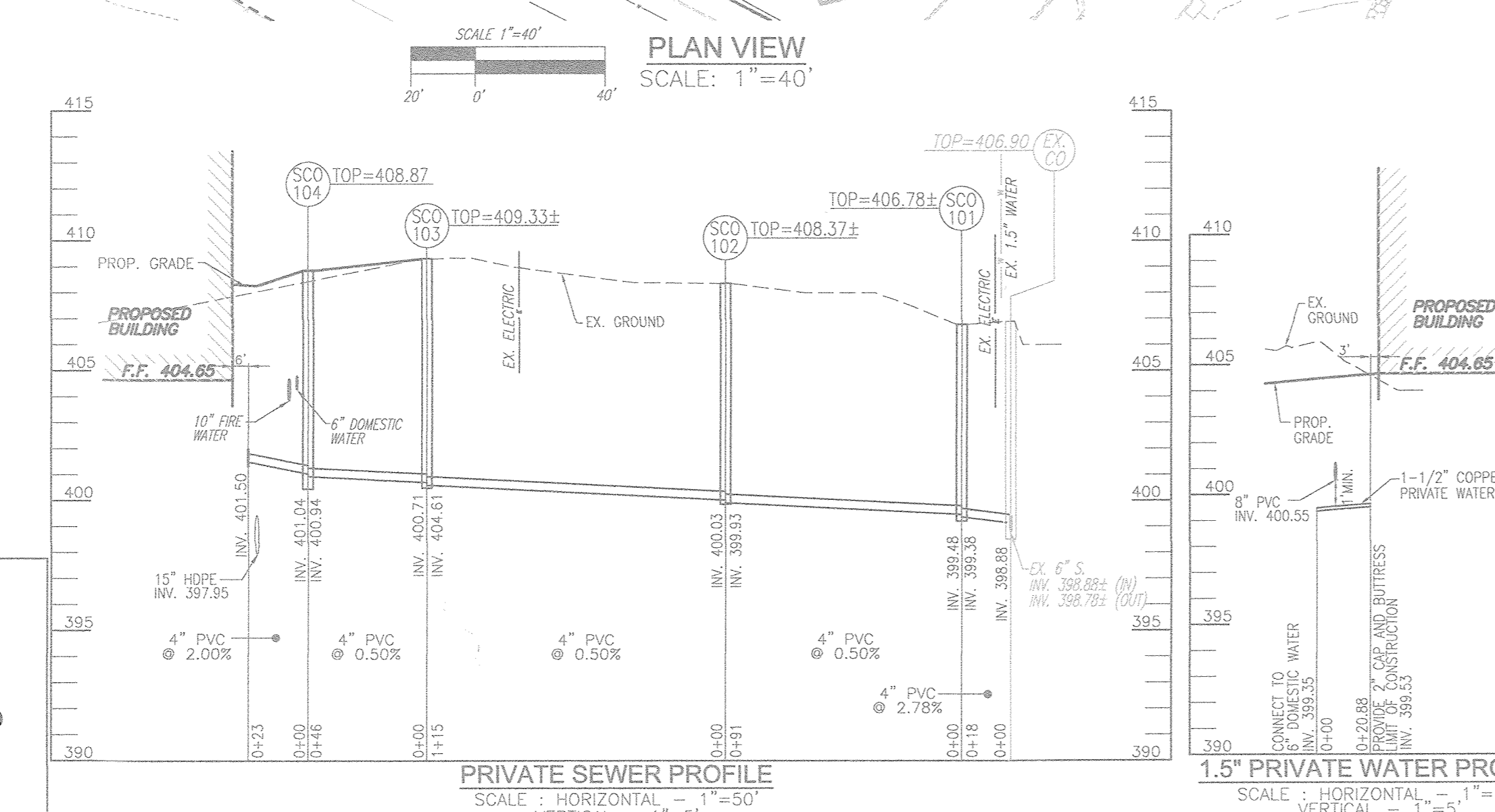
SIZE	TYPE	LENGTH
4"	PVC (SD)	15
8"	PVC (SD)	83
12"	HDPE (SD)	65
15"	HDPE (SD)	451
4"	PERF. PVC (SWM)	63
6"	PERF. PVC (SWM)	63
6"	SOLID PVC (SWM)	6
4"	PVC (SEWER)	293
1-1/2"	COPPER (WATER)	21
6"	DIP (DOM. WATER)	386
10"	DIP (FIRE WATER)	431

**AS-BUILT CERTIFICATION FOR PSWM**  
I HEREBY CERTIFY THAT THE FACILITY SHOWN ON THIS PLAN WAS CONSTRUCTED AS SHOWN ON THE "AS-BUILT" PLANS AND COMPLIES WITH THE APPLICABLE CODES AND SPECIFICATIONS. I HAVE VERIFIED THAT THE CONTRIBUTING DRAINAGE AREA IS SUFFICIENTLY STABILIZED TO PREVENT LOGGING OF THE UNDERGROUND SWM FACILITY.

DATE: 8/11/18  
P.E. NAME: [Signature]

**SD Drainage Area**

DRAINAGE AREA	AREA AC	C	IMP %
DA-EXB1	0.43	0.86	100%
DA-EXB2	0.04	0.86	100%
DA-1	0.21	0.86	70%
DA-2A	0.07	0.83	95%
DA-2B	0.005	0.19	100%
DA-3	0.24	0.71	0%
DA-TD1	0.28	0.69	75%
DA-TD2	0.02	0.62	65%



PRIVATE SEWER PROFILE  
SCALE: HORIZONTAL - 1"=50'  
VERTICAL - 1"=5'

- LEGEND:**
- EXISTING CONTOUR
  - PROPOSED CONTOUR
  - PROPOSED SPOT ELEVATION
  - EXISTING CURB AND GUTTER
  - PROPOSED CURB AND GUTTER
  - EXISTING UTILITY POLE
  - EXISTING LIGHT POLE
  - EXISTING SIGN
  - PROPOSED STORM DRAIN
  - PROPOSED STORM DRAIN INLET
  - EXISTING TREES (FIELD LOCATED)
  - EXISTING SPECIMEN TREE
  - EXISTING TREELINE (FIELD LOCATED)
  - EXISTING FENCE
  - PROPERTY LINE
  - RIGHT-OF-WAY LINE
  - WIRE
  - WELLS
  - DRAINAGE AREA
  - EXISTING WETLAND
  - EXISTING WETLAND BUFFER
  - EXISTING STREAM
  - EXISTING STREAM BUFFER
  - PROPOSED TREELINE

EXISTING UTILITIES SHOWN ON THESE PLANS HAVE BEEN LOCATED FROM EXISTING SITE DEVELOPMENT PLANS, FIELD SURVEYS, FILES PROVIDED BY CLIENT, PUBLIC WATER AND SEWER EXTENSION PLANS AND AVAILABLE RECORD DRAWINGS, AND FIELD SURVEYS. APPROXIMATE LOCATION OF EXISTING UTILITIES SHOWN ARE FOR THE CONTRACTOR'S INFORMATION ONLY.

CONTRACTOR SHALL TEST PIT TO VERIFY ALL EXISTING UTILITIES SHOWN, WELL IN ADVANCE OF CONSTRUCTION ACTIVITIES AND TAKE ALL NECESSARY PRECAUTIONS TO PROVIDE REQUIRED CLEARANCES FOR ALL PROPOSED UTILITIES. TO PROTECT THE EXISTING UTILITIES TO REMAIN, TO MAINTAIN UNINTERRUPTED SERVICE TO EXISTING FACILITIES, AND TO VERIFY ALL PROPOSED CONNECTIONS ARE ADEQUATE IN LOCATION AND ELEVATION.

ANY UTILITIES REQUIRING REMOVAL, RE-ALIGNMENT AND/OR ADJUSTMENT FOR THE CONSTRUCTION OF THESE PLANS IS THE RESPONSIBILITY OF THE CONTRACTOR AND/OR W.R. GRACE.

ANY DAMAGE INCURRED DUE TO ANY EXISTING UTILITIES SHALL BE REPAIRED IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.

APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING

DATE: 10-25-17

DATE: 10-25-17

DATE: 10-25-17

**OWNER/DEVELOPER**  
W. R. GRACE & CO.  
7500 GRACE DR.  
COLUMBIA, MD 21044-4098  
(410) 531-4000

NO.	REVISION	DATE
1	REVISE TO REDUCE THE BUILDING SIZE AND RECONFIGURE THE SITE	10/11/17

**REVISED SITE DEVELOPMENT PLAN  
STORM DRAIN DRAINAGE AREA MAP  
AND UTILITY PROFILES**

**GRACE TECH PARK  
WAREHOUSE BUILDING**

TAX MAP: 35 GRID: 22  
5TH ELECTION DISTRICT

PLAT 21235 (L. 273 F. 186)  
HOWARD COUNTY, MARYLAND

**ROBERT H. VOGEL  
ENGINEERING, INC.**

ENGINEERS • SURVEYORS • PLANNERS

8407 MAIN STREET  
ELICOTT CITY, MD 21043

TEL: 410.461.7666  
FAX: 410.461.6961

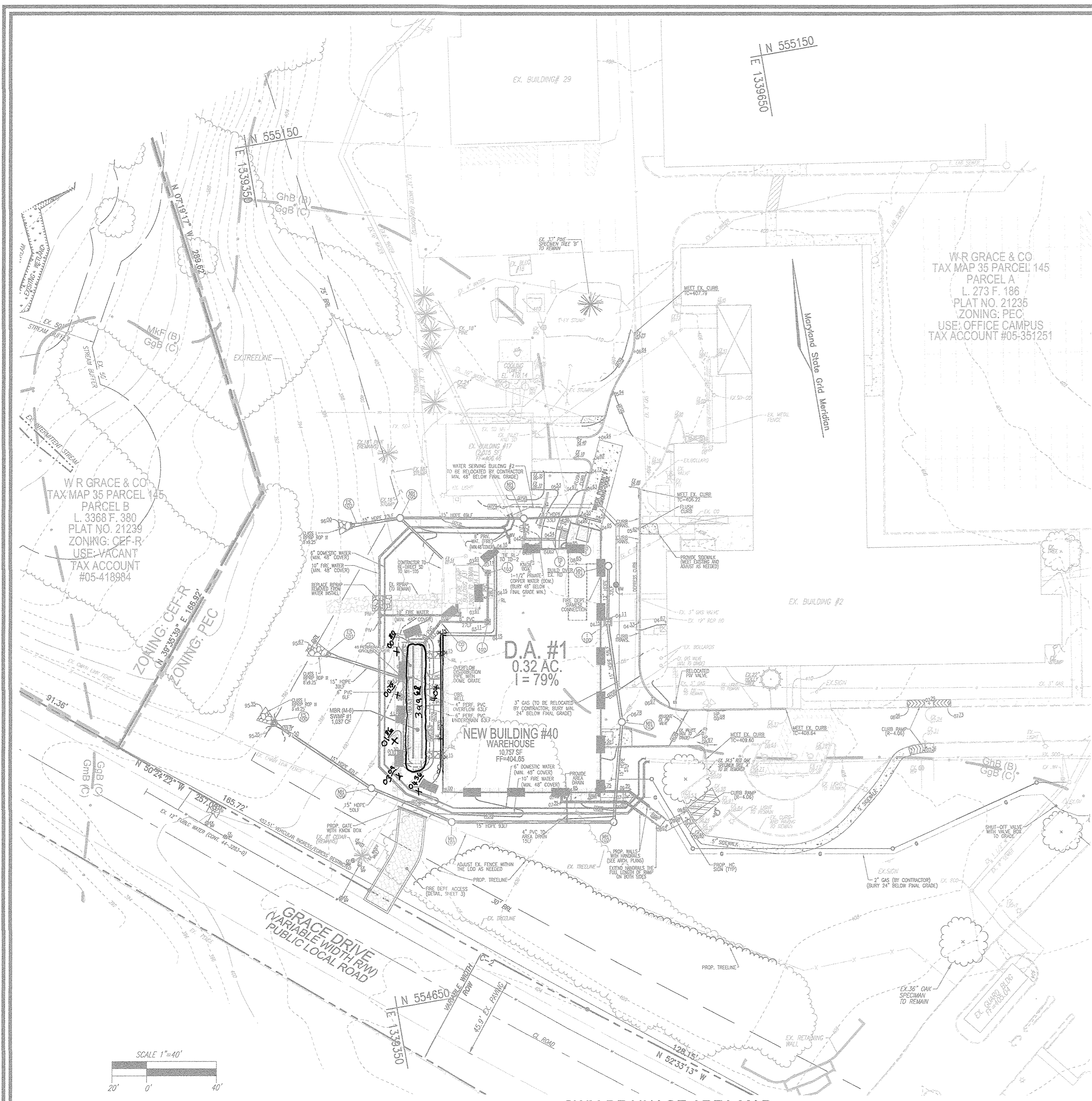
**PROFESSIONAL CERTIFICATE**

DESIGN BY: RHV/DZE  
DRAWN BY: KG/DZE  
CHECKED BY: RHV

DATE: OCTOBER 2017  
SCALE: AS SHOWN  
W.O. NO.: 15-20

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A FULLY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 1183 EXPIRATION DATE 09-27-2019

6 SHEET OF 8



**SWM DRAINAGE AREA MAP**  
SCALE: 1"=40'

EXISTING UTILITIES SHOWN ON THESE PLANS HAVE BEEN LOCATED FROM EXISTING SITE DEVELOPMENT PLANS, FIELD SURVEYS, FILES PROVIDED BY CLIENT, PUBLIC WATER AND SEWER EXTENSION PLANS AND AVAILABLE RECORD DRAWINGS, AND FIELD SURVEYS. APPROXIMATE LOCATION OF EXISTING UTILITIES SHOWN ARE FOR THE CONTRACTORS INFORMATION ONLY.

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ANY DAMAGE INCURRED DUE TO ANY EXISTING UTILITIES SHALL BE REPAIRED IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.

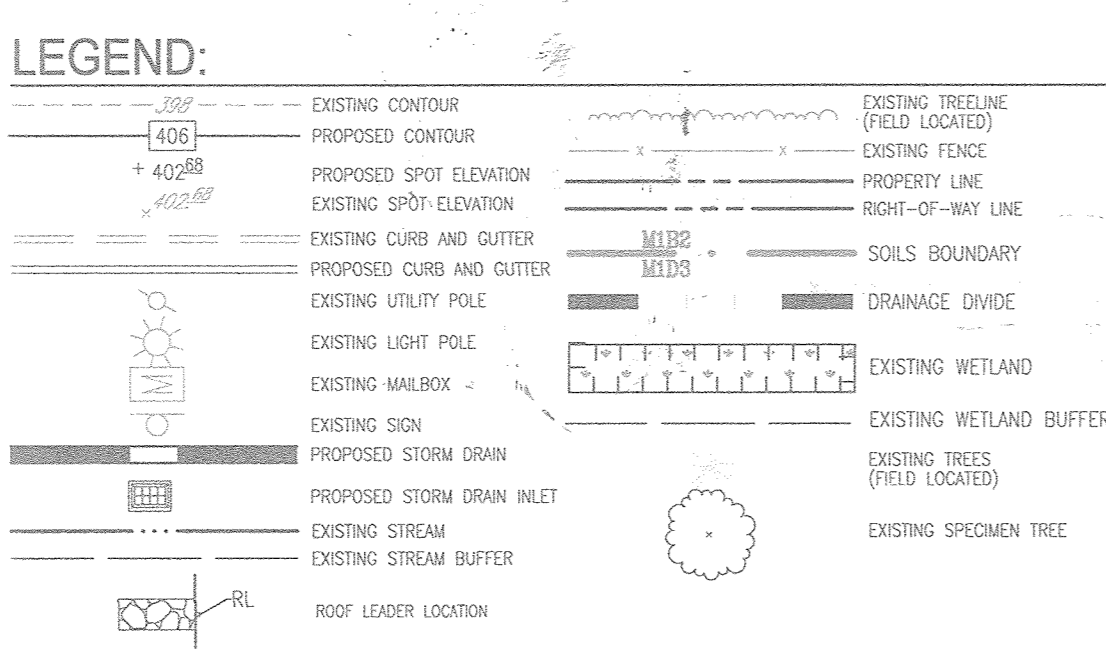
**SOILS LEGEND**  
HOWARD COUNTY SOILS MAP #17 & 23

SYMBOL	NAME/DESCRIPTION	SOIL TYPE	ERODIBLE 'K' VALUE	HYDRIC	
GgB	GLENELO CLAY, 3-8% SLOPES	C	NO	0.28	NO
GgB	GLENELO-URBAN LAND COMPLEX, 0-8% SLOPES	B	NO	0.28	NO
MeB	MANOR LOAM, 3-8% SLOPES	B	NO	0.28	NO
MeC	MANOR LOAM, 8-15% SLOPES	B	NO	0.28	NO

**SOILS NOTE:**  
HIGHLY ERODIBLE SOILS ARE THOSE SOILS WITH A SLOPE GREATER THAN 15 PERCENT OR THOSE SOILS WITH A SOIL ERODIBILITY FACTOR K GREATER THAN 0.35 AND WITH A SLOPE GREATER THAN 5 PERCENT.

Pe= 1.50 in.  
ESDv=(Pe/RvxA)/12  
Rv=0.05+0.009H  
V=initial depth of rainfall  
Vmax=1yr rainfall+2.6"

DA	% IMPERV	Rv	DA	ESDv	MINIMUM REQ VOLUME	MAXIMUM VOLUME	TOTAL VOL PROVIDED	SWM PRACTICE	SURFACE STORAGE AREA (SF)	DEPTH (FT)	ESDv (CF)	Rev STONE
1	79	0.77	0.32	1,330	887	2305	913	MICRO-BIORETENTION	685	1.0	913	428
TOTAL ESDv BY SUBAREA:				0.32	1,330		913		685		913	428



APPROVED: HOWARD COUNTY DEPARTMENT OF PLANNING AND ZONING

10-23-17  
DATE

10-25-17  
DATE

10-25-17  
DATE

**MICRO-BIORETENTION DATA CHART**

MBR Facility	Ponding Depth (ft)	Ponding Elevation ELEV. A	Top of Mulch ELEV. B	Bottom of Mulch ELEV. C	Bottom of Plant Mix ELEV. D	Bottom of Pea Gravel ELEV. E	Depth of Stone (ft.)	Size of Underdrain (ft.)	Invert of Underdrain	Size of Overflow (ft.)	Invert of 4" Overflow	Bottom of Stone ELEV. F	Depth of REV Stone (ft.) (25% ESDv x 40% Voids)	Bottom of REV Stone ELEV. G
SWMF #1	1.00	400.63	399.66	399.26	397.38	397.05	1.00	0.50	396.20	0.33	396.20	396.05	0.83	395.22

**APPENDIX B.4.C SPECIFICATIONS FOR MICRO-BIORETENTION, RAIN GARDEN, LANDSCAPE INFILTRATION & INFILTRATION BERMS**

**1. MATERIAL SPECIFICATIONS**  
THE ALLOWABLE MATERIALS TO BE USED IN THESE PRACTICES ARE DETAILED IN TABLE B.4.1.

**2. FILTERING MEDIA OR 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 COMBED WITHIN THE MICRO-BIORETENTION PRACTICE THAT MAY BE HARMFUL TO PLANT GROWTH, OR PROVE A HYDROLOGIC 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 CDMM 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 IN TO 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.

**3. COMPACTION**  
IT IS VERY IMPORTANT TO MINIMIZE COMPACTION OF BOTH THE BASE OF BIORETENTION PRACTICES AND THE REQUIRED BACKFILL, WHEN POSSIBLE. USE EXCAVATION HOES TO REMOVE ORIGINAL SOIL. IF PRACTICES ARE EXCAVATED USING LOADERS, THE CONTRACTOR SHOULD USE WIDE TRACK OR MARSH TRACK EQUIPMENT, OR LIGHT EQUIPMENT WITH TIRE 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 AVOIDED AT THE BASE OF THE BIORETENTION FACILITY BY USING A PRIMARY TILLING OPERATION SUCH AS CHISEL PLOW, RIPPER, OR SUBSOILER. THESE TILLING OPERATIONS ARE TO REFRACURE 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. ASHTRAY 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.

**4. PLANT MATERIAL**  
RECOMMENDED PLANT MATERIAL FOR MICRO-BIORETENTION PRACTICES CAN BE FOUND IN APPENDIX A, SECTION A.2.3.

**5. PLANT INSTALLATION**  
COMPOST IS A BETTER ORGANIC MATERIAL SOURCE, IS LESS LIKELY TO FLOAT, AND SHOULD BE PLACED IN THE WIND 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 (6 TO 12 MONTHS) FOR ACCEPTABLE ROOTSTOCK OF THE PLANT MATERIAL SHALL BE KEPT MOIST DURING TRANSPORT AND ON-SITE STORAGE. THE PLANT ROOT BALL SHOULD BE PLANTED SO 1/3RD OF THE BALL IS ABOVE THE GRADE SURFACE. THE CENTER 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 7" STAKES ONLY AS NECESSARY AND FOR THE FIRST GROWING SEASON ONLY. STAKES ARE TO BE EQUALLY SPACED ON THE OUTSIDE OF THE TREE BALL. GRASS AND LEGUME PLOTS 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, DEERAYS, OR AT A MINIMUM, IMPROVES 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.

**6. UNDERDRAINS**  
UNDERDRAINS SHOULD MEET THE FOLLOWING CRITERIA:  
• PIPE - SHOULD BE 4" TO 6" DIAMETER, SLOTTED OR PERFORATED RIGID PLASTIC PIPE (ASTM F 758, TYPE PS 28, OR AASHTO-M-278) IN A GRAVEL LAYER. THE PREFERRED MATERIAL IS SLOTTED, 4" RIGID PIPE (E.G., PVC OF HDPE).  
• PERFORATIONS - IF PERFORATED PIPE IS USED, PERFORATIONS SHOULD BE 3/8" DIAMETER LOCATED 6" ON CENTER WITH A MINIMUM OF FOUR HOLES PER ROW. PIPE SHALL BE WRAPPED WITH A 1/4" (NO. 4 OR 4x4) GALVANIZED HARDWARE CLOTH.  
• GRAVEL - THE GRAVEL LAYER (NO. 57 STONE PREFERRED) SHALL BE AT LEAST 3" THICK ABOVE AND BELOW THE UNDERDRAIN.  
• THE MAIN COLLECTOR PIPE SHALL BE AT A MINIMUM 0.5% SLOPE.  
• A NON-PERFORATED OBSERVATION WELL MUST BE PROVIDED (ONE PER EVERY 1,000 SQUARE FEET) TO PROVIDE A CLEAN-OUT POINT AND MONITOR PERFORMANCE OF THE FILTER.  
• A 1/4" LAYER OF PEA GRAVEL (1/8" TO 3/8" STONE) SHALL BE LOCATED BETWEEN THE FILTER MEDIA AND UNDERDRAIN TO PREVENT MIGRATION OF FINES INTO THE UNDERDRAIN. THIS LAYER MAY BE CONSIDERED PART OF THE FILTER BED WHEN BED THICKNESS EXCEEDS 2".  
THIS MAIN COLLECTOR PIPE FOR UNDERDRAIN SYSTEMS SHALL BE CONSTRUCTED AT A MINIMUM SLOPE OF 0.5%. OBSERVATION WELLS AND/OR CLEAN-OUT PIPES MUST BE PROVIDED (ONE MINIMUM PER EVERY 1000 SQUARE FEET OF SURFACE AREA).

**7. MISCELLANEOUS**  
THESE PRACTICES MAY NOT BE CONSTRUCTED UNTIL ALL CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED.

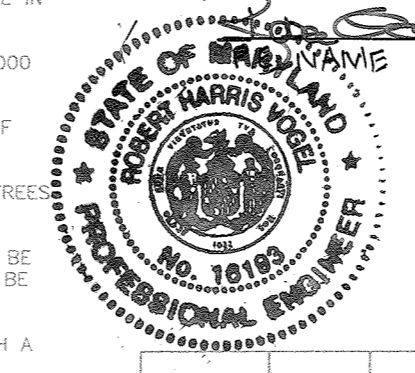
**OPERATION AND MAINTENANCE SCHEDULE FOR LANDSCAPE INFILTRATION (M-3), MICRO-BIORETENTION (M-6), RAIN GARDENS (M-7), BIORETENTION SWALE (M-8), AND ENHANCED FILTERS (M-9)**

1. 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 PRUNING. ACCEPTABLE REPLACEMENT PLANT MATERIAL IS LIMITED TO THE FOLLOWING: 2000 MARYLAND STORMWATER DESIGN MANUAL, VOLUME II, TABLE A.4.1 AND 2.

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 DISKAGED TREES AND SHRUBS, AND REPLACE ALL DEFICIENT STAKES AND WIRES.

3. 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.

4. THE OWNER SHALL CORRECT SOIL EROSION ON AN AS NEEDED BASIS, WITH A MINIMUM OF ONCE PER MONTH AND AFTER EACH HEAVY STORM.



**AS-BUILT CERTIFICATION FOR PERM**  
I HEREBY CERTIFY THAT THE FACILITY SHOWN ON THE PLAN WAS CONSTRUCTED AS SHOWN ON THE "AS-BUILT" PLANS AND COMPLIES WITH THE APPROVED PLANS AND SPECIFICATIONS. I HAVE VERIFIED THAT THE CONTRIBUTING DRAINAGE AREA IS SUFFICIENTLY STABILIZED TO PREVENT CLOGGING OF THE UNDERGROUND SWM FACILITY.

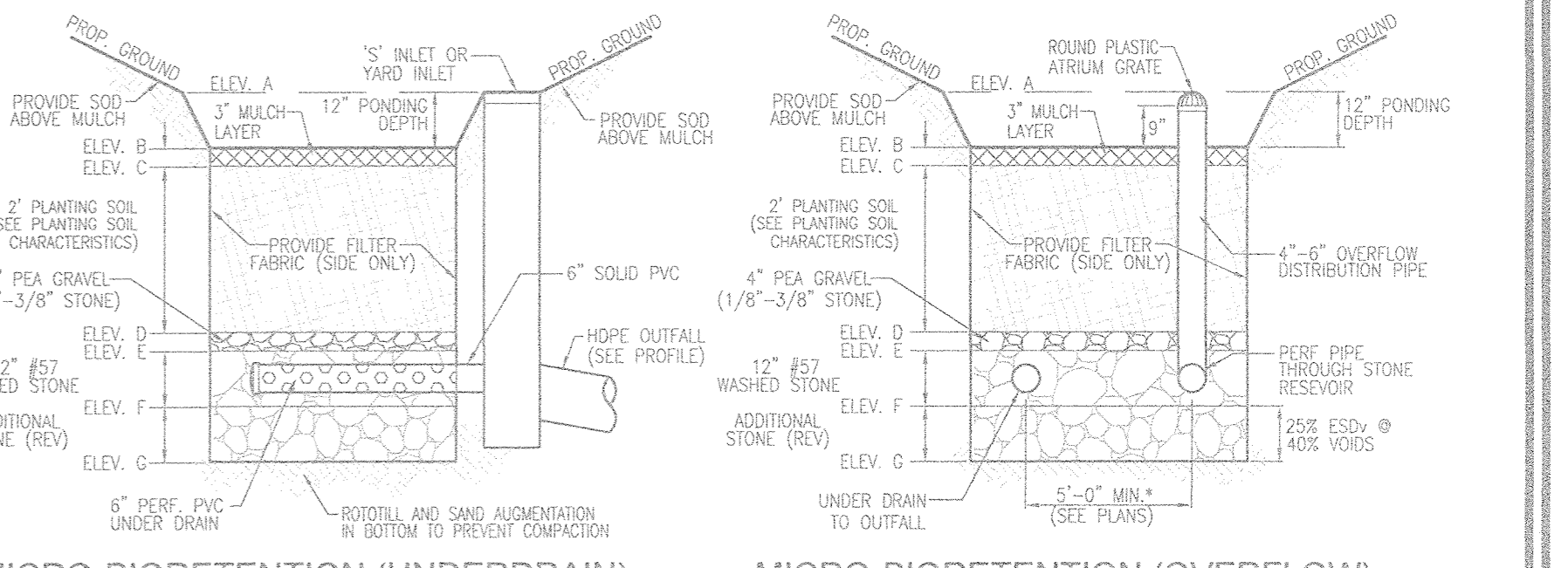
16193 8/1/18  
P.E. # DATE

**ENVIRONMENTAL SITE DESIGN PRACTICE**

DRAINAGE AREA #	AREA TREATED	FACILITY NUMBER	PERMEABLE PAVEMENT	LANDSCAPE INFILTRATION	PERVIOUS SIDEWALK	BIO GRAVEL SWALE	MICRO BIO TRENCH	ESDv VOLUME
1	14,051	SWMF#1	0	0	0	0	0	913
SUBTOTAL 1			0	0	0	0	0	913
TOTALS:			0	0	0	0	0	913

TOTAL AREA 14,051 SF  
0.32 AC

TOTAL ESDv PROVIDED: 913



**MICRO-BIORETENTION (UNDERDRAIN)** NOT TO SCALE

**MICRO-BIORETENTION (OVERFLOW)** NOT TO SCALE

**MICROBIORETENTION NOTES:**

- ONLY THE SIDES OF MICROBIORETENTION ARE TO BE WRAPPED IN FILTER FABRIC. FILTER FABRIC BETWEEN LAYER OR AT THE BOTTOM OF THE MICROBIORETENTION WILL CAUSE THE MBR TO FAIL, AND THEREFORE SHALL NOT BE INSTALLED.
- WRAP THE PERFORATED MBR UNDERDRAIN PIPE WITH 1/4" MESH (4x4) OR SMALLER GALVANIZED HARDWARE CLOTH.
- PROVIDE 5" MINIMUM SPACING BETWEEN UNDER DRAIN AND PERFORATED PIPE THROUGH STONE RESERVOIR OR SPACE PIPE EQUALLY ACROSS BOTTOM FOR SMALL BIOS. (SEE PLANS)

Appendix B.4. Construction Specifications for Environmental Site Design Practices

**Table B.4.1 Materials Specifications for Micro-Bioretenion, Rain Gardens & Landscape Infiltration**

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 diaphragm	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 I nonwovens
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 over pipes; not necessary underneath pipes. Perforated pipe shall be wrapped with 1/4-inch galvanized hardware cloth
Poured in place concrete (if required)	MSHA Min No. 3; F = 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 350.8R9; vertical loading [H-10 or H-20]; allowable horizontal loading (based on soil pressure); and analysis of potential cracking. Sand substitutions such as Diabase and Gneiss (AASHTO #10 are not acceptable. No calcium carbonate 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"	

**OWNER/DEVELOPER**  
W R GRACE & CO.  
7500 GRACE DR.  
COLUMBIA, MD 21044-4098  
(410) 531-4000

NO.	REVISION TO REDUCE THE BUILDING SIZE AND RECONFIGURE THE SITE	DATE
1		10/11/17

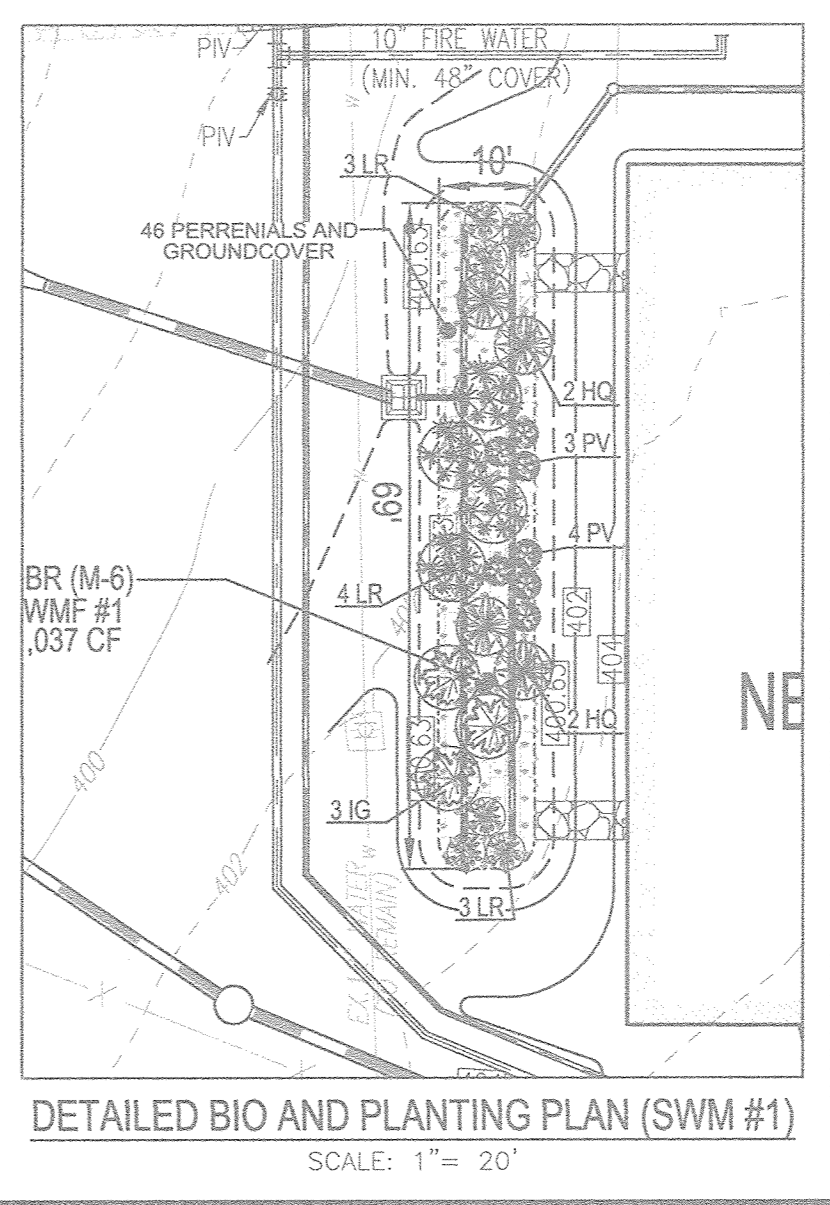
REVISED SITE DEVELOPMENT PLAN  
**STORMWATER MANAGEMENT DRAINAGE AREA MAP AND DETAILS**  
GRACE TECH PARK WAREHOUSE BUILDING  
TAX MAP: 35 GRACE 22  
5TH ELECTION DISTRICT  
PLAT 21235 (L. 273 F. 186)  
PARCEL 145, PARCEL A HOWARD COUNTY, MARYLAND

**ROBERT H. VOGEL ENGINEERING, INC.**  
ENGINEERS • SURVEYORS • PLANNERS  
8407 MAIN STREET  
ELLCOTT CITY, MD 21043  
TEL: 410-461-7666  
FAX: 410-461-5961

**PROFESSIONAL CERTIFICATE**  
DESIGN BY: RHV/DZE  
DRAWN BY: KG/DZE  
CHECKED BY: RHV  
DATE: OCTOBER 2017  
SCALE: AS SHOWN  
W.O. NO.: 15-20

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. 16193, EXPIRATION DATE 08-27-2018.

7 SHEET OF 8



**BIORETENTION PLANTING SCHEDULE (SHRUB/JORNMENTAL GRASSES)**

LEGEND KEY	QTY	BOTANICAL NAME/COMMON NAME	SIZE	REMARKS
IG	3	ILEX GLABRA 'SHAMROCK' INKBERRY HOLLEY	1 GALLON	
IV	4	ITEA VIRGINICA 'HENRY'S GARNETT' VIRGINIA QUERCUPHIRE	1 GALLON	
HQ	4	HYDRANGEA QUERCIFOLIA OAKLEAF HYDRANGEA	1 GALLON	
LR	6	LEUCOCTHEMUS RACEMOSA FETTERBUSH	1 GAL.	
PV	7	PANICUM VIRGATUM SWITCHGRASS	1 GAL.	

**BIORETENTION PERENNIALS/GROUND COVER PLANTING SCHEDULE**

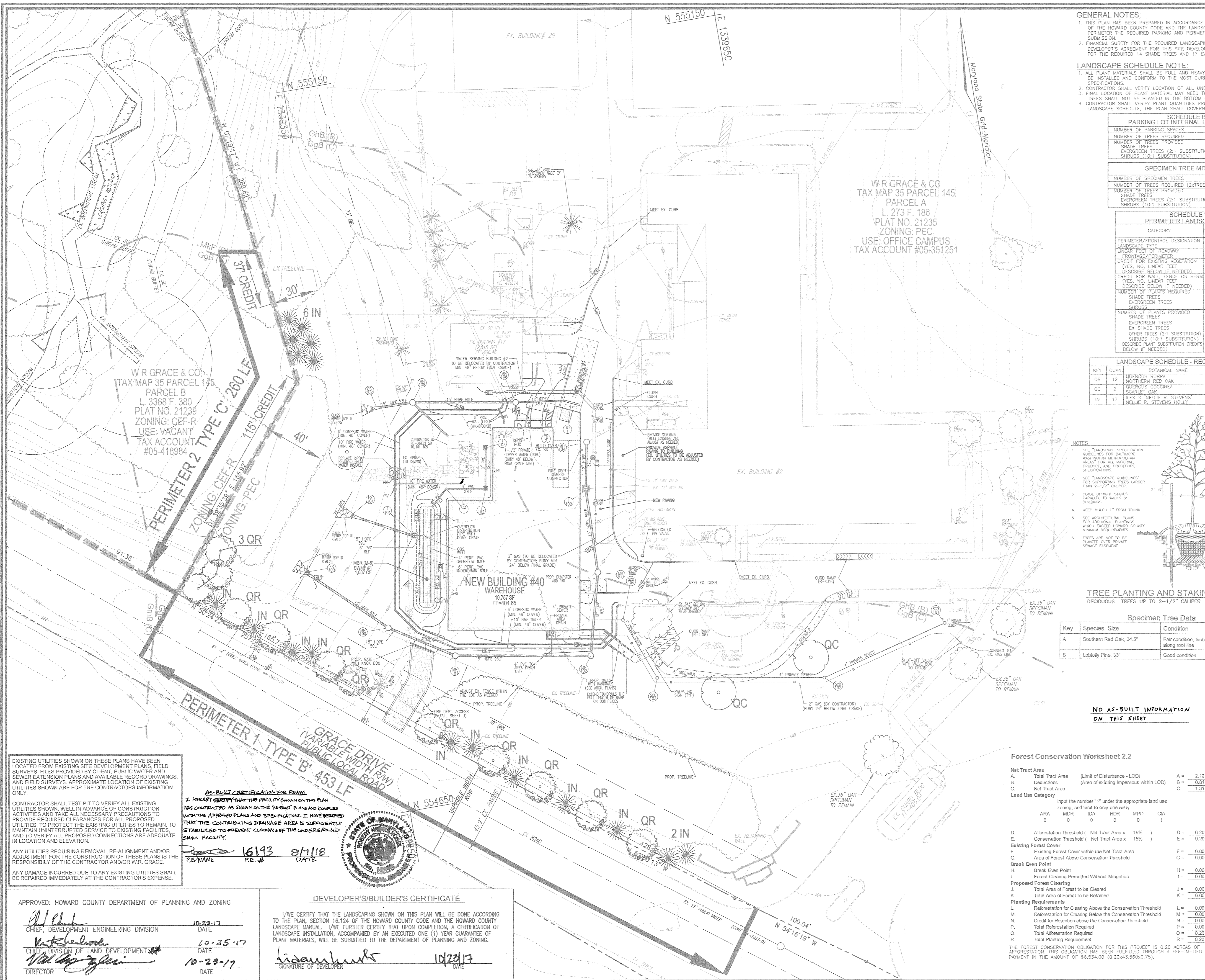
LEGEND	QTY	BOTANICAL NAME/COMMON NAME	SIZE	REMARKS
	23	BAPTISIA AUSTRALIS FALSE INDIGO	4" POT	12"-15" O.C. FOR SIDES AND BOTTOM OF MBR. MIX ALL VARIETIES IN A NATURALISTIC RANDOM PATTERN THROUGHOUT. PLANT IN GROUPS OF 3. NO LESS THAN 9 PLANTS PER CLUMP.
	23	ACORUS GRAMINEUS 'OGON' GOLDEN VARIATED SWEET FLAG	1 OT.	

**MICRO-BIORETENTION PLANTING REQUIREMENTS**

MBR #	LF	AREA	STEMS REQUIRED (0.0229)	STEMS PROVIDED
1	153	685	16	24
TOTALS:	153	685	16	24

BIORETENTION AREAS ARE TO BE PLANTED BASED ON: A MINIMUM DENSITY OF 1000 STEMS PER PLANTED ACRE (0.0229 STEMS PER SQUARE FOOT).

AS-BUILT - JUNE, 2018 SDP-17-006



- GENERAL NOTES:**
- THIS PLAN HAS BEEN PREPARED IN ACCORDANCE WITH THE PROVISIONS OF SECTION 16.24 OF THE HOWARD COUNTY CODE AND THE LANDSCAPE MANUAL. THE REQUIRED PARKING AND PERIMETER THE REQUIRED PARKING AND PERIMETER LANDSCAPING WILL BE BONDED PER THIS SUBMISSION.
  - FINANCIAL SURETY FOR THE REQUIRED LANDSCAPING HAS BEEN POSTED AS PART OF THE DEVELOPER'S AGREEMENT FOR THIS SITE DEVELOPMENT PLAN IN THE AMOUNT OF \$8,750.00 FOR THE REQUIRED 1/4 SHADE TREES AND 1/4 EVERGREENS.
- LANDSCAPE SCHEDULE NOTE:**
- ALL PLANT MATERIALS SHALL BE FULL AND HEAVY, BE WELL FORMED AND SYMMETRICAL, AND BE INSTALLED AND CONFORM TO THE MOST CURRENT HOWARD COUNTY SPECIFICATIONS.
  - CONTRACTOR SHALL VERIFY LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO DIGGING.
  - FINAL LOCATION OF PLANT MATERIAL MAY NEED TO VARY TO MEET FINAL FIELD CONDITIONS. TREES SHALL NOT BE PLANTED IN THE BOTTOM OF DRAINAGE SWALES.
  - CONTRACTOR SHALL VERIFY PLANT QUANTITIES PRIOR TO BIDDING. IF PLAN DIFFERS FROM LANDSCAPE SCHEDULE, THE PLAN SHALL GOVERN.

**SCHEDULE B**  
**PARKING LOT INTERNAL LANDSCAPING**

NUMBER OF PARKING SPACES	1
NUMBER OF TREES REQUIRED	0
NUMBER OF TREES PROVIDED	0
SHADE TREES	0
EVERGREEN TREES (2:1 SUBSTITUTION)	0
SHRUBS (10:1 SUBSTITUTION)	0

**SPECIMEN TREE MITIGATION**

NUMBER OF SPECIMEN TREES	1
NUMBER OF TREES REQUIRED (2X TREES DEMO)	2
NUMBER OF TREES PROVIDED	2
SHADE TREES	2
EVERGREEN TREES (2:1 SUBSTITUTION)	0
SHRUBS (10:1 SUBSTITUTION)	0

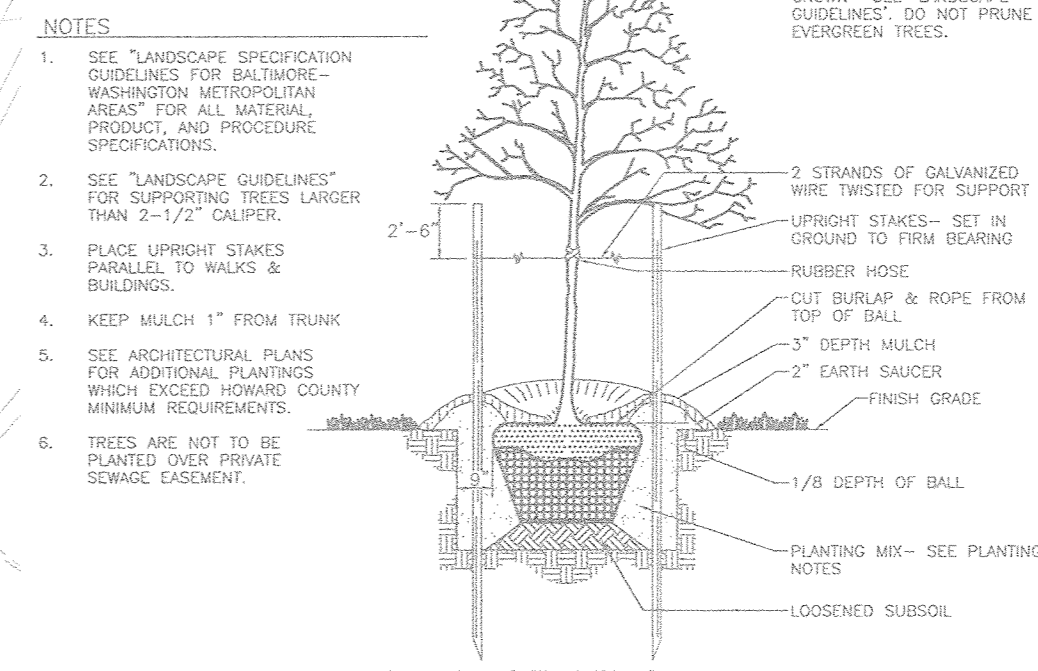
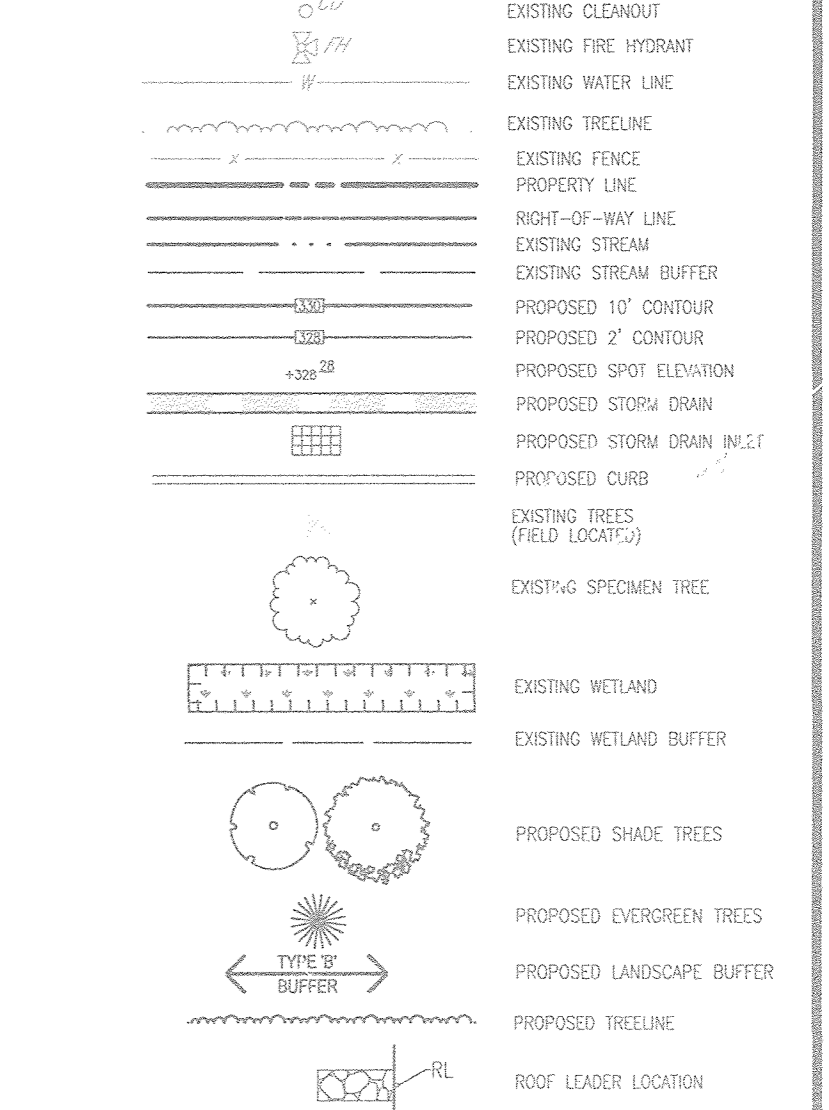
**SCHEDULE 'A'**  
**PERIMETER LANDSCAPE EDGE**

CATEGORY	NUMBER OF PERIMETER AND ROADWAYS	TOTAL
PERIMETER/FRONTAGE DESIGNATION	1	2
LANDSCAPE TYPE	B	C
LINEAR FEET OF ROADWAY FRONTAGE/PERIMETER	453'	260'
CREDIT FOR EXISTING VEGETATION (YES, NO, LINEAR FEET DESCRIBE BELOW IF NEEDED)	No	Yes 152 LF
CREDIT FOR WALL, FENCE OR BEAM (YES, NO, LINEAR FEET DESCRIBE BELOW IF NEEDED)	No	No
NUMBER OF PLANTS REQUIRED		
SHADE TREES	150	9
EVERGREEN TREES	140	11
SHRUBS	140	11
NUMBER OF PLANTS PROVIDED		
SHADE TREES	9	3
EVERGREEN TREES	11	6
OTHER TREES (2:1 SUBSTITUTION)	1	2
SHRUBS (10:1 SUBSTITUTION)	1	1
DESCRIBE PLANT SUBSTITUTION CREDITS BELOW IF NEEDED		

**LANDSCAPE SCHEDULE - REQUIRED PLANTING**

KEY	QUAN	BOTANICAL NAME	SIZE	CAT
QR	12	QUERCUS ROBUR NORTHERN RED OAK	2.5"-3" CAL	B & B
QC	2	QUERCUS COCCINEA SCARLET OAK	3" DBH	B & B
IN	17	ILEX 'NELLIE R. STEVENS' NELLIE R. STEVENS HOLLY	8" HOT. MIN.	B & B

- LEGEND:**
- EXISTING CURB AND GUTTER
  - EXISTING UTILITY POLE
  - EXISTING LIGHT POLE
  - EXISTING SIGN
  - EXISTING SANITARY MANHOLE
  - EXISTING SANITARY LINE
  - EXISTING 10' CONTOUR
  - EXISTING 2' CONTOUR
  - SOILS
  - EXISTING CLEANOUT
  - EXISTING FIRE HYDRANT
  - EXISTING WATER LINE
  - EXISTING TRENCH
  - EXISTING FENCE
  - PROPERTY LINE
  - RIGHT-OF-WAY LINE
  - EXISTING STREAM
  - EXISTING STREAM BUFFER
  - PROPOSED 10' CONTOUR
  - PROPOSED 2' CONTOUR
  - PROPOSED SPOT ELEVATION
  - PROPOSED STORM DRAIN
  - PROPOSED STORM DRAIN INLET
  - PROPOSED CURB
  - EXISTING TREES (FIELD LOCATIONS)
  - EXISTING SPECIMEN TREE
  - EXISTING WETLAND
  - EXISTING WETLAND BUFFER
  - PROPOSED SHADE TREES
  - PROPOSED EVERGREEN TREES
  - PROPOSED LANDSCAPE BUFFER
  - PROPOSED TRENCH
  - PROPOSED LEADER LOCATION
  - PRUNE AS DIRECTED
  - RUBBER HOSE
  - WIRE CUTS
  - TURNBUCKLES



**Specimen Tree Data**

Key	Species, Size	Condition	Action
A	Southern Red Oak, 34.5"	Fair condition, limb dieback and fungus	TO BE REMOVED
B	Loblolly Pine, 33"	Good condition	TO REMAIN

**NO AS-BUILT INFORMATION ON THIS SHEET**

**Forest Conservation Worksheet 2.2**

Net Tract Area	A = 2.12
Total Tract Area (Limit of Disturbance - LOD)	B = 0.20
Deductions (Area of existing impervious within LOD)	C = 1.31
Net Tract Area	D = 0.20
Existing Forest Cover	E = 0.20
Existing Forest Cover within the Net Tract Area	F = 0.00
Area of Forest Above Conservation Threshold	G = 0.00
Break Even Point	H = 0.00
Break Even Point	I = 0.00
Forest Clearing Permitted Without Mitigation	J = 0.00
Proposed Forest Clearing	K = 0.00
Total Area of Forest to be Cleared	L = 0.00
Total Area of Forest to be Retained	M = 0.00
Planting Requirements	N = 0.00
Reforestation for Clearing Above the Conservation Threshold	O = 0.00
Reforestation for Clearing Below the Conservation Threshold	P = 0.00
Credits for Retention above the Conservation Threshold	Q = 0.00
Total Reforestation Required	R = 0.00
Total Afforestation Required	S = 0.00
Total Planting Requirement	T = 0.00

Input the number "1" under the appropriate land use zoning, and limit to only one entry

ARA	MCR	CA	HR	MPD	CIA
0	0	0	0	0	1

THE FOREST CONSERVATION OBLIGATION FOR THIS PROJECT IS 0.20 ACRES OF AFFORESTATION. THIS OBLIGATION HAS BEEN FULFILLED THROUGH A FEE-IN-LIEU PAYMENT IN THE AMOUNT OF \$6,534.00 (0.20x43,560x0.75).

**OWNER/DEVELOPER**  
W. R. GRACE & CO.  
7500 GRACE DR  
COLUMBIA, MD 21044-4098  
(410) 531-4000

**REVISIONS**

NO.	REVISION	DATE
1	REVISE TO REDUCE THE BUILDING SIZE AND RECONFIGURE THE SITE	10/11/17

**REVISED SITE DEVELOPMENT PLAN**  
**LANDSCAPE PLAN AND FOREST CONSERVATION PLAN**  
**GRACE TECH PARK WAREHOUSE BUILDING**  
TAX MAP 35 GRID: 22 PARCEL 145, PARCEL A  
5TH ELECTION DISTRICT PLAT 21235 (L. 273/F. 186) HOWARD COUNTY, MARYLAND

**ROBERT H. VOGEL ENGINEERING, INC.**  
ENGINEERS • SURVEYORS • PLANNERS  
840 MAIN STREET, SUITE 21043 TEL: 410-461-7666  
ELICOTT CITY, MD 21043 FAX: 410-461-1896

**DESIGN BY:** RHV/DZE  
**DRAWN BY:** KG/DZE  
**CHECKED BY:** RHV  
**DATE:** OCTOBER 2017  
**SCALE:** AS SHOWN  
**W.O. NO.:** 15-20

**PROFESSIONAL CERTIFICATE**  
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A FULLY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND (09-27-2018)

**8 SHEET OF 8**