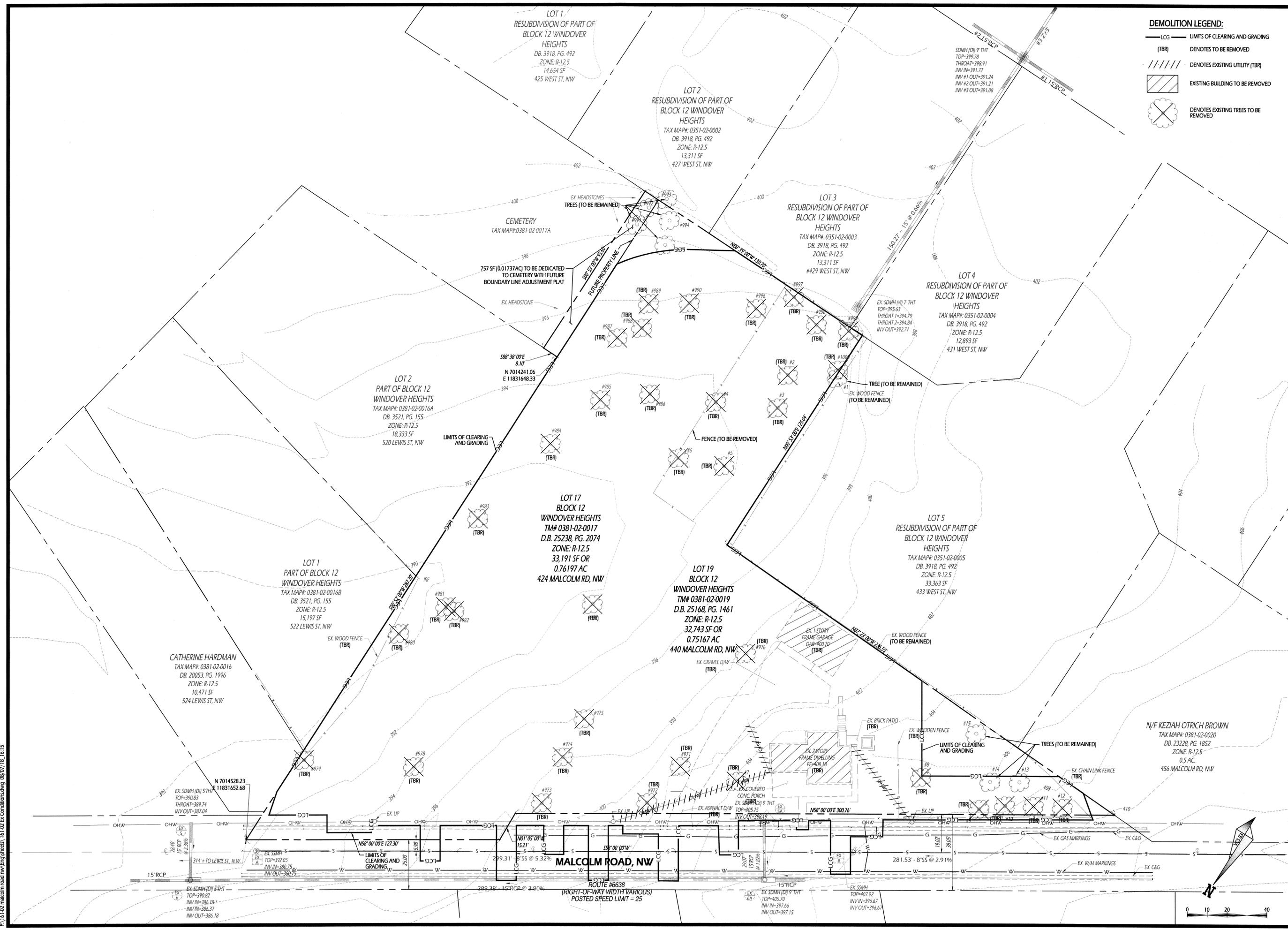


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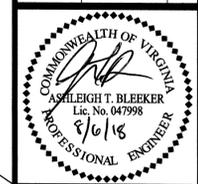


DEMOLITION LEGEND:

- LCG — LIMITS OF CLEARING AND GRADING
- (TBR) DENOTES TO BE REMOVED
- ////// DENOTES EXISTING UTILITY (TBR)
- [Hatched Box] EXISTING BUILDING TO BE REMOVED
- [Circle with X] DENOTES EXISTING TREES TO BE REMOVED

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EXISTING CONDITIONS & DEMOLITION PLAN
MALCOLM ROAD SUBDIVISION
FINAL PLAN
 HUNTER HILL DISTRICT, TOWN OF VIENNA, FAIRFAX COUNTY, VIRGINIA



SMITH ENGINEERING
 14901 BOGLE DRIVE SUITE 202
 CHANTILLY, VA 20151
 PHONE: 703-956-6204
 PROJECT: 161-02
 PROJECT MANAGER: ASHLEIGH T. BLEEKER
 Ashleigh@SMITHEngineeringVA.com

PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/25/18	SECOND SUBMISSION
07/16/18	THIRD SUBMISSION

OTHER PLAN DISTRIBUTIONS

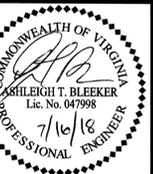
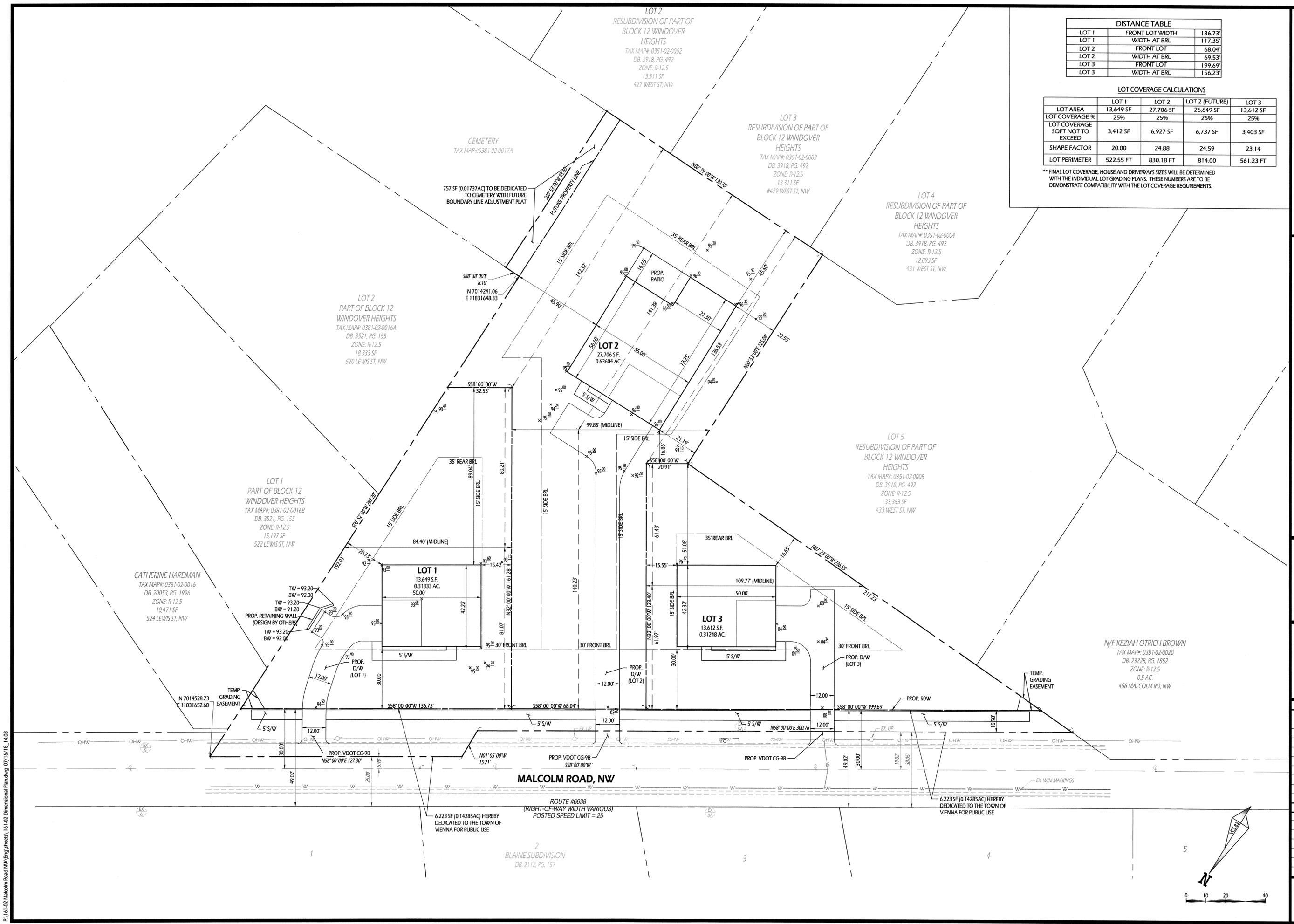
SCALE: 1" = 20'
 DATE: JANUARY 18, 2018
 SHEET 3 OF 30



DISTANCE TABLE		
LOT 1	FRONT LOT WIDTH	136.73'
LOT 1	WIDTH AT BRL	117.35'
LOT 2	FRONT LOT	68.04'
LOT 2	WIDTH AT BRL	69.53'
LOT 3	FRONT LOT	199.69'
LOT 3	WIDTH AT BRL	156.23'

LOT COVERAGE CALCULATIONS				
	LOT 1	LOT 2	LOT 2 (FUTURE)	LOT 3
LOT AREA	13,649 SF	27,706 SF	26,649 SF	13,612 SF
LOT COVERAGE %	25%	25%	25%	25%
LOT COVERAGE SOFT NOT TO EXCEED	3,412 SF	6,927 SF	6,737 SF	3,403 SF
SHAPE FACTOR	20.00	24.88	24.59	23.14
LOT PERIMETER	522.55 FT	830.18 FT	814.00	561.23 FT

** FINAL LOT COVERAGE, HOUSE AND DRIVEWAYS SIZES WILL BE DETERMINED WITH THE INDIVIDUAL LOT GRADING PLANS. THESE NUMBERS ARE TO BE DEMONSTRATE COMPATIBILITY WITH THE LOT COVERAGE REQUIREMENTS.



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OTHER PLAN DISTRIBUTIONS

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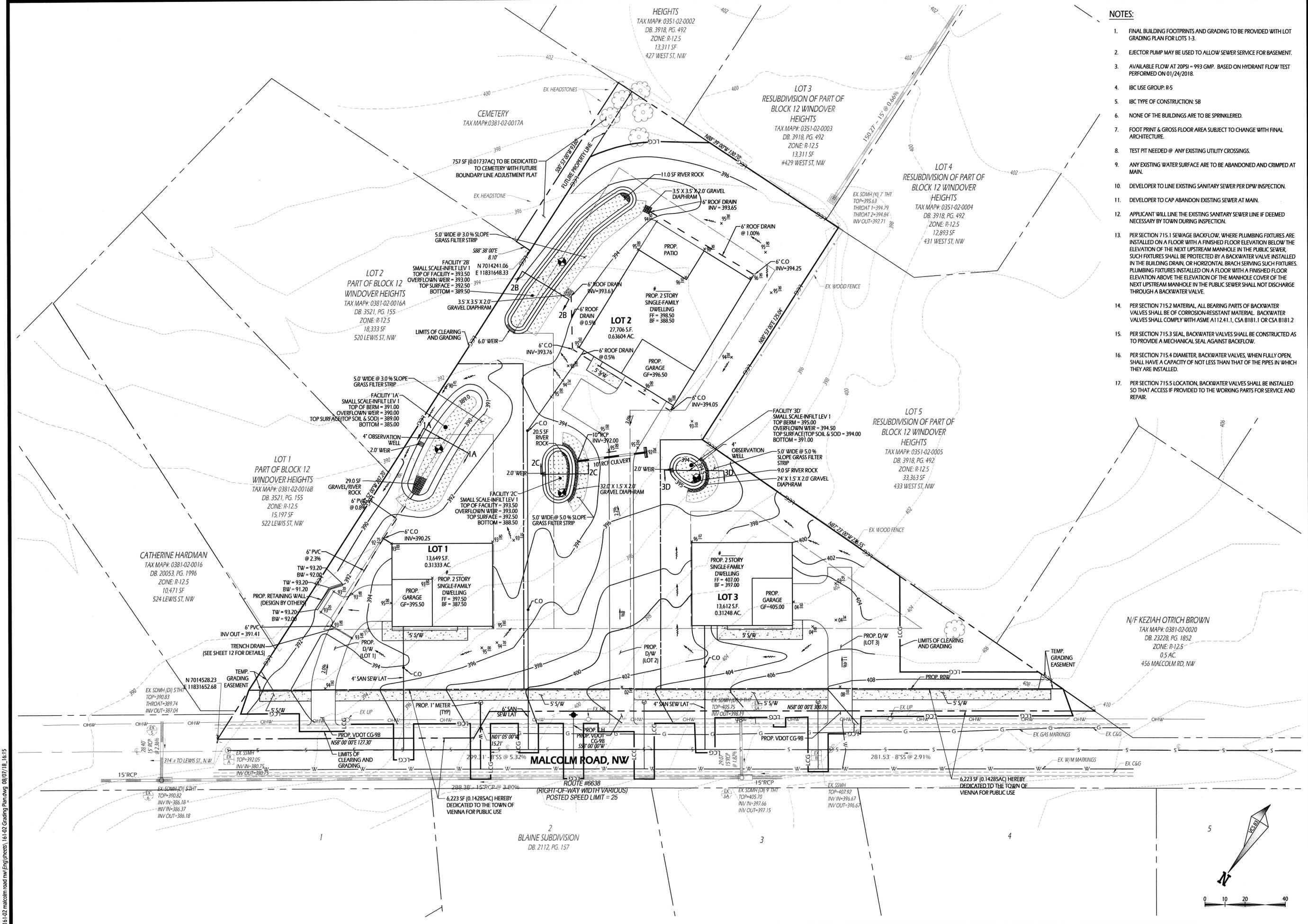
PLAN SUBMISSIONS	
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07/16/18	THIRD SUBMISSION

OTHER PLAN DISTRIBUTIONS

SCALE: 1" = 20'
DATE: JANUARY 18, 2018
SHEET 5 OF 30

NOTES:

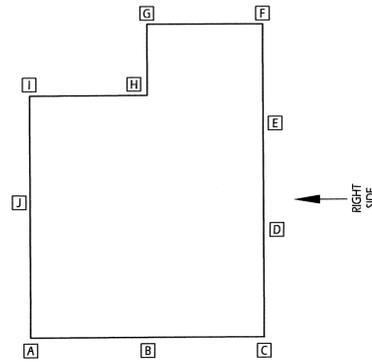
- FINAL BUILDING FOOTPRINTS AND GRADING TO BE PROVIDED WITH LOT GRADING PLAN FOR LOTS 1-3.
- EJECTOR PUMP MAY BE USED TO ALLOW SEWER SERVICE FOR BASEMENT.
- AVAILABLE FLOW AT 20PSI = 993 GPM. BASED ON HYDRANT FLOW TEST PERFORMED ON 01/24/2018.
- IBC USE GROUP: R-5
- IBC TYPE OF CONSTRUCTION: SB
- NONE OF THE BUILDINGS ARE TO BE SPRINKLERED.
- FOOT PRINT & GROSS FLOOR AREA SUBJECT TO CHANGE WITH FINAL ARCHITECTURE.
- TEST PIT NEEDED @ ANY EXISTING UTILITY CROSSINGS.
- ANY EXISTING WATER SURFACE ARE TO BE ABANDONED AND CRIMPED AT MAIN.
- DEVELOPER TO LINE EXISTING SANITARY SEWER PER DPW INSPECTION.
- DEVELOPER TO CAP ABANDON EXISTING SEWER AT MAIN.
- APPLICANT WILL LINE THE EXISTING SANITARY SEWER LINE IF DEEMED NECESSARY BY TOWN DURING INSPECTION.
- PER SECTION 715.1 SEWAGE BACKFLOW, WHERE PLUMBING FIXTURES ARE INSTALLED ON A FLOOR WITH A FINISHED FLOOR ELEVATION BELOW THE ELEVATION OF THE NEXT UPSTREAM MANHOLE IN THE PUBLIC SEWER, SUCH FIXTURES SHALL BE PROTECTED BY A BACKWATER VALVE INSTALLED IN THE BUILDING DRAIN, OR HORIZONTAL BRANCH SERVING SUCH FIXTURES. PLUMBING FIXTURES INSTALLED ON A FLOOR WITH A FINISHED FLOOR ELEVATION ABOVE THE ELEVATION OF THE MANHOLE COVER OF THE NEXT UPSTREAM MANHOLE IN THE PUBLIC SEWER SHALL NOT DISCHARGE THROUGH A BACKWATER VALVE.
- PER SECTION 715.2 MATERIAL, ALL BEARING PARTS OF BACKWATER VALVES SHALL BE OF CORROSION-RESISTANT MATERIAL. BACKWATER VALVES SHALL COMPLY WITH ASME A112.41.1, CSA B181.1 OR CSA B181.2
- PER SECTION 715.3 SEAL, BACKWATER VALVES SHALL BE CONSTRUCTED AS TO PROVIDE A MECHANICAL SEAL AGAINST BACKFLOW.
- PER SECTION 715.4 DIAMETER, BACKWATER VALVES, WHEN FULLY OPEN, SHALL HAVE A CAPACITY OF NOT LESS THAN THAT OF THE PIPES IN WHICH THEY ARE INSTALLED.
- PER SECTION 715.5 LOCATION, BACKWATER VALVES SHALL BE INSTALLED SO THAT ACCESS IF PROVIDED TO THE WORKING PARTS FOR SERVICE AND REPAIR.



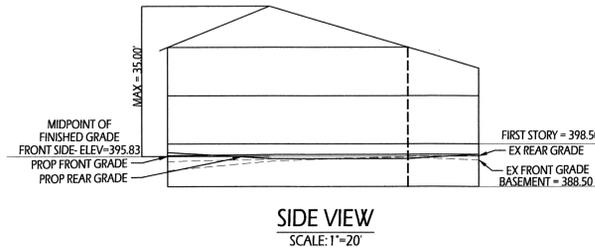
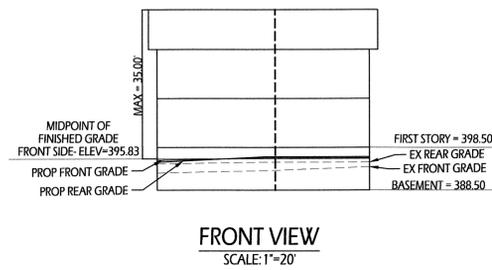
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FINISHED LOT GRADE CALCULATIONS
SCALE: 1"=20'

LOT 2

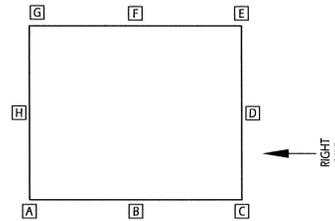


LOCATION	EX GRADE	PROP GRADE	DIFFERENCE
MIDPOINT OF FINISHED GRADE FRONT SIDE- ELEV=395.83			
A	392.50	395.50	+ 3.00'
B	393.00	396.00	+ 3.00'
C	393.96	396.00	+ 2.04'
D	393.96	396.30	+ 2.34'
E	394.30	396.30	+ 2.00'
F	395.00	396.30	+ 1.30'
G	394.60	396.30	+ 1.70'
H	394.00	396.50	+ 2.50'
I	394.60	395.00	+ 0.40'
J	393.50	394.00	+ 0.50'

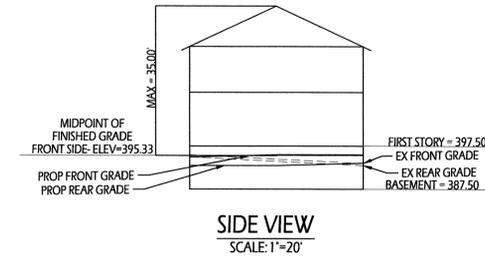
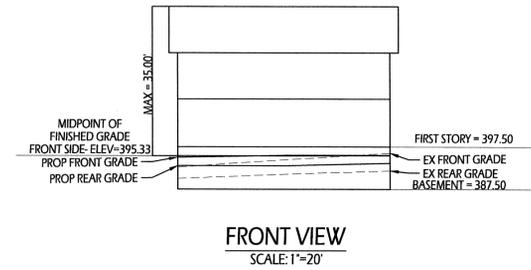


FINISHED LOT GRADE CALCULATIONS
SCALE: 1"=20'

LOT 1

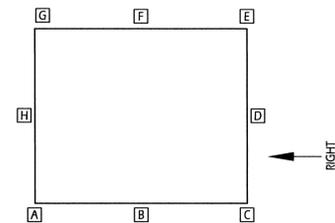


LOCATION	EX GRADE	PROP GRADE	DIFFERENCE
MIDPOINT OF FINISHED GRADE FRONT SIDE- ELEV=395.33			
A	392.70	395.00	+ 2.30'
B	394.40	395.50	+ 1.10'
C	396.00	395.50	- 0.50'
D	394.00	394.50	+ 0.50'
E	391.80	393.60	+ 1.80'
F	391.00	393.00	+ 2.00'
G	390.24	393.00	+ 2.76'
H	391.00	394.00	+ 3.00'

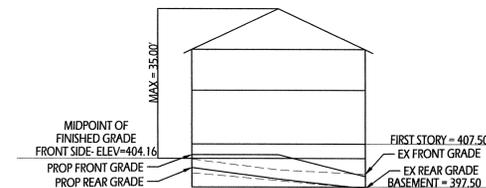
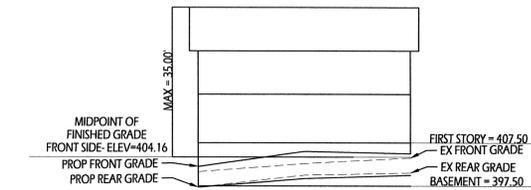


FINISHED LOT GRADE CALCULATIONS
SCALE: 1"=20'

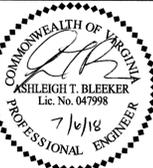
LOT 3



LOCATION	EX GRADE	PROP GRADE	DIFFERENCE
MIDPOINT OF FINISHED GRADE FRONT SIDE- ELEV=404.16			
A	400.80	402.00	+ 1.20'
B	402.68	405.50	+ 2.82'
C	404.00	405.00	+ 1.00'
D	401.50	404.50	+ 3.00'
E	400.50	400.00	- 0.50'
F	400.00	399.20	- 0.80'
G	397.20	396.67	- 0.53'
H	399.00	399.40	+ 0.40'



NOTE: HOUSE ELEVATIONS ARE CONCEPTUAL. FINAL ELEVATIONS SHALL BE PROVIDED WITH THE LOT GRADING PLANS.



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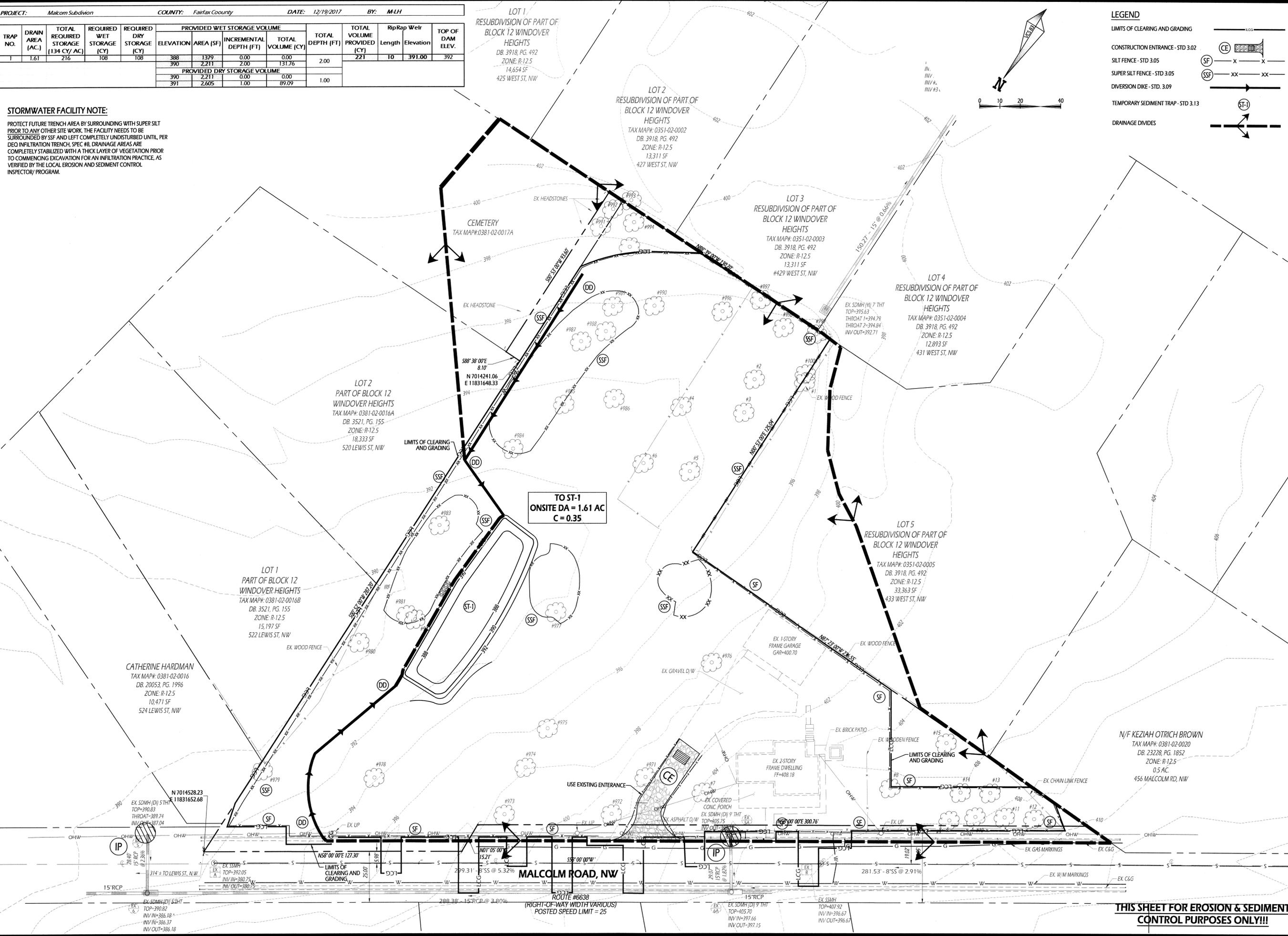
PLAN SUBMISSIONS	
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OTHER PLAN DISTRIBUTIONS

PROJECT: Malcom Subdivision		COUNTY: Fairfax County		DATE: 12/19/2017		BY: MLH						
TRAP NO.	DRAIN AREA (AC.)	TOTAL REQUIRED STORAGE (134 CY/AC)	REQUIRED WET STORAGE (CY)	REQUIRED DRY STORAGE (CY)	PROVIDED WET STORAGE VOLUME			TOTAL DEPTH (FT)	TOTAL VOLUME PROVIDED (CY)	RipRap Weir Length	RipRap Weir Elevation	TOP OF DAM ELEV.
					ELEVATION	AREA (SF)	INCREMENTAL DEPTH (FT)					
1	1.61	216	108	108	388	1379	0.00	0.00	2.00	10	391.00	392
					390	2,211	2.00	131.76				
					PROVIDED DRY STORAGE VOLUME							
					390	2,211	0.00	0.00	1.00			
					391	2,605	1.00	89.09				

STORMWATER FACILITY NOTE:

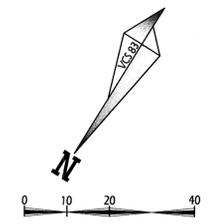
PROTECT FUTURE TRENCH AREA BY SURROUNDING WITH SUPER SILT PRIOR TO ANY OTHER SITE WORK. THE FACILITY NEEDS TO BE SURROUNDED BY SF AND LEFT COMPLETELY UNDISTURBED UNTIL PER DEO INFILTRATION TRENCH, SPEC #8, DRAINAGE AREAS ARE COMPLETELY STABILIZED WITH A THICK LAYER OF VEGETATION PRIOR TO COMMENCING EXCAVATION FOR AN INFILTRATION PRACTICE, AS VERIFIED BY THE LOCAL EROSION AND SEDIMENT CONTROL INSPECTOR/PROGRAM.



TO ST-1
ONSITE DA = 1.61 AC
C = 0.35

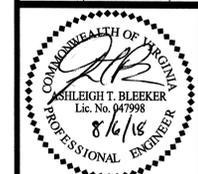
LEGEND

- LIMITS OF CLEARING AND GRADING
- CONSTRUCTION ENTRANCE - STD 3.02
- SILT FENCE - STD 3.05
- SUPER SILT FENCE - STD 3.05
- DIVERSION DIKE - STD. 3.09
- TEMPORARY SEDIMENT TRAP - STD 3.13
- DRAINAGE DIVIDES



SMITH ENGINEERING

EROSION & SEDIMENT CONTROL PLAN - PHASE I
MALCOLM ROAD SUBDIVISION
FINAL PLAN
HUNTER HILL DISTRICT, TOWN OF VIENNA, FAIRFAX COUNTY, VIRGINIA



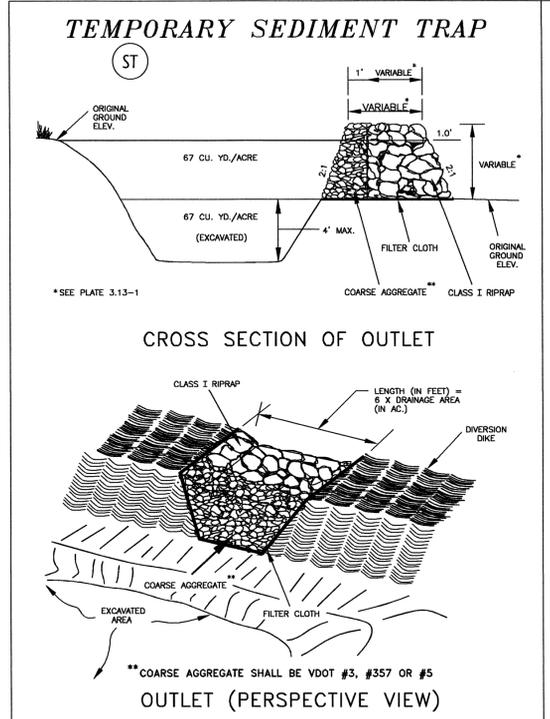
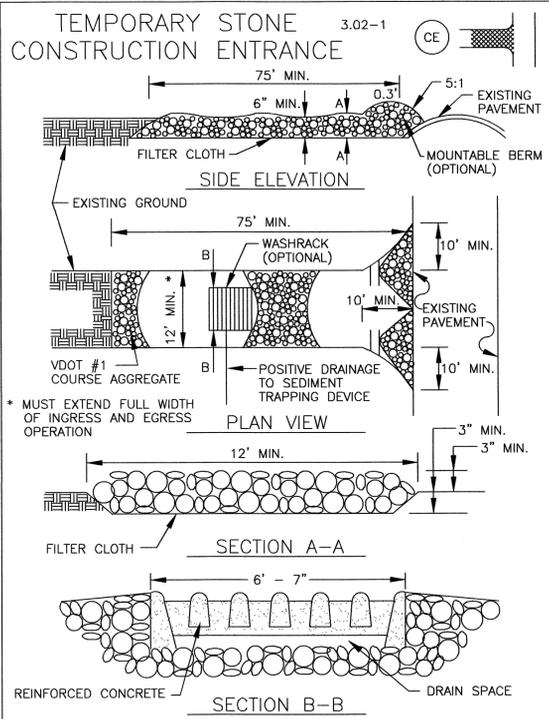
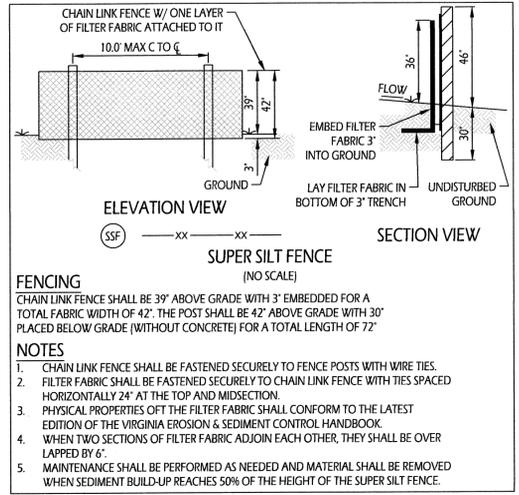
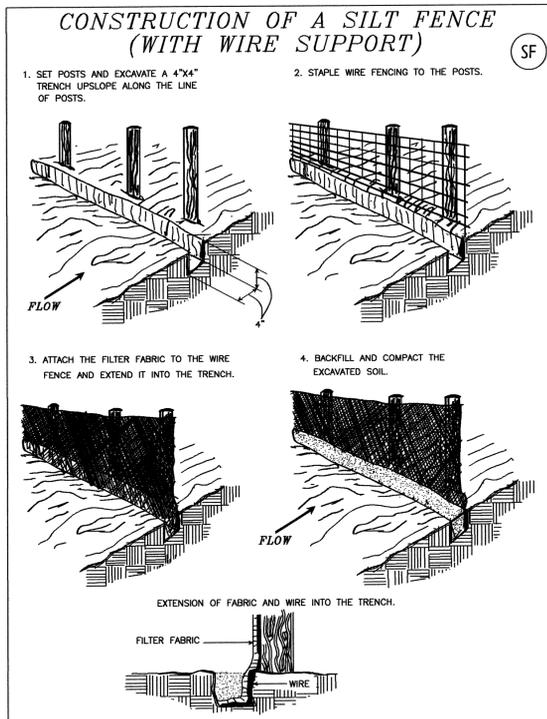
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OTHER PLAN DISTRIBUTIONS

THIS SHEET FOR EROSION & SEDIMENT CONTROL PURPOSES ONLY!!!

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SOURCE: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sarwood & Lynn. PLATE 3.06-1

SOURCE: VA. DSWC. PLATE 3.13-2

SOURCE: VA. DSWC. PLATE 3.09-1

SOURCE: ADAPTED from VDOT Standard Sheets and Va. DSWC. PLATE 3.08-1

EROSION AND SEDIMENT CONTROL NARRATIVE:

PROJECT DESCRIPTION AND EXISTING SITE CONDITIONS
 THE EXISTING LOT IS CURRENTLY DEVELOPED WITH AN EXISTING HOUSE AND DRIVEWAY TO BE DEMOLISHED. THE SITE IS MODERATELY VEGETATIVE WITH EXISTING MATURE TREES, SHRUBS AND OTHER FORMS OF VEGETATION AND IS GENERALLY SLOPING FROM WEST TO NORTH EAST, WITH GRADES RANGING FROM 3% TO 13%. THIS PROPOSED SUBDIVISION PLAN PROVIDES THREE NEW 2.5-STORY DWELLING WITH ATTACHED GARAGE AND ASSOCIATED ON-SITE IMPROVEMENTS WITHIN THE SUBJECT LOT AS WELL AS FRONTAGE IMPROVEMENTS ALONG MALCOLM ROAD N.W. THE PROJECT PROPOSES TO DISTURB APPROXIMATELY 1.36 ACRES OF THE LOT, AS NOTED IN GENERAL NOTE SHEET 2. PER CURRENT FAIRFAX COUNTY MAPPING, THERE IS NO KNOWN FLOODPLAIN, RESOURCE PROTECTION OR MANAGEMENT AREAS EXISTING ON OR NEAR THE SUBJECT LOT.

ADJACENT PROPERTIES AND OFF-SITE AREAS
 THE SUBJECT LOT IS BOUNDED ON ONE SIDE BY RESIDENTIAL PROPERTIES TO THE SOUTH EAST AND WEST AND BY MALCOLM ROAD, N.W. TO THE NORTH. A SECTION OF STREET IMPROVEMENTS IS TO BE PERFORMED ON MALCOLM ROAD, N.W. OFF-SITE LAND DISTURBANCE WILL BE PERFORMED WITH THIS PROJECT OTHER THAN THAT WHICH IS SHOWN WITHIN THE RIGHT-OF-WAY.

SOILS AND CRITICAL EROSION AREAS
 THE SOIL TYPE WITHIN AREAS OF PROPOSED CONSTRUCTION IS SHOWN AND DESCRIBED IN THE SOILS INFORMATION AND MAPPING ON SHEET 1. THERE ARE NO CRITICAL AREAS THAT EXIST WITHIN THE LIMIT OF PROPOSED CONSTRUCTION AND SITE GRADING. CONTRACTOR SHALL HAUL AWAY EXCESS SOIL.

CRITICAL EROSION AREAS
 THERE ARE NO CRITICAL EROSION AREAS ON THIS PROJECT.

STORMWATER MANAGEMENT
 THE PRE-DEVELOPED AND POST-DEVELOPED RUNOFF RATES HAVE BEEN APPROPRIATELY EVALUATED FOR THIS DEVELOPMENT AND ARE INCLUDED IN THIS PLAN. BIORETENTION FACILITIES ARE PROPOSED AS A MEANS OF WATER QUANTITY AND QUALITY CONTROLS.

EROSION AND SEDIMENT CONTROL MEASURES:

UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO THE MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), CURRENT EDITION, AND THE FAIRFAX COUNTY PUBLIC FACILITIES MANUAL (PFM).

STRUCTURAL VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH) PRACTICES
 TEMPORARY STONE CONSTRUCTION ENTRANCE - STD 3.02, SILT FENCE & SUPER SILT FENCE - STD 3.05, SEDIMENT TRAP PLATE 3.13-2.

SEQUENCE OF CONSTRUCTION
 ALL EROSION AND SEDIMENT CONTROL DEVICES SHALL BE PLACED PRIOR TO OR AS THE FIRST STEP IN CLEARING AND GRADING OPERATIONS. THE CONTRACTOR SHALL INITIALLY CLEAR ONLY SUFFICIENT AREA AS NEEDED TO INSTALL PHASE I SEDIMENT CONTROL DEVICES AS SHOWN ON THE PLAN. CONTRACTOR SHALL MAKE EFFORTS TO CLEAR AREAS REQUIRED FOR SEDIMENT AND EROSION CONTROL DEVICES FIRST.

REMAINING CLEARING AND GRADING OPERATIONS SHALL BE CONDUCTED ONLY AFTER ALL SEDIMENT AND EROSION CONTROL DEVICES ARE IN PLACE AND OPERATIONAL UPON COMPLETION OF CONSTRUCTION. ALL TEMPORARY EROSION AND SEDIMENT CONTROLS SHALL BE REMOVED AS PERMITTED BY THE TOWN OF VIENNA INSPECTOR. ALL DISTURBED AREAS SHALL BE STABILIZED AND SEEDED (OR SODDED AT THE OWNERS EXPENSE).

TEMPORARY STABILIZATION
 ALL ON-SITE AREAS DISTURBED BY CONSTRUCTION ACTIVITIES AND REQUIRING TEMPORARY STABILIZATION SHALL BE STABILIZED PER THE VESCH STD SPEC 3.31. SELECTION OF PLANTING REQUIREMENTS SHALL BE BASED ON THE SPECIFIC SITE, SEASON AND VESCH TABLES 3.31.B AND 3.31.C. SOIL TESTING SHALL BE CONDUCTED TO DETERMINE IF LIME IS NECESSARY FOR TEMPORARY SEEDING. IF REQUIRED, LIME SHALL BE APPLIED BASED ON VESCH TABLE 3.31.A. FERTILIZER (10-20-10 OR EQUIVALENT NUTRIENTS) SHALL BE APPLIED AT A RATE OF 600 POUNDS PER ACRE (14 POUNDS PER 1,000 SQUARE FEET). SEED SHALL BE EVENLY APPLIED, WITH SMALL GRAINS PLANTED NO DEEPER THAN 1 INCH, AND GRASSES OR LEGUMES WITH NO LESS THAN 1/4 INCH OF SOIL COVER. SEEDING MADE IN THE FALL FOR WINTER COVER AND DURING HOT AND DRY SUMMER MONTHS SHALL BE MULCHED IN ACCORDANCE WITH VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH) STD 3.35.

MANAGEMENT PRACTICES

- CONSTRUCTION SHALL BE SEQUENCED SO THAT GRADING OPERATIONS CAN BEGIN AND END AS QUICKLY AS POSSIBLE.
- SEDIMENT TRAPPING MEASURES SHALL BE INSTALLED AS A FIRST STEP IN GRADING AND SHALL BE SEEDED AND MULCHED IMMEDIATELY FOLLOWING INSTALLATION.
- TEMPORARY SEEDING OR OTHER STABILIZATION SHALL BE APPLIED WITHIN SEVEN (7) DAYS TO DENUDE AREAS THAT MAY NOT BE AT FINAL GRADE BUT SHALL REMAIN UNDISTURBED FOR LONGER THAN FOURTEEN (14) DAYS.
- AREAS WHICH ARE NOT TO BE DISTURBED SHALL BE CLEARLY MARKED BY FLAGS, SIGNS, ETC.
- TREE SAVE AREAS SHALL BE CLEARLY MARKED IN THE FIELD BY ORANGE SAFETY FENCE.
- PERMANENT SOIL STABILIZATION SHALL BE APPLIED TO DENUDE AREAS WITHIN SEVEN (7) DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE.
- ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN THIRTY (30) DAYS AFTER ADEQUATE SITE STABILIZATION AND AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED, AS AUTHORIZED BY COUNTY INSPECTORS. TRAPPED SEDIMENT AND THE DISTURBED SOIL AREAS RESULTING FROM THE DISPOSITION OF TEMPORARY MEASURES SHALL BE PERMANENTLY STABILIZED TO PREVENT FURTHER EROSION AND SEDIMENTATION.
- WHEN SEDIMENT IS TRANSPORTED ONTO A PAVED ROAD SURFACE, THE ROAD SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM THE ROADS BY SHOVELING OR SWEEPING AND TRANSPORTED TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING WILL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER.

PERMANENT STABILIZATION
 PERMANENT SOIL STABILIZATION SHALL BE APPLIED TO DENUDE AREAS WITHIN SEVEN (7) DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. EROSION CONTROL BLANKETS SHALL BE INSTALLED OVER FILL SLOPES WHICH HAVE BEEN BROUGHT TO FINAL GRADE AND HAVE BEEN SEEDED TO PROTECT THE SLOPE FROM RILL AND GULLY EROSION AND TO ALLOW SEED TO GERMINATE PROPERLY. MULCH (STRAW OR FIBER) SHALL BE USED ON RELATIVELY FLAT AREAS AND SHALL BE APPLIED AS A SECOND STEP IN THE SEEDING OPERATION. IN ALL SEEDING OPERATIONS, SEED, FERTILIZER AND LIME SHALL BE APPLIED PRIOR TO MULCHING.

- MAINTENANCE**
 IN GENERAL, ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CHECKED DAILY AND AFTER EACH SIGNIFICANT RAINFALL EVENT. THE FOLLOWING ITEMS SHALL BE CHECKED IN PARTICULAR, AS THEY APPLY TO THIS PLAN:
- SEDIMENT BASINS SHALL BE CLEANED OUT WHEN THE LEVEL OF SEDIMENT BUILDUP REACHES THE CLEANOUT POINT INDICATED ON THE RISER PIPE.
 - GRAVEL OUTLETS SHALL BE CHECKED REGULARLY FOR SEDIMENT BUILDUP WHICH MAY PREVENT DRAINAGE. IF THE GRAVEL IS CLOGGED BY SEDIMENT, IT SHALL BE REMOVED AND CLEANED OR REPLACED.
 - SILT FENCE BARRIERS SHALL BE CHECKED REGULARLY FOR UNDERMINING OR DETERIORATION OF THE FABRIC. SEDIMENT SHALL BE REMOVED WHEN THE LEVEL OF SEDIMENT DEPOSITION REACHES HALFWAY TO THE TOP OF THE BARRIER.
 - SEEDED AREAS SHALL BE CHECKED REGULARLY TO ENSURE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED AND RE-SEEDED AS NEEDED.
 - ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES MUST BE MADE IMMEDIATELY AFTER THE INSPECTION.

EROSION AND SEDIMENT CONTROL NOTES:

- REFER TO GENERAL NOTES FOR THE TOTAL DISTURBED AREA. NO AREA SHALL BE LEFT DENUDE FOR A PERIOD LONGER THAN 7 DAYS EXCEPT FOR THAT PORTION OF THE SITE IN WHICH WORK WILL BE CONTINUOUS BEYOND 7 DAYS.
- ALL SEDIMENT AND EROSION CONTROL DEVICES SHALL CONFORM WITH CURRENT EDITION OF VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK AND TOWN OF VIENNA CODE AND SHALL BE SUBJECT TO FIELD REVISION AND FINAL APPROVAL OF THE TOWN OF VIENNA INSPECTOR.
- CONTRACTOR SHALL INSTALL THE CONSTRUCTION ENTRANCE TO A LENGTH OF 75 FEET AND A WIDTH OF AT LEAST 10 FEET OR AS SHOWN ON THE PLAN, BEGINNING AT THE EDGE OF EXISTING PAVEMENT. NO WASH RACK SHALL BE REQUIRED UNLESS DEEMED NECESSARY BY THE TOWN OF VIENNA INSPECTOR AT THE TIME OF CONSTRUCTION. NO WASHING OF VEHICLES OR EQUIPMENT WILL BE PERMITTED IN ANY AREA WHICH WILL DRAIN UNCONTROLLED TO ANY PUBLIC RIGHT-OF-WAY OR DRAINAGE SWALE BELOW THE CONSTRUCTION AREA.
- A FILTER FABRIC UNDERLINER SHALL BE INSTALLED UNDER THE TEMPORARY CONSTRUCTION ENTRANCE AGGREGATE PER TOWN OF VIENNA REQUIREMENTS. VDOT 21A AGGREGATE MAY BE SUBSTITUTED FOR NO. 1 STONE IN CONSTRUCTION ENTRANCE IF FILTER FABRIC UNDERLINER IS EMPLOYED.
- SEDIMENT AND EROSION CONTROLS SHOWN HEREON APPLY TO BOTH PHASES ONE AND TWO. REFER TO NARRATIVE FOR SPECIFIC PHASING.

EROSION & SEDIMENT CONTROL SEQUENCE

PHASE I:
 PHASE I OPERATIONS ARE TO CONTROL EROSION AND SEDIMENT ASSOCIATED WITH THE INITIAL CLEARING AND GRADING. PHASE I CONTROLS ARE TO REMAIN IN PLACE UNTIL THE SITE IS PROPERLY STABILIZED. THE INSTALLATION SEQUENCE SHALL BE AS FOLLOWS:

- OBTAIN THE APPROPRIATE CONSTRUCTION PERMIT AND ATTEND A PRE-CONSTRUCTION MEETING WITH THE INSPECTOR PRIOR TO STARTING ANY LAND DISTURBING ACTIVITIES.
- THE EXISTING DRIVEWAY SHALL BE USED AS THE TEMPORARY CONSTRUCTION ENTRANCE WITH WASH RACK AT LOCATION AS SHOWN ON PLAN.
- CLEAR AND GRUB ONLY THE AREAS NECESSARY TO INSTALL SILT FENCE, SUPER SILT FENCE, DIVERSION DIKES, AND SEDIMENT TRAP CONTROL MEASURES.
- INSTALL PHASE I CONTROLS SUCH AS SILT FENCE, SUPER SILT FENCE, DIVERSION DIKES, SEDIMENT TRAP AND AS APPLICABLE TO THIS PLAN.
- ONCE THE SITE INSPECTOR HAS APPROVED THE INSTALLATION OF EROSION AND SEDIMENT CONTROL MEASURES, APPLY TEMPORARY OR PERMANENT SEEDING TO ALL DENUDE AREAS AS EARTH-WORK OPERATIONS PROGRESS.
- THE CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION OF ANY ADDITIONAL EROSION CONTROL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION.

PHASE II:
 PHASE II SEDIMENT CONTROL MEASURES ARE INTENDED TO PROVIDE CONTROL DURING THE FINAL STAGES OF SITE DEVELOPMENT. PHASE II CONTROL MEASURES, WHICH ARE NOT IN CONFLICT WITH FINAL CONSTRUCTION AND PROVIDE EFFECTIVE CONTROL, MAY REMAIN IN PLACE DURING THE FINAL STAGES OF SITE DEVELOPMENT. THE PHASE II SEQUENCE SHALL BE AS FOLLOWS:

- INSTALL THE STORM CULVERT AND UNDERGROUND UTILITIES. INSTALL PHASE II CONTROLS SUCH AS CULVERT INLET PROTECTION AND OUTLET PROTECTION, AS SHOWN ON THE PHASE II PLAN.
- BRING THE SITE TO FINAL GRADE.
- PERMANENTLY STABILIZE THE SITE WITH SEEDING. MAINTAIN PERIMETER CONTROLS UNTIL UPSTREAM AREAS ARE FULLY STABILIZED.
- START CONSTRUCTION OF STORMWATER FACILITIES AND INSTALL SUPER SILT FENCE AROUND EACH FACILITY.
- OBTAIN THE INSPECTOR'S APPROVAL FOR SITE STABILIZATION BEFORE REMOVAL OF ANY PHASE I SEDIMENT TRAPS AND SEDIMENT BASINS.
- CONSTRUCT FINAL DRIVEWAY ENTRANCES TO EACH LOT.
- OBTAIN INSPECTOR'S APPROVAL PRIOR TO THE REMOVAL OF ANY SEDIMENT CONTROLS.
- SEDIMENT FROM TEMPORARY STRUCTURES SHALL BE DISPOSED OF BY SPREADING ON SITE OR HAULING AWAY IF NOT SUITABLE FOR FILL. ALL DENUDE AREAS ARE TO PERMANENTLY STABILIZED WITH PERMANENT VEGETATION UPON THE APPROVAL OF THE INSPECTOR.

NOTE:
 SEE SHEET 26 FOR INFILTRATION TRENCH CONSTRUCTION AND MAINTENANCE SEQUENCE.

GENERAL EROSION AND SEDIMENT CONTROL NOTES
 ES-1: UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION CONTROL PRACTICES SHALL BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH THE MINIMUM STANDARDS AND SPECIFICATION OF THE 1992 VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH).

ES-2: THE PLAN APPROVING AUTHORITY MUST BE NOTIFIED ONE WEEK PRIOR TO THE PRE-CONSTRUCTION CONFERENCE, ONE WEEK PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITIES, AND ONE WEEK PRIOR TO THE FINAL INSPECTION.

ES-3: ALL EROSION CONTROL MEASURES SHALL BE PLACED PRIOR TO OR AS THE FIRST STEP IN CLEARING.
 ES-4: A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN SHALL BE MAINTAINED ON THE SITE AT ALL TIMES.

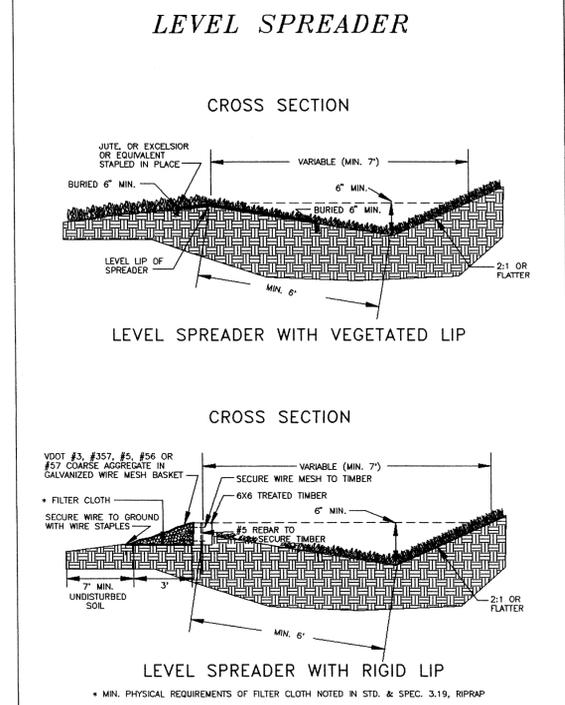
ES-5: PRIOR TO COMMENCING LAND DISTURBING ACTIVITIES IN AREAS OTHER THAN INDICATED ON THESE PLANS (INCLUDING, BUT NOT LIMITED TO, OFF-SITE BORROW OR WASTE AREAS), THE CONTRACTOR SHALL SUBMIT A SUPPLEMENTARY EROSION CONTROL PLAN TO THE OWNER FOR REVIEW AND APPROVAL BY THE PLAN APPROVING AUTHORITY.

ES-6: THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLATION OF ANY ADDITIONAL EROSION CONTROL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION AS DETERMINED BY THE PLAN APPROVING AUTHORITY.

ES-7: ALL DISTURBED AREAS ARE TO DRAIN TO APPROVED SEDIMENT CONTROL MEASURES AT ALL TIMES DURING LAND DISTURBING ACTIVITIES AND DURING SITE DEVELOPMENT UNTIL FINAL STABILIZATION IS ACHIEVED.

ES-8: DURING DEWATERING OPERATIONS, WATER SHALL BE PUMPED INTO AN APPROVED FILTERING DEVICE.
 ES-9: THE CONTRACTOR SHALL INSPECT ALL EROSION AND SEDIMENT CONTROL DEVICES PERIODICALLY AND AFTER EACH RUNOFF-PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES SHALL BE MADE IMMEDIATELY.

1992 3.21

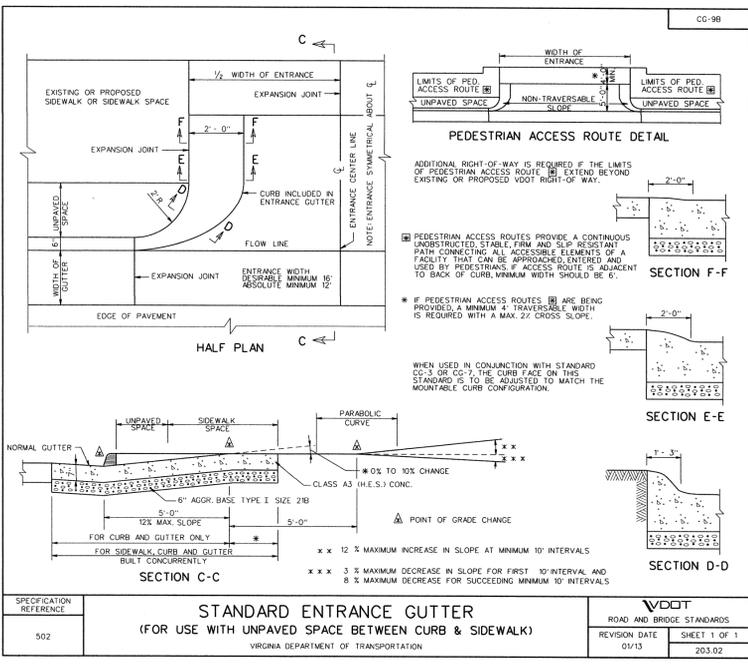
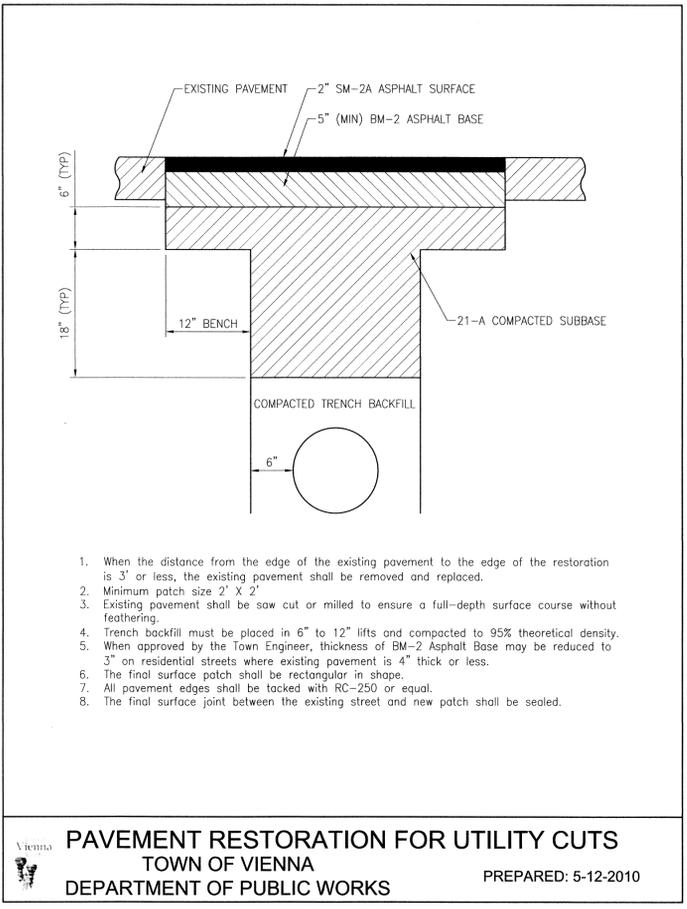
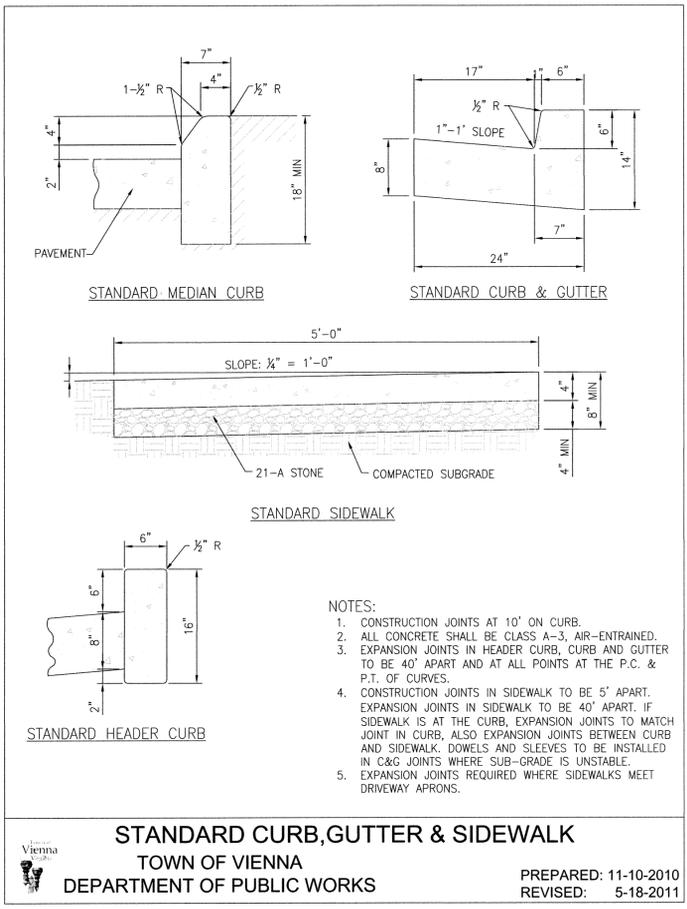


Source: Va. DSWC and N.C. Erosion and Sediment Control Planning and Design Manual. Plate 3.21-2

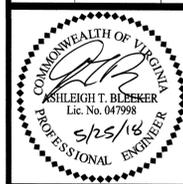


SMITH ENGINEERING
 14901 BOGLE DRIVE SUITE 202
 CHANTILLY, VA 20151
 PHONE: 703-956-6204
 PROJECT: 161-02
 PROJECT MANAGER: ASHLEIGH T. BLEEKER
 Ashleigh@SMITHEngineeringVA.com

PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/05/18	Second Subm.
07/16/18	Third Submission
OTHER PLAN DISTRIBUTIONS	
SCALE:	NOT TO SCALE
DATE:	JANUARY 18, 2018
SHEET	9 OF 30



P:\161-02 Malcolm Road NW\Eng\Sheets\161-02 Street Plan & Profile.dwg 05/25/18 10:05



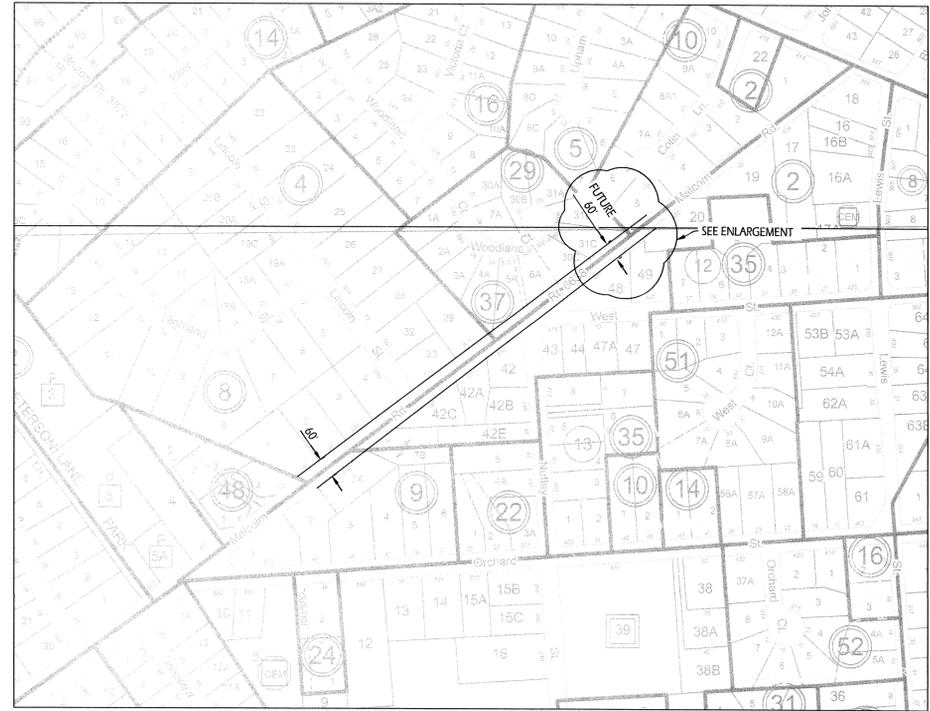
SMITH ENGINEERING
14901 BOGLE DRIVE SUITE 202
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PROJECT: 161-02
PROJECT MANAGER:
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PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/25/18	Second Subm.
07/16/18	Third Submission

OTHER PLAN DISTRIBUTIONS

ROW DEDICATION NARRATIVE:

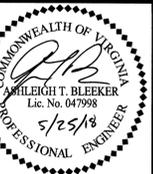
USING THE GIS INFORMATION FOR ALL OF MALCOLM ROAD, THE R/W IN FRONT OF THE MALCOLM HEIGHTS SUBDIVISION (TAX MAP #038-3-08) IS 60'. WE EXTENDED THOSE R/W LINES TOWARD OUR SITE. THE SOUTHERN R/W EXTENSION LINES UP WITH THE R/W FOR PARCEL #038-3-01-49. (SEE DRAWING) NEXT, WE MEASURED THE R/W IN FRONT OF PARCEL #038-3-01-48 AND #038-3-01-20 AND DETERMINED IT TO BE 35'. THEN WE MEASURED THE DISTANCE FROM POINT 'B' (SEE DRAWING) TO THE R/W LINE IN FRONT OF #038-3-01-49 AND DETERMINED IT TO BE 12.5'. THIS MADE SENSE TO US BECAUSE IF YOU TAKE HALF OF THE 35' R/W (17.5') AND ADD TO THE 12.5', THEN YOU GET THE 30' WHICH IS HALF OF THE 60' R/W. NEXT WE TOOK A FIXED POINT THAT WE OBTAINED FROM THE FIELD SURVEY, POINT 'A', AND OFF-SET OUR FRONT PROPERTY LINE (R/W) 12.5' FOR OUR R/W DEDICATION.



MALCOM ROW
NOT TO SCALE



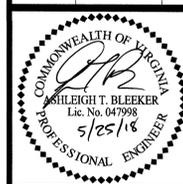
MALCOM ROW DEDICATION
NOT TO SCALE



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PLAN SUBMISSIONS	
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05/25/18	Second Subm.
07/16/18	Third Submission

OTHER PLAN DISTRIBUTIONS

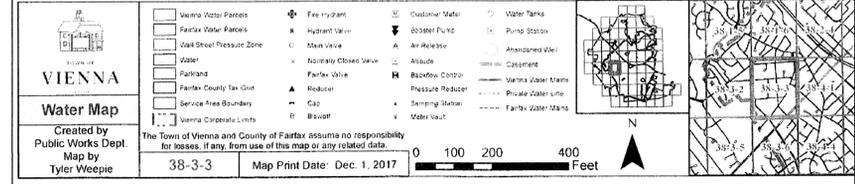
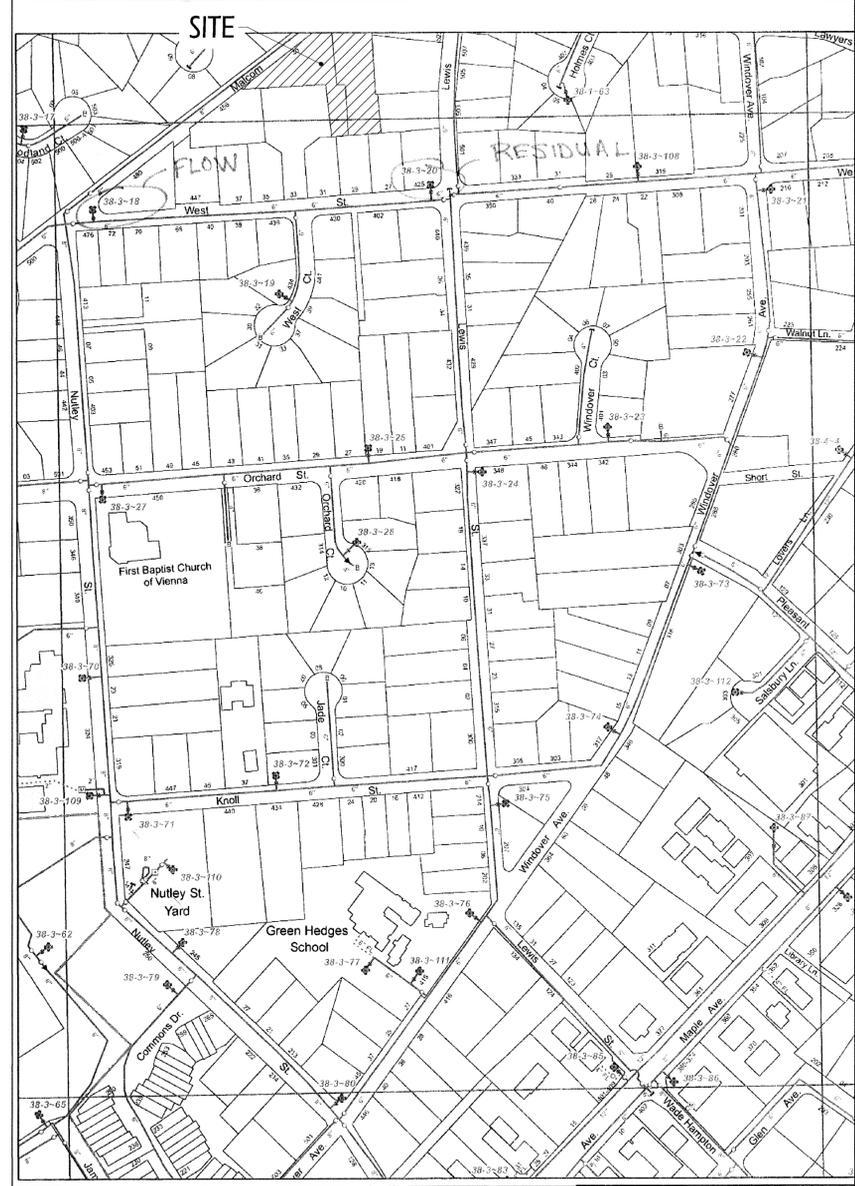


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PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/20/18	Second Subm
07/16/18	Third Submission

OTHER PLAN DISTRIBUTIONS

SANITARY SEWER LATERAL COMPUTATIONS														
PROJECT NAME:		MALCOLM ROAD SUBDIVISION		PROJECT:		161-02								
COUNTY:		TOWN OF VIENNA		DATE:		5/25/2018								
ENGINEER:		SMITH ENGINEERING												
Ejector Pump Required	Lot No.	Invert Station	Invert @ Main	Crown @ Main	Length of Lateral House	Slope of Lateral (%)	Riser Height	Distance To Riser	Lateral Elev. @ House	Ground Elev. @ House	Basement Floor Elev. @ End	Difference Basement Floor Elev. to Crown @ Main	Difference Basement Floor Elev. to Lateral End Elev.	Lateral Material
From Manhole:	EX. A	To Manhole:	EX. B	Station:	10+00.00	Slope:	5.32%	Length:	299.31	Low Invert:	380.75	Material:	8"	
YES	1	10+87.29	385.39	386.06	61.2	2.08%	0.0	0.00	387.33	395.50	387.50	1.44	0.17	4" PVC
YES	2	11+49.32	388.69	389.36	206.7	1.00%	0.0	0.00	391.43	395.50	388.50	-0.86	-2.93	6" PVC
YES	3	12+37.04	393.36	394.03	61.2	2.08%	0.0	0.00	395.30	395.50	397.50	3.47	2.20	4" PVC



LOT 1: TRENCH DRAIN

ADS, Inc. Drainage Handbook Specifications • 1-39

ADS DURASLOT® PIPE SPECIFICATION

Scope
This specification describes 4- through 36-inch (100 to 900 mm) ADS DURASLOT pipe for use in surface drain applications.

Pipe Requirements
DURASLOT pipe, as manufactured by Hall Construction Products and Services (HCPS) and distributed by ADS, Inc., shall have a smooth interior and annular exterior corrugations with an aluminum slot mounted longitudinally along the length of the pipe to accept the grate frame while maintaining the original pipe diameter.

- 4- through 10-inch (100 to 250mm) pipe shall meet AASHTO M252, Type S.
- 12- through 36-inch (300 to 900 mm) pipe shall meet AASHTO M294, Type S or ASTM F2306.
- Manning's "n" value for use in design shall be 0.012.

The aluminum grate frame shall be manufactured from 0.063" tempered commercial aluminum meeting the requirements of ASTM B209, consisting of two parallel plates separated by spacers spanning the slot on 6" centers. The grate shall be 1/2" #13 galvanized steel meeting the requirements of ASTM F1267, Type 2, Class 2. The grate shall have a diamond-shaped opening and be ADA compliant. The flange at the bottom of the aluminum grate shall be riveted to the pipe with a minimum of two rivets per linear foot.

Fittings
DURASLOT fittings shall be modified from fittings which conform to AASHTO M252, AASHTO M294, or ASTM F2306.

Installation
Installation shall be in accordance with HCPS recommended installation instructions. Contact your local ADS representative or visit www.ads-pipe.com for a copy of the latest installation guidelines.

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ADS, Inc. Drainage Handbook Specifications • 1-40

ADS DURASLOT® DIMENSIONS

L (Drain Grate Length)	Nominal Pipe Diameter										
	4"	6"	8"	10"	12"	15"	18"	24"	30"	36"	
E (Pipe End Length)	118"					116"					
H (2.5" slot)	2.75"	3"	3"	3.5"	3.75"	4"	4.75"	5"	5.25"		
H (6.0" slot)	6.25"	6.5"	6.5"	6.5"	7"	7"	7.25"	8.25"	8.25"		
W (Pipe Width w/ Corrugation)	0.34"	0.46"	0.61"	0.73"	1.15"	1.30"	1.57"	1.86"	2.55"	2.85"	
F (Flange Length)	0.5"	0.75"	0.75"	0.75"	0.75"	0.75"	1.0"	1.0"	1.0"		
O (Opening Width)	1.25"	1.75"	1.75"	1.75"	1.75"	1.75"	1.75"	1.75"	1.75"		
S (Slot Width)	1.75"	2.25"	2.25"	2.25"	2.25"	2.25"	2.25"	2.25"	2.25"		

* In stock - standard sizes

PIPE LENGTH = 120"

12" - 36"

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Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 6 20

LOT 2 - 10 inch Culvert

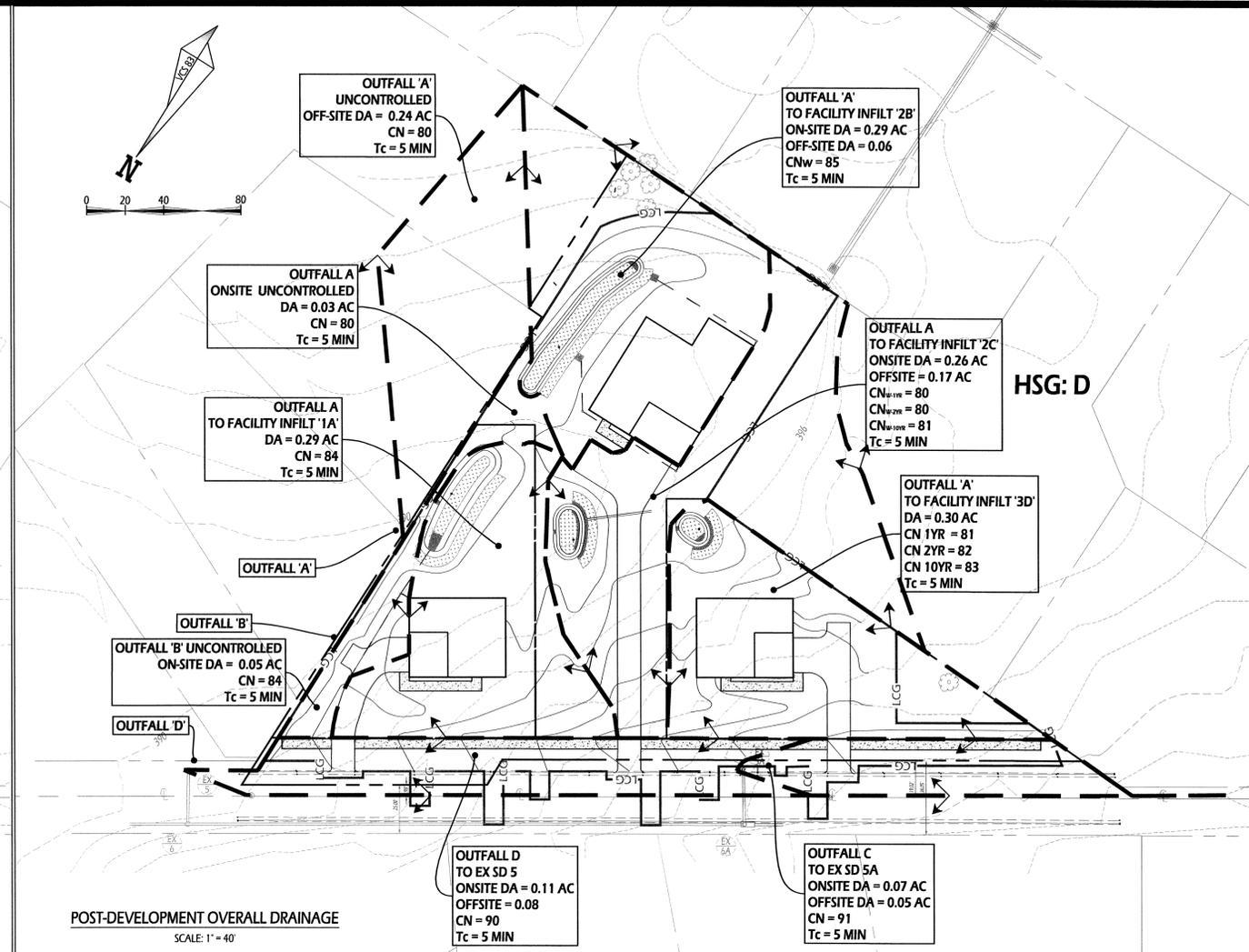
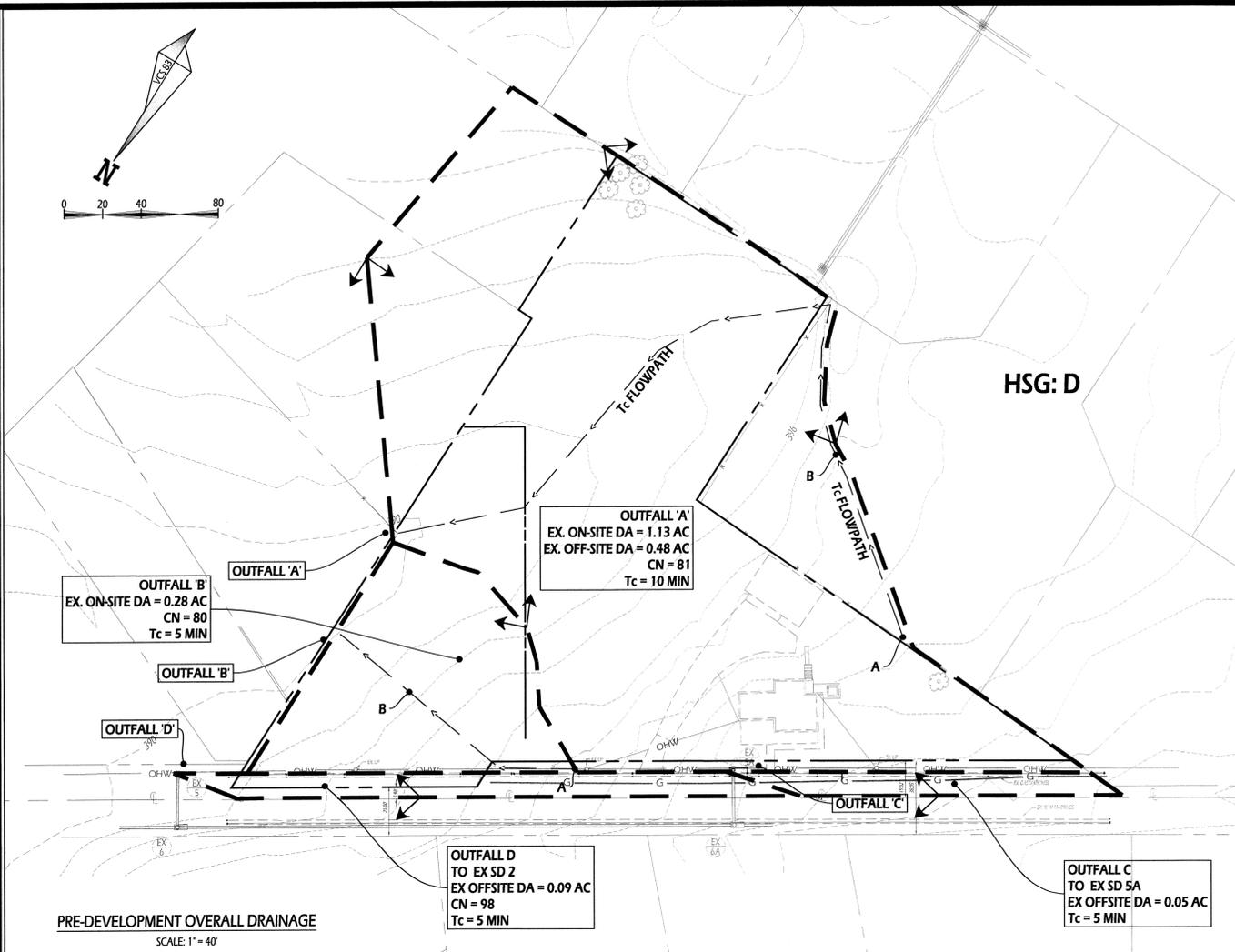
Invert Elev Dn (ft)	= 392.00	Calculations	
Pipe Length (ft)	= 35.00	Qmin (cfs)	= 1.32
Slope (%)	= 0.80	Qmax (cfs)	= 1.32
Invert Elev Up (ft)	= 392.28	Tailwater Elev (ft)	= (dc+D)/2
Rise (in)	= 10.0		
Shape	= Circular	Highlighted	
Span (in)	= 10.0	Qtotal (cfs)	= 1.32
No. Barrels	= 1	Qpipe (cfs)	= 1.32
n-Value	= 0.013	Qovertop (cfs)	= 0.00
Culvert Type	= Circular Concrete	Veloc Dn (ft/s)	= 2.80
Culvert Entrance	= Square edge w/headwall (C)	Veloc Up (ft/s)	= 3.73
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5	HGL Dn (ft)	= 392.67
		HGL Up (ft)	= 392.80
		Hw Elev (ft)	= 393.07
		Hw/D (ft)	= 0.94
		Flow Regime	= Inlet Contr

Embankment	
Top Elevation (ft)	= 395.00
Top Width (ft)	= 13.00
Crest Width (ft)	= 30.00

1" WATER METER SETTING

TOWN OF VIENNA
DEPARTMENT OF PUBLIC WORKS
PREPARED: 11-11-2010

Labels include: TOP OF CURB, (TOP) FORD TYPE A #A32-T 1 1/2" LID (W/ STANDARD PENTAGON BOLT), S/W, (YOKE) FORD #Y504 FOR 1" METER WITH 1" COPPER SERVICE IN & OUT, NOTE: YOKE NUTS TO BE 1", 1" ANGLE VALVE (CUSTOMER RESPONSIBILITY START AT THIS VALVE), EXPANSION CONN. FORD #EC-4, FORD H.B., TYPE K SOFT COPPER USED FROM WATER MAIN TO METER YOKE AND FROM YOKE TO PVC COUPLING (IF USED), PVC TUBING TO HOUSE IF USED, COPPER TO PLASTIC ADAPTOR OR COUPLING IF PVC IS USED TO HOUSE.



SWM STUDY POINT OUTFALL 'A'
 WATER QUANTITY CONTROL SUMMARY

PRE-DEVELOPED OUTFALL 'A' OFFSITE		PRE-DEVELOPED OUTFALL 'A' ONSITE		PRE-DEVELOPED TOTAL OUTFALL 'A'	
AREA (A)	0.48 AC	AREA (A)	1.13 AC	HYDRAFLOW COMBINE TOTAL ONSITE & OFFSITE	
CN	80	CN	81	Q 1 PRE-	2.98 CFS
Tc	10.00 MIN	Tc	5.00 MIN	VOL 1 PRE-	6,264 CF
Q 1 PRE-	0.77 CFS	Q 1 PRE-	2.24 CFS	Q 2 PRE-	4.06 CFS
VOL 1 PRE-	1,757 CF	VOL 1 PRE-	4,507 CF	Q 10 PRE-	7.99 CFS
Q 2 PRE-	1.06 CFS	Q 2 PRE-	3.04 CFS		
Q 10 PRE-	2.13 CFS	Q 10 PRE-	5.92 CFS		

ROUTED THRU FACILITY '1A'	ROUTE THRU FACILITY '2B'	THRU FACILITY '2C'
SEE SHEET 20	SEE SHEET 25	
HYDRAFLOW ROUTING COMBINE '2C' & '1A'	HYDRAFLOW ROUTING	HYDRAFLOW COMBINE '3D' & '2C'
Q 1 POST = 1.14 CFS	Q 1 POST = 0.00 CFS	Q 1 POST = 1.38 CFS
VOL 1 POST = 952 CF	VOL 1 POST = 0 CF	VOL 1 POST = 2,782 CF
Q 2 POST = 2.25 CFS	Q 2 POST = 0.00 CFS	Q 2 POST = 1.82 CFS
Q 10 POST = 5.10 CFS	Q 10 POST = 1.54 CFS	Q 10 POST = 3.86 CFS

SWM ENERGY BALANCE EQUATION: $Q1_{ALLOW} = 0.8(Q1_{PRE} \times VOL1_{PRE}) / VOL1_{POST}$
 $\leq 7.58 \text{ CFS}$

SWM STUDY POINT OUTFALL 'B'
 WATER QUANTITY CONTROL SUMMARY

PRE-DEVELOPED OUTFALL 'B' ONSITE		POST-DEV OUTFALL 'B' UNCONTROLLED ONSITE	
AREA (A)	0.28 AC	AREA (A)	0.05 AC
CN	80	CN	84
Tc	5.00 MIN	Tc	5.00 MIN
Q 1 PRE-	0.53 CFS	Q 1 POST-	0.12 CFS
VOL 1 PRE-	1,057 CF	VOL 1 POST-	234 CF
Q 2 PRE-	0.72 CFS	Q 2 POST-	0.15 CFS
Q 10 PRE-	1.43 CFS	Q 10 POST-	0.28 CFS

SWM ENERGY BALANCE EQUATION: $Q1_{ALLOW} = 0.9(Q1_{PRE} \times VOL1_{PRE}) / VOL1_{POST}$
 $\leq 2.15 \text{ CFS}$

SWM STUDY POINT OUTFALL 'C'

PRE-DEVELOPED OUTFALL 'C'		POST-DEV OUTFALL 'C' UNCONTROLLED ONSITE/OFFSITE	
AREA (A)	0.05 AC	AREA (A)	0.12 AC
CN	98	CN	91
Tc	5.00 MIN	Tc	5.00 MIN
Q 1 PRE-	0.20 CFS	Q 1 POST-	0.38 CFS
VOL 1 PRE-	457 CF	VOL 1 POST-	793 CF
Q 2 PRE-	0.23 CFS	Q 2 POST-	0.48 CFS
Q 10 PRE-	1.36 CFS	Q 10 POST-	0.79 CFS

SWM ENERGY BALANCE EQUATION: $Q1_{ALLOW} = 0.9(Q1_{PRE} \times VOL1_{PRE}) / VOL1_{POST}$
 $\leq 0.10 \text{ CFS}$

*NOTE: See sheet 16A for storm comps & outfall analysis

SWM STUDY POINT OUTFALL 'D'

PRE-DEVELOPED OUTFALL 'D'		POST-DEV OUTFALL 'D' UNCONTROLLED ONSITE/OFFSITE	
AREA (A)	0.09 AC	AREA (A)	0.19 AC
CN	98	CN	90
Tc	5.00 MIN	Tc	5.00 MIN
Q 1 PRE-	0.35 CFS	Q 1 POST-	0.58 CFS
VOL 1 PRE-	822 CF	VOL 1 POST-	1,197 CF
Q 2 PRE-	0.42 CFS	Q 2 POST-	1.13 CFS
Q 10 PRE-	0.65 CFS	Q 10 POST-	1.23 CFS

SWM ENERGY BALANCE EQUATION: $Q1_{ALLOW} = 0.9(Q1_{PRE} \times VOL1_{PRE}) / VOL1_{POST}$
 $\leq 0.22 \text{ CFS}$

*NOTE: See sheet 16A for storm comps & outfall analysis

OUTFALL NARRATIVE:

THE EXISTING DRAINAGE FLOWS FROM THE SOUTHWEST TO NORTHEAST ALONG MALCOLM ROAD N.W. AND INTO EXISTING STORM DRAIN ALONG LAWYER ROAD AND EVENTUALLY OUTFALL INTO PINEY BRANCH FLOODPLAIN. THERE IS A LARGE AMOUNT OF UNCONTROLLED RUNOFF FROM UPSTREAM PROPERTIES THAT DRAIN THROUGH SUBJECT PROPERTY BEFORE IT DRAINS INTO THE EXISTING STORM DRAIN OFFSITE.

STUDY POINT FOR ADEQUATE OUTFALL FOR THIS DEVELOPMENT WILL BE AT OUTFALL 'A' AND OUTFALL 'B'. THE SITE'S RUNOFF RATE WILL REDUCE OR EQUAL TO THE EXISTING RUNOFF TO THE DOWNSTREAM CONDITION, BY CONTROLLING MAJORITY OF THE ONSITE AND OFFSITE RUNOFF THROUGH THE IMPLEMENTATIONS ON LOT INFILTRATION TRENCH FACILITIES. THESE FACILITIES CONTROL THE RUNOFF AS IT INFILTRATE SUBSURFACE AND REDUCES THE 1YR 24-HOUR STORM AND THE RELEASE RATES FOR THE 2 AND 10 YEARS AT THE OUTFALLS 'A' AND 'B' ARE LESS THAN OR EQUAL TO PRE-DEVELOPED CONDITIONS. SEE SHEET 16A FOR OUTFALLS 'C' AND 'D'.

IT IS IN THE OPINION OF THE SUBMITTING ENGINEER THAT AN ADEQUATE OUTFALL EXISTS FOR THE SITE.

CHANNEL PROTECTION:

PURSUANT TO COUNTY TECHNICAL BULLETIN DATED JUNE 16, 2017 AND PFM 6-02026, THE DISCHARGE FROM THE RE-DEVELOPMENT AT OUTFALL 'A' AND OUTFALL 'B' WILL HAVE NO INCREASE IN PEAK RATES AND WILL NOT AGGRAVATE ANY EXISTING DRAINAGE PROBLEM OR CAUSE ANY NEW DRAINAGE PROBLEM TO THE DOWNSTREAM PROPERTY. THEREFORE NO FURTHER ANALYSIS IS REQUIRED AT THESE OUTFALLS.

OUTFALLS 'C' AND 'D' WILL HAVE A SLIGHT INCREASE RUNOFF TO THE EXISTING 15' RCP. A STORM COMPUTATIONS ANALYZES THE EXISTING PIPE NETWORKS TO THE POINT OF OUTFALL ANALYSIS, WHICH HAS THE CAPACITY TO CONVEY THE INCREASE IN RUNOFF WITHOUT AGGRAVATING TO THE DOWNSTREAM CONVEYANCE SYSTEMS OR PROPERTIES. SEE SHEET 16A FOR STORM COMPUTATIONS AND OUTFALL ANALYSIS.

FLOOD PROTECTION:

THE DISCHARGE FROM THE RE-DEVELOPMENT SHEET FLOWS ALONG MALCOLM ROAD AND BEING CONVEY TO EXISTING STORM DRAIN SYSTEMS NORTH EAST OF SITE. ALL AREAS OF TOWN OF VIENNA HAVE BEEN DESIGNATED AS LOCALIZED FLOODING. MAJOR OF THE PROPOSED SITE'S PEAK RUNOFF FOR 10YR 24-HR STORM EVENT WILL BE LESS THAN OR EQUAL THAN EXISTING AT OUTFALLS 'A' AND 'B'. OUTFALLS 'C' AND 'D' WILL BE WITHIN THE EXISTING STORMWATER CONVEYANCE SYSTEMS. SEE SHEET 16A FOR OUTFALL ANALYSIS. THEREFORE SITE'S DEVELOPMENT WILL HAVE NO IMPACTS OF FLOODING DOWNSTREAM.

STORMWATER MANAGEMENT NARRATIVE

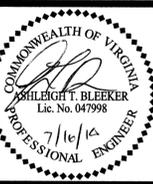
THE MALCOLM SUBDIVISION PROJECT ENCOMPASSES APPROXIMATELY 1.40 AC IN THE TOWN OF VIENNA. THE SITE CURRENTLY HAS A SINGLE FAMILY DWELLING ON IT, AND IS LOCATED WITHIN A LARGER DRAINAGE SHED TOTALING 4.25 AC AT OUTFALL 'B'. THE DRAINAGE SHED, CONSISTING OF AN EXISTING DEVELOPED AREA WITH SINGLE FAMILY HOMES AND PAVED AREAS. THE DRAINAGE AREA DRAINS UNCONTROLLED IN A NORTH EASTERLY DIRECTION ALONG THE FRONTAGE OF THE SUBJECT SITE ALONG MALCOLM ROAD N.W., AND INTO EXISTING STORM SYSTEMS ALONG LAWYER ROAD AND CONVEYS THE RUNOFF INTO PINEY BRANCH FLOODPLAIN NORTHEAST OF SITE.

THE DEVELOPMENT SITES RUNOFF SHALL EITHER REDUCE OR EQUAL TO THE EXISTING RUNOFF ALONG MALCOLM ROAD N.W. WITH THE PROPOSED INFILTRATION TRENCH FACILITIES ON LOT OF THE THREE (3) SUBDIVISION LOTS. APPROXIMATELY 1.06 AC OF THE SUBJECT AREA IS ANTICIPATED TO FLOW TO THE PROPOSED SWM/BMP FACILITIES. THE REMAINING DRAINAGE AREA OF 0.34 AC WILL GO UNCONTROLLED PROPOSED SWM FACILITIES. THE RUNOFF FROM THIS DRAINAGE AREA WILL COMBINED WITH THE RUNOFF RELEASES FROM THE SWM/BMP FACILITIES WILL HAVE THE TOTAL RELEASE RATES LESS THAN OR EQUAL TO PRE-DEVELOPED RATES FOR 2YR AND 10YR 24-HR STORM EVENTS AT OUTFALL 'A', MEETING THE STORMWATER MANAGEMENT DETENTION REQUIREMENTS FOR THE SUBDIVISION DEVELOPMENT. SEE SWM SUMMARY ON THIS SHEET.

IT IS THE OPINION OF THE SUBMITTING ENGINEER THAT STORMWATER MANAGEMENT REQUIREMENTS FOR THE 2 AND 10 YEAR STORM EVENTS HAVE BEEN SATISFIED.

STORMWATER MANAGEMENT FACILITY MAINTENANCE NOTE:

ALL INDIVIDUAL ON LOT INFILTRATION FILTERS WILL BE PRIVATELY MAINTAINED BY THE RESPECTIVE PROPERTY OWNER. A PRIVATE MAINTENANCE WILL BE REQUIRED.

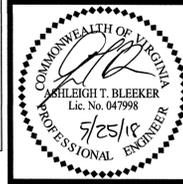


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 PHONE: 703-956-6204
 PROJECT: 161-02
 PROJECT MANAGER:
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DATE	DESCRIPTION
02/02/18	FIRST SUBMISSION
05/25/18	SECOND SUBMISSION
07/16/18	THIRD SUBMISSION

OTHER PLAN DISTRIBUTIONS

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PLAN SUBMISSIONS table with columns for date, submission type, and status. Includes entries for 02/02/18 (FIRST SUBMISSION), 05/25/18 (second subm), and 07/16/18 (third submission). Other Plan Distributions table below.

PRE - 10YR HYDROGRAPH STUDY POINT OUTFALL 'A' OFFSITE
Hydrograph Report
Hyd. No. 33
Outfall A_ Ex Offsite
Hydrograph type = SCS Runoff, Storm frequency = 10 yrs, Time interval = 1 min, Drainage area = 0.480 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 4.87 in, Storm duration = 24 hrs

PRE - 2YR HYDROGRAPH STUDY POINT OUTFALL 'A' OFFSITE
Hydrograph Report
Hyd. No. 33
Outfall A_ Ex Offsite
Hydrograph type = SCS Runoff, Storm frequency = 2 yrs, Time interval = 1 min, Drainage area = 0.480 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 3.17 in, Storm duration = 24 hrs

PRE - 1YR HYDROGRAPH STUDY POINT OUTFALL 'A' OFFSITE
Hydrograph Report
Hyd. No. 33
Outfall A_ Ex Offsite
Hydrograph type = SCS Runoff, Storm frequency = 1 yrs, Time interval = 1 min, Drainage area = 0.480 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 2.67 in, Storm duration = 24 hrs

PRE - 10YR HYDROGRAPH STUDY POINT OUTFALL 'A' ONSITE
Hydrograph Report
Hyd. No. 32
Outfall A_ Ex Onsite
Hydrograph type = SCS Runoff, Storm frequency = 10 yrs, Time interval = 1 min, Drainage area = 1.130 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 4.87 in, Storm duration = 24 hrs

PRE - 2YR HYDROGRAPH STUDY POINT OUTFALL 'A' ONSITE
Hydrograph Report
Hyd. No. 32
Outfall A_ Ex Onsite
Hydrograph type = SCS Runoff, Storm frequency = 2 yrs, Time interval = 1 min, Drainage area = 1.130 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 3.17 in, Storm duration = 24 hrs

PRE - 1YR HYDROGRAPH STUDY POINT OUTFALL 'A' ONSITE
Hydrograph Report
Hyd. No. 32
Outfall A_ Ex Onsite
Hydrograph type = SCS Runoff, Storm frequency = 1 yrs, Time interval = 1 min, Drainage area = 1.130 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 2.67 in, Storm duration = 24 hrs

PRE - 10YR HYDROGRAPH STUDY POINT OUTFALL 'A' TOTAL ONSITE/OFFSITE
Hydrograph Report
Hyd. No. 34
Outfall A_ Ex Onsite/Offsite
Hydrograph type = Combine, Storm frequency = 10 yrs, Time interval = 1 min, Inflow hyds. = 32, 33, Peak discharge = 7.989 cfs, Time to peak = 11.97 hrs, Hyd. volume = 16,987 cuft, Contrib. drain. area = 1.610 ac

PRE - 2YR HYDROGRAPH STUDY POINT OUTFALL 'A' TOTAL ONSITE/OFFSITE
Hydrograph Report
Hyd. No. 34
Outfall A_ Ex Onsite/Offsite
Hydrograph type = Combine, Storm frequency = 2 yrs, Time interval = 1 min, Inflow hyds. = 32, 33, Peak discharge = 4.063 cfs, Time to peak = 11.97 hrs, Hyd. volume = 8,517 cuft, Contrib. drain. area = 1.610 ac

PRE - 1YR HYDROGRAPH STUDY POINT OUTFALL 'A' TOTAL ONSITE/OFFSITE
Hydrograph Report
Hyd. No. 34
Outfall A_ Ex Onsite/Offsite
Hydrograph type = Combine, Storm frequency = 1 yrs, Time interval = 1 min, Inflow hyds. = 32, 33, Peak discharge = 2.981 cfs, Time to peak = 11.97 hrs, Hyd. volume = 6,264 cuft, Contrib. drain. area = 1.610 ac

PRE - 10YR HYDROGRAPH STUDY POINT OUTFALL 'B' ONSITE
Hydrograph Report
Hyd. No. 37
Outfall B_ Ex Onsite
Hydrograph type = SCS Runoff, Storm frequency = 10 yrs, Time interval = 1 min, Drainage area = 0.280 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 4.87 in, Storm duration = 24 hrs

PRE - 2YR HYDROGRAPH STUDY POINT OUTFALL 'B' ONSITE
Hydrograph Report
Hyd. No. 37
Outfall B_ Ex Onsite
Hydrograph type = SCS Runoff, Storm frequency = 2 yrs, Time interval = 1 min, Drainage area = 0.280 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 3.17 in, Storm duration = 24 hrs

PRE - 1YR HYDROGRAPH STUDY POINT OUTFALL 'B' ONSITE
Hydrograph Report
Hyd. No. 37
Outfall B_ Ex Onsite
Hydrograph type = SCS Runoff, Storm frequency = 1 yrs, Time interval = 1 min, Drainage area = 0.280 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 2.67 in, Storm duration = 24 hrs

PRE - 10YR HYDROGRAPH STUDY POINT OUTFALL 'C' ONSITE
Hydrograph Report
Hyd. No. 50
Ex. SD 4_OUTFALL C
Hydrograph type = SCS Runoff, Storm frequency = 10 yrs, Time interval = 1 min, Drainage area = 0.110 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 4.87 in, Storm duration = 24 hrs

PRE - 2YR HYDROGRAPH STUDY POINT OUTFALL 'C' ONSITE
Hydrograph Report
Hyd. No. 50
Ex. SD 4_OUTFALL C
Hydrograph type = SCS Runoff, Storm frequency = 2 yrs, Time interval = 1 min, Drainage area = 0.110 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 3.17 in, Storm duration = 24 hrs

PRE - 1YR HYDROGRAPH STUDY POINT OUTFALL 'C' ONSITE
Hydrograph Report
Hyd. No. 50
Ex. SD 4_OUTFALL C
Hydrograph type = SCS Runoff, Storm frequency = 1 yrs, Time interval = 1 min, Drainage area = 0.110 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 2.67 in, Storm duration = 24 hrs

PRE - 10YR HYDROGRAPH STUDY POINT OUTFALL 'D' ONSITE
Hydrograph Report
Hyd. No. 53
Ex. SD 2_OUTFALL D
Hydrograph type = SCS Runoff, Storm frequency = 10 yrs, Time interval = 1 min, Drainage area = 0.160 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 4.87 in, Storm duration = 24 hrs

PRE - 2YR HYDROGRAPH STUDY POINT OUTFALL 'D' ONSITE
Hydrograph Report
Hyd. No. 53
Ex. SD 2_OUTFALL D
Hydrograph type = SCS Runoff, Storm frequency = 2 yrs, Time interval = 1 min, Drainage area = 0.160 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 3.17 in, Storm duration = 24 hrs

PRE - 1YR HYDROGRAPH STUDY POINT OUTFALL 'D' ONSITE
Hydrograph Report
Hyd. No. 53
Ex. SD 2_OUTFALL D
Hydrograph type = SCS Runoff, Storm frequency = 1 yrs, Time interval = 1 min, Drainage area = 0.160 ac, Basin Slope = 0.0 %, Tc method = User, Total precip. = 2.67 in, Storm duration = 24 hrs

EX. OUTFALL 'A' - Runoff Curve Numbers_OFFSITE table with columns for Area (acres), A Soils, B Soils, C Soils, D Soils, Total Area (ac)

EX. OUTFALL 'A' - Runoff Curve Numbers_ONSITE table with columns for Area (acres), A Soils, B Soils, C Soils, D Soils, Total Area (ac)

EX. OUTFALL 'B' - Runoff Curve Numbers_ONSITE table with columns for Area (acres), A Soils, B Soils, C Soils, D Soils, Total Area (ac)

EX. OUTFALL 'C' - Runoff Curve Numbers_OFFSITE table with columns for Area (acres), A Soils, B Soils, C Soils, D Soils, Total Area (ac)

EX. OUTFALL 'D' - Runoff Curve Numbers_OFFSITE table with columns for Area (acres), A Soils, B Soils, C Soils, D Soils, Total Area (ac)

Time of concentration (Tc) Condition: PRE-DEVELOPED OUTFALL 'A' table with columns for Segment ID, Surface description, Manning's roughness coefficient, Flow length, Two-year, 24-hour rainfall, Land slope, Travel time

Time of concentration (Tc) Condition: PRE-DEVELOPED OUTFALL 'B' table with columns for Segment ID, Surface description, Manning's roughness coefficient, Flow length, Two-year, 24-hour rainfall, Land slope, Travel time

POST OFFFALL 'A' - Runoff Curve Numbers_OFFSITE UNCONTROLLED						
	Area (acres)	A Soils	B Soils	C Soils	D Soils	Total Area (ac)
Forrest/Open Space- Undisturbed, protected forest/open space or reforested land	CN	0	0	0	0	0.00
Managed Turf- disturbed, graded for yards or other turn to be mowed/managed	CN	39	61	74	80	0.24
Impervious Cover	CN	98	98	98	98	0.00
	CN				80	0.24

POST OFFFALL 'A' - Runoff Curve Numbers_ONSITE UNCONTROLLED						
	Area (acres)	A Soils	B Soils	C Soils	D Soils	Total Area (ac)
Forrest/Open Space- Undisturbed, protected forest/open space or reforested land	CN	0	0	0	0	0.00
Managed Turf- disturbed, graded for yards or other turn to be mowed/managed	CN	39	61	74	80	0.03
Impervious Cover	CN	98	98	98	98	0.00
	CN				80	0.03

POST - 1YR HYDROGRAPH STUDY POINT OFFFALL 'A'
OFFSITE UNCONTROLLED

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 37
Outfall A_Offsite Unc_Post

Hydrograph type = SCS Runoff	Peak discharge = 0.451 cfs
Storm frequency = 1 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 906 cuft
Drainage area = 0.240 ac	Curve number = 80
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 2.67 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 2YR HYDROGRAPH STUDY POINT OFFFALL 'A'
OFFSITE UNCONTROLLED

Hydrograph Report 2

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 37
Outfall A_Offsite Unc_Post

Hydrograph type = SCS Runoff	Peak discharge = 0.617 cfs
Storm frequency = 2 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 1,239 cuft
Drainage area = 0.240 ac	Curve number = 80
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 3.17 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 10YR HYDROGRAPH STUDY POINT OFFFALL 'A'
OFFSITE UNCONTROLLED

Hydrograph Report 3

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 37
Outfall A_Offsite Unc_Post

Hydrograph type = SCS Runoff	Peak discharge = 1.222 cfs
Storm frequency = 10 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 2,497 cuft
Drainage area = 0.240 ac	Curve number = 80
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 4.87 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 1YR HYDROGRAPH STUDY POINT OFFFALL 'A'
ONSITE UNCONTROLLED

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 38
Outfall A_Onsite Unc_Post

Hydrograph type = SCS Runoff	Peak discharge = 0.056 cfs
Storm frequency = 1 yrs	Time to peak = 113.97 hrs
Time interval = 1 min	Hyd. volume = 113 cuft
Drainage area = 0.030 ac	Curve number = 80
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 2.67 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 2YR HYDROGRAPH STUDY POINT OFFFALL 'A'
ONSITE UNCONTROLLED

Hydrograph Report 2

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 38
Outfall A_Onsite Unc_Post

Hydrograph type = SCS Runoff	Peak discharge = 0.077 cfs
Storm frequency = 2 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 155 cuft
Drainage area = 0.030 ac	Curve number = 80
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 3.17 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 10YR HYDROGRAPH STUDY POINT OFFFALL 'A'
ONSITE UNCONTROLLED

Hydrograph Report 3

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 38
Outfall A_Onsite Unc_Post

Hydrograph type = SCS Runoff	Peak discharge = 0.153 cfs
Storm frequency = 10 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 312 cuft
Drainage area = 0.030 ac	Curve number = 80
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 4.87 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 1YR HYDROGRAPH STUDY POINT OFFFALL 'A'
TOTAL ONSITE

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 39
Outfall 'A'_Onsite1yr

Hydrograph type = Combine	Peak discharge = 1.178 cfs
Storm frequency = 1 yrs	Time to peak = 12.03 hrs
Time interval = 1 min	Hyd. volume = 1,065 cuft
Inflow hyds. = 9, 29, 38	Contrib. drain. area = 0.030 ac

POST - 2YR HYDROGRAPH STUDY POINT OFFFALL 'A'
TOTAL ONSITE

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 40
Outfall 'A'_Onsite2yr

Hydrograph type = Combine	Peak discharge = 2.320 cfs
Storm frequency = 2 yrs	Time to peak = 12.00 hrs
Time interval = 1 min	Hyd. volume = 2,157 cuft
Inflow hyds. = 9, 30, 38	Contrib. drain. area = 0.030 ac

POST - 10YR HYDROGRAPH STUDY POINT OFFFALL 'A'
TOTAL ONSITE

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 41
Outfall 'A'_Onsite10yr

Hydrograph type = Combine	Peak discharge = 6.680 cfs
Storm frequency = 10 yrs	Time to peak = 11.98 hrs
Time interval = 1 min	Hyd. volume = 7,782 cuft
Inflow hyds. = 9, 31, 38	Contrib. drain. area = 0.030 ac

POST - 1YR HYDROGRAPH STUDY POINT OFFFALL 'A'
TOTAL ONSITE/OFFSITE

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 43
Outfall 'A'_Post Offsite/Onsite1yr

Hydrograph type = Combine	Peak discharge = 1.467 cfs
Storm frequency = 1 yrs	Time to peak = 12.03 hrs
Time interval = 1 min	Hyd. volume = 1,971 cuft
Inflow hyds. = 37, 39	Contrib. drain. area = 0.240 ac

POST - 2YR HYDROGRAPH STUDY POINT OFFFALL 'A'
TOTAL ONSITE/OFFSITE

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 44
Outfall 'A'_Post Offsite/Onsite2yr

Hydrograph type = Combine	Peak discharge = 2.860 cfs
Storm frequency = 2 yrs	Time to peak = 12.00 hrs
Time interval = 1 min	Hyd. volume = 3,396 cuft
Inflow hyds. = 37, 40	Contrib. drain. area = 0.240 ac

POST - 10YR HYDROGRAPH STUDY POINT OFFFALL 'A'
TOTAL ONSITE/OFFSITE

Hydrograph Report 1

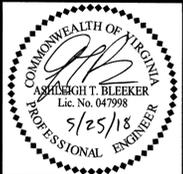
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 45
Outfall 'A'_Post Offsite/Onsite10yr

Hydrograph type = Combine	Peak discharge = 7.836 cfs
Storm frequency = 10 yrs	Time to peak = 11.98 hrs
Time interval = 1 min	Hyd. volume = 10,279 cuft
Inflow hyds. = 37, 41	Contrib. drain. area = 0.240 ac

SMITH ENGINEERING

SWM COMPUTATIONS - STUDY POINT OFFFALL 'A'
MALCOLM ROAD SUBDIVISION
FINAL PLAT
HUNTER HILL DISTRICT, TOWN OF VIENNA, FAIRFAX COUNTY, VIRGINIA

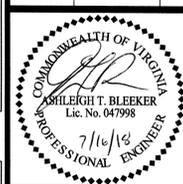


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PROJECT: 161-02
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PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/22/18	Second Subm
07/16/18	Third Submission

OTHER PLAN DISTRIBUTIONS

SCALE: N/A
DATE: JANUARY 18, 2018
SHEET 15 OF 30



SMITH ENGINEERING
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PROJECT: 161-02
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PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/25/18	SECOND SUBMISSION
07/16/18	THIRD SUBMISSION

OTHER PLAN DISTRIBUTIONS

POST OUTFALL 'B' - Runoff Curve Numbers_ONSITE UNCONTROLLED						
		A Soils	B Soils	C Soils	D Soils	Total Area (ac)
Forrest/Open Space- Undisturbed, protected forest/open space or reforested land	Area (acres)	0	0	0	0	0.00
	CN	30	55	70	77	
Managed Turf- disturbed, graded for yards or other turn to be mowed/managed	Area (acres)	0	0	0	0.04	0.04
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0	0	0	0.01	0.01
	CN	98	98	98	98	
						0.05

POST OUTFALL 'C' - Runoff Curve Numbers_ONSITE/OFFSITE						
		A Soils	B Soils	C Soils	D Soils	Total Area (ac)
Forrest/Open Space- Undisturbed, protected forest/open space or reforested land	Area (acres)	0	0	0	0	0.00
	CN	30	55	70	77	
Managed Turf- disturbed, graded for yards or other turn to be mowed/managed	Area (acres)	0	0	0	0.05	0.05
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0	0	0	0.07	0.07
	CN	98	98	98	98	
						0.12

POST OUTFALL 'D' - Runoff Curve Numbers_ONSITE/OFFSITE						
		A Soils	B Soils	C Soils	D Soils	Total Area (ac)
Forrest/Open Space- Undisturbed, protected forest/open space or reforested land	Area (acres)	0	0	0	0	0.00
	CN	30	55	70	77	
Managed Turf- disturbed, graded for yards or other turn to be mowed/managed	Area (acres)	0	0	0	0.08	0.08
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0	0	0	0.11	0.11
	CN	98	98	98	98	
						0.19

POST - 1YR HYDROGRAPH UNCONTROLLED TO STUDY POINT 'B' ONSITE

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Thursday, 02 / 1 / 2018

Hyd. No. 33

Outfall B_Post Onsite Uncont

Hydrograph type = SCS Runoff	Peak discharge = 0.116 cfs
Storm frequency = 1 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 234 cuft
Drainage area = 0.050 ac	Curve number = 84
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 2.67 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 2YR HYDROGRAPH UNCONTROLLED TO STUDY POINT 'B' ONSITE

Hydrograph Report 2

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Thursday, 02 / 1 / 2018

Hyd. No. 33

Outfall B_Post Onsite Uncont

Hydrograph type = SCS Runoff	Peak discharge = 0.153 cfs
Storm frequency = 2 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 310 cuft
Drainage area = 0.050 ac	Curve number = 84
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 3.17 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 10YR HYDROGRAPH UNCONTROLLED TO STUDY POINT 'B' ONSITE

Hydrograph Report 3

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Thursday, 02 / 1 / 2018

Hyd. No. 33

Outfall B_Post Onsite Uncont

Hydrograph type = SCS Runoff	Peak discharge = 0.284 cfs
Storm frequency = 10 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 590 cuft
Drainage area = 0.050 ac	Curve number = 84
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 4.87 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 1YR HYDROGRAPH STUDY POINT 'C' ONSITE/OFFSITE

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 06 / 29 / 2018

Hyd. No. 51

POST SD 5A_OUTFALL C

Hydrograph type = SCS Runoff	Peak discharge = 0.380 cfs
Storm frequency = 1 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 793 cuft
Drainage area = 0.120 ac	Curve number = 91
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 2.67 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 2YR HYDROGRAPH STUDY POINT 'C' ONSITE/OFFSITE

Hydrograph Report 2

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 06 / 29 / 2018

Hyd. No. 51

POST SD 5A_OUTFALL C

Hydrograph type = SCS Runoff	Peak discharge = 0.475 cfs
Storm frequency = 2 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 1,002 cuft
Drainage area = 0.120 ac	Curve number = 91
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 3.17 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 10YR HYDROGRAPH STUDY POINT 'C' ONSITE/OFFSITE

Hydrograph Report 3

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 06 / 29 / 2018

Hyd. No. 51

POST SD 5A_OUTFALL C

Hydrograph type = SCS Runoff	Peak discharge = 0.793 cfs
Storm frequency = 10 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 1,732 cuft
Drainage area = 0.120 ac	Curve number = 91
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 4.87 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 1YR HYDROGRAPH STUDY POINT 'D' ONSITE/OFFSITE

Hydrograph Report 1

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 06 / 29 / 2018

Hyd. No. 54

POST SD 5_OUTFALL D

Hydrograph type = SCS Runoff	Peak discharge = 0.578 cfs
Storm frequency = 1 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 1,197 cuft
Drainage area = 0.190 ac	Curve number = 90
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 2.67 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 2YR HYDROGRAPH STUDY POINT 'D' ONSITE/OFFSITE

Hydrograph Report 2

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 06 / 29 / 2018

Hyd. No. 54

POST SD 5_OUTFALL D

Hydrograph type = SCS Runoff	Peak discharge = 0.727 cfs
Storm frequency = 2 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 1,523 cuft
Drainage area = 0.190 ac	Curve number = 90
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 3.17 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST - 10YR HYDROGRAPH STUDY POINT 'D' ONSITE/OFFSITE

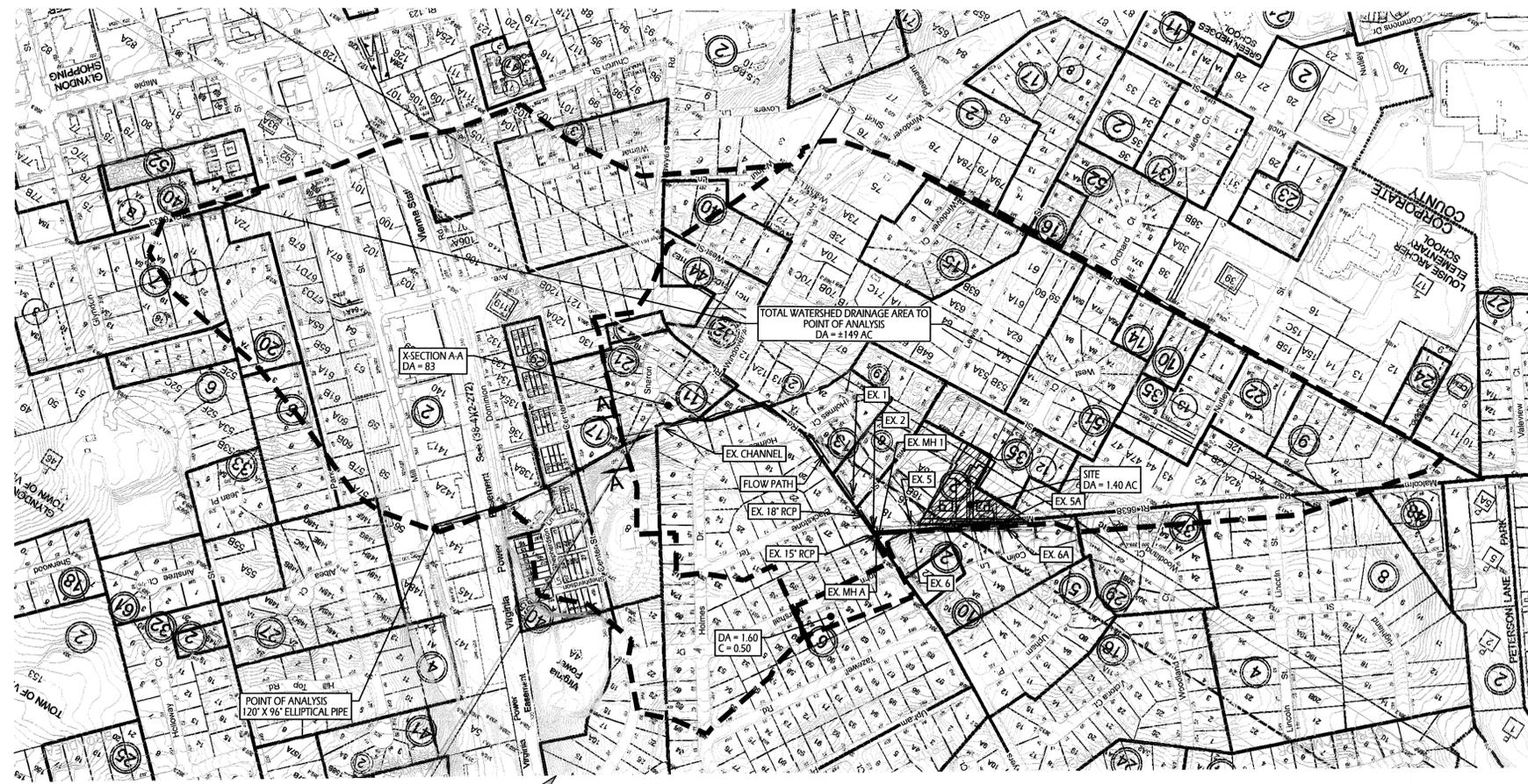
Hydrograph Report 3

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 06 / 29 / 2018

Hyd. No. 54

POST SD 5_OUTFALL D

Hydrograph type = SCS Runoff	Peak discharge = 1.233 cfs
Storm frequency = 10 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 2,668 cuft
Drainage area = 0.190 ac	Curve number = 90
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 4.87 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484



OVERALL DRAINAGE MAP
SCALE: 1" = 300'

OUTFALL ANALYSIS NARRATIVE

THE MALCOLM SUBDIVISION PROJECT ENCOMPASSES APPROXIMATELY 1.40 AC IN THE TOWN OF VIENNA. THE SITE IN ITS PRE-DEVELOPMENT CONDITION EXISTS AS A SINGLE FAMILY DWELLING UNIT. ENTIRE SITE DRAINS NORTH AND INTO AN EXISTING STORM SEWER NETWORK NORTH-EAST OF SITE AND CONVEY THE RUNOFF INTO PINEY BRANCH, LOCATED NORTH OF SITE. THE POST DEVELOPMENT OF THE SITE CONSISTS OF THREE SINGLE FAMILY DETACHED HOUSE LOTS WITH SWM/BMP FACILITIES ON EACH LOT. DRAINAGE FROM THE PROPOSED DEVELOPMENT SHALL FLOW IN THE SAME MANNER AS PRE-DEVELOPMENT. PROJECT PROVIDES RIGHT OF WAY DEDICATION FOR THE PROPOSED SIDEWALK, WHICH RESULTS AN INCREASE IN RUNOFF AT OUTFALLS 'C' & 'D'. CHANNEL PROTECTION AND FLOOD PROTECTION ARE BEING ANALYZED. THE PROJECT ANALYZES SITES DRAINAGE WITHIN A LARGER DRAINAGE SHED OF APPROXIMATELY ±149 AC. TO THE POINT OF ANALYSIS PRE AND POST RUNOFF IS BEING CONVEYED BY A CLOSED CONDUIT STORM SEWER SYSTEMS NORTH EAST OF SITE FOR APPROXIMATELY 1,130 FEET DOWNSTREAM INTO A CHANNEL NORTH-EAST OF SITE. THIS CHANNEL IS APPROXIMATELY 543 FEET IN LENGTH BEFORE RUNOFF ENTERS THE EXISTING CULVERTS AT CENTER STREET AND CONVEY THROUGH AN EXISTING 120" X 96" PIPE BEFORE IT OUTFALLS INTO PINEY BRANCH. WITH THE IMPLEMENTATION OF SWM/BMP FACILITIES ON THE LOTS, RUNOFF FROM THE DEVELOPMENT WITHIN THIS PORTION OF WATERSHED EITHER EQUAL TO OR LESS THAN PRE-DEVELOPMENT IN THE EXISTING CONVEYANCE STORM SYSTEMS. THEREFORE, THE PROPOSED DEVELOPMENT SHALL HAVE NO ADVERSE EFFECT TO THE DOWNSTREAM CONVEYANCE SYSTEMS AT THE OUTFALL ANALYSIS.

PRE-Dev @ X-Section A-A			
AREA (ac)	Q _{2yr} (cfs)	Q _{10yr} (cfs)	
DA (outfall A,B,C,D)	2.00	5.43	11.43 (see swm summary sheet 13)
DA (offsite SFD)	81.00	220.73	294.44
C=	0.50		
TOTAL	83.00	226.16	305.87

POST-Dev @ X-Section A-A			
AREA (ac)	Q _{2yr} (cfs)	Q _{10yr} (cfs)	
DA (outfall A,B,C,D)	2.00	4.62	10.14 (see swm summary sheet 13)
DA (offsite SFD)	81.00	220.73	294.44
C=	0.50		
TOTAL	83.00	225.35	304.58

PRE-Dev @ Ex. 120" x 96" RCP			
AREA (ac)	Q _{2yr} (cfs)	Q _{10yr} (cfs)	
DA (outfall A,B,C,D)	2.00	5.43	11.43 (see swm summary sheet 13)
DA (offsite SFD)	147.00	400.58	534.35
C=	0.50		
TOTAL	149.00	406.01	545.78

POST-Dev @ Ex. 120" x 96" RCP			
AREA (ac)	Q _{2yr} (cfs)	Q _{10yr} (cfs)	
DA (outfall A,B,C,D)	2.00	4.62	10.14 (see swm summary sheet 13)
DA (offsite SFD)	147.00	400.575	534.345
C=	0.50		
TOTAL	149.00	405.20	544.49

STORM SEWER DESIGN COMPUTATIONS																		
PROJECT NAME: MALCOLM ROAD COUNTY: FAIRFAX ENGINEER: SMITH ENGINEERING										PROJECT NUMBER: 161-02 DATE: 4/3/2018								
SMITH ENGINEERING																		
FROM POINT	TO POINT	AREA DRAIN 'A'		C	INCR. ACCUMULATED	INLET TIME MINUTES	RAIN FALL IN./HR	RUN-OFF Q C.F.S.	INVERT ELEV.		LENGTH FT.	SLOPE %	DIA. IN.	CAPACITY C.F.S.	VEL. F.P.S.	FLOW TIME MINUTES		REMARKS
		ACRES	C						UPPER (FT)	LOWER (FT)						INCR.	ACCUMULATED	
EX 5A	EX 6A	0.05	0.90	0.05	0.05	5.00	7.27	0.33	398.19	397.66	29.07	1.82%	15	8.72	3.20	0.15	5.15	Existing Conditions
		0.12	0.75	0.09	0.09	5.00	7.27	0.65	398.19	397.66	29.07	1.82%	15	8.72	4.10	0.12	5.12	Proposed Conditions
EX 5	EX 6	0.08	0.90	0.07	0.07	5.00	7.27	0.52	387.04	386.37	28.40	2.36%	15	9.92	4.00	0.12	5.12	Existing Conditions
		0.19	0.75	0.14	0.14	5.00	7.27	1.04	387.04	386.37	28.40	2.36%	15	9.92	4.97	0.10	5.10	Proposed Conditions
EX 6	EX MH A							1.69				2.09%	15	9.34	5.69			Pipe Slope taking from Lawyers Road Improvements Plan
EX MH A	EX MH 1	1.60	0.50	0.80	0.80	5.00	7.27	7.51				5.00%	15	14.44	11.77			DA approx. from GIS Overall Drainage Map. Pipe Slope taking from Lawyers Road Improvements Plan.
EX MH 1	EX 2							7.51				5.00%	18	23.49	11.69			Pipe Slope taking from Lawyers Road Improvements Plan.
EX 2	EX 1							15.78				2.30%	18	15.93	10.27			Total Qs includes outfall from prop. three lots. Pipe slope from Lawyers Road Improvements Plan.
EX 1	Point of Analysis	149.00	0.50	74.50	74.50	5.00	7.27	544.49				0.50%	108	882.92	14.52			DA approx. from GIS Overall Drainage Map. Total Qs includes outfall from prop. three lots. Ex. 120" x 96" Pipe approx. Equivalent to 108" Round Pipe. Using a min. 0.5% Slope

Channel Report

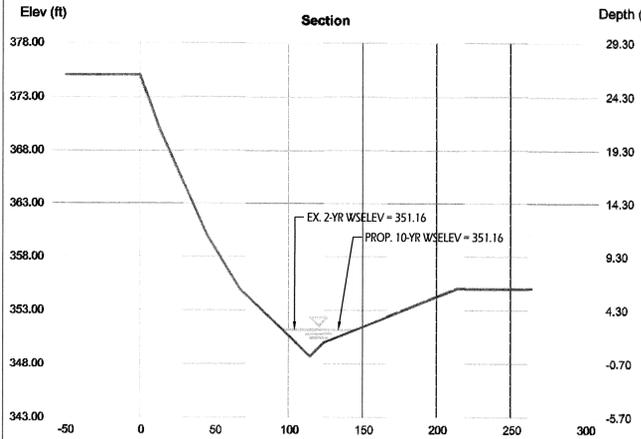
Hydroware Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 2 2018

X-Section A-A 2yr (Pre)

User-defined Invert Elev (ft)	= 348.70	Highlighted Depth (ft)	= 2.46
Slope (%)	= 1.00	Q (cfs)	= 228.16
N-Value	= 0.035	Area (sqft)	= 51.61
		Velocity (ft/s)	= 4.38
Calculations Compute by: Known Q	= 226.16	Wetted Perim (ft)	= 48.98
		Crit Depth, Yc (ft)	= 2.23
		Top Width (ft)	= 48.70
		EGL (ft)	= 2.76

X-Section A-A 2yr (Post)

User-defined Invert Elev (ft)	= 348.70	Highlighted Depth (ft)	= 2.46
Slope (%)	= 1.00	Q (cfs)	= 225.35
N-Value	= 0.035	Area (sqft)	= 51.61
		Velocity (ft/s)	= 4.37
Calculations Compute by: Known Q	= 225.35	Wetted Perim (ft)	= 48.98
		Crit Depth, Yc (ft)	= 2.22
		Top Width (ft)	= 48.70
		EGL (ft)	= 2.76



Channel Report

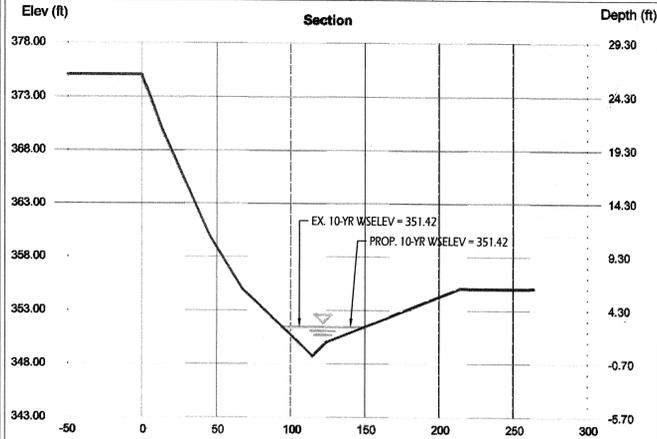
Hydroware Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jul 2 2018

X-Section A-A 10yr (Pre)

User-defined Invert Elev (ft)	= 348.70	Highlighted Depth (ft)	= 2.72
Slope (%)	= 1.00	Q (cfs)	= 305.87
N-Value	= 0.035	Area (sqft)	= 65.14
		Velocity (ft/s)	= 4.70
Calculations Compute by: Known Q	= 305.87	Wetted Perim (ft)	= 55.66
		Crit Depth, Yc (ft)	= 2.48
		Top Width (ft)	= 55.35
		EGL (ft)	= 3.06

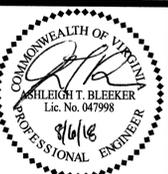
X-Section A-A 10yr (Post)

User-defined Invert Elev (ft)	= 348.70	Highlighted Depth (ft)	= 2.72
Slope (%)	= 1.00	Q (cfs)	= 304.58
N-Value	= 0.035	Area (sqft)	= 65.14
		Velocity (ft/s)	= 4.68
Calculations Compute by: Known Q	= 304.58	Wetted Perim (ft)	= 55.66
		Crit Depth, Yc (ft)	= 2.47
		Top Width (ft)	= 55.35
		EGL (ft)	= 3.06



STORM WATER INLET COMPUTATIONS

PROJECT: Malcolm Road Subdivision DATE: April 4, 2018																															
NUMBER	LENGTH (FT)	STATION	DRAINAGE AREA (AC)	C	CA	I (IN/HR)	O INCR (CFS)	O CARRYOVER (CFS)	O (1) GUTTER FLOW	S GUTTERS SLOPE (FT/FT)	Sx PAVEMENT CROSS SLOPE (FT/FT)	T SPREAD	W (FT)	W/T	SW GUTTER CROSS SLOPE (FT/FT)	SwSx	Eg (ft)	a	Sw ^{0.6} /(12W)	Sc (FT/FT) = Sw ^{0.6} /Eg	Lr (FT) / S	P EFFECT LENGTH (FT)	L/L	d (FT)	E	n(FT)	O INTERCEPT (CFS)	d/n	Ox CARRYOVER (CFS)	T SPREAD @ SAG (FT)	REMARKS
EX 5A	DI-3B	8	0.12	0.75	0.09	4.00	0.36	0.00	0.36	0.04	0.021	1.40	2.0	1.43	0.083	4.00	1.00	3.5	0.146	0.167	5.90	5.50	1.36	100.00%	0.360		0.00		0.00		CONT.
EX 5	DI-3B	4	0.19	0.75	0.14	4.00	0.57	0.00	0.57	0.05	0.021	1.60	2.0	1.25	0.083	4.00	1.00	3.5	0.146	0.167	7.65	7.50	0.52	73.58%	0.419		0.15		0.15		CONT.



PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/25/18	SECOND SUBMISSION
07/16/18	THIRD SUBMISSION

OTHER PLAN DISTRIBUTIONS	

P:\161-02_Malcolm Road NW\Eng\Drawings\161-02_Outfall_Analysis.dwg 08/07/18 14:57

Project Name: Malcom Subdivision
 Date: 11/27/2017
 Linear Development Project? No

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area (acres) → 1.36

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be				1.28	1.28
Impervious Cover (acres)				0.08	0.08
					1.36

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be				1.00	1.00
Impervious Cover (acres)				0.36	0.36
Area Check	OK.	OK.	OK.	OK.	1.36

Constants		Runoff Coefficients (Rv)				
Annual Rainfall (inches)	43	A Soils	B Soils	C Soils	D Soils	
Target Rainfall Event (inches)	1.00	Forest/Open Space	0.02	0.03	0.04	0.05
Total Phosphorus (TP) EMC (mg/L)	0.26	Managed Turf	0.15	0.20	0.22	0.25
Total Nitrogen (TN) EMC (mg/L)	1.86	Impervious Cover	0.95	0.95	0.95	0.95
Target TP Load (lb/acre/yr)	0.41					
Pj (unitless correction factor)	0.90					

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre		
Pre-ReDevelopment	Listed	Adjusted ¹
Forest/Open Space Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf Cover (acres)	1.28	1.00
Weighted Rv(turf)	0.25	0.25
% Managed Turf	94%	93%
Impervious Cover (acres)	0.08	0.08
Rv(impervious)	0.95	0.95
% Impervious	6%	7%
Total Site Area (acres)	1.36	1.08
Site Rv	0.29	0.30

Treatment Volume and Nutrient Load

Pre-ReDevelopment Treatment Volume (acre-ft)	0.0330	0.0272
Pre-ReDevelopment Treatment Volume (cubic feet)	1,437	1,183
Pre-ReDevelopment TP Load (lb/yr)	0.90	0.74
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	0.66	0.69
Baseline TP Load (lb/yr) (0.41 lbs/acre/yr applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		0.44

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)		Land Cover Summary-Post		Land Cover Summary-Post	
Post ReDev. & New Impervious		Post-ReDevelopment		Post-Development New Impervious	
Forest/Open Space Cover (acres)	0.00	Forest/Open Space Cover (acres)	0.00	New Impervious Cover (acres)	0.28
Weighted Rv(forest)	0.00	Weighted Rv(forest)	0.00	Rv(impervious)	0.95
% Forest	0%	% Forest	0%	% Impervious	26%
Managed Turf Cover (acres)	1.00	Managed Turf Cover (acres)	1.00	Final Site Area (acres)	1.36
Weighted Rv (turf)	0.25	Weighted Rv (turf)	0.25	Final Post Dev Site Rv	0.44
% Managed Turf	74%	% Managed Turf	93%	ReDev Site Rv	0.30
Impervious Cover (acres)	0.36	ReDev. Impervious Cover (acres)	0.08		
Rv(impervious)	0.95	Rv(impervious)	0.95		
% Impervious	26%	% Impervious	7%		
Total Site Area (acres)	1.36	Total ReDev. Site Area (acres)	1.08		
Final Post Dev Site Rv	0.44	ReDev Site Rv	0.30		

Treatment Volume and Nutrient Load

Final Post-Development Treatment Volume (acre-ft)	0.0493	Post-ReDevelopment Treatment Volume (acre-ft)	0.0272	Post-Development Treatment Volume (acre-ft)	0.0222
Final Post-Development Treatment Volume (cubic feet)	2,149	Post-ReDevelopment Treatment Volume (cubic feet)	1,183	Post-Development Treatment Volume (cubic feet)	966
Final Post-Development TP Load (lb/yr)	1.35	Post-ReDevelopment TP Load (lb/yr)*	0.74	Post-Development TP Load (lb/yr)	0.61
Final Post-Development TP Load per acre (lb/acre/yr)	0.99	Post-ReDevelopment TP Load per acre (lb/acre/yr)	0.69	Post-Development TP Load per acre (lb/acre/yr)	0.61
		Max. Reduction Required (Below Pre-Development Load)	20%		
		TP Load Reduction Required for Redeveloped Area (lb/yr)	0.15	TP Load Reduction Required for New Impervious Area (lb/yr)	0.49

TP Load Reduction Required (lb/yr) 0.64

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	0.06	0.10	0.06	0.08	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	0.06	0.10	0.06	0.08	0.00	OK.
MANAGED TURF AREA (ac)	0.23	0.19	0.20	0.22	0.00	OK.
MANAGED TURF AREA TREATED (ac)	0.23	0.19	0.20	0.22	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft³) 2,149
 D.A. A = LOT 1 FAC '1A'
 D.A. B = LOT 2 FAC '2B'
 D.A. C = LOT 2 FAC '2C'
 D.A. D = LOT 3 FAC '3D'

Runoff Reduction Volume and TP By Drainage Area

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft ³)	215	250	194	234	0	893
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	0.27	0.33	0.24	0.29	0.00	1.13
TP LOAD REDUCTION ACHIEVED (lb/yr)	0.17	0.20	0.15	0.18	0.00	0.70
TP LOAD REMAINING (lb/yr)	0.10	0.13	0.09	0.11	0.00	0.43

NITROGEN LOAD REDUCTION ACHIEVED (lb/yr) 1.11 1.29 1.00 1.21 0.00 4.61

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	1.35
TP LOAD REDUCTION REQUIRED (lb/yr)	0.64
TP LOAD REDUCTION ACHIEVED (lb/yr)	0.70
TP LOAD REMAINING (lb/yr):	0.65

REMAINING TP LOAD REDUCTION REQUIRED (lb/yr): 0.00 **
 ** TARGET TP REDUCTION EXCEEDED BY 0.06 LB/YEAR **

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	9.66
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	4.61
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	5.05

PROJECT AREA NARRATIVE

THE EXISTING DISTURBED AREA OF 1.36 AC IS BEING USED AS PROJECT SITE AREA. THE SITE CONSISTS OF MODERATE VEGETATED OPEN SPACE, PAVED DRIVEWAY AND DWELING STRUCTURE. THE PROJECT SITE IS TO BE SUBDIVIDED INTO THREE (3) LOTS. FOR THE PURPOSES OF DETERMINING WATER QUALITY CONTROL REQUIREMENTS, VRRM THE RE-DEVELOPMENT IS BEING UTILIZED.

WATER QUALITY CONTROL REQUIREMENTS:

THE VRRM SPREADSHEET HAS COMPUTED A TOTAL REQUIRED PHOSPHORUS REDUCTION OF 0.64 LB/YR. THROUGH THE IMPLEMENTATION OF FOUR INFILTRATION TRENCHES LEVEL 1 FACILITIES, THE ANTICIPATED PHOSPHORUS REDUCTION FOR THE PROPOSED SUBDIVISION HAS EXCEEDED ITS REQUIREMENTS. THEREFORE WATER QUALITY CONTROL HAS BEEN MET.

Runoff Volume and Curve Number Calculations

Enter design storm rainfall depths (in):

1-year storm	2-year storm	10-year storm
2.62	3.17	4.87

Use NOAA Atlas 14 (<http://hdsc.nws.noaa.gov/hdsc/pfds/>)

Drainage Area Curve Numbers and Runoff Depths*

Curve numbers (CN, CNadj) and runoff depths (RV_{Developed}) are computed with and without reduction practices.

Drainage Area A LOT 1 FAC '1A' ONSITE		A Soils	B Soils	C Soils	D Soils	Total Area (acres):
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	0.29
	CN	30	55	70	77	Runoff Reduction Volume (ft ³): 215
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.23	
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.06	
	CN	98	98	98	98	

RV _{Developed} (watershed-inch) with no Runoff Reduction*	1-year storm	2-year storm	10-year storm
	1.21	1.66	3.15
RV _{Developed} (watershed-inch) with Runoff Reduction*	1.01	1.46	2.95
Adjusted CN*	81	81	82

Drainage Area B LOT 2 FAC '2B' ONSITE		A Soils	B Soils	C Soils	D Soils	Total Area (acres):
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	0.29
	CN	30	55	70	77	Runoff Reduction Volume (ft ³): 250
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.19	
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.10	
	CN	98	98	98	98	

RV _{Developed} (watershed-inch) with no Runoff Reduction*	1-year storm	2-year storm	10-year storm
	1.34	1.81	3.35
RV _{Developed} (watershed-inch) with Runoff Reduction*	1.10	1.57	3.11
Adjusted CN*	82	83	83

Drainage Area C LOT 2 FAC '2C' ONSITE		A Soils	B Soils	C Soils	D Soils	Total Area (acres):
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	0.26
	CN	30	55	70	77	Runoff Reduction Volume (ft ³): 194
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.20	
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.06	
	CN	98	98	98	98	

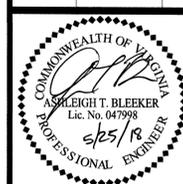
RV _{Developed} (watershed-inch) with no Runoff Reduction*	1-year storm	2-year storm	10-year storm
	1.21	1.66	3.15
RV _{Developed} (watershed-inch) with Runoff Reduction*	1.00	1.45	2.95
Adjusted CN*	80	81	82

Drainage Area D LOT 3 FAC '3D' ONSITE		A Soils	B Soils	C Soils	D Soils	Total Area (acres):
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00	0.30
	CN	30	55	70	77	Runoff Reduction Volume (ft ³): 234
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.22	
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.08	
	CN	98	98	98	98	

RV _{Developed} (watershed-inch) with no Runoff Reduction*	1-year storm	2-year storm	10-year storm
	1.27	1.73	3.25
RV _{Developed} (watershed-inch) with Runoff Reduction*	1.06	1.52	3.03
Adjusted CN*	81	82	83

SMITH ENGINEERING

OVERALL BMP COMPUTATIONS (1 OF 2)
 MALCOLM ROAD SUBDIVISION
 FINAL PLAT
 HUNTER HILL DISTRICT, TOWN OF VENNA, FAIRFAX COUNTY, VIRGINIA



SMITH ENGINEERING
 14901 BOGLE DRIVE SUITE 202
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 PROJECT: 161-02
 PROJECT MANAGER: ASHLEIGH T. BLEEKER
 Ashleigh@SMITHEngineeringVA.com

PLAN SUBMISSIONS
 02/02/18 FIRST SUBMISSION
 03/29/18 Second Subm
 07/16/18 Third Submission

OTHER PLAN DISTRIBUTIONS

SCALE: N/A
 DATE: JANUARY 18, 2018
 SHEET 17 OF 30

Drainage Area A LOT 1 FAC '1A' ONSITE

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				0.23	0.23	0.25
Impervious Cover (acres)				0.06	0.06	0.95
Total					0.29	

Total Phosphorus Available for Removal in D.A. A (lb/yr) 0.27
 Post Development Treatment Volume in D.A. A (ft³) 429

Stormwater Best Management Practices (RR = Runoff Reduction)

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft ³)	Runoff Reduction (ft ³)	Remaining Runoff Volume (ft ³)	Total BMP Treatment Volume (ft ³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50	0.23	0.06	0	215	215	429	25	0.00	0.27	0.17	0.10	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.06	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.23	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft ³)	215	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr) 0.27		
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) 0.17		
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) 0.10		

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

Drainage Area B LOT 2 FAC '2B' ONSITE

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				0.19	0.19	0.25
Impervious Cover (acres)				0.10	0.10	0.95
Total					0.29	

Total Phosphorus Available for Removal in D.A. B (lb/yr) 0.33
 Post Development Treatment Volume in D.A. B (ft³) 517

Stormwater Best Management Practices (RR = Runoff Reduction)

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft ³)	Runoff Reduction (ft ³)	Remaining Runoff Volume (ft ³)	Total BMP Treatment Volume (ft ³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50	0.19	0.10	0	250	250	500	25	0.00	0.31	0.20	0.12	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.10	AREA CHECK: OK.
TOTAL TURF AREA TREATED (ac)	0.19	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. B (ft ³)	250	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr) 0.33		
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr) 0.20		
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr) 0.13		

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

Drainage Area C LOT 2 FAC '2C' ONSITE

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				0.20	0.20	0.25
Impervious Cover (acres)				0.06	0.06	0.95
Total					0.26	

Total Phosphorus Available for Removal in D.A. C (lb/yr) 0.24
 Post Development Treatment Volume in D.A. C (ft³) 388

Stormwater Best Management Practices (RR = Runoff Reduction)

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft ³)	Runoff Reduction (ft ³)	Remaining Runoff Volume (ft ³)	Total BMP Treatment Volume (ft ³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50	0.20	0.06	0	194	194	388	25	0.00	0.24	0.15	0.09	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.06	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.20	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. C (ft ³)	194	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr) 0.24		
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr) 0.15		
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr) 0.09		

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

Drainage Area D LOT 3 FAC '3D' ONSITE

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				0.22	0.22	0.25
Impervious Cover (acres)				0.08	0.08	0.95
Total					0.30	

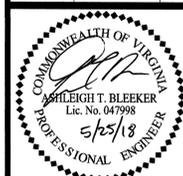
Total Phosphorus Available for Removal in D.A. D (lb/yr) 0.29
 Post Development Treatment Volume in D.A. D (ft³) 469

Stormwater Best Management Practices (RR = Runoff Reduction)

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft ³)	Runoff Reduction (ft ³)	Remaining Runoff Volume (ft ³)	Total BMP Treatment Volume (ft ³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50	0.22	0.08	0	234	234	469	25	0.00	0.29	0.18	0.11	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	0.08	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.22	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. D (ft ³)	234	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. D (lb/yr) 0.29		
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr) 0.18		
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. D (lb/yr) 0.11		

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS



SMITH ENGINEERING
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 CHANTILLY, VA 20151
 PHONE: 703-956-6204
 PROJECT: 161-02
 PROJECT MANAGER:
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 Ashleigh@SMITHEngineeringVA.com

PLAN SUBMISSIONS
02/02/18 FIRST SUBMISSION
02/25/18 Second Subm
07/16/18 Third Submission

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Infiltration Test Log **DRAFT**

Project Name: 440 Malcolm Rd NW, Vienna, VA 22180 Test Date: December 21, 2017
Project No.: VA17037 Location: 1A-DP

TIME	Depth to Water Level*	Time Increment	Depth Change	Rate	Comments
	inches	hours	inches	inches per hour	
11:10 AM	63.36	0.00	---	---	Start of Hour 1
12:10 PM	67.56	1.00	4.200	4.20	
12:16 PM	64.20	0.00	---	---	Start of Hour 2
1:16 PM	68.04	1.00	3.840	3.84	
1:17 PM	64.20	0.00	---	---	Start of hour 3
2:17 PM	68.04	1.00	3.840	3.84	
2:18 PM	64.20	0.00	---	---	Start of hour 4
3:18 PM	68.40	1.00	4.200	4.20	End of hour 4

Presoaked Water Height (ft.): DRY
Depth of pipe above existing grade (ft.): 2.00
Total length of pipe (ft.): 7.00
Total depth of pipe below existing grade (ft.): 5.00
Diameter of pipe (in.): 3.00

Average Infiltration Rate = **4.02** inches/hour

Infiltration Test Log **DRAFT**

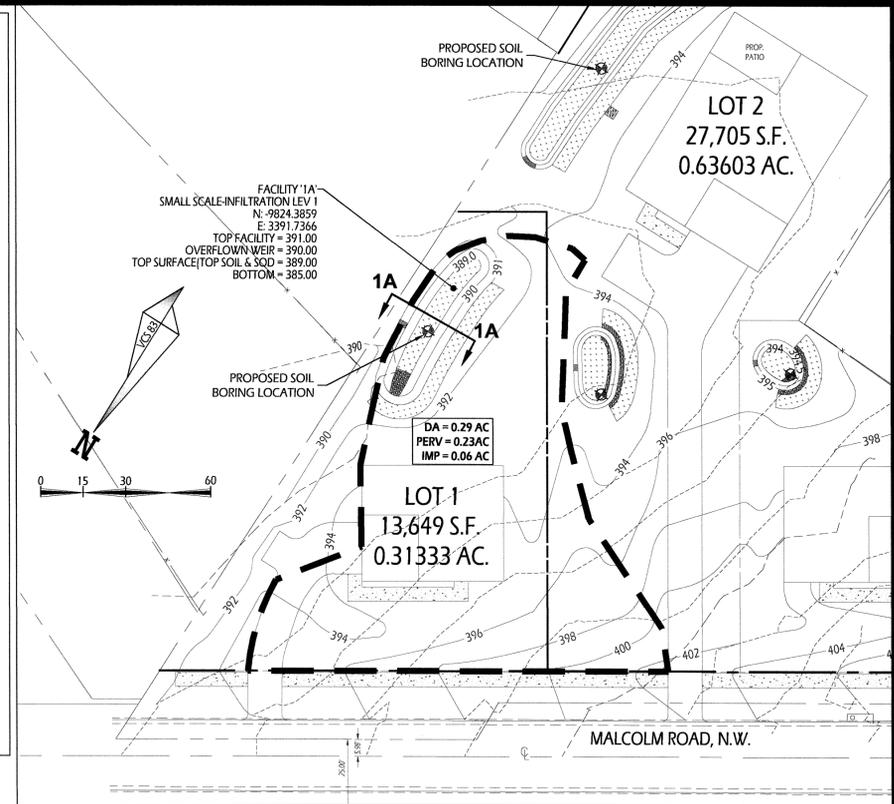
Project Name: 440 Malcolm Rd NW, Vienna, VA 22180 Test Date: December 21, 2017
Project No.: VA17037 Location: 1A-SH

TIME	Depth to Water Level*	Time Increment	Depth Change	Rate	Comments
	inches	hours	inches	inches per hour	
11:13 AM	52.80	0.00	---	---	Start of Hour 1
12:13 PM	57.96	1.00	5.160	5.16	
12:18 PM	52.80	0.00	---	---	Start of Hour 2
1:18 PM	57.60	1.00	4.800	4.80	
1:19 PM	52.80	0.00	---	---	Start of hour 3
2:19 PM	57.60	1.00	4.800	4.80	
2:21 PM	52.80	0.00	---	---	Start of hour 4
3:21 PM	57.60	1.00	4.800	4.80	End of hour 4

Presoaked Water Height (ft.): DRY
Depth of pipe above existing grade (ft.): 2.75
Total length of pipe (ft.): 6.17
Total depth of pipe below existing grade (ft.): 3.42
Diameter of pipe (in.): 3.00

Average Infiltration Rate** = **4.80** inches/hour

** After observed equilibrium at 1:18 PM.



Pond Report 2

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 03/16/2018

Pond No. 4 - LOT 1-SMALL SCALE-INFILT '1A' LV1

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 385.00 ft. Voids = 40.00%

Stage / Storage Table

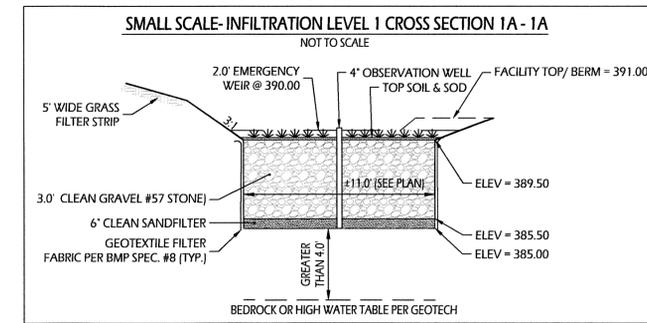
Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	385.00	324	0	0
4.00	389.00	324	518	518
5.00	390.00	2,439	553	1,071
6.00	391.00	2,544	997	2,068

Culvert / Orifice Structures

[A]	[B]	[C]	[PrRsr]	[A]	[B]	[C]	[D]
Rise (in) = 0.00	0.00	0.00	0.00	Crest Len (ft) = 2.00	0.00	0.00	0.00
Span (in) = 0.00	0.00	0.00	0.00	Crest El. (ft) = 390.00	0.00	0.00	0.00
No. Barrels = 0	0	0	0	Weir Coeff. = 3.33	3.33	3.33	3.33
Invert El. (ft) = 0.00	0.00	0.00	0.00	Weir Type = Rect	---	---	---
Length (ft) = 0.00	0.00	0.00	0.00	Multi-Stage = No	No	No	No
Slope (%) = 0.00	0.00	0.00	n/a				
N-Value = .013	.013	.013	n/a				
Orifice Coeff. = 0.60	0.60	0.60	0.60	Exfil. (in/hr) = 2.010	(by Contour)		
Multi-Stage = n/a	No	No	No	TW Elev. (ft) = 0.00			

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	385.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
4.00	518	389.00	---	---	---	---	0.00	---	---	---	0.015	---	0.015
5.00	1,071	390.00	---	---	---	---	0.00	---	---	---	0.113	---	0.113
6.00	2,068	391.00	---	---	---	---	6.66	---	---	---	0.118	---	6.778

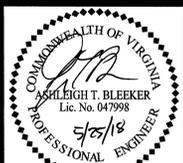


NOTE: THE BERM AND OVERFLOW WEIR SHALL BE SODDED AND PEGGED IN ACCORDANCE WITH THE MOST RECENT EDITION OF VESCH.

INFILTRATION TRENCH DESIGN COMPUTATIONS - LOT 1

INPUT DATA	
Proposed Infiltration Trench #1, Level:	1
On-lot Drainage Area to Trench, CDA =	0.29 acres 12632.4 SF
Total Impervious Area to Trench =	2614.00 sf
f =	4.02 infiltration rate (in/hr)
f =	2.01 recommended design infiltration rate (in/hr)
TvBMP (from VRRM)	327.00 From VRRM
Tv Multiplier (Lv. 1 vs. Lv 2)	1 x 327.00
Total Req. Stormwater TvBMP=	327.00 CF
Provided for Tv =	327.00 CF
Maximum Depth, d _{max} =	(1/2) f x t _d / (n x 12)
d _{max} =	20.1 ft
Proposed Depth, d =	3.00 ft
Minimum Surface Area, SA =	Tv / (n x d + 1/2 f x t)
SA =	63 SF
Trench Surface Area Provided, SA =	496 SF at Elevation 390.50 (Sa)
Minimum Surface Area of Gravel/River Rock =	10Yr Total Q Inflow / Infiltration Rate of Gravel
Infiltration Rate of Gravel/River Rock =	17,000 cf/day OR 0.19 cfs
10 Year Total Inflow =	5.50 cfs (FROM HYDROGRAPHS)
Minimum Surface Area of Gravel/River Rock Required =	28.95 sf
Provided Surface Area of Gravel/River Rock =	29.00 sf
Maximum Surface Ponding Below Overflow Weir =	0.50 ft
Approx. Volume from Ponding =	309.75 cf
Volume in Trench =	595.20 cf
Max Storage Volume (Including Ponding) =	904.95 cf
Outflow rate =	Design Inf. Rate ((IN/HR) x Trench Area (SF) x 1/12 (FT/IN) x (1/366) SEC/HR) = 0.023 CFS
Time for storage to dewater =	Vol _{we} / (fxS _s) (VSMH, Minimum Standard 3.10) = 905 ft ³ / (2.01 in/hr x 496 ft ² x 1/12 ft/in) = 10.9 HRS < 48 HRS OKAY

Final Infiltration Trench Facility Design:	PreTreatments Required: 2 Small-Scale Infiltration
Trench Surface Area:	527.0 sf
Approximate Trench Surface Dimensions:	76' x 7'
Trench Surface Elevation:	390.5
Trench Bottom Elevation:	387.5
Water Table / Bed Rock Elevation (From Boring):	None
Bottom is more than 4.0 ft. from water table/bed rock:	Yes
6" Clean Sand Layer (Bottom):	387.5
6" Clean Sand Layer (Top):	388.0
Gravel Storage (Bottom):	388.0
Gravel Storage (Top):	390.5
Primary Surface Treatment:	Sod/Grass
Minimum Required Gravel/River Rock Area on Surface:	29.0 ft.
Overflow Weir:	391.0
Weir Length:	2.00 ft.
Berm/Top of Facility:	391.5
Provided: Leaf Screen on Gutter	
Grass Filter Strip	
River Rock	

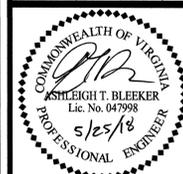


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PLAN SUBMISSIONS

02/02/18	FIRST SUBMISSION
05/22/18	Second Subm.
07/16/18	Third Submission

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PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
03/20/18	Second Subm
07/16/18	Third Submission

OTHER PLAN DISTRIBUTIONS

POST INFLOW FACILITY '1A'- 1YR HYDROGRAPH
LOT 1

1

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Tuesday, 03 / 20 / 2018

Hyd. No. 1
POST_LOT 1-FAC '1A'

Hydrograph type = SCS Runoff	Peak discharge = 0.674 cfs
Storm frequency = 1 yrs	Time to peak = 718 min
Time interval = 1 min	Hyd. volume = 1,356 cuft
Drainage area = 0.290 ac	Curve number = 84*
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 2.67 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST INFLOW FACILITY '1A'- 2YR HYDROGRAPH
LOT 1

2

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Tuesday, 03 / 20 / 2018

Hyd. No. 1
POST_LOT 1-FAC '1A'

Hydrograph type = SCS Runoff	Peak discharge = 0.888 cfs
Storm frequency = 2 yrs	Time to peak = 718 min
Time interval = 1 min	Hyd. volume = 1,799 cuft
Drainage area = 0.290 ac	Curve number = 84*
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 3.17 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST INFLOW FACILITY '1A'- 10YR HYDROGRAPH
LOT 1

3

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Tuesday, 03 / 20 / 2018

Hyd. No. 1
POST_LOT 1-FAC '1A'

Hydrograph type = SCS Runoff	Peak discharge = 1.646 cfs
Storm frequency = 10 yrs	Time to peak = 717 min
Time interval = 1 min	Hyd. volume = 3,422 cuft
Drainage area = 0.290 ac	Curve number = 84*
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 4.87 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST INFLOW- 1YR HYDROGRAPH
FACILITY '1A'

1

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Monday, 03 / 19 / 2018

Hyd. No. 26
InFlow '1A'_2C&'1A'_1yr

Hydrograph type = Combine	Peak discharge = 2.058 cfs
Storm frequency = 1 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 4,138 cuft
Inflow hyds. = 1, 22	Contrib. drain. area = 0.290 ac

POST INFLOW- 2YR HYDROGRAPH
FACILITY '1A'

1

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Monday, 03 / 19 / 2018

Hyd. No. 27
InFlow '1A'_2C&'1A'_2yr

Hydrograph type = Combine	Peak discharge = 2.811 cfs
Storm frequency = 2 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 5,667 cuft
Inflow hyds. = 1, 23	Contrib. drain. area = 0.290 ac

POST INFLOW- 10YR HYDROGRAPH
FACILITY '1A'

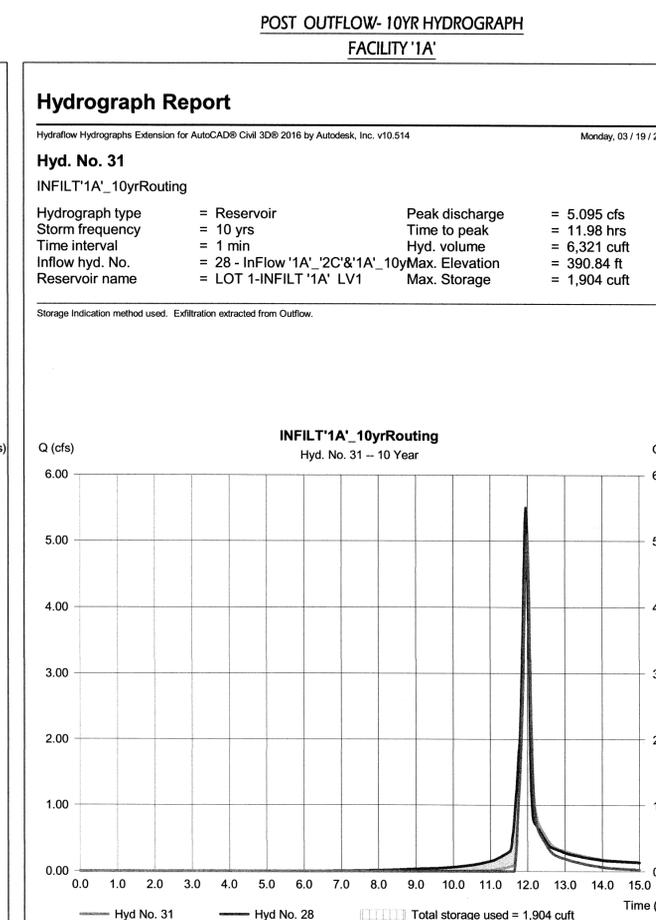
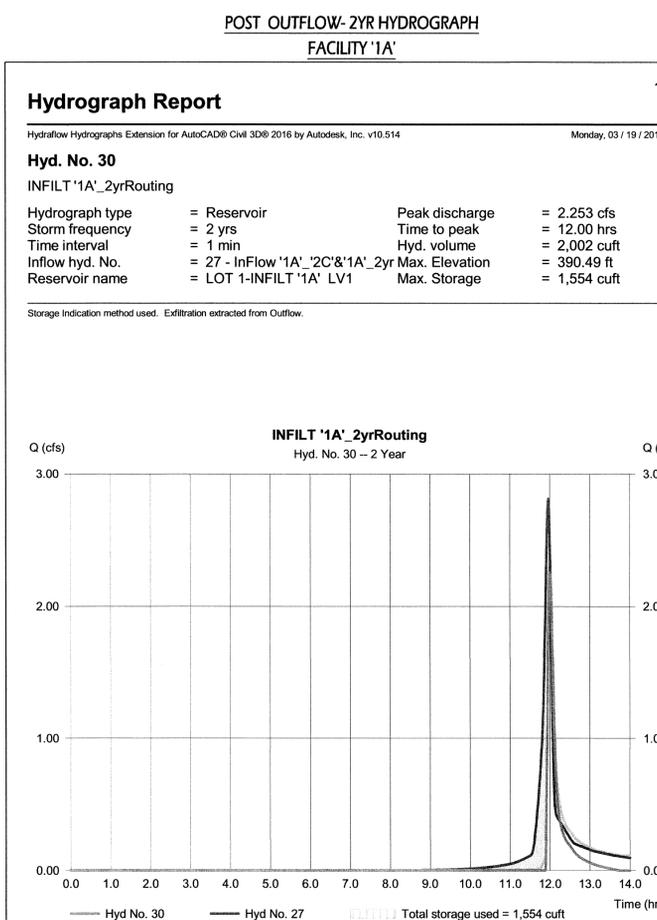
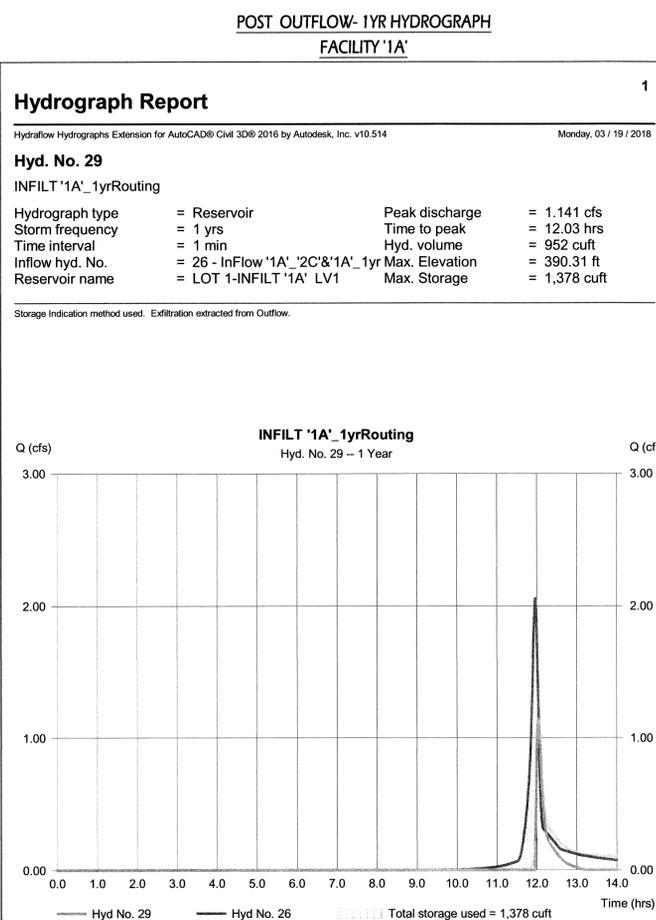
1

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Monday, 03 / 19 / 2018

Hyd. No. 28
InFlow '1A'_2C&'1A'_10yr

Hydrograph type = Combine	Peak discharge = 5.502 cfs
Storm frequency = 10 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 11,368 cuft
Inflow hyds. = 1, 24	Contrib. drain. area = 0.290 ac



INFILTRATION TRENCH DESIGN COMPUTATIONS - LOT 2 (FAC 2B)

Proposed Infiltration Trench #1, Level: 1 INPUT DATA
 On-lot Drainage Area to Trench, CDA = 0.35 acres 15246 SF
 Total Impervious Area to Trench = 4356.00 sf Small-Scale Infiltration
 $f = 4.23$ infiltration rate (in/hr)
 $f = 2.12$ recommended design infiltration rate (in/hr)

TvBMP (from VRRM) = 572.00 From VRRM
 Tv Multiplier (Lv. 1 vs. Lv 2) = 1 x 572.00
 Total Req. Stormwater TvBMP = 572.00 CF
 Provided for Tv = 572.00 CF
 If Forebay is Required: N/A
 86 CF (15% STORAGE REQUIRED FOR FOREBAY)

Maximum Depth, $d_{max} = (1/2)(f \times t_d) / (n \times 12)$ Equation 8.2
 $d_{max} = 21.2$ ft 5 max. depth (Table 8.5)
 Proposed Depth, $d = 3.00$ ft
 Minimum Surface Area, $SA = Tv / (n \times d + 1/2 f \times t_d)$ $n = \text{porosity of stone} = 0.4 \text{ in/hr}$
 $SA = 105$ SF
 Trench Surface Area Provided, $SA = 436$ SF at Elevation 392.50 (Sa)

Minimum Surface Area of Gravel/River Rock = 10Yr Total Q Inflow / Infiltration Rate of Gravel
 Infiltration Rate of Gravel/River Rock = 17,000 cf/day OR 0.19 cfs
 10 Year Total Inflow = 1.73 cfs (FROM HYDROGRAPHS)
 Minimum Surface Area of Gravel/River Rock Required = 9.11 sf
 Provided Surface Area of Gravel/River Rock = 9.50 sf

Maximum Surface Ponding Below Overflow Weir = 0.50 ft
 Approx. Volume from Ponding = 369 cf
 Volume in Trench = 523.00 cf
 Max Storage Volume (Including Ponding) = 892.20 cf

Ponding Stage Storage	
Elevation	Area
392.5	598
393	878

Outflow rate Design Inf. Rate (IN/HR) x Trench Area (SF) x 1/12 (FT/IN) x (1/366) SEC/HR
 = 0.021 CFS
 Time for storage to dewater = $Vol_{wq} / (f \times SA)$ (VSMH, Minimum Standard 3.10)
 = 892 ft³ / (2.12 in/hr X 436 ft² X 1/12 ft/in)
 = 11.6 HRS < 48 HRS OKAY

Final Infiltration Trench Facility Design:

Trench Surface Area: 598.0 sf
 Approximate Trench Surface Dimensions: 6.0' x 87'
 Trench Surface Elevation: 392.5
 Trench Bottom Elevation: 389.5
 Water Table / Bed Rock Elevation (From Boring): None
 Bottom is more than 4.0 ft. from water table/bed rock: Yes
 6" Clean Sand Layer (Bottom): 389.5
 6" Clean Sand Layer (Top): 390.0
 Gravel Storage(Bottom): 390.0
 Gravel Storage(Top): 392.5
 Primary Surface Treatment: Sod/Grass
 Minimum Required Gravel/River Rock Area on Surface: 9.5 ft.
 Overflow Weir: 393.0
 Weir Length: 2.00 ft.
 Berm/Top of Facility: 393.5

PreTreatments Required: 2 Small-Scale Infiltration
 Provided: Gravel Diaphragm
 Grass Filter Strip

INFILTRATION TRENCH DESIGN COMPUTATIONS - LOT 2 (FAC 2C)

Proposed Infiltration Trench #1, Level: 1 INPUT DATA
 On-lot Drainage Area to Trench, CDA = 0.42 acres 18295.2 SF
 Total Impervious Area to Trench = 2610.00 sf Small-Scale Infiltration
 $f = 1.11$ infiltration rate (in/hr)
 $f = 0.56$ recommended design infiltration rate (in/hr)

TvBMP (from VRRM) = 534.00 From VRRM
 Tv Multiplier (Lv. 1 vs. Lv 2) = 1 x 534.00
 Total Req. Stormwater TvBMP = 534.00 CF
 Provided for Tv = 534.00 CF
 If Forebay is Required: N/A
 80 CF (15% STORAGE REQUIRED FOR FOREBAY)

Maximum Depth, $d_{max} = (1/2)(f \times t_d) / (n \times 12)$ Equation 8.2
 $d_{max} = 5.6$ ft 5 max. depth (Table 8.5)
 Proposed Depth, $d = 4.00$ ft
 Minimum Surface Area, $SA = Tv / (n \times d + 1/2 f \times t_d)$ $n = \text{porosity of stone} = 0.4 \text{ in/hr}$
 $SA = 196$ SF
 Trench Surface Area Provided, $SA = 200$ SF at Elevation 392.50 (Sa)

Minimum Surface Area of Gravel/River Rock = 10Yr Total Q Inflow / Infiltration Rate of Gravel
 Infiltration Rate of Gravel/River Rock = 17,000 cf/day OR 0.19 cfs
 10 Year Total Inflow = 3.86 cfs (FROM HYDROGRAPHS)
 Minimum Surface Area of Gravel/River Rock Required = 20.32 sf
 Provided Surface Area of Gravel/River Rock = 20.50 sf

Maximum Surface Ponding Below Overflow Weir = 0.50 ft
 Approx. Volume from Ponding = 70 cf
 Volume in Trench = 320.00 cf
 Max Storage Volume (Including Ponding) = 390.00 cf

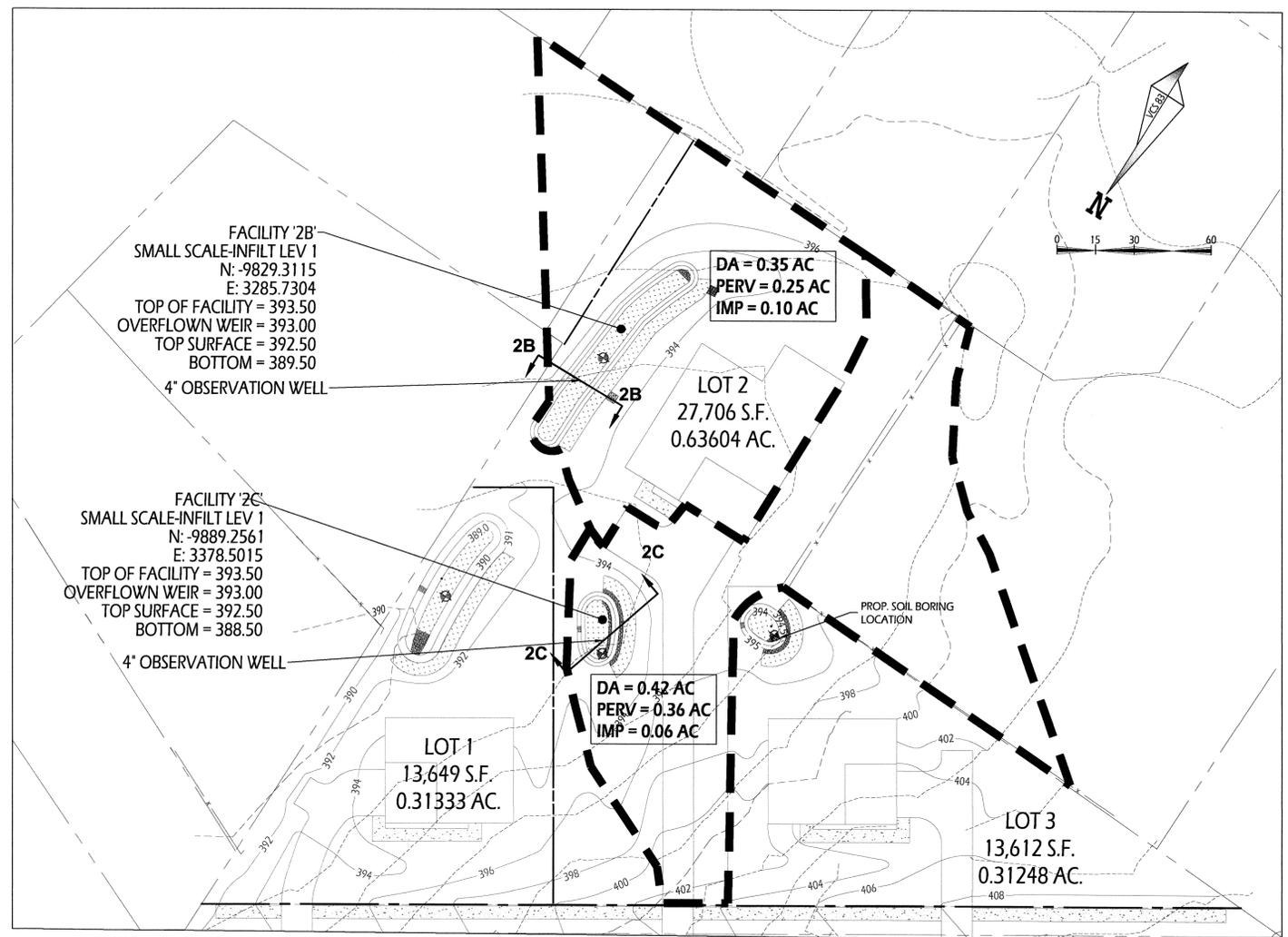
Ponding Stage Storage	
Elevation	Area
392.5	110
393.0	170

Outflow rate Design Inf. Rate (IN/HR) x Trench Area (SF) x 1/12 (FT/IN) x (1/366) SEC/HR
 = 0.003 CFS
 Time for storage to dewater = $Vol_{wq} / (f \times SA)$ (VSMH, Minimum Standard 3.10)
 = 390 ft³ / (0.56 in/hr X 200 ft² X 1/12 ft/in)
 = 41.8 HRS < 48 HRS OKAY

Final Infiltration Trench Facility Design:

Trench Surface Area: 160.0 sf
 Approximate Trench Surface Dimensions: 7.0' x 19.0'
 Trench Surface Elevation: 392.5
 Trench Bottom Elevation: 388.5
 Water Table / Bed Rock Elevation (From Boring): None
 Bottom is more than 4.0 ft. from water table/bed rock: Yes
 6" Clean Sand Layer (Bottom): 388.5
 6" Clean Sand Layer (Top): 389.0
 Gravel Storage(Bottom): 389.0
 Gravel Storage(Top): 392.5
 Primary Surface Treatment: Sod/Grass
 Minimum Required Gravel/River Rock Area on Surface: 20.5 ft.
 Overflow Weir: 393.0
 Weir Length: 2.00 ft.
 Berm/Top of Facility: 393.5

PreTreatments Required: 2 Small-Scale Infiltration
 Provided: Gravel Diaphragm
 Grass Filter Strip



BMP MAP - FACILITY '1A'
 SCALE: 1" = 30'

Pond Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 03/16/2018

Pond No. 1 - LOT 2-SMALL SCALE-INFILT '2B' LV1

Pond Data
 Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 388.50 ft. Voids = 40.00%

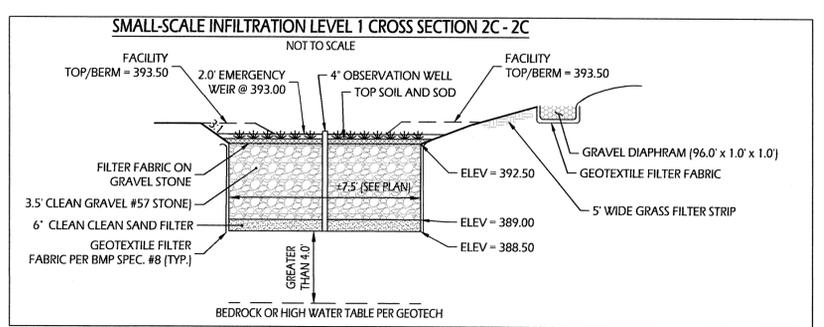
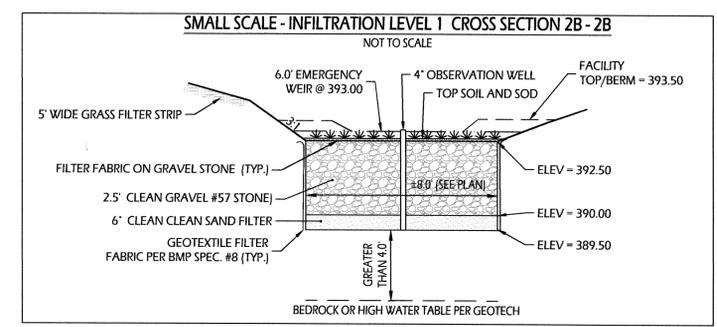
Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	388.50	598	0	0
4.00	392.50	598	957	957
4.50	393.00	2,262	286	1,243
5.00	393.50	1,990	425	1,668

Culvert / Orifice Structures

[A]	[B]	[C]	[PrfRsr]	[A]	[B]	[C]	[D]
Rise (in) = 0.00	0.00	0.00	0.00	Crest Len (ft) = 2.00	0.00	0.00	0.00
Span (in) = 0.00	0.00	0.00	0.00	Crest El. (ft) = 393.00	0.00	0.00	0.00
No. Barrels = 0	0	0	0	Weir Coeff. = 3.33	3.33	3.33	3.33
Invert El. (ft) = 0.00	0.00	0.00	0.00	Weir Type = Rect	---	---	---
Length (ft) = 0.00	0.00	0.00	0.00	Multi-Stage = No	No	No	No
Slope (%) = 0.00	0.00	0.00	n/a				
N-Value = 0.13	0.13	0.13	n/a	Effil (in/hr) = 2.120	(by Contour)		
Orifice Coeff. = 0.60	0.60	0.60	0.60	TW Elev. (ft) = 0.00			
Multi-Stage = n/a	No	No	No				

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	PrfRsr cfs	Wv A cfs	Wv B cfs	Wv C cfs	Wv D cfs	Effil cfs	User cfs	Total cfs
0.00	0	388.50	---	---	---	0.00	---	---	---	0.000	---	0.000
4.00	957	392.50	---	---	---	0.00	---	---	---	0.029	---	0.029
4.50	1,243	393.00	---	---	---	0.00	---	---	---	0.111	---	0.111
5.00	1,668	393.50	---	---	---	2.35	---	---	---	0.098	---	2.452



SMITH ENGINEERING
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 PHONE: 703-956-6204
 PROJECT: 161-02
 PROJECT MANAGER: ASHLEIGH T. BLEEKER
 Ashleigh@SMITHEngineeringVA.com

DATE	DESCRIPTION
02/02/18	PLAN SUBMISSIONS
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04/18/18	Second Subm.
04/18/18	Third Submission

OTHER PLAN DISTRIBUTIONS

SCALE: AS SHOWN
 DATE: JANUARY 18, 2018
 SHEET 21 OF 30



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Infiltration Test Log DRAFT

Project Name: 440 Malcolm Rd NW, Vienna, VA 22180 Test Date: December 21, 2017
 Project No.: VA17037 Location: 2B-SH

TIME	Depth to Water Level*	Time Increment	Depth Change	Rate	Comments
	inches	hours	inches	inches per hour	
11:07 AM	62.40	0.00	---	---	Start of Hour 1
12:07 PM	66.72	1.00	4.320	4.32	
12:12 PM	62.40	0.00	---	---	Start of Hour 2
1:12 PM	66.12	1.00	3.720	3.72	
1:13 PM	62.40	0.00	---	---	Start of hour 3
2:13 PM	66.84	1.00	4.440	4.44	
2:14 PM	62.40	0.00	---	---	Start of hour 4
3:14 PM	66.84	1.00	4.440	4.44	End of hour 4

Presoaked Water Height (ft.): DRY
 Depth of pipe above existing grade (ft.): 1.08
 Total length of pipe (ft.): 7.00
 Total depth of pipe below existing grade (ft.): 5.92
 Diameter of pipe (in.): 3.00

Average Infiltration Rate = 4.23 inches/hour


Infiltration Test Log DRAFT

Project Name: 440 Malcolm Rd NW, Vienna, VA 22180 Test Date: December 21, 2017
 Project No.: VA17037 Location: 2B-DP

TIME	Depth to Water Level*	Time Increment	Depth Change	Rate	Comments
	inches	hours	inches	inches per hour	
11:04 AM	85.20	0.00	---	---	Start of Hour 1
12:04 PM	94.44	1.00	9.240	9.24	
12:07 PM	85.20	0.00	---	---	Start of Hour 2
1:07 PM	94.80	1.00	9.600	9.60	
1:08 PM	85.20	0.00	---	---	Start of hour 3
2:08 PM	94.80	1.00	9.600	9.60	
2:09 PM	84.96	0.00	---	---	Start of hour 4
3:09 PM	94.80	1.00	9.840	9.84	End of hour 4

Presoaked Water Height (ft.): DRY
 Depth of pipe above existing grade (ft.): 1.00
 Total length of pipe (ft.): 9.00
 Total depth of pipe below existing grade (ft.): 8.00
 Diameter of pipe (in.): 3.00

Average Infiltration Rate = 9.57 inches/hour


Infiltration Test Log DRAFT

Project Name: 440 Malcolm Rd NW, Vienna, VA 22180 Test Date: December 19, 2017
 Project No.: VA17037 Location: 2C-SH

TIME	Depth to Water Level*	Time Increment	Depth Change	Rate	Comments
	inches	hours	inches	inches per hour	
10:46 AM	50.40	0.00	---	---	Start of Hour 1
11:46 AM	54.72	1.00	4.320	4.32	
11:47 AM	50.40	0.00	---	---	Start of Hour 2
12:47 PM	53.76	1.00	3.360	3.36	
12:50 PM	50.40	0.00	---	---	Start of hour 3
1:50 PM	53.28	1.00	2.880	2.88	
1:51 PM	49.92	0.00	---	---	Start of hour 4
2:51 PM	53.16	1.00	3.240	3.24	End of hour 4

Presoaked Water Height (ft.): DRY
 Depth of pipe above existing grade (ft.): 2.00
 Total length of pipe (ft.): 6.00
 Total depth of pipe below existing grade (ft.): 4.00
 Diameter of pipe (in.): 3.00

Average Infiltration Rate = 3.16 inches/hour

** After observed equilibrium at 12:47 PM.

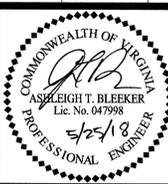

Infiltration Test Log DRAFT

Project Name: 440 Malcolm Rd NW, Vienna, VA 22180 Test Date: December 21, 2017
 Project No.: VA17037 Location: 2C-DP

TIME	Depth to Water Level*	Time Increment	Depth Change	Rate	Comments
	inches	hours	inches	inches per hour	
11:16 AM	62.40	0.00	---	---	Start of Hour 1
12:16 PM	63.48	1.00	1.080	1.08	
12:21 PM	62.40	0.00	---	---	Start of Hour 2
1:21 PM	63.60	1.00	1.200	1.20	
1:22 PM	62.40	0.00	---	---	Start of hour 3
2:22 PM	63.60	1.00	1.200	1.20	
2:24 PM	62.40	0.00	---	---	Start of hour 4
3:24 PM	63.36	1.00	0.960	0.96	End of hour 4

Presoaked Water Height (ft.): 0.46
 Depth of pipe above existing grade (ft.): 1.00
 Total length of pipe (ft.): 7.00
 Total depth of pipe below existing grade (ft.): 6.00
 Diameter of pipe (in.): 3.00

Average Infiltration Rate = 1.11 inches/hour



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POST INFLOW - 1YR HYDROGRAPH
FACILITY '2B'

1

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 5
InFlow_LOT 2-Fac '2B'

Hydrograph type = SCS Runoff	Peak discharge = 0.854 cfs
Storm frequency = 1 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 1,723 cuft
Drainage area = 0.350 ac	Curve number = 85*
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 2.67 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST INFLOW - 2YR HYDROGRAPH
FACILITY '2B'

2

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 5
InFlow_LOT 2-Fac '2B'

Hydrograph type = SCS Runoff	Peak discharge = 1.115 cfs
Storm frequency = 2 yrs	Time to peak = 11.97 hrs
Time interval = 1 min	Hyd. volume = 2,269 cuft
Drainage area = 0.350 ac	Curve number = 85*
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 3.17 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST INFLOW - 10YR HYDROGRAPH
FACILITY '2B'

3

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 5
InFlow_LOT 2-Fac '2B'

Hydrograph type = SCS Runoff	Peak discharge = 2.037 cfs
Storm frequency = 10 yrs	Time to peak = 11.95 hrs
Time interval = 1 min	Hyd. volume = 4,256 cuft
Drainage area = 0.350 ac	Curve number = 85*
Basin Slope = 0.0 %	Hydraulic length = 0 ft
Tc method = User	Time of conc. (Tc) = 5.00 min
Total precip. = 4.87 in	Distribution = Type II
Storm duration = 24 hrs	Shape factor = 484

POST OUTFLOW - 1YR HYDROGRAPH
FACILITY '2B'

1

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 9
INFILT '2B'_Routing

Hydrograph type = Reservoir	Peak discharge = 0.000 cfs
Storm frequency = 1 yrs	Time to peak = 13.00 hrs
Time interval = 1 min	Hyd. volume = 0 cuft
Inflow hyd. No. = 5 - InFlow_LOT 2-Fac '2B'	Max. Elevation = 392.54 ft
Reservoir name = LOT 2-INFILT '2B' LV1	Max. Storage = 980 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

INFILT '2B'_Routing
Hyd. No. 9 -- 1 Year

Total storage used = 980 cuft

POST OUTFLOW - 2YR HYDROGRAPH
FACILITY '2B'

2

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

Hyd. No. 9
INFILT '2B'_Routing

Hydrograph type = Reservoir	Peak discharge = 0.000 cfs
Storm frequency = 2 yrs	Time to peak = 12.25 hrs
Time interval = 1 min	Hyd. volume = 0 cuft
Inflow hyd. No. = 5 - InFlow_LOT 2-Fac '2B'	Max. Elevation = 392.88 ft
Reservoir name = LOT 2-INFILT '2B' LV1	Max. Storage = 1,174 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

INFILT '2B'_Routing
Hyd. No. 9 -- 2 Year

Total storage used = 1,174 cuft

POST OUTFLOW - 10YR HYDROGRAPH
FACILITY '2B'

3

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514
Monday, 03 / 19 / 2018

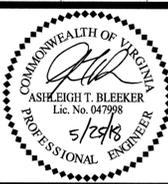
Hyd. No. 9
INFILT '2B'_Routing

Hydrograph type = Reservoir	Peak discharge = 1.540 cfs
Storm frequency = 10 yrs	Time to peak = 12.00 hrs
Time interval = 1 min	Hyd. volume = 1,149 cuft
Inflow hyd. No. = 5 - InFlow_LOT 2-Fac '2B'	Max. Elevation = 393.38 ft
Reservoir name = LOT 2-INFILT '2B' LV1	Max. Storage = 1,563 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

INFILT '2B'_Routing
Hyd. No. 9 -- 10 Year

Total storage used = 1,563 cuft



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PLAN SUBMISSIONS	
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05/25/18	Second Subm.
07/16/18	Third Submission

OTHER PLAN DISTRIBUTIONS

POST INFLOW - 1YR HYDROGRAPH
 FACILITY '2C'

Hydrograph Report			
Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514		Monday, 03 / 19 / 2018	
Hyd. No. 12			
POST_LOT 2-Fac '2C' 1yr			
Hydrograph type	= SCS Runoff	Peak discharge	= 0.789 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 1 min	Hyd. volume	= 1,585 cuft
Drainage area	= 0.420 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

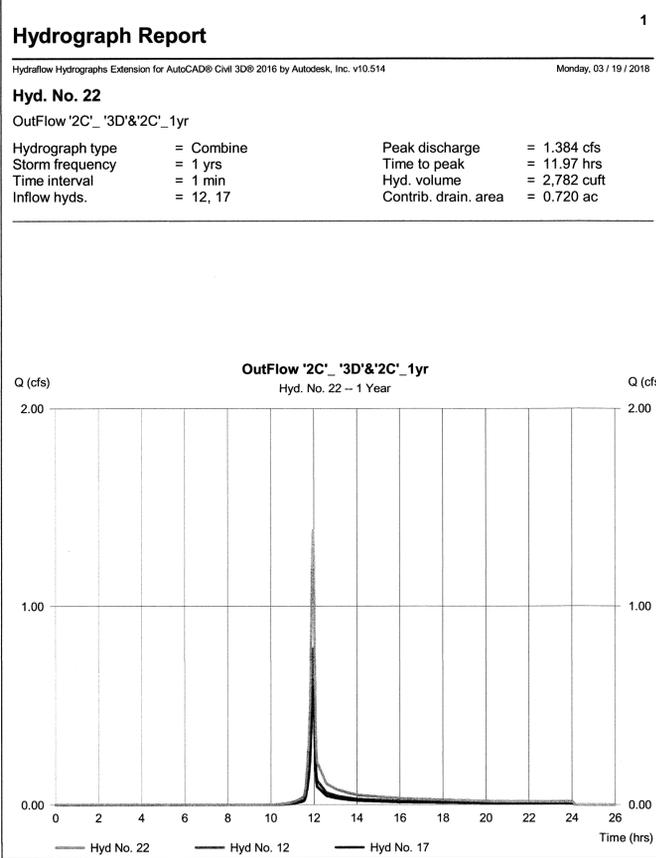
POST INFLOW - 2YR HYDROGRAPH
 FACILITY '2C'

Hydrograph Report			
Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514		Monday, 03 / 19 / 2018	
Hyd. No. 13			
POST_LOT 2-Fac '2C' 2yr			
Hydrograph type	= SCS Runoff	Peak discharge	= 1.079 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 1 min	Hyd. volume	= 2,168 cuft
Drainage area	= 0.420 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.17 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

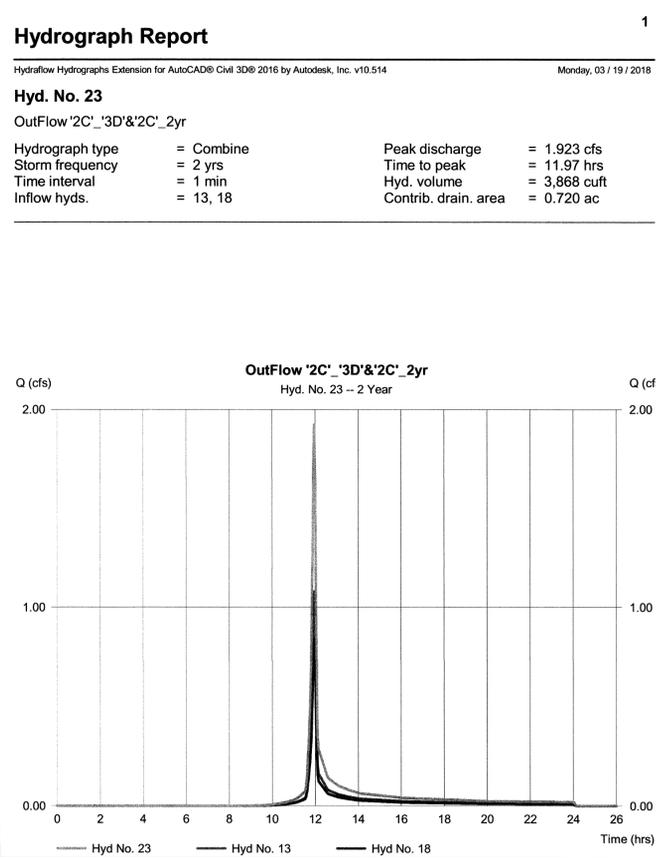
POST INFLOW - 10YR HYDROGRAPH
 FACILITY '2C'

Hydrograph Report			
Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514		Monday, 03 / 19 / 2018	
Hyd. No. 14			
POST_LOT 2-Fac '2C' 10yr			
Hydrograph type	= SCS Runoff	Peak discharge	= 2.199 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.97 hrs
Time interval	= 1 min	Hyd. volume	= 4,514 cuft
Drainage area	= 0.420 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.87 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

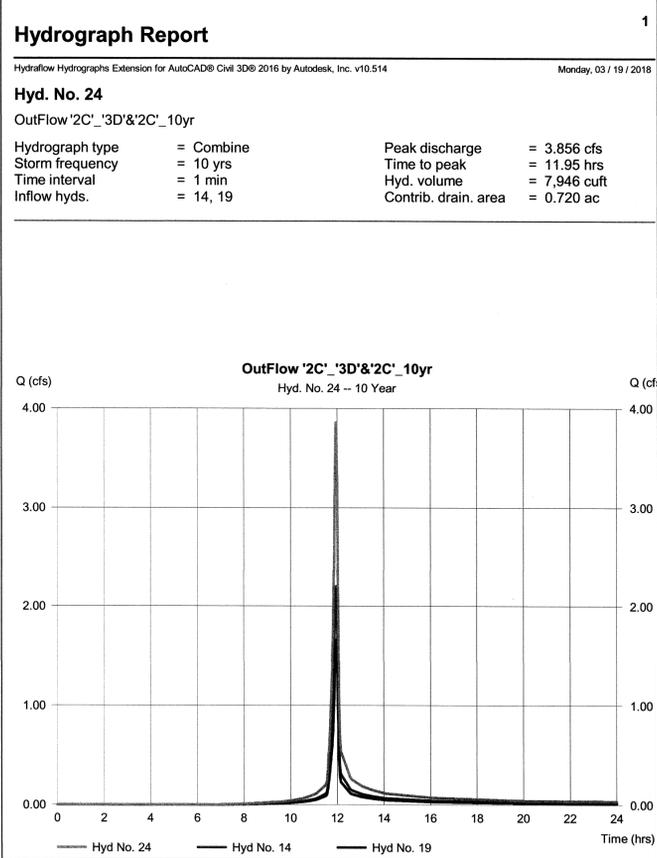
POST OUTFLOW - 1YR HYDROGRAPH
 FACILITY '2C'



POST OUTFLOW - 2YR HYDROGRAPH
 FACILITY '2C'



POST OUTFLOW - 10YR HYDROGRAPH
 FACILITY '2C'



Infiltration Test Log

DRAFT

Project Name: 440 Malcolm Rd NW, Vienna, VA 22180 Test Date: December 19, 2017
Project No.: VA17037 Location: 3D-SH

TIME	Depth to Water Level*	Time Increment	Depth Change	Rate	Comments
	inches	hours	inches	inches per hour	
10:49 AM	63.00	0.00	---	---	Start of Hour 1
11:49 AM	72.60	1.00	9.600	9.60	
11:51 AM	62.64	0.00	---	---	Start of Hour 2
12:51 PM	71.52	1.00	8.880	8.88	
12:54 PM	63.00	0.00	---	---	Start of hour 3
1:54 PM	70.44	1.00	7.440	7.44	
1:56 PM	63.00	0.00	---	---	Start of hour 4
2:56 PM	70.44	1.00	7.440	7.44	End of hour 4

Presoaked Water Height (ft.): DRY
Depth of pipe above existing grade (ft.): 1.67
Total length of pipe (ft.): 7.00
Total depth of pipe below existing grade (ft.): 5.33
Diameter of pipe (in.): 3.00

Average Infiltration Rate** = 7.44 inches/hour

** After observed equilibrium at 1:54 PM.

Infiltration Test Log

DRAFT

Project Name: 440 Malcolm Rd NW, Vienna, VA 22180 Test Date: December 19, 2017
Project No.: VA17037 Location: 3D-DP

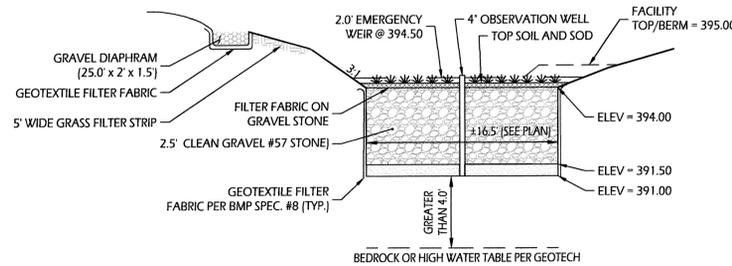
TIME	Depth to Water Level*	Time Increment	Depth Change	Rate	Comments
	inches	hours	inches	inches per hour	
10:52 AM	61.80	0.00	---	---	Start of Hour 1
11:52 AM	71.04	1.00	9.240	9.24	
11:56 AM	61.80	0.00	---	---	Start of Hour 2
12:56 PM	70.44	1.00	8.640	8.64	
12:59 PM	61.80	0.00	---	---	Start of hour 3
1:59 PM	69.72	1.00	7.920	7.92	
2:01 PM	61.80	0.00	---	---	Start of hour 4
3:01 PM	69.60	1.00	7.800	7.80	End of hour 4

Presoaked Water Height (ft.): 0.09
Depth of pipe above existing grade (ft.): 0.83
Total length of pipe (ft.): 7.00
Total depth of pipe below existing grade (ft.): 6.17
Diameter of pipe (in.): 3.00

Average Infiltration Rate** = 7.86 inches/hour

** After observed equilibrium at 1:59 PM.

SMALL SCALE - INFILTRATION TRENCH LEVEL 1 CROSS SECTION 3D - 3D
NOT TO SCALE



NOTE: THE BERM AND OVERFLOW WEIR SHALL BE SODDED AND PEGGED IN ACCORDANCE WITH THE MOST RECENT EDITION OF VESCH.

POST OUTFLOW - 1YR HYDROGRAPH
FACILITY '3D'

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Monday, 03 / 19 / 2018

Hyd. No. 17

POST_LOT 3-Fac '3D'_1yr

Hydrograph type	= SCS Runoff	Peak discharge	= 0.596 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 1 min	Hyd. volume	= 1,196 cuft
Drainage area	= 0.300 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

POST OUTFLOW - 2YR HYDROGRAPH
FACILITY '3D'

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Monday, 03 / 19 / 2018

Hyd. No. 18

POST_LOT 3-Fac '3D'_2yr

Hydrograph type	= SCS Runoff	Peak discharge	= 0.844 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 1 min	Hyd. volume	= 1,700 cuft
Drainage area	= 0.300 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.17 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

POST OUTFLOW - 10YR HYDROGRAPH
FACILITY '3D'

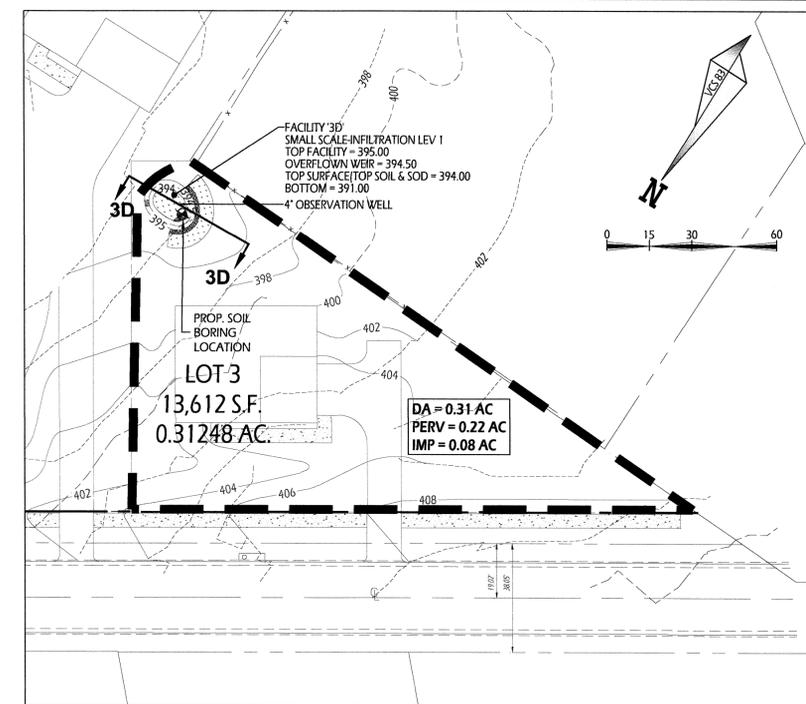
Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Monday, 03 / 19 / 2018

Hyd. No. 19

POST_LOT 3-Fac '3D'_10yr

Hydrograph type	= SCS Runoff	Peak discharge	= 1.659 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.95 hrs
Time interval	= 1 min	Hyd. volume	= 3,433 cuft
Drainage area	= 0.300 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.87 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



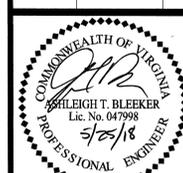
POST-DEVELOPMENT OVERALL DRAINAGE

SCALE: 1" = 30'

INFILTRATION TRENCH DESIGN COMPUTATIONS - LOT 3 FAC 3D

Proposed Infiltration Trench #1, Level:	1	INPUT DATA
On-lot Drainage Area to Trench, CDA =	0.30 acres	13068 SF
Total Impervious Area to Trench =	3485.00 sf	Small-Scale Infiltration
f =	7.44 infiltration rate (in/hr)	
f =	3.72 recommended design infiltration rate (in/hr)	
TvBMP (from VRRM)	469.00 From VRRM	
Tv Multiplier (Lv. 1 vs. Lv 2)	1 x	469.00
Total Req. Stormwater TvBMP =	469.00 CF	If Forebay is Required: N/A
Provided for Tv =	469.00 CF	70 CF (15% STORAGE REQUIRED FOR FOREBAY)
Maximum Depth, d _{max} = (1/2)(f x tv) / (n x 12)		Equation 8.2
d _{max} =	37.2 ft	5 max. depth (Table 8.5)
Proposed Depth, d =	3.00 CF	
Minimum Surface Area, SA = Tv / (n x d + 1/2 f x tv)		n = porosity of stone 0.4 in/hr
SA =	54 SF	
Trench Surface Area Provided, SA =	102 SF at Elevation 394.00 (Sa)	
Minimum Surface Area of Gravel/River Rock = 10Yr Total Q Inflow / Infiltration Rate of Gravel		
Infiltration Rate of Gravel/River Rock =	17,000 cf/day OR 0.19 cfs	(FROM HYDROGRAPHS)
10 Year Total Inflow =	1.66 cfs	
Minimum Surface Area of Gravel/River Rock Required =	8.74 sf	
Provided Surface Area of Gravel/River Rock =	9.00 sf	
Maximum Surface Ponding Below Overflow Weir =	0.50 ft	Ponding Stage Storage
Approx. Volume from Ponding =	66.5 cf	Elevation Area
Volume in Trench =	122.40 cf	394 102
Max Storage Volume (Including Ponding) =	188.90 cf	394.5 164
Outflow rate	Design Inf. Rate (IN/HR) x Trench Area (SF) x 1/12 (FT/IN) x (1/366) SEC/HR	
=	0.009 CFS	
Time for storage to dewater =	Vol _{weir} / (f x S _w)	(VSMH, Minimum Standard 3.10)
=	189 ft ³ / (3.72 in/hr x 102 ft ² x 1/12 ft/in)	
=	6.0 HRS	< 48 HRS OKAY

Final Infiltration Trench Facility Design:	PreTreatments Required: 2 Small-Scale Infiltration
Trench Surface Area:	102.0 sf
Approximate Trench Surface Dimensions:	12' x 16.5'
Trench Surface Elevation:	394.0
Trench Bottom Elevation:	391.0
Water Table / Bed Rock Elevation (From Boring):	None
Bottom is more than 4.0 ft. from water table/bed rock:	Yes
6" Clean Sand Layer (Bottom):	391.0
6" Clean Sand Layer (Top):	391.5
Gravel Storage (Bottom):	391.5
Gravel Storage (Top):	394.0
Primary Surface Treatment:	Sod/Grass
Minimum Required Gravel/River Rock Area on Surface:	9.0 sf
Overflow Weir:	394.5
Weir Length:	2.00 ft.
Berm/Top of Facility:	395.0
Provided: Gravel Diaphragm	
Grass Filter Strip	



PLAN SUBMISSIONS
02/02/18 FIRST SUBMISSION
05/16/18 Second Subm.
07/16/18 Third Submission

OTHER PLAN DISTRIBUTIONS

P:\161-02 Malcom Road NW (Eng)\plans\INFILTRATION TRENCH CONSTRUCTION & MAINTENANCE & CHECKLIST.dwg 05/25/18_1009

7.3. Steep Terrain

Forcing conventional infiltration practices in steep terrain can be problematic with respect to slope stability, excessive hydraulic gradients and sediment delivery. Unless slope stability calculations demonstrate otherwise, it is generally recommended that infiltration practices should be located a minimum horizontal distance of 200 feet from down-gradient slopes greater than 20%. Micro-scale and small-scale infiltration can work well, as long as their smaller up-gradient and down-gradient building setbacks are satisfied.

7.4. Cold Climate and Winter Performance

Infiltration practices can be designed to withstand more moderate winter conditions. The main problem is caused by ice forming in the voids or the subsoils below the practice, which may briefly result in nuisance flooding when spring melting occurs. The following design adjustments are recommended for infiltration practices installed in higher elevations:

- The bottom of the practice should extend below the frost line.
- Infiltration practices are not recommended at roadside locations that are heavily sanded and/or salted in the winter months (to prevent movement of chlorides into groundwater and prevent clogging by road sand).
- Pre-treatment measures can be oversized to account for the additional sediment load caused by road sanding (up to 40% of the *T_v*).
- Infiltration practices must be set back at least 25 feet from roadways to prevent potential frost heaving of the road pavement.

7.5. Linear Highway Sites

Infiltration practices can work well for linear highway projects, where soils are suitable and can be protected from heavy disturbance and compaction during road construction operations.

SECTION 8: CONSTRUCTION

8.1. Construction Sequence

The following is a typical construction sequence to properly install infiltration practices. The sequence may need to be modified to reflect the scale of infiltration, site conditions, and whether or not an underdrain needs to be installed.

Infiltration practices are particularly vulnerable to failure during the construction phase for two reasons. First, if the construction sequence is not followed correctly, construction sediment can clog the practice. In addition, heavy construction can result in compaction of the soil, which can then reduce the soil's infiltration rate. For this reason, a careful construction sequence needs to be followed. Ideally, the infiltration practice should be outside the limits of disturbance.

- During site construction, the following steps are absolutely critical:
- Avoid excessive compaction by delineating the area of the proposed practice and preventing construction equipment and vehicles from traveling over the proposed location.

- Keep the infiltration practice "off-line" until construction is complete. Prevent sediment from entering the infiltration site by using super silt fence, diversion berms or other means. In the erosion and sediment (E&S) control plan, indicate the earliest time at which stormwater runoff may be directed to a conventional infiltration basin. The E&S control plan must also indicate the specific methods to be used to temporarily keep runoff from the infiltration site.
- Infiltration practice sites should never serve as the sites for temporary sediment control devices (e.g., sediment traps, etc.) during construction.
- Upland drainage areas need to be completely stabilized with a thick layer of vegetation prior to commencing excavation for an infiltration practice, as verified by the local erosion and sediment control inspector/program.

8.2. Installation

The actual installation of an infiltration practice is done using the following steps:

1. Excavate the infiltration practice to the design dimensions *from the side*, using a backhoe or excavator. The floor of the pit should be completely level, but equipment should be kept off the floor area to prevent soil compaction.
2. Correctly install filter fabric on the trench sides. Large tree roots should be trimmed flush with the sides of infiltration trenches to prevent puncturing or tearing of the filter fabric during subsequent installation procedures. When laying out the geotextile, the width should include sufficient material to compensate for perimeter irregularities in the trench and for a 6-inch minimum overlap at the top of the trench. The filter fabric itself should be tucked under the sand layer on the bottom of the infiltration trench. Stones or other anchoring objects should be placed on the fabric at the trench sides, to keep the trench open during windy periods. Voids may occur between the fabric and the excavated sides of a trench. Natural soils should be placed in all voids, to ensure the fabric conforms smoothly to the sides of excavation.
3. Scarify the bottom of the infiltration practice, and spread 6 inches of sand on the bottom as a filter layer.
4. Anchor the observation well(s), and add stone to the practice in 1-foot lifts.
5. Use sod to establish a dense turf cover for at least 10 feet on each side of the infiltration practice to reduce erosion and sloughing. If the vegetation is seeded instead, use native grasses primarily due to their adaptability to local climates and soil conditions.

8.3. Construction Inspection

Inspections are needed during and immediately after construction to ensure that the infiltration practice is built in accordance with the approved design and this specification. Qualified individuals should use detailed inspection checklists to include sign-offs at critical stages of construction, to ensure that the contractor's interpretation of the plan is consistent with the designer's intentions. An example construction phase inspection checklist for Infiltration practices

is provided at the end of this specification. Inspection during the following key points during construction will help insure successful performance:

- Check elevations of the excavation invert. Ensure that the soil at the bottom of the infiltration facility has not been smeared by the excavation equipment. The bottom soil should be scarified with the teeth of the backhoe bucket.
- Installation of the bottom 6-inch sand filter layer and the initial layer of stone prior to placement of any storage components.
- Top cover of pea gravel or turf as required on plans.
- Stabilization of adjacent pre-treatment filter strips and the contributing drainage area prior to bringing infiltration area into service.

Upon final inspection and acceptance, the GPS coordinates should be logged for all infiltration practices and submitted for entry into the local BMP maintenance tracking database.

SECTION 9: MAINTENANCE

9.1. Maintenance Agreements

The Virginia Stormwater Management regulations specify the circumstances under which a maintenance agreement must be executed between the owner and the VSMP Authority and sets forth inspection requirements, compliance procedures if maintenance is neglected, notification of the local program upon transfer of ownership, and right-of-entry for local program personnel.

- When micro-scale or small-scale infiltration practices are installed on private residential lots, homeowners will need to (1) be educated about their routine maintenance needs, (2) understand the long-term maintenance plan, and (3) be subject to a deed restriction, drainage easement or other mechanism enforceable by the VSMP Authority to ensure that infiltrating areas are not converted or disturbed.
- The mechanism should, if possible, grant authority for local agencies to access the property for inspection or corrective action.

9.2. Maintenance Inspections

Annual site inspections are critical to the performance and longevity of infiltration practices, particularly for small-scale and conventional infiltration practices. Maintenance of infiltration practices is driven by annual inspections that evaluate the condition and performance of the practices, including the following:

- The drawdown rate should be measured at the observation well for three days following a storm event in excess of 1/2 inch in depth. If standing water is still observed in the well after three days, this is a clear sign that that clogging is a problem.
- Check inlets, pre-treatment cells, and any flow diversion structures for sediment buildup and structural damage. Note if any sediment needs to be removed.
- Inspect the condition of the observation well and make sure it is still capped.
- Check that no vegetation forms an overhead canopy that may drop leaf litter, fruits and other vegetative materials that could clog the infiltration device.

- Evaluate the vegetative quality of the adjacent grass buffer and perform spot-reseeding if the cover density is less than 90%.
- Generally inspect the upland contributing drainage area for any controllable sources of sediment or erosion.
- Look for weedy growth on the stone surface that might indicate sediment deposition or clogging.
- Inspect maintenance access to ensure it is free of woody vegetation, and check to see whether valves, manholes and/or locks can be opened and operated.
- Inspect internal and external infiltration side slopes for evidence of sparse vegetative cover, erosion or slumping, and make necessary repairs immediately.

Based on inspection results, specific maintenance tasks will be triggered. Example maintenance inspection checklists for infiltration practices can be accessed in Appendix C of Chapter 9 of the *Virginia Stormwater Management Handbook* (2010)

9.3. Ongoing Maintenance

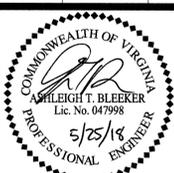
Effective long-term operation of infiltration practices requires a dedicated and routine maintenance inspection schedule with clear guidelines and schedules, as shown in **Table 8.9** below. Where possible, facility maintenance should be integrated into routine landscaping maintenance tasks.

Table 8.9. Typical Maintenance Activities for Infiltration Practices

Maintenance Activity	Schedule
<ul style="list-style-type: none"> • Replace pea gravel/topsoil and top surface filter fabric (when clogged). • Mow vegetated filter strips as necessary and remove the clippings. 	As needed
<ul style="list-style-type: none"> • Ensure that the contributing drainage area, inlets, and facility surface are clear of debris. • Ensure that the contributing drainage area is stabilized. • Remove sediment and oil/grease from pre-treatment devices, as well as from overflow structures. • Repair undercut and eroded areas at inflow and outflow structures. 	Quarterly
<ul style="list-style-type: none"> • Check observation wells 3 days after a storm event in excess of 1/2 inch in depth. Standing water observed in the well after three days is a clear indication of clogging. • Inspect pre-treatment devices and diversion structures for sediment build-up and structural damage. • Remove trees that start to grow in the vicinity of the infiltration facility. 	Semi-annual inspection
<ul style="list-style-type: none"> • Clean out accumulated sediments from the pre-treatment cell. 	Annually

SMITH ENGINEERING

INFILTRATION TRENCH CONSTRUCTION & MAINTENANCE & CHECKLIST
MALCOLM ROAD SUBDIVISION
FINAL PLAN
HUNTER MILL DISTRICT, TOWN OF VIENNA, FAIRFAX COUNTY, VIRGINIA



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PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/18/18	Second Subm
07/11/18	Third Submission

OTHER PLAN DISTRIBUTIONS

LANDSCAPING SPECIFICATIONS VEGETATION PROTECTION TREE AND SHRUB PLANTING MATERIALS

1. THE PERMITTEE SHALL PROTECT THE ABOVE AND BELOW-GROUND PORTIONS OF ALL VEGETATION SHOWN ON THE APPROVED PLAN TO BE PRESERVED WITHIN AND CONTIGUOUS TO THE SITE. AFTER VEGETATION HAS BEEN REMOVED WITHIN THE AREA AUTHORIZED TO BE CLEARED UNDER THE PHASE I EROSION AND SEDIMENT CONTROL PLAN, PROTECTIVE DEVICES SHALL BE INSTALLED IMMEDIATELY.
2. ALONG ALL LIMITS OF CLEARING & GRADING ADJACENT TO AREAS OF VEGETATION TO BE PRESERVED, A DEVICE SHALL BE USED WHICH EFFECTIVELY PROTECTS THE ABOVE AND BELOW-GROUND PORTIONS OF THE TREES AND OTHER VEGETATION TO BE PRESERVED. THE DEVICE(S) USED SHALL BE IN CONFORMANCE WITH THE APPROVED PLANS AND ALL CONSTRUCTION PERSONNEL SHALL BE INSTRUCTED TO HONOR THESE DEVICES. THE PROTECTION DEVICES DESCRIBED BELOW ARE PROVIDED AS SUGGESTIONS ONLY.
3. BARRIER FENCE, ORANGE PLASTIC FENCE, WELDED WIRE FENCE, CHAIN LINK FENCE, BOARD FENCE, OR CHICKEN WIRE FENCE MAY BE USED WHEN PLACED WITHIN THE DISTURBED AREA AT THE LIMITS OF CLEARING AND GRADING AND ERECTED AT A HEIGHT OF 4'. THE FENCING MATERIAL SHALL BE MOUNTED ON 6' TALL STEEL POSTS DRIVEN 1.5' INTO THE GROUND AND PLACED A MAXIMUM OF 6' APART, EXCEPT FOR WELDED WIRE FENCE AND CHAIN LINK FENCE WHERE STEEL POSTS MAY BE PLACED A MAXIMUM OF 10' APART. WHEN BOARD FENCING IS USED IT SHALL BE MOUNTED ON 6' TALL WOODEN STAKES DRIVEN 1.5' INTO THE GROUND AND PLACED A MAXIMUM OF 6' APART.
4. FILTER FABRIC FENCE, SILT FENCE, OR SUPER SILT FENCE MAY BE USED FOR TREE PROTECTION WHEN PLACED AT THE LIMITS OF GRADING AND CONSTRUCTED AS SPECIFIED IN THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK.
5. A TEMPORARY PERIMETER DIKE WHICH HAS BEEN CONSTRUCTED FOR EROSION AND SEDIMENT CONTROL MAY DOUBLE AS A PROTECTIVE DEVICE FOR VEGETATION PRESERVED. THE DIKE SHALL BE LOOSELY CONSTRUCTED AS SPECIFIED IN THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK AND SHALL BE CONSTRUCTED ENTIRELY WITHIN THE DISTURBED AREA. IF THE DIKE IS REMOVED BEFORE THE CONSTRUCTION IS COMPLETED, THE INSTALLATION OF SUBSTITUTE TREE PROTECTION AND/OR EROSION AND SEDIMENT CONTROL DEVICES IS REQUIRED.

TREE AND SHRUB PLANTING MATERIALS

1. ALL TREE AND SHRUB SIZES SHALL MEET THE STANDARDS SPECIFIED IN THE AMERICAN ASSOCIATION OF NURSERYMEN'S AMERICAN STANDARD FOR NURSERY STOCK.
2. THE USE OF SUBSTITUTIONS SHALL NOT RESULT IN EXCEEDING THE GENUS AND SPECIES LIMITS TO CURTAIL THE SPREAD OF DISEASE OR INSECT INFESTATION IN A PLANT SPECIES. NO MORE THAN 70% OF THE TREES PLANTED ON SITE ARE TO BE OF ONE GENUS.
3. TREES AND SHRUBS SHALL BE NURSERY GROWN UNLESS OTHERWISE APPROVED AND SHALL BE HEALTHY AND VIGOROUS, FREE FROM DEFECTS, DECAY, DISFIGURING ROOTS, SUN-SCALD, INJURIES, ABRASIONS, DISEASES, INSECT PESTS, AND ALL FORMS OF INFESTATIONS OR OBJECTIONABLE DISFIGUREMENTS AS DETERMINED BY THE DIRECTOR. PLANTS SHALL BE IN CONFORMANCE WITH AMERICAN STANDARD FOR NURSERY STOCK.
4. BALLED AND BURLAPPED TREES AND SHRUBS SHALL BE DUG USING STANDARD SIZES WITH FIRM, NATURAL BALLS OF EARTH AND SECURELY WRAPPED IN ACCORDANCE WITH AMERICAN STANDARD FOR NURSERY STOCK.
5. BARE ROOT TREES AND SHRUBS SHALL BE DUG WITH ADEQUATE FIBROUS ROOTS WHICH SHALL BE PROTECTED DURING HANDLING AND PLANTING TO GUARANTEE AGAINST DRYING AND ROOT DAMAGE. CONTAINER GROWN STOCK SHALL HAVE GROWN IN A CONTAINER LONG ENOUGH FOR THE ROOT SYSTEM TO HOLD ITS SOIL TOGETHER.

DELIVERY AND TEMPORARY STORAGE

1. PLANTS SHALL BE PROTECTED DURING DELIVERY TO PREVENT DESICCATION OF LEAVES.
2. TREES AND SHRUBS SHOULD BE PLANTED ON DAY OF DELIVERY. IF THIS IS NOT POSSIBLE, THE CONTRACTOR SHALL PROTECT UNPLANTED PLANTS BY KEEPING THEM IN SHADE, WATERED, AND PROTECTED WITH SOIL MULCH, OR OTHER ACCEPTABLE MATERIAL.
3. TREES AND SHRUBS SHALL NOT REMAIN UNPLANTED FOR MORE THAN TWO WEEKS.

PLANTING OF NURSERY STOCK

1. ALL TREES AND SHRUBS SHALL BE PLANTED AS SPECIFIED IN THE LATEST EDITION OF "LANDSCAPE SPECIFICATION GUIDELINES FOR BALTIMORE-WASHINGTON METROPOLITAN AREA," PREPARED BY THE LANDSCAPE CONTRACTORS ASSOCIATION OF METROPOLITAN WASHINGTON AND AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS.
2. IF PLANTING IN AREAS THAT HAVE BEEN PREVIOUSLY COMPACTED, THE SOIL SHALL BE PROPERLY PREPARED (TILLED AND AMENDED AS NEEDED BASED ON SOIL SAMPLES) TO A DEPTH OF 2', PRIOR TO INSTALLATION OF LANDSCAPE MATERIAL. SOIL WITHIN INDIVIDUAL PLANTING HOLES SHALL NOT BE AMENDED.
3. THE STAKING AND GUYING OF TREES IS NOT REQUIRED EXCEPT PLANTING IN WINDY LOCATIONS, ON STEEP SLOPES, OR WHERE VANDALISM MAY BE A CONCERN. ALL STAKES AND GUY'S MUST BE REMOVED WITHIN SIX MONTHS OF PLANT INSTALLATION.
4. ALL TREES AND SHRUBS SHALL BE MULCHED AFTER PLANTING, TO A MINIMUM DEPTH OF 2", BUT NO MORE THAN 3", WITH AN APPROPRIATE MULCH SUCH AS PINE BARK, PINE NEEDLES, WOOD CHIPS, OR SHREDDED BARK. MULCH SHALL COVER THE ENTIRE ROOT AREA AND SAUCER; HOWEVER, MULCH SHALL NOT TOUCH THE TRUNK.
5. TOPSOIL MIXTURE SHALL BE TWO PARTS EXISTING TOPSOIL MIXED EVENLY WITH ONE PART SPHAGNUM PEAT MOSS OR PEAT HUMUS. EXISTING TOPSOIL SHALL BE FREE OF STONES, LUMPS, PLANTS, ROOTS AND OTHER DEBRIS OVER 1-1/2 INCHES. IT SHALL NOT CONTAIN TOXIC SUBSTANCES HARMFUL TO PLANT GROWTH. TOPSOIL SHALL HAVE A PH RANGE OF 5.0 TO 7.0.
6. PLANTING PROCEDURES FOR TREES AND SHRUBS:
 - A. PLANTING SHALL OCCUR IN ACCORDANCE WITH ALL DETAILS.
 - B. TREES AND SHRUBS SHALL BE PLACED IN THE PLANTING PIT, BY LIFTING FROM THE BALL (NEVER FROM THE BRANCHES OR TRUNK). ALL PLANT MATERIAL SHALL BE PLANTED IN A STRAIGHT POSITION WITHIN THE PLANTING PIT WITH THE MOST DESIRABLE SIDE PLACED TOWARDS THE PROMINENT VIEW (SIDEWALK, STREET, ETC.).
 - C. THE TREE OR SHRUB PIT SHALL BE BACKFILLED WITH A SOIL MIXTURE AS PER #5 OF THESE SPECIFICATIONS. THE PIT SHALL BE FILLED HALFWAY INITIALLY AND TAMPED FIRMLY. ALL ROPES, WIRES, ETC. ON THE ROOT BALL SHALL BE CUT AND THE BURLAP OR BALL WRAP PULLED BACK TO THE EDGE OF THE ROOT BALL. COMPLETE BACKFILLING THE PLANT PIT AND TAMP FIRMLY. BACKFILL SOILS SHALL NOT COVER THE TOP OF THE ROOT BALL AND SAUCER WITH A MINIMUM OF 3" SHREDDED HARDWOOD OR PINE BARK MULCH. WATER THOROUGHLY OR UNTIL PLANT PIT IS FILLED WITHIN ONE HOUR OF PLANTING.

FINAL ACCEPTANCE AND WARRANTY PER AGREEMENT BETWEEN OWNER AND CONTRACTOR.

PLANTING OF TRANSPLANTED TREES AND SHRUBS

1. TREES TO BE TRANSPLANTED SHALL BE FULL AND HEALTHY WITHOUT ANY SIGNIFICANT DEFECTS AND SHOULD BE ABLE TO OVERCOME ROOT DISTURBANCE. THE PROPOSED TRANSPLANT LOCATION(S) SHALL APPROXIMATE THE ENVIRONMENTAL TOLERANCES THE SPECIES IS ABLE TO WITHSTAND.
2. RELOCATING DECIDUOUS TREES IS BEST CARRIED OUT IN LATE FALL OR EARLY SPRING. RELOCATING EVERGREEN TREES IS BEST CARRIED OUT IN THE EARLY SPRING.
3. TREES TO BE TRANSPLANTED SHALL BE CROWN CLEANED AND WATERED HEAVILY BEFORE LIFTING. IMMEDIATELY AFTER PLANTING, THE TREE SHALL BE WELL WATERED AND TOP DRESSED WITH 2 - 3" OF MULCH. SOIL MOISTURE LEVELS SHALL BE CHECKED AT LEAST EVERY TWO WEEKS AND TREES SHALL BE WATERED IF NECESSARY.
4. TREES TO BE TRANSPLANTED SHOULD BE PLACED IN THEIR PERMANENT LOCATIONS IMMEDIATELY. IF THIS IS NOT POSSIBLE, ROOT BALLS OF LIFTED BALLED AND BURLAPPED TREES SHOULD BE PLACED IN A STORAGE AREA IN TEMPORARY TRENCHES DUG DEEP ENOUGH TO ENTIRELY SURROUND THE ROOT BALL, OR ENCASED IN A MINIMUM OF 12" OF COMPOSTED MULCH. ROOT BALLS OF TREES LIFTED WITH A TREE SPADE SHALL BE PLACED IN TEMPORARY STORAGE HOLES THAT ARE CREATED WITH THE SAME SIZE TREE SPADE. THE STORAGE AREA SHALL BE WELL PROTECTED FROM CONSTRUCTION EQUIPMENT AND PERSONNEL, LOCATED IN A SHADY ENVIRONMENT, AND HAVE A WATER SOURCE NEARBY. SOIL MOISTURE LEVELS SHALL BE CHECKED AT LEAST EVERY TWO WEEKS AND TREES SHALL BE WATERED IF NECESSARY.

PRUNING

1. ALL PRUNING SHALL BE DONE IN ACCORDANCE WITH THE AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) A300-1995 PRUNING STANDARDS.
2. CUTS AND WOUNDS SHALL NOT BE TREATED WITH TREE WOUND DRESSING UNLESS APPROVED BY THE COUNTY.
3. CLIMBING OR TREE SPIKES SHALL NOT BE USED TO CLIMB LIVE TREES UNLESS THE TREE IS BEING REMOVED.
4. IF THE SOIL HAS BECOME COMPACTED OVER THE ROOT ZONE OF ANY TREE, THE GROUND SHALL BE AERATED BY VERTICAL MULCHING. THIS TREATMENT IS ACCOMPLISHED BY DRILLING 1" TO 2" DIAMETER HOLES IN THE GROUND TO A DEPTH OF 1', AND FILLING THE HOLES WITH COMMERCIALY AVAILABLE ORGANIC MATTER PRODUCTS, HUMUS, COMPOSTED MANURE OR OTHER COMPOSTED PRODUCTS. THIS PROCEDURE SHALL BE REPEATED EVERY 18" TO 24"

NEWLY PLANTED VEGETATION

1. ANY VEGETATION REQUIRED BY THE CONSERVATION PLAN OR THE COUNTY, WHICH IN THE OPINION OF THE INSPECTOR IS DEAD OR IS NOT HEALTHY, SHALL BE REPLACED BY THE CONTRACTOR.
2. TREES SHALL BE RESTAKED BY THE CONTRACTOR IF NECESSARY. ALL STAKES AND SUPPORTING WIRES SHALL BE REMOVED WITHIN ONE YEAR OF PLANTING.

SEEDING SPECIFICATIONS

- I. SEEDING
ALL SEEDING SHALL BE PERFORMED PER SEEDING CHART. NO SEEDING SHALL BE DONE ON FROZEN GROUND OR WHEN TEMPERATURE IS 32 DEGREES FAHRENHEIT OR LOWER.
- II. MULCHING
FOLLOWING SEEDING, APPLY A ONE INCH LAYER OF STRAW TO HASTEN GERMINATION. STRAW MULCH SHALL BE ANCHORED BY EITHER A MULCH TILLER, ASPHALT EMULSION, CHEMICAL MULCH BINDER, TWINE OR NETTING.
- III. FINAL ACCEPTANCE
FINAL ACCEPTANCE AND WARRANTY PER AGREEMENT BETWEEN OWNER AND CONTRACTOR.

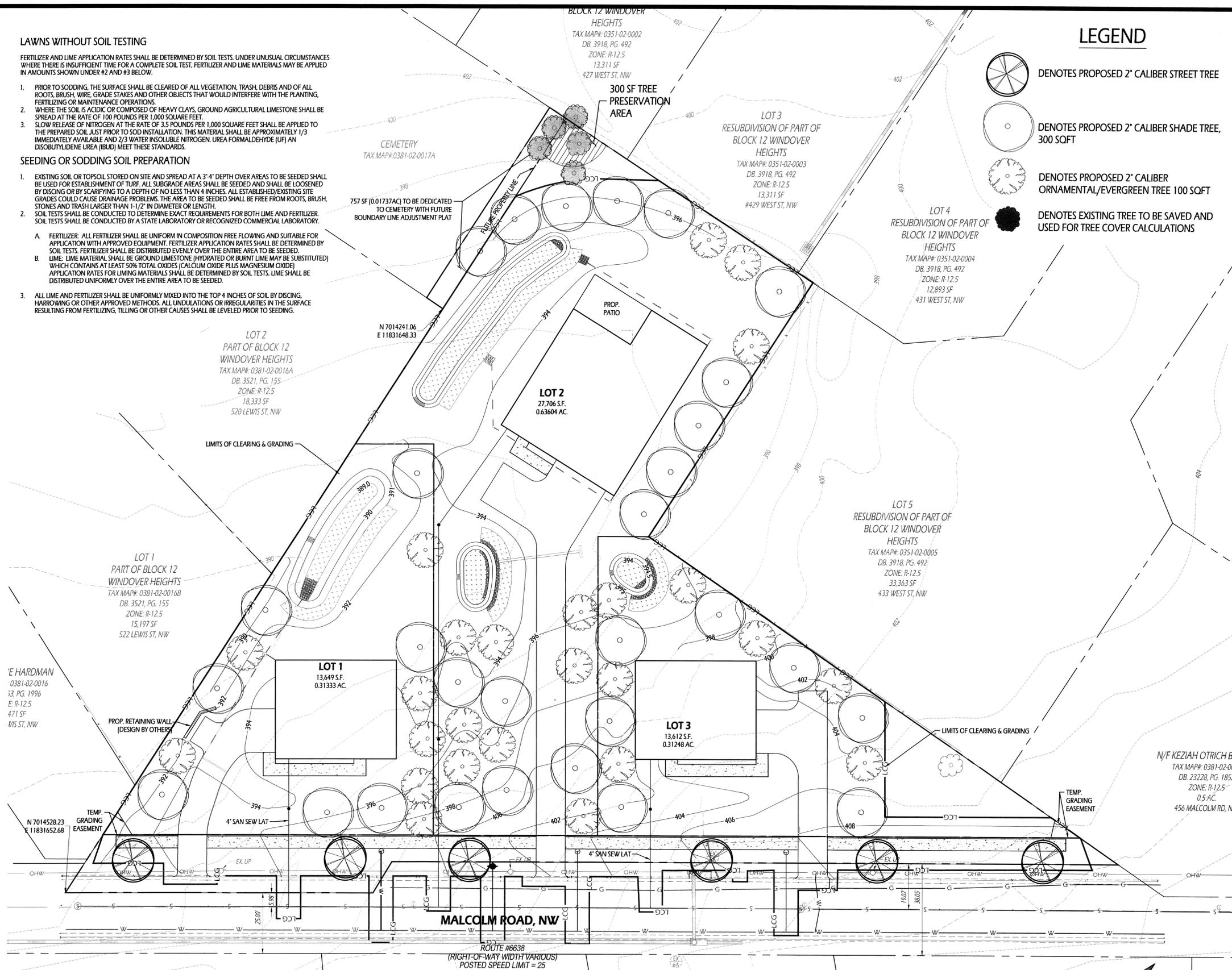
LAWNS WITHOUT SOIL TESTING

FERTILIZER AND LIME APPLICATION RATES SHALL BE DETERMINED BY SOIL TESTS. UNDER UNUSUAL CIRCUMSTANCES WHERE THERE IS INSUFFICIENT TIME FOR A COMPLETE SOIL TEST, FERTILIZER AND LIME MATERIALS MAY BE APPLIED IN AMOUNTS SHOWN UNDER #2 AND #3 BELOW.

1. PRIOR TO SODDING, THE SURFACE SHALL BE CLEARED OF ALL VEGETATION, TRASH, DEBRIS AND OF ALL ROOTS, BRUSH, WIRE, GRADE STAKES AND OTHER OBJECTS THAT WOULD INTERFERE WITH THE PLANTING, FERTILIZING OR MAINTENANCE OPERATIONS.
2. WHERE THE SOIL IS ACIDIC OR COMPOSED OF HEAVY CLAYS, GROUND AGRICULTURAL LIMESTONE SHALL BE SPREAD AT THE RATE OF 100 POUNDS PER 1,000 SQUARE FEET.
3. SLOW RELEASE OF NITROGEN AT THE RATE OF 3.5 POUNDS PER 1,000 SQUARE FEET SHALL BE APPLIED TO THE PREPARED SOIL JUST PRIOR TO SOD INSTALLATION. THIS MATERIAL SHALL BE APPROXIMATELY 1/3 IMMEDIATELY AVAILABLE AND 2/3 WATER INSOLUBLE NITROGEN. UREA FORMALDEHYDE (UF) AN DISOBUTYLEDNE UREA (IBUD) MEET THESE STANDARDS.

SEEDING OR SODDING SOIL PREPARATION

- A. FERTILIZER SHALL BE UNIFORM IN COMPOSITION FREE FLOWING AND SUITABLE FOR APPLICATION WITH APPROVED EQUIPMENT. FERTILIZER APPLICATION RATES SHALL BE DETERMINED BY SOIL TESTS. FERTILIZER SHALL BE DISTRIBUTED EVENLY OVER THE ENTIRE AREA TO BE SEEDDED.
 - B. LIME: LIME MATERIAL SHALL BE GROUND LIMESTONE (HYDRATED OR BURNT LIME MAY BE SUBSTITUTED) WHICH CONTAINS AT LEAST 50% TOTAL OXIDES (CALCIUM OXIDE PLUS MAGNESIUM OXIDE). APPLICATION RATES FOR LIMING MATERIALS SHALL BE DETERMINED BY SOIL TESTS. LIME SHALL BE DISTRIBUTED UNIFORMLY OVER THE ENTIRE AREA TO BE SEEDDED.
3. ALL LIME AND FERTILIZER SHALL BE UNIFORMLY MIXED INTO THE TOP 4 INCHES OF SOIL BY DISCING, HARROWING OR OTHER APPROVED METHODS. ALL UNDULATIONS OR IRREGULARITIES IN THE SURFACE RESULTING FROM FERTILIZING, TILLING OR OTHER CAUSES SHALL BE LEVELED PRIOR TO SEEDING.



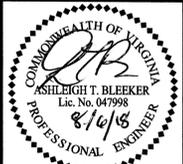
LEGEND

-  DENOTES PROPOSED 2" CALIBER STREET TREE
-  DENOTES PROPOSED 2" CALIBER SHADE TREE, 300 SQFT
-  DENOTES PROPOSED 2" CALIBER ORNAMENTAL/EVERGREEN TREE 100 SQFT
-  DENOTES EXISTING TREE TO BE SAVED AND USED FOR TREE COVER CALCULATIONS

SMITH ENGINEERING

LANDSCAPING PLAN
MALCOLM ROAD SUBDIVISION
FINAL PLAT

HUNTER HILL DISTRICT, TOWN OF VIENNA, FAIRFAX COUNTY, VIRGINIA



SMITH ENGINEERING
14901 BOGLE DRIVE SUITE 202
CHANTILLY, VA 20151
PHONE: 703-956-6204
PROJECT: 161-02
PROJECT MANAGER:
ASHLEIGH T. BLEEKER
Ashleigh@SMITH-EngineeringVA.com

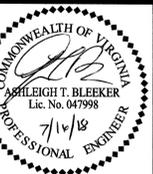
PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/25/18	SECOND SUBMISSION
07/16/18	THIRD SUBMISSION

OTHER PLAN DISTRIBUTIONS

SCALE: 1" = 20'
DATE: JANUARY 18, 2018
SHEET 27 OF 30

THIS SHEET FOR LANDSCAPING PURPOSES ONLY!!!

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PLAN SUBMISSIONS	
02/02/18	FIRST SUBMISSION
05/25/18	SECOND SUBMISSION
07/16/18	THIRD SUBMISSION

OTHER PLAN DISTRIBUTIONS

LOT 1 PLANTING LIST							
	BOTANICAL NAME	COMMON NAME	QTY.	STOCK SIZE (HEIGHT / CALIPER)	TREE COVER CREDIT (SF)	TREE CANOPY SUBTOTAL (SF)	REMARKS
	SHADE TREES	Quercus rubra Acer Rubrum Quercus phellos	7	2.0" CALIPER	300	2,100	Upon installation the owner may chose the exact number and placement of the various species listed
	ORNAMENTAL/ EVERGREEN TREES	Chionanthus virginicus Cercis canadensis Amelanchier arborea	7	2.0" CALIPER	100	700	
	STREET TREES	Ulmus Americana Platanus x acerifolia Fagus grandifolia	2	2.0" CALIPER	N/A	N/A	
Total 20-YEAR CANOPY PROVIDED						2,800 SF	

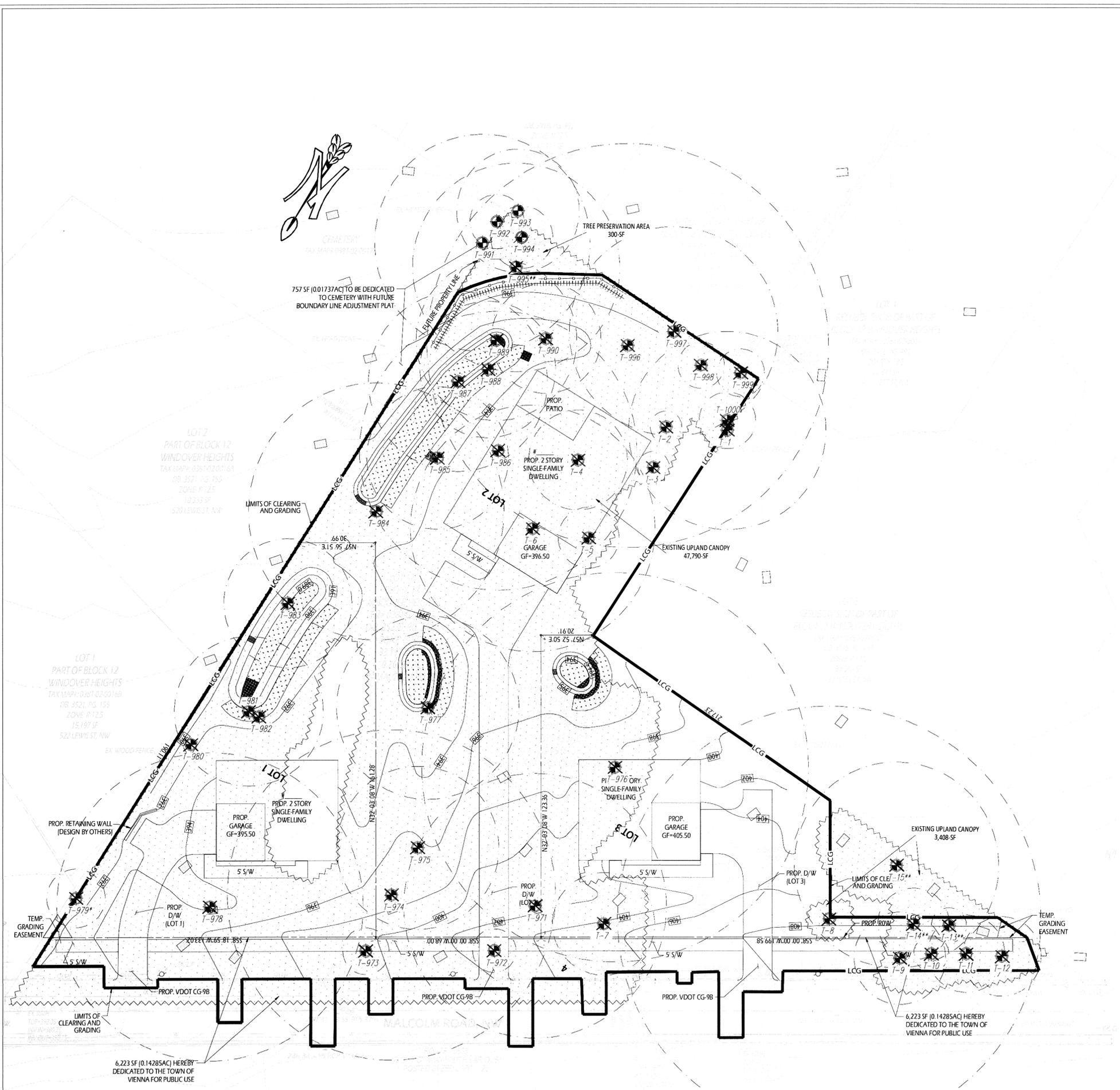
SCHEDULE LOT 1 TREE COVER CALCULATIONS			
Tree Cover Required:			
Gross site area:	13,649 SF		
Existing ROW:	(+/-) 0 SF		
Percent of tree cover required:	20%		
Total area of tree cover required:	2730 SF		
Tree Cover Provided:			
Tree cover from landscaping:	2,800 SF		
Tree cover from preservation:	0 SF		
Total tree cover provided:	2,800 SF	Required 2730 SF	Requirement met? YES

LOT 2 PLANTING LIST							
	BOTANICAL NAME	COMMON NAME	QTY.	STOCK SIZE (HEIGHT / CALIPER)	TREE COVER CREDIT (SF)	TREE CANOPY SUBTOTAL (SF)	REMARKS
	SHADE TREES	Quercus rubra Acer Rubrum Quercus phellos Acer saccharum	15	2.0" CALIPER	300	4,500	Upon installation the owner may chose the exact number and placement of the various species listed
	ORNAMENTAL/ EVERGREEN TREES	Chionanthus virginicus Cercis canadensis Amelanchier arborea Magnolia virginiana	11	2.0" CALIPER	100	1,100	
	STREET TREES	Ulmus Americana Platanus x acerifolia Liquidambar styraciflua	1	2.0" CALIPER	N/A	N/A	
Total 20-YEAR CANOPY PROVIDED						5,600 SF	

SCHEDULE LOT 2 TREE COVER CALCULATIONS			
Tree Cover Required:			
Gross site area:	27,706 SF		
Existing ROW:	(+/-) 0 SF		
Percent of tree cover required:	20.0%		
Total area of tree cover required:	5541 SF		
Tree Cover Provided:			
Tree cover from landscaping:	5,600 SF		
Tree cover from preservation:	375 SF		
Total tree cover provided:	5,975 SF	Required 5541 SF	Requirement met? YES

LOT 3 PLANTING LIST							
	BOTANICAL NAME	COMMON NAME	QTY.	STOCK SIZE (HEIGHT / CALIPER)	TREE COVER CREDIT (SF)	TREE CANOPY SUBTOTAL (SF)	REMARKS
	SHADE TREES	Quercus rubra Acer Rubrum Quercus phellos	7	2.0" CALIPER	300	2,100	Upon installation the owner may chose the exact number and placement of the various species listed
	ORNAMENTAL/ EVERGREEN TREES	Chionanthus virginicus Cercis canadensis Amelanchier arborea	7	2.0" CALIPER	100	700	
	STREET TREES	Ulmus Americana Platanus x acerifolia Fagus grandifolia	3	2.0" CALIPER	N/A	N/A	
Total 20-YEAR CANOPY PROVIDED						2,800 SF	

SCHEDULE LOT 3 TREE COVER CALCULATIONS			
Tree Cover Required:			
Gross site area:	13,612 SF		
Existing ROW:	(+/-) 0 SF		
Percent of tree cover required:	20%		
Total area of tree cover required:	2722 SF		
Tree Cover Provided:			
Tree cover from landscaping:	2,800 SF		
Tree cover from preservation:	0 SF		
Total tree cover provided:	2,800 SF	Required 2722 SF	Requirement met? YES

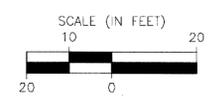


LEGEND

- TREE LINE
- EXISTING TREE CANOPY (51,198 SF)
- TREE PRESERVATION AREA (300 SF)
- CRITICAL ROOT ZONE (CRZ)
- TREE LOCATION
- TREE TO BE REMOVED
- TREE PROTECTION FENCING
- ROOT PRUNING

NOTES:

1. THE PROPERTY DELINEATED HEREON IS LOCATED AT 424 AND 440 MALCOM ROAD, NW AND PROPOSES A 3 LOT SUBDIVISION.
2. BOUNDARY AND TOPOGRAPHIC INFORMATION FROM FIELD SURVEY FROM HUGE SURVEYS, 2018.
3. PROPOSED DEVELOPMENT PLAN BY SMITH ENGINEERING, 2018.
4. TREE EVALUATIONS AND COMPUTATIONS BY TNT ENVIRONMENTAL, INC., DECEMBER 2017 AND JANUARY 2018 (MR. AVI M. SAREEN, CERTIFICATION #: MA-4727A).
5. CRZ MEASUREMENTS IN RADIUS.
6. TOTAL EXISTING CANOPY COVER: 51,198 SQUARE FEET.
7. TOTAL SITE AREA: 61,189 SQUARE FEET (NOT INCLUDING 6,223 R/W DEDICATION).
8. PERCENT OF SITE COVERED: 83.7%
9. PERCENT COVER REQUIRED BY ZONING: 20%
10. CANOPY TO BE PRESERVED:
PROPOSED PRESERVATION LOT 2: 300 SF * 1.25 MULTIPLIER = 375 SF (1.4% OF LOT 2 CANOPY COVERAGE)
11. MINIMUM CANOPY AREA TO BE PLANTED TO MEET REQUIREMENTS:
MINIMUM CANOPY TO BE PLANTED LOT 1: 2,730 SF (20% OF 13,649 SF)
MINIMUM CANOPY TO BE PLANTED LOT 2: 5,166 SF (18.6% OF 27,706 SF)
MINIMUM CANOPY TO BE PLANTED LOT 3: 2,722 SF (20% OF 13,612 SF)



ENVIRONMENTAL
 13996 Parkcrest Circle, Suite 101
 Chantilly, VA 20151
 PH: 703-466-5123 WWW.TNTENVIRONMENTALINC.COM

MALCOM RD, NW
 PROPERTIES

TREE PRESERVATION
 PLAN

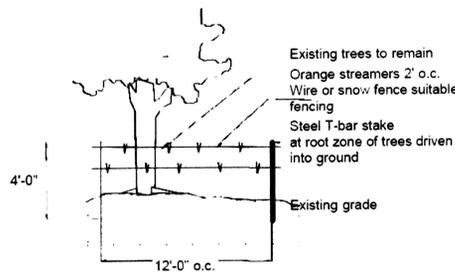
REVISIONS	
DATE	COMMENTS
5-24-18	REV PER UPDATES (LAD)

SHEET 29 OF 30

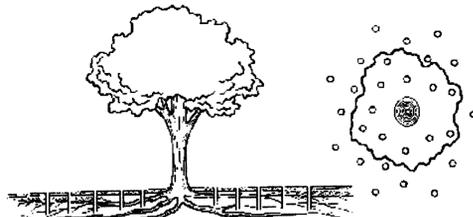
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 PROJECT DATE: 01/29/18
 DRAFT: LAD CHECK: AMS
 FILE NUMBER: 1037

6,223 SF (0.14285AC) HEREBY DEDICATED TO THE TOWN OF VIENNA FOR PUBLIC USE

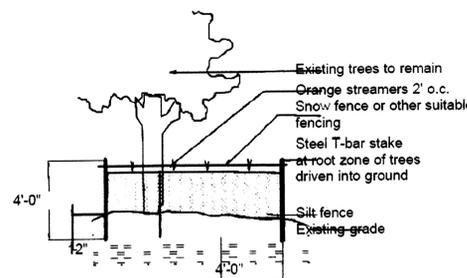
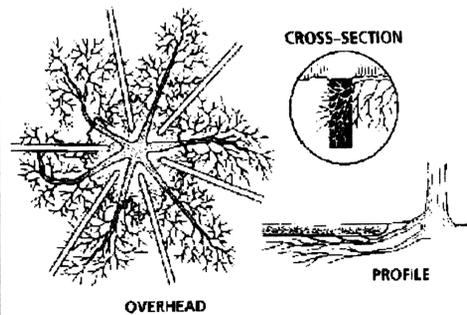
6,223 SF (0.14285AC) HEREBY DEDICATED TO THE TOWN OF VIENNA FOR PUBLIC USE



CONSTRUCTION FENCE FOR TREE PROTECTION



ROOT ZONE AERATION DETAIL - Drilling Holes/Vertical Mulching *
 NOTE: Holes are to be 2-4 inches in diameter and made about 3 feet on center, throughout the root zone of the tree. Depth shall be at least 12 inches and may be deeper if the soil grade has been raised. Holes are to be filled with peat moss, wood chips, pea gravel or other materials that maintain aeration and support root growth. * Source: International Society of Arboriculture



o.c. COMBINED SILT AND TREE PROTECTION FENCE

* Source: Steve Clark and Associates

TREE PROTECTION PLAN NOTES:

1. A PRE-CONSTRUCTION MEETING SHALL BE HELD ON-SITE TO EXPLAIN PROTECTION MEASURES TO OPERATORS, CONSTRUCTION SUPERVISORS, OR CONTRACTOR'S REPRESENTATIVES WITH THE TOWN ARBORIST OR THEIR REPRESENTATIVE.
2. CONTRACTOR ON THE SITE SHALL STAKE CLEARING LIMITS IN ORDER TO FACILITATE LOCATION FOR TRENCHING AND FENCING INSTALLATION FOR TREE PROTECTION.
3. NO CLEARING OR GRADING SHALL BEGIN IN AREAS WHERE TREE PRESERVATION MEASURES HAVE NOT BEEN COMPLETED.
4. THE USE OF HEAVY EQUIPMENT IS STRICTLY PROHIBITED WITHIN TREE PRESERVATION AREAS TO INCLUDE THE REMOVAL OF UNWANTED TREES, STRUCTURES, PADS ETC. SHALL BE REMOVED BY HAND.
5. THE SEQUENCE OF TREE PRESERVATION MEASURES, IF REQUIRED, SHALL BE AS FOLLOWS:
 - A. ROOT PRUNING TRENCHING;
 - B. TREE PROTECTION FENCING;
 - C. TREE PRUNING AND CHEMICAL TREATMENT;
 - D. AERATION SYSTEMS INSTALLED;
6. THE PRECEDING MEASURES SHALL BE DIRECTED IN THE FIELD BY THE CONSTRUCTION SUPERVISOR.
7. TREE PROTECTION FENCING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION. NO ALTERATION SHALL OCCUR WITHOUT PRIOR APPROVAL BY A TOWN REPRESENTATIVE.
8. CRITICAL ROOT ZONE SHALL BE DEFINED AS 1.5' RADIUS PER 1" OF DBH. DBH (DIAMETER AT BREAST HEIGHT) SHALL BE MEASURED AT A HEIGHT OF 4.5' FROM HIGHEST POINT OF GROUND AT BASE OF TRUNK.
9. THE PROTECTION PROVIDED SHALL CONSIST OF FENCING AROUND THE TREE TO THE DRIP LINE AND THE AREAS ENCLOSED KEPT FREE OF ALL SOIL, EQUIPMENT, AND CONSTRUCTION MATERIAL STORAGE, WHICH INCLUDES FINAL GRADING AND LANDSCAPING EFFORTS.
10. ROOT PRUNING REQUIREMENTS: UNLESS OTHERWISE INSTRUCTED BY THE OFFICE OF THE HEAD ARBORIST, ROOT PRUNING MUST BE PERFORMED WHEN THE LIMITS OF DISTURBANCE FALL WITHIN CRITICAL ROOT ZONE OF TREES TO BE SAVED. ROOTS SHALL BE PRUNED TO A MINIMUM DEPTH OF 12" AT OR BEFORE THE LOD.
11. TREES THAT ARE DETERMINED BY THE TOWN ARBORIST TO BE IN "POOR" CONDITION SHALL NOT COUNT TOWARDS CANOPY COVERAGE CALCULATIONS.
12. ALL PRUNING SHALL BE DONE IN ACCORDANCE WITH THE AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) A300-1995 PRUNING STANDARDS. CLIMBING OR TREE SPIKES SHALL NOT BE USED TO CLIMB LIVE TREES UNLESS THE TREE IS BEING REMOVED.
13. NEWLY PLANTED TREES SHALL BE HEALTHY AND VIGOROUS, AND MEET ALL ANSI STANDARDS. ALL NEWLY INSTALLED TREES THAT ARE REQUIRED BY THE TREE CONSERVATION PLAN, WHICH IN THE OPINION OF THE TOWN ARBORIST ARE DEAD OR ARE NOT HEALTHY, SHALL BE REPLACED BY THE CONTRACTOR.

INVASIVE SPECIES CONTROL NARRATIVE:

1. ANY APPLICATION OF ENVIRONMENTALLY SENSITIVE APPROVED HERBICIDES SHALL BE APPLIED BY A VIRGINIA CERTIFIED APPLICATOR OR REGISTERED TECHNICIAN.
2. ENGLISH IVY: REMOVE FROM TREES BY CUTTING ALL VINES AT GROUND LEVEL. VINES SHOULD BE CUT AGAIN SEVERAL FEET UP THE TRUNK. PEEL THE CUT SECTION OF IVY OFF BUT CARE SHOULD BE TAKEN NOT TO STRIP THE BARK OFF THE TREE. PULL GROUND IVY BACK A FEW FEET FROM THE BASE OF THE TREE TO SLOW REGROWTH UP THE TREE TRUNK. REMOVE GROUND IVY BY HAND PULLING, CUTTING AND MULCHING OVER TOP, AND/OR APPLYING A GLYPHOSATE HERBICIDE AS A 4-PERCENT SOLUTION (1 PINT PER 3-GALLON MIX) TO LEAVES OR FRESHLY CUT LARGE STEMS, BY THOROUGHLY WETTING THEM. USE A STRING TRIMMER TO REDUCE GROWTH LAYERS AND TO INJURE LEAVES FOR IMPROVED HERBICIDE UPTAKE. RETREATMENT MAY BE NECESSARY FOR COMPLETE ERADICATION. THE ENGLISH IVY REMNANTS SHALL BE BAGGED AND REMOVED FROM THE PROJECT SITE.
3. ORNAMENTAL BITTERSWEET: VINES SHALL BE REMOVED BY HAND, INCLUDING THE ROOTS, WHERE POSSIBLE TO MINIMIZE DISTURBANCE. FOR VINES TOO LARGE TO PULL, CUT AT GROUND LEVEL OR GRUB. CUT VINE STEMS MAY ALSO BE TREATED WITH A SYSTEMIC HERBICIDE BY A CERTIFIED APPLICATOR. FOR LARGE INFESTATIONS, A FOLIAR APPLICATION OF A SYSTEMIC HERBICIDE SUCH AS GLYPHOSATE OR TRICLOPYR MAY BE APPLIED FROM LATE SUMMER TO FALL BY A CERTIFIED APPLICATOR.
4. TATARIAN HONEYSUCKLE: WHERE POSSIBLE, SEEDLINGS INCLUDING ROOT STRUCTURE SHOULD BE EXCAVATED AND REMOVED WITH SHOVEL. ALTERNATIVELY, BRANCHES AND MAIN STEM SHOULD BE CUT BACK TO ONE (1) INCH ABOVE SOIL SURFACE DURING MID TO LATE AUTUMN WHEN TEMPERATURES ARE ABOVE 60 DEGREES FAHRENHEIT. A SOLUTION OF AT LEAST 20% GLYPHOSATE HERBICIDE SHOULD BE APPLIED TO OPEN CUT FACE OF STUMP WITHIN TWO (2) TO THREE (3) MINUTES OF CUT. REFER TO HERBICIDE LABEL FOR APPLICATION INSTRUCTIONS. BRANCHES AND VEGETATION DEBRIS SHOULD BE REMOVED OFFSITE. REAPPLY HERBICIDE IN THE LATE FALL AND AGAIN IN WINTER AS NECESSARY.
5. WHITE MULBERRY: CONTROL AND MANAGEMENT SHOULD BE ATTEMPTED DURING FLOWERING, BEFORE SEED PRODUCTION. CUTTING THE TREE TO THE GROUND LEVEL IS THE FIRST MEASURE OF CONTROL AND WILL REQUIRE REPEATED CUTTING OF RESPROUTS OR SUPPLEMENTAL APPLICATION OF HERBICIDE AS RESPROUT OCCURS. GIRDLING CAN BE EFFECTIVE ON LARGE TREES AND SHOULD BE CONDUCTED BY CUTTING THROUGH THE BARK OF THE TREE, AROUND THE ENTIRE TRUNK OF THE TREE, AT LEAST 6 INCHES ABOVE THE SURFACE. SUBSEQUENT RESPROUTING SHOULD BE TREATED WITH AN HERBICIDE. HAND PULLING CAN BE EFFECTIVE WITH YOUNG SEEDLINGS BUT CARE SHOULD BE GIVEN TO REMOVE THE ENTIRE ROOT SINCE BROKEN FRAGMENTS MAY RESPROUT.
6. INVASIVE SPECIES CONTROL SHALL COMMENCE WITH E&S PHASE I AND BE CONDUCTED UNTIL THE PLANTS NOTED ABOVE ARE NO LONGER IN ABUNDANCE OR UNTIL BOND RELEASE, WHICHEVER IS LATER.

Tree Number	Common Name	Size (inches DBH)	Critical Root Zone (feet)	Condition	Remove	Notes & Arborist Recommendations
971	American Elm	36.0	54.0	Fair	x	Vines up the trunk, dead limbs, codominant leaders
972	Ornamental Cherry	5.9	8.9	Good	x	
973	Ornamental Cherry	6.3	9.5	Fair	x	Shallow roots
974	American Elm	45.0	67.5	Fair	x	Double trunk, vines up the trunk, dead limbs
975	Black Walnut	22.2	33.3	Fair	x	Codominant leaders, many vines, dead limbs
976	Silver Maple	53.0	79.5	Poor	x	Many vines, dead limbs, debris at base
977	Black Walnut	25.0	37.5	Fair	x	Covered in vines, dead limbs
978	Mulberry	42.0	63.0	Poor	x	Double trunk, one failing trunk, many vines, dead limbs
979	Mulberry	8.0	12.0	Fair	x*	Shared. Some Vines and one-sided
980	Dead Locust	-	-	Dead	x	Dead tree
981	Black Walnut	20.4	30.6	Poor	x	Poor form, dead limbs, uprooting
982	Dead Tree	-	-	Dead	x	Dead tree
983	Mulberry	17.5	26.3	Poor	x	Many vines, many dead limbs
984	Silver Maple	35.0	52.5	Poor	x	Deadwood, dead limbs, covered in vines
985	Red Maple	19.4	29.1	Poor	x	Many vines, dead limbs
986	Silver Maple	38.0	57.0	Poor	x	Vines up the trunk, some dead limbs, dieback
987	Red Maple	24.5	36.8	Poor	x	Diseased, vines up the trunk
988	Red Maple	18.6	27.9	Fair	x	Dead limbs, vines
989	Red Maple	22.0	33.0	Fair	x	Topped branches, vines up the trunk
990	Red Maple	15.0	22.5	Good	x	
991	Black Cherry/Tulip Poplar	13/16.5	44.3	Fair/Good		Cherry growing out of Tulip Poplar, near cemetery
992	Mulberry	7.4	11.1	Good		Near cemetery
993	Pin Oak	16.8	25.2	Fair		Offsite, some dead limbs
994	Black Cherry	8.5	12.8	Fair		Prune dead limbs and water sprouts
995	Red Maple	28.4	42.6	Fair	x**	Some dead limbs, water sprouts
996	Mulberry	55.0	82.5	Poor	x	Mostly dead, triple trunk, trunk failing
997	Northern Red Oak	28.5	42.8	Fair	x	Dead limbs
998	Northern Red Oak	6.3	9.5	Fair	x	Broken limbs
999	American Elm	6.5	9.8	Poor	x	Topped leader
1000	Black Cherry	7.7	11.6	Fair	x	One-sided, vines
1	Northern Red Oak	27.0	40.5	Fair	x	Covered in vines
2	Black Cherry	4.3	6.5	Fair	x	Covered in vines
3	Black Cherry	4.3	6.5	Fair	x	Covered in vines, old cavity
4	Black Cherry	13.5	20.3	Fair	x	Some English ivy
5	Tulip Poplar	8.3	12.5	Good	x	
6	Black Cherry	7.5/26	50.3	Fair	x	Double trunk, vines up the trunk
7	Crabapple	14.0	21.0	Poor	x	Cavity, covered in vines, some dead limbs
8	Red Maple	58.0	87.0	Poor	x	Double trunk, one dead trunk, topped, vines
9	Crabapple	12.5	18.8	Fair	x	Covered in vines
10	Crabapple	4.8	7.2	Fair	x	Water sprouts
11	Crabapple	10.5	15.8	Poor	x	Deadwood, English ivy, topped
12	Crabapple	10.8	16.2	Poor	x	Deadwood, English ivy, topped
13	Crabapple	4.8	7.2	Fair	x**	English ivy
14	Crabapple	9.8	14.7	Fair	x**	Water sprouts
15	Mulberry	28.0	42.0	Poor	x**	Covered in vines, many dead limbs

NOTES:

- *1. SHARED TREES SHALL NOT BE REMOVED WITHOUT WRITTEN PERMISSION FROM AFFECTED ADJACENT PROPERTY OWNERS.
- **2. TREES NOTED FOR REMOVAL WITHIN THE SAVE AREAS SHALL BE DONE SO BY HAND WITHOUT THE USE OF HEAVY MACHINERY.
3. OFFSITE TREES WERE ASSESSED FROM THE SUBJECT PROPERTY SO NOT TO TRESPASS ONTO ADJACENT PROPERTY. DBH MEASUREMENTS ARE APPROXIMATE.
4. TREES LOCATED WITHIN OR ON THE LIMITS OF DISTURBANCE, OR RATED AS BEING "POOR" IN CONDITION, ARE RECOMMENDED FOR REMOVAL BY TNT ARBORISTS DUE TO THE LIKELIHOOD OF TREE FAILURE. HOWEVER, AT THE DISCRETION OF THE APPLICANT, SOME OF THESE MAY BE PRESERVED DURING CONSTRUCTION WITH THE APPROVAL OF THE TOWN ARBORIST.



FOR AUTHENTICITY ONLY

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MALCOM RD, NW
 PROPERTIES

TREE PRESERVATION
 DETAILS & NARRATIVE

REVISIONS	
DATE	COMMENTS

SHEET 32 OF 30
 OF 32

SCALE: NTS
 PROJECT DATE: 01/29/18
 DRAFT: LAD CHECK: AMS
 FILE NUMBER: 1037