CLARK | AZAR & ASSOCIATES

Montgomery County Department of Parks

Silver Spring Intermediate Neighborhood Park
7801 Chicago Avenue
Tacoma Park, Maryland 20912

Stormwater Management Concept Engineering Report

2-4-19

Prepared by:
Matt Edelman, EIT

Reviewed by:
Jason Azar, PE

CAA Project No. 145.002

PROFESSIONAL CERTIFICATION: I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND

LICENSE NO.: 31168 EXPIRATION DATE: 1-12-21

February 2019

Clark | Azar & Associates
(301) 528-2010
20440 Century Boulevard, Suite 220
Germantown, MD 20874

TABLE OF CONTENTS

Stormwater Management Concept Engineering Report
Silver Spring Intermediate Neighborhood Park
Takoma Park, Maryland

SECTION

I. Stormwater Management Concept Narrative

I. Site Introduction

Montgomery County Department of Parks proposes to renovate the existing Silver Spring Intermediate Neighborhood Park located at 7801 Chicago Avenue, Takoma Park, MD 20912. The site is located within the jurisdiction of the City of Takoma Park and is required to meet all City regulations for stormwater management. The park is located on Block 68 and comprised of Lots 4-11. The property is bounded to the northeast by Boston Avenue, the northwest by Chicago Avenue, the southwest by Philadelphia Avenue, and the southeast by two residential lots. The Park is located within a residential neighborhood (R-60).

II. Existing Conditions

The site consists of an existing parking lot, paved walkways, basketball courts, tennis courts, woodchip playground area, and natural grass open space play areas. There is currently a stormdrain system (4'x6' culvert) that runs through the center of the park property conveying water from the surrounding areas to a 36" RCP stormdrain located along Boston Avenue. Additionally, there are a few inlets located within the park property that are collecting runoff from the property and tying into the stormdrain system in the park. There is a large concrete riser structure located at the northeast corner of the park that collects runoff from a concrete swale running along the eastern property line and from a pipe with flared end section facing the grass play areas. This structure connects to the existing 36" RCP along Boston Avenue and is not tied into the existing stormdrain network located on-site. Study Point 1 was taken at the outfall from the park at the existing manhole on the 36" RCP along Boston Avenue. The drainage area to this point includes surface runoff and piped flow. There is currently no stormwater quality management provided within the park property.

During large storm events, it has been documented that excess runoff has collected at the northeastern property corner of the park and eventually overtopped the existing retaining wall along Boston Avenue. Based on preliminary stormdrainage computations, the existing 36" RCP pipe located along Boston Avenue appears to be slightly under capacity for the 10-yr storm event. This pipe (as well as all stormdrain pipes located within the surrounding right-of-way) is controlled by the City of Takoma Park. The contributing drainage area to this stormdrain outfall pipe has been found to produce approximately 115.61 cfs for the 10-yr storm event. The capacity of the existing 36" RCP stormdrain was found to be approximately 108.84 cfs.

Topographic survey information was provided by Potomac Valley Surveys field data collected in October 2018 and supplemented with Montgomery County GIS information for use in this design.

III. Proposed Conditions

The Department of Parks proposes to renovate the existing park to provide ADA access to the various facilities on-site. These renovations include providing accessible ramps, seating, walkways throughout the park property, as well as an ADA parking space within the existing parking lot area. In addition, Parks will be replacing/repairing the existing retaining walls along Boston Avenue that are in poor condition and adjust grading in the natural grass open space areas to be used as play fields for various athletic activities. A majority of the existing non-compliant paved walkways will be removed with the addition of the new accessible pathways within the park. A portion of the proposed walkways will be comprised of pervious pavement in order to minimize the increase in impervious area attributed to these improvements. There will be a minimal net increase in impervious as a result of the replacement of the non-compliant walkways.

IV. Stormwater Management

Stormwater management will be provided to meet ESD requirements for the limits of disturbance. The required ESDv will be provided by two micro-bioretention facilities on the northwest side of the proposed building addition. The site was designed using Environmental Site Design criteria per the Maryland Stormwater Design Manual and Montgomery County Stormwater Regulations and in compliance with the Stormwater Management Act of 2007 to the Maximum Extent Practicable (MEP). The stormwater management design strategy for this project was to seek to replicate the natural hydrology of the site by utilizing small-scale stormwater management practices to minimize the impact of land development on downstream water resources.

Per current Maryland Department of the Environment, the Pe required for treatment was calculated using the total limits of disturbance (LOD) to the study point at the point of discharge for the project area. This Pe was used to determine the required ESD volume that must be provided.

Table 1: ESDv Requirements Summary

Study Point	LOD Area (sf)	Total Impervious Area (sf)	% Impervious	Soil Type	Target Pe * (in)	LOD Rv	ESDv Required (cf)	ESDv Provided (cf)
1	88,425	12,110	13.7%	B/C	1.0	0.173	1,277	1,400**

*Per Chapter 5 of MDE Stormwater Manual
**Does not include ESDv treatment volume provided by MBR-B

The ESDv requirement for this project will be provided with a micro-bioretention facility located just north of the existing parking lot. The existing inlet located within the parking lot will be converted to a manhole and a sidewalk flume will be added to convey runoff from the parking lot into the facility. An overflow riser will be installed and will tie-into the existing stormdrain network located on-site. In addition, Parks would like to provide additional treatment volume above the site requirements via a micro-bioretention facility located near the northeast corner of the property to collect surface runoff from the existing tennis courts and natural grass play areas. The contributing drainage area for the additional facility exceeds 20,000 sf, however, it is not required to meet the site ESDv requirements and therefore will not be restricted by the drainage area limitations.

The installation of the two micro-bioretention facilities will enhance the existing topography of the park, while maintaining the existing drainage patterns and provide stormwater treatment where none was previously provided. The limits of the Study Point 1 drainage area are the same in the pre and post-development conditions.

As a result of the pre-submission meeting held with the City of Takoma Park on 1/23/2019, it was determined that the implementation of stormwater management quality treatment facilities would satisfy the City's stormwater management requirement. Although existing quantity concerns do remain as a result of the existing contributing drainage areas to the Study Point, Parks is not required to provide a quantity mitigation facility at this time. It is not anticipated that the minimal increase in imperviousness on-site will have substantial impact on the existing runoff quantity conveyed to the Study Point.

VI. Conclusions

Two micro bioretention areas are proposed to provide ESDv for the site. This design greatly improves the existing water quality of this site as no stormwater management currently exists

within the park property and meets MDE requirements for stormwater management. The existing drainage patterns are also maintained in the post-development condition which meets the intent of MDE and ESD.

II. Environmental Site Design Calculations

a) ESDv Required

CLARK | AZAR & ASSOCIATES

Project:	Silver Spring Intermediate Neighborhood Park	**Date:**	2/4/2019
Project Number:	145.002	**Calculated by:**	ME
Calculation:	ESDv Required Calculations	**Reviewed by:**	JA

ESDv Required Computations

Study Point	LOD Area (sf)	Total Post Development Impervious Area (sf)	% Impervious	Rv	HSG Areas			Target Pe (in)	ESDv Required (cf)
					HSG	Area (sf)	Pe		
1	88,425	12,110	13.7%	0.173	B	79,726	1.0	1.0	1,277
					C	8,699	1.0		

b) ESDv Provided

CLARK | AZAR & ASSOCIATES

Project: Silver Spring Intermediate Neighborhood Park
Project Number: 145.002
Calculation: ESDv Provided Calculations

Date: 2/4/2019
Calculated by: ME
Reviewed by: JA

Summary of ESDv Required*			
Study Point	LOD Area	Target Pe	ESDv Required
1	88,425	1.0	1,277

*See ESDv Requirements Computations for detail

Alternative Surfaces	
GR	Green Roof
PP	Permeable Pavement
ST	Synthetic Turf

Micro-Scale Practices	
RH	Rainwater Harvesting
SGW	Submerged Gravel Wetlands
LI	Landscape Infiltration
IT	Infiltration Trench
DW	Dry Wells
MB	Micro-Bioretention
RG	Rain Gardens
SW-G or B	Swales (specify grass or bio)
EF	Enhanced Filters
INF	Infiltration

Non-Structural Practices	
DRR	Disconnection of Roof Runoff
DNR	Disconnection of Non- Roof Runoff
SCA	Sheetflow to Conservation Areas

STUDY POINT 1

					Alternative Surfaces						Micro-Scale Practices								Non-Structural Practices												
Sub-Basin Drainage Area (sf)	Sub-Basin Total Area* (sf)	(ac)	Sub-Basin Impervious Area (sf)	Sub-Basin R_v	Drainage Area of Surface (sf)	Alternative Surface Used	Filter Media Thickness (in)	P_E Provided by Surface (in)	Rv of DA of Surface	ESDv Provided by Surface (cf)	Drainage Area to Practice (sf)	Micro-Scale Practice Used	Surface Area of Practice (sf)	Depth of Media (ft)	n	ESDv Provided by Media (cf)	Ponding of ESDv (ft)	ESDv Provided by Ponding (cf)	Total ESDv Provided by Practice (cf)	Drainage Area to Practice (sf)	Non-Structural Practice Used	Disconnect Length/ Buffer Width (ft)	Ratio of Disconnect Length to Contributing Length	Rv of DA	P_E Provided by Practice (in)	ESDv Provided by Practice (cf)	Total ESDv Provided over Sub-Basin DA (in)	Minimum ESD_V over Sub-Basin (1.0 in)	Maximum ESD_V over Sub-Basin (2.6 in)	Credited ESD_V over Sub-Basin	PE Credited over Sub-Basin
1	17,277	0.397	10,108	0.577							17,277	MB	500	4.50	0.4	900	1.00	500	1400								**1400**	830	2158	**1400**	**1.69**
2**	37,908	0.870	18,954	0.500							37,908	MB	614	4.50	0.4	1105	1.00	614	1719								**1719**	1580	4107	**1719**	**1.09**

*Drainage area to facility minus area of facility and embankment
**Treatment provided by MBR-B not counted towards ESDv site requirements

ESDv Credited Within Study Area	**1,400**
TOTAL ESDv Within Study Area (Including MBR-B)	**3,119**
P_E Credited Over Required Study Area	**1.10**

III. Preliminary Stormdrain Computations

a) TR-55 Pre-Development 10-Yr Computations

WinTR-55 Current Data Description

--- Identification Data ---

User: ME
Project: Silver Spring Park
SubTitle: Pre-Development 10-Year
State: Maryland
County: Montgomery NOAA_C
Filename: J:\145.002 - Silver Spring Intermediate Park\CIVIL\COMPUTATIONS\SD Comps\Pre-Development 10-Year

Date: 2/4/2019
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
A		Outlet	26.48	86	.315
B		Outlet	7.14	85	.454

Total area: 33.62 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.1	3.99	4.77	5.97	7.03	8.23	2.57

Storm Data Source: Montgomery NOAA_C County, MD (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

Silver Spring Park
Pre-Development 10-Year
Montgomery NOAA_C County, Maryland

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
3.1	3.99	4.77	5.97	7.03	8.23	2.57

Storm Data Source: Montgomery NOAA_C County, MD (NRCS)
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

ME

Silver Spring Park
Pre-Development 10-Year
Montgomery NOAA_C County, Maryland

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 10-Yr (cfs)
SUBAREAS	
A	96.02
B	21.00
REACHES	
OUTLET	115.61

ME

Silver Spring Park
Pre-Development 10-Year
Montgomery NOAA_C County, Maryland

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
A	96.02 12.07
B	21.00 12.14
REACHES	
OUTLET	115.61

ME

Silver Spring Park
Pre-Development 10-Year
Montgomery NOAA_C County, Maryland

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
A	26.48	0.315	86	Outlet	
B	7.14	0.454	85	Outlet	

Total Area: 33.62 (ac)

ME

Silver Spring Park
Pre-Development 10-Year
Montgomery NOAA_C County, Maryland

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
A							
SHEET	100	0.0100	0.150				0.219
SHALLOW	220	0.0300	0.050				0.022
CHANNEL	1331					5.000	0.074
					Time of Concentration		.315
B							
SHEET	100	0.0025	0.150				0.381
SHALLOW	70	0.0025	0.050				0.024
CHANNEL	884					5.000	0.049
					Time of Concentration		.454

ME

Silver Spring Park
Pre-Development 10-Year
Montgomery NOAA_C County, Maryland

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
A	Residential districts (1/8 acre)	B	21.5	85
	Residential districts (1/8 acre)	C	3.31	90
	Residential districts (1/8 acre)	D	1.67	92
	Total Area / Weighted Curve Number		26.48	86
B	Residential districts (1/8 acre)	B	6.78	85
	Residential districts (1/8 acre)	C	.36	90
	Total Area / Weighted Curve Number		7.14	85

IV. Geotechnical Report

"Delivering right solutions through quality services and engineering excellence"

Geotechnical Engineering Report

Silver Spring Intermediate Park
Silver Spring, MD
DMY Project No. 03.04228.01

Prepared for

Clark | Azar & Associates, Inc.
January 4, 2019

DMY

DMY ENGINEERING CONSULTANTS INC.

Dulles, VA
Williamsburg, VA
Washington, DC
Gaithersburg, MD

January 4, 2019

Ms. Dana W. Clark
President
Clark | Azar & Associates, Inc.
20440 Century Boulevard, Suite 220
Germantown, MD 20874

Reference: Geotechnical Engineering Report
Silver Spring Intermediate Park
Silver Spring, MD
DMY Project No. 03.04228.01

Dear Ms. Clark:

DMY Engineering Consultants Inc. (DMY) is pleased to submit this geotechnical engineering report for the above-referenced project. This report presents the review of the information provided to us, the discussion of the site and subsurface conditions encountered, and our geotechnical recommendations.

We appreciate the opportunity to be of service to you on this project and would be happy to discuss our findings with you. We look forward to serving as your geotechnical engineer on the remainder of this project and on future projects.

Respectfully,

DMY ENGINEERING CONSULTANTS INC.

Jun Yao, Ph.D., EIT.
Staff Geotechnical Engineer

Xin Chen, Ph.D., P.E., MBA.
Geotechnical Practice Leader

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

1.1. PROJECT INFORMATION AND SITE CONDITIONS

DMY Engineering Consultants Inc. (DMY) was retained by Clark | Azar & Associates, Inc. to perform a geotechnical investigation for the improvement of Silver Spring Intermediate Neighborhood Park located at 7801 Chicago Ave in Silver Spring of Montgomery County, Maryland. The project site is bounded by Boston Ave to the northeast, Chicago Ave to the northwest, Philadelphia Ave to the southwest, and residential area to the southeast. Figure 1 in Appendix A shows the approximate project location.

Silver Spring Intermediate Neighborhood Park is the site of a former Montgomery County Public School (MCPS). The park is currently owned by MCPS and maintained by Montgomery Parks. The school buildings were demolished in the 1970s and the site was gradually developed as a park. The project site currently consists of vegetated areas, a parking lot, two athletic fields, and a playground. Montgomery Parks plans to refresh the park to meet accessibility and environmental requirements and better address the community's current and future needs. It is our understanding that the proposed project will consist of the construction of new asphalt walkways, a retaining wall and stormwater management facilities.

The description of the proposed project given above is based on the information provided to us by the Client and information gathered during our site reconnaissance. If any of the assumptions or project information is incorrect, DMY should be informed so that we may revise our geotechnical recommendations, if necessary.

1.2. SCOPE OF SERVICES

The purposes of this study were to obtain the subsurface soil and groundwater information for the proposed construction. Our study was performed in accordance with our proposal dated November 15, 2018, as authorized by Client on November 19, 2018. Our scope of services included the following:

- Reviewing the project information provided to us;
- Drilling Standard Penetration Test (SPT) borings at three (3) locations;
- Drilling three (3) auger borings in adjacent to the corresponding SPT borings;
- Performing three (3) infiltration test in accordance with the Montgomery County Soil Testing Guidelines for Stormwater Management Practices;
- Performing laboratory tests on selected soil samples.
- Evaluating field and laboratory data;
- Preparing this geotechnical engineering report.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1. FIELD EXPLORATION

The field exploration consisted of drilling a total of three (3) Standard Penetration Test (SPT) borings (SB-1 to SB-3). Three (3) auger borings (I-1 to I-3) were also drilled in adjacent to the corresponding

SPT borings for in-situ infiltration tests. The boring and infiltration test locations were selected and staked out in the field by the Client. Figure 2 Boring Location Plan in Appendix A shows the approximate boring locations.

The SPT borings (SB-1 to SB-3) were drilled by a track-mounted CME-55 drill rig (3.25-inch hollow-stem auger with split spoon sampler) per ASTM D1586. Groundwater levels and cave-in depth were measured at each SPT boring during and at the end of drilling. SPT borings were backfilled with auger cuttings immediately after the completion for public safety concerns. The field exploration procedures are included in Appendix B.

After drilling to the required depths in the infiltration auger borings (I-1 through I-3), temporary 5-inch-diameter solid PVC pipes were inserted into the open boreholes. Goundwater levels were measured at the end of drilling and 24 hours after drilling completion for infiltration boreholes. The cased boreholes were presoaked with approximately 2 feet of potable water for 24 hours prior to the field infiltration tests in the following day. The infiltration tests were conducted in general accordance with Montgomery County Soil Testing Guidelines for Stormwater Management Practices effective in October, 2012.

Following field operations, the soil samples were transported to our laboratory for further analysis and testing. The samples will be stored in our laboratory for a period of 90 days from the submittal date of this report. After this period, the samples will be discarded unless we are instructed otherwise.

2.2. LABORATORY TESTING

Representative soil samples were selected and tested in our laboratory to verify field classifications and to determine pertinent engineering properties. The laboratory testing results are included in Appendix C of this report. The laboratory testing program included the following:

- Natural moisture content (ASTM D 2216) 3 Tests
- Grain size analysis (ASTM D 422) 3 Tests
- Atterberg Limits (ASTM D 4318) 3 Tests
- Hydrometer analysis (ASTM D 7928) 3 Tests

3.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

3.1. SITE GEOLOGY

According to the Geologic Map of Montgomery County, Maryland dated 1968, the project site is located in the Piedmont Physiographic Province. The Piedmont Province is a Physiographic Province of the larger Appalachian division, bounded between the Blue Ridge Mountains to the west and the Atlantic Seaboard fall line to the east. The underlying formation at the project site is Wissahickon Formation–Boulder Gneiss (wbg) dated from the Late Precambrian. The Boulder Gneiss consists of medium-grained garnet-oligoclase-mica-quartz gneiss and locally intensely foliated gneiss or schist.

3.2. SUBSURFACE CONDITIONS

The subsurface conditions encountered at the locations explored are shown in the boring logs in Appendix B. The records represent our interpretation of the subsurface conditions in accordance with generally accepted geotechnical engineering practice. The lines designating the interfaces between various strata on the boring logs are approximate, as the actual transitions between soil strata are often gradual. In the absence of foreign substances, it is difficult to distinguish between natural soils and clean soil fills. Although individual test borings are representative of the subsurface conditions at the precise boring locations on the dates shown, they are not necessarily indicative of the subsurface conditions at other locations or at other times. Below is the generalized subsurface soil stratigraphy based on our subsurface investigation:

Surficial Materials
About 6 to 10 inches of topsoil were encountered at all three SPT borings.

Existing Fill
Possible existing fill materials identified as silty SAND with gravel (SM) was encountered in Boring SB-1. The depth of this stratum extended to 2 feet below existing site grades at Boring SB-1.

Residual Soils
Residual soils were encountered in all three SPT borings. This stratum was encountered beneath the surficial materials or possible fill materials and extended 13 to 15 feet below the existing site grade. The residual soils were identified as Silty SAND (SM), Clayey SAND (SC), Sandy SILT (ML), SILT with Sand (ML), Sandy LEAN CLAY (CL). Varying amounts of mica were present in the soil samples.

Highly Weathered Rock
Highly weathered rock, derived from the weathering of the bedrock, was encountered in Boring SB-1 to its boring termination. The highly weathered rock was sampled as silty SAND (SM).

Groundwater
During the drilling, groundwater was not encountered in all three SPT borings and three Infiltration Auger borings. At the end of drilling, groundwater was not encountered in all three SPT borings and Auger Probe I-2, except that groundwater was encountered at 10 feet and 9.6 feet below existing site grade in Auger Probes I-1 and I-3, respectively. At 24 hours after drilling completion, groundwater was at 9.5 feet, 6.4 feet and 9.7 feet below existing site grade in Auger Probes I-1, I-2 and I-3, respectively. It should be noted that groundwater levels fluctuate with seasonal and climatic variations and may be different at other times and locations than those stated in this report.

4.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

4.1. STORMWATER MANAGEMENT

Based on the field infiltration test results summarized in Appendix B, the calculated infiltration rate and soil type at I-1, I-2 and I-3 are summarized in the following table. The negative field infiltration rates

indicate that there was no downward infiltration and water level raised during the infiltration test at all three infiltration locations. This is possibly due to water gain from the ground water. There was no noticeable rainfall during our field operation. Per Maryland *Stormwater Design Manual* (2000), it is required that infiltration rate shall be 0.52 inch per hour or higher if the designer proposes to eliminate the underdrain. Additionally, water table should be located at least 4 feet below the bottom of the stormwater management facility. Therefore, it is our opinion that the infiltration methods do not appear to be feasible for use as stormwater management facility at the locations tested at the project site.

Table 4-1: Summary of Infiltration Tests

Test Location	Avg. Field Infiltration Rate (in./hr.)	Soil Classification at Infiltration Stratum	
		USCS	USDA
I-1	-0.27	Silty Sand	Sandy Loam
I-2	-0.66	Silty Sand	Loamy Sand
I-3	-0.06	Silt with Sand	Loam

4.2. RETAINING WALL

No information regarding retaining wall is provided at the time of preparing this report. It is anticipated that a new earth retaining wall less than 5 ft may be proposed at the east corner of the park near SB-3. The retaining wall should be designed to withstand lateral earth pressures and surcharge loads. The following parameters may be used for design of the retaining wall:

- Friction Angle for Soil Backfill/Natural Soils: 28°
- Unit Weight of Soil Backfill: 110 pcf
- Coefficient of Sliding Friction between concrete and subgrade soil: 0.35*
- Equivalent Active Fluid Pressure: 58 psf/ft
- Allowable bearing capacity: 2000 psf
- Passive earth pressure shall be ignored in the design unless a shear key is provided

The above soil parameters assume that the wall backfill consist of either existing residual soils or properly compacted onsite silty SAND (SM), SILT with sand (ML) or more granular soils. The above equivalent fluid pressures assume that constantly functioning drainage systems are installed between the wall and the soil backfill to prevent any accidental buildup of hydrostatic pressures. The wall design should also account for any surcharge loads within a 45-degree slope from the base of the wall.

Proper drainage measures should be provided to minimize any hydrostatic pressure build-up (from groundwater and/or infiltrating rain water) behind the retaining wall. Adequate drainage can be accomplished if a blanket of select granular backfill, such as No. 57 stone, is used behind the wall. To prevent migration of fines into the select granular backfill, the select granular backfill should be wrapped with a layer of filter fabric (geotextile). The select granular backfill should be extended from the bottom to approximately one feet below the final grade behind the wall. A perforated collector pipe should be installed at the base of the wall to gravity drain any water from the drainage blanket behind the wall to

daylight. The collector pipe should be surrounded by a minimum of six inches of select granular backfill (such as No. 57 stone) wrapped in filter fabric. Weep holes should be provided for the retaining wall with outlet at a height of six inches above the ground surface in front of the wall. The ground surface adjacent to the retaining wall should be kept properly graded to prevent ponding of water adjacent to the wall.

4.3. PAVEMENT

No laboratory or field California Bearing Ratio (CBR) test is performed on soils at the time of this report. The CBR value in percentage can be correlated with the SPT values in mm/blows as the following equation (Livneh, 1989):

$$\log CBR = -5.13 + 6.55(\log SPT)^{-0.26}$$

The minimum SPT N-value (SPT N = 5 blows/ft) from top 4 feet soils of all three SPT borings were used for calculating the CBR value. Thus, CBR value was estimated to be about 3 which is less than CBR of 5 and is considered as poor subgrade condition.

It is our understanding that the asphalt walkway will not have any vehicle traffic. We recommend 4-inches of Asphalt Concrete Surface Course (SM-9.5mm) for the proposed asphalt walkway, per 2008 Hot Mix Asphalt Pavement Design Guide from the Maryland Asphalt Association, Inc.

5.0 CONSTRUCTION RECOMMENDATIONS

5.1. SITE PREPARATION

The site preparation shall be performed in accordance with Maryland-National Capital Park and Planning Commission (M-NCPPC)'s specification *Section 200.07 – Excavation, Filling & Grading,* Paragraph *"E. Site Preparation".* All areas to be paved will be proof rolled at subgrade using a 20-ton, fully-loaded dump truck or another pneumatic-tire vehicle of similar size and weight. Any soft, loose, or unsuitable soils should be removed and replaced with suitable materials. Exposed subgrades should be sloped and sealed at all times to facilitate rainfall runoff. Ponding water on subgrade shall be prohibited.

5.2. FILLS AND BACKFILLS

The fills and backfill materials shall meet the minimum requirements in M-NCPPC's specification *Section 200.04 – Excavation, Filling & Grading,* Paragraph *"A. Fill and Backfill".* The fill and backfill materials shall also have a Liquid Limit less than 40, a Plasticity Index less than 15. Based on the subsurface conditions observed in our exploration, the majority of the onsite natural soils and fills consist of AASHTO A-2-4 (silty or clayey sands) and A-4 (silt with sand) which meet the fills and backfills requirements.

Fill materials should be placed in lifts not exceeding 8 inches in loose thickness and moisture conditioned to within 2 percentage points of the optimum moisture content. For non-structural areas, Each layer of fill shall be compacted to 85% of maximum dry density obtained in accordance with ASTM Standard D 698. For paved surfaces and structural backfill, each layer of fill shall be compacted to 95% of maximum dry

density obtained in accordance with ASTM Standard D 698. Heavy earthwork equipment should maintain a minimum horizontal distance away from the retaining wall of one foot per foot of vertical wall height. Lighter compaction equipment should be used close to the retaining wall.

5.3. RETAINING WALL CONSTRUCTION

All foundation excavations should be sloped or stepped back in accordance with Occupational Safety and Health Administration (OSHA) regulations for excavations. Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for extensive period of time. Foundation concrete should be placed on the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a 3-inch thick "mud mat" of "lean" concrete be placed on the bearing soils.

5.4. CONSTRUCTION WATER CONTROL

Based on our subsurface exploration at this site, it is not anticipated that the permanent groundwater table at the site will be encountered above the design subgrade levels. However, perched water may be anticipated. The surface of the site should be properly graded to keep drainage of the surface water away from the proposed construction areas.

5.5. PRE-CONSTRUCTION SURVEY

We recommend that a pre-construction photographic survey on the adjacent structures be performed prior to the construction. It has been our experience that such pre-construction surveys can usually help prevent potential claims as a result of pre-existing damages that were not apparent to nearby property owners until they began to observe their building following the construction of adjoining properties.

5.6. CONSTRUCTION INSPECTION

All earthwork (including but not limited to site preparation, fill placement and compaction, foundation excavation, pavement subgrade, asphalt placement and compaction, retaining wall construction, etc.) should be inspected by a geotechnical engineer licensed in the State of Maryland or an engineering technician under the supervision of such an engineer. The geotechnical engineer or his/her representative should inspect subgrades, observe the placement of fill and backfill, perform field density tests (i.e., compaction tests), and perform laboratory testing of fill and backfill materials.

5.7. POST GEOTECHNICAL REPORT SERVICE

We recommend that DMY Engineering Consultants Inc., under a separate cost proposal, be given the opportunity to review the final design plans and specifications. This review will evaluate whether the recommendations and comments provided herein have been understood and properly implemented.

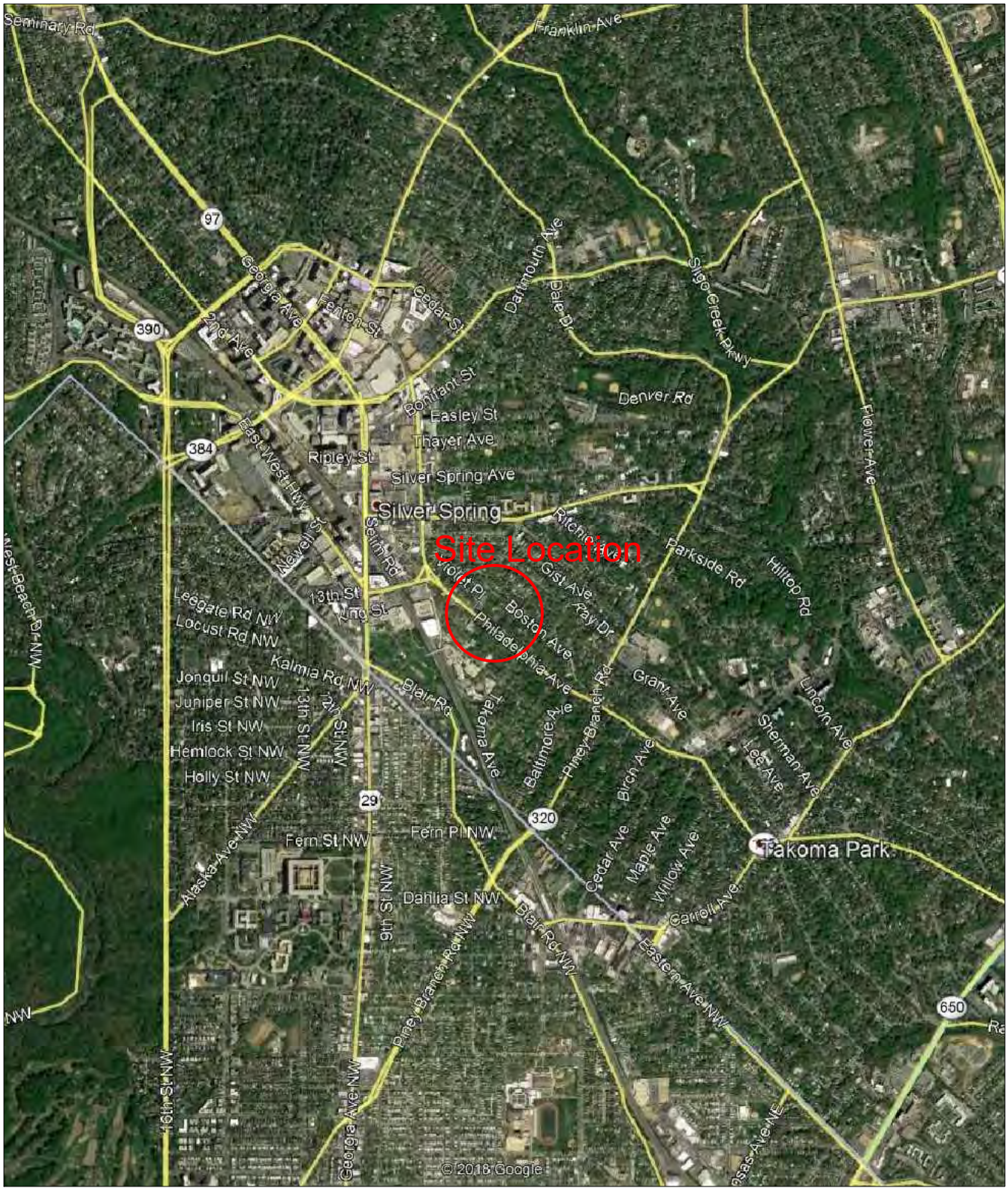
6.0 LIMITATIONS

The recommendations provided are based in part on project information provided to us and are only applied to the specific project and site discussed in this report. If the project information section in this report contains incorrect information or if additional information is available, DMY should be contacted to review our recommendations. We can then modify our recommendations for the proposed project.

Regardless of the thoroughness of a subsurface investigation, there is always a possibility that subsurface conditions may vary from those documented during a subsurface exploration at specific locations. In addition, the construction process itself may alter subsurface conditions. Therefore, experienced geotechnical personnel should be engaged to observe and document the construction procedures used and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations. We recommend that DMY be retained to provide this service based upon our familiarity with the project, the subsurface conditions, and the intent of the recommendations.

We have prepared this report for use by the design professionals for design purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report.

APPENDIX A FIGURES



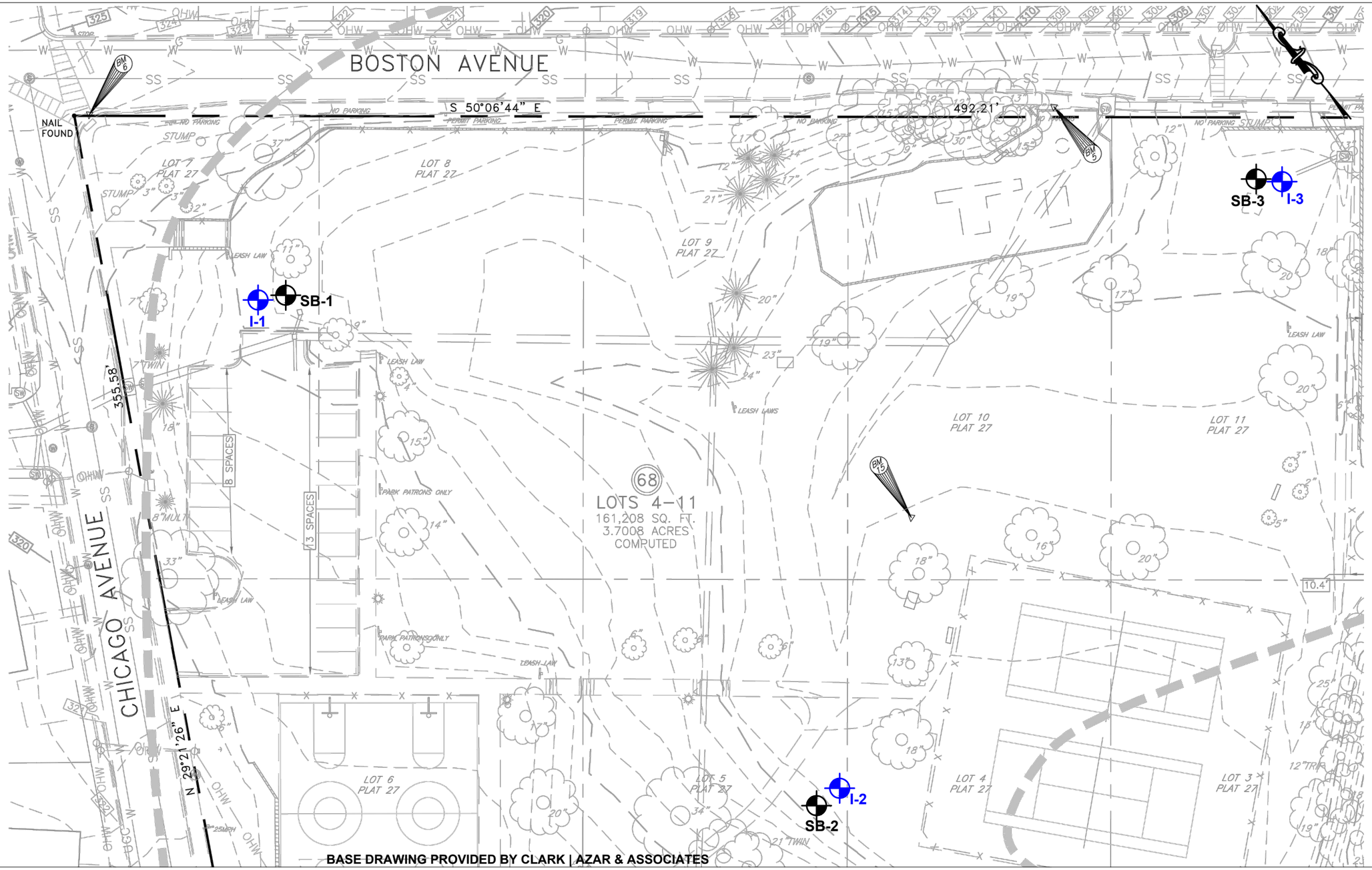
COPYRIGHT GOOGLE

SITE LOCATION MAP

DMY ENGINEERING CONSULTANTS INC.
45662 TERMINAL DRIVE, SUITE 110
DULLES, VIRGINIA 20166
PHONE: (703) 665-0586
FAX: (301) 768-4169

SILVER SPRING INTERMEDIATE PARK
SILVER SPRING, MARYLAND

DATE:	DRAFTED BY:	PROJECT NO.:
12/31/2018	JY	03.04228.01
SCALE:	CHECKED BY:	FIGURE NO.:
1"=2000'	XC	1



BASE DRAWING PROVIDED BY CLARK | AZAR & ASSOCIATES

APPROXIMATE SOIL PROFILE BORING LOCATION

APPROXIMATE INFILTRATION BORING LOCATION

BORING LOCATION PLAN

DMY ENGINEERING CONSULTANTS INC.
45662 TERMINAL DRIVE, SUITE 110
DULLES, VIRGINIA 20166
PHONE: (703) 665-0586
FAX: (301) 768-4169

SILVER SPRING INTERMEDIATE PARK
SILVER SPRING, MD

DATE:	DRAFTED BY:	PROJECT NO.:
12/31/18	JY	03.04228.01
SCALE:	CHECKED BY:	FIGURE NO.:
1"=39'	XC	2

APPENDIX B BORING LOGS, FIELD RESULTS AND OPERATIONS

PROJECT NAME: Silver Spring Intermediate Park
PROJECT NO.: 03.04228.01
LOCATION: Silver Spring, MD
CLIENT: Clark | Azar & Associates, Inc.

SB-1

PAGE 1 OF 1

DATE(S) DRILLED:12/12/2018
DRILLING METHOD(S): 3.25 in HSA
DRILLING EQUIPMENT: CME55
DRILLER: David LOGGER: J.Yao
SURFACE ELEVATION: 318.0 ft

GROUND WATER NOT ENCOUNTERED DURING DRILLING
DRY AT END OF DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (FT)	ELEVATION (FT)	SPT BLOW COUNTS	SAMPLE LEGEND	SAMPLE INTERVAL	% RECOVERY	ROCK QUALITY DESIGNATION %	RMR	GEOLOGIC STRATA	GRAPHIC LOG	MATERIAL DESCRIPTION OF STRATA	LIQUID LIMIT LL	PLASTICITY INDEX PI	MOISTURE CONTENT (%)	% Finer than #200
		2 7 4 3		0.0	50			FS3		0.0 / 318.0 TOPSOIL **Tops** -6 in 0.5 / 317.5 Tan, fine silty sand with gravel FILL, medium dense, moist **FL-SM**				
	315	3 3 3 3		2.0	25			R3		2.0 / 316.0 Brown, fine SILTY SAND, contains mica, loose, moist **SM**				
5		WOH 1 1 2		4.0	50			R3		4.0 / 314.0 Brown, fine CLAYEY SAND, contains mica, very loose, wet **SC**				
		2 3 6 6		6.0	100					6.0 / 312.0 Brown, fine SILTY SAND, contains mica, loose to medium dense, moist **SM**				
	310	2 4 5 6		8.0	58			R3						
10		4 6 7 11		10.0	100						NP	NP	21.1	27.3
	305	20 38 50/4		13.0	100			WR3		13.0 / 305.0 Brown, HIGHLY WEATHERED ROCK sampled as fine SILTY SAND, contains rock fragments, very dense, moist **SM**				
15										15.0 / 303.0 Boring Terminated				

REMARKS: -Surface elevation was estimated from the Boring Locations Exhibit A provided by client.
-Cave-in depth was at 13ft below existing site grade at SPT profile boring.
-Groundwater readings at the end of drilling and 24 hours after drilling completion were at 10ft and 9.5ft below existing site gradt at infiltration auger probe.

PAGE 1 OF 1
SB-1

DMY ENGINEERING CONSULTANTS INC.
45662 Terminal Drive, Suite 110
Dulles, Virginia 20166
tel: (703) 665-0586 fax: (301) 768-4169

PROJECT NAME: Silver Spring Intermediate Park
PROJECT NO.: 03.04228.01
LOCATION: Silver Spring, MD
CLIENT: Clark | Azar & Associates, Inc.

SB-2

PAGE 1 OF 1

DATE(S) DRILLED:12/12/2018
DRILLING METHOD(S): 3.25 in HSA
DRILLING EQUIPMENT: CME55
DRILLER: David LOGGER: J.Yao
SURFACE ELEVATION: 309.5 ft

GROUND WATER NOT ENCOUNTERED DURING DRILLING
DRY AT END OF DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (FT)	ELEVATION (FT)	SPT BLOW COUNTS	SAMPLE LEGEND	SAMPLE INTERVAL	% RECOVERY	ROCK QUALITY DESIGNATION %	RMR	GEOLOGIC STRATA	GRAPHIC LOG	MATERIAL DESCRIPTION OF STRATA	LIQUID LIMIT LL	PLASTICITY INDEX PI	MOISTURE CONTENT (%)	% Finer than #200
				0.0						0.0 / 309.5 TOPSOIL **Tops** -6 in				
		WOH 2 3 4			92					0.5 / 309.0 Brown, fine SILTY SAND, contains mica, loose to medium dense, moist **SM**				
		2 4 6 6		2.0	100			R3						
	305	4 5 6 7		4.0	46									
5				6.0						6.0 / 303.5 Brown, sandy LEAN CLAY, contains mica, stiff, moist **CL**				
		3 6 8 10			100			R2						
				8.0						8.0 / 301.5 Brown and red, sandy SILT, contains mica, stiff, moist **ML**				
	300	4 7 8 12			100			R2						
10				10.0						10.0 / 299.5 Gray, fine SILTY SAND, contains mica, medium dense to dense, moist **SM**	NP	NP	23.5	27.2
		3 7 10 15			96									
								R3						
		10 12 30 50/4		13.0	100									
	295													
15										15.0 / 294.5 Boring Terminated				

REMARKS:
-Surface elevation was estimated from the Boring Locations Exhibit A provided by client.
-Cave-in depth was at 12.5ft below existing site grade at SPT profile boring.
-Groundwater readings at 24 hours after drilling completion were at 6.4ft below existing site gradt at infiltration auger probe.

PAGE 1 OF 1

SB-2

DMY ENGINEERING CONSULTANTS INC.
45662 Terminal Drive, Suite 110
Dulles, Virginia 20166
tel: (703) 665-0586 fax: (301) 768-4169

PROJECT NAME: Silver Spring Intermediate Park
PROJECT NO.: 03.04228.01
LOCATION: Silver Spring, MD
CLIENT: Clark | Azar & Associates, Inc.

SB-3

PAGE 1 OF 1

DATE(S) DRILLED:12/12/2018
DRILLING METHOD(S): 3.25 in HSA
DRILLING EQUIPMENT: CME55
DRILLER: David LOGGER: J.Yao
SURFACE ELEVATION: 303.0 ft

GROUND WATER NOT ENCOUNTERED DURING DRILLING
DRY AT END OF DRILLING
NO LONG TERM MEASUREMENTS TAKEN

FIELD DATA | **LAB DATA**

DEPTH (FT)	ELEVATION (FT)	SPT BLOW COUNTS	SAMPLE LEGEND	SAMPLE INTERVAL	% RECOVERY	ROCK QUALITY DESIGNATION %	RMR	GEOLOGIC STRATA	GRAPHIC LOG	MATERIAL DESCRIPTION OF STRATA	LIQUID LIMIT LL	PLASTICITY INDEX PI	MOISTURE CONTENT (%)	% Finer than #200
		3 4 4 5		0.0	100					0.0 / 303.0 TOPSOIL **Tops** -10 in				
				2.0						0.8 / 302.2 Brown, fine SILTY SAND WITH GRAVEL, contains mica, loose, moist **SM**				
	300	3 3 3 3			92			R3						
				4.0						trace gravel				
5		1 2 2 2			58									
				6.0						6.0 / 297.0 Brown and gray, fine SILT WITH SAND, contains mica and quartz gravel, firm to stiff, wet **ML**				
		1 3 3 5			96									
	295			8.0										
		3 4 5 6			67			R2						
10				10.0										
		3 3 3 6			100						NP	NP	13.9	72.2
	290			13.0						13.0 / 290.0 Brown and red, fine SILTY SAND, contains mica and rock fragments, medium dense, moist **SM**				
		3 6 15 31			96			R3						
15										15.0 / 288.0 Boring Terminated				

REMARKS: -Surface elevation was estimated from the Boring Locations Exhibit A provided by client.
-Cave-in depth was at 12.5ft below existing site grade at SPT profile boring.
-Groundwater readings at the end of drilling and 24 hours after drilling completion were at 9.6ft and 9.7ft below existing site gradt at infiltration auger probe.

PAGE 1 OF 1
SB-3

DMY ENGINEERING CONSULTANTS INC.
45662 Terminal Drive, Suite 110
Dulles, Virginia 20166
tel: (703) 665-0586 fax: (301) 768-4169

FIELD INFILTRATION TESTING SUMMARY

DMY Project No.: 03.04228.01 **Project Name:** Silver Spring Intermediate Park

Test Date: 12/14/2018 **Tester:** J. Yao

Boring No.: I-1

Infiltration Hole Depth (in.): 120 Reference Depth for Test (24" above bottom)

PVC Pipe Stickup (in.): 21 from edge of PVC pipe (in.): 117

	Test 1	Test 2	Test 3	Test 4
Start Time	10:12 AM	11:12 AM	12:12 PM	1:12 PM
Finish Time	11:12 AM	12:12 PM	1:12 PM	2:12 PM
Start Depth to Water (in.)	117.00	116.64	116.40	116.16
Start Head (in.)	24.00	24.36	24.60	24.84
Finish Depth to Water (in.)	116.64	116.40	116.16	115.92
Fall (in.)	-0.36	-0.24	-0.24	-0.24

Calculated Infiltration Rate (in/hr)

Average or last reading :

-0.27

Boring No.: I-2

Infiltration Hole Depth (in.): 120 Reference Depth for Test (24" above bottom)

PVC Pipe Stickup (in.): 36 from edge of PVC pipe (in.): 132

	Test 1	Test 2	Test 3	Test 4
Start Time	10:16 AM	11:16 AM	12:16 PM	1:16 PM
Finish Time	11:16 AM	12:16 PM	1:16 PM	2:16 PM
Start Depth to Water (in.)	132.00	131.28	130.56	129.96
Start Head (in.)	24.00	24.72	25.44	26.04
Finish Depth to Water (in.)	131.28	130.56	129.96	129.36
Fall (in.)	-0.72	-0.72	-0.60	-0.60

Calculated Infiltration Rate (in/hr)

Average or last reading :

-0.66

Boring No.: I-3

Infiltration Hole Depth (in.): 120 Reference Depth for Test (24" above bottom)

PVC Pipe Stickup (in.): 36 from edge of PVC pipe (in.): 132

	Test 1	Test 2	Test 3	Test 4
Start Time	10:20 AM	11:20 AM	12:20 PM	1:20 PM
Finish Time	11:20 AM	12:20 PM	1:20 PM	2:20 PM
Start Depth to Water (in.)	132.00	132.00	132.00	131.76
Start Head (in.)	24.00	24.00	24.00	24.24
Finish Depth to Water (in.)	132.00	132.00	131.76	131.76
Fall (in.)	0.00	0.00	-0.24	0.00

Calculated Infiltration Rate (in/hr)

Average or last reading :

-0.06

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS	-	Split Spoon Sampler	RB	-	Rock Bit Drilling
ST	-	Shelby Tube Sampler	BS	-	Bulk Sample of Cuttings
RC	-	Rock Core; NX, BX, AX	PA	-	Power Auger (no sample)
PM	-	Pressuremeter	HSA	-	Hollow Stem Auger
DC	-	Dutch Cone Penetrometer	WS	-	Wash Sample

Standard Penetration Test (SPT) resistance refers to the blows per foot (bpf) of a 140 lb hammer falling 30 inches on a 2 in. O.D. split-spoon sampler as specified in ASTM D-1586. The blow count is commonly referred to as the N-value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density of Cohesionless Soils

SPT-N (bpf)	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 50	Dense
>50	Very Dense

Consistency of Cohesive Soils

SPT-N (bpf)	Consistency
0 – 1	Very Soft
2 – 4	Soft
5 – 8	Firm
9 – 15	Stiff
16 – 30	Very Stiff
31 – 50	Hard
>50	Very Hard

Weathered Rock (WR) may be defined as SPT-N values exceeding 60 bpf depending on site specific conditions. Refer carefully to boring logs.

Rock Fragments, gravel, cobbles, boulders, or debris may produce N-values that are not representative of actual soil properties.

III. Unified Soil Classification Symbols:

GP – Poorly Graded Gravel
GW – Well Graded Gravel
GM – Silty Gravel
GC – Clayey Gravels
SP – Poorly Graded Sands
SW – Well Graded Sands
SM – Silty Sands
SC – Clayey Sands

ML – Low Plasticity Silts
MH – High Plasticity Silts
CL – Low Plasticity Clays
CH – High Plasticity Clays
OL – Low Plasticity Organics
OH – High Plasticity Organics
CL-ML – Dual Classification (Typical)

IV. Laboratory Testing and Water Level Symbols:

LL – Liquid Limit (%)
PI – Plastic Index (%)
W – Moisture Content (%)
DD – Dry Density (PCF)
NP – Non Plastic
-200 – Percent Passing No. 200 Sieve
PP – Pocket Penetrometer (TSF)


Water Level at Time of Drilling, or as Shown


Water Level at End of Drilling, or as Shown


Water Level after 24 Hours, or as Shown

SUBSURFACE EXPLORATION PROCEDURES

Soil Borings – Hollow Stem Auger

In hollow stem auger drilling, the drill rig utilizes continuous flight, hollow stem (center opening ranges from 2-1/4 to 4-1/4 inches in size) augers to advance the boreholes. During drilling or formation cutting, the center of the hollow augers is filled with rods connected to a plug at the bottom bit. Once the desired drilling depth is reached, the center plug and rods can be pulled out, leaving the hollow augers in place to hold the borehole open for sampling and well installation. Sampling is performed through the center opening in the hollow stem augers by means of the split-barrel sampling procedure in accordance with ASTM D1586. Usually, drilling fluid is not used during the soil drilling using this procedure.

Standard Penetration Tests

In this process, a 2 foot long, 2 inch outside-diameter split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches into the ground by successive blows of a 140 pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The blows required for the first 6 inches of penetration are allowed for seating the sampler into any loose cuttings, and the sum of the blows required for penetration of the second and third 6 inch increments constitutes the standard penetration resistance or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value can be used as a qualitative indication of the in-place relative density of cohesionless soils (sands). In a less reliable way, it also indicates the consistency of cohesive soils (clays/silts). This indication is qualitative, since many factors can significantly affect the N-value and prevent a direct correlation among drilling crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies. The N-value also has been empirically correlated with various soil properties including strength, compressibility and potential for difficult excavation.

APPENDIX C LABORATORY TESTING RESULTS

DMY ENGINEERING CONSULTANTS INC.
45662 Terminal Drive, Suite 110
Dulles, Virginia 20166
tel: (703) 665-0586 fax: (301) 768-4169

SUMMARY OF LABORATORY RESULTS (AASHTO)

CLIENT Clark Azar & Associates, Inc.

PROJECT NAME Silver Spring Intermediate Park

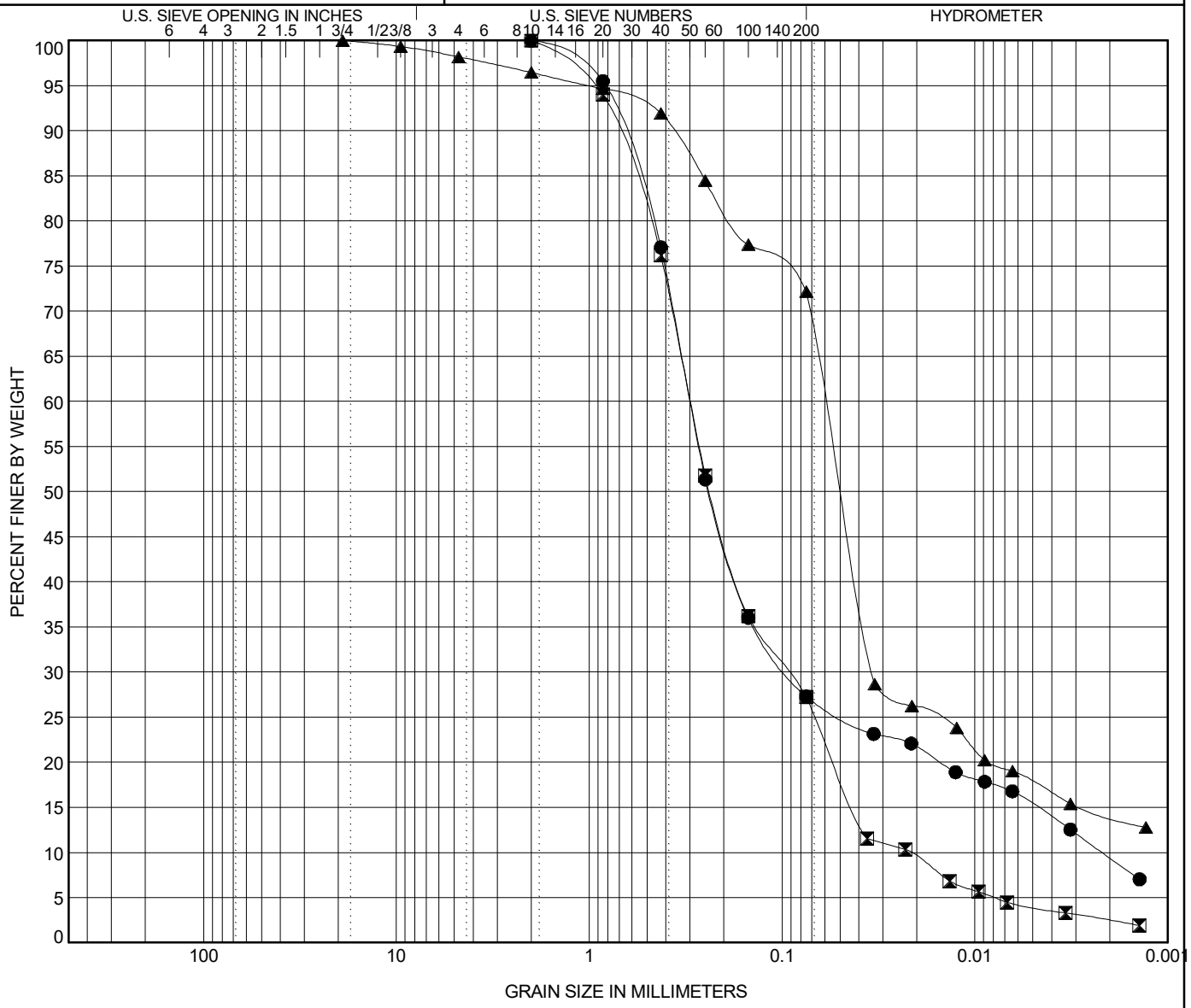
PROJECT NUMBER 03.04228.01

PROJECT LOCATION Silver Spring, MD

Sample ID	Depth (FT)	Liquid Limit	Plastic Limit	Plasticity Index	%<#200 Sieve	Water Content (%)	Proctor Method	Max Dry Density (pcf)	Optimum Moisture (%)	Oversize Fraction (%)	AASHTO CLASSIFICATION
SB-1-S-6	10.0 - 12.0	NP	NP	NP	27.3	21.1					Brown, Silty Sand (**SM**) A-2-4
SB-2-S-6	10.0 - 12.0	NP	NP	NP	27.2	23.5					Gray, Silty Sand (**SM**) A-2-4
SB-3-S-6	10.0 - 12.0	NP	NP	NP	72.2	13.9					Gray, Silt With Sand (**ML**) A-4

PROJECT NAME: Silver Spring Intermediate Park
PROJECT NO.: 03.04228.01
LOCATION: Silver Spring, MD
CLIENT: Clark Azar & Associates, Inc.

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	SAMPLE	DEPTH (FT)	SAMPLE DESCRIPTION	LL	PL	PI
●	**SB-1-S-6**	**10.0-12.0**	Brown, Silty Sand (**SM**)	**NP**	**NP**	**NP**
⧓	**SB-2-S-6**	**10.0-12.0**	Gray, Silty Sand (**SM**)	**NP**	**NP**	**NP**
▲	**SB-3-S-6**	**10.0-12.0**	Gray, Silt With Sand (**ML**)	**NP**	**NP**	**NP**

		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-1-S-6**	**2**	**0.299**	**0.093**	**0.002**	**0.0**	**72.7**	**12.0**	**15.3**
⧓	**SB-2-S-6**	**2**	**0.299**	**0.093**	**0.022**	**0.0**	**72.8**	**23.2**	**4.0**
▲	**SB-3-S-6**	**19**	**0.06**	**0.034**		**1.8**	**26.0**	**54.5**	**17.7**

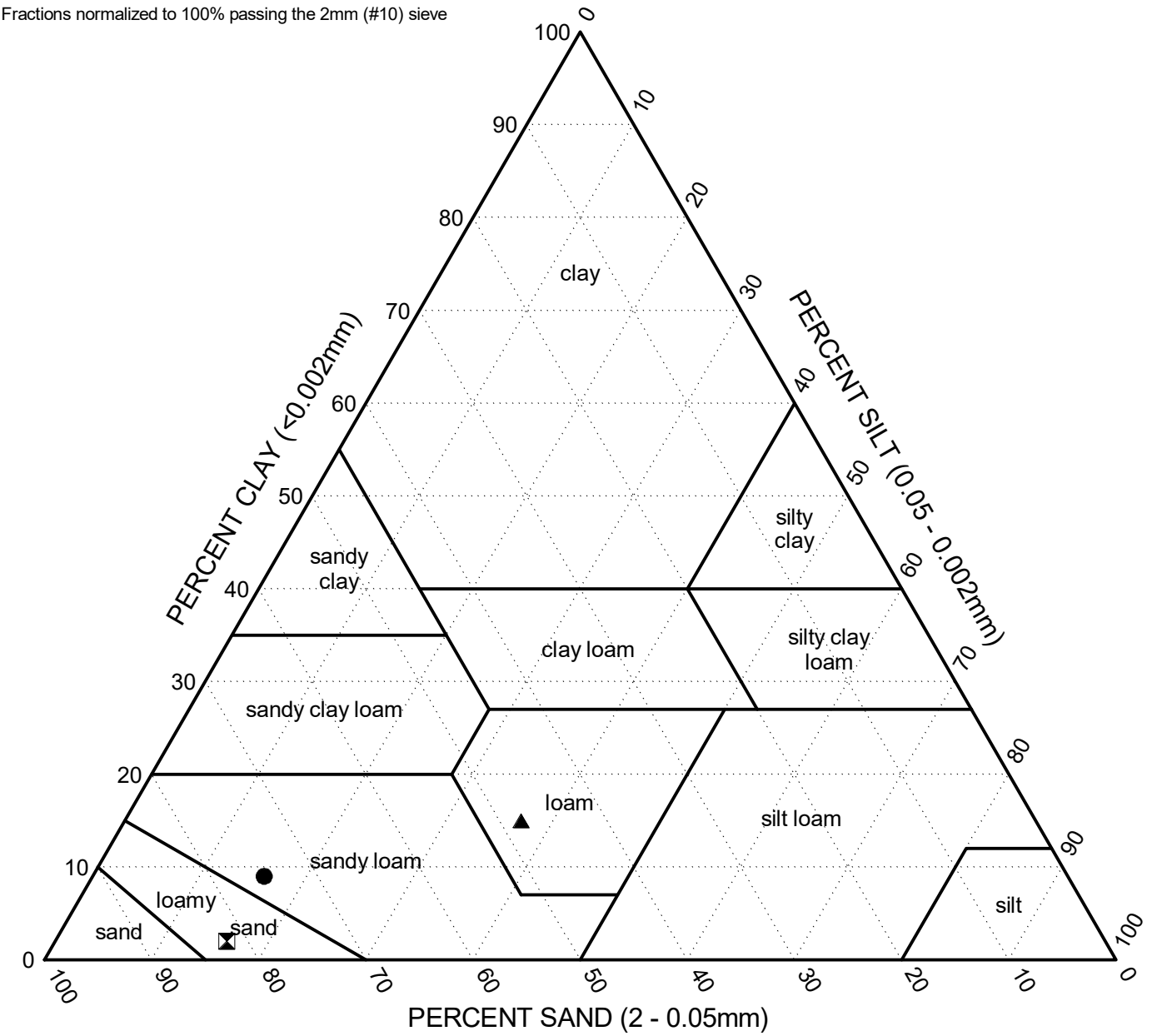
GRAIN SIZE:F:\EC - ENGINEERING\@ CMT - LAB\@ SOIL LAB ASSIGNMENTS\@ALL LAB ASSIGNMENTS\03.04228.01 SILVER SPRING INTERMEDIATE PARK\#1192.GPJ:#1192.GPJ:12/24/18

DMY ENGINEERING CONSULTANTS INC.
45662 Terminal Drive, Suite 110
Dulles, Virginia 20166
tel: (703) 665-0586 fax: (301) 768-4169

PROJECT NAME: Silver Spring Intermediate Park
PROJECT NO.: 03.04228.01
LOCATION: Silver Spring, MD
CLIENT: Clark Azar & Associates, Inc.

USDA Textural Classification Chart

Fractions normalized to 100% passing the 2mm (#10) sieve



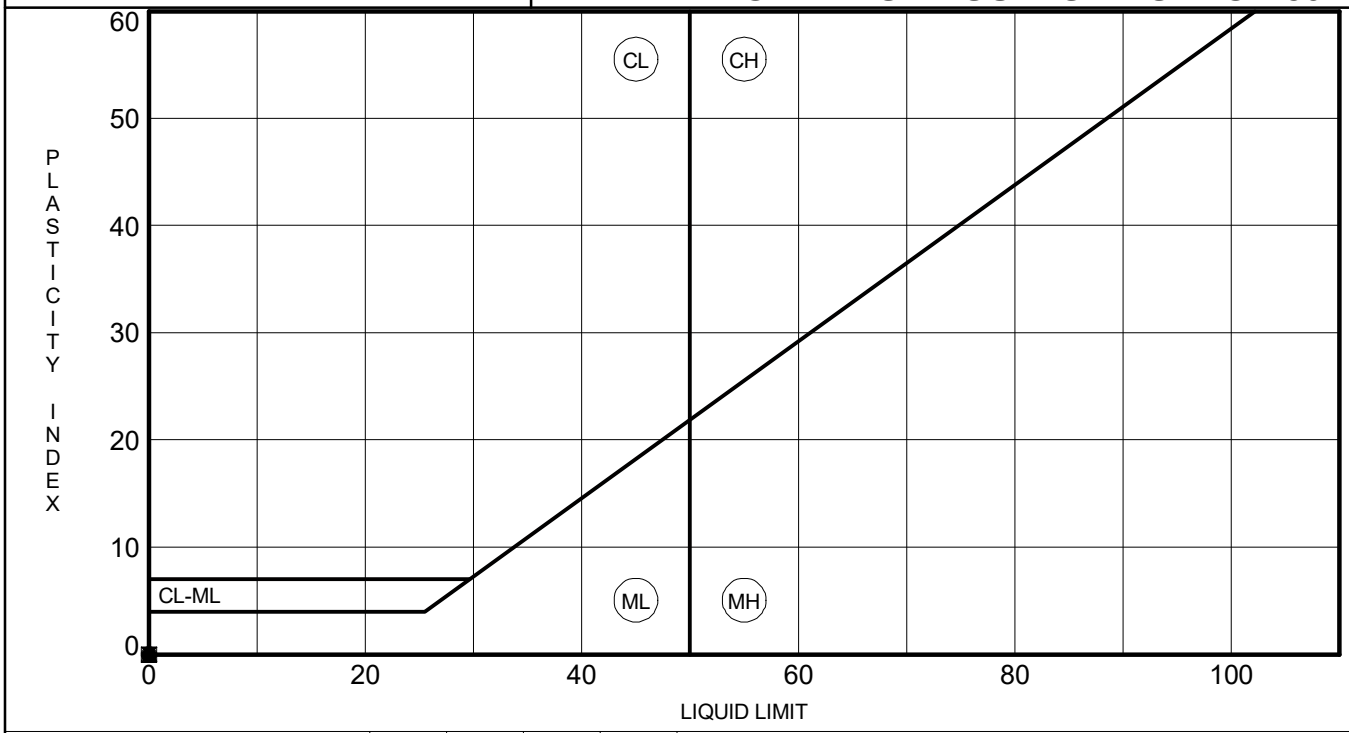
	Sample	Depth (ft)	USDA Classification	Sand (%)	Silt (%)	Clay (%)
●	**SB-1-S-6**	**10.0-12.0**	**SANDY LOAM**	**74.8**	**15.8**	**9.4**
⊠	**SB-2-S-6**	**10.0-12.0**	**LOAMY SAND**	**81.5**	**16.0**	**2.5**
▲	**SB-3-S-6**	**10.0-12.0**	**LOAM**	**47.5**	**37.9**	**14.6**

USDA TEXTURAL CLASSIFICATION:F:\EC - ENGINEERING\@ CMT - LAB\@ SOIL LAB ASSIGNMENTS\@ALL LAB ASSIGNMENTS\03.04228.01 SILVER SPRING INTERMEDIATE PARK\#1192.GPJ:#1192.GPJ:12/24/18

DMY ENGINEERING CONSULTANTS INC.
45662 Terminal Drive, Suite 110
Dulles, Virginia 20166
tel: (703) 665-0586 fax: (301) 768-4169

PROJECT NAME: Silver Spring Intermediate Park
PROJECT NO.: 03.04228.01
LOCATION: Silver Spring, MD
CLIENT: Clark Azar & Associates, Inc.

ATTERBERG LIMITS RESULTS AASHTO T89/T90

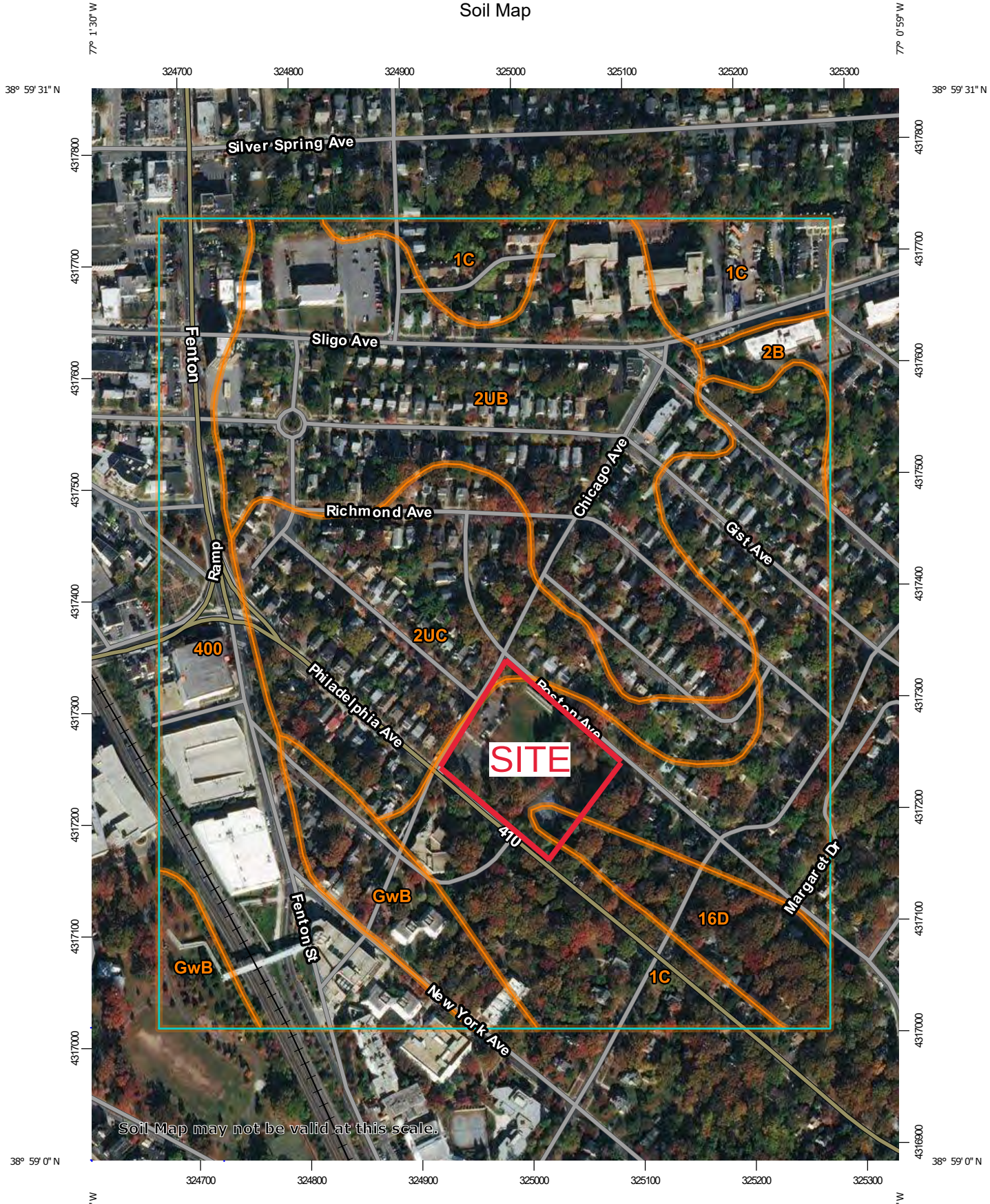


	SAMPLE	DEPTH (FT)	LL	PL	PI	Fines	SAMPLE DESCRIPTION
●	**SB-1-S-6**	**10.0-12.0**	**NP**	**NP**	**NP**	**27.3**	Brown, Silty Sand (**SM**)
⧓	**SB-2-S-6**	**10.0-12.0**	**NP**	**NP**	**NP**	**27.2**	Gray, Silty Sand (**SM**)
▲	**SB-3-S-6**	**10.0-12.0**	**NP**	**NP**	**NP**	**72.2**	Gray, Silt With Sand (**ML**)

DMY ENGINEERING CONSULTANTS INC.
45662 Terminal Drive, Suite 110
Dulles, Virginia 20166
tel: (703) 665-0586 fax: (301) 768-4169

V. Soils Information

Custom Soil Resource Report
Soil Map



Map Scale: 1:4,680 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Montgomery County, Maryland
Survey Area Data: Version 14, Sep 11, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 3, 2015—Feb 22, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1C	Gaila silt loam, 8 to 15 percent slopes	B	33.2	30.6%
2B	Glenelg silt loam, 3 to 8 percent slopes	B	1.4	1.3%
2UB	Glenelg-Urban land complex, 0 to 8 percent slopes	B	28.2	25.9%
2UC	Glenelg-Urban land complex, 8 to 15 percent slopes	B	17.4	16.0%
16D	Brinklow-Blocktown channery silt loams, 15 to 25 percent slopes	C	4.8	4.4%
400	Urban land	D	17.1	15.7%
GwB	Goresville gravelly silt loam, 3 to 8 percent slopes	C	6.7	6.2%
Totals for Area of Interest			**108.7**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

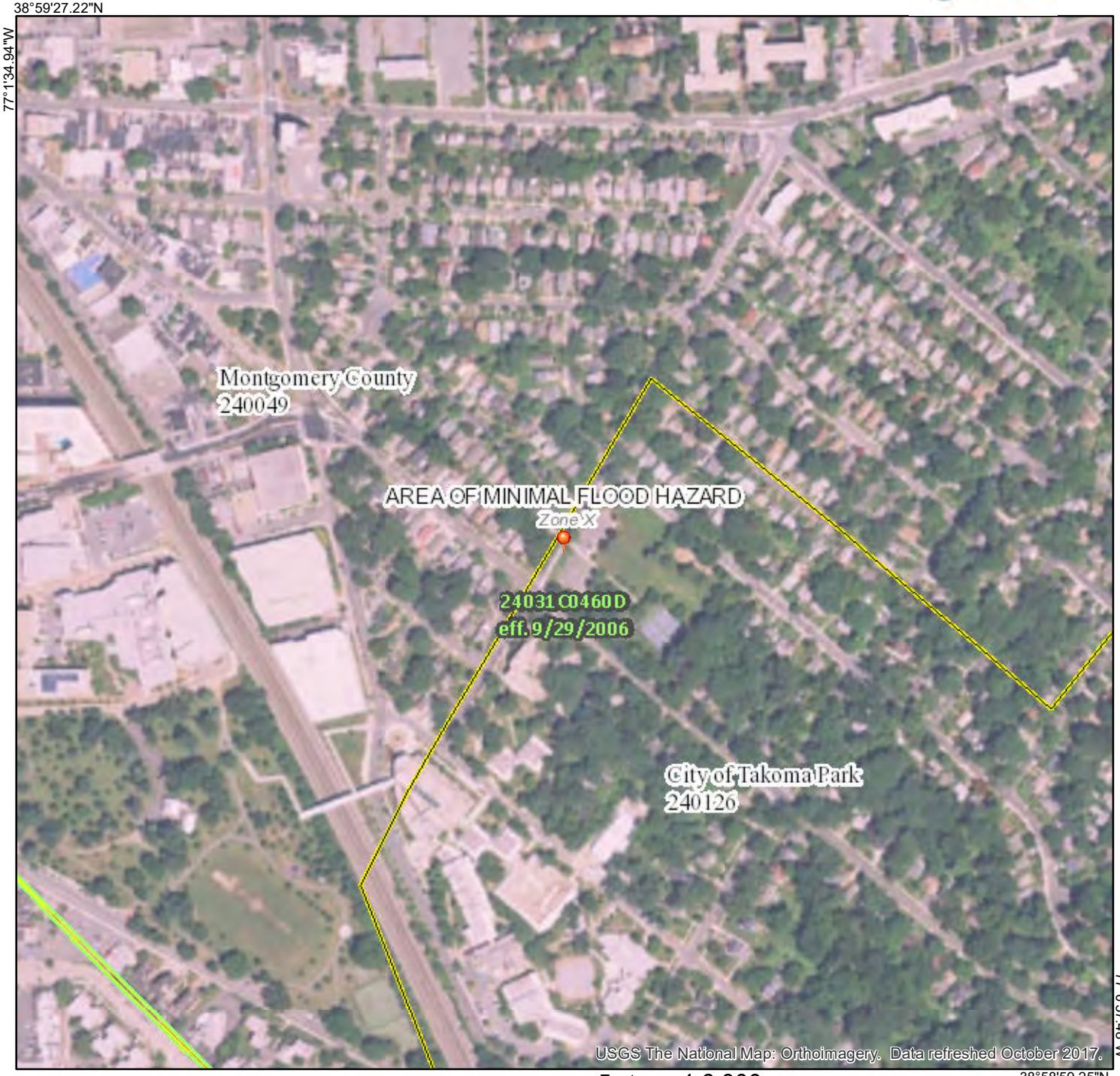
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

VI. FEMA Floodplain Map

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/19/2018 at 3:13:05 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

VII. Appendix

a) Pre-Development Drainage Area Map