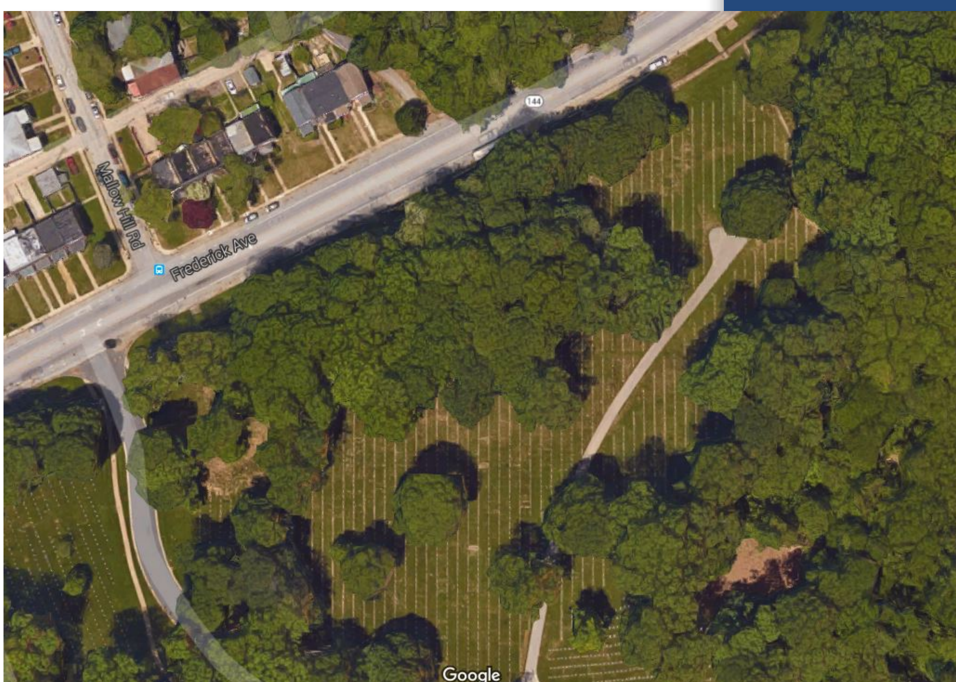
Stormwater Management Report

Baltimore National Cemetery

Niche Columbarium, In-Ground Cremains, Site Improvements

5501 Frederick Ave
Catonsville, MD 21228

May 2016



Prepared for:

U.S. Department of Veterans Affairs
810 Vermont Avenue
NW Washington, DC 20420

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED REGISTERED LANDSCAPE ARCHITECT UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 3487, EXPIRATION DATE: 7/3/2016.

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STATE OF MARYLAND
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LANDSCAPE ARCHITECT

5/20/16

KCI TECHNOLOGIES

KCI Job No 27133363.14

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INTRODUCTION

The goal of this project is to expand the Baltimore National Cemetery, including the construction of columbarium niches and in-ground cremains, along with miscellaneous site improvements including a new access road and restoration of the flag pole. In accordance with the "Stormwater Management Act of 2007" this report addresses environmental site design for improvements associated with the expansion project.

SITE DESCRIPTION AND NATURAL RESOURCES

The project site is Baltimore National Cemetery, located at 5501 Frederick Avenue, in Catonsville, MD. The cemetery is located approximately ten miles southwest of Baltimore, with access off of Frederick Ave. The northern portion of the site lies within the City of Baltimore limits, while the remaining area falls under Baltimore County jurisdiction. The Department of Veterans Affairs owns one 72.2 acre parcel adjacent to Frederick Avenue (Ward-25, Section-01, Block-8139G, Lot-001). Baltimore City zoning designates the northern portion of the site as R-4 ‘General Resident District’ in Section 61 on the Baltimore City zoning map. Baltimore County zoning designates the southern portion of the site as DR5.5 “Density Residential 5.5 units per acre.” The Work is limited to the northeast section of the parcel, designated as area “Q” by the cemetery.

The watershed listed for the site by Maryland Department of the Environment is Patapsco River Lower North Branch (02130906). The northern portion of the site drains north toward Frederick Avenue, while the southern portion drains south to Herbert Run. Drainage flows southeast from the site into the Patapsco River, eventually emptying into the Chesapeake Bay.

The site consists of the following soils per NRCS Web Soil Survey:
17B- Legore Loam with a 0 to 8 percent slope, HSG B
17C- Legore Loam with an 8 to 15 percent slope, HSG B
18UB- Legore Urban Land Complex with a 0 to 8 percent slope, HSG D
35B- Sunny Side fine Sandy Loam with 0 to 8 percent slope, HSG B
35C- Sunny Side fine Sandy Loam with an 8 to 15 percent slope, HSG B

In accordance with FEMA Flood Insurance Rate Map Numbers 2400870022E, effective February 02, 2012, and 2400100389F, effective September 26, 2008, a portion of the site falls into Zone A, Special Flood Hazard Areas subject to inundation by the 1% (100-year) annual chance flood. Although base flood elevations were not determined for the area of concern, the minimum adjacent base flood elevation is 281 feet. Surveyed elevations encompassing the area of work show that the lowest point has an elevation of 291.3 feet. The remaining site falls in Zone X, areas determined to be outside the 0.2% annual chance floodplain.

The existing cemetery consists of an office and service building, a lodge, a committal shelter, parking, and 16 burial sections. Currently, the cemetery houses only traditional burials. The proposed expansion will provide additional options with columbarium niches and in-ground cremains. The storm water drainage is directed by the existing topography to concrete flumes that run through the northeast section of the site and parallel to Frederick Avenue. The flume runoff is directed northeast along Frederick

Avenue. The site also has a storm drain network including pipes and inlets to collect stormwater runoff from internal roads and parking areas. Concrete flumes in the northeastern portion of the site may be converted to a storm drain system with pipes and inlets.

SITE IMPROVEMENTS

The proposed work occurs in an undeveloped area adjacent to Section P along Frederick Avenue, which will be designated the new Section Q. Access to the section is provided along a new internal roadway that pulls off from the main drive, runs down the slope, along the fence, and back to the new burial section. In order to keep the trees in this area the uphill side of the roadway is a retaining wall. The roadway is 20 feet wide along much of its length, but there is a section where it extents too close to existing burials and must reduce to a 12 foot one way section. North of the one way section, there are 4 parking spaces including handicapped parking and the road terminates in a turnaround at Section Q. Approximately 324 in-ground cremains are planned for Section Q and 1,400 columbarium niches. The columbarium wall is set into the hillside and is being used as a retaining wall. The road is graded toward inlets along the existing curb at the fence. This will require removal of the flume to the point that the new drive meets the fence. The entire area will be picked up in a pipe from that point on.

STORMWATER CONVEYANCE

An existing concrete flume along the cemetery fence line periodically discharges through piped drains to the state maintained storm drain system within the right-of-way. This project proposes the flume be replaced with a series of storm drain piping and inlets, though a small portion of the flume will remain intact near the cemetery entrance.

The proposed access road parallel to Frederick Avenue will drain away from the site to the new inlets along the fence line. Runoff is captured from the access road and directed to a proposed infiltration trench. Inlets are also shown upslope of the proposed columbarium and retaining wall for the access road to redirect site runoff that drains toward Frederick Avenue from the existing cemetery. A network of trench drain is provided adjacent to the access road in areas where construction will be in close proximity to existing grave sites. The concrete swale running northwest through the site near the proposed columbarium will be redirected through piping to discharge into the new storm drain system behind the columbarium as well. All upslope drainage is kept separate from the treated runoff and discharges directly to the State maintained storm drain network, bypassing the stormwater facility.

STORMWATER MANAGEMENT REQUIREMENTS

The following requirements apply to this project in regards to Stormwater Management:

1. Water Quality must be provided utilizing Environmental Site Design (ESD) to the Maximum Extent Practical.
2. Erosion and Sediment Control Practices must conform to the 2011 MDE Erosion and Sediment Control Handbook.

Environmental Site Design (ESD) requirements were calculated following the design guidelines set forth in the MDE Stormwater Management Regulations, latest edition.

QUALITATIVE MANAGEMENT (ESD)

The project Limit of Disturbance (LOD) is estimated to be 1.14 acres. The site's existing impervious cover is less than 40%; therefore, the site is considered a new development site. Per MDE regulations, any net increase of impervious cover must be treated for quality management at the target PE value. Improvements associated with the project will result in a net increase in impervious area of approximately 0.364 acres.

The ESD requirements were calculated for the site as provided in Appendix A. The site's total ESD volume management requirement is 2,935 cubic feet. The site's ESD requirements shall be met on-site as follows with a single infiltration trench facility:

ESD Facility	Contributing Area	Percent Impervious	Facility Length	Facility Width	Media Depth	Media Voids	ESD Volume Provided
IT-1	23,504 sf	62%	150 ft	10 ft	5 ft	40%	3,000 cf

ESDv Required: **2,987 cf**
<u>ESDv Provided: 3,000 cf</u>
Net ESDv: **+13 cf**

QUANTITATIVE MANAGEMENT

Per Table 1 (Page 30) of the Maryland Stormwater Management Guidelines for State and Federal Projects dated April 12, 2010, QP_2 and QP_{10} are not typically required for Baltimore County or City unless the project is located in the Coastal Plain (south of the Chesapeake & Delaware Canal), where there are downstream flooding issues, or conveyance is inadequate.

EROSION AND SEDIMENT CONTROL

Soil Erosion and Sediment Control shall be provided in accordance with the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control. Soil Erosion and Sediment Control BMP's to be utilized shall include stabilized construction entrance, silt fence, filter log, inlet protection, and temporary and permanent stabilization.

FLOODING

Because disturbance is proposed within the floodplain, application for a Letter of Map Amendment (LOMA) from FEMA will be necessary to establish the property's location in relation to the Special Flood Hazard Area. It is expected that the affected portion of the site was inadvertently mapped within the floodplain, but actually sits above the base flood elevation. If the LOMA application is not accepted, permitting will be required through Maryland Department of the Environment and the US Army Corps of Engineers Joint Permit Application. It has been discovered that several adjacent properties have been successfully removed from the floodplain through the LOMA process. With this precedent being established, it is anticipated that this project could be permitted the same allowance. A LOMA application is currently under review by FEMA and a Joint Permit Application for floodplain has been filed with FEMA as a backup.

CONCLUSION

The Baltimore National Cemetery project will not have an adverse impact on natural features and resources. The project's Limit of Disturbance (LOD) is estimated to be approximately 1.14 Acres and will be constructed in one phase. The project will incorporate an ESD practice and be designed to meet the latest Maryland Stormwater Management and Erosion and Sediment Control Regulations.

APPENDIX A

ESD COMPUTATIONS

KCI

Project Name:	Baltimore National Cemetery	By:	JMS	Date:	2/25/16
Project Number:	27133363.14	Chk:	BCM	Date:	2/25/16

Stormwater Management Using Environmental Site Design (ESD)

Total Parcel Area	2.0776	AC
Total Parcel Existing Impervious Coverage	0.1378	AC
Total Parcel Existing Impervious Percentage	6.63	%

Site Is Considered New Development

Site Area or Limit of Disturbance (A)	1.14	AC
Existing Conditions Impervious	0.076	AC
Existing Conditions Pervious	1.064	AC
Proposed Conditions Impervious (At)	0.44	AC
Proposed Conditions Pervious	0.7	AC
New Impervious	0.364	AC

New Development Calculations

(Treatment of all impervious)

Percent Impervious (I)

I = (At/A)100% = 39 %

At = 0.44

A = 1.14

Rainfall Depth Target (Pe)

%HSGA =		%	1.8 "	=	0	"
%HSGB =	100	%	1.8 "	=	1.8	"
%HSGC =		%	1.8 "	=	0	"
%HSGD =		%	1.6 "	=	0	"
Composite Target Pe					1.8	"

Volumetric Runoff Coefficient (Rv)

Rv = 0.05 + 0.009(I) = 0.401

I = 39

ESD Design Runoff Volume (ESDv)

ESDv = [(Pe)(Rv)(A)]/12 = 0.06857 AC-FT

Pe = 1.8

Rv = 0.4

A = 1.14

Total ESDv for the Site	**2987 CF**

KCI

Project:	Baltimore National Cemetery		
J.O.	27133363.14		
By:	JMS	Date:	5/20/2016
Checked:	BCM	Date:	5/20/2016

Stormwater Management ESD Techniques and Facility Design

Infiltration Trench Facility 1

Drainage Area to Facility (A) = 23504 SF
Impervious = 14614 SF
Pervious = 8890 SF

Total Facility Storage Requirements:

I = Imp/A *100% = 62.177 %

Rv = 0.05 + 0.009(I) = 0.6096

Target Pe = 1.8 "

ESDv = $\frac{(Pe)(Rv)(A)}{12}$ = **2149 CF**

Max Pe = 2.7 "

ESDv = $\frac{(Pe)(Rv)(A)}{12}$ = **3224 CF**

Facility Geometry:

Facility Length = 150 FT
Facility Width = 10 FT
Facility Surface Area (SA) = 1500 SF
Facility Depth / Media Thickness (D) = 5 FT

Facility Storage:

Storage = SA*D*0.4 = 3000 CF

Total Temporary Storage Volume Provided = 3,000 CF
Maximum Storage Volume Allowed = 3,224 CF

Total Credited Volume towards ESD Requirement = 3,000 CF

Therefore, the Total Required Temporary Surface Volume has been Provided for Treating 100% of the Impervious Draining to the Facility.

Pe Provided:

Pe = $\frac{(ESDv)(12)}{(Rv)(A)}$ = **2.51 "**

APPENDIX B

PIPE SIZING COMPUTATIONS

KCI	Project Name:	Baltimore National Cemetery	By: JMS	Date:	4/22/16
	Project Number:	27133363.14	Chk: BCM	Date:	4/22/16

STORM DRAIN DESIGN SUMMARY

Rational Method: Q = CiA
Q = Flow Rate
C = Runoff Coefficient — C = 0.35 (Lawn) / 0.95 (Impervious)
i = Rainfall Intensity — i = 6.55* (10 year intensity @ 5 min)
A = Drainage Area

*From NOAA Precipitation Frequency Data Server

Flow Entry Point	Drainage Area		C	Q10	
I-1	0.242	Ac.	0.54	0.856	cfs
I-2	0.099	Ac.	0.95	0.616	cfs
I-3	0.048	Ac.	0.95	0.299	cfs
I-4	0.060	Ac.	0.95	0.373	cfs
I-5	0.091	Ac.	0.62	0.371	cfs
I-6	0.142	Ac.	0.53	0.493	cfs
I-7	0.269	Ac.	0.40	0.705	cfs
I-8	0.534	Ac.	0.35	1.224	cfs
I-9	0.043	Ac.	0.35	0.099	cfs
I-10	0.009	Ac.	0.35	0.021	cfs
I-11	0.541	Ac.	0.35	1.24	cfs
I-12	0.175	Ac.	0.35	0.401	cfs
I-13	0.000	Ac.	0.35	0	cfs
I-14	0.212	Ac.	0.35	0.486	cfs
I-15	0.033	Ac.	0.35	0.076	cfs
I-16	0.204	Ac.	0.35	0.468	cfs
I-17	0.159	Ac.	0.35	0.365	cfs
I-18	0.242	Ac.	0.35	0.555	cfs
I-19	0.614	Ac.	0.35	1.408	cfs
I-20	0.247	Ac.	0.35	0.566	cfs
Trench Drain	3.415	Ac.	0.35	7.829	cfs

Pipe Designation	Cumulative Q		Pipe Size		Full Flow Capacity	
P-1	0.856	cfs	8	in	1.2	cfs
P-2	1.472	cfs	10	in	2.2	cfs
P-3	1.771	cfs	10	in	2.2	cfs
P-4	2.143	cfs	12	in	3.6	cfs
P-5	0.371	cfs	8	in	1.2	cfs
P-6	0.493	cfs	8	in	1.2	cfs
P-7	5.438	cfs	18	in	10.5	cfs
P-8	1.45	cfs	12	in	3.4	cfs
P-9	2.79	cfs	12	in	3.4	cfs
P-10	2.691	cfs	12	in	3.4	cfs
P-11	2.671	cfs	12	in	3.4	cfs
P-12	1.431	cfs	10	in	2.2	cfs
P-13	1.029	cfs	10	in	2.2	cfs
P-14	1.029	cfs	10	in	2.2	cfs
P-15	0.543	cfs	8	in	1.2	cfs
P-16	0.468	cfs	8	in	1.2	cfs
P-17	0.36	cfs	8	in	1.2	cfs
P-18	2.893	cfs	12	in	3.6	cfs
P-19	1.974	cfs	10	in	2.2	cfs
P-20	0.566	cfs	8	in	1.2	cfs

APPENDIX C

SOILS REPORT (WEB SOIL SURVEY)

United States Department of Agriculture

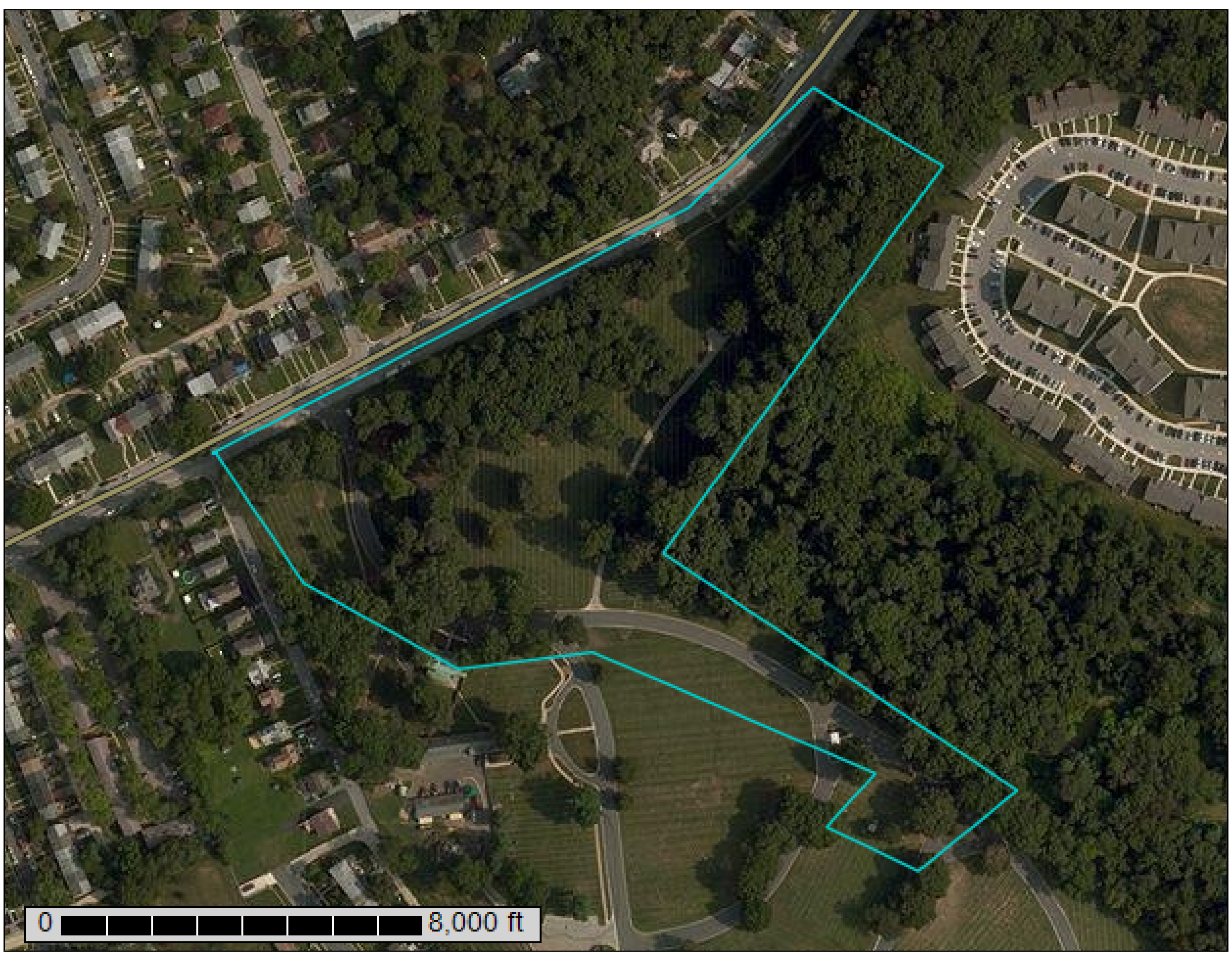
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

City of Baltimore, Maryland



July 2, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

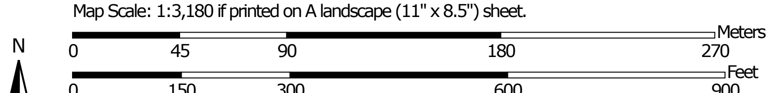
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:3,180 if printed on A landscape (11" x 8.5") sheet.



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 1:12,000.

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: http://websoilsurvey.nrcs.usda.gov
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: City of Baltimore, Maryland
Survey Area Data: Version 10, Sep 24, 2014

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

Date(s) aerial images were photographed: Jul 5, 2014—Aug 15, 2014

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.

Map Unit Legend

City of Baltimore, Maryland (MD510)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
17B	Legore loam, 0 to 8 percent slopes	6.8	52.6%
17C	Legore loam, 8 to 15 percent slopes	3.5	27.1%
18UB	Legore-Urban land complex, 0 to 8 percent slopes	0.2	1.4%
35B	Sunnyside fine sandy loam, 0 to 8 percent slopes	2.2	17.1%
35C	Sunnyside fine sandy loam, 8 to 15 percent slopes	0.2	1.8%
Totals for Area of Interest		**12.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

City of Baltimore, Maryland

17B—Legore loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: kxkm
Elevation: 80 to 2,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Legore and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Legore

Typical profile

H1 - 0 to 12 inches: loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

17C—Legore loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: kxkn
Elevation: 80 to 2,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Legore and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Legore

Typical profile

H1 - 0 to 12 inches: loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B

18UB—Legore-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: kxkt
Elevation: 80 to 2,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 40 percent
Legore and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Legore

Typical profile

H1 - 0 to 12 inches: loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

Description of Urban Land

Typical profile

H1 - 0 to 60 inches: variable

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 inches to
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D

35B—Sunnyside fine sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: kxm6
Elevation: 150 to 350 feet
Mean annual precipitation: 38 to 44 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Sunnyside and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sunnyside

Typical profile

H1 - 0 to 10 inches: fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

35C—Sunnyside fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: kxm7
Elevation: 150 to 350 feet
Mean annual precipitation: 38 to 44 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Sunnyside and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sunnyside

Typical profile

H1 - 0 to 10 inches: fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group

Map Scale: 1:3,180 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 45, 90, 180, 270

Feet: 0, 150, 300, 600, 900

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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:12,000.

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: http://websoilsurvey.nrcs.usda.gov
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: City of Baltimore, Maryland
Survey Area Data: Version 10, Sep 24, 2014

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

Date(s) aerial images were photographed: Jul 5, 2014—Aug 15, 2014

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

Hydrologic Soil Group— Summary by Map Unit — City of Baltimore, Maryland (MD510)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
17B	Legore loam, 0 to 8 percent slopes	B	6.8	52.6%
17C	Legore loam, 8 to 15 percent slopes	B	3.5	27.1%
18UB	Legore-Urban land complex, 0 to 8 percent slopes	D	0.2	1.4%
35B	Sunnyside fine sandy loam, 0 to 8 percent slopes	B	2.2	17.1%
35C	Sunnyside fine sandy loam, 8 to 15 percent slopes	B	0.2	1.8%
Totals for Area of Interest			**12.9**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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