Drainage Report for:

Universal Aerospace Co., Inc. – Site Grading/Paving

June 26, 2012

Prepared by:

Cascade Surveying & Engineering., Inc.

Job #19425
V:\19425\Drainage (19425)

Project Summary

Upstream & Downstream Analysis

Flow Control & Runoff Treatment

Appendix

Maps

Soils

Infiltration Trench Design

Maintenance Manual

Drainage Information Summary Form

Project Total Area: **±1 acres**

Project Development Area: **±0.65 acres**

Number of Lots (if applies): **1**

Summary Table

Drainage Basin Information	**Individual Basin Information**	
	A	**B**
On-site Sub-basin Area (acres)	1 acres	
Type of Storage Proposed	N/A	
Appx. Dead Storage Vol (cf)	N/A	
Appx. Live Storage Vol (cf)	N/A	
Soil Type(s) (Natural Resource Conservation Service)	Lynnwood Loamy Sand	
Pre-developed Discharge Rates		
Q (cfs.)		
2 yr.	0.24	
10 yr.	0.40	
50 yr.	0.48	
Redevelopment Area (acres)	N/A	
Post-development Runoff Rates (without quantity controls)		
Q (cfs.)		
2 yr.	0.56	
10 yr.	0.86	
50 yr.	0.98	
Post-development Runoff Rates (with quantity controls)		
Q (cfs.)		
2 yr.	0	
10 yr.	0	
50 yr.	0	
Offsite Upstream Area		
Number of acres	0	
Offsite Downstream Flow		
Q(cfs) 50 yr.	0	

Project Summary

PROPERTY DESCRIPTION

The project site is located in a portion of Section 22, Township 31 North, Range 05 East W.M. More specifically the site lies in the Arlington Airport on 59th Dr. NE 2 blocks North of the Airport office. The property is identified by Airport Lot # 30-A as shown below in Figure 1, highlighted in pink.

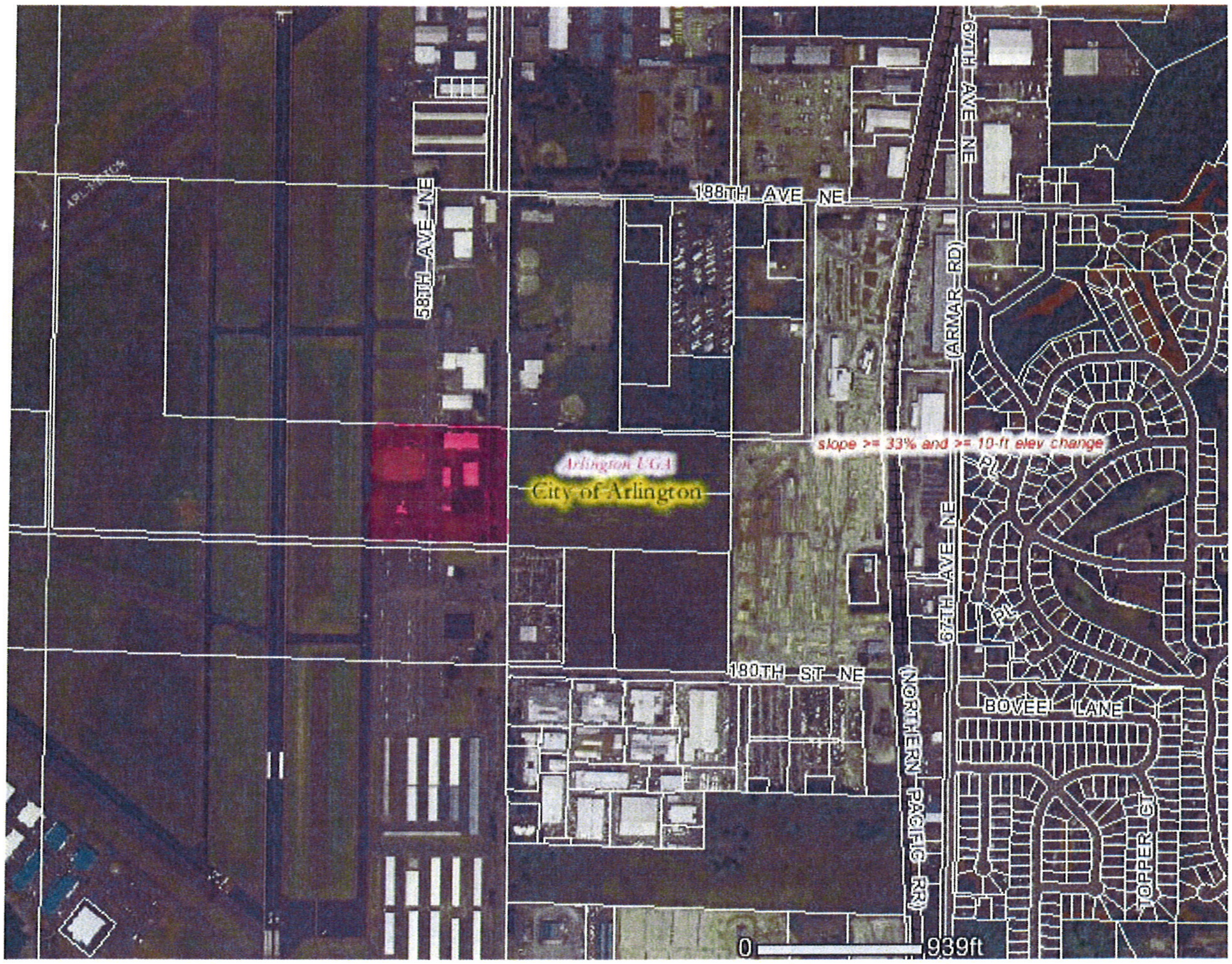


Figure 1: Vicinity Map. Not to scale.

EXISTING CONDITIONS

The project site is approximately 1 acre, and is a leased lot at the Arlington Airport. It lies on the West side of 59th Dr NE, approximately two blocks North of the Airport Office. To the West it is bounded by the taxiway and to the East by 59th Dr. NE. Lots to the North and South are developed sites for industrial use.

There is one building on the site and the rest is predominantly paved, with one seeded area between the building and the taxiway. The property to the east has large vegetated areas consisting of grass and landscaped portions along the frontages.

According to the USDA NRCS Soil Survey of Snohomish County, the soil type on site is Lynwood Loamy Sand. This very deep, and somewhat excessively drained soil, is on terraces and outwash plains. The surface layer is grayish brown loamy sand about 1 inch thick. The upper part of the subsoil is dark brown loamy sand about 14 inches thick. The substratum to a depth of 60 inches or more is grayish brown sand. In some areas the surface layer and subsoil are sandy loam.

Site topography is flat, with slopes between 0-3%. There is a small paved area offsite that drains onto the property, but does not contribute a significant amount of stormwater runoff. All storm water runoff either puddles in the flat portions of the site, or drains to existing catch basins throughout the property.

DEVELOPED CONDITIONS

The proposal is to remove the existing asphalt, grade and re-pave it, and construct an infiltration trench so that all storm water runoff drains to catch basins and gets properly treated before infiltrating. Total area to be paved is approximately 20,495 sq ft.

The proposed development activity is considered new development and results in more than 5,000 sq ft of new/replaced impervious surface. Therefore according to the 2005 DOE Stormwater Manual, the new development project must comply with minimum requirements 1-10.

Below is an outline describing how the proposed development activity complies with all five of the minimum requirements.

1. **Preparation of a stormwater site plan** – A stormwater site plan has been prepared as part of and as a supplement to this report.

2. **Stormwater Pollution Prevention Plan (SWPPP) –** A SWPP Plan and Narrative have been prepared in accordance with MR#2. Refer to the Targeted plan set for the SWPP Plan, and refer to the supplemental report titled SWPPP Narrative for complete detail. Land disturbance for the new development activity is estimated at 0.65-acre; therefore, the property owner or the operator of the site will not need to submit a Notice of Intent (NOI) application for a General Construction Stormwater Permit administered by the Washington State Department of Ecology (DOE). This project must be permitted by Snohomish County before land disturbance can occur.

3. **Water pollution source control for new development or redevelopment** – No known pollution-generating activities described in volume IV, chapter 3 and 4 will be performed on-site during construction or are proposed for the developed site following construction. Any sources of pollution that may result from the construction activity will be controlled according to SWPPP Element #9, Control Pollutants.

4. **Preservation of natural drainage systems and outfalls** – The natural drainage patterns identified in the Drainage Report and on the Stormwater Site Plan will be maintained during construction and post development.

5. **On-site stormwater management** –On-site stormwater management BMPs will be used to infiltrate stormwater runoff on-site. All runoff will be infiltrated using infiltration trenches.

6. **Runoff Treatment** – On site treatment trenches will be used to provide runoff treatment.

7. **Flow Control –** On site infiltration trenches will be used to provide flow control for stormwater runoff.

8. **Wetlands Protection** – There are no on-site wetlands.

9. **Basin/Watershed Planning** – The project site does not impact the basin/watershed.

10. **Operation & Maintenance** – An O & M manual is included with the drainage report.

Upstream & Downstream Analysis

UPSTREAM ANALYSIS

Since the site and surrounding areas are flat, 0-3% slope, there are no up stream areas which drain onto the property. This was based on site visits, in which no offsite drainage onto the property was observed. In the event that there is contributing drainage from upstream areas, the effects would be negligible, as any offsite storm water would be inconsequential in volume.

DOWNSTREAM ANALYSIS

Since the site and surrounding topography are flat, 0-3% slope, there is no downstream drainage. The site will be graded such that all stormwater will be captured and infiltrated onsite, thus there will be no downstream impacts.

FLOW CONTROL & RUNOFF TREATMENT

On-site stormwater management will be implemented using the existing bio-swale/infiltration system and an additional treatment/infiltration trench. Approximately half of the proposed development will be routed to the existing bio-swale/infiltration system, which is approximately 100' long. The bio-swale will treat all polluted stormwater runoff from the parking lots before it is infiltrated.

The remaining stormwater runoff will be routed to a treatment trench, via catch basins, where it will be treated using a sand filter before it is infiltrated. The treatment trench is sized to treat runoff from the two year storm. Stormwater runoff volumes in excess of the two year storm will over flow into an infiltration trench where it will directly infiltrate into the native sandy loam.

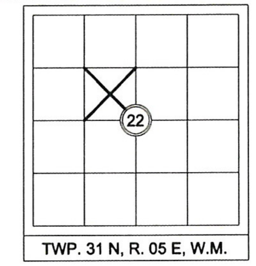
Appendix

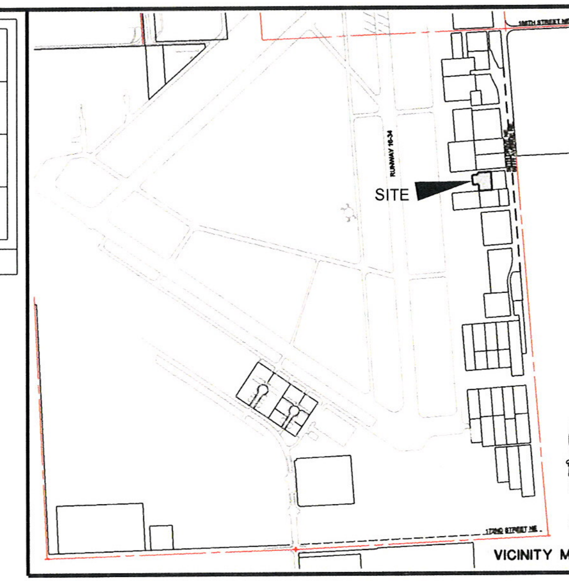
CITY OF ARLINGTON

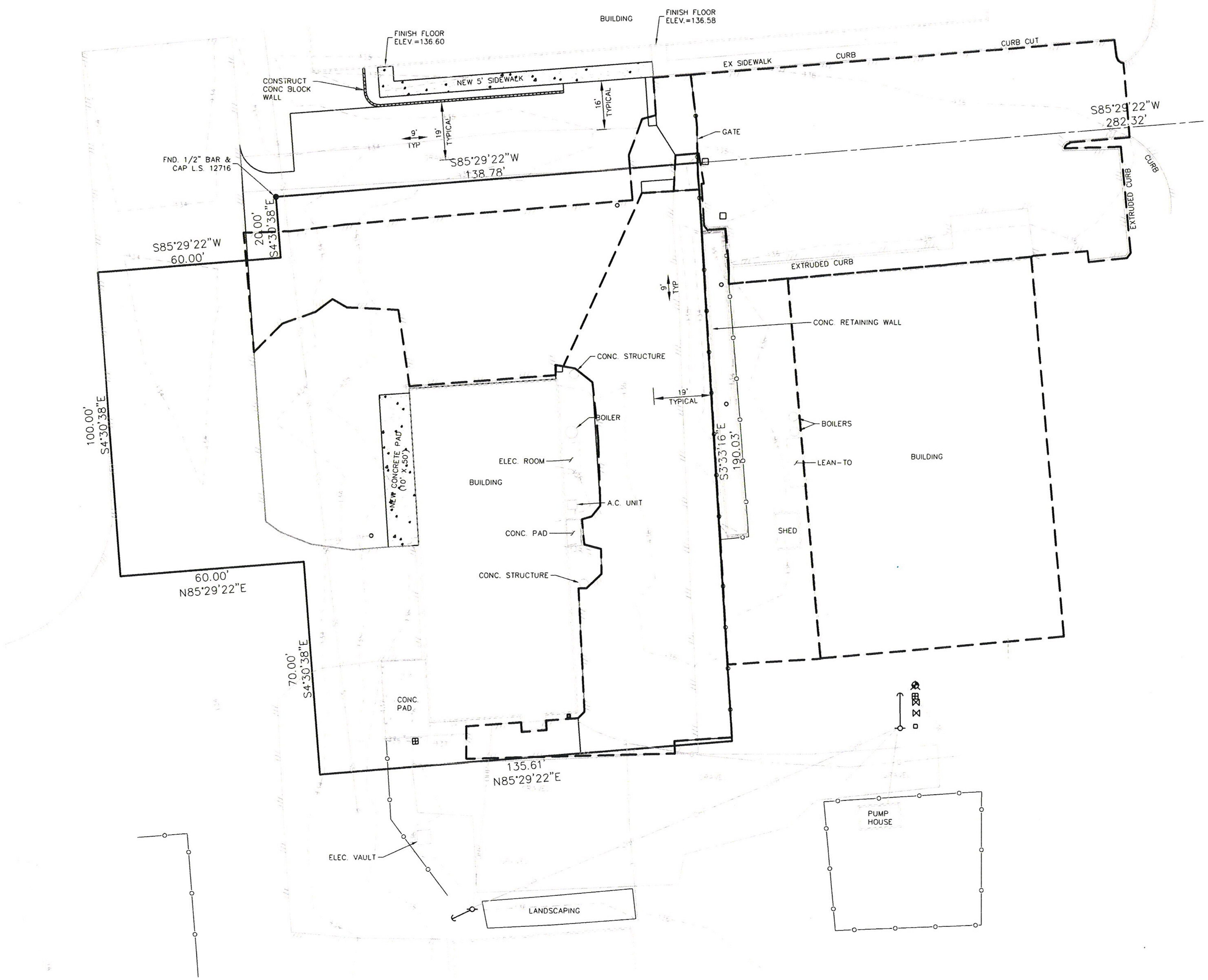
UNIVERSAL AEROSPACE CO., INC.

FILE NO.

PORTION OF SEC. 22, TWP. 31 N., RGE. 05 E., W.M.







LEGEND:

- PROPERTY LINE
- ROW
- SECTION LINE
- CENTER LINE
- EXISTING CONTOUR LINE
- FINISHED CONTOUR LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING DRAINAGE DITCH
- EXISTING STORM DRAINAGE PIPE
- EXISTING WATER LINE
- EXISTING SANITARY SEWER LINE
- EXISTING UNDER FIELD DRAINAGE LINE
- DRAINAGE BOUNDARY

GRAPHIC SCALE

20 0 10 20 40

1 inch = 20 ft

CALL TWO BUSINESS DAYS BEFORE YOU DIG 1-800-424-5555

V:\19425\DWG\CONSTRUCTION\19425 DRAINAGE AREAS.DWG (NOTES)

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ARLINGTON, WASHINGTON 98223
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1-800-593-5551
(360) 435-5551

FREDRICK H. POYNER — STATE OF WASHINGTON — 12716 — REGISTERED PROFESSIONAL LAND SURVEYOR

7-9-12

REVISION	DATE	BY

DESIGNED RLD DATE 06/12
DRAWN TAA DATE 06/12
CHECKED RLD DATE 06/12
FIELD BOOK ARL 124

CITY OF ARLINGTON
UNIVERSAL AEROSPACE CO., INC.
CONSTRUCTION DRAWINGS
EXISTING DRAINAGE AREA
Z-00-000-
CITY FILE NO.

1 OF 2

19425

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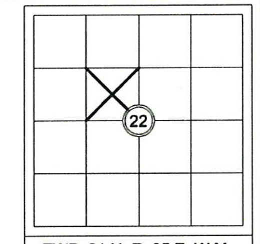

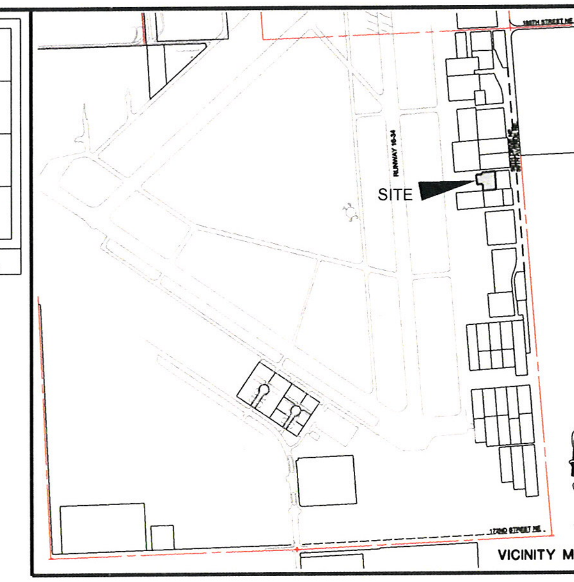

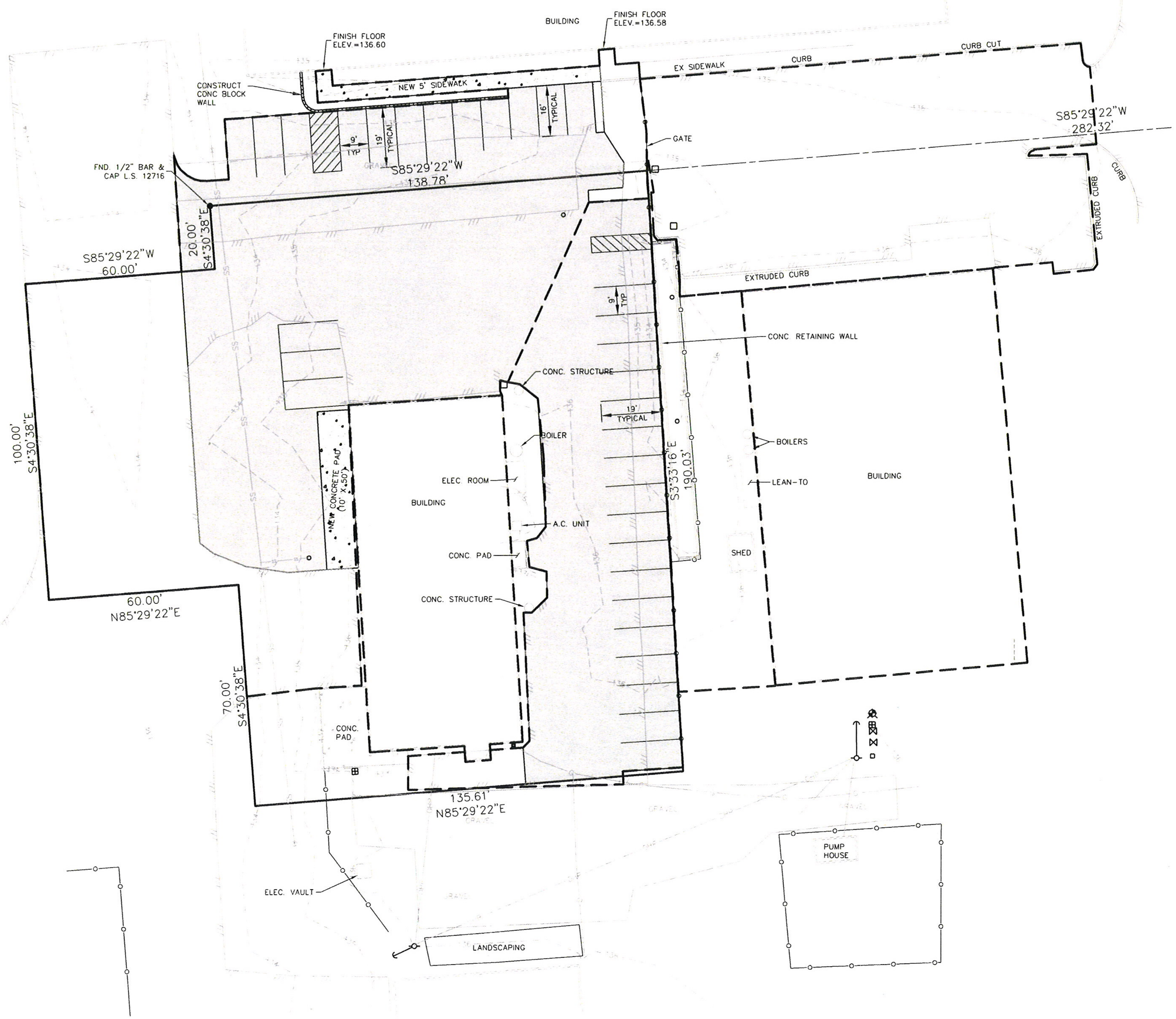

LEGEND:

(solid line)	PROPERTY LINE
(dashed line)	ROW
	SECTION LINE
	CENTER LINE
	EXISTING CONTOUR LINE
	FINISHED CONTOUR LINE
	EXISTING EDGE OF PAVEMENT
	EXISTING DRAINAGE DITCH
	EXISTING STORM DRAINAGE PIPE
	EXISTING WATER LINE
	EXISTING SANITARY SEWER LINE
	EXISTING UNDER FIELD DRAINAGE LINE
(heavy dashed line)	DRAINAGE BOUNDARY

GRAPHIC SCALE

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1 inch = 20 ft.

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UNIVERSAL AEROSPACE CO., INC.
CONSTRUCTION DRAWINGS
DEVELOPED DRAINAGE AREAS
Z-00-000-
CITY FILE NO.

19425

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United States Department of Agriculture

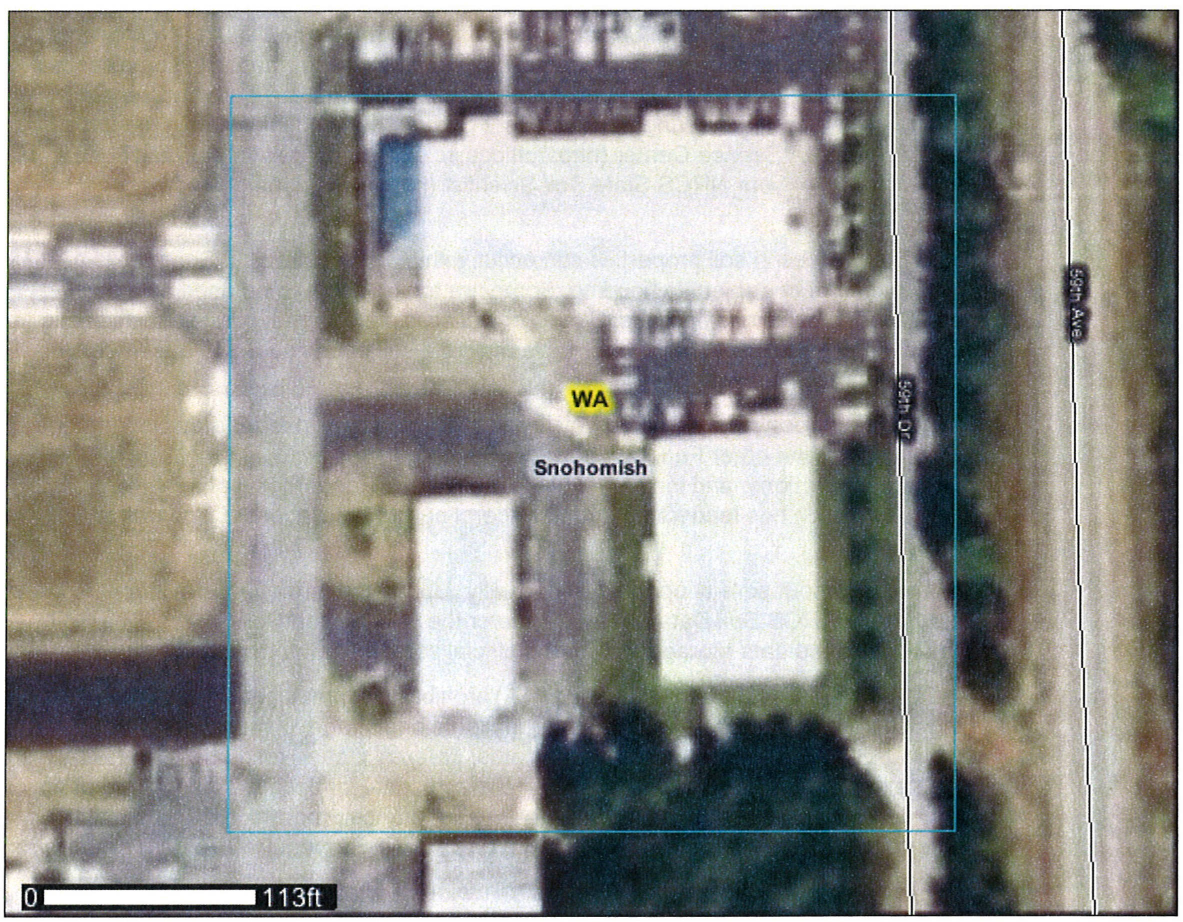
NRCS

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
Snohomish County Area, Washington

Universal Aerospace



June 26, 2012

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://soils.usda.gov/sqi/) 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://soils.usda.gov/contact/state_offices/).

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 Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

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.

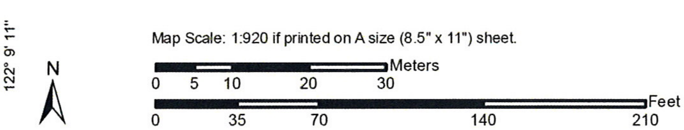
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in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

Custom Soil Resource Report
Soil Map

Map Scale: 1:920 if printed on A size (8.5" x 11") sheet.



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

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

- Gully
- Short Steep Slope
- Other

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:920 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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 accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

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

Soil Survey Area: Snohomish County Area, Washington
Survey Area Data: Version 6, Sep 22, 2009

Date(s) aerial images were photographed: 7/24/2006

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

Snohomish County Area, Washington (WA661)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
30	Lynnwood loamy sand, 0 to 3 percent slopes	3.4	100.0%
Totals for Area of Interest		**3.4**	**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.

Snohomish County Area, Washington

30—Lynnwood loamy sand, 0 to 3 percent slopes

Map Unit Setting

Elevation: 50 to 600 feet
Mean annual precipitation: 40 to 65 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 180 to 200 days

Map Unit Composition

Lynnwood and similar soils: 85 percent
Minor components: 3 percent

Description of Lynnwood

Setting

Landform: Outwash plains, terraces
Parent material: Glacial outwash

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.8 inches)

Interpretive groups

Land capability (nonirrigated): 4s

Typical profile

0 to 1 inches: Loamy sand
1 to 29 inches: Loamy sand
29 to 60 inches: Sand

Minor Components

Custer

Percent of map unit: 3 percent
Landform: Depressions

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

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Hydraulic Modeling Inputs				
Gravel Trench			**Box Swale**	
Length =	80'		Mannings (n) =	0.3
Width =	4'		Slope =	0.75%
Depth =	4.3		Width =	5.5'
Infiltration Rate =	10 in/hr		Discharge =	WWHM Output
Void Ratio =	30%			
T_c =	18.08 min			
L_{Tc} =	190.76'			
S_{Tc} =	2%			
C_{Tc} =	0.9			

Notes:
1. The gravel trench was modeled completely using WWHM3
2. The box swale was modeled using WWHM3 and FlowMaster. WWHM3 was used to get the runoff volumes that were then put into FlowMaster to get the depth of flow in the box swale
3. WWHM file name: 19425-3

Gravel Trench			
	Areas (ac)		
	Building	Parking Lot	Lawn
Existing	0.23 (10193)	0	0
Proposed	0.23 (10193)	0	0

Existing Conditions		
Gravel Trench		
Return Interval (yr)	Q (cfs)	Y in trench (ft)
2	0.1089	1.11
5	0.1376	1.44
10	0.1578	1.66
25	0.1849	1.97
50	0.2061	2.21
100	0.2283	2.46

Developed Conditions			
Gravel Trench			
Return Interval (yr)	Q (cfs)	Y in trench (ft)	Overflow Depth
2	0.1954	2.09	-
5	0.2528	2.73	-
10	0.2934	3.19	0.19
25	0.3476	3.80	0.80
50	0.3903	4.28	0.71
100	0.4349	4.33	0.45

Box Swale			
	Areas (ac)		
	Building	Parking Lot	Lawn
Existing	0	0.22 (9483)	O.081 (3561)
Proposed	0.06 (2675)	0.40 (17388)	0.101 (4287)

Existing Conditions		
Box Swale		
Return Interval (yr)	Q (cfs)	Y in trench (ft)
2	0.0798	0.13
5	0.1066	0.16
10	0.1256	0.18
25	0.1512	0.20
50	0.1713	0.21
100	0.1924	0.23

Developed Conditions		
Box Swale		
Return Interval (yr)	Q (cfs)	Y in trench (ft)
2	0.1663	0.21
5	0.2218	0.25
10	0.2612	0.28
25	0.3139	0.31
50	0.3555	0.34
100	0.3990	0.36

Note:
1. Flow rates were determined using WWHM3
2. Infiltration rate for infiltration trench assumed at 10 in/hr
3. Q for gravel trench is cumulative, i.e. flow from box swale plus flow directly contributed to the gravel trench
4. Volume used for Y in trench and overflow depth was calculated by multiplying Q by T_c (Time of concentration)
5. Volume of voids were taken to be 30%

Infiltration Trench			
	Areas (ac)		
	Building	**Parking Lot**	**Lawn**
Existing	0	0.13 (5609)	0
Proposed	0.06 (2675)	0.49 (21106)	0

Flow's (cfs)		
Return Interval (yr)	**Existing**	**Proposed**
2	0.0468	0.1979
5	0.0623	0.2635
10	0.0732	0.3098
25	0.0879	0.3719
50	0.0994	0.4207
100	0.1115	0.4719

	W/O Drain rock	**W/ Drain Rock**
Volume of 2yr storm	190 ft^3	634 ft^3
Treatment Trench	4' wide x 4' deep x 40' long	
Volume of 100yr storm	253 ft^3	844 ft^3
minus vol. treatment trench)		
Overflow Trench	4' wide x 4' deep x 53' long	

Note: 1. WWHM File Name: 19425-4
2. T_c = 16.03 min, Length used =150' Slope =2%
3. Volume of voids were taken to be 30%