TECHNICAL MEMORANDUM

Date: November 5, 2021

To: Tony Doran, Engineering Associate, Engineering Division/Public Works, City of Tualatin

From: Paul Knox, PE
Rohith Jalagam

Subject: **Marvelous Motors Stormwater Report**
17835 SW Pacific Highway
Tualatin OR 97062
Akana Project Number 21-033

Marvelous Motors, LLC contracted with Akana in August 2021 to address the stormwater management requirements of the City of Tualatin for Site Plan review to add a new building to the existing car lot.

BACKGROUND

Marvelous Motors is an automobile dealership located at 17835 SW Pacific Highway in Tualatin, Oregon on an existing facility constructed in 1996. An existing stormwater management pond, approximately 25-feet wide, 50-feet long and 1-foot deep was constructed with the original construction. The current owner proposes to add a small structure to the site to the west of the existing office and currently has an application for a site plan review with the City of Tualatin Planning Department. We understand that the site plan review application has been found to be incomplete, due to absence of a stormwater management plan to mitigate the impact of the newly created impervious surface. This report serves to meet that requirement.

APPLICABILITY OF STORMWATER MANAGEMENT CODE REQUIREMENTS

The new building and improvements associated with the building for which the Site Plan review is sought will add new and modified impervious area to the site.

Modified Impervious Area:

Slab Area = 35′ x 32′ = 1120 square feet

Sidewalk Area = 5′ x 19′ = 95 square feet

Asphalt Apron Area = ((14+35)/2) x 10 = 245 square feet

Total Modified Impervious Area = 1460 square feet

New Impervious Area:

Sidewalk Area = 5' x 16' = 80 square feet

Total New Impervious Area = 80 square feet

Because the total new and modified impervious area proposed by the project exceeds 1,000 square feet, the City of Tualatin requires that new stormwater management facilities be included with the project to mitigate the effects of the new development. The City of Tualatin has adopted the Design and Construction Standards of the Clean Water Services (CWS) of Washington County, Oregon as their design standard, subject to city-specific modifications stipulated in the Tualatin Development Code and Tualatin Municipal Code.

STORMWATER MANAGEMENT APPROACH

In accordance with the City of Tualatin standards and the CWS Design and Construction Manual, proposed stormwater management facilities need to address water quality treatment, hydromodification, and detention equivalent for all required impervious areas.

An existing stormwater pond is located on the site and was considered as an option for addressing the stormwater management needs for the new building. An infiltration test was performed at the pond to provide design information to be considered for the project. However, no records or design calculations are available from either the property owner or the City. As a result, we felt that the effort needed to re-engineer the pond calculations to evaluate its adequacy to meet the current code would be considerable and we elected to consider a small new storm facility located near the new building.

We also understand that there is some uncertainty regarding an easement for the existing surface drainage released from the existing storm pond. This led us to concentrate on providing a stormwater management method that keeps stormwater produced by the new building on the site. Infiltration was chosen as the means to provide stormwater treatment and disposal for runoff produced by the small new building.

Infiltration-based design requirements are detailed in Section 4.08.3 of the CWS Design and Construction Manual. Soil soils must be found to be suitable for infiltration, infiltration testing should be done by proscribed methods, and site conditions which preclude infiltration shall not be present at the site of the proposed facility. Each of these requirements will be discussed in the paragraphs that follow.

Soil Data:

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey webpage, the soil series underlaying the project site are Hillsboro loams, describes as well drained soils, whose typical depth to groundwater or restrictive layers exceeds 80 inches (6.5 feet). Infiltration rates used for simplified sizing, per Table 4-5 of the CWS Design and Construction Manual, can be taken to be 2 inches per hour. However, to be sure, Akana performed infiltration testing to better assess the suitability of the site for infiltration facilities.

Infiltration Test Methods:

Open pit falling head infiltration tests were performed at two locations, one inside the existing storm pond and another immediately adjacent to the proposed building. The infiltration testing procedures and data formatting used were based on Infiltration Testing Guide for the Clackamas County Service District No. 1 Stormwater Standards, as the CWS standards do not include a specific testing methodology. The Clackamas County border is located less than three miles from the site and shares similar soil characteristics.

Measured infiltration rates were found to be 7.80 inches per hour near the proposed building and 2.88 inches per hour at the existing storm pond. Measured test values exceeded the minimum the allowable minimum rate of 2 inches per hour at both locations. The highest measured infiltration rate was found at the test site near the proposed building and so the stormwater facility is proposed for this location. A copy of the infiltration test report for the site is included in Appendix A.

Site Factors Precluding Infiltration:

According to the Oregon Department of Geology and Mineral Industries' Statewide Landslide Information Layer for Oregon (SLIDO) website, areas of moderate to high regional landslide susceptibility are located in the general region of the site, but appear to be more than 100 feet away from the proposed site improvements. See Appendix B for a printout from the SLIDO website. The fact that no landslide activity has been observed in the vicinity of the existing storm pond over the past 25 years leads us to believe that the proposed storm facility is located in a relatively stable area, with respect to landslides.

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey webpage, depth to groundwater or restrictive layers, such as competent bedrock, typically exceeds 80 inches for this soil series. No evidence of groundwater or bedrock was encountered during excavation of the test holes.

According to the Oregon Department of Environmental Quality (DEQ) Environmental Cleanup Site Information Database webpage, no records indicating subsurface contamination or leaking

underground storage tanks have been recorded on this site. See Appendix B for printouts from the DEQ database.

Slopes across the site do not consistently exceed 25%, so this criterion would not preclude infiltration at this site.

As a result of the findings above, we find that infiltration is a viable method to manage stormwater produced by the new proposed small building.

STORMWATER FACILITY SIZING CALCULATIONS

The proposed stormwater management approach for this project is the "Non-Structural Infiltration Planter/Rain Garden." Table 4-3 of CWS Design and Construction Manual shows that the Non-Structural Infiltration Planter is an approvable approach for: Quantity for Conveyance Capacity, Hydromodification, Water Quality Treatment, and Low Impact Development.

Hydromodification Sizing:

The CWS Hydromodification standards were implemented to reduce impacts to downstream receiving water bodies from new development and other activities which create and/or modify 1,000 square feet or greater of impervious surface. The proposed improvements total 1,540 square feet of modified and new impervious area and is considered under "Category 1 – Small Project" for hydromodification by Table 4-2 Section 4.03.5 of CWS Design and Construction Manual. Category 1 requirements are outlined in Section 4.03.5(a). We followed the approach of Section 4.03.5(a)(1) to address hydromodification through an infiltration facility, using the Standard Sizing approach described in Section 4.08.5.

The infiltration planter has been designed using a spreadsheet, known as the Stormwater Planter Sizing Calculator, that incorporates the Santa Barbara Unit Hydrograph (SBUH) and reservoir routing, in order to evaluate dynamic flow routing through the proposed facility, in accordance with the requirements of Section 4.08.5.b.2.

A synthetic rainfall distribution, the standard NRCS Type 1A is divided into 10-minute increments, using the 24-hour rainfall depth as a scale factor to apply to the unit hydrograph. For each time increment, runoff from the new and modified impervious surfaces created by the project is calculated and routed to infiltration planter, whose geometric properties and infiltration rates are entered as inputs to the sizing calculator. Each increment of flow is infiltrated into the soil beneath the facility. When the inflow rate exceeds the infiltration capacity, water is stored within the facility, first in the rock trench beneath the planter and then in a ponded volume above the planter surface, which is set to

a maximum depth of 6-inches for the hydromodification storm event, the 10-year, 24-hour storm per Section 4.08.5.b.1. The planter area is adjusted until the maximum ponded depth does not exceed 6-inches and the planter has completely infiltrated the design storm volume in a maximum of 30 hours.

The stormwater planter sizing calculator was run for the conditions established by the Simplified Method as a test run to verify the model. For a sizing factor of 12% and an allowable infiltration rate of 1-inch per hour (half the stated nominal infiltration rate of 2-inches per hour), the ponded depth was found to be 4.9 inches, slightly less than the allowable maximum depth of 6-inches. These results confirmed that the sizing calculator was suitable for use in this application. See Appendix E planter sizing calculations.

The proposed infiltration planter was then sized using the measured infiltration rates, with a Safety Factor of 3 applied to the rate. The measured infiltration rate at the facility location was found to be 7.2 inches per hour. The factor infiltration rate used for the facility design was 2.4 inches per hour (7.2 inches per hour / 3). The minimum planter area that met the design criteria was found to be 105 square feet (35' x 3'). However, the infiltration planter was oversized to 140 square feet (35' x 4') to fully infiltrate the 100-year, 24-hour storm event. Planter sizing runs for the 10-year, 24-hour (hydromodification) and 100-year, 24-hour storm events are included in Appendix E.

Water Quality Treatment Sizing:

The impervious area required to be treated is defined by the redevelopment standards, using the following equation per CWS Design and Construction Manual Section 4.08.1(d)(1):

Water Quality Treatment Area = New Impervious + (3 x Total Modified Impervious Area)

= 80 + (3 x 1,460) square feet

= 4,460 square feet

Water Quality Volume (cu. ft) = (0.36 in x Water Quality Treatment Area) / 12 in/ft

= (0.36 in x 4,460 sq ft) / 12 in/ft

= 133.8 cu. ft

Water Quality Flow (cfs) = Water Quality Volume (cu. ft) / 14,400 seconds

= 133.8 cu. ft / 14,400 seconds

= 0.00929 cfs

Using the water quality flow rate found above, the planter infiltration sizing calculator run for the hydromodification storm was inspected to verify that the designed facility is capable of infiltrating both the design water quality flow. The maximum inflow rate for the designed infiltration facility occurs 470 minutes after the beginning of the storm, and is 0.0391 cfs, more than four times the design water quality flow rate.

Dividing the water quality volume by the planter facility area provides an average depth to be infiltrated of

Average Depth to be Infiltrated = (133.8 cu ft / 140 sq ft) = 0.96 ft x 12 in/ft = 11.5 inches

Dividing the average depth to be infiltrated by design infiltration rate provides an average time to infiltrate the design water quality volume

Average Time to Infiltrate the Design Water Quality Volume = 11.5 in / 2.40 in/hr = 4.8 hr.

As the Water Quality design storm event has a return period of 96 hours, per Section 4.08.2.a, we can expect the water quality volume to be fully infiltrated before another similar storm event will return.

Proposed Planter Dimensions:

Area required for Non-Structural Infiltration Planter per Standard Sizing (SBUH)= 140 square feet

Length of Non-Structural Infiltration Planter = 35 feet

Width of Non-Structural Infiltration Planter = 4 feet

Depth of Non-Structural Infiltration Planter = 30 inches.

For every 100 square feet 115 herbaceous plants, planted 1-foot on-center spacing, ½ gal container size or 100 herbaceous plants, 1-foot on center, and 4 shrubs,1-gallon container size 2-foot on center will be provided. More information regarding the Non-Structural Infiltration Planter/Rain Garden is provided in Appendix D.

Stormwater Conveyance:

Section 5.05.2 of CWS Design and Construction Manual and Section 74.640 of the Tualatin Development Code require that site stormwater conveyance facilities (pipes) be sized to fully convey the runoff produced from the 25-year storm event. The proposed stormwater planter will be located directly adjacent to the new building, so no piping is proposed. Stormwater will be routed to the infiltration planter by downspouts or direct drainage from the roof.

Our infiltration facility sizing calculations show that no stormwater will leave the site during the 100-year storm event (see Appendix E). As a result, the proposed site improvements will not adversely impact stormwater flows leaving the site along the existing overland flow path. In fact, the overall quantity of stormwater flows leaving the site will be slightly reduced, as runoff from a portion of the existing impervious areas of the site which are presently routed to the existing stormwater pond will now be infiltrated.

CONCLUSION

According to publicly available information and infiltration testing at the site, the soil underlaying the project site is suitable for infiltration of stormwater runoff and factors which would preclude infiltration do not appear to be present.

The Non-Structural Infiltration Planter proposed for the site meets the stormwater management requirements of the City of Tualatin to mitigate the impact of newly created impervious surface. The Non-Structural Infiltration Planter is an approvable approach for: Quantity for Conveyance Capacity, Hydromodification, Water Quality Treatment, and Low Impact Development and should be approved for this project.

Attachments

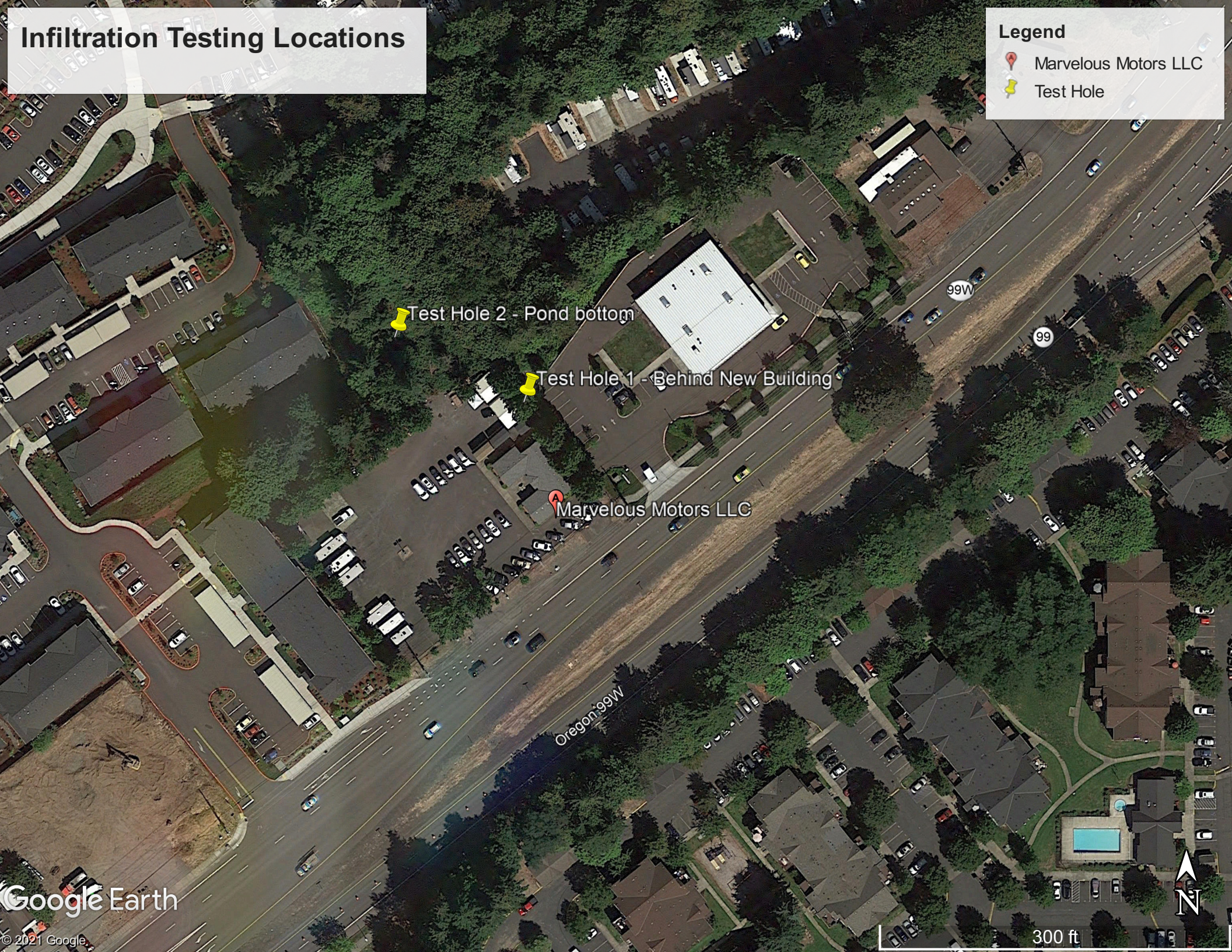
Appendix A—Infiltration Test Report
Appendix B— Webpage Printouts of Data Showing Site Conditions
Appendix C— Site Plan showing the size and location of "Non-Structural Infiltration Planter/Rain Garden"
Appendix D— "Non-Structural Infiltration Planter/Rain Garden" data sheet from the CWS Low Impact Design Manual.
Appendix E— Infiltration Facility Sizing Calculations

APPENDIX A

INFILTRATION TESTING LOCATIONS

(1 Sheet)

Attachment to Infiltration Test Report,
not to
Stormwater Report


Infiltration Testing Locations
Legend
Marvelous Motors LLC
Test Hole
Test Hole 2 - Pond bottom
Test Hole 1 - Behind New Building
Marvelous Motors LLC
99W
99
Oregon 99W
Google Earth
© 2021 Google
N
300 ft

APPENDIX B

INFILTRATION TEST DATA TABLE FOR TEST HOLE 1

(1 Sheet)

Attachment to Infiltration Test Report,
not to
Stormwater Report

Figure E-3: Infiltration Test Data Table

Location: Behind New Building	**Date:** 08-24-2021	**Test Hole Number:** 1
Depth to bottom of hole: 18 Inches	**Diameter of hole:** 0.25'	**Test Method:** Open Pit Falling Head
Tester's Name: Rohith Rao Jalagam **Tester's Company:** Akana	**Tester's Contact Number:**	

Depth, feet	Soil Texture
0-0.33	Mulch
0.33-1.5	Gravel, Silt Mixture

Time	Time interval, minutes	Measurement, feet	Drop in water level, feet	Percolation rate, inches per hour	Remarks
1:15	0	0.17	-		
1:25	10	0.62	0.45	32.40	
1:35	10	0.96	0.34	24.48	
1:45	10	1.09	0.13	9.36	
1:55	10	1.21	0.12	8.64	
2:05	10	1.31	0.10	7.20	
2:15	10	1.41	0.10	7.20	

Measured Infiltration Rate = 7.20 inches per hour

APPENDIX C

INFILTRATION TEST DATA TABLE FOR TEST HOLE 2

(1 Sheet)

Attachment to Infiltration Test Report,
not to
Stormwater Report

Figure E-3: Infiltration Test Data Table

Location: Pond Bottom	**Date:** 08-24-2021	**Test Hole Number:** 2
Depth to bottom of hole: 24 Inches	**Diameter of hole:** 0.25'	**Test Method:** Open Pit Falling Head
Tester's Name: Rohith Rao Jalagam **Tester's Company:** Akana	**Tester's Contact Number:**	

Depth, feet	Soil Texture
0-0.10	Duff/Sediment
0.10-2.0	Brown Silt

Time	Time interval, minutes	Measurement, feet	Drop in water level, feet	Percolation rate, inches per hour	Remarks
12:50	0	0.17	-		
1:10	20	0.40	0.23	8.28	
1:30	20	0.63	0.23	8.28	
1:50	20	0.73	0.10	3.60	
2:10	20	0.82	0.09	3.24	
2:30	20	0.93	0.11	3.96	
2:50	20	1.01	0.08	2.88	

Measured Infiltration Rate = 2.88 inches per hour

APPENDIX B

WEBPAGE PRINTOUTS OF DATA SHOWING SITE CONDITIONS

NRCS Web Soil Survey

Oregon Department of Geology and Mineral Industries' Statewide Landslide Information Layer for Oregon (SLIDO) website printout

Oregon DEQ Environmental Cleanup Site Information Database webpage printouts

(18 Sheets)

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 Washington County, Oregon

Marvelous Motors

September 20, 2021

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 (https://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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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: 1:818 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N 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 1:20,000.

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:
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: Washington County, Oregon
Survey Area Data: Version 18, Jun 11, 2020

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

Date(s) aerial images were photographed: Aug 1, 2019—Sep 12, 2019

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
21B	Hillsboro loam, 3 to 7 percent slopes	1.2	100.0%
Totals for Area of Interest		**1.2**	**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.

Washington County, Oregon

21B—Hillsboro loam, 3 to 7 percent slopes

Map Unit Setting

National map unit symbol: 21y6
Elevation: 160 to 240 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Hillsboro and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hillsboro

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty and loamy old alluvium

Typical profile

H1 - 0 to 15 inches: loam
H2 - 15 to 48 inches: loam
H3 - 48 to 57 inches: fine sandy loam
H4 - 57 to 81 inches: fine sand

Properties and qualities

Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
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 supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

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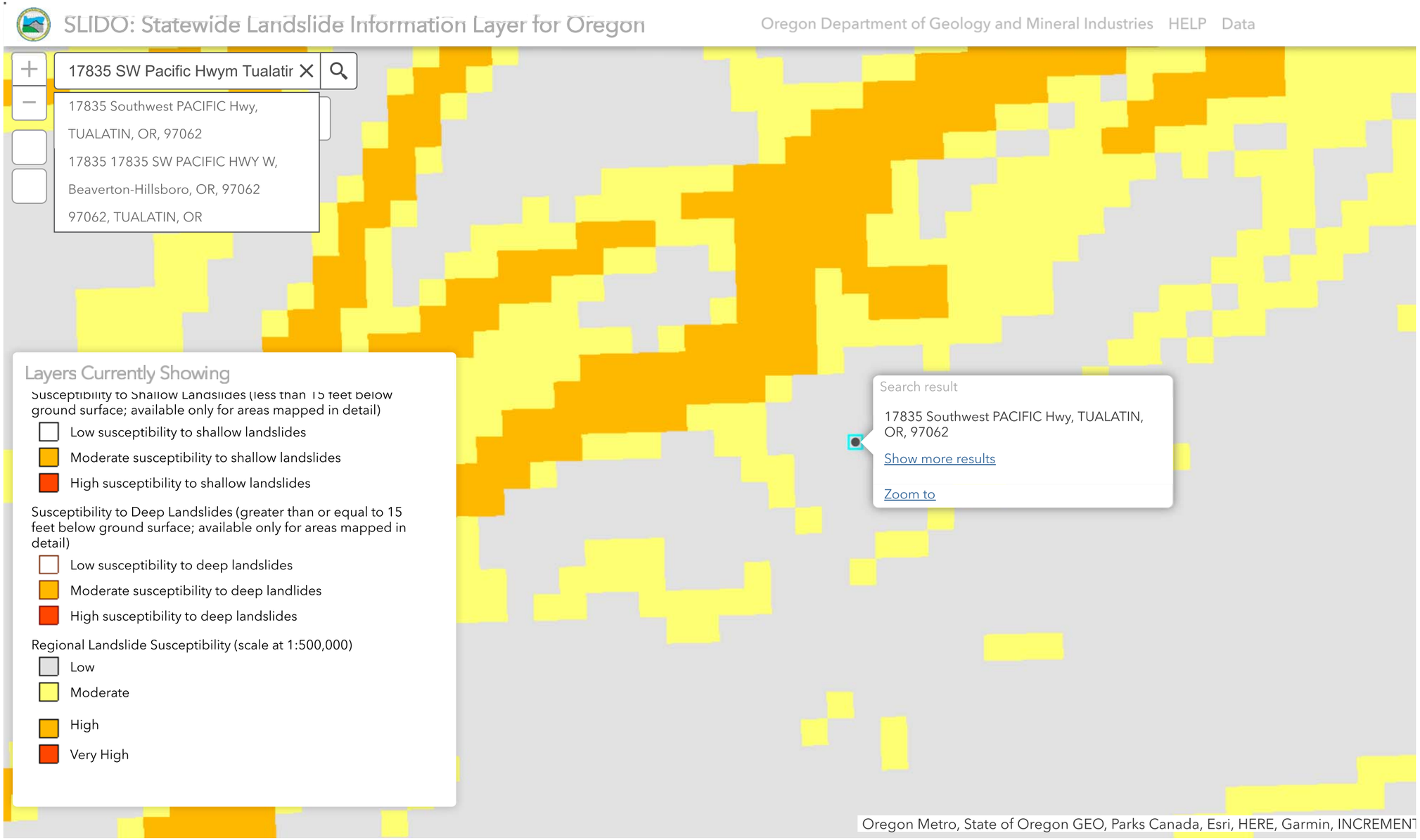

SLIDO: Statewide Landslide Information Layer for Oregon
Oregon Department of Geology and Mineral Industries
HELP
Data
17835 SW Pacific Hwym Tualatir
17835 Southwest PACIFIC Hwy, TUALATIN, OR, 97062
17835 17835 SW PACIFIC HWY W, Beaverton-Hillsboro, OR, 97062
97062, TUALATIN, OR
Layers Currently Showing
Susceptibility to Shallow Landslides (less than 15 feet below ground surface; available only for areas mapped in detail)
Low susceptibility to shallow landslides
Moderate susceptibility to shallow landslides
High susceptibility to shallow landslides
Susceptibility to Deep Landslides (greater than or equal to 15 feet below ground surface; available only for areas mapped in detail)
Low susceptibility to deep landslides
Moderate susceptibility to deep landlides
High susceptibility to deep landslides
Regional Landslide Susceptibility (scale at 1:500,000)
Low
Moderate
High
Very High
Search result
17835 Southwest PACIFIC Hwy, TUALATIN, OR, 97062
Show more results
Zoom to
Oregon Metro, State of Oregon GEO, Parks Canada, Esri, HERE, Garmin, INCREMENT
100ft
-122.804 45.391 Degrees

Search Results for Environmental Cleanup Site Information as of September 20, 2021 at 4:46:41 PM

records match your search criteria.

Your search criteria

Site ID:	Site Name:	
Address: 17835 SW Pacific Highway		
County:	City: TUALATIN	Zip Code: 97062
Latitude Min:	Latitude Max:	Longitude Min:
Township:	Range:	Section:
Site Action or Milestone:	All Action Codes	
Contaminant: None		Contaminant Alias: None
Return Only Orphan Sites:		Return Only Brownfield Sites:

Department of Environmental Quality (http://www.oregon.gov/DEQ/)
700 NE Multnomah Street, Suite 600 Portland, OR 97232
Hours: Mon-Fri, 8 a.m.-5 p.m
Email: DEQInfo@deq.state.or.us (mailto:DEQInfo@deq.state.or.us) | Phone: 503-229-5696 | Fax: 503-229-6124

Oregon Department of Environmental Quality

Oregon DEQ: Underground Storage Tanks Cleanup Database Search Results

No Matching Data Found For Criteria Entered

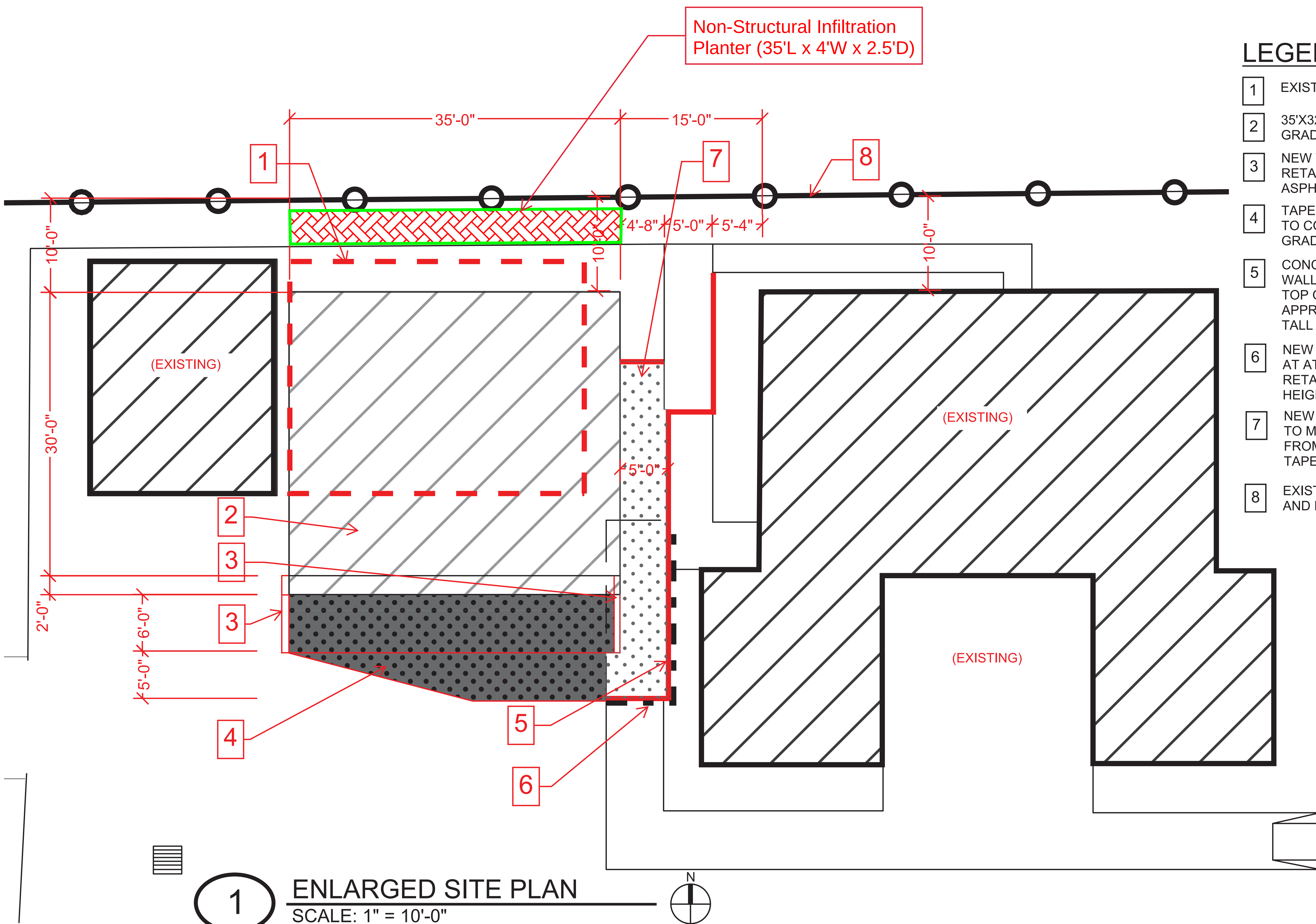
Click On Column Name To Re-Sort Data
Click on Site-Specific Log Number to View Details

LOG NUMBER	FAC ID	SITE NAME	ADDRESS	CITY	ZIP

APPENDIX C

SITE PLAN SHOWING THE SIZE AND LOCATION OF "NON-STRUCTURAL INFILTRATION PLANTER/RAIN GARDEN"

(1 Sheet)



ENLARGED SITE PLAN

1

SCALE: 1" = 10'-0"

(EXISTING PARKING LOT)

LEGEND

1. EXISTING SHED REMOVED
2. 35'X32' CONCRETE SLAB ON GRADE
3. NEW TAPERED CONCRETE RETAINING CURB +6" ABOVE ASPHALT SURFACE
4. TAPERED ASPHALT APRON TO CONCRETE SLAB ON GRADE
5. CONCRETE RETAINING WALL TO BE FLUSH WITH TOP OF (E) SIDEWALKS APPROXIMATELY 6" TO 11" TALL
6. NEW 36" TALL GUARD RAIL AT AT CONCRETE RETAINING WALL AT HEIGHTS GREATER THAN 6"
7. NEW CONCRETE WALK TO MAINTAIN 5' WIDTH FROM (E) SIDEWALK TO TAPERED ASPHALT
8. EXISTING PROPERTY LINE AND FENCE

MARVELOUS MOTORS

17835 SW PACIFIC HIGHWAY TUALATIN, OR 970602

DATE 09.08.2020

CHECKED jc

DRAWN jc

PROJECT NO. .

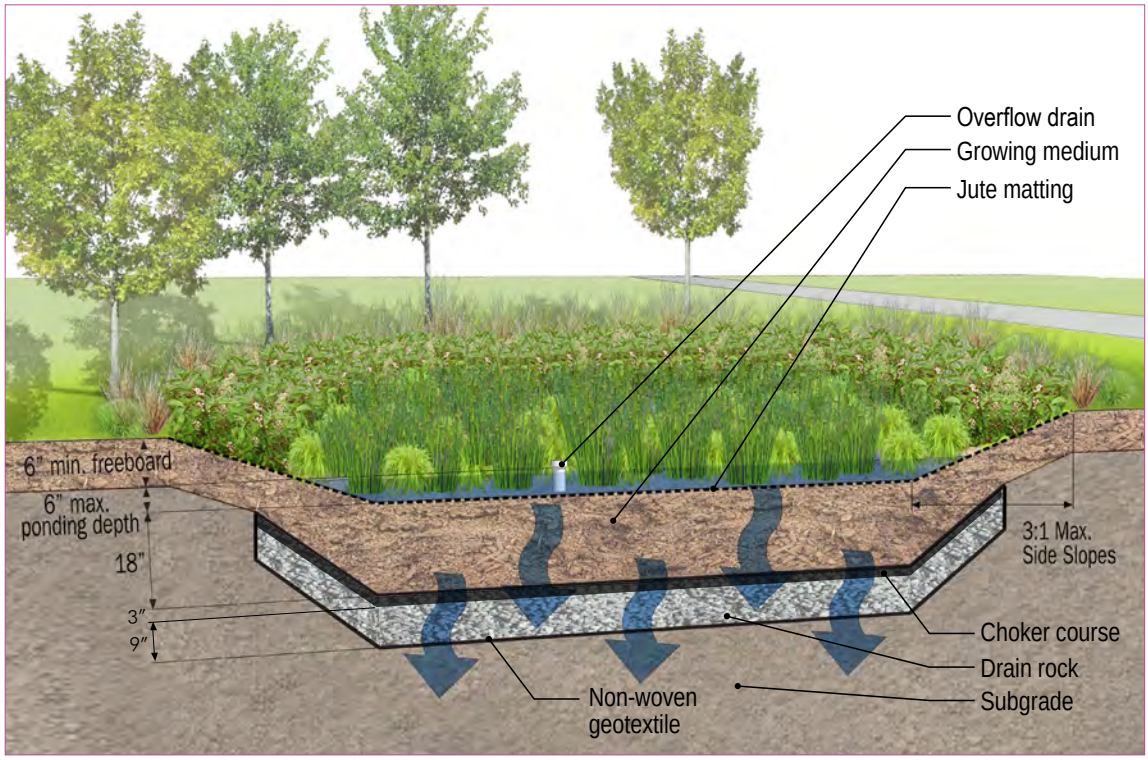
C1.1

APPENDIX D

"NON-STRUCTURAL INFILTRATION PLANTER/RAIN GARDEN" DATA SHEET

(3 Sheets)

Non-Structural Infiltration Planter/Rain Garden



parking areas & impermeable landscape

permeable soils

Description

Non-Structural Infiltration planters (also known as rain gardens) are landscaped reservoirs that collect, filter, and infiltrate stormwater runoff, allowing pollutants to settle and filter out as the water percolates through planter soil and infiltrates into the ground. Non-Structural Infiltration planters typically require less piping than flow-through planters and a smaller facility size than traditional swales where native soils allow for infiltration. Depending on the site, Non-Structural Infiltration planters can vary in shape and construction, with or without walls to contain the facility, or formed as a shallow, basin-like depression.

Application & Limitations

Non-Structural Infiltration planters should be integrated into the overall site design and may help fulfill the landscaping area requirement. Non-Structural Infiltration planters can be used to manage stormwater flowing from all types of impervious surfaces, from private property and within the public right-of-way. Check with the local jurisdiction if proposing to use Non-Structural Infiltration planters in the public right-of-way. The size, depth, and use of Non-Structural Infiltration planters are determined by the infiltration rates of the site's existing soils.

Y - Public System Approvable
Y - Quantity for Conveyance
Y - Hydromodification Approach
Y - Water Quality Treatment Approach

Orenco Woods Park

Non-Structural Infiltration Planter/Rain Garden

Design Factors

Soil Suitability and Facility Sizing

The size and depth of the Non-Structural Infiltration planter will depend upon the infiltration rate of existing soils. A sizing factor of 0.06 assumes the site infiltration rate is less than 2 in/hr.

For example, the size of a Non-Structural Infiltration planter managing 1,500 square feet of total impervious area would be 90 square feet (1,500 x 0.06).

Size may be decreased if:

- Demonstrated infiltration rate is greater than 2 in/hr using ASTM D3395-09 method; or
- Amended soil depth is increased

Geometry/Slopes

The shape may be circular, square, rectangular, etc. to suit the site design requirements. Regardless of the shape, a minimum planter width of 30 inches is needed to achieve sufficient time for treatment and avoid short-circuiting. Planters in a relatively flat, landscaped open area should not slope more than 0.5% in any direction.

Piping for Non-Structural Infiltration planters

Follow Plumbing Code requirements for piping that directs stormwater from impervious surfaces to planters. Stormwater may flow directly from the public street right-of-way or adjacent parking lot areas via curb openings. For Non-Structural Infiltration planters install an overflow drain to allow not more than 6 inches of water to pond. On private property, follow Plumbing Code requirements for this overflow drain and piping, and direct excess stormwater to an approved disposal point as identified on permit drawings. Check with local jurisdiction or use Clean Water Services Design and Construction Standards for additional information on piping material for use in the public right-of-way.

Setbacks

Check with the local building department to confirm site-specific requirements.

- Generally, a minimum setback of 10 feet from building structures is recommended.
- Planters should not be located immediately upslope of building structures.

Before site work begins, clearly mark Non-Structural Infiltration planter areas to avoid soil disturbance during construction. No vehicular traffic should be allowed within 10 feet of Non-Structural Infiltration planter areas, except as necessary to construct the facility. Consider construction of Non-Structural Infiltration planter areas before construction of other impervious surfaces to avoid unnecessary traffic loads. To avoid erosion, use approved erosion control BMPs.

Soil Amendment/Mulch

Amended soils with appropriate compost and sand provide numerous benefits: infiltration; detention; retention; better plant establishment and growth; reduced summer irrigation needs; reduced fertilizer needs; increased physical, chemical and microbial pollution reduction; and, reduced erosion potential.

Primary treatment will occur in the top 18 inches of the Non-Structural Infiltration planter. Amended soil in the treatment area is composed of organic compost, gravelly sand and topsoil. Compost is weed-free, decomposed, non-woody plant material; animal waste is not allowed. Check with the local jurisdiction or Clean Water Services for Seal of Testing Approval Program (STA) Compost provider.

Vegetation

Planted vegetation helps to attenuate stormwater flows and break down pollutants by interactions with bacteria, fungi, and other organisms in the planter soil. Vegetation also traps sediments, reduces erosion, and limits the spread of weeds. Appropriate, carefully selected plantings enhance the aesthetic and habitat value. For a complete list of allowable plants refer to see page 76.

The entire water quality treatment area should be planted appropriately for the soil conditions. Walled infiltration run-on planters will be inundated periodically. Therefore, the entire planter should be planted with herbaceous rushes, sedges, perennials, ferns and shrubs that are well-suited to wet-to-moist soil conditions.

Non-Structural Infiltration Planter/Rain Garden

Fowler Middle School, Tigard

If the Non-Structural Infiltration planter has side slopes (basin without vertical walls), soil conditions will vary from wet to relatively dry; several planting zones should be considered. The flat bottom area will be moist-to-wet, and the side slopes will vary from moist at the bottom to relatively dry near the top where inundation rarely occurs. The moisture gradient will depend upon the designed maximum water depth, total depth of the planter, and steepness of the side slopes. This moisture gradient is a transition zone and should be planted with species that tolerate occasional standing water, withand plants that prefer drier conditions toward the top of the slope. Areas above the side slopes, immediately adjacent to the basin, and above the designed high-water line will not be inundated and should be planted with self-sustaining, low- maintenance grasses, perennials, and shrubs suitable for the local climate.

Native plants are encouraged, but non-invasive ornamentals that add aesthetic and functional value are acceptable with approval. All vegetation should be planted densely and evenly to ensure proper hydrological function of the Non-Structural Infiltration planter. For a complete list of allowable plants refer to page 76.

Quantities per 100 square feet:

- 115 herbaceous plants, 1' on center spacing, ½-gal container size; or
- 100 herbaceous plants, 1' on center, and 4 shrubs, 1-gal container size 2' on center.

Small trees are allowed in raingardens and should be selected based ony their adaptability to wet-to-moist conditions and full size at maturity. Trees should be placed along the side slopes of the facility rather than at the bottom. Trees should be a minimum 2 gallon by 2 feet tall. Dig planting area twice the width of tree rootball and the depth of the rootball plus 12" (or total depth of 30",— whichever is greater) should be backfilled with amended soil for optimal growth, with no sub-surface rock layer.

Required Maintenance Period

- Water-efficient irrigation should be applied for the first two years after construction of the facility, particularly during the dry summer months, while plantings become established. Irrigation after these two years is at the discretion of the owner.
- If public, the permittee is responsible for the maintenance of the Non-Structural Infiltration planter for a minimum of two years following construction and acceptance of the facility.

Long- Term Maintenance

If private, the property owner will be responsible for ongoing maintenance per a recorded maintenance agreement (see page 88 for example maintenance agreement).

For detailed Operation and Maintenance Plans that describe proper maintenance activities, please refer to page 91.

All publicly maintained facilities not located in the public right-of-way must have a public easement to ensure access for maintenance.

References

Clean Water Services Design and Construction Standards.

APPENDIX E

INFILTRATION FACILITY SIZING CALCULATIONS

(10 Sheets)

Calibration Run to Verify Stormwater Planter Sizing Tool Works in This Application

STORMWATER PLANTER SIZING CALCULATOR
24 Hour Storm, SBUH Type 1A Rainfall Distribution

Reduced by half from stated 2", assuming Simplified Method has to be conservative

USER INPUTS

24 Hour Rainfall Depth =	3.45	in	Enter 10-yr storm event
Drainage area =	1540	sf	Enter
Drainage Area Runoff Coefficient =	0.98		0.9 - 0.98 for imp surface
Native Soil Infiltration Rate =	1	in/hr	Enter
Depth of Rock Trench Below Planter (optional) =	9	inches	Enter, optional — Excludes 3" Choker Course
Void Ratio for RockTrench =	30%	%	Typically 30% for uniformly graded rock
5' Wide x 37' Long **Planter Area =**	184.8	sf	Adjust this until max ponding depth in raingarden is 6 inches and the facility is completely empty in 30 hours

CALCULATED DESIGN CRITERIA

Maximum Ponding Depth in Planter =	4.93	in	Calculated — 6" Maximum Allowable
Depth of Water Left in Rock Trench After 30 Hours =	0.00	in	Calculated
Depth of Water Left in Planter After 30 Hours =	0.00	in	Calculated
Planter Area is Adequately Sized?	TRUE		Calculated, if FALSE, increase Planter Area and/or Depth of Rock Trench Below Planter until TRUE

OTHER CALCULATED VALUES

Peak Rainfall Intensity =	1.12	in/hr	Calculated from distribution
Ratio of Planter to Drainage Area =	0.120		Calculated (aka Sizing Factor) — 12% per Simplified Method
Storage Capacity of Rock Trench=	41.58	cf	Calculated

SBUH HYDROGRAPH

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time (min)	Rainfall Depth (in)	Rainfall Intensity (in/hr)	Inflow Rate (cfs)	Inflow Volume (cf)	Runoff Depth (in)	Facility Infiltration Rate (cfs)	Inflow Rate - Facility Infiltration Rate (cfs)	Inflow Volume - Infiltration Volume (cf)	Cumulative Inflow Volume to be Stored (cf)	Rock Trench Ponding (if incl in design) (in)	Planter Ponding Depth (in)
0	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00
10	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
20	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00
30	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
40	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
50	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
60	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
70	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
80	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
90	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
100	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	0.00	0.00	0.00
110	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	0.00	0.00	0.00
120	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	0.00	0.00	0.00
130	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	0.00	0.00	0.00
140	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	0.00	0.00	0.00
150	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	0.00	0.00	0.00
160	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	0.00	0.00	0.00
170	0.0207	0.12	0.00	2.60337	0.02029	0.0042778	0.00006	0.0367	0.04	0.01	0.00
180	0.0207	0.12	0.00	2.60337	0.02029	0.0042778	0.00006	0.0367	0.07	0.02	0.00
190	0.0207	0.12	0.00	2.60337	0.02029	0.0042778	0.00006	0.0367	0.11	0.02	0.00
200	0.0207	0.12	0.00	2.60337	0.02029	0.0042778	0.00006	0.0367	0.15	0.03	0.00
210	0.0207	0.12	0.00	2.60337	0.02029	0.0042778	0.00006	0.0367	0.18	0.04	0.00
220	0.0207	0.12	0.00	2.60337	0.02029	0.0042778	0.00006	0.0367	0.22	0.05	0.00
230	0.0242	0.14	0.01	3.03727	0.02367	0.0042778	0.00078	0.4706	0.69	0.15	0.00
240	0.0242	0.14	0.01	3.03727	0.02367	0.0042778	0.00078	0.4706	1.16	0.25	0.00
250	0.0242	0.14	0.01	3.03727	0.02367	0.0042778	0.00078	0.4706	1.63	0.35	0.00
260	0.0242	0.14	0.01	3.03727	0.02367	0.0042778	0.00078	0.4706	2.10	0.46	0.00
270	0.0242	0.14	0.01	3.03727	0.02367	0.0042778	0.00078	0.4706	2.57	0.56	0.00
280	0.0242	0.14	0.01	3.03727	0.02367	0.0042778	0.00078	0.4706	3.04	0.66	0.00
290	0.0283	0.17	0.01	3.55794	0.02772	0.0042778	0.00165	0.9913	4.04	0.87	0.00
300	0.0283	0.17	0.01	3.55794	0.02772	0.0042778	0.00165	0.9913	5.03	1.09	0.00
310	0.0283	0.17	0.01	3.55794	0.02772	0.0042778	0.00165	0.9913	6.02	1.30	0.00
320	0.0283	0.17	0.01	3.55794	0.02772	0.0042778	0.00165	0.9913	7.01	1.52	0.00
330	0.0283	0.17	0.01	3.55794	0.02772	0.0042778	0.00165	0.9913	8.00	1.73	0.00
340	0.0283	0.17	0.01	3.55794	0.02772	0.0042778	0.00165	0.9913	8.99	1.95	0.00
350	0.0328	0.20	0.01	4.122	0.03212	0.0042778	0.00259	1.5553	10.55	2.28	0.00
360	0.0328	0.20	0.01	4.122	0.03212	0.0042778	0.00259	1.5553	12.10	2.62	0.00
370	0.0328	0.20	0.01	4.122	0.03212	0.0042778	0.00259	1.5553	13.66	2.96	0.00
380	0.0328	0.20	0.01	4.122	0.03212	0.0042778	0.00259	1.5553	15.21	3.29	0.00
390	0.0328	0.20	0.01	4.122	0.03212	0.0042778	0.00259	1.5553	16.77	3.63	0.00
400	0.0328	0.20	0.01	4.122	0.03212	0.0042778	0.00259	1.5553	18.32	3.97	0.00
410	0.0462	0.28	0.01	5.81419	0.04531	0.0042778	0.00541	3.2475	21.57	4.67	0.00

420	0.0462	0.28	0.01	5.81419	0.04531	0.0042778	0.00541	3.2475	24.82	5.37	0.00
430	0.0462	0.28	0.01	5.81419	0.04531	0.0042778	0.00541	3.2475	28.07	6.07	0.00
440	0.0621	0.37	0.01	7.81011	0.06086	0.0042778	0.00874	5.2434	33.31	7.21	0.00
450	0.0621	0.37	0.01	7.81011	0.06086	0.0042778	0.00874	5.2434	38.55	8.34	0.00
460	0.1173	0.70	0.02	14.7524	0.11495	0.0042778	0.02031	12.1858	50.74	9.00	0.59
470	0.1863	1.12	0.04	23.4303	0.18257	0.0042778	0.03477	20.8637	71.60	9.00	1.95
480	0.0932	0.56	0.02	11.7152	0.09129	0.0042778	0.01525	9.1485	80.75	9.00	2.54
490	0.0621	0.37	0.01	7.81011	0.06086	0.0042778	0.00874	5.2434	85.99	9.00	2.88
500	0.0462	0.28	0.01	5.81419	0.04531	0.0042778	0.00541	3.2475	89.24	9.00	3.09
510	0.0462	0.28	0.01	5.81419	0.04531	0.0042778	0.00541	3.2475	92.49	9.00	3.31
520	0.0462	0.28	0.01	5.81419	0.04531	0.0042778	0.00541	3.2475	95.74	9.00	3.52
530	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	96.99	9.00	3.60
540	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	98.24	9.00	3.68
550	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	99.49	9.00	3.76
560	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	100.74	9.00	3.84
570	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	101.99	9.00	3.92
580	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	103.25	9.00	4.00
590	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	104.50	9.00	4.09
600	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	105.75	9.00	4.17
610	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	107.00	9.00	4.25
620	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	108.25	9.00	4.33
630	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	109.50	9.00	4.41
640	0.0304	0.18	0.01	3.81828	0.02975	0.0042778	0.00209	1.2516	110.76	9.00	4.49
650	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	111.31	9.00	4.53
660	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	111.87	9.00	4.56
670	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	112.43	9.00	4.60
680	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	112.99	9.00	4.64
690	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	113.54	9.00	4.67
700	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	114.10	9.00	4.71
710	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	114.66	9.00	4.75
720	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	115.22	9.00	4.78
730	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	115.77	9.00	4.82
740	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	116.33	9.00	4.85
750	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	116.89	9.00	4.89
760	0.0248	0.15	0.01	3.12404	0.02434	0.0042778	0.00093	0.5574	117.44	9.00	4.93
770	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	117.35	9.00	4.92
780	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	117.26	9.00	4.91
790	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	117.16	9.00	4.91
800	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	117.07	9.00	4.90
810	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	116.98	9.00	4.90
820	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	116.88	9.00	4.89
830	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	116.79	9.00	4.88
840	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	116.70	9.00	4.88
850	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	116.60	9.00	4.87
860	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	116.51	9.00	4.87
870	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	116.42	9.00	4.86
880	0.0197	0.12	0.00	2.4732	0.01927	0.0042778	-0.00016	-0.0935	116.32	9.00	4.85
890	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	115.93	9.00	4.83
900	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	115.53	9.00	4.80
910	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	115.13	9.00	4.78
920	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	114.73	9.00	4.75
930	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	114.34	9.00	4.72
940	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	113.94	9.00	4.70
950	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	113.54	9.00	4.67
960	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	113.15	9.00	4.65
970	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	112.75	9.00	4.62
980	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	112.35	9.00	4.60
990	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	111.95	9.00	4.57
1000	0.0173	0.10	0.00	2.16948	0.01691	0.0042778	-0.00066	-0.3972	111.56	9.00	4.54
1010	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	110.73	9.00	4.49
1020	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	109.89	9.00	4.44
1030	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	109.06	9.00	4.38
1040	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	108.23	9.00	4.33
1050	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	107.40	9.00	4.27
1060	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	106.57	9.00	4.22
1070	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	105.74	9.00	4.17
1080	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	104.91	9.00	4.11
1090	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	104.08	9.00	4.06
1100	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	103.25	9.00	4.00
1110	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	102.41	9.00	3.95
1120	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	101.58	9.00	3.90
1130	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	100.75	9.00	3.84
1140	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	99.92	9.00	3.79

1150	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	99.09	9.00	3.73
1160	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	98.26	9.00	3.68
1170	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	97.43	9.00	3.63
1180	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	96.60	9.00	3.57
1190	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	95.77	9.00	3.52
1200	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	94.94	9.00	3.46
1210	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	94.10	9.00	3.41
1220	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	93.27	9.00	3.36
1230	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	92.44	9.00	3.30
1240	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	91.61	9.00	3.25
1250	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	90.78	9.00	3.19
1260	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	89.95	9.00	3.14
1270	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	89.12	9.00	3.09
1280	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	88.29	9.00	3.03
1290	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	87.46	9.00	2.98
1300	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	86.62	9.00	2.92
1310	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	85.79	9.00	2.87
1320	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	84.96	9.00	2.82
1330	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	84.13	9.00	2.76
1340	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	83.30	9.00	2.71
1350	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	82.47	9.00	2.66
1360	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	81.64	9.00	2.60
1370	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	80.81	9.00	2.55
1380	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	79.98	9.00	2.49
1390	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	79.14	9.00	2.44
1400	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	78.31	9.00	2.39
1410	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	77.48	9.00	2.33
1420	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	76.65	9.00	2.28
1430	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	75.82	9.00	2.22
1440	0.0138	0.08	0.00	1.73558	0.01352	0.0042778	-0.00139	-0.8311	74.99	9.00	2.17

END OF STORM OCCURS IN 24 HOURS BUT THE INFILTRATION MAY CONTINUE FOR ANOTHER 6 HOURS…

1450	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	72.42	9.00	2.00
1460	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	69.86	9.00	1.84
1470	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	67.29	9.00	1.67
1480	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	64.72	9.00	1.50
1490	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	62.16	9.00	1.34
1500	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	59.59	9.00	1.17
1510	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	57.02	9.00	1.00
1520	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	54.46	9.00	0.84
1530	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	51.89	9.00	0.67
1540	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	49.32	9.00	0.50
1550	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	46.76	9.00	0.34
1560	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	44.19	9.00	0.17
1570	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	41.62	9.00	0.00
1580	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	39.06	8.45	0.00
1590	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	36.49	7.90	0.00
1600	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	33.92	7.34	0.00
1610	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	31.36	6.79	0.00
1620	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	28.79	6.23	0.00
1630	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	26.22	5.68	0.00
1640	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	23.66	5.12	0.00
1650	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	21.09	4.56	0.00
1660	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	18.52	4.01	0.00
1670	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	15.96	3.45	0.00
1680	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	13.39	2.90	0.00
1690	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	10.82	2.34	0.00
1700	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	8.26	1.79	0.00
1710	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	5.69	1.23	0.00
1720	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	3.12	0.68	0.00
1730	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.56	0.12	0.00
1740	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00
1750	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00
1760	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00
1770	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00
1780	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00
1790	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00
1800	0.0000	0.00	0.00	0	0	0.0042778	-0.00428	-2.5667	0.00	0.00	0.00

THE FACILITY MUST HAVE INFILTRATED THE ENTIRE STORM IN 30 HOURS TO BE READY FOR THE NEXT ONE

Size Stormwater Planter per CWS D&CS Chapter 4.08.5 Standard Sizing

STORMWATER PLANTER SIZING CALCULATOR
24 Hour Storm, SBUH Type 1A Rainfall Distribution

USER INPUTS

24 Hour Rainfall Depth =	3.45	in	Enter 10-yr storm event
Drainage area =	1540	sf	Enter
Drainage Area Runoff Coefficient =	0.98		0.9 - 0.98 for imp surface
Native Soil Infiltration Rate =	2.4	in/hr	Enter Measured rate 7.2 in/ hr w/ Safety Factor or 3
Depth of Rock Trench Below Planter (optional) =	9	inches	Enter, optional Excludes 3" Choker Course
Void Ratio for RockTrench =	30%	%	Typically 30% for uniformly graded rock
4' Wide x 35' Long **Planter Area =**	140	sf	Adjust this until max ponding depth in raingarden is 6 inches and the facility is completely empty in 30 hours

CALCULATED DESIGN CRITERIA

Maximum Ponding Depth in Planter =	1.78	in	Calculated 6" Maximum Allowable
Depth of Water Left in Rock Trench After 30 Hours =	0.00	in	Calculated
Depth of Water Left in Planter After 30 Hours =	0.00	in	Calculated
Planter Area is Adequately Sized?	TRUE		Calculated, if FALSE, increase Planter Area and/or Depth of Rock Trench Below Planter until TRUE

OTHER CALCULATED VALUES

Peak Rainfall Intensity =	1.12	in/hr	Calculated from distribution
Ratio of Planter to Drainage Area =	0.091		Calculated (aka Sizing Factor)
Storage Capacity of Rock Trench=	31.50	cf	Calculated

SBUH HYDROGRAPH

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time (min)	Rainfall Depth (in)	Rainfall Intensity (in/hr)	Inflow Rate (cfs)	Inflow Volume (cf)	Runoff Depth (in)	Facility Infiltration Rate (cfs)	Inflow Rate - Facility Infiltration Rate (cfs)	Inflow Volume - Infiltration Volume (cf)	Cumulative Inflow Volume to be Stored (cf)	Rock Trench Ponding (if incl in design) (in)	Planter Ponding Depth (in)
0	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
10	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
20	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
30	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
40	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
50	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
60	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
70	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
80	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
90	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
100	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
110	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
120	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
130	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
140	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
150	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
160	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
170	0.0207	0.12	0.00	2.60337	0.02029	0.0077778	-0.00344	-2.0633	0.00	0.00	0.00
180	0.0207	0.12	0.00	2.60337	0.02029	0.0077778	-0.00344	-2.0633	0.00	0.00	0.00
190	0.0207	0.12	0.00	2.60337	0.02029	0.0077778	-0.00344	-2.0633	0.00	0.00	0.00
200	0.0207	0.12	0.00	2.60337	0.02029	0.0077778	-0.00344	-2.0633	0.00	0.00	0.00
210	0.0207	0.12	0.00	2.60337	0.02029	0.0077778	-0.00344	-2.0633	0.00	0.00	0.00
220	0.0207	0.12	0.00	2.60337	0.02029	0.0077778	-0.00344	-2.0633	0.00	0.00	0.00
230	0.0242	0.14	0.01	3.03727	0.02367	0.0077778	-0.00272	-1.6294	0.00	0.00	0.00
240	0.0242	0.14	0.01	3.03727	0.02367	0.0077778	-0.00272	-1.6294	0.00	0.00	0.00
250	0.0242	0.14	0.01	3.03727	0.02367	0.0077778	-0.00272	-1.6294	0.00	0.00	0.00
260	0.0242	0.14	0.01	3.03727	0.02367	0.0077778	-0.00272	-1.6294	0.00	0.00	0.00
270	0.0242	0.14	0.01	3.03727	0.02367	0.0077778	-0.00272	-1.6294	0.00	0.00	0.00
280	0.0242	0.14	0.01	3.03727	0.02367	0.0077778	-0.00272	-1.6294	0.00	0.00	0.00
290	0.0283	0.17	0.01	3.55794	0.02772	0.0077778	-0.00185	-1.1087	0.00	0.00	0.00
300	0.0283	0.17	0.01	3.55794	0.02772	0.0077778	-0.00185	-1.1087	0.00	0.00	0.00
310	0.0283	0.17	0.01	3.55794	0.02772	0.0077778	-0.00185	-1.1087	0.00	0.00	0.00
320	0.0283	0.17	0.01	3.55794	0.02772	0.0077778	-0.00185	-1.1087	0.00	0.00	0.00
330	0.0283	0.17	0.01	3.55794	0.02772	0.0077778	-0.00185	-1.1087	0.00	0.00	0.00
340	0.0283	0.17	0.01	3.55794	0.02772	0.0077778	-0.00185	-1.1087	0.00	0.00	0.00
350	0.0328	0.20	0.01	4.122	0.03212	0.0077778	-0.00091	-0.5447	0.00	0.00	0.00
360	0.0328	0.20	0.01	4.122	0.03212	0.0077778	-0.00091	-0.5447	0.00	0.00	0.00
370	0.0328	0.20	0.01	4.122	0.03212	0.0077778	-0.00091	-0.5447	0.00	0.00	0.00
380	0.0328	0.20	0.01	4.122	0.03212	0.0077778	-0.00091	-0.5447	0.00	0.00	0.00
390	0.0328	0.20	0.01	4.122	0.03212	0.0077778	-0.00091	-0.5447	0.00	0.00	0.00
400	0.0328	0.20	0.01	4.122	0.03212	0.0077778	-0.00091	-0.5447	0.00	0.00	0.00
410	0.0462	0.28	0.01	5.81419	0.04531	0.0077778	0.00191	1.1475	1.15	0.33	0.00

420	0.0462	0.28	0.01	5.81419	0.04531	0.0077778	0.00191	1.1475	2.30	0.66	0.00
430	0.0462	0.28	0.01	5.81419	0.04531	0.0077778	0.00191	1.1475	3.44	0.98	0.00
440	0.0621	0.37	0.01	7.81011	0.06086	0.0077778	0.00524	3.1434	6.59	1.88	0.00
450	0.0621	0.37	0.01	7.81011	0.06086	0.0077778	0.00524	3.1434	9.73	2.78	0.00
460	0.1173	0.70	0.02	14.7524	0.11495	0.0077778	0.01681	10.0858	19.82	5.66	0.00
470	0.1863	1.12	0.04	23.4303	0.18257	0.0077778	0.03127	18.7637	38.58	9.00	0.61
480	0.0932	0.56	0.02	11.7152	0.09129	0.0077778	0.01175	7.0485	45.63	9.00	1.21
490	0.0621	0.37	0.01	7.81011	0.06086	0.0077778	0.00524	3.1434	48.77	9.00	1.48
500	0.0462	0.28	0.01	5.81419	0.04531	0.0077778	0.00191	1.1475	49.92	9.00	1.58
510	0.0462	0.28	0.01	5.81419	0.04531	0.0077778	0.00191	1.1475	51.07	9.00	1.68
520	0.0462	0.28	0.01	5.81419	0.04531	0.0077778	0.00191	1.1475	52.21	9.00	1.78
530	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	51.37	9.00	1.70
540	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	50.52	9.00	1.63
550	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	49.67	9.00	1.56
560	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	48.82	9.00	1.48
570	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	47.97	9.00	1.41
580	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	47.12	9.00	1.34
590	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	46.27	9.00	1.27
600	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	45.43	9.00	1.19
610	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	44.58	9.00	1.12
620	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	43.73	9.00	1.05
630	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	42.88	9.00	0.98
640	0.0304	0.18	0.01	3.81828	0.02975	0.0077778	-0.00141	-0.8484	42.03	9.00	0.90
650	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	40.49	9.00	0.77
660	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	38.95	9.00	0.64
670	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	37.40	9.00	0.51
680	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	35.86	9.00	0.37
690	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	34.32	9.00	0.24
700	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	32.78	9.00	0.11
710	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	31.23	8.92	0.00
720	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	29.69	8.48	0.00
730	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	28.15	8.04	0.00
740	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	26.61	7.60	0.00
750	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	25.06	7.16	0.00
760	0.0248	0.15	0.01	3.12404	0.02434	0.0077778	-0.00257	-1.5426	23.52	6.72	0.00
770	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	21.33	6.09	0.00
780	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	19.13	5.47	0.00
790	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	16.94	4.84	0.00
800	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	14.75	4.21	0.00
810	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	12.55	3.59	0.00
820	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	10.36	2.96	0.00
830	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	8.17	2.33	0.00
840	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	5.97	1.71	0.00
850	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	3.78	1.08	0.00
860	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	1.59	0.45	0.00
870	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	0.00	0.00	0.00
880	0.0197	0.12	0.00	2.4732	0.01927	0.0077778	-0.00366	-2.1935	0.00	0.00	0.00
890	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
900	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
910	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
920	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
930	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
940	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
950	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
960	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
970	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
980	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
990	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
1000	0.0173	0.10	0.00	2.16948	0.01691	0.0077778	-0.00416	-2.4972	0.00	0.00	0.00
1010	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1020	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1030	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1040	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1050	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1060	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1070	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1080	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1090	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1100	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1110	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1120	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1130	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1140	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00

Maximum Inflow Rate (0.0391 cfs)

1150	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1160	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1170	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1180	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1190	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1200	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1210	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1220	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1230	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1240	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1250	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1260	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1270	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1280	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1290	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1300	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1310	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1320	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1330	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1340	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1350	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1360	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1370	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1380	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1390	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1400	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1410	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1420	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1430	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00
1440	0.0138	0.08	0.00	1.73558	0.01352	0.0077778	-0.00489	-2.9311	0.00	0.00	0.00

END OF STORM OCCURS IN 24 HOURS BUT THE INFILTRATION MAY CONTINUE FOR ANOTHER 6 HOURS…

1450	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1460	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1470	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1480	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1490	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1500	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1510	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1520	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1530	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1540	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1550	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1560	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1570	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1580	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1590	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1600	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1610	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1620	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1630	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1640	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1650	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1660	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1670	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1680	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1690	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1700	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1710	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1720	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1730	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1740	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1750	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1760	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1770	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1780	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1790	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1800	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00

THE FACILITY MUST HAVE INFILTRATED THE ENTIRE STORM IN 30 HOURS TO BE READY FOR THE NEXT ONE 36 HOURS PER CWS D&CS

Verify Runoff from New and Modified Imperrvious Area produced by 100-yr, 24-hour Storm Event Does Not Discharge Off Site

STORMWATER PLANTER SIZING CALCULATOR
24 Hour Storm, SBUH Type 1A Rainfall Distribution

USER INPUTS

24 Hour Rainfall Depth =	4.5	in	Enter 100-yr storm event
Drainage area =	1540	sf	Enter
Drainage Area Runoff Coefficient =	0.98		0.9 - 0.98 for imp surface
Native Soil Infiltration Rate =	2.4	in/hr	Enter Measured rate 7.2 in/ hr w/ Safety Factor or 3
Depth of Rock Trench Below Planter (optional) =	9	inches	Enter, optional Excludes 3" Choker Course
Void Ratio for RockTrench =	30%	%	Typically 30% for uniformly graded rock
4' Wide x 35' Long **Planter Area =**	140	sf	Adjust this until max ponding depth in raingarden is 6 inches and the facility is completely empty in 30 hours

CALCULATED DESIGN CRITERIA

Maximum Ponding Depth in Planter =	5.29	in	Calculated Does not discharge into overflow set 6" above pond bottom, therefore runoff from 100-year storm event does not leave site.
Depth of Water Left in Rock Trench After 30 Hours =	0.00	in	Calculated
Depth of Water Left in Planter After 30 Hours =	0.00	in	Calculated
Planter Area is Adequately Sized?	TRUE		Calculated, if FALSE, increase Planter Area and/or Depth of Rock Trench Below Planter until TRUE

OTHER CALCULATED VALUES

Peak Rainfall Intensity =	1.46	in/hr	Calculated from distribution
Ratio of Planter to Drainage Area =	0.091		Calculated (aka Sizing Factor)
Storage Capacity of Rock Trench=	31.50	cf	Calculated

SBUH HYDROGRAPH

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time (min)	Rainfall Depth (in)	Rainfall Intensity (in/hr)	Inflow Rate (cfs)	Inflow Volume (cf)	Runoff Depth (in)	Facility Infiltration Rate (cfs)	Inflow Rate - Facility Infiltration Rate (cfs)	Inflow Volume - Infiltration Volume (cf)	Cumulative Inflow Volume to be Stored (cf)	Rock Trench Ponding (if incl in design) (in)	Planter Ponding Depth (in)
0	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
10	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
20	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
30	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
40	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
50	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
60	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
70	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
80	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
90	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
100	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
110	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	0.00	0.00	0.00
120	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	0.00	0.00	0.00
130	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	0.00	0.00	0.00
140	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	0.00	0.00	0.00
150	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	0.00	0.00	0.00
160	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	0.00	0.00	0.00
170	0.0270	0.16	0.01	3.3957	0.02646	0.0077778	-0.00212	-1.2710	0.00	0.00	0.00
180	0.0270	0.16	0.01	3.3957	0.02646	0.0077778	-0.00212	-1.2710	0.00	0.00	0.00
190	0.0270	0.16	0.01	3.3957	0.02646	0.0077778	-0.00212	-1.2710	0.00	0.00	0.00
200	0.0270	0.16	0.01	3.3957	0.02646	0.0077778	-0.00212	-1.2710	0.00	0.00	0.00
210	0.0270	0.16	0.01	3.3957	0.02646	0.0077778	-0.00212	-1.2710	0.00	0.00	0.00
220	0.0270	0.16	0.01	3.3957	0.02646	0.0077778	-0.00212	-1.2710	0.00	0.00	0.00
230	0.0315	0.19	0.01	3.96165	0.03087	0.0077778	-0.00118	-0.7050	0.00	0.00	0.00
240	0.0315	0.19	0.01	3.96165	0.03087	0.0077778	-0.00118	-0.7050	0.00	0.00	0.00
250	0.0315	0.19	0.01	3.96165	0.03087	0.0077778	-0.00118	-0.7050	0.00	0.00	0.00
260	0.0315	0.19	0.01	3.96165	0.03087	0.0077778	-0.00118	-0.7050	0.00	0.00	0.00
270	0.0315	0.19	0.01	3.96165	0.03087	0.0077778	-0.00118	-0.7050	0.00	0.00	0.00
280	0.0315	0.19	0.01	3.96165	0.03087	0.0077778	-0.00118	-0.7050	0.00	0.00	0.00
290	0.0369	0.22	0.01	4.64079	0.03616	0.0077778	-0.00004	-0.0259	0.00	0.00	0.00
300	0.0369	0.22	0.01	4.64079	0.03616	0.0077778	-0.00004	-0.0259	0.00	0.00	0.00
310	0.0369	0.22	0.01	4.64079	0.03616	0.0077778	-0.00004	-0.0259	0.00	0.00	0.00
320	0.0369	0.22	0.01	4.64079	0.03616	0.0077778	-0.00004	-0.0259	0.00	0.00	0.00
330	0.0369	0.22	0.01	4.64079	0.03616	0.0077778	-0.00004	-0.0259	0.00	0.00	0.00
340	0.0369	0.22	0.01	4.64079	0.03616	0.0077778	-0.00004	-0.0259	0.00	0.00	0.00
350	0.0428	0.26	0.01	5.37653	0.0419	0.0077778	0.00118	0.7099	0.71	0.20	0.00
360	0.0428	0.26	0.01	5.37653	0.0419	0.0077778	0.00118	0.7099	1.42	0.41	0.00
370	0.0428	0.26	0.01	5.37653	0.0419	0.0077778	0.00118	0.7099	2.13	0.61	0.00
380	0.0428	0.26	0.01	5.37653	0.0419	0.0077778	0.00118	0.7099	2.84	0.81	0.00
390	0.0428	0.26	0.01	5.37653	0.0419	0.0077778	0.00118	0.7099	3.55	1.01	0.00
400	0.0428	0.26	0.01	5.37653	0.0419	0.0077778	0.00118	0.7099	4.26	1.22	0.00
410	0.0603	0.36	0.01	7.58373	0.05909	0.0077778	0.00486	2.9171	7.18	2.05	0.00

420	0.0603	0.36	0.01	7.58373	0.05909	0.0077778	0.00486	2.9171	10.09	2.88	0.00
430	0.0603	0.36	0.01	7.58373	0.05909	0.0077778	0.00486	2.9171	13.01	3.72	0.00
440	0.0810	0.49	0.02	10.1871	0.07938	0.0077778	0.00920	5.5204	18.53	5.29	0.00
450	0.0810	0.49	0.02	10.1871	0.07938	0.0077778	0.00920	5.5204	24.05	6.87	0.00
460	0.1530	0.92	0.03	19.2423	0.14994	0.0077778	0.02429	14.5756	38.63	9.00	0.61
470	0.2430	1.46	0.05	30.5613	0.23814	0.0077778	0.04316	25.8946	64.52	9.00	2.83
480	0.1215	0.73	0.03	15.2807	0.11907	0.0077778	0.01769	10.6140	75.14	9.00	3.74
490	0.0810	0.49	0.02	10.1871	0.07938	0.0077778	0.00920	5.5204	80.66	9.00	4.21
500	0.0603	0.36	0.01	7.58373	0.05909	0.0077778	0.00486	2.9171	83.57	9.00	4.46
510	0.0603	0.36	0.01	7.58373	0.05909	0.0077778	0.00486	2.9171	86.49	9.00	4.71
520	0.0603	0.36	0.01	7.58373	0.05909	0.0077778	0.00486	2.9171	89.41	9.00	4.96
530	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	89.72	9.00	4.99
540	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	90.03	9.00	5.02
550	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	90.35	9.00	5.04
560	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	90.66	9.00	5.07
570	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	90.98	9.00	5.10
580	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	91.29	9.00	5.12
590	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	91.60	9.00	5.15
600	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	91.92	9.00	5.18
610	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	92.23	9.00	5.21
620	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	92.54	9.00	5.23
630	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	92.86	9.00	5.26
640	0.0396	0.24	0.01	4.98036	0.03881	0.0077778	0.00052	0.3137	93.17	9.00	5.29
650	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	92.58	9.00	5.24
660	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	91.99	9.00	5.18
670	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	91.40	9.00	5.13
680	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	90.80	9.00	5.08
690	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	90.21	9.00	5.03
700	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	89.62	9.00	4.98
710	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	89.03	9.00	4.93
720	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	88.44	9.00	4.88
730	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	87.84	9.00	4.83
740	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	87.25	9.00	4.78
750	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	86.66	9.00	4.73
760	0.0324	0.19	0.01	4.07484	0.03175	0.0077778	-0.00099	-0.5918	86.07	9.00	4.68
770	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	84.63	9.00	4.55
780	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	83.19	9.00	4.43
790	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	81.75	9.00	4.31
800	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	80.31	9.00	4.18
810	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	78.87	9.00	4.06
820	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	77.42	9.00	3.94
830	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	75.98	9.00	3.81
840	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	74.54	9.00	3.69
850	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	73.10	9.00	3.57
860	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	71.66	9.00	3.44
870	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	70.22	9.00	3.32
880	0.0257	0.15	0.01	3.22592	0.02514	0.0077778	-0.00240	-1.4408	68.78	9.00	3.20
890	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	66.94	9.00	3.04
900	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	65.11	9.00	2.88
910	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	63.27	9.00	2.72
920	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	61.43	9.00	2.57
930	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	59.60	9.00	2.41
940	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	57.76	9.00	2.25
950	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	55.92	9.00	2.09
960	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	54.09	9.00	1.94
970	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	52.25	9.00	1.78
980	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	50.41	9.00	1.62
990	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	48.57	9.00	1.46
1000	0.0225	0.14	0.00	2.82975	0.02205	0.0077778	-0.00306	-1.8369	46.74	9.00	1.31
1010	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	44.33	9.00	1.10
1020	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	41.93	9.00	0.89
1030	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	39.53	9.00	0.69
1040	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	37.13	9.00	0.48
1050	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	34.72	9.00	0.28
1060	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	32.32	9.00	0.07
1070	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	29.92	8.55	0.00
1080	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	27.51	7.86	0.00
1090	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	25.11	7.17	0.00
1100	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	22.71	6.49	0.00
1110	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	20.31	5.80	0.00
1120	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	17.90	5.12	0.00
1130	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	15.50	4.43	0.00
1140	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	13.10	3.74	0.00

1150	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	10.69	3.06	0.00
1160	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	8.29	2.37	0.00
1170	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	5.89	1.68	0.00
1180	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	3.49	1.00	0.00
1190	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	1.08	0.31	0.00
1200	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1210	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1220	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1230	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1240	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1250	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1260	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1270	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1280	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1290	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1300	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1310	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1320	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1330	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1340	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1350	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1360	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1370	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1380	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1390	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1400	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1410	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1420	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1430	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00
1440	0.0180	0.11	0.00	2.2638	0.01764	0.0077778	-0.00400	-2.4029	0.00	0.00	0.00

END OF STORM OCCURS IN 24 HOURS BUT THE INFILTRATION MAY CONTINUE FOR ANOTHER 6 HOURS…

1450	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1460	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1470	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1480	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1490	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1500	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1510	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1520	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1530	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1540	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1550	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1560	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1570	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1580	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1590	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1600	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1610	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1620	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1630	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1640	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1650	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1660	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1670	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1680	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1690	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1700	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1710	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1720	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1730	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1740	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1750	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1760	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1770	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1780	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1790	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00
1800	0.0000	0.00	0.00	0	0	0.0077778	-0.00778	-4.6667	0.00	0.00	0.00

THE FACILITY MUST HAVE INFILTRATED THE ENTIRE STORM IN 30 HOURS TO BE READY FOR THE NEXT ONE

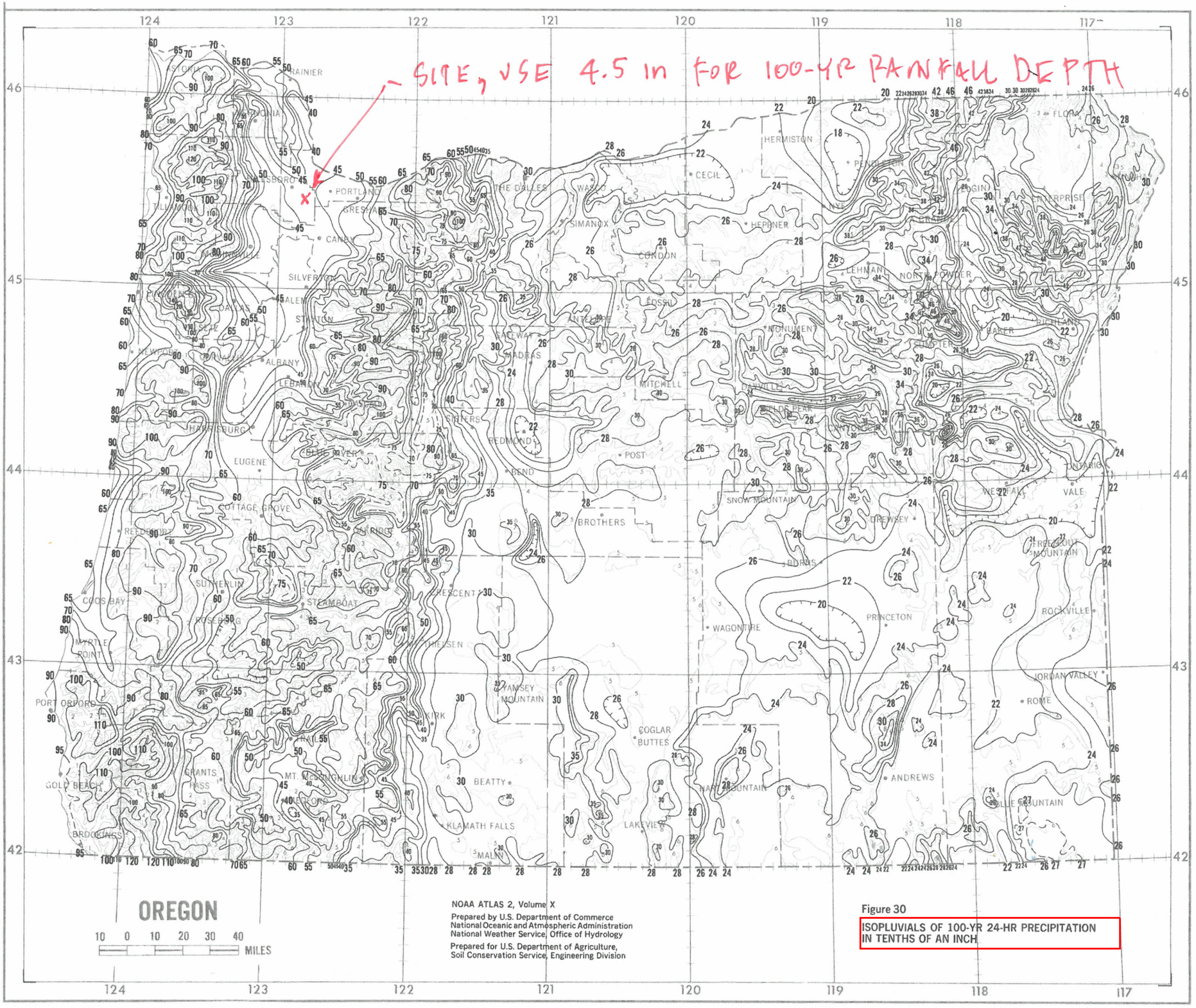


Figure 30

ISOPLUVIALS OF 100-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH