EXHIBIT I
SOILS

OAR 345-021-0010(1)(i)

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ATTACHMENTS

INTRODUCTION

Archway Solar Energy LLC (Applicant) proposes to construct the Archway Solar Energy Facility (Facility) in Lake County, Oregon, with generating capacity of up to 400 megawatts (MW). The Facility may also contain a battery energy component with storage capacity of up to 400 MW and discharge capacity of up to 1,600 megawatt-hours. This Exhibit I provides soils information as required by Oregon Administrative Rules (OAR) 345-021-0010(i).

OAR 345-021-0010(1)(i) *Information from reasonably available sources regarding soil conditions and uses in the analysis area, providing evidence to support findings by the Council as required by OAR 345-022-0022, including:*

Response: The evidence provided in this Exhibit demonstrates that the requirements specified in OAR 345-022-0022 have been met. The Facility is not expected to result in significant adverse impacts to soils in the analysis area, which is the same as the Facility boundary for this exhibit. The potential impacts from erosion are anticipated to be minimal and will occur primarily during construction. The impacts are addressed through erosion-control measures required by the 1200-C Construction Stormwater National Pollution Discharge Elimination System (NPDES) Permit. A 1200-C permit application is included as Attachment I-2 to this Exhibit. The application will be independently submitted to the Oregon Department of Environmental Quality (DEQ) under separate cover. Applicant anticipates a permit decision from DEQ before the start of Facility construction.

I.1 IDENTIFICATION AND DESCRIPTION OF SOIL TYPES

OAR 345-021-0010(1)(i)(A) *Identification and description of the major soil types in the analysis area.*

Response: A soils map showing the major soil units in the analysis area is provided in Attachment I-1; the following sections provide descriptions of the major soil units (NRCS 2020a; NRCS 2020b).

I.1.1 Flagstaff and Salhouse Soils

Flagstaff and Salhouse soils account for 76.5 percent (%) of the soils in the analysis area, are on lakebeds and formed in lucastrine deposits derived from volcanic ash. Flagstaff soils have low saturated hydraulic conductivity, a depth to water table of zero to four inches, occasional frequency of ponding and no frequency of flooding. Salhouse soils have moderately high saturated hydraulic conductivity, a depth to water table of more than 80 inches and no frequency of ponding or flooding.

I.1.2 Thornlake Soils

Thornlake soils account for 10.4 percent (%) of the soils in the analysis area and are also on lakebeds and formed in lucastrine deposits derived from volcanic ash. Thornlake soils have moderately high saturated hydraulic conductivity, a depth to water table of more than 80 inches and no frequency of ponding or flooding.

I.1.3 McConnel Soils

McConnel soils account for 6 percent (%) of the soils in the analysis area and formed in alluvium derived from mixed rocks with a component of loess and volcanic ash over lacustrine deposits or alluvium. McConnel soils have high saturated hydraulic conductivity, a depth to water table of more than 80 inches and no frequency of ponding or flooding.

The Custom Soils Report, attachment I-1 further explores the specific soil properties on the proposed site.

I.2 IDENTIFICATION AND DESCRIPTION OF LAND USES

OAR 345-021-0010(1)(i)(B) *Identification and description of current land uses in the analysis area, such as growing crops, that require or depend on productive soils.*

Response: The primary land use within the analysis area consists of private land, some of which is used for cattle grazing. None of the land within the analysis area is irrigated or used for growing crops. All the soil types within the analysis area have a Natural Resources Conservation Service (NRCS) land capability classification of 6 or 8 (NRCS, 2020a).

I.3 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON SOILS

OAR 345-021-0010(1)(i)(C) *Identification and assessment of significant potential adverse impact to soils from construction, operation and retirement of the facility, including, but not limited to, erosion and chemical factors such as salt deposition from cooling towers, land application of liquid effluent, and chemical spills.*

Response: As listed in Table C-1 of Exhibit C, construction of the Facility will result in a total disturbance of approximately 3,201 acres. The Facility will permanently disturb approximately 3,191 acres and unavoidable impacts to soils will result during operations from the footprint of structures and components. Temporarily disturbed acres will be restored following construction, and the permanently disturbed acres will be restored following retirement.

The following section discusses potential water and wind erosion impacts to site soil, and the limitations posed by the soils related to Facility construction, operation, and retirement activities, hazardous materials, and other soil limitations such as frost action and shrink-swell.

I.3.1 Water Erosion Impacts

The rate and magnitude of soil erosion by water are controlled by rainfall intensity and runoff, soil erodibility, and vegetation cover. Northern Lake County is in a portion of the state that has some of the highest rainfall intensity (Miller et al. 1973). Intense rainfall events may cause widespread and volumetrically significant erosion, especially in areas with soil types vulnerable to water erosion and/or where vegetation and soils are disturbed by construction, agriculture, or other activities.

Management practices and erosion control methods to prevent water erosion impacts are described in section I.5.

I.3.2 Wind Erosion Impacts

Wind can be a serious environmental and economic concern. It can cause soil erosion and crop damage. The soils within the analysis area could be subject to wind erosion, particularly when the vegetation is removed. Because of steady, relatively high wind speeds, and brief but intense rainfall events, areas of vegetation removal could potentially expose soils to accelerated water and wind erosion during construction until they are stabilized. Excavations for foundations, roads, and trenches could also temporarily expose the excavated spoils to wind and water erosion during construction. Mitigation measures to account for the high wind erosion (Fugitive Dust Control) are described in Section I.5.

I.3.3 Construction Impacts

Facility construction will require aggregate and construction of new or improved access roads and surfacing. Rock required for construction of Facility components will be obtained from one or more existing, permitted, commercially-producing quarries. Associated rock-crushing

activities will occur at the quarries before transporting to the site. Accordingly, no soil or rock will be disturbed to create new quarry sites.

Because the construction of roads, foundations, and other Facility components will be engineered, these components are subject to the requirements of a NPDES stormwater construction permit and other pertinent construction and operation permits and pollution control. In accordance with these regulations, the Applicant will implement an erosion and sediment control plan and erosion-control best management practices (BMPs) during Facility construction and operation. Attachment I-2 contains the NPDES permit application.

Construction will require the use of heavy equipment and haul trucks to deliver aggregates, concrete, water, and similar construction supplies. The repeated traffic of heavy machinery could cause localized soil compaction, which could result in temporary loss of agricultural productivity where the trucks are forced to leave existing access roads. Potential loss in agricultural productivity caused by compaction will be temporary and will be mitigated as described below.

I.3.4 Operations Impacts

Facility operations will have no impact on soil erosion. General Facility operation will be constrained to the access and service roads. Therefore, no ground disturbance is anticipated to occur during Facility operations. Depending on the effects of solar module dust and dirt on energy production (referred to as soiling), the solar modules will be washed. For the purpose of this analysis, it is conservatively assumed that they will be washed twice a year and require 250,000 gallons per wash, for a total of 0.5 million gallons per year. Washwater will be discharged by evaporation and seepage into the ground. If during Facility operation the Applicant identifies a need to use cleaning solutions, the Applicant will use only low volatile organic compound (VOC), biodegradable cleaning solutions.

I.3.5 Retirement Impacts

During retirement, potential erosion hazards will be similar to those occurring during construction. Soil will be exposed to accelerated soil erosion because of the lack of vegetation during the removal of solar arrays, underground cables, and roadways.

I.3.6 Hazardous Material Impacts

No significant impacts are expected to occur from chemical factors during construction, operation, or retirement. Only minimal amounts of chemicals, such as lubricating oils and cleaners for the turbines and pesticides for weed control, will be used at the Facility site. Chemicals will be stored according to applicable requirements and regulations to limit the risk of adverse effects related to chemical factors. The risk of a chemical spill is negligible and the impacts of any such spill would be limited, because of the small amounts of chemicals that will be transported to the Facility site. Exhibit G provides a discussion of precautions to be taken in handling hazardous materials, such as lubricating oils, and the measures to be taken in the event of a spill.

I.3.7 Other Soil Limitations

Frost action: Frost action refers to freezing and thawing of soil moisture. Frost action can damage roads, building, and other structures. To avoid damage from frost action these soils could potentially require mitigation measures (discussed below).

Shrink-Swell: Changes in soil moisture cause certain clay minerals in soils to either expand or contract. The amount and type of clay minerals in the soil influence the change in volume. Structures or roads built on shrinking or swelling soils could be damaged by the change in volume of the soil. Linear extensibility (shrink-swell potential) refers to the change in length of

an unconfined clod as its moisture content is decreased from a moist state to a dry state. The volume change is reported as percent change for the soil. The most common soils on the site have a low shrink-swell. Therefore, shrinking and swelling of these soils are not expected to impact the Facility.

Corrosion: Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Steel that intersects multiple soil boundaries or soil layers is more susceptible to corrosion than the steel entirely within one kind of soil or within one soil layer. The site design incorporates corrosion calculations into foundation galvanization; therefore, risk of corrosion is not expected to impact the Facility.

I.4 DESCRIPTION OF PROPOSED MITIGATION MEASURES

OAR 345-021-0010(1)(i)(D) *A description of any measures the applicant proposes to avoid or mitigate adverse impact to soils.*

Response: Direct permanent impacts to soils will occur as a result of Facility construction. Although permanent impacts are unavoidable, they will be minimized whenever possible. Reclamation measures will be implemented to restore the temporarily disturbed near-surface soils at the Facility. Construction of access roads, foundations, and other facilities will be regulated by an erosion and sediment control plan and a 1200-C Construction Stormwater NPDES Permit (see Attachment I-2) that will require BMPs to minimize possible impacts from erosion or other impacts to soils.

A summary of the BMPs provided in Attachment I-2 along with additional proposed mitigation measures is provided below. The mitigation measures will be implemented to minimize or avoid adverse impacts to soils during construction of the Facility and access roads. The measures may be upgraded or modified as needed to comply with applicable local, state, and federal erosion and sediment control regulations. The mitigation measures are as follows:

- **Clearing and Grading:** To the maximum extent practicable, clearing and grading will be phased to prevent exposed inactive areas from becoming a source of erosion. As grading progresses, temporary or permanent soil stabilization measures will be applied immediately on disturbed areas and for all roadways, including gravel roadways. Construction activities will avoid or minimize excavation and creation of bare ground during wet weather.
- **Protect Playa Areas:** Using fencing or other means, playas will be identified, marked, and protected for preservation.
- **Existing Vegetation:** To the extent practicable, existing vegetation will be preserved and open areas will be revegetated or placed with stable ground cover. When practicable, open areas will be revegetated or stabilized before and after grading or construction. Erosion and sediment control and perimeter sediment control measures will be in place before vegetation is disturbed and will remain in place and be maintained, repaired, and promptly implemented for the duration of construction.
- **Soil Stockpiles:** At the end of each workday, soil stockpiles will be stabilized or covered, or other BMPs will be implemented to prevent discharges to surface waters or conveyance systems leading to surface waters.
- **Silt Fencing:** Silt fencing will be installed at various locations throughout the Facility and will be used as perimeter control. The fencing will be installed around the perimeter of material stockpiles and the perimeter of construction laydown areas. The silt fencing and other erosion-control measures will remain in place until the disturbed areas are permanently

stabilized and the risk of erosion has been eliminated. Additional details regarding silt fencing construction and placement are provided in the 1200-C Construction Stormwater NPDES Permit (see Attachment I-2).

- **Fiber Rolls:** Fiber rolls may be installed to decrease the velocity of stormwater sheet flow. The rolls will be used along the downgradient edge of access roads adjacent to slopes or sensitive areas. Additional details regarding fiber roll construction and placement are provided in the 1200-C Construction Stormwater NPDES Permit (see Attachment I-2).
- **Temporary Stabilization (Mulching, Matting, Soil Binders, and Tackifiers):** These measures will be used for stabilization and during reseeding and revegetation of disturbed areas.
- **Stabilized Construction Entrance/Exit:** A stabilized construction entrance and exit will be installed at locations where soil (exposed, disturbed land) or newly constructed roads intersect existing paved roads.
- **Revegetation:** At the completion of land-disturbing activities, the site will be revegetated with an approved seed mix as necessary consistent with the Facility's *Revegetation and Noxious Weed Control Plan* (see Attachment P-3 to Exhibit P). The seed will be applied with mulch to protect the seeds as the grass establishes. Scarifying and reseeding of affected areas will occur after construction has been completed.
- **Pollutant Management:** Material, waste storage areas, and other nonstormwater controls will be established. During construction, source-control measures will be implemented to reduce the potential of chemical pollution to surface water or groundwater during construction. Chemical pollution could occur from a release of diesel fuel or lubricating oils, or from improper debris and waste handling. Fuels and oils will be stored in a dedicated area, and construction vehicles will be fueled and maintained only in dedicated areas. The handling, storage, and disposal of materials will be consistent with federal, state, and local ordinances, and in a manner that will not cause stormwater contamination.
- **Haul Truck Traffic:** Before land-disturbing activities begin, BMPs will be in place to prevent the tracking of sediment onto public or private roads such as using graveled (or paved) exits and parking areas, placing gravel on all unpaved roads onsite, or using an exit tire wash. Haul truck traffic will be limited to improved access roads and gravel-covered haul roads, limiting deep soil compaction and disturbance. The loads of the haul trucks and heavy equipment, and the resulting induced stress, will be distributed through the gravelly surfacing material, minimizing compaction of the native soils to an anticipated 6 inches or less. Mitigation efforts to reduce impacts from soil compaction will include scarifying and reseeding affected areas after construction is completed.
- **Geotechnical Investigation and Design:** Soil hazards that could impact facilities include shrinking and swelling of fine-grained soils, and frost action. Therefore, during the design phase of the Facility, a detailed geotechnical investigation and testing program will be conducted to evaluate the engineering properties of the soils and measure groundwater levels. The foundation types and pavement thickness for roads will be designed based on engineering properties of the soils. A limited geotechnical investigation was conducted by Terracon (2020) and describes construction techniques.
- **Frost Action:** Mitigation for frost action in surficial soils will be addressed by soil improvements, and if needed, over-excavation and replacement by nonfrost-susceptible soils, and drainage. Other geologic and seismic hazards are discussed and addressed in Exhibit H.

- **Fugitive Dust Abatement:** BMPs will be used to control fugitive dust in accordance with DEQ regulations. Water, soil-binding agents, or other dust control techniques will be implemented as needed to avoid wind-blown soil. For example, the Facility will minimize temporary and permanent impacts from fugitive dust by using measures including applying water to disturbed ground and roads during construction, implementing wheel wash and vehicle scrape for construction vehicles, imposing appropriate construction and operation speed limits on site roads, graveling or paving permanent roadways, and revegetation after construction, covering temporary stockpiles with fabric or other materials, using chemical dust suppressants and flocculating agents, minimizing the disrupted surface area, and rescheduling work around especially windy days.
- **Facility Retirement:** Retirement requirements will include strict implementation of erosion-control measures when soil is exposed to prevent erosion. In addition to revegetation requirements, erosion-control measures will include the use of silt fences, mulching, check dams, and other similar methods.

I.5 MONITORING PROGRAM

OAR 345-021-0010(1)(i)(E) *The applicant's proposed monitoring program, if any, for adverse impact to soils during construction and operation.*

Response: Erosion- and sediment-control measures will be inspected and maintained regularly as detailed in the erosion and sediment control plan and 1200-C Construction Stormwater NPDES Permit (see Attachment I-2 for NPDES permit application). The inspections will verify that the structural BMPs described in the plan are in good condition and are minimizing erosion. The inspections will also verify that the procedures used to prevent stormwater contamination from construction materials and petroleum products are effective.

As outlined in the erosion and sediment control plan, the following inspection and maintenance practices will be used to maintain erosion and sediment controls:

- The stabilized construction entrance will be inspected for sediment tracked on the road. Traffic will be directed to use the stabilized entrance when leaving the site.
- Sediment barrier fences (silt fences) will be inspected, and accumulated sediments will be removed when they reach one-third the height of the silt fence. Any areas that develop rills or washouts along the silt fence will be repaired and reanchored to avoid concentrated flows.
- A maintenance inspection report that details corrective actions will be made after each inspection.
- An employee-training program will be developed and implemented to educate employees about the requirements of the erosion and sediment control plan.

The attached erosion control plan was prepared to an earlier version of the Facility layout. The current Facility layout as shown in Exhibit B will receive an updated Erosion Control Plan. The BMPs and mitigation methods will be edited as needed to match the updated Facility layout. The update of the Erosion Control Plan will not change the fact that the facility construction, operation, and eventual retirement will not cause any significant adverse impacts to soils.

I.6 SUMMARY

The evidence presented in this Exhibit demonstrates that Facility construction, operation, and retirement will not cause significant adverse impacts to soils. Construction of roads, photovoltaic arrays, and other Facility components will be regulated by an erosion and sediment control plan and a 1200-C Construction Stormwater NPDES Permit that will require BMPs to

minimize possible impacts to soils from wind and water erosion. Implementation of the mitigation measures described in this Exhibit will further minimize that potential. In addition, the rigorous reclamation measures described in this Exhibit will be instituted to restore the temporarily disturbed near-surface soils at the Facility. On the basis of this evidence, the Council may find that the design, construction, operation, and retirement of the Facility will not likely result in significant adverse impacts to soils.

I.7 REFERENCES

NRCS. 2020a. *Custom Soil Resource Report for Lake County, Oregon, Northern Part, Parts of Lake and Klamath Counties*. September 30.

NRCS. 2020b. *Official Soil Series Descriptions*. Soil Survey Staff. United States Department of Agriculture NRCS, Lincoln, Nebraska. Accessed September 2020. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053587.

Terracon Consultants, Inc. (Terracon). 2020. *Preliminary Geotechnical Engineering Report, Archway Solar, Christmas Valley, Lake County, Oregon*. Prepared for Invenergy Solar Development, LLC, Chicago, Illinois. February 28.

Attachment I-1
Custom Soil Report

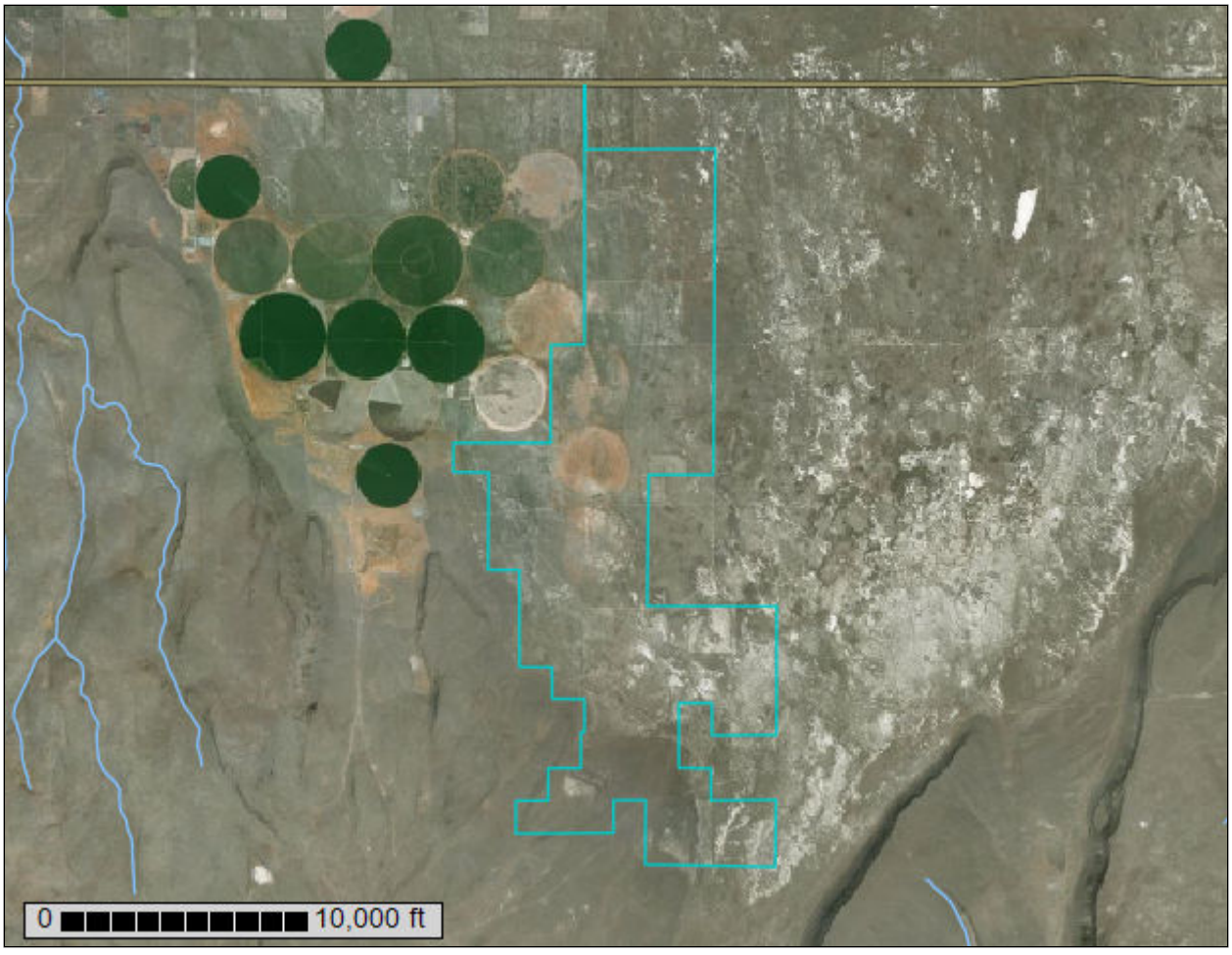
United States Department of Agriculture

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 Lake County, Oregon, Northern Part, Parts of Lake and Klamath Counties



September 30, 2020

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.

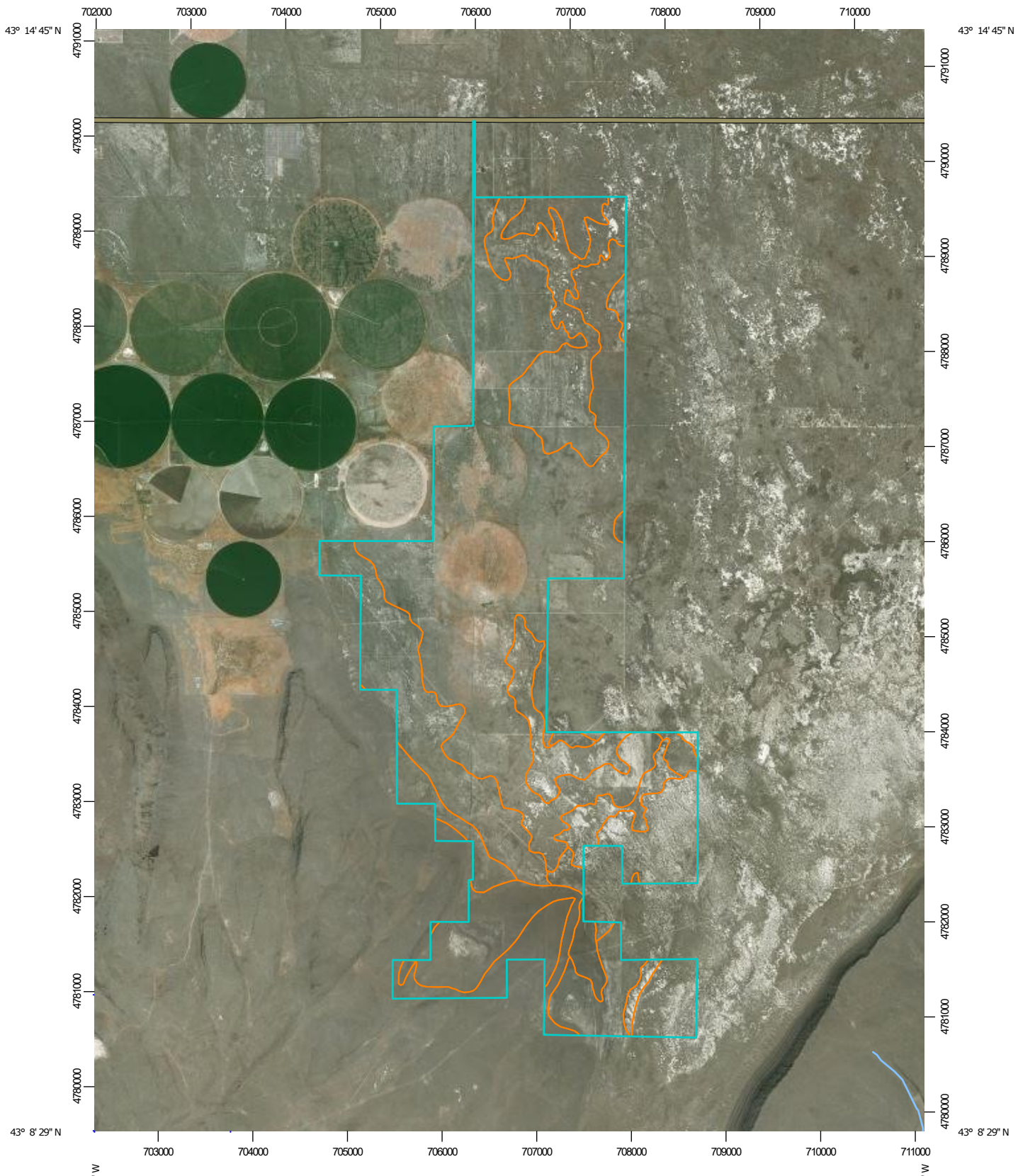
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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: 1:56,500 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 2500 5000 10000 15000

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 1:24,000.

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: Lake County, Oregon, Northern Part, Parts of Lake and Klamath Counties
Survey Area Data: Version 18, Sep 14, 2020

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

Date(s) aerial images were photographed: Nov 6, 2015—Aug 23, 2016

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
304	Felcher-Rock outcrop complex, 15 to 45 percent south slopes	7.6	0.2%
313	Flagstaff complex, 0 to 1 percent slopes	2,316.1	51.7%
314	Flagstaff-Playas complex, 0 to 1 percent slopes	685.2	15.3%
315	Flagstaff-Salhouse complex, 0 to 20 percent slopes	172.2	3.8%
317	Fort Rock ashy sandy loam, 0 to 2 percent slopes	146.5	3.3%
435	McConnel gravelly sandy loam, sodic substratum, 0 to 5 percent slopes	266.8	6.0%
520	Playas	13.8	0.3%
530	Rabbithills gravelly loamy sand, 0 to 5 percent slopes	146.0	3.3%
572	Salhouse ashy loamy fine sand, strongly alkaline, 2 to 20 percent slopes	256.0	5.7%
617	Suckerflat-Rock outcrop complex, 8 to 15 percent slopes	0.1	0.0%
628	Thornlake complex, 0 to 2 percent slopes	467.6	10.4%
Totals for Area of Interest		**4,477.9**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion

of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

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

Lake County, Oregon, Northern Part, Parts of Lake and Klamath Counties

304—Felcher-Rock outcrop complex, 15 to 45 percent south slopes

Map Unit Setting

National map unit symbol: 1tqd3
Elevation: 4,290 to 5,740 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 80 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Felcher, south, and similar soils: 70 percent
Rock outcrop: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Felcher, South

Setting

Landform: Hillslopes, mountain slopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Mountainflank, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from volcanic rock such as welded tuff or basalt

Typical profile

A - 0 to 4 inches: very cobbly sandy loam
Bw - 4 to 14 inches: very cobbly loam
Bk - 14 to 27 inches: extremely stony sandy loam
R - 27 to 37 inches: bedrock

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 10.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R023XY300OR - SOUTH SLOPES 10-12 PZ

Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Volcanic rock

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

313—Flagstaff complex, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1tqdd
Elevation: 4,300 to 4,350 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 50 to 80 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Flagstaff, ashy very fine sandy loam surface, and similar soils: 50 percent
Flagstaff, ashy sandy loam surface, and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Flagstaff, Ashy Very Fine Sandy Loam Surface

Setting

Landform: Lakebeds
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits derived from volcanic ash

Typical profile

AEn - 0 to 4 inches: ashy very fine sandy loam
Bn - 4 to 12 inches: ashy silty clay loam
BCknz - 12 to 16 inches: paragravelly ashy silt loam
Cknqz - 16 to 43 inches: extremely parachannery ashy silt loam
Ckq - 43 to 69 inches: very parachannery ashy silty clay loam
Cz - 69 to 80 inches: paragravelly ashy loamy fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 12 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Strongly saline (30.0 to 42.0 mmhos/cm)
Sodium adsorption ratio, maximum: 700.0
Available water capacity: Very high (about 18.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R024XY013OR - LOW SODIC TERRACE 6-10 PZ
Hydric soil rating: No

Description of Flagstaff, Ashy Sandy Loam Surface

Setting

Landform: Lakebeds
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits derived from volcanic ash

Typical profile

AEn - 0 to 4 inches: ashy sandy loam
Bn - 4 to 12 inches: ashy silty clay loam
BCknz - 12 to 16 inches: paragravelly ashy silt loam
Cknqz - 16 to 43 inches: extremely parachannery ashy silt loam
Ckq - 43 to 69 inches: very parachannery ashy silty clay loam
Cz - 69 to 80 inches: paragravelly ashy loamy fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 12 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Strongly saline (30.0 to 42.0 mmhos/cm)
Sodium adsorption ratio, maximum: 700.0
Available water capacity: Very high (about 18.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R024XY625OR - ALKALINE BASIN 8-10 PZ
Hydric soil rating: No

314—Flagstaff-Playas complex, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1tqdf
Elevation: 4,300 to 4,320 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 50 to 80 days
Farmland classification: Not prime farmland

Map Unit Composition

Flagstaff and similar soils: 50 percent
Playas: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Flagstaff

Setting

Landform: Lakebeds
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits derived from volcanic ash

Typical profile

AEn - 0 to 4 inches: ashy silt loam
Bn - 4 to 12 inches: ashy silty clay loam
BCknz - 12 to 16 inches: paragravelly ashy silt loam
Cknqz - 16 to 43 inches: extremely parachannery ashy silt loam
Ckq - 43 to 69 inches: very parachannery ashy silty clay loam
Cz - 69 to 80 inches: paragravelly ashy loamy fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 12 percent

Gypsum, maximum content: 2 percent
Maximum salinity: Strongly saline (30.0 to 42.0 mmhos/cm)
Sodium adsorption ratio, maximum: 700.0
Available water capacity: Very high (about 18.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R024XY013OR - LOW SODIC TERRACE 6-10 PZ
Hydric soil rating: No

Description of Playas

Setting

Landform: Playas
Parent material: Volcanic ash and lacustrine deposits derived from mixed volcanic rock

Typical profile

C1 - 0 to 6 inches: stratified clay to silty clay loam
C2 - 6 to 60 inches: stratified clay to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 inches
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to strongly saline (1.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum: 100.0
Available water capacity: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

315—Flagstaff-Salhouse complex, 0 to 20 percent slopes

Map Unit Setting

National map unit symbol: 1tqdg
Elevation: 4,300 to 4,450 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 50 to 80 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Flagstaff and similar soils: 45 percent
Salhouse and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Flagstaff

Setting

Landform: Lakebeds
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits derived from volcanic ash

Typical profile

AEn - 0 to 4 inches: ashy very fine sandy loam
Bn - 4 to 12 inches: ashy silty clay loam
BCknz - 12 to 16 inches: paragravelly ashy silt loam
Cknqz - 16 to 43 inches: extremely parachannery ashy silt loam
Ckq - 43 to 69 inches: very parachannery ashy silty clay loam
Cz - 69 to 80 inches: paragravelly ashy loamy fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 12 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Strongly saline (30.0 to 42.0 mmhos/cm)
Sodium adsorption ratio, maximum: 700.0
Available water capacity: Very high (about 18.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R024XY013OR - LOW SODIC TERRACE 6-10 PZ
Hydric soil rating: No

Description of Salhouse

Setting

Landform: Lakebeds, beach ridges
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear, concave, convex
Across-slope shape: Linear, convex
Parent material: Eolian deposits derived from volcanic ash over lacustrine deposits derived from volcanic ash and mixed volcanic rock

Typical profile

A - 0 to 5 inches: ashy loamy fine sand
C - 5 to 42 inches: ashy loamy sand
Bwb - 42 to 61 inches: ashy silt loam

Properties and qualities

Slope: 0 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 30.0
Available water capacity: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R024XY005OR - SODIC DUNES
Hydric soil rating: No

317—Fort Rock ashy sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1tqdj
Elevation: 4,300 to 4,500 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 50 to 80 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Fort rock and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fort Rock

Setting

Landform: Lake terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash over lacustrine deposits derived from mixed volcanic rock such as basalt or tuff

Typical profile

A - 0 to 5 inches: ashy sandy loam
BA - 5 to 16 inches: gravelly ashy sandy loam
Bw1 - 16 to 28 inches: ashy loamy sand
2Bw2 - 28 to 35 inches: very gravelly loamy sand
2Bq - 35 to 39 inches: very gravelly sandy loam
3C - 39 to 60 inches: extremely gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 25 to 35 inches to strongly contrasting textural stratification
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water capacity: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: R024XY609OR - DROUGHTY BOTTOM 6-10 PZ
Hydric soil rating: No

435—McConnel gravelly sandy loam, sodic substratum, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1tqj5
Elevation: 4,260 to 4,600 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 80 to 100 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Mcconnel, sodic substratum, and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mcconnel, Sodic Substratum

Setting

Landform: Beach terraces, lake terraces
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and eolian deposits over lacustrine deposits and gravelly alluvium derived from mixed volcanic rock

Typical profile

A - 0 to 1 inches: gravelly sandy loam
Bw - 1 to 12 inches: sandy loam
2BC - 12 to 18 inches: gravelly sandy loam
2Bk - 18 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 12.0 mmhos/cm)
Sodium adsorption ratio, maximum: 15.0
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R024XY013OR - LOW SODIC TERRACE 6-10 PZ
Hydric soil rating: No

520—Playas

Map Unit Setting

National map unit symbol: 1tqls
Elevation: 4,300 to 5,990 feet
Mean annual precipitation: 8 to 20 inches
Mean annual air temperature: 43 to 47 degrees F
Frost-free period: 50 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Playas: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Playas

Setting

Landform: Playas

Parent material: Volcanic ash and lacustrine deposits derived from mixed volcanic rock

Typical profile

C1 - 0 to 6 inches: stratified clay to silty clay loam
C2 - 6 to 60 inches: stratified clay to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 inches
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to strongly saline (1.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum: 100.0
Available water capacity: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

530—Rabbithills gravelly loamy sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1tqm3
Elevation: 4,320 to 4,860 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 80 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Rabbithills

Setting

Landform: Lake terraces, fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and lacustrine deposits derived from mixed volcanic rock

Typical profile

A1 - 0 to 3 inches: gravelly loamy sand
A2 - 3 to 12 inches: sandy loam
Bkqm - 12 to 22 inches: cemented fine sandy loam
2BCk - 22 to 40 inches: loam
2Cr - 40 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 12 to 16 inches to duripan; 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 10.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R024XY017OR - SHALLOW LOAM 8-10 PZ
Hydric soil rating: No

572—Salhouse ashy loamy fine sand, strongly alkaline, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: 1tqng
Elevation: 4,290 to 4,400 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 50 to 80 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Salhouse, strongly alkaline, and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Salhouse, Strongly Alkaline

Setting

Landform: Lakebeds, beach ridges
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear, concave, convex
Across-slope shape: Linear, convex
Parent material: Eolian deposits derived from volcanic ash over lacustrine deposits derived from volcanic ash and mixed volcanic rock

Typical profile

A - 0 to 5 inches: ashy loamy fine sand
C - 5 to 42 inches: ashy loamy sand

Bwb - 42 to 61 inches: ashy silt loam

Properties and qualities

Slope: 2 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 30.0
Available water capacity: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R024XY005OR - SODIC DUNES
Hydric soil rating: No

617—Suckerflat-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1tqpx
Elevation: 4,320 to 4,650 feet
Mean annual precipitation: 8 to 11 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 50 to 80 days
Farmland classification: Not prime farmland

Map Unit Composition

Suckerflat and similar soils: 50 percent
Rock outcrop: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Suckerflat

Setting

Landform: Lava plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and slope alluvium or colluvium derived from volcanic rock such as basalt or tuff-breccia

Typical profile

A - 0 to 8 inches: ashy loamy sand

Bw - 8 to 18 inches: cobbly ashy loam
2R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R023XY608OR - DROUGHTY PUMICE PLAINS 8-11 PZ
Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Volcanic rock

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

628—Thornlake complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1tqq8
Elevation: 4,280 to 4,400 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 50 to 80 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Thornlake, strongly alkaline, and similar soils: 45 percent

Thornlake, moderately alkaline, and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Thornlake, Strongly Alkaline

Setting

Landform: Lakebeds
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits derived from volcanic ash

Typical profile

A - 0 to 7 inches: ashy sandy loam
Bn - 7 to 25 inches: ashy loam
Bkn - 25 to 61 inches: ashy sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 9 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 80.0
Available water capacity: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R024XY625OR - ALKALINE BASIN 8-10 PZ
Hydric soil rating: No

Description of Thornlake, Moderately Alkaline

Setting

Landform: Lakebeds
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits derived from volcanic ash

Typical profile

A - 0 to 7 inches: ashy silt loam
Bn - 7 to 25 inches: ashy loam
Bkn - 25 to 61 inches: ashy sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 9 percent
Maximum salinity: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 80.0
Available water capacity: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R024XY009OR - DRY BASIN
Hydric soil rating: No

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Attachment I-2

1200-C Construction Stormwater NPDES Permit Application With Erosion And Sediment Control Plan

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

APPLICATION FOR NEW NPDES GENERAL PERMIT 1200-C

Instructions for Completion of 1200-C Construction Stormwater Application: For stormwater discharges to surface waters from construction activities, disturbing one acre or more that do not meet automatic coverage requirements (see page 3 for additional information).

A. PROJECT INFORMATION

1. Enter the legal name of the applicant. This must be the legal Oregon name (i.e., Acme Products, Inc.) or the legal representative of the company if it operates under an assumed business name (i.e., John Smith, dba Acme Products). The name must be a legal, active name registered with the Oregon Department of Commerce, Corporation Division (503) 378-4752, (http://egov.sos.state.or.us/br/pkg_web_name_srch_inq.login), unless otherwise exempted by their regulations. The permit will be issued to the legal name of the applicant.
    - Permit coverage may be transferred from one party to another. For example, a developer may apply for a permit and then transfer the permit to a contractor. Transfer forms: http://www.oregon.gov/deq/wq/wqpermits/Pages/Forms.aspx
2. Provide invoice contact information for billing of DEQ annual permit fee if different from the applicant in #1 above. This is the person or entity legally responsible for payment of the annual fee invoice. This must be the same company as the applicant. not a third party independent of the applicant.
3. Provide contact information for the Architect or Consulting Engineer who designed the Erosion and Sediment Control Plan (ESCP) and Dewatering Plan, if applicable.
4. Provide information on the Erosion and Sediment Control Inspector. This is not a DEQ or DEQ Agent inspector; this is an inspector employed by the applicant. As of January 1, 2017, for project 5 acres or more include inspectors' qualification program, certification number and expiration date.
5. Provide the common name of the project (for example, the name of the subdivision), the location of the site, and, if available, a street address.
6. Check the box that best describes the nature of the construction activity. If "other" is selected, describe the use and include a Standard Industrial Classification Code (visit http://www.osha.gov/pls/imis/sicsearch.html for codes). For projects that have submitted a joint permit application, please provide the US Army Corps of Engineers assigned number.
7. Enter latitude and longitude for the approximate center of the site, to the nearest 15 seconds. Latitude and longitude can be obtained from DEQ's location finder web site at http://deqapp1/website/lit/data.asp. To get the longitude and latitude to appear you can also zoom in and re-center until you find the area. You may want to turn off DEQ interests to eliminate the yellow dots and you may want to turn on the Aerial Photos to help you locate the site (note that the aerial photos are over ten years old). The latitude and longitude will be indicated on the left side of the page once you have checked the locate place at the top of the page and clicked on a location.
8. If known, specify approximate start date. Provide information on the project size as indicated (based on the total project and not just a single phase).
9. For projects that anticipate dewatering or the need for active treatment system, additional details of BMPs and an operation and maintenance plan is required. This includes a plan review fee (Table 70H) for treatment of contaminants beyond sediment. Fee table
10. Indicate the name(s) of the receiving water(s) (i.e., indicate where stormwater runoff during construction will flow). Request information from local authority or other resource to determine the name of the receiving waterbody. Your receiving water may be a lake, stream, river, wetland or other waterbody, and may or may not be located adjacent to the site. Your stormwater may discharge directly to the receiving water or indirectly via a storm sewer system, an open drain or ditch, or other conveyance structure. Do NOT list a man-made conveyance, such as a storm sewer system, as your receiving water. If you discharge to an irrigation channel or ditch you must also indicate the owner or operator of the irrigation channel or ditch. Indicate the first natural receiving water your stormwater discharge enters.

    For example, if your discharge enters a storm sewer system, that empties into Trout Creek, which flows into Pine River, your receiving water is Trout Creek, because it is the first natural waterbody your discharge will reach. Similarly, a discharge into a ditch that feeds Spring Creek should be identified as "Spring Creek" since the ditch is a manmade conveyance. If you discharge into a municipal separate storm sewer system (MS4), you must identify the waterbody into which that portion of the storm sewer discharges. That information should be readily available from the operator of the MS4.

11. Indicate whether stormwater runoff during construction will discharge directly to or through a storm sewer or drainage system that discharges to a Total Maximum Daily Load (TMDL) **or** 303(d) listed waterbody for turbidity or sedimentation. To make this determination, the following tools are available on DEQ's website:
    - WQ Assessment page: http://www.deq.state.or.us/wq/assessment/rpt2012/search.asp to use scroll down to search criteria: waterbody and listing status Category 5 (303d) and Category 4a (TMDL approved).

B. SIGNATURE OF LEGALLY AUTHORIZED REPRESENTATIVE

DEFINITION OF LEGALLY AUTHORIZED REPRESENTATIVE:

Please also provide the information requested in brackets *[ ]*

- **Corporation** - president, secretary, treasurer, vice-president, or any person who performs principal business functions; or a manager of one or more facilities that is authorized in accordance to corporate procedure to sign such documents.
- **Partnership** - General partner *[list of general partners, their addresses, and telephone numbers]*.
- **Sole Proprietorship** - Owner(s) *[each owner must sign the application]*.
- **City, County, State, Federal, or other Public Facility** - Principal executive officer or ranking elected official.
- **Limited Liability Company** - Member *[articles of organization]*.
- **Trusts –** Acting trustee *[list of trustees, their addresses, and telephone numbers]*.

(please see 40 CFR §122.22 for more detail, if needed)

APPLICATION AND FEE SUBMITTAL

To authorize permit registration, the following must be completed and submitted to the appropriate DEQ regional office or DEQ Agent

- ☐ DEQ application form signed by the Legally Authorized Representative and meeting the signature requirements above.
- ☐ DEQ LUCS and associated Findings.
- ☐ Stormwater Erosion and Sediment Control Plan Narrative, if applicable.
- ☐ Dewatering and/or Treatment Plan, if applicable.
- ☐ Stormwater Erosion and Sediment Control Plan Drawings; full-sized hard copy and electronic file.
- ☐ Applicable permit fee. Appropriate fees are available at http://www.oregon.gov/deq/Rulemaking%20Docs/340-045-0075WQFeeTables.pdf. All stormwater permits charge an application fee and an annual fee upon registration. DEQ will invoice the annual fee amount if your project coverage extends more than a year. **Please note:** if submitting a dewatering or active treatment O&M Plan to address contaminants beyond sediment, a disposal system plan review fee may be charged as indicated in Table 70H.

APPLICATION AND FEE SUBMITTAL

Submit this application, Narrative Parts I, II & III (if applicable), LUCS, Erosion and Sediment Control Plan (full-sized hard copies and electronic copy), Dewatering and/or Treatment Plan and the applicable fee to the appropriate DEQ regional office or DEQ Agent listed below. Contact the appropriate DEQ regional office or DEQ Agent for the best way to submit the electronic version of the ESCP.

AGENTS AND REGIONAL OFFICES CONTACTS

City of Eugene 99 W. 10th Avenue Eugene, OR 97401 541-682-2706	**City of Troutdale** 342 SW 4th Street Troutdale, OR 97060 503-674-3300
Clean Water Services 2550 SW Hillsboro Highway Hillsboro, OR 97123 503-681-5101 *Includes Banks, Beaverton, Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, North Plains, Sherwood, Tigard, Tualatin, and portions of Washington Co.*	**Rogue Valley Sewer Services** 138 West Vilas Road, PO Box 3130 Central Point, OR 97502 541-664-6300

DEQ Northwest Region	DEQ Western Region		DEQ Eastern Region		
700 Lloyd Building at 700 NE Multnomah St., Suite #600, Portland, OR 97232 503-229-5263 or 1-800-452-4011	165 East 7th Avenue, Suite 100 Eugene, OR 97401 541-686-7930 or 1-800-844-8467		800 SE Emigrant Avenue, Suite 330 Pendleton, OR 97801 541-278-4605 or 1-800-304-3513		
Clackamas	Benton	Lane	Baker	Hood River	Sherman
Clatsop	Coos	Lincoln	Crook	Jefferson	Umatilla
Columbia	Curry	Linn	Deschutes	Klamath	Union
Multnomah	Douglas	Marion	Gilliam	Lake	Wallowa
Tillamook	Jackson	Polk	Grant	Malheur	Wasco
Washington	Josephine	Yamhill	Harney	Marrow	Wheeler

DEQ USE ONLY

File #:

Application #:

LLID/RM:

River Mile:

Legal Name Confirmed: ☐

Notes:

State of Oregon Department of Environmental Quality

DEPARTMENT Of ENVIRONMENTAL QUALITY

APPLICATION FOR NEW NPDES GENERAL PERMIT 1200-C

For stormwater discharges to surface waters from construction activities disturbing one acre or more that do not meet automatic coverage requirements.*

DEQ USE ONLY

Date Received:

Amount: $

Check #:

Check Name:

Deposit #:

Receipt #:

Notes:

*A project *may* be eligible for "automatic coverage" under NPDES general permit 1200-CN if stormwater *does not* discharge to a waterbody with a TMDL or 303(d) listing for sediment or turbidity *and* it meets one of the following criteria (see 1200-CN at http://www.oregon.gov/deq/FilterPermitsDocs/1200cnPermit.pdf:

1) Disturbs less than one acre and is located in Gresham, Troutdale, or Wood Village.
2) Disturbs less than five acres and is located in Albany, Corvallis, Eugene, Milwaukie, Multnomah Co. (unincorporated areas), Springfield, West Linn, or Wilsonville.
3) Disturbs less than five acres and is within the jurisdictions of Clackamas Co. Water Environment Services [Gladstone, areas within Clackamas Co. Service Dist. #1 (excluding Happy Valley), and areas within the Surface Water Management Agency of Clackamas Co. (including Rivergrove)], Clean Water Services (Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard, Tualatin, and Washington Co. within Urban Growth Boundary), or Rogue Valley Sewer Services.

A. PROJECT INFORMATION

1. Archway Solar Energy LLC
Applicant (entity legally responsible for permit)

Contact Name (if different from applicant)

1 S Wacker Drive, Suite 1800
Address

Chicago | Illinois | 60606
City | State | Zip

503-964-8900 | lminer@invenergy.com
Telephone | E-Mail Address

2. Invoicing information (person or entity legally responsible for payment of annual fee invoice; not a third party independent of the applicant)

Invoice Contact Name (if different from applicant)

Address

City | State | Zip

Telephone | E-Mail Address

3. RRC Power & Energy, LLC
Architect/Engineering Firm (Erosion & Sediment Control Plan)

Eric Thornbrew
Project Manager

480-246-4132 | EricThornbrew@RRCCompanies.com
Telephone | E-Mail Address

4. Applicant's Designated Erosion and Sediment Control Inspector

Company Name

Telephone | E-Mail Address

Qualification program, certification number and expiration date

5. Archway Solar Energy Facility
Name of Project

Christmas Valley Hwy and 3 Mile Road
Address or Cross Street

Christmas Valley | Oregon | 97641
City | State | Zip

Lake County
County

6. Nature of Construction Activity
- ☐ Single Family (SIC Code 1521)
- ☐ Multi-Family Residential (SIC Code 1522)
- ☐ Commercial (SIC Code 1542)
- ☐ Industrial (SIC Code 1541)
- ☐ Highway (SIC Code 1611)
- ☐ Restoration (SIC Code 1629)
- ☐ Utilities (SIC Code 1623): _____
- ■ Other (SIC Code required): 4911 Electric Power Generation

Army Corps No. (if any): _____

7. Approximate location of center of site

Latitude: 43.23722 N Longitude: 120.4628 W

For assistance: DEQ Location Improvement Tool at: http://deqapp1/website/lit/data.asp

8. Approximate start date: January 1, 2022

Project Size
Total Site Acreage (acres): 4913

Total Disturbed Area (acres): 2380

Total Number of Lots: 1

9. Is there soil or groundwater contamination located within the site boundary? ☐ YES ■ NO

Will you be dewatering during construction (plan review fee may apply)? ☐ YES ■ NO

Depth to groundwater: > 20ft Data Source: Soil Borings

10. Receiving waterbody - Must identify final discharge location of construction stormwater flows.
- ☐ Waters of the State (name or description):
- ☐ Municipal storm sewer or drainage system (include downstream receiving waterbody):
- ☐ Ditch (include downstream receiving waterbody):
- ☐ Irrigation channel or ditch (include owner or operator):
- ☐ Infiltration device(s) (construction stormwater discharge to underground injection control/drywell is prohibited)
- ■ Other: The site drains north to an undeveloped area adjacent to the Christmas Valley Sand Dunes

11. Stormwater runoff during construction discharges directly to or through a storm sewer or drainage system that discharges to a waterbody with a Total Maximum Daily Load (TMDL) **or** 303(d) listing for turbidity or sedimentation? ☐ YES ■ NO

***For assistance: DEQ assessment database page at* http://www.deq.state.or.us/wq/assessment/rpt2012/search.asp

B. SIGNATURE OF LEGALLY AUTHORIZED REPRESENTATIVE

The legally authorized representative *must* sign the application (see instructions – Section C).

I hereby certify that the information contained in this application is true and correct to the best of my knowledge and belief. In addition, I agree to pay all permit fees required by Oregon Administrative Rules 340-045. This includes a compliance determination fee invoiced annually by DEQ to maintain the permit.

Name of Legally Authorized Representative (Type or Print) | **Title**

Signature of Legally Authorized Representative | **Date**